The JPL Implementation Plan

Fiscal Year 2000

Implementing NASA's Mission at the Jet Propulsion Laboratory

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

JPL is engaged in the quest for knowledge about our solar system, the universe, and the Earth to answer fundamental science questions and provide benefits to the nation from breakthrough missions. An important objective is to help broaden the benefits of the space program by making it more affordable, dependable, and frequent and more widely engaging, relevant, and accessible. As we succeed we will help create a world in which space enriches the human experience for all.

A key to achieving our goals is an increased emphasis on effective partnering and collaborations with other nations. We must combine strengths with other NASA centers, federal laboratories, industry, and academia to develop long-range strategies and engage broader capabilities for space exploration.

A second area of emphasis has been to restructure how we implement challenging fast-track missions in a process-oriented, interdependent, multimission environment. In a dramatic demonstration of what can be accomplished in this new environment, we have launched six missions in FY'99; of these, four were interplanetary missions launched for a total of $600 million and within one percent of the cost estimate.

In FY'00 we will build on these accomplishments by enhancing our program management practices and continuing to foster high-caliber, cross-functional teams. Working together, we will continue to serve as a gateway to the solar system and beyond.

Edward C. Stone
Director

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.

Contents

The JPL Implementation Plan

NASA asks all centers, including JPL, to manage strategically. This means that we must do our work in ways that support the plans and commitments established by the Agency and by the NASA strategic enterprises. *The JPL Implementation Plan* provides the roadmap to relate all our programs, projects, and tasks—and ultimately our individual efforts—to NASA's strategic and performance plans.

To ensure that management decisions and practices are based on sound strategic and implementation planning, NASA developed the NASA Strategic Management System. This system is responsive to the Government Performance and Results Act (GPRA), a law that requires every federal agency (including NASA) to:

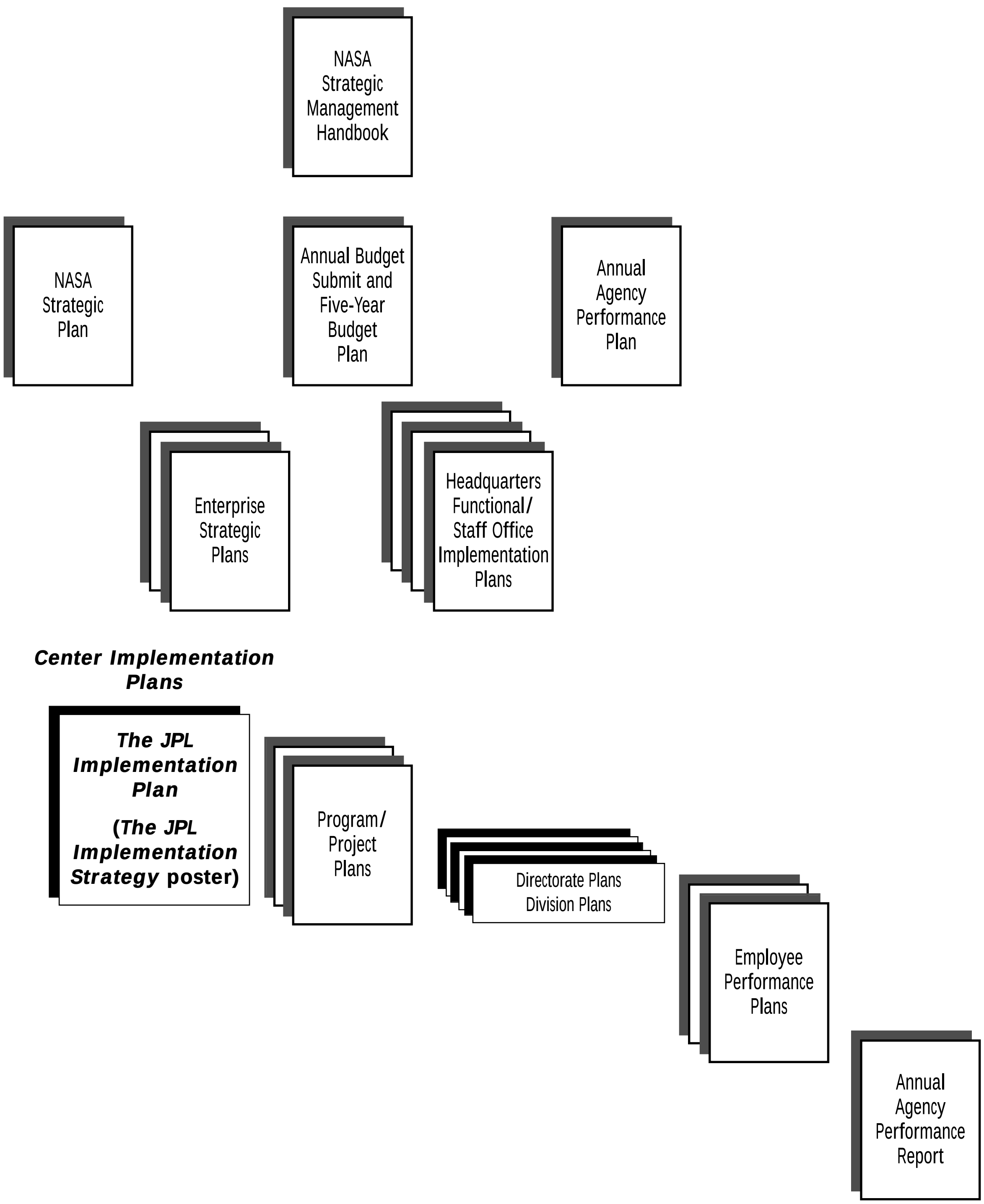
- Develop a strategic plan.
- Prepare and submit an annual performance plan to the president and to Congress.
- Submit an annual performance report to the president and to Congress.

Strategic management guidance for NASA centers and JPL is established in the *NASA Strategic Management Handbook* (NPG 1000.2). The JPL plan, which is shown within the NASA Strategic Management System on the next page, is organized into four major sections:

- "The JPL Implementation Strategy," which presents our mission, agency and enterprise assignments, values, strategies, and change goals in support of NASA's strategic vision.
- "Implementing the NASA Mission at JPL," which describes how the JPL programs, projects, and tasks contribute to NASA's four strategic enterprises.
- "JPL Institutional Implementation," which identifies JPL's contributions to NASA's four crosscutting processes.
- "Center of Excellence for Deep Space Systems," which summarizes the key JPL capabilities, discipline centers of excellence, technologies, and unique facilities that support NASA's deep space systems mission.

Throughout the plan, JPL performance objectives (listed in sidebars) either contribute directly to targets in the FY'00 NASA Performance Plan—and are indicated in bold type—or are JPL commitments critical to successful implementation. Performance reports are published in the JPL Self-Assessment at the end of each fiscal year.

NASA STRATEGIC MANAGEMENT AND IMPLEMENTATION PLANNING



NASA's Strategic Management System Documents
(Modified from *The NASA Performance Plan*, Fiscal Year 2000)

THE JPL IMPLEMENTATION STRATEGY

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

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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 Assignments

Center Missions

- Planetary Science and Exploration
- Earth Science Instrument Technology

Center of Excellence for Deep Space Systems

Space Science Enterprise

- Lead Center for Exploration of the Solar System
  - Mars Exploration Robotic Missions
  - Cassini–Huygens Mission to Saturn
  - Deep Space Systems: Outer planets missions and associated technology programs
  - Foreign Space Science Collaborations
- Lead Center for the Space Infrared Telescope Facility
- Lead Center for New Millennium Program
- Coordinating Center for the Astronomical Search for Origins
- Operating Deep Space Missions

Earth Science Enterprise

- Lead Center for New Millennium Earth Observing Systems
- Lead Center for Solid Earth and Physical Oceanography Missions
- Center for Scientific Leadership in Oceanography, Solid Earth Sciences, and Atmospheric Chemistry.
- Instrument Development

NASA uses a variety of means to organize and focus the efforts of the centers to achieve Agency missions.

- *Four Strategic Enterprises are the primary business areas for implementing NASA's mission and serving customers.*
- *Centers of Excellence are focused, Agency-wide leadership responsibilities in a specific area of technology or knowledge.*
- *Center missions identify the primary concentration of capabilities to support the accomplishment of Strategic Enterprise goals.*
- *NASA programs are assigned to Lead Centers for implementation; functional leadership operations are assigned to Principal Centers.*

Human Exploration and Development of Space Enterprise

- HEDS/Space Science Joint Planning for Integrated Robotic-Human Mars Exploration
- Microgravity Fundamental Physics and Microgravity Advanced Technology Development and Transfer

Functional Leadership

- Lead Center for NASA Electronic Parts and Packaging Program

JPL Mission

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

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.

JPL Values

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

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.

JPL Implementation Strategies

- 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.

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

- 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.

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IMPLEMENTING THE NASA MISSION AT JPL

In this section we

- Display JPL contributions within the NASA Strategic Roadmap to the Future.
- Summarize JPL programmatic contributions to enterprise and multi-enterprise goals.
- Identify JPL FY'00 performance objectives that support programmatic implementation and NASA's FY'00 performance targets.
- Describe JPL work for reimbursable sponsors.

	1999 – 2002	2003 – 2009	2010 – 2023
NASA 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 Extended Mission, Cassini–Huygens) Great Observatory (SIRTF) Mars Surveyor Program ('01) Operating Deep Space missions (VGR, ULS...) Origins (Keck Interferometer) Discovery (Stardust, Genesis, Deep Impact) SMEX (GALEX) Fundamental physics Astrobiology Foreign-led science missions Earth science missions, instruments, science • SRTM, SAR, MISR, SeaWinds, AIRS • ESSP (GRACE, CloudSat)	Outer Planets II (Europa Orbiter, Pluto Express, Solar Probe) Great Observatory (SIRTF) Origins (SIM) Discovery (Deep Impact) Mars Sample Return, micromissions, and future Mars Surveyor missions Explorer Fundamental physics Astrobiology SEU (FIRST, LISA, ARISE, Planck) Earth science missions, instruments, science • SAR, Jason, AlphaSCAT, TES, MLS Mars Network (in situ communication and navigation system at Mars)	Solar System in situ exploration and sample return Future Outer Planets missions Origins (SIM, TPF) Discovery Interstellar missions Mars Robotic Outposts • Permanent presence • Water access Fundamental physics Astrobiology Earth science missions, instruments, science • ESSP • Explorer In situ communication and navigation systems at various planets and their moons • Interplanetary Internet
To advance human exploration, use, and development of space.	Mars Surveyor Program • Landing sites • Geology and climate • Environmental experiments on Martian surface • Joint planning (HEDS/Space Science)	Mars Surveyor Program • Sampling, drilling • Aerocapture • ISRU • Shared payloads (HEDS/ Space Science) First Robotic Outposts on Mars Telecom and Operations • Mars Network; Mars Areostationary Relay Satellite (for high-bandwidth communications) JPL Space Station Research	Mars Robotic Outposts • Permanent presence • Water access • Infrastructure for human exploration Joint robotic/human exploration Next-generation of Mars Areostationary relay satellite systems • HDTV (fully operational optical communications)
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) Unified flight, ground, and test data system architecture Advanced Robotic Systems	**Revolutionary Technology Advances** Advanced flight systems "System on a chip" Advanced in situ and sampling systems Large, lightweight, high-precision deployable structures Ultrasensitive detectors Microspacecraft and instruments Intelligent, highly autonomous systems Highly advanced power, propulsion, and communications Science data fusion, visualization, and compression	**Revolutionary Technology Advances** Global operational optical communications Dramatically increased communications bandwidth High-fidelity virtual presence Dexterous, dynamically stable, in situ autonomous robotic systems Novel in situ manufacturing systems Quantum sensors, computing Autonomous spacecraft constellations

The NASA Strategic Roadmap

The Agency's goals have been grouped in three time frames spanning a 25-year period, as displayed on the NASA Strategic Management System Roadmap.* Each timeframe is defined by a unifying theme that characterizes the primary focus of activity for that period. The initial timeframe for the roadmap (1999–2002) presents the near-term goals that correlate to NASA's fiscal year 1999 budget and the president's 5-year plan. Mid- and long-term goals are presented in the 2003–2009 and 2010–2023 timeframes, respectively. These goals represent a balanced set of science, exploration, and technology development outcomes that the Agency believes can be accomplished over the next 25 years. While the mid- and long-term goals will be executed in timeframes that exceed current budget authority, they represent a strategic direction that is consistent with the NASA vision and mission.

The figure to the left sets JPL program activities into NASA's strategic roadmap to illustrate our contributions to NASA's near-, mid-, and long-term mission plans.

* See the *NASA Strategic Plan 1998 with 1999 Interim Adjustments*, pages 8 and 9, for the complete set of roadmap goals. NASA strategic plans are available at <http://www.hq.nasa.gov/office/codez/plans.html>.

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JPL Contributions to the Space Science Enterprise

This section presents

- JPL's contributions to Space Science Enterprise science goals (grouped within the theme areas of the enterprise mission), and to enterprise technology and education goals
- JPL performance objectives for FY'00

JPL Roles and Assignments

Center Missions

- Planetary Science and Exploration
- NASA Center for Excellence: Deep Space Systems

JPL Program Roles and Responsibilities

- Lead Center for Exploration of the Solar System
    - Mars Exploration Robotic Missions
    - Cassini-Huygens Mission to Saturn
    - Deep Space Systems: Outer planets missions and associated technology programs
    - Foreign Space Science Collaborations
- Lead Center for the Space Infrared Telescope Facility
- Lead Center for New Millennium Program
- Coordinating Center for the Astronomical Search for Origins
- Operating Deep Space Missions

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'00 Performance Objectives

Deliver the SIRTF Infrared Array Camera (IRAC), Multiband Imaging Photometer (MIPS), and Infrared Spectrograph (IRS) instruments.

Assemble and successfully test the breadboard cooler for ESA's Planck mission.

Deliver the GALEX science instrument to the Principal Investigator at Caltech for science calibration.

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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

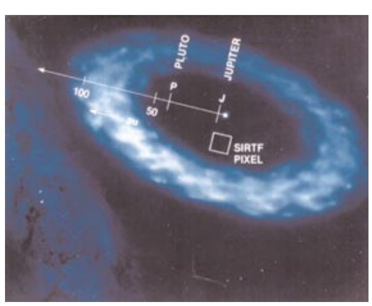
Origins of Structure

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 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, hence, 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)

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)

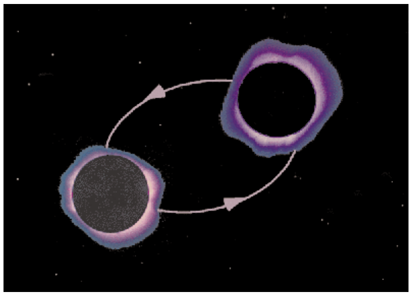
Map the history and probe the causes of star formation. (GALEX)

Large-Scale Phenomena and Extreme Conditions

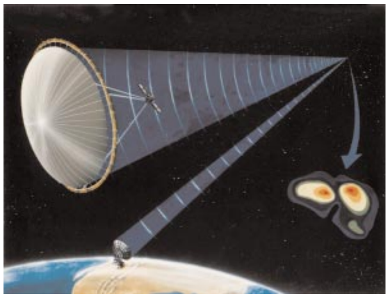
Test gravity in the strong field limit, observing gravitational waves from the coalescence of black holes, binary black holes, and galactic binary systems containing collapsed stars. (LISA)

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 the coalescence of black holes during growth of massive black holes.



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

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Complete the NGST Development Cryogenic Active Telescope Testbed (DCATT) phase 1, measure ambient operation with off-the-shelf components, and make final preparations for phase 2, the measurement of cold telescope operation with selected "flight-like" component upgrades.

Demonstrate target perfomance levels of the Superconductor-Insulator-Superconductor (SIS) mixer.

Objectives in **bold** contribute directly to performance targets in the *NASA Performance Plan* for FY'00. See appendix for complete text of targets and objectives.

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'00 Performance Objectives

Deliver Mars '01 Orbiter and Lander science instruments that meet capability requirements.

Meet the milestone for the Mars '03 instruments selection and initiate implementation of the Lander mission. Deliver engineering models of the radio-frequency subsystem and antennas for the radar sounder instrument.

Deliver Rosetta environmental qualification models for the four U.S.- provided instruments to ESA.

Complete Genesis spacecraft assembly and start functional testing.

Recover at least 90% of playback data from at least one Galileo flyby of Io.

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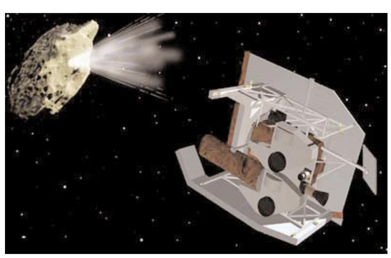
Understanding the nature of our solar system requires that we characterize the physical and chemical records of the processes that formed its many diverse objects. Emphasis on in situ exploration and sample return will enable us to assemble and test integrated, predictive models of the evolutionary pathways of planets and solar systems. We must investigate the evolution and current composition of various 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 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, Deep Impact, and the Outer Planets Program)



The Deep Impact mission will blast a crater into a comet nucleus to reveal the comet's pristine material and structure retained from the formation of the solar system.

