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SPECIAL ISSUES

PERFORMANCE EVALUATION OF SELECT PROGRAMS

Three NASA Themes have been reviewed by OMB for performance effectiveness using the Performance Assessment Rating Tool (PART). The results are summarized in the accompanying table. For further details on the performance assessments of the Themes listed here, refer to the NASA chapter in the *Performance and Management Assessments* volume of the President's Budget.

The PART is an evaluation tool developed by the White House Office of Management and Budget (OMB) to assess the effectiveness of Federal programs. The PART will be phased in over time across all Federal Agencies. After undergoing extensive testing by OMB, Federal Agencies and Departments were asked to apply the PART to 20% of all programs (NASA Themes) to determine how well it assesses program effectiveness and management performance.

The PART will be applied to an additional 20% of Federal Programs each year until the tool is used as a standard assessment for all Programs. The PART identifies the program management changes needed to improve a program's effectiveness. As PART is applied to the remaining NASA Themes, they will need to demonstrate the same high standards of performance as these initial Themes. Programs previously assessed using the PART will be reassessed and their scores raised or lowered depending on changes in performance.

Theme	Rating	Explanation	Recommendations
Space Station	**Results Not Demonstrated**	Space Station cost controls have improved since recent overruns, but it is too early to tell whether management reforms will continue to be successful.	NASA will continue building the U.S. core Space Station, and the Administration will monitor program performance to see if recent management reforms are successful.
Space Shuttle	**Moderately Effective**	Shuttle operations are well managed, but investments to improve the Shuttle suffer from inadequate planning and poor cost management.	NASA will develop tools to track the impact of investments on the Shuttle's operational life, flight safety, and facilities conditions. NASA also will strengthen capital investment cost controls.
Mars Exploration Program	**Effective**	Good planning and execution have led to important scientific discoveries. The program has recovered from the loss of two spacecraft in late 1990s.	NASA will carefully track development of the 2003 Mars rover missions which are a major program challenge. NASA also will use planning for potential missions next decade to drive technology investments this decade.

SPECIAL ISSUES

UPDATE ON THE PRESIDENT'S MANAGEMENT AGENDA

NASA is fully committed to improving the quality of our management by implementing the President's Management Agenda. This is a government-wide effort to improve the way that Government manages in five key areas: Human Capital, Financial Management, E-Government, Competitive Procurement, and Integrated Budget and Performance. The Office of Management and Budget (OMB) uses a red/yellow/green 'stoplight' rating system to rate for agency status and progress. Green is the best possible rating. The discussion below describes our progress in 'getting to green' in all five areas.

The President's Management Agenda provides the central focus for all management reform efforts across the Agency, including our Freedom to Manage initiatives. NASA has established a highly integrated, disciplined process for 'getting to green' with weekly status reports to the Administrator by each of our five President's Management Agenda (PMA) area champions. NASA is one of only a few agencies that have a written agreement with OMB on the specific steps required to achieve green; and other agencies are seeking to adopt NASA's approach.

NASA's status rating improved for both human capital and budget and performance integration efforts. For human capital, NASA has begun to implement its strategic human capital plan, including a tracking system to identify workforce deficiencies across the agency. In competitive sourcing, NASA has achieved the government-wide, 15 percent competitive sourcing goal, but is still working on a plan to achieve the long-term, 50 percent goal. The status of financial performance fell due to a disclaimer on NASA's 2001 audit, but the agency has worked hard to resolve all issues from that audit. As of January 2003, NASA now has an unqualified opinion. Progress in E-Government has been slower due to information technology security reporting issues and problems with completing documentation to justify some information technology investments. In budget and performance integration, NASA is now budgeting for the full cost of its programs and has integrated its budget and performance plans starting with this budget.

	Human Capital	Competitive Sourcing	Financial Performance	E-Government	Budget and Performance Integration
Status	↑ 🟡	🔴	↓ 🔴	🔴	↑ 🟡
Progress	🟢	🟢	🟢	🟢	🟢
Arrows indicate change in status since baseline evaluation on September 30, 2001					

PERFORMANCE BUDGETING

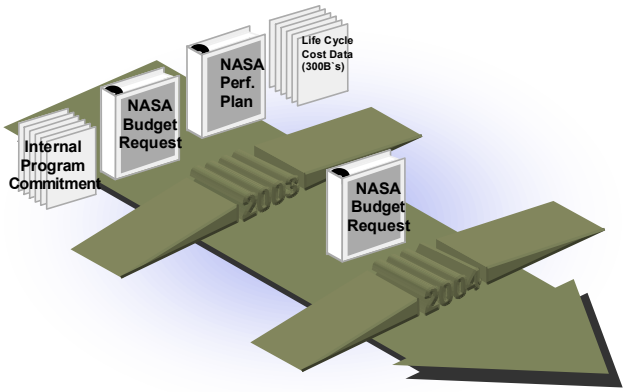
The FY 2004 NASA Budget Request is a performance-based budget. This represents a significant change from past years' budgets. It addresses challenges posed by NASA's stakeholders.

"What has been missing:

- Past and planned results are not shown with budget requests, let alone lined in a cost-and-results relationship.
- Program managers responsible for achieving results often do not control the resources they use or have flexibility to use them effectively.
- Performance and cost data are recorded in separate systems and not integrated to provide timely, analytical, feedback to decision makers and managers.
- Americans cannot readily assess program results, and cannot compare performance and cost across programs."

-- *FY03 Pres. Budget (Government-Wide Analytical Perspectives pg. 3)*

Many of the documents that in past years were separate, have now been combined into one. Most importantly, this brings together the NASA Budget Request and the NASA Performance Plan. Beyond these two major documents, the data sheets in this new document replace many separately published and maintained data sheets. These include presentations of the life cycle cost of development programs and projects.



The FY 2004 Budget Request integrates the information that was provided in past years in separate documents.

The benefits of this integrated, performance-based budget are significant.

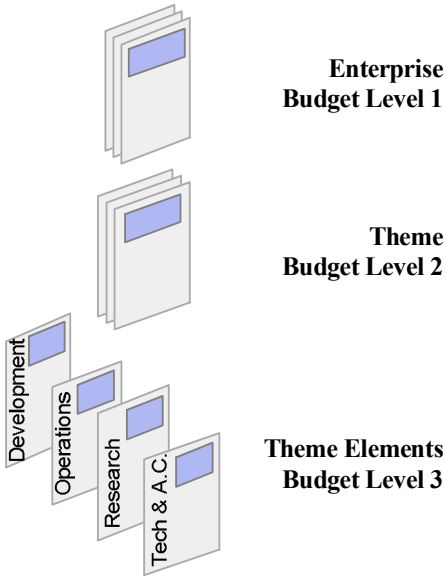
First, there will be fewer, more informative pages. The same information was provided in multiple documents before. For instance, program descriptions appeared in the Budget Request, the Performance Plan, special life-cycle cost exhibits, and internal commitment agreements. Now, this information is presented once and the chance of discrepancy between documents is eliminated. There is also a uniformity of information across programs. As part of the integration, a single set of Agency-wide templates was developed. Each Enterprise, Theme, Program, and Project had to provide comparable information in the appropriate template.

Beyond providing consistent and comparable information, the templates are concise. Details about acquisition strategy and technical commitments are presented in one place. In previous years there was a great deal of information that was redundant or excessive, and that has been eliminated. In other areas it might be useful to have access to additional detail. A comprehensive approach was used where hyperlinks are presented so that an interested reader can easily access this detail.

The second major benefit of the integrated budget and performance document is that the same structure is used across all Agency documentation, including the 2003 Strategic Plan, the Budget and integrated Performance Plan, and the Performance Report. The performance of strategic investments can be directly measured because the investment will be explicitly tracked under one name. Every program or project can be traced from the Agency Vision and Mission, by way of the Strategic Plan.

THE NEW BUDGET FORMAT - OVERVIEW

This year, the budget has a new look. The new format was devised as a part of the budget and performance integration effort. It should provide an easy to navigate system to reference all the elements of the NASA FY 2004 Budget. It also presents the costs and benefits of each element in a consistent, easy to understand way.



The budget is structured in levels. At the first level are the 6 Enterprises. At the second level are the 18 Themes. The third level is split into four categories. Each of these levels is described on a set of uniform sheets. The fourth level provides additional detail and is discussed on the Level 3 sheets.

The new look of the budget comes from the use of standardized templates. A different template is used to present each budget level. The templates ensure that the same information is provided for each element of the budget. It is this standardization that makes it easy to navigate through the document to find the information you need and also makes it easy to compare information between two parts of the budget.

Content at Level 1
Each Enterprise section starts with a two-page summary of the Theme areas within the Enterprise plus an outline of the purpose of the Enterprise.

Content at Level 2
Each Theme section has a four page "business case" followed by data sheets for the programs and projects within this area.

The Theme is discussed in terms of the President's Research and Development Investment Criteria. These criteria lay out the benefits of a Theme in three parts: relevance, quality, and performance. The Theme's cost is also presented.

With this information, it is possible to evaluate the Theme as an investment. The sheets should provide the answers to the questions:

- What is this investment?
- Why is this investment relevant?
- How and when are the activities being performed?
- Who is accountable for the quality of the outcomes and outputs?

The Theme's cost and performance should be viewed together. The performance section conveys the expected outcomes and outputs that can be achieved by the funding in the request.

Content at Level 3
The four sheets for the Level 3 Theme elements -- Development, Operations, Research, and Technology and Advanced Concepts -- each contain the same sections. The specific data presented within some sections is different among the four types of Level 3 elements. Most Level 3 write-ups are 2 pages in length and Technology and Advanced Concepts are usually 3 pages.

The first page is the commitment page. Here, each sheet must clearly describe the Program or Project's connection to its parent Theme. Commitment page tying the program or project to the strategic and performance plans plus the specific technical commitment made.

The second page is the implementation page showing detailed information about how the Program or Project is being implemented. This information includes the acquisition strategy. It also includes a list of internal and external agreements as well as a list of planned and past independent reviews.

The last section of the second page shows the budget or life cycle cost. Here, the requested levels of budget authority are shown for the current budget request. For development activities that have a life cycle, the complete cost from start to finish is shown.

THE NEW BUDGET FORMAT – HOW TO READ A DATA SHEET

Sections of Level 1 Enterprise Data Sheets

The Enterprise data sheets provide the purpose of the Enterprise plus they guide a reader to the Themes that comprise an Enterprise.

There is one large Enterprise image here that is carried throughout the document. Theme images and names are listed on the right representing each of the budget Themes. These Theme images also appear on the appropriate Level 2 Theme data sheets.

The Enterprise images are retrospective, and the theme images are prospective. The retrospective images and their captions depict a NASA accomplishment from the previous year. The prospective images and their captions depict a planned activity, concept vehicle, or scientific area of study.

Sections of Level 2 Theme Data Sheets

The Theme data sheets are a minimum of four pages, and the Themes represent the key elements of the new budget structure. The uniformity of the sheets facilitates an investment-oriented discussion so decisions and trade-offs can be made using comparable data.

The sheets begin with the single Theme image – the same image that represents the Theme elsewhere in the budget. The additional Theme pages lay out the justification for the budget request and performance commitment for which the Theme will be accountable. The justification is addressed in terms of relevance, strategy, performance, and budget.

Overview

In this section, each Theme lays out the broad picture of what its activities are. The overview should answer the question, "What is this investment and what are its benefits?" In particular, there should be a synopsis of the FY 2004 highlights.

Each Theme is part of NASA's 2003 Strategic Plan. The activities of the Theme are directly responsible for performance that leads to the Agency's goals and objectives. The table presented on each overview page is an excerpt of the Plan, showing the Theme's specific responsibilities. For each objective, there are performance measures in a section of the Theme data sheet that follows. The Theme must demonstrate progress toward these long-term objectives on an annual basis through the performance measures.

The Theme's relevance discussion must further make the case that this Theme's implementation strategy will help NASA meet its strategic goals and objectives.

Relevance

Relevance, quality, and performance are the Research and Development Investment Criteria established by the White House Office of Science and Technology Policy (OSTP) and the OMB. "R&D investments must have clear plans, must be relevant to national priorities, agency Missions, and relevant fields, and must justify their claim on taxpayer resources."

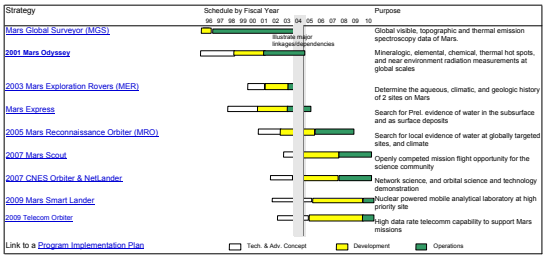
The narrative on relevance for each Theme demonstrates why the theme:

- is relevant to national priorities;
- is relevant to the NASA Strategic Plan, tying the table above to the measures on the next page; and
- is relevant to the scientific community.

The relevance to education and public benefits is called out separately. NASA has both longstanding and new initiatives in educational outreach, with contributions from each Theme. Each Theme also articulates its public benefits by answering the question, "In what ways will NASA's explorations and investigations change the way we live in and view our world?"

Relevance should be verifiable from the Independent Reviews listed at the Theme level and below.

Implementation



The implementation chart is a strategic roadmap, showing how each of the Level 3 elements fit and is integrated and contributes to achieving the goals and objectives of the Theme. The elements on the chart are color-coded depending on their phase by Development, Operations, Research, and Technology and Advanced Concepts. The year of the budget request is highlighted with a vertical bar.

The purpose of each element is presented in a column on the right. This purpose is a synopsis of the "Level 3" data sheet's Purpose section, intended to briefly summarize what each element does, how the elements are interdependent, and how they work together to achieve the Theme's objectives and the Agency's goals.

