



The Space Race Continues

The Evolution of Space Tourism from Novelty to Opportunity

Matthew D. Melville, Vice President

Shira Amrany, Consulting and Valuation Analyst

HVS GLOBAL HOSPITALITY SERVICES

369 Willis Avenue

Mineola, NY 11501

USA

Tel: +1 516 248-8828

Fax: +1 516 742-3059

June 2009

NORTH AMERICA - Atlanta | Boston | Boulder | Chicago | Dallas | Denver | Mexico City | Miami | New York | Newport, RI | San Francisco | Toronto | Vancouver | Washington, D.C. | EUROPE - Athens | London | Madrid | Moscow | ASIA - Beijing | Hong Kong | Mumbai | New Delhi | Shanghai | Singapore | SOUTH AMERICA - Buenos Aires | São Paulo | MIDDLE EAST - Dubai

At a space business forum in June 2008, Dr. George C. Nield, Associate Administrator for Commercial Space Transportation at the Federal Aviation Administration (FAA), addressed the future of commercial space travel: “There is tangible work underway by a number of companies aiming for space, partly because of their dreams, but primarily because they are confident it can be done by the private sector and it can be done at a profit.” Indeed, private companies and entrepreneurs are currently aiming to make this dream a reality. While the current economic downturn will likely slow industry progress, space tourism, currently in its infancy, is poised to become a significant part of the hospitality industry.

Unlike the space race of the 1950s and 1960s between the United States and the former Soviet Union, the current rivalry is not defined on a national level, but by a collection of first-mover entrepreneurs that are working to define the industry and position it for long-term profitability. The race includes and depends on technology firms focused on developing the safest, most reliable, and most economical spacecraft, as well as service firms, or space lines, that will ultimately market and provide space travel experiences to willing “Novanauts¹.”

In this race to send private citizens into space, the first team to cross the finish line will not necessarily win international bragging rights, but can expect to benefit from establishing a name within the space travel industry. Companies that hope to have any chance at success must first establish credibility and demonstrate reliability and safety to a population that may be skeptical of the prospect of commercial space travel. Specialty firms have announced intentions to develop the technology and/or market commercial space travel to the masses, with some currently collecting deposits for future suborbital flights and, in one instance, lunar missions.

Billionaire Charles Simonyi joined a team of astronauts for his second paid visit to the International Space Station on March 25, 2009. While this experience may currently be available to the world’s wealthiest individuals, opportunities for the average earthling to experience space travel are on the horizon. “Space-like” experiences such as the Zero G Jet are currently available, while true space flight opportunities are in development. This article will explore the latest advancements in space tourism and will consider opportunities for this fledging industry. The impact of the current global economic conditions on the evolution of space travel is also considered. We further investigate who the current major players are, review the existing space tourism studies published by industry experts, and provide our expectations for the future of this industry.

¹ Novanauts term coined by the article authors in reference to new, citizen astronauts.

Commercial Space Travel: Types of Experiences, Major Players, and Offerings

No longer an exclusive endeavor of the government, space travel is being pursued for commercial gains – enabled by the FAA’s Commercial Space Launch Amendments Act of 2004² (CSLAA) and further influenced by the \$10 million Ansari X Prize³. Within the past decade, private citizens have paid large sums to be among the first to experience a variety of space and space-like experiences, including parabolic flights simulating weightlessness, suborbital flights, and higher-altitude weeklong orbital flights to the International Space Station. The prices associated with these experiences have ranged from roundly \$5,000 per person for a parabolic flight to roundly \$20 million for a trip to the International Space Station. The following figure provides definitions for space-like and space flight experiences.