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

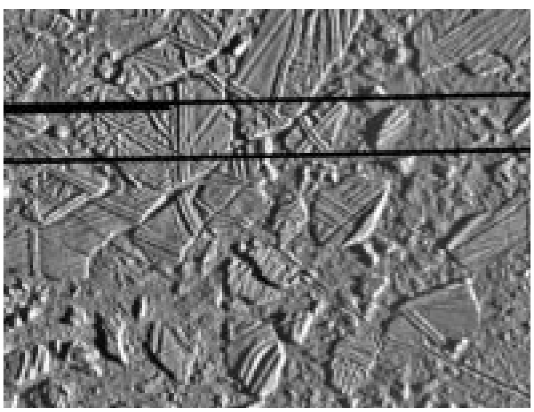
Observe and report daily Martian weather. (Mars Surveyor Program)

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

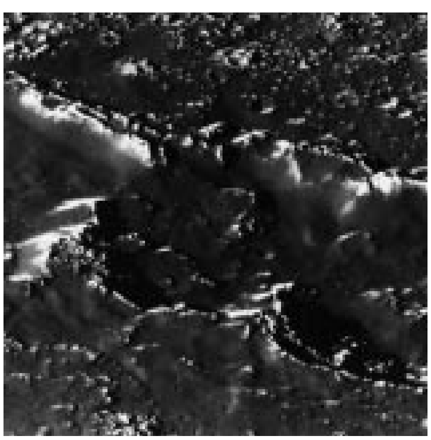
Study the source and variability of the solar wind and the sun's magnetic field. (Ulysses, Solar Probe, and Genesis)

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.



Galileo images show an icy surface of Callisto that has been reworked by extensive impact cratering.

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~~The Mars Climate Orbiter (MCO) will aerobrake from its initial insertion orbit into a near-polar, Sun-synchronous, circular orbit and will initiate mapping operations.~~

~~Mars Polar Lander will successfully land on Mars in December 1999 and operate its science instruments for the prime mission.~~

The Mars Global Surveyor (MGS) will acquire science data, conduct at least two atmospheric mapping campaigns, and relay to Earth data transmitted at adequate signal levels by the Deep Space-2 Mars microprobes.

Capture at least 90% of available Ulysses science data.

Successfully complete preliminary designs for the Europa Orbiter and Pluto Kuiper Express missions.

Continue Cassini operations during the quiescent cruise phase without major anomalies, conduct planning for the Jupiter gravity-assist flyby, and explore early science data collection opportunities.

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Average 12 hours of Voyager Interstellar Mission data captured per day per spacecraft to characterize the heliosphere and the heliospheric processes at work in the outer solar system, as well as the transition from the solar system to interstellar space.

Continue Stardust spacecraft cruise operations without major anomalies and perform interstellar dust collection.

Objectives in **bold** contribute directly to performance targets in the *NASA Performance Plan* for FY'00. See appendix for complete text of targets and objectives.

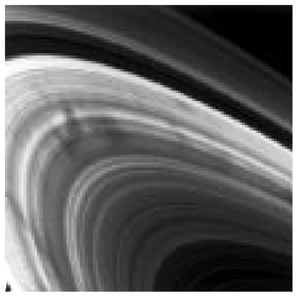
Study atmospheric circulation and magnetospheric processes.(Galileo and Cassini)

Study ring system dynamics. (Cassini)

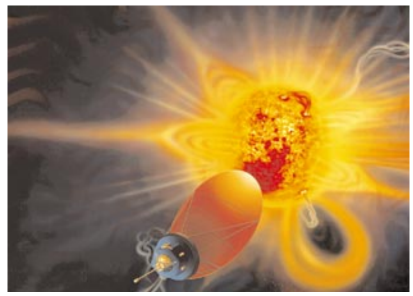
Test the survivability of spacecraft electronics in the extreme radiation environment around Jupiter. (Galileo)

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 two separated spacecraft. Image bright astronomical objects at a resolution needed to detect planets about other stars. (Space Technology 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'00 Performance Objectives

The Space Interferometry Mission (SIM) System Testbed (STB) will demonstrate that the Remote Manipulator Systems optical path difference can be controlled at 1.5 nanometers, operating in an emulated on-orbit mode.

Complete and deliver a technology development plan for the Terrestrial Planet Finder (TPF) mission.

Test development of the interferometer program for connecting the twin Keck 10-meter telescopes with an array of four 2-meter class outrigger telescopes by detecting and tracking fringes with two test siderostats.

Objectives in **bold** contribute directly to performance targets in the *NASA Performance Plan* for FY'00. See appendix for complete text of targets and objectives.

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'00 Performance Objectives

Successfully complete the Europa Orbiter project PDR and begin the integration and test of the Avionics Engineering Model.

Objectives in **bold** contribute directly to performance targets in the *NASA Performance Plan* for FY'00. See appendix for complete text of targets and objectives.

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, Deep Impact)

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)

Determine how various lifeforms alter the atmosphere of their host planets (astrobiology) and how the "signatures" of these alterations can be detected remotely (TPF).

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

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 the 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 the 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)

Develop Innovative Technologies

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'00 Performance Objectives

The Center for Integrated Space Microelectronics will deliver to the X2000 First Delivery project the first engineering model of an integrated avionics system that includes the functionality of command and data handling, attitude control, power management and distribution, and science payload interface. The system will be used on the Europa Orbiter and other missions.

...continued in sidebar, next page

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, X2000 First Delivery)

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

Develop technologies for space-based interferometers and large telescopes. Develop technologies for autonomous operations of multiple spacecraft in formation. (Origins technology initiatives)

Develop technologies for advanced radioisotope power sources and integrated avionic systems-on-a-chip. (Deep Space and Outer Planets Program technologies)

Develop instruments and optics for far-infrared and submillimeter telescopes. (FIRST and Planck missions, Structure and Evolution of the Universe technology)

*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, autonomous mission operation, revolutionary computing (DNA, quantum), and design and operations infrastructure.

Develop technologies for end-to-end mission operation, data collection, transmission, and analysis. (Mission Data System)

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. Continue actual flight validation of key technologies. (Deep Space 1 and 2, Space Technology 3, 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)

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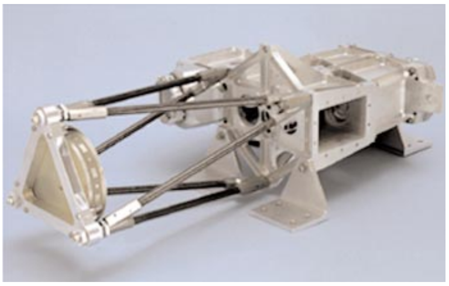
Demonstrate in situ subsurface science data acquisition technology on Deep Space 2.

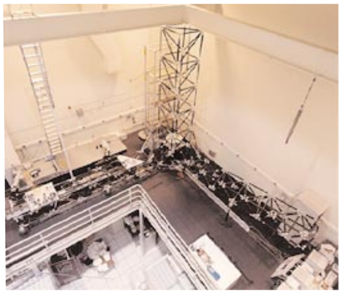
Develop (1) quantum technologies, (2) nano-biosystems technologies, and (3) large structures/optics technology thrusts.

Complete, review, and publish a suite of JPL technology roadmaps keyed to NASA visions for the future.

The New Millennium Deep Space-2 spacecraft will deploy two microprobes to penetrate the Mars surface and demonstrate technologies in situ subsurface science data acquisition—key technologies for future planetary exploration.



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.

Develop Innovative Technologies

Technology Investment Planning

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

Conduct trade studies and assist in NASA's prioritization and administration of an effective technology program. (CETDP Implementor Office at JPL, Technology Planning and Integration Working Group)

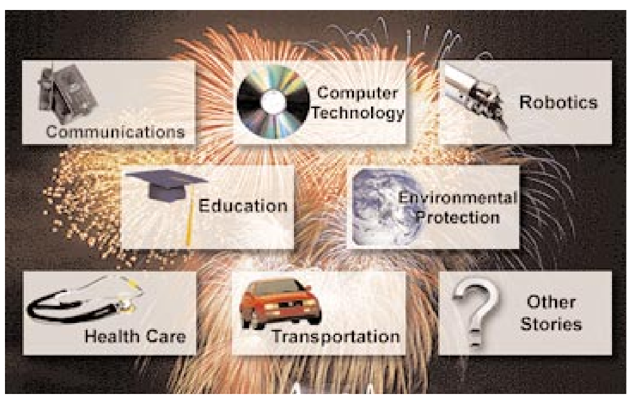
Technology Commercialization and Industrial Partnerships

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)

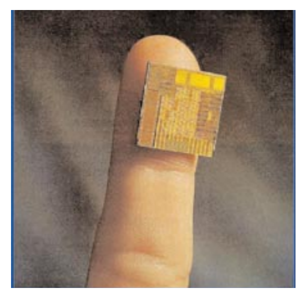
Ensure that federally funded intellectual property is made available to U.S. companies through licenses, and facilitate new start-up companies using JPL-derived technology.

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.



"System 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.

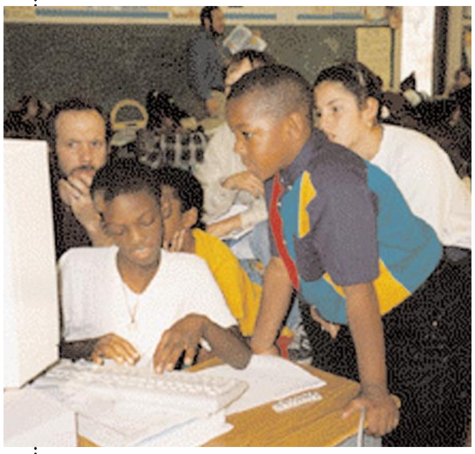
To share the excitement of discoveries and knowledge generated by space science missions, JPL

- Sponsors and participates in teacher training and development of curriculum supplements.
- 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 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.

JPL FY'00 Performance Objectives

See "Outreach" in the "JPL Institutional Implementation" chapter.



Pasadena students download space images from the Internet.

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JPL Contributions to the Earth Science Enterprise

This section presents

- JPL's contributions to the Earth Science Enterprise goals to:
  - Observe, understand, and model the Earth system to learn how it is changing, and the consequences for life on Earth. (This goal is grouped into five science themes.)
  - Expand and accelerate the realization of economic and societal benefits from Earth science, information, and technology.
  - Develop and adopt advanced technologies to enable mission success and serve national priorities.
- Related JPL performance objectives for FY'00

JPL Roles and Assignments

Center Mission

- Instrument Technology

JPL Program Roles and Responsibilities

- Lead Center for New Millennium Earth Observing Systems
- Lead Center for Solid Earth and Physical Oceanography Missions
- Science Contributions: Oceanography, Solid Earth Sciences, and Atmospheric Chemistry
- Mission Contributions: Instrument Development

EARTH SCIENCE ENTERPRISE MISSION

Develop a scientific understanding of the Earth system and its response to natural and human-induced changes to enable improved prediction of climate, weather, and natural hazards for present and future generations.

NASA Goal: Observe, Understand, and Model the Earth System
Climate Variability and Change

JPL FY'00 Performance Objectives

Benchmark global and regional rainfall measurements (support).

Conduct Sea Ice dynamics research to predict consequences of El Niño or La Niña (support).

Use MISR data to determine consequences of biomass burning in Africa (primary).

Launch Jason-1 mission (primary).

Continue measurement of total solar irradiance by launching ACRIMSAT (primary).

Use Airborne Sounder to decipher impact of past climate variation on polar regions (support).

Use Passive-Active L-S Band aircraft instrument to develop technique for ocean surface salinity measurements (primary).

Generate the first basin-scale high-resolution estimate of the state of the Pacific Ocean as part of the international Global Ocean Data Assimilation Experiment (GODAE). (primary)

Develop an automatic volcano cloud/ash detection algorithm employing EOS data sets for use by the Federal Aviation Administration. (support)

Objectives in bold contribute directly to performance targets in the *NASA Performance Plan* for FY'00. See appendix for complete text of targets and objectives.

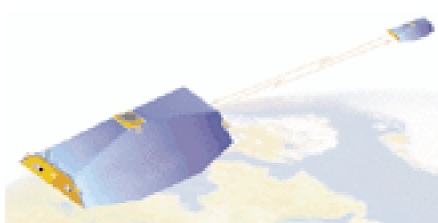
El Niño, La Niña, and African-American-Asian-Australian monsoons are examples of seasonal-to-interannual climate variations that impact two-thirds of the world's population. We will develop and use remotely sensed observations (together with in situ observations) to monitor, describe, and understand 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

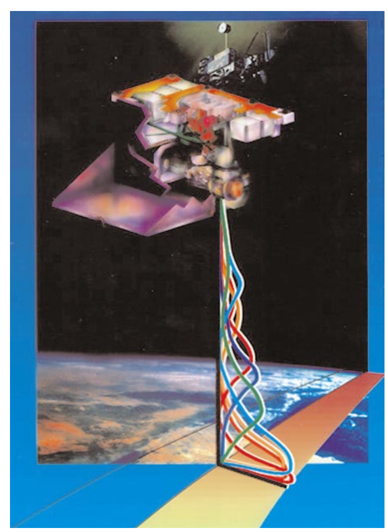
JPL is making science, technology, and mission contributions to NASA's Climate Variablity and Change science program. Our missions, instruments, and experimental techniques focus on answering two questions:

- Is climate varying in ways we can understand and predict? (primary role)
- What causal relationships can be established between observed climate changes and specific forcing factors? (supporting role)

JPL's role in understanding climate variability includes responsibility for the following measurements and for the associated modeling, data assimilation, and data analysis.



The Gravity Recovery and Climate Experiment will enable a better understanding of ocean surface currents and heat transport, changes in sea-floor pressure, ocean mass, mass balance of the ice sheets and glaciers, and changes in the storage of water and snow on the continents.



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

Ocean Surface Winds

QuikSCAT was launched in June 1999 to partially fill a data gap in global ocean wind vectors created when the Japanese ADEOS spacecraft carrying the NASA Scatterometer was lost in 1997. The SeaWinds mission, in partnership with the National Space Development Agency of Japan for Earth remote sensing, is scheduled for launch on the ADEOS-II spacecraft in CY2001.

Ocean Surface Topography

Data produced by the TOPEX/Poseidon spacecraft and its continuation with Jason-1, scheduled for launch in 2000, have varied applications, including climate forecasting, hurricanes, ocean circulation, fisheries management, ship routing, offshore industries, marine mammal science, and monitoring marine debris and coral reef health.

Time-Variable Precision Gravity Field Mapping

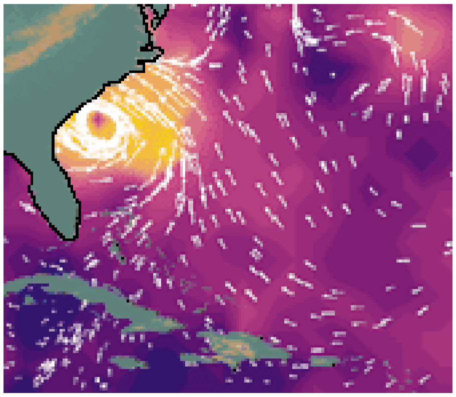
GRACE (2001) will enable a new model of the Earth's gravity field. JPL manages the mission for the University of Texas and leads the satellite development and test for an international U.S.-German mission team.

Sea Surface Temperature

The AIRS/AMSU/HSB instrument suite (JPL-AIRS supports the GSFC-led partnership) on the EOS PM-1 satellite will launch in 2000 to enable daily use of the data products for weather forecasting, to investigate the hydrological cycle in the atmosphere, and to study the long-term effects of water vapor on global warming.

Sea Surface Salinity

Sea surface salinity is a critical measurement to support ocean circulation investigations. Aircraft measurements and mission formulation studies are being undertaken in preparation for a sea surface salinity mission.



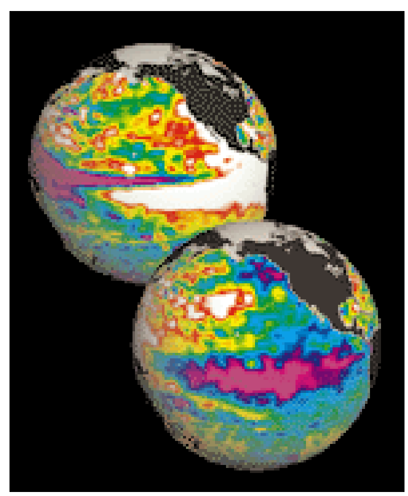
The SeaWinds instrument on board NASA's new QuikSCAT ocean-viewing satellite captured this image of Hurricane Floyd on September 15, 1999, as it moved toward Cape Fear, North Carolina.

