The Future of NOAA Satellite Systems and Data

--

H.R. 353 Weather Research & Forecasting Innovation Act of 2017

Committee on Earth Science & Applications from Space (CESAS)

Washington, DC

March 28, 2017

Conrad C Lautenbacher, Jr

CEO, GeoOptics, Inc

Agenda

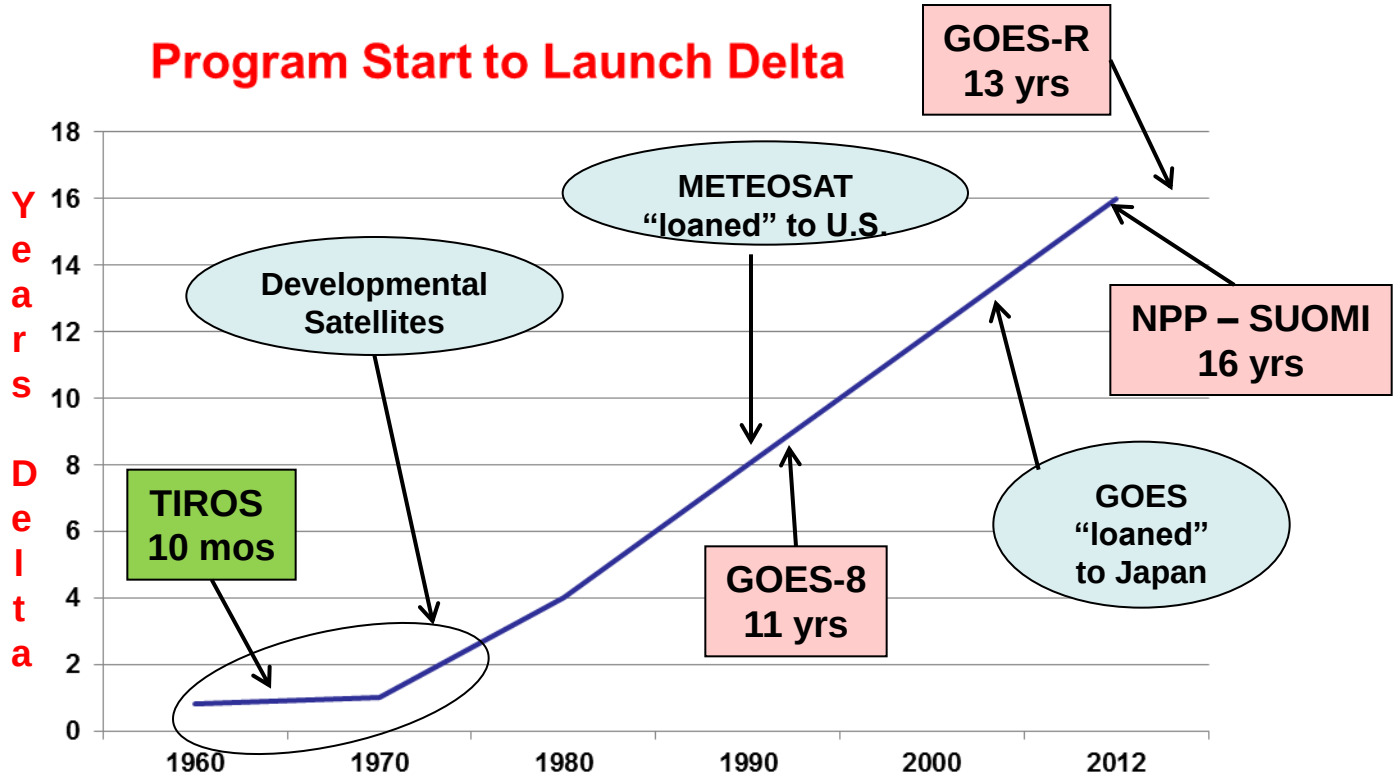
- The Task
- Current System Issues
  - Business Model
  - Changing Technical Landscape
  - Weather Satellite Pipeline
  - Resource Use
  - U.S. Policies & Practices
  - The Weather Enterprise
- Discussion

Study of NOAA Future Satellites Systems*

- Recommendations for more robust and cost-effective data
- **Costs and benefits of constellations of many small satellites, standardized bus design, purchasing of data**
- Identify weather model essential observations based on observations, assessment of weather research, and cost
- Identify current observations that could improve the model quality today
- identify and prioritize future observations that could contribute to existing and future weather models
- **Develop recommendations on a portfolio of observations that balances the best of private and non-private sources, and space and Earth-based sources**.

