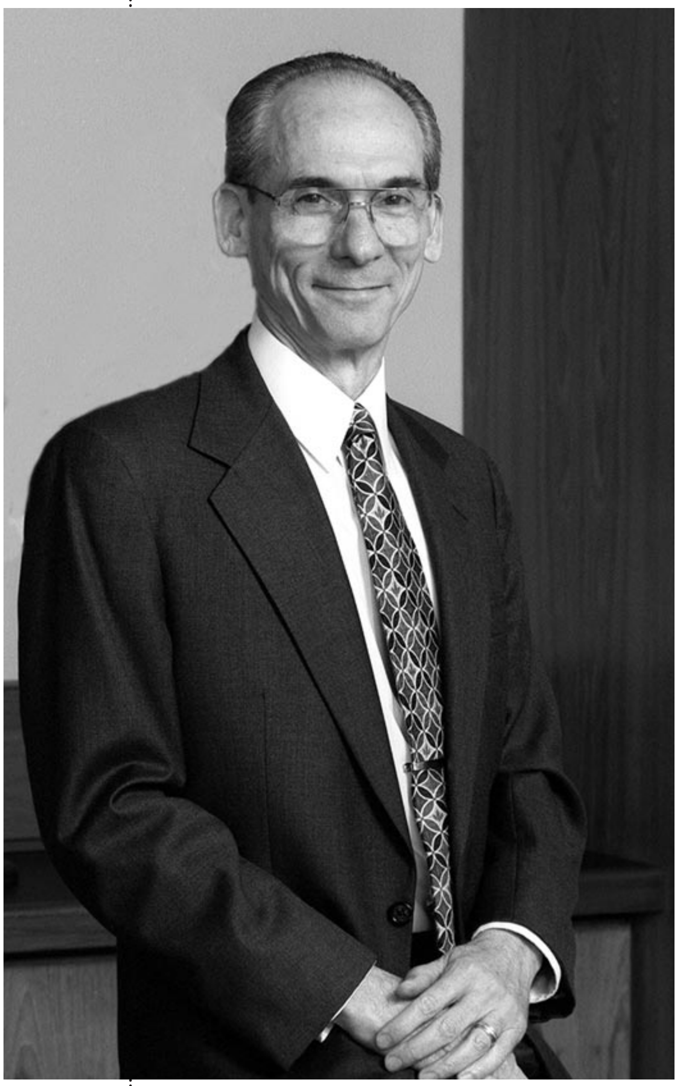
The JPL Implementation Plan

Fiscal Year 1999

Implementing NASA's Mission at the Jet Propulsion Laboratory



Key to achieving our goals is a renewed commitment to effective partnering and to collaborations with other nations. ... Working together, we will continue to serve as a gateway to the solar system and beyond.

E C Stone

JPL is engaged in the quest for knowledge about our solar system, the universe, and the Earth in order to answer fundamental science questions and to provide benefits to the nation through breakthrough missions. In this pursuit, we will help create a world in which space enriches the human experience for all. It is in this context that JPL conducts its near-term planning in alignment with the National Space Policy and the *NASA Strategic Plan*.

The JPL Implementation Plan guides our efforts and establishes our performance objectives for the coming fiscal year. It defines our mission and values in support of the NASA vision, establishes our implementation strategies for meeting our customers' needs, and identifies the Laboratory's change goals for the next three to five years. The plan also describes our present and future programs and how they contribute to NASA's mission, NASA enterprise goals, and other needs of national significance. In undertaking these programs, we will help broaden the benefits of the space program by making it more affordable, dependable, and frequent and more widely engaging, relevant, and accessible.

A key to achieving our goals is a renewed commitment to effective partnering and to collaborations with other nations. We must combine strengths with other NASA centers, federal laboratories, industry, and academia to develop long-range perspectives and capabilities for space exploration. A second area of emphasis is to restructure the way we work to implement challenging fast-track missions in a process-oriented, interdependent, multimission environment. One of the keys to accomplishing this goal is to break down any internal barriers to building high-caliber, cross-functional teams and by adopting improved business and technical processes. Working together, we will continue to serve as a gateway to the solar system and beyond.

Edward C. Stone

Director

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The JPL Implementation Plan

The JPL Implementation Plan responds to the planning process and requirements established in the *NASA Strategic Management Handbook*. The planning process, depicted in the accompanying figure, brings focus to NASA's future plans, and ensures that NASA's management decisions and practices are based on sound strategic and implementation planning while addressing the challenges of continuing change.

NASA's implementation planning is one step in NASA's Strategic Management Process, which consists of four components:

- Strategic planning (NASA agency and enterprise strategic plans)
- Implementation planning (this document)
- Execution of programs, projects, and processes
- Organizational performance evaluation (NASA Performance Report)

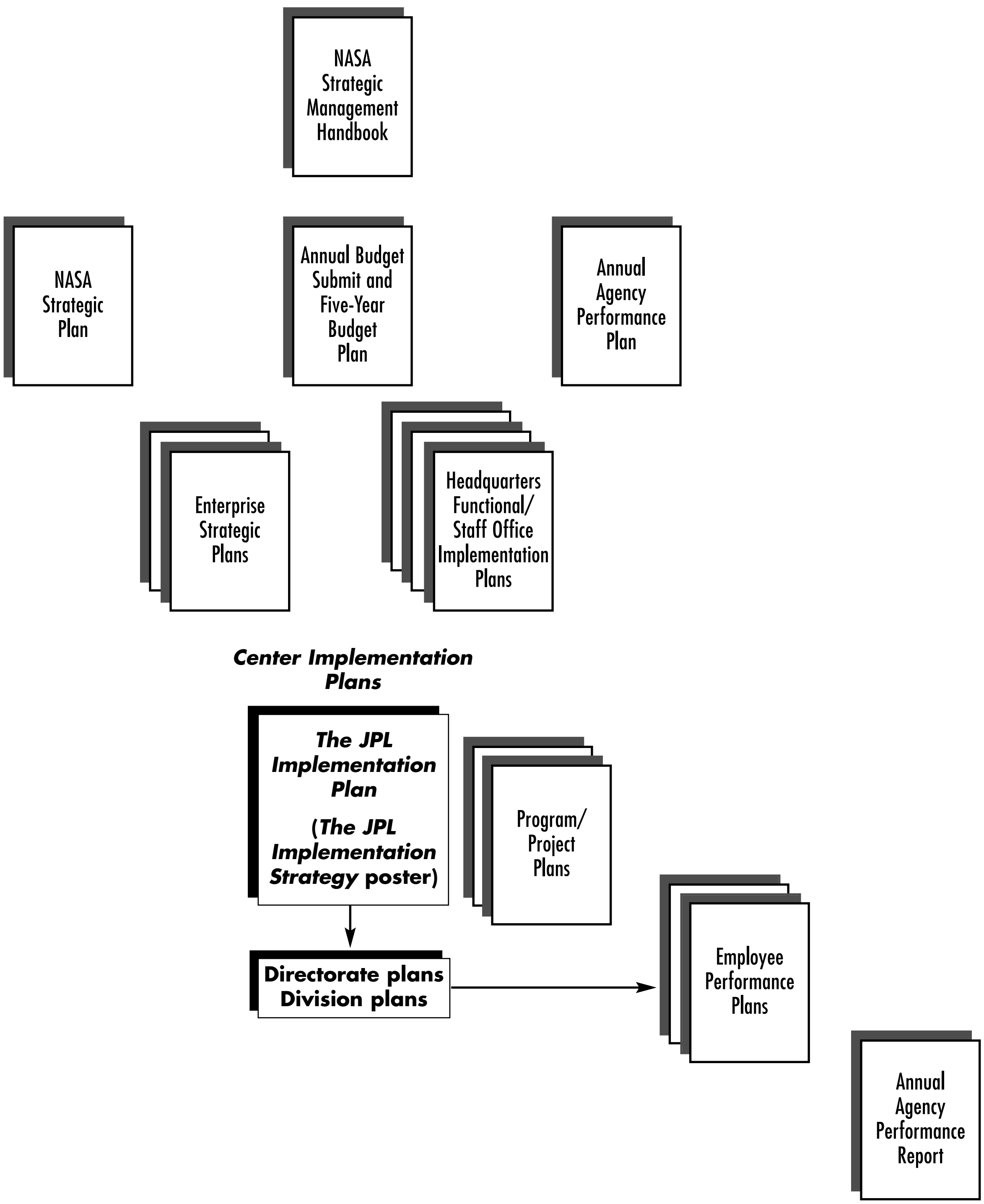
For more information on strategic management planning, see the *NASA Strategic Management Handbook.*

The *JPL Implementation Plan* defines the relationship of strategies from NASA's enterprise strategic plans to the roles, missions, centers of excellence, and program-specific JPL assignments (lead center and support activities). The JPL plan also describes the alignment of our institutional, program, and project activities with enterprise goals and crosscutting process strategies, as well as with the Agency's performance targets for FY'99. The plan is supported by the relevant program, project, and center of excellence plans that detail content, resource requirements, and schedule commitments, along with the metrics accountable to JPL and its managers.

The FY'99 plan sets our strategies for institutional, center of excellence, and assigned Agency support functions. Our strategies will be updated as required to reflect decisions made during the Agency strategic planning process. In this way, the *JPL Implementation Plan* bridges strategic direction and execution activities.

The JPL Implementation Plan is also the communication tool that allows our customers to see that their requirements are being addressed and that ensures that employees understand their contribution to the highest level strategies and objectives of NASA. The final linkage is made through each individual's performance plan and appraisal. The plan is signed by the Laboratory Director, who is responsible for the strategies and implementation activities it contains.

NASA STRATEGIC MANAGEMENT AND IMPLEMENTATION PLANNING



NASA's Strategic Management System Documents
(modified from *The NASA Performance Plan*, Fiscal Year 1999)

IMPLEMENTING THE NASA MISSION AT JPL

In this section we

- Identify JPL's NASA-assigned program lead center and support responsibilities.
- Display JPL contributions within the NASA Strategic Road Map to the Future to show how JPL programs, projects, instruments, tasks, and plans support the NASA mission.

	1999 – 2002	2003 – 2009	2010 – 2023
Mission	**Establish a Presence** **Deliver world-class programs and cutting-edge technology through a revolutionized NASA**	**Expand Our Horizons** **Ensure continued U.S. leadership in space and aeronautics**	**Develop the Frontiers** **Expand human activity and space-based commerce in the frontiers of air and space**
To advance and communicate scientific knowledge and understanding of Earth, the solar system, the universe, and the environment of space for research	Outer Planets I (Galileo, Cassini–Huygens) Great Observatory (SIRTF) Mars Surveyor Program Operating Deep Space Missions (VGR, ULS...) Origins (Keck Interferometer) Discovery (Stardust, Genesis) International Payloads Earth Science Missions, Instruments, Science SRTM, LightSAR ESSP (GRACE) SMEX (WIRE, GALEX) Fundamental Physics	Outer Planets Cassini–Huygens/Solar Probe Origins (SIM) Discovery Mars Surveyor Program Earth Science Missions, Instruments, Science ESSP SMEX SEU (FIRST, LISA, ARISE, Planck) Fundamental Physics	Future Outer Planets Missions Origins (Planet Finder) Discovery Mars Surveyor Program Earth Science Missions, Instruments, Science ESSP SMEX Fundamental Physics
To explore, use, and enable the development of space for human enterprise	**Mars Surveyor Program** Landing Sites Aerocapture Geology and Climate Joint Planning (HEDS/SSE) JPL HEDS tasks in Environment and Health Monitoring	**Mars Surveyor Program** Sampling ISRU Joint Missions (HEDS/SSE) **Telecomm and Ops:** Mars Relay Satellite; High-Bandwidth Communications **JPL Space Station Research**	**Mars Expeditions** Joint Robotic/Human Exploration HDTV (full operational optical communications) Areostationary Mars Relay Satellite Systems
To research, develop, verify, and transfer advanced aeronautics, space, and related technologies	**Critical New Technologies** Large, lightweight deployable structures *(SIM and NGST Technology Programs, Inflatable Technology Program)* Miniature spacecraft and instruments *(X2000, NMP DS2 '99)* Autonomous systems; sample acquisition and return *(SIM and NGST Technology Programs)* Innovative power, propulsion, and communications *(X2000, NMP DS1 '98)*	**Long-Range Technology Development** NMP CSMT, ADSSD Advanced Deep Space Telecommunications and Operations Advanced Mission Assurance **Industry Participation in Missions**	**Telecommunications and Operations** Global Operational Optical Communications InterPlaNET Increased Communications Bandwidth **Industry Participation in Missions**

An overview of JPL program activities set into NASA's Strategic Road Map illustrates our contributions to NASA's near-, mid-, and long-term mission plans.

JPL Roles in the NASA Mission

JPL has several roles in implementing NASA's mission, as shown in the box on the next page. We are a key implementation center for the Space Science Enterprise, have important roles for the Earth Science Enterprise and the Human Exploration and Development of Space Enterprise, and work on exciting research tasks for the Aeronautics and Space Transportation Technology Enterprise.

This section identifies JPL's NASA-assigned program lead center and support responsibilities.

AGENCY ASSIGNMENTS

Mission Areas:
Planetary Science and Exploration
Earth Science Instrument Technology

NASA Center of Excellence: Deep Space Systems

ENTERPRISE ASSIGNMENTS

JPL's program roles and responsibilities contribute to three NASA strategic enterprises:

Space Science Enterprise

- Lead Program Center for:
  - Mars Exploration Robotic Missions
  - Cassini–Huygens Mission to Saturn
  - Space Infrared Telescope Facility
  - New Millennium Deep Space Missions
- Coordinating Center for the Astronomical Search for Origins
- Program Management Center for Operating Deep Space Missions

Earth Science Enterprise

- Lead Center for New Millennium Earth Observing Systems
- Scientific Leadership in Oceanography, Solid Earth Sciences, and Atmospheric Chemistry
- Lead Instrument Development, Measurement Techniques, Science and Technology Mission Concept Development

Human Exploration and Development of Space Enterprise

- HEDS/SSE Joint Planning for Integrated Robotic-Human Mars Exploration
- Microgravity Fundamental Physics
- Microgravity Advanced Technology Development

JPL NASA-assigned roles and responsibilities

JPL Assignments – Summary by Enterprise

NASA Space Science Enterprise (SSE)

Center of Excellence for Deep Space Systems

- Serve as the national focal point and intellectual leader for the development and utilization of advanced deep space systems. Plan and implement technology development programs and system integration and test activities. Integrate the relevant programs and facilities from the NASA field centers and from other agencies.
- Develop and test revolutionary technologies that help fulfill the NASA vision of "a spacecraft on a chip."

Lead Center for Mars Exploration Robotic Missions

- Plan and execute a long-term program for the robotic exploration of Mars, with a focus on the existence of past or present life. Plan and ensure development of the required technologies.
- Work in partnership with NASA's Human Exploration and Development of Space Enterprise on an integrated robotic-human program of Mars exploration.

Lead Center for the Cassini–Huygens Mission to Saturn

- Complete the Cassini–Huygens mission development, and operate the spacecraft during its cruise to Saturn and during science operations. Lead the development and dissemination of the knowledge products from the Cassini–Huygens mission.

Lead Center for the Space Infrared Telescope Facility

- Plan, develop, launch, and operate the Space Infrared Telescope Facility (SIRTF) mission as a NASA facility telescope. Develop investigation programs and lead the development and dissemination of knowledge products.

Lead Center for New Millennium Deep Space Missions

- Identify new technologies that are critical to future low-cost space science missions and for which flight validation is a necessary step. Plan, develop, and execute deep space missions to validate these new technologies. Quantify and disseminate the results of the technology flights.
- Serve as NASA's program office for the New Millennium program. Develop partnerships with private industry for technology identification and validation.

Coordinating Center for the Astronomical Search for Origins

- Plan and develop the technology and mission program for detection and study of extra-solar planets. Conduct detailed assessments and pre-development studies of the Space Interferometry mission and the Terrestrial Planet Finder. Support the integration of the Space Science Enterprise themes into a unified program focusing on the origin and extent of life.

Program Management Center for Operating Deep Space Missions

- Lead the operations activities of ongoing deep space projects (Cassini, Galileo, Ulysses, Voyager).
- Support operations of other U.S. and international space flight missions as directed by NASA.
- Maintain, operate, and plan improvements of the Deep Space Network.

Collateral Responsibilities in support of formal assignments

- Plan, manage, and execute elements of the space science and technology programs as directed by NASA, and support other NASA activities with concurrence of the Office of Space Science.
- Utilize JPL's unique capabilities in support of national needs and priorities with the concurrence of the NASA Office of Space Science.

NASA Earth Science Enterprise (formerly Mission to Planet Earth)

Lead Center for New Millennium Earth Observing Systems

- Ensure timely evaluation, development, validation, and infusion of technology into all future Earth Science Enterprise space, ground-based, airborne and balloon instruments.
- Advance spacecraft, instrument, and ground system technologies, including those requiring system-level spaceflight validation.

Center for scientific leadership in Oceanography, Solid Earth Sciences, and Atmospheric Chemistry

- Use data from aircraft, balloon, and satellite platforms in conjunction with laboratory experimentation, field work, numerical circulation modeling, and data assimilation in predictability studies of ozone depletion, climate variability, land-cover and land-use change, and natural hazards.
- Develop key ocean data products and disseminate them to the broad user community through the Physical Oceanography Distributed Active Archive Center (PODAAC).
- Include commercial, state, and local applications in the usage of Earth observation data.
- Link improvements in our scientific understanding of Earth with the larger NASA studies of the universe and search for life.

Lead in the development and flight of new instruments and measurement techniques, and in conceiving new scientific and technological missions

- Ensure continued flow of atmospheric ozone, aerosol loading, water vapor, temperature and trace constituent measurements from aircraft, balloon, and satellite platforms.
- Continue key oceanography data sets through follow-on flights of TOPEX/Poseidon and the NASA Scatterometer (NSCAT).
- Enable the mapping of the static and time-varying global gravity field with the Gravity Recovery and Atmospheric Change Experiment (GRACE) satellite-to-satellite tracking mission.
- Develop new methods for assessing natural hazards, such as volcanic eruptions, earthquakes, floods, and wildfires.
- Develop measurement techniques for land surface topography and topographic change to support the spectrum of Earth Science Enterprise science needs.

NASA Human Exploration and Development of Space (HEDS) Enterprise

HEDS/SSE joint planning for Integrated Robotic–Human Mars Exploration

- Develop jointly with other NASA centers the ongoing Mars Exploration Program and develop new technologies.

Microgravity Fundamental Physics and Microgravity Advanced Technology Development and Transfer

- Engage and nurture the involvement of the fundamental physics scientific community in the unique opportunities for research in the microgravity environment.
- Provide the leadership and program management for the fundamental physics microgravity research discipline.
- Manage flight and ground research projects in fundamental physics.
- Manage a multi-center collaborative program to develop enabling technology for microgravity research.

NASA Aeronautics and Space Transportation Technology (ASTT) Enterprise

- While JPL has no assigned role, JPL performs several tasks in support of a visionary Advanced Space Transportation program.

The JPL Implementation Strategy

In this section we present our mission, values, strategies, and change goals, which provide a common focus for our efforts to implement NASA's vision.