JPL is making important supporting contributions to understanding the relationship between observed climate changes and specific forcing factors with data from near-term missions and planned future missions.

- The Multi-Angle Imaging Spectroradiometer (MISR), launched on Terra (formerly EOS-AM) in December 1999, will measure the amount of sunlight absorbed by the Earth's surface and particles in the Earth's atmosphere.
- Cloud and water vapor forcing will be studied with AIRS/AMSU/HSB (2000) and CloudSat.
- ACRIMSAT (launched in December 1999) will monitor the variability of the sun's total output of optical energy from ultraviolet to infrared wavelengths — called total solar irradiance — for studies of sun/Earth climatic interactions and solar physics analysis.
- Mass balance of polar ice sheets will be studied with international and future Fast-repeat Interferometric SARs (FIS).

Sea-Ice Dynamics and Thickness

The Alaska SAR Facility (ASF) exists to acquire, process, archive, and distribute satellite SAR data for the U.S. government and research communities. These data are making significant contributions to sea-ice science.



Observations of the El Niño/ La Niña phenomenon in the Pacific Ocean by the U.S./French TOPEX/Poseidon orbiting satellite have vastly improved our understanding of the oceans, weather, and climate.

NASA Goal: Observe, Understand, and Model the Earth System Solid Earth Science and Natural Hazards

Natural hazards are inevitable manifestations of Earth processes but need not be inevitable disasters. NASA can assist society in reducing losses of life, casualties, and property, as well as reducing social and economic disruptions from future natural disasters. This program's goal is to contribute to the scientific understanding of Earth processes and the conditions that lead to natural disasters, apply NASA-developed, Earth-science- inspired technology to risk mitigation, transfer demonstrated technology to responsible federal and state agencies, and develop international conventions for timely exchange of space-based information relating to disastrous events.

JPL FY'00 Performance Objectives

Use southern California GPS array data to understand the connection between seismic risk and crustal strain leading to earthquakes (primary).

Demonstrate the utility of spaceborne data for floodplain mapping with the Federal Emergency Management Agency (primary).

Develop models to use time-varying gravity observations for the first time in space (primary).

Objectives in **bold** contribute directly to performance targets in the *NASA Performance Plan* for FY'00. See appendix for complete text of targets and objectives.

JPL Contributions

JPL is making primary science, technology, and mission contributions to NASA's Solid Earth Science and Natural Hazards science program. Our missions, instruments, and experimental techniques focus on answering two questions:

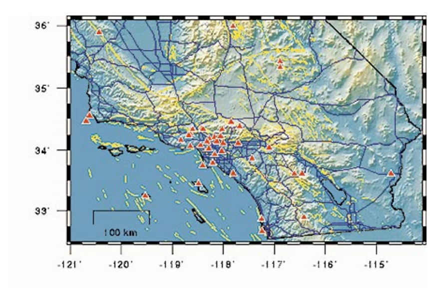
- How is the Earth's topographic surface being transformed and how can this knowledge be used to predict future changes?
- What are the motions of Earth's interior and what can we infer about internal processes, such as mantle convection and the generation of Earth's magnetic field?

Topography and Topographic Change

The Southern California Integrated GPS Network (SCIGN) is an array of GPS stations throughout Southern California for estimating earthquake potential and, in the event of an earthquake, to measure co-seismic crustal deformation.

ASTER (1999), an imaging instrument on Terra (EOS AM-1), will be used to obtain detailed maps of surface temperature, emissivity, reflectance, and elevation, among other things. These measurements will significantly improve our ability to assess volcanic hazards.

The Shuttle Radar Topography Mission (SRTM) will obtain high-resolution topography of 80% of the Earth's land surface and will serve as the baseline data set from which high-resolution topographic changes will be measured with SAR interferometry.



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

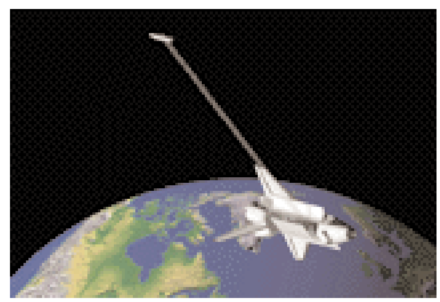
Internal Processes

JPL is responsible for the International GPS Service (IGS) and Global GPS Network (GGN), which are critical for supporting NASA's low Earth-orbiting missions and research into changes in Earth's rotation.

Systematic measurements of Earth's magnetic field will be made with the Champ, Oersted, and SAC-C missions.

Time-variable precision gravity field mapping will be provided by GRACE (2001) and follow-on missions employing laser metrology and quantum measurement techniques.

Remote sensing imaging allows volcanologists to monitor and map active volcanoes that are otherwise difficult and dangerous to study.



SRTM, a reimbursable task funded by NIMA through Code Y, flew on the space shuttle in early 2000. It produced the most accurate and complete topographic map of the Earth's surface ever assembled.

NASA Goal: Observe, Understand, and Model the Earth System
Atmospheric Chemistry

JPL Contributions

JPL is making primary science and technology contributions and contributes support to missions in NASA's atmospheric chemistry program. Our science, technology, and experimental techniques focus on answering three questions:

- Is the Montreal Protocol working to stop ozone depletion by industrially produced chemicals?
- How is the distribution of trace constituents affected by meteorological and chemical processes?
- How much will industrial and urban pollution expand and what will be the consequences?

Data gathered include global observations from space and more localized observations from aircraft, balloon, and ground sensors. Modeling and analysis of the data and supporting laboratory measurements are used to advance understanding and provide guidance for future measurement needs.

The Microwave Limb Sounder (MLS) instrument on NASA's Upper Atmosphere Research Satellite (UARS) studies stratospheric ozone. An advanced MLS is planned for the EOS CHEM satellite, and will measure key molecules that are critical for understanding global change in Earth's upper troposphere, stratosphere, and mesosphere.

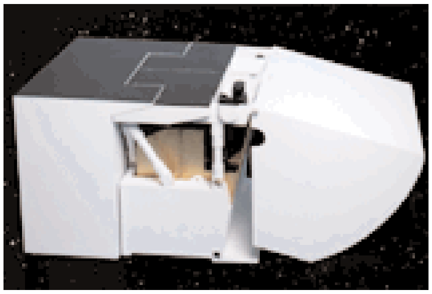
TES (2002), a high-resolution spectrometer to measure the distribution of minor and trace gases in Earth's troposphere, will fly on the EOS chemistry platform to calibrate models of the state of the Earth's lower atmosphere.

Aircraft and balloon data are improving our understanding of the chemistry and processes affecting atmospheric ozone, especially the stratospheric ozone layer.

JPL FY'00 Performance Objectives

Implement the SAGE III Ozone Loss and Validation Experiment (SOLVE). Acquire correlative data to validate SAGE III data and assess high-latitude ozone loss with aircraft and balloon measurements.

Objectives in **bold** contribute directly to performance targets in the *NASA Performance Plan* for FY'00. See appendix for complete text of targets and objectives.



Tropospheric Emission Spectrometer (TES) will fly on the EOS chemistry platform to calibrate models of the present and future state of the Earth's lower atmosphere.

NASA Goal: Observe, Understand, and Model the Earth System Biology and Bio-geochemistry of Ecosystems and the Global Carbon Cycle

JPL Contributions

JPL is supporting science, technology, and missions in NASA's Biology and Bio-geochemistry of Ecosystems and Global Carbon Cycle program. Our science, technology, and experimental techniques focus on answering three questions:

- How do ecosystems respond to and affect environmental change?
- How are land cover and land use changing? What are the causes and consequences?
- What is the role of ecosystems in the global carbon cycle and how might it change?

Investigating Land Ecosystem Recovery from Disturbances

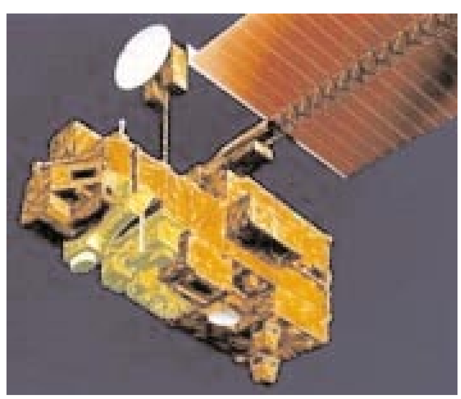
- MISR (1999)
- ASTER (1999)
- Hyperspectral Imaging
- SAR

Identifying Changes in Land Cover/Land Use

- ASTER (1999)
- EO-1 (2000)

Monitoring Changes in Marine and Terrestrial Primary Productivity

- Hyperspectral Imaging (AVIRIS and EO-1)



ASTER on Terra will serve as a 'zoom' lens for the other on board instruments and will be a vital tool for monitoring and mapping glaciers, volcanoes, and areas of marine and terrestrial productivity around the world.

NASA Goal: Observe, Understand, and Model the Earth System
Global Water and Energy Cycle

JPL Contributions

JPL is making primary technology contributions and is supporting science and missions in NASA's Global Water and Energy Cycle program. Our science, technology, and experimental techniques focus on answering three questions:

- Is the global water cycle accelerating?
- Can hydrologic processes that control water resources be related to large-scale climate anomalies?
- Can the affects of atmospheric and surface processes be accurately represented in climate models?

Trends in the Water Cycle Rate

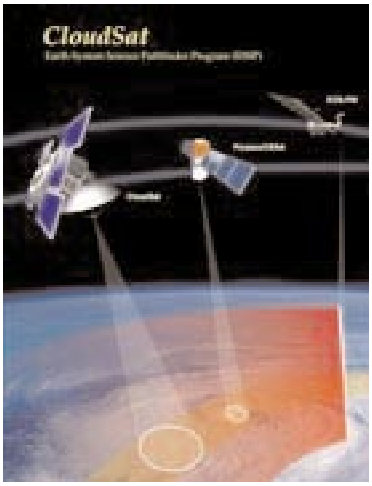
- AIRS (2000)

Impact of Fast Processes on Climate

- EOS-PM (2000)
- CloudSat (2003)

Impact of Climate Change on Regional Weather

- Cold land processes research (under study)



CloudSat will provide better predictions of clouds and their role in climate change through cloud-climate feedback.

NASA Goal: Expand and accelerate the realization of economic and societal benefits from Earth science, information, and technology

- Enable productive use of Earth system science results, data, and technology in the public and private sectors.
- Enable the development of a robust commercial remote sensing industry.
- Increase public understanding of and involvement in Earth system science through formal and informal educational opportunities.

JPL FY'00 Performance Objectives

See "Outreach" in "JPL Institutional Implementation" chapter.

Students conduct their own "ocean height" experiment with an interactive TOPEX/Poseidon model in a museum exhibit.

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 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 is playing a substantial role in Enterprise initiatives in informal education, as well. JPL also provides significant support to community colleges, as well as thematic leadership for education and outreach efforts for radar, ocean dynamics and winds, GPS applications (including earthquake studies), and the New Millennium program.

JPL shares the excitement and knowledge generated by Earth science missions through a variety of educational and outreach activities.

- Sponsors and participates in teacher training and development of curriculum supplements.
- 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.

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.

Work with GSFC and the commercial sector to develop advanced instruments and develop and launch spacecraft for NOAA operational environmental satellite programs.

NASA Goal: Develop and adopt advanced technologies to enable mission success and serve national priorities

- Develop advanced technologies to reduce the cost of and expand the capability for scientific Earth observation.
- Develop advanced information systems for processing, archiving, accessing, visualizing, and communicating Earth science data.
- Partner with operational agencies to develop and implement better methods for using remotely sensed observations in Earth system monitoring and prediction.

JPL FY'00 Performance Objectives

See "Outreach" in the "JPL Institutional Implementation" chapter

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).
- Contribute to Earth Science Enterprise technology planning, including the Capability Needs Assessment database 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 tasks funded by Code Y and Code S Core Technology program.
- Carry out instrument design and trade studies.
- Develop advanced instrument prototypes, and manage aircraft, uncrewed-aerial-vehicle, and balloon demonstrations as required.
- Carry out mission development and trade studies.

- Work with the Earth Science Technology Office (ESTO) to plan for the infusion of new instruments, measurement techniques, and technology into future Earth Science Enterprise missions.

Manage the New Millennium Program (NMP) to advance and validate instrument, spacecraft, and ground system technologies requiring 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 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.

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JPL Contributions to the Human Exploration and Development of Space Enterprise

This section presents

- JPL's contributions to the HEDS mission and objectives
- Related JPL performance objectives for FY'00

JPL Roles and Assignments

- HEDS/Space Science Joint Planning for Integrated Robotic-Human Mars Exploration
- Microgravity Fundamental Physics and Microgravity Advanced Technology Development and Transfer

HUMAN EXPLORATION AND DEVELOPMENT OF SPACE ENTERPRISE

MISSION

To open the Space frontier by exploring, using, and enabling the development of Space and to expand the human experience into the far reaches of Space.

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'00 Performance Objectives

Conduct successful Low-Temperature Microgravity Physics (LTMP) Facility preliminary design review.

Conduct requirements definition reviews for three candidate investigations, and select two for the first LTMP mission on the International Space Station (ISS).

Conduct successful science concept reviews for three candidate investigations for the second LTMP mission on ISS.

Conduct successful requirements definition review for first Laser Cooling and Atomic Physics (LCAP) investigation on ISS, and science concept review for the second investigation.

Support NASA in conducting selection of new fundamental physics investigations by meams of a NASA research announcement.

Support NASA in definition of National Center for Microgravity Fundamental Physics, and in selection of consortium members to operate the center.

Complete the delivery of the Mars Environmental Compatibility Assessment (MECA) to the MSP'01 project.

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Contribute to a technology investment strategy to support future human exploration.

Demonstrate capabilities for future human exploration.

Objectives in **bold** contribute directly to performance targets in the *NASA Performance Plan* for FY'00. See appendix for complete text of targets and objectives.

JPL Contributions

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

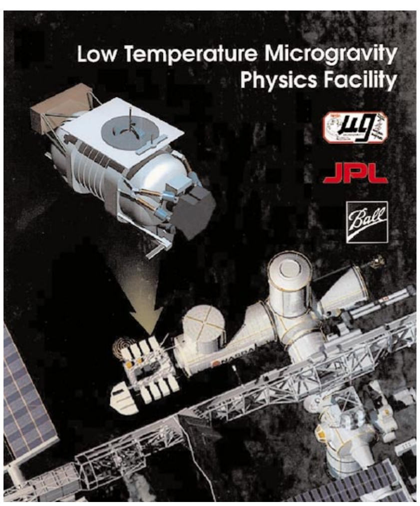
- Mars Surveyor '01, '03, '05 (planned cooperatively with HEDS and other NASA centers)
- In situ resource utilization (participating with JSC)
- Martian soil and dust characterization
- Precision landing on Mars
- Architecture for high-bandwidth communication and in situ navigation at Mars

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.

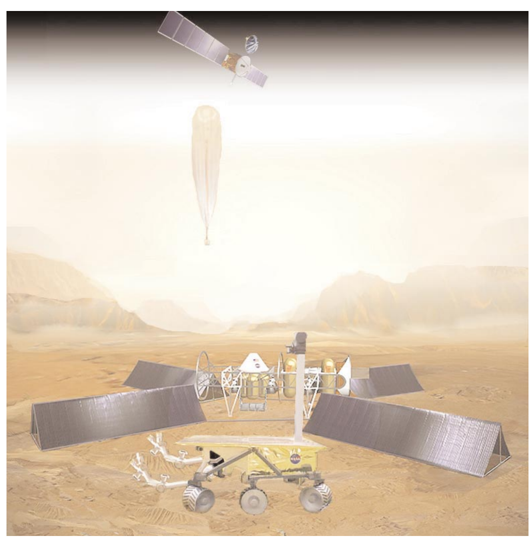
- A program of ground research in fundamental physics.
- A program of flight projects, with JPL-supplied experimental hardware support.

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.



Robotic outposts would be permanent and self-sustaining with occasional re-supply and could be deployed as expandable intelligent stations in space or on the Moon, Mars, or elsewhere. They could conduct planetary in situ studies or remote astrophysical observations and could set the stage for later human participation.

JPL Contributions to the Aero-Space Technology Enterprise

This section presents

- JPL contributions to the Aero-Space Technology goal to enable the full commercial potential of space and the expansion of space research and exploration.
- Related JPL performance objectives for FY'00.

JPL Roles and Assignments

While JPL has no assigned role, JPL performs several tasks in support of a visionary advanced space transportation program.

JPL FY'00 Performance Objectives

Complete NSTAR mission profile ground testing for Deep Space One.

Support flight testing of the X-33 vehicle.

Objectives in **bold** contribute directly to performance targets in the *NASA Performance Plan* for FY'00. See appendix for complete text of targets and objectives.

