



# *If You Build It, Who Will Come? Identifying Markets for Low-Cost Small Satellites*

*Jeff Foust*

*Futron Corporation*

*22<sup>nd</sup> Annual AIAA/USU Conference on Small Satellites*

*2008 August 11*

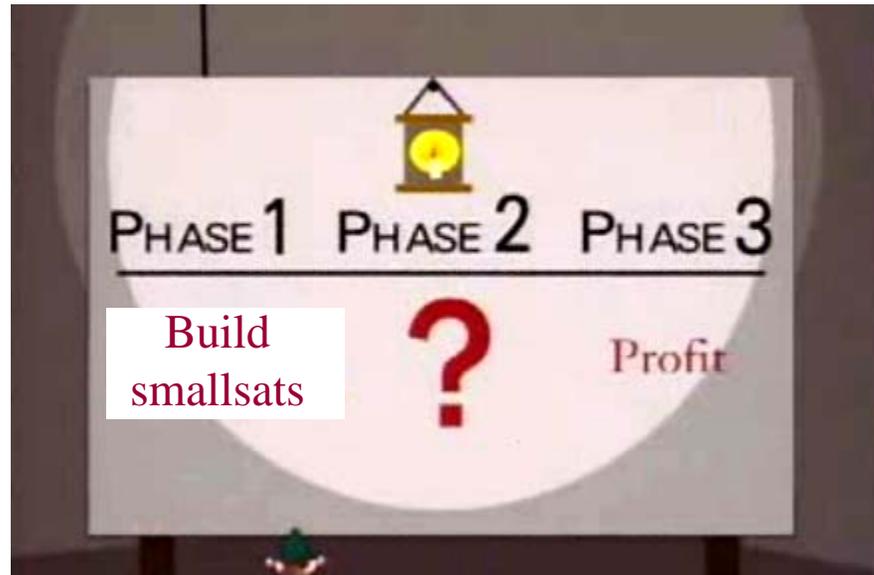


## *Overview*

---

- Why study smallsat markets?
- Study basics
- Market identification
- Market analysis, selection of most promising markets
- Conclusions

## *Why study smallsat markets? (With apologies to South Park)*



- Very good at the technology of smallsats
- But who wants to buy these smallsats? And how many?
- “I think you should be more explicit here in step two”



## *Study basics*

---

- Study performed by Futron for AFRL PTI (via SAIC) in fall 2006
- Purpose: identify what markets would be promising for a notional low-cost small satellite system
- Approach:
  - Market identification
  - Market analysis
  - Selection and study of most promising markets
  - Market size estimates



## *The notional smallsat*

---

- **Mass:** no more than 100–200 kilograms
- **Payload mass fraction:** in excess of 50 percent
- **Power:** 200 watts orbit-averaged, 500 watts peak
- **Life expectancy:** one to two years
- **Total cost:** \$5–10 million (with low-cost launch options available)



## *Market identification*

---

- Brainstorming exercise to look for all possible markets that could be served by the notional smallsat platform
- Carried out through secondary research as well as through interviews with several smallsat manufacturers
- Over 30 markets identified in four areas:
  - Military
  - Civil/commercial communications
  - Civil/commercial remote sensing
  - Other



## *The big list of markets (1 of 2)*

---

- Military
  - Blue Force Tracking
  - Communications
  - Intelligence, Surveillance, and Reconnaissance (ISR)
  - Meteorology
  - Missile Defense and Early Warning
  - Ocean Condition Monitoring
  - On-Orbit Servicing
  - Positioning, Navigation, and Timing (PNT)
  - Precision Targeting
  - Science and Technology
  - Space Asset Defense
  - Space Surveillance and Situational Awareness
  - System Augmentation or Gap-fillers
- Civil/Commercial Communications
  - Asset Tracking
  - Gap-filler Communications for Disaster Relief
  - Remote Site Communications and Data
  - Polling of Unattended Sensors
  - Store-and-Forward Communications
  - Wide Area Broadcast



## *The big list of markets (2 of 2)*

---

- Civil/Commercial Remote Sensing
  - Dangerous Sea Monitoring
  - Disaster Assessment
  - Earth Observation
  - Environmental Monitoring
  - Meteorology
  - Natural Resource Surveying
- Other
  - Assist Astronaut EVA
  - Biotech
  - Entertainment
  - Microgravity Research
  - Moon-Mars Scout, Communications, Sensing, and Navigation Networks
  - On-Orbit Inspection and Servicing of Space Systems
  - Scientific Research
  - Technology Demonstration



## *Market assessment*

---

- Futron assessed each identified market through:
  - Secondary research
  - Interviews (30) with potential customers, including:
    - US military agencies
    - US civil government agencies
    - Universities
    - Corporations (up to Fortune 500 level)
- For each market:
  - Is this market feasible for the notional smallsat?
  - Is there customer interest?
    - If no, why not?
    - If yes, how many, and how soon?
  - Other issues that could help or hinder smallsat acceptance



## *Top markets*

---

- Six markets emerged as the most promising in the near term:
  - 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



## *Science and technology*

---

- An existing market that could be enhanced by low-cost smallsats
  - Space qualifying hardware
  - SERB payloads
- Faces competition from other, larger smallsat buses under development
- Market size: up to 10-20 per year

- Augment existing capabilities and/or serve as gapfiller in the event of loss of assets in crisis
- Competition from larger space assets as well as terrestrial systems (such as UAVs)
- Dependent on the success of the overall Operationally Responsive Space paradigm
- Market size: up to 10 per year



