

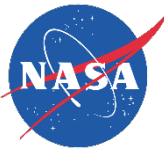
LEO Commercialization Studies

Dina Contella

March 6, 2019

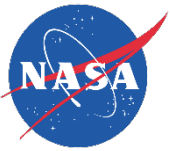


LEO Commercialization Studies



- **12 companies completed 4-month-long studies on the commercialization of LEO and ISS**
- **Variety of independent market consulting firms, transportation and habitat suppliers, and market demand service providers**
- **Study objectives included:**
 - Commercialization concepts and technical configurations for commercial habitable platforms in LEO (using ISS or free-flying) - “Destinations”
 - Business plans that explore the viability of commercial destinations
 - Role of government and evolution of ISS in the roadmap to commercialization of LEO
- **“Destination” concepts included:**
 - Spent upper stages converted into habitable volumes
 - Inflatable modules
 - New modules, traditionally-built but modernized
 - Re-use of ISS components
 - Use of Gateway program ‘copi

Companies that Performed Studies



How do Commercial “Destinations” Make Money?

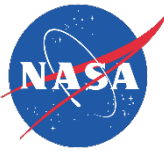


- **“Accommodations”** – sleep stations, toilet, galley, etc. for tourists or foreign/US governments
- **Research & Development** – use of facilities or space and power/utilities for customer facilities, and possibly commercial crewmember time to conduct experiments
- **In-space manufacturing of unique materials or products** – use of facilities or space and power/utilities
 - Items made in space and then sold on the ground: For example, fiber optics
 - Items made in space for on-orbit use: For example, parts for maintaining or assembling spacecraft
- **Entertainment** – films, documentaries, sporting events
- **Sponsorship and Advertising**
- **Transportation of people and cargo to/from Low Earth Orbit**
- **Large Structure and Satellite Assembly**

Some Observations from the Studies



- **Commercial market predictions vary, making forecast difficult**
 - The markets are emerging – some might ‘take off’ and some might fail
 - Competition for revenue includes terrestrial, parabolic/sub-orbital flights, and other space stations (commercial or non-U.S.)
- **Early on, NASA’s use of and payment to destinations will be a key enabler for the emerging commercial market**
 - NASA was often considered the “anchor tenant” of the commercial destinations in the studies
 - Studies generally assumed some number of NASA crew in Low Earth Orbit at all times, and NASA would pay ‘rent’ to a landlord Destination to accommodate them
 - Because NASA has a need for microgravity research and exploration testing in Low Earth Orbit in the future, many studies assumed their destinations housed U.S. government research



Some Observations from the Studies

- **High crew and cargo transportation costs to/from LEO negatively affect both station costs and commercial market demand**
 - Transportation costs make up a very large portion of the cost of a space station over time – on the order of 2/3 of annual costs are spent on crew and cargo missions
 - A reduction in the seat cost to transport tourists to orbit from 10's of millions of dollars down to a few million dollars could significantly increase the number of potential tourists that can afford a trip
 - The cost is very high to transport raw materials into space, convert them into something else (such as fiber optics) and return them to the ground – so the end product must sell at a very high price
- **Continuing ISS use over the next few years supports commercial industry growth**
 - Businesses want to use ISS directly, for example by attaching a commercial module to an ISS port, or if free-flying, they prefer to be co-located in orbit near ISS