NASA Office of Space Science
Office of the Technology Director

# Enabling Telescopes of the Future:
## Long-Range Technology Investing

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## Snapshot of OSS: April, 2002

The Office of Space Science at NASA Headquarters has a current staff of about 60 professionals (aka, scientists, engineers, budget analysts) and an annual budget of $2.5 B out of NASA's $15.0 B.

About 35 missions or programs in various stages of development or operation are managed by OSS, notable among them are Hubble Space Telescope, Mars Global Surveyor, Mars 2001 Odyssey, Chandra X-ray Observatory, TRACE (solar observatory), Cassini (mission to Saturn), Galileo (mission at Jupiter), and Next Generation Space Telescope.

OSS has an annual technology budget of several hundred million dollars.

*So, what is it that we are doing?*

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# Office of Space Science

## Selected Current/Near-Future Technology Priorities

In-Space Propulsion:
initiated by Decade Planning Team (FY02)

Nuclear Power and Propulsion:
initiated by Decade Planning Team (FY03)

Advanced Materials/Smart Materials:
proposed by NASA Exploration Team as future initiative

Large Telescope Systems:
proposed by A&P Division for future initiative

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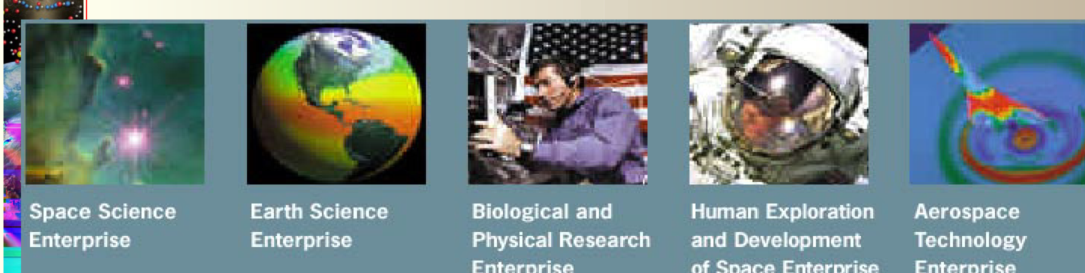
# NASA CHARTER

- **To advance and communicate scientific knowledge and understanding of the Earth, the solar system, and the universe, and**
- **To advance human exploration, use, and development of space, and**
- **To research, develop, verify, and transfer, advanced aeronautics and space technologies.**

***New agency "vision" to be presented on 14 April.***



## TECHNOLOGY PRINCIPLES

- Technology priorities are determined by science program requirements,
- Manage the technology program effectively, with milestones, deliverables . . .
- Implement space demonstrations of selected technologies: precursors and demos
- Use technologies in multiple missions and as "stepping stones"
- Promote partnerships with other Enterprises, agencies, industry, and academia
- Use open competition and external peer review wherever possible

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## NASA LONG-RANGE TECHOLOGY PLANNING PROCESS (ca. 2002)

1. Science/Mission priorities determined within Divisions via Strategic Planning processes, plus Administrators new "vision"
2. [Mission concepts derived from #1]
3. Technology priorities derived from #2
4. [Evaluation of "gaps", priorities, . . . within OSS and OAT.]
5. New initiatives or re-programming, as appropriate

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## NASA FUTURE TECHOLOGY and MISSION PLANNING

**What are the primary challenges to future new missions/new technologies?**

- Priorities for the science program
  - Determining the <u>major</u> science goals for OSS via the Strategic Plan
- Priorities among the mission options
  - The priority missions to achieve these goals
- Developing mission concepts
  - Sufficient information to identify long-term technology priorities
- Priorities for the technology investments
  - Given limited funding, which are the “must haves”?
- Near-term mission needs versus long-term technology programs
  - Technology funding as “bank account”

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## NASA FUTURE TECHOLOGY and MISSION PLANNING

**What are the primary challenges to future new missions/new technologies? [continued]**

- Technology maturation
  - Sustained investment, coordination with other Enterprises
- Technology infusion into missions
  - OSS missions favor established technologies
- Flight demonstrations
  - Insufficient opportunities for flight demonstration
- Significant technologies outside OSS . . . and NASA
  - OSS projects subject to vagaries external to OSS management
- Mission software consistently a mission’s “Achilles Heel”
  - Unmanaged largest technology element

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## A FEW DO'S AND DON'TS IN GETTNG FUTURE MISSIONS

DO at least get your science goals, if not your mission concept, into the OSS Strategic Plan (and associated roadmaps)

DO play close attention to the priority goals of OSS: make sure that your mission demonstrates clear relevance to these goals.

DO get your key technologies as priorities into the Division technology roadmap and Strategic Plan,

DO follow and offer input on technology funding, management, etc, but . . .

DON'T advocate the wrong (or lower-priority) technologies.
*For example, detectors are obvious and trivial.*
*What about materials, optical systems, precision structures . . .?*

DON'T forget the systems studies: launch systems, operations, orbits, costs

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## Example Technology Recommendations

- Current capabilities appear to be inadequate for autonomously-deploying precision structures in space significantly larger than NGST

- No capabilities are planned to recover, service, upgrade science facilities beyond LEO
  *10 - 30% of satellites suffer life-limiting failures*

- Enabling technology investments include precision lightweight structures and large lightweight optics, plus innovative (and poorly-studied) orbits

- Enhancing technology investments include detector and communication systems

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