The NASA Vision

NASA is an investment in America's future. As explorers, pioneers, and innovators, we boldly expand frontiers in air and space to inspire and serve America and to benefit the quality of life on Earth.

The NASA vision communicates the theme for the future of the nation's aeronautics and space program.

JPL Mission

Expand the frontiers of space by conducting challenging robotic space missions for NASA.

- Explore our solar system
- Expand our knowledge of the universe
- Further our understanding of Earth from the perspective of space
- Pave the way for human exploration

Apply our special capabilities to technical and scientific problems of national significance.

Our mission is what we do to implement NASA's vision.

The JPL mission areas for NASA are Planetary Science and Exploration, and Earth Science Enterprise Instrument Technology.

JPL Values

Openness: of our people and our processes. We use candid communication to ensure better results.

Integrity: of the individual and the institution. We value honesty and trust in the way we treat one another and in the way we meet our commitments.

Quality: of our products and our people. We carry out our mission with a commitment to excellence in both what we do and how we do it.

Innovation: in our processes and products. We value employee creativity in accomplishing tasks.

Our values are attributes we work to keep deeply rooted in the JPL culture.

JPL Implementation Strategies

Our strategies are paths we will take to support our customers' needs, consistent with the realities of the external environment.

- Focus our talents and resources in science, technology, and engineering on achieving that which no one has done before.
- Establish a presence throughout the solar system and accelerate our understanding of Earth's environment and the universe through small, frequent, low-cost missions, and pursue a study of neighboring solar systems made affordable through innovation.
- Build the highest value space science and Earth-observation program by combining JPL's strengths with those of partners at other NASA centers and in industry, federal laboratories, academia, and other nations.
- Contribute to national goals by serving as a scientific and technological bridge between NASA and other government agencies and by developing innovative applications programs that respond to evolving needs of these agencies.
- Infuse new technology into flight and ground systems, and transfer technology for commercial use.
- Nurture our capability to conduct a vigorous and successful robotic space science and Earth-observation program.
    - Enhance the expertise and experience to understand and integrate all aspects essential to the conceptualization, implementation, and conduct of space science missions.
    - Provide the programmatic leadership that brings revolutionary technology and scientific continuity into a series of missions.
    - Infuse our knowledge of reliable, long-life spacecraft into low-cost missions.
    - Forge new linkages between science and technology to enable new observational instruments that address critical science objectives.
    - Set world standards for performance of deep space telecommunications and navigation capabilities while simplifying and reducing the cost of mission operations.

- Identify, use, and continually improve all our work processes, incorporating best practices to achieve highest quality products with minimum applied resources.
- Inspire the public with the wonder of space science, and enhance science and engineering education.
- Promote individual and organizational excellence by investing in employee learning and growth and by creating a working environment based on mutual trust and respect.
- Contribute to the nation as a socially responsible organization.
  - Build a workforce that is representative, at all levels, of America's diversity.
  - Increase the opportunities for American businesses to participate in NASA programs.

JPL Change Goals

Our change goals specify areas where cultural transformation is needed over the next three to five years.

Technology

We will rapidly develop and infuse cutting-edge technology into flight missions and instruments.

- Accelerate the infusion of technology through systemic alignment, rapid development and maturation, and proactive incorporation in flight design.
- Invest in long-term technologies and processes that enable breakthrough capabilities in flight and ground systems.
- Provide leadership in establishing a national space technology collaboration among NASA centers and with other federal laboratories, universities, and industry.

Partnering

We will seek substantive collaboration with high-caliber organizations whose strengths complement ours.

- Involve industry in significant roles in our missions and programs while focusing our internal resources on one-of-a-kind, first-of-a-kind programs.
- Establish long-term relationships when mutually advantageous.

Employee

We will, as a collective responsibility of all at JPL, create a work environment based on mutual trust and respect that enables high-quality work and promotes personal development.

- Engage employees in management decisions affecting their activities through open, candid, two-way communication.
- Provide employees with the information, tools, authority, and support necessary to fulfill their responsibilities effectively.
- Recognize employee contributions and celebrate our successes in a manner that fosters teamwork and collaboration.
- Invest in employee skill and career development by providing the resources, time, and encouragement for employees to acquire technical training.
- Provide employees with the mentoring and challenging assignments necessary to achieve professional personal growth.

Best Business Practices

We will base our administrative processes on best business practices.

- Acquisition processes will provide purchasing and subcontracting capability consistent with short-cycle-time missions.
- Financial processes will provide accurate, near-real-time, fiscal information and mechanisms for fiscal control of all work activities.
- The personnel acquisition, assignment, and deployment processes will meet the needs of short-cycle-time projects and tasks.

Core Business Implementation

We will implement challenging fast-track missions and systems in a process-oriented, interdependent, multimission environment.

- Adopt, use, and continually improve JPL core processes, tools, and facilities developed by the Develop New Products (DNP) Project.
- Develop, use, and continually improve the DNP processes that enable cost-effective, multimission operations.
- Adopt, use, and continually improve the support and service processes, and related tools, implemented by the New Business Solutions (NBS) Project.

JPL Contributions to NASA Strategic Enterprises

In this section we

- Summarize JPL programmatic contributions to enterprise goals.
- Discuss multi-enterprise technology and deep space communications and mission operations support to NASA missions.
- Identify JPL FY'99 performance objectives that support programmatic implementation and NASA's FY'99 performance targets.
- Describe JPL work for non-NASA sponsors.

JPL Contributions to the Space Science Enterprise

In this section, we describe the JPL contributions to the Space Science Enterprise science goals, shown below (grouped by the four mission themes). We also identify the JPL contributions to enterprise technology goals and education and public outreach goals.

THE SPACE SCIENCE ENTERPRISE MISSION

- Solve mysteries of the universe.
- Explore the solar system.
- Discover planets around other stars.
- Search for life beyond Earth.

From origins to destiny, chart the evolution of the universe and understand its galaxies, stars, planets, and life.

Solve Mysteries of the Universe

NASA Science Goals

- Understand how structure in our universe (e.g., clusters of galaxies) emerged from the Big Bang.
- Test physical theories and reveal new phenomena throughout the universe, especially through the investigation of extreme environments.
- Understand how both dark and luminous matter determine the geometry and fate of the universe.
- Understand the dynamical and chemical evolution of galaxies and stars, and the exchange of matter and energy among stars and the interstellar medium.

JPL FY'99 Performance Objectives

- *Launch and initiate observations with WIRE.*
- *Complete the SIRTF design and commence fabrication of flight and ground hardware and software.*
- *Deliver optical stimulus and optical wavefront control algorithms for NGST to the GSFC testbed.*
- *Complete two NGST instrument concept studies.*
- *Prepare a Technology road map for LISA, and begin implementing it.*
- *Fabricate ARISE 3-m antenna dish and adaptive feed and conduct antenna tests (joint antenna development with the U. S. Air Force).*

Understanding how the universe transitioned from the Big Bang to the present profusion of galaxies, stars, and planets requires that we examine the earliest traces of structure and the processes by which it evolved. We must observe very young galaxies as they are forming, and we must begin to measure the amount of non-luminous matter in the universe to understand the gravitational interactions. We must also understand the chemical and dynamical processes within galaxies, and the plasma processes by which stars discharge matter into the surrounding space.

JPL Contributions

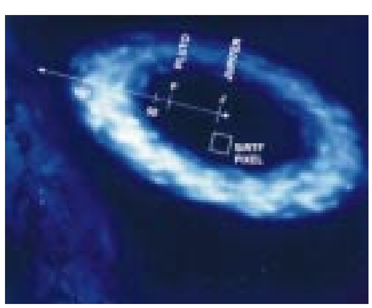
Origins of Structure

Provide observations of very young and forming galaxies. (SIRTF and FIRST)

Observe the distribution of matter in the universe 300,000 years after the Big Bang, including the seeds from which clusters of galaxies and galaxies grew. (Planck)

Use radio astronomy to study the evolution of active galactic nuclei. (Space VLBI and ARISE)

Return a sample of the solar wind to test our theories of planetary system formation. (Genesis)



In addition to its role in the Great Observatories program, SIRTF also marks the first major step in NASA's Origins program, a series of missions designed to study the formation and evolution of galaxies, stars, planets, and the entire universe.

Non-Luminous Matter

Determine with high accuracy the total amount of matter in the universe and how much of it is dark, and therefore the geometry and ultimate fate of the universe. (Planck)

Help to quantify the amount of dust and other dark matter in interstellar space. (SIRTF and FIRST)

Measure the mass, velocity and composition of dust along its trajectory. (Cassini–Huygens)

Study the evolution of starburst galaxies and search for protogalaxies. (WIRE)

Chemical, Dynamical, and Plasma Processes

Provide spectral characteristics of galaxies during their formation. (SIRTF and FIRST)

Study matter in the interstellar medium as it collapses to form stars and as it is expelled from stars. (FIRST)

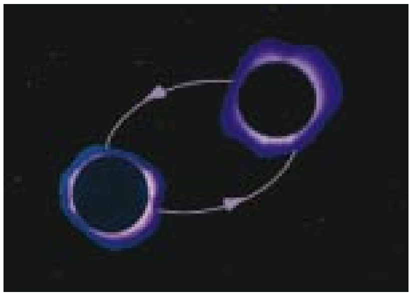
Map the history and probe the causes of star formation. (GALEX)

Large-Scale Phenomena and Extreme Conditions

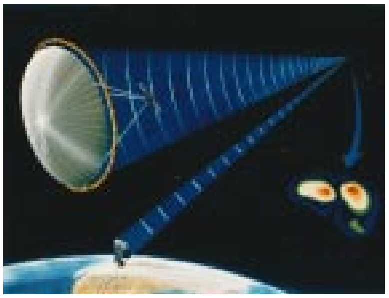
Test gravity in the strong field limit, observing gravitational waves from the coalescence of black holes, binary black holes, and galactic binary systems containing collapsed stars. (LISA)

Investigate the extreme environment near massive black holes in active galactic nuclei. (ARISE)

Enhance our ability to accurately measure distances in the universe and the separation between galaxies. (SIM)



LISA will observe gravitational waves from coalescence of black holes during growth of massive black holes.



ARISE will investigate extreme environments to test physical theories and reveal new phenomena.

Explore the Solar System

NASA Science Goals

- Understand the nature and history of our solar system, and what makes Earth similar to and different from its planetary neighbors.
- Understand mechanisms of long- and short-term solar variability, and the specific processes by which Earth and other planets respond.

JPL FY'99 Performance Objectives

- ***Successfully complete the MGS phase 2 aerobraking and begin the mapping mission.***
- *Deliver the 2 microprobe systems comprising the Deep Space 2 project to KSC and integrate with Mars Polar Lander spacecraft.*
- *Successfully launch the Mars Climate Orbiter and Mars Polar Lander at the 1998 opportunity within the agreed cost cap (Mars '98 mission).*
- *Perform in-flight verification on the Mars '98 mission of the performance of the orbiter's Pressure Modulated Infrared Reflectance Radiometer (PMIRR) and the lander's Mars Volatile and Climate Surveyor (MVACS).*
- *Inject Mars Climate Orbiter into Mars orbit.*

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Understanding the nature of our solar system requires that we characterize the physical and chemical records of the processes that formed its many diverse objects. We must investigate the evolution and current composition of small bodies throughout the solar system, and we must also observe the effects of the sun and the solar wind on the Earth and on other planets. These investigations will enable us to assemble and test integrated, predictive models of the evolutionary pathways of planets and solar systems, and will enormously enrich our understanding of the history and future of planet Earth.

JPL Contributions

Records of Formation

Observe ancient surfaces in the outer solar system as well as the remnants of the solar nebula preserved in giant planet atmospheres. (Galileo and Cassini)

Study the chemical composition of primitive bodies, including comets, Pluto, and the Kuiper Belt objects. (Stardust and the Outer Planets Program)

Comet Nucleus Sample Return, a future outer solar system mission, will provide a well-preserved sample of comet ice and rock.

Galileo images of Callisto, Ganymede, Io, and Europa have revealed new details of the geology and diversity of these Jovian satellites.

Our Solar System: Present Conditions and Clues to the Past

Provide a detailed physical and chemical characterization of the Martian surface and atmosphere. (Mars Surveyor Program)

Reveal the diversity of bodies in the outer solar system. (Galileo, Cassini, and the Outer Planets Program)

Active Solar and Planetary Processes

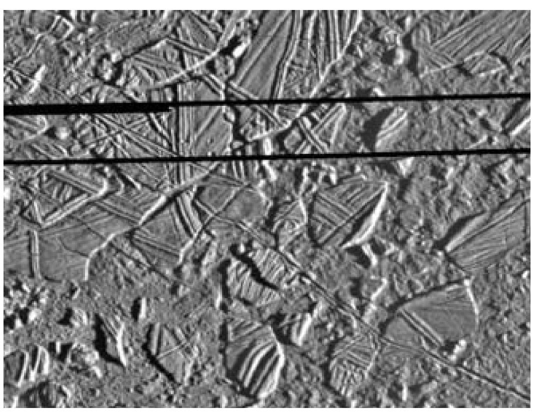
Observe and report daily Martian weather. (Mars Surveyor Program)

Observing volcanism on Io and perhaps surface changes on Europa. (Galileo)

Study the source and variability of the solar wind and the sun's magnetic field. (Ulysses, Solar Probe, and Genesis)

Measure the sun's effect on the planets and satellites and the extent of its influence. (Voyager, Galileo, Cassini, the Outer Planets Program, and the Mars Surveyor Program)

Study tidal forces and the internal structure of Europa. (The Outer Planets Program)



Galileo images of Europa show a crust that has been highly disrupted, suggesting that liquid water has been present near the surface. A future Outer Planets mission to Europa will confirm and characterize the possible subsurface ocean.

The icy surface of Callisto has been reworked by extensive impact cratering.

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- ***Demonstrate technologies to reduce mass and power consumption and increase instrument reach and dexterity with the Mars 98 Lander.***
- *Establish a firm plan for the Mars Surveyor '01 mission.*
- *Produce a Mars program architecture acceptable to all major stakeholders.*
- ***Launch the New Millennium Program Deep Space 1 mission and successfully complete its primary mission including flyby of asteroid. Demonstrate an electric ion propulsion system with specific impulse ten times greater than chemical propulsion systems.***
- *Demonstrate the feasibility of a Mars balloon with ground demonstrations.*

Objectives in **bold** contribute directly to performance targets in the *NASA Performance Plan* for FY'99.

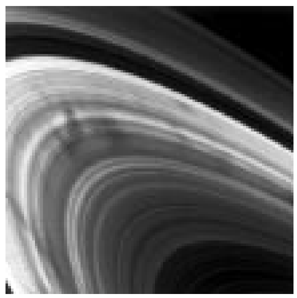
Study atmospheric circulation and magnetospheric processes.(Galileo and Cassini)

Study ring system dynamics. (Cassini)

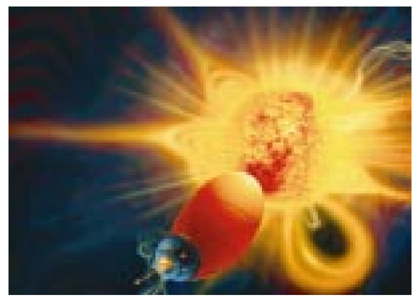
Test the survivability of spacecraft electronics in the extreme radiation environment around Jupiter. (Galileo)

Study the plasma environment very near the sun. (Solar Probe)

Study conditions very deep in Jupiter's atmosphere. (Outer Planets Program)



The Cassini mission will further advance our knowledge of the complex and beautiful Saturnian system.



Solar Probe will conduct an in situ examination of a stellar wind for clues to its generation, physical characteristics, and chemical composition.

Discover Planets Around Other Stars

NASA Science Goal

- Understand how stars and planetary systems form together.

Understanding the nature and number of planetary systems around other stars calls for a variety of investigations. We will use telescopes capable of collecting the faint light from the earliest galaxies. We will combine the light gathered from several small telescopes spaced far apart and create images with the equivalent resolution of a telescope the size of a football field. With this technique, called interferometry, we can block the light from distant stars so that we will be able to see the much smaller and dimmer planets orbiting them.

JPL Contributions

Search for evidence of planet-forming disks around young stars and will determine how the disks evolve. (SIRTF, FIRST, Keck Interferometer, and SIM)

Enable the detection of large planets and "brown dwarfs" in orbit around other stars. (Keck Interferometer and SIM)

Demonstrate the technology for very-long-baseline optical interferometry using three separated spacecraft. Image bright astronomical objects at a resolution needed to detect planets about other stars. (Deep Space 3)

Drawing needed technologies from SIM, SIRTF, and NGST, detect planets outside our solar system and measure their atmospheric constituents. Survey planetary systems around a thousand of the brightest nearby stars. (TPF)

SIM will revolutionize the field of astrometry — the precision measurement of star positions on the sky — and enable planet detection and the study of other solar systems in formation.

JPL FY'99 Performance Objectives

- ***Assemble and lab-test the Keck interferometer beam combiner optics at JPL.***
- ***Use the Micro-Arcsecond Metrology Testbed to demonstrate an improvement in measurement precision for optical pathlengths in laser light to the 100-picometer range.***
- *Deliver the Space Interferometry Mission real-time control software core to the Deep Space 3 and Keck projects.*
- *Produce Terrestrial Planet Finder Technology road map.*

Objectives in **bold** contribute directly to performance targets in the *NASA Performance Plan* for FY'99.

Search for Life Beyond Earth

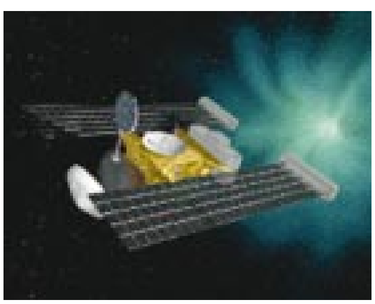
NASA Science Goals

- Understand the origin and evolution of life on Earth.
- Understand the external forces, including comet and asteroid impacts, that affect life and the habitability of Earth.
- Identify locales and resources for future human habitation within the solar system.
- Understand how life may originate and persist beyond Earth.

JPL FY'99 Performance Objectives

- *Successfully launch Stardust.*
- ***Successfully complete and receive scientific data from at least 8 of 10 planned Galileo data-taking encounters of Europa.***

Objectives in **bold** contribute directly to performance targets in the *NASA Performance Plan* for FY'99.



Stardust will capture samples of comet gas and dust and return them to Earth.

Understanding life in the cosmos requires detailed study of the chemical and physical precursors to life, the conditions and environments that may lead to life both in our solar system and in other solar systems, and ultimately a search for direct evidence of life. A natural extension of these scientific investigations will lead to an understanding of the future habitability of Earth and the potential for human expansion into the solar system.