Some Themes present their implementation strategy in other ways while still addressing the timetable and the purpose.

Status

In this section, the Theme reports noteworthy accomplishments and successes from the previous fiscal year. This is a general discussion of past performance and not directly tied to individual FY 2002 performance measures. Because the Theme structure is new with the 2003 Strategic Plan, the FY2002 Performance Plan cannot be directly assessed according to the 2003 organization. For a more in-depth discussion of FY2002 performance by individual annual goal, please refer to the *Fiscal Year 2002 Performance and Accountability Report*.

Performance Measures

Based on the new Administration R&D Investment Criteria, OMB Circular A-11, and the Government Performance and Results Act, the performance measures are quantitative long term outcomes supported by annual output metrics. These measures indicate how this Theme is contributing towards the strategic objectives.

In the past, the connection between the Performance Plan measures and the Strategic Plan objectives was not explicit. Now there is an explicit linkage. Strategic Objectives and long-term outcomes are numbered according to the goals and objectives in the 2003 Strategic Plan. Annual performance measures are numbered by Theme. A measure number consists of the one digit fiscal year, identifying the fiscal year of the performance plan, the standard abbreviation of the Theme name, then the number of this measure within the Theme. For example, 4MEP9 is used for the 9th metric in the Mars Exploration Program Theme for the FY04 budget.

There are also uniform metrics for which each Theme is accountable and will eventually be rolled up to assess overall performance at the Agency level. These are:

1. Each Development project will complete its current phase within 10% of total life-cycle cost shown on the table below.

2. Each Research project will allocate *[a Theme specific percentage]* of its funding competitively during FY04.

3. The Theme will complete all of its missions within 10% of its baseline schedules.

Independent Review

INDEPENDENT REVIEWS — Data current as of 9/9/2002

Types of Review	Performer	Last Review	Next Review	Purpose
Indep Annual Review	IPAO	01-Jan-01	03-Mar-03	
Nat'l Academy	SSB			

Relevance and quality are verified through the prior and planned Independent Reviews listed at the Theme level and below.

The purpose should note -- in addition to the topics covered -- whether the review is a retrospective evaluation of ongoing efforts or it is a prospective evaluation of planning and implementation.

If no reviews are conducted at the Theme level, it will be noted that reviews were conducted at the Project level. For these reviews, refer to the appropriate page.

Budget

The budget tables present the proposed FY 2004 budget. Three years are shown, from FY 2002 to FY 2004. All the Themes' Level 3 elements are also shown, labeled as one of the four types Development, Operations, Research, and Technology and Advanced Concepts. The "FY 02" column reflects the FY 2002 budget as adjusted per the Congressional Operating Plan letter dated 9/30/02. The "FY 03" column reflects the FY 2003 Presidents Budget Submit (PBS) as Amended. The "Change" column includes both programmatic and full cost adjustments. FY 2004 is in full cost. In the table, the change column is highlighted in blue and all numbers in full cost are highlighted in yellow.

Themes only report a LCC for development activities. FY 2002, FY 2003, Prior and BTC are not in full cost. The years FY 2004 to FY 2008 are in full cost. Next year, we will have complete lifecycle costs for Development activities in full cost.

Sections of Level 3 Data Sheet

Each Level 3 data sheet is one of four activity types (Development, Operations, Research, or Technology and Advanced Concepts.) These sheets are organized in very similar manners, but with specific differences. There is one exception, the Education programs, which appears on a custom sheet.

The specific differences are appropriate to the different types of activities. Development sheets, for example, represent specific commitments to technical requirements and a life cycle cost with a level of maturity that allows NASA to be committed to and accountable for the budget and schedule estimates. Technology and Advanced Concepts shows the progression of new technologies according to their technology readiness levels.

Each Level 3 sheet consists of two or three pages with the following sections.

Purpose

PURPOSE

Objectives	Reference 2003 Strategic Plan Performance M
Strategic objective that the ASO Theme is addressing [TBD]	4ASO1, 4ASO3, 4ASO4

The purpose of this activity must be clearly presented. In particular, the purpose must be tied to the Strategic Objectives with a commitment to a set of annual performance goals. These are referenced by number and can be found on the parent Theme sheet.

Overview

The overview explains what the elements of this activity are, the summary of what work is being performed, what is being built, or what is being investigated.

Program Management

NASA manages its Programs and Projects according to internal policies and procedures. The primary document is NASA Procedures and Guidelines (NPG) 7120.5B. Programs that are not in full compliance with NPG 7120.5B are documented.

The Programs and Projects also have accountable officials responsible for the management of this investment. Primary points of contact are provided to the NASA Headquarters level. The NASA Centers with Program responsibility are also listed.

Technical Commitment

The technical commitment is presented relative to an original baseline. This baseline, with date, is defined right under the heading so that it may be referenced as needed. For Development, this baseline will be some form of commitment agreement document, in most cases a NASA Program Commitment Agreement.

TECHNICAL COMMITMENT

Baseline Commitment as of 7/02, as established in the Level Requirement Document for the Mars Reconnaissance Orbiter (MRO) project.

Technical Specifications	FY04 President's Budget	Change from Baseline
End of nominal life	5.4 years after launch; December 31, 2010	Unchanged
Primary Science Phase	Dec. '06 thru Dec. '08	Unchanged
Mass	2000 kg	Unchanged
Power	5 kW (Beginning of Mission (BOM) at Earth)	Unchanged
Raw Data Volume	26 Tbits	Unchanged
Mapping Targeted Imaging	30cm/pixel ground sampling monochromatic imaging; < 40m/pixel ground sampling for mineralogical mapping	Unchanged
Contex imaging	<7.5 m/pixel ground sampling context imaging from 300 km altitude	Unchanged
Primary science orbit (PSO)	255 X 320 km	Unchanged

Schedule	FY04 President's Budget	Change from Baseline
Instruments selection	Nov-01	Unchanged
Mission PDR	Jul-02	Unchanged
NAR	Jul-02	Unchanged
Mission CDR	3Q/FY03	Unchanged
Start S/C level I&T	3Q/FY04	Unchanged
Ship to launch site	3Q/FY05	Unchanged
Launch	4Q/FY05	Unchanged

Two tables are always presented. The first is specifications; the second is schedule. These tables are tailored, depending on whether the data sheet is for Development, Operations, Research, or Technology and Advanced Concepts activity.

For Development sheets, the precise, fixed requirements will be presented. These are usually the top-level requirements that the program is committed to achieving. For spacecraft, the schedule will include the launch date.

For Operations sheets, the elements being operated will be listed. This list may be facilities on board the International space Station or it may be a set of independent spacecraft. Only key milestones will be presented in the schedule, particularly FY 2004 milestones.

For Research sheets, the portfolio will be described. With many individual Principal Investigators carrying out a large set of experiments and data analysis, research is discussed only at the portfolio level. The schedule will note any periodic research announcements that are planned.

TECHNICAL COMMITMENT

The baseline for this technical commitment is the FY2002 budget reflected in the FY2002 NASA Appropriation.

Technical Specifications		FY04 President's Budget				Change from Base
		FY02	FY03	FY04		
Validate in a laboratory and a relevant environment aircraft component technologies and advanced flight operations for reducing noise by 10 dB (re. to CY 1997 soa) to simultaneously enable air traffic growth and reduce community noise impact.	TRL	2	3	3	4	None
	$M	20.0	41.3	58.7		

Chart Continued on Next Page

For Technology and Advanced Concepts, there are two types of tables. Advanced Concepts are typically projects that will eventually move to development when they reach an appropriate level of maturity, including an independent cost estimate, a non-advocate review (NAR), and a preliminary design review (PDR). For technology, there is a unique table to identify which technologies are advanced and identify the specific application if it is in support of a future mission. As appropriate, the individual technology and advanced concepts may be listed separately or they may be rolled together.

Technologies have a Technology Readiness Level (TRL) progress roadmap, showing progress, plans, and status as well as associated funding. Advanced concepts have a list of preliminary requirements.

Technology Readiness Level Description	
Increasing Maturity ↑	9. Actual system proven through successful mission operations
	8. Actual system completed and qualified through test and demonstration
	7. System prototype demonstration in an operational environment
	6. System/subsystem model or prototype demonstration in a relevant environment
	5. Component and/or breadboard validation in relevant environment
	4. Component and/or breadboard validation in laboratory environment
	3. Analytical and experimental critical function and/or characteristic proof of concept
	2. Technology concept and/or application formulated Invention begins
	1. Basic principles observed and reported

Acquisition Strategy & Performing Organizations

ACQUISITION STRATEGY & PERFORMING ORGANIZATIONS

The prime contractor for HST operations is the Consolidated Space Operations Contractor, Lockheed Martin Space Operations. FUSE operations are performed by the Johns Hopkins University. SIRTF operations will be performed by the Jet Propulsion Laboratory. In FY02, direct procurement represented 100% of budget authority. **Changes since FY03 Pres. Budget: None.**

Current Acquisitions	Actual *	Selection Method	Actual *	Performer	Actual *
Cooperative Agreements	0%	Full & Open Competition	100%	Industry	66%
Cost Reimbursable	100%	Sole Source		Government	0%
Fixed Price	0%		100%	NASA Intramural	0%
Grants	0%			University	0%
Other	0%	Sci Peer Review	100%	Non Profit	34%
* as % of FY02 direct procurement	100%	* as % of FY02 direct procurement		* as % of FY02 direct procurement	100%

Future Acquisitions - Major	Selection	Goals
CSOC recompetition	late 2003	100% Full & Open Competition

The Programs and Projects all present a standard set of information about their procurement. There is a general discussion plus two tables covering current data and planning data. All information pertains to the direct procurement portion of the Level 3 element's budget. The procurement data is typically based on the prior fiscal year for which data is available.

The discussion presents highlights of and changes to the acquisition strategy as well as a list of noteworthy performing organizations. Different Programs and Projects have distinct procurement strategies. Some are new efforts and some are nearing completion. Research procurements are different in nature from spacecraft development procurements in how they are solicited and in the type of procurement vehicle, such as grants or cost-plus contracts.

In the table for current acquisitions, three categories are displayed. The procurement part of the FY 2002 budget data is characterized by type, by selection method, and by performing organization. Different types of Programs can be distinguished by their procurement distributions. Research and data analysis programs will be predominantly grants selected through peer review and the work will be carried out predominantly at universities.

In the table for future acquisitions, the top planned announcements, procurements, etc. are presented. This table is not intended to show exhaustive detail of all future procurements, but rather to provide a snapshot and a way to compare the near-term strategies across all Theme areas. The selection time frame is presented as precisely as it is known. This may be a month, a quarter, or even just a year. The acquisition goals are also presented as precisely as they are known. For instance, it would already be known that a NASA Research Announcement would be selected through full and open competition.

Agreements

This section lists significant internal or external agreements that have been forged to carry out this Program or Project. Internal agreements are internal to NASA and represent cross-Theme and cross Enterprise activities. External agreements are between NASA and other organizations, in particular other U. S. Government agencies or foreign entities.

Independent Review

INDEPENDENT REVIEWS Data current as of 9/9/2002

Types of Review	Performer	Last Review	Next Review	Purpose
Indep Annual Review	IPAO	01-Jan-01	03-Mar-03	
Nat'l Academy	SSB			

Relevance and quality are verified through Independent Reviews listed at the Theme level and at Level 3.

The summary should note -- in addition to the topics covered -- whether the review is a retrospective evaluation of ongoing efforts, a prospective evaluation of planning and implementation, and whether it addresses relevance or quality.

Budget and Life Cycle Cost

The budget tables present the FY 2004 budget request. Level 3 Development sheets present a life cycle cost. Level 3 Operations, Research, and Technology and Advanced Concepts sheets present a three-year budget.

The "FY 02" column reflects the FY 2002 budget as updated by the Congressional Operating Plan letter dated 9/30/02. The "FY 03" column reflects the FY 2003 Presidents Budget Submit (PBS) as Amended. The "Change" block includes all changes, both programmatic and full cost adjustments. A

comparison to show FY 03 as translated to full cost, with FY 04, to isolate the programmatic changes, is included in the Full Cost Budgeting discussion starting on page S&AP 2-6 and 2-7. FY 2004 is in full cost. In the table, the change block is highlighted in blue and all numbers in full cost are highlighted in yellow.

For Development sheets, a life cycle cost is presented. These sheets expand upon the three budget columns, adding "Prior," "BTC," and "FY05" to "FY08" columns. FY 2002, FY 2003, Prior and BTC are not in full cost. The years FY 2004 to FY 2008 are in full cost. The specific items that are included in this program/project's definition of life cycle are listed above the table. Some examples of life cycle definitions are:

- These figures include all costs excluding retirement costs and pre-development technology.
- These figures include the costs of all phases.
- These figures represent all costs associated with a program completion date of 2012.

During this year, we will update lifecycle estimates so that all estimates will be in Full Cost for next years Budget Request.