Flight Descriptions and Trajectories

Parabolic	For 90 to 100 minutes, a jet performs 12 to 15 parabolas, each providing about 30 seconds of reduced gravity or weightlessness totaling 6-7 minutes of reduced gravity for the trip.
Suborbital	A 2.5-hour experience providing a trip over 62 miles (100 kilometers) above the earth's surface to experience 5 minutes of weightlessness, a view of the curvature of the earth, and a dark star-filled sky.
Orbital	Such trips entail traveling in low-earth orbit at 150 miles (240 kilometers) to 22,500 miles (36,000 kilometers) above the earth's surface and so far have included weeklong stays at the International Space Station.
Lunar	Launching first into low-earth orbit, this trip includes an initial weeklong stay at the International Space Station before an additional launch into orbit around the moon for another weeklong trip.
And Beyond...	Long-term (decades away) opportunity for humans to travel beyond earth's moon to the further reaches of outer space.

² CSLAA was signed on December 23, 2004, by U.S. President George W. Bush. The CSLAA makes the Federal Aviation Administration responsible for regulating human space flight in addition to establishing an experimental permit regime for developmental reusable suborbital rockets.

³ The Ansari X Prize was awarded on October 4, 2004, to aerospace designer Burt Rutan and financier Paul Allen, who led the first private team to build and launch a spacecraft capable of carrying three people to 100 kilometers above the earth's surface, twice within two weeks.

Private investors, companies, and the industry as a whole are currently working towards making space travel possible from a variety of “Spaceports,” which would be located around the globe. Locations noted during our research include, but are not limited to, the United States (California, Florida, New Mexico, Texas, and Oklahoma), Kazakhstan, French Guiana, Russia, Sweden, Australia, Singapore, and the United Arab Emirates. As more spaceports are developed, commercial space travel providers anticipate providing point-to-point global travel. Other projects under way include the development of orbital space facilities that would serve as “space hotels.” Ultimately the goal of the industry is to provide a profitable means of offering suborbital, orbital, and possibly lunar-and-beyond expeditions. The development pace of the more complex service offerings (orbital point-to-point flights, space hotels, lunar expeditions, etc.) will be greatly influenced by the initial success of the commercial space tourism industry’s first movers, offering suborbital experiences.

Parabolic Flights and Beyond

Established in 1993, Zero G was the first company to market a simulated space experience, offering tickets for parabolic flights based in major tourist destinations in the United States. Zero G offers passengers the sensation of weightlessness without traveling to space. The company’s specially fitted jumbo jets perform parabolic maneuvers to recreate the sensation of Martian and lunar gravity, as well as total weightlessness. The Las Vegas-based company has flown over 100 flights and currently offers tickets for roundly \$5,000 per person, as well as charter flights for groups. In January 2008, Zero G was acquired by Space Adventures, Ltd.

To date, Space Adventures is the only private company to have sent citizens into space – including the “first space tourist,” Dennis Tito. Space Adventures sent Tito into orbit for nearly eight days in 2001 via the Russian Soyuz shuttle for a reported \$20 million. According to a 2007 article from FOX news, Space Adventures has sold almost \$200 million in tourist space flights since 2001⁴. The company is looking to expand its offerings and is currently taking reservations aboard the “first private expedition to the moon” for \$100 million per seat. Others forging their way into commercial space travel include Sir Richard Branson’s Virgin Galactic. Virgin Galactic has teamed with X-Prize winner, Scaled Composites, to shuttle private citizens on suborbital flights beginning in 2010. Tickets are currently priced at \$200,000, and the company has collected a reported US\$30 million as of January 2008⁵. Other companies collecting money for reservations for suborbital flights include Rocketplane for \$250,000 per person and XCOR for roundly \$95,000.

4 David, Leonard. "Space Adventures Plans Private Trips Around Moon." FOXNews.com 29 June 2007. 8 Jan. 2009 <<http://www.foxnews.com/story/0,2933,287367,00.html>>.

5 Virgin Galactic. "Plans for Spaceport Sweden." Press release. News. 4 Mar. 2008. 8 Jan. 2009 <<http://www.virgingalactic.com/htmlsite/news.php>>.

Another player that has received media attention is Bigelow Aerospace. Currently the sole manufacturer for several of NASA's key expandable space station modules, the company is developing a family of modules to serve as the first commercial space habitats. Bigelow plans to launch the first "orbital resort" in the near future but currently has no target timeframe for the launch. A similar initiative is being pursued by Galactic Suite, a Spanish Company with plans to package pre-space training on a remote island, with space travel to the orbital resort by 2012. A 2007 press release indicated a roundly €3 million per person price for this experience.

