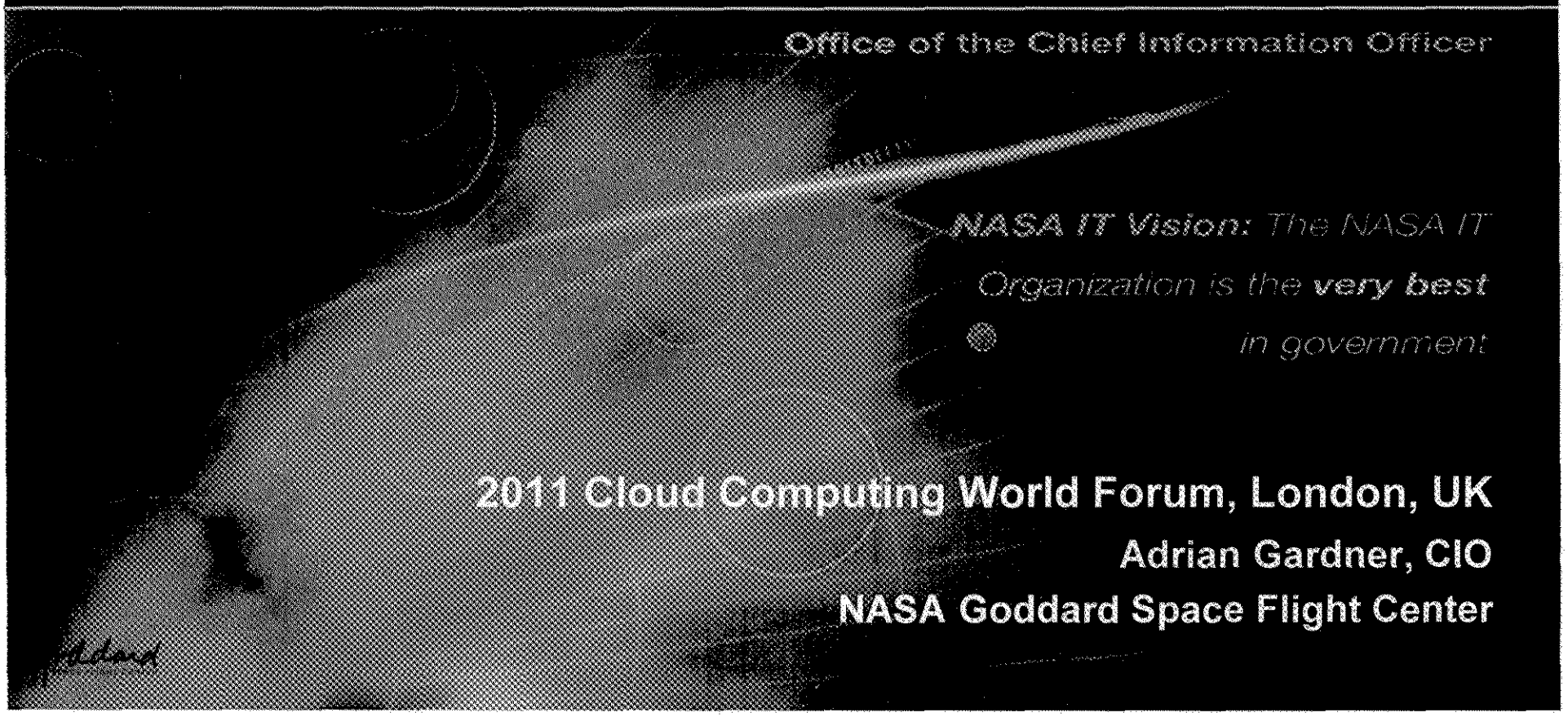
National Aeronautics and Space Administration

