National Aeronautics and Space Administration

NASA REAL PROPERTY ASSET MANAGEMENT PLAN

An Implementation Plan for Improved Asset Management

www.nasa.gov

January 2008

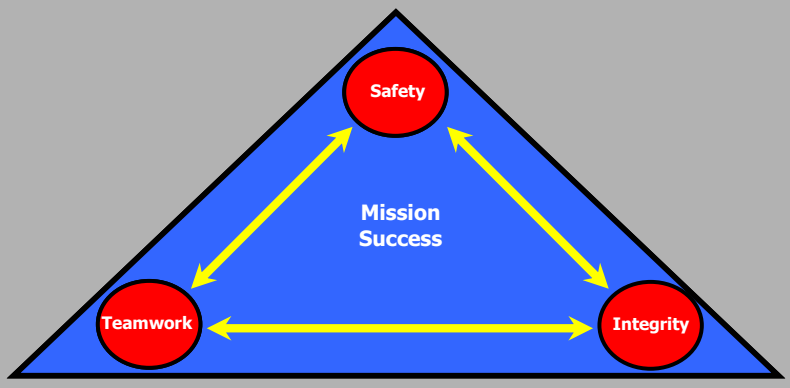
A Renewed Spirit of Discovery: The Vision For U.S. Space Exploration

Goal and Objectives

The fundamental goal of this vision is to advance U.S. scientific, security, and economic interests through a robust space exploration program. In support of this goal, the United States will:

- Implement a sustained and affordable human and robotic program to explore the solar system and beyond;
- Extend human presence across the solar system, starting with a human return to the Moon by the year 2020, in preparation for human exploration of Mars and other destinations;
- Develop the innovative technologies, knowledge, and infrastructures both to explore and to support decisions about the destinations for human exploration; and,
- Promote international and commercial participation in exploration to further U.S. scientific, security, and economic interests.

NASA Core Values



NASA is dedicated to the values of Safety, Teamwork, Integrity, and Mission Success. These shared core values express the ethics that guide our behavior. The Agency aspires to achieve these values in everything it does. NASA values:

Safety

NASA's constant attention to safety is the cornerstone upon which we build mission success. We are committed, individually and as a team, to protecting the safety and health of the public, our team members, and those assets that the Nation entrusts to us.

Teamwork

NASA's most powerful tool for achieving Mission Success is a multidisciplinary team of competent people. The Agency will build high-performing teams that are committed to continuous learning, trust, and an openness to innovation and new ideas.

Integrity

NASA is committed to an environment of trust, built upon honesty, ethical behavior, respect, and candor. Building trust through ethical conduct as individuals and as an organization is a necessary component of mission success.

Mission Success

NASA's reason for being is to conduct successful space missions on behalf of this Nation. We undertake missions to explore, discover, and learn. And we believe that mission success is the natural consequence of an uncompromising commitment to safety, teamwork, and integrity.

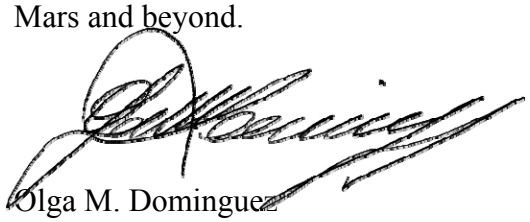
Message from the Assistant Administrator for Infrastructure and Administration

In January 2003, the Government Accountability Office (GAO) designated Federal real property as a high-risk area due to longstanding problems with excess and underutilized property, deteriorating facilities, unreliable real property data, and costly space challenges. In February 2004, the President added the Federal Asset Management Initiative to the President's Management Agenda and signed Executive Order 13327, "Federal Real Property Asset Management." The order requires each Agency to prioritize actions needed to improve the operational and financial management of the Agency's real property inventory.

NASA recognized the importance of real property management well before the GAO report and Executive Order, as evidenced by many of its real property initiatives and the development of its *Real Property Management Plan*, signed by the Administrator in November 2004. This document, the *NASA Real Property Asset Management Plan*, is the final part of a two-part foundation laid to promote efficient and economical use of its real property assets in accordance with Executive Order 13327 and the direction of the Federal Real Property Council. It will be updated as necessary to align with renewed Agency goals, value, and management structure and to ensure compliance with Federal Real Property Council guidelines.

Real property is integral to achieve the *Vision for Space Exploration* "…to advance U.S. scientific, security, and economic interests through a robust space exploration program." Through excellence in real property management, NASA adds value to its programs and workforce by ensuring that its real property assets meet established goals. It also provides appropriate stewardship of these assets to achieve the best value for the American taxpayers' investment. NASA's real property goals and associated improvement initiatives for achieving excellence are defined in the *Real Property Management Plan*. The *Real Property Asset Management Plan* addresses how NASA will meet these goals and provides specific actions and timelines. Jointly, the *Real Property Asset Management Plan* and *Real Property Management Plan* serve as the foundation for a systematic, comprehensive approach to excellent real property management.

We challenge you to strive for continual improvement in your stewardship of NASA's real property. We each have a valuable role to play in the management of these vital assets, as they are critical in returning human exploration to the Moon and then on to Mars and beyond.



Olga M. Dominguez
Assistant Administrator for Infrastructure and Administration and
NASA Senior Real Property Officer

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Section 1. Introduction

In conjunction with the *NASA Real Property Management Plan* (RPMP), the *NASA Real Property Asset Management Plan* (AMP) guides NASA in promoting efficient and economical use of Federal real property resources as required by Executive Order (EO) 13327, "Federal Real Property Asset Management." In this plan, "asset," "constructed asset," and "facility" are often used interchangeably and generally refer to buildings, structures, and other improvements to land (including roads and utilities). NASA embraces the principles of the Federal Real Property Council (FRPC) established by EO 13327. The FRPC's ten guiding principles, applicable to Federal real property asset management, include:

1. Support agency missions and strategic goals *(Refer to Section 2).*
2. Use public and commercial benchmarks and best practices *(Section 2 and Appendix B).*
3. Employ life-cycle cost-benefit analysis *(Sections 2 and 3).*
4. Promote full and appropriate utilization *(Section 4).*
5. Dispose of unneeded assets *(Section 5).*
6. Provide appropriate levels of investment *(Section 2).*
7. Accurately inventory and describe all assets *(Section 4).*
8. Employ balanced performance measures *(Appendix A).*
9. Advance customer satisfaction *(Section 3 and Appendix A).*
10. Provide for safe, secure, and healthy workplaces *(Section 2).*

This plan addresses the FRPC template for agency asset management plans, which includes:

a. Integrated Guiding Principles *(Section 1).*
b. Agency-Specific Owner's Objectives *(Section 2).*
c. Periodic Evaluation of All Assets *(Section 4).*
d. Prioritized Operations and Maintenance & Capital Improvement Plans *(Sections 3 and 4).*
e. Identified Resource Requirements to Support Plans *(Sections 2, 3, and 4).*
f. "Building Block" Asset Business Plans in Agency Portfolio Context *(Section 4).*
g. Continuous Monitoring and Feedback Mechanism *(Sections 3, 4, and Appendix A).*
h. Consideration of Socio-Economic-Environmental Responsibilities *(Section 5).*
i. Adequate Human Capital Support of Asset Management Organization *(Section 2).*
j. Common Government-Wide Terminology *(to be added upon FRPC publication).*

The section numbers following each of the Council's principles and template items above provides a cross-reference with the AMP.

With the RPMP as the foundation, this AMP establishes a systematic, comprehensive approach to real property management. Real property is integral to achieve the *Vision for Space Exploration* "…to advance U.S. scientific, security, and economic interests through a robust space exploration program." Through excellence in real property management, NASA adds value to its programs and workforce by ensuring that its real property assets meet established goals. It also provides appropriate stewardship of these assets to achieve the best value for the American taxpayers' investment. The RPMP defines NASA's real property strategy along with

associated goals and improvement initiatives for achieving excellence. The AMP addresses *how* NASA will implement the strategy and achieve these goals and initiatives.

The AMP also documents how NASA ensures economical use of its entire portfolio and who is accountable for excellence in real property management. It specifies and defines an integrated approach to real property management. Figure 1-1 shows the relationship among NASA's real property strategic and planning documents.

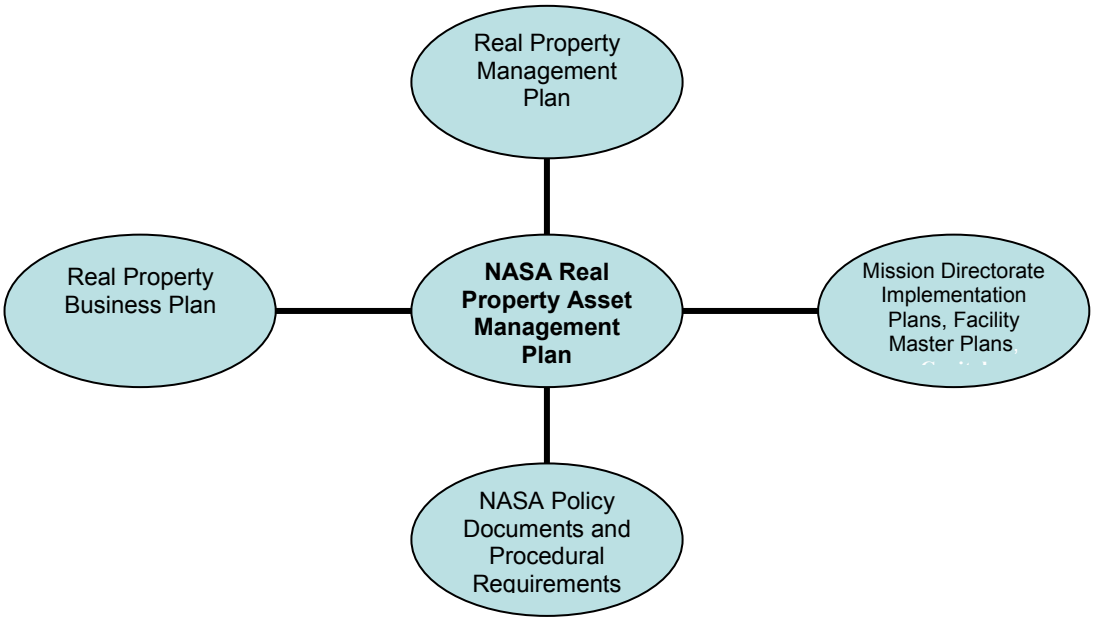


***Figure 1-1**: Integration of NASA Documents Comprising the Agency's Real Property Asset Management Plan*

The following is a brief summary this AMP's content:

Section 1 – *Introduction* provides an introduction and describes the approach and content of this plan.

Section 2 – *Support of Agency Missions and Strategic Goals* addresses NASA's mission and its real property support in implementing its missions and strategic goals, its human capital and organizational structure, its decision-making framework, and its owner's objectives.

Section 3 – *Planning and Acquisition of Real Property* describes how NASA plans for and acquires real property assets, develops its Capital Improvement Plan, identifies its prioritized acquisition list each fiscal year, measures the effectiveness of its acquisition results, and identifies key initiatives to improve financial management and acquisition performance.

Section 4 – *Operations of Real Property* describes how NASA operates its real property assets, addressing its inventory system, its Operations and Maintenance Plans, its Asset Business Plans

or “Building Block” Plans, and its periodic evaluation of assets. Additionally, operational measures are described as well as key initiatives that are underway to improve operational performance.

Section 5 – *Disposal of Unneeded Real Property* describes how NASA disposes of unneeded real property assets, measures the effectiveness of its redeployment actions, and identifies key initiatives to improve the pace of disposition.

Section 2. Support of Agency Missions and Strategic Goals

To effectively manage and optimize real property assets, investment, operational, and disposal decisions need to be integrated with and supportive of core mission activities. To facilitate integration of real property asset management decisions with the Agency's mission, two elements are needed—a clear understanding of the mission that drives the allocation and use of all available resources (human capital, physical capital, financial capital, and technology/information capital) and an effective decision-making framework.

This section discusses NASA's mission, human capital, and decision-making framework and its application to real property management.

2.1 Agency Mission

Congress enacted the National Aeronautics and Space Act of 1958 to provide for research into problems of flight within and outside the Earth's atmosphere and to ensure that the United States conducts activities in space devoted to peaceful purposes for the benefit of humankind. Nearly 50 years later, NASA's new mission statement proudly pledges the Agency to continue the traditions begun in 1958, utilizing NASA's unique competencies in scientific and engineering systems to carry out and achieve the Agency's purpose:

To pioneer the future in space exploration, scientific discovery, and aeronautics research.

The Vision for U.S. Space Exploration, a new directive for the Nation's space exploration program. The fundamental goal of this directive is "to advance U.S. scientific, security, and economic interests through a robust space exploration program." NASA is committed to a journey of exploring the solar system and beyond: Returning to the Moon in the next decade, then venturing further into the solar system, ultimately sending humans to Mars and beyond. He challenged NASA to establish new and innovative programs to enhance understanding of the planets, to ask new questions, and to answer questions that are as old as humankind.

NASA enthusiastically embraced the Agency's new Vision and published it as *The Vision for Space Exploration* in February 2004. That document embodies the strategy NASA will follow to extend a human presence throughout the solar system.

In September 2005, NASA adopted six Strategic Goals to focus the Agency toward achieving the Vision for Space exploration.

- **Strategic Goal 1**: Fly the Shuttle as safely as possible until its retirement, not later than 2010.

- **Strategic Goal 2**: Complete the International Space Station in a manner consistent with NASA's International Partner commitments and the needs of human exploration.

- **Strategic Goal 3:** Develop a balanced overall program of science, exploration, and aeronautics consistent with the redirection of the human spaceflight program to focus on exploration.

- **Strategic Goal 4:** Bring a new Crew Exploration Vehicle into service as soon as possible after Shuttle retirement.

- **Strategic Goal 5:** Encourage the pursuit of appropriate partnerships with the emerging commercial space sector.

- **Strategic Goal 6**: Establish a lunar return program having the maximum possible utility for later missions to Mars and other destinations.

To ensure that NASA's real property asset management is integrated with and enables its mission work, NASA developed the *NASA Real Property Management Plan*, signed by the NASA Administrator in November, 2004, to describe the role of real property in achieving NASA's mission in space exploration, scientific discovery, and aeronautics research.

2.1.1 NASA Real Property Management Plan

The *NASA Real Property Management Plan* (RPMP) (http://www.hq.nasa.gov/office/codej/codejx/Assets/Docs/RPMPFinalwithdate11-04.pdf) , which was developed as the basis for managing NASA real property, states:

> *"Real property is integral in achieving NASA's Vision and Mission in science, technology, and discovery. NASA provides value to its programs and workforce through excellence in real property management by ensuring real property assets meet Agency goals.*
>
> *NASA also provides appropriate stewardship of these assets to achieve the best value for the American taxpayers' investment. The Agency must strive to identify and develop innovative real property management solutions, and to construct and operate only the real property required to conduct NASA programs, maintain its core capabilities, and meet national responsibilities."*

The RPMP defines five major goals for ensuring that real property supports NASA's mission and how real property must be considered throughout the Agency's decision-making process (Table 1-1).

- **Real Property Management Goal 1**: NASA will identify and address real property requirements as an integral part of Agency, Mission Directorate, program, and project planning**.**
- **Real Property Management Goal 2:** NASA will construct and operate new real property to meet mission requirements only when existing capabilities cannot be effectively used or modified.
- **Real Property Management Goal 3**: NASA will continually evaluate its real property assets to ensure alignment with the NASA Mission.
- **Real Property Management Goal 4:** NASA will leverage its real property to its maximum potential.
- **Real Property Management Goal 5:** NASA will sustain, revitalize, and modernize its real property required by the NASA Mission.

***Table 1-1**: Real Property Management Plan Goals*

NASA has significant real property challenges with an infrastructure approaching an average age of 40 years for its constructed assets, a rising backlog of repair needs, deteriorating facility conditions, and a potential significant amount of underutilized or excess property. In striving to meet the above goals, NASA managers will do the following:

- Improve real property capital planning by integrating mission considerations into the real property decision-making process, making good business decisions when evaluating and selecting real property assets, evaluating and selecting real property assets by using an investment approach, and continually evaluating results.
- Determine the core facilities required to support NASA's mission.
- Identify, plan, and implement options to eliminate unnecessary real property through divestment, demolition/deconstruction, and other innovative programs.
- Ensure credible, long-term budget planning for constructed asset sustainment, revitalization, and modernization.
- Minimize the negative effects associated with competing stakeholder interests on real property decision-making.
- Ensure that historic properties are managed in a manner that promotes the long-term preservation and use of those properties as Federal assets and, where appropriate and consistent with NASA's mission, that contributes to the local community and its economy.
- Provide employees with appropriate tools and incentives that facilitate good business decisions.

- Address human capital issues related to real property by recognizing that real property conditions affect NASA's ability to attract and retain high-performing individuals and the productivity and morale of employees.

2.1.2 NASA Strategic Plan

The NASA Strategic Plan provides the top-level strategy for how the Agency will accomplish its strategic objectives. Crosscutting management strategies form the underlying foundation for conducting the business of the Agency to support its programmatic and institutional operations and to guide the Agency's strategic investment decisions and performance. These management strategies are braced by the Agency's core values and reflect the Agency's commitment to successfully implementing the President's *Management Agenda and our Vision for Space Exploration*. The strategies also serve as a guide for the development and maintenance of NASA's institutional programs, projects, and plans.

NASA's goals in its Strategic Plan address prudent asset management. Specifically, the Strategic Plan affirms:

> *"Strategic management of NASA's real property assets is integral to achieving NASA's strategic goals. NASA's real property assets, including land, buildings, facilities, roads, and utility systems, constitute a major capital investment. NASA is the ninth largest federal government property holder. The Agency owns more than 100,000 acres of real estate and over 5,400 buildings and other structures totaling more than 44 million square feet. The current replacement value for NASA real property is over $23 billion.*
>
> *Real property also impacts employee morale and productivity. NASA provides value to its programs and workforce through excellence in real property management by ensuring that NASA's real property assets meet Agency goals. NASA also provides stewardship of these assets to achieve the best value for the American taxpayers' investment.*
>
> *The Agency will continue to identify and develop innovative management solutions and to purchase, construct, and operate only those assets required to conduct NASA programs, maintain the Agency's core capabilities, and meet national responsibilities."*

2.1.3 NASA Strategic Management and Governance Handbook

The *NASA Strategic Management and Governance Handbook* sets forth the principles by which NASA strategically manages the Agency. It identifies the internal and external requirements that drive the Agency's key management principles. One of the crosscutting management strategies identified for governing, managing, implementing, monitoring, and controlling the work of the Agency is "Strategic Management of Capital Assets." As a mission-driven Agency, a proper

balance must exist between program requirements, maintaining unique specialized facilities/infrastructure and competitiveness.

2.2 Real Property Organization Mission

NASA recently transformed its organizational structure, streamlining the Agency and putting it in a better position to implement its *Vision for Space Exploration*. This transformation restructured its Strategic Enterprises into Mission Directorates to better align with the vision. It also restructured Headquarters support functions and clarified organizational roles and responsibilities. NASA functional offices were restructured as Mission Support Offices.