JPL Contributions

The "Building Blocks" of Life: An Inventory of Water and Organics

Study Mars crustal water and past organic chemistry. (Mars Surveyor Program)

Assay organics, ice, and water in the satellites and atmospheres of Jupiter and Saturn. (Galileo and Cassini)

Search for evidence of water on Europa. (Galileo Extended Mission)

Study cometary organics and their possible role in "seeding" life on Earth. (Stardust)

Provide much more detailed insight into life's chemical building blocks via an encounter with Pluto, a return to Europa, and a comet nucleus sample return. (Outer Planets Program)

Develop "biosignatures" of life in extreme temperature, dryness, salinity, and pH environments on Earth to identify the potential places to search for extraterrestrial life. (Astrobiology studies)

Search for life in samples to be returned from Mars, comets, and other extraterrestrial locations by developing methods for in situ life detection. (Future missions to Mars and Europa)

Conditions, Environments, and Evidence of Life

Assess active chemistry at Titan, which may mimic pre-biotic conditions on Earth. (Cassini–Huygens)

Identify planetary systems around other stars as a first step in the detection of habitable planets. (SIM)

Study Mars' climate history and episodes conducive to the formation of life. Utilize landers and rovers to search in situ for evidence of life, and return samples to Earth for detailed analysis. (Mars Surveyor Program)

A Mars Sample Return mission will seek evidence of past life on Mars.

The Cassini mission's Huygens probe will investigate the organic chemistry of Saturn's moon Titan and add to our understanding of life's processes.

The Mars Surveyor robotic missions are building a comprehensive understanding of Mars water, organics, climate, evidence of life, and resources for future missions.

Long-Term Habitability of Earth

Inventory and track near-Earth objects to understand long-term impact probabilities (NEAT), and characterize selected objects. (Goldstone Solar System Radar)

Provide insight into global climate change by studying the evolutionary pathway of Mars. (Mars Surveyor Program)

Coordinate NASA-sponsored efforts to detect, track, and characterize potentially hazardous asteroids and comets that could approach Earth. (NEAP)

Human Exploration: Locales and Resources

Provide data on Mars water and other resources, and produce detailed local and global maps of Mars for use in site selection and comparison. (Mars Surveyor Program)

Technology

NASA Goals

- Lower mission life-cycle costs and provide critical new capabilities.
- Develop innovative technologies to address far-term scientific goals, spawn new measurement concepts and mission opportunities, and create new ways of doing space science.
- Develop and nurture an effective science-technology partnership.
- Stimulate cooperation among industry, academia, and government.
- Identify and fund the development of important crosscutting technologies.*

JPL FY'99 Performance Objectives

- *Complete integration and field testing of the FIDO rover sample acquisition and caching methodology for the Mars '03 mission.*
- *Deliver low-temperature lithium-ion battery technology to the Mars '01 project.*
- *Develop an interstellar technology development plan and roadmap with external partners and begin technology development program.*
- *Deliver software prototype of Mission Data System flight-to-ground software architecture enabling scaleable autonomy.*
- *Fabricate large (~150 elements) monolithic spider bolometer array for potential insertion onto the FIRST mission.*

See also Multi-Enterprise Technology.

To meet the challenges of the exciting, aggressive, and cost-constrained future space science program, we must rely on an equally aggressive and carefully planned technology development program. Critical new developments are needed in low-mass, autonomous, robust deep space systems; instruments and systems for in situ exploration and sample return; and interferometry and advanced telescope technologies. These will be complemented by a variety of ongoing core technology developments, and by ground testbed and flight validation programs.

JPL Contributions

Focused Technology Development: Critical New Capabilities

Develop revolutionary micro-avionics, micromechanical systems, and computing technologies and build them into a new generation of very low-mass, highly capable space science flight systems. (Advanced Deep Space System Development Initiative)

Develop instruments and systems for in situ exploration and sample return. (Exploration Technology Program)

Develop technologies for space-based interferometers and large telescopes. (Origins technology initiatives)

*Crosscutting technology is described in "Multi-Enterprise Technology."

Core Technology Developments: Multimission R&D

Plan and conduct basic research and technology development in propulsion, power, microdevices, environmental effects, sensors, and instruments.

Develop key technologies, including higher radio frequency (e.g., Ka-band) and optical communications systems, automated deep space tracking stations and mission operations, high-bandwidth deep space communications, autonomous navigation, science data visualization, and protocols and standards that permit multimission systems and interoperability.

Technology Validation and Infusion

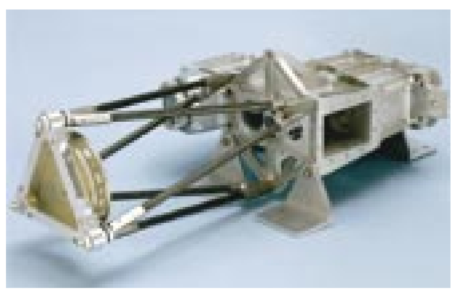
Identify key technologies for the future and validate them on space flight missions. (New Millennium Program)

With DOD, flight validate new space technologies and measure the space environment and its effect on spacecraft system. (STRV)

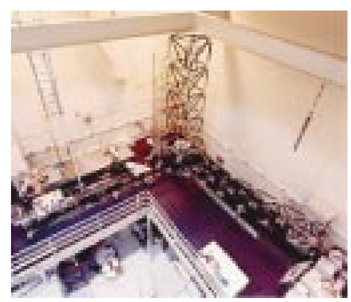
Demonstrate nanorover technology on an asteroid rendezvous mission in collaboration with the Japanese Institute of Space and Astronautical Science. (MUSES-CN)

Infuse new capabilities into low-cost missions. (Ground testbeds)

The New Millennium Deep Space 1 spacecraft will fly by an asteroid and a comet to validate technology for future space science missions.



Interferometers collect starlight to determine the positions of stars with extreme precision. Interferometry is a key technology for detecting planets around other stars.



SIM technology is being tested in the Micro-Precision Interferometry Testbed, the world's only full-scale experimental model of a space-based interferometer.

Technology Investment Planning

Effectively plan technology for end-to-end mission/system design and costing. (Project Design Center and Intelligent Design Environment)

Conduct trade studies and assist in NASA's prioritization and administration of an effective technology program. (Level 2 Technology Planning and Integration Office, staffed by JPL for NASA)

Technology Commercialization and Industrial Partnerships

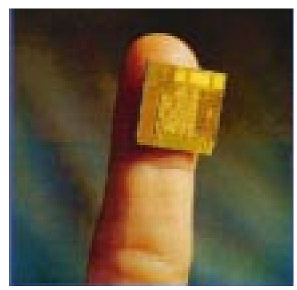
Form advanced R&D partnerships with U.S. companies, apply JPL technology and special expertise to company problems, and develop long-range partnerships with industry to support emerging markets. (Commercial Technology Program)

Ensure that federally funded intellectual property is made available to U.S. companies through licenses, and facilitate new start-up companies using JPL-derived technology.

Cooperative Technology Developments

Applies the creative energies of industry to the advancement of space technology while developing products of commercial value. (through the Small Business Innovation Research program and technology cooperation agreements with industry)

JPL programs contribute to a variety of successful technology commercialization, transfer, and partnership programs.



"Spacecraft on a chip" is the long-term vision that provides focus for much of the Deep Space technology program.

Education and Public Outreach

NASA Goals

- Use our missions and research programs and the talents of the space science community to contribute measurably to efforts to reform science, mathematics, and technology education, particularly at the pre-college level, and the general elevation of scientific and technical understanding throughout the country.
- Cultivate and facilitate the development of strong and lasting partnerships between the space science community and the communities responsible for science, mathematics, and technology education.
- Contribute to the creation of the talented scientific and technical workforce needed for the 21st century.
- Promote the involvement of underserved/underutilized groups in Space Science education and outreach programs and their participation in Space Science research and development activities.
- Share the excitement of discoveries and knowledge generated by Space Science missions and research programs by communicating clearly with the public.

JPL Contributions

JPL is a partner in realizing Space Science Enterprise goals for education and public outreach. We concentrate on incorporating education and outreach elements into all of our space science missions and providing easy access to information.

To share the excitement of discoveries and knowledge generated by space science missions, JPL

- Sponsors and participates in teacher training and curriculum development.
- Contributes to systemic improvements in science and technology education.
- Works closely with the media.
- Forms partnerships with museums, planetariums, science and technology centers, libraries, and commercial organizations.
- Develops visual products to illustrate discoveries.
- Conducts regional and national conferences, workshops, and other public events.

JPL FY'99 Performance Objectives

- ***Ensure that all proposed mission concepts include a reviewed outreach component and that approved missions develop a long-range outreach plan within 1 year of formal selection.***
- *Develop and execute multi-project in-service teacher training and public education program for solar system missions.*

...continued on sidebar next page

JPL leads the Solar System Exploration Education and Public Outreach Forum, enables broad-based access to planetary data through the Planetary Data System and Photojournal, and provides thematic leadership for education and outreach efforts for Small Bodies, Planetary Exploration, and the New Millennium program.

Pasadena students download space images from the Internet.

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- ***Implement Solar System Exploration Education and Public Outreach Forum, including broad on-line accessibility to outreach materials and resources.***
- ***Ensure that all JPL projects work regularly with their appropriate Forum and the OSS Broker/Facilitator network.***

Objectives in **bold** contribute directly to performance targets in the *NASA Performance Plan* for FY'99.

JPL Contributions to the Earth Science Enterprise

Earth Science Enterprise comprises an integrated set of spacecraft and other remote-sensing platforms and in situ measurement capabilities; data and information management systems to capture, process, archive, and distribute global data sets; and research and analysis programs to convert data into new knowledge of the Earth system. In this section, we identify JPL contributions to the five Earth Science research themes. We also discuss JPL contributions to Earth Science goals in education and public outreach and technology transfer.

EARTH SCIENCE ENTERPRISE GOALS AND SCIENCE RESEARCH THEMES

- Expand scientific knowledge of the Earth system using NASA's unique capabilities from the vantage points of space, aircraft, and in situ platforms.

  Science Themes:
  - Land-Cover Change and Land-Use Change Research
  - Seasonal-to-Interannual Climate Variability and Prediction
  - Natural Hazards Research and Applications
  - Long-Term Climate: Natural Variability and Change
  - Atmospheric Chemistry and Ozone Research
- Disseminate information about the Earth system.
- Enable the productive use of Earth Science Enterprise science and technology in the public and private sectors.

NASA Goal: Expand Knowledge of the Earth System
Land-Cover Change and Land-Use Change

JPL FY'99 Performance Objectives

- ***Provide the technology and the instruments to collect SAR data, which will provide data sufficient to create a digital topographic map of 80% of the Earth's land surface.***
- *Complete validation/calibration of the Radarsat Precision Processor and the ScanSAR Processor for the Alaska SAR Facility.*

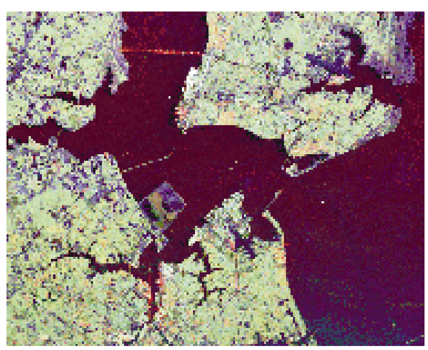
Objectives in **bold** contribute directly to performance targets in the *NASA Performance Plan* for FY'99.

Human societies are driving pervasive and increasingly rapid changes in land cover and land use and are threatening such critical resources as marine fisheries, wetlands, and arable land. High-spectral-resolution and synthetic aperture radar (SAR) data help us classify different land-cover types, which can lead to a better understanding of the consequences of land-use changes.

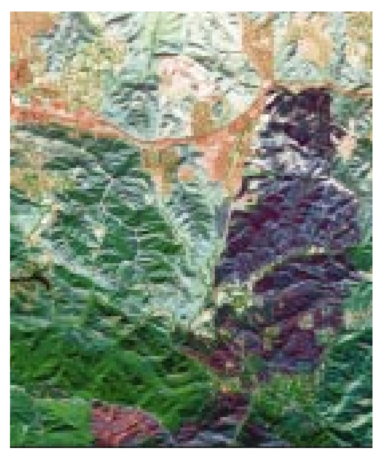
JPL Contributions

Visible, near-infrared, thermal-infrared and synthetic aperture radar data provide high-spatial and spectral-resolution mapping of land cover and land use.

- Map continental scale tropical forest and study deforestation in the Amazon and Congo basin. (SAR, Alaska SAR Facility, and JPL supercomputing facility)
- Monitor seasonality, variability of forest types, and changes in forest biomass due to logging practices or natural fire in boreal and temperate forests in North America. (SAR)
- Produce maps and time series of fire occurrence and land-use/land-cover change. (AVIRIS)
- Improve our knowledge of the Earth's vegetation. (MISR)



SIR-C/X-SAR imaging radar data enables study of the effects of urbanization and other human activities on the ecosystem and landscape. These images help the Earth Science Enterprise evaluate the sustainability of current land uses.



AVIRIS is an optical sensor flown on a NASA ER-2 airplane. AVIRIS monitors the occurrence and impact of fires, and other important changes in Earth's vegetation cover.

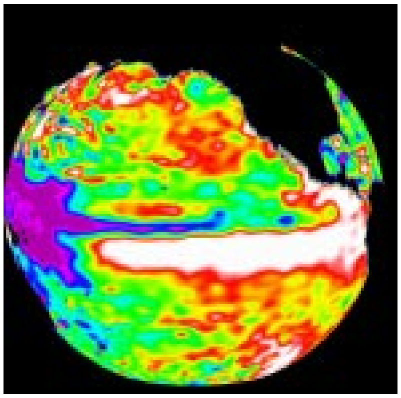
NASA Goal: Expand Knowledge of the Earth System
Seasonal-to-Interannual Climate Variability and Prediction

El Niño, La Niña, and African-American-Asian-Australian monsoons are examples of seasonal-to-interannual climate variations that impact two-thirds of the world's population. We will develop and use remotely sensed observations (together with in situ observations) to monitor, describe, and understand seasonal-to-interannual climate variations; and will use observational and model-assimilated data sets to improve understanding of climate processes and to improve our predictive models.

JPL Contributions

El Niño Variability

- Investigate surface winds to determine the onset of seasonal-to-interannual climate changes. (QuikSCAT and SeaWinds)
- Investigate movements of ocean water associated with El Niño. (TOPEX/Poseidon, Jason, and GRACE)
- Describes movement of upper tropospheric water vapor during an El Niño. (MLS)



TOPEX/Poseidon spacecraft observations of sea level in the Pacific Ocean in September 1997. The white area is a huge warm water mass indicating an El Niño condition is developing. This El Niño disrupted global weather patterns in 1997–1998.

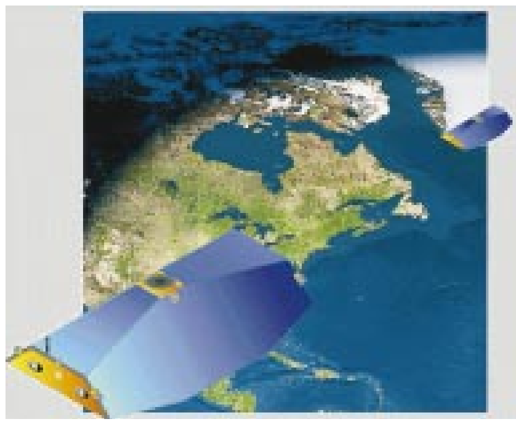
JPL FY'99 Performance Objectives

- ***Launch QuikSCAT and begin delivery of QuikSCAT data products to the calibration/validation and science teams. Provide wind speed and direction measurements over at least 90% of the ice-free global oceans every two days.***
- *Deliver the SeaWinds Instrument to ADEOS II for integration and test.*
- *Deliver the final MISR and ASTER Science Data Processing software to the DAACs; support the EOS AM launch and begin science data production and data analysis.*
- *Extend TOPEX/Poseidon ocean topography uninterrupted monitoring for the seventh year. Monitor the tropical Pacific for post-El Niño developments.*
- *Prepare the NASA portion of Jason-1 for a May 2000 launch.*

Objectives in **bold** contribute directly to performance targets in the *NASA Performance Plan* for FY'99.

Global Climate Variability

- Monitor global temperature and moisture profiles. (GPS and EOS-AIRS)
- Measure global soil moisture. (SAR and a new suite of instruments)
- Identify volcanic aerosols and their effect on the Earth's energy balance. (EOS instruments MISR and ASTER)



The GRACE mission will "weigh" various parts of the Earth system, learning about the distribution and changes in ocean mass, the polar ice sheets, and underground aquifers.

NASA Goal: Expand Knowledge of the Earth System
Natural Hazards Research and Applications

The goal of the Natural Hazards Program is to expand our understanding of the causes and consequences of natural hazards — earthquakes, volcanoes, wildfires, floods, and short-term climate hazards such as storms and drought. The program is designed to improve our capability to predict and mitigate the impact of natural disasters on life, property, and the environment.

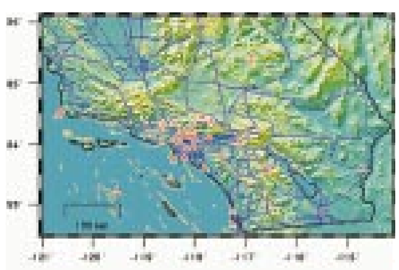
JPL FY'99 Performance Objectives

- *Establish LightSAR joint venture partnership with industry.*

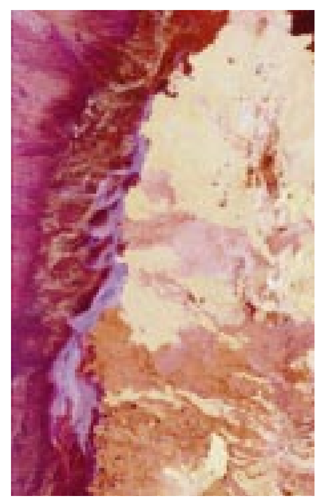
JPL Contributions

Process Studies

- Study pre-, co-, and post-seismic regional surface deformations. (GPS dense array technology and time series SAR interferometry)
- Detect changes in thermal anomalies and the ratio of different volcanic gases, as well as centimeter-scale deformation as precursor activity of volcanoes. (Airborne TIMS and AES and satellite ASTER, TES, and MLS)
- Provide an unprecedented ability to monitor boreal and tropical forests, volcanic activity, crustal deformation, and changes in glaciers and ice sheets. (LightSAR)



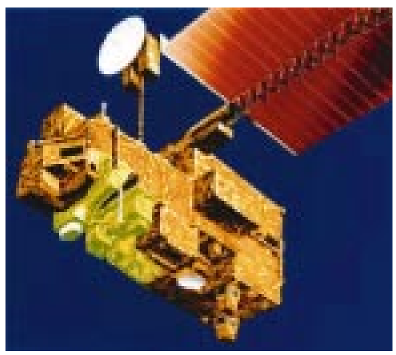
Location of GPS instruments monitoring earthquakes and crustal deformation in Southern California as part of SCIGN. GPS is one of the most important new technologies for the study of earthquakes.



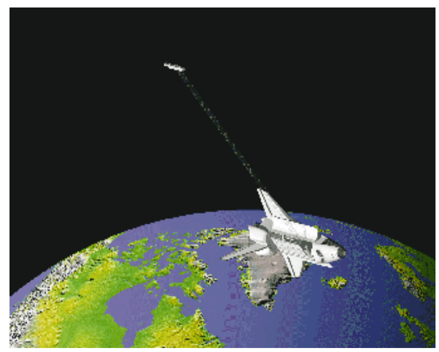
Remote sensing imaging allows volcanologists to monitor and map active volcanoes that are otherwise difficult and dangerous to study. This radar image of Erta Ale, in the Afar region of northeastern Ethiopia, is similar to what would be acquired by LightSAR, a low-cost low-mass, high-performance synthetic aperture radar system to provide data for commercial and civilian applications.