Cloud as a Game-Changing Business Strategy

Office of the Chief Information Officer

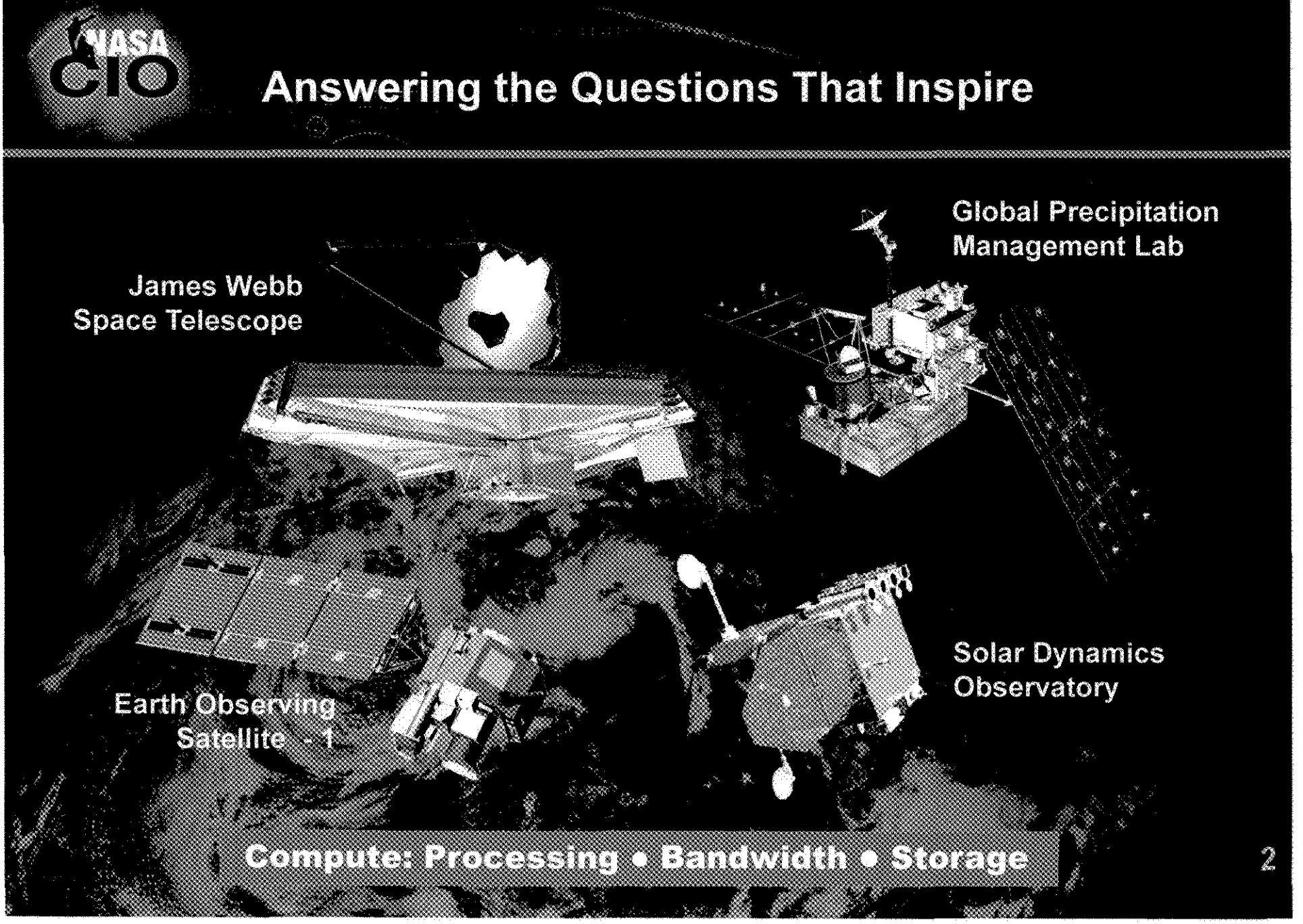


*NASA IT Vision: The NASA IT Organization is the **very best** in government*

2011 Cloud Computing World Forum, London, UK

Adrian Gardner, CIO
NASA Goddard Space Flight Center

