



Business Context of Space Tourism

Harrison H. Schmitt

December 2002

UWFDM-1192

Accepted by the Space Technology and Applications International Forum (STAIF-2003),
2–5 February 2003, Albuquerque NM.

FUSION TECHNOLOGY INSTITUTE

UNIVERSITY OF WISCONSIN

MADISON WISCONSIN

Business Context of Space Tourism

Harrison H. Schmitt

Fusion Technology Institute
University of Wisconsin
1500 Engineering Drive
Madison, WI 53706

<http://fti.neep.wisc.edu>

December 2002

UWFDM-1192

Accepted by the Space Technology and Applications International Forum (STAIF-2003),
2–5 February 2003, Albuquerque NM.

Business Context of Space Tourism

Harrison H. Schmitt

*University of Wisconsin-Madison, P.O. Box 90730, Albuquerque, NM 87199
505 823 2616, schmitt@engr.wisc.edu*

Abstract. Broadly speaking, two types of potential commercial activity in space can be defined. First, there are those activities that represent an expansion and improvement on services with broad existing commercial foundations such as telecommunications. The second type of potential commercial activity in space is one that may offer a type of service with few or any existing commercial foundations such as space-based remote sensing. Space tourism clearly belongs in the first category of potential commercial activity in space. Roles in cooperation with the private sector that might be considered for NASA include 1) acceleration of the “Professional in Space” initiative, 2) research and technology developments related to a) a “Tourist Destination Module” for the Space Station, b) an “Extra Passengers Module” for the payload bay of the Space Shuttle, and c) a “Passenger-rated Expendable Launch Vehicle,” 3) definition of criteria for qualifying candidate space tourists, and 4) initiatives to protect space tourism from unreasonable tort litigation. As baseline information for establishing fees, the cost of a possible tourist flight should be fully and objectively delineated. If it is correct that the marginal cost of each Space Shuttle flight to Earth orbit is about \$100 million and the effective Shuttle payload is about 50,000 pounds, then the marginal cost would be roughly \$2,000 per pound.

INTRODUCTION

Space tourism clearly is not the most critical issue facing the United States, the world and NASA in the short term, but at least temporarily it has caught the attention of the media. In future decades, it could become a central concern for NASA or a commercial spinoff from NASA, just as commercial air transport considerations dominate today’s FAA. How broad and substantive this interest is within the electorate, outside of a small number of space activists, is not yet clear. At some point, however, the U.S. Administration may feel it needs to respond definitively to this issue. NASA has not covered itself in glory in its recent public statements on this subject.

COMMERCIAL SPACE

Broadly speaking, two types of potential commercial activity in space can be defined. First, there are those activities that represent an expansion and improvement on services with broad existing commercial foundations. Most obvious of these services has been the explosion in satellite communications services since their introduction in the 1960s. Satellite communications built primarily on an existing infrastructure of hard line and radio telecommunications upon which the country and the world already depended. This new means of offering old services also took advantage of research and technology development related to launch vehicles and space communications hardware funded by the U.S. government. The use of satellites almost seamlessly added great new value to the existing communications infrastructure. The recent failure of low earth orbit (LEO) satellite constellations to compete in the communications marketplace is the exception – at least so far – that proves the rule. Technical delays in the introduction of the Iridium, ICO, and Orbcomm LEO-based services failed to take advantage of their window of commercial opportunity which opened briefly in the mid-1990s. That window was closed more rapidly than expected by the expansion of cellular phone coverage; however, LEO deployment and marketing delays were the dominant problem faced by these initiatives. Future LEO opportunities may slowly open, initially in areas such as long haul truck tracking, environmental monitoring, defense applications, and the like that will provide

another commercial opportunity for LEO communications systems. Now that the initial investments have been written off, the initial debt burden of some of these systems has disappeared for the new owners.

In this first category of space commercial activity, there are examples of non-commercial activities that have supported extensive enterprises on Earth, including the use of satellites for weather observation, environmental observation and Earth remote sensing, and navigation. These applications have been pioneered by means of government funding, but commercial ventures that use them are developing rapidly within existing infrastructures.