NASA Headquarters, located in Washington, DC, exercises management over the space operations centers, aeronautics research centers, science centers, and other installations that constitute NASA. Headquarters' principal roles and responsibilities are to:

1. Establish Agency policy.
2. Define strategy and architectures.
3. Ensure statutory/regulatory compliance.
4. Define program objectives and top-level requirements.
5. Monitor program performance.
6. Manage intergovernmental relationships.
7. Allocate resources.
8. Perform Headquarters essential services.

This model shifts the focus of Headquarters away from program implementation and toward strategic management, and it concentrates the Centers' efforts on program and project execution.

2.2.1 Facilities Engineering and Real Property Division Mission

The Facilities Engineering and Real Property Division (FERP) of NASA Headquarters, provides functional leadership for all Agency facility engineering programs, including facility planning, construction, maintenance, and real estate. In addition to leadership, FERP provides consulting, a wide range of enabling and analysis tools, and insight for NASA's real property managers to ensure that NASA has the facilities available that are necessary to meet NASA's mission.

In all aspects of NASA's real property and in partnership with the Mission Directorates and Centers, FERP creates opportunities to enable mission success.

- To ensure integration, best practices, and fiduciary responsibility for the Agency's construction program;
- To provide Agency functional leadership for facilities maintenance;
- To provide functional leadership for Agency real estate management and master planning; and

- To be the "honest broker" to senior management and those with external oversight regarding the NASA real property programs, taking an Agency-wide view in support of "one-NASA."

To accomplish its mission, FERP strives for optimal real property performance by maintaining a global perspective; fostering continual breakthrough improvements; leveraging knowledge management, new technology, and buying power; searching for and promulgating industry best practices by participating with professional facility organizations; and providing appropriate advice and analyses regarding all real property matters for NASA.

2.2.1.1 Portfolio Management

NASA uses portfolio management to address its overall real property requirements from an Agency perspective. NASA's real property management is performed on a life cycle basis, including the following basic phases:

- **Planning**: NASA uses Master Planning at its Centers as well as advanced program planning at the Agency level. The Center Master Plan (CMP) is each Center's statement of its concept for the orderly management and future development of the Center's real property assets. It is the overall plan for Center development. It provides a narrative, statistical, and graphic record of current capabilities and conditions (natural features, buildings, structures, utilities, transportation systems, and other improvements), as well as proposed conceptual capabilities necessary to support program requirements, Mission Directorate requirements, and the NASA Strategic Plan. See Master Planning for Real Property for more information on Center Master Plans. Planning is an essential element of the Agency's real property program and is required and measured prior to proceeding with real property actions. This phase also includes the relevant environmental documentation required before major real property actions can occur. Planning is the responsibility of the NASA Centers, with planning policy and overall plan approvals conducted at the Headquarters level. Planning is also conducted extensively through the NASA budget formulation process. Currently, not all NASA Centers have up-to-date Center Master Plans. FERP is working closely with those Centers that do not have up-to-date CMPs to ensure that such plans are being developed. NASA's goal is for all Centers to have up-to-date CMPs by December 2008.
- **Acquisition**: NASA acquires real property through many means, but the primary method is the use of new construction or renovations of existing assets. NASA also uses leasing as a vehicle for acquisition when necessary and where appropriate, depending on life-cycle cost analyses. Acquisition is normally done through competitive construction, leasing, or purchasing contracts. NASA constantly looks for innovative methods of acquisition, such as third party financing, when available and appropriate. It is also its policy to use existing assets wherever possible prior to acquiring new assets. Therefore, the NASA acquisition program is relatively minor, with less than $100 million of new construction annually and, normally, no new land acquisition.
- **Operations and Maintenance**: The life cycle of a constructed asset includes extensive operations and maintenance activities and costs. NASA has several initiatives in place to

increase efficiency of maintenance and operations and reduce the costs involved. NASA also encourages the replacement of old, inefficient, and expensive assets with new, efficient, and sustainable assets wherever possible.

- **Disposal**: NASA encourages demolition/deconstruction of constructed assets that are beyond their useful lives, and outleasing or otherwise leveraging the value of underutilized or unneeded assets that are in good condition or may be required by NASA programs in the future. NASA seeks consolidations to reduce the amount of real property it must maintain in order to make more property available for reuse, revenue generation, or disposal.

2.2.1.2 Facilities Engineering and Real Property Division Focus Areas

- **Planning and Real Estate**: Providing a wide-ranging perspective of current and planned physical resources; fostering alliances with other agencies and organizations to increase reliance on national facility capability and to eliminate unnecessary redundancies; exploring new opportunities, such as enhanced-use leasing, public/private partnerships, and privatization; exploring new technologies for facilities management and master planning; maintaining NASA's real property inventory; and developing strategies and policies to implement and standardize asset management tools across the Agency.
- **Design and Construction**: Fostering, evaluating, and facilitating opportunities to improve constructed asset use, safety, health, security, maintainability, and sustainability; leading the planning, design, and construction of facility projects; maximizing stretching the buying power of related resources and assessing whether they are applied efficiently and effectively; developing and applying best practices for maximum return on investments at lower life-cycle costs.
- **Maintenance and Operations**: Ensuring required facilities reliability and availability at the minimum cost; developing standardized "tools" and improvement practices that incorporate advanced maintenance and operations methods and technologies; monitoring the condition and performance of the NASA plant; and advocating for appropriate NASA maintenance and operations funding.
- **Resources**: Providing leadership and support for resources and analyses for financial management, budget development, and funds expenditures in all facilities areas; interacting with external stakeholders including Congress and the Office of Management and Budget (OMB); and fully supporting and implementing Integrated Financial Management.

2.2.2 NASA Centers

The ten NASA Centers and associated facilities each have different missions, types of facilities, and geographic characteristics. Mission support facilities include unique and world-class aeronautics research, space vehicle manufacturing, launch, and command and control facilities. Locations range from the snow belt to the humid/corrosive environment of the Florida coast as shown by Figure 2-1. The Centers uses their Center Master Plans to guide real property decisions. See the NASA home page at www.nasa.gov for information on each Center.

Each Center has its own facilities management organization to support its real property requirements. Each organization reports to its respective Center Director, who develops and manages his/her institution to meet the needs of the many and various programs assigned to that Center. The Center Director is responsible for sorting out resources and matching them to Agency priorities and is accountable for all Center real property management operations in support of program roles and missions. The Center Directors ensure that day-to-day real property management and operations are conducted in accordance with policies established by the Facilities Engineering and Real Property Division, Mission Directorates, Chief Financial Officer, and other Mission Support Offices at Headquarters. The facilities staffing at NASA Centers is unique at each Center due to the varied missions, history, geographic location, and culture.

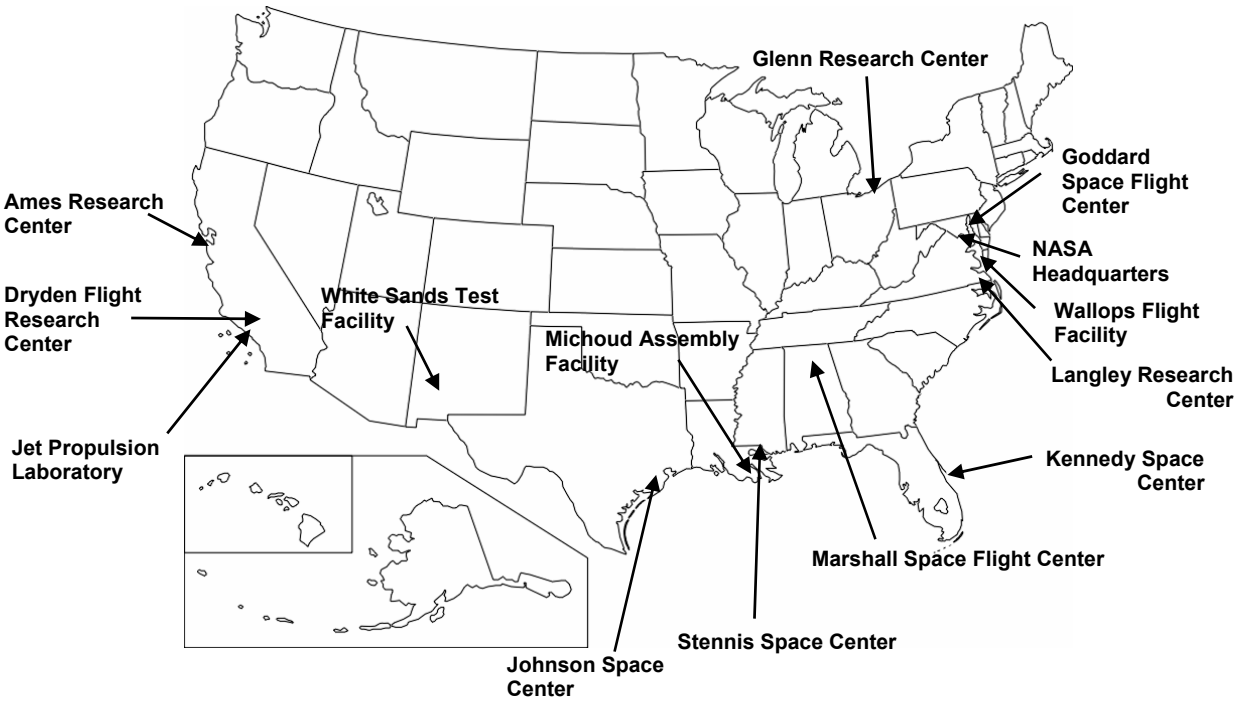


***Figure 2-1**: NASA Field Centers and Component Sites*
(Total NASA sites: Approximately 63 in the continental United States and 26 overseas, including sites where NASA owns facilities but not the land.)

NASA Centers are embracing changes to traditional ways of doing business. For example, many of the Centers have implemented or are implementing hybrid performance-based contracts for facility maintenance and operations. NASA is attempting to use the right method for each contract task while maintaining the performance-based contract emphasis. As another example, reliability centered maintenance (RCM) programs are in place and are being expanded with positive results (see Section 4.5). Partnering between NASA Construction Managers, architectural-engineering firms, and construction contractors is being used during design and construction contracts to improve schedules, reduce change order costs, improve contractual relationships, and improve quality in the finished product. The primary tool used for this is the NASA Partnering Desk Reference. NASA Headquarters Facilities Engineering and Real

Property Division is working on many innovative real property initiatives, and the Centers are actively pursuing similar initiatives. Sections 3, 4, and 5 describe them in greater detail.

2.3 Human Capital and Organization Infrastructure

2.3.1 Agency Reporting Structure

NASA's organizational structure is designed to promote efficient and effective management of all the activities required to operate its complex and diverse organization. The officials and staff at Headquarters have a broad Agency-wide mission and "corporate" focus with a primary role to: (1) develop strategy and mission architectures; (2) integrate across program and mission boundaries; and (3) assess programs. The primary role of Centers is to manage programs and projects and execute the mission. The Agency strives to reach a reasonable balance of responsibility between Headquarters and Centers. In accordance with this principle, the Center Directors report organizationally to the Associate Administrator (AA). Mission Directorates report to the AA and have no institutional oversight of Centers.

The NASA organization employs a "checks and balances" model aligning capability with responsibility, which creates the appropriate level of management tension required for the successful execution of high-risk endeavors. In addition, a Program Analysis and Evaluation (PA&E) organization was formed during FY 2005, whose purpose is to provide advice and recommendations to the Office of the Administrator on all aspects of NASA programs and issues of strategic importance to the Agency, evaluation of alternative programs, and their cost effectiveness.

NASA is program/project driven, and its organization reflects that focus. Figure 2-2 is a notional representation of the NASA organization. All of the management elements, working in an integrated manner and honoring NASA's values (see Table 2-1), promote the leadership behaviors to help the Agency achieve its mission. If good strategic planning provides the long-term direction of the Agency, shared core values express the ethics that guide its behavior.

NASA Values	
Safety	*NASA's constant attention to safety is the cornerstone upon which we build mission success. We are committed, individually and as a team, to protecting the safety and health of the public, our team members, and those assets that the Nation entrusts to us.*
Teamwork	*NASA's most powerful tool for achieving mission success is a multi-disciplinary team of competent people. The Agency will build high-performing teams that are committed to continuous learning, trust, and openness to innovation and new ideas.*
Integrity	*NASA is committed to an environment of trust, built upon honesty, ethical behavior, respect, and candor. Building trust through ethical conduct as individuals and as an organization is a necessary component of mission success.*
Mission Success	*NASA's reason for being is to conduct successful space missions on behalf of this Nation. We undertake missions to explore, discover, and learn. And we believe that mission success is the natural consequence of an uncompromising commitment to safety, teamwork, and integrity.*

***Table 2-1**: NASA Values*

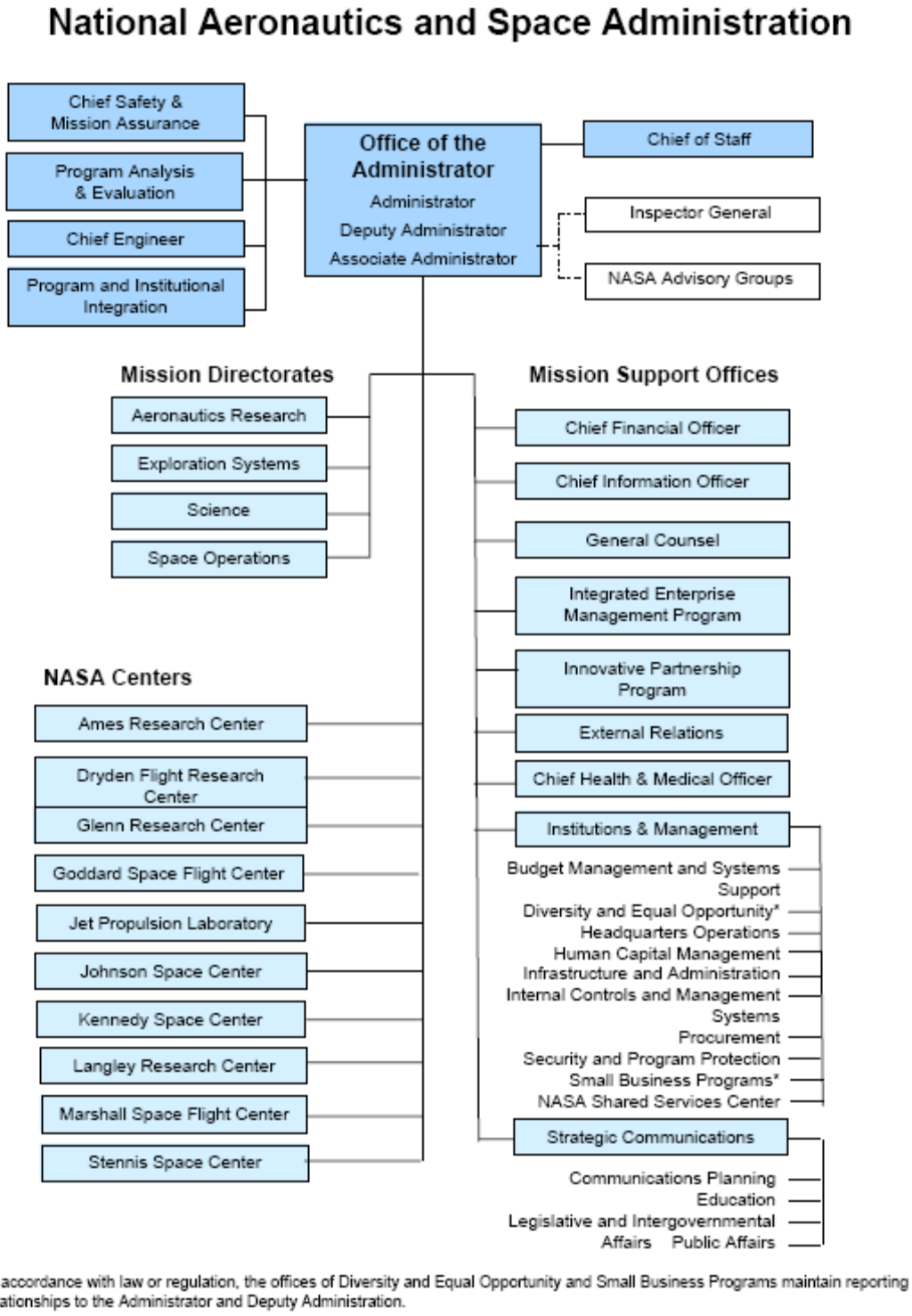


***Figure 2-2**: NASA's Organizational Structure*

(Dated December, 2007)

2.3.2 Real Property Asset Management Reporting Structure

Achieving results is the shared responsibility of all organizations at all levels. The Centers directly manage the large majority of NASA's real property with guidance and oversight from Headquarters. The Centers' real property management organizations report to their respective Center Directors, who in turn report to the Associate Administrator, Office of the Administrator.

The Associate Administrator for Institutions and Management (AA/IM) at Headquarters serves as the principal integrator and advisor to the Administrator and Deputy Administrator on policy and management of real property assets and institutional operations. The Office of Infrastructure and Administration, Facilities Engineering and Real Property Division, and the Agency real property community serve as the strategic advisors to Agency and Center management on real property issues. Line managers are responsible for making effective use of real property data, programs, practices, and tools and for identifying impediments to and opportunities for improving the institutional management of real property. The section, "Accountability and Responsibilities for Achieving Results," in the *NASA Real Property Management Plan* provides greater detail on NASA's reporting structure and the levels of authority for making real property decisions.

Figure 2-3 shows an overview of the integration of the three-tiered approach with NASA's existing organizational structure.

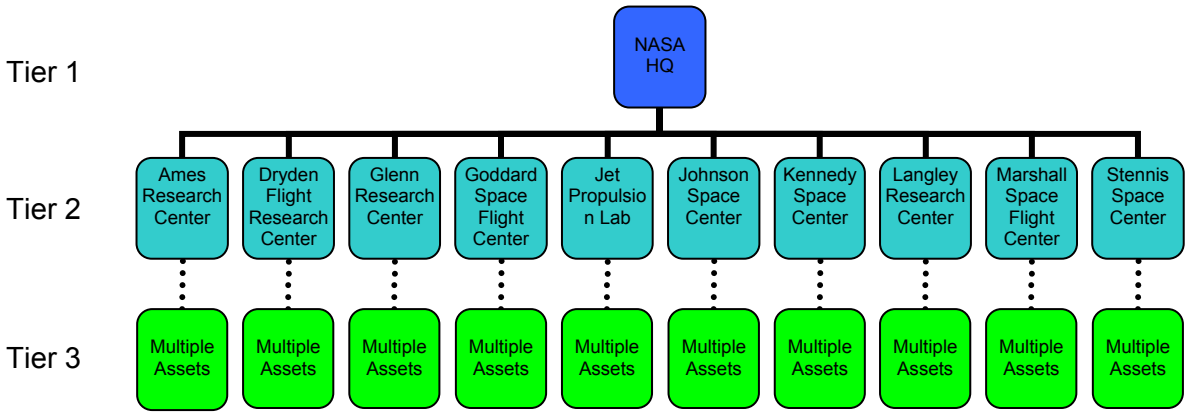


***Figure 2-3**: Agency Asset Management Integration*

2.3.3 Human Capital

NASA's core competencies are recognized as integral, necessary, and critical contributors to achieving Agency strategic objectives. NASA understands the importance of having a competent real property workforce with the appropriate skills and training to support the Agency's core competencies, goals, and mission. Strategic management of human capital is critical for strengthening the Agency. Hence, NASA developed the Workforce Implementation Plan to guide its human capital management decisions. In response to the President's *Management Agenda,* NASA created a Competency Management System (CMS) as a tool to help managers identify and maintain their core competencies.