Answering the Questions That Inspire



Compute: Processing • Bandwidth • Storage

Complex Project Management

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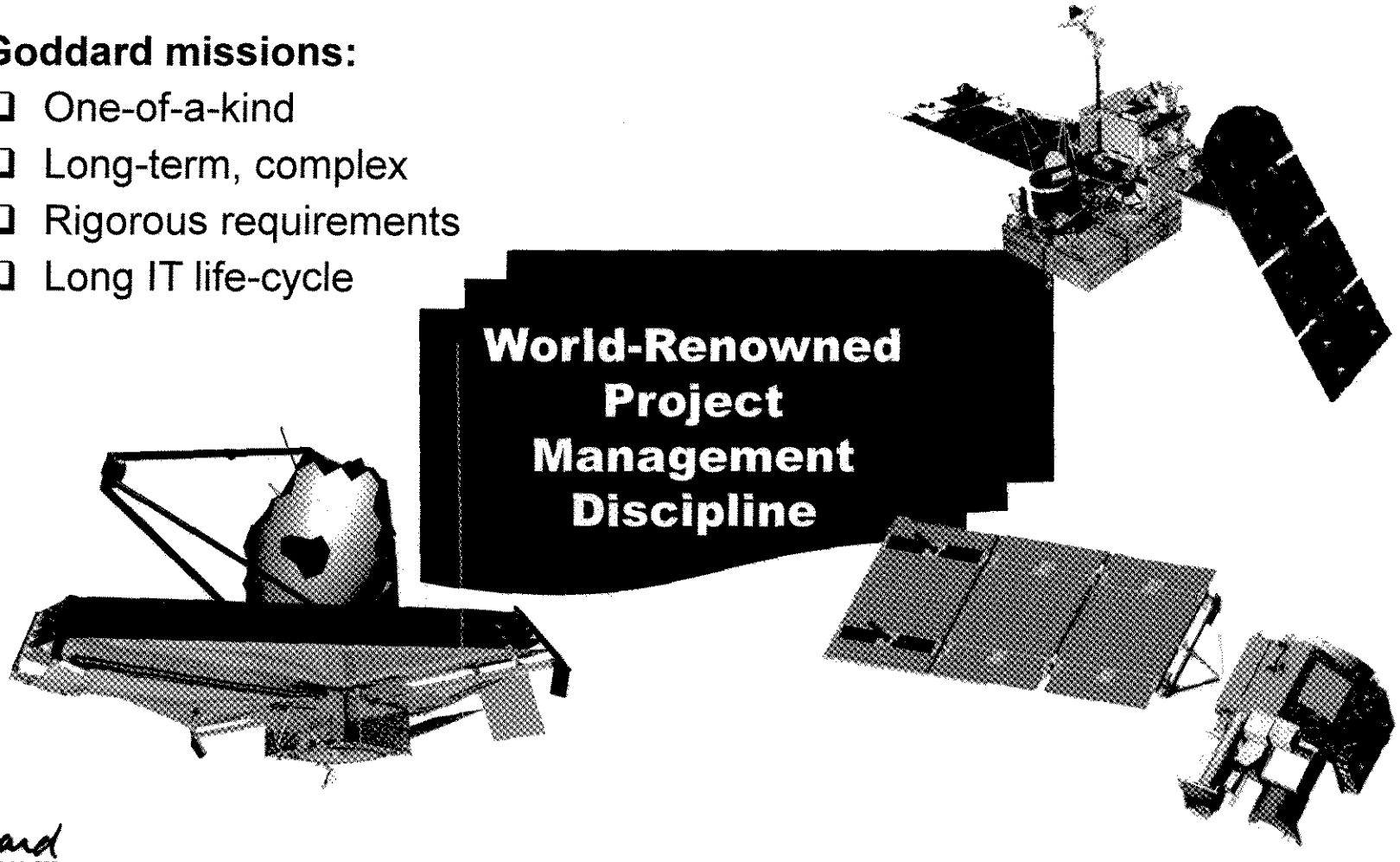
- ❑ One-of-a-kind
- ❑ Long-term, complex
- ❑ Rigorous requirements
- ❑ Long IT life-cycle

