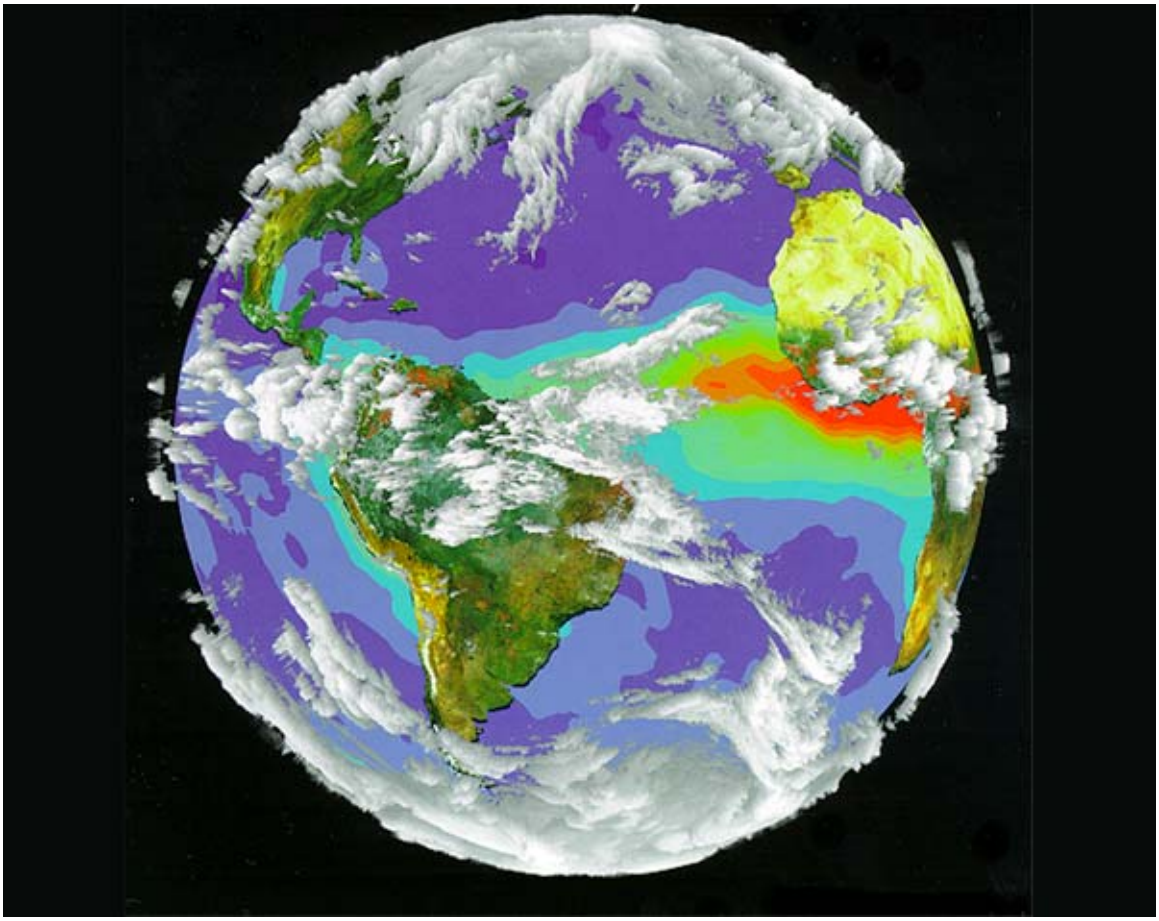
THEME: Earth System Science



This image combines data sets of sea surface temperature, land vegetation cover, cloud cover, and large-scale fires from the Terra satellite Combining such data sets allows us to see the Earth as a system of interacting atmosphere, oceans, land, ice, and life. NASA introduced the concept of Earth System Science to promote total understanding of how Earth's atmosphere, biosphere, oceans, and continents shape Earth's climate and its variations. This way of looking at the Earth as a system is a powerful means of understanding and predicting changes we see around us, giving us the capability to better protect ourselves and our home planet.

EARTH SYSTEM SCIENCE

MAJOR EVENTS IN FY 2004

- Launches of Aura, Cloudsat and Calipso satellites. Aura will study Earth's ozone, air quality, and climate. Cloudsat will measure the structure of clouds to better quantify their key role in the Earth's water cycle and climate system. Calipso, with Aura and the advanced polarimeter, will study the role of aerosols in climate, reducing uncertainties in climate models.
- Use satellite observations to provide daily and seasonal global atmospheric water vapor, rainfall, snowfall, sea-ice, and ice-sheet maps; use these observations to improve scientific understanding and models of water cycle through the Earth system.
- Use satellite-derived localized temperature and moisture profiles, with unprecedented accuracy and global coverage, to improve predictive capabilities of regional weather models.
- Assimilate satellite and in situ observations into a variety of ocean, atmosphere, and ice models for purposes of estimating the state of Earth's seasonal and decadal climate.
- Demonstrate the benefits of formation flying satellites in a constellation (i.e. creating first super-satellite) to enable generation of integrated science products, e.g., aerosol distribution, optical thickness and properties to assess affect on climate aerosols.

THEME: Earth System Science

OVERVIEW

NASA uses the vantage point of space to observe Earth and understand both how it is changing and the consequences for life. The Earth System Science Theme works with the science community to answer questions on the frontiers of science that have profound societal importance, and for which remote sensing of the Earth can make a defining contribution. The program funds research at the Nation's universities, conducts research at NASA Centers, and collaborates with other research agencies and the U.S. Climate Change Science Program Office/U.S. Global Change Research Program, and the National Research Council to define these questions and lay the scientific foundation for prioritizing and approaching them. The program is answering the scientific community's call for comprehensive observation of the Earth's major components. Research results contribute to the development of sound environmental policy and economic investment decisions. With the FY 2004 budget request, NASA will continue its progress in answering key scientific questions and demonstrating practical applications in response to national priorities.

Missions	Goals supported by this theme	Objectives supporting those goals Reference 2003 Strategic Plan
Understand and Protect our Home Planet	1. Understand the Earth System and apply Earth system science to improve prediction of climate, weather, and natural hazards.	1.1 Understand how the Earth is changing, better predict change, and understand the consequences for life on Earth.
Inspire the Next Generation of Explorers	6. Inspire and motivate students to pursue careers in science, technology, engineering, and mathematics.	6.3 Enhance science, technology, and mathematics instruction with unique teaching tools and experiences that only NASA can provide, that are compelling to teachers and students. (Supporting Role)
	7. Engage the public in shaping and sharing the experience of exploration and discovery.	7.2 Improve science literacy by engaging the public in NASA missions and discoveries, and their benefits, through such avenues as public programs, community outreach, mass media, and the internet. (Supporting Role)

RELEVANCE

The NASA Earth System Science program is driven by the recognition of the societal importance of the natural variability of the Earth system and the realization that humans are no longer passive participants in global change, but are instead causing significant changes in atmospheric composition, land use and land cover, and water resources.

Our satellites are examining the global water cycle, including the roles of precipitation and ice. Understanding how water cycles through the Earth system of oceans, atmosphere, land, and ice is essential for assessing the future of fresh water availability in the U.S. Southwest and other thirsty regions of the globe. NASA is also studying the seasonal rhythm of terrestrial and marine ecosystems on a global scale for the first time. This view of the seasonal uptake and release of carbon provides us with new insights into the role of ecosystems in the carbon cycle. This research helps us assess the impact of global change on food and fiber production.

The FY 2004 budget reflects the alignment of the Earth System Science program with the President's call for action through the U.S. Climate Change Research Initiative (CCRI). In support of this effort, we are accelerating the development and launch of an advanced polarimeter to increase our understanding of black carbon soot and other aerosols as causes of climate change.

Education and Public Benefits
The Earth Systems Science theme increases public awareness and understanding of how the Earth functions as a system, and enables the use of Earth science information and results in teaching and learning at all levels of education. We also build capacity for productive use of Earth science results, technology, and information in resolving everyday practical problems via the Earth Science Applications theme.

THEME: Earth System Science

IMPLEMENTATION

Earth System Science employs a constellation of more than 15 Earth observing satellites routinely making measurements with over 80 remote sensing instruments to observe the Earth. This information is used to analyze, model, and improve our understanding of the Earth system. Data gathered by these spacecraft will enable improved predictions of climate, weather, and natural hazards.

Earth System Science is a multiple-project program with program responsibility in the Office of Earth Science at NASA HQ. Enterprise official is Dr.Ghassem Asrar, Associate Administrator for Earth Science at HQ. Theme Director is Dr. Jack Kaye at HQ.

Strategy and Purpose
NASA works with the science community to identify questions on the frontiers of science that have profound societal importance, and to which remote sensing of the Earth can make a defining contribution. These science questions become the foundation of a research strategy, which defines requirements for scientific observations, and a roadmap for combining the technology, observations, modeling efforts, basic research, and partnerships needed to answer the questions over time. The roadmaps listed below can be seen at: http://earth.nasa.gov/roadmaps
Climate Variability and Change - Develop integrated models of the ocean, air, cryosphere and land surface, and apply to retrospective and future studies of climate variability and change.
Weather - Develop the technology, observational and modeling capacity needed to improve daily and extreme weather forecasting (e.g. hurricanes, tornadoes).
Atmospheric Composition - Understand the trace constituent and particulate composition of the Earth's atmosphere and predict its future evolution.
Carbon Cycle, Ecosystems, and Biogeochemistry - Understand and predict changes in the Earth's terrestrial and marine ecosystems and biogeochemical cycles.
Water & Energy Cycles - Characterize and predict trends and changes in the global water and energy cycles.
Earth Surface and Interior Structure - Utilize state-of-the-art measurements and advanced modeling techniques to understand and predict changes in the Earth's surface and interior.
Tailoring: No exceptions to NPG 7120.5B have been taken.

STATUS

In FY02, this Theme advanced our knowledge of the Earth system in many ways, including:

• Polar Ice Sheets: Knowledge about the ice-covered regions in Greenland and Antarctica provided us with the ability to make a quantitative assessment of changes in ice cover. This knowledge will aide scientists in their ability to test climate models, and will also improve our ability to provide assessments of potentially hazardous changes in sea level and sea ice distributions.

• Atmospheric Aerosols: The most comprehensive evaluation of the global distribution and properties of atmospheric aerosols became available in FY02. The current data provides information not just on aerosol presence, but on the nature of the aerosol particle, including whether or not it can have a net warming or cooling effect on the local climate, and how it interacts with the climate. Combined with ground-based data, this information can help scientists understand aerosol impacts on local weather, agricultural productivity, and air quality.

• Clouds: NASA made great progress in linking satellite and in situ measurements of clouds with their effects on atmospheric radiation. Detailed in situ observations of clouds were made during a NASA-led campaign in which one platform used a suite of more than two dozen instruments to make comprehensive measurement of cloud particle properties. The results should improve information about cloud particle distributions and properties, understanding of satellite remote sensing of clouds, and characterization of cloud formation in climate models.

• Precipitation Studies: Data from several years of operation of the Tropical Rainfall Measuring Mission (TRMM) satellite were available in FY02, and as a result, uncertainty about the global rainfall distribution in the tropics has been reduced by a factor of two, and our knowledge of the variation in precipitation from year to year has been enhanced.

THEME: Earth System Science

PERFORMANCE MEASURES

Annual Performance Goals	
	OUTCOME: A well managed program in accordance with Agency implementing strategies.
4ESS1	Development: Each project will complete its current phase within 10% of total life-cycle cost shown on the table below.
4ESS2	Research: Each Research project will allocate 80% of its funding competitively during FY04.
4ESS3	Development: Each project will complete its mission within 10% of its baseline schedules.
4ESS4	Technology: Successfully develop and infuse technologies that will enable future science measurements. We will do this by: 1) advancing 25% of funded technology developments one Technology Readiness Level (TRL); 2) maturing 2-3 technologies to the point where they can be demonstrated in space or in an operational environment.
4ESS5	Operations: At least 90 percent of all on-orbit instruments will be operational during their design lifetimes.
4ESS6	Data information system and services: Disseminate data that are easy to access to science focus area customers.
1.1.1	OUTCOME: Observe, analyze, and model the Earth system to discover how it is changing and the consequences for life on Earth.
4ESS7	**Atmospheric Composition -** Integrate high latitude satellite, suborbital, and ground based observations, coupled with laboratory studies and model calculations to assess the potential for future ozone depletion in the arctic, and characterize the properties and distributions of various types of clouds and aerosols as they relate to the extinction of solar radiation in the atmosphere. In the 2010-2014 timeframe, we will aim to improve our ability to predict future ozone change by developing multi-year maps of key tropospheric pollutants and their altitude distribution and variability. Progress toward achieving outcomes will be validated by external review.
4ESS8	**Weather -** Improve predictive capabilities of regional models using satellite-derived localized temperature and moisture profiles and ensemble modeling. We plan to greatly improve weather and severe storm forecasting by 2014 by creating cloud models with detailed microphysics and spatial resolution of approximately 25 kilometers or less. Progress toward achieving outcomes will be validated by external review.
4ESS9	**Carbon Cycles, Ecosystems, and Biogeochemistry -** Reduce land cover errors in ecosystem and carbon cycle models, and quantify global terrestrial and marine primary productivity and its interannual variability. One goal we plan to reach by the 2010-2014 timeframe is the identification and quantification of carbon sources and sinks at the sub-regional scales (approximately 100 kilometers) with high confidence, leading to progress in predicting the future of carbon-cycling. Progress toward achieving outcomes will be validated by external review.
4ESS10	**Water and Energy Cycle** - Enhance land surface modeling efforts, which will lead to improved estimates of soil moisture and run-off. One of our goals for the 2010-2014 timeframe is to have global observation of precipitation over the entire diurnal cycle and important land surface quantities, such as soil moisture and snow quantity at mesoscale resolution (i.e., on the order of kilometers). Progress toward achieving outcomes will be validated by external review.
4ESS11	**Climate, Variability and Change -** Assimilate satellite and in situ observations into a variety of ocean, atmosphere, and ice models for purposes of state estimation; provide experimental predictions on a variety of climatological timescales; and determine the plausibility of these predictions using validation strategies. One of the goals in the 2010-2014 timeframe is the development of 10-year or longer climate forecasts leading to better informed policy choices on greenhouse gas emissions and carbon management. Progress toward achieving outcomes will be validated by external review.
4ESS12	**Earth Surface and Interior Structure -** Advance understanding of surface change through improved geodetic reference frame, estimates of mass flux from satellite observations of Earth's gravitational and magnetic fields, and airborne and spaceborne observations of surface height and deformation. One goal toward predicting changes in Earth's surface is to achieve high resolution global topography at meter resolution and decimeter vertical accuracy for the 2010-2014 timeframe. Progress toward achieving outcomes will be validated by external review.
6.3.1	OUTCOME: Improve quality of STEM instruction.
4ESS13	Education: Make Earth science information products available to curricula developers.
7.2.2	OUTCOME: Engage the public in NASA's scientific exploration of Earth from space.
4ESS14	Post the most exciting imagery and explanations about Earth science on the Earth observations/ESE website.

