Space Commercialization in the Next Decade - Economic Risk or Opportunity

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Space Commercialization – Communications Example

Space Commercialization in communications has been successful

- TV, Radio, regional direct to home internet, internet data trunking, regional and global mobile phone and data services
- Commercial provision of government communications has been a win win for Government and commercial operators

There have also been failures

- Iridium, Globalstar, ICO - all are in existence with new business plans
- Teledesic, Astrolink and others never got out of development stage
- $ Billions of dollars lost on failed ventures in the late 90’s
Every Current Service Sector is Rapidly Evolving

New Services Now in Operation

Fixed

Broadcast

Mobile

Milsatcom

Full Mesh

Greatly Increased HDTV Capacity

Coming Online

Reduced Terminal Sizes, Return Channel for Mobile Broadcast

Full flexible beams & bandwidth, Onboard Router, Optical Crosslinks

Broadband Multimedia

Ka-band HDTV broadcast

Mobile Video

Network Centric Ops
Market Forces are Driving Products

General Trends

Mobility

Bandwidth Intensive Applications

Network Centric Operations

Business Flexibility, Deployment Predictability

Reduced Terminal Sizes

Increased Satellite Bandwidth

Bandwidth Efficient Modulation, Compression

Standard, Flexible Payloads

Flexible Beams

Flexible Bandwidth

Flexible Signal Routing

Higher power, more standard, more flexible satellites: Any bandwidth, anywhere, any time
A Vision of the Future for Communication Satellites

Highly Reconfigurable Satellites with Flexible Payloads

Operating Mode 1
Example: commercial & government spot beams and video distribution regional beams

Operating Mode 2
Example: commercial spot beams for underserved regions and surge capability (Olympics, World Cup, natural disaster)

Operating Mode 3
Example: commercial telecom services and video distribution in US

Operating Mode 4
Example: On-orbit backup for multiple satellites

A single satellite design can serve multiple orbit slots
What about the future?

What are some of the potential new markets in space?
- Satellite servicing – Orbital Express and others
- Tourism – Sub orbital, orbital and Hotels
- Materials processing - TBD

All new frontiers open up with new opportunities when the price of bringing the “middle class” is affordable
- The “new world”
- The “West”
- Automobiles
- Commercial Aircraft
- Commercial spacecraft ??

Space is still a new frontier 50+ years after the first exploration
Servicing types

- Refueling – does it make economic sense?
  - Launch Vehicle underperformance insurance
  - Cost of getting the fuel to the S/C
  - Desire or requirement for an upgraded capability
  - Economics of the satellite propulsion system

- Repair and replace
  - Failed component replacement
    - Penalty (?) for line replaceable unit design
    - Timing of replacement

- Deployment issues repair
  - Risk of making things worse

- Anomaly resolution – “look but do not touch”
OE Firsts

FIRST fully autonomous "soft" capture of a satellite while stationkeeping
FIRST fully autonomous transfer of propellant from one vehicle to another on orbit with US technology
FIRST fully autonomous transfer of a component from one vehicle to another using advanced robotics
FIRST fully autonomous capture of free flying vehicle & component transfer using closed-loop servo vision system with autonomous fault recovery
FIRST fully autonomous capture & servicing of a satellite from 200 km range without client assistance
FIRST fully autonomous on-board navigation & guidance to approach & stationkeep within 10 cm of client using passive, targetless systems
FIRST on-orbit use of embedded IEEE 1394 (Firewire) spacecraft network – enables computer ORU transfer
Tourism – Sub orbital, orbital and Hotels

§ When will I get to go?
   – Price point needs to be at upper middle class affordability
   – $10000? – that’s what my wife told me….

§ Insurance, indemnification, failures
   – How will these affect the business case and the market
   – Can this fledging business survive in today’s litigious environment
   – Small commercial aircraft market is good analogy
Zero G Materials processing

What, how much, why?

How do we even get the knowledge of what can be done?
- Space station not ideal for zero g
- Lower cost transportation is key
What does the past tell us about the risks and opportunities?

- Is there a business plan that makes sense?
- Is the technology at a sufficient technology readiness level for a commercial activity?
- Is there a non-served or underserved need that a space system could fulfill?

And the (much?) farther future
- Space Power to the Earth