* Presenter's edit of H.R.352 Weather Research and Forecasting innovation Act of 2017

“Business Model” Issues



- Small “Operational” Satellite Numbers – 1 loss a disaster
- Operational Satellites that are really “Developmental”
- Inherent Cost Growth and Schedule Delays

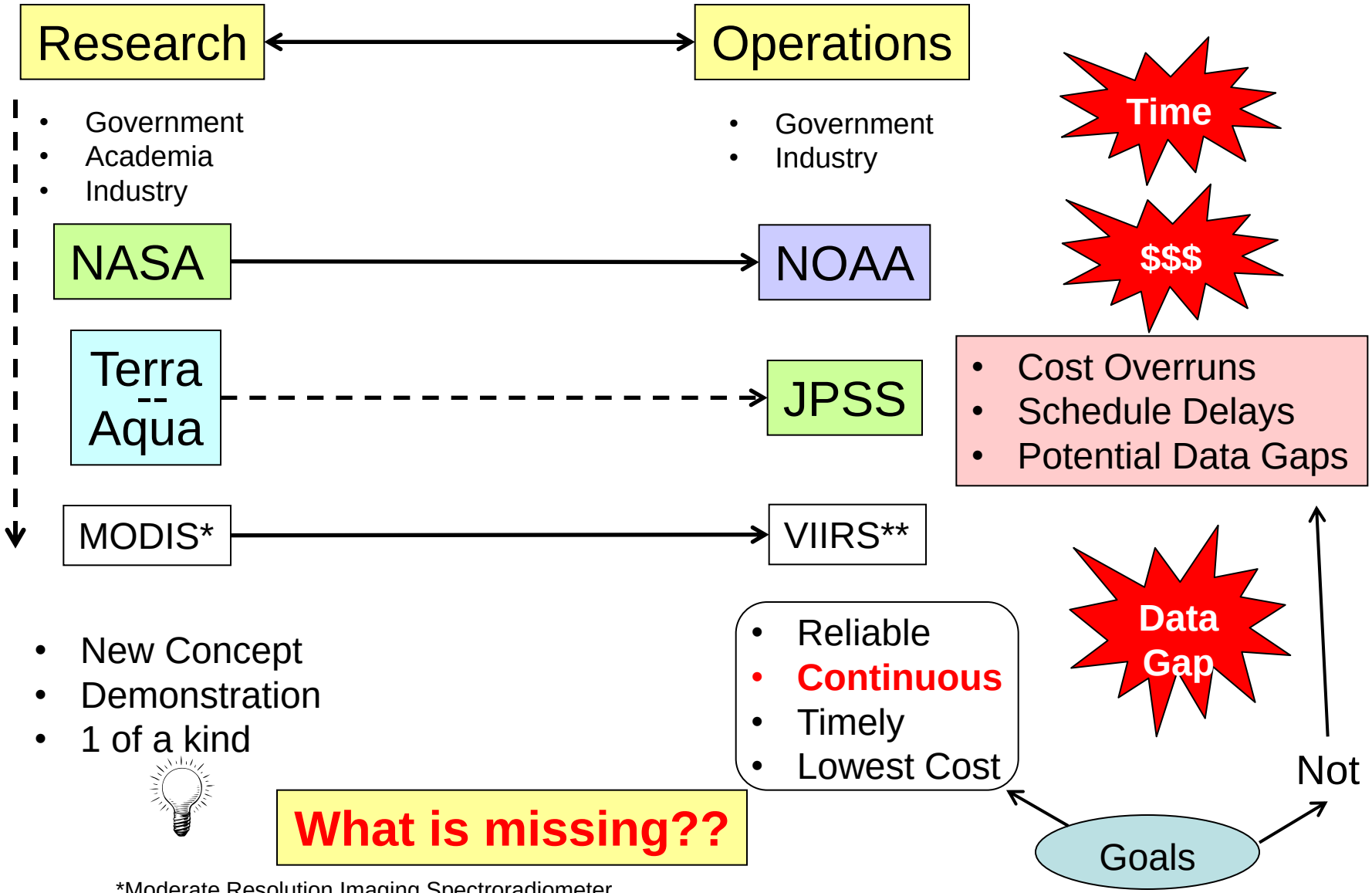
Changing Technical Landscape

- Aging Work Force
  - Pioneers are retiring
  - Challenge and Opportunity