THEME: Earth System Science

INDEPENDENT REVIEWS

Types of Review	Performer	Last Review	Next Review	Purpose
External Peer Review	Nat Academy of Science	2000	2003	Review of Science Plan
External Peer Review	Earth Science Advisory Committee	Nov 2002	Nov 2003	Annual peer review

BUDGET

Budget Authority ($millions)	FY02	FY03	Chng	FY04	Comments
Earth System Science	**1,241.4**	**1,248.8**	**+228.6**	**1,477.4**	
Development	665.5	332.7	-54.2	278.5	
Aura	70.4	85.3	-32.8	52.5	
GIFTS (EO-3)	30.0	22.3	+4.7	27.0	
Cloudsat	25.3	27.4	-10.9	16.5	
Calipso	29.5	33.8	-5.4	28.4	
Special:Seawinds	3.8	2.2	+2.3	4.5	
Special: IceSAT	29.2	0.0	0.0	0.0	
Special: SORCE	21.0	4.0	-1.9	2.1	
EOSDIS	291.5	74.3	+24.0	98.3	
Prior and Small Projects < $100m	164.8	83.4	-57.3	26.1	
CCRI Polarimeter Development			+23.2	23.2	New Initiative (See SAE 8-2).
Operations	48.0	247.8	+74.4	322.2	
Technology and Advanced Concepts	189.3	311.0	+42.3	353.3	
Technology Infusion	71.8	65.0	+13.9	78.9	
Missions in Formulation	117.5	246.0	+28.4	274.4	
Research	338.6	357.3	+166.1	523.4	

Note: For all formats, the FY 02 column reflects the FY 2002 Congressional Operating Plan dated 9/30/02. The FY 03 column reflects the FY 2003 President's Budget Submit (PBS) as Amended. The Change column includes both programmatic and full cost adjustments. FY 2004 column is in full cost.

Indicated budget numbers in Full Cost.

Indicates changes since the FY 2003 Presidents Budget Submit.

FY 2002 and FY 2003 are not in full cost.

THEME: Earth System Science

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THEME: Earth System Science

DEVELOPMENT: AURA

PURPOSE

Objectives	Reference 2003 Strategic Plan	Performance Measures
1.1		4ESS1, 4ESS3, 4ESS7

The Aura mission will study the Earth's ozone, air quality, and climate, providing answers to the following questions: 1) Is the ozone layer, which shields us from the Sun's ultraviolet radiation, recovering? The release of chlorofluorocarbons (CFC's) has caused a dramatic decrease in the ozone layer during the last two decades, especially over Earth's polar regions, but detection of stratospheric ozone depletion led to the regulation and phasing-out of CFC production worldwide. 2) Is global air quality getting worse? The chemistry of Earth's lower atmosphere, the troposphere, is changing. At this level of the atmosphere, ozone pollution, an extremely toxic byproduct of agricultural burning, deforestation, urban activity, and industry, is increasing worldwide. 3) How is Earth's climate changing? Ozone and water vapor in the upper troposphere and lower stratosphere are important "greenhouse gases," playing a significant role in regulating our climate. Understanding how water vapor and ozone vary will reveal how these constituents moderate global temperature increases.

OVERVIEW

Aura is the third major satellite in the Earth Observing System constellation. The first and second missions, Terra and Aqua, are designed to study the land, oceans, and the Earth's radiation budget. Aura's chemistry measurements will follow up on measurements which NASA pioneered with its Nimbus 7 satellite (1978), continued with NASA's Upper Atmosphere Research Satellite (1991), and the Total Ozone Mapping Spectrometer (TOMS) series of missions. The satellite will be launched in January 2004 and operate for five or more years.

Link to project homepage for more information: http://aura.gsfc.nasa.gov/

PROGRAM MANAGEMENT

Aura is part of the EOS program with program responsibility delegated to the Goddard Space Flight Center. The GSFC Program Management Council (PMC) has Aura Project governing responsibility. Enterprise official is Dr. Ghassem Asrar, Associate Administrator for Earth Sciences. Theme Director is Dr. Jack Kaye. Aura Program Manager is Doug McCuistion.

TECHNICAL COMMITMENT

The baseline for this technical commitment was made in 1993. However, the final baseline consistent with these requirements was not reached until 1995. The requirements are detailed in the EOS Program Commitment Agreement.

Technical Specifications	FY04 President's Budget	Change from Baseline - None
The Aura project will launch four instruments on the EOS Common Spacecraft into a 705km, 98.2-degree inclination, sun-synchronous orbit. The spacecraft will have an equatorial crossing time (ascending node) of 1:45pm.		
The **High Resolution Dynamic Limb Sounder (HIRDLS)** - Infrared limb-scanning radiometer designed to look through the "edge" of Earth's atmosphere to study aerosols and clouds.		
The **Microwave Limb Sounder (MLS) -** Passive microwave radiometer/spectrometer which will study ozone depletion and radiation in the Earth's troposphere and stratosphere.		
The **Tropospheric Emission Spectrometer (TES) -** Infrared imaging spectrometer to measure global distributions of key atmospheric pollutants.		
The **Ozone Measuring Instrument (OMI) -** An imaging spectrometer to map total column densities of aerosols and ozone in the stratosphere and troposphere.		

Schedule	FY04 President's Budget	Baseline	Change from Baseline
Start of Formulation	Aug-93	Aug-93	--
Spacecraft Delta PDR	Oct-99	Mar-98	+19 Months
Spacecraft Delta CDR	Aug-00	Jun-99	+17 months
Last Instrument Delivery	Nov-02	Mar-99	+17 Months
Operational Readiness Review	Nov-02	Oct-02	+13 Months
Launch Readiness Review	Jan-04	Dec-02	+13 Months
Data Validation Period	1 yr after receipt by investigators		--
Observatory Operational Lifetime	5 years		--

THEME:	Earth System Science
DEVELOPMENT:	AURA

ACQUISITION STRATEGY & PERFORMING ORGANIZATIONS

Major acquisitions for Aura are: three U.S. instruments, spacecraft development, launch vehicle services through the Kennedy Space Center . Three instruments were selected for development in 1990. MLS and TES are built by JPL. HIRDLS is built by Lockheed Martin and the fourth, OMI, was confirmed for the mission in April 1998 and is being built by the Netherlands. The spacecraft is being built as part of the EOS common spacecraft contract by TRW for GSFC. **Changes since FY03 Pres. Budget: None.**

Current Acquisitions	Actual *	Selection Method	Actual *	Performer	Actual *
Cooperative Agreements	0%	Full & Open Competition	100%	Industry	63%
Cost Reimbursable	100%	Sole Source	0%	Government	11%
Fixed Price	0%		####	NASA Intramural	0%
Grants	0%			University	26%
Other	0%	Sci Peer Review	100%	Non Profit	0%
* as % of FY02 direct procurement	100%	* as % of FY02 direct procurement		* as % of FY02 direct procurement	100%

Future Acquisitions - Major	Selection	Goals
No major acquisitions remain, as the program is one year from launch.	N/A	N/A

AGREEMENTS

Internal: Launch services provided by KSC. The program is not dependent on other NASA activities outside of the control of the Associate Administrator for Earth Science.

External: HIRDLS instrument is a joint development with the United Kingdom's Natural Environmental Research Council, and the OMI instrument is provided by the Netherlands' Agency for Aerospace Programs. Both are covered by Memoranda of Agreement between the respective governments. **Changes since FY03 Pres. Budget: None.**

INDEPENDENT REVIEWS

Types of Review	Performer	Last Review	Next Review	Purpose
Indep. Annual Review	IPAO - LARC	Oct-00	TBD	Affirmation of Program Commitment Agreement.
Pre-Environmental Review	SMO		Spring 03	Confirm Observatory is ready for environmental tests.
Pre-Ship Review	SMO		Fall 04	Confirm Observatory is ready for shipment to launch site.

BUDGET/LIFE CYCLE COST

Total budget authority represents the Life Cycle Cost (LCC).

Budget Authority ($ in millions)	Prior	FY02	FY03	FY04	FY05	FY06	FY07	FY08	BTC	Total	Comments
FY 2004 President's Budget (LCC)	551.2	70.4	85.3	52.5	4.6	3.4	0.1	0.1	0.1	767.7	
Development	537.2	63.3	55.2	45.1	4.6	3.4	0.1	0.1	0.1	709.1	
Launch Vehicle	14.0	7.1	30.1	7.4						58.6	
Data Analysis											
(funded through Mission Op and Research activities)											
Changes since FY 03 Pres. Budge		0.0	0.0	+52.4	+4.8	+3.6	+0.1	+0.1	+0.1	+61.1	***Reason for Change:***
Development		+21.3	-14.8	+42.8	+4.6	+3.4	+0.1	+0.1	+0.1	+57.6	Launch Delay to January 2004.
Launch Vehicle		-21.3	+14.8	+7.0						+0.5	Rephase to accommodate delay.
Data Analysis											
Full Cost				+2.6	+0.2	+0.2				+3.0	Inclusion of full cost.
FY 2003 President's Budget (LCC)	551.2	70.4	85.3	0.1						707.0	
Development	537.2	42.0	70.0	0.1						649.3	
Launch Vehicle	14.0	28.4	15.3							57.7	
Data Analysis											
Initial Baseline (LCC)	765.3									765.3	
Development (Feb '95)	707.6									707.6	
Launch Vehicle	57.7									57.7	

Indicates budget numbers in Full Cost.

Indicates changes since the FY 2003 Presidents Budget Submit.

FY 2002, FY 2003, Prior and BTC are not in full cost.

THEME:	Earth System Science
DEVELOPMENT:	CloudSat

PURPOSE

Objectives	Reference 2003 Strategic Plan	Performance Measures
1.1		4ESS1, 4ESS3, 4ESS11

CloudSat observations will improve cloud modeling, contributing to better predictions of cloud formation and distribution and to a better understanding of the role of clouds in Earth's climate system. Clouds are the key component of the Earth's hydrological cycle, and they dominate the planet's solar and thermal radiation budgets. Even small changes in their abundance or distribution could significantly alter the climate. These considerations lead scientists to believe that the main uncertainties in climate model simulations are due to the difficulties in adequately representing clouds and their radiative properties.

OVERVIEW

CloudSat is designed to measure the vertical structure of clouds from space. CloudSat will fly a millimeter-wave (94 GHz) radar that is capable of seeing a large fraction of clouds and precipitation, from very thin cirrus clouds to thunderstorms producing heavy precipitation. CloudSat will furnish data needed to evaluate and improve the way clouds are represented in global models, thereby contributing to better predictions of clouds and a more complete knowledge of their role in climate change.Cloudsat, a collaboration among NASA, the Canadian Space Agency (CSA), and the U.S. Air Force, is co-manifested with CALIPSO. CSA is contributing instrument components and the U.S. Air Force is contributing ground operations.

Cloudsat will answer the following science question: What are the effects of clouds and surface hydrologic processes on Earth's climate?

Link to project homepage for more information: http://cloudsat.atmos.colostate.edu/

PROGRAM MANAGEMENT

CloudSat is part of the Earth Explorers Program, with program responsibility delegated to the GSFC. The GSFC center Program Management Council (PMC) has CloudSat governing responsibility. Enterprise official is Dr. Ghassem Asrar, Associate Administrator for Earth Science. Theme Director is Dr. Jack Kaye. Program Manager is Doug McCuistion.

TECHNICAL COMMITMENT

The baseline for this technical commitment was made in December 2001 and is detailed in the Earth Explorers Program Commitment Agreement (PCA).

