Emerging Opportunities for Low-Cost Small Satellites in Civil and Commercial Space

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Overview

- Recap of earlier market assessment
- Review of emerging opportunities
- Opportunities and threats for smallsats
Previous Market Analysis

- Study performed for AFRL/PTI in 2006, presented here in 2008
- Purpose: identify what markets would be promising for a notional low-cost small satellite system
  - 100-200 kg
  - $5-10M
  - 1-2 year life expectancy
- Identify and evaluate potential military, commercial, and civil missions, determine most promising markets, evaluate in greater detail
2008 Study Results

- Over 30 markets identified
- Six emerged as most promising:
  - Military
    - Science and technology
    - Intelligence, surveillance, and reconnaissance (ISR)
  - Civil/commercial communications
    - Polling of unattended sensors
    - Remote site communications
  - Civil/commercial remote sensing
    - High-resolution Earth observation
    - Landsat-class data for environmental monitoring
- Key smallsat strengths: cost and responsiveness
- Potential addressable market size:
  - 40-75 satellites/year
  - $290-570M/year
Most Promising and Emerging Markets

- Military
  - Space Surveillance and Situational Awareness
  - Missile Defense and Early Warning
  - Communications
  - ISR
  - Polling of Unattended Sensors
  - Remote Site Communications
  - Scientific Research
  - Civil/Commercial Communications
- Science and Technology
  - High-Resolution Earth Observation
  - Landsat-Class Data for Environmental Monitoring
  - Technology Demonstration
  - Civil/Commercial Remote Sensing and Other
- Civil/Commercial
  - Meteorology
  - Dangerous Sea Monitoring
  - Asset Tracking

Better Decisions…Better Future
Emerging Opportunities

• What’s changed since 2008?
  ➢ No great technological and market breakthroughs
  ➢ Space access still a primary obstacle
  ➢ Recession has had a limited market in overall space industry, but may affect emerging markets disproportionately
  ➢ New administration and revisions to space policy have reshaped the landscape to some degree

• Most promising markets still remain “promising”
  ➢ No major developments by government or commercial sector to take advantage of these

• What does this mean for emerging opportunities?
Emerging Interest in Technology Development

• FY2011 budget proposal includes strong support for smallsat technology development and demonstration:
  - Franklin smallsat technology development program
  - Edison smallsat technology demonstration program
• A couple hundred million dollars through FY2015 for these programs
  - Subject, as always, to Congressional appropriations
  - If funded, could create significant demand for tech demo missions and also enable future missions
• Also significant funding for technology demonstration within ESMD
  - Flagship and enabling technology demonstration programs – roles for smallsats?
  - Funding here less certain
Commercial Scientific Research with Smallsats

- Growing interest in biotech research in space, primarily on the ISS, but with challenges of access and cost
- Smallsats can potentially provide a lower-cost (and more responsive means) of access to space for these researchers
  - GeneSat and PharmaSat have served as pathfinders for this
  - Access to space is still a challenge
- Smallsat synergies with ISS - Nanoracks
Call in the SWOT Team

- Smallsat community very good at understanding its strengths and weaknesses, but what about external issues?
  - Opportunities (positives) and threats (negative)
- Is it time for a partial SWOT analysis for smallsats?
- Briefly examine a couple issues in the OT part of SWOT
Hosted Payloads: An Introduction

• What is a hosted payload?
  ➢ “the utilization of available capacity on commercial satellites to accommodate additional transponders, instruments, or other spacebound items” primarily for gov’t agencies

• Several such payloads have already flown or are planned:
  ➢ WAAS
  ➢ IRIS
  ➢ CHIRP

• Growing government interest in utilizing these opportunities, primarily for their speed and cost versus satellite programs

• Hosted payloads explicitly endorsed in new (June 2010) National Space Policy
Hosted Payloads: Friend or Foe?

- Hosted payloads have the potential to fly payloads that might previously been considered for smallsats
  - Especially true for technology demonstration missions
  - Less true for communications payloads
- Large (theoretical) number of flight opportunities today (20-25 commercial GEO spacecraft launched per year) could attract more users
- However, commercial satellite operators are risk averse
  - Will you risk a $200M satellite on an experimental payload?
  - This could drive some experimental payloads back to smallsats, perhaps to demonstrate the technology for future hosted payload opportunities
Commercial Suborbital Vehicles

• Several companies actively developing commercial suborbital vehicles:
  ➢ Armadillo Aerospace
  ➢ Blue Origin
  ➢ Masten Space Systems
  ➢ Virgin Galactic
  ➢ XCOR Aerospace

• While space tourism has been the primary market for most of these companies, all have shown varying degrees of interest in flying scientific and technology demo payloads

• NASA supporting this with the Commercial Reusable Suborbital Research (CRuSR) program
Suborbital Vehicles: Friend or Foe?

• Can suborbital vehicles replace smallsats for some experiments?
  ➢ Offer repeatability, reusability, low costs
  ➢ Interest in a variety of scientific and technical fields

• These vehicles, though, cannot provide sustained access to the space environment that satellites can

• These could provide a way to reduce technological risk and advance TRL for smallsat systems in a relatively inexpensive, responsive manner
Other OT Considerations

• Access to space
  - Yes, it’s still a major (the major?) problem for smallsats
  - Developments by SpaceX promising
  - Suborbital vehicles also proposing low-cost smallsat systems
  - Greater push for rideshare opportunities
  - Also: NASA’s Nanosat Launch Challenge competition

• Proof of concept demonstrations
  - Still a lack of awareness in smallsat capabilities among many potential customers
  - A role for Franklin/Edison programs?

• Orbital debris
  - A growing concern in the wake of the Chinese ASAT test Cosmos-Iridium collision
  - Concerns that smallsats (especially Cubesats) contribute to orbital debris
  - Do we need to mandate deorbit systems for such spacecraft to reduce those concerns?
Conclusions

• There have been no breakthroughs in smallsat demand in the last two years
• However, there are emerging opportunities, in particular NASA’s interest in smallsat technology development and demonstration
• Several key problems remain, but progress is being made (slowly)
• What’s needed for progress to continue:
  ➢ Steady funding for smallsat tech development
  ➢ Improve access to space for smallsats
  ➢ Better understanding of potential markets and their requirements