AERO-SPACE TECHNOLOGY ENTERPRISE

- Enable U.S. leadership in global civil aviation through safer, cleaner, quieter, and more affordable air travel.
- Revolutionize air travel and the way in which aircraft are designed, built, and operated.
- Enable the full commercial potential of space and expansion of space research and exploration.
- Enable world-class aerospace R&D services, including facilities and expertise, and pro-actively transfer cutting-edge technologies in support of industry and U.S. government R&D.

JPL Contributions

Develop key technologies in high-speed and subsonic transportation, X-33 avionics, high-performance computing (information technology), advanced propulsion (NSTAR).

Conduct a vigorous technology commercialization program (Commercial Technology Program).

Multi-Enterprise Technology

JPL FY'00 Performance Objectives

Execute a 632 program responsive to NASA needs.

This section presents

- A brief description of NASA's Cross-Enterprise Technology Development Program.
- JPL contributions to cross-enterprise technology development.

NASA MISSION RELATED TO MULTI-ENTERPRISE TECHNOLOGY

To research, develop, verify, and transfer advanced aeronautics, space, and related technologies.

The relationship between technology and new NASA programs is changing. Technology now drives NASA's future missions. Missions are implemented when technology readiness allows an affordable implementation. To meet this challenge, advanced technology must be planned, developed, and "infused" into programs much more quickly than before.

The NASA Office of Space Science is responsible for crosscutting technology that supports the missions of more than one enterprise through its management of the Cross-Enterprise Technology Development Program (CETDP). The CETDP develops multi-enterprise technology primarily at low technology-readiness levels. Emphasis is on basic R&D, proof of concept, and breadboard development. Development does extend into environmental testing and preparation for validation, but only with shared funding from technology customers.

The CETDP develops technology in ten major "thrusts":

- Advanced Power and Onboard Propulsion
- Atmospheric and In-Space Systems
- Breakthrough Sensor and Instrument Component Technology
- Distributed Spacecraft
- High-Rate Data Delivery
- Micro/Nano-Sciencecraft
- Next-Generation Infrastructure
- Surface Systems
- Thinking Space System
- Ultralight Structures and Space Observatories

Each thrust is managed by a Thrust Area Manager, or TAM, who reports to the CETDP Implementor. Through its competitive NASA research announcements, the CETDP ensures expanded participation of universities and industry in partnerships and technology transfer.

JPL Contributions

JPL will play a key role in managing this program by staffing the CETDP Implementor's office. JPL will also staff three of the ten TAM positions.

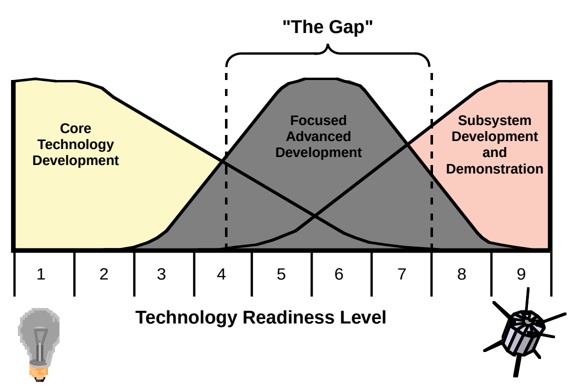
JPL provides TAMs for three thrust areas.

The JPL technology program supports all thrusts in the CETDP.

JPL's support technology development ranges from early concepts to validated, mission-ready software and devices. Technology efforts are grouped into three main categories:

- Core Technology: Fundamental and often enterprise-crossing technology research and development. (CETDP, Director's Discretionary Fund, advanced concepts, HPCC, information systems)
- Focused Technology: Transitional and future-mission-set–responsive technology-maturing efforts (Advanced Technology)
- Technology Qualification, Validation, and Demonstration to bring technology to full mission readiness (subsystem demonstrations). (New Millennium)

JPL's combination of core, focused, and validation programs will provide direct support for the CETDP and a complete and effective pathway for the infusion of multi-enterprise technology into NASA's missions.



Use of technology readiness levels helps to ensure that the right technology is ready at the right time. FY'00 efforts will enable balanced technology infusion.

Multi-Enterprise Deep Space Communications and Mission Operations

JPL FY'00 Performance Objectives

Contribute to the planned reduction of the space communications budget consistent with SOMO's instructions and associated customer priorities.

Invest JPL space communications technology budget in activities that will lead to new services, decreased unit service costs, and/or increased service quantity and quality, while providing the potential for space commercial opportunities—including leveraging through relationships with industry, academic institutions, and other government organizations.

Track DSN unscheduled downtime to establish a baseline to measure future improvements.

Objectives in **bold** contribute directly to performance targets in the *NASA Performance Plan* for FY'00. See appendix for complete text of targets and objectives.

This section presents

- JPL contributions to NASA deep space flight projects data and mission services.
- Related performance objectives for FY'00.

JPL Contributions

Through its telecommunications and mission operations efforts, JPL provides NASA's deep space flight projects with data and mission services. These activities are conducted for both the NASA Office of Space Science and, the Space Operations Management Office (SOMO) of the NASA Office of Space Flight. As a major contributor to the NASA Space Science Enterprise and, eventually, to the piloted Mars missions of the Human Exploration and Development of Space Enterprise, JPL plans and develops world-class advanced telecommunications and mission operations technologies. 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.

In executing these responsibilities, JPL will make significant contributions to the revolutions in system architectures and technologies needed to provide reliable, affordable communications and operations support to the growing fleet of spacecraft and mobility systems exploring our solar system — and beyond.

Implementing New System Architectures

JPL is transforming NASA's Deep Space Network and associated Mission Operations System architecture into a service provision system known as the Deep Space Mission System (DSMS). This system will enable more efficient provision of currently available services as well as the creation of entirely new services. A key feature of the DSMS will be a better unification of the flight-ground architecture needed to operate spacecraft and mobility systems. Within this unified architecture, JPL is working to evolve both the flight- and ground-based hardware and software to have standardized "plug-and-play" compatibility. Hence, unlike the mission-unique and, therefore, expensive hardware and software needed to operate missions of the past, the new operations paradigm will be both more applicable and affordable for a broad spectrum of missions. And, much of it will actually be embodied in onboard spacecraft autonomy — enabling a more affordable, multimission-capable Mission Operations System architecture and less frequent contacts with an already oversubscribed ground antenna network.

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

An initiative integral to creating one of the first gateways on this Interplanetary Internet is the Mars Network — a constellation of communication relay and navigation satellites designed to support Mars global reconnaissance, surface exploration, sample return missions, robotic outposts, and eventual human exploration. By providing in situ support for these missions, Mars Network will increase the data volume that they can return to Earth, while significantly diminishing the load such missions would place on the DSMS if each were to require individual tracking while at Mars. As in situ operations expand to other bodies (e.g., Europa, comets, asteroids) techniques pioneered with the Mars Network will be applied to enhance and enable missions to these destinations.

Implementing New Technologies

Providing reliable, affordable telecommunication, navigation, and mission services to the rapidly growing spacecraft fleet also necessitates the application of new technologies. Along with the onboard autonomy described above, JPL is also working to develop and apply technology that will automate and simplify network operations on the ground. And, to service the exploratory fleet without substantially increasing expensive ground-based assets, JPL is working to improve network capacity through the application of higher radio, and even optical, frequencies – enabling orders-of-magnitude leaps in the data rates available for future missions. To enable maximal use of this mission data return, JPL will work to advance science data fusion, visualization, and compression technologies.

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.

Reimbursable Work

JPL FY'00 Performance Objectives

Increase the number of formal, technology development partnering agreements with federal organizations by at least one.

Initiate at least one formal, technology development partnering agreement with an aerospace firm.

Increase reimbursable funding of technology developments or demonstrations that support NASA needs by at least 10%.

Increase reimbursable funding of in-situ technologies by at least 10%.

Arrange for at least one new JPL technology to be demonstrated on a mission of another agency, or for another agency's technology to be flown on a JPL mission.

Objectives in **bold** contribute directly to performance targets in the *NASA Performance Plan* for FY'00. See appendix for complete text of targets and objectives.

This section presents

- A description of the JPL reimbursable program.
- Examples of JPL contributions to NASA's effort through collaborations with other federal agencies and industry.
- Related performance objectives for FY'00.

JPL's Reimbursable Program

To support NASA's strategy to achieve efficiency and effectiveness through collaboration with other federal agencies and industry, the JPL reimbursable program has three primary purposes, each responding to a NASA performance target.

- **Build bridges to other organizations to combine strengths.** JPL seeks interdependent partnerships with other federal agencies, federal laboratories, and NASA's industrial supplier community. Partners are selected from among organizations whose missions or technologies closely parallel NASA interests; partnerships are formalized when a long-term program of interdependent work can be anticipated. JPL currently has formal partnership agreements with the Air Force Research Laboratory and the National Reconnaissance Office—Office of Advanced Science and Technology. In FY'00 JPL will pursue additional mutually beneficial partnerships and explore a wide variety of relationships among partners. JPL's experience indicates that innovative new partnerships and funding models are necessary to achieve NASA strategic needs.

- **Seek collaborative technology development and demonstration opportunities.** JPL's collaborative work focuses on three mission and technology categories: spacecraft systems and technology, in situ instrument and mobility technology, and mission control technology. These collaborative opportunities arise from JPL's partnerships and from outreach to agencies, laboratories, and companies with missions and technologies synergistic to JPL's. JPL also applies its special capabilities to technical and scientific problems of national importance. These activities must pass rigorous screening by both JPL management and the NASA Management Office. The screening ensures that the activities involve areas of special competence, that they are significant to NASA and to the nation, and that they do not compete with or duplicate industry work.

- **Provide a path for the transfer of NASA technology to industrial suppliers to stimulate supplier innovation and performance.** JPL's technology commercialization efforts to aerospace firms continue to aggressively implement the Technology Affiliates program and technology development partnerships. These efforts also address NASA's congressional mandate to further U.S. economic competitiveness through transfers to non-aerospace firms.

JPL Contributions

Examples of Reimbursable Spacecraft Technology Efforts

JPL is participating in mission studies for an on-orbit rendezvous and docking demonstration with the Air Force Research Laboratory (AFRL) and for on-orbit spacecraft servicing (by means of rendezvous and docking) with the Defense Advanced Research Projects Agency as a means of sharing costs to validate Mars Sample Return on-orbit capsule recovery technology.

The National Reconnaissance Office (NRO) is co-funding the NASA Crosscutting Technology Development Program's NASA Research Announcement (NRA) to develop very lightweight, large optical space structures. Such structures are a goal of NASA's new Gossamer Space Structures program.

JPL and AFRL are jointly developing large, lightweight radar antennas under NRO Director's Innovation Initiative funding. These antennas have potential value to future NASA radar missions and extend the design space of very lightweight structures.

For the Defense Advanced Research Projects Agency (DARPA), JPL is developing a new paradigm for the design of evolvable hardware for adaptive computing. The effort will demonstrate self-reconfigurable circuits that evolve directly in hardware on a VLSI chip. This work is being implemented in JPL's Center for Integrated Space Microsystems.

NASA/GSFC and NASA/JPL are participating in an interagency partnership involving Sandia Laboratories, AFRL, NRO, and Intel Corporation to develop a radiation-hardened version of the Intel Pentium® processor. Completion of this work will allow most popular desktop software to operate on board space vehicles.

Examples of Reimbursable In Situ Technology Efforts

For DARPA, JPL is serving as a technical hub for electroactive polymer material evaluation. In addition, within this hub JPL will design, develop, and demonstrate muscle-like actuators, mechanisms, and devices that will enable advanced devices for in situ exploration missions.

For the Army Research Laboratory, JPL is developing Terrain Perception Software that permits autonomous operations of a vehicle over off-road terrain. The software identifies obstacles in the vehicle's path and then steers the vehicle to avoid them. The software is in simultaneous use for advanced planetary rovers.

Examples of Reimbursable Mission Control Technology Efforts

Under joint funding from the National Security Agency and the NASA High Performance Computing program, JPL is leading a nationwide team of university, industry, and federal laboratory researchers to develop the world's first computer operating at petaflop speeds. Such computing capability will be needed as modern model-based design and mission control techniques reach maturity.

For the Defense Information Systems Agency (DISA), JPL is developing the Kernel of the Common Operating Environment, the environment in which all defense command and control software operates. This work is being performed in partnership with JPL's new Mission Data System development.

For the Marine Corps Warfighting Laboratory, JPL is developing a web-based, object-oriented shared net and wireless, mobile LAN network to provide real-time, intelligent, tailored information routing from a common, automatically updated data set. This enables autonomous reasoning in a changing environment (in situ decision making).

JPL Institutional Implementation

In this section we

- Demonstrate how JPL contributes to NASA's crosscutting processes and objectives.
- Describe how JPL's institutional leadership and operations, technical leadership and operations, outreach activities, and investments contribute to NASA's mission.
- Identify the JPL implementation activities and FY'00 performance objectives that support institutional processes and activities.

JPL IMPLEMENTATION SUPPORT TO NASA'S CROSSCUTTING PROCESSES

JPL Contributions (by organization)	NASA's Crosscutting Process and Objectives	Manage Strategically			Provide Aerospace Products and Capabilities				Generate Knowledge	Communicate Knowledge
		Optimize Alignment	Improve Acquisition	Improve Information Technology	Reduce Cost	Improve Engineering	Improve Program/ Project Management	Integrate Technology Efforts		
Institutional Leadership and Operations	Office ot the Director and Executive Council	●							●	
	Chief Scientist	●							●	
	Strategic Management	●								
	Change Management	●								
	Human Resources	●					●			
	Office of the Associate Director and Institutional Management Committee	●			●				●	
	Institutional Computing and Information Services			●						
	Chief Financial Officer	●	●				●			
Engineering and Science	Engineering and Science Directorate				●	●			●	
	Engineering and Mission Assurance	●			●	●	●			
Outreach	Education and Public Outreach									●
	Commercialization and Technology Transfer							●		●
	Program Directorates (SESPD, TAP, TMOD)	●					●	●	●	

JPL Institutional Contributions

In "Implementing the NASA Mission at JPL," we described how JPL aligns with NASA's enterprises and programs. This section describes how JPL aligns institutionally with NASA by identifying JPL contributions to NASA's crosscutting processes and process objectives.

JPL Roles and Assignments

Functional Leadership

- Lead Center for NASA Electronic Parts and Packaging Program.

NASA'S CROSSCUTTING PROCESSES AND OBJECTIVES

Manage Strategically

- Optimize alignment with customers and ensure compliance
- Improve acquisition processes
- Improve information technology capability and services

Provide Aerospace Products and Capabilities

- Reduce cost and development time of products and services
- Improve engineering capability
- Capture best practices and process knowledge to improve program/project management
- Integrate technology efforts with outside customers and partners

Generate Knowledge

- Acquire advice
- Plan and set priorities through roadmaps, meetings, review process, etc.
- Select and fund/conduct research analysis programs
- Select and implement flight missions
- Analyze data
- Publish and disseminate results
- Create archives for mission data
- Conduct further research of all enterprise data programs

Communicate Knowledge

- Highlight and create opportunities for NASA customers to participate
- Improve knowledge, understanding, and use of NASA's programs

(Paraphrased from *NASA Performance Plan*, Fiscal Year 2000)

Institutional Leadership and Operations

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 JPL 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 financial officer, chief scientist, programmatic and operational directors, and the Caltech general counsel.

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

The *NASA Strategic Management Handbook* defines how NASA and all its centers, including JPL, meet the requirements of the Government Performance and Results Act of 1993 and other NASA planning and management needs. *The JPL Implementation Plan* is our guide to how JPL's assigned roles, mission areas, and leadership responsibilities serve NASA and the nation and describes the various JPL contributions that implement NASA's strategic plans.

JPL FY'00 Performance Objective

Office of the Director/Deputy Director and Executive Council

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

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.

Initiate a new research and development program on quantum technology.

Initiate a new research and development program on isotopic remote sensing of carbon and oxygen.

Strategic Management

Publish new JPL Strategic Management Plan.

Enable all JPL staff to link their FY'00 performance plans to relevant JPL and NASA plans.

Change Management

The Office of the Director leads JPL change efforts, overseeing the design, implementation, system engineering, and integration of changes needed to adapt to external and internal forces, as well as institutionalizing those changes, which includes related employee communication and integrating laboratory operations. 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), and changed the way in which JPL jobs are classified and employees are compensated and rewarded.

JPL is committed to being a process organization practicing process-based management (PBM). 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, and enabling easy and continual improvement of processes based on measured performance. Fundamental PBM principles and terminology have been defined, as well as the attributes of process organization that JPL will strive to achieve as it evolves.

Human Resources

JPL Human Resources provides 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'00 Performance Objectives

Change Management

Show measurable progress against all JPL change goals.

Define a minimum of one performance metric for each JPL process, each with a baseline measure and at least initial trend data.

Measure closure of the gap between the desired attributes of a process organization and JPL's state at the beginning of the fiscal year.