Risk Assessment

- Produce maps of vegetation that may be susceptible to wildfires. (AVIRIS)
- Evaluate regional consequences of short-term climate events such as flooding, monsoon occurrence, storm frequency and severity, and drought. (external collaborations)
- Predict the most likely paths of lava flows and flooding, enabling mitigation to be directed towards populations at greatest risk. (ASTER and SRTM)



ASTER will detect and monitor thermal properties of volcanoes and measure changes in the sulphur dioxide flux in volcanic plumes, all of which may be precursors to eruptive activity.



SRTM, a reimbursable task funded by NIMA through Code Y, is scheduled to fly on the space shuttle in late 1999. It will produce the most accurate and complete topographic map of Earth's surface ever assembled.

NASA Goal: Expand Knowledge of the Earth System
Long-Term Climate: Natural Variability and Change

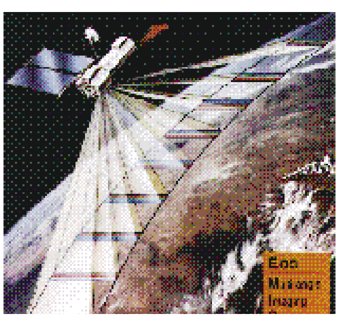
Satellite data play an essential part in determining the global radiation budget and estimating global climate change.

JPL Contributions

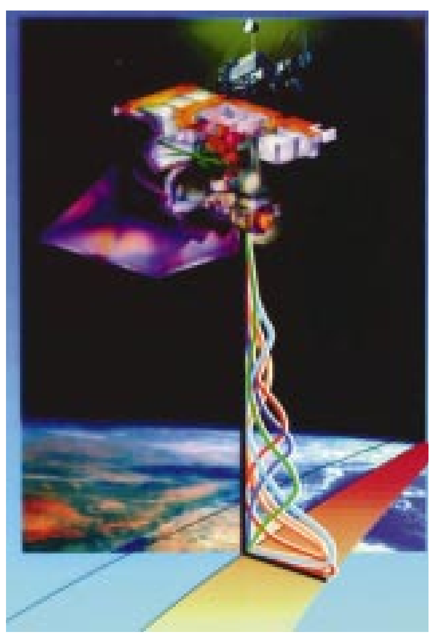
- Assemble the first comprehensive global multi-angle data set enabling scientists to obtain accurate aerosol distribution maps, cloud heights and motions, and land bidirectional reflectance. (MISR)
- Gather atmospheric temperature and humidity data (AIRS) and the solar constant (ACRIM) to help us understand climate variability and sensitivity.
- Determine cloud cover and water content. (AIRS)
- Use ocean surface topography profiles to depict ocean variability. (TOPEX/Poseidon, Jason, GRACE, and follow-on missions)
- Increase understanding of atmospheric chemistry. (ATMOS, MLS, TES, and AIRS instruments)

JPL FY'99 Performance Objectives

- *Complete the AIRS flight instrument integration and test and calibration/validation within the final cost-to-complete estimate.*
- *Complete environmental testing of the ACRIMSAT spacecraft.*



MISR will fly on the EOS AM-1 spacecraft to capture multi-angle optical scattering data with the nine MISR cameras.



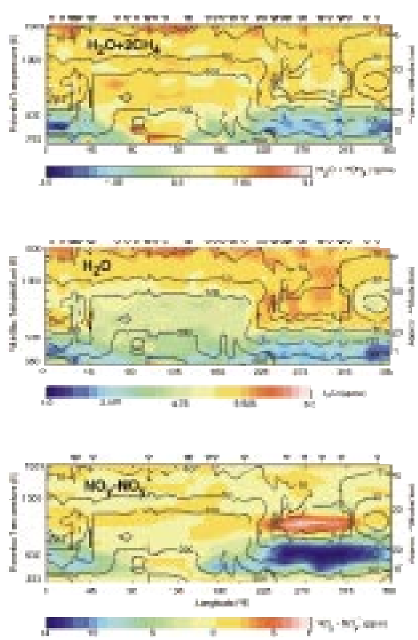
AIRS will fly on EOS PM-1 in the year 2000 to make measurements that will improve weather prediction and will observe changes in Earth's climate.

NASA Goal: Expand Knowledge of the Earth System
Atmospheric Chemistry and Ozone Research

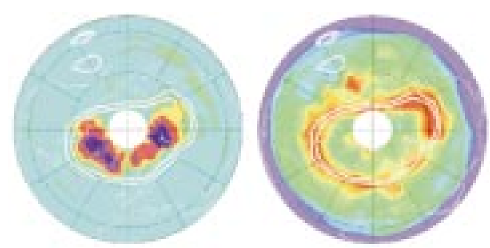
Research in atmospheric ozone in the future will increasingly focus on the troposphere, particularly on measurements of the abundance of tropospheric ozone and its precursors. Our atmospheric observations include global observations from space as well as more localized observations from aircraft, balloon, and ground sensors. Modeling and analysis of the data and supporting laboratory kinetic and spectroscopic measurements are needed to advance our understanding and provide guidance for future measurement needs.

JPL Contributions

- Measure chemistry, temperature, and winds in the troposphere and stratosphere; and build profiles of temperature, ozone, and other trace constituents. (MLS, TES, and ESSP/CCOSM, and aircraft and balloon instruments)
- Determine the mechanisms of ozone depletion and their year-to-year variations. (MLS and UARS)



ATMOS observations have been used to study the removal of reactive nitrogen and water by sedimentation of polar stratospheric clouds, an important process for formation of the Antarctic ozone hole.



MLS measures ozone, chlorine monoxide, nitric acid, and atmospheric temperatures to improve our understanding of the causes and variation of ozone depletion.

NASA Goal: Disseminate Information About the Earth System

- Implement data system architectures that are open, distributed, and responsive to user needs.
- Foster the development of an informed and environmentally aware public.

JPL Contributions

Science Data System

- Support the Alaska SAR facility by integrating high-payoff commercial information technology and SAR processing solutions that will enhance product quality or reduce operations costs.
- Partner with industry in evolving and operating the Physical Oceanography DAAC to provide cost-effective data management and distribution services for the oceanographic community.
- Support the utilization of new data sets as well as the development of the EOS Data and Information System through participation in the Earth Science Information partnerships.

Education and Public Outreach

JPL is a partner in realizing Earth Science Enterprise education and outreach goals. JPL shares the excitement and knowledge generated by Earth science missions through a variety of educational and outreach activities. In addition, JPL and Ames Research Center play leadership roles in the development of a broad-based partnership with the California State University system to improve Earth science training for future teachers. JPL also provides significant support to community colleges, as well as thematic leadership for education and outreach efforts for radar, ocean winds, GPS applications (including earthquake studies), and the New Millennium program.

JPL FY'99 Performance Objectives

- *Establish multi-project in-service teacher training activity for Earth Science.*
- *Implement Earth Science pre-service teacher training initiative (ALERT) with California State University campuses and Ames Research Center; define role of community colleges.*
- *Develop integrated Earth Science web preserve, including thematic science linkages and available materials.*
- *Contribute to a broad-based, cooperative education and outreach program for EOS.*

NASA Goal: Enable the Productive Use of Earth Science Enterprise Science and Technology in the Public and Private Sectors

- Develop, validate, infuse, and transfer advanced remote sensing technology and concepts.
- Extend the use of NASA's research and technology beyond the science community to meet the needs of global, national, state, and local users through strategic collaborations with key public and private sector organizations.
- Support the development and leverage of commercial investments and capabilities in remote sensing and information systems to cost-effectively meet Earth Science Enterprise science objectives and to enhance the relevance of Earth Science Enterprise scientific discovery to the public and private sectors.
- Make major scientific contributions that can have a significant economic impact on international, national, and regional environmental assessment and mitigation policy.

JPL FY'99 Performance Objectives

- *Demonstrate 118, 190, 240, and 640 GHz radiometer receiver front ends for MLS.*
- *Fabricate broadband TIR detectors (QWIPs).*
- *Demonstrate solid state laser metrology for TES.*
- *Develop technology road map for THz passive and active systems.*
- *Design and fabricate hot electron bolometers for advanced MLS above 1 THz.*

JPL Contributions

Remote Sensing Technology and Concepts

- Participate in all aspects of Earth Science Enterprise technology planning.
  - Participate in Technology Strategy Team Executive Group (TST/EG).
  - Carry out mission trade studies as requested by TST/EG.
  - Maintain Earth Science Enterprise technology plan databases, including the Capability Needs Assessment and the Integrated Technology Development Plan.
- Lead the development of next-generation instruments in areas of JPL expertise, including radars, passive microwave and submillimeter, imaging spectroscopy, thermal IR, GPS, magnetometry, and in situ chemical and meteorological measurements.
  - Manage Code Y, Code S Core Technology Program, and SBIR–sponsored technology development activities and Instrument Incubator Program instrument development tasks.
  - Carry out instrument design and trade studies.
  - Develop advanced instrument prototypes, and manage aircraft, uncrewed-aerial-vehicle, and balloon demonstrations as required.

  - Work with Goddard Space Flight Center (GSFC) to plan for the infusion of new instruments into future Earth Science Enterprise missions.
  - Develop techniques, technologies, and instruments appropriate for geosynchronous platforms, and work with GSFC to infuse these into future operational NOAA/Integrated Program Office missions.
- Manage the New Millennium Program (NMP) to advance and validate instrument, spacecraft, and ground system technologies requiring system-level spaceflight validation.
  - Maintain a Science Working Group, including appropriate Earth Science Enterprise representation to articulate a NASA-wide vision of priority space system capability needs for the next century.
  - Maintain through the NMP Integrated Product Development Teams a broad-based vision of leap-ahead technologies with potential to significantly reduce the cost of future high-priority Earth Science missions.
  - Manage the process by which appropriate validation flights are selected.
  - Provide oversight management of the validation flights.

Applied Research and Technology

- Work with NASA to develop an Earth Science Applications Research Program capitalizing on JPL's expertise in land remote sensing with ASTER, AVIRIS, and AIRSAR.
- Develop Earth Science Information Partnerships designed to extend the use and applications of the EOS DIS and its extensive data holdings to a broader user and value-added community.
- Improve access to Earth Science Enterprise science results and distribution of applications results through key transfer agents, such as associations of city, county, and state governments as well as commercial firms that provide value-added, decision-making products to these agents and to other firms in the private sector.
- Work with GSFC and the commercial sector to develop advanced instruments and develop and launch spacecraft for NOAA operational environmental satellite programs.

Enhancement of Commercial Capabilities

- Work with industry to identify emerging market opportunities for remote-sensing technology and to guide the development/transfer of remote-sensing instruments and data processing capabilities to meet these opportunities accordingly.
- Work with industry to implement the LightSAR program.
- Develop industrial partnerships during prototype development or first-of-a-kind implementation of instruments/missions leading to the complete transfer of capabilities to industry for future implementation.
- Support the Alaska SAR Facility by working with commercial firms to develop and provide advanced SAR processing algorithms and software systems for routine operations that address the requirements of emerging growth markets.

Environmental Assessments

- Provide measurements, modeling, and analyses in support of international assessments of the environmental effects of human activities on atmospheric ozone, including aircraft hydrocarbon emissions and release of industrial trace gases (SO_2 and CO_2 emissions, nitrogen content of soils, and biomass).
- Advance GPS and remote-sensing (that is, radar and visible/near-infrared) technology development and implementation to gain a better understanding of tectonic hazards in California and in other regions of the globe where catastrophic losses are likely, and where risk assessment and loss modeling are deficient.
- Provide quantitative analyses of land-cover change in regions of the globe where hazards, deforestation, agricultural productivity, energy and environmental monitoring are critical to the human, financial, and economic infrastructure.
- Develop a framework for providing timely pre- and post-event scientific information on natural hazards, such as wind, hurricane, severe climate, flooding, and earthquakes for risk assessment, loss estimation, mitigation planning and response, and for estimating potential and actual impact on the global financial economy.

JPL Contributions to the Human Exploration and Development of Space Enterprise

In this section, we describe JPL contributions to HEDS objectives.

HUMAN EXPLORATION AND DEVELOPMENT OF SPACE ENTERPRISE OBJECTIVES

- Understand the fundamental role of gravity and the space environment in biological, chemical, and physical systems.
- Ensure the health, safety, and performance of space flight crews through space and environmental medicine.
- Use HEDS research facilities innovatively to achieve breakthroughs in science and technology.
- Enable human exploration through Space Science Enterprise robotic missions.

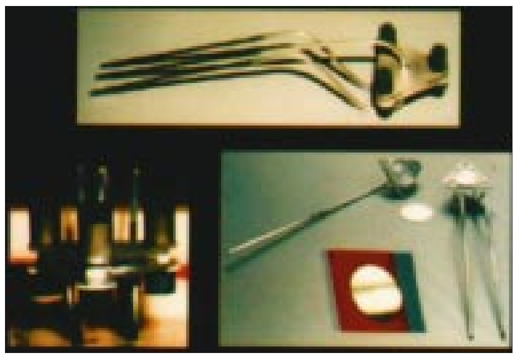
JPL FY'99 Performance Objectives

- *Conduct successful Low-Temperature Microgravity Physics (LTMP) Facility conceptual design review and first mission science concept reviews.*
- *Conduct successful Laser Cooling and Atomic Physics (LCAP) science concept reviews.*
- *Complete science concept review and requirements definition review for Satellite Test of the Equivalence Principle (STEP).*
- *Publish a road map for Fundamental Physics in Space.*

JPL Contributions

Develop jointly (with JSC) the ongoing Mars Exploration Program and develop key technologies.

- Mars Surveyor '01, '03, '05 (planned cooperatively with HEDS and other NASA centers)
- In situ Resource Utilization (conducted cooperatively with JSC)
- Precision landing on Mars
- Aerocapture at Mars
- Radiation at Mars
- High-bandwidth communication from Mars



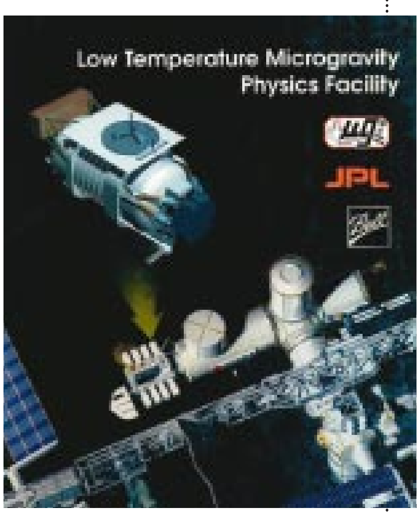
Techniques are being explored for the production of oxygen and carbon monoxide on Mars for eventual use in fueling sample return vehicles or in supporting humans on Mars.

In collaboration with the Microgravity Research Program Office at MSFC, provide the leadership and management of the fundamental physics research discipline, including low-temperature condensed matter physics, laser cooling and atomic physics, and gravitational and relativistic physics.

- A program of ground research in fundamental physics.
- A program of flight projects, with JPL-supplied experimental hardware support.
- Enabling technology development program management.

Manage basic and applied research programs in microgravity fundamental physics and microgravity advanced technology development and transfer.

Develop instruments for space station environment and health monitoring.



An LTMP Facility is being developed to fly on the International Space Station to conduct experiments in microgravity physics.

Multi-Enterprise Technology

The relationship between technology and new flight missions has changed dramatically. Technology now drives NASA's future missions, and science missions are flown when technology readiness allows an affordable implementation. To meet this challenge, advanced technology must be planned, developed, and infused into flight programs in new and accelerated ways. The NASA Office of Space Science is responsible for all technology that directly supports its future Space Science Enterprise mission and for crosscutting technology that supports the missions of more than one enterprise.

JPL plays a leading role in this Code S critical technology leadership responsibility. Our program emphasizes the technology required for Planetary Science and Exploration and Deep Space Systems. We also address needs throughout NASA's programs that require technology from JPL's specific areas of expertise, such as microelectronics, microdevices, focal plane sensors and detectors, interferometry, robotics, rovers, inflatables, and deep space communications.

The JPL technology program supports and enables all phases of mission activities, from studies and simulations to mission operations and scientific data visualization. The program creates bridges to the expertise of the other NASA centers and other agencies. Universities are contributing in expanded ways to creative new concepts, and we develop much mission-ready technology through industry.

JPL FY'99 Performance Objectives

- *Complete the first cycle of a "ready to use" list of fresh NASA and DOD technologies, and provide the list and access to technology experts in order to meet mission commitments.*
- *Deliver the AMTEC radioisotope power system flight validation test experiment to GSFC.*
- *Deliver a free flyer magnetometer sciencecraft for a sounding rocket demonstration.*
- *Demonstrate 3.0 nanometers of "stellar" fringe tracking ability on the micro-precision interferometer (MPI) test bed.*
- *Install first generation scalable embedded computing testbed operating at 30–200 MOP/W.*
- *Integrate and test the Avionics Flight Experiment's (AFE) operational compatibility with the X-33; complete flight analysis and final report.*

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Technology development ranges from early concepts to validated, mission-ready software and devices. To ensure that the right technology is ready when needed and is a good fit to the activity and customer using it, we group technology efforts into three categories of developmental maturity correlated with lead time for required use:

- Core Technology: fundamental and often enterprise-crossing technology research and development
- Focused Technology: transitional- and future-mission-set-responsive technology-maturing efforts
- Technology Qualification, Validation, and Demonstration: to bring technology to full mission worthiness (subsystem development and demonstration)

These categories map directly into NASA's technology readiness levels, which define stages of technology evolution. Historically, JPL has excelled primarily in developing core technologies. NASA's new focused programs will enable much-needed growth in focused technology efforts, and the expanding New Millennium Program will complete the transition to validation for space-operational use. The "technology gap" will largely have been bridged.

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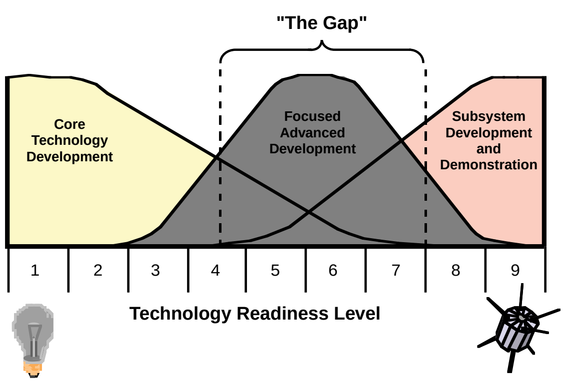
- *Achieve operational status for the first phase of integrated DNP/ISE testbeds.*
- *Complete the second cycle of the JPL Technology Inventory as part of the NASA Office of Chief Technologist process.*
- *Achieve at least 200 of the new technologies reported in NASA.*
- *Contribute at least 50 NASA commercial success stories.*
- *Execute at least 200 NASA licenses (patents and copyrights) for use of intellectual property.*
- *Complete the JPL Technology Community Leader road maps in support of the NASA suite of technology communities.*
- *Establish technology external review committee and carry out first set of reviews.*



Technology readiness levels ensure that the right technology is ready at the right time. FY'99 efforts will enable much-needed growth in focused advanced technology development.