TERMS

2GRLV	Second Generation Reusable Launch Vehicle Program
AAH	Advanced Animal Habitat
AATT	Advanced Air Transportation Technology
ACS	Advanced Camera for Surveys
ADF	Avian Development Facility
AEE	Advanced Engineering Environment
AFRL	Air Force Research Lab
AGATE	Advanced General Aviation Transport Experiments
AHMS	Advanced Health Management System
AHST	Advanced Human Support Technology
ALTV	Approach and Landing Test Vehicle
AMS	Alpha Magnetic Spectrometer
AO	Announcement of Opportunity
AOS	Airspace Operations Systems
APG	Annual Performance Goal
APL	Applied Physics Laboratory (John Hopkins)
APMC	Agency Program Management Council
ARPO	Autonomous Rendezvous and Proximity Operations
ASC	Aviation System Capacity
ASI	Agenzia Spaziale Italiana *or* Italian Space Agency
ASO	Astronomical Search for Origins
AST	Aerospace Technology (Enterprise)
AT	Aeronautics Technology
ATAC	Air Transport Association of Canada
ATLO	Assembly, Test, Launch Operations
ATMIS	ATMospheric Instrumentation System
AU	Astronomical Unit
AVGS	Advanced Video Guidance Sensor
AvSSP	Aviation Safety and Security Program
BAAs	Broad Agency Announcements
BAF	Booster Applications Facility
BAT	Burst Alert Telescope
BATC	Ball Aerospace and Technology Corporation
BEC	Bose Einstein Condensate
BNL	Brookhaven National Laboratory
BOE	Basis of Estimate
BPR	Biological and Physical Research (Enterprise)
BPRAC	Biological and Physical Research Advisory Committee
BR	Bioastronautics Research
BTC	Baseline To Completion
BTF	Biotechnology Facility
CAIG	Cost Analysis Improvement Group
CAM	Centrifuge Accommodation Module
CANs	Cooperative Agreement Notices
CAPPS	Checkout and Payload Processing Services
CARA	CA Association for Research in Astronomy
CARD	Cost Analysis Requirements Document
CAS	Commercial Advisory Subcommittee
CAU	Cockpit Avionics Upgrade
CCRI	U.S. Climate Change Research Initiative
CCU	Cell Culture Unit
CDC	Center for Disease Control
CDP	Command and Display Processor
CDR	Critical Design Reviews
CEOS	Committee On Earth Observation Satellites
CERCLA or Superfund	Comprehensive Environmental Response, Compensation, and Liability Act
CETDP	Cross Enterprise Technology Development Program
CFIT	Controlled Flight Into Terrain
CFO	Chief Financial Officer
CFPs	Calls for Proposal
CFR	Code of Federal Regulations
CICT	Computing, Information and Communications Technology
CIR	Combustion Integrated Rack
CLCS	Checkout and Launch Control System
CME	Coronal Mass Ejection
CMG	Control Moment Gyro
CNES	Centre National d'Etudes Spatiales *or* French Space Agency
COF	Construction of Facilities
Co-Is	Co-Investigators
COLSA	COLSA Corporation
Core Values (NASA's)	Safety, People, Excellence and Integrity
COS	Cosmic Origins Spectrograph
CRFS	Commercial Research and Flight Support
CSA	Canadian Space Agency
CSOC	Consolidated Space Operations Contract
CTV	Crew Transfer Vehicle
DA	Data Analysis
DAA	Deputy Associate Administrator

SPECIAL ISSUES: Terms

DAAC	Distributed Active Archive Center
DAG/TM	Distributed Air/Ground Traffic Management
DARA	See DLR
DART	Demonstration of Autonomous Rendezvous Technology
DD250	Defense Department Form DD250
DDR&E	Director, Defense Research and Engineering
DES	Dewar and Enclosure Subsystem
DLR	German Aerospace Center
DOD	Department of Defense
DOE	Department of Energy
DOT	Department of Transportation
DSS	Decision Support System
E2	Extended Science
EAP	Educator Astronaut Program
ECLSS	Environmental Control and Life Support System
ECR	Environmental Compliance and Restoration
ECS	Engineering for Complex Systems
ECT	Enabling Concepts and Technologies
ED	Education Programs
EDL	Entry, Descent, and Landing
El Nino	A climate disturbance created in the Pacific Ocean every 2-5 years.
ELV	Expendable Launch Vehicle
ELVIS	Expendable Launch Vehicle Integrated Support
EMD	Engineering, Manufacturing and Development
Enterprises	Space Science, Earth Science, Biological and Physical Research, Aerospace Technology, Education, and Space Flight
EOS	Earth Observing System
EPA	Environmental Protection Agency
EPMC	Enterprise Program Management Council
EPO	Education and Public Outreach
EPPS	Energetic Particle and Plasma Spectrometer
ERAST	Environmental Research Aircraft and Sensor Technology
ESA	European Space Agency
ESE	Earth Science Enterprise
ESS	Electronics and Software Subsystem
ESSAAC	Earth Systems Science Applications Advisory Committee
EVA	Extravehicular Activity
EVE	Extreme Ultraviolet Variability Experiment
EXPRESS	Expedite the Processing of Experiments to the Space Station (Pallet)
FAA	Federal Aviation Administration
FAD	Formulation Authorization Document
FAT	Final Assembly and Test
FCF	Fluids and Combustion Facility
FEMA	Federal Emergency Management Agency
FHA	Flight Hardware Available
FIR	Fluids Integrated Rack
FSB	Fundamental Space Biology
FSD	Full Scale Development
FUSE	Far Ultraviolet Spectroscopic Explorer
FY	Fiscal Year
G&A	General and Administrative (costs)
GEO	Geosynchronous Earth Orbit
GFE	Government Furnished Equipment
Goals	There are 10 goals: 7 are Mission driven and 3 are enabling.
GOJ	Government of Japan
GRB	Gamma Ray Burst
GRNS	Gamma-Ray and Neutron Spectrometer
GSRP	Graduate Student Research Program
GWAC	Government Wide Agency Control
HHR	Habitat Holding Racks
HIRDLS	High Resolution Dynamics Limb Sounder
HMF FRCS	Hypergolic Maintenance Facility Forward Reaction Control System
HMI	Helioseismic and Magnetic Imager
HRF	Human Research Facility
HRI	Human Research Initiative
HST	Hubble Space Telescope
IAA	International Academy of Astronautics
IBPD	Integrated Budget and Performance Document
ICE	Independent Cost Estimate
IDP	Integrated Display Processor
IG	Inspector General
IGA	Intergovernmental Agreement
IIR	Independent Implementation Review
IIRT	Independent Implementation Review Team
IMCE	Management and Cost Evaluation
IMPACT	In situ Measurements of Particles and CME Transients
IPAO	Independent Program Assessment Office
IPS	Integrated Planning System
IRT	Independent Review Team
IS	Implementing Strategies
ISAS	Institute of Space and Astronautical Science

SPECIAL ISSUES: Terms

ISP	In-Space Propulsion
ISPR	International Standard Payload Rack
ISS	International Space Station
ISTAR	Integrated System Test of an Air Breathing Rocket
ISTP	Integrated Space Transportation Plan
IT	Information Technology
ITF	Integrated Training Facility
IVHM	Intelligent Vehicle Health Management
JACIE	Joint Agency Committee for Imagery Evaluation
JIMO	Jupiter Icy Moons Orbiter
JSRA	Joint Sponsored Research Agreement
JWST	James Webb Space Telescope
LASP	Laboratory for Atmospheric and Space Physics (University of Colorado)
LBTI	Large Binocular Telescope Interferometer
LCC	Life Cycle Cost
LEO	Low Earth Orbit
LISA	Laser Interferometer Space Antenna
LMA	Lockheed Martin Astronautics
LSG	Life Science Glovebox
LSTO	Launch Services Task Order
LTMPF	Low Temperature Microgravity Physics Facility
MAG	Magnetometer
MARSIS	Mars Advanced Radar for Subsurface and Ionospheric Sounding
MASCS	Mercury Atmospheric and Surface Composition Spectrometer
MCC	Mission Control Center
MCC-H	Mission Control Center-Houston
MCC-M	Mission Control Center-Moscow
MCR	Mission Confirmation Review
MDIS	Mercury Dual Imaging System
MEMS	Micro Electro-Mechanical Systems
MEP	Mars Exploration Program
MEPAG	Mars Exploration Program Analysis Group
MESSENGER	Mercury Surface, Space ENvironment, GEochemistry and Ranging
MGS	Mars Global Surveyor
MIDEX	NASA Medium-Size Explorer
MIIS	Mishap Initiator Identification System
MLA	Mercury Laser Altimeter
MLP	Mobile Launcher Platforms
MLS	Microwave Limb Sounder
MMRTG	Multi-Missions Radioisotope Thermoelectric Generators
MO	Missions of Opportunity
MOA	Memoranda of Agreement
MOU	Memorandum of Understanding
MPLM	Multi Purpose Logistic Modules
MSL	Mars Science Laboratory
MSM	Mission and Science Measurement Technology
MSRF	Materials Science Research Rack
MT	Mobile Transporter
MUBLCOM	Multiple path Beyond Line of Sight Communication
MUREP	Minority University Research and Education Program
MUSS	Multi-User Systems and Support
NAC	NASA Advisory Committee
NACA	National Advisory Committee for Aeronautics
NAI	National Aerospace Initiative
NAR	Non-Advocate Review
NAS	National Airspace System
NASDA	National Space Development Agency of Japan
NBL	Neutral Buoyancy Lab
NCAM	National Consortium for Aviation Mobility
NEIGE	NetLander Ionosphere and Geodesy Experiment
NEO	Near Earth Object
NEPER	NASA Education Program Evaluation Review Panel
NESDIS	National Environmental Satellite, Data and Information Service
NEXT	NASA Exploration Team
NExTNAS	NASA Exploratory Technologies for the National Airspace System
NGLT	Next Generation Launch Technology
NICMOS	Near Infrared Camera and Multi-Object Spectrometer
NIH	National Institutes of Health
NIMA	National Imagery and Mapping Agency
NISN	NASA Integrated Services Network
NLS	NASA Launch Services
NOAA	National Oceanic and Atmospheric Administration
NPG	NASA Procedures and Guidelines
NRA	NASA Research Announcement
NRC	National Research Council *or* Nuclear Regulatory Commission
NRC/ASEB	National Research Council Aeronautics and Space Engineering Board
NSBRI	National Space Biomedical Research Institute
NSF	National Science Foundation

SPECIAL ISSUES: Terms

NSI	Nuclear Systems Initiative (Program)
NSSC	NASA's Shared Services Center
NSTC	National Science and Technology Council
NTTC	National Technology Transfer Center
OAT	Office of Aerospace Technology
OBPR	Office of Biological and Physical Research (Enterprise)
OEP	Operational Evolution Plan
OHS	Office of Homeland Security
OMB	Office of Management and Budget
OPF	Orbiter Processing Facilities
OPF ORR	Orbiter Processing Facility Orbiter Rollout Review
OPIMC	OSF Program and Institutional Management Council
OSF	Office of Space Flight
OSP	Orbital Space Plane
OSS	Office of Space Science
OSTP	Office of Science and Technology Policy
PAD	Pad Abort Demonstrator
PAO	Public Affairs Office
PBOSG	Plum Brook Operations Support Group
PBRF	Plum Brook Reactor Facility
PBS	President's Budget Submit
PCA	Program Commitment Agreement
PCS	Physics of Colloids in Space
PCU	Power Control Unit
PDR	Preliminary Design Review
PDS	Hungarian Space Agency *or* Passive Dosimeter System *or* Planetary Data System
PI	Principal Investigator
PIMC	Program Institutional Management Council
PLASTIC	PLAsma and SupraThermal Ion and Composition
PMC	Program Management Council
PO	Physical Oceanography (at Jet Propulsion Laboratory)
POC	Point of Contact
POCAAS	Payload Operations Concepts and Architecture Assessment Study
POIC	Payloads Operations Information Center
POIF	Payloads Office Information Facility
POP	Program Operating Plan
PPARC	Particle Physics CNES
PPSF	Psychological and Physiological Stresses and Factors
PRU	Plant Research Unit
PSO	Primary Science Orbit
PSR	Physical Sciences Research
QAT	Quiet Aircraft Technology
R&A	Research and Analysis
R&D	Research and Development
R&T	Research and Technology
RAND	The RAND Corporation
RBCC	Rocket Based Combined Cycle
RCRA	Resource Conservation and Recovery Act
ReMaP	Research Maximization and Prioritization Task Force
RFPs	Request for Proposals
RHU	Radioactive Heater Units
RI	Research Institution
RLV	Reusable Launch Vehicle
ROSS	Research Opportunities in Space Science
RP	Rocket Propellant
RPC	Research Partnership Center
RPT	Rocket Propulsion Test
S&MA	Safety and Mission Assurance
S/C I & T	Spacecraft Integration and Test
SAE	Science, Aeronautics and Exploration
SAGAT	Situation Awareness Global Assessment Technique
SAIC	Science Applications International Corporation
SAO	Smithsonian Astrophysical Observatory
SATS	Small Aircraft Transportation System
SB	Small Business
SBCs	Small Business Concerns
SBIR	Small Business Innovative Research
SDB	Small disadvantaged business
SDMAC	Space Department MAnagement Committee
SDR	System Design Review
SEAT	Science Engineering Analysis and Test
SEC	Sun-Earth Connection
SECAS	Sun-Earth Connection Advisory Subcommittee
SECCHI	Sun-Earth Connection Coronal and Heliospheric Investigation
SEIS	SEISmology Experiment
SELVS	Support of Expendable Launch Vehicles
SEU	Structure and Evolution of the Universe
SEUS	Structure and Evolution of the Universe Subcommittee
SFC	Space Flight Capabilities
SFOC	Space Flight Operations Contract