## *Polling of unattended sensors*

---

- Primarily for civil government agencies, like USGS, that need better access to data from sensors in remote locations
- Competition from existing space systems (like ORBCOMM) as well as terrestrial radio
- Market size: 20-30 satellites every two years (to maintain global constellation)



## *Remote site communications*

---

- Primarily for civil government agencies that want two-way communications with staff in remote locations
- Competition from terrestrial radio and existing space systems (ORBCOMM, Iridium, etc.)
- Market size: 20-30 satellites every two years (to maintain global constellation)



## *High-resolution Earth observation*

---

- Provide moderately high resolution imagery (< 2 meters/pixel) with higher temporal resolution than current systems
- Market for such imagery is growing, expected to reach \$1 billion a year by 2010
- Competition from aerial imagery, existing space systems
- Market size: up to 10-20 satellites every two years



## *Landsat-class imagery*

---

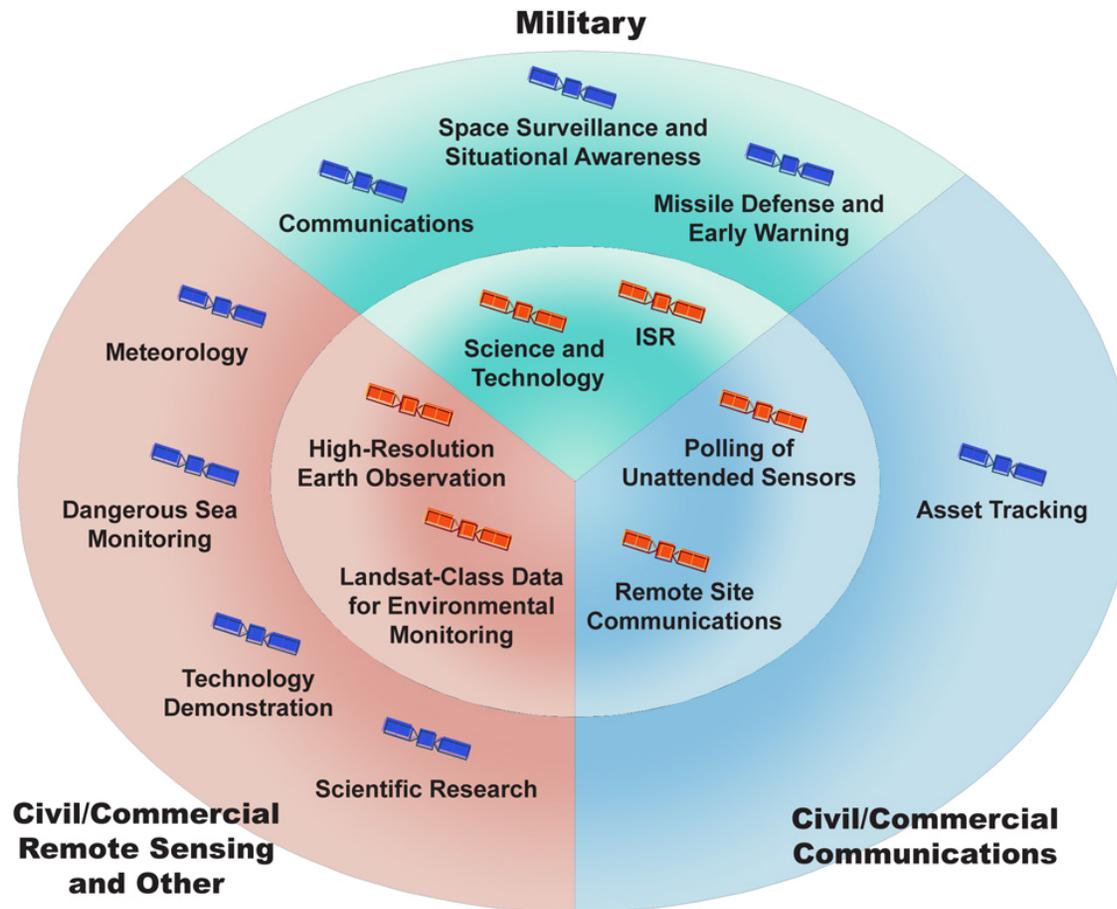
- Medium spatial resolution (30-90 meters) multispectral imagery for Earth sciences applications
- Smallsat constellation could provide this with higher temporal resolution than single large satellite
  - Such a concept was considered for Landsat 8 but rejected
- Competition from Landsat and other existing space assets
- Market size: up to 6-12 every two years



## *Overall potential addressable smallsat markets*

<b>Market</b>	<b>Satellites/Yr</b>	<b>Revenue/Yr (\$M)*</b>
Military Science and Technology	10-20	75-150
Intelligence, Surveillance, and Reconnaissance	1-10	7.5-75
Remote Site Communications	10-15	75-112.5
Polling of Unattended Sensors	10-15	75-112.5
High-Resolution Earth Observation	5-10	37.5-75
Landsat-class Environmental Monitoring	3-6	22.5-45
<b>TOTAL</b>	<b>39-76</b>	<b>292.5-570</b>

\*Assumes average satellite price of \$7.5M





## *Insights and concerns*

---

- Lack of awareness
  - Many potential customers not familiar with smallsats and their capabilities
  - Education and marketing needed
- Concerns about smallsat utility
  - Skepticism that you can deliver these capabilities in smallsats
  - Address with technology demos, “existence proofs”
- Avoiding satellite operations
  - Many potential customers don’t want to get into business of operating satellites
  - Get existing satellite operators into this field
- Other issues
  - Availability of low-cost launch
  - Export control concerns for US companies