Multi-Enterprise Deep Space Communications and Mission Operations

JPL telecommunications and mission operations efforts provide space communications and operations systems that define the state of the art, span the solar system, and service NASA's space exploration fleet. In so doing, JPL helps enable the missions of the NASA Space Science Enterprise and the future piloted Mars missions of the Human Exploration and Development of Space Enterprise. JPL's programmatic responsibilities span four areas:

- Provide telecommunications for successful execution of a broad spectrum of space exploration missions.
- Provide mission operations that add significant value to the conduct of space exploration missions.
- Conduct ground-based radio astronomy, solar system radar, and radio science observations.
- Manage and operate assigned flight projects. Current flight projects include Voyager, Galileo, Ulysses, Space Very-Long-Baseline Interferometry (SVLBI), and Cassini.

During FY'99 and '00, we will make significant contributions to the revolutions in technology and affordability needed to support ongoing operations for a large exploratory fleet of spacecraft in the solar system—and beyond. The work to achieve these contributions is transforming JPL's Deep Space Network and associated Mission Operations System architecture into a service provision system known as the Deep Space Mission System. A key element of the DSMS will be a next-generation mission data system, or MDS. The MDS is, in essence, the combination of hardware and software needed to operate spacecraft. JPL and its international and commercial partners are evolving both the flight- and ground-based elements of this hardware and software to have standardized "plug and play" compatibility. Hence, unlike the mission-unique hardware and software needed to operate missions of the past, the MDS will be applicable to a broad spectrum of missions. And, much of it will actually be embodied in onboard spacecraft autonomy, enabling a smaller, multi-mission operations team on the ground.

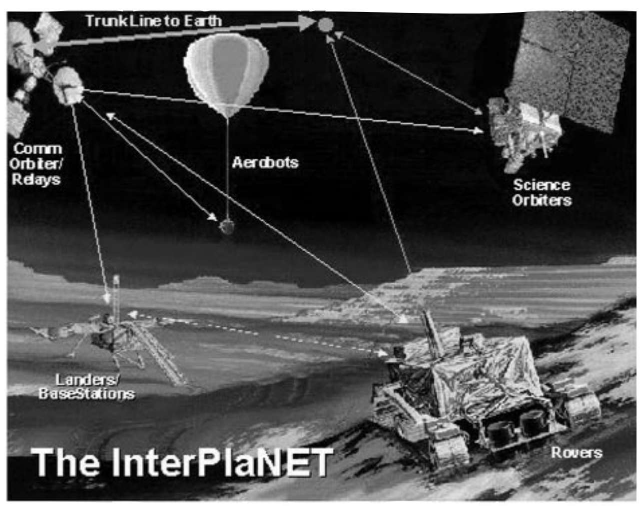
JPL FY'99 Performance Objectives

- *Validate Ka-band tracking of Deep Space 1.*
- *Develop and test Ka-band flight hardware prototypes.*
- *Complete automation of network control and the 26-m subnet.*
- *Achieve 95% usable data return.*
- *Deliver the first increment of the next-generation mission data system.*
- *Develop mission operations services and initiate transition to service-based organization.*
- *Reduce operations and maintenance costs.*
- *Transition workforce to an R&D focus.*

The communication protocols between the spacecraft and the ground are being evolved away from complicated bit exchanges and toward file transfer protocols similar to those used on the Internet. In essence, an Interplanetary Internet, or InterPlaNET, is being created. The simple, intuitive interface associated with this approach should greatly simplify mission support and enable customers to have easy access to data and value-added data products. Analogous to trends in private industry, customers will see deep space telecommunications merged with information services.

Over the next decade, the InterPlaNET will need to support a fleet of simultanous robotic deep space missions and will eventually need to support piloted missions to Mars. With this in mind, JPL is working to increase network capacity through an appropriate mixture of new facilities, technological advances, and innovative operational procedures. A major initiative along these lines is the push toward higher radio, and even optical, frequencies—enabling orders-of-magnitude increases in the data rates available for future missions.

At the same time, JPL is continuing to apply its telecommunication assets to the vigorous pursuit of radio astronomy, solar system radar, and radio science observations. In conjunction with new telecommunications techniques, these scientific pursuits offer an opportunity to validate technology while enhancing science return.



JPL is working to create an Interplanetary Internet, or "Inter-Pla-NET," that will simplify mission support and enable customers to have easy access to data and value-added data products.

Non-NASA Work

NASA recognizes that JPL is a major national resource, and encourages JPL to perform work for non-NASA sponsors that give JPL the opportunity to apply our special capabilities to public sector problems. Non-NASA work at JPL focuses on efforts that

- Apply technology or abilities that are developed, used, or acquired in the conduct of work by JPL for NASA or other sponsors.
- Are needed for future NASA work.

JPL technology efforts are chosen for their strategic importance to NASA. Non-NASA technology sponsors are selected for their related needs. Efforts for all sponsors of a given technology area are planned cooperatively under the guidance of one JPL program office, and tasks are sometimes co-funded where needs are directly overlapping. The Center for Space Microelectronics Technology (CSMT) program, which receives the bulk of JPL's non-NASA technology funds, is reviewed annually by a Board of Governors with membership from all sponsors. Coordination among technology sponsors is actively pursued by both JPL and NASA Code S managers.

Proposals for all non-NASA work are rigorously screened for NASA relevance and for duplication by both JPL management and the NASA Management Office–JPL.

JPL FY'99 Performance Objectives

- *Build a bridge between DOD and NASA – Define and initiate NRO/NIMA/NASA remote sensing phenomenology program.*
- *Initiate joint NASA/DOD technology development program in large optical systems.*
- *Complete the DOD-funded system integration of sensors and three-dimensional neural network–based processor, and demonstrate real-time target recognition.*
- *Expand the reimbursable application to national, state, and local needs of JPL's capabilities in sensors and communications, command and control for emergency management, and direct methanol fuel cell technologies.*

Examples of Defense Technologies with NASA Applications

- For the Ballistic Missile Defense Organization, JPL is developing advanced infrared and millimeter wave sensors, instruments, and instrument systems with internal data processing; many are being qualified and demonstrated in space or field environments.
- For the National Communications System, JPL is developing components and advanced architectures for Mobile Satellite Communications.
- For the Army Communications and Electronics Command, JPL is developing high-capacity air-to-air communications relays.
- For the Air Force Rome Laboratory, JPL is developing a novel opto-electronic oscillator of spectrally highly pure reference signals.

Examples of Transportation Technologies

- For the National Highway Traffic Safety Administration (in cooperation with NASA), JPL is identifying and evaluating air bag technology for automobile safety.
- For the same sponsor, JPL is developing and will apply an advanced automotive testbed for evaluating collision avoidance technologies.

Example of Environmental Management

- For the Defense Advanced Research Projects Agency, JPL (in a consortium that includes the State of California Department of Conservation and CALGIS, a California corporation) is developing a commercial technology demonstration of geosynchronous synthetic aperture radar (GEOSAR), an airborne interferometric radar system for accurate topographic and geographic mapping.

JPL Institutional Implementation

In this section we

- Demonstrate how JPL's institutional implementation strategies support NASA's crosscutting processes and strategies.
- Describe how JPL's institutional leadership, integration and support activities, and investments contribute to NASA's mission.
- Identify the JPL implementation strategies and FY'99 performance objectives that support institutional processes and activities.

JPL IMPLEMENTATION SUPPORT TO NASA'S CROSSCUTTING PROCESSES

NASA's Crosscutting Processes and Strategies / **JPL Implementation Strategies**	Manage Strategically			Provide Aerospace Products and Capabilities	Generate Knowledge	Communicate Knowledge
	...measure our performance ...demonstrating contributions to national needs	...change [how] we work with... contractors and streamline regulations	...deliver on our commitments... and [manage strategically]	...reestablish NASA's role [in] R&D...	...collaborate with old and new partners.	...foster partnerships with teachers and students
Focus our talents and resources...			●	●		
Establish a presence...			●	●		
...combine strengths...		●	●	●	●	●
...serve as a bridge...	●				●	
Infuse new technology... and transfer...	●	●		●	●	
Nurture our capability...			●	●		
...incorporate best practices...		●	●			
Inspire the public...	●			●	●	●
...invest in employees...			●	●		
Contribute...as a socially responsible organization.	●				●	

JPL Institutional Alignment with NASA

JPL's institutional processes enable and enhance the Laboratory's ability to carry out our programmatic assignments. JPL's institutional processes directly respond to the needs of JPL's program offices and projects while at the same time ensuring that the Laboratory is aligned with the *NASA Strategic Plan* and with NASA's strategic planning processes and procedures defined in the *NASA Strategic Management Handbook*.

NASA has established four Agency-wide crosscutting processes that are critical to the success of Agency programs and activities. Accordingly, JPL's Lab-wide institutional leadership, integration and support, and investment processes are aligned with the Agency's crosscutting processes. This is accomplished by aligning JPL's implementation strategies with the NASA strategies for carrying out these processes.

As is the case with JPL's programmatic implementation commitments summarized in the previous section, JPL's institutional commitments in this section are intended to reflect, and to be driven by, the Agency's FY'99 commitments as put forth in the FY'99 *NASA Performance Plan.* (FY'99 JPL objectives that contribute directly to the performance targets in the *NASA Performance Plan* are denoted by **bold** text.)

NASA'S CROSSCUTTING PROCESSES AND STRATEGIES

(From the 1998 *NASA Strategic Plan*)

Manage Strategically

- We will measure our performance and communicate our results, demonstrating NASA's relevance and contributions to national needs.
- We will change the way we work with our contractors and streamline regulations.
- We will deliver on our commitments, be accountable for the success of our programs, and provide a balanced and stable aeronautics and space program by implementing strategic management throughout NASA.

Provide Aerospace Products and Capabilities

- We will focus on what we do best by reestablishing NASA's role as a research and development agency.

Generate Knowledge

- We will collaborate with old and new partners.

Communicate Knowledge

- We will foster partnerships with teachers and students.

Leadership

JPL FY'99 Performance Objectives

Office of the Director/Deputy Director and Executive Council

- *Accomplish all schedule and cost commitments for FY'99 as planned in POP98-1.*

Office of the Associate Director and the IMC

- *Reduce annual allocated direct and multiprogram support costs and stay within the cost plans.*
- *Achieve the agreed-to workyear downsize target by achieving the workyear/month target.*
- *Maintain schedule for releasing lease space by vacating Building 601 by end of CY'99.*
- *Meet the NASA Y2K milestones.*

Objectives in **bold** contribute directly to performance targets in the *NASA Performance Plan* for FY'99.

Office of the Director and the Executive Council

The JPL Director's Office provides overall direction, management, and staff support in key areas needed to execute *The JPL Implementation Plan*, the Center of Excellence for Deep Space Systems, and other JPL assignments. The JPL program offices that carry out the Agency's programs, projects, and tasks report to the director.

The Executive Council develops JPL policies, plans, and operating guidelines and provides a mechanism for executives to align and integrate their implementation responsibilities and activities with each other. The director convenes and leads the Executive Council, which includes the deputy director, associate director, chief scientist, programmatic and operational directors, controller, and the Caltech general counsel.

Office of the Associate Director and the Institutional Management Committee

The Institutional Management Committee (IMC) provides implementation planning, policy guidance, and management overview of the institutional infrastructure and allocates operational funding and investments in the technical and administrative infrastructure. The associate director convenes and leads the IMC, which includes the controller, program office deputy directors and alternates, operations offices deputy directors, and the manager of Institutional Computing and Information Services.

Chief Scientist

The Chief Scientist serves as a focus for basic research, provides vision, and sets goals for science and advanced technology and participates in mission planning that may lead to new areas of research.

Strategic Management

Certain of the objectives and performance targets in the FY'99 *NASA Performance Plan* are intended to implement NASA's crosscutting "Manage Strategically" process and are applicable to JPL as a whole, and are therefore reflected in the Laboratory's leadership objectives.

JPL FY'99 Performance Objectives

Chief Scientist

- *Select a Grand Challenge research concept for JPL and start investigation.*
- *Initiate at least two additional memoranda of understanding with universities.*
- *Ensure the establishment of an astrobiology laboratory/facility at JPL by the end of FY'00.*
- *Ensure the upgrade of the data acquisition system for the Near Earth Objects Project is complete by the end of FY'00.*

Strategic Management

- *Publish new JPL Strategic Management Plan.*
- *Establish the process needed to enable all JPL staff to link their FY'99 Performance Plans to relevant JPL and NASA plans.*
- *Ensure that each JPL directorate establishes at least one new partnering agreement.*
- ***Ensure that at least 80% of subcontract funds obligated by JPL are in performance-based contracts.***
- ***Maintain a diverse JPL workforce during the downsizing effort.***

Objectives in **bold** contribute directly to performance targets in the *NASA Performance Plan* for FY'99.

JPL FY'99 Performance Objectives

Change Management

- *Complete the transition to process-based management.*
- *Show measurable progress against all of JPL's change goals.*
- *Complete the definition, documentation, and establishment of baseline performance measures for processes encompassing all of JPL work in FY'99.*

Products and Capabilities

- ***Ensure that at least 10% of obligated subcontracted R&D funds are in commercial partnerships.***
- ***Ensure that average spacecraft cost for JPL's Space Science and Earth Science missions is $190M or less and the average spacecraft development time is 4 1/2 years or less, for the period FY'99 thru FY'03.***

Objectives in **bold** contribute directly to performance targets in the *NASA Performance Plan* for FY'99.

Change Management

The Office of the Director leads the change management function, which oversees the implementation, system engineering, integration, and employee communication relative to the changes needed to adapt to external and internal forces. Prior change management efforts have laid the total quality management (TQM) foundation for subsequent changes, initiated fundamental and radical changes in the way JPL's work is done (process reengineering), reduced the number of the JPL staff, and changed the way in which JPL jobs are classified and employees are compensated and rewarded.

Process-based management (PBM) is an ongoing change management effort. The goal of PBM is to effect a cultural shift in emphasis from managing functional organizations, and the people attached to them, to managing the way work is done (process). Related objectives include empowering the people who do the work, significantly reducing the command and control approach to managing people, ensuring clear and unambiguous responsibility and accountability for process design and use, flattening the organization structure, and enabling easy and continual improvement of processes based on measured performance.

Products and Capabilities

Certain objectives and performance targets from NASA's "Provide Aerospace Products and Capabilities" process also affect many elements of the Laboratory and are embedded in several performance objectives.

Outreach

The Director's Office leads the development of JPL institutional-level outreach implementation planning in response to NASA policies and plans for all elements of outreach i.e., for the "communicate knowledge" process audiences: education, public information, technology transfer and commercialization, and international partners. Increasingly, JPL outreach activities are to be planned and implemented as integrated, long-term, theme-oriented efforts, in order to use internal outreach resources more effectively and to improve quality and continuity of customer interaction.

Human Resources

Provides HR strategies, processes, consultation, and services that:

- Attract, reward, and retain a highly skilled, diverse workforce.
- Enable and encourage everyone at JPL to achieve the Laboratory's goals in a safe, healthy, productive work environment based on mutual trust and respect.
- Promote career development and personal professional excellence.
- Facilitate cultural change through open, candid, two-way communication.

JPL FY'99 Performance Objectives

Outreach

- *Establish an overall JPL External Communications process.*
- *Develop a best practices database and archive for JPL outreach activities.*
- *Implement a broad-based outreach training program for JPL outreach personnel and their managers.*
- *Prepare and execute an external communications plan and process for missions requiring launch approval.*

Human Resources Directorate

- *Provide training resources and processes that support the goal of 40 hours of training per employee.*
- *Provide managers with additional tools to reward and recognize employees.*
- *Provide innovative services and support changes in the work environment that enable JPL to become an "employer of choice."*

Integration and Support: Engineering and Science

JPL FY'99 Performance Objectives

Engineering and Science Directorate

- *Initiate the Career Mentoring Program (piloted in FY'98) for all ESD technical employees.*
- *Establish at least one new university partnership for each of JPL's six discipline centers of excellence.*
- ***Demonstrate, through application to approved projects, all the processes and tools necessary to maintain cost and development time at NASA target levels.***
- *Demonstrate the ability to routinely plan the implementation of Mobile Science Laboratories, including system design, partnering approaches, infrastructure requirements, staffing, and facility needs.*

Objectives in **bold** contribute directly to performance targets in the *NASA Performance Plan* for FY'99.

Engineering and Science Directorate

The Engineering and Science Directorate enables program implementation by committing to the JPL programs to find the best people, immerse them in an environment conducive to innovation and teamwork, and ensure that they are presented with challenging and unique problems to solve. The directorate's efforts are guided by NASA's focus on doing what the Agency does best and ensuring NASA's position as a preeminent research and development agency.

In order to promote innovation and to transfer routine operational responsibilities to others, the Engineering and Science Directorate continually seeks to collaborate with old and new partners within and outside the NASA community. The Directorate forms long-term strategic alliances where possible, thereby changing the way JPL has traditionally worked with contractors, consistent with NASA's intent to vest higher levels of integration responsibility and accountability in the private sector.

Chief Engineer

The Chief Engineer oversees and provides leadership of the Laboratory's engineering processes and standards, and reviews the development and implementation of projects. All engineering organizations support the Chief Engineer, but primary support is provided by OEMA.

Office of Engineering and Mission Assurance

The Office of Engineering and Mission Assurance (OEMA) develops and implements tailored, cost-effective safety and mission assurance programs for JPL programs, projects, and tasks. To improve safety and mission success, OEMA ensures that mission assurance disciplines are integrated early into the life cycle of JPL programs and projects, as appropriate to the characteristics of each program or project. OEMA has developed and is maintaining the JPL Risk Management Process, and provides risk management tools and support to JPL's programs and projects. OEMA also provides independent assessments of JPL programs and projects and communicates risk issues to JPL and to NASA Headquarters management, promotes the development and infusion of advanced assurance technologies, processes, and spaceflight lessons learned to enable cost-efficient, reliable, and successful programs, and provides primary support to the JPL Chief Engineer.

JPL FY'99 Performance Objectives

Chief Engineer

- *Become ISO 9001 registered by April 1999, five months prior to the contractual requirement (September 1999).*

Office of Engineering and Mission Assurance

- *Integrate mission assurance, information systems and independent assessment tools into the DNP process.*
- *Develop a plan to reduce the risk of inserting new hardware and software technology into flight projects.*
- *Institutionalize a JPL risk management process for flight projects.*
- *Develop insight mechanisms on performance-based contracting.*
- *Develop and implement the JPL director-level Governing Program Management Council process.*
- *Identify which OEMA-maintained databases to make available on-line, and implement at least 60% of these.*
- *Develop three new partnerships with outside organizations.*
- *Develop process for assessing and quantifying overall mission risk.*

Integration and Support: Business and Finance

JPL FY'99 Performance Objectives

Controller's Office

- *Successfully complete implementation of the New Business Solutions Project, with financial and acquisition processes operational at the beginning of FY'99 and human resources processes operational at the beginning of the second quarter of FY'99.*
- *Ensure continuing proper management of the financial aspects of all JPL activities during the transition to the new business systems and processes.*
- *Ensure the continuing presence of a robust customer service capability as users adapt to new business tools and processes.*
- ***Achieve 70% or greater of obligations costed.***

Objectives in **bold** contribute directly to performance targets in the *NASA Performance Plan* for FY'99.