SPECIAL ISSUES: Terms

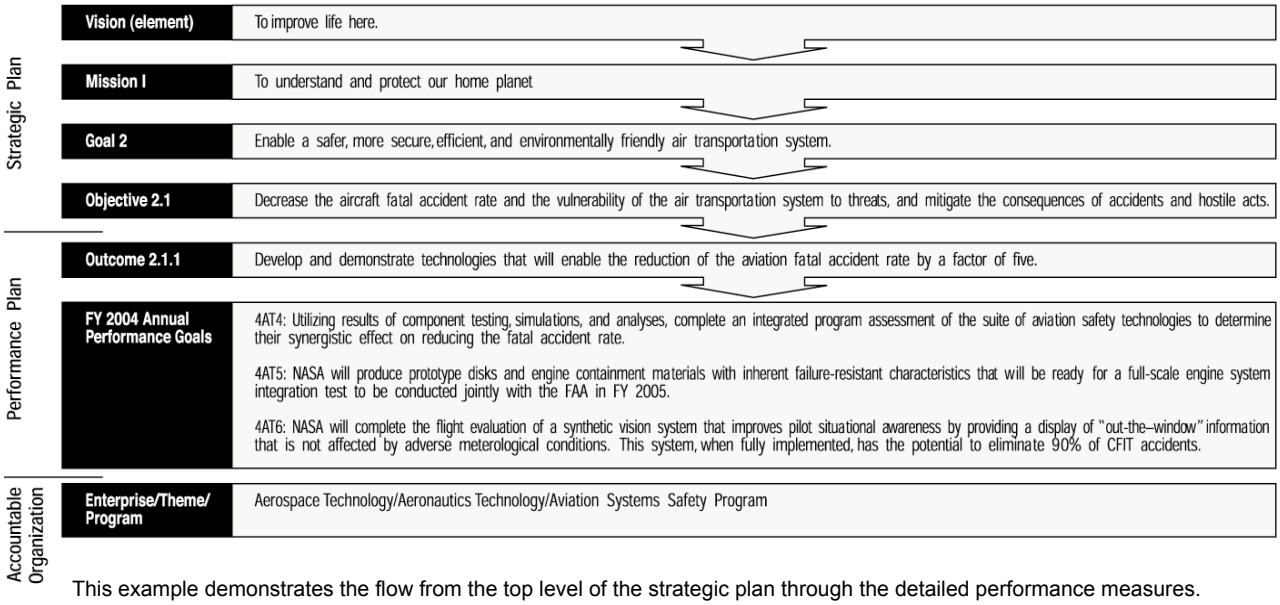
SHARAD	Shallow Radar
SHARP	Slender Hypervelocity Aerothermodynamic Research Probes
SHARPP	Solar Heliospheric Activity Research and Prediction Program
SHCT	Short Hall Civil Tiltrotor
SIM	Space Interferometry Mission
SIRTF	Space Infrared Telescope Facility
SLEP	Service Life Extension Program
SLI	Space Launch Initiative
SLWT	Super Lightweight Tank
SMC	Senior Management Council
SMEX	Small Explorer
SMO	Systems Management Organization
SMPMC	Systematic Measurements Program Management Council
SMS	Surface Management System
SOA	State of the Art
SOFIA	Stratospheric Observatory for Infrared Astronomy
Space Flight Capabilities	Space Flight, Crosscutting Technology, Safety & Mission Assurance, and Institutional Support
SPD	Space Product Development
SPF	Software Production Facility
SPRL	Space Physics Research Laboratory (University of Michigan)
SSB	Space Studies Board
SSBRP	Space Station Biological Research Project
SScAC	Space Science Advisory Committee
SSE	Space Science Enterprise *or* Solar System Exploration
SSES	Solar System Exploration Subcommittee
SSME	Space Shuttle Main Engines
SSP	Space Shuttle Program
SSRMS	Space Station Remote Manipulator System
SSTF	Space Station Training Facility
STARS	NASA's Staff and Recruiting System
STEM	Science, Technology, Engineering, and Mathematics
STLT	Space Transfer and Launch Technology Program
STTR	Small Business Technology Transfer
SWAVES	STEREO/WAVES
SWOB	Small women owned business
TAP	Terminal Area Productivity
TBCC	Turbine Based Combined Cycle
TCA	Theme Commitment Agreement
TCAT	21st Century Aircraft Technology
TDRSS	Tracking and Data Relay Satellite system
TEB	Technology Executive Board
TES	Thermal Emissions Spectrometer
Themes (NASA)	There are 18 themes, grouped by Enterprise.
TMCO	Technical, Management, Cost, and Other Program Factors. Other includes E/PO, SDB, and tech infusion/transfer.
TPF	Terrestrial Planet Finder
TRL	Technology Readiness Level, see page S&AP 4-9
TRMM	Tropical Rainfall Measuring Mission
TSA	Transportation Security Agency
TSC	Telecommunications Support Center
TTA	Technical Task Agreements
UAV	Unmanned Aerial Vehicles
UEET	Ultra-Efficient Engine Technology
UHF	Ultra High Frequency
ULF	Ultra Low Frequency
UNESCO	United Nations Educational, Scientific and Cultural Organization
URETI	University Research and Engineering Technology Institute
USACE	U.S. Army Corps of Engineers
USAF	United States Air Force
USDA	U. S. Department of Agriculture
USGS	U.S. Geological Survey
USRA	Universities Space Research Association
UVOT	UltraViolet/Optical Telescope
VAB	Vehicle Assembly Building
VAMS	Virtual Airspace Modeling and Simulation
VIB	Virtual Iron Birds
VS	Vehicle Systems
VSP	Vehicle Systems Program
WFC3	Wide Field Camera 3
WORF	Window Observational Research Facility
X43C	Flight demonstrator combining NASA airframe experience and USAF propulsion development
XRT	X-Ray Telescope

SPECIAL ISSUES: Performance Plan Summary

NASA's planning process starts with long-term Vision and Mission and flows to more focused near-term plans and documents.

The NASA Vision, Mission, goals, and objectives are documented in the strategic plan. These have been further decomposed into outcomes and FY 2004 annual performance goals, which are distributed throughout the themes in this Integrated Budget and Performance Document. Each theme traces its allocations from the Mission statements to the annual performance goals. The table in this section shows the total allocation of outcomes and annual performance goals to each mission, goal and objective, as collected from the themes throughout this document.

The specific annual performance goals in this summary are traceable to the themes using the naming convention for the annual performance plans. For example, 4AT6 is goal number 6 for the Aeronautics Theme for FY2004, and 4ISS5 is goal number 5 for the International Space Station Theme for FY2004. The theme identifiers are shown below.



This example demonstrates the flow from the top level of the strategic plan through the detailed performance measures.

Themes

ASO–Astronomical Search for Origins
AT–Aeronautics Technology
BSR–Biological Sciences Research
ED–Education Programs
ESA–Earth Science Applications
ESS–Earth System Science
ISS–International Space Station
ITTP–Innovative Technology Transfer Partnerships
MEP–Mars Exploration Program
MSM–Mission and Science Measurement Technology
PSR–Physical Sciences Research
RPFS–Research Partnerships and Flight Support
SEC–Sun-Earth Connection
SEU–Structure and Evolution of the Universe
SFS–Space and Flight Support
SLI–Space Launch Initiative
SSE–Solar System Exploration
SSP–Space Shuttle Program

SPECIAL ISSUES: Performance Plan Summary

Mission I: To Understand and Protect our Home Planet

Goal 1: Understand the Earth system and apply Earth system science to improve prediction of climate, weather, and natural hazards.

Obj. 1.1 Understand how the Earth is changing, better predict change, and understand the consequences for life on Earth.

Outcome 1.1.1 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.

Outcome 1.1.2 Expand Earth Science research opportunities through utilization of the unique capabilities of the Space Shuttle.

4SSP1 Achieve 100% on-orbit mission success when carrying Earth science payloads. For this metric, mission success criteria are those provided to the prime contractor (SFOC) for purposes of determining successful accomplishment of the performance incentive fees in the contract.

Outcome 1.1.3 Provision of Space Station accommodations to support Earth Science Research.

4ISS1 Provide, at least, 80% of the upmass, middecks and crew time for Earth Science payloads as established at the beginning of FY 2004.

Outcome 1.1.4 Enhance Earth Science research through definition of future opportunities for utilization of unique human capabilities in space.

4SFS1 Identify 2-3 innovative system and infrastructure concepts (and associated technologies) driven by the requirements of ambitious future Earth system science missions.

4SFS2 Develop and review technology maturation road maps and investment strategies necessary to realize these transformational capabilities for Earth system science.

Obj. 1.2 Expand and accelerate the realization of economic and societal benefits from Earth science, information, and technology.

Outcome 1.2.1 Expand and accelerate the realization of economic and societal benefits from Earth science, information, and technology.

4ESA1 National applications: Benchmark measurable enhancements to at least 2 national decision support systems using NASA results.

4ESA2 Cross Cutting Solutions: Expand DEVELOP (Digital Earth Virtual Environment and Learning Outreach Project) workforce development program to at least 5 additional states.

4ESA3 Cross Cutting Solutions: Competitively select at least 5 solutions projects for the Research, Education, Applications solutions Network (REASoN) program to serve national applications.

4ESA4 Cross Cut Solutions: Verify and validate at least two commercial remote sensing sources/products for Earth science research.

Obj. 1.3 Understand the origins and societal impacts of variability in the Sun-Earth connection.

Outcome 1.3.1 Define the origins and societal impacts of variability in the Sun-Earth Connection.

4SEC4 Successfully demonstrate progress in developing the capability to predict solar activity and the evolution of solar disturbances as they propagate in the heliosphere and affect the Earth. Progress towards achieving outcomes will be validated by external review.

4SEC5 Successfully demonstrate progress in specifying and enabling prediction of changes to the Earth's radiation environment, ionosphere, and upper atmosphere. Progress towards achieving outcomes will be validated by external review.

4SEC6 Successfully demonstrate progress in understanding the role of solar variability in driving space climate and global change in the Earth's atmosphere. Progress towards achieving outcomes will be validated by external review.

Obj. 1.4 Catalog and understand potential hazards to Earth from space.

Outcome 1.4.1 Explore the space environment to discover hazards to Earth.

4SSE4 Successfully demonstrate progress in determining the inventory and dynamics of bodies that may pose an impact hazard to Earth. Progress towards achieving outcomes will be validated by external review.

4SSE5 Successfully demonstrate progress in determining the physical characteristics of comets and asteroids relevant to any threat they may pose to Earth. Progress towards achieving outcomes will be validated by external review.

Goal 2: Enable a safer, more secure, efficient, and environmentally friendly air transportation system.

Obj. 2.1 Decrease the aircraft fatal accident rate and the vulnerability of the air transportation system to threats, and mitigate the consequences of accidents and hostile acts.

Outcome 2.1.1 Develop & demonstrate technologies that will enable the reduction of the aviation fatal accident rate by 50% from the FY 1991 - 1996 average.

4AT4 Utilizing results of component testing, simulations, and analyses, complete an integrated program assessment of the suite of aviation safety technologies to determine their synergistic effect on reducing the fatal accident rate. (AvSSP)

4AT5 Propulsion system malfunctions are cited in 25% of fatal accidents, with disk and/or fan blade component failures being attributed to about 15% of these malfunctions. In FY 2004 NASA will provide deliver prototype disks, and engine containment materials with inherent failure resistant characteristics that will be ready for a full scale engine system integration test to be conducted jointly with the FAA in FY05. (AvSSP)

4AT6 Controlled Flight into Terrain (CFIT) accounts for 30% of General Aviation fatal accidents. During FY 2004, NASA will complete the flight evaluation of a synthetic vision system that improves pilot situational awareness by providing a display of "out-the–window" information that is not effected by adverse metrological conditions. This system when fully implemented has the potential to eliminate 90% of CFIT accidents. (AvSSP)

Outcome 2.1.2 Develop & demonstrate decision support technologies for ground-based and air/ground air traffic management systems that detect and manage threatening aircraft.

4AT7 Complete a preliminary demonstration, in a realistic operational environment, of an automated system to provide real-time identification of flight path deviations and a means to alert authorities in a prompt and consistent manner. (AvSSP)

Obj. 2.2 Protect local and global environmental quality by reducing aircraft noise, emissions and other contaminants.

Outcome 2.2.1 Validate aircraft component technologies and advanced operations for reducing noise by 10dB (re: CF 1997 SOA) in laboratory and relevant environment to enable air traffic growth.

4AT8 Validate initial concepts for engine and airframe source noise reduction by 5dB (re: to CY 2001 SOA). (Vehicle Systems)

Outcome 2.2.2 Demonstrate combustor configurations for reducing NOx emission by 70% (re. to 1996 ICAO standard) to reduce smog and lower atmospheric ozone. Demonstrate airframe and engine component technologies for reducing the green-house gas, CO2, emissions by 25% (re. to 2000 SOA).

4AT9 Experimentally demonstrate a 2-stage highly loaded compressor for increasing pressure rise per stage. (Vehicle Systems)

Obj. 2.3 Enable more people and goods to travel faster and farther, with fewer delays.

Outcome 2.3.1 Develop & demonstrate technologies that enable a 50% increase in the aviation system throughput.

4AT10 Complete validation and assessment of the Advanced Air Transportation Technologies products (tools/concepts) through field and laboratory demonstrations, analyses, evaluations, and assessments on a tool-by-tool basis to demonstrate an increase in terminal throughput by 35 percent and an increase in en route throughput by 20 percent. (Airspace Systems)

Outcome 2.3.2 Provide the technologies and processes for conducting trade-off analyses amongst future air transportation system's concepts and technologies.

4AT11 Develop a non-real-time Virtual Airspace Simulation Technology environment that will model the National Airspace System and provide the capability to conduct trade-off analyses amongst future air transportation system's concepts and technologies. (Airspace Systems)

Outcome 2.3.3 Develop and demonstrate technologies to enable increased utilization of local & regional airports to enhance mobility.

4AT12 Flight demonstrate the ability to double the operations rate at non-towered, non-radar airports in low-visibility conditions using self-separation and flight-path guidance technologies for general aviation aircraft. (Airspace Systems).

Outcome 2.3.4 Develop and demonstrate NASA exploratory technologies for the National Airspace System (NAS) to meet projected growth in passenger demand beyond 2010.