Technical Specifications	FY04 President's Budget	Change from Baseline
Instrument:	The CloudSat sensor is the Cloud Profiling Radar (CPR). The CPR is a 94-GHz nadir-looking radar which measures the power backscattered by clouds as a function of distance from the radar.	--
Launch and Mission Profile:	The CloudSat satellite will be co-manifested with CALIPSO on a Delta II launch vehicle. CloudSat will fly in near-formation with Aqua.	
Science Data Products and Processing:	The CloudSat CPR provides calibrated, range-resolved radar reflectivity measurements.	--
Mission Operations:	The U.S. Air Force Space Test Program will provide ground operations and manage communications. It is expected that the data will be downlinked up to 7 times per day.	--
Data Archiving and Distribution:	The Colorado State University Cooperative Institute for Research in the Atmosphere will be responsible for processing, archiving and distributing the mission science data.	--

Schedule	FY04 President's Budget	Change from 03 Baseline
Instrument Del. To I&T	Jul-03	- 4 months
S/C Bus Del. To I&T	Sep-03	-2 months
Launch	Under replan - no earlier than 10/04	+6 months
Mission Design Life	2 years	--

THEME:	Earth System Science
DEVELOPMENT:	CloudSat

ACQUISITION STRATEGY & PERFORMING ORGANIZATIONS

Major acquisitions for CloudSat are: Science investigations; 94GHz Cloud Profiling radar and spacecraft bus; and operations system development. MOU with the Canadian Space Agency (CSA) for radar components, and science operations (2 yrs.). JPL is prime contractor for radar development and overall mission management. Ball Aerospace is building the spacecraft bus under contract with JPL. Data processing provided by Colorado State University under contract with GSFC. **Changes since FY03 Pres. Budget: Implementation Phase of contracts.**

Current Acquisitions	Actual *	Selection Method	Actual *	Performer	Actual *
Cooperative Agreements	0%	Full & Open Competition	100%	Industry	3%
Cost Reimbursable	99%	Sole Source	0%	Government	
Fixed Price	0%		100%	NASA Intramural	94%
Grants	1%			University	3%
Other	0%	Sci Peer Review	100%	Non Profit	0%
* as % of FY02 dir. proc.	100%	* as % of FY02 dir. proc.		* as % of FY02 dir. proc.	100%

Future Acquisitions - Major	Selection	Goals
No major acquisitions remain.	N/A	

AGREEMENTS

Internal: GSFC/JPL - CloudSat Mission Formulation/Implementation Subprocess, 12/00.
External: GSFC/Colorado State University - CloudSat Mission Implementation Phase, 12/00; GSFC/USAF, MOU Ground Support/Mission Operation of SMC-801 CloudSat, 9/00; NASA/Canadian Space Agency, LOA Development of the CloudSat Cooperative Mission, 11/99; NASA/Canadian Space Agency, Interim Agreement, Development of the CloudSat Cooperative Mission, 10/01; SCU/LPL/DOE Memorandum of Agreement; DOE ground validation data from its Atmospheric Measurements program. **Changes since FY03 Pres. Budget: Implementation Phase of contracts.**

INDEPENDENT REVIEWS

Types of Review	Performer	Last Review	Next Review	Purpose
Preliminary Design Review	IIRT	Sep.-00		Demo prelim. designs meet mission reqs w/ acceptable risk.
Mission Confirmation Review	IIRT	Nov.-00		Seek OES AA approval to enter Implementation Phase.
Critical Design Review	IIRT	Jul.-01		Provide tech review of the end-to-end mission system.
Pre-environmental Review	IIRT		TBD	Assess flt. h/w, s/w, & environ. test facilities for acceptance.
Pre-ship Review	IIRT		TBD	Verify sys. elements meet mission reqs & ready for launch.
Operational Readiness Review	IIRT		TBD	Verify sys. elements meet mission reqs & ready for launch.
Mission Readiness Review	IIRT		TBD	Assess readiness of mission to proceed w/ launch & ops.
Flight Readiness Review	IIRT		TBD	Update status; cert. flt. readiness; open MMR issues.
Launch Readiness Review	IIRT		TBD	Final review before launch.

BUDGET/LIFE CYCLE COST

Total budget authority represents the Life Cycle Cost (LCC).

Budget Authority ($ in millions)	Prior	FY02	FY03	FY04	FY05	FY06	FY07	FY08	BTC	Total	Comments
FY 2004 President's Budget (LCC	68.3	25.3	27.4	16.5	2.7	1.7	0.0	0.0	0.0	141.8	
Development	57.4	24.6	16.3	7.5						105.8	
Operations				1.9	2.7	1.7				6.3	
Launch Vehicle	10.9	0.7	11.1	7.0						29.7	
Data Analysis										0.0	
Changes since FY 03 PBS	0.0	+1.5	0.0	0.0	+0.1	+0.1				+1.6	***Reason for Change:***
Development	+1.0	+0.8	+0.4	-0.9						+1.3	LV costs less than projected (held in
Operations				+0.1	+0.1	+0.1				+0.3	reserves).
Launch Vehicle	-1.0	+0.7	-0.4	+0.7						+0.0	
Data Analysis										+0.0	
FY 2003 President's Budget	68.3	23.8	27.4	16.5	2.6	1.6	0.0	0.0	0.0	140.2	Initial baseline set in Formulation;
Development	56.4	23.8	15.9	8.4						104.5	subsequently, mission underwent
Operations				1.8	2.6	1.6				6.0	significant replanning.
Launch Vehicle	11.9		11.5	6.3						29.7	
Data Analysis										0.0	
Initial Baseline	71.1	29.8	10.3	3.1	1.5	0.0	0.0	0.0	0.0	115.8	FY 2001 President's Budget.
Development	58.2	18.3	3.7	0.0	0.0					80.2	
Operations			1.2	3.1	1.5					5.8	
Launch Vehicle	12.9	11.5	5.4							29.8	

Indicates budget numbers in Full Cost.
Indicates changes since the FY 2003 Presidents Budget Submit.

THEME:	Earth Systems Science
DEVELOPMENT:	Cloud-Aerosol Lidar and Infrared Pathfinder Satelllite Observations (CALIPSO)

PURPOSE

Objectives	Reference 2003 Strategic Plan	Performance Measures
1.1		4ESS1, 4ESS3, 4ESS7

The Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations (CALIPSO) mission will address the role of clouds and aerosols in the Earth's radiation budget, providing key measurements to improve climate predictions. Climate models predict a significant global warming in response to the rising concentrations of carbon dioxide and other greenhouse gases in the atmosphere, but uncertainties in the modeled radiative effects of aerosols (small suspended particles) and clouds contribute to the overall uncertainty in the predictions of the climate models. Current predictive capabilities must be improved to enable policy makers to reach balanced decisions on mitigation strategies.

OVERVIEW

The mission will fly a 3-channel lidar (a laser) in formation with Aqua and CloudSat to obtain coincident observations of radiative fluxes and the atmosphere. This set of measurements is essential for quantification of global aerosol and cloud radiative effects. CALIPSO consists of a partnership between NASA and France's Centre Nationale D'Etudes Spatiale (CNES). CNES is providing a PROTEUS spacecraft, the imaging infrared radiometer (IIR), payload-to-spacecraft I&T, and spacecraft mission operations. This mission will improve our ability to predict the future state of Earth's climate. Together, CALIPSO and Aqua provide: (1) a global measurement suite from which the first observationally-based estimates of aerosol direct radiative forcing of climate can be made, (2) a dramatically improved empirical basis for assessing aerosol indirect radiative forcing of climate, (3) a factor of 2 improvement in the accuracy of satellite estimates of long-wave radiative fluxes at the Earth's surface and in the atmosphere, and (4) a new ability to assess cloud-radiation feedback in the climate system. CALIPSO is co-manifested with CloudSat and is scheduled to launch no earlier than October 2004.

Link to project homepage for more information: http://www-calipso.larc.nasa.gov

PROGRAM MANAGEMENT

CALIPSO is part of the Earth Probes program with program responsibility delegated to the Goddard Space Flight Center. The GSFC Program Management Council (PMC) has CALIPSO Project governing responsibility. Enterprise official is Dr. Ghassem Asrar, Associate Administrator for Earth Science. Theme Director is Dr. Jack Kaye. Program Manager is Doug McCuistion.

TECHNICAL COMMITMENT

The baseline for this technical commitment was made in February 2001 and is detailed in the Earth Probes Program Commitment Agreement (PCA).

Technical Specifications	FY04 President's Budget	Change from Baseline
Instruments:	3-channel Lidar, Imaging Infrared Radiometer, and Wide Field Camera	--
Launch and Mission Profile:	Satellite is planned to be launched into a 705km altitude, 98.08 degrees inclined orbit. CALIPSO is planned to be co-manifested with CloudSat on a Delta II launch vehicle and will fly in near formation with Aqua.	--
Science Data Products and Processing:	Science data sets will consist of aerosol and cloud vertical distributions; aerosol extinction and optical depth; cloud extinction, optical depth, emissivity, and effective particle size; and surface and atmospheric radiative fluxes.	--
Mission Operations:	Mission Operations Control Center at LaRC and the CNES-contributed Satellite Operations Control Center in Toulouse, France.	--

Schedule	FY04 President's Budget	Change from 03 Baseline
Instrument Del. To I&T	Jun-03	+1 month
S/C Bus Del. To I&T	May-03	--
Launch	Under replan - no earlier than 10/04	+6 months
Mission Design Life	3 years	

THEME:	Earth Systems Science
DEVELOPMENT:	Cloud-Aerosol Lidar and Infrared Pathfinder Satelllite Observations (CALIPSO)

ACQUISITION STRATEGY & PERFORMING ORGANIZATIONS

Major acquisitions for CALIPSO are: payload, science investigations, science data ground system, algorithm implementation, operations center development; and science operations (3 years). Prime contract with Ball Aerospace for payload awarded in August 1999. MOU agreement in place between NASA and CNES to provide the IIR and Spacecraft PROTEUS bus. **Changes since FY03 Pres. Budget: None**.

Current Acquisitions	Actual *	Selection Method	Actual *	Performer	Actual *
Cooperative Agreements	0%	Full & Open Competition	100%	Industry	95%
Cost Reimbursable	99%	Sole Source	0%	Government	1%
Fixed Price	0%		100%	NASA Intramural	0%
Grants	1%			University	4%
Other	0%	Sci Peer Review	100%	Non Profit	0%
	100%	* as % of FY02 direct procurement			100%

Future Acquisitions - Major	Selection	Goals
No major acquisitons remain.	N/A	N/A

AGREEMENTS

Internal: GSFC/LaRC Memorandum of Understanding, April 1999.

External: NASA/CNES Letter of Agreement (June 1999), NASA/CNES MOU (awaiting signature).

Changes since FY03 Pres. Budget: None.

INDEPENDENT REVIEWS

Types of Review	Performer	Last Review	Next Review	Purpose
System Requirements Review	IIRT	Jan.-00		Review science & tech reqs; demo traceability.
Preliminary Design Review	IIRT	Sep.-00		Prelim. designs meet reqs w/ acceptable risk.
Mission Design Reivew	IIRT	Sep.-00		Prelim. designs meet reqs w/ acceptable risk.
Mission Confirmation Reivew	IIRT	Nov.-00		OES AA approval to enter Implementation Phase.
Delta MDR	IIRT	Mar.-01		Implement rebaseline w/i cost & schedule.
Delta MCR	IIRT	Apr.-01		OES AA approval to enter Implementation Phase.
Critical Design Reivew	IIRT	Mar.-02		Provide expert tech review of mission system.
Payload Pre-Ship Readiness Review	IIRT		TBD	System elements meet reqs/ready for launch.
Satelllite Pre-Ship Reivew	IIRT		TBD	Mission elements meet reqs/ready for launch.
Mission Readiness Review *	IIRT		TBD	Assess readiness of sys. to launch & assess ops.
Flight Readiness Review *	IIRT		TBD	Status; cert. flt. Readines; open MMR issues.
Launch Readiness Review *	IIRT		TBD	Final review before launch.
* IIRT co-chairs support but do not chair				

BUDGET/LIFE CYCLE COST

Total budget authority represents the Life Cycle Cost (LCC).

Budget Authority ($ in millions)	Prior	FY02	FY03	FY04	FY05	FY06	FY07	FY08	Total	Comments
FY 2004 President's Budget	56.5	29.5	33.8	28.4	7.6	4.5	3.0	0.0	163.3	
Development	47.3	27.1	22.8	0.2					97.4	
Operations				21.2	7.6	4.5	3.0		36.3	
Launch Vehicle	9.2	2.4	11.0	7.0					29.6	
Data Analysis									0.0	
Changes since FY 03 PBS	0.0	-1.5	0.0	9.4	1.7	1.6	1.1		12.4	***Reason for Change:***
Development	+3.0	-3.9	+0.5	-11.7					-12.1	LV costs less than proj.
Operations				+9.4					+9.4	Reserves transfer from
Launch Vehicle	-3.0	+2.4	-0.5	+0.7					-0.4	dev. LV costs less than
Date Analysis										2.4% projected
Full Cost				+11.0	+1.7	+1.6	+1.1		+15.5	Inclusion of full cost
FY 2003 President's Budget	56.5	31.0	33.8	19.0	5.9	2.9	1.9	0.0	151.0	Initial baseline set in
Development	44.3	31.0	22.3	11.9					109.5	Formulation;
Operations				0.8	5.9	2.9	1.9		11.5	subsequently, mission
Launch Vehicle	12.2		11.5	6.3					30.0	underwent significant
Data Analysis									0.0	replanning.
Initial Baseline (LCC)	65.6	23.9	16.0	4.5	2.2	0.0	0.0	0.0	112.2	FY 2001 President's
Development (Feb)	52.6	12.4	3.2						68.2	Budget.
Operations			7.5	4.5	2.2				14.2	
Launch Vehicle	13.0	11.5	5.3						29.8	

Indicates budget numbers in Full Cost.
Indicates changes since the FY 2003 Presidents Budget Submit.
FY 2002, FY 2003, Prior and BTC are not in full cost.