With the space tourism industry in its infancy, each prospective operator and space technology development firm is working to set the standards for safety, comfort, and the overall Novanaut experience. One thing can be concluded from our research of existing space tourism companies: Multiple organizations and individuals believe that there is a future for us in space travel. The following figures provide details on a selection of players in the space travel industry as of the time of our research.

Space Tourism Oriented Companies: Zero G; Space Adventures, Ltd.; Bigelow Aerospace – History and Description

Company Name	Start Date, Founders, and Headquarters	Description
Zero G	Founded in 1993 by Dr. Diamandis and Dr. Lichtenberg in Las Vegas, Nevada, USA	Zero G is a privately held space entertainment and tourism company that is currently offering FAA-approved parabolic flights, allowing passengers to experience weightlessness without traveling into space. Since its first commercial flight in 2004, Zero G has conducted over 100 flights in numerous cities across the U.S. In January 2008, Zero G was acquired by Space Adventures.
Space Adventures, Ltd.	Founded in 1998 by Eric C. Anderson along with several other entrepreneurs from the aerospace, adventure travel, and entertainment industries in Vienna, Virginia, USA	Space Adventures is currently the first and only space exploration company to send private clients to space and aims to continue to open spaceflight and the space frontier to private citizens. Through arrangements with their long-standing partner, the Federal Space Agency of the Russian Federation (FSA), Space Adventures has sold more than \$200 million in contracts for space tourist flights, including the first space tourist, Dennis Tito, for \$20 million in 2001. Space Adventures acquired Zero G Corporation in March 2008. Past and present corporate clients and partners include Pepsi Corporation, Hard Rock Cafe, Oracle Corporation, Volkswagen, and U.S. Airways.
Bigelow Aerospace	Founded in 1999 by Robert Bigelow (owner of Budget Suites of America) in North Las Vegas, Nevada, USA	Bigelow Aerospace is a private start-up company pioneering work on expandable space station modules, which will serve as the first commercial space habitats capable of supporting a human crew. The company is funded in large part by the fortune Bigelow gained through ownership of Budget Suites of America. Bigelow has stated that he is prepared to fund the company \$500 million through 2015.

Space Tourism Oriented Companies: Zero G; Space Adventures, Ltd.; Bigelow Aerospace – Facilities/Vehicles, Services, and Current Pricing

Company Name	Facilities/Vehicles		Services		Pricing
	Existing	Proposed	Existing	Proposed	
Zero G	Vehicles: G-FORCE ONE, a specially modified Boeing 727-200 aircraft, able to accommodate up to 35 fliers and six crew members; Facilities: Regular flights from Las Vegas, Nevada, and from the Kennedy Space Center near Orlando, Florida. The aircraft is also available for charter flights anywhere in the U.S. for groups.	N/A	Zero-G Flight: 3-4 hours of parabolic flight where passengers can experience weightlessness for 30-second intervals totaling an accumulated 7 to 8 minutes of reduced gravity	N/A	Parabolic Flight: \$4,950/seat
Space Adventures, Ltd.	Vehicles: Space Adventures currently sends tourists to the International Space Station via Russian Soyuz vehicles; Facilities: Training facility in Star City, Russia, headquarters in Arlington, Va., and offices in Cape Canaveral, Fla., Moscow, and Tokyo.	Facilities: Spaceport Singapore and Ras Al-Khaimah spaceport – an hour's drive outside Dubai	Space Adventures has developed a number of programs, including suborbital and orbital space flights, launch tours, zero-gravity flights (with the acquisition of Zero G), and spaceflight training. They are also currently taking reservations for private expeditions to the moon.	Space adventures plans to launch the first private mission to the International Space Station (ISS) aboard a fully dedicated mission of the Soyuz-TMA spacecraft (scheduled to launch in the second half of 2011). In addition, "over the next decade"... Space Adventures will fly clients on "suborbital flights, on voyages to Earth orbit and on historic expeditions that circumnavigate the moon. Flights will leave from spaceports both on Earth and in space, visiting private space stations, and aboard dozens of different vehicles." Planned attractions for the Singapore spaceport include training, simulations, variety of flight experiences, four-day space camp for children, and an interactive visitor center.	Suborbital Spaceflight: \$102,000 (including \$4,000 cancellation insurance); Private expedition to the moon: \$100 Million; Spaceflight Club: \$980 in annual dues as credit toward price of future spaceflight.
Bigelow Aerospace	Vehicles: Genesis I and Genesis II, smaller-scale prototypes of the proposed full-scale space station; Facilities: Mission control center in Las Vegas, Nevada, which monitors and operates the company's spacecraft currently in orbit and will control BA's future space facilities	Vehicles: "Sundancer, planned for launch early in the next decade, will be the first module built by Bigelow Aerospace capable of manned operation. It would support a crew of up to three for varying mission durations and eventually provide the backbone for the first commercial space station." CSS Skywalker, an orbital resort module, is also being developed.	None at the time of this writing.	Bigelow Aerospace announced business plans to offer (by 2012) a four-week orbital stay for \$15 million, with another four weeks for an additional \$3 million. An entire orbital facility could also be leased for \$88 million a year, or half a facility for \$54 million a year. The company also plans to sell Space Station modules for \$100 million each.	N/A