> A new scientific truth does not triumph by convincing its opponents and making them see the light, but rather its opponents eventually die, and a new generation grows up that is familiar with it. — Max Planck *Scientific Autobiography and Other Papers*, trans. F. Gaynor (1950), 33.

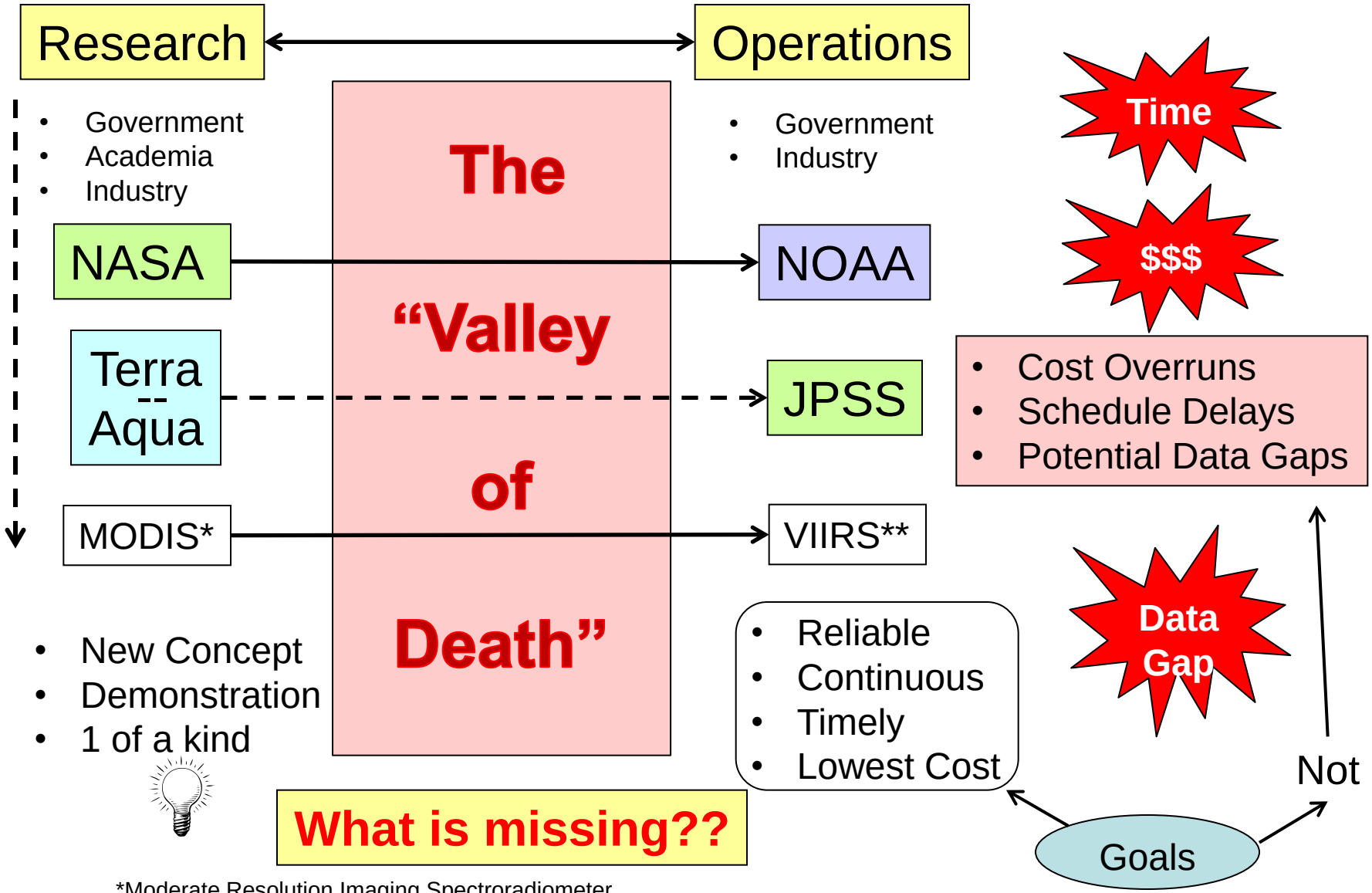
- Technology Moving Rapidly
- New Space Business Model(s)
  - “Battle Stars” vs. “Cellularized” constellations
  - Expand Commercial Roles (e.g. data continuity)