THEME: Earth System Science

DEVELOPMENT: SeaWinds

PURPOSE

Objectives	Reference 2003 Strategic Plan	Performance Measures
1.1		4ESS1, 4ESS3, 4ESS11

The SeaWinds missions provide long-term, high-resolution, ocean surface wind data (both speed and direction) used for studies of ocean circulation, climate and air-sea interaction. These measurements are crucial to understanding and predicting severe weather patterns and climate changes. SeaWinds data will increase our knowledge of global ocean circulation over inter-annual and decadal time scales; the effects of hydrological processes on climate; and the relationship of variations in weather, precipitation, and water resources to climate variation.

OVERVIEW

SeaWinds will use a Ku Band microwave radar with a rotating antenna to determine radar scattering globally and to infer wind velocity (speed and direction) over 90% of the ice-free ocean surface every two days with a resolution of 25km. SeaWinds will acquire all-weather, high-resolution measurements of near-surface winds over the global oceans. It will determine atmospheric forcing, ocean response and will characterize air-sea interaction mechanisms on various spatial and temporal scales. SeaWinds will also combine wind data with measurements from scientific instruments in other disciplines to understand mechanisms of global climate change and weather patterns. SeaWinds will improve weather forecasts near coastlines by using wind data in numerical weather and wave prediction models that will also improve storm warning and monitoring.

Link to project homepage for more information: http//winds.jpl.nasa.gov

PROGRAM MANAGEMENT

SeaWinds is part of the Focused Physical Oceanography and Solid Earth (FPOSE) program with program responsibility delegated to JPL. The JPL Program Management Council (PMC) has SeaWinds governing responsibility. Enterprise official is Dr. Ghassem Asrar, Associate Administrator for Earth Science at HQ. Theme Director is Dr. Jack Kaye. Program Manager is Doug McCuistion.

TECHNICAL COMMITMENT

The baseline for this technical commitment was made in March 1998, and is detailed in the EOS Program Commitment Agreement (PCA).

Technical Specifications	FY04 President's Budget	Change from Baseline
* Employ a Ku-band scatterometer to infer wind velocity over 90% of the ice-free ocean surface every		--
two days with a resolution of 25 km for a duration of three years with a goal of five years.		--
* Produce wind vector measurements over the ice-free oceans from 90% of the obtained data within 5 workin		--
days of data receipt.		--
* Flag measurements for the presence of land and ice in the footprint. Where available, use data from AMSR		--
to provide a rain flag.		--
* Wind speed accuracy will be the greater of 2 m/s rms or 10% rms from 3 to 30 m/s; wind direction		--
accuracy will be 20 degrees rms.		--
* Provide software and data to NOAA to enable their production of near-real-time ocean wind vector		--
information from SeaWinds data.		--
SeaWinds Mission data will be used for weather forecasting, storm detection and tracking, global climate studies, monsoon monitoring, ship routing, and as an aid to offshore oil well platform design and spill cleanup.		

Schedule	FY04 President's Budget	Change from Baseline	
Start of Formulation	Dec-92	--	
Start of Implementation (PDR)	May-95	--	
Instrument delivery to Japan (1)	Mar-99	+13 mos	21%
Mission Readiness Review	Oct-02	+39 mos	50%
Launch (1)	Dec-02	+40 mos	50%
Spacecraft and Instrument activation	4 months following launch	--	
Data Calibration/Validation Period	6 months following Instrument activation	--	
Instrument Operational Lifetime	3 years (Goal of 5 years)	--	
(1) Launch date slipped from baseline date of August 1999 to December 2002 due to Japanese launch vehicle problems.			

THEME:	Earth System Science
DEVELOPMENT:	Seawinds

ACQUISITION STRATEGY & PERFORMING ORGANIZATIONS

Major acquisitions for SeaWinds were: Traveling Wave Tube Amplifiers from Hughes Electron Dynamics; Scatterometer Electronics Subsystem from Raytheon; SeaWinds Antenna Subsystem from Honeywell Space Systems Operation; Antenna Assembly Structure from Composite Optics; and Platform Waveguide from Continental Microwave. No acquisitions were planned for FY02 and none are planned for FY03 and FY04. Contracts with universities will be conducted through the Ocean Vector Winds Science Team, which will fund all scientific investigations for SeaWinds. **Changes since FY03 Pres. Budget: None.**

Current Acquisitions	Actual *	Selection Method	Actual *	Performer	Actual *
Cooperative Agreements	0%	Full & Open Competition	100%	Industry	100
Cost Reimbursable	100%	Sole Source	0%	Government	0%
Fixed Price	0%		100%	NASA Intramural	0%
Grants	0%			University	0%
Other	0%	Sci Peer Review	100%	Non Profit	0%
	100%	* as % of FY02 direct procurement			100%

Future Acquisitions - Major	Selection	Goals
N/A Spacecraft was launched December 2002.	N/A	N/A

AGREEMENTS

Internal: The program is not dependent on other NASA activities outside of the control of the Associate Administrator for Earth Science.

External: Memorandum of Understanding between NASDA, NASA and NOAA for Cooperation in the ADEOS-II Program, September 1996. Memorandum of Understanding, between JPL and the Principal Investigator, February 1995. Technical Implementation Agreement between NOAA and NASA Regarding Support by the U.S. Ground System for ADEOS-II, September 1997. **Changes since FY03 Pres. Budget: None.**

INDEPENDENT REVIEWS

Types of Review	Performer	Last Review	Next Review	Purpose
Preliminary Design Review	JPL	May-95		Eval. readiness to proceed with detailed design.
Critical Design Review	JPL	Jan-96		Eval. readiness to proceed with fabrication, assembly, and I&T.
Pre-Environmental Review	JPL	Apr-97		Eval. readiness to test, including procedures, equipment & fac.
Pre-Ship Review	JPL	Mar-99		Eval. readiness to ship Instrument to NASDA.
Operational Readiness Review	JPL	Jul-02		Eval. ops readiness, including fac., procedures & personnel.
Risk Review	JPL	Sep-02		Determine if risks are adequately characterized and assessed.
Mission Readiness Review	JPL	Sep-02		Eval. readiness of systems prior to launch & proceed with ops.

BUDGET/LIFE CYCLE COST

Total budget authority represents the Life Cycle Cost (LCC).

Budget Authority ($ in millions)	Prior	FY02	FY03	FY04	FY05	FY06	FY07	FY08	BTC	Total	Comments
FY 2004 President's Budget	139.0	3.8	2.2	4.5	3.0	2.5	2.3			157.2	
Development	139.0	3.8								142.8	
Operations			2.2	4.5	3.0	2.5	2.3			14.4	
Data Analysis											
(funded through Mission Op and Research activities)											
Changes since FY 03 PBS		-0.7		+3.4	+2.5	+2.3	+2.2			+9.7	***Reason for Change:***
Development		-0.7								-0.7	Reph. due to launch slip to 11/02.
Operations				+3.3	+2.4	+2.2	+2.1			+10.0	Approved O/G for routine ops
Data Analysis											and data processing.
Corp G&A				+0.1	+0.1	+0.1	+0.1			+0.4	
FY 2003 President's Budget	139.0	4.5	2.2	1.0	0.5	0.2	0.1			147.5	
Development	139.0	4.5								143.5	
Operations			2.2	1.0	0.5	0.2	0.1			4.0	
Data Analysis											
Initial Baseline (LCC)	135.0									135.0	FY 1997 President's Budget.
Development	135.0									135.0	Assumed 8/99 launch.
Operations											Embedded in Ground System.

Indicates budget numbers in Full Cost.
Indicates changes since the FY 2003 Presidents Budget Submit.

THEME: Earth System Science

DEVELOPMENT: ICE, Cloud and Elevation Satellite (ICESat)

PURPOSE

Objectives	Reference 2003 Strategic Plan	Performance Measures
1.1		4ESS1, 4ESS3,4ESS11

The Ice, Cloud and Elevation Satellite (ICESat) will measure changes in Earth's ice sheets to support long-term climate variability studies, providing a 3-year data set of ice sheet topography. ICESat will also measure height profiles of clouds and aerosols, land elevations and vegetation cover, and approximate sea ice thickness. The continuous satellite observations will detect interannual changes in the surface mass balance and determine whether they are due to recent or long-term changes in climate.

OVERVIEW

The GLAS instrument on ICESat will determine the distance from the satellite to the Earth's surface and to intervening clouds and aerosols. It will do this by precisely measuring the time it takes for a short pulse of laser light to travel to the reflecting object and return to the satellite. Although surveyors routinely use laser methods, the challenge for ICESat is to perform the measurement 40 times a second from a platform moving 26,000 km (16,000 mi) per hour. In addition ICESat will be 600 km above the Earth and the precise locations of the satellite in space and the laser beam on the surface below must be determined at the same time.
NASA selected Ball Aerospace to provide its Ball Commercial Platform 2000 (BCP 2000) spacecraft bus for this mission. In cooperation with the University of Colorado/ Laboratory for Atmospheric and Space Physics (LASP), Ball Aerospace will provide the mission operations for ICESat. This includes a Mission Operations Center, a Flight Operations Team, and a Flight Dynamics System, all based on systems currently supporting other similar missions.

Link to project homepage for more information: http://icesat.gsfc.nasa.gov/

PROGRAM MANAGEMENT

ICESat is part of the EOS program, with program responsibility delegated to Goddard Space Flight Center (GSFC). The GSFC Program Management Council (PMC) has ICESat Project governing responsibility. Enterprise official is Dr. Ghassem Asrar, Associate Administrator for Earth Science. Theme Director is Dr. Jack Kaye. Program Manager is Doug McCuistion.

TECHNICAL COMMITMENT

The baseline for this technical commitment was made in 4/1998 and is detailed in the EOS Program Commitment Agreement (PCA).

Technical Specifications	FY04 President's Budget	Change from Baseline
The objectives of the ICESat mission will be achieved via a laser altimetry instrument, the Geoscience Laser Altimeter System (GLAS), which is an Nd:YAG laser with 1064 and 532 nm output. The instrument was placed into a 600 km, 94° inclination orbit by a Delta II (Model 7320) Expendable Launch Vehicle (ELV) in January 2003. The spacecraft accommodates the GLAS instrument, which has a mass of less than 300kg and power capacity of 330 W. The ICESat and GLAS instrument have a design lifetime of 3 years. Over that period of time ICESat will: - Produce calibrated profiles of ice-sheet surface elevations over Greenland and Antarctica with better than 20 cm accuracy (1s).		--

Schedule	FY04 President's Budget	Baseline	Change from Baseline
Start of Implementation	Apr-98	Apr-98	--
Spacecraft Complete	Jun-01	Oct 01	-4 Months
Instrument Delivery	Jun-02	Oct 01	+8 Months
Observatory I&T Complete	Oct-02	May02	+5 Months
Operations Readiness Review	Oct-02		--
Launched	Jan-03	Jan-02	+12 Months
Data Validation Period	120 days after launch		--
Observatory Operational Lifetime	3 years		--

THEME: Earth System Science

DEVELOPMENT: ICE, Cloud and Elevation Satellite (ICESat)

ACQUISITION STRATEGY & PERFORMING ORGANIZATIONS

Major acquisitions for ICESat are: spacecraft from Ball Aerospace, launch vehicle from Kennedy Space Center, GPS receivers built by the Jet Propulsion Laboratory, and the GLAS instrument built by the Goddard Space Flight Center (including $9M telescope, lasers, laser reference system, star tracker, heat pipes, and detectors). **Changes since FY03 Pres. Budget: None.**

Current Acquisitions	Actual *	Selection Method	Actual *	Performer	Actual *
Cooperative Agreements	0%	Full & Open Competition	100%	Industry	60%
Cost Reimbursable	0%	Sole Source	0%	Government	0%
Fixed Price	51%		100%	NASA Intramural	0%
Grants	0%			University	0%
Other: Cost Plus	49%	Sci Peer Review	100%	On-site Contractors	40%
* as % of FY02 direct proc.	100%	* as % of FY02 direct proc.		* as % of FY02 direct proc.	100%

Future Acquisitions - Major	Selection	Goals
N/A Mission launched January 2003.	N/A	N/A

AGREEMENTS

Internal: Launch vehicle provided by KSC. ICESat is not dependent on other NASA activities outside of the control of the Associate Administrator for Earth Science.

External: No external agreements exist for ICESat. **Changes since FY03 Pres. Budget: None.**

INDEPENDENT REVIEWS

Types of Review	Performer	Last Review	Next Review	Purpose
Confirmation Review	IPAO	21-Apr-98	N/A	Confirm readiness for mission implementation.
Independent Annual Review	IPAO	4-Oct-00	N/A	Eval. Dev.status in terms of cost, schedule, tech. progress.
GLAS PER	SSMO/ IRT	Apr-02	N/A	Evaluate GLAS readiness for environmemntal testing.
GLAS Pre-ship Review	SSMO/ IRT	15-Jun-02	N/A	Assess environmental results for Instrument shipment.
Observatory PER	SSMO/ IRT	29-Jul-02	N/A	Evaluate observatory readiness for environmemntal testing.
Observatory Pre-Ship Review	SSMO/ IRT	17-Oct-02	N/A	Assess environmental results for observatory shipment.
Launch Readiness Review	SSMO/ IRT	12-Dec-02	N/A	Determine launch readiness.

