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"The Next 20 Years – Can Small Sats Become a Mainstream Asset for the US Government?"

An Industry Perspective

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Overview

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- Where have we been?
- A Classic Economic Opportunity
- Christensen's Five (5) Factors of a Disruptive Technology
- The "New" Satellite Standard
- The Personal Computer Analogy
- Keys to the Kingdom

Where Have We Been?

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- There Have Been Successes
  - University & Laboratory Centered
    - Cube Sats
    - Falcon Sat
  - First Time Users of Operational Systems
    - DMC
  - Experimental Government Missions
    - Clementine
    - TacSats
- Not Everyone Has Bought In!!

A State of Cautious Optimism

What Will It Take?

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- Christensen's Five (5) Factors of a Disruptive Technology
  - Initially ***Underperforms*** the dominant or "Standard" of its time
  - ***Generally*** cheaper, simpler, smaller and more convenient
  - Leading customers ***Generally*** "Do Not Want" and "Cannot Use"
  - Steady improvement toward the standard
  - Eventually displaces the incumbent

A Classic Economic Opportunity
(For The "Right" Players)

The Five (5) Factors Applied to Small Sats

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- 1) ***Initially*** **underperforms the dominant or "Standard" of its time**
  - **Intuitively obvious: Size Does Matter!**
  - **Size limits capability**
- **Response:**
  - **A smaller version designed & built to today's standard is *Not* the solution**
  - **Key on 1 or 2 simple but mission effective payloads**

Key Word: "Initially"

The Five (5) Factors Applied to Small Sats (Con't)

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- 2) *Generally cheaper, simpler, smaller and more convenient*
  - Maybe we should substitute "affordable"?
  - Meets ORS parameters
- Response:
  - This is the theme the small sat community has been built around

Sounds like a perfect fit- so far!

The Five (5) Factors Applied to Small Sats (Cont'd)

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- 3) Leading customers *Generally* "Do Not Want" and "Cannot Use"!
  - Change is hard!
  - Comfort factors need to be re-defined!
- Response:
  - Identify those customers willing to take the leap
  - Target simpler missions or mission "Slices"
  - Small successes will lead to gradual acceptance
  - Gov't procurement process needs to be tailored to be supportive

It's Not Too Hard!
It's Just Different!

The Five (5) Factors Applied to Small Sats (Cont'd)

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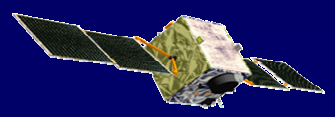
- 4) Steady improvement toward the standard
  - Key to performance is miniaturization and standardization of payloads and interfaces
- Response:
  - Don't grow requirements (and thus size, schedule and cost)
  - Take constellation approach to expand mission coverage (Network it!)
  - Design in the TRL advancing options (qualify terrestrial COTS by flying it as an adjunct mission enhancement opportunity)

Do Not Construe as a Replacement!
We Need to Define our own Standard!



The Five (5) Factors Applied to Small Sats (Cont'd)

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- 5) Eventually displaces the incumbent
  - Don't take literally
- Response:
  - It's the business & program process that needs fixing, not the product!
  - Small Sats can create and satisfy a significant niche market
  - ……and be the driving force behind the "Re-Invention" of the US Space Industry!

Do We Really Understand The End Result We Are After?

Does Your Laptop Look Like This?