The CMS is an Agency-wide collection of business processes, data, and tools shared by all Centers to measure and communicate the Agency's corporate knowledge base. It is used to assess alignment with the overall Agency mission by measuring imbalances in current or future workforce compared to NASA strategies and program and project requirements. Using quantitative data, it also is used to support decisions about how to invest wisely in areas such as training and development, recruiting, and career planning. Program managers use the competency information to augment other workforce information to align the workforce to the Agency's mission.

NASA's Real Property core competencies include Master Planning, Facilities Engineering and Management, Facility Civil Engineering, Facility Mechanical Engineering, Facility Electrical Engineering, Construction Management, Real Property Management, and Facilities Operations and Maintenance. These competenices have been documented in the Agency's CMS. NASA supports continuous learning to strengthen these Real Property core competencies and to remain cognizant of and import applicable industry trends, benchmarks, and best practices. The Facilities Engineering and Real Property Division conducts periodic reviews of facilities staffing, using contractors experienced with such analyses. These reviews include benchmarking with similar organizations to determine staffing needs.

2.4 Real Property Asset Management Decision-Making

2.4.1 Role of Strategic Planning in Asset Management Decision-Making

Decision-making begins with strategic planning. Strategic planning is the process of identifying strategic goals and objectives and then developing and implementing plans to reach them. The Agency Mission is achieved through strategic goals/objectives, which are pursued tactically through specific performance goals. Performance goals, which are synonymous with requirements, are met through programs and projects.

NASA controls all strategic management processes through its governance structure, which consists of three Agency-level management councils:

- The **Senior Management Council** determines NASA strategic direction at the vision and mission level, and it assesses the Agency's progress on this level as well.
- The **Program Management Council** guides program and project performance, defining successful achievement of NASA strategic goals and objectives.
- The **Operations Management Council** reviews and approves institutional plans.

Asset management decisions are vetted through the Operations Management Council. This Council serves as NASA's senior decision-making body for reviewing and approving capital investments and issuing institutional budget guidance. A comprehensive view of NASA's strategic management system is shown in Figure 2-4.

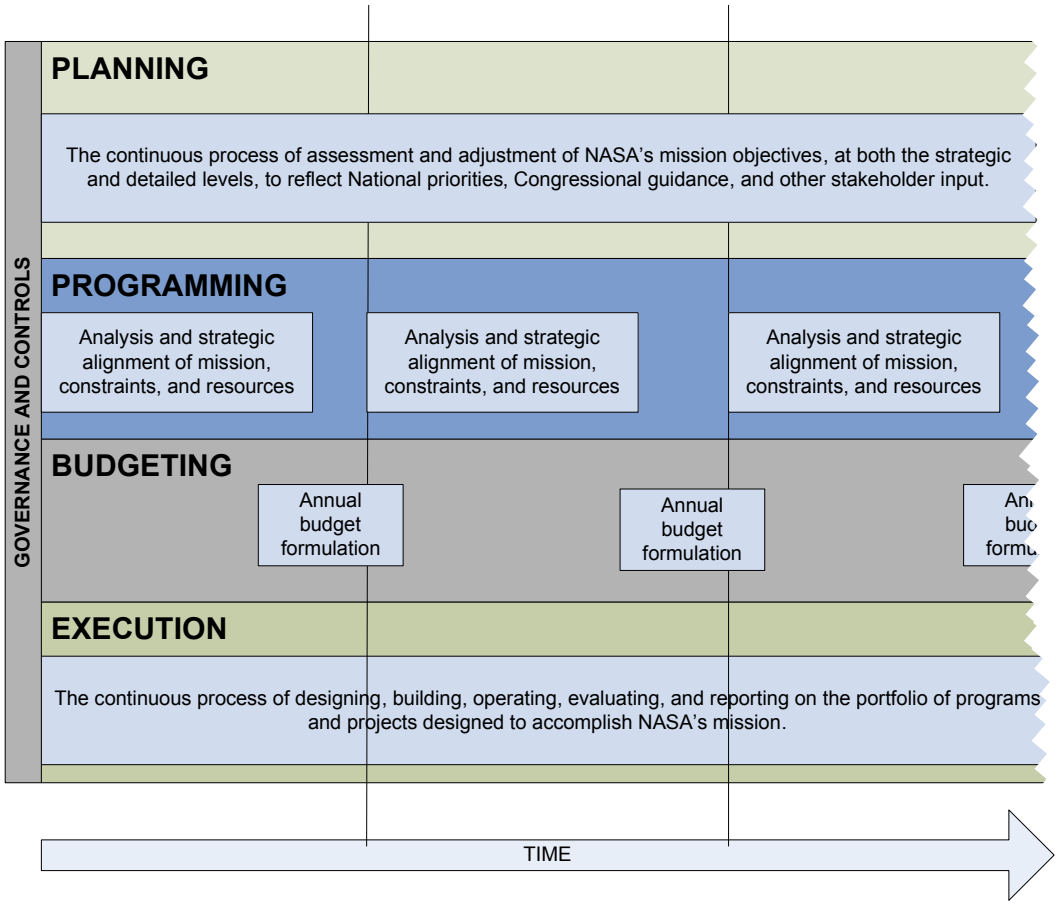


Figure 2-4: *NASA Strategic Management System Overview. External and internal requirements have been incorporated into the four processes that make up the NASA strategic management system. Together the processes create a disciplined approach to managing that places an emphasis on planning, performance and results.*

As part of the strategic planning framework, NASA is required to submit to OMB an Annual Performance Budget. The Agency uses a rigorous planning and budgeting process, including full-cost accounting, to ensure that resources are properly allocated at all levels to meet mission and institutional needs. This process ensures accountability for stewardship of resources throughout the Agency and allows Agency leadership to ensure that financial decisions match Agency priorities, to make appropriate tradeoff decisions, and to respond to external requirements for budget submission and execution materials.

In order to ensure asset decision-making is addressed early during program and project formulation, NASA's key policies for programs and projects require early analysis of real property needs. NASA Procedural Requirement, *Program and Project Management Processes and Requirements* (NPR 7120), governs the formulation, approval, implementation, and evaluation of all Agency programs and projects. For each new project, one of the first steps during the project formulation phase is for Center project managers to conduct a comprehensive analysis of infrastructure needs. In alignment with the RPMP, the policy requires the project

manager to coordinate with the Facilities Engineering and Real Property Division and/or the Center facilities organization to assess existing Agency-wide capabilities to meet infrastructure needs. It also requires the project manager to assess whether facilities in other Government agencies, industry, academia, and international organizations can be utilized to reduce project life-cycle cost and risk. Through synergy with other programs and projects, NASA can avoid costly duplication of supporting infrastructure. See Section 2.4.2 for more detail on this process.

The strategic management framework, shown in Figure 2-5, drives mutual alignment of the NASA Strategic Plan with all subordinate plans, including Mission Directorate Implementation Plans, the Agency Institutional Implementation Plan, performance plans, program and project plans, and implementing workforce and facilities plans at the Centers. The Agency Institutional Implementation Plan is currently being developed and will have clear requirements traceability back to the Strategic Plan in order to verify compliance to the plan, to define the baseline from which monitoring and evaluation will occur, and to enable the development of performance reporting to external stakeholders.

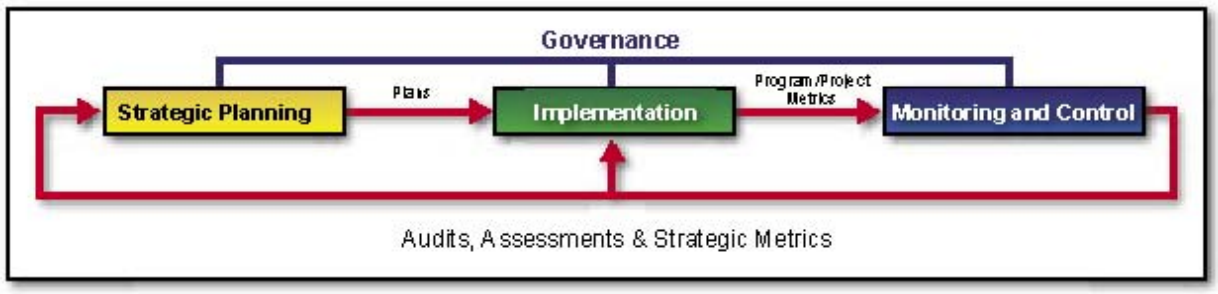


***Figure 2-5**: Strategic Management Stages*

NASA uses the RPMP as the strategic planning document for identifying Agency real property goals. The RPMP will ultimately be incorporated into the Agency's Institutional Implementation Plan. The RPMP goals and associated improvement initiatives, shown in Table 2-2, serve as drivers for NASA management's use in making real property asset management decisions.

Goal 1 – NASA will identify and address real property requirements as an integral part of Agency, Mission Directorate, program, and project planning.
A. Include real property requirements and associated life-cycle costs in program/project budgets from the early planning stages.
B. Ensure facility program/project managers participate as members of the mission/program team from the inception of the program.
C. Ensure Mission Directorates and program managers continually review real property requirements throughout the program life cycle and address changing requirements.
D. Identify capability shortages and determine how they will be addressed.
E. Ensure Agency- and/or Mission Directorate-validated strategic (future) capabilities are maintained.
Goal 2 – NASA will construct and operate new real property to meet mission requirements only when existing capabilities cannot be effectively used or modified.
Seek alternatives to new construction by using the following approach:
A. Consider advanced technologies as alternatives to brick-and-mortar facility solutions.
B. Use/modify existing NASA real property.
C. Leverage the resources (fiscal and physical) of other Federal agencies, industry, and academia.
When construction is needed, NASA will do the following:
A. Plan, design, and construct facilities for sustainability to ensure new facilities are of the right size and type; are safe, secure, and environmentally sound; provide quality workplaces; and operate efficiently and effectively.
B. Advocate for appropriate construction, operation, and deconstruction funds.
C. Use advanced technologies for NASA master planning, design, construction, and facility operations.
Goal 3 – NASA will continually evaluate its real property assets to ensure alignment with the NASA Mission.
A. Identify and address real property requirements as an integral part of Agency strategic planning.
B. Conduct and periodically update a corporate analysis that correlates Mission requirements with real property infrastructure.
C. Identify real property capability gaps and determine how to fulfill the capability.
D. Identify and eliminate redundant and excess real property capabilities.
E. Demolish/deconstruct unneeded facilities.
F. Develop and maintain Center Master Plans (update every 3 years) that ensure the future physical development of each Center effectively and efficiently supports the NASA Mission. Note: These plans are living documents and are updated as necessary based on changes to mission or other mission-related actions. There is a formal requirement to perform a 3-year review to ensure that the CMP is up to date.
Goal 4 – NASA will leverage its real property to its maximum potential.
A. Seek alternatives to NASA ownership of real property where feasible and economically viable.
B. Seek alternative uses for its underutilized real property, including outleasing and consolidation of functions.
C. Make full use of authorities that allow public/private agreements and cost sharing, such as enhanced-use leasing authority and Space Act agreements.
D. Seek third-party financing/services-in-kind opportunities, including privatization, for facility management (e.g., transfer NASA utilities to commercial entity and purchase services).
E. Market temporarily available capacity to non-NASA customers.
F. Divest real property when appropriate.
G. Seek adaptive reuse of historical facilities wherever possible.
Goal 5 – NASA will sustain, revitalize, and modernize its real property required by the NASA Mission.
A. Define target levels for NASA facilities conditions.
B. Determine and allocate the resources to achieve the target levels.
C. Use advanced technologies and best practices for NASA sustainment, revitalization, and modernization.
D. Implement sustainment best practices for all facility requirements, including maintaining historical facilities, environmental stewardship, and safety and health considerations.

***Table 2-2**: Real Property Management Plan Goals and Initiatives*

2.4.2 Asset Decision Process

NASA's real property asset management decisions are generally the responsibility of Center Directors. Center Directors have authority over their budgets, schedules, and human and real property assets. They are responsible for working across organizational lines to perform appropriate integration functions and for making day-to-day decisions using portfolio management in line with guidance and oversight from Headquarters. Governance by the Strategic Management Council, the Operations Management Council, and the Program Management Council are used in the cases where decisions require high degrees of integration, visibility, and approval.

2.4.2.1 New Requirement

As shown in Figure 2-6, a new capability requirement is normally first identified by a NASA program or project, a NASA Center, or a Mission Directorate. New capability requirements are those that at least initially appear to require new construction to meet the needs of the owner, such as a program or Center. New construction may include conversion of an existing constructed asset to a different function, additions to existing assets, or the construction of a new building or asset.

The first step in this process is to validate the requirement for new construction as briefly described in Section 2.4.1 above. NASA procedural requirements (NPR 7120) require a Program Manager to prepare a business case for new construction. The business case includes full life-cycle cost (including operations, sustainment, and disposal), benefit estimates, alternatives and sensitivity analyses, and risk assessments. For example, an alternatives analysis to the use of a constructed asset might include the use of computer modeling to meet the requirement. The business case is reviewed and approved by FERP and the appropriate Mission Directorate. FERP, supported by the Office of Program Analysis and Assessment, validates new requirements proposed by the Centers and others.

The next step is to prepare the acquisition strategy. Alternatives, including use of existing assets or use of non-NASA assets, are also reviewed and the most cost-effective method of meeting the requirement is chosen and implemented. Acquisition of constructed assets through lease or construction is discussed in other sections of this plan and is covered in detail in the NPR's shown in Figure 2-6.

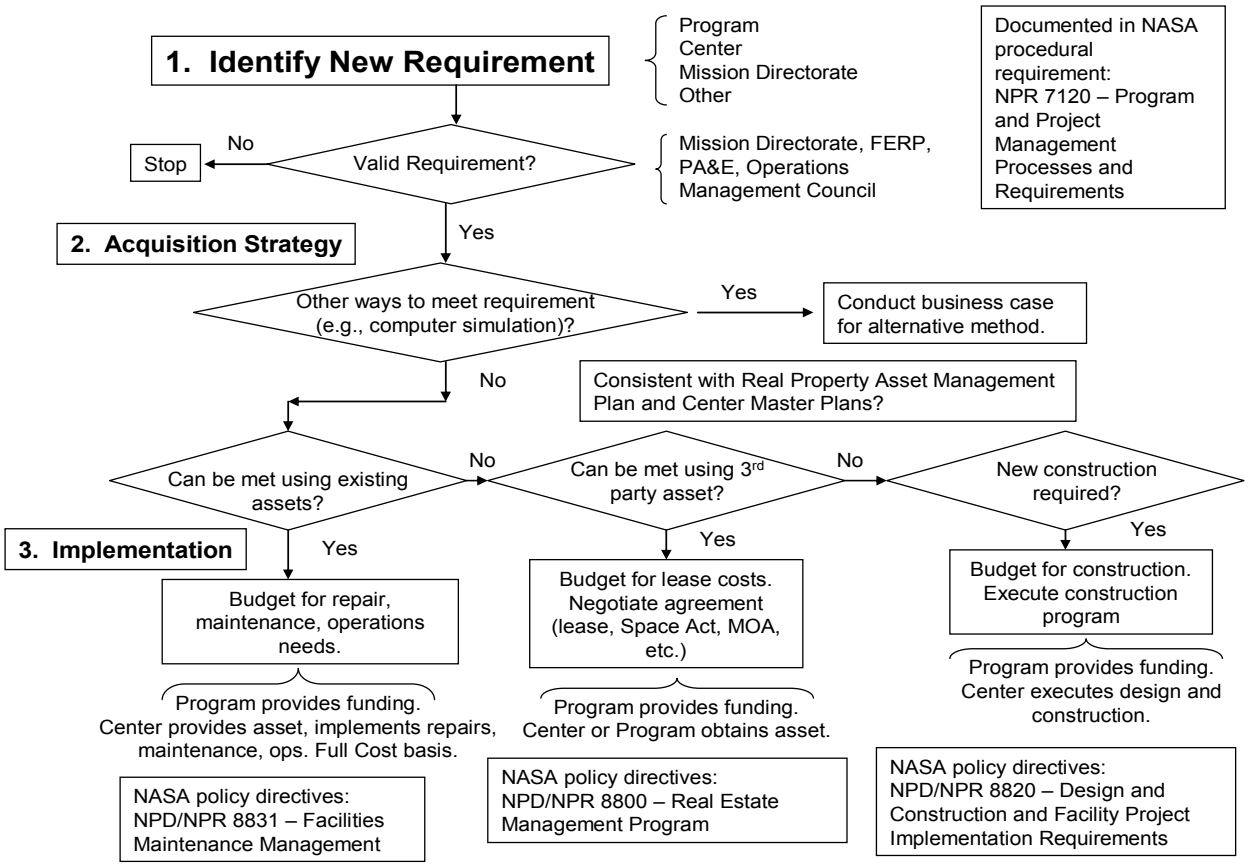


***Figure 2-6**: Real Property Decision Process, New Requirements*

2.4.2.2 Existing Assets

The process for managing NASA existing assets is different than that for new requirements. The need for existing assets is reviewed on an annual basis by the Centers, Mission Directorates, and FERP during the budget preparation process or as required. NASA will use a disposition decision process to manage its existing assets. The factors used to determine the disposition of assets include mission dependency, utilization, condition, and efficiency (operations and maintenance costs). Figure 2-7 shows a simple process for the determination of the disposition of existing assets; however, no one factor will be the sole determinant of asset disposition. Rather, these factors are used to focus attention on those assets that may need additional attention. For example, assets that are found to be no longer needed for mission (mission dependency), may be analyzed for disposal through demolition/deconstruction, sale, or outleasing. Utilization may drive consolidation decisions, disposal decisions, or acquisition decisions. Condition and efficiency may indicate the need for additional maintenance, repair, and upgrade resources.