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."

Significantly reduce cycle time of key HR processes affecting hiring and promotion.

Maintain a diverse workforce.

Objectives in **bold** contribute directly to performance targets in the *NASA Performance Plan* for FY'00. See appendix for complete text of targets and objectives.

JPL FY'00 Performance Objectives

Associate Director, Institutional

Control expenditures to not exceed the FY'00 cost plan for allocated direct and multiprogram support.

Keep development and upgrade of major facilities within cost and schedule plans.

Vacate Bldg. 601, the last off-site lease, by the end of FY'00.

Increase online access to scientific, technical, and business information.

Achieve cost savings from conservation of physical resources.

Begin implementation of knowledge management infrastructure services.

Evolve and continuously improve Enterprise Information System and networking services.

Significantly improve information technology security and related training.

Objectives in **bold** contribute directly to performance targets in the *NASA Performance Plan* for FY'00. See appendix for complete text of targets and objectives.

Associate Director, Institutional

The associate director for institutional operations has the management and leadership responsibility for the allocated direct and multiprogram support budgets; workforce plans; processes for enabling services; organizations providing computing, information, logistics, facilities, environmental, ethics, and security services; institutional infrastructure; and monitoring and assessment of institutional performance.

- Institutional Management Committee
- Provide Enabling Services Domain
- Institutional Computing and Information Services Office
- Logistics and Technical Information Division
- Facilities Division
- Facilities Space Council
- Environmental Affairs Office
- Ethics Office

Associate Director, Financial Operations/Chief Financial Officer

The chief financial officer has the management and leadership responsibility for the financial management, contract administration, institutional business systems, acquisition activities, and project resources administration activities of the laboratory.

- The Accounting and Finance Division is responsible for developing, implementing, and maintaining JPL's financial and workforce management processes and for defining and delivering functional system requirements to be used in the development, implementation, and enhancement of the Institutional Business System (IBS).
- The Institutional Business Systems Office is responsible for the operations and maintenance of JPL's institutional automated business system, and provides technical support for the development, implementation, and enhancement of that system.
- The Contracts Management Office (CMO) serves as the point of contact between NASA, other sponsors, the Office of General Counsel, and laboratory personnel on all matters relating to administration of and compliance with the prime contract between NASA and Caltech. CMO coordinates, reviews, and accepts all contractual documentation and communications concerning the prime contract and task orders, and processes and administers laboratory requests for services from Caltech and Caltech requests for services from the laboratory.
- The Project Resource Administration Division (PRAD) provides project resource administration services and products to the Programmatic Directorates. PRAD provides leadership and supports the development of resource plans that meet, support, and respond to NASA, Caltech, JPL, and reimbursable sponsor constraints and needs.
- The Acquisition Division is responsible for the purchasing and subcontracting of supplies and services. It is also responsible for the stores and inventory management activity.

JPL FY'00 Performance Objectives

Associate Director, Financial Operations/Chief Financial Officer

Continue the operation and enhancement of the New Business Systems (NBS) and commence the system software upgrade by the end of CY'00.

Ensure continuing proper management of the financial aspects of all JPL activities.

Ensure the continuing presence of a robust customer service capability.

Reduce cycle times for contracts and purchase orders, and reduce transaction costs.

Cost 70% or more of the resources authority available to cost within the fiscal year.

Ensure that at least 80% of subcontract funds obligated by JPL are in performance-based contracts.

Meet or exceed targets for small, small disadvantaged, and women-owned business.

Objectives in **bold** contribute directly to performance targets in the *NASA Performance Plan* for FY'00. See appendix for complete text of targets and objectives.

Technical Leadership and Operations

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.

The Engineering and Science Directorate is responsible for development and operations of the processes used by the laboratory to implement projects and tasks, and is also responsible for the laboratory's discipline centers of excellence. (See "Center of Excellence for Deep Space Systems" section.)

JPL FY'00 Performance Objectives

Engineering and Science Directorate

Define and implement a system to measure the performance of the processes associated with the delivery of new products (the DNP processes).

Define and implement a formal continuous improvement program for the DNP processes.

Complete the OP/SP Europa and CloudSat DNP preliminary design process pilots, and incorporate lessons learned in the formulation processes.

Pilot improvements in key areas of the mission software process with at least one flight project.

Capture best practices/lessons learned in each of the four PAPAC subprocesses: project and program formulation, approval, implementation, and evaluation.

Objectives in **bold** contribute directly to performance targets in the *NASA Performance Plan* for FY'00. See appendix for complete text of targets and objectives.

Safety and Mission Assurance Directorate

The Safety and Mission Assurance Directorate (SMAD) provides the institutional leadership in support of the NASA commitment to ensure the safety of all personnel, missions, and assets. In this leadership role, SMAD develops and supports the implementation of tailored, cost-effective safety and mission assurance programs and processes that are integrated early into the life cycle of JPL programs and projects. SMAD contributions include

- Risk management process, tools, and support.
- Independent assessments of JPL programs, projects, and processes.
- Development and infusion of advanced safety and mission assurance technologies, processes, and space flight lessons learned to enable safe, cost-effective, reliable, and successful programs.

Lead Center for the NASA Electronic Parts and Packaging Program (NEPP)

JPL is the lead center for the NASA Electronic Parts and Packaging (NEPP) program, which is a multi-center activity managed by JPL through the NASA Office of Chief Engineer. It supports the near-term needs of the four NASA enterprises through implementation of the following objectives:

- Assess the reliability of newly available electronic parts and packaging technology.
- Evaluate advanced parts and packaging technology to expedite the readiness for infusion.
- Develop new methods and processes for parts and packaging evaluation, selection, and qualification.
- Disseminate quality assurance, reliability, validation, tools, and available information to the NASA community.

Safety Initiative

JPL contributes to the NASA Safety Initiative through

- Employee Assistance Program services
- Hazard abatement
- Health monitoring (baselining and yearly updates) through the Medical Surveillance Program.

Systems Management Office

The Systems Management Office is the JPL director's independent assessment arm for the Governing Program Management Council (GPMC) process, which evaluates program cost, schedule, and technical content to ensure that JPL programs and projects are meeting their commitments.

JPL FY'00 Performance Objectives

Safety and Mission Assurance Directorate

In support of the NASA Agency Safety Initiative (ASI), develop and implement a plan for infusing safety awareness and good safety practices into JPL processes and infrastructure.

Develop training modules for SMAD tools.

Implement the SMAD Assurance Technology Infusion Plan to help at least three projects accelerate the infusion of new technology into their activities.

Develop with SESPD a risk management process for flight projects, with standardized assessment and data management methodologies, that is tailorable to the needs of the individual projects.

Increase the leveraging funding of technology development by 10%.

Develop and implement a process for assessing and rating overall project mission risk during formulation phase and throughout the life cycle.

Infuse Flight Hardware Logistics Program (FHLP) into JPL projects and DNP.

Implement an insight model of software quality assurance that allows the early determination and management of risk for a project with internal and/or outside suppliers/partners.

Improve JPL GPMC process.

Develop a customer relationship in electronic parts engineering, reliability, and radiation effects with JPL, NASA, government, industry, and academia.

Reduce the number of lost work days.

Outreach

JPL FY'00 Performance Objectives

Education and Public Outreach

Increase and improve public access to online and printed materials.

Enhance opportunities to communicate through mass media.

Engage the public through participation in major events and activities.

Objectives in **bold** contribute directly to performance targets in the *NASA Performance Plan* for FY'00. See appendix for complete text of targets and objectives.

JPL Education and Public Outreach

The Director's Office at JPL leads institution-level outreach implementation planning in response to the outreach goals associated with NASA's "Communicate Knowledge" process. JPL is also a partner in realizing the specific outreach goals established by NASA's Space Science, Earth Science, and Human Exploration and Development of Space Enterprises.

JPL's institutional goal for Outreach is to communicate JPL/NASA scientific discoveries, technological achievements, and societal contributions to the public in a timely, understandable, and inspiring way.

Recognizing that "the public" represents a large and diverse group of people with unique interests and needs, JPL is committed to a customer-focused approach in its outreach efforts. The specific audiences we serve include:

- The general public
- The media
- Teachers, students, and other members of the education community
- National, regional, and local leaders
- Businesses and industry
- The scientific and technical community
- The "informal" education community (e.g., museums, planetariums, science centers, and libraries)
- International partners

JPL outreach products and activities are integrated, long-term, and theme-oriented to improve the coordination and delivery of messages, allow JPL to use internal outreach resources effectively, and encourage the sharing of "lessons learned" for continual improvement. Informal and formal evaluation from our various customer groups contribute substantially to all JPL outreach efforts.

JPL projects and programs work closely with other parts of NASA and carefully coordinate efforts with sponsoring offices at NASA Headquarters. Results from all activities are separated in a timely fashion through the designated agency reporting structures.

JPL tailors products and activities to serve the varied public interests and needs.

Public Outreach

JPL shares new and exciting knowledge about the Earth, the solar system, the universe, and technology.

- Mission Events
- Mission Information
- Major Web Sites
- Planetary Photojournal
- Visualizations
- Commercialization
- Conferences
- Naming Contests
- Student Expreriments
- Exhibits
- Animations
- Public Events

Formal Education

JPL is committed to encouraging science, math, and technology education so that current and future generations can participate in, and enjoy the rewards of our increasingly science- and technology-oriented society.

- Solar System Educator Fellows
- Educator Workshops
- Mars Millennium
- Curriculum Supplements
- Education Conferences
- ITEA Partnership
- CD-ROMs
- Student Support

Informal Education

JPL works with organizations and institutions devoted to increasing public understanding of and interaction with space, science, and technology.

- Museums/Planetaria/Science Centers/Libraries
- Solar System Ambassadors
- From the Other Planets to the Inner City
- The Space Place
- CD-ROMs

JPL FY'00 Performance Objectives

Outreach (continued)

Enhance teacher and student training, education, and participation in science, math, and technology (following the six program objectives established in NASA's Strategic Plan for Education) using JPL program results and information.

Enhance opportunities to reach out to industry and to communicate the societal benefits of space research to the general public.

Ensure strong education/public outreach components for all projects and selected research efforts, with clear metrics for evaluation.

Provide continuous improvement in customer service through regular reporting and systematic evaluation on all activities.

Objectives in **bold** contribute directly to performance targets in the *NASA Performance Plan* for FY'00. See appendix for complete text of targets and objectives.

JPL FY'00 Performance Objectives

Commercialization and Technology Transfer

Stimulate private sector investment in JPL research, development, and missions. Identify one commercial opportunity.

Increase by 200 the number of new technologies communicated to the public. Achieve at least 200 of the new technologies reported in NASA.

Supply at least one new medical-related technology for publication in NASA's Technology Innovations.

Provide at least three articles on appropriate technologies for each of NASA's principal technology communications publications ("Innovations," "Spinoff," and "Tech Briefs").

30% of JPL's R&D budget (as defined by Headquarters) will be reflected in commercial partnerships.

Contribute at least 50 NASA commercial success stories.

Execute at least 200 NASA/Caltech licenses (patents and copyrights) for use of intellectual property.

Transfer at least one technology development to a commercial entitiy for operational use.

Objectives in **bold** contribute directly to performance targets in the NASA Performance Plan for FY'00. See appendix for complete text of targets and objectives.

Commercialization and Technology Transfer

The JPL Commercialization and Technology Transfer Program works to effectively apply JPL expertise to the problems of U.S. companies through the formation of partnerships with industry. The Commercialization and Technology Transfer Office ensures that federally funded intellectual property is made available to U.S. companies through licenses and facilities start-ups utilizing JPL-derived technologies.

Investments

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 while reducing cycle times and costs 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'00 key investments are identified below.

Discipline Centers of Excellence

JPL has established seven 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 centes, JPL invests in multidisciplinary staff, state-of-the-art equipment, and facilities. The centers are modeled after the JPL Center for Space Microelectronics Technology (founded in 1987).

Information System Infrastructure

The Institutional Computing and Information Services Office will conduct systems engineering for an enterprise architecture for knowledge management. The information infrastructure technology needed to enable and support NASA missions will be prototyped, and the Enterprise Information System will take advantage of and incorporate leading-edge technology.

JPL FY'00 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 Intergrated Space Microsystems*
- *Center for Space Mission Architecture and Design*
- *Center for Deep Space Communications and Navigation Systems*
- *Center for Information and Software Systems Research*

Evolve and advance information infrastructure capabilities.

Develop mission concepts and proposals in areas of Agency emphasis.

Mission Concepts and Proposal Development

The FY'00 emphasis for investment in bids and proposals is on missions, instruments opportunities and technology announcements in solar system exploration, Earth science, and origins and fundamental physics.

JPL will continue to concentrate on the Mars Network and optical communication and on the synergistic application of NASA space technology to other national needs, with priority on technology flight experiments.

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.

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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 of Excellence

JPL has established seven 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, which create a framework for JPL activities that support NASA's Center of Excellence for Deep Space Systems, are modeled after the existing JPL Center for Space Microelectronics Technology (founded in 1987), and feature multidisciplined staff, and state-of-the-art equipment and facilities. Each center activity seeks 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 seven discipline centers for excellence are described below.

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, and the Army. CSMT conducts research and advanced development in microdevices, microsystems, and revolutionary computing.

CSMT focuses on those aspects of microtechnology 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 revolutionary computing, both in space and on the ground, for space system autonomy, mission data analysis and visualization.

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.

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

The mission of the Center for In Situ Exploration and Sample Return (CISSR) 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, and the outer planets.

Center for Integrated Space Microsystems (est. 1998)

The Center for Integrated Space Microsystems (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. The center will grow in the future to include all the advanced technologies and subsystems required for an advanced spacecraft of very small scale.

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

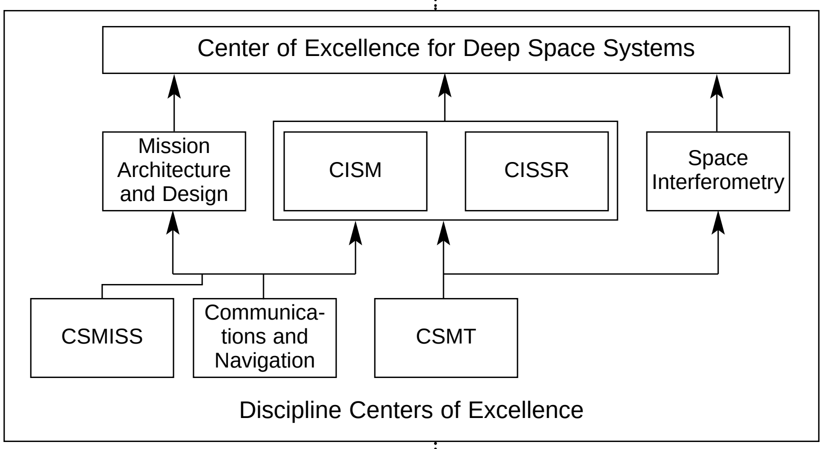
This center is intended to pull together and focus the efforts of key mission- and system-level assets that support JPL's ability to design and implement missions. Through these efforts it will ensure maximal value of JPL's missions with respect to scientific content, affordability, technological content, 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.

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

This center provides technical leadership for programs in the communications and navigation 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.

Center for Space Mission Information and Software Systems (est. 1999)

Information technology is critical to the success of JPL missions and to JPL's future competitiveness. In this era of shorter, concurrent projects, mission software must be developed quickly and reliably to meet first-of-a-kind and recurring challenges. The recent establishment of an information technology center of excellence unifies information technology efforts and strategic planning across the laboratory. The center's focus includes creating a mission software development process as well as building a world-class information technology community at JPL.



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).

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.

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), CISSR (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 CISSR is indicated by their enclosure in a box.

Communications and navigation technologies and capabilities, along with those in information systems, 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 CISSR. They play a significant but lesser role in shaping Space Interferometry systems.

Technology: Meeting the Challenge

JPL contributes directly to NASA's mutli-enterprise, focused, and flight validation technology programs. JPL conducts fundamental and early technology development for several core technology programs. JPL's focused technology programs produced advanced, critical-path spacecraft and instrument technologies in well-defined, mission concept-specific areas. JPL's flight validation programs demonstrate advanced technologies in actual flight applications. In combination, these technology programs provide as effective pipeline for infusion of the laboratories' technologies into NASA missions.

Advanced Flight Validation and Development Programs

The New Millennium Program and the 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 Aero-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, and companies, along with 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. JPL's Reimbursable program, described in "Implementing the NASA Mission at JPL," and Commercialization and Technology Transfer program, described in the "JPL Institutional Implementation," are important contributors to these partnerships.