Space Tourism Oriented Companies: *Blue Origin LLC; RocketPlane; SpaceX* – History and Description

Company Name	Start Date, Founders, and Headquarters	Description
Blue Origin LLC	Founded in 2000 by Jeff Bezos in Kent, Washington, USA	Blue Origin is a privately funded aerospace company focused on suborbital spaceflight. Blue Origin's aim is to "patiently, step-by-step, lower the cost of spaceflight so many people can afford to go and so humans can better continue exploring the solar system." Jeff Bezos, also founder of Amazon.com, is keeping the company's progress and long-term plans as confidential as possible.
RocketPlane	Founded in 2001 by The State of Oklahoma in Oklahoma, City, USA	RocketPlane is a private corporation aiming to design and build spaceplanes as well as market and operate them. They aim to create a series of "highly reusable and safe space vehicles to serve the markets in the suborbital, point-to-point, orbital regions, and beyond."
SpaceX	Founded in 2002 by Elon Musk (founder of PayPal and the Zip2 Corporation) in Hawthorne, CA, USA	SpaceX is a privately owned company aiming to improve the reliability and cost efficiency of space transportation "by a factor of ten." SpaceX currently works with a broad spectrum of customers, including NASA, the Department of Defense, leading private aerospace companies, and international commercial and government entities. In December 2008, SpaceX won the Commercial Resupply Services contract, which guarantees NASA missions worth \$1.6 billion.

Space Tourism Oriented Companies: Blue Origin LLC; RocketPlane; SpaceX – Facilities/Vehicles, Services, and Current Pricing

Company Name	Facilities/Vehicles		Services		Pricing
	Existing	Proposed	Existing	Proposed	
Blue Origin LLC	Vehicles: Goddard, a first development vehicle in the New Shepard program; Facilities: Privately owned launch site in Culberson County, Texas	Vehicles: New Shepard - a "vertical-landing vehicle designed to take a small number of astronauts on a sub-orbital journey into space"	None at the time of this writing	Commercial suborbital tourist service in 2010 with flights about once a week	N/A
RocketPlane	Vehicles: Preliminary design phase of RocketPlane XP; Facilities: Engineering office in Oklahoma City, Oklahoma, while developments continue at Burns Flat, Oklahoma – the future home of RocketPlane's Flight Operations Center	Vehicles: RocketPlane XP - carrying 1 pilot and 5 passengers; Facilities: Future operational base at Oklahoma Spaceport, run by the Oklahoma Space Industry Development Authority	Reservations for Commercial Suborbital trips in 2010	N/A	Suborbital Spaceflight: \$250,000
Space X	Vehicles: Falcon 1 - Low-cost, low-earth-orbit vehicle, Falcon 9 - medium to large satellite market designed for manned spaceflight; Facilities: Launch facilities at the Kwajalein Atoll (Reagan Test Site) in the Marshall Islands, at Cape Canaveral, Florida, and at Vandenberg Air Force Base in California. Vehicle manufacturing and design integration facilities are housed in Hawthorne, California, and engine and large-scale structural testing occurs at the test site in McGregor, Texas. SpaceX also maintains offices in Washington, D.C.	Vehicles: Falcon 9 Heavy - capable of carrying over two times the weight into low earth orbit of Falcon 9. Dragon - reusable spacecraft designed for transporting cargo and crew to and from orbiting destinations, being developed in partnership with NASA	None at the time of this writing	Missions to the International Space Station after the Space Shuttle retires in 2010	N/A