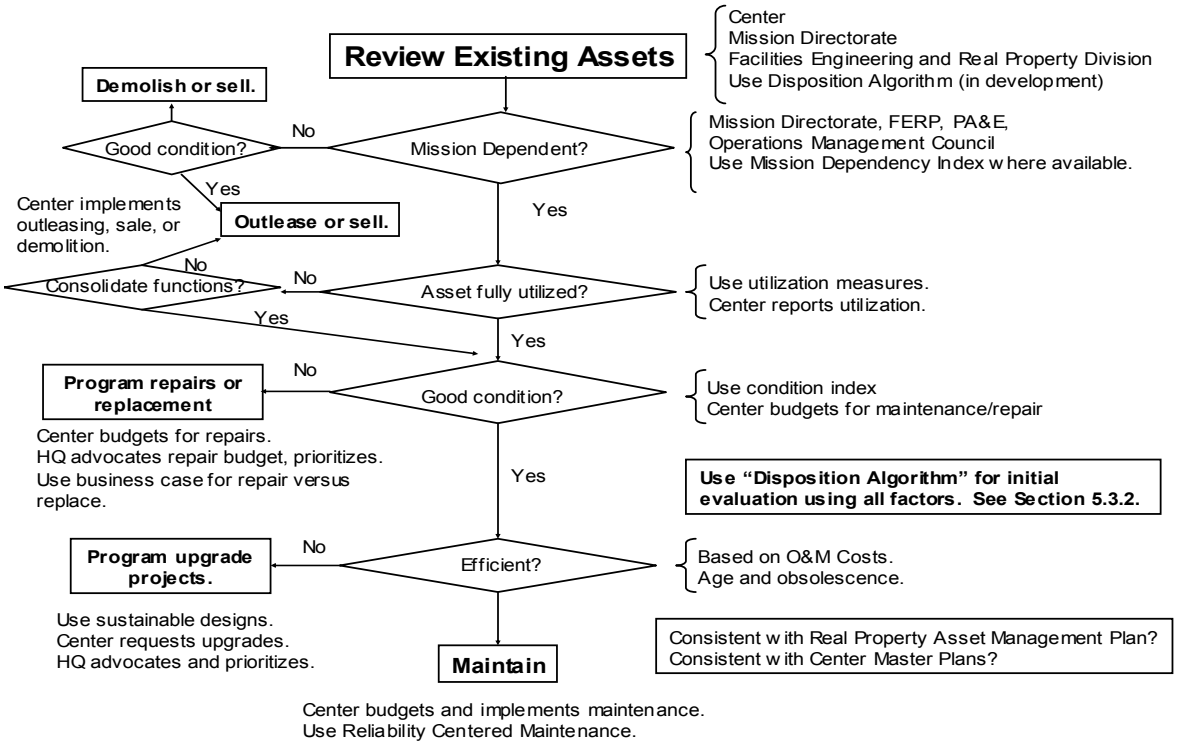


***Figure 2-7**: Real Property Decision Process, Exiting Assets*

2.4.2.3 Shared Capability Assets Program

NASA is responsible for managing many high-cost capital assets and capabilities that support the Nation's research and development needs, as well as the needs of this Agency, now and in the future. Examples of such assets include wind tunnels, rocket propulsion testing facilities, thermal vacuum facilities, and high-performance computing capabilities. Many of the capabilities are unique and expensive to operate, in large part because the long-term demand for their use is difficult to anticipate. NASA Centers responsible for hosting these capabilities often do not have a sufficient number of customers for these services to pay for the total cost of their operation. Consequently, host Centers and a few paying customers have to subsidize inordinately the full cost of associated assets.

NASA must ensure that Agency- or Mission-Directorate-validated strategic capabilities are maintained (see Table 2-2, NASA Real Property Management Plan, Goal 1). NASA also must preserve its shared capability assets (skills, equipment, sites, and facilities) into the future. A proper balance must be maintained between program requirements, facilities/infrastructure, and staying competitive. In order to prevent any one Center from having to bear the full costs of a critical NASA or national asset, NASA has established a Shared Capability Assets Program and separate Headquarters programming and budgeting process.

The Shared Capability Assets Program and associated corporate capital account allow Centers to conduct economically viable business while maintaining the Agency's core capability assets. The establishment of the corporate capital account for unique or highly specialized facilities and infrastructure also increases utilization and efficiencies across a particular asset class and promotes institutional excellence. This supports competitive pricing of NASA capital and unique assets. NASA will use the program to identify and prioritize its critical assets and make strategic investment decisions to replace, modify, or disposition them based on NASA and national needs.

As discussed previously, existing assets are reviewed by the Centers, Mission Directorates, and the Office of Infrastructure and Administration during the budget preparation process, or as required based on an assets business base (see Figure 2-7). An asset becomes a candidate for inclusion in the Agency's Shared Capability Assets Program when the asset:

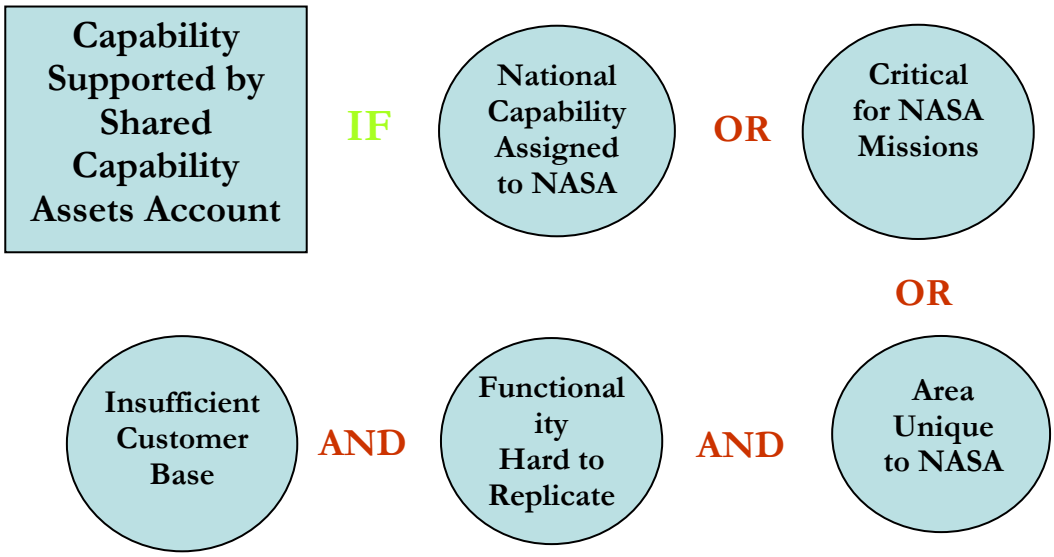
1. is determined to be a national capability assigned to NASA; or,
2. is determined to be critical for NASA missions; or,
3. supports an area unique to NASA;

And,

The asset's functionality is hard to replicate;

And,

The asset has an insufficient customer base.



Key Assumption: All like assets will be grouped and considered as a single capability (Asset Class).

***Figure 2-8**: Shared Capability Assets Program Criteria*

Specifically, NASA evaluates the asset considering the following factors:

- Asset is critical to carry out NASA Mission, now or in the future.
- Asset is a shared capability.
- There exist no feasible alternatives.
- Asset is world class.
- Asset supports an area in which NASA is uniquely qualified to perform and where investments can be highly leveraged to add value to overall business or mission.
- Functionality of the asset is hard to replicate without significant investment.
- Asset has a high replacement cost versus annual O&M cost.
- Asset is central to "competitiveness."
- Asset can be priced based on usage; demand can be forecast to enable asset estimate.
- Current customer base is not sufficient to economically sustain the asset.

NASA uses the above factors along with other analysis and programmatic considerations to make final determinations about whether an asset is included in the Shared Capability Assets Program. If an asset is determined to be in the program, then *all* like assets will be grouped and considered as a single capability or asset class within the program. After nomination, review, and selection by the Agency, assets and/or asset classes will be added to or withdrawn from the Shared Capability Assets Program account based on an overall prioritization and balance among the assets being considered and within the overall constraints of Agency priorities and resources.

The Office of Infrastructure and Administration staffs and manages the Shared Capability Assets Program, establishes budget requirements in coordination with the Office of the Chief Financial Officer, and interfaces with the Mission Directorates, Mission Support Offices, Centers, and the Office of Program Analysis and Evaluation. The Operations Management Council and Strategic Management Council are the governing authorities for the program. See Section 5.1 for more details on the Shared Capability Assets Program.

2.5 Owner's Objectives

NASA has established a set of qualitative owner's objectives specific to its portfolio, which are detailed in the *NASA Real Property Management Plan*. Table 2-2 outlines the RPMP goals and associated improvement initiatives. Quantitative owner's objectives are expressed in NASA's long-term outcome goals and performance targets listed in Appendix A.

These Real Property Management Strategic Goals are the foundation for developing a portfolio or asset level strategy. NASA's asset management framework involves understanding and balancing mission needs/risks and the condition/performance of its assets. The strategic underpinning of this framework is employing new technologies to move physical infrastructure beyond brick-and-mortar facilities solutions and to leverage national, industrial, and intellectual

capabilities. NASA is also committed to providing stewardship of these assets in the best interest of the American taxpayer's investment.

2.6 Benchmarking

NASA employs tools that ensure sound real property asset management decisions, for example, benchmarking and best practices. Benchmarking identifies, measures, and compares processes, products, and services with those of recognized leaders to achieve superior performance. NASA performs benchmarking internally among NASA Centers and externally with other agencies and private industry. From these benchmarking activities, best practices are developed from those practices that are deemed to enhance NASA's rates of success in real property asset management. NASA is a member of and actively participates in a number of leading organizations where benchmark information is shared. They include: the U.S. Green Building Council, Construction Industry Institute, Federal Facilities Council, Society for Machinery Failure Prevention Technology, Society of American Military Engineers, National Institute of Building Sciences, Building Commissioning Association, Association for Facilities Engineering, Association of Physical Plant Administrators, National Science and Technology Council, and the Society for Maintenance and Reliability Professionals. NASA has also conducted specific benchmarking studies recently in such areas as construction safety and reliability centered maintenance. Refer to Appendix B, where a partial list of NASA benchmarking reports and best practices is provided.

Section 3. Planning and Acquisition of Real Property

NASA's acquisitions are driven by mission requirements. During the planning and acquisition phases, NASA translates mission needs into requirements, marshals the necessary resources, and ensures that the necessary real property assets are delivered. Planning and acquisition are similar to other projects in terms of the level of analysis and management practices needed for successful execution.

As with other projects per *NPR 7120.5, NASA Program and Project Management Processes and Requirements*, the cognizant Mission Support Office invests in a period of concept screening (e.g., business case analyses) prior to committing to a real property project. This upfront effort is considered part of the project preformulation period. In accordance with *NPR 8800.15, NASA Real Estate Management Program Implementation Manual*, all requests for approval to take real property acquisition actions are forwarded to the Director, Facilities Engineering and Real Property Division by the Center. The request for approval is coordinated with the Mission Directorates and other NASA Senior Management officials as appropriate. The request is to include information on the real property action, such as the description of the asset to be acquired, justification to acquire the asset, and availability of other sites, both Government and non-Government owned. These requests ensure among other aspects that NASA uses existing Government-owned assets before seeking to add assets or square footage to the Federal inventory.

If there are no suitable solutions, NASA has three main alternatives—building a new Federal asset, buying an existing asset, or leasing a new asset from the private sector. To determine the acquisition approach that is most appropriate, NASA considers: How many assets are needed, how quickly the asset is needed, how long the asset is needed, and how specialized the asset is or how complex the requirement is. Each of these factors has a significant impact on the cost of alternatives and thus the feasibility of the project acquired, either by construction, purchase, or lease.

NASA has authority under the National Aeronautics and Space Act of 1958, as amended to acquire real estate interest whether through gift, purchase, lease, or other means. The Space Act states in part in Section 203.c.3:

> *"In the performance of its functions the Administration is authorized…to acquire (by purchase, lease, condemnation, or otherwise), construct, improve, repair, operate, and maintain laboratories, research and testing sites and facilities, aeronautical and space vehicles, quarters and related accommodations for employees and dependents of employees of the Administration, and such other real and personal property (including patents), or any interest therein, as the Administration deems necessary within and outside the continental United States; to acquire by lease or otherwise, through the Administrator of General Services, buildings or parts of buildings in the District of Columbia for the use of the Administration for a period not to exceed ten years without regard to the Act of March 3, 1877 (40 U.S.C. 34); to lease to others such real and personal property; to sell and otherwise dispose of real and personal*

property (including patents and rights thereunder) in accordance with the provisions of the Federal Property and Administrative Services Act of 1949, as amended (40 U.S.C. 471 et seq.); and to provide by contract or otherwise for cafeterias and other necessary facilities for the welfare of employees of the Administration at its installations and purchase and maintain equipment therefore."

3.1 Capital Improvement Plans

NASA's Facilities Engineering and Real Property Division plays a key role in securing the necessary resources to maintain current real property assets, acquire new or replacement assets that meet the evolving needs of the agency, and preserving the historical and cultural assets placed in NASA's trust. The annual real property Capital Improvement Plan is part of the Agency's 5-year budget described in *NPD 1000, Strategic Management and Governance Handbook*. The annual capital improvement plan contains those construction of facilities (CoF) projects that were prioritized and approved for funding using the process described in Section 3.1.1.

NASA Headquarters is in the process of preparing a 6-Year Capital Improvement Plan for the Agency, which coordinates each Center's proposed projects with other Center's projects in the Agency. The NASA Capital Improvement Plan will contain those projects above $5M that, based on the Center Master Plan and other policies, are recommended for implementation in the succeeding 6 years. Capital improvement projects are those that directly relate to a Center's Master Plan, including major repairs, repair-by-replacement, new construction, and demolition/deconstruction.

3.1.1 Construction and Repair Project Prioritization Process

Beginning with the FY 2003 budget preparation process, NASA institutional construction and repair (CoF) projects are prioritized Agency-wide using an algorithm that "scores" projects based on many factors. These factors include mission criticality, current corporate initiatives, such as security, deferred maintenance, health and safety initiatives, American with Disabilities Act requirements, repair-by-replacement, sustainability, and Facility Condition Index (FCI). The algorithm is used each year by a Headquarters team of mission and mission support offices (with Center input), with the scoring factors and the weighting of the factors based on current Agency initiatives and priorities.

In FY 2007, the CoF prioritization process evolved. Currently, a risk-based approach is used in which a 5x5 risk matrix with axis of "severity" and "probability of occurrence" is employed. The impact of not doing the project is written and submitted to substantiate the scores. Discerning factors, previously used in the prioritization process, are utilized to differentiate priority of projects with the same core.

Using the algorithm mentioned above, FERP conducts an onboard CoF prioritization session with representation from the Mission Directorates, Missions Support Offices, and Centers. The resulting prioritized list of CoF projects is recommended to the Operations Management Council (OMC).

Additionally, by also asking for an "unconstrained prioritized list" of projects from the Centers in order to prepare the prioritized list, NASA is able to develop a true picture of institutional CoF requirements. This is then used in conjunction with Agency performance measures to justify total funding levels for major facility projects.

Program-direct CoF projects, which are funded directly by the programs, are not involved in the prioritization process. These are generally projects required to support new programmatic needs. They do, however go through the approval decision process illustrated in Figure 2-5 and the business case process described in Section 2.4.

3.1.2 CoF Project Approval Levels/Budgeting Process

Included in the current 5-year NASA budget is the Construction of Facilities Program for projects and real estate acquisitions to accomplish NASA missions. Components of NASA's Capital Improvement Plan include Discrete Projects ($5 million and over), Minor Projects ($500,000 up to $5 million), Facilities Planning and Design, and Demolition/Deconstruction Projects.

NASA requires Congressional approval or direct appropriations for Discrete Projects, which are line items in NASA's budget. Minor Projects are grouped as a lump sum by Field Center. The process for developing the Capital Improvement Plan for submission to Congress is part of the NASA budget formulation process.

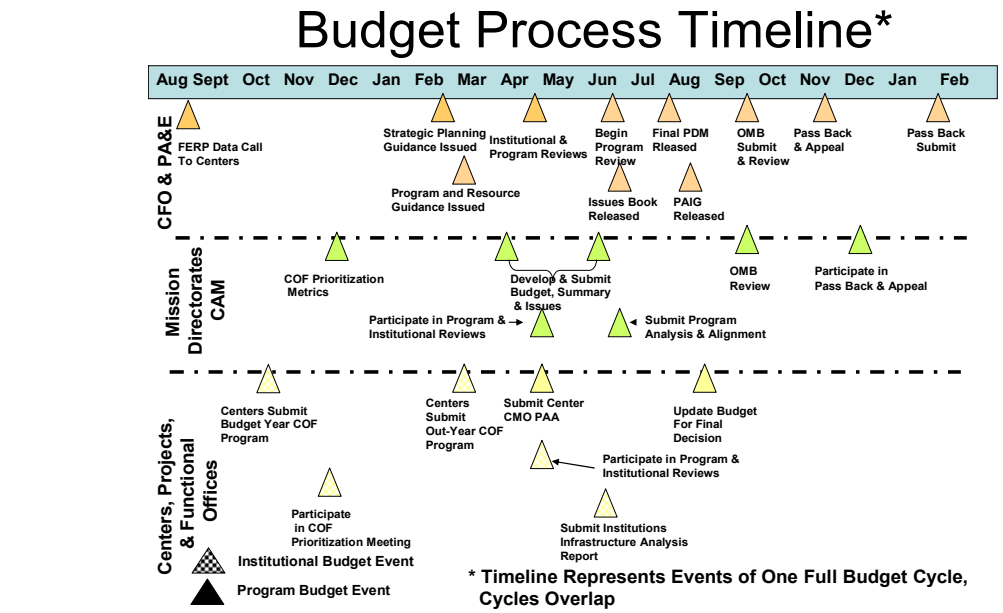
The CoF program is developed through a process involving Centers, Headquarters, and OMB, as part of the annual budget preparation process, also known as the Planning, Programming Budgeting and Execution or "PPBE" process. Figure 3-1 shows a typical timeline for the PPBE process. The timeline depicts the major activities of the budget process, when they occur, and the level in the Agency at which they are performed. These activities are identified as either Institutional or Program Budget events. Institutional requirements are developed and submitted by the Centers in the early phase of the process. The Agency decides on the appropriate size of the institutional budget to establish the labor, service pool, and Center General and Administrative rates for use in Program Budget development. Next, the Centers develop and submit their Program Budget for Agency review. Once program decisions are finalized, any adjustment required to the institutional rates are made and the budget is submitted to OMB.

Project funding thresholds are based on the annual authorization and appropriation legislation and the National Aeronautics and Space Act of 1958, as amended. The authorities and responsibilities identified in *NPD 7330.1, Approval Authorities for Facility Projects*, apply to all CoF projects and are responsible for ensuring conformance with applicable legislated limitations. Current thresholds and authorities are as follows:

- Routine Facility Maintenance: Center authority, unlimited annual amount. Annual amount spent and plans for future annual maintenance spending are reported to Headquarters.

- Center Authority Repair: Projects under $500,000 are planned, programmed, budgeted, approved, and implemented by the Center. Repair projects of $50,000 to $500,000 are reported to Headquarters.
- "Minor" Repair and Construction: Projects of $500,000 to under $5 million are developed and implemented by the Centers but require Headquarters approval (Mission Directorate and Facilities Engineering and Real Property Division). The "Minor" project budget is reported as a NASA-wide lump sum in the President's budget. In FY 2004 and FY 2005, these funds were included in the Center General Overhead and Administrative budgets. Beginning in FY2006, NASA placed these funds back into an Agency-wide account.
- "Discrete" Repair and Construction: Projects over $5 million are developed and implemented by the Centers but require Headquarters approval (Mission Directorate and FERP). Discrete projects are listed individually in the President's budget and changes to them must be approved in advance. Discrete funds are managed by FERP until contract award. The contracts and projects are managed by the Centers.

The Construction of Facilities (CoF) program development and approval process is depicted in Figure 3-2, CoF Program Management. The figure shows the detail of how the CoF program process flows from one organization to the next. The activities accomplished by each organization during that part of the process are identified under the boxes. The "Program Development" and "Program Approval" sections show the detailed activities for the CoF Program associated with the PPBE process depicted in Figure 3-1. The "Program Execution" section shows how resources and project approvals are provided to the Centers and the program/project management roles and responsibilities of each organization.



