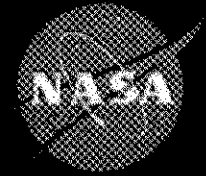National Aeronautics and Space Administration

NASA

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

Global Precipitation
Management Lab

James Webb
Space Telescope

Solar Dynamics
Observatory

Earth Observing
Satellite - 1

Compute: Processing • Bandwidth • Storage

Goddard missions:

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

World-Renowned Project Management Discipline

Goddard
SPACE FLIGHT CENTER

Project Lifecycle Example: Solar Dynamics Observatory (SDO)

Announcement of Opportunity

Systems Concept Review

Preliminary Design Review

Critical Design Review

Instrument Integration and Test

Mission Readiness Briefing

Flight Operations Readiness Review

Launch!

2001   2003   2004   2005   2007-2008   2009   2009   2010

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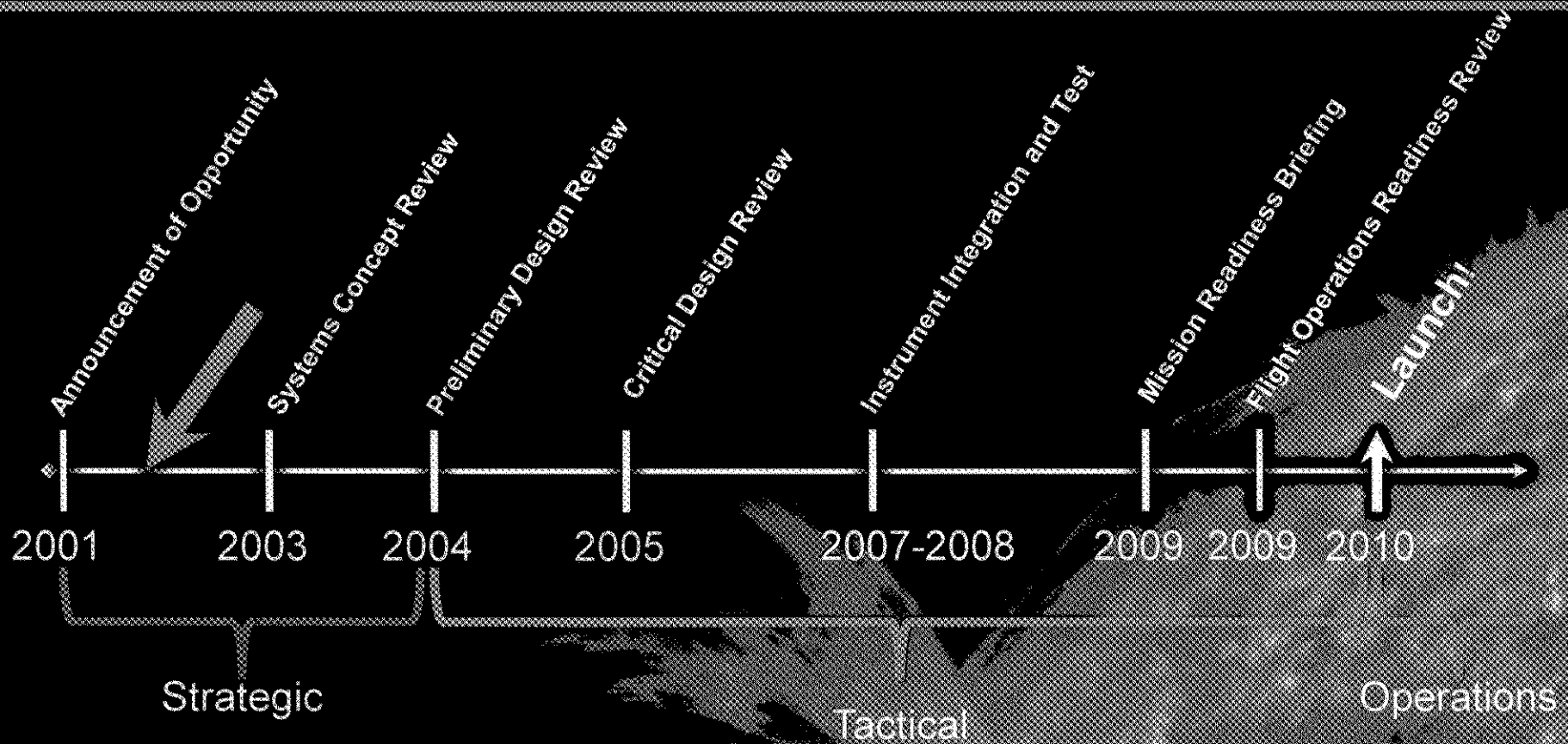
Challenges and cost drivers accompany long-term, complex project development