4AT13 Based on research completed under AATT project and current work under VAMS project, provide preliminary analysis and assessment of distributed air/ground traffic management (DAG/TM) operational concept.

Goal 3: Create a more secure world and improve the quality of life by investing in technologies and collaborating with other agencies, industry, and academia.

Obj. 3.1 Enhance the Nation's security by developing and demonstrating critical access-to-space technologies that benefit NASA, DOD, and other government agencies.

Outcome 3.1.1 An established partnership between NASA and DoD to ensure space technology investments are fully leveraged. (NGLT)

4SLI17 The DoD responsive space lift requirements as defined by the Analysis of Alternatives process will be assessed to determine the potential and priorities for leveraged technology investments that support both NASA and DoD needs.

Outcome 3.1.2 Advance goals of a more secure world and a higher quality of life by providing and defining more capable and affordable future in space operations infrastructure.

4SFS3 Identify 2-3 innovative systems and infrastructure concepts (and associated technologies) that can support prospective requirements of ambitious future space systems that contribute materially to security and the quality of life.

4SFS4 Develop and review of technology maturation road maps and investment strategies necessary to realize these transformational capabilities.

Outcome 3.1.3 Create a more Secure World and improve the quality of life by investing in technologies and collaborating with other agencies, industry, and academia.

4ESA5 Benchmark improvements to at least two of the target national applications - Air quality and Agricultural competitiveness.

Obj. 3.2 Enhance the Nation's security through aeronautical partnerships with DOD and other government agencies.

Outcome 3.2.1 Gain experience in multi-national space construction & operations to support future cooperative programs.

4ISS2 The ISS will meet its commitments with the International Partners to provide Node-2 in FY04.

Outcome 3.2.2 Develop and conduct tests of innovative technologies that contribute to the superiority of air vehicles in support of the National defense.

4AT14 Conduct and obtain flight test data of Autonomous Aerial refueling technologies in support of DoD UCAV Program. (Vehicle Systems)

Obj. 3.3 Improve the Nation's economic strength and quality of life by facilitating innovative use of NASA technology.

Outcome 3.3.1 Transfer NASA technology to the Nation.

4ITTP1 Complete 200 transfers of NASA technologies, expertise or facility usage to the U.S. private sector, through hardware licenses, software usage agreements, or Space Act agreements.

Obj. 3.4 Leverage resources in support of national priorities through partnerships across industry, academia, and government for market-driven research in space.

Outcome 3.4.1 Advance NASA's vision and mission by leveraging industry investment in space-based commercial activity through active partnership with industry and academia.

4RPFS1 Complete realignment plans of SPD, initiate phase-out, and demonstrate contributions to agency mission.

4RPFS2 Enable industry research in space that allows them to bring one commercial product under investigation to market by FY04.

Obj. 3.5 Resolve scientific issues impacting Earth-based technological and industrial applications using the unique low-gravity environment of space.

Outcome 3.5.1 Use the unique low-gravity environment to resolve scientific issues that impact Earth-based technological and industrial applications.

4PSR1 Improve understanding of the detailed physical and chemical processes associated with combustion, the efficiency of combustion, and how soot is produced in flames; the properties and behavior of granular materials such as soils and powders; growing crystals of large molecules for applications in drug development and biomedical research; and growing tissues outside the body (cellular assembling processes in tissue cultures) for research and medical treatments. Progress toward accomplishing this Performance Goal will be assessed by an advisory committee.

4RPFS3 Integrate and prepare the Combustion Integrated Rack research facility for launch in the FY 2004 time frame.

Outcome 3.5.2 Provision of ISS accommodations to support NASA, other U.S. Government Agencies, Industry and Academic research and technology development.

4ISS3 Provide at least 80% of the upmass, middecks, and crewtime for technology development payloads as established at the start of FY 2004.

SPECIAL ISSUES: Performance Plan Summary

Mission II: To Explore the Universe and Search for Life

Goal 4: Explore the fundamental principles of physics, chemistry, and biology through research in the unique natural laboratory of space.

Obj. 4.1 Understand how life responds to the space environment and the role of gravity in the processes of life.

Outcome 4.1.1 Describe and determine the ability of life to adapt and thrive in the space environment.

4BSR1 Advance understanding of the role of gravity in biological processes at all levels of biological complexity. FY 04 activities will include soliciting ground-based research in all Fundamental Biology disciplines, planning for increased early ISS utilization for basic biology research in the 2005 and beyond time frame, and maintaining an open, competitive and productive program in fundamental space biology.

Outcome 4.1.2 Ensure the opportunity for successful scientific research projects and programs by providing safe, reliable, and affordable launch and recovery capability, sustaining payload resources, and a human presence.

4SSP2 Achieve 100% on-orbit mission success when carrying physical science payloads. For this metric, mission success criteria are those provided to the prime contractor (SFOC) for purposes of determining successful accomplishment of the performance incentive fees in the contract.

Obj. 4.2 Understand the fundamental organizing principles of nature and how they give rise to structure and complexity in matter, using the unique low-gravity environment in space.

Outcome 4.2.1 Advance the scientific understanding of complex biological and physical systems.

4PSR2 Use research in the low gravity environment of space to advance the scientific understanding of complex biological and physical systems. FY 04 accomplishments will include maintaining an open, competitive, and productive research community, and carrying out and analyzing results of ISS experiments in colloidal physics. Progress toward accomplishing this performance goal will be assessed by an advisory committee.

Outcome 4.2.2 Advance understanding of fundamental issues in condensed matter physics and atomic physics.

4PSR3 Investigate fundamental and unresolved issues in condensed matter physics and atomic physics. FY 04 activities will include maintaining an open, competitive and productive research program in condensed matter physics, Bose-Einstein condensation, and atomic clocks development for space-based utilization. Progress toward accomplishing this performance goal will be assessed by an advisory committee.

Outcome 4.2.3 Provision of Space Station accommodations to support Physics, Chemistry and Biological Research.

4ISS4 Provide, at least, 80% of the upmass, middecks and crew time for Biological and Physical Sciences' payloads as established at the beginning of FY 2004.

Goal 5: Explore the solar system and the universe beyond, understand the origin and evolution of life, and search for evidence of life elsewhere.

Obj. 5.1 Learn how the solar system originated and evolved to its current diverse state.

Outcome 5.1.1 Determine how the solar system originated and evolved to its current diverse state.

4SSE6 Successfully demonstrate progress in understanding the initial stages of planet and satellite formation. Progress towards achieving outcomes will be validated by external review.

4SSE7 Successfully demonstrate progress in studying the processes that determine the characteristics of bodies in our solar system and how these processes operate and interact. Progress towards achieving outcomes will be validated by external review.

4SSE8 Successfully demonstrate progress in understanding why the terrestrial planets are so different from one another. Progress towards achieving outcomes will be validated by external review.

4SSE9 Successfully demonstrate progress in learning what our solar system can tell us about extra-solar planetary systems. Progress towards achieving outcomes will be validated by external review.

Outcome 5.1.2 Support future exploration by providing Space Shuttle launch capability for research, technology development, and exploration missions.

4SSP3 Achieve 100% on-orbit mission success when servicing HST. For this metric, mission success criteria are those provided to the prime contractor (SFOC) for purposes of determining successful accomplishment of the performance incentive fees in the contract.

Obj. 5.2 Determine the characteristics of the solar system that led to the origin of life.

Outcome 5.2.1 Determine the characteristics of the solar system that led to the origin of life.

4SSE10 Successfully demonstrate progress in determining the nature, history, and distribution of volatile and organic compounds in the solar system. Progress towards achieving outcomes will be validated by external review.

4SSE11 Successfully demonstrate progress in identifying the habitable zones in the solar system. Progress towards achieving outcomes will be validated by external review.

Obj. 5.3 Understand how life begins and evolves.

Outcome 5.3.1 Understand how life begins and evolves.

4SSE12 Successfully demonstrate progress in identifying the sources of simple chemicals that contribute to prebiotic evolution and the emergence of life. Progress towards achieving outcomes will be validated by external review.

4SSE13 Successfully demonstrate progress in studying Earth's geologic and biologic records to determine the historical relationship between Earth and its biosphere. Progress towards achieving outcomes will be validated by external review.

Obj. 5.4 Understand the current state and evolution of the atmosphere, surface, and interior of Mars.

Outcome 5.4.1 Understand the current state and evolution of the atmosphere, surface, and interior of Mars.

4MEP4 Successfully demonstrate progress in characterizing the present climate of Mars and determine how it has evolved over time. Progress towards achieving outcomes will be validated by external review.

4MEP5 Successfully demonstrate progress in investigating the history and behavior of water and other volatiles on Mars. Progress towards achieving outcomes will be validated by external review.

4MEP6 Successfully demonstrate progress in studying the chemistry, mineralogy, and chronology of Martian materials. Progress towards achieving outcomes will be validated by external review.

4MEP7 Successfully demonstrate progress in determining the characteristics and dynamics of the interior of Mars. Progress towards achieving outcomes will be validated by external review.

Obj. 5.5 Determine if life exists or has ever existed on Mars.

Outcome 5.5.1 Determine whether life exists or has ever existed on Mars.

4MEP8 Successfully demonstrate progress in investigating the character and extent of prebiotic chemistry on Mars. Progress towards achieving outcomes will be validated by external review.

4MEP9 Successfully demonstrate progress in searching for chemical and biological signatures of past and present life on Mars. Progress towards achieving outcomes will be validated by external review.

Obj. 5.6 Develop an understanding of Mars in support of possible future human exploration.

Outcome 5.6.1 Develop an understanding of Mars in support of possible future human exploration.

4MEP10 Successfully demonstrate progress in identifying and studying the hazards that the Martian environment will present to human explorers. Progress towards achieving outcomes will be validated by external review.

4MEP11 Successfully demonstrate progress in inventorying and characterizing Martian resources of potential benefit to human exploration of Mars. Progress towards achieving outcomes will be validated by external review.

Outcome 5.6.2 Enable safer, more affordable and more effective future human and robotic exploration missions by defining science-driven, innovative approaches and concepts to inform future decisions concerning systems infrastructures.

4SFS5 Identify 4-6 innovative system and infrastructure concepts (and associated technologies) that can support the requirements of ambitious future space science missions.

4SFS6 Develop and independently review technology maturation road maps and investment strategies necessary to realize these transformational capabilities for Space Science.

Obj. 5.7 Discover what powered the Big Bang and the nature of the mysterious dark energy that is pulling the Universe apart.

Outcome 5.7.1 Discover what powered the Big Bang and the nature of the mysterious dark energy that is pulling the Universe apart.

4SEU4 Successfully demonstrate progress in search for gravitational waves from the earliest moments of the Big Bang. Progress towards achieving outcomes will be validated by external review.

4SEU5 Successfully demonstrate progress in determining the size, shape, and matter-energy content of the Universe. Progress towards achieving outcomes will be validated by external review.

4SEU6 Successfully demonstrate progress in measuring the cosmic evolution of the dark energy, which controls the destiny of the Universe. Progress towards achieving outcomes will be validated by external review.

Obj. 5.8 Learn what happens to space, time, and matter at the edge of a black hole.

Outcome 5.8.1 Learn what happens to space, time, and matter at the edge of a black hole.

4SEU7 Successfully demonstrate progress in determining how black holes are formed, where they are, and how they evolve. Progress towards achieving outcomes will be validated by external review.

4SEU8 Successfully demonstrate progress in testing Einstein's theory of gravity and mapping space-time near event horizons of black holes. Progress towards achieving outcomes will be validated by external review.

4SEU9 Successfully demonstrate progress in observing stars and other material plunging into black holes. Progress towards achieving outcomes will be validated by external review.

Obj. 5.9 Understand the development of structure and the cycles of matter and energy in the evolving Universe.

Outcome 5.9.1 Understand the development of structure and explore the cycles of matter and energy in the evolving Universe.

4SEU10 Successfully demonstrate progress in determining how, where, and when the chemical elements were made, and tracing the flows of energy and magnetic fields that exchange them between stars, dust, and gas. Progress towards achieving outcomes will be validated by external review.

4SEU11 Successfully demonstrate progress in exploring the behavior of matter in extreme astrophysical environments, including disks, cosmic jets, and the sources of gamma-ray bursts and cosmic rays. Progress towards achieving outcomes will be validated by external review.

4SEU12 Successfully demonstrate progress in discovering how the interplay of baryons, dark matter, and gravity shapes galaxies and systems of galaxies. Progress towards achieving outcomes will be validated by external review.

Obj. 5.10 Understand how today's universe of galaxies, stars, and planets came to be.

Outcome 5.10.1 Understand how today's Universe of galaxies, stars, and planets came to be.

4ASO4 Successfully demonstrate progress in learning how the cosmic web of matter organized into the first stars and galaxies and how these evolved into the stars and galaxies we see today. Progress towards achieving outcomes will be validated by external review.

4ASO5 Successfully demonstrate progress in understanding how different galactic ecosystems of stars and gas formed and which ones might support the existence of planets and life. Progress towards achieving outcomes will be validated by external review.

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Obj. 5.11 Learn how stars and planetary systems form and evolve.

Outcome 5.11.1 Learn how stars and planetary systems form and evolve.

4ASO6 Successfully demonstrate progress in learning how gas and dust become stars and planets. Progress towards achieving outcomes will be validated by external review.

4ASO7 Successfully demonstrate progress in observing planetary systems around other stars and comparing their architectures and evolution with our own. Progress towards achieving outcomes will be validated by external review.

Obj. 5.12 Understand the diversity of other worlds and search for those that might harbor life.

Outcome 5.12.1 Explore the diversity of other worlds and search for those that might harbor life.

4ASO8 Successfully demonstrate progress in characterizing the giant planets orbiting other stars. Progress towards achieving outcomes will be validated by external review.