CMO = Center Management and Operations
COF = Construction of Facilities
PAA = Program Analysis and Alignment
PAIG = Program and Institutional Guidance

Figure 3-1: *Budget Cycle (Program Operating Plan Process*

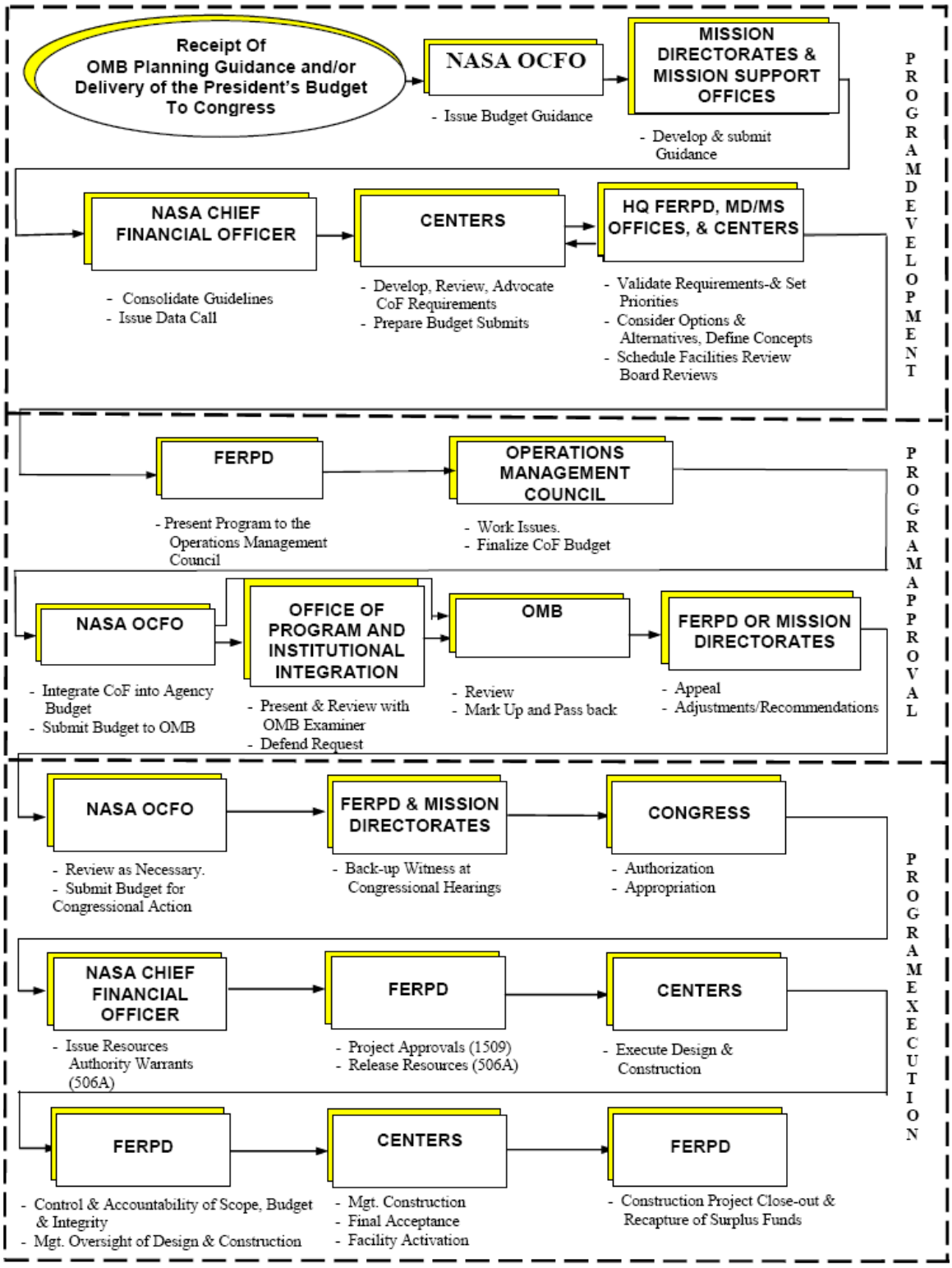


Figure 3-2: *CoF Program Management*

3.1.3 Major "Discrete" Projects

The CoF Program addresses program requirements that serve a Federal need that cannot be readily met with existing Federal assets or assets available in the private sector. The prioritization of these projects is done in close coordination with the customer or program area with the requirement. The prioritization of Institutional Discrete CoF Projects is done in close coordination with the customer or program area with the requirement (refer to Section 3.1.1, Institutional CoF Prioritization Process,).

Capital planning and budgeting integration (annual work planning) are key components of NASA's current real property management. The capital planning and associated budget integration take place at the Centers and discrete projects are approved at HQ. After the budgets are developed, FERP annually reviews their portfolios and plans with NASA HQ executives, and Center executives and real property directors to ensure conformance to the Agency and Federal goals.

The Centers' facilities management organizations perform due diligence to determine the best way to meet the Agency's mission needs using engineering studies, requirements documents, project management plans, Project Definition Rating Index (PDRI), life cycle cost analysis, and conceptual designs. These studies define the project and present an evaluation of alternatives to meet mission requirements, alternative cost estimates, construction efforts, and acquisition planning and phasing.

Final designs are completed prior to the construction phase of a project to provide more detailed cost estimates, implementation options, design directives, and scheduling and phasing plans. Requirements Documents that are completed in the early design stage address the following:

- Project objective
- Customer definition and advocacy
- Constructed asset operating parameters
- System requirements

After completion of the Requirements Document, it undergoes a comprehensive review by the project stakeholders including all functional offices necessary to ensure the project complies with internal and external requirements (e.g., safety, security, energy, legal, planning, acquisition, Center, Office of the Chief Financial Officer, and environmental).

All projects are required to have a Project Management Plan, which addresses the following areas:

- Identification of the Facility Project Manager and other individuals or organizations responsible for project implementation,
- Description of the functional requirement including the operational need date(s),

- Description of the planned constructed asset including capacity, scope, location, sustainability elements, special features, Construction Cost Estimate, and, for projects that involve less than the total requirement, the incremental phasing schedule and rationale,
- Identification of all relevant environmental, safety, and cultural requirements,
- An acquisition plan ensuring the funding method and schedule to support the operational need date(s),
- A project schedule with key milestones for planning, environmental, design, acquisition, construction, and activation,
- Configuration/change control procedures and responsibilities, and
- Description of design reviews, documentation, fiscal control procedures, and reporting frequency.

For Discrete Projects, the Project Management Plan is approved by Headquarters Facilities Engineering and Real Property Division.

NASA uses the PDRI to determine a project's readiness for final design and construction. The PDRI is a checklist used by the Project Manager, project team, and customer to determine the areas requiring clarification and further study. Among the many elements evaluated by the PDRI, the following are a few examples: Business strategy, owner philosophies, project requirements, site information, building programming, design parameters, equipment, procurement strategy, deliverables, and project control and execution.

If the PDRI assessment indicates that the project risk is low, then the project may proceed to final design and construction. If the project risk is considered high, then the project team is required to identify the problem areas and evaluate the risks to the overall success of the project.

NASA Headquarters uses a number of criteria to assess the relative priority of projects among the Centers. These include the following:

- Alignment with the Capital Improvement Plan and Center Master Plan.
- Consistency with the overall Agency/Center goals and missions.
- High priority for safety, American Disability Act, security, and sustainability projects.
- Impacts of projects on the Facilities Revitalization Rate and Facilities Condition Index.
- Impacts of projects on historic and cultural preservation.

Earned value management (EVM) will be used only for facilities projects that are developmental in nature or high risk, e.g., use nonstandard construction techniques or untried technologies. EVM is not typically required for facility projects because they are usually accomplished using standard construction techniques, equipment, and materials; and utilizing fixed price and fixed performance period contracts. The construction management process required by NPR 8820 qualifies as a Performance-Based Management System (PBMS) that complies with the essential elements of EVM for all construction projects over $500,000 (i.e., requires tracking of cost, schedule, and scope and contractors are paid based on completed work).

3.1.4 Minor Projects

Similar to Discrete Projects, NASA Centers perform analyses and engineering studies to develop Minor Projects for submission to FERP, using the PPBE process described in Section 3.1. These projects are then assessed by FERP, using the criteria discussed in Section 3.1.1. For Minor Projects, Project Management Plans are approved at the Center level. Requirements Documents and PDRIs also are completed for Minor Projects.

Once final project rankings are established, the budget submission is completed based on the amount of funding that is available. Remaining projects are maintained at the Center level for submission the following year, residual funding if it becomes available, or alternative methods of meeting the need.

3.1.5 Acquisition of Leases

In lieu of construction, NASA can lease assets that belong to private owners or other government entities to satisfy requirements. A lease is used when a business case analysis shows it to be more advantageous based on life cycle and business considerations, normally for short-term requirements. NASA does not typically do a significant amount of leasing. Leases with a term of more than 5 years require Headquarters approval. NASA also uses Space Act authority to obtain the use of assets when appropriate.

NASA ensures that leasing proposals conform to OMB's operating lease scoring requirements and examines each leasing proposal for consistency with the portfolio strategy, the availability of space in the local market, and the appropriateness of timing. Projects meeting all applicable criteria are included in NASA's annual budget request to OMB and Congress.

NASA obtains leases in a variety of ways, including using the General Services Administration, with assistance of private real estate services firms or in-house personnel. The leases are written and negotiated by the owning Center, following policies and guidance issued by Headquarters. If 5 years or less in term, the Center Director also has the authority to sign and execute the lease. NASA solicits offers on a competitive basis, negotiates with offerors, and makes awards to the lowest priced acceptable offer. Some solicitations, known as "Best Value," also consider tradeoffs between price and other factors.

3.2 Acquisition Performance Measures and Continuous Monitoring

3.2.1 Federal Real Property Council Acquisition Measures

NASA will adopt the Federal Real Property Council acquisition measures once they have been developed and defined.

3.2.2 Agency-Specific Measures

NASA does not acquire a significant amount of new real property. NASA's focus, as previously described, is on reusing existing real property or utilizing assets owned by others. For this reason, NASA does not track the specific performance of real property acquisition; however, NASA does track specific measures regarding the design and construction process, some of which are discussed below.

3.2.2.1 Construction Acquisition Measure

Appendix A contains the measures used by NASA to evaluate the effectiveness of construction acquisitions, primarily using the standard program management measures of cost, schedule, and scope.

3.2.2.2 Leasing Acquisition Measure

For leasing, NASA tracks the number of leases and size (square footage) of leased spaces. The goal is to reduce leasing to the extent possible.

3.2.2.3 Enhanced Use Leasing Measure

NASA has authority at two of its Centers to outlease underutilized property and to retain the proceeds for facilities projects. Enhanced Use Leasing (EUL) is only for outleasing, (the lease of NASA property to some party for their use). The metric that is used to evaluate performance in this area is Outlease Revenue. NASA is seeking an upward trend in Outlease Revenue. In addition, NASA is pursuing legislative action to gain the use of EUL at all 10 of the field Centers. See Section 4.4 for a fuller description of EUL.

All Centers have authority under the National Historic Preservation Policy Act to lease historic properties and retain revenues received to maintain those properties.

3.2.2.4 Customer Satisfaction Surveys/Measures

The performance of construction is assessed with a customer satisfaction survey that addresses the quality, timeliness, budget, and schedule. This survey is completed as part of the project closeout process. The results are tabulated each fiscal year at each Field Center and then forwarded to the Facilities Engineering and Real Property Division for assessment. The current goal is to achieve a rating of 75 percent or higher at each Center.

3.3 Acquisition Initiatives

NASA is striving to improve the delivery of on time, within budget, and within scope capital projects. To accomplish this, NASA has two specific initiatives specified in the Real Property Management Plan underway to improve planning and delivery of acquisition projects and to improve financial and program management. The initiatives first address identifying and addressing real property requirements as an integral part of Agency, Mission Directorate, program, and project planning. The second initiative is to ensure that NASA constructs new real property only to meet mission requirements when existing capabilities cannot be effectively used or modified. The two initiatives are:

Real Property Requirements as an Integral Part of Planning
To ensure that NASA appropriately plans for future mission needs it is necessary that Real Property Requirements be developed as early in the planning phase as possible. To effect this change, NASA has modified or is in the process of modifying its policy and procedural requirements.

Construct and Operate New Real Property Only When Absolutely Necessary
NASA will examine all new real property requirements to ensure that only those capabilities that are not available elsewhere are built and operated. Determinations will be made on existing capabilities for effective use if modified, considering advanced technologies to brick and mortar constructed asset solutions; modifying existing NASA real property; and leveraging the resources (fiscal and physical) of other Federal agencies, industry, and academia.

Section 4. Operations of Real Property

The operations phase of NASA's real property assets involves making decisions regarding maintenance and reinvestment, as well as monitoring administration of leases and servicing agency needs. This section describes some of NASA's processes and initiatives regarding the maintenance and operation of its existing assets. Figure 2-6 portrays the decision flow for evaluating existing assets.

4.1 Real Property Inventory

NASA manages more than 360,000 acres of real property and owns more than 100,000 of those acres. It has approximately 5,400 buildings and other structures totaling more than 44 million square feet of diverse real property assets located around the world. These assets range from commercial office buildings, warehouses, testing labs, and wind tunnels to launch pads, antennas, roads, and utilities. In total, they represent more than $23 billion in current replacement value (CRV).

Critical real property information is needed on all assets to support operational decision-making. NASA's Real Property Inventory (RPI) and Facility Utilization System (FUS) provide a Web-based, automated means for recording, maintaining, and reporting real property data for all assets valued over $5,000. It contains basic information on every real property asset owned by NASA, as well as basic information on leased assets. It provides an automatic mechanism for reporting real property information to NASA Headquarters and General Services Administration (GSA), and assists in compiling, analyzing, and reporting real property and facility utilization data. The database also catalogs a wealth of information about individual NASA facilities, which is heavily used to manage the real property portfolio.

The NASA RPI is a "real time" database of all constructed assets and land. It is validated annually, with updates and corrections continually applied as necessary. It is flexible, user-friendly, and based on commercial-off-the-shelf software. Section 4.1.1 describes some of the data that is contained in the RPI. The RPI is NASA's fiscal tracking system for real property. All capital acquisitions and changes to capital assets are recorded in the RPI. However, it is not linked directly to the Integrated Financial Management System. The fiscal data in the RPI can be uploaded electronically to the Center CFO's for their use.

4.1.1 Asset Documentation

A "property card" is the basic repository of information on each individual real property asset under NASA management and control that is contained in the RPI. All real property constructed assets with an initial cost or book value of $5,000 or more have property card information in the RPI system. The following data fields are found on the property cards:

- *Property number*. Center-assigned constructed asset number.
- *Property name*. Constructed asset name, which is usually descriptive.

- *Structure*. Type of property: Land, buildings, leasehold improvements, other structures and facilities, or leased structures or buildings.
- *Construction*. Type of construction, such as permanent, semi-permanent, and temporary.
- *Card date*. Date on which the property card was originally filled out.
- *Ledger account*. Code obtained from the NASA *Financial Management Manual*, which requires that all NASA real property assets receive a ledger account coding of land, improvements to land, buildings, other structures and facilities, or leasehold improvements. The system automatically assigns this account number when structure type is selected.
- *NASA classification*. Every NASA real property asset is assigned 1 of more than 500 real property classifications. The classification depends on the function or composition of the asset. For example, different classifications are applied to concrete or bituminous runways. NASA Form 1134 lists all classifications. Selection of a NASA classification code drives system selection of the constructed asset capacity in the valuation section of the property card.
- *GSA usage code*. The NASA classification coding system refers the user to the appropriate matching GSA usage code, which is also found on NASA Form 1134.
- *Land area type*. Information on the type of land involved, whether rural or urban. When the property card is for a constructed asset (as opposed to land), the usual entry is null.
- *NASA interest*. The basis on which NASA uses and controls the property. Typical entries are owned, leased, or use permit.
- *Status*. Assets may be classified as either active or inactive. If inactive, they are further designated as standby, mothballed, or abandoned.
- *Utilization level*. Facilities may be classified as overutilized, utilized, underutilized, or not utilized.
- *Description*. A description of the constructed asset and its location with sufficient detail to allow someone who is unfamiliar with the constructed asset to locate and identify it.
- *Inventory dates*. Date when an inventory of the constructed asset was last conducted and the performing organization (NASA or GSA).
- *Valuations*. Cost and size information concerning the constructed asset. The book cost of the constructed asset is the cost to acquire or construct the constructed asset. Also included in book cost are all costs necessary to bring the constructed asset to a form and location suitable for its intended purpose (that is, the total cost to NASA). Book cost represents the original capitalized value of the asset, adjusted for modifications. (The recorded book cost is updated annually by the cost of any additions, modifications, or demolition/deconstruction of $5,000 or more.)

  The database automatically generates the Current Replacement Value (CRV) by escalating the book value of the constructed asset using the *Engineering News Record* (ENR) annual 20-cities average building cost index (BCI) factors. The CRV calculations are made by indexing the construction cost using the BCI value for the year of construction, indexing each change in book value using the BCI value for the year in

which the change was made, and then summing the results. By clicking on the CRV button, the user also can view the CRV in past years and the CRV if one of the individual listed city's BCI were used instead of the 20-cities average. The "Plant Replacement Value" (PRV) is the cost to replace a constructed asset to meet current requirements and is calculated and reported in the annual Federal Real Property Profile. It is not recorded in the RPI.

The valuations field also records the constructed asset's original and current capacity, and its original and current size. When a Center's real property data administrator enters the correct NASA classification for the constructed asset into the property card, the database automatically inserts the correct unit of measure for that classification. For example, a runway's capacity is measured in square yards, buildings in square feet, liquid storage tanks in gallons, liquid pumping facilities in gallons per minute and electric power plants in kilowatts. A click on the unit of measure listed on the property card converts the measurement, where appropriate, from the English system to the metric system.

- *Transaction activity*. Transaction activities greater than $5,000 concerning the constructed asset. These transaction activities include modifications or renovations to the constructed asset, adjustments to capitalization costs (book value), and transfers of management or control of the constructed asset.
- *Constructed asset photo*. Photograph of the constructed asset.

4.1.2 Other Real Property Inventory Features

The RPI can produce a number of useful standard reports for the real property portfolio. NASA uses these reports to track real property status and to make decisions regarding real property management. In addition to standard reports, the RPI can produce custom reports relatively quickly and simply. Some of the standard reports contained in the RPI include:

- Summary Report by Center and Subordinate Sites
- NASA Property Class Codes Aggregate Report
- Land Summary by Center and Subordinate Sites
- Property Listing by Center and Subordinate Sites
- In/Out Grant Report (includes EUL Leases as out-grants)
- Building Space Utilization Report

The RPI is modified as required in support of the Federal Real Property Council (FRPC) performance measures and inventory guidance. Recent enhancements to the NASA real property database include the addition or modification of the following data elements:

- Condition index (CI), as defined by the FRPC.
- Utilization, as defined by the FRPC; initially, utilization will be a fairly subjective determination by the owning Centers with spot checks by Headquarters and will use the four categories issued by the FRPC.

- O&M costs.
- Mission dependency index (MDI); initially, mission dependency will be a fairly subjective determination by the owning Centers with spot checks by Headquarters and will be categorized into "mission critical," "mission dependent, not critical," and "not mission dependent" per FRPC guidance. NASA is developing a more objective MDI that will produce a score with a 0–100 scale.
- Historical status.

The Facility Utilization System, a part of the RPI, contains information on how the asset is being used, such as site closure reports, property utilization reviews, and data on the various classes of personnel using a constructed asset's space. Originally intended to comply with NASA's real property recording and reporting requirements (in lieu of paper records), RPI/FUS is now used for many other purposes, such as financial capital asset reporting and supporting parametric models that are used to estimate facility sustainment and deferred maintenance costs.