APPENDICES

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

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JPL Points of Contact

TOPIC	NAME	TELEPHONE
The JPL Implementation Plan	Richard P. O'Toole	818 354-3409
Implementing the NASA Mission at JPL	Larry N. Dumas	818 354-3401
Space and Earth Science	Charles Elachi	818 354-5673
Deep Space Exploration	Chris P. Jones	818 354-0811
Mars Exploration	Chris P. Jones	818 354-0811
Origins	Firouz M. Naderi	818 354-9291
New Millennium Program	Fuk K. Li	818 354-2849
SIRTF	Larry L. Simmons	818 354-6336
Earth Missions	Charles Yamarone	818 354-7141
Foreign Space Science Collaborations	John B. Wellman	818 393-7861
Technology	Michael J. Sander	818 354-0239
NASA	Arthur J. Murphy	818 354-3480
Reimbursable	William H. Spuck	818 354-3528
Deep Space Communications	Gael F. Squibb	818 354-4500
JPL Institutional Operations	Kirk M. Dawson	818 354-6354
JPL Financial Operations	Fred C. McNutt	818 354-5453
Center of Excellence for Deep Space Systems	Charles Elachi or William J. Weber	818 354-5673 818 354-2800

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

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JPL Alignment with NASA Enterprise Plans

Space Science Enterprise OSS Strategic Plan, November 1997
(modified by JPL for FY'00 objectives)

Science Goals	Science Objectives (number)	JPL Programs: In Study	In Development	In Operations
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) Measure the amount and distribution of dark and luminous matter in the ancient and modern universe. (4)	SIM FIRST* Planck* LISA ARISE	SIRTF GALEX	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) Study compact objects and investigate how disks and jets are formed around them. (7) Measure space plasma processes both remotely and in situ. (9) Test the Theory of General Relativity. (5)			VIM Ulysses Cassini–Huygens
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)	Planck*		VIM
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) Study compact objects and investigate how disks and jets are formed around them. (7) Study the formation and evolution of the chemical elements and how stars evolve and interact with the interstellar medium. (8) Measure space plasma processes both remotely and in situ. (9)	FIRST* ARISE SIM Solar Probe	SIRTF	VIM Ulysses Cassini–Huygens

* foreign space science mission

Space Science Enterprise continued...

Science Goals	Objectives (number)	JPL Programs: In Study	JPL Programs: In Development	JPL Programs: In Operations
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)	SIM FIRST* TPF	SIRTF	Keck Interferometer
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)	Mars Surveyor Program Europa Orbiter Pluto/Kuiper Express Solar Probe Deep Impact	Genesis MIRO MUSES-CN*	Galileo Mars Global Surveyor Cassini–Huygens Stardust Deep Space 1 Ulysses VIM
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)	Solar Probe SIM		Galileo Cassini–Huygens Ulysses VIM

* foreign space science mission

Space Science Enterprise continued...

Science Goals	Objectives (number)	JPL Programs: In Study	In Development	In Operations
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)	Mars Surveyor Program Astrobiology Studies	MUSES-CN*	NEAP NEAT
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)	Pluto/Kuiper Express	MUSES-CN*	NEAT, NEAP Galileo Ulysses Cassini–Huygens Stardust Deep Space 1
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 Surveyor Program		Mars Global Surveyor Deep Space 1
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 Surveyor Program Europa Orbiter SIM TPF Deep Impact		Mars Global Surveyor Galileo Cassini–Huygens

* foreign space science mission

Earth Science Enterprise

Mission to Planet Earth Strategic Plan, May 1997

Goals	Themes/Objectives	JPL Programs
1. Observe, understand, and model the Earth system to learn how it is changing, and the consequences for life on Earth.	Climate Variability and Change	QuickSCAT TOPEX/Poseidon JASON 1 GRACE AIRS/AMSU/HSB Aircraft measurements MISR ACRIMSAT Airborne Sounder Passive-Active Airborne CloudSat SAR Alaska SAR
	Solid Earth Science and Natural Hazards	SCIGN ASTER SRTM IGS GRACE Champ Oerstead SAC-C
	Atmospheric Chemistry	SAGE III (SOLVE) MLS TES Aircraft and Balloon
	Biology and Bio-geochemistry of Ecosystems and the Global Carbon Cycle	AVIRIS Hyper-spectral imaging SAR EO-1

Earth Science Enterprise continued...

Goals	Themes / Objectives	JPL Programs
	Global Water and Energy Cycle	AIRS EOS-PM CloudSat
2. Expand and accelerate the realization of economic and societal benefits from Earth science, information, and technology.	Enable productive use of Earth system science results, data, and technology in the public and private sectors	Physical Oceanography DAAC (PODAAC)
	Enable the development of a robust commercial remote sensing industry	Alaska SAR EOS-DIS (support) Earth Science Information Partnerships
	Increase public understanding of and involvement in Earth system science through formal and informal educational opportunities	Education and Public Outreach
3. Develop and adopt advanced technologies to enable mission success and serve national priorities.	Develop advanced technologies to reduce the cost and expand the capability for scientific Earth observation	
	Develop advanced information systems for processing, archiving, accessing, visualizing, and communicating Earth science data	Remote sensing technology and concepts
	Partner with opertional agencies to develop and implement better methods for using remotely sensed observations in Earth system monitoring and prediction	Applied research and technology

Human Exploration and Development of Space

HEDS Strategic Plan, January 1996

Goals	Objectives	JPL Programs
1. Increase human knowledge of nature's processes using the space environment.	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
	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.	Enable human exploration through space science enterprise robotic missions	Mars Surveyor '01,' 03, '05 MVACS '98, Athena, and APEx In Situ Propellant Production
	Expand human presence in space by assembling and operating the International Space Station	Low-Temperature Microgravity Physics Facility Laser Cooling and Atomic Physics (LCAP)
	Develop biomedical knowledge and technologies to maintain human health and performance in space	Virtual Reality
	Establish a human presence on the Moon, in the Martian System, and elsewhere in the inner solar system	MECA
	Develop opportunities for commerce in space as a basis for future settlements	
3. Achieve routine space travel	Sustain space shuttle operations at improved levels of safety and efficiency	

Human Exploration and Development of Space continued....

Goals	Objectives	JPL Programs
	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
	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.	Promote knowledge and technologies that promise to enhance our health and quality of life Broaden and strengthen our nation's achievements in science, math, and engineering Involve our nation's citizens in the adventure of exploring space Join with other nations in the international exploration and settlement of space	Mars Educational Outreach Program Microgravity Fundamental Physics Education and Outreach Program

Aero-Space Technology

Goals	Objectives	JPL Programs
Enable the full commercial potential of space and expansion of space research and exploration	Revolutionize in-space transportation Revolutionize space launch capabilities	Commercial Technology Program NSTAR X-33 Avionics Information Technology

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FY’00 NASA Performance Targets and JPL Objectives

This appendix presents:
The NASA performance targets that relate to JPL work and the corresponding JPL objective.
Additional institutional-level JPL objectives that support enterprise goals and objectives but for which there are no explicit performance targets identified.

The NASA performance targets for JPL work and JPL objectives table is organized as follows:

Programmatic
The programmatic performance targets and JPL objectives are organized by strategic enterprise.
- Space Science Enterprise
- Earth Science Enterprise
- Human Exploration and Development of Space Enterprise
- Aero-Space Technology Enterprise

Institutional
The institutional performance targets and JPL objectives are organized by NASA cross-cutting process.
- Manage Strategically
- Provide Aerospace Products and Capabilities
- Communicate Knowledge
- Generate Knowledge

Note 1: This appendix includes only NASA objectives and performance targets related to JPL work. For the complete set of NASA objectives and performance targets, see the *NASA Performance Plan, Fiscal Year 2000*, available at <*http://www.hq.nasa.gov/office/codez/plans.html*>

Note 2: Objectives that support more than one NASA performance target are enclosed in brackets [ ] after the first entry.

NASA FY'00 Performance Target	NASA ID#	JPL Objective	JPL Imp. Plan ref.

Programmatic

Space Science Enterprise

Space Science Goal: Chart the evolution of the universe, from origins to destiny, and understand its galaxies, stars, planets, and life

Objective: Solve mysteries of the universe

Deliver the SIRTF Infrared Array Camera (IRAC), Multiband Imaging Photometer (MIPS), and Infrared Spectrograph (IRS) instruments during April 2000. The instruments shall perform at their specified levels at delivery.	OS5	Deliver the SIRTF Infrared Array Camera (IRAC), Multiband Imaging Photometer (MIPS), and Infrared Spectrograph (IRS) instruments during April 2000. The instruments shall perform at their specified levels at delivery.	Space Science Solve Mysteries of the Universe
Assemble and successfully test the breadboard cooler for ESA's Planck mission in April 2000.	OS7	Assemble and successfully test the breadboard cooler for ESA's Planck mission in April 2000.	
Deliver the GALEX science instrument from JPL to the Space Astrophysics Laboratory at Caltech during April 2000 for science calibration. The instrument will be fully integrated, functionally tested, and environmentally qualified at the time of the scheduled delivery.	OS8	Deliver the GALEX science instrument from JPL to the principal investigator at Caltech during April 2000 for science calibration. The instrument will be fully integrated, functionally tested, and environmentally qualified at the time of the scheduled delivery.	
Complete the NGST Developmental Cryogenic Active Telescope Testbed (DCATT) phase 1, measure ambient operation with off- the-shelf components, and make final preparations for phase 2, the measurement of cold telescope operation with selected "flight-like" component upgrades.	OS53	Complete the NGST Developmental Cryogenic Active Telescope Testbed (DCATT) phase 1, measure ambient operation with off- the-shelf components, and make final preparations for phase 2, the measurement of cold telescope operation with selected "flight-like" component upgrades.	
Demonstrate performance of the Superconductor-Insulator-Superconductor (SIS) mixer to at least 8hv/ k at 1,120 GHz and 10hv/ k at 1,200 GHz. The U. S. contribution to the ESA FIRST is the heterodyne instrument, which contains the SIS receiver.	OS62	Demonstrate performance of the Superconductor-Insulator-Superconductor (SIS) mixer to at least 8hv/ k at 1,120 GHz and 10hv/ k at 1,200 GHz. The U. S. contribution to the ESA FIRST is the heterodyne instrument, which contains the SIS receiver.	

Objective: Explore the solar system

Deliver the Mars 01 Orbiter and Lander science instruments that meet capability requirements by June 1, 2000; prelaunch Gamma Ray Spectrometer (GRS) tests shall determine abundances in known calibration sources to 10% accuracy.	OS29	Deliver the Mars 01 Orbiter and Lander science instruments that meet capability requirements by June 1, 2000; prelaunch Gamma Ray Spectrometer (GRS) tests shall determine abundances in known calibration sources to 10% accuracy.	Space Science Explore the Solar System

NASA FY'00 Performance Target	NASA ID#	JPL Objective	JPL Imp. Plan ref.
Assuming the Mars Surveyor program architecture is confirmed, meet the milestones for the Mars 03 instrument selection and initiate implementation of the lander mission. Deliver engineering models of the radio-frequency subsystem and antennas for the radar sounder instrument to ESA (if ESA approves the Mars Express mission), and select the contractors for the major system elements of the Mars Surveyor 05 mission.	OS30	Assuming the Mars Surveyor program architecture is confirmed, meet the milestones for the Mars 03 instrument selection and initiate implementation of the lander mission. Deliver engineering models of the radio-frequency subsystem and antennas for the radar sounder instrument to ESA (if ESA approves the Mars Express mission), and select the contractors for the major system elements of the Mars Surveyor 05 mission.	
The Rosetta project will deliver the electrical qualification models for the four U.S.-provided instruments to ESA in May 2000 for integration with the Rosetta Orbiter.	OS20	The Rosetta project will deliver the environmental qualification models for the four U.S.-provided instruments to ESA in May 2000 for integration with the Rosetta Orbiter.	
Complete Genesis spacecraft assembly and start functional testing in November 1999.	OS31	Complete Genesis spacecraft assembly and start functional testing in November 1999.	
The baseline Galileo mission ended in 1997; the target for FY00 is to recover at least 90% of playback data from at least one Galileo flyby of Io.	OS45	The baseline Galileo mission ended in 1997; the target for FY00 is to recover at least 90% of playback data from at least one Galileo flyby of Io.	
The Mars Climate Orbiter (MCO) will aerobrake from its initial insertion orbit into a near-polar, Sun-synchronous, approximately 400-km circular orbit and will initiate mapping operations no later than May 2000, acquiring 70% of the available science data and relaying to Earth 70% of the data transmitted at adequate signal levels by the Mars Polar Lander (MPL).	OS40	~~The Mars Climate Orbiter (MCO) will aerobrake from its initial insertion orbit into a near-polar, Sun-synchronous, approximately 400-km circular orbit and will initiate mapping operations no later than May 2000, acquiring 70% of the available science data and relaying to Earth 70% of the data transmitted at adequate signal levels by the Mars Polar Lander (MPL).~~	
MPL will successfully land on Mars in December 1999 and operate its science instruments for the 80-day prime mission with at least 75% of planned science data returned.	OS41	~~Mars Polar Lander will successfully land on Mars in December 1999 and operate its science instruments for the 80-day prime mission with at least 75% of planned science data returned.~~	
The Mars Global Surveyor (MGS) will acquire 70% of science data available, conduct at least two 5-day atmospheric mapping campaigns, and relay to Earth at least 70% of data transmitted at adequate signal levels by the Deep Space-2 Mars microprobes.	OS46	The Mars Global Surveyor (MGS) will acquire 70% of science data available, conduct at least two 5-day atmospheric mapping campaigns, and relay to Earth at least 70% of data transmitted at adequate signal levels by the Deep Space-2 Mars microprobes.	

NASA FY'00 Performance Target	NASA ID#	JPL Objective	JPL Imp. Plan ref.
Continue Cassini operations during the quiescent cruise phase without major anomalies, conduct planning for the Jupiter gravity- assist flyby, and explore early science data collection opportunities. The following in-flight activities will be completed: Instrument Checkout #2; uplink Articulation and Attitude Control Subsystem (AACS) software update with Reaction Wheel Authority capability; Command and Data Subsystem Version 8; and Saturn tour designs for selection by the Program Science Group.	OS34	Continue Cassini operations during the quiescent cruise phase without major anomalies, conduct planning for the Jupiter gravity- assist flyby, and explore early science data collection opportunities. The following in-flight activities will be completed: Instrument Checkout #2; uplink Articulation and Attitude Control Subsystem (AACS) software update with Reaction Wheel Authority capability; Command and Data Subsystem Version 8; and Saturn tour designs for selection by the Program Science Group.	
Capture at least 90% of available Ulysses science data. These data will be the only data observed from outside-of- the-ecliptic plane.	OS35	Capture at least 90% of available Ulysses science data. These data will be the only data observed from outside-of-the-ecliptic plane.	
Average 12 hours of Voyager Interstellar Mission data capture per day per spacecraft to characterize the heliosphere and the heliospheric processes at work in the outer solar system as well as the transition from the solar system to interstellar space.	OS36	Average 12 hours of Voyager Interstellar Mission data capture per day per spacecraft to characterize the heliosphere and the heliospheric processes at work in the outer solar system as well as the transition from the solar system to interstellar space.	
Continue Stardust spacecraft cruise operations without major anomalies and perform interstellar dust collection for at least 36 days.	OS37	Continue Stardust spacecraft cruise operations without major anomalies and perform interstellar dust collection for at least 36 days.	
Successfully complete a preliminary design for either the Europa Orbiter or Pluto-Kuiper Express mission (whichever is planned for earlier launch) that is shown to be capable of achieving the Category 1A science objectives with adequate cost, mass, power, and other engineering margins.	OS64	Successfully complete preliminary designs for the Europa Orbiter and Pluto-Kuiper Express mission that are shown to be capable of achieving the Category 1A science objectives with adequate cost, mass, power, and other engineering margins.	

Objective: Discover planets around other stars

The Space Interferometry Mission (SIM) System Testbed (STB) will demonstrate, in May 2000, that Remote Manipulator System optical path difference can be controlled at 1.5 nanometers, operating in an emulated on-orbit mode.	OS52	The Space Interferometry Mission (SIM) System Testbed (STB) will demonstrate, in May 2000, that Remote Manipulator System optical path difference can be controlled at 1.5 nanometers, operating in an emulated on-orbit mode.	Space Science Discover Planets Around Other Stars
Complete and deliver a technology development plan for the Terrestrial Planet Finder (TPF) mission by June 2000. This infrared interferometer mission is projected for a 2010 launch and requires the definition of technologies that will not be developed or demonstrated by precursor missions.	OS54	Complete and deliver a technology development plan for the Terrestrial Planet Finder (TPF) mission by June 2000. This infrared interferometer mission is projected for a 2010 launch and requires the definition of technologies that will not be developed or demonstrated by precursor missions.	

NASA FY'00 Performance Target	NASA ID#	JPL Objective	JPL Imp. Plan ref.
Development of the interferometer program for connecting the twin Keck 10-meter telescopes with an array of four 2-meter class outrigger telescopes will be tested by detecting and tracking fringes with two test siderostats at 2- and 10-micron wavelengths.	OS55	Development of the interferometer program for connecting the twin Keck 10-meter telescopes with an array of four 2-meter class outrigger telescopes will be tested by detecting and tracking fringes with two test siderostats at 2- and 10-micron wavelengths.	