BUDGET/LIFE CYCLE COST

Total budget authority represents the Life Cycle Cost (LCC). These figures include the following.

Budget Authority ($ in millions)	Prior	FY02	FY03	FY04	FY05	FY06	FY07	FY08	BTC	Total	Comments
FY 2004 President's Budget (LC	192.9	29.2								222.1	
Development	152.2	24.8								177.0	
Launch Vehicle	40.7	4.4								45.1	
Data Analysis (funded through Mission Op and Research activities)											
Changes since FY 03 PBSt		+7.6								+7.6	***Reason for Change:***
Development		+10.1								+10.1	Launch Delaly due to late delivery
Launch Vehicle		-2.5								-2.5	of GLAS instrument.
Date Analysis											
Corporate G&A											
FY 2003 President's Budget	192.9	21.6								214.5	Delayed instrument delivery;
Development	152.2	14.7								166.9	incurred penalties for launch delay.
Launch Vehicle	40.7	6.9								47.6	Instrument optical stability rework.
Data Analysis											
Initial Baseline (LCC)	127.5	37.6								165.1	FY 1997 President's Budget.
Development	83.7	37.6								121.3	
Launch Vehicle	43.8									43.8	

Indicates changes since the FY 2003 Presidents Budget Submit.
FY 2002, FY 2003, Prior and BTC are not in full cost.

THEME: Earth System Science

DEVELOPMENT: Geosynchronous Imaging Fourier Transform Spectrometer (GIFTS)

PURPOSE

Objectives	Reference 2003 Strategic Plan	Performance Measures
1.1		4ESS1, 4ESS3,4ESS8,4ESS10

The Geosynchronous Imaging Fourier Transform Spectrometer (GIFTS) mission will validate advanced technologies for lower cost remote sensing systems, and provide a water vapor winds measurement capability to improve operational weather observation and prediction. This will enable significant improvements in the accuracy of short-term weather forecasts. GIFTS will also monitor pollutants and greenhouse gases in both the Earth's troposphere and stratosphere, improving our ability to forecast air quality.

OVERVIEW

This mission is designed to demonstrate technologies required to measure atmospheric temperature within 1 degree Kelvin and 1 km vertical resolution from geostationary orbit for the first time. Such measurements will enable significant improvements in the accuracy of short-term weather forecasts. In addition, GIFTS will enable advanced technologies and include: an imaging interferometer; large focal-plane array; low power, high efficiency mechanical cooler; and new data readout and signal processing electronics. These technologies will be used for measuring temperature, water vapor, wind, and chemical composition with high resolution in space and time. GIFTS is being planned as a partnership with the Office of Naval Research (ONR) in the Department of the U.S. Navy and NOAA. This partnership will include provisions for funding the spacecraft and launch vehicle (through the U.S. Air Force Space Technology Program office), upgrading the reliability of the instrument to meet a seven-year lifetime, validation of the products by the National Environmental Satellite, Data and Information Service (NESDIS), investing in technology infusion for the next generation of NOAA operational sounders, as well as for transferring

Link to project homepage for more information: http://nmp.jpl.nasa.gov

PROGRAM MANAGEMENT

GIFTS is part of the New Millennium Program (NMP), managed out of the JPL NMP office. The mission is a collaboration among NASA, NOAA, and the Department of the Navy. The project hardware implementation and first year of mission operations is managed by Langley Research Center. Enterprise official is Dr. Ghassem Asrar. Theme Director is Dr. Jack Kaye. Program Manager is Doug McCuistion.

TECHNICAL COMMITMENT

The baseline for this technical commitment was made in the NMP Program Commitment Agreement (PCA).

Technical Specifications	FY04 President's Budget	Change from Baseline
Design for 7-year lifetime. Includes an initial year to demonstrate breakthrough technologies, and an extended period over the Indian Ocean to provide imaging and selected weather products to the U.S. Navy.		--
During both phases, the instrument will perform the following measurements:		
Measure the surface temperature to better than 1/2 Kelvin;		--
Measure temperature profiles of the atmosphere to better than +/- 1 Kelvin for 1 km layers (1s);		--
Measure and spatially resolve the wind velocity to better than 4 m/s for 2 km layers (1s); and		--
Measure the water vapor level to better than 20% accuracy for 2 km layers (1s).		--

Schedule	FY04 President's Budget	Change from Baseline
Start of Formulation	Nov-99	--
Start of Implementation	May-02	--
GIFTS Instrument CDR	Jun-03	--
GIFTS Instrument delivery to S/C	Aug-04	--
Observatory Launch Readiness Date	Nov-05	--
Transfer to Indian Ocean	Mar-06	--
Delivery of Mission Validation Data	Jun-07	--
Observatory Operational Lifetime	7 years with 50% reliability	--

THEME: Earth System Science

DEVELOPMENT: Geosynchronous Imaging Fourier Transform Spectrometer (GIFTS)

ACQUISITION STRATEGY & PERFORMING ORGANIZATIONS

Major acquisitions for GIFTS-IOMI are: Contract with Space Dynamics Lab for the imaging interferometer instrument, complete with subcontracts for detector assemblies (BAE), high reliability lasers (Test), cryocoolers (Lockheed-Martin), and star tracker assemblies (Texas A&M University).

Changes since FY03 Pres. Budget: None.

Current Acquisitions	Actual *	Selection Method	Actual *	Performer	Actual *
Cooperative Agreements	0%	Full & Open Competition	99%	Industry	18%
Cost Reimbursable	100%	Sole Source	1%	Government	13%
Fixed Price	0%		100%	NASA Intramural	1%
Grants	0%			University	68%
Other	0%	Sci Peer Review	100%	Non Profit	0%
* as % of FY02 direct procurement	100%	* as % of FY02 direct procurement		* as % of FY02 direct procurement	100%

Future Acquisitions - Major	Selection	Goals
RAD 750 Processors	FY03/04	N/A
Control Module	FY03/04	

AGREEMENTS

Internal: The program is not dependent on other NASA activities outside of the control of the Associate Administrator of Earth Science.

External: An MOA has been signed with the Department of the Navy and NOAA, with those two agencies responsible for significant portions of the mission hardware and software. Through the Navy, the Air Force is providing the launch vehicle.

Changes since FY03 Pres. Budget: MOA signed July 22, 2002.

INDEPENDENT REVIEWS

Types of Review	Performer	Last Review	Next Review	Purpose
PDR/CDR	SMO	20-Mar-01		Establish design readiness to proceed to implementation.
Delta Confirmation Assessment	SMO	5-Mar-02		Establish maturity of developmental technology components.
Mission Confirmation Review	SMO	23-Apr-02		Determine readiness to proceed to implementation.
Instrument CDR	SMO/IRT		21-Feb-03	Determine instrument readiness to proceed to fabrication and assembly.
Mission CDR	SMO/IRT		15-Mar-03	Determine mission readiness to proceed to production.
Mission Pre-Ship Review	SMO/IRT		15-Aug-05	Determine completeness of observatory verification and test.
Mission Readiness Review	Smo/IRT		15-Sep-05	Establish completeness of mission coordination, ops planning and ground system development.
Launch Readiness Review	SMO/IRT		15-Oct-05	Determine overall system readiness to launch.

BUDGET/LIFE CYCLE COST

Budget Authority ($ in millions)	Prior	FY02	FY03	FY04	FY05	FY06	FY07	FY08	BTC	Total	Comments
FY 2004 President's Budget	26.8	30.0	22.3	27.0	15.5	0.0	0.0			121.6	
Development	26.8	30.0	22.3	27.0	15.5					121.6	
(includes ops for tech demo mission)										0.0	
Changes since FY 03 Pres. Budget				+16.8	+7.9	-3.9	-2.0			+18.8	***Reason for Change:***
Development				+5.0	+2.6	-3.9	-2.0			+1.7	Rephase and restoration of commitment.
Full cost				+11.8	+5.3					+17.1	Inclusion of full cost.
FY 2003 President's Budget	26.8	30.0	22.3	10.2	7.6	3.9	2.0			102.8	
EO-3/GIFTS	26.8	30.0	22.3	10.2	7.6	3.9	2.0			102.8	
Initial Baseline (LCC)	41.8	30.0	7.3	13.4	6.7	4.0	0.0		2.0	105.2	FY 2002 President's Budget.

Indicates budget numbers in Full Cost.
Indicates changes since the FY 2003 Presidents Budget Submit.
FY 2002, FY 2003, Prior and BTC are not in full cost.

THEME: Earth System Science

DEVELOPMENT: Solar Radiation and Climate Experiment (SORCE)

PURPOSE

Objectives	Reference 2003 Strategic Plan	Performance Measures
1.1		4ESS1, 4ESS3, 4ESS7, 4ESS11

The Solar Radiation and Climate Experiment (SORCE) will provide measurements of the Sun's energy input (including x ray, ultraviolet, visible, near-infared, and total solar radiation) to the Earth's atmosphere. The measurements provided by SORCE specifically address long-term climate change, natural variability and enhanced climate prediction, and atmospheric ozone and UV-B radiation. These measurements are critical to studies of the Sun, its effect on our Earth system, and its influence on humankind.

OVERVIEW

SORCE measures the Sun's output with the use of radiometers, spectrometers, photodiodes, detectors, and bolometers engineered into instruments mounted on a satellite observatory. The SORCE satellite orbits around the Earth accumulating solar data. Spectral measurements identify the irradiance of the Sun by characterizing the Sun's energy and emissions in the form of color that can then be translated into quantities and elements of matter. Data obtained by the SORCE experiment will be used to model the Sun's output and to explain and predict the effect of the Sun's radiation on the Earth's atmosphere and climate.

The Total Solar Irradiance (TSI) measurement is a continuation of the first space-borne measurements begun by Nimbus 7 in 1978. Currently, three spacecraft are sustaining the TSI database: ACRIMSAT, the Upper Atmosphere Research Satellite (UARS), and the Solar Heliospheric Observer (SOHO) a Space Science mission. Continued and uninterrupted population and monitoring of the TSI data set will provide insight into the role of solar forcing on long-term climate changes. These measurements will continue the spectrally resolved solar irradiance measurements being made from UARS since 1991, as well as earlier missions for TSI measurements, and will add additional capability. They will be used to further understand the effects of solar variability on long-term global climate change and influences on the stratospheric ozone layer. Additionally, the spectral measurements in the 200-300 nm and 1500 nm spectral regions will fulfill the NPOESS operational requirements as part of a tri-agency partnership among NASA, NOAA, and DoD.

Link to homepage for more information: http://lasp.colorado.edu/sorce/

PROGRAM MANAGEMENT

SORCE is under the EOS program with program responsibility delegated to the Goddard Space Flight Center (GSFC). The GSFC Program Management Council (PMC) has SORCE governing responsibility. Enterprise official is Dr. Ghassem Asrar, Associate Administrator for Earth Science. Theme Director is Dr. Jack Kaye. Program Manager is Doug McCuistion.

TECHNICAL COMMITMENT

Technical Specifications	FY04 President's Budget	Change from Baseline
Total Irradiance Monitor	Absolute Accuracy 150-250 PPM	--
Solar/Stellar Irradiance Comparison Experiment	Spectral Resolution 0.1-0.2 nm, Absolute Accuracy 1.5 - 5%	--
Spectral Irradiance Monitor	Spectral Resolution 0.2 -30 nm, Absolute Accuracy 1500	--
XUV Photometer System	Spectral Resolution 5 - 10 nm, Absolute Accuracy 20%	--

Schedule	FY04 President's Budget	Change from Baseline
Implementation Start (PDR)	May-99	--
SC Complete	Feb-02	+4 months
Last Instrument Delivery	Apr-02	+6 months
I&T Complete	Oct-02	+5 months
Deliver S/C to L/V Site	Oct-02	+4 months
Launch	Jan-03	+6 months
Data Validation Period	Apr-03	+6 months
Observatory Operational Lifetime	Jan-07	+6 months

THEME: Earth System Science

DEVELOPMENT: Solar Radiation and Climate Experiment (SORCE)

ACQUISITION STRATEGY & PERFORMING ORGANIZATIONS

Major acquisitions for SORCE are: Instruments, Program Management, Spacecraft and Operations from the University of Colorado's Laboratory for Atmospheric and Space Physics (LASP). The Spacecraft is subcontracted by LASP to Orbital Sciences Corporation. The LASP contract is a Cost Plus, No Fee. Launch Vehicle is provided by Orbital Sciences Corporation through the Kennedy Space Center.

Changes since FY03 President Budget: NONE

Current Acquisitions	Actual *	Selection Method	Actual *	Performer	Actual *
Cooperative Agreements	0%	Full & Open Competition	100%	Industry	40%
Cost Reimbursable	61%	Sole Source	0%	Government	1%
Fixed Price	37%		100%	NASA Intramural	0%
Grants	0%			University	59%
Other	2%	Sci Peer Review	100%	Non Profit	0%
* as % of FY02 direct procurement	100%	* as % of FY02 direct procurement		* as % of FY02 direct procurement	100%

Future Acquisitions - Major	Selection	Goals
Mission launched Jan. 2003. No acquisitions remaining.	N/A	N/A

AGREEMENTS

Internal: CSOC/JSC (operations); KSC (launch vehicle). *External:* None

Changes since FY03 Presidents Budget: Some Operations support is now provided by CSOC (previous budget assumed LASP was providing all).