4.2 Historic Preservation

In addition to providing procedures to the requirements of the National Environmental Policy Act (NEPA), Executive Order 12114, and *NPR 8580.1, Implementing the National Environmental Policy Act and Executive Order 12114,* also include procedures to comply with the requirements of the National Historic Preservation Act of 1966, as amended, and Executive Orders 11593 (Protection And Enhancement Of The Cultural Environment), 13006 (Locating Federal Facilities on Historic Properties in Our Nation's Central Cities), and 13287 (Preserve America).

The National Historic Preservation Act (NHPA) establishes the National Register of Historic Places (National Register) and requires Federal agencies to consider the effects of their actions on cultural resources that are listed or are eligible for listing in the National Register. To evaluate possible effects of the proposed actions, the implementing regulations of Section 106 of the NHPA require agencies to identify and evaluate historic resources, assess the area of potential effect (APE) of the proposed action on the historic resources, consult with the State Historic Preservation Office (SHPO), and solicit comments from the Advisory Council on Historic Preservation in certain instances. The purpose of this act is to protect historic resources in the project areas that are listed in or eligible for listing in the National Register. Such listings can include districts, sites, buildings, structures, and objects significant in American history, architecture, archaeology, and culture. Recent amendments to NHPA emphasize the need to solicit concerns from Native Americans to protect traditional religions and culturally important properties.

RPI data is used to monitor and report on the condition of NASA's historic resources and assets in accordance with EO 13287, Preserve America. NASA assesses its constructed assets for historic significance as necessary. NASA recently added a data element to the RPI to characterize each asset's historical designation status as "National Landmark," "Listed on National Historical Register," "Eligible for Listing," "Not Eligible" (or "evaluated, not historic") "Not Surveyed" (or "not evaluated") and "Not Applicable." These characterizations will be

reviewed annually and changed as necessary ensure compliance with FRPC inventory requirements and appropriate management of historic assets. Information in support of these requirements is maintained in the RPI. It is also an essential component in establishing and tracking Integrated Cultural Resource Management Plans (ICRMPs) for each Center.

4.3 Asset Planning, Business Plans, and Cases

Each Center prepares Center Master Plans, which flow from Mission Directorate Implementation Plans, the Agency's Institutional Implementation Plan and the Strategic Plan. This series of plans forms the NASA real property asset business planning process. NASA has recently instituted a requirement for business case plans to be prepared and approved in specific cases, including new construction or major acquisitions, major leases, significant disposal actions, and other major real property actions. Therefore, the Centers, via the Agency's implementation plans and Facility Master Plans, are considered the "building blocks" for NASA asset business plans.

4.3.1 NASA Strategic Plan

As stated in Section 2.3, asset management decision-making begins with strategic planning. The Agency Strategic Plan sets the course for the Agency, establishes the highest level metrics against which to measure performance, and is the foundation for all other plans in NASA. Figure 4-1 illustrates the relationship between external requirements and internal documents. The *NASA Strategic Management and Governance Handbook*, *NPD 1000*, provides detail about how high-level Agency strategies are turned into executable programs and projects with supporting budgets. Within the strategic planning process, Agency-level strategies are derived from the top-level Implementation Plans. NASA currently uses the RPMP as the strategic planning document for making real property decisions. In the near future, the RPMP will be subsumed by the Agency's Institutional Implementation Plan. In support of the Agency's Institutional Implementation Plan, each Center is required to develop a detailed Center Master Plan that is required to be updated at minimum of every 3 years. These plans comprise NASA's Asset Business Plans.

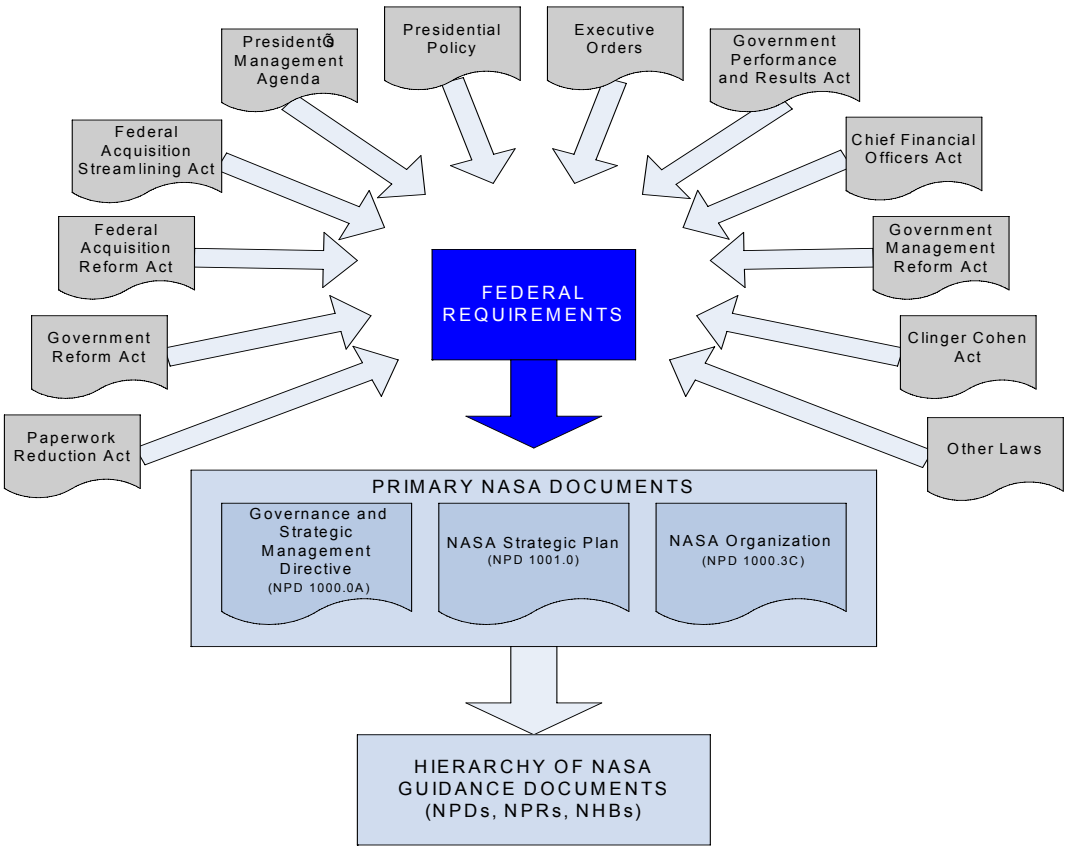


***Figure 4-1**: System Requirements. The way NASA conducts its missions and operations are defined by a number of external and internal requirements. These requirements have been incorporated into three primary NASA documents that, in turn, inform the hierarchy of policy, requirement, and procedural documents used to manage the Agency*

4.3.2 Institutional Implementation Plan

Once the Strategic Plan is approved, each Mission Directorate develops its own Implementation Plan to carry out the Strategic Plan. All institutional offices contribute to one Institutional Plan. The Institutional Implementation Plan will take into account all relevant information from the Annual Budget and the Integrated Budget and Performance Document. The Institutional Implementation Plan will serve as the bridge between strategic planning and execution of the Center Master Plan. A NASA Procedural Requirements document will be developed that describes the process and procedures for developing the Implementation Plan.

4.3.3 Center Master Plans

Centers are responsible for establishing and maintaining the institutional capabilities (human capital, facilities, processes, etc.) required for programs, projects, and missions. Each Center prepares and maintains a Center Master Plan (CMP) in accordance with NPD 8810, Master Planning for Real Property and NPR 8810 Master Planning Procedural Requirements. The CMP is the Center's statement of its concept for the orderly management and future development of the Center's real property assets, including land, buildings, physical resources, and infrastructure.

It is the overall plan for Center development. It provides a narrative, statistical, and graphical record of current capabilities and conditions (natural features, buildings, structures, utilities, transportation systems, and other improvements), as well as proposed conceptual capabilities necessary to support program requirements, mission requirements, and the NASA Strategic Plan.

The CMP is integrated with and supports Mission Directorate Implementation Plans, the Agency's Institutional Implementation Plan, the Real Property Management Plan and the Strategic Plan. The CMP is prepared in accordance with applicable NASA implementing guidelines and other planning processes, including environmental planning. The CMP ensures compliance with real property requirements established by pertinent statutes and regulations, Office of Management and Budget circulars, Executive orders, and Agency directives and guidance. Finally, Center Master Plans will be developed, maintained and periodically reviewed to ensure the future physical development of each Center supports the NASA Mission.

4.4 Periodic Evaluation of Assets

4.4.1 Evaluation of Real Property To Ensure Alignment With NASA Mission

NASA's Real Property Management Plan addresses the periodic evaluation of assets. Real Property Goal 3 states: "NASA will continually evaluate its real property assets to ensure alignment with the NASA Mission." To accomplish this goal, NASA identifies and addresses real property requirements as an integral part of strategic planning. The Agency will continually assess the mission requirements in regard to its supporting real property and will perform an analysis that correlates mission requirements with real property infrastructure approximately every 3 years. The Center Master Plans are also mission requirement driven.

Through periodic evaluations, NASA will identify real property capability gaps and determine how to fulfill the capability; identify and eliminate redundant and excess real property capabilities; and demolish or deconstruct unneeded facilities. These will be accomplished in conformance with real property policies and annual budget guidance, and use resources such as the Agency demolition/deconstruction fund.

The NASA Mission Dependency Index (MDI) methodology and procedures identify the relative importance of NASA facilities in terms of mission requirements. MDI is based on principles of Risk Management and Utility Theory. It uses Operational Risk Management (ORM) techniques of probability and severity and applies them to facilities in terms of interruptability, relocatability, replaceability, and repairability. MDI also takes into account mission "intradependencies" (those that reside within an organizational unit at a NASA Center) and mission interdependencies (those that reside between organizational units at a NASA Center). When combined with other facility management metrics, MDI can be used to support decisions related to the following:

- Project prioritization.
- Identification of divestiture opportunities.
- Space planning optimization.
- Resource management.

- Funding distributions.
- Physical security/force protection investments.

The MDI supports and is consistent with Federal Facility Asset Management principles. Condition assessment, utilization, cost, and mission dependency are the four key performance metrics identified by the Federal Real Property Council (FRPC) governance process. MDI has been recognized as a "Best Practice" by the General Services Administration in 2003, and cited by the National Academy of Sciences' National Research Council, the Federal Facilities Council, and the Association of Higher Education Facilities Officers (APPA).

In addition, as discussed in Section 2.4.2, with the establishment of the Shared Capability Assets Program and separate Headquarters programming and budgeting process, NASA will assess and prioritize its critical assets in order to make strategic investment decisions. The program will ensure that facilities and capabilities vital to NASA's success will be sustained for the customers who need them. NASA's Office of Program Assessment and Evaluation will provide advice and independent assessment of the proposed candidate capabilities.

In support of these efforts, NASA developed an asset disposition process that all potential users and customers will use to determine if an asset is needed or if it is ready for disposal (see Section 5). Based on any decision to place a facility into an inactive status and any subsequent demolition/deconstruction or disposal through transfer or sale, the Center will update the RPI database. This will enhance the accuracy of the database and ensure that FRPC guidance is followed.

4.4.2 Annual Condition Assessment Surveys of Real Property

NASA's facility condition index (FCI) is a general measure of constructed asset condition at a specific time. It is measured on a 5-point scale: "5" is a like-new constructed asset that has little or no repair requirements, and "1" is a constructed asset that should be or has been condemned. Assets with an FCI of 3 or lower are considered in poor condition. NASA performs condition assessment surveys annually of all NASA constructed assets to quantify repair or deferred maintenance (DM), needs. DM and FCI determinations are based on a parametric model that assigns a system condition index (SCI) to nine major systems in each NASA constructed asset. It is calculated as the weighted average of the systems' condition ratings. NASA also uses FCI to track constructed asset condition as a basis for major repair funding by estimating the funding required to raise the NASA average FCI to a target FCI goal. The NASA FCI and DM models are also used to calculate the Condition Index (CI), which conforms to FRPC guidance.

The NASA model was developed following an extensive review of existing practices in Government, academia, and the private sector. The 5-point scale was chosen as a simple rating measure that could be defined and quickly scored by visual inspection. It is very similar to the quick but accurate decision a professional car buyer must make at the car auction because the decision to bid is based on visual inspection without test driving or other diagnostic procedures. NASA has validated the model by direct comparison with the U.S. Army Corps of Engineers (USACE)-developed BUILDER and VFA's commercial facilities models, as well as less rigorous

comparisons with other models. The NASA model is based on many features of the USACE Parametric Cost Estimating System (PACES) model and the DoD Facility Sustainment model.

NASA tracks the financial performance of its assets using several key performance measures including the Facility Revitalization Rate (FRR), percentage of programs out of annual cycle on a dollar basis, outleasing revenue, and obligation rates. Current performance is to be compared against performance goals from public sector benchmarks, previously established performance criteria, or individual performance measure goals. NASA regularly works with the Federal Facilities Council, the National Institute of Building Sciences, the Construction Industry Institute, the National Science and Technology Council's Physical Infrastructure and Systems Security Working Group, the Association of Facility Engineers, and other groups to compare its performance and identify "best practices."

4.5 Reuse of Underutilized Property

NASA continues to encourage reuse of underutilized real property assets to the maximum extent possible. NASA has been given authority to implement Enhanced Use Leasing (EUL) at two Centers (Ames Research Center and Kennedy Space Center), which allows them to reuse their underutilized assets. NASA is pursuing expansion of EUL authority to include all Centers. Agency-wide EUL authority would allow NASA to better manage its entire real property portfolio. EUL allows NASA to outlease underutilized property, saving operations and maintenance costs and potentially bringing in additional revenue that can be used to maintain and repair existing real property assets. NASA is seeking legislative approval for comprehensive EUL authority.

NASA also seeks users of its unique assets that have been determined to be mission essential but not fully utilized. The Major Facilities Inventory (MFI) was developed for this purpose. The MFI is primarily a major research/test capabilities database. The MFI captures core technical assets that support NASA's science, research and development, engineering, and operational endeavors. The MFI information is useful for identifying these key resources and the person to contact for more information.

4.6 Operations and Maintenance Plan

NASA's goal is to improve the institutional management of the Agency's capital assets. NASA's policy includes ensuring that NASA-owned and -operated assets are properly aligned with the NASA mission and are in operating condition (except for facilities in "mothballed" status).

NASA does not prepare annual Operations and Maintenance (O&M) plans for its constructed asset process, but the Centers prepare Annual Work Plans (AWPs) for their maintenance and repair programs. The amount required to support the constructed assets for the following budget year and estimated for future years is developed during the annual PPBE process. It is a bottom-up budget process that results in O&M spending plans.

4.6.1 Maintenance

To determine annual maintenance requirements, NASA uses three "measures": The Facility Sustainment Model, a parametric model developed by the Department of Defense and adapted by NASA for its use; the 2 percent–4 percent of CRV model developed by the National Research Council; and a bottoms-up unconstrained report from the Centers. NASA compares these requirements measurement tools to the amount of funding proposed by the Centers and makes determinations regarding the annual constructed asset maintenance levels. As part of this assessment, NASA tracks the facility condition index; Section 4.7.2 describes the FCI performance measure objectives in further detail.

NASA's facilities and equipment are maintained in the most cost-effective fashion available that minimizes risk to processes and products, protects the safety and health of personnel and the environment, protects and preserves capabilities and capital investments, provides quality workplaces for NASA employees, and enables the Agency's mission.

NASA applies the reliability-centered maintenance (RCM) approach, which employs a full range of maintenance strategies varying from "run to failure" to "streamlined failure mode and effects analysis (FMEA) combined with predictive testing and inspection (PT&I)" to institutional and program facilities and related equipment. NASA's *Facilities Maintenance Management, NPR 8831*, describes the RCM philosophy, principles, requirements analysis, failure identification, program benefits, impact on facilities life cycle, and program components. (See Chapter 7: "Reliability Centered Maintenance" Section 7.9 "Other RCM Applications.")

The Centers:

(1) Use state-of-the-art management techniques that optimize maintenance activities with respect to risk management and cost. These principles are outlined in the *NASA Reliability Centered Maintenance Guide* and the *NASA Reliability Centered Building and Equipment Acceptance Guide*. Both can be found in NPR 8831, Chapter 8. The *Maintenance Guide* contains sample contract clauses that can be used for facilities planning, design, new construction, modification, equipment procurement, and maintenance and operations (M&O) contracts. The *Equipment Acceptance Guide* provides criteria based on RCM principles for equipment acceptance.

(2) Use accepted standards as guidelines to determine facilities and equipment maintenance funding requirements when detailed requirements and associated estimates are not available.

(3) Generate, track, establish trends for, and manage facilities maintenance activities by using appropriate performance metrics to enable overall maintenance program review and continuous improvement.

(4) Undertake benchmarking activities, resulting in identifying, sharing, and implementing "best practices." A partial best practices list includes NASA Construction of Facilities (CoF) best practices; construction safety best practices (as a result of Construction Industry Institute information), maintenance and sustainability best practices such as RCM and predictive testing, and inspection (PT&I), and reliability-centered building and equipment acceptance (RCB&EA)

and Leadership in Energy and Environmental Design (LEED) Existing Building (EB). Other best practices include utilization of an online real property inventory system (RPI), guide performance work statement (GPWS), continual analysis of internal functions and data for trending, use of a facility sustainment model (FSM), and continual training. A more comprehensive list is provided in Appendix B.

(5) Ensure that each Center develops and monitors the performance of an Annual Work Plan (AWP) that defines and quantifies, in terms of budget dollars and/or workforce estimates, all scheduled maintenance to be accomplished in the following fiscal year and documents all accomplishments in the current year. Annual maintenance and repair plans/proposals for institutional and program facilities and related equipment reflect the level of activity necessary to arrest annual growth of deferred maintenance, such as at the level indicated by the Facility Sustainment Model. The AWP addresses the following:

a. Preventive maintenance, programmed maintenance, repair, and replacement of obsolete items.
b. Projected deferred maintenance or backlog of maintenance and repairs.
c. Projected operating costs for central utility plants and other services such as grounds care.
d. Allocations for nonscheduled work: Trouble calls, emergency work, and nonmaintenance service requests.

(6) Account for facilities and equipment maintenance and repair expenditures in accordance with the *NASA Financial Requirements Manual*.

(7) Assess constructed asset and equipment conditions by applying the *NASA Deferred Maintenance Parametric Estimating Guide*. Scheduled and unscheduled maintenance and repair visits also are used to record condition codes of facilities and equipment for use in the Computerized Maintenance Management System. http://www.hq.nasa.gov/office/codej/codejx/Assets/Docs/DMParametricEstimatingGuideApr03.pdf . This parametric estimating model determines the level of deferred maintenance within NASA's inventory of facilities. It is based on condition assessments of nine primary facility systems and enables a repeatable, auditable, near 100-percent survey of NASA real property within a limited timeframe and budget. The model rapidly assesses the overall condition of each facility in NASA's inventory and produces a consistent, repeatable, auditable deferred maintenance estimate.

(8) Use Performance-Based Contracting (PBC) and best-value principles to the maximum extent possible to shift the appropriate degree of cost risk to contractors and maximize competitive pricing.

The AWP provides a guide for the year's activity to ensure that NASA Center and Agency priorities are followed and the maintenance program progresses in a proactive versus a reactive mode of operation. The AWP balances estimated emergency and urgent reactive maintenance with predefined RCM activities, such as programmed maintenance, PT&I, preventive maintenance, and proactive maintenance. The plan promotes the adoption of new maintenance technologies and documents the maintenance requirements for the year.