The second type of potential commercial activity in space is one that may offer a type of service with few or any existing commercial foundations. These might be collectively referred to as the “cure for cancer” opportunities. One should never underestimate the rate at which new arenas for research can pay off. It is likely, however, that we will collectively need to be much more at home in the space environment than we are today, and understand that environment much more fully than we do now, before we can count on significant commercial returns on the “cure for cancer” opportunities. On the other hand, historical analogies may provide some guidance with respect to the future prospects of highly innovative space technologies. It is worth noting that the preponderance of human experience supports the conclusion that the greatest value to be obtained from a bold new enterprise will likely come from activities that are, initially, completely unforeseen. Our national history is replete with examples of this phenomenon. To offer only one example, we have Thomas Jefferson’s letter of instruction to Meriwether Lewis prior to the formation of the Lewis and Clark expedition of 1803-06. That letter reminds Lewis that a primary reason for the purchase of the Louisiana Territory, and of the expedition, was the hope and intention of finding a suitable water route between St. Louis, Missouri, and the Pacific Ocean, thereby to effect appropriate transportation for the burgeoning fur trade (Ambrose, 1997). How many of us today believe this to have been the greatest value to come from the Lewis and Clark expedition? Yet, Jefferson was one of the most prescient men of his, or any other, time. Similarly, it is more than likely that no one alive today can envision the advances in the human condition that will arise from the expansion of civilization into space. The possibility of energy resources coming from the Moon (Schmitt, 1997) may be such an advance.

Earth remote sensing, mentioned briefly above, is the one area of potential space business that lies somewhere between the two major types of potential commercial activities discussed above, and on which several companies have bet significant investments on a commercial payoff. Ultimately I believe they are right; however, the existing infrastructure of the unique space remote sensing marketplace, although it exists for aircraft-based products, is not as large and as well integrated as that which existed in the 1960s for telecommunications. These initial entrants into the space remote sensing market (Earthwatch, Orbimage, etc.) may have a close call, depending on the degree to which government becomes their anchor customer and on the success of their first spacecraft. At least there is no “cellular” system establishing a competitive new service.

SPACE TOURISM INITIATIVES

Space tourism clearly belongs in the first category of potential commercial activity in space. Today, there exists a broadly based demand for tourist destinations and a large service industry that serves that demand, including transportation, accommodations, travel agencies, food service, etc. The primary questions facing such a potential space industry are “how to get started” and “how much of a role should taxpayer funds play in helping the industry to get started.” Let me suggest that there may be legitimate and relatively low cost roles for NASA in stimulating a permanent space tourism industry in ways comparable to its role in stimulating the space communications industry. The following summarizes each of the roles that might be considered for NASA.

(1) Accelerate the re-activation of the “Professional-in-Space” initiative of the early 1980s, inappropriately canceled after the Challenger accident in 1985. The new initiative could begin with the flight of Barbara Morgan, the late Teacher-in-Space Christa McAuliffe’s backup, on the earliest feasible Space Shuttle mission. Ms. Morgan actually is now part of the Astronaut Corps, having been selected in her own right. Thus, the initial step in the implementation of this action should be rather straightforward. In support of Astronaut Morgan’s mission, NASA also should assist in the re-activation of the Teacher-in-Space network of classroom teachers that came into existence in response to Christa McAuliffe’s selection as the first teacher to fly in space. This network of the over one hundred state and territory finalists for the Teacher-in-Space selection had mobilized some 400 schools that were to interact with Christa during her flight.

As a continuation of the Professional-in-Space initiative, NASA should establish relationships with a broad base of national professional societies. It should challenge those societies to help define the criteria for selection of candidates from their professions and the priorities for their flights to earth orbit and/or extended stays at the International Space Station.

(2) Undertake a research and technology development project within which interested and credible commercial entities would work with NASA to define the technical design and private financing options for a potential “Tourist Destination Module” for the Space Station. If, in the course of this initial design effort, it is clear that new technologies are required to make the Tourist Destination Module commercially viable, then joint NASA/industry research and technology efforts could be initiated. Once technically and financially feasible approaches to these challenges have been identified, then the participating commercial entities could move the new technologies out from under the antitrust umbrella of the NASA-sponsored effort into the competitive marketplace. (This, of course, is the tried and true method of stimulating a new industry that NASA’s predecessor, the National Advisory Committee on Aeronautics, used for half a century to advance the American aircraft industry.)