INDEPENDENT REVIEWS

Types of Review	Performer	Last Review	Next Review	Purpose
Mission Design Review	SSMO/IRT	May 1999	TBD	Demonstrate prelim. designs meet mission reqmts w/ accep.
Independent Annual Review	IPAO	Oct. 2000	TBD	Evaluate dev. status in terms of cost, schedule, tech. progress.
Mission Operations Review	SSMO/IRT	April 2001	TBD	Evaluate mission operations plans, facilities, etc.
Instrument Pre-Ship Review	SSMO/IRT	Feb. 2002	TBD	Verify system elements meet mission reqmts./ready for launch.
Pre-Ship Review	SSMO/IRT	Oct. 2002	TBD	Verify system elements meet mission reqmts./ready for launch.
Mission Readiness Review	SSMO/IRT	Oct. 2002	TBD	Assess readiness of mission system to launch & assess ops.
Launch Readiness Review	SSMO/IRT	Nov. 2002	TBD	Final review before launch.

BUDGET/LIFE CYCLE COST

Total budget authority represents the Life Cycle Cost (LCC).

Budget Authority ($ in millions)	Prior	FY02	FY03	FY04	FY05	FY06	FY07	FY08	BTC	Total	Comments
FY 2004 President's Budget	73.5	21.0	4.0	2.1	2.2	2.2	2.4	0.8	0.0	108.3	
Development	60.1	10.4	1.5	0.5	0.5	0.5	0.5	0.5		74.5	
Launch Vehicle	13.1	9.1								22.2	
Operations	0.3	1.5	2.5	1.7	1.7	1.7	1.9	0.3		11.6	
Changes since FY 03 PBS		+2.3		+0.1	+0.2	+0.2	+0.6	+0.8		+4.3	***Reason for Change:***
Development		+1.2		+0.1	+0.1	+0.1	+0.1	+0.5		+2.1	Delay and rephase
Launch Vehicle		+0.9								+0.9	Delay
Operations		+0.2		+0.1	+0.1	+0.1	+0.5	+0.3		+1.3	Delay rephase
FY 2003 President's Budget	73.5	18.7	4.0	2.0	2.0	2.0	1.8	0.0	0.0	104.0	
Development	60.1	9.2	1.5	0.4	0.4	0.4	0.4			72.4	
Launch Vehicle	13.1	8.2								21.3	
Operations	0.3	1.3	2.5	1.6	1.6	1.6	1.4			10.3	
Initial Baseline (LCC)	75.8	16.7	4.0	2.0	2.0	2.0	1.8	0.0	0.0	104.3	
Development	59.7	6.6	1.7							68.0	
Launch Vehicle	16.1	8.9								25.0	
Operations		1.2	2.3	2.0	2.0	2.0	1.8			11.3	

Indicates budget numbers in Full Cost.

Indicates changes since the FY 2003 Presidents Budget Submit.
FY 2002, FY 2003, Prior and BTC are not in full cost.

THEME: Earth System Science

DEVELOPMENT: Earth Observing System Data and Information System (EOSDIS)

PURPOSE

Objectives	Reference 2003 Strategic Plan	Performance Measures
1.1		4ESS 6, 4ESS 14

Earth Observing System Data and Information System Science Development supports development and evolution of new and existing science data processing, archiving, and distribution functions. The work comprises the Strategic Evolution of ESE Data Systems (SEEDS), which will guide the evolution of EOSDIS, and an engineering capability within the Earth Science Data and Information System (ESDIS) Project which can provide enhancements and enable needed evolution.

OVERVIEW

EOSDIS Development will complete the development of the end-to-end EOSDIS system, including the development of the control centers for the Aura and ICESat missions. In addition, the EOSDIS supports the development of the GLAS Science Investigator-Led Processing System (SIPS) for ICESat and the development of the HIRDLS, MLS, OMI, and TES SIPS for Aura. The Program will complete the development of the EOSDIS Science Data Processing System in FY03.

EOSDIS Development also supports new Earth Science Enterprise missions and the evolution of existing systems to support new missions. Specifically, it will support the Enterprise approach for the next decade, the Strategic Evolution of ESE Data Systems (SEEDS), currently being formulated. EOSDIS Development also supports the evolution of TRMM's processing system to an integrated Precipitation Processing System, capable of handling global precipitation data, as a SEEDS prototype. It will support the science data system development for new missions including the NPOESS Prep Project (NPP).
-The EOSDIS budget was split into development and operations in FY02.

Link to project homepage for more information: http://eosdismain.gsfc.nasa.gov/eosinfo/EOSDIS_Site/

PROGRAM MANAGEMENT

EOSDIS Development and EOS Operations are managed by the GSFC. The SEEDS project will also be managed by GSFC. The GSFC Program Management Council (PMC) has EOSDIS Project governing responsibility. Enterprise official is Dr. Ghassem Asrar, Associate Administrator for Earth Science. Theme Director is Dr. Jack Kaye. Program Manager is Doug McCuistion.

TECHNICAL COMMITMENT

The EOSDIS baseline was established in 1986. The requirements are detailed in the EOS PCA.

Technical Specifications	FY04 President's Budget	Change from Baseline
EOSDIS	EOSDIS success criteria are to successfully support the ground operations of the EOS missions: Terra, Aqua, Aura, and ICESat, including spacecraft and instrument control, data acquisition, and telemetry processing; to operate the eight Distributed Active Archive Centers, which archive and distribute the data; and to support science investigator-led processing. The success criteria are to add the additional capabilities for new missions in an evolutionary manner, incorporating applicable new technologies that result in cost-effective operations.	-- -- --

Schedule	FY04 President's Budget	Change from Baseline
Start of Formulation	Nov-88	--
Start of Implementation	Oct-90	--
Data Validation Period	6 months - 1 year after receipt by investigators (depends on maturity of instrument technology).	--
Operational Lifetime	20 years	--

THEME: Earth System Science

DEVELOPMENT: Earth Observing System Data and Information System (EOSDIS)

ACQUISITION STRATEGY & PERFORMING ORGANIZATIONS

Major acquisitions are:
EOSDIS Science Data Processing System, to be completed in FY03. Raytheon is the prime contractor.
EOSDIS Clearinghouse (ECHO), EOSDIS Data Gateway (EDG), and Dynamic Queries,ongoing. Global Sciences and Technology, Inc. is the prime contractor for all of these smaller ongoing efforts. ESDIS is in the process of moving these separate GST procurments from multiple contracts to a consolidated 5-year GSA contract (FY03 - FY07).
Changes since FY03 Pres. Budget: None.

Current Acquisitions	Actual *	Selection Method	Actual *	Performer	Actual *
Cooperative Agreements	0%	Full & Open Competition	100%	Industry	99%
Cost +	91%	Sole Source	0%	Government	0%
Fixed Price	9%		100%	NASA Intramural	0%
Grants	0%			University	1%
Other	0%	Sci Peer Review	100%	Non Profit	0%
* as % of FY02 direct procurement	100%	* as % of FY02 direct procurement		* as % of FY02 direct procurement	100%

Future Acquisitions - Major	Selection	Goals
1. Contract transitions from EOSDIS Core System (ECS) to ESDIS Maintenance and Development (EMD).	Fall 02	100% Full & Open Competition

AGREEMENTS

Internal: Several MOAs are in place to satisfy the requirements of the Science Investigator-Led Processing System (SIPS).
External: An MOA has been signed with USGS for the coordination of the United Nations Environmental Program.
Changes since FY03 Pres. Budget: None.

INDEPENDENT REVIEWS

Types of Review	Performer	Last Review	Next Review	Purpose
Indep. Annual Review	IPAO	1-Jan-01	3-Mar-03	Affirmation of Program Commitment Agreement.
Annual Review	ESSAAC	Nov 2002	Nov 2003	Validation and peer review of program direction.

BUDGET/LIFE CYCLE COST

Total budget authority represents the Life Cycle Cost (LCC). These figures include only the estimates for the development of EOSDIS beginning in FY03 and beyond. Prior years are included the cost of operations.

Budget Authority ($ in millions)	Prior	FY02	FY03	FY04	FY05	FY06	FY07	FY08	BTC	Total	Comments
FY 2004 President's Budget (LCC)	2164.8	291.5	74.3	98.3	98.6	100.6	99.4	104.7		3032.3	
Development	2164.8	291.5	74.3	98.3	98.6	100.6	99.4	104.7		3032.3	
Changes since FY 03 Pres. Budget		-1.5		+22.3	+29.3	+29.3	+32.8	+40.7		+154.4	***Reason for Change:***
Op plan adjustment		-1.5									
Full Cost				+22.3	+29.3	+29.3	+32.8	+40.7		+154.4	Inclusion of Full Cost.
FY 2003 President's Budget (LCC)	2164.8	293.0	74.3	76.0	69.3	71.3	66.6	0.0		2815.3	Baseline only covers
Development	2164.8	293.0	74.3	76.0	69.3	71.3	66.6			2815.3	period through 2001.
Operations										0.0	
Initial Baseline (thru 01)	2332.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0		2332.6	FY 1997 President's
Development (Feb '97)	2332.6									2332.6	Budget.

Indicates budget numbers in Full Cost.
Indicates changes since the FY 2003 Presidents Budget Submit.
FY 2002, FY 2003, Prior and BTC are not in full cost.

THEME: Earth System Science

OPERATIONS

PURPOSE

Objectives:	Reference 2003 Strategic Plan	Performance Measures
1.1		4ESS5

Earth System Science Operations encompasses spacecraft command and control, mission planning and data acquisition, tracking and data recovery, the processing of satellite instrument data to scientific geophysical-parameter sets, and the subsequent maintenance and distribution of these information products.

OVERVIEW

The broad objectives of Earth System Science Operations are to establish data sets spanning decades for research into climate and global change, and to acquire science data sets via various NASA facilities. Specific facilities include spacecraft control centers, tracking and data acquisition stations, and data processing, archiving and distribution facilities.

Ground Network	http://www.wff.nasa.gov/~code452/
Operating Missions	http://visibleearth.nasa.gov/Sensors/
EOS	http://earth.nasa.gov/

PROGRAM MANAGEMENT

The EOS operations responsibility was delegated to the Goddard Space Flight Center. The Systematic Measurements Program Management Council (SMPMC) has governing responsibility. Enterprise official is Dr. Ghassem Asrar, Associate Administrator for Earth Science. Theme Director is Dr. Jack Kaye. Program Manager is Doug McCuistion.

TECHNICAL COMMITMENT

The baseline for each mission in operations was established during the project's Non-Advocacy Review (NAR). The requirements are detailed in each mission's Program Commitment Agreement (PCA).

Technical Specifications	FY04 President's Budget	Change from Baseline
Operating Missions -TOMS,UARS,TRMM,ERBS, Topex and ASF	Missions in their prime phase are expected to achieve their individual data delivery objectives; extended phases have reduced objectives.	--
EOS (e.g. Terra, Aqua, ICESat)	Provides mission operations and science information end-to-end for various missions, including data processing, data archiving and distribution, and heritage data to fulfill established Earth science goals and objectives. Committed to capturing 95% of science data, to maintain processing and thru-put rates for all instruments, and providing archive and distribution services until 3 years after end of mission lifetime.	--
Ground Network	Tracking stations and related systems acquire data from orbiting automated spacecraft (99% availability),balloons, sounding rockets, and Space Shuttle missions (99.5% availability).	--

Schedule	FY04 President's Budget		Change from Baseline
Operating Missions (includes Alaska SAR Facility)	These operating missions have met prime objectives and are in extended mission phases.		--
	Total Ozone Mapping Spectrometer (TOMS)	1996-2004	
	Upper Atmosphere Research Satellite (UARS)	1991-2003	
	Tropical Rainfall Measuring Mission (TRMM)	1997-2004	
	Earth Radiation Budget Satellite (ERBS)	1986-2003	
	Topex	1992-2003	
EOS -DAACS, ESMO, PI Processing Federation, Networks, etc.	EOS schedules are commensurate with enumerated spacecraft prelaunch, launch and postlaunch milestones for check-out, end-to-end test, and operations throughout spacecraft prime mission lifetime plus 3 years. NASA has agreements with USGS and NOAA for long-term archiving of data.		--
Ground Network	In transition from government assets to commercial services. NASA plans to maintain a capability to support current and future missions.		--

THEME: Earth System Science

OPERATIONS

ACQUISITION STRATEGY & PERFORMING ORGANIZATIONS

The prime contractor for the Ground Network,UARS, and TRMM missions is Lockheed Martin under the Consolidated Space Operations Contract (CSOC). This contract covers 5 years of operations, ending in December 2003. The prime contractor on the EOS mission is Raytheon. **Changes since FY03 Pres. Budget:**

Current Acquisitions	Actual *	Selection Method	Actual *	Performer	Actual *
Cooperative Agreements	0%	Full & Open Competition	96%	Industry	87%
Cost Reimbursable	84%	Sole Source	4%	Government	0%
Fixed Price	4%		100%	NASA Intramural	7%
Grants	5%			University	6%
Other	7%	Sci Peer Review	3%	Non Profit	0%
* as % of FY02 direct procurement	100%	* as % of FY02 direct procurement		* as % of FY02 direct procure	93%

Future Acquisitions - Major	Selection	Goals
1. Follow-On Contract to CSOC	Dec 03	100% Full & Open Competition
2. Follow-On to ECS: EMD	Mar 03	100% Full & Open Competition

AGREEMENTS

Internal: MOA for Mission Services and Space Communications with NASA Office of Space Flight and Office of Space Sciences.

External: National Research Council Review of DAACS.