Objective: Search for Life Beyond Earth

The Europa Orbiter project will successfully complete a PDR in March 2000 and will begin the integration and test of the Avionics Engineering Model in July 2000.	OS56	The Europa Orbiter project will successfully complete a PDR in March 2000 and will begin the integration and test of the Avionics Engineering Model in July 2000.	Space Science Search for Life Beyond Earth

Space Science Goal: Develop new critical technologies to enable innovative and less costly mission and research concepts

Objective: Develop innovative technologies for enterprise missions and for external customers

In April 2000, the Center for Integrated Space Microelectronics will deliver to the X2000 First Delivery project the first engineering model of an integrated avionics system that includes the functionality of command and data handling, attitude control, power management and distribution, and science payload interface. The system will be used on the Europa Orbiter and other missions.	OS57 (OS70)	The Center for Integrated Space Microelectronics will deliver to the X2000 First Delivery project the first engineering model of an integrated avionics system that includes the functionality of command and data handling, attitude control, power management and distribution, and science payload interface. The system will be used on the Europa Orbiter and other missions.	Space Science Develop Innovative Technologies
N/A		Demonstrate in situ subsurface science data acquisition technology on Deep Space 2.	
		Develop (1) quantum technologies, (2) nano—biosystems technologies, and (3) large structures/optics technology thrusts.	
		Complete, review, and publish a suite of JPL technology roadmaps keyed to NASA visions for the future.	Develop Innovative Technologies
		Execute a 632 program responsive to NASA needs.	Multi-Enterprise Technology

Space Science Goal: Contribute measurably to achieving the science, math, and technology education goals of our Nation, and share widely the excitement and inspiration of our missions and discoveries

Objective: Incorporate education and enhanced public understanding of science as integral components of Space Science missions and research

Successful achievement of at least seven of the following eight objectives will be made. (1) Each new Space Science mission will have a funded education and outreach program. (2) By the end of FY00,	OS67	Increase and improve public access to online and printed materials. (OS67-7) Enhance teacher and student training, education, and participation in science,	Outreach (Education)

NASA FY'00 Performance Target	NASA ID#	JPL Objective	JPL Imp. Plan ref.
10% of all Space Science research grants will have an associated education and outreach program under way. (3) Twenty-six states will have Enterprise-funded education or outreach programs planned or under way. (4) At least five research, mission development/ operations, or education programs will have been planned/undertaken in Historically Black Colleges and Universities, Hispanic Serving Institutions, or Tribal Colleges, with at least one project under way in each group. (5) At least three national and two regional educational or outreach conferences will be supported with a significant Space Science presence. (6) At least three exhibits or planetarium shows will be on display. (7) An online directory providing enhanced access to major Space Science-related products and programs will be operational by end of the fiscal year. (8) A comprehensive approach to assessing the effectiveness and impact of the Space Science education and outreach efforts will be under development, with a pilot test of the evaluation initiated.		math, and technology (following the 6 Program Objectives established in NASA's Strategic Plan for Education) using our program results and information. (OS67-4) Engage the public through participation in major events and activities. (OS67-5) Ensure strong education/public outreach components for all projects and selected research efforts, with clear metrics for evaluation. (OS67-1, OS67-2, OS67-8)	

Earth Science Enterprise

Earth Science Goal: Observe, understand, and model the Earth system to learn how it is changing, and the consequences for life on Earth.

[Note: science themes reflected in the *JPL Implementation Plan* comply with current Earth Science themes, which are different from the objectives in the *NASA Performance Plan*]

Objective: Predict seasonal-to-interannual climate variations

Establish a benchmark for global and regional rainfall measurements by combining TRMM measurements with measurements from other sources. Create maps of the diurnal cycle of precipitation for the first time. Combine the existing 10-year data set with TRMM measurements to validate climate models and demonstrate the impact of rainfall on short-term weather forecasting. Distribute through the Goddard DAAC for ease of access to science and operational users.	0Y9	Benchmark global and regional rainfall measurements (support).	Earth Science Observe Earth System: Change Variability and Change
Develop/ improve methods to couple state-of-the-art land surface and sea ice models to a global coupled ocean-atmosphere model and use to predict regional climactic consequences of El Niño or La Niña occurrence in the tropical Pacific. Results of research will be published in the open literature and	0Y10	Conduct sea ice dynamics research to predict consequences of El Niño or La Niña (support).	

NASA FY'00 Performance Target	NASA ID#	JPL Objective	JPL Imp. Plan ref.
provided to NOAA's National Climate Prediction Center and the U. S. Navy's Fleet Numeric Prediction Center. Ultimate goal: develop a capability to significantly improve the prediction of seasonal-to-interannual climate variations and their regional climate consequences. The main focus is on North America.			
Measure production and radiative properties of aerosols produced by biomass burning in Africa based on SAFARI 2000 (field experiment) and EOS instruments. Includes extensive international participation. This burning is estimated to contribute one-half of global atmospheric aerosols.	0Y11	Use MISR data to determine consequences of biomass burning in Africa (primary).	
Launch the NASA-CNES Jason-1 mission. This follow-on to TOPEX/Poseidon is to achieve a factor-of-4 improvement in accuracy in measuring ocean basin-scale sea-level variability. This is 1 order of magnitude better than that specified for TOPEX/Poseidon.	0Y12	Launch Jason-1 mission (primary).	
Generate the first basin-scale high-resolution estimate of the state of the Pacific Ocean as a part of the international Global Ocean Data Assimilation Experiment (GODAE).	0Y47	Generate the first basin-scale high-resolution estimate of the state of the Pacific Ocean as a part of the international Global Ocean Data Assimilation Experiment (GODAE) (primary).	

Objective: Identify natural hazards, processes, and mitigation strategies

Use southern California GPS array data to understand the connection between seismic risk and crustal strain leading to earthquakes.	0Y37	Use southern California GPS array data to understand the connection between seismic risk and crustal strain leading to earthquakes (primary).	Earth Science Observe Earth System: Solid Earth Science and Natural Hazards
Develop models to use time-varying gravity observations for the first time in space.	0Y38	Develop models to use time-varying gravity observations for the first time in space (primary).	Solid Earth Science and Natural Hazards
Demonstrate the utility of spaceborne data for floodplain mapping with the Federal Emergency Management Agency.	0Y39	Demonstrate the utility of spaceborne data for floodplain mapping with the Federal Emergency Management Agency (primary).	
Develop an automatic volcano cloud/ ash detection algorithm employing EOS data sets for use by the Federal Aviation Administration.	0Y40	Develop an automatic volcano cloud/ ash detection algorithm employing EOS data sets for use by the Federal Aviation Administration (support)	Earth Science Observe Earth System: Climate Variability and Change

Objective: Detect long-term climate change, causes, and impact

Provide for the continuation of the long-term, precise measurement of the total solar irradiance with the launch of EOS	0Y15	Continue measurement of total solar irradiance by launching ACRIMSAT (primary).	Earth Science Observe Earth System:

NASA FY'00 Performance Target	NASA ID#	JPL Objective	JPL Imp. Plan ref.
ACRIM.		Complete environmental testing of the ACRIMSAT spacecraft.	Climate Variability and Change
Initiate a program of airborne mapping of layers within the Greenland ice sheet to decipher the impact of past climate variation on polar regions.	0Y18	Use Airborne Sounder to decipher impact of past climate variation on polar regions (support).	
Develop a remote-sensing instrument/ technique for ocean surface salinity measurements from aircraft. Goal to improve measurement accuracy to 1 order of magnitude better than available in FY98. The ultimate goal is the capability to globally measure sea surface salinity from space.	OY19	Use Passive-Active L-S Band aircraft instrument to develop technique for ocean surface salinity measurements (primary).	

Objective: Understand the causes of variation in atmospheric ozone concentration and distribution

Implement the SAGE III Ozone Loss and Validation Experiment. Measurements will be made from October 1999 to March 2000 in the Arctic/ high- latitude region from the NASA DC- 8, ER- 2, and balloon platforms. Will acquire correlative data to validate SAGE III data and assess high-latitude ozone loss.	OY22	Implement the SAGE III Ozone Loss and Validation Experiment (SOLVE) to acquire correlative data to validate SAGE III data and assess high-latitude ozone loss with aircraft and balloon measurements.	Earth Science Observe Earth System: Atmospheric Chemistry

Earth Science Goal: Expand and accelerate the realization of economic and societal benefits from Earth science, information, and technology.

Objective: Increase public understanding of Earth Science through education and outreach.

Conduct at least 300 workshops to train teachers in the use of Enterprise education products.	OY31	[Enhance teacher and student training, education, and participation in science, math, and technology (following the six program objectives established in NASA's Strategic Plan for Education) using our program results and information.]	Outreach (Education)
Increase the number of schools participating in GLOBE to 10,500, a 30% increase over FY'99; increase participating countries to 77 (from 72).	OY32		

Earth Science Goal: Develop and adopt advanced technologies to enable mission success and serve national priorities.

Objective: Develop and transfer advanced remote-sensing technologies.

Transfer at least one technology development to a commercial entity for operational use.	OY34	Transfer at least one technology development to a commercial entity for operational use.	Outreach (C&TT

NASA FY'00 Performance Target	NASA ID#	JPL Objective	JPL Imp. Plan ref.

Human Exploration and Development of Space Enterprise

HEDS Goal: Expand the frontier (Office of Space Flight and OLMSA)

Objective: Enable human exploration through collaborative robotic missions

Objective: Define innovative, safe, and affordable human exploration mission architectures

Complete the development and initiate the implementation of a comprehensive technology investment strategy to support future human exploration that includes capability development for increasing self-sustainability, decreasing transit times, developing commercial opportunities, reducing cost and risk, and increasing knowledge and operational safety.	OH36	Contribute to a technology investment strategy to support future human exploration.	HEDS
N/A		Complete the delivery of the Mars Environmental Compatibility Assessment (MECA) to the MSP'01 project.	

Objective: Invest in enabling high-leverage exploration technologies

In coordination with other Enterprises, develop and implement tests and demonstrations of capabilities for future human exploration in the areas of advanced space power, advanced space transportation, information and automation systems, and sensors and instruments.	OH38	Demonstrate capabilities for future human exploration.	HEDS

Goal: Expand the commercial development of space (OLMSA)

Objective: Facilitate access to space for commercial researchers

Invest 25% of the space communications technology budget by FY'00 in projects that could enable space commercial opportunities, including leveraging through a consortium of industry, academia, and government.	OH44	Invest JPL space communications technology budget in activities that will lead to new services, decreased unit service costs, and/or increased service quantity and quality while providing the potential for space commercial opportunities—including leveraging through relationships with industry, academic institutions, and other government organizations.	Multi-Enterprise Deep Space Communications and Mission Operations

Goal: Expand scientific knowledge (OLMSA)

Objective: In partnership with the scientific community, use the space environment to explore chemical, biological, and physical systems

N/A		Conduct successful Low-Temperature Microgravity (LTMP) facility preliminary design review.	HEDS

NASA FY'00 Performance Target	NASA ID#	JPL Objective	JPL Imp. Plan ref.
N/A		Conduct requirements definition reviews for three candidate investigations, and select two for the first LTMP mission on the International Space Station (ISS).	HEDS
		Conduct successful science concept reviews for three candidate investigations for the second LTMP mission on ISS.	
		Conduct successful requirements definition review for first Laser Cooling and Atomic Physics (LCAP) investigation on the ISS, and science concept review for the second investigation.	
		Support NASA in conducting selection of new fundamental physics investigations by means of a NASA research announcement.	
		Support NASA in definition of National Center for Microgravity Fundamental Physics, and in selection of consortium members to operate the center.	

HEDS Goal: Enable and establish a permanent and productive human presence in Earth orbit (Office of Space Flight and OLMSA)

Objective: Meet strategic space mission operations needs while reducing costs and increasing standardization and interoperability

Reduce the space communications budget submit for FY00 by 30–35% from the FY96 congressional budget submit.	OH43	Contribute to the planned reduction of the space communications budget consistent with SOMO's instructions and associated customer priorities.	Multi-Enterprise Deep Space Communications and Mission Operations

Aero-Space Technology Enterprise

Aero-Space Technology Goal for Space Transportation: Enable the full commercial potential of space and expansion of space research and exploration

Objective: Revolutionize in-space transportation

Complete NSTAR Mission Profile (100% design life) ground testing for Deep Space-1 (concurrent, identical firing of an NSTAR engine in a vacuum chamber with the actual firing sequence of the in-flight propulsion system).	OR10	Complete NSTAR mission profile ground testing for Deep Space One.	Aero-Space Technology

Objective: Revolutionize space launch capabilities

Conduct the flight testing of the X-33 vehicle.	OR9	Support the flight testing of the X-33 vehicle.	Aero-Space Technology

NASA FY'00 Performance Target	NASA ID#	JPL Objective	JPL Imp. Plan ref.

Institutional

Manage Strategically Cross-cutting Process

Manage Strategically Goal: Provide a basis for the Agency to carry out its responsibilities effectively and safely and enable management to make critical decisions regarding implementation activities and resource allocations that are consistent with the goals, objectives, and strategies contained in NASA's Strategic, Implementation, and Performance Plans.

Objective: Optimize investment strategies and systems to align human, physical, and financial resources with customer requirements, while ensuring compliance with applicable statutes and regulations

Maintain a diverse NASA workforce throughout the downsizing efforts	OMS2	Maintain a diverse work force.	Institutional Leadership and Operations (HR)
Reduce the number of Agency lost workdays (from occupational injury or illness) by 5% from the FY94– 96 3- year average.	OMS3	Reduce the number of lost work days.	Technical Leadership and Operations (SMAD)
N/A		In support of the NASA Agency Safety Initiative (ASI), develop and implement a plan for infusing safety awareness and good safety practices into JPL processes and infrastructure.	
Achieve a 5% increase in physical resource costs avoided from the previous year through alternate investment strategies in environmental and facilities operations.	OMS12	Achieve a cost savings from conservation of physical resources.	Institutional Leadership and Operations (Associate Director, Institutional)
Cost 70% or more of available resources.	OMS4	Cost 70% or more of the resources authority available to cost within the fiscal year.	(Associate Director, Financial)
N/A		Accomplish all schedule and cost commitments for FY'00 as planned in POP99-1.	(Office of the Director)
		Publish new JPL Strategic Management Plan.	(Strategic Management)
		Enable all JPL staff to link their FY'00 performance plans to relevant JPL and NASA plans.	
		Show measurable progress against all JPL change goals.	(Change Management)
		Define a minimum of one performance metric for each JPL process, each with a baseline measure and at least initial trend data.	

NASA FY'00 Performance Target	NASA ID#	JPL Objective	JPL Imp. Plan ref.
		Measure closure of the gap between the desired attributes of a process organization and JPL's state at the beginning of the fiscal year.	
		Provide innovative services and support changes in the work environment that enable JPL to become an "employer of choice."	(Human Resources)
		Control expenditures to not exceed the FY'00 cost plan for allocated direct and multiprogram support.	(Associate Director, Institutional)
		Vacate Building 601, the last off-site lease, by the end of FY'00.	
		Continue the operation and enhancement of the New Business Systems (NBS) and commence the system software upgrade by the end of CY'00.	(Associate Director, Financial)
		Ensure the continuing presence of a robust customer service capability.	
		Support JPL's discipline centers of excellence.	Investments
		Develop mission concepts and proposals in areas of Agency emphasis.	

Objective: Improve the effectiveness and efficiency of Agency acquisitions through the increased use of techniques and management that enhance contractor innovations and performance.

Of funds available for PBC, maintain PBC obligations at 80% (funds available exclude grants, cooperative agreements, actions <$ 100,000, SBIR, STTR, FFRDC's, intragovernmental agreements, and contracts with Foreign governments or international organizations).	OMS5	Ensure that at least 80% of subcontract funds obligated by JPL are in performance-based contracts.	(Associate Director, Financial)
Achieve at least the congressionally mandated 8% goal for annual funding to small disadvantaged businesses (including prime and subcontracts, small disadvantaged businesses, HBCUs, other minority institutions, and women- owned small businesses).	OMS8	Meet or exceed targets for small, small disadvantaged, and women-owned business.	
N/A		Reduce cycle times for contracts and purchase orders, and reduce transaction costs.	

Objective: Improve information technology capability and services.

Improve information technology infrastructure service delivery to provide increased capability and efficiency while maintaining a customer rating of "satisfactory" and holding costs per resource unit to the FY98 baseline.	OMS10	Begin implementation of knowledge management infrastructure services.	(Associate Director, Institutional)

NASA FY'00 Performance Target	NASA ID#	JPL Objective	JPL Imp. Plan ref.
		Evolve and continuously improve Enterprise Information System and networking services.	
		Significantly improve information technology security and related training.	
N/A		Increase on-line access to scientific, technical, and business information.	
		Evolve and advance information infrastructure capabilities.	Investments

Provide Aerospace Products and Capabilities Cross-cutting Process

PAPAC Goal: Enable NASA's Strategic Enterprises and their Centers to deliver products and services to customers more effectively and efficiently while extending the technology, research, and science benefits broadly to the public and commercial sectors

Objective: Reduce the cost and development time to deliver products and operational services.

