THE FOOD CHAIN OF THE SMALL SATELLITE ECOSYSTEM

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Why This Paper

Low Cost is a recurrent theme in Small Sat Conferences

Small Satellites does not mean lower complexity.

How can satellite manufacturers handle risks and still make a reasonable profit?

In short:

- where is the meat?
- Is the Small Sat a stable economical system?



In the proceedings of

USU Small Satellites conferences of 2006 and 2004

ESA-CNES Symposia on Small Satellite System & Services of Chia Laguna (2006) and La Rochelle (2004)

"Low Cost" is mentioned 658 times

"Return on Investment"... 20 times :-((



A little bit of Biology...

...In a food chain of a biological system, plants (or producers) fix energy from the Sun and use inorganic material to manufacture complex organic substances; consumers (e.g. birds, mammals) use the energy fixed by plants as their nutrients; finally decomposers (e.g. bacteria) break down dead organisms and release nutrients back to the environment for use by the producers



The analogy with the Small Sat Ecosystem

Producers (equipment suppliers) transform raw materials by using the energy (funds). Consumers (the users) use data and services provided by the satellites to release back the nutrients in form of need of better services and more accurate data: these products generate more funds.

This chain creates a stable economical system.



... Is this true?...



Nutrients

Understand/Measure

Explore

Flight Test

Exploit Space Infrastructure

Gap Filler /
Complementary Missions

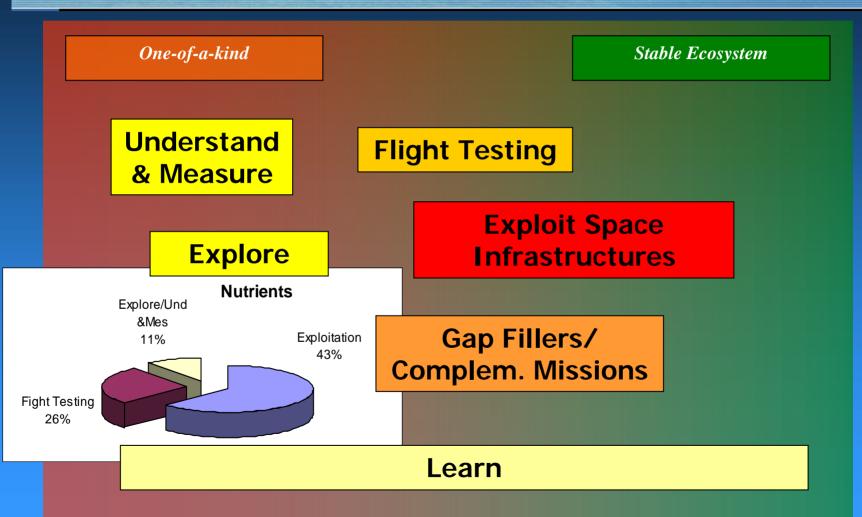
Learn



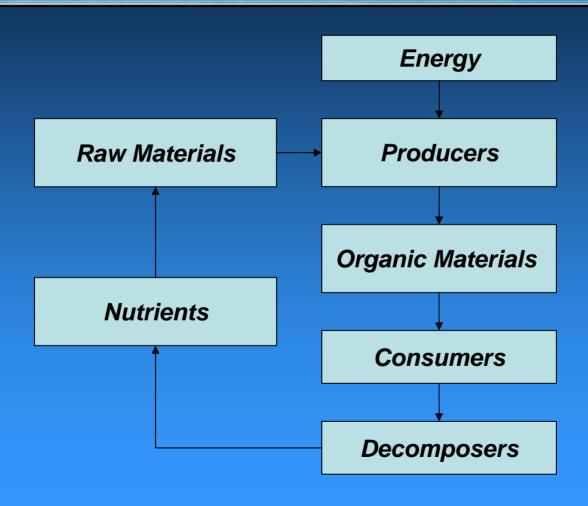


One-of-a-kind or a stable ecosystem?