Changes since FY03 Pres. Budget: MOA (above), decision not to extend CSOC.

INDEPENDENT REVIEWS

Types of Review	Performer	Last Review	Next Review	Purpose
None	N/A	N/A	N/A	N/A

BUDGET

Budget Authority ($ in millions)	FY02	FY03	FY04	Comments
FY 2004 President's Budget (Operations)	48.0	247.8	322.2	
Operating Missions	48.0	28.8	22.2	
UARS, ERBS, TRMM, QuikTOMS, Seastar/Seawifs, TOMS	36.0	20.3	12.2	
ASF	12.0	8.5	10.1	
Earth Science Ops		176.6	256.5	Transferred from Dev to Ops in FY03 Budget.
Ground Network		42.4	43.5	Transferred from OSF to OES in FY03.
Changes since FY 03 Pres. Budget			+55.6	Reason for Change:
Ground Network Investments				Network sustaining investments.
Transfer EOSDIS dev to Ops				Realign between Develop and ops.
Ops reduction of 5%			-10.0	Reduced to accommodate agency priorities.
Full Cost			+65.6	Inclusion of full cost.

Indicates budget numbers in Full Cost.

Indicates changes since the FY 2003 Presidents Budget Submit.

FY 2002 and FY 2003 are not in full cost.

THEME: Earth System Science

RESEARCH

PURPOSE

Objectives	Reference 2003 Strategic Plan	Performance Measures
1.1		4ESS2, 4ESS7-12,14

The Earth System Science Research program is designed to answer pressing science questions, including: How is the global Earth system changing and what are the consequences for human civilization? How can we predict future changes in the Earth system? In recent years, NASA's Earth System Science Program has begun to provide answers to these questions through an integrated approach using satellites, suborbital platforms, surface based observations, laboratory experiments, and computational modeling.

OVERVIEW

The Earth Science Research Program at NASA studies the Earth as a whole system, utilizing measurements made by Earth satellites, as well as by Suborbital and Airborne assets. These observations, enhanced by the work of the Mission Science Teams and Algorithm Development activities, enlarge the Earth system knowledge base and are incorporated into models in order to improve our ability to predict climate, weather, and natural hazards. Computing capabilities funded through the Research Program's Information Systems effort further support these improvements. The program also selects and funds over 1,200 U.S. scientific research tasks through the Research and Analysis activity. Scientists from seventeen other nations, funded by their own countries and collaborating with U.S. researchers, are also part of the program. These researchers develop Earth system models from Earth science data, conduct laboratory and field experiments, run aircraft campaigns, develop new instruments, and thus expand our understanding of our planet. In FY04, NASA Earth Science Research Program will continue to provide the technology, observations, and modeling results that contribute towards the provision of answers to the questions society poses about our home planet.

Link to project homepage for more information: http://www.earth.nasa.gov/science/index.html

PROGRAM MANAGEMENT

The Earth System Science Research program has program responsibility delegated to NASA Headquarters. The Science Division Director is Dr. Jack Kaye. The Headquarters Program Management Council (PMC) has governing responsibility. Enterprise official is Dr. Ghassem Asrar, Associate Administrator for Earth Science.

TECHNICAL COMMITMENT

Technical Specifications	FY04 President's Budget	Change from Baseline
NASA works with the science community to identify questions on the frontiers of science that have profound societal importance, and to which remote sensing of the Earth can make a defining contribution. These science questions become the foundation of a research strategy, which defines requirements for scientific observations, and roadmaps for combining the technology, observations, modeling efforts, basic research, and partnerships needed to answer the questions over time. These can be seen at: http://earth.nasa.gov/roadmaps		

Schedule	FY04 President's Budget	Change from Baseline
Research Announcements (NRAs, AOs, etc.)	Estimated Selection Date:	
NPOESS Preparatory Project	FY03 - 4th Qtr.	--
Earth Observing System	FY03 - 4th Qtr.	--
Interdisciplinary Science	FY03 - 4th Qtr.	--
Modeling/Analysis	FY04 - 3rd Qtr.	--
Terrestrial Hydrology	FY04 - 1st Qtr.	--
Global Water Cycle	FY04 - 4th Qtr.	--
Land Cover Land Use/Applications	FY04 - 3rd Qtr.	--
Physical Oceanography	FY04 - 3rd Qtr.	--
Tropospheric Chemistry and the INTEX Field Mission	FY04 - 3rd Qtr.	--
CAMEX 5	FY04 - 4th Qtr.	--

THEME: Earth System Science

RESEARCH

ACQUISITION STRATEGY & PERFORMING ORGANIZATIONS

The NASA Research program is based on full and open competition. Grants are peer reviewed and selected based on NASA Research Announcements (NRAs), Broad Agency Announcements (BAAs), and Announcements of Opportunity (AOs).

Changes since FY03 President's Budget: None

Current Acquisitions	Actual *	Selection Method	Actual *	Performer	Actual *
Cooperative Agreements	13%	Full & Open Competition	81%	Industry	8%
Cost Reimbursable	0%	Sole Source	19%	Government	7%
Fixed Price	16%		100%	NASA Intramural	24%
Grants	51%			University	61%
Other: Interagency Agmts	20%	Sci Peer Review	100%	Non Profit	0%
* as % of FY02 dir. proc.	100%	* as % of FY02 dir. proc.		* as % of FY02 dir. proc.	100%

Future Acquisitions - Major	Selection	Goals
NPOESS Preparatory Project	FY03 - 4th Qtr.	95% Sci Peer Review, 100% Grants
Earth Observing System	FY03 - 4th Qtr.	95% Sci Peer Review, 100% Grants
Interdisciplinary Science	FY03 - 4th Qtr.	95% Sci Peer Review, 100% Grants
Modeling/Analysis	FY04 - 3rd Qtr.	95% Sci Peer Review, 100% Grants
Terrestrial Hydrology	FY04 - 1st Qtr.	95% Sci Peer Review, 100% Grants
Global Water Cycle	FY04 - 4th Qtr.	95% Sci Peer Review, 100% Grants
Land Cover Land Use/Applications	FY04 - 3rd Qtr.	95% Sci Peer Review, 100% Grants
Physical Oceanography	FY04 - 3rd Qtr.	95% Sci Peer Review, 100% Grants
Tropospheric Chemistry and the INTEX Field Mission	FY04 - 3rd Qtr.	95% Sci Peer Review, 100% Grants
CAMEX 5	FY04 - 4th Qtr.	95% Sci Peer Review, 100% Grants

AGREEMENTS

Internal: The program is not dependent on other NASA activities outside of the control of the Associate Administrator of Earth Science.

External: Various Memorandums of Understanding and Agreements with NOAA, NSF, USGS, and other federal and foreign entities. **Changes since FY03 Pres. Budget: None.**

INDEPENDENT REVIEWS

Types of Review	Performer	Last Review	Next Review	Purpose
External Peer Review	Nat Academy	2000	2003	External review of Science Plan.
External Peer review	ESSAAC	Nov 2002	Nov 2003	Overall assessment of progress and priorities.
U.S Climate Change		2002	2003	Realign agencies, prioritize, coordinate the Program.

BUDGET

Budget Authority ($ in millions)	FY02	FY03	FY04	Comments
FY 2004 President's Budget (Research)	338.6	357.3	523.4	
EOS Science	49.3	53.6	67.0	
Suborbital Science		25.0	35.4	
Airborne Science	23.0			
UAV Science	2.0			
Information Systems	13.6	10.5	14.9	
Algorithm Development			81.2	
Mission Science Teams	94.6	102.6	109.4	
Research & Analysis	156.1	162.2	215.5	
CofF		3.4		
Changes since FY 03 Pres. Budget			+156.6	Reason for Change:
Suborbital Science Program			-10.0	Program restructure.
R and A			-5.0	General reduction.
NPP science team			+3.0	Transfer from dev. to mission science team.
Science teams			+3.0	CCRI research.
Full Cost			+110.0	Inclusion of full cost.
Algorithm Development			+55.6	Transfer from dev. to mission science team.

Indicates budget numbers in Full Cost.

Indicates changes since the FY 2003 Presidents Budget Submit.

FY 2002 and FY 2003 are not in full cost.

THEME: Earth System Science

TECHNOLOGY AND ADVANCED CONCEPTS: Technology Infusion Program

PURPOSE

Objectives	Reference 2003 Strategic Plan	Performance Measures
1.1		ESS4

NASA's Earth Science Enterprise (ESE) is dedicated to understanding the total Earth system and the effects of natural and human-induced changes on the global environment. Advanced technology will play a major role in enabling the ESE science/applications program of the future. The Earth Science Technology Program (ESTP):

- Enables ESE science and application programs by providing new capabilities and reducing the cost of Earth science measurements planned in the near, mid, and far term; and
- Ensures consistency between the ESE Strategic Plan and the implementing technology strategy, as manifest in the Earth Science Technology Program and New Millennium Program (NMP) and other relevant agency programs

OVERVIEW

The Earth Science Enterprise formed the Earth Science Technology Office (ESTO) to provide strategic, science-driven technology assessments and requirements development. ESTO will integrate and prioritize these requirements among various implementing programs and projects by maintaining a link between science/applications objectives and technology investments. ESTO aggressively pursues promising scientific and engineering concepts and ensures that the program maintains an effective balance of instrument and information systems investments.

ESTO implements the ESE focused technology program, which includes: the **Instrument Incubator Program (IIP)** to develop new instruments and measurement techniques at the system level; **Advanced Technology Initiatives (ATI)**, which develop technologies required for next generation, space-based missions; **Advanced Information Systems Technology (AIST)**, to develop end-to-end information technologies for future missions; **Computational Technologies (CT)**, to develop and apply high performance computing technologies for Earth and space science; and **Advanced Platform Technology (APT)**. The **New Millennium Program (NMP)** validates innovative measurement concepts, enabling instrument technologies, and space platform technologies required for future missions. The focused technology program also supports **Integrated Product Development Teams**. ESTO will leverage technology investments through internal NASA program synergy and external partnerships. These efforts will include: **Information Systems (IS), Small Business Innovative Research (SBIR), Space Based Technology (SBT), NASA Institute of Advanced Concepts (NIAC), Revolutionary Aero Space Concepts (RASC),** and other agencies' (e.g., DoD) programs.

Link to project homepage for more information: http://esto.nasa.gov

PROGRAM MANAGEMENT

The program responsibility has been assigned to the Goddard Space Flight Center (GSFC). Enterprise official is Ghassem Asrar, Associate Administrator for the Office of Earth Science at HQ. Point of Contact is George J. Komar, Program Manager, Earth Science Technology Office. This program is in full compliance with NPG7120.5B.

TECHNICAL COMMITMENT

The baseline for the ESTO and NMP technical commitment is the PCA.

Technical Specifications	FY04 President's Budget								Change from Baseline
		FY02	FY03	FY04	FY05	FY06	FY07	FY08	
1) Annually advance 25% of funded technology developments one Technology Readiness Level (TRL).	TRL % Change	25%	25%	25%	25%	25%	25%	25%	--
2) Mature 2-3 technologies to the point where they can be demonstrated in space or in an operational environment.	Number Matured	3	2	2	2	2	2	2	--
3) Enable one new science measurement capability or significantly improve performance of an existing one.	Number Enabled	1	1	1	1	1	1	1	--

THEME: Earth System Science

TECHNOLOGY AND ADVANCED CONCEPTS: Technology Infusion Program

Schedule	FY04 President's Budget	Change from Baseline
Integrated Technology Development Plan	2nd Qtr FY03	--
Earth Science Technology Conference	3rd Qtr FY03	--
Technology Infusion Plan	3rd Qtr FY03	--
Advanced Technology Initiatives (ATI) NRA	2nd Qtr FY04	--
Instrument Incubator Program (IIP) NRA	3rd Qtr FY04	--
Advanced Info Systems Technology (AIST) NRA	3rd Qtr FY05	--

ACQUISITION STRATEGY & PERFORMING ORGANIZATIONS

Technology studies and development efforts are procured primarily through the NRA process.
Changes since FY03 Pres. Budget: None.

Current Acquisitions	Actual *	Selection Method	Actual *	Performer	Actual *
Cooperative Agreements	0%	Full & Open Competition	80%	Industry	15%
Cost Reimbursable	100%	Sole Source	10%	Government	8%
Fixed Price	0%	Congressional Initiatives	10%	NASA Intramural	32%
Grants	0%		100%	University	25%
Other	0%	Sci Peer Review	100%	Non Profit	20%
* as % of FY02 direct procurement	100%	* as % of FY02 direct procurement			100%

Future Acquisitions - Major	Selection	Goals
1. Advanced Technology Initiatives NRA	2nd Qtr FY04	Competitively awarded proposals to support ESS technology needs.
2. Instrument Incubator Program NRA	3rd Qtr FY04	Competitively awarded proposals to support ESS technology needs.
3. Advanced Info Systems Technology NRA	3rd Qtr FY05	Competitively awarded proposals to support ESS technology needs.

THEME: Earth System Science

TECHNOLOGY AND ADVANCED CONCEPTS: Technology Infusion Program

AGREEMENTS

Internal: The program is not dependent on other NASA activities outside of the control of the Associate Administrator for Earth Science.

External: None.

Changes since FY03 Pres. Budget: None.

INDEPENDENT REVIEWS

Types of Review	Performer	Last Review	Next Review	Purpose
External Review Committee	ESSAAC	Nov 02	Nov 03	Overall assessment of progress and priorities.