Meet schedule and cost commitments by keeping the development and upgrade of major scientific facilities and capital assets within 110% of cost and schedule estimates, on average.	OP1	Keep development and upgrade of major facilities within cost and schedule plans.	Institutional Leadership (Associate Director, Institutional)

Objective: Improve and maintain NASA's engineering capability.

Ensure the availability of NASA's spacecraft and facilities by decreasing the FY99 unscheduled downtime.	OP2	Track DSN unscheduled downtime to establish a baseline to measure future improvements.	Multi-Enterprise Communications and Mission Operations
N/A		Develop training modules for SMAD tools.	Technical Leadership (SMAD)
		Implement the SMAD Assurance Technology Infusion Plan to help at least three projects accelerate the infusion of new technology into their activities.	
		Develop with SESPD a risk management process for flight projects, with standardized assessment and data management methodologies, tailorable to the needs of the individual projects.	
		Increase the leveraging funding of technology development by 10%.	
		Develop and implement a process for assessing and rating overall project mission risk during formulation phase and throughout the life cycle.	
		Infuse Flight Hardware Logistics Program (FHLP) into JPL projects and DNP.	
		Implement an insight model of software quality assurance that allows the early determination and management of risk for a project with internal and/or outside suppliers/partners.	

NASA FY'00 Performance Target	NASA ID#	JPL Objective	JPL Imp. Plan ref.
		Develop a customer relationship in electronic parts engineering, reliability, and radiation effects with JPL, NASA, government, industry, and academia.	
		Improve JPL GPMC process.	
		(Note: See also objectives supporting "Capture and preserve engineering…," below)	

Objective: Capture and preserve engineering and technological best practices and process knowledge to continuously improve NASA's program/ project management.

(Note: These JPL objectives also align with the NASA PAPAC objective to improve and maintain NASA's engineering capability.)

Capture a set of best practices/ lessons learned from each program, including at least one from each of the four Provide Aerospace Products and Capabilities subprocesses, commensurate with current program status. Data will be implemented in process improvement and program/ project management training.	OP5	Capture best practices/lessons learned in each of the four PAPAC subprocesses: project and program formulation, approval, implementation, and evaluation.	Technical Leadership (ESD)
N/A		Define and implement a system to measure the performance of the processes associated with the delivery of new products (the DNP processes).	(ESD)
		Define and implement a formal continuous improvement program for the DNP processes.	
		Complete the OP/SP Europa and CloudSAT DNP preliminary design process pilots, and incorporate lessons learned in the formulation processes.	
		Pilot improvements in key areas of the mission software process with at least one flight project.	
		Provide training resources and processes that support the goal of 40 hours of training per employee.	Institutional Leadership (Human Resources)
		Significantly reduce cycle time of key HR processes affecting hiring and promotion	
		Ensure continuing proper management of the financial aspects of all JPL activities.	(Associate Director, Financial)

Objective: Focus on integrated technology planning and technology development in cooperation with commercial industry and other NASA partners and customers.

Dedicate the percentage of the Agency's R& D budget that is established in the FY99 process to commercial partnerships.	OP 6	Initiate at least one formal, technology development partnering agreement with an aerospace firm.	Reimbursable Work

NASA FY'00 Performance Target	NASA ID#	JPL Objective	JPL Imp. Plan ref.
		Increase reimbursable funding of technology developments or demonstrations that support NASA needs by at least 10%.	
		30% of JPL's R&D budget (as defined by Headquarters) will be reflected in commercial partnerships.	Outreach (C&TT)
Increase the amount of leveraging of the technology budget with activities of other organizations, relative to the FY99 baseline that is established during the process development.	OP7	Increase the number of formal, technology development partnering agreements with federal organizations by at least one.	Reimbursable Work
		Increase reimbursable funding of in-situ technologies by at least 10%.	
		Arrange for at least one new JPL technology to be demonstrated on a mission of another agency, or for another agency's technology to be flown on a JPL mission.	
N/A	.	Stimulate private sector investment in JPL research, development, and missions. Identify one commercial opportunity.	Outreach (C&TT)
		Execute at least 200 NASA/Caltech licenses (patents and copyrights) for use of intellectual property.	

Generate Knowledge Cross-cutting Process

Generate Knowledge Goal: Extend the boundaries of knowledge of science and engineering, capture new knowledge in useful and transferable media, and share new knowledge with customers.

Objectives:

- **Acquire advice**
- **Plan and set priorities**
- **Select and fund/conduct research and analysis programs**
- **Select and implement flight missions**
- **Analyze data (initial)**
- **Publish and disseminate results**
- **Create archives**
- **Conduct further research**

N/A		Select a Grand Challenge research concept for JPL and start investigation.	Institutional Leadership and Operations (Chief Scientist)
		Initiate at least two additional memoranda of understanding with universities.	

NASA FY'00 Performance Target	NASA ID#	JPL Objective	JPL Imp. Plan ref.
		Ensure the establishment of an astrobiology laboratory/facility at JPL by the end of FY'00.	
		Ensure the upgrade of data acquisition system for the Near Earth Objects Project is complete by the end of FY'00.	
		Initiate a new research and development program on quantum technology.	
		Initiate a new research and development program on isotopic remote sensing of carbon and oxygen.	

Communicate Knowledge Cross-cutting Process

Communicate Knowledge Goal: Ensure that NASA's customers receive the information derived from NASA's research efforts that they want, in the format they want, for as long as they want it.

Objective: Highlight existing and identify new opportunities for NASA's customers, including the public, the academic community, and the Nation's students, to participate directly in space research and discovery.

Assist customers who use the STI Help Desk and the NASA Image eXchange (NIX) digital image data base within a specific turnaround period.	OC10	[Increase and improve public access to online and printed materials.]	Institutional Outreach (Education)
Support no less than 800 portable exhibit loans and send portable exhibits to a minimum of 175 targeted events per year.	OC11	[Engage the public through participation in major events and activities.]	
Seek to maintain a level of participation involvement of approximately 3 million with the education community, including teachers, faculty, and students.	OC1	[Enhance teacher and student training, education, and participation in science, math, and technology (following the six program objectives established in NASA's Strategic Plan for Education) using our program results and information.]	
Increase new opportunities to transfer technology to private industry from 19,600 to 19,800. These opportunities will be made available to the public through the TechTracs data base and will be measured by monitoring a controlled data field that indicates the number of new technologies communicated to the public.	OC9	Enhance opportunities to reach out to industry and to communicate the societal benefits of space research to the general public.	
N/A		Provide continuous improvement in customer service through regular reporting and systematic evaluation on all activities.	

Objective: Improve the external constituent communities' knowledge, understanding, and use of the results and opportunities associated with NASA's programs.

NASA FY'00 Performance Target	NASA ID#	JPL Objective	JPL Imp. Plan ref.
The Office of Scientific and Technical Information plans to improve the NIX metasearch engine accessing all NASA digital image data bases, adding QuickTime, video, animation, and browse categories on NASA's key topics of interest to customers.	OC6	[Increase and improve public access to online and printed materials.]	Institutional Outreach (Education)
The Office of Public Affairs is acquiring the capability to provide the media with digital, high- definition video when broadcasting industry converts to digital broadcasting in the next decade. It will also add a searchable online digital version of the NASA Headquarters photo archive to the NASA Home Page.	OC12	Enhance opportunities to communicate through mass media.	
The Office of Public Affairs will open exhibits to new audiences. A series of new exhibits with updated information on the Agency's four Enterprises will begin circulation. New Internet sites to inform the public of exhibits available for loan will expedite the loan process and attract new audiences. Two NASA Centers will create new exhibits and renovate visitor facilities to attract and accommodate additional visitors.	OC13	[Engage the public through participation in major events and activities.]	
The History Office will target high school students through the use of a History Day competition on "Science, Technology, and Invention." The contest is being conducted in concert with the History Day Organization, with cosponsored teacher workshops at every NASA Center.	OC14	[Enhance teacher and student training, education, and participation in science, math, and technology (following the six program objectives established in NASA's Strategic Plan for Education) using our program results and information.]`	
The Office of Aero-Space Technology's Aerospace Technology Innovation publication will be targeting medical facilities for new readership, as well as the automotive industry for new technology transfer opportunities. The organization will attend the Society for Automotive Engineers annual tradeshow in Detroit, Michigan.	OC15	[Enhance opportunities to reach out to industry and to communicate the societal benefits of space research to the general public.]	
Increase the NASA- sponsored, -funded, or –generated report documents for the scientific community and public from 11,600 to 13,920.	OC4	[Increase and improve public access to online and printed materials.]	
Increase the nontraditional NASA-sponsored scientific and technical information through the NIX digital image data base from 300,000 in FY98 to more than 470,000 in FY00.	OC16	[Increase and improve public access to online and printed materials.]	
Increase the number of searched pages in NASA web space by 5% per year, relative to the FY99 baseline.	OC17	[Increase and improve public access to online and printed materials.]	
Maintain a baseline for live satellite interview programs of no less than 10 live shots per month.	OC19	[Enhance opportunities to communicate through mass media.]	

NASA FY'00 Performance Target	NASA ID#	JPL Objective	JPL Imp. Plan ref.
Provide publications that will communicate technologies available for commercial use and technologies that have been commercialized by industry to facilitate technology transfer. The three principal publications are Innovation, Spinoff, and Tech Briefs, whose effectiveness will be measured by monitoring readership and frequency of use as sources of reference.	OC21	[Enhance opportunities to reach out to industry and to communicate the societal benefits of space research to the general public.]	
		Contribute at least 50 NASA commercial success stories	Outreach (C&TT)
		Increase by 200 the number of new technologies communicated to the public. Achieve at least 200 of the new technologies reported in NASA.	
		Supply at least one new medical-related technology for publication in NASA's *Technology Innovations*.	
		Provide at least three articles on appropriate technologies for each of NASA's principal technology communications publications (*Innovations*, *Spinoff*, and *Tech Briefs*).	

Related Documents

National Space Policy, September 19, 1996

http://www.whitehouse.gov/WH/EOP/OSTP/NSTC/html/fs/fs-5.html

NASA Strategic Management Documents

NASA strategic plans, enterprise plans, and center (including JPL) plans
http://www.hq.nasa.gov/office/codez/plans.html

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

NASA memorandum to Jet Propulsion Laboratory (attention Director) from S/Associate Administrator for Space Science, "Assignment for Lead Center Responsibility for NASA Participation in Foreign Space Science Mission," May 5, 1999.

Lead Center for Solid Earth and Physical Oceanography Missions [assignment pending]

NASA Code AE approval copy of JPL letter 5020-98-037L HKD:TEG:pb, "JPL Proposal for the NASA Electronic Parts and Packaging Lead Center Role," letter dated October 15, 1998, approval dated November 5, 1998.

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Abbreviations

632	Budget line item for multi-enterprise technology led by Code S
ACRIMSAT	Active Cavity Radiometer Irradiance Monitor Satellite
ADEOS	Advanced Earth Observing Satellite
AFRL	Air Force Research Laboratory
AIRS	Atmospheric Infrared Sounder
AIRSAR	Airborne Synthetic Aperture Radar
AlphaSCAT	Alpha Scatterometer
AMSU	Advanced Microwave Sounding Unit
APEx	Athena Precursor Experiment (Mars'01)
ARISE	Advanced Radio Interferometer between Space and Earth
ASF	Alaska SAR Facility
ASI	Agency Safety Initiative
ASTER	Advanced Spaceborne Thermal Emission and Reflection Radiometer
AVIRIS	Airborne Visible Infrared Imaging Spectrometer
BETSCE	Brilliant Eyes Ten-Kelvin Sorption Cryocooler Experiment
BMDO	Ballistic Missile and Defense Organization
Caltech	California Institute of Technology
CETDP	Cross-Enterprise Technology Development Program
CHEM	Chemistry [EOS satellite]
CHeX	Confined Helium Experiment
CISM	Center for Integrated Space Microsystems
CISSR	Center for In Situ Exploration and Sample Return
CMO	Contracts Management Office
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)
CSMAD	Center for Space Mission Architecture and Design
CSMISS	Center for Space Mission Information and Software Systems

CSMT	Center for Space Microelectronics Technology
CY	calendar year
DAAC	Distributed Active Archive Center
DARPA	Defense Advanced Research Projects Agency
DCATT	Development Cryogenic Active Telescope Testbed
DIS	Data and Information System
DISA	Defense Information Systems Agency
DNP	Develop New Products Project
DOD	Department of Defense
DS	Deep Space
DSMS	Deep Space Mission System
DSN	Deep Space Network
ECAP	employee contribution and performance (performance evaluation)
EMLS	EOS MLS
EOS	Earth Observing System
EOSDIS	Earth Observing System Data and Information System
ESA	European Space Agency
ESD	Engineering and Science Directorate
ESSP	Earth System Science Pathfinder
ESTO	Earth Science Technology Office
FIRST	Far Infrared and Submillimeter Telescope
FHLP	Flight Hardware Logistics Program
FY	fiscal year
GALEX	Galaxy Evolution Explorer
GGN	Global GPS Network
GODAE	Global Ocean Data Assimilation Experiment
GPMC	Governing Program Management Council
GPS	Global Positioning System
GRACE	Gravity Recovery and Atmospheric Change Experiment
GSFC	Goddard Space Flight Center
HEDS	Human Exploration and Development of Space Enterprise
HPCC	High-Performance Computing and Communications
HSB	Humidity Sounder Brazil
HQ	Headquarters

IBS	Institutional Business Systems
ICIS	Institutional Computing and Information Services Office
IGS	International GPS Service
IMAS	Integrated Multispectral Atmospheric Sounder
I/O	input/output
IR	infrared
IRAC	Infrared Array Camera
IRS	Infrared Spectrograph
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
ISS	International Space Station
ITEA	International Technology Education Association
JPL	Jet Propulsion Laboratory
JSC	Johnson Space Center
KSC	Kennedy Space Center
LAN	local area network
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
MGS	Mars Global Surveyor
MIDEX	Mid-Sized Explorer
MISR	Multi-Angle Imaging Spectro Radiometer
MLS	Microwave Limb Sounder
MOU	memorandum of understanding
MSFC	Marshall Space Flight Center
MSP	Mars Surveyor Program

MUSES-CN	Mu Space Engineering Satellite
MVACS	Mars Volatiles and Climate Surveyor
NASA	National Aeronautics and Space Administration
NBS	New Business Systems
NEAP	Near-Earth Asteroid Prospector Mission
NEAT	Near-Earth Asteroid Tracking
NEPP	NASA Electronic Parts and Packaging Program
NGST	Next-Generation Space Telescope
NIMA	National Imagery Mapping Agency
NMP	New Millennium Program
NOAA	National Oceanic and Atmospheric Administration
NRA	NASA Research Announcement
NRO	National Reconnaissance Office
NSCAT	NASA Scatterometer
NSTAR	In Space Transportation Advanced Space Transportation Program
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
PAPAC	provide aerospace products and capabilities cross-cutting process
PBM	process-based management
PM-1	first evening EOS satellite
PMIRR	pressure-modulated infrared reflectance radiometer
PODAAC	Physical Oceanography Distributed Active Archive Center
POP	program operating plan
PRAD	Product Resources Administration Division
QuikSCAT	Quick Scatterometer
QWIP	quantum-well infrared photodetector
R&D	research and development
SAC-C	Satellite de Aplicaciones Cientificas-C
SAGE	Stratospheric Aerosol and Gas Experiment
SAR	synthetic aperture radar
SBIR	Small Business Innovation Research
SCIGN	Southern California Integrated GPS Network
SESPD	Space and Earth Science Programs Directorate

SEU	Structure and Evolution of the Universe
SIM	Space Interferometry Mission
SIR-C	Shuttle Imaging Radar-C
SIRTF	Space Infrared Telescope Facility
SIS	superconductor-insulator-superconductor
SMAD	Safety and Mission Assurance Directorate
SMEX	Small Explorer
SOLVE	Sage III Ozone Loss and Validation Experiment
SOMO	Space Operations Management Office
SRTM	Shuttle Radar Topography Mission
SSE	Space Science Enterprise
STB	system testbed
STEP	Satellite Test of the Equivalence Principle
STRV	Space Test Research Vehicle
SVLBI	Space Very-Long-Baseline Interferometry
TAM	Thurst Area Manager
TAP	Technology and Applications Programs (Directorate)
TES	Tropospheric Emission Spectrometer
TMOD	Telecommunications and Mission Operations Directorate
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
X-SAR	X-Band Synthetic Aperture Radar

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http://techinfo.jpl.nasa.gov/implementationplan/