World-Renowned Project Management Discipline



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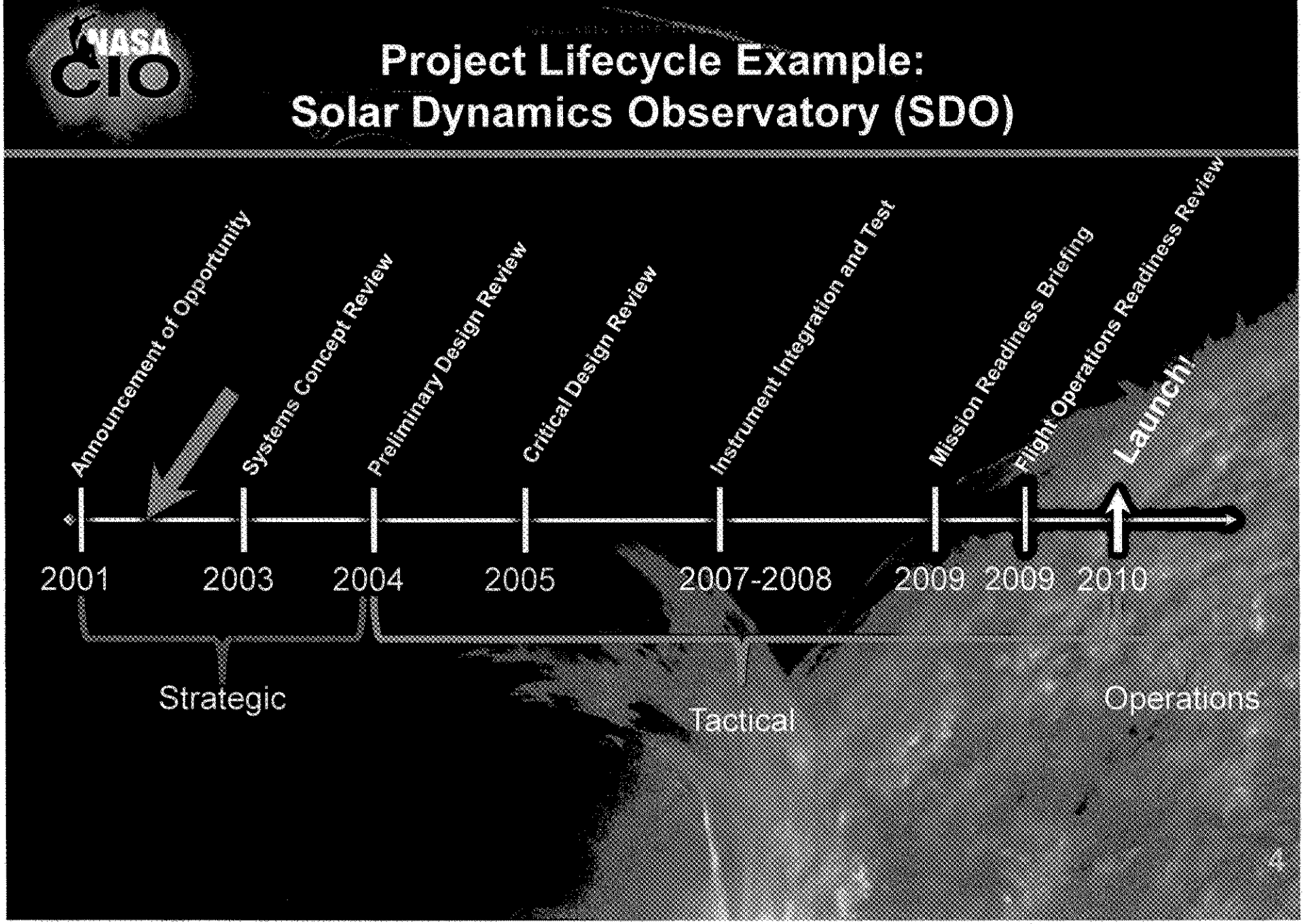
Project Lifecycle Example: Solar Dynamics Observatory (SDO)



Challenges of Project Development

Challenges and cost drivers accompany long-term, complex project development

- Long procurement/acquisition times for hardware
- Must estimate the required compute in advance of actual need
- Expensive hardware can be obsolete by launch
- Projects developed separately don't always interoperate
- Multiple certifications are required for duplicative development environments
- Costly software licensing is required for each duplicative environment

Cloud Brings Solutions

Cloud offers well-known solutions to complex project challenges

- Reduction of duplicative hardware, software, licensing, and networking
- On-demand access to compute—no advance estimating needed
- Incredible scalability/elasticity
- Rapid acquisition and decommissioning
- Easier information sharing in the Cloud
- "Try it before you buy it"
- Greener project management

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Not a One-Size-Fits-All Solution

Despite its many advantages, Cloud may not always be the answer

- High-security projects may require hardware at Go-Live (physical separation)
- Caution about introducing perceived risk to a project
- Distributed data or applications lead to latency concerns
- Certain spectrums of compute are not suitable for Cloud (e.g., supercomputing or embedded IT)
- Cultural resistance to change

Implement Strategically

When project management is complex, be strategic about Cloud implementation.