Controller's Office

The Controller's Office ensures that JPL complies with the NASA prime contract and applicable state and federal regulatory requirements and ensures that all financial aspects of JPL activities are managed efficiently and effectively.

Business Operations Directorate

The Business Operations Directorate provides acquisition, technical information, logistics, facilities, safety, environmental and other business and administrative products and services.

JPL FY'99 Performance Objectives

Business Operations Directorate

- *Reduce cycle times for contracts and purchase orders, and reduce acquisition operating costs.*
- *Meet or exceed targets for small businesses, small disadvantaged businesses and women-owned businesses.*
- *Increase on-line access to scientific, technical, and business information.*
- *Develop and implement a faster, cost-effective process to colocate program and project personnel.*
- *Initiate the vacating of Bldg. 601, the last off-site lease.*
- *Conduct 44 safety and health training courses to meet regulatory requirements, and reduce lost-time injuries and illnesses.*
- *Conduct a pollution prevention program to reduce targeted releases into the environment by 50% from baseline 1991.*
- *Contract for particular elements of photo/imaging, records, archives, and engineering and construction.*

Investments

JPL FY'99 Investment Objectives

- *Support JPL's discipline centers of excellence:*
  - *Center for Space Microelectronics Technology*
  - *Center for Space Interferometry*
  - *Center for In Situ Exploration and Sample Return*
  - *Center for Integrated Space Microsystems*
  - *Center for Space Mission Architecture and Design*
  - *Center for Deep Space Communications and Navigation Systems*
- *Evolve and advance information infrastructure capabilities.*
- *Develop mission concepts and proposals in areas of Agency emphasis.*

Overall Approach

JPL allocates a portion of its allocated direct/multiple program support budget (which includes the funds necessary for Laboratory operations) for institutional investments that support the *NASA Strategic Plan*, and that provide technical enhancements, process improvements, and reduced operations costs. The primary objective is to enable the Laboratory to meet or exceed the needs of the *NASA Strategic Plan* and to develop appropriate first-of-a-kind technical products that meet or exceed customer needs and quickly transfer that technology to industry.

Investments

Each year, JPL identifies key investments as part of an overall investment plan. The amounts of the investments are determined in accordance with need and affordability. FY'99 key investments are identified below.

Discipline Centers of Excellence

JPL has established six discipline centers of excellence to develop engineering and technology that provide the knowledge, hardware, and software that enable new classes of future missions. To implement and operate the centers, JPL invests in multidisciplinary staff, state-of-the-art equipment, and facilities. The centers are modeled after the existing JPL Center for Space Microelectronics Technology (founded in 1987).

Information Systems Infrastructure

The Institutional and Computing Information Systems Office will conduct systems engineering for an enterprise architecture for knowledge management. The information infrastructure needed to enable and support NASA initiatives in the Intelligent Synthesis Environment and the Collaborative Engineering Environment will be prototyped, and the Enterprise Information System will take advantage of and incorporate leading-edge technology.

Mission Concepts and Proposal Development

- The FY'99 emphasis for investment in bids and proposals is on advanced instrument concepts for planetary life detection and Earth observation, and on astrophysics and fundamental physics. Future mission concepts will be investigated or proposed for SMEX-class missions.
- FY'00 investigations and proposals in space and earth science will focus on MIDEX, ESSP, and Discovery missions.
- JPL will continue to concentrate on the synergistic application of NASA space technology to other national needs.

CENTER OF EXCELLENCE FOR DEEP SPACE SYSTEMS

In this section we

- Provide a top-level summary of the *Center of Excellence for Deep Space Systems.*
- Identify the key capabilities, technologies, and unique facilities that support NASA's deep space systems mission.

Center of Excellence for Deep Space Systems

As NASA's lead center for the exploration of the solar system, JPL is known throughout the world for the development and operation of highly complex, first-of-a-kind space systems. Some of the most challenging and exciting scientific projects ever undertaken depended on JPL expertise in areas such as spacecraft design, communications, and navigation. Through this experience, JPL has developed a foundation of technologies, techniques, capabilities, and facilities that is a true national resource.

With its designation as NASA's Center of Excellence for Deep Space Systems, JPL will continue to focus not only its own capabilities, but also those of other NASA centers, federal laboratories, universities, and private industry on the challenges of the future Space Science program. By probing the mysteries of the universe and the origins of life, JPL will help to energize the nation's economy with technological advances as it educates and inspires the world with exploration and discovery.

Charter

The Center of Excellence for Deep Space Systems is chartered with maintaining the Agency's preeminent position in deep space systems development and operation. It implements this charge by leading, sustaining, and nurturing a variety of supporting technology programs, science capabilities and relationships, infrastructure development and investment, and advanced spacecraft development and operations capabilities. These discrete but closely coordinated programs are fiscally supported by program and institutional resources from the NASA enterprises, both directly and indirectly (through investment of JPL discretionary funds). Collectively, these programs make up the Center of Excellence for Deep Space Systems.

Key Capabilities: JPL Discipline Centers for Excellence

A number of JPL activities are important to JPL's Center of Excellence, but the framework is provided by JPL's supporting discipline centers of excellence. JPL has established the six discipline centers of excellence to develop specialized knowledge, hardware, and software in disciplines that are key to enabling new classes of future missions in the *NASA Strategic Plan*. These centers, modeled after the existing JPL Center for Space Microelectronics Technology (founded in 1987), feature multidisciplined staff, and state-of-the-art equipment and facilities. Each center will also seek partnerships in its area of excellence.

JPL's discipline centers of excellence are major forces in the advancement of three of NASA's Seven Critical Technology Areas for the Future: miniaturization, intelligent systems, and instruments/ sensors. The centers' products, along with those of other JPL technological efforts, provide selective but valuable support to the other areas: human support, space transportation, aeronautics, and intelligent advanced system design.

JPL's has six discipline centers for excellence in operation:

1. Center for Space Microelectronics Technology (est. 1987)

   The Center for Space Microelectronics Technology (CSMT) was established by an MOU between NASA and Caltech in 1987. CSMT is a formal joint program of NASA, BMDO, DARPA, the Army, and the Department of Commerce. CSMT is overseen by a board of governors representing the sponsoring agencies and Caltech. Board members include representatives of NASA Code S and the chief technologist. CSMT conducts research and advanced development in microelectronics, sensors, and high-performance computing.

   CSMT focuses on those aspects of microelectronics and advanced computing that are unique to space applications. These areas of focus include sensors for those portions of the electromagnetic spectrum not accessible from Earth because the atmosphere is opaque; microinstruments and microelectronic systems for miniature spacecraft; and high-performance computing, both in space and on the ground, for mission data analysis and visualization.

2. Center for Space Interferometry (est. 1996)

   The Center for Space Interferometry is intended to develop and maintain a world-class, leading-edge capability in optical interferometric imaging and astrometric technology. It is expected to enable and nurture world-class science experiments in extra–solar system exploration and astrophysics.

   Through the center's work, JPL will provide lightweight space telescopes, interferometers, and advanced detectors for the next generation of astrophysics missions.

3. Center for In Situ Exploration and Sample Return (est. 1996)

   The mission of the Center for In Situ Exploration and Sample Return is to focus and enhance JPL's scientific, technological, and system-development capabilities—and to provide focus for partnerships—in domains central to in situ and sample return missions to solar system bodies. Current emphasis is on experimental measurement techniques and scientific instruments; sample acquisition and instrument deployment; mobility in the atmosphere, on the surface, and in the subsurface; and transportation to and from the surfaces and atmospheres of the bodies explored. The center's work will enable JPL to carry out sample return missions to Mars and comet nuclei and in situ missions to Europa, Titan, Venus, the solar wind, and the outer planets.

4. Center for Integrated Space Microsystems (est. 1998)

   The CISM is the focal point for the system architecture, core technology development, system-level integration, and validation of breakthrough technologies for a complete avionics-on-a-chip that will integrate key spacecraft subsystems into a single unit. These subsystems are computer, telecommunications, navigation, power management, and sensor technology. Dedicated on June 5, 1998, CISM is fully operational. The center is developing the avionics technologies for the X2000 First Delivery project, and developing and delivering advanced technologies leading towards complete avionics systems on a chip. In addition, CISM conducts advanced basic research activities in revolutionary computing technologies, including quantum computing and biological computer systems. The center will grow in the future to include all the advanced technologies and subsystems required for an advanced spacecraft of very small scale.

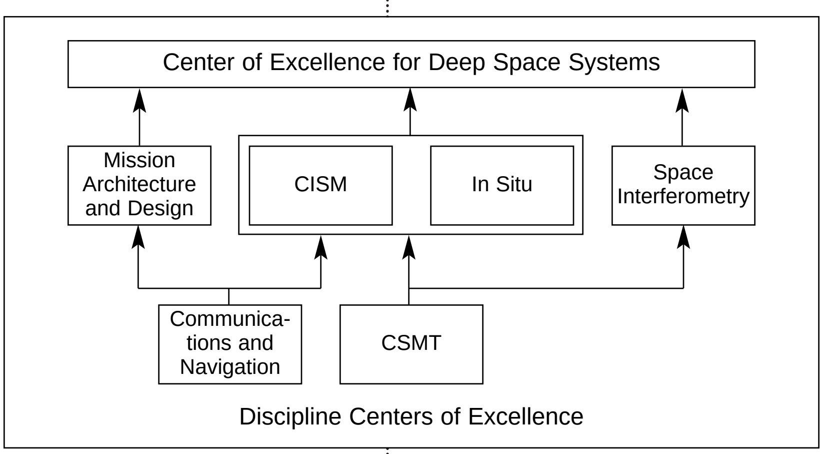
5. Center for Space Mission Architecture and Design (est. 1997)

   This center is intended to pull together and focus the efforts of key mission- and system-level assets that compose JPL's ability to design and implement missions. Through these efforts it will ensure maximal value of JPL's missions with respect to scientific content, affordability, technological content, and strategic conception. The center is concerned with the continual, aggressive development of processes, tools, and people needed to conceive, plan, and implement these missions.

6. Center for Deep Space Communications and Navigation Systems (est. 1997)

   This center provides technical leadership for programs in these disciplines within JPL and coordinates with other NASA centers, universities, and industry to enable NASA to meet its goals in deep space exploration. It acts to ensure NASA's continued leadership in these critical fields of deep space systems and in their applications to both Space Science and HEDS enterprises. Elements of the center include deep space communications link technology, deep space networking strategies, deep space navigation and position location, distributed operations across the solar system, and coordinated use of autonomous systems in space.

The JPL discipline centers of excellence are concerned both with technology development and with the enhancement of JPL's capabilities. The accompanying figure displays the interactions among the centers as technology producers and demonstrates the fact that their technology products are major enablers for JPL's role as Center of Excellence for Deep Space Systems.



Products of the JPL discipline centers of excellence enable JPL's role as the NASA Center of Excellence for Deep Space Systems (arrows indicate flow of technology products).

CSMT concentrates on developing advanced microelectronics concepts and devices and high-performance computing. These are the technological seeds of many of the instruments and avionic systems being developed in CISM (flight-configured, miniaturized avionics), In Situ (instruments and systems for in situ emplacement, operations, and possible sample return), and Space Interferometry (precision structures, optical systems, and computing intensive control systems). The interdependence between CISM and In Situ is indicated by their enclosure in a box.

Communications and navigation technologies and capabilities define the enabling parameters for the missions and systems addressed under Mission Architecture and Design as well as the specific systems planned through CISM and In Situ. They play a significant but lesser role in shaping Space Interferometry systems.

Technology: Meeting the Challenge

Core Technology Programs

These crosscutting technology programs are responsible for fundamental and early technology research and development. Made up of both internal and external technology efforts, they also represent the primary conduit for infusing new technologies from other NASA centers, other government agencies, industry, and universities. Such programs are expected to enable new missions.

Focused Technology Programs

The focused technology programs are responsible for advanced technology development in well-defined, critical-path spacecraft and instrument areas supporting identified deep space mission concepts. The focused and core technology programs are well coordinated and complementary in early development efforts, while the focused technology and advanced validation and development programs are synergistic in more mature development areas.

Advanced Flight Validation and Development Programs

The New Millennium Program and the X-2000/Advanced Deep Space Systems Development Program provide for flight unit advanced development, validation, and engineering and normally represent the final stage of technology development prior to flight mission infusion and operation.

JPL tasks in support of NASA's Aeronautics and Space Transportation Technology include aircraft systems concept-to-test and environmental impact and technology R&D in high-speed and subsonic flight, NSTAR (In Space Transportation) Advanced Space Transportation Program, and X-33 Advanced Technology Demonstrator for the Reusable Launch Vehicle Program.

Partnerships

The evolutionary paths for deep space systems are defined by complex interactions of innovative scientific thought and technological advances, which in turn depend on both inspiration and hard work. Since JPL has no corner on any of these, its conduct of the Center of Excellence for Deep Space Systems emphasizes involvement, collaboration, and combining strengths with other NASA centers, federal laboratories, universities, companies, and organizations outside the U.S. Where appropriate, these relationships should resemble true partnerships—long-term relationships in which equals share the costs, risks, and long-term benefits of a joint endeavor.

APPENDICES

- JPL Points of Contact
- JPL Alignment with NASA Enterprise Plans
- Assessment of FY'98 JPL Performance Objectives
- FY'00 Performance Objectives
- Related Documents
- Abbreviations

JPL Points of Contact

The JPL Implementation Plan	Richard P. O'Toole	818-354-3409
JPL Contributions to NASA Strategic Enterprises		
Space Science Enterprise		
Mars Exploration Robotic Missions	Norman R. Haynes	818-354-0554
Cassini Mission to Saturn	Robert T. Mitchell	818-354-5152
Space Infrared Telescope Facility	Larry L. Simmons	818-354-6336
New Millennium Deep Space Missions	Fuk K. Li	818-354-2849
Center of Excellence for Deep Space Systems	Charles Elachi	818-354-5673
Astronomical Search for Origins	Firouz M. Naderi	818-354-9291
Operating Deep Space Missions	Terry D. Linick	818-354-3161
Theme : Solve Mysteries of the Universe	Firouz M. Naderi	818-354-9291
Theme : Explore the Solar System	Douglas S. Stetson	818-354-4877
Theme : Discover Planets	Firouz M. Naderi	818-354-9291
Theme : Search for Life Beyond Earth	Kenneth H. Nealson	818-354-9219
Earth Science Enterprise		
Instrument Technology and New Millennium Earth Observing Systems	Fuk K. Li	818-354-2849
Oceanography, Solid Earth Sciences and Atmospheric Chemistry	Diane L. Evans	818-354-2418
New Instrument Techniques and New Missions	Fuk K. Li	818-354-2849
ESE Science Themes	Diane L. Evans	818-354-2418
Disseminate Information	Diane L. Evans	818-354-2418
Human Exploration and Development of Space Enterprise		
Fundamental Physics and Station Research	Michael Devirian	818-354-3993
Aeronautics and Space Transportation Technology Enterprise	Arthur J. Murphy	818-354-3480
Non-NASA Work	Michael J. Sander	818-354-0239
Technology	Michael J. Sander	818-354-0239
Technology Commercialization	Merle McKenzie	818-354-2577
Deep Space Communications and Mission Operations	Gael F. Squibb	818-354-4086
Outreach	Richard P. O'Toole	818-354-3409

Note: Address e-mail to points of contact in the following form:
firstname.lastname@jpl.nasa.gov

JPL Institutional Implementation	Larry N. Dumas	818-354-3400
Leadership	Edward C. Stone	818-354-3405
Process-Based Management	Richard P. Laeser	818-354-3622
Chief Scientist	Moustafa Chahine	818-354-6057
Integration and Support: Engineering and Science	William J. Weber	818-354-2800
Engineering and Mission Assurance	Harry K. Detweiler	818-354-4929
Chief Engineer	John R. Casani	818-354-6578
Integration and Support: Administrative and Operations	Kirk M. Dawson	818-354-6354
Business and Finance	Kirk M. Dawson	818-354-6354
Controller	William H. Harrison	818-354-5453
Business Operations	Daryal T. Gant	818-354-2970
Investments	Kirk M. Dawson	818-354-6354
Process Reengineering	Richard P. Laeser	818-354-3622
Discipline Centers of Excellence	William J. Weber	818-354-2800
Mission Concepts and Proposal Development	Kirk M. Dawson	818-354-6354
Center of Excellence for Deep Space Systems	Charles Elachi	818-354-5673

JPL Alignment with NASA Enterprise Plans

NASA Enterprise	Goals	Objectives (number)	JPL Programs *
Space Science Enterprise OSS Strategic Plan, November 1997 (modified by JPL for FY'99 objectives)	1. Understand how structure in our Universe (e.g., clusters of galaxies) emerged from the Big Bang.	Observe the earliest structure in the Universe, the emergence of stars and galaxies in the very early universe and the evolution of galaxies and the intergalactic medium. (1,2,3)	SIRTF SIM
		Measure the amount and distribution of dark and luminous matter in the ancient and modern universe. (4)	FIRST Planck SMEX (WIRE, GALEX) LISA, ARISE Cassini–Huygens
	2. Test physical theories and reveal new phenomena throughout the universe, especially through the investigation of extreme environments.	Identify the origin of gamma-ray bursts and high-energy cosmic rays. (6)	VIM
		Study compact objects and investigate how disks and jets are formed around them. (7)	Ulysses
		Measure space plasma processes both remotely and in situ. (9)	Cassini–Huygens
		Test the Theory of General Relativity. (5)	STEP
	3. Understand how both dark and luminous matter determine the geometry and fate of the universe.	Measure the amount and distribution of dark and luminous matter in the ancient and modern universe. (4)	VIM Planck
	4. Understand the dynamical and chemical evolution of galaxies and stars and the exchange of matter and energy among stars and the interstellar medium.	Observe the evolution of galaxies and the intergalactic medium. (3)	VIM Ulysses SIRTF
		Study compact objects and investigate how disks and jets are formed around them. (7)	FIRST ARISE Cassini–Huygens
		Study the formation and evolution of the chemical elements and how stars evolve and interact with the interstellar medium. (8)	SIM Solar Probe
		Measure space plasma processes both remotely and in situ. (9)	Cassini–Huygens