The AWP is a compilation of all maintenance and repair work to be accomplished during the year, including an estimate for unforeseen work. This compilation is the result of analyzing the total work requirements and integrating them with the budget

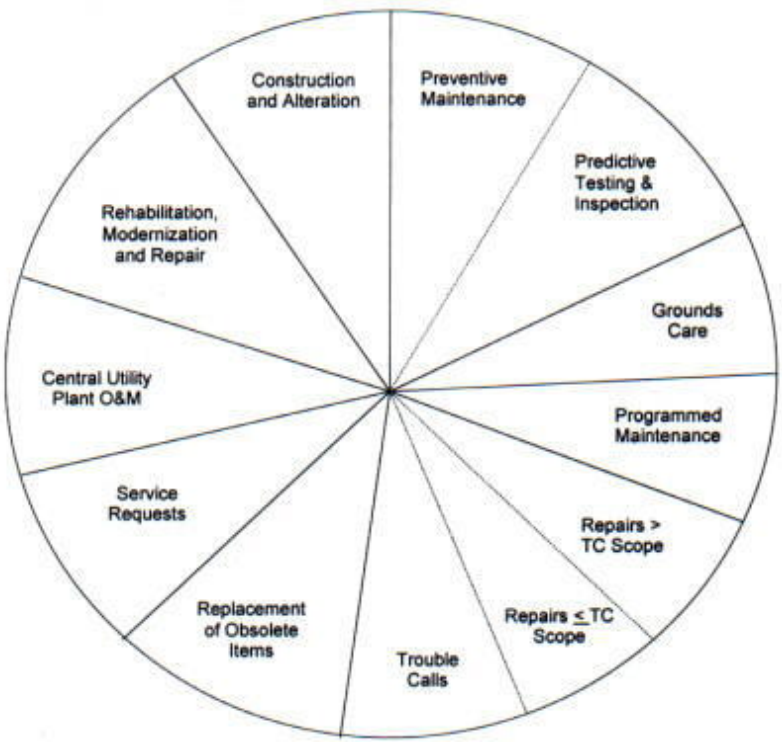


***Figure 4-2**: Elements of the Annual Work Plan*

Figure 4-2 shows the specific elements in the facilities maintenance AWP. Cumulatively, the elements define the total facilities maintenance program planned at a Center for a given year and the estimated cost in dollars and other resources (work force, materials, and equipment).

The AWP contains specific information that is obtained from the Real Property Inventory, coupled with the RCM database. This information is augmented by a variety of files and other key documents, including the Agency Strategic Plan, Center Implementation Plans, Center Master Plan, PM requirements, a continuous inspection program, historical funding data, Energy Efficiency and Water Conservation 5-Year Plan, and facilities history records.

The Computerized Maintenance Management System (CMMS) and Computer Aided Facility Management (CAFM) are electronic systems used to provide information about constructed asset and equipment maintenance histories, criticality codes, priorities, performance metrics, trouble call histories, and other unforeseen requirements on which to base a reasonable estimate of the required level of effort for each season of the year. Each Center maintains its own CMMS and CAFM systems. Procedural requirements on the use of these systems may be found in *NPR 8831.2, Facilities Maintenance Management*, Chapter 6.

4.6.2 Operations

While specific operations plans are not mandated, the Centers must determine the operations requirements during the budget process, track operations expenditures, and implement best practices for operations to the maximum extent possible. Contractors at the Centers perform most operations and maintenance activities, with most Centers awarding multiyear Center Operations Support Contracts that cover operations, maintenance, minor repairs, and other routine Center operations. NASA Center facilities personnel in conjunction with NASA procurement specialists develop the contract requirements for Center operations based on the Center business bases and operations and maintenance needs. The contracts are typically hybrids consisting of Performance-Based (PB) and Indefinite Delivery/Indefinite Quantity (IDIQ), combination fixed-price and award-fee, and are monitored closely by Center personnel.

The largest cost of operations is utilities. NASA tracks and reports its energy use and energy conservation goals continuously as required by Executive Order and law. NASA strives to lower the cost of utilities by implementing conservation practices and technology. NASA also has mandated a minimum of Silver rating under the LEED Program established by the U.S. Green Building Council. This sustainable design policy ensures that NASA's new construction and major renovations result in the most affordable, operationally efficient assets possible. NASA encourages sustainable maintenance and operations through the LEED-EB reference guide.

NASA also encourages demolition/deconstruction and closure of unneeded or inefficient assets to lower NASA's operations costs. NASA is developing a constructed asset closure plan (see Section 5).

NASA is collecting O&M costs at the constructed asset level. Once the data is collected, NASA will analyze and benchmark it against available public and private sector data. This benchmarking activity will lead NASA to potential improvements in asset operations and maintenance. NASA will collect the cost and benchmarking data annually.

4.7 Plan for Basic Repair and Alterations Needs and Capital and Operating Resource Requirements

Based on appropriations, NASA allocates its budget by first ensuring that all operating expenses are funded. These include all of the contract costs for leases and operating expenses in the O&M Plan for buildings/assets, such as cleaning, maintenance, and utilities. It also includes additional contractual obligations for purchase contracts and all overhead items like salaries, training, travel, IT, and other contracts necessary to help NASA run its business. The remaining dollars (typically on the order of $200 million) are divided between the discrete and minor projects in the Construction of Facilities Program to fund the Capital Improvement Plan.

Capital repair projects (more than $500,000) are proposed by the Centers to Headquarters each year based on their needs and budget guidelines. Projects are evaluated and prioritized at an Agency level based on the needs of the Agency, normally including the following factors:

- Mission criticality.
- Center priority.
- Mission Directorate priority.
- Safety.
- Security and health.
- Sustainability (environmental and energy factors).
- Accessibility.
- Design readiness.
- Facilities Engineering Division assessment.
- Deferred Maintenance reduction.

4.8 Operations Performance Measures and Continuous Monitoring

4.8.1 Operations Performance Measures

NASA uses performance measures to evaluate program performance and effectiveness. For example, NASA annually evaluates its progress in achieving the energy intensity reduction goals as mandated by Executive Orders and the National Energy Conservation Policy Act. Figure 4-3 shows NASA's execution with respect to the FY 2015 goal of 30 percent reduction below the FY 2003 baseline for goal-subject facilities.

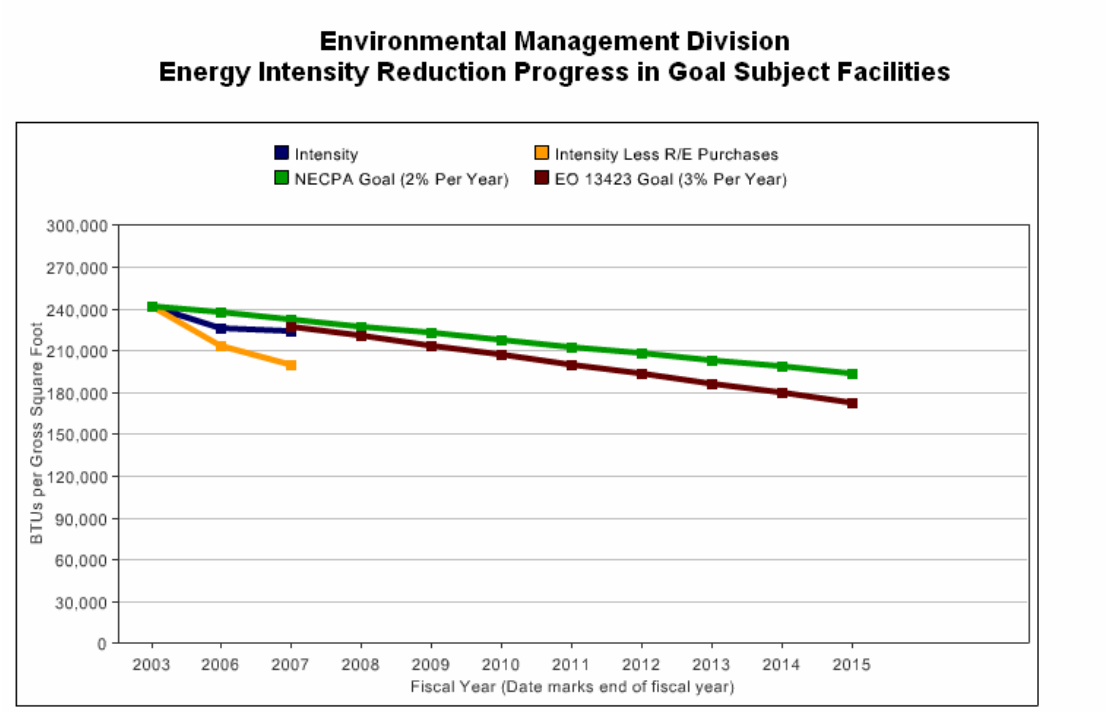


***Figure 4-3**: NASA Energy Intensity Reduction Progress*

Other examples of measures in use include the following:

- Utility consumption: As discussed above, NASA tracks utility consumption with a goal toward continual reduction in consumption and costs.
- O&M costs: NASA has tracked maintenance costs annually, but will also begin tracking operations costs. A rising trend in costs will trigger analyses of the reasons and potential implementation of cost-saving initiatives.
- Customer Satisfaction Index: This is a two-tiered rating gauging the effectiveness of the constructed asset in meeting the mission requirements and the needs of the individual building tenants. This may include ratings received by the Facilities Engineering and Real Property Division from the annual departmental survey. The ratings include red (for declining trend), yellow (for steady state), and green (for improving trend).

4.8.2 Federal Real Property Council Measures

4.8.2.1 Condition Index

NASA has adopted the FRPC definition of condition index (CI), calculated as follows:

$$CI = \left(1 - \frac{\$ \text{ repair needs}}{\$ \text{ plant replacement}}\right) \times 100$$

NASA uses its Deferred Maintenance to determine repair needs. With its current DM at about $1.77 billion and repair value of approximately $23 billion, NASA's condition index is approximately a 92 or "fair" condition. NASA is currently evaluating setting a condition index goal that will be based on NASA requirements and affordability.

4.8.2.2 Facility Utilization

Currently, NASA tracks utilization in the Real Property Inventory as described earlier. NASA also uses the Facility Utilization System (FUS) to track "equivalent use days" of its major facilities.

NASA's utilization data is based on the FRPC's latest standards. The vacancy rate derived from this calculation is tracked by asset and used as part of annual performance measures. As the FRPC further defines utilization, NASA will work to ensure consistency with the standards. NASA will initially use the categories and percentage utilization shown in Table 4-1 to determine asset utilization to the extent possible.

Category	Overutilized	Utilized	Underutilized	Not utilized
Offices[a]	>95	75–95	<75	Not applicable
Warehouses[b]	>85	50–85	10–50	<10
Hospitals[c]	>95	70–95	25–70	<25
Laboratories[d]	>85	60–85	30–60	<30
Housing[e]	Not applicable	85–100	<85	Not applicable

[a] Ratio of occupancy to current design capacity.
[b] Ratio of gross square feet occupied to current design capacity.
[c] Ratio of occupancy to current design capacity.
[d] Ratio of active units to current design capacity.
[e] Percentage of individual units occupied. It does not need to be reported at the individual housing unit level, but the manner in which NASA measures and reports it should be determined in consultation with OMB.

***Table 4-1**: FRPC Facility Utilization (Percent)*

4.8.2.3 Operating Costs

NASA is collecting operating and maintenance costs as described earlier. As the FRPC further defines O&M costs, NASA will work to ensure consistency with standards.

4.8.2.4 Mission Dependency

Mission dependency is the value an asset brings to the performance of the mission, as determined by the governing body. Consistent with the FRPC's latest standards, NASA divides assets into the following categories:

- *Mission critical:* Without the constructed asset or parcel of land, the mission is compromised.

- *Mission dependent, not critical:* Does not fit into the "mission critical" or "not mission dependent" categories.
- *Not mission dependent:* Does not affect the mission.

NASA is in the process of developing a more objective, numerical mission dependency index for all real property assets to assist in determining mission dependency.

4.8.3 Agency-Specific Measures

In addition to the four measures recommended by the FRPC, NASA has developed other measures (refer to Appendix A for details) for financial performance, asset condition and value, operating efficiency, and disposition. These measures include the following:

Financial Performance
NASA has several key performance measures designed to track financial performance. These measures include the Facility Revitalization Rate, percentage of programs out of annual cycle, outleasing revenue, and obligation rates.

Facility Condition Index
NASA's facility condition index (FCI) is a general measure of constructed asset condition at a specific point in time. It is measure on a 5-point scale: "5" is a like-new constructed asset that has little or no repair requirements, and "1" is a constructed asset that should be or has been condemned. FCI is a parametric model that assigns a system condition index (SCI) to nine major systems in each NASA constructed asset. It is calculated as the weighted average of the systems' condition ratings. NASA also uses FCI to track constructed asset condition as a basis for major repair funding by estimating the funding required to raise the NASA average FCI to a target FCI goal. NASA's overall average FCI is currently at 3.7 with a goal of 4.0.

Facility Sustainment Model
NASA senior managers traditionally asked what would be the annual cost to perform maintenance on facilities from actual requirements or from zero-based methods. Because of the cost of manpower and time required, NASA facilities engineering and real property staff were unable to perform this detailed cost analysis. Therefore, NASA used the National Research Council recommendation to spend 2 percent to 4 percent of the current replacement value (CRV) on facility maintenance each year—the benchmark for Federal facilities maintenance. Over the last few years, DoD has developed the Facility Sustainment Model (FSM), a parametric estimating tool for forecasting annual maintenance funding requirements for its facilities, and NASA now uses this model.

NASA uses FSM to determine its minimum constructed asset maintenance requirements. The model considers the type and size of facilities managed and draws upon a large database of facilities sustainment costs. NASA compares maintenance funding to the FSM to determine "facility sustainment rate."

Maintenance Measures

NASA collects numerous measures tracking the performance of the Center maintenance programs. Several are listed below:

- Size of real property inventory: NASA annually reviews the value and size (number of assets, square footage) of assets to track the progress of programs such as the demolition/deconstruction program and conformance to this plan. A rise in this measure would indicate that new acquisition is outpacing disposals and may be placing additional burden on NASA infrastructure.
- Percentage of assets underutilized (of the entire portfolio): The goal is to increase utilization through consolidation, use of existing assets for new requirements, outleasing, and disposal of unneeded assets.
- Sustainment rate (sustainment funding divided by FSM and sustainment funding divided by CRV): NASA is working to increase the sustainment rate by increasing available funding for maintenance and repair, as well as reducing requirements by reducing the overall inventory.
- Demolition/deconstruction execution and outstanding requirements (number and size of assets demolished or awaiting demolition/deconstruction): NASA is tracking its central demolition/deconstruction program to determine progress toward disposing of aged, deteriorated, unneeded assets, which in turn reduces the requirements for maintenance and operations funding.
- New construction-to-renovation ratio: As stated in this AMP, new construction is the last option. This measure indicates NASA conformance to the plan by measuring the renovation and reuse of assets versus new construction. The goal is to maintain a low ratio. It is measured primarily in number of construction projects versus number of renovation projects.
- New construction-to-disposal ratio: Similar to the above measures, this ratio can indicate the success of implementing the goals of this AMP to reduce real property size.
- Percentage of Real Property Business Plan (RPBP) initiatives implemented: This is a measure of the success of taking advantages of the real property opportunities identified by the RPBP, which is incorporated as part of this plan.
- Percentage of new construction or major renovation projects that meet LEED silver status: Compliance with sustainable design concepts is important to NASA, as such compliance has been shown by industry to lead to long-term life cycle cost savings. NASA policy dictates the achievement of LEED Silver certification for all new construction and major renovation projects. This measure tracks the success of NASA in meeting this policy. Additional measures will be established to measure the long-term benefits of sustainable design.

4.9 Operations Initiatives

NASA is in the early stages of collecting operations and maintenance costs. As NASA collects and benchmarks O&M over the next few years, improvement initiatives will be developed as necessary and operating efficiency will be tracked. NASA has the following initiatives in place now:

- Sustainability: NASA has mandated a LEED Silver rating for all new construction and major renovations to increase maintainability, energy efficiency, and employee productivity, and to reduce other costs such as water consumption. NASA is developing guidelines to use sustainable maintenance and operation practices in existing buildings.
- Energy Conservation: In addition to CoF projects, NASA is actively employing alternative financing mechanisms, such as use of Energy Performance Savings Contracts and Utility Energy-Efficiency Service Contracts, to reduce energy consumption and demand.
- Reliability Centered Maintenance: As described above, RCM reduces the cost of standard maintenance and repair.
- Performance-Based Contracting: NASA encourages the use of performance-based contracts to improve operations and maintenance performance by contractors.

Section 5. Disposal of Unneeded Real Property

5.1 Tools to Support Decision-Making

When an asset is determined to no longer meet the customer/mission needs, often through the decision processes outlined in Section 2.4.2 and Figure 2-7, NASA pursues redeployment, demolition/deconstruction or replacement of the asset. NASA evaluates the asset considering the following factors:

- Current and long-range customer mission needs.
- Uniqueness—is the asset "one of a kind".
- Value (cost to replace).
- Cost to maintain (life-cycle analysis) and cost to reestablish function.
- Condition of the asset.
- Community considerations and local planning objectives.
- Stewardship issues, such as historic preservation, environmental impact, and national location policy (e.g., Executive Orders 12072 and 13006).
- Available alternative solutions.

NASA uses the above factors along with other analysis and programmatic considerations to make final determinations about retention or disposal of a particular asset. Asset disposition is normally accomplished through the Planning, Programming, Budgeting & Execution (PPBE) process, discussed in Section 3.1. Figure 5-1 depicts NASA's process as it is conducted as part of the PPBE process.

While appearing complex, the process shown in Figure 5-1 includes some basic decision points:

1. A program or Center determines an asset is no longer needed.
2. The asset is "marketed" to other NASA programs through the Mission Directorates.
3. Assets with no identified NASA need are evaluated and marketed for potential outleasing or use by others. The Centers and Mission Directorates normally do this. (See Section 4.4 for discussion of Enhanced Use Leasing.)
4. Assets with no current use are evaluated as to their NASA or national strategic value by the Mission Directorates, the Shared Capability Assets Office, and the Office of Program Analysis and Evaluation (PA&E) using the factors listed above. Assets with strategic value are those that have no current tenant or use but which may be needed for future NASA or national programs.
5. Unneeded assets with strategic value are maintained until needed, funded by the Center or by the Shared Capability Assets Account as determined by the Shared Capability Assets Office and PA&E, and approved by the Operations Management Council and the Strategic Management Council as applicable.