- ❑ Determine where Cloud can bring the most value to the organization
- ❑ Gauge levels of potential adoption willingness among projects
- ❑ Choose an approach for implementation

a. Enterprise-Wide: Embed directly into project management framework

b. Use on a project-by-project basis

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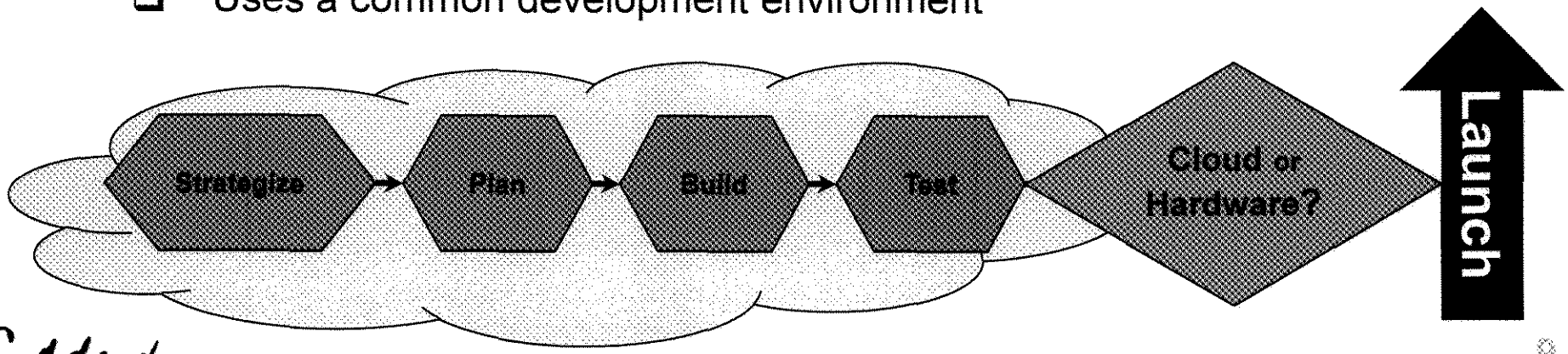
Enterprise-Wide Approach

Enterprise-wide: Embed directly into project management framework

- All IT-related project **development** occurs in the Cloud; at **launch,** mission can switch back to hardware if needed
- All IT projects use the same suite of tools, which the organization provides on an as-needed basis
- Uses a common development environment