The U.S. Weather Satellite "Pipeline"



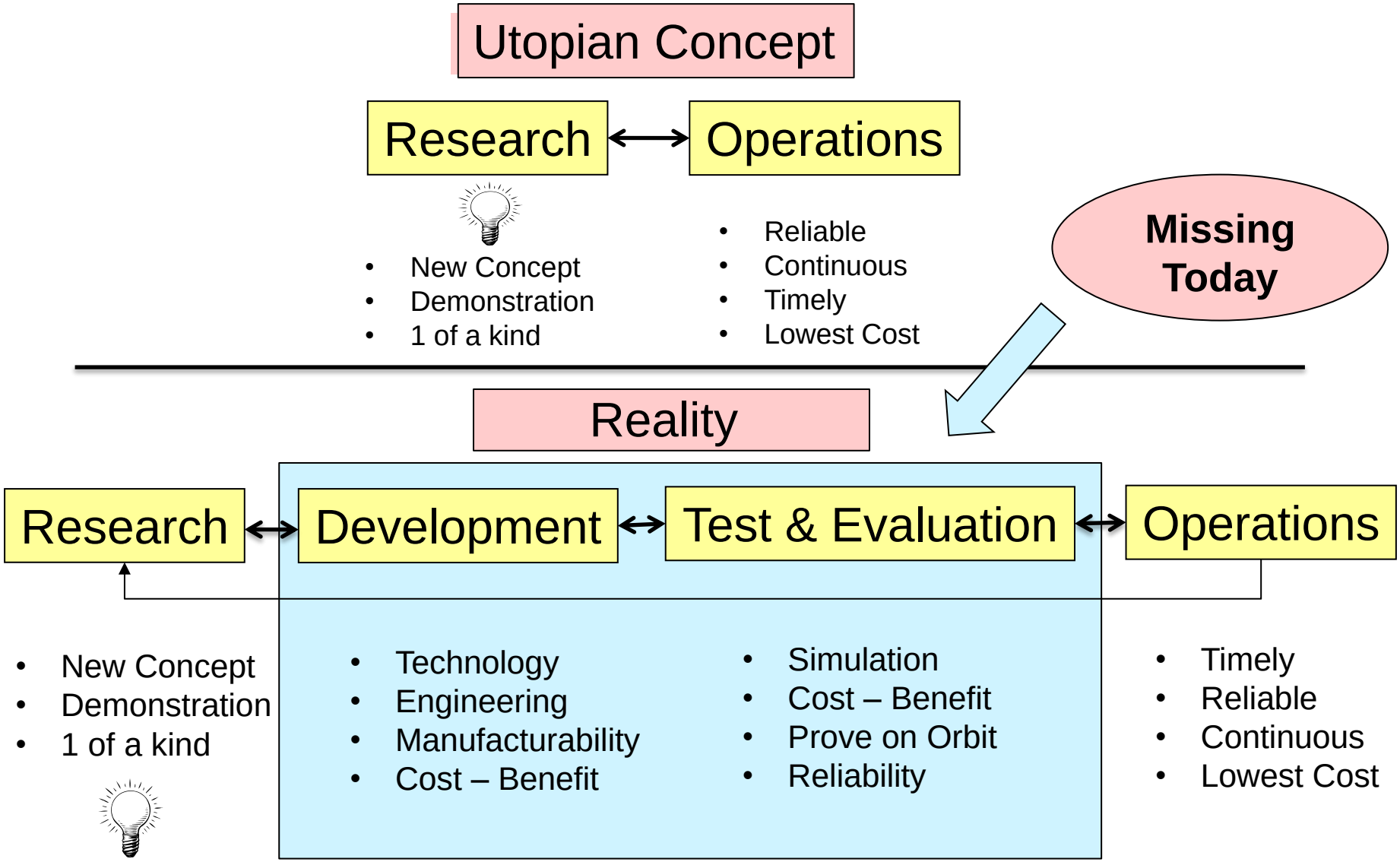
*Moderate Resolution Imaging Spectroradiometer
**Visible Infrared Imaging Radiometer Suite