4ASO9 Successfully demonstrate progress in finding out how common Earth-like planets are and seeing if any might be habitable. Progress towards achieving outcomes will be validated by external review.

4ASO10 Successfully demonstrate progress in tracing the chemical pathways by which simple molecules and dust evolve into the organic molecules important for life. Progress towards achieving outcomes will be validated by external review.

4ASO11 Successfully demonstrate progress in developing the tools and techniques to search for life on planets beyond our solar system. Progress towards achieving outcomes will be validated by external review.

Obj. 5.13 Understand the changing flow of energy and matter throughout the Sun, heliosphere, and planetary environments.

Outcome 5.13.1 Understand the changing flow of energy and matter throughout the Sun, heliosphere, and planetary environments.

4SEC7 Successfully demonstrate progress in understanding the structure and dynamics of the Sun and solar wind and the origins of magnetic variability. Progress towards achieving outcomes will be validated by external review.

4SEC8 Successfully demonstrate progress in determining the evolution of the heliosphere and its interaction with the galaxy. Progress towards achieving outcomes will be validated by external review.

4SEC9 Successfully demonstrate progress in understanding the response of magnetospheres and atmospheres to external and internal drivers. Progress towards achieving outcomes will be validated by external review.

Obj. 5.14 Understand the fundamental physical processes of space plasma systems.

Outcome 5.14.1 Support exploration of the fundamental physical processes of space plasma systems.

4SEC10 Successfully demonstrate progress in discovering how magnetic fields are created and evolve and how charged particles are accelerated. Progress towards achieving outcomes will be validated by external review.

4SEC11 Successfully demonstrate progress in understanding coupling across multiple scale lengths and its generality in plasma systems. Progress towards achieving outcomes will be validated by external review.

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Mission III: To Inspire the Next Generation of Explorers

Goal 6: Inspire and motivate students to pursue careers in science, technology, engineering, and mathematics.

Obj. 6.1 Improve student proficiency in science, technology, engineering and mathematics by creating a culture of achievement using educational programs, products and services based on NASA's unique missions, discoveries and innovations.

Outcome 6.1.1 Kindergarten through graduate students will be more proficient in science, technology, engineering, and mathematics (STEM).

4ED1 Develop/implement customized education program for pilot cohort of 40 schools to improve student STEM proficiency. Progress will be validated through external evaluation conducted according to accepted professional standards.

4ED2 Develop at least 3 ethnic-focused space exploration teaching tools in FY04 that target Hispanic/Latino, African American, and Native American K-12 students in order to improve student proficiency in STEM. Identify institutions/schools that enroll at least 60% of the targeted population to implement these tools no later than FY05. Progress will be validated through external evaluation conducted according to accepted professional standards.

4ED3 Support the achievement of education objectives as established by state and local education authorities through the coordinated application of NASA assets, conducting activities for educators and students as requested. Progress will be assessed through a standards-based, external evaluation, validated by an external panel.

4PSR4 Engage students in inquiry-based learning experiences through development and distribution of classroom activities that simulate biological and physical sciences space research investigations. These activities will align with standards-based curriculum.

4BSR2 Engage students in inquiry-based learning experiences through development and distribution of classroom activities that simulate biological and physical sciences space research investigations. These activities will align with standards-based curriculum.

4MSM15 Provide at least 4 products that deliver or facilitate the delivery of NASA science and engineering content into formal and informal educational institutions. Disseminate educational products to at least 1,000 schools, educators, or students. Provide remote access of educational materials into the classroom via advanced information technologies. Support NASA presence at educational workshops, conferences or symposiums. Support development of academic course material in Aerospace Technology. Progress will be validated in FY04 through external evaluation conducted according to accepted professional standards. (CICT, RMCS & ECT)

4SSE14 Provide opportunities for students to work directly with NASA space science missions, facilities, and data.

4SEU13 Provide opportunities for students to work directly with NASA space science missions, facilities, and data.

4ASO12 Provide opportunities for students to work directly with NASA space science missions, facilities, and data.

4MEP12 Provide opportunities for students to work directly with NASA space science missions, facilities, and data.

4SEC12 Provide opportunities for students to work directly with NASA space science missions, facilities, and data.

4SSP4 Ensure the development & distribution of OSF content for curricular use in NASA Explorer Schools and in the Educator Mission Specialist Program.

4ISS5 Ensure the development & distribution of OSF content for curricular use in NASA Explorer Schools and in the Educator Mission Specialist Program.

4SFS7 Ensure the development & distribution of OSF content for curricular use in NASA Explorer Schools and in the Educator Mission Specialist Program.

4SLI18 An instructional video program and standards-based lesson guide highlighting applications of science, technology, engineering and mathematics will be produced for the 'NASA CONNECT" series to help student proficiency in these technical fields.

Obj. 6.2 Motivate K-16+ students from diverse communities to pursue science and math courses and ultimately college degrees in science, technology, engineering, and mathematics.

Outcome 6.2.1 More students from diverse communities motivated to pursue careers in STEM.

4ED4 Provide educational assistance, through competitive scholarships and fellowships, to at least 400 undergraduate and 200 graduate students from diverse communities to pursue degrees in STEM disciplines. A longitudinal database will be developed to track career development paths.

4ESA6 Education: Integrate NASA-reviewed Earth science education results through partnerships into "Revolution" blueprint for Earth Science Education.

4ESA7 Education: Select at least 50 new graduate fellowships to contribute to human capital for Earth science community.

4SSE15 Provide new opportunities for participation in the space science program by an increasingly diverse population, including opportunities for minorities and minority universities to compete for and participate in space science missions, research, and education programs.

4SEU14 Provide new opportunities for participation in the space science program by an increasingly diverse population, including opportunities for minorities and minority universities to compete for and participate in space science missions, research, and education programs.

4ASO13 Provide new opportunities for participation in the space science program by an increasingly diverse population, including opportunities for minorities and minority universities to compete for and participate in space science missions, research, and education programs.

4MEP13 Provide new opportunities for participation in the space science program by an increasingly diverse population, including opportunities for minorities and minority universities to compete for and participate in space science missions, research, and education programs.

4SEC13 Provide new opportunities for participation in the space science program by an increasingly diverse population, including opportunities for minorities and minority universities to compete for and participate in space science missions, research, and education programs.

4SSP5 Increase by 10%, students participating in OSF research and development opportunities that enhances their academic experience, strengthens their professional skills, and supports their successful transition into scientific and technical workforce.

4ISS6 Increase by 10%, students participating in OSF research and development opportunities that enhances their academic experience, strengthens their professional skills, and supports their successful transition into scientific and technical workforce.

4SFS8 Increase by 10%, students participating in OSF research and development opportunities that enhances their academic experience, strengthens their professional skills, and supports their successful transition into the scientific and technical workforce.

Obj. 6.3 Enhance science, technology, engineering and mathematics instruction with unique teaching tools and experiences that only NASA can provide, that are compelling to teachers and students.

Outcome 6.3.1 Improve quality of STEM instruction.

4ED5 Engage K-12 educators in the Educator Astronaut Program to provide unique teaching resources to the STEM teaching profession. Progress will be validated through external evaluation conducted according to accepted professional standards.

4ED6 Establish engaging, interactive web-based teaching resources for educators that support STEM instruction. Progress will be assessed using standards-based evaluation techniques.

4ED7 Provide opportunities for minority institutions to enhance their capacity to prepare both pre-service and in-service teachers to teach mathematics and science. Program effectiveness will be measured by tracking the number of teachers who obtain certification to teach mathematics and science and who are then employed to teach.

4ED8 Provide financial resources and NASA research data to enable interdisciplinary teams from university teacher education programs to develop innovative courses for pre-service teachers. Outcomes will be evaluated by university faculty and graduate students through a multi-faceted protocol.

4AT15 To improve student proficiency in STEM, develop and disseminate education standards-based curriculum support products that deliver science and engineering content based on Aerospace Technology research. Progress toward improvement will be assessed by feedback on the disseminated support products.

4PSR5 Develop collaborations with Professional Education Associations directed to enhancement of educator proficiency in use of space research content and classroom, educational hardware focused on standards-based curriculum.

4PSR6 Develop and train facilitators for dissemination of 3 comprehensive Educator Professional Development Seminar packages focused on biological and physical sciences research that coordinates with standard's based science, math, and technology concepts.

4BSR3 Develop collaborations with Professional Education Associations directed to enhance educator proficiency in use of space research content and classroom educational hardware focused on standards-based curriculum.

4BSR4 Develop and train facilitators for dissemination of 3 comprehensive Educator Professional Development Seminar packages focused on biological and physical sciences research that coordinates with standard's based science, math, and technology concepts.

4RPFS4 Develop collaborations with Professional Education Associations directed to enhancement of educator proficiency in use of space research content and classroom, educational hardware focused on standards-based curriculum.

4RPFS5 Develop and train facilitators for dissemination of 3 comprehensive Educator Professional Development Seminar packages focused on biological and physical sciences research that coordinates with standard's based science, math, and technology concepts.

4SSE16 Provide high quality educational materials and teacher training based on Theme content and focused on national curriculum standards.

4SSE17 Provide exhibits, materials, workshops, and personnel at national and/or regional education and outreach conferences.

4SEU15 Provide high quality educational materials and teacher training based on Theme content and focused on national curriculum standards.

4SEU16 Provide exhibits, materials, workshops, and personnel at national and/or regional education and outreach conferences.

4ASO14 Provide high quality educational materials and teacher training based on Theme content and focused on national curriculum standards.

4ASO15 Provide exhibits, materials, workshops, and personnel at national and/or regional education and outreach conferences.

4MEP14 Provide high quality educational materials and teacher training based on Theme content and focused on national curriculum standards.

4MEP15 Provide exhibits, materials, workshops, and personnel at national and/or regional education and outreach conferences.

4SEC14 Provide high quality educational materials and teacher training based on Theme content and focused on national curriculum standards.

4SEC15 Provide exhibits, materials, workshops, and personnel at national and/or regional education and outreach conferences.

4ESS13 Make Earth science information products available to curricula developers.

4SSP6 Reach and expose, through both formal and informal education venues, 800 in-service and pre-service teachers, university teacher education faculty and students to mathematics and science careers and to OSF's unique educational resources.

4SSP7 During the academic year 2003-2004, increase by 2 the number of pre-college programs for students participation in OSF center sponsored education enrichment activities that promote their interest in and knowledge of mathematics, science, engineering and technology career fields.

4ISS7 Reach and expose, through both formal and informal educations venues, 800 in-service and pre-service teachers, university teacher education faculty and students to mathematics and science careers and to OSF's unique educational resources.

4ISS8 During academic year 2003-2004, increase by 2 the number of pre-college programs for students participation in OSF center sponsored education enrichment activities that promotes their interest in and knowledge of mathematics, science, engineering and technology career fields.

4SFS9 Reach and expose, through both formal and informal educations venues, 800 in-service and pre-service teachers, university teacher education faculty and students to mathematics and science careers and to OSF's unique educational resources.

4SFS10 During academic year 2003-2004, increase by 2 the number of pre-college programs for students participation in OSF center sponsored education enrichment activities that promotes their interest in and knowledge of mathematics, science, engineering and technology career fields.

Obj. 6.4 Improve higher education capacity to provide for NASA's and the Nation's future science and technology workforce requirements.

Outcome 6.4.1 More students prepared to enter the STEM workforce.

4ED9 Provide education and research opportunities to a diverse cohort of students and faculty in STEM disciplines that support human resources needs of the science and technology workforce (NASA, contractors, and/or universities). A longitudinal database to track students' career paths will be used to determine the number of graduates from NASA student programs who enter the science and technology workforce (NASA, contractors, and/or universities).

4ED10 Provide Minority Institutions with information and technical assistance on strategies that enhance STEM program development, management, and sustainability. Progress toward the outcome will be reviewed by an external panel.

4ED11 Develop partnerships and programs that strengthen research in NASA-related fields that enhance academic and research infrastructure at Minority Institutions. Progress toward the outcome will be reviewed by an external panel.

4ED12 Involve universities in states underrepresented in their share of competitively awarded grants, in NASA related research. An evaluation of the quality of research results will be conducted.

4SSE18 Provide higher education opportunities offered through OSS research awards and other NASA research and education programs.

4SEU17 Provide higher education opportunities offered through OSS research awards and other NASA research and education programs.

4ASO16 Provide higher education opportunities offered through OSS research awards and other NASA research and education programs.

4MEP16 Provide higher education opportunities offered through OSS research awards and other NASA research and education programs.

4SEC16 Provide higher education opportunities offered through OSS research awards and other NASA research and education programs.

4SSP8 During academic year 2003-2004, increase by 4% the number of undergraduate & graduate students & faculty researchers exposed & gaining hands-on experience in OSF's state-of-the-art research instrumentation & methodologies.

4SSP9 Host 2 forums to strengthen OSF partnership with the minority university community & to more fully engage faculty & students from this community in OSF's mission.

4ISS9 During the Academic year 2003-2004, increase by 4% the number of undergraduate and graduate students and faculty researchers exposed and gaining hands-on experience in OSF's state-of-the-art research instrumentation and methodologies.

4ISS10 Host 2 forums to strengthen OSF partnership with the minority university community to more fully engage faculty and students from this community in OSF's mission.

4SFS11 During academic year 2003-2004, increase by 4% the number of undergraduate and graduate students and faculty researchers exposed and gaining hand-on experience in OSF's state-of-the art research instrumentation and methodologies.

4SFS12 Host 2 forums to strengthen OSF partnership with the minority university community and to more fully engage faculty and students from this community in OSF's mission.

4ITTP2 Engage at least four institutions of higher education in the NASA mission in FY '04 by providing opportunities and experience for students to help prepare them for successful careers in the field of technology management through NASA intern experience.

