

Space Tourism

The challenges to getting there and where we stand so far.

Presentation Goals

- **Challenges:**

- Technology
- Public support
- Cost



- **Where we stand now:**



- **The Future:**

- Sub-Orbital Flights
- Space Hotels
- Lunar Orbits



The RLV (reusable launch vehicle)

- meeting resistance in manufacture
 - Competition w/ more flexible ELV companies
 - Competition w/ terrestrial 'adventures'
 - Market driven
 - High risk
 - Limited pay back
- Possible satellite market to assist
- Passenger certification:
 - Assume similar to commercial airplane
 - Chance for safety critical system failure 1 in a billion per flight hour



Get 'er done

- "The U.S. government is committed to working cooperatively with private space transportation interests to drive down today's Shuttle costs of hundreds of millions each trip with the anticipation that, with new kinds of vehicles, this cost could be lowered to tens of millions. This translates into lowering the per person trip cost from hundreds of thousands of dollars"
 - 'General Public Space Travel and Tourism'
- Today: \$400 million per launch
- Hopes: lower launch costs so that tickets go between \$20,000-\$50,000
- To overcome all obstacles in technology, psychology, and operations would involve investment of billions
- Where is this money going to come from? Is there enough impetus in private sector? How much will the gov't feasibly be able to contribute?

Public Opinion

- Non-partisan surveys show high interest (tens of millions) of 'average' Americans interested in going to space, even at high cost
- *Is this true? Where is the public support of space science then?*



And once the technology has been brought up to standards...

Public Consideration

- There's a reason it's called the vomit comet...
- Preventing/ameliorating space sickness
 - Nausea pills?
 - Artificial gravity?
- Gravity at take off and landing
 - Down to 2x surface
- Passenger preparation
 - Space camp
 - Part of the appeal?



Comforts far from home

- Facilities with basic comforts
 - privacy,
 - entertainment,
 - easy to operate toilets, showers,
 - eating-drinking facilities



- Entertainment
 - Space sports
 - Earth viewing lounge

Virgin Galactic



- Winner of Ansari X-prize
- Now flight testing WhiteKnightTwo and SpaceShipTwo for commercial suborbital flights
- \$200,000 for 2.5 hr flight up to 110 km (68 mi) and a few minutes of weightlessness



Virgin Passengers

- Operations from Mojave Spaceport
- Three day training in New Mexico
 - Involving macrogravity and microgravity preparation
- First 50,000ft with WhiteKnight transporter
- Then SpaceShipTwo launch off, ascent to 110 km.
- Use 'feathering' technique for re-entry



- To date have invested \$75,000,000
- By 2015 expect to have spent \$500,000,000 and have first commercial space complex (CSC) in orbit
- "Bigelow Aerospace is not in the hotel business. We are in the business of creating structures for other people to use as hotels, laboratories, factories, corporate yachts, adjunct colleges, medical clinics, astronaut training facilities, or imaginative environments for public entertainment, etc., etc..."

Genesis I

- Launched July 2006
- Inflatable space habitat with 11 cubic meter of space
- 6in thick walls
- 8 solar arrays
 - Produces 1 kilowatt power, keeps 26V battery charge



Inside Genesis I



Outside Genesis I

Genesis II



- Same size as Genesis I
 - With 22 cameras instead of 13
 - Additional sensors and avionics
 - 'Fly Your Stuff'
 - For \$300 people could send up pictures, mementos, etc.



The Future for Bigelow

- April 2007, announce intent to offer business plans for a four week 'space vacation' for \$15 million, an additional 4 wks for 3 million.

- "I have recognized all along that we may be ready with a destination but must wait for the progress of affordable, available transportation to catch up."

› Robert T. Bigelow

Discussion

- *Projects such as Bigelow's need cheaper launch vehicles to achieve cost effectiveness.*
- *How do you think it best to proceed in the development of such vehicles? Gov't? Private?*



Space Adventures

- Send first space tourist to ISS for \$20 million in 2001.
 - Six month training required
- Now offering space walks for extra \$15 million, 1 month training, lengthen mission 6-8 days
- Majority of machinery Russian

Space Adventure Spaceports

- Two global spaceports in development:

- United Arab Emirates

- UAE spaceport for development of Explorer
 - Suborbital plane,
 - Seats five, in development with Russian Federal Space Agency

- Singapore

- Spaceport Singapore w/ facility for training, public education, interactive public displays



Conceptualized design for UAE spaceport

Space Adventures' Future

- Circumlunar Flights
 - Sequence of manned and unmanned flights involving initial Soyuz rocket
 - Second launch of unmanned booster to rendezvous later
- Two commercial seats at \$100 million apiece

Conceptualized Singapore spaceport. Will offer actual space flights as well as G-force training and space walk simulations in neutral buoyancy tanks.