- ❑ 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

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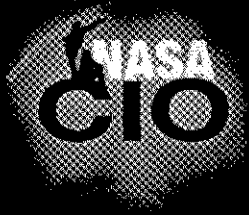
Cloud offers well-known solutions to complex project challenges

- ❑ 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

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

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
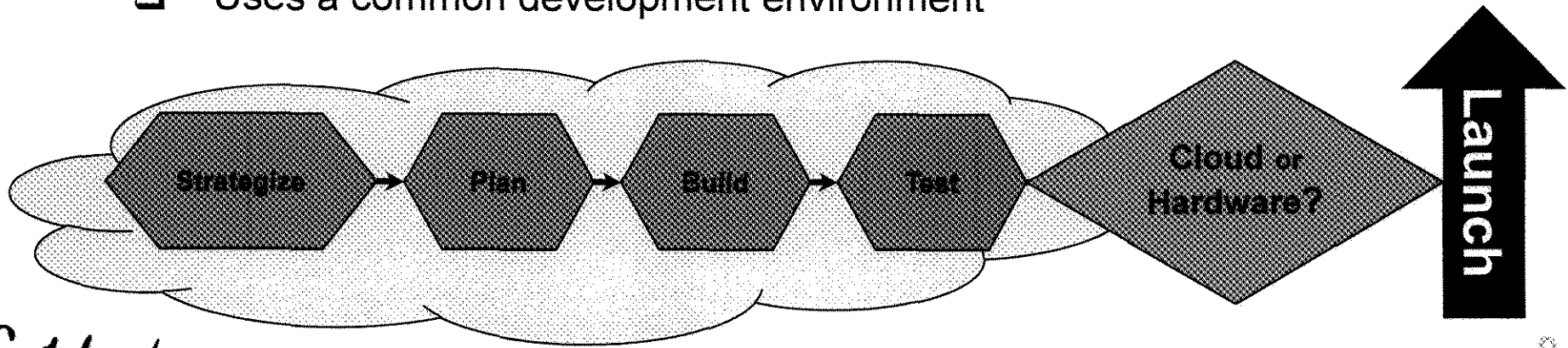
- ❏ Choose an approach for implementation