In this context, NASA also should work with the Departments of Interior and Agriculture to examine the feasibility and necessary procedures for the potential operation of the Tourist Destination Module as a National Park. This cooperative effort should include the necessary qualifications of a resident “ranger” to oversee the activities and instruction of visitors to the Module.

(3) Undertake a research and technology development project under which interested and credible commercial entities would work with NASA to define the technical design and private financing options for a potential “Extra Passengers Module” for inclusion in the Space Shuttle payload bay. If, in the course of this initial design effort, it is clear that new technologies are required to make the Extra Passengers Module commercially viable then joint research and technology efforts could be initiated. Once technically and financially feasible approaches to these challenges had been established, then the participating commercial entities again could take the new technologies out of the NASA sponsored effort into the competitive marketplace.

(4) Undertake a research and technology development project to define the technical design and private financing options for a potential “Passenger-rated Expendable Launch Vehicle” derived from the nation’s current and near-term inventory of such launch vehicles. In this effort, interested and credible commercial entities would work with NASA, the Air Force, and existing launch vehicle suppliers. If, in the course of this initial design work, it is clear that new technologies, such as two-stage-to-orbit reusable vehicles, are required to make the Passenger-rated Expendable Launch Vehicle commercially viable then joint research and technology efforts could be initiated. Once technically and financially feasible approaches to these challenges had been established, then the participating commercial entities could move the new technologies out of the NASA sponsored effort into the competitive marketplace.

(5) Conduct a series of workshops with interested non-governmental space interest organizations and appropriate entities of the National Institutes of Health to help develop the necessary criteria for qualifying candidate space tourists as being physically capable, safe and properly trained for spaceflight. These workshops also should examine and evaluate the feasibility of various methods for the initial selection of candidate tourists as well as the appropriate fees that should be charged for space excursions. (It has been proposed by some that the initial selection of tourists be conducted through a national lottery. It would seem that there would be many practical and legal difficulties in using such a process; however, the workshops should fully examine this option as well as others.)

As baseline information for establishing fees, the cost (but not necessarily the price which might be set by auction or by subsidy) of a possible tourist flight should be fully and objectively delineated. If it is correct that the marginal cost of each Space Shuttle flight to Earth orbit is about \$100 million and the effective Shuttle payload is about 50,000 pounds, then the marginal cost would be roughly \$2,000 per pound. This is the usual airline method of pricing discounted seats for tourists given that the business traveler amortizes the fixed costs. Similarly, the government’s primary purposes for flying the Space Shuttle would cover the sunk cost in infrastructure and normal operations. Added to the marginal cost would be that of special equipment, training, in-flight support, etc. necessary to support a tourist flight. It may be interesting to note that the Russians reportedly charged Tito and Shuttleworth \$20 million each for their flights. If they and their equipment each weighed about 200 pounds, \$20 million equates

to about \$10,000 per pound not including the other cost items. Even though \$10,000/pound is about the going, full payload heavy lift launch cost, the Russians appear to be charging what the market will bear on a case by case basis.

(6) Finally, NASA should work with the Department of Justice and the Congress to evaluate legislative means of removing the threat of tort litigation that potentially would stifle the new space tourism industry. Under existing law, litigation would begin immediately in the event of an accident involving a space tourist.

CONCLUSION

Space tourism should be a long-term objective of private space endeavors and should be appropriately encouraged by government. The development of commercial lunar helium-3 fusion power is the most expeditious route to providing the technology and business base by which space tourism can become a reality for a broad spectrum of human beings.

REFERENCES

Ambrose, S., "Undaunted Courage," Simon and Schuster, New York, 511 p, 1997.

Schmitt, H. H., "Interlune-Intermars Business Initiative: Returning to Deep Space," Journal of Aerospace Engineering, April, pp. 60-67, 1997.