Space Tourism Oriented Companies: *Virgin Galactic; PlanetSpace* – History and Description

Company Name	Start Date, Founders, and Headquarters	Description
Virgin Galactic	Founded in 2004 by Sir Richard Branson (Virgin Companies) in London, UK	Virgin Galactic is a joint venture between Sir Richard Branson's Virgin Group and Burt Rutan's Scaled Composites (which has been contracted to design and build the aircraft). In the next few years, VG will begin taking private individuals to space (and back) aboard SpaceShipTwo, a new generation of commercial manned space vehicles, based on the Ansari X Prize-winning SpaceShipOne prototype.
PlanetSpace	Founded in 2005 by Geoff Sheerin (CEO of the Canadian Arrow corporation) and Dr. Chirinjeev Kathuria in Chicago, IL, USA	PlanetSpace is a private corporation focused in space commercialization and developing space-related technologies. The company is currently teamed with major players in rocket booster and spacecraft development, including ATK, Lockheed Martin, and Boeing.

Space Tourism Oriented Companies: *Virgin Galactic; PlanetSpace* – Facilities/Vehicles, Services, and Current Pricing

Company Name	Facilities/Vehicles		Services		Pricing
	Existing	Proposed	Existing	Proposed	
Virgin Galactic	Vehicles: Spaceship Two and the Mother Ship, WhiteKnightTwo; Facilities: Launching Site at Mojave Spaceport, California	Vehicles: "VG will own and operate at least five of the new spaceships and two mother ships"; Facilities: Spaceport Sweden, based in Kiruna, will use this facility as its European spaceport. Virgin Galactic will also establish headquarters and operate its space flights from the world's first purpose-built commercial spaceport, Spaceport America, in New Mexico.	Suborbital Space Flight: 3 days of pre-flight preparation in conjunction with a 2.5-hour flight into suborbital space, once per week, carrying 6 astronaut passengers and 2 pilots.	As operations progress, VG plans to launch 2 flights per day	Suborbital Spaceflight: \$200,000; deposits vary with reservation period
PlanetSpace	Facilities: Orbital launch facility in Cape Canaveral, Florida	Vehicles: Arrow for suborbital flight, and the Silver Dart, an orbital spacecraft capable of carrying 8 passengers	None at the time of this writing	"PlanetSpace is developing a broad spectrum of commercial space services that include Cargo and Crew to the ISS, Point-to-Point Global Travel, Space Tourism, Satellite Orbital Delivery and Escape Velocity Missions."	N/A: "reservations will be accepted soon" as noted on website.

Understanding the Market Potential

As Space Tourism has yet to establish itself as a viable industry, there is little tangible evidence to conclude that a substantial market exists. However, an in-depth market study was conducted to forecast potential demand and revenues for space tourism activities through 2021 by Futron, a U.S.-based firm specializing in technology management consulting.

In 2006, Futron revisited an extensive market study they conducted in 2002, adjusting for the year, ticket prices, and updated population wealth statistics. The original study was based on a pool representative of those able to purchase such a luxury experience – surveying 450 wealthy⁶ individuals to determine their interest in space tourism and willingness to take part in such flights at a number of price points. Such luxury travelers are estimated as 3% of the total international tourist arrivals worldwide, yet account for 25% of total international travel expenditures – totaling US\$180 billion in 2006.