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

b. **Use on a project-by-project basis**

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SPACE FLIGHT CENTER
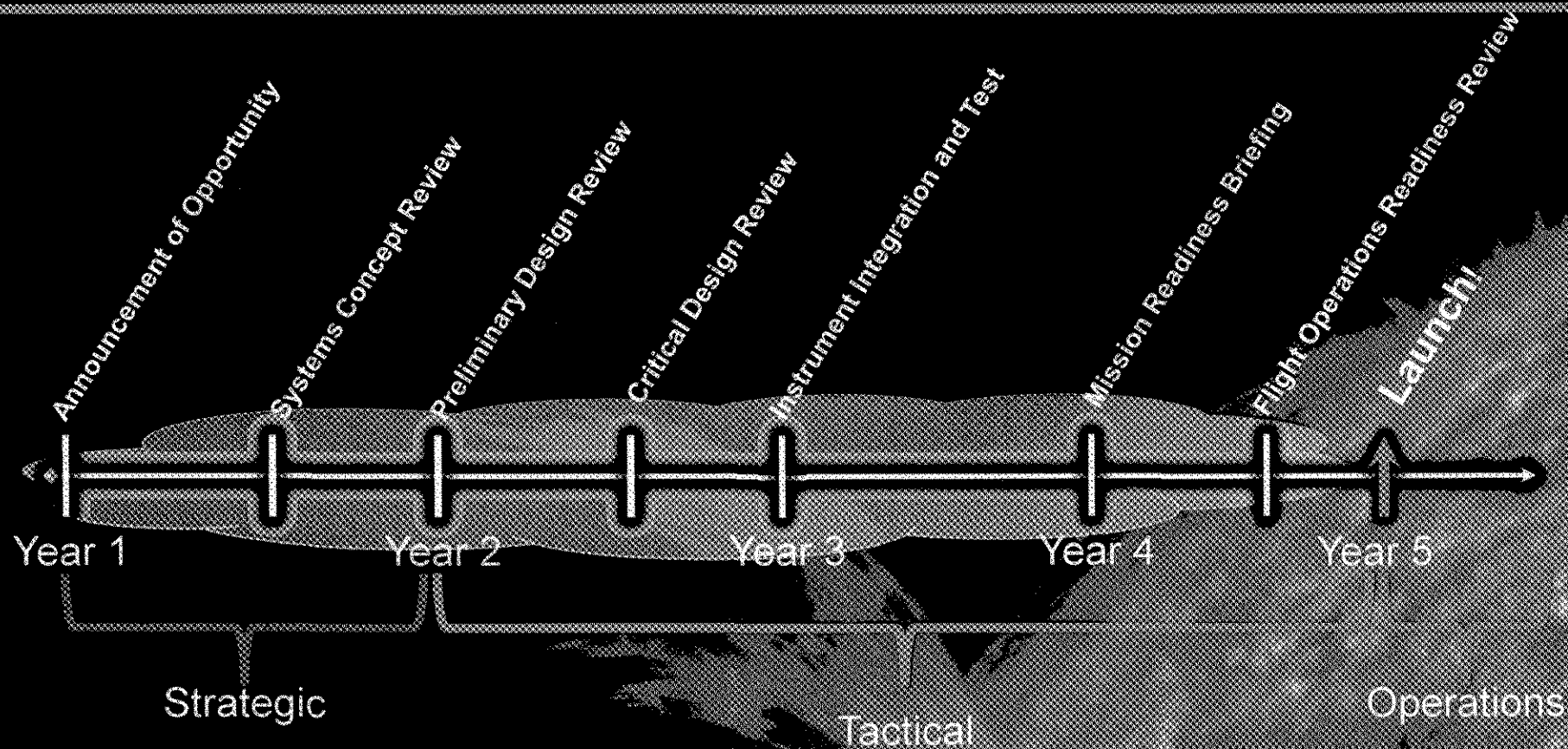
Enterprise-Wide Approach

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
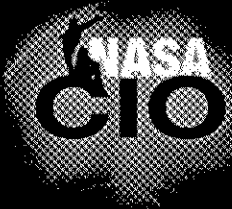
❑ Uses a common development environment

Strategize → Plan → Build → Test → Cloud or Hardware? → Launch

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Enterprise-Wide Approach, Project Lifecycle Within the Cloud

Announcement of Opportunity

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Launch!

Year 1   Year 2   Year 3   Year 4   Year 5

Strategic   Tactical   Operations

Respond to Requirements
Change the Paradigm

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

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

   2006 | | 2015

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

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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

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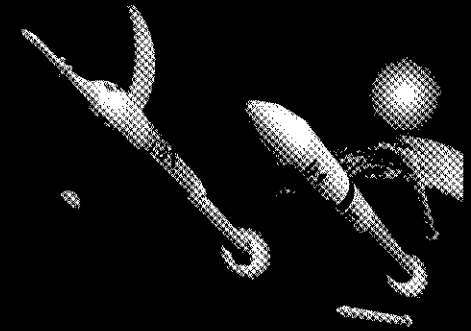
Artist's rendition of planned Constellation boosters Ares I and V.

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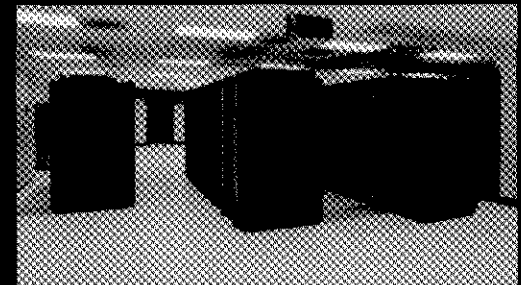
The newest unit of the NASA Center for Climate Simulation's Discover supercomputer.

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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