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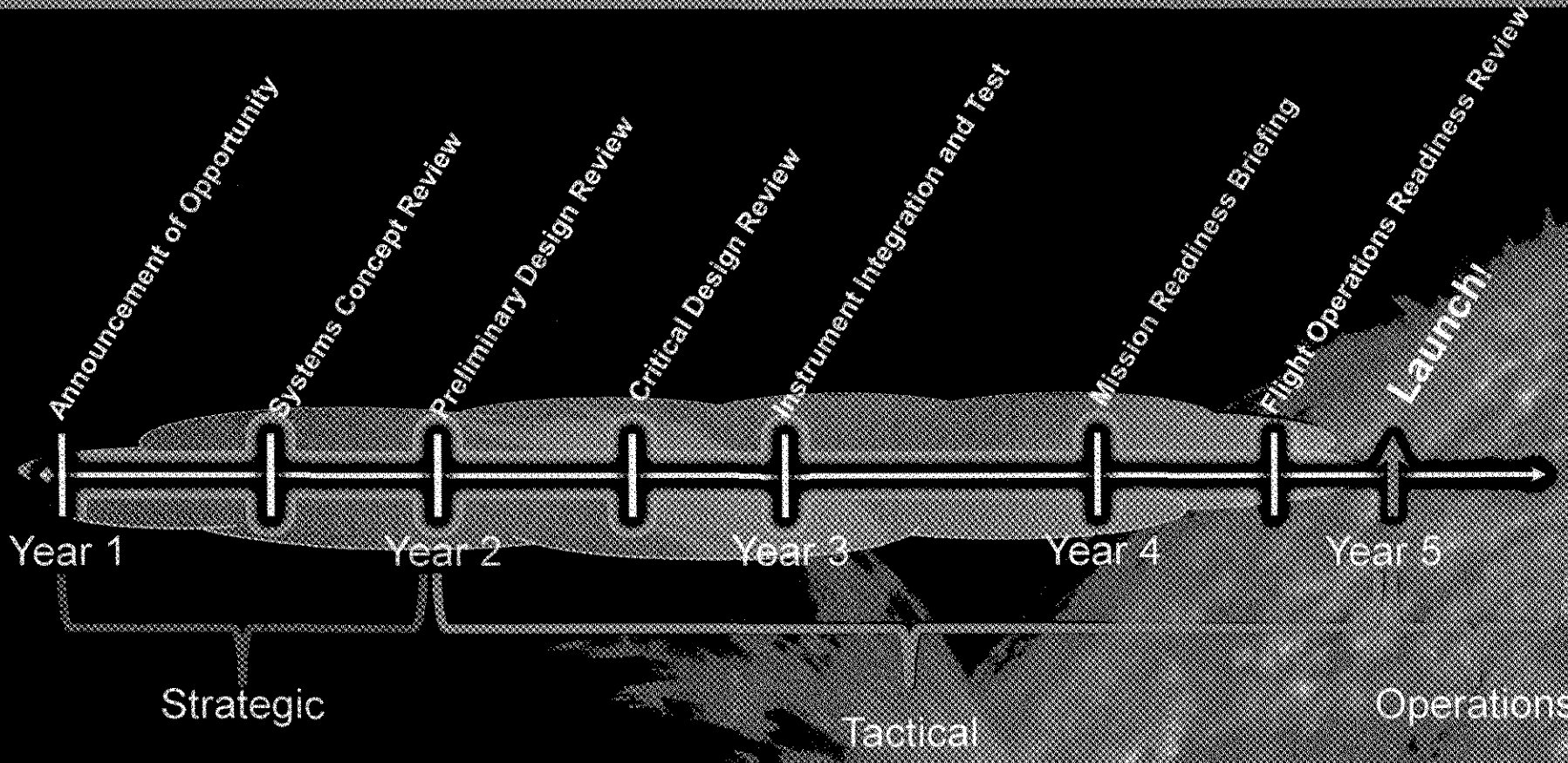
Enterprise-Wide Approach, Project Lifecycle Within the Cloud



Respond to Requirements
Change the Paradigm

Enterprise-Wide Approach, Benefits

Benefits:

- ❑ Economies of scale reduces costs organization-wide
- ❑ No need to "guess" at compute requirements—buy as needed
- ❑ Project doesn't need to manage maintenance of compute
- ❑ Reduces software licenses needed
- ❑ Common certification process can be developed
- ❑ If project switches back to hardware for production environment:
  - ✓ Can buy the latest IT right before launch, vs. years in advance
  - ✓ Will know exactly what compute is required to do the job

Challenge:
In a multi-project environment, implementing Cloud Enterprise-wide may not be feasible

Project-by-Project Approach

Six project types conducive to introducing Cloud

1. **Projects with a development timeline beyond Moore's Law; buy the latest IT on a "just-in-time" basis, vs. years in advance**
   - System or mission development (e.g., satellites, ships, etc.)
   - Planning and architecting new businesses or lines of business
   - Construction of buildings or renovations

Like SDO, the James Webb Space Telescope timeline spans almost a decade.

