



Space Dynamics

LABORATORY

Utah State University Research Foundation

“ It’s a Small World After All:
Small Launchers and Small Satellites”

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Center for Strategic and International Studies

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SDL in Brief

- A nonprofit corporation owned by Utah State University
- Founded in 1959
- Financially independent - ~ \$50 M/year
- 1 of 12 University Affiliated Research Centers
- 370 employees
- 500+ successful missions, more than 2000 sensors
- Over 200,000 ft² of state-of-the-art facilities
- Logan, UT; Wash, DC; Bedford, MA; Albuquerque, NM



Observations

- USA Today - “1 quadrillion calculations a second”
 - 2002 NEC Earth Simulator 36,000,000,000,000 c/sec
 - 2008 IBM Blue Gene/p 1,000,000,000,000,000 c/sec
- National Wildlife – “Walden Warming”
 - Based on Thoreau’s 1846 data at Walden Pond
 - Blue-berries are blooming two weeks earlier, the water temperature has increased 4.5 degrees F and birds are arriving 2 to 4 weeks earlier
- Space News – Monthly launch report, too few US launches
- USU Small Satellite Conference, August 2007
 - Small Sat Technology developments are amazing !
 - Flight Demonstration prospects are low or time to flight too long.
- Passion and Energy
 - Small Sat and Small Launcher personnel have it !!! It reminds me of the 1960’s
 - We will need it as another 27 % of the US Space work force reach retirement age over the next year



Big and Small, and Often

- The Mother - Daughter approach is being discussed in the industry
 - A modest number of Large Communication Satellites
 - A few Data Relay Satellites
 - Global Position Satellite System

Coupled with

- Arrays of small, simple, short lived satellites
- The Small Satellites and Large Satellites talk to each other
 - Acquire and update navigation and location information
 - Download data for rebroadcast via the large Satellites
 - Uploads and commands via the large Satellites
 - Greatly reduces power, NAV and COM requirements on Small Sats
 - Communication with ground would be transferred to the Large Sats



The Questions

- What should the US be doing in these markets ?
 - Establish a sustainable new framework for the future
 - The Mother Daughter Program can be a win-win
 - » Large Sats and Large Launchers
 - » Small Sats and Small Launchers
 - The Program will benefit all users
 - » Civil
 - » Military
 - » Commercial
 - » Scientific
 - » Academia
 - » Diplomats
 - » Politics
 - Will dramatically increase R&D turns
 - Can serve as an ORS/Emergency Gap filler
 - Be a renewable legacy program
 - And if the users work together, this can be very affordable



The rest of the Questions

- What are the drivers, what does the future look like, is the US leading and what are our capabilities?
 - Drivers - Smart, passionate and energized people are our primary asset, they need to have the opportunity to learn by doing
 - The future is driven by investment.
 - Leadership is all about what we are going to do tomorrow. We need more investment in technology demonstration and launch operations.
 - We are blessed with a plethora of infrastructure, academic institutes, technology and bright people.
 - We are driven by market challenge and competition.
 - the world is investing to be leaders in these markets



An Approach

- Add the “Mother – Daughter” architecture to our plan.
- Build a broad base of Program Advocates.
- Establish discipline in requirements where it simplifies system interfaces, reduces recurring cost and provides alternate launch vehicle or payload substitution.
 - Mechanical Interfaces, Power Interfaces, Communication frequencies, etc.
 - Build the “Wireless Interfaces” as Mr. Gary Payton has described it.
- Develop a minimum systems set of requirements for Small Satellites
 - Adequate testing that the payload will not harm the launch vehicle or other payloads.
 - Basically system safety, contamination and interference requirements.
 - Plan for de-orbiting





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