Goal 7: Engage the public in shaping and sharing the experience of exploration and discovery.

Obj. 7.1 Improve the capacity of science centers, museums, and other institutions, through the development of partnerships, to translate and deliver engaging NASA content.

Outcome 7.1.1 Improve the capacity of science centers, museums, and other institutions, through the development of partnerships, to translate and deliver engaging NASA content.

4ED13 Establish a collaboration with the Association of Science and Technology Centers, in addition to partnerships with at least five major science centers or museums. Provide the science centers and museums with mechanisms to motivate students to pursue STEM subjects and to share with the public NASA's research, mission, and discoveries.

4SSE19 Through partnerships with major science museums or planetariums, put on display or on tour major exhibitions or planetarium shows based on Theme content.

4SSE20 Provide materials and technical expertise to support the development of exhibits and programs at science museums and planetariums.

4SEU18 Through partnerships with major science museums or planetariums, put on display or on tour major exhibitions or planetarium shows based on Theme content.

4SEU19 Provide materials and technical expertise to support the development of exhibits and programs at science museums and planetariums.

4ASO17 Through partnerships with major science museums or planetariums, put on display or on tour major exhibitions or planetarium shows based on Theme content.

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4MEP17 Through partnerships with major science museums or planetariums, put on display or on tour major exhibitions or planetarium shows based on Theme content.

4MEP18 Provide materials and technical expertise to support the development of exhibits and programs at science museums and planetariums.

4SEC17 Through partnerships with major science museums or planetariums, put on display or on tour major exhibitions or planetarium shows based on Theme content.

4SEC18 Provide materials and technical expertise to support the development of exhibits and programs at science museums and planetariums.

Obj. 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.

Outcome 7.2.1 Engage the public in NASA missions and discoveries through such avenues as public programs, community outreach, mass media, and the Internet.

4SSE21 Seek out and capitalize on special events and particularly promising opportunities in the Theme science program to bring space science to and involve the public in the process of scientific discovery.

4SEU20 Seek out and capitalize on special events and particularly promising opportunities in the Theme science program to bring space science to and involve the public in the process of scientific discovery.

4ASO19 Seek out and capitalize on special events and particularly promising opportunities in the Theme science program to bring space science to and involve the public in the process of scientific discovery.

4MEP19 Seek out and capitalize on special events and particularly promising opportunities in the Theme science program to bring space science to and involve the public in the process of scientific discovery.

4SEC19 Seek out and capitalize on special events and particularly promising opportunities in the Theme science program to bring space science to and involve the public in the process of scientific discovery.

Outcome 7.2.2 Engage the public in NASA's scientific exploration of Earth from space.

4ESA8 Provide in public venues at least 50 stories on the scientific discoveries, practical benefits, or new technologies sponsored by the Earth Science Enterprise.

4ESS14 Post the most exciting imagery and explanations about Earth science on the Earth observations/ESE website.

Outcome 7.2.3 Use OSF unique facilities, education resources, formal and informal venues (conferences, workshops, science centers, museums) and print, web and TV media, to reach and engage an increasing number or percent of the public in exploration and space development activities.

4SSP10 Increase by 10%, OSF venues (educational, commercial, and political) that provide "hands-on" opportunities for the public to experience and become more knowledgeable of OSF benefits and contributions, particularly ISS.

4SSP11 Increase the number of visits to the Space Flight website.

4SFS13 Increase by 10%, OSF venues (educational, commercial, and political) that provide "hands-on" opportunities for the public to experience and become more knowledgeable of OSF benefits and contributions, particularly ISS.

4SFS14 Increase the number of visits to the Space Flight website.

4ISS11 Increase by 10% venues (education, and commercial) that provides "hands-on" opportunities for the public to experience and become more knowledgeable of benefits and contributions, particularly the International Space Station.

4ISS12 Increase the number of visits to the Space Flight website.

Outcome 7.2.4 Broaden OBPR research information to diverse audiences.

4BSR5 Increase distribution of the Space Research newsletter by 5,000 over FY 03 circulation in order to further educate the general public, industry and academia on space-based research.

4BSR6 Establish and sustain a series of media presentations of OBPR research, through collaboration with PAO, to convey important space-based research results to the general public, industry and academia.

4BSR7 OBPR will expand its involvement in reaching minority and under-represented sectors of the public, through participation in conferences and community events that reflect cultural awareness and outreach. There will be at least one new venue more, associated with a minority and/or under-represented community, then outreach efforts taking place in FY 03.

4PSR7 Increase distribution of the Space Research newsletter by 5,000 over FY 03 circulation in order to further educate the general public, industry and academia on space-based research.

4PSR8 Establish and sustain a series of media presentations of OBPR research, through collaboration with PAO, to convey important space-based research results to the general public, industry and academia.

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4RPFS7 Establish and sustain a series of media presentations of OBPR research, through collaboration with PAO, to convey important space-based research results to the general public, industry and academia.

4RPFS8 OBPR will expand its involvement in reaching minority and under-represented sectors of the public, through participation in conferences and community events that reflect cultural awareness and outreach. There will be at least one new venue associated with a minority and/or under-represented community over outreach efforts taking place in FY 03.

Obj. 7.3 Increase public awareness and understanding of how research and innovations in aerospace technology affect and improve the quality of life.

Outcome 7.3.1 Increase public awareness and appreciation of the benefits made possible by NASA research and innovation in aerospace technology.

4AT16 Partner with external organizations to celebrate the centennial of powered flight highlighting NASA's accomplishments & activities in the advancement of flight.

4AT17 Partner with museums & other cultural organizations and institutions to promote NASA achievements to non-traditional audiences, develop and implement a series of traveling exhibitions highlighting NASA activities, develop and distribute informational material related to accomplishments and plans.

4MSM16 Maintain publicly-available websites at the Program and Project levels. Publish at least 10 articles or papers on key innovations. Support at least 2 conferences or exhibits highlighting research in Aerospace Technology. (CICT, RMCS & ECT)

4SLI19 Space transportation technical exhibits will be sponsored for at least five events reaching over 50,000 participants to improve public appreciation of the ongoing activities and benefits of NASA's space transportation research and technology development efforts.

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Enabling Capabilities

Goal 8: Ensure the provision of space access, and improve it by increasing safety, reliability, and affordability.

Obj. 8.1 Assure safe, affordable, and reliable U.S.-based crew access and return from the International Space Station.

Outcome 8.1.1 An Orbital Space Plane that provides safe, affordable and reliable access to and from the International Space Station (ISS). (OSP)

4SLI4 The OSP Program Plan will be approved and the OSP Level 2 Requirements will be established and approved.

4SLI5 A conceptual design of the Orbital Space Plane will be completed with sufficient cost, schedule, technical, and risk definition to enable a full-scale development decision.

4SLI6 The X-37 Approach and Landing Test Vehicle will be certified for flight demonstration, establishing it as a test platform for technology demonstrations supporting the OSP.

4SLI7 The Demonstration of Autonomous Rendezvous Technology flight article will be certified for flight demonstration, establishing it as a test platform for demonstrating key technologies required to enable an autonomous (no pilot in the loop) approach of an OSP to the International Space Station.

Obj. 8.2 Improve the safety, affordability and reliability of future space transportation systems.

Outcome 8.2.1 Technology development and risk reduction results that open up the Nation's access to space by demonstrating substantial improvements in safety, reliability, and cost as compared to current space transportation systems. (NGLT)

4SLI8 The Next Generation Launch Technology (NGLT) Program Plan will be approved, aligning the Program implementation approach with the Space Transportation strategic objectives.

4SLI9 The preliminary design of a reusable hydrocarbon prototype rocket engine will be completed, demonstrating the design's applicability to a reusable launch vehicle.

4SLI10 A LOx/LH2 full flow staged combustion engine cycle will be operationally demonstrated to determine its applicability to a reusable launch vehicle.

4SLI11 The preliminary design of a Rocket Based Combined Cycle (RBCC) ground testbed will be completed, paving the way toward ground demonstration of a hypersonic air-breathing propulsion system.

4SLI12 The preliminary design of a Mach 4 ground turbine testbed will be completed, leading to the development of the primary element of a turbine-based combined-cycle hypersonic air-breathing propulsion system.

4SLI13 The fabrication of the X-43C Mach 5 Multi-Module Flowpath Propulsion Demonstrator will be completed, enabling the ground demonstration of a hydrocarbon dual-mode scramjet powered vehicle applicable for a reusable launch vehicle.

4SLI14 The testing and analysis of a light weight ceramic composite cooled panel in a scramjet test article will be completed, demonstrating a critical propulsion technology needed for development of an air-breathing reusable launch vehicle.

4SLI15 The design and fabrication of a Mach 15 hypersonic scramjet model platform will be completed, leading to the demonstration of a scramjet engine at high Mach number.

Obj. 8.3 Improve the accessibility of space to better meet research, Space Station assembly, and operations requirements.

Outcome 8.3.1 Assure public, flight crew, and workforce safety for all Space Shuttle operations and safely meet the FY04 manifest and flight rate commitment.

4SSP12 Achieve zero type A (damage to property at least $1M or death) or B (damage to property at least $250K or permanent disability or hospitalization of 3 or more persons) mishaps in FY2004.

4SSP13 Achieve an average of 8 or fewer flight anomalies per Space Shuttle mission.

4SSP14 Provide safe, reliable space transportation and/or a space-based platform that allows our customers to achieve 100% on-orbit mission success for all flights in FY 2004. For this metric, mission success criteria are those provided to the prime contractor (SFOC) for purposes of determining successful accomplishment of the performance incentive fees in the contract.

4SSP15 Perform annual critical review of requirements, priorities, risks, and progress to effectively support Shuttle service life extension.

Obj. 8.4 Assure capabilities for world-class research on a laboratory in low Earth orbit.

Outcome 8.4.1 Provision of a well-managed program that is safe, reliable, and affordable.

4ISS13 Achieve reduced costs and improved accountability through the reduction in the number of direct ISS Program Office contracts.

4ISS14 Assure zero Type A or Type B on-orbit mishaps in FY04 as defined in the OSF Contingency Action Plan.

4ISS15 Achieve 90% success and accomplishment for planned on-orbit ISS assembly and logistical activities on the Space Shuttle missions scheduled for FY2004.

Obj. 8.5 Provide services for space communications, rocket propulsion testing, and launch in support of NASA, other government agencies and industry.

Outcome 8.5.1 Provide reliable launch services on Expendable Launch Vehicles to meet agency requirements.

4SFS15 Maintain NASA success rate at or above a running average of 95% for missions noted on the Expendable Launch Vehicle (ELV) manifest.

Outcome 8.5.2 Provide reliable communications and mission control systems for every flight mission.

4SFS16 Achieve at least 95% of planned data delivery for the International Space Station, each Space Shuttle mission, and low-Earth orbiting missions in FY04.

Outcome 8.5.3 Minimize technical, cost, and schedule risk to NASA, DoD and Commercial test customers by ensuring safe and efficient operations of NASA test facilities.

4SFS17 Achieve zero mishaps that constitute a major breach of safety.

4SFS18 Achieve positive feedback from a minimum of 95% of all test customers.

Obj. 8.6 Create concepts, technologies and capabilities for transportation beyond LEO, and define plans to enable affordable future infrastructures.

Outcome 8.6.1 Advance future human and robotic exploration and development of space objectives.

4SFS19 Define and provide Level 1 OSF requirements related to future human and robotic exploration and development of space to NASA programs pursuing improvements in access to space.

4SFS20 Identify key concepts (near term to far term) and technology road maps for space transportation capabilities, focusing on future human & robotic space exploration and development.

Goal 9: Extend the duration and boundaries of human space flight to create new opportunities for exploration and discovery.

Obj. 9.1 Understand and control the human health risks of space flight.

Outcome 9.1.1 Identify and test biomedical countermeasures that will make space flight safer for humans.

4BSR8 Use ground-based and space-based research to address risk areas related to long duration phenomena such as bone loss, psychological adaptation to isolation and confinement, and the biological effects of radiation as described in the Critical Path Roadmap. Progress toward accomplishing this performance goal will be reviewed by an advisory committee.

4BSR9 Publish results of Bioastronautics experiments conducted during early ISS Increments (1 through 8) and preliminary results from Increments 9 and 10. Progress toward accomplishing this performance goal will be reviewed by an advisory committee.

4BSR10 Maintain productive peer-reviewed research program in Biomedical Research and Countermeasures including a National Space Biomedical Research Institute that will perform team-based, focused countermeasure-development research. Progress toward accomplishing this goal will be reviewed by an advisory committee.

Outcome 9.1.2 Acquire physics and biology database required to predict radiation risk in space with accuracy sufficient to enable astronauts to accomplish three 180-day missions on ISS without exceeding career radiation limits, at a 95% confidence level.

4BSR11 Expand the space radiation research science community to involve cutting edge researchers in related disciplines by soliciting, selecting, and funding high quality research.

4BSR12 Complete 2 experimental campaigns ("runs") using recently completed Booster Applications Facility (BAF) at Brookhaven National Laboratory (BNL) to measure survival, genetic mutation (mutagenesis), and chromosome aberrations in cells and tissues to improve understanding of the biological effects of the space radiation environment. Progress toward accomplishing this performance goal will be reviewed by an advisory committee.

4BSR13 Evaluate radiation risks to astronauts by continued and careful analysis of past radiation exposures, results of medical follow up, and comparison with appropriately chosen control population not exposed to similar levels of radiation. Make experimental data available for operational use on ISS and other space-related activities where appropriate. Progress toward accomplishing this performance goal will be reviewed by an advisory committee.

Outcome 9.1.3 Advance understanding of the role of gravity in biological processes to support biomedical research for human exploration.