The U.S. Weather Satellite "Pipeline"

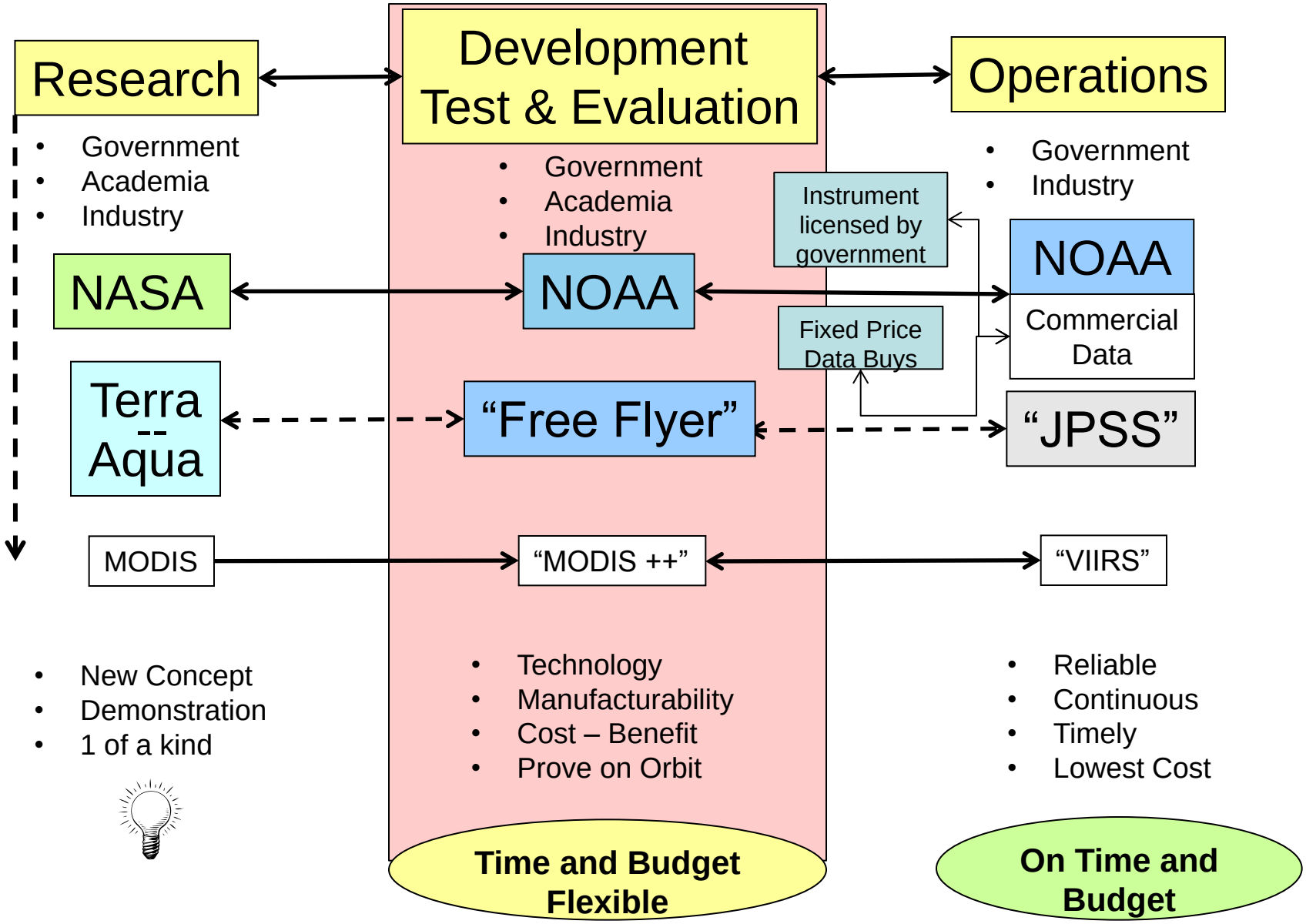


*Moderate Resolution Imaging Spectroradiometer
**Visible Infrared Imaging Radiometer Suite

The U.S. Weather Satellite "Pipeline"



The U.S. Weather Satellite "Pipeline"



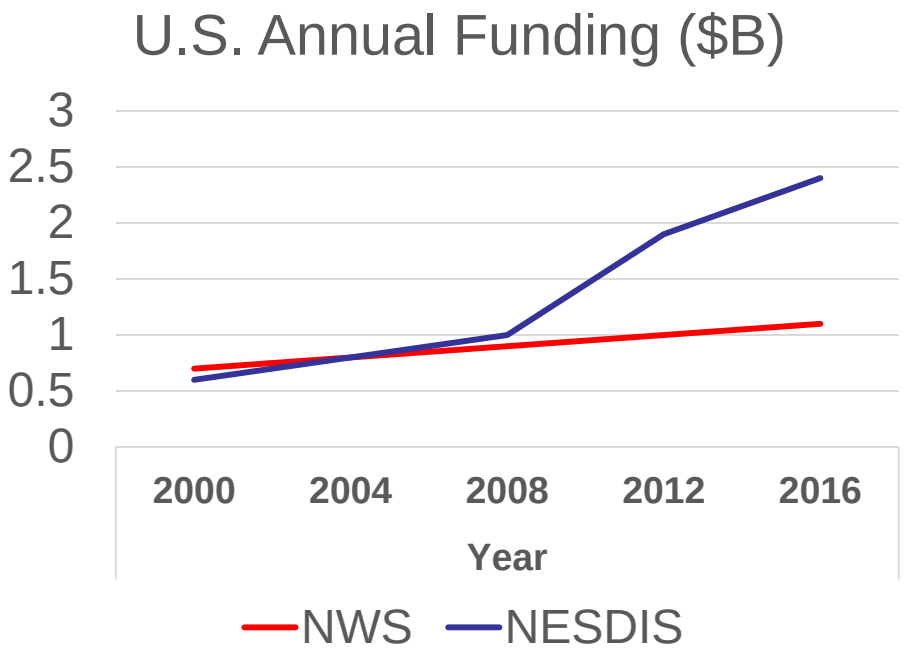
Weather Satellites

Current

- Satellite costs escalating
- $B per satellite
- Can afford only 1-2 at a time
- 10-15 year development time
- technology out of date by launch

Future

- $K per satellite
- Very small, 100 or more
- Short development time
- Replenish annually as needed
- New technology
- Easy to test & introduce



Best balance of funding for weather forecast improvement?