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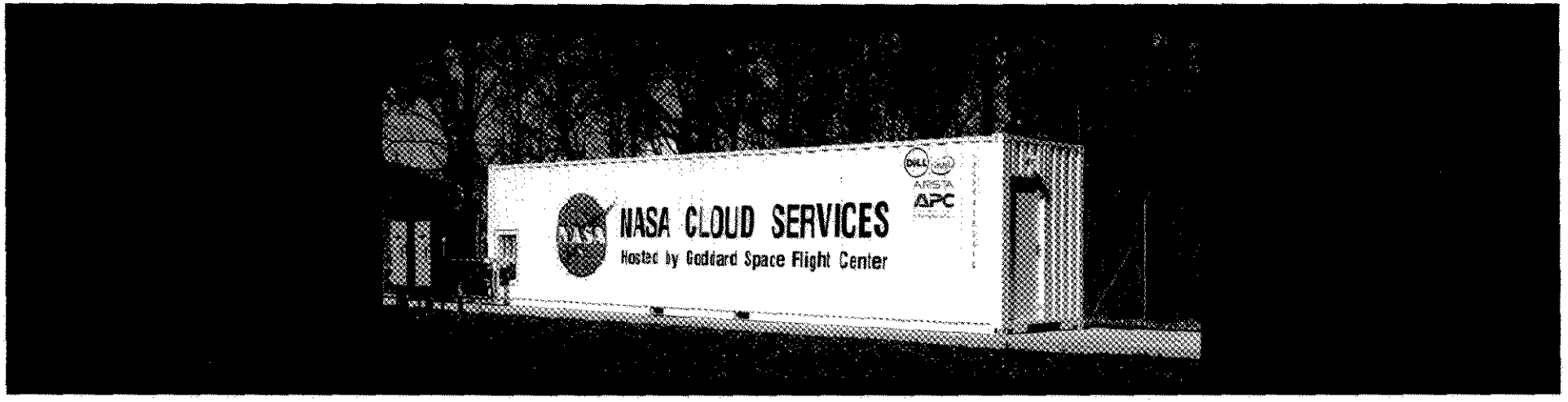
Project-by-Project Approach, cont.

2. **Data-center paradigms that need a temporary stop-gap compute capability**
   - ❑ When going from an older to a newer data center
   - ❑ Server consolidations
   - ❑ Reorganization of a data center
   - ❑ Moving a data center



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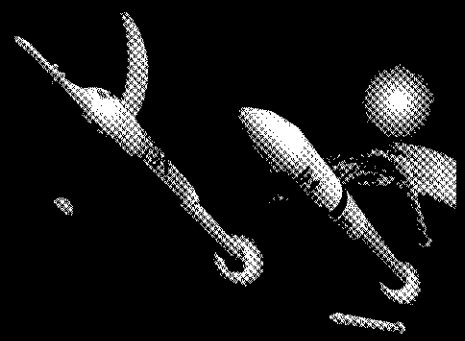
Project-by-Project Approach, cont.

3. **Risk associated with a project, business, change, etc.**
   - ❑ During potentially significant changes in IT
   - ❑ During uncertain changes in demand
   - ❑ Uncertain status of a major project; will it be defunded?

4. **Situations that foster challenging funding profiles**
   - ❑ Businesses with cyclic demands (e.g., agriculture)
   - ❑ Economic downturns/cycles (e.g., weak markets)

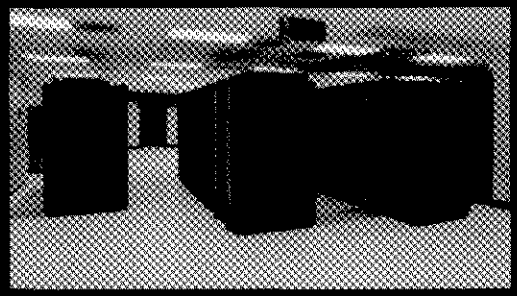


Artist's rendition of planned Constellation boosters Ares I and V.

Project-by-Project Approach, cont.

5. **Ramping up new projects, business units, or businesses**
   - ❑ Utilizing Cloud as you need compute, while you wait for acquisition, with potentially long lead times
   - ❑ Utilizing Cloud until known IT scope is understood

6. **Proofs of Concept and Pilots…scope it before you buy it**
   - ❑ Scoping of workstation or server performance
   - ❑ Load balancing of clusters or high-end servers
   - ❑ Scoping of network performance



The newest unit of the NASA Center for Climate Simulation's Discover supercomputer.

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Summary

Embedding Cloud strategically in project management can help ensure:

- Business success
- Risk mitigation
- Significant cost savings
- Better understanding of compute requirements: storage, processing, etc.
- The ability to obtain the latest technologies when buying; buy just-in-time vs. years in advance

Thank you