** includes current and future program elements*

NASA Enterprise	Goals	Objectives (number)	JPL Programs
Space Science Enterprise *continued...*	5. Understand how stars and planetary systems form together.	Study the formation and evolution of the chemical elements and how stars evolve and interact with the interstellar medium. (8) Observe and characterize the formation of stars, protoplanetary disks, and planetary systems and detect Neptune-size planets around other stars. (10)	SIRTF, Keck Interferometer Future Programs SIM FIRST TPF
	6. Understand the nature and history of our solar system, and what makes Earth similar to and different from its planetary neighbors.	Measure solar variability and learn to predict its effect on Earth more accurately. (11) Study the interactions of planets with the solar wind. (12) Characterize the history, current environment, and resources of Mars, especially the accessibility of water. (13) Investigate the composition, evolution, and resources of the Moon, small bodies, and Pluto-like objects across the solar system. (16)	Galileo Genesis Mars Global Surveyor Mars Surveyor '98 Cassini–Huygens Stardust Deep Space 1,2 Ulysses VIM MIRO Future Programs Mars Surveyor Europa Orbiter Pluto/Kuiper Express Solar Probe MUSES-CN
	7. Understand long- and short-term mechanisms of solar variability, and the specific processes by which Earth and other planets respond.	Investigate the processes that underlie the diversity of solar system objects. (19) Measure space plasma processes both remotely and in situ. (9) Measure solar variability and learn to predict its effect on Earth more accurately. (11) Study the interactions of planets with the solar wind. (12)	Galileo Cassini–Huygens Ulysses VIM Future Program Solar Probe Cassini–Huygens
	8. Understand the origin and evolution of life on Earth.	Measure solar variability and learn to predict its effect on Earth more accurately. (11) Complete the inventory and characterize a sample of near-Earth objects down to 1-km diameter. (17) Reconstruct the conditions on the early Earth that were required for the origin of life and determine the processes that govern its evolution. (18)	Future Program Mars Surveyor MUSES-CN NEAP NEAT Astrobiology Studies

NASA Enterprise	Goals	Objectives (number)	JPL Programs
Space Science Enterprise *continued...*	9. Understand the external forces, including comet and asteroid impacts, that affect life and the habitability of Earth.	Measure solar variability and learn to predict its effect on Earth more accurately. (11) Complete the inventory and characterize a sample of near-Earth objects down to 1-km diameter. (17) Reconstruct the conditions on the early Earth that were required for the origin of life and determine the processes that govern its evolution. (18)	NEAT, NEAP Galileo, Ulysses, Cassini–Huygens Stardust Deep Space 1 International Payloads MUSES-CN Future Program Pluto/Kuiper Express
	10. Explore the solar system to identify locales and resources for future human habitation.	Measure solar variability and learn to predict its effect on Earth more accurately. (11) Characterize the history, current environment, and resources of Mars, especially the accessibility of water. (13) Investigate the composition, evolution, and resources of the Moon, small bodies, and Pluto-like objects across the solar system. (16) Complete the inventory and characterize a sample of near-Earth objects down to 1-km diameter. (17)	Mars Exploration Robotic Missions Mars Pathfinder Mars Global Surveyor Mars Surveyor '98 Deep Space 1,2 Future Program Mars Surveyor
	11. Understand how life may originate and persist beyond Earth.	Determine the pre-biological history and biological potential of Mars and other bodies in the solar system. (14) Determine whether a liquid water ocean exists today on Europa and seek evidence of organic or biological processes. (15)	Mars Exploration Robotic Missions Mars Pathfinder Mars Global Surveyor Mars Surveyor '98 Galileo, Cassini–Huygens Future Programs Mars Surveyor Europa Orbiter SIM TPF

NASA Enterprise	Goals	Objectives	JPL Programs
Earth Science Enterprise Mission to Planet Earth Strategic Plan, May 1997	Expand scientific knowledge of the Earth system using the unique vantage point of space.	1.1 To understand the consequences of land-cover and land-use changes as they impact ecological processes, and evaluate what human activities contribute to changes occurring in the landscape. To understand how changes in land-cover and land-use impact socio-economic activity and human health. These involve developing the capability to perform repeated global inventories of land-cover and land-use from space, and to develop the scientific understanding and models necessary to evaluate the consequences of observed changes.	Current Missions/Instruments SIR-C/X-SAR SRTM Alaska SAR Facility Aircraft Future Missions EOS/ASTER LightSAR
		1.2 To monitor, describe, and understand seasonal-to-interannual climate variability with the aim of developing and improving capability to predict socio-economically important climatic anomalies on these time scales.	Current Missions TOPEX/Poseidon NSCAT Aircraft Future Missions Jason 1,2 EOS/ASTER SeaWinds 1,2 EOS/MISR EOS/ACRIM EOS/IMAS EOS/AIRS
		1.3 To understand Earth processes which can lead to natural disasters, develop risk assessment capability for vulnerable regions, and coordinate with U.S. disaster managers and international space agencies.	Current Missions SIR-C/X-SAR SCIGN Aircraft Future Missions SRTM LightSAR
		1.4 To understand the causes and consequences of long term (decades-to-centuries) climate variations on regional as well as global scales, both natural and human induced.	Current Missions TOPEX/Poseidon Future Missions Jason 1,2 EOS/MISR EOS/ACRIM EOS/MLS EOS/AIRS EOS/TES EOS/ASTER EOS/IMAS LightSAR

NASA Enterprise	Goals	Objectives	JPL Programs
Earth Science Enterprise *continued...*		1.5 To develop understanding of processes affecting distributions of ozone and other constituents which most directly affect its concentrations in the global troposphere and stratosphere, as well as the distributions of oxidizing species in the global troposphere, to document their current evolution from ground-, aircraft-, balloon-, and space-based observations and predict future changes that affect biologically active radiation and predict future changes that affect radiative forcing and climate.	Current Missions UARS/ACRIM UARS/MLS ATMOS Aircraft/Balloons Future Missions EOS/ACRIM EOS/MLS EOS/TES
	2. Disseminate information about the Earth system.	2.1 Implement data system architectures that are open, distributed and responsive to user needs. 2.2 Foster the development of an informed and environmentally aware public.	Physical Oceanography DAAC (PODAAC)
	3. Enable the productive use of Earth Science Enterprise science and technology in the public and private sectors.	3.1 Develop, infuse, and transfer advanced remote sensing technology and concepts. 3.2 Extend the use of NASA's research and technology beyond the traditional science community to be applied to the needs of national, state, and local users. 3.3 Support the development and leverage of commercial capabilities in remote sensing and information systems to cost-effectively meet Earth Science Enterprise science objectives and to enhance the relevance of Earth Science Enterprise scientific discovery. 3.4 Make major scientific contributions to regional, national, and international environmental assessments.	JPL participating in Earth Science Enterprise integrated technology planning

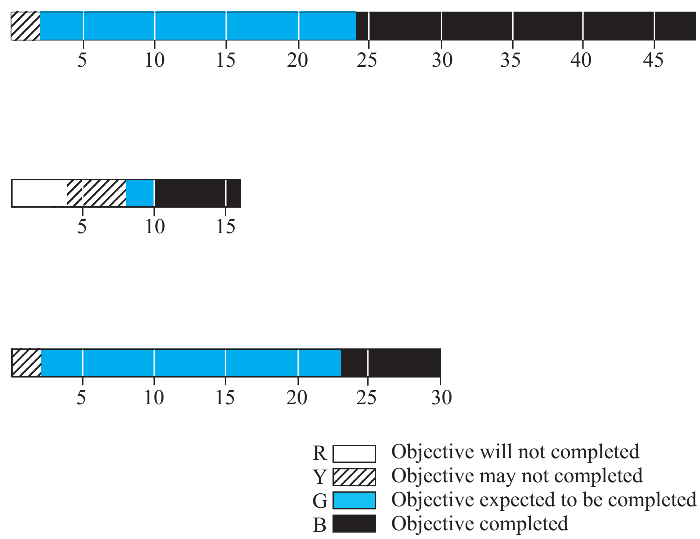
NASA Enterprise	Goals	Objectives	JPL Programs *
Human Exploration and Development of Space HEDS Strategic Plan, January 1996	1. Increase human knowledge of nature's processes using the space environment.	1. Understand the fundamental role of gravity and the space environment in biological, chemical, and physical systems.	Microgravity Fundamental Physics
		Test the Theory of General Relativity	STEP
		2. Use HEDS' research facilities innovatively to achieve breakthroughs in science and technology.	Inflatable Antenna Experiment BETSCE Laser Cooling STEP
	2. Explore and settle the solar system.	1. Enable human exploration through space science enterprise robotic missions.	Mars Surveyor '01,' 03, '05 MVACS '98, Athena, and APEx In Situ Propellant Production
		2. Expand human presence in space by assembling and operating the International Space Station.	Low-Temperature Microgravity Physics Facility Laser Cooling and Atomic Physics (LCAP)
		3. Develop biomedical knowledge and technologies to maintain human health and performance in space.	Virtual Reality
		4. Establish a human presence on the Moon, in the Martian System, and elsewhere in the inner solar system.	MECA
		5. Develop opportunities for commerce in space as a basis for future settlements.	
	3. Achieve routine space travel.	1. Sustain space shuttle operations at improved levels of safety and efficiency.	

NASA Enterprise	Goals	Objectives	JPL Programs
Human Exploration and Development of Space *continued...*		2. Ensure the health, safety, and performance of space flight crews through space and environmental medicine.	Miniature Mars Spectrometer Microhygrometer Neural Networks Tunable Diode Laser Diode Sensors Electronic Nose
		3. Develop requirements, demonstrate and implement advanced propulsion systems and other advanced space transportation systems and capabilities to enable exploration.	
	4. Enrich life on Earth through people living and working in space.	1. Promote knowledge and technologies that promise to enhance our health and quality of life. 2. Broaden and strengthen our nation's achievements in science, math, and engineering. 3. Involve our nation's citizens in the adventure of exploring space. 4. Join with other nations in the international exploration and settlement of space.	Mars Educational Outreach Program Microgravity Fundamental Physics Education and Outreach Program

Assessment of FY'98 JPL Performance Objectives

REALM	R	Y	G	B	OBJECTIVES
PROGRAMMATIC		**2**	**22**	**24**	**48**
• Space Science		1	9	5	15
• Earth Science		1	2	5	8
• HEDS				5	5
• Technology				3	3
• Deep Space Comm & MO			11	2	13
• Non-NASA Work				4	4
LEADERSHIP	**4**	**4**	**2**	**6**	**16**
• OAD/IMC			1	2	3
• Chief Scientist				3	3
• Change Management	1				1
• Process-Based Management	2	2		1	5
• Outreach	1				1
• HR		2	1		3
INTEGRATION & SUPPORT		**2**	**21**	**7**	**30**
• ESD			3	4	7
• OEMA			8		8
• Chief Engineer (ISO)			1		1
• Controller		1	2		3
• Business Operations		1	7		8
• Investments				3	3
	4	**8**	**45**	**37**	**94**

STATUS



FY'98 JPL Implementation Plan *objectives status summary as of August 21, 1998. Eighty-seven percent of the objectives were either completed or expected to be completed.*

The chart above portrays in an aggregated form the status (Red, Yellow, Green, Black) of all the performance objectives in the *JPL FY'98 Implementation Plan*. "Red" means that the objective will not be completed in FY'98. "Yellow" means the objective may not be completed. "Green" means that the objective is expected to be completed this year. "Black" means the objective has been achieved already. Color assessments are the judgment of the individual responsible for the achievement of the objective.

For this purpose, the performance objectives are grouped under the realms of Programmatic, Leadership, and Integration and Support, following the groupings in the Implementation Plan. Forty-eight programmatic performance objectives support the four NASA Enterprises, plus Deep Space Communications and Mission Operations, and Non-NASA work.

Sixteen Leadership performance objectives comprise the fiscal year's commitment of the top management and commitments to change, to outreach, and to human resources. Thirty Integration and Support performance objectives include the crosscutting and implementation functions. In an unweighted assessment of the objectives, 87% of the objectives are either complete or expected to be complete. Specific objectives assessed to be Red or Yellow are stated below along with their assessment. Some performance objectives represent actions to implement JPL Change Goals.

Notes on the Performance Objectives Judged Red or Yellow

Space Science

Y Complete the first year of MGS observations.

(Spacecraft anomaly resulted in replan; on track on new schedule.)

Earth Science

Y Start development of IMAS, another major step in demonstrating faster, better, cheaper Earth science instruments and systems.

(Not a new start; however, technology development proceeding under the Instrument Incubator program.)

Change Management

R Transition to process-based management.

(Executive Council must first develop a shared understanding of what this means; subsequently, a new plan for getting there can be developed. Action initiated 8/21. Results unlikely by the end of the fiscal year.)

Process-Based Management

Y Progress on documentation of processes, policies, and procedures sufficient for ISO 9000 registration in FY'99 and for JPL operational needs.

(Documentation not complete.)

R Complete the definition, documentation, and establishment of baseline performance measures for processes encompassing all JPL work.

(Documentation milestones for all processes are not being achieved by the end of the fiscal year. A new resolve, beginning with the JPL executive management, and a revised schedule are needed.)

R Complete the Develop New Products reengineering project, which is reengineering a major subset of the Develop New Products process, focusing on flight mission and instrument design, development, and operations.

(This objective interpreted as delivery of a 24-month cycle-time DNP capability. That capability has been replanned to FY'99. The delay is due primarily to the interdependence with ISO work and the slow engagement with flight projects.)

Y Complete the NBS reengineering project

(Schedule extremely tight; expect to remain Yellow until completed. Human resources and payroll replanned to January 1999.)

Outreach

R Complete development of, and implement, an improved process for planning and coordinating outreach efforts.

(Improved process is defined; implementation on hold, pending appointment of leader/owner.)

Human Resources Directorate

Y Refine JPL's performance management process (employee contribution and performance, or ECAP) to align individual performance goals and strategic priorities as part of the strategic planning cycle.

(Concept of performance goals linked to strategic plans introduced. More significant revisions needed for ECAP process.)

Y Provide managers with additional tools to reward and recognize employees, including non-base pay options.

(Review and approval in process; options announcement delayed to October.)

Controller's Office

Y Successfully implement the New Business Solutions Project which is reengineering acquisition, finance, and human resources business processes around a purchased, off-the-shelf system. New Business Solutions will become operational in 1998.

(Timekeeping implemented in June–August; budgeting in August; and finance, acquisition, services, assets scheduled for beginning of FY'99. Human resources and payroll replanned to January 1999.)

Business Operations Directorate

Y Continue to consolidate activities at the main Oak Grove site, reduce Pasadena-area leased facilities, and eliminate all such leases by the end of calendar year 1998.

(Objective was based on a now outdated schedule to vacate Building 601. Shortage of space at Oak Grove has caused that schedule to be slipped.)

FY'00 Performance Objectives

FY'00 objectives have been identified this year to ensure that employee performance planning aligns well with Laboratory and Agency goals and objectives.

FY'00 PERFORMANCE OBJECTIVES FOR PROGRAM IMPLEMENTATION

Space Science Enterprise

Programmatic Objectives

- Complete the Deep Space 2 mission with the successful in situ operation of the Mars penetrators in conjunction with the Mars Surveyor '98 project.
- Obtain NASA approval for the implementation of Deep Space 5 in early FY'00.
- Prototype demonstration of System on a Chip (SOAC) technology by the end of FY'00.
- Deliver a Next Generation Space Telescope flight demonstration inflation-deployed sun shield to GSFC.
- Establish initial operation of the Keck Interferometer with the test siderostats and involve the science community in the key science projects (exo-zodiacal measurements and direct detection of Jupiter-mass planets) through a NRA.
- Complete anomaly-free period of flight operations for Stardust.
- Deliver all three SIRTF science instruments and the SIRTF cryostat for integration into the Cryo-Telescope Assembly.
- Deliver Mars Surveyor '01 instruments - Athena Precursor Experiment (APEx), Mars Environmental Compatibility Assessment (MECA) experiment, and the robotic arm.
- Complete MUSES-CN initial delivery to ISAS.
- Deliver electrical qualification models for the four U.S. Rosetta orbiter instruments to ESA on schedule and successfully integrate them with the spacecraft.
- Demonstrate Mars '03 Mobile Science Laboratory engineering model in terrestrial setting.
- Develop the needed instrument technology for FIRST. This includes heterodyne receivers and local oscillators. Two basic metrics can be used: frequency and sensitivity.
- Develop the needed telescope technology for FIRST. The primary metric is surface accuracy over the thermal range.
- Complete the MGS mapping mission.
- Land Mars Polar Lander and successfully complete its surface mission.
- Successfully complete the aerobraking phase of Mars Climate Orbiter and begin mapping operations.
- Successfully develop the Mars Surveyor '01 mission into assembly, test, and launch operations (ATLO) phase.
- Begin phase C development of Mars Surveyor '03 mission.

FY'00 PERFORMANCE OBJECTIVES FOR PROGRAM IMPLEMENTATION *(continued)*

Space Science Enterprise (cont'd)

Technology Objectives

- Complete flight hardware for NGST inflatable sunshield and deliver to GSFC for flight test.
- Deliver visual feature tracking capability for autonomous precision landing on a small body within a 15-m error ellipse from a 10-km orbit.
- See also Multi-Enterprise Technology.

Education and Outreach Objectives

- Establish significant partnerships with at least 20 different informal education centers regarding exploration of the solar system and universe.
- Implement the Mars Millennium Project, in coordination with NASA and external organizations.
- Develop and execute a multi-project urban/rural education initiative.

FY'00 PERFORMANCE OBJECTIVES FOR PROGRAM IMPLEMENTATION

Earth Science Enterprise

Programmatic Objectives

- Launch the New Millennium Program Earth Orbiting-1 mission (December 1999).
- Deliver the AIRS instrument to the EOS PM spacecraft for integration and test.
- Support the ADEOS II launch in August 2000 and begin SeaWinds data production after early instrument turn-on.
- Begin TES and MLS flight instrument integration and test; begin science product generation software development.
- Complete phase-out of the Alaska SAR processor and the phase-in of an integrated Level 0 archive system.
- Prepare the NASA portions of Jason-1 by the completion of system testing of the satellite, delivering the Project Operations Control Center, launching the satellite, and commencing mission operations.
- Begin delivery of Jason data products to the science team and calibration/validation team.
- Contribute to the development of an Earth Science federated data system through the successful development and initial operation of Earth System Information Partners (ESIPs).
- Extend TOPEX/Poseidon ocean topography uninterrupted monitoring for the eighth year.
- Complete development of Earth Science Mission Center (ESMC) for Earth Science Program multi-mission operations.
- Deliver integrated GRACE satellites (to Space Systems/Loral) for system tests by October 2000.

FY'00 PERFORMANCE OBJECTIVES FOR PROGRAM IMPLEMENTATION

Earth Science Enterprise

Technology Objectives

- Fabricate miniature optical systems and holographic optical elements.
- Demonstrate sounder spectrometer with no moving parts.

Education and Outreach Objectives

- Extend ALERT pre-service teacher training initiative to include participation by at least 20 California community colleges.
- Establish significant partnerships regarding exploration of the Earth with at least 10 different informal education centers.
- Arrange partnerships with at least five different external educational/commercial organizations and substantially contribute to their products (i.e., CD-ROMs, videos, teacher supplements).

FY'00 PERFORMANCE OBJECTIVES FOR PROGRAM IMPLEMENTATION

Human Exploration and Development of Space Enterprise

- Conduct successful Low-Temperature Microgravity Facility preliminary design review and first mission requirement definition review.
- Conduct successful Low-Temperature Microgravity Facility second mission science concept review.
- Complete requirements definition review for Laser Cooling and Atomic Physics Experiments.