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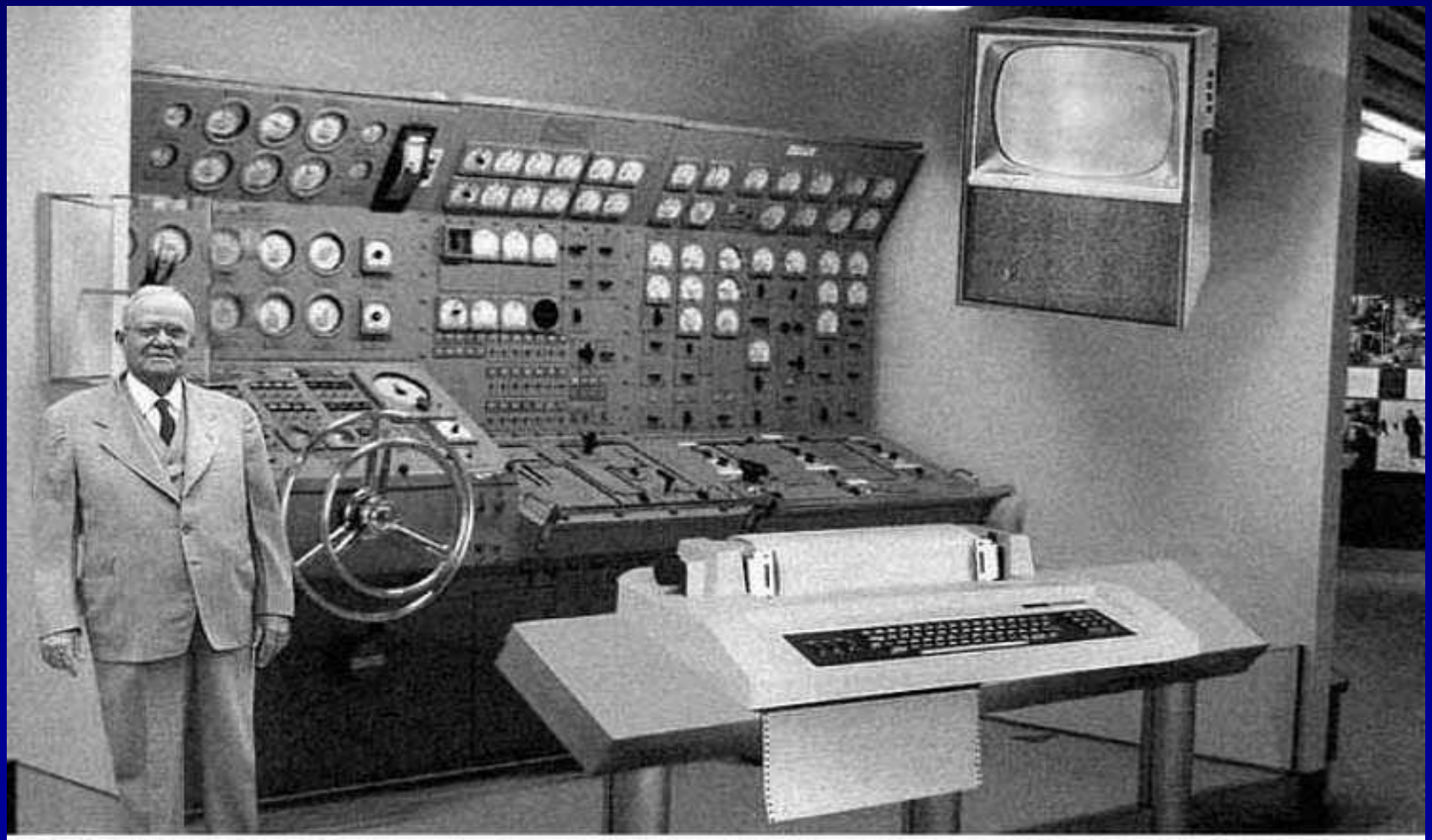
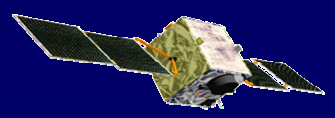


Scientists from the RAND Corporation have created this model to illustrate how a "home computer" could look like in the year 2004. However the needed technology will not be economically feasible for the average home. Also the scientists readily admit that the computer will require not yet invented technology to actually work, but 50 years from now scientific progress is expected to solve these problems. With teletype interface and the Fortran language, the computer will be easy to use.



PC's & Small Sats
The Technology Adoption Curve

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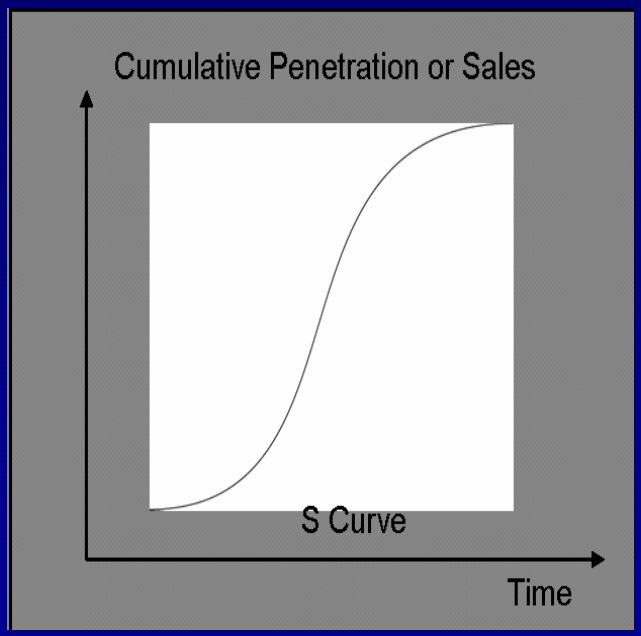
- Innovators (2.5%)
  - Universities
- Early Adopters (13.5%)*
  - Gov't Labs
- Early Majority (34%)
- Late Majority (34%)
- Laggards (16%)



* = We are here!

Who Would Ever Want One of Those Things?

The Next 20 Years
Keys to Small Sat Success

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- U.S. policy must allow small sat providers/users access to low-cost responsive ***launch*** options
- Reductions in acquisition ***cycle time*** will reduce pressure on requirements growth
- Smaller, less expensive satellites does not necessarily have to mean LESS ***performance***
- ***Educate*** customers on what is required to achieve affordable, rapidly responsive, mission capability from small satellites

The Reformation of the US Space Program Must be a National Objective - And Small Sats Can/Will Play a Leading Role!

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QUESTIONS?