Considering the world population of people wealthy enough to afford space flights, as well as their fitness and interest levels, Futron used a 40-year maturity model to forecast demand and potential annual revenue from suborbital services in 2021 to reach 13,000 passengers and an estimated US\$676 million – taking into account declining ticket prices due to economies of scale and applying the Fisher-Pry S-Curve⁷ to the potential demand pool. The original study also estimated orbital flights to generate \$300 million per year, generating a \$1-billion industry by 2021.

While Futron's updated forecasts for 2006 are down from 2002's estimate of 15,000, the study concludes “despite a delayed introduction of commercial passenger suborbital flights, and an increase in initial ticket prices over earlier expectations, demand for suborbital space tourism remains strong.” In addition, one should note that the FAA's Office of Commercial Space Transportation has set no specific health or fitness requirements for passengers, suggesting a wider range of acceptability. In addition, the updated study does not take into account any changes in “the public's perception of, or level of interest in, suborbital space tourism,” which is likely to have changed since the Ansari X Prize was awarded and companies like Virgin Galactic announced their plans.

Although the Futron study cannot provide us with certainties for the future of commercial space travel, the report does give us a sense of potential revenues and scale of the primary demographic. As of the summer of 2008, over 250 people had put deposits down or paid the full price for Virgin Galactic's suborbital flight tickets, while another 600 had signed up to buy tickets once flights begin. As with any new innovation, these individuals will

⁶ Those with an annual income of at least \$250,000 or a net worth of at least \$1 million

⁷ Market experience has shown that the adoption of new technological services, such as commercial aviation, typically follows an established pattern popularly known as an S-curve, characterized by slow absorption as the market becomes familiar with the product, followed by a period of accelerated adoption as the market embraces the product, and culminating with a deceleration in adoption as the market nears a saturation point.

lead the way for the industry's expansion, eventually creating economies of scale, lowering ticket prices, and increasing accessibility to a wider demographic.

Impact of the Current Economy and Future Trends for the Space Tourism Industry

Is there enough demand to warrant long-term success of the commercial space travel industry? Only time will tell. With the current economic recession, technological advances and the launch of regularly scheduled suborbital (and beyond) flights are likely to be delayed.

However, when we consider the forecasts from the Futron study and the inclinations of a large population towards adventure tourism and activities generally perceived as higher risk, or extreme (i.e., skydiving, scuba diving, rock climbing, etc.), the authors foresee the progression of commercial space travel as a viable industry in the long term. While information is limited on the payoff and functionality of each company's plan and proposed operating models, long-term success will rely on basic critical factors such as safety, reliability, service differentiation, and value.

As spaceports are built and ticket prices lowered as a result of economies of scale, we predict point-to-point space travel to spur demand and a sustainable source of business. As demonstrated by the cruise industry, combining a destination with the travel experience may justify this mode of travel for some and support repeat purchases, avoiding the possibility of becoming a once-in-a-lifetime experience. In this case, destinations may include "hotels" in space or locations across the globe that can be reached quickly and conveniently.

We also predict that existing and new luxury brands will partner with space technology developers to offer upscale service and accommodations for affluent travelers in the first space hotels and hotels located proximate to space training and launching sites. We expect to see tourism centers (hotel accommodations, entertainment, and restaurants) to be developed adjacent to spaceport locations to house guests during space training. These supportive developments will be especially necessary in remote Spaceport locations. As the first space flights are expected to be affordable to only the wealthiest individuals, who are accustomed to the finest accommodations, we expect that these hotels will be in the luxury segment.

For some, the dream of space travel could be a reality within the next decade. The innovators in the space tourism industry will do much to define the future experiences of prospective Novanauts, setting the standards for safety, creating realistic expectations of the in-flight experience, and developing packages and experiences that will represent the most value for the target market. The start of the second space race is currently under way, with possibilities that are truly out of this world!