Matthias Otto

Feasibility Study and Future Projections of Suborbital Space Tourism at the Example of Virgin Galactic

Bachelor Thesis

Examicus

European University of Applied Science, Brühl/Rheinland (EUFH):

COLOGNE BUSINESS SCHOOL

Feasibility Study and Future Projections of Suborbital Space Tourism at the Example of Virgin Galactic

Bachelor's Thesis

in partial fulfilment of the requirements for the degree of

BACHELOR OF ARTS (BA)

in International Business

with specialisation in Tourism Management

Matthias Otto

Cologne, April, 2008

To Jana and Florian

Acknowledgements

This work would not have been possible without the contribution of a great number of people that made themselves available for interviews and thus helped me with my investigations on suborbital space tourism. In particular, I am deeply grateful to the following persons:

Dr. Robert A. Goehlich
Founder of Space Tourism Course, *Keio University*, Yokohama, Japan

Will Whitehorn
President, *Virgin Galactic*, London, UK

John S. Spencer
Founder and President, *Space Tourism Society*, Los Angeles, USA

Anthony Haynes
Propulsion Team Leader, *Starchaser Industries*, Hyde, UK

Dr. Olle Norberg
Chairman, *Spaceport Sweden*, Kiruna, Sweden

Jane Reifert
President, *Incredible Adventures*, Sarasota, USA

Christoph Berner
Head of Marketing & PR, *Designreisen*, Munich, Germany

Douglas Graham
Public Affairs, *XCOR Aerospace*, Mojave, USA

Tom Shelley
Vice President of Marketing, *Space Adventures*, Vienna, USA

Dr. Mathias Spude
Company Spokesman, *EADS Astrium Germany*, Bremen, Germany

Table of Contents

List of Figures

List of Tables

List of Abbreviations

AMD	Advanced Micro Devices
ARCA	Aeronautics and Cosmonautics Romanian Association
ASA	Accredited Space Agent
CC	Crew Capsule
CEO	Chief Executive Officer
EADS	European Aeronautic Defence and Space Company
EKAD	East Kern Airport District
ELV	Expendable Launch Vehicle
ESA	European Space Agency
FAA	Federal Aviation Administration
FAI	Fédération Aéronautique Internationale
FAQ	Frequently Asked Questions
HNWI	High Net Worth Individual
ILTM	International Luxury Travel Market
ISS	International Space Station
LEO	Low-Earth-Orbit
MCAAS	Marine Corps Auxiliary Air Station
MPL	Maximum Probable Loss
NASA	National Aeronautics and Space Administration
PTC	Product Development Company
RLV	Reusable Launch Vehicle
SCSG	Southern California Selene Group
SSC	Swedish Space Corporation
USSR	Union of Soviet Socialist Republics
WTC	Western Technology Center

Definitions

Suborbital Space Flight: "Suborbital space flight for tourism can be defined where customers pay an initially high price to go on a quick ballistic flight in a spacecraft into space, get a few minutes of weightlessness and then return to Earth, without reaching orbit." (Goehlich, 2002, pp. 15-16)

Space Tourism: "Space tourism can be defined to include not only the vehicles that take public passengers into space, but also from the perspective of the "destination" paradigm. As such, the industry can be envisioned to include not only Earth based attractions that simulate the space experience such as space theme parks, space training camps, virtual reality facilities, multi-media interactive games and telerobotic Moon rovers controlled from Earth, but also parabolic flights, vertical suborbital flights, orbital flights lasting up to 3 days, or week-long stays at a floating space hotel, including participatory educational, research and entertainment experiences as well as space sports competitions (i.e. space Olympics). (Goehlich, 2007, p. 215)

Space Tourism: "Ordinary members of the public buying tickets to travel to space and back." (Space Future, 2007)

Apogee: "The apogee is the point at which a body is at its furthest orbit from the Earth. The word derives from the Greek prefix *apo* meaning away and the word *gaia* meaning Earth. When a body is at apogee, it is also at its minimal orbital velocity." (McGuigan, 2008)

The Karman Line: Named after Hungarian Theodore von Karman, an engineer and physicist dealing with aeronautics, the term Karman Line is generally used to describe the boundary between Earth and Outer Space, which is defined by the Fédération Aéronautique Internationale, an astronautic records commission, to be at an altitude of 100 kilometres. (FAI, 2004)

Low-Earth-Orbit: "The region of space below the altitude of 2000 km." (NASA, 1995)