4BSR14 Solicit ground-based research in appropriate Fundamental Biology disciplines to lay the ground work for advanced understanding of the role of gravity in biological processes associated with the human health risks of space flight. Progress toward accomplishing this performance goal will be reviewed by an advisory committee.

4BSR15 Plan for increased early utilization for basic biology research in 2005 to take advantage of evolving ISS capabilities. Progress toward accomplishing this performance goal will be reviewed by an advisory committee.

4BSR16 Maintain a competitive, productive peer-reviewed research program to advance understanding of the role of gravity in biological processes. Progress toward accomplishing this performance goal will be reviewed by an advisory committee.

Obj. 9.2 Develop knowledge and technologies to make life support systems self sufficient and improve human performance in space.

Outcome 9.2.1 Identify & test technologies to reduce total mass requirements for Life Support.

4BSR17 Demonstrate, through vigorous research and technology development, a 50% reduction in the projected mass of a life support flight system compared to the system baselined for ISS. Progress toward reducing the mass requirements for life support will be evaluated by an advisory committee.

Outcome 9.2.2 Develop knowledge and technologies to make life support systems self-sufficient and improve human performance in space.

4MSM1 Demonstrate ground test of a Mobile Intelligent Vehicle Health Management (IVHM) system for internal spacecraft operations that will provide environmental sensing capabilities and knowledge management services. The Mobile IVHM will perform independent calibration checks for environmental sensors; autonomously replace or substitute for failed environmental sensors; hunt down and isolate gas leaks and temperature problems; and provide a range of crew personal data assistant functions. (RMCS)

Obj. 9.3 Resolve fundamental low-gravity issues affecting technologies for human space travel beyond low-Earth orbit.

Outcome 9.3.1 Increase research database with results from radiation measurements, microgravity combustion and heat transport investigations.

4PSR10 Extend the available database on radiation effects in materials using the newly commissioned Booster Application Facility at Brookhaven. Progress will be reviewed b y an advisory committee.

4PSR11 Analyze results of ISS and Space Shuttle (STS 107) investigations on fire safety and microgravity combustion. Progress will be reviewed by an advisory committee.

4PSR12 Prepare for and carry out microgravity heat exchange investigation on ISS. Progress will be reviewed b y an advisory committee.

Obj. 9.4 Demonstrate the ability to support a permanent human presence in low Earth orbit as a stepping-stone to human presence beyond.

Outcome 9.4.1 Operation of the ISS as an on-going research facility to further human experience and develop technology for self-sustaining systems.

4ISS16 Maintain to within 90%, the predicted maintenance and logistics hardware replacement schedule.

4ISS17 Provide 100% of the logistics required to sustain the permanent crew living aboard the ISS.

Outcome 9.4.2 Further the capability of humans to live and work safely in space by transporting crews to ISS for longer on-orbit durations.

4SSP17 Achieve 100% on-orbit mission success for all Shuttle flights to ISS in FY 2004. For this metric, mission success criteria are those provided to the prime contractor (SFOC) for purposes of determining successful accomplishment of the performance incentive fees in the contract.

Obj. 9.5 Create innovative approaches and concepts to inform future decisions concerning systems, infrastructures and missions for human and robotic exploration of space.

Outcome 9.5.1 Enable safer, more affordable and more effective future human activities beyond LEO.

4SFS21 Identify 4-7 innovative system and infrastructure concepts (and associated technologies) in support of ambitious future human activities beyond LEO.

4SFS22 Identify 5-9 alternative human exploration mission options based on these innovative concepts.

4SFS23 Develop and review technology maturation road maps and investment strategies necessary to realize these transformational capabilities.

Outcome 9.5.2 Develop innovative approaches and concepts to inform future decisions concerning systems, infrastructures and missions for human and robotic exploration of space.

4MEP20 Develop advanced concepts for Mars missions where human intervention can significantly increase the scientific return, and develop a technology roadmap for critical technologies that can be demonstrated effectively in the core robotic program.

Outcome 9.5.3 An established space transportation investment strategy that is responsive to the Agency's science-driven missions. (NGLT)

4SLI16 The systems assessment of the Next Generation Launch Technology needs, priorities, and technical performance metrics will be completed, providing an integrated roadmap for space launch technology investments.

Goal 10: Enable revolutionary capabilities through new technology.

Obj. 10.1 Improve the capability to assess and manage risk in the synthesis of complex systems.

Outcome 10.1.1 Enable new technologies to identify and reduce mission risk.

4MSM2 Develop a Prototype Concept Design Risk Workstation that provides the capability to identify, track, and trade-off risk in the conceptual design phase of missions. The workstation will integrate databases, visualization modules, solicitation routines, system simulations, and analysis programs that support an interactive system design process. (RMCS)

Obj. 10.2 Create new system concepts and demonstrate new technologies that enable new science measurements.

Outcome 10.2.1 Identify high-payoff mission enabling technologies to guide program investment decisions.

4MSM3 Develop a process for assessing the system-level benefits of new technologies, and complete technology assessments on 3 representative mission classes selected by the Technology Executive Board. A mission class is a set of missions with similar scientific objectives, such as large space-based astronomical observatories. The technology assessment will be concluded when the mission enabling technologies have been identified, and system-level performance goals for these technologies have been established. (ECT)

Outcome 10.2.2 Reduce trip time for interplanetary missions

4MSM4 Demonstrate lightweight, sub-kilowatt ion engine for small spacecraft to reduce interplanetary trip time by 30%. (ECT)

Outcome 10.2.3 Enable new science measurements

4MSM5 Develop bio-molecular probe to detect specific biomarker signature in-vitro for disease detection and astronaut health monitoring. Demonstrate a molecular probe that detects at least one specific biomarker in cells. (CICT)

4MSM6 Demonstrate > 5% efficiency for 2-micron laser transmitter. State-of-the-art laser transmitters have about 3% efficiency. Higher efficiency will enable smaller, lighter space-based lidar instruments for active sensing of the Earth's atmosphere. (ECT)

4MSM7 Develop 1,000-element array of superconducting transition edge sensors to enable astronomical imaging in the unexplored submillimeter region of the spectrum. (ECT)

4MSM8 Develop miniature chromatography system for separation and detection of organic materials to enable the search for life on other planets. (ECT)

Outcome 10.2.4 Enable revolutionary spacecraft systems for distributed science collection and lower mission cost.

4MSM9 Demonstrate by simulation millimeter precision formation flying. The simulation will validate sensors and control algorithms needed to enable constellations of spacecraft for distributed science measurements. (ECT)

4MSM10 Develop microspacecraft ground testbed that incorporates micro navigation subsystem, micro thrusters, and multifunctional structure. By integrating miniaturized spacecraft subsystems, the testbed will demonstrate a factor of 2 to 3 reduction in spacecraft mass, which will result in lower mission costs. (ECT)

Outcome 10.2.5 Increased capabilities to acquire and return scientific data.

4MSM11 Develop critical spacecraft networking technologies. Demonstrate spacecraft communications technologies achieving 1Gbps or greater for near Earth, and 1Mbps or greater for deep space applications. Develop related protocols and software for Internet-like space computing and communications. High bandwidth communications and networking technologies will increase scientific return. (CICT)

4MSM12 Demonstrate in a laboratory environment deployment and rigidization of a jointed inflatable truss to enable modular assembly of large apertures. In-space assembly will enable a factor of 10 increase in aperture size to increase scientific return. (ECT)

Outcome 10.2.6 Enable intelligent and autonomous systems for science exploration missions.

4MSM13 Complete simulated autonomous science exploration mission - Demonstrate a successful analogue science mission (terrestrial rover or simulated spacecraft) with key autonomy technologies in planning/scheduling, science data priority assignment, system executives, and diagnostic systems, enabling goal-directed systems for science exploration missions. (CICT)

Obj. 10.3 Create breakthrough information and communication systems to increase our understanding of scientific data and phenomena.

Outcome 10.3.1 Reduce the time required to design and operate future missions.

4MSM14 Develop collaborative science and engineering technologies for integrated simulation and information management, enabling reductions in set-up and management times for aerospace engineering, science simulations, and mission status awareness of remote exploration missions. Demonstrate standardized protocols and specifications for interoperability of simulation components and heterogeneous data sources; provide visual assembly of workflow components and tools; provide applications-oriented process management; and demonstrate heterogeneous database access technology that can automatically access distributed, heterogeneous data sources. (CICT)

Obj. 10.4 Create novel aerospace concepts in support of future human and robotic exploration and development of space.

Outcome 10.4.1 Accelerate the development of new revolutionary technologies by enabling better investment decisions.

4SFS24 Define and provide Level 1 OSF requirements related to future human and robotic exploration and development of space to NASA and other Agency programs pursuing improvements in future revolutionary space capabilities.

4SFS25 Identify 8-10 concepts for transformational space capabilities, focusing on future human & robotic space exploration and development, in areas including space assembly, maintenance and servicing, space utilities and power, and self-sufficient space systems.

4SFS26 Develop technology road maps and formulation of investment options to enable these capabilities.

Obj. 10.5 Create novel aerospace concepts to support Earth and space science missions.

Outcome 10.5.1 Develop technologies that will enable solar powered vehicles to be used as platforms for telecommunications and emergency management missions.

4AT18 Demonstrate the efficient performance of a flight-prototype regenerative energy storage system in an altitude chamber. (Vehicle Systems)

Outcome 10.5.2 Develop and demonstrate technologies required for routine Unmanned Aerial Vehicle operations in the National Airspace System at and above Flight Level 180.

4AT19 Deliver a validated set of requirements for UAV access at and above FL400, and a preliminary set of requirements for access at and above FL180. (Vehicle Systems)

Obj. 10.6 Enhance NASA's Mission by leveraging partnerships between NASA Enterprises, U.S. industrial firms, and the venture capital community for innovative technology development.

Outcome 10.6.1 Improve NASA's Mission by leveraging partnerships with non-aerospace industry and academia, and facilitate NASA's use of commercially available technology.

4ITTP3 Promote and develop innovative technology partnerships between NASA, venture capital firms and U.S. industry for the benefit of all Enterprise mission needs.

4ITTP4 Align SBIR/STTR with priorities contributing to NASA mission and vision.

4ITTP5 Review and rank all SBIR/STTR proposals within 100 days of the solicitation closure date.

SPECIAL ISSUES: Performance Plan Summary

Implementing Strategies

IS-1: Achieve management and institutional excellence comparable to NASA's technical excellence.

Obj. IS-1.1	Attract and maintain a workforce that is representative of the Nation's diversity and includes the competencies that NASA needs to deliver the sustained levels of high performance that the Agency's challenging Mission requires.
Obj. IS-1.2	Define and adopt procedures to improve the competitive acquisition of programs, services, and assets to benefit the NASA Mission and the American taxpayer.
Obj. IS-1.3	Improve and streamline the NASA financial management system to enhance accuracy, timeliness, and accountability.
Obj. IS-1.4	Unify the processes for strategic and budget planning, budget reporting, and performance planning and reporting.
Obj. IS-1.5	Beginning in early 2003, provide an integrated and user-friendly NASA-wide Internet portal that will provide improved public access to NASA Mission results and other products, improved visibility into NASA plans and programs, and enhanced communication among NASA employees and contractors.
Obj. IS-1.6	Improve the institutional management of capital assets to ensure that NASA's real property, personal property, processes, and systems are sustained and optimized to support NASA's missions and the capabilities required for today and tomorrow.

IS-2: Demonstrate NASA leadership in the use of information technologies.

Obj. IS-2.1	By 2005 provide all NASA operations with secure, highly reliable, interoperable information systems.
Obj. IS-2.2	By 2005 enable NASA people to communicate across an integrated, low-cost information technology infrastructure.
Obj. IS-2.3	By 2005 design and operate a One NASA network to improve organizational interactions and foster improved collaboration and sharing of accumulated NASA knowledge assets.
Obj. IS-2.4	By 2005 establish systems to deliver superior information services to consumers, educators, students, researchers, and the general public, as well as to Government agencies, NASA contractors and suppliers, and other businesses.

IS-3: Enhance NASA's core engineering, management, and science capabilities and processes to ensure safety and mission success, increase performance and reduce cost.

Obj. IS-3.1	Implement collaborative engineering capabilities and integrated design solutions to reduce the life-cycle cost and technical, cost, and schedule risk of major programs.
Obj. IS-3.2	Apply methods and technologies to ensure that designs are safe and have a high likelihood for success.
Obj. IS-3.3	Improve our systems engineering capability and ensure that all NASA programs follow systems engineering best practices throughout their life cycles.
Obj. IS-3.4	Establish a process management approach that can be tailored to the needs of all projects and programs based on safety, scope, complexity, cost, and acceptable risk.
Obj. IS-3.5	Use peer review to ensure that NASA's scientific research is of the highest quality.

IS-4: Ensure that all NASA work environments, on Earth and in space, are safe, healthy, environmentally sound, and secure.

Obj. IS-4.1	Prevent injuries from occurring during the course of NASA activities on NASA facilities or in the use of NASA equipment.
Obj. IS-4.2	Work closely with other Government agencies and local authorities to identify and try to remove all security threats to NASA people, facilities, and information.
Obj. IS-4.3	Protect NASA's physical assets from damage or theft.
Obj. IS-4.4	Eliminate the incidence of occupational health problems for the NASA workforce.
Obj. IS-4.5	Eliminate environmental incidents, toxic chemical use, hazardous waste, and environmental liability at all NASA sites.

IS-5: Manage risk and cost to ensure success and provide the greatest value to the American public.

Obj. IS-5.1	Provide tools, techniques, and expertise that will enable all elements of the Agency to make well-informed decisions on matters of critical Mission importance.
Obj. IS-5.2	Improve processes for cost estimation and the management of major NASA projects and programs.