Business Models: Old vs New

Global Precipitation Measurement (GPM) Satellite

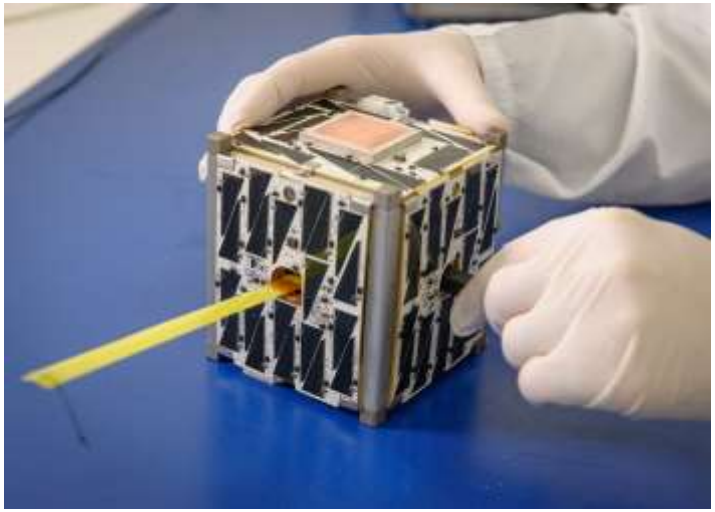
=

3 story, 2 car garage @ 8600 Lbs

CubeSat

=

4” cube
5 – 8 lbs

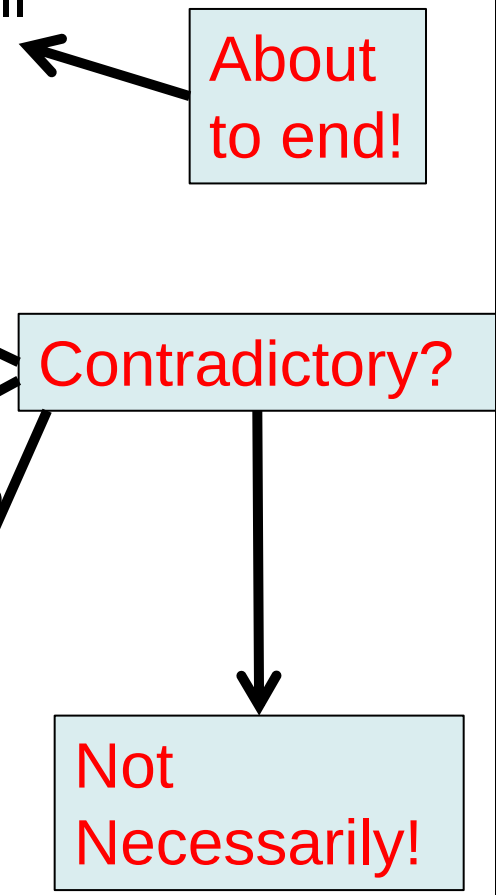


U.S. Policies & Practices

- Government develops, owns and operates all weather satellites (Practice)
  - Cannot be sold to private entities (Law)
- Government Data & Products free to:
  - government agencies, researchers, public
  - U.S. Commercial Weather Industry (Practice)
- Government Space Policy (Executive Order)
  - Purchase commercial space services to maximum
  - Do not compete with US commercial space activities
- World Meteorological Organization (WMO)
  - Resolution 40 – Data Sharing
- Fair Weather Report – National Academies
  - Recognition of Commercial Weather industry
  - **Academia, Government, Commercial**

U.S. Policies & Practices

- Government develops, owns and operates all weather satellites (Practice)
  - Cannot be sold to private entities (Law)
- Government Data & Products free to:
  - government agencies, researchers, public
  - U.S. Commercial Weather Industry (Practice)
- Government Space Policy (Executive Order)
  - Purchase commercial space services to maximum
  - Do not compete with US commercial space activities
- World Meteorological Organization (WMO)
  - Resolution 40 – Data Sharing
- Fair Weather Report – National Academies
  - Recognition of Commercial Weather industry
  - **Academia, Government, Commercial**



The Weather Enterprise

Products and Services

Maximizing Value

Government

- **Public Safety**
- Economic Health
- National Defense
- Regulation

Academia

- Science
- **Research**

Commercial

- Services
- **Efficiency**
- Competition
- **Robust Economy**
- Communication

The End

"We are really the generation that reached the limits."

Earth scientists "….are the only ones who can explain the basic processes … that are threatening us"

Jeffrey Sachs*

Education

Research

- **Accept the challenge**
- **Work for a sustainable future**

Conrad C Lautenbacher, Jr.

*Eos News Vol 95, No 51, 23 Dec 14