FY'00 PERFORMANCE OBJECTIVES FOR MULTI-ENTERPRISE TECHNOLOGY

- Complete the second cycle of a "ready to use" list of fresh NASA and DOD technologies, and provide the list and access to technology experts in order to meet mission commitments.
- Develop and demonstrate prototype of MCAS terminal.
- Demonstrate 512 × 512 active pixel focal plane array with all-digital onboard processing.
- Demonstrate 1.5 nanometers of "stellar" fringe tracking stability on the Micro-Precision Interferometer (MPI) Testbed.
- Increase the number of new technologies reported in NASA.
- Increase the number of commercial success stories for NASA.
- Increase the number of licenses for use of intellectual property for NASA.
- Increase amount of TAP technology being done by the university community by 50% and the number of university participants by 10%.
- Develop and advocate needed funding levels for the Agency for the three JPL OCT "Pillar Technology" initiatives (miniaturization, deep space technology, and compact instruments).

FY'00 PERFORMANCE OBJECTIVES FOR DEEP SPACE COMMUNICATIONS AND MISSION OPERATIONS

- Complete validation of Deep Space 1 Ka-band tracking.
- Develop and test Ka-band flight hardware prototypes.
- Bring Table Mountain 1-m Optical Communications R&D site on-line.
- Implement antenna X-band feed improvements.
- Develop new international, commercial, and educational partnerships.
- Simplify network systems and upgrade the command system.
- Deliver the first increment of a new service planning and preparation system.
- Deliver incremental improvements to the next-generation Mission Data System.
- Continue the transition to a services-based organization.
- Decommission DSS 42 and 61.

FY'00 TECHNOLOGY PERFORMANCE OBJECTIVES FOR NON-NASA WORK

- Build a bridge between DOD and NASA by initiating a significant technology project/task from NRO/NIMA.

FY'00 PERFORMANCE OBJECTIVES FOR LEADERSHIP

Office of the Director/Deputy Director and Executive Council

- Accomplish all schedule and cost commitments for FY'00 as planned in POP99-1.

Office of the Associate Director and the Institutional Management Committee

- Reduce annual allocated direct and multiprogram support costs and stay within the FY'00 cost plans.
- Invest in activities and infrastructure that are enabling or increase efficiency.
- Stabilize workforce at 5,000 workyears during FY'00.
- Vacate all leased space.

Chief Scientist

- Ensure the establishment of an astrobiology laboratory/facility at JPL.
- Ensure that the upgrade of the data acquisition system for the Near Earth Objects Project is complete.

Strategic Management

- Achieve steady-state alignment of performance measures with NASA.

Products and Capabilities

- Ensure that average spacecraft cost for JPL's Space Science and Earth Science missions is $190M or less and the average spacecraft development time is 4 1/2 years or less, for the period FY'99 thru FY'03.

Change Management

- Show measurable progress against all of JPL's current change goals.

Outreach

- Establish formal annual assessment of all education and outreach programs.
- Develop and implement integrated education and public outreach programs for all advanced technology/demonstration missions.

Human Resources Directorate

- Provide training resources and processes that support the goal of 40 hours of training per employee.
- Provide innovative services and support changes in the work environment that enable JPL to become an "employer of choice."

FY'00 PERFORMANCE OBJECTIVES FOR INTEGRATION AND SUPPORT

Engineering and Science Directorate

- Establish at least one new university partnership for each of JPL's six discipline centers of excellence.
- Demonstrate, through application to approved projects, all the processes and tools necessary to maintain the average spacecraft cost for JPL's Space Science and Earth Science missions at $190M or less, and the average spacecraft development time at $4^1/_2$ years or less, for the period FY'99 through FY'03.

Office of Engineering and Mission Assurance

- Complete reliability analyses tool infusion in the DNP.
- Develop on-line environmental estimates criteria/guidelines approach.
- Initiate a consolidated procurement of new-generation flight computers for multiple project customers.
- Implement 5X Mission Assurance Management/PAL cross training program.
- Increase industrial leveraging in the area of assurance technology development to 3.5:1 (three and a half outside dollars contributed to every JPL dollar spent).
- Develop, in concept with the other NASA centers, a Supplier Quality Database that yields a rating system for NASA's suppliers.
- Develop and implement a Materials and Processes Program that is focused on the early validation and verification of the materials and processes to be used by JPL projects.

Chief Engineer

- TBD

Controller's Office

- TBD

FY'00 PERFORMANCE OBJECTIVES FOR INTEGRATION AND SUPPORT *(continued)*

Business Operations Directorate

- Reduce cycle times for contracts and purchase orders, and reduce acquisition operating costs.
- Meet or exceed targets for small businesses, small disadvantaged businesses, and women-owned businesses that are agreed to each fiscal year with NASA.
- Increase on-line access to scientific, technical, and business information, including library resources, archival records, Laboratory-produced scientific and technical reports, and forms.
- Implement a faster, cost-effective process to colocate personnel supporting an emerging program or project.
- Consolidate Pasadena-area facilities at the Oak Grove site, and eliminate all off-site leases. In the first quarter of FY'00, complete the vacating of Building 601, the last off-site lease.
- Conduct 44 safety and health training courses that meet regulatory requirements, and reduce lost-time injuries and illnesses.
- Conduct a pollution-prevention program to reduce targeted releases into the environment by 50% from baseline 1991.

Related Documents

National Space Policy, September 19, 1996
http://www.whitehouse.gov/WH/EOP/OSTP/NSTC/html/fs/fs-5.html

NASA Documents
NASA Strategic Plan
http://www.hq.nasa.gov/office/nsp

NASA Strategic Management Handbook
http://www.hq.nasa.gov/office/codez/strahand/frontpg.htm

NASA Performance Plan for Fiscal Year 1999
http://www.hq.nasa.gov/office/codez/pplan99/contents.htm

To the Solar System: Exploration and Discovery. A Mission and Technology Roadmap 2000–2015
http://eis.jpl.nasa.gov/roadmap/site

The Space Science Enterprise Plan: Origins, Evolution, and Destiny of the Cosmos and Life
http://www.hq.nasa.gov/office/oss/strategy/1997/

OSS Integrated Technology Summary
http://nic.nasa.gov/oss

Partners in Education: A Strategy for Integrating Education and Public Outreach into NASA's Space Science Programs
http://www.hq.nasa.gov/office/oss/edu/educov.htm

Implementing the Office of Space Science Education/Public Outreach Strategy
http://www.hq.nasa.gov/office/oss/edu/imp_plan.htm

Mission to Planet Earth Strategic Enterprise Plan 1997–2002 (draft)
http://www.hq.nasa.gov/office/ese/visions/Strategic_Enterprise_1997-202.pdf

NASA's Enterprise for the Human Exploration and Development of Space: The Strategic Plan
http://www.hq.nasa.gov/osf/heds/hedsplan.html

Aeronautics and Space Transportation Technology: Three Pillars for Success
http://www.hq.nasa.gov/office/aero/oastthp/brochure/brochure.htm

Safety and Mission Assurance Strategic Plan
http://www.hq.nasa.gov/office/codeq/qstrat.htm

Center Implementation Plans

Ames Research Center

Ames Research Center Implementation Plan: Implementing NASA's Strategic Plan

The NASA Center of Excellence Information Technology Plan
http://www.arc.nasa.gov/enhanced/coe/text/plan.html

Goddard Space Flight Center

Goddard Space Flight Center Implementing NASA's Strategies for the 21st Century
http://pao.gsfc.nasa.gov/gsfc/strategic/gsfcplan.htm

Jet Propulsion Laboratory

The JPL Implementation Plan
http://techinfo.jpl.nasa.gov/implementationplan/

Johnson Space Center

JSC as a Center of Excellence in Human Operations in Space, February 10, 1997 (contact Joe Loftus)

Kennedy Space Center

Kennedy Space Center Implementation Plan
http://www.ksc.nasa.gov/facts/impplan/impwhit.html

Langley Research Center

Langley Research Center Strategic and Quality Framework
http://larclp.larc.nasa.gov/

Marshall Space Flight Center

MSFC Implementation Plan
http://www.msfc.nasa.gov:80/general/impplan/

JPL Assignment Documents

NASA memorandum to Jet Propulsion Laboratory (attention Director) through AT/Associate Deputy Administrator (Technical) from S/Associate Administrator for Space Science, "Assignment of Lead Center Responsibility for Mars Exploration Robotic Missions," August 6, 1993.

NASA memorandum to Jet Propulsion Laboratory (attention Director) from S/Associate Administrator for Space Science, "Assignment of Lead Center Responsibility for the Space Infrared Telescope Facility (SIRTF)," June 18, 1997.

NASA memorandum to Jet Propulsion Laboratory (attention Manager, Low Temperature Microgravity Physics Program) from UG/Director, Microgravity Science and Applications Division, "Transfer of the Microgravity Technology Management Function," June 28, 1996.

NASA memorandum to Distribution from UG/Director, Microgravity Science and Applications Division, "Implementation of New Management Responsibilities at the Field Centers," April 4, 1996.

Astronomical Search for Origins and Planetary Systems: Management Plan, for the Origins Theme, September 1, 1997

JPL Lead Center Program Plans

Program Plan: The Mars Exploration Program, NASA Office of Space Science, October 1, 1997

Cassini Program Plan, August 26, 1996

Space Infrared Telescope Facility Program Plan, August 25, 1997

New Millennium Program Plan, July 1997

Other JPL Documents

Strategic Management Process Plan

Task Plan for Microgravity Technology Management Function

Directorate-level plans for FY'99

Abbreviations

ACRIM	Active Cavity Radiometer Irradiance Monitor
ADEOS	Advanced Earth Observing Satellite
ADSSD	Advanced Deep Space System Development
AIRS	Atmospheric Infrared Sounder
AIRSAR	Airborne Synthetic Aperture Radar
AES	Airborne Emission Spectrometer
AFE	Avionics Flight Experiment
AM-1	first morning EOS satellite
APEx	Athena Precursor Experiment (Mars'01)
ARISE	Advanced Radio Interferometer between Space and Earth
ASF	Alaska SAR Facility
ASTER	Advanced Spaceborne Thermal Emission and Reflection Radiometer
ASTT	Aeronautics and Space Transportation Technology Enterprise
ATMOS	Atmospheric Trace Molecule Spectroscopy Experiment
AVIRIS	Airborne Visible Infrared Imaging Spectrometer
BETSCE	Brilliant Eyes Ten-Kelvin Sorption Cryocooler Experiment
BMDO	Ballistic Missile and Defense Organization
CALGIS	a California corporation
Caltech	California Institute of Technology
CCOSM	Chemistry and Circulation Occultation Spectroscopy Mission
CHEM	Chemistry [EOS satellite]
CHeX	Confined Helium Experiment
CISM	Center for Integrated Space Microsystems
Code Q	NASA's Office of Safety and Mission Assurance
Code S	NASA's Office of Space Science
Code U	NASA's Office of Life and Microgravity Sciences and Applications
Code Y	NASA's Office of Mission to Planet Earth

CofE	center of excellence (referring to JPL discipline centers)
COM	communications
CPU	central processing unit
CSMAD	Center for Space Mission Architecture and Design
CSMT	Center for Space Microelectronics Technology
DAAC	Distributed Active Archive Center
DARPA	Defense Advanced Research Projects Agency
DIS	Data and Information System
DNP	Develop New Products project
DOD	Department of Defense
DS	Deep Space
DSMS	Deep Space Mission System
ECAP	employee contribution and performance (performance evaluation)
EMLS	EOS MLS
EOS	Earth Observing System
EOSDIS	Earth Observing System Data and Information System
ESD	Engineering and Science Directorate
ESIP	Earth System Information Partner
ESMC	Earth Science Mission Center
ESSP	Earth System Science Pathfinder
FIDO	Field-Integrated Design and Operations
FIRST	Far Infrared and Submillimeter Telescope
FY	fiscal year
GALEX	Galaxy Evolution Explorer
GEM	Galileo Europa Mission
GEOSAR	geosynchronous synthetic aperture radar
GPS	Global Positioning System
GRACE	Gravity Recovery and Atmospheric Change Experiment
GSFC	Goddard Space Flight Center
HEDS	Human Exploration and Development of Space Enterprise
ICIS	Institutional Computing and Information Services Office
IMAS	Integrated Multispectral Atmospheric Sounder
I/O	input/output

ISAS	Institute of Space and Astronautical Sciences of Japan
ISE	Intelligent Synthesis Environment
ISO	International Standards Organization
ISO 9000	the body of quality management and quality assurance standards
ISO 9001	a standard that specifies quality system requirements
ISRU	In Situ Resource Utilization
JPL	Jet Propulsion Laboratory
JSC	Johnson Space Center
KSC	Kennedy Space Center
LCAP	Laser Cooling and Atomic Physics
LightSAR	Light Synthetic Aperture Radar
LISA	Laser Interferometer Space Antenna
LTMP	Low-Temperature Microgravity Physics
MDS	mission data system
MECA	Mars Environmental Compatibility Assessment
MEMS	microelectromechanical systems
MIDEX	Mid-Sized Explorer
Mini-STEP	Mini Satellite Test of the Equivalence Principle
MIRO	Microwave Instrument for Rosetta Orbiter
MISR	Multi-Angle Imaging Spectro Radiometer
MLS	Microwave Limb Sounder
MSFC	Marshall Space Flight Center
MPI	micro-precision interferometer
MOPS	mission operations per second
MUSES-CN	Mu Space Engineering Satellite
MVACS	Mars Volatiles and Climate Surveyor
NASA	National Aeronautics and Space Administrations
NBS	New Business Solutions Project
NEAP	Near-Earth Asteroid Prospector Mission
NEAT	Near-Earth Asteroid Tracking
NIMA	National Imagery Mapping Agency
NMP	New Millennium Program
NOAA	National Oceanic and Atmospheric Administration
NRO	National Reconnaissance Office
NSCAT	NASA Scatterometer

NSTAR	In Space Transportation Advanced Space Transportation Program
OEMA	Office of Engineering and Mission Assurance
OSS	Office of Space Science
Outer Planets I	Galileo, Cassini–Huygens
Outer Planets II	Europa Orbiter, Pluto-Kuiper Express, Solar Probe, Comet Nucleus Sample Return
PM-1	first evening EOS satellite
PMIRR	pressure-modulated infrared reflectance radiometer
PODAAC	Physical Oceanography Distributed Active Archive Center
POP	program operating plan
QuikSCAT	Quick Scatterometer
QWIP	quantum-well infrared photodetector
R&D	research and development
SAR	synthetic aperture radar
SBIR	Small Business Innovation Research
SCIGN	Southern California Integrated GPS Network
SEASAT	Sea Satellite
SEU	Structure and Evolution of the Universe
SIM	Space Interferometry Mission
SIR-C	Shuttle Imaging Radar-C
SIRTF	Space Infrared Telescope Facility
SMEX	Small Explorer
SRTM	Shuttle Radar Topography Mission
SSE	Space Science Enterprise
STEP	Satellite Test of the Equivalence Principle
STRV	Space Test Research Vehicle
SVLBI	Space Very-Long-Baseline Interferometry
TES	Tropospheric Emission Spectrometer
TIMS	Thermal Infrared Multispectral Scanner

TIR	Thermal Infrared Radiometer
TOPEX	Ocean Topography Experiment
TPF	Terrestrial Planet Finder
TQM	total quality management
TST/EG	Technology Strategy Team Executive Group
U.S.	United States
UARS	Upper Atmosphere Research Satellite
ULS	Ulysses
UMLS	UARS MLS
VGR	Voyager
VIM	Voyager Interstellar Mission
VLBI	very-long-baseline interferometry
WIRE	Wide Field Infrared Explorer
X-SAR	X-Band Synthetic Aperture Radar

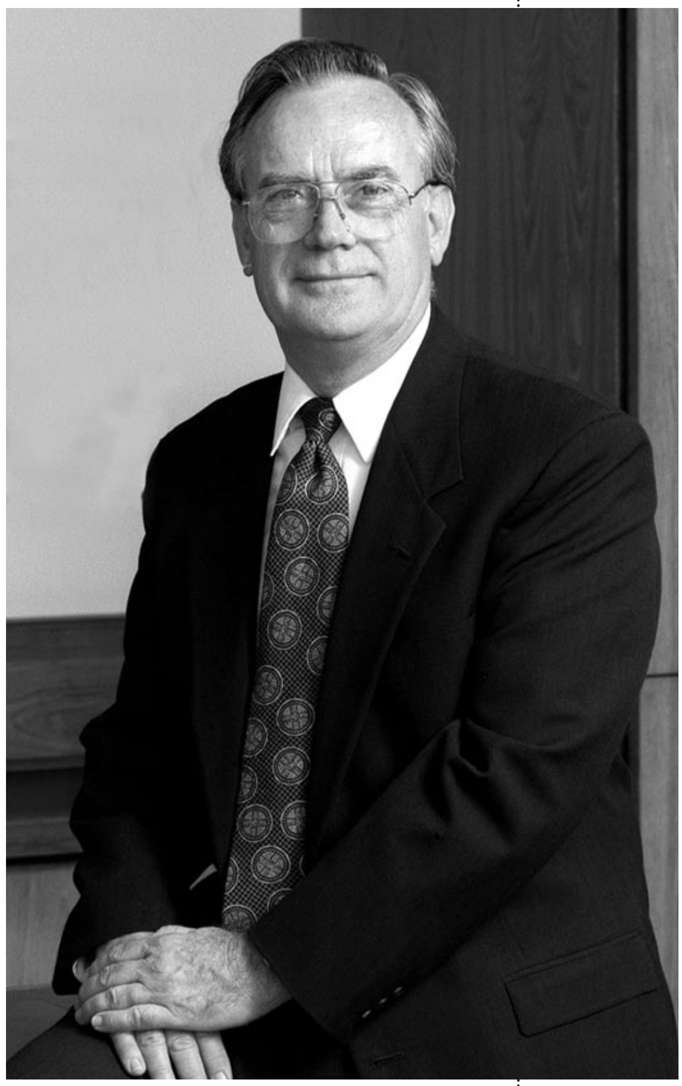
JPL's planning has served us well. We have made great progress in our change goals, and we have used our strategies to guide our process improvement initiatives. These are helping us implement NASA's new wave of exploration as we help turn NASA's vision into reality.

We have been entrusted with key elements of NASA's mission, and we face the challenges of implementation with a determination to succeed, on behalf of humankind. We are committed to creating a work environment at JPL that enables this success and also encourages personal and professional growth by our staff.

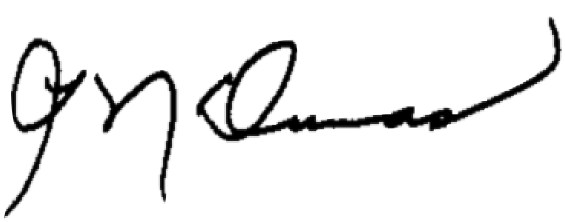
The JPL Implementation Plan is evidence of our commitment to strategic planning and goal setting. If, in carrying out this plan, each of us accepts personal responsibility for the quality of the work we do, improving the way we do it, and building a supportive work environment, JPL will continue to be one of the best places on Earth from which to explore space.

Larry N. Dumas

Deputy Director



It is the people of JPL who do JPL's work. ... If each of us accepts personal responsibility for the quality of work we do ... and for building a supportive work environment, JPL will continue to be one of the best places on Earth from which to explore space.



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