Idea of Cost Sharing Raw Materials

Trained Personnel
Awareness of Space
Cost & Risk Sharing
Nutrients

Algeria, China, Nigeria, Spain, Turkey, UK *Energy*

Disaster Monitoring Constellation

Producer

Training Opportunities

Organic Materials

Universities Consumers

Users Remote Sensing Data Decomposers



CNES & ESA Programs to address the lower end of the Space Market Energy

Best Value for Money
Raw Materials

EADS-Astrium of Toulouse (F)

Producer

Inter Cultural Cross Talk Nutrients Stable Turnover
Stability of Workforce and Know-how
Organic Materials

Low end of the Space Market Consumers

Affordable Turn Key Solutions

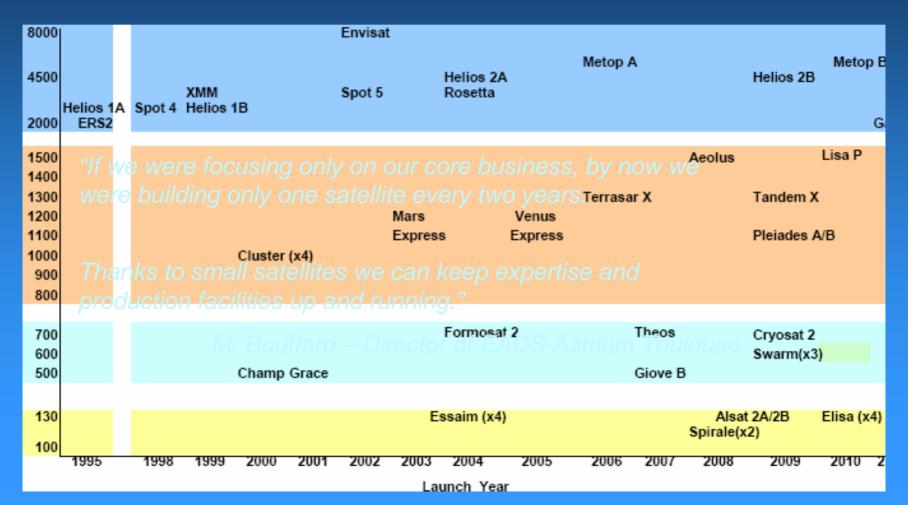
Decomposers

The Food Chain of the Small Sal

21st Annual Conference on Small Satellites



Why big companies want to build Small Sats?





Conclusion #1

There are examples of stable ecosystems of small satellites. Most of them, if not all of them, are in close relation with universities or they have an educational role in broad sense.

The educational role remains the underlying nutrient of small satellites.



Conclusions #2

The reliability demonstrated by small satellites in recent years starts to generate more trust in old customers. This is the first form of nutrient for having large institutions using small satellites as a test platform or to complement existing services.

Two new ecosystems are on the horizon:

small satellites as a technology platform

small satellite to complement operational satellites

...one more question...



| Country | GNP Growth % |
|------------|-----------------|
| Azerbaijan | 25.0 |
| Georgia | 19.2 |
| China | 8.0 |
| Kazakhstan | 8.9 |
| India | 6.8 |
| Vietnam | 7.1 |
| Russia | 7.0 |
| Ukraine | 4.1 |

The world in 2007 offers:

free communications cheap transportation of goods and persons

We live in a smaller world with immense emerging economies



Competitiveness was driving the western economies in the late 90s.

In the Space sector "...the most important driving force is [...] the budget with which sponsoring organization has to work with" (Jilla & David, Intl. Journal of Small Sat Engineering 1997.)

Affordability of western products is opening immense markets of the emerging economies.



What kind of Satellites can we sell to those countries?



The Food Chain of the Small Satellite Ecosystem 21st Annual Conference on Small Satellites





"We don't sell motorbikes"

"We sell to a 49 year old accountant the possibility to wear black leather and ride through small towns frightening everybody" (CEO - Harley Davidson)





Small Satellites are not only cost effective tools to retrieve data from space

They are educational tools, objects of national pride, and...a dream...

The NASA Mars Path Finder web site had more visitors than the Titanic Movie had spectators and a similar cost.

Deep Impact set the absolute record of internet hit with 80 million people visiting the web site in 24 hours

Carolyn Wincer, head of astronaut sales for Virgin Galactic, said in an interview in July 2007: "... Virgin Galactic has \$25 million in deposits from prospective passengers for suborbital flights"



Are Emerging Economies a Threat or an Opportunity?

If we put together the raw materials as:

- affordability of small satellites
- the educational role they historically have

If we consider the *Energy* provided by the needs of the emerging economies

We have an idea of the opportunities small satellites have in next future.