BUDGET

Budget Authority ($ in millions)	FY02	FY03	FY04	Comments
Technology Infusion	71.8	65.0	78.9	
Instrument Incubator Program	15.0	22.0	27.0	
Advanced Info Systems Technology	9.5	9.8	11.5	
Advanced Technology Initiatives	19.7	8.5	12.3	
Computational Technology	21.8	19.0	21.9	
NMP Future Missions				
IDPT	5.8	5.7	6.1	
Changes since FY 03 Pres. Budget	-30.0	-22.3	+1.7	Reason for Change:
Full Cost			+17.7	Inclusion of Full Cost.
EO-3 Funding to development	-30.0	-22.3	-10.2	Realign budget structure.
NMP future missions			-5.8	Accommodate follow-on rephase.
Indicates budget numbers in Full Cost.				
Indicates changes since the FY 2003 Presidents Budget Submit.				
FY 2002 and FY 2003 are not in full cost.				

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THEME:	Earth System Science
TECHNOLOGY AND ADVANCED CONCEPTS:	Missions in Formulation

PURPOSE

Objectives	Reference 2003 Strategic Plan	Performance Measures
1.1		4ESS 7-12

The next generation of EOS missions will provide new technology and space systems to meet the observing requirements in the Earth System Science Research strategy. NASA has identified a mission architecture over the mid term that will help achieve specific scientific goals using a combination of systematic and exploratory missions.

OVERVIEW

The new missions selected will capitalize on our investments in advanced technologies to reduce lifecycle time/cost and to better relate to longer-term scientific questions and practical applications. The approach to mission selection and implementation will ensure the maturity of essential technologies during mission definition/formulation for both exploratory and systematic missions (i.e. no missions will go into implementation until key technologies are ready).

PROGRAM MANAGEMENT

The program responsibility will be delegated to a responsible Center for each mission as it enters implementation. Enterprise official is Dr. Ghassem Asrar, Associate Administrator for Earth Science at HQ.

TECHNICAL COMMITMENT

The baseline for this technical commitment is the FY02 budget. If, after the Preliminary Design Review, a program is approved to proceed to development, a Program Commitment Agreement (PCA) will rebaseline this commitment.

Technical Specifications FY04 President's Budget	Change from Baseline*
* These missions will not have a baseline until Mission Confirmation review (MCR); technical specifics subject to final approval to proceed to implementation.	
NPOESS Preparatory Project (NPP) is being formulated to: *Fulfill a national commitment to obtain and make available a 15-year data record of fundamental global climate change observations. *This is a shared-cost precursor mission to the next generation of operational polar weather satellites being developed by the National Polar-Orbiting Operational Environmental Satellite System (NPOESS) Integrated Program Office (IPO). a 5-yr. joint NASA, NOAA, DoD effort. *Ensures NASA's long-term science observational needs are met by the operational system, and ensures transfer of key technologies NASA developd as part of the EOS program into the next generation of operational satellites.	
Global Precipitation Mission (GPM) is being formulated to: *Improve climate prediction by quantifying the space-time variability of precipitation and contributing to water budget closure. *Improve global/regional numerical weather prediction model accuracies through instantaneous rain rate and latent heating measurements. *Improve global water cycle prediction through frequent sampling and complete Earth coverage of precipitation. *Sample precipitation globally with reduced diurnal aliasing for precipitation rates from 0.3 to 110 mm/hr. *Provide immediate data and rain images with data latency less than 3 hours and with 25%-50% precision. *Provide 3-hour data products and rain images with 15%-40% precision. *Provide 3-hour precipitation estimates that deliver 90% of the collected science data on average over a 30 day period. *Provide processed (Level 1, 2 & 3) data with completeness of 98% of the collected science data. *Provide a minimum 3 years of measurement of global precipitation with a goal of 5 years.	
Landsat Data Continuity Mission (LDCM) is being formulated to: *Continue the basic global land cover change data set, as addressed in the Land Remote Sensing Policy Act of 1992 (P.L. 102-555). *Enable various management alternatives, with a preference given to a commercial data purchase. *Provide synoptic, repetitive multispectral, high-resolution, digital imagery of the Earth's land surfaces. *Characterize and monitor change in land-cover and land-surface processes; improve the assessment of rates of land-cover changes. *Observe deforestation, ecosystem fragmentation, argicultural productivity, glacier dynamics, and coastal hazards; and monitor volcanoes.	

THEME: Earth System Science

TECHNOLOGY AND ADVANCED CONCEPTS: Missions in Formulation

Technical Specifications	FY04 President's Budget	Change from Baseline *

Ocean Vector Winds Mission (OVWM) is being formulated to:

* Utilize a Ku-band scatterometer to infer wind velocity over 90% of the ice-free ocean surface every two days with a resolution of 25 km or better for a duration of three years with a goal of five years.
* Produce wind vector measurements over the ice-free oceans from 90% of the obtained data within 5 working days of data receipt.
* Flag measurements for the presence of land, ice, and/or significant rain in the footprint.
* Wind speed accuracy will be 2 meters/second rms or better from 3 to 20 m/s; and 10% rms or better for wind speeds from 20 to 30 m/s.
* Wind direction accuracy will be 20 degrees rms or better for wind speeds from 3 to 30 m/s.
* Provide software and data to NOAA to enable the production of near-real-time ocean wind vector information from OVWM data.

Ocean Surface Topography Mission (OSTM) is being formulated to:

* Provide a minimum of 3 years of measurement of ocean surface topography with a goal of 5 years.
* Launch on the same orbit as Jason-1 by flying within +/- 1 km of the same 9.9 day repeating ground track.
* Maintain the accuracy of Jason-1 (e.g. ocean topography to 4.2 cm at 1/sec along-track data rate with a goal of 2.5 cm).
* Maintain the stability of the global sea level measurement with a drift less than 1 mm/year.
* Maintain any relative bias from Jason-1 to less than 5 mm.
* Process more than 80% of all theoretically possible data that can be collected in a five-year period.
* Process more than 95% of all recovered over-ocean data obtained during any 12-month period.

Aquarius is being formulated to:

*Provide the first global measurements of salt concentration on the ocean's surface to explore the response of the ocean to climate and the water cycle.
*Provide a salinity sensor L-band radiometer (1.4 GHz passive), and a surface roughness sensor L-band scatterometer (1.2GHz active) instrument.
*Provide global salinity maps at 0.2 PSU accuracy on a monthly basis at 100km resolution for three years.
*Understand the regional and global processes that couple changes in water cycle and ocean circulation and influence present and future climate.

Orbiting Carbon Observatory (OCO) is being formulated to:

*Provide the first global CO2 measurement with the precision, resolution, and coverage needed to characterize CO2 sources and quantify their variability.
*Utilize three high-resolution grating spectrometers to obatin spectra of reflected sunlight in CO2 and oxygen bands.
*Create time-dependent global maps of CO2 with relative accuracies of 0.3%.
*Enable chemical transport models that will use these data to retrieve CO2 sources and sinks, enabling reliable estimates of future atmospheric concentrations of CO2.

Other activities under this program include:

*Solar Irradiance,
*Total Column Ozone,
*Future Missions/ESSP Support, and
*Other Follow-On Studies.

Schedule	FY04 President's Budget	Change from Baseline*
NPOESS Preparatory Project (NPP)		
Start of Formulation	Oct-98	
Start of Implementation	Mid-2003	
Spacecraft Ready for Instrument Integration	Nov-04	
Launch Readiness	First half CY 2006	
Global Precipitation Mission (GPM)		
Start of Formulation	Dec-01	
Non-Advocate Review (Mission Confirmation	TBD	
Preliminary Design Review	TBD	
Start of Implementation	TBD	
Launch	TBD (Core Satellite)	TBD (Constellation Satellite)
Observatory Operational Lifetime	3 years (5 years goal)	

* These missions will not have a baseline until Mission Confirmation review (MCR); technical specifics subject to final approval to proceed to implementation.

THEME: Earth System Science

TECHNOLOGY AND ADVANCED CONCEPTS: Missions in Formulation

TECHNICAL COMMITMENT - CONTINUED

Schedule	FY04 President's Budget	Change from Baseline
Landsat Data Continuity Mission (LDCM)		
Start of Formulation	Aug. 2000	--
Non-Advocate Review (Mission Confirmation Review)	N/A	--
Preliminary Design Review	Nov-02	--
Start of Implementation	Jul-03	--
Launch	NLT Dec-06	--
Data Validation Period	NLT Sep-07	
Observatory Operational Lifetime	5 years+	--
OceanVector Winds Mission (OVWM)		
Start of Formulation	TBD	--
Non-Advocate Review (Mission Confirmation Review)	TBD	--
Preliminary Design Review	TBD	--
Start of Implementation	TBD	--
Launch	TBD	--
Observatory Operational Lifetime	3 years (5 years goal)	--
Ocean Surface Topography Mission (OSTM)		
Start of Formulation	Late 2002	--
Non-Advocate Review (Mission Confirmation Review)	TBD	--
Preliminary Design Review	Mid 2003	--
Start of Implementation	Mid 2003	--
Launch	Late 2006	--
Observatory Operational Lifetime	3 years (5 years goal)	--
Orbiting Carbon Observatory (OCO)		
Start of Formulation	Late 2003	--
Non-Advocate Review (Mission Confirmation Review)	TBD	--
Preliminary Design Review	TBD	--
Start of Implementation	TBD	--
Launch	Mid 2007	--
Observatory Operational Lifetime	2 years (4 years goal)	--
Aquarius		
Start of Formulation	Late 2003	
Non-Advocate Review (Mission Confirmation Review)	TBD	
Preliminary Design Review	TBD	
Start of Implementation	Mid 2003	
Launch	Late 2008	
Observatory Operational Lifetime	3 years (5 years goal)	--

ACQUISITION STRATEGY & PERFORMING ORGANIZATIONS

Major acquisitions for NPP are: ATMS Instrument; competitively awarded in December 2002 to Aerojet (subsequently bought by Northrop Grumman). Spacecraft Bus; Delivery Order awarded through the Rapid Spacecraft Acquisition contract in May, 2002. The remainder of these missions are still in early formulation and the acquisition strategy is still being defined.

Changes since FY03 Pres. Budget: None.

Current Acquisitions (for NPP only)	Actual *	Selection Method	Actual *	Performer	Actual *
Cooperative Agreements	0%	Full & Open Competition	100%	Industry	95%
Cost Reimbursable	70%	Sole Source	0%	Government	0%
Fixed Price	25%		100%	NASA Intramural	5%
Grants	0%			University	0%
Other	5%	Sci Peer Review	%	Non Profit	0%
* as % of FY02 direct procurement	100%	* as % of FY02 direct procurement			100%

Future Acquisitions - Major	Selection	Goals
IDCM Implementation Phase Contract Award	Jun-03	100% competed
Missions are all in formulation. Future acquisitions being defined.		

THEME: Earth System Science

TECHNOLOGY AND ADVANCED CONCEPTS: Missions in Formulation

AGREEMENTS

Internal: None at this time.
External:
NPP: NASA/NOAA/DoD Initial Implementation Agreement, 11/21/99.
LDCM: NASA-USGS Initial Implementation Agreement, 1/11/01.
Changes since FY03 Pres. Budget: None.

INDEPENDENT REVIEWS

Types of Review	Performer	Last Review	Next Review	Purpose
NPP				
Independent Assessment	IPAO	N/A	TBD	
Non-Advocate Review	IIRT	N/A	TBD	Evaluation of readiness to enter Implementation.
Indep. Implementation Rev	IIRT	N/A	TBD	Independent assessment of the program's progress.
GPM				
Independent Assessment	IRT/IPAO	N/A	4Q/FY02-1Q/FY03	Assess requirements, design concepts, implementation plans, risks, and life cycle cost.
Non-Advocate Review	IRT/IPAO	N/A	1Q/FY04	
Indep. Implementation Rev	IRT/IPAO	N/A	Annually during Implementation	

BUDGET

Budget Authority ($ in millions)	FY02	FY03	FY04	Comments
2004 President's Budget				
Advanced Concepts	117.5	246.0	274.4	
NPP	67.2	153.1	95.6	
GPM	11.3	8.0	28.2	
LDCM	12.0	45.0	60.0	
Ocean Winds	5.7		2.7	
Ocean Topography	9.0	32.4	40.0	
Solar Irradiance			2.6	
Total Column Ozone			0.3	
Other follow-on studies	2.9		0.8	
ESSP formulation:	9.4	7.5	44.3	Anticipated direct cost of Aquarius and OCO; full cost to be spread once formulation.
Aquarius (ESSP)	1.2	1.0	8.2	
Orbiting Carbon Observatory	2.3	2.0	17.7	
Future missions/ESSP suppor	5.9	4.5	18.4	
Changes since FY 03 PBS			-46.3	***Reason for Change:***
NPP			-55.0	Rephase
NPP			+0.2	Transfer to science team/OMPS instrument
NPP			+12.5	Full cost
GPM			-15.0	Delay/Rephase
GPM			+16.2	Full cost
LDCM			+6.0	Rephase and general reduction
LDCM			+9.0	Full cost
Ocean Winds			-28.9	Delay/Rephase
Ocean Winds			+0.1	Full cost
Ocean Topography			+1.6	Full cost
Solar Irradiance			+0.5	Full cost
Total Column Ozone			+0.3	Full cost
ESSP			+8.2	Full cost
CERES/Other Studies			-2.0	Realign to development

Indicates budget numbers in Full Cost.
Indicates changes since the FY 2003 Presidents Budget Submit.