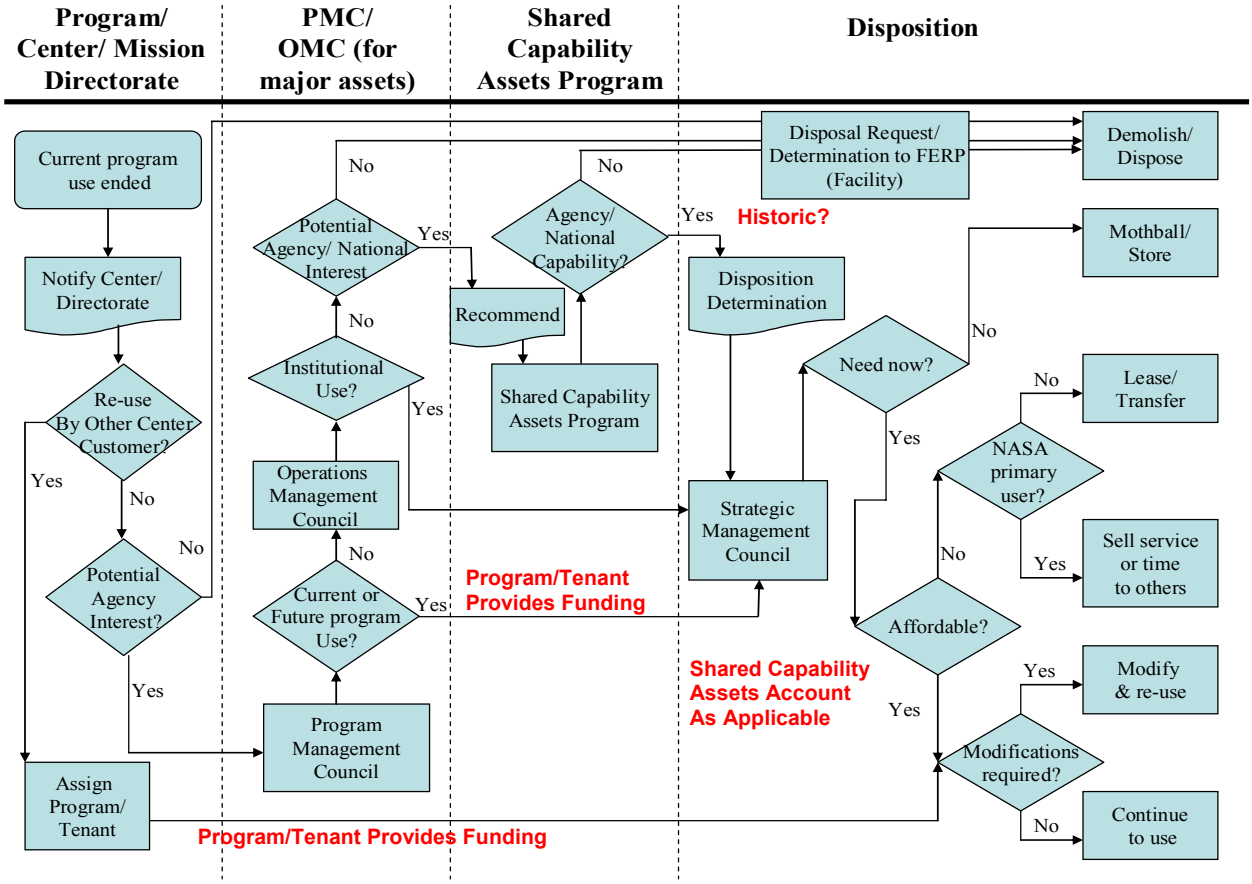


***Figure 5-1**: Asset Disposition Process*

6. Unneeded assets with no strategic value are evaluated for disposal through sale or demolition/deconstruction.

Centers, the Program Management Council, the Shared Capability Assets Program Office, the Operations Management Council, and the Strategic Management Council are all involved in the disposition process, supported by the Facilities Engineering and Real Property Division.

Once NASA decides to report property as excess to the needs of the Government, NASA follows the procedures and requirements of *NPR 8800.15, Real Estate Management Program Implementation Manual*. This document identifies the prerequisites for disposal, exclusions, procedures, environmental and safety considerations, and applicable legal references. NASA continues to encourage reuse and disposal of real property assets to the maximum extent possible. NASA also continues to take advantage of opportunities to consolidate, vacate, and otherwise reduce the need for real property, and to pursue innovative disposal actions.

5.2 Disposal Process

NASA does not have direct authority to dispose of its excess real estate assets and, therefore, must comply with the applicable provisions of the Federal Property and Administrative Services Act of 1949, as amended, 40 U.S.C. 471 et seq. This act established the General Services Administration as the agency responsible for the disposal of Federal assets and the sole authority to institute regulations for such actions. These regulations, Federal Property Management Regulations (FPMR) FPMR 101–47, titled, "Utilization and Disposal of Real Property," detail the procedures and forms required by a Federal agency requesting the disposition of Federal real estate.

Specifically to NASA, prior to disposition of real property by NASA Centers, the following criteria must be met:

- Real property must be in excess to the needs of the holding Center.
- Real property must have been screened for possible use by other NASA Centers and determined to be not needed.
- Real property must have been screened for historic significance, coordination with the SHPO completed, and mitigation measures completed as required.
- Real property must have a recorded capitalized value not in excess of $50,000.
- Disposal action proposed must have been reviewed for legal sufficiency and concurred with by the Center's Chief Counsel Office.

Excess real property having a recorded capitalized value more than $50,000 is submitted to Headquarters for review and approval by the Director, Facilities Engineering and Real Property Division.

In addition to the above criteria, NASA evaluates the environmental and safety impacts associated with asset disposition. Coordination with the Center Environmental Office in accordance with *NPR 8800.15, Real Estate Management Program Implementation Manual*, is required to ensure that all environmental requirements, particularly the closure requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Resource Conservation and Recovery Act (RCRA), are addressed. Environmental documentation, at a minimum, includes the following:

- *Environmental Baseline Survey* that reviews the operational history of the real property to identify potential environmental issues including, but not limited to, hazardous substance activities, equipment containing polychlorinated biphenyls, asbestos-containing materials, underground storage tank systems, wetlands, and floodplains.
- *National Environmental Policy Act* documentation to assess potential environmental impacts of the action in accordance with *NPR 8580.1, Implementing the National Environmental Policy Act and Executive Order 12114*. An Environmental Assessment or Environmental Impact Statement may be required.

The Center Safety and Mission Assurance (SMA) Office ensures that all safety hazards and issues have been identified and addressed to comply with NASA standards, procedures, and guidelines. Safety documentation includes a Safety Baseline Survey that provides the operational safety history of the real property, which identifies the potential safety hazards and concerns as related, but not limited to, constructed asset safety, fire protection, confined space entry, nuclear safety, radiation protection, explosives, and pressurized systems.

5.3 Disposal Performance Measures and Continuous Monitoring

5.3.1 Federal Real Property Council Disposal Measures

NASA currently utilizes a disposal algorithm to indicate which of its facilities is no longer needed and may be submitted for disposal/demolition The disposition algorithm analyzes Condition Index, utilization, annual operations and maintenance costs, and Mission Dependency in order to focus attention on those assets requiring disposal, additional funding, or other action (see Figure 2-6). While not a true "measure," this algorithm will help NASA focus its attention on those facilities that are eligible for disposal or outleasing.

5.3.2 Agency-Specific Measures

Amount of Owned Assets: NASA tracks the amount of real property it owns and leases through number of assets, value of assets, and square footage. In general, the goal is to achieve a decreasing trend.

Demolition/Deconstruction/Disposal Effectiveness: NASA will track the effectiveness of its demolition/deconstruction and disposal programs by tracking decreasing operations and maintenance costs, decreasing repair backlogs, and increasing condition index that can be directly attributable to reduction of aged, deteriorated, and unneeded assets.

Also see Appendix A for performance measures and Section 4.8.3 for other measures that can apply to disposal.

5.4 Disposal Initiatives

NASA is striving to improve and expedite disposal of unneeded assets. To accomplish this, NASA has five specific initiatives underway. The initiatives include: Establishing a central demolition/deconstruction fund, developing and implementing the Real Property Business Plan, implementing Enhanced Use Leasing (EUL), and creating real estate business support.

Central Demolition/Deconstruction Fund
The central demolition/deconstruction fund is managed by NASA Headquarters Facilities Engineering and Real Property Division for purely demolition/deconstruction projects; it is designed to encourage the Centers to remove excess real property. Demolition/deconstruction projects are submitted to FERP for review and priority evaluation. Projects with low payback periods and high rates of return earn the highest consideration for support from this fund. The fund is currently funded at $15 million per year through FY 2011.

Real Property Business Plan (RPBP)
The RPBP provides several opportunities to consolidate functions and reuse vacated facilities; they also may be demolished, outleased, or sold. These opportunities are the responsibility of the Centers to implement and are centrally tracked.

Enhanced Use Leasing
EUL allows NASA to outlease underutilized property, saving operations and maintenance costs and potentially bringing in additional revenue that can be used to maintain and repair existing real property assets.

Real Estate Business Support
NASA provides real estate business support within the Headquarters Facilities Engineering and Real Property Division. FERP uses in-house and contracted expertise to provide assistance to Centers in implementing the Real Property Business Plan opportunities, and develops innovative real property initiatives, such as public-private ventures.

Appendix A. NASA Real Property Asset Management Metrics

Metric number	Description of metric or measure	Definitions	Metric targets
Key FRPC Portfolio Metrics			
1	Condition Index (CI)	A general measure of constructed asset condition at a specific point in time. CI is calculated as the ratio of repair needs to plant replacement value (PRV). The CI will be reported as a "percent condition" on a scale of 0% to 100%, and will be calculated as (1 - $repair needs / $PRV) x 100. "Repair needs" is the amount necessary to ensure that a constructed asset is restored to a condition substantially equivalent to the originally intended and designed capacity, efficiency, or capability. Agencies/Departments will initially determine repair needs based on existing processes, with a future goal to further refine and standardize the definition. PRV is the cost of replacing an existing asset at today's standards.	95%
2	Facility Utilization Index (FUI)	Percent utilization of a facility measured on a scale of 0–100%	TBD
3	Annual Facility Operating and Maintenance Costs	1. Recurring maintenance and repair costs; 2. Utilities (includes plant operation and purchase of energy); 3. Cleaning and/or janitorial costs (includes pest control, refuse collection and disposal to include recycling operations); and 4. Roads/grounds expenses (includes grounds maintenance, landscaping, and snow and ice removal from roads, piers, and airfields).	Downward Trend
4	Mission Dependency Index (MDI)	Three-category rating (mission critical, mission dependent not critical, and not mission dependent) that provides the asset's relative importance to a mission. MDI is a systematic process for identifying the dependency of a mission on facilities in terms of interruptability, relocateability, and replaceability. MDIs are applied at the building level or asset level, and the resulting index is a driver for prioritizing projects.	Reduction of number of Non-mission Dependent Assets
5	FCI	A general measure of constructed asset condition at a specific point in time. Condition assessment surveys are performed annually to quantify the repair needs of the Agency. These needs are then compared to the Current Replacement Value of the facilities that are calculated annually. Assets with a FCI of 3 or lower are considered to be in poor condition. D10	4.0 Target revised. See 3 Year Rolling Plan
6	DELETED*		
7	DELETED*		
8	DELETED*		
9	DELETED*		
10	DELETED*		
11	Construction Performance – Design (KPI design)	Total designs completed / total designs authorized	0.90 to 1.00
12	Construction Performance – Budget	KPI cost/budget = (Final construction cost / cost at award – 1	Less than 0.05

Metric number	Description of metric or measure	Definitions	Metric targets
13	Construction Performance – Schedule	KPI schedule = Final duration / approved duration	Less than 0.15
14	Construction Performance - Contract awards	KPI contract awards=Total contracts awarded / total contracts approved	0.90 to 1.00
15	Construction Performance – Obligation	KPI obligation = Total $ contracts obligated/total $ available of contracts	Greater than 0.80
16	Construction Performance – Safety	KPI safety = Total number of LWCIR	Less than 1
17	Construction Performance – Sustainability	KPI sustainability = # LEED registered / total number of applicable projects	Greater than 0.50
18	Construction Performance - Customer Satisfaction Index (quality - assumed)	KPI customer satisfaction = Average normalized user satisfaction index	Greater than 4 on 5 point scale
19	Total PRV (adjusted for inflation)	Total Plant Replacement Value (PRV) - A multiple of facility quantity, CCF unit costs, area cost factors, and a factor for SIOH and design costs. Includes adjustment for inflation. This value is calculated from RPI and DM data. in order to report item #1 Condition Index.. It is not used internally within NASA	NA
20	Customer Satisfaction Index	2 Two-tiered rating gauging a) the effectiveness of the facility in meeting: (a) the mission requirement and (b) needs of the individual building tenants. This may include ratings received by the Division division from the annual departmental survey. Ratings: Red=declining trend, Yellow=steady state, Green=improving trend.	This is in the process of development. Target is 100% satisfaction.
21	DELETED*		
22	Demolition volume	Number of facilities actually demolished	Upward Trend
23	DELETED*		
24	DELETED*		
25	DELETED*		
26	DELETED*		
27	DELETED*		
28	DELETED*		
29	Deferred Maintenance (DM)	Deferred maintenance - NASA's replacement for the standard BMAR measurement. Calculated using a parametric model based on agency Agency-wide inspection. Currently conducted on an annual basis but may change in the future. Is It is used to track the backlogs of NASA repair.	Downward Trend
30	DELETED*		
31	Facility Sustainment Model (FSM)	NASA uses this DoD model to determine minimum NASA wide facility maintenance requirements. The model is modified to fit NASA. NASA maintenance funding percentage of FSM requirement. Ratings: Red=below 90%; Yellow=90-–95%, Green=above 95%.	NA
32	Facility Mishap Rates	Number of mishaps related to facility problems. Reported by Centers.	Zero
33	Facility Maintenance Effectiveness Measures	Scheduled Maintenance $ / Total Maintenance $	Upward Trend
34	Facility Maintenance Effectiveness Measures	Breakdown Repair $ / Total Maintenance $	Downward Trend

Metric number	Description of metric or measure	Definitions	Metric targets
35	DELETED*		
36	Facility Maintenance Effectiveness Measures	Deferred Maintenance / CRV	Downward Trend
37	Facility Maintenance Effectiveness Measures	Maintenance & Repair $ / CRV	Upward Trend
38	Facility Security Requirements	Number of Center-identified security requirements corrected / number of security projects identified. (Source: CoF Self Assessment)	100%
39	Facility Safety Requirements	Number of Center-identified safety requirements corrected / number of safety projects identified	100%
40	Facility Accessibility Requirements	Number of Center-identified accessibility requirements corrected / number of accessibility projects identified	100%
41	Facility Age or Remaining Life	Reduce the average age of NASA facilities through demolition and repair by replacement. Measure: NASA facility age averaged Agency-wide. Ratings: Red= over 67 years; Yellow=50-–67 years; Green=under 50 years. Note: Ratings assume adequate maintenance has been done. Remaining life is a better measure that is planned for development for NASA real property.	Downward Trend for Age

Appendix B. NASA Benchmarking and Best Practices

B.1 Benchmarking

The sources listed in this appendix demonstrate the large inventory of benchmark activities used by NASA staff to monitor performance and introduce new best practices. NASA is also very active in professional organizations (see below for a partial list of partners as well as http://www.hq.nasa.gov/office/codej/codejx for more information).

- FY04 NASA-wide Facilities Condition Assessment and Deferred Maintenance Estimate, January 2005
- FY04 Facilities Condition and Deferred Maintenance Report: Significant Observations, Lessons Learned, and Suggestions for Future Improvements, October 2004
- FY04 Facilities Condition and Deferred Maintenance Report: Real Property Inventory Quality Assurance Report, October 2004
- Reliability & Safety of Aged Electrical & Dynamic Equipment, October 2004
- Deferred Maintenance Assessment of the National Naval Medical Center, September 2004
- Comparison Between FY90 Facilities Condition Survey and the FY02 Deferred Maintenance Condition Assessment, August 2004
- Reliability-Centered Building and Equipment Acceptance Guide, July 2004
- FY06 Agency-wide Facilities Sustainment Model, July 2004
- Deferred Maintenance Limits Study, June 2004
- Failure Modes and Effects Analysis and Reliability-Centered Maintenance Evaluations, 2003
- FY03 NASA-wide Facilities Condition Assessment and Deferred Maintenance Estimate, October 2003
- FY03 NASA-wide Facilities Condition Assessment and Deferred Maintenance Estimate: Real Property Inventory Anomalies Report, October 2003
- FY03 NASA-wide Facilities Condition Assessment and Deferred Maintenance Estimate: Lessons Learned Report, October 2003
- NASA Facility Sustainment Model Category Review, October 2003
- Facilities Managers Guide to Cutting Edge Management Techniques, June 2003
- Deferred Maintenance Costs versus Facility Condition Indexes, May 2003
- The NASA Deferred Maintenance Parametric Estimating Guide, April 2003

- Report on the FY02 NASA-wide Standardized Deferred Maintenance Assessment, March 2003
- General Accounting Office – Executive Guide: Leading Practices in Capital Decision-Making (GAO/AIMD-99-32)
- The National Academies – Federal Facilities Council publications:
  - Starting Smart: Key Practices for Developing Scopes of Work for Facility Projects
  - Learning From Our Buildings: A State-of-the-Practice Summary of Post-Occupancy Evaluation (2001). FFC Technical Report #145.
  - Capital Asset Management: Tools and Strategies for Decision Making, Conference Proceedings (2001). FFC Technical Report #143.
  - Sustainable Federal Facilities: A Guide to Integrating Value Engineering, Life-Cycle Costing, and Sustainable Development (2001). FFC Technical Report #142.
  - Deferred Maintenance Reporting for Federal Facilities: Meeting the Requirements of Federal Accounting Standards Advisory Board Standard Number 6, As Amended. (2001). FFC Technical Report #141.
  - Adding Value to the Facility Acquisition Process: Best Practices for Reviewing Facility Designs (2000). FFC Technical Report #139.
  - Contracts and Agreements for the Repair and Alteration of Federal Facilities (1998) FFC Technical Report #137 (out of print)
  - Stewardship of Federal Facilities: A Proactive Strategy for Managing the Nation's Public Assets (1998). NRC Committee to Assess Techniques for Developing Maintenance and Repair Budgets.
  - Budgeting for Facilities Maintenance and Repair Activities (1996). FFC Technical Report #131.
  - The Use of Partnering in the Facilities Design Process, Summary of a Symposium (1994). FFC Technical Report #126.
- Memberships and participation in leading organizations for real property management, the construction industry, and maintenance and engineering
  - Real Estate Executive Board
  - Construction Industry Institute
  - FIATECH
  - Federal Facilities Council Research Advisory Board
  - Society for Machinery Failure Prevention Technology
  - Society of American Military Engineers
  - National Institute of Building Sciences
  - Building Commissioning Association
  - Association for Facilities Engineering

- Association of Physical Plant Administrators
- U.S. Green Building Council
- National Science and Technology Council
- Society for Maintenance and Reliability Professionals

B.2 Best Practices

- NASA Construction of Facilities (CoF) Best Practices

These are procedures used to detect issues and avoid problems in the acquisition, management, and administration of design and construction contracts. Best practices are practical techniques gained from professional experience that may be used to improve the acquisition process and the end product, include the following:

- Preproject planning, which includes defining the project requirements and utilizing a Project Definition Requirements Index (PDRI) during three broad stages of design, with project planning being the first.
- Site investigation and schematic design (20 percent), including cost estimates prior to NASA's budget submission to OMB.
- Life cycle cost analysis concepts for selection of project systems, equipment, materials, and methods. A formal economic analysis must be prepared for all major (discrete) projects costing $5 million or more, as directed by OMB Circular NO. A-94.
- Value engineering studies and review during the design phase (life-cycle cost rather than the initial cost).
- Constructability reviews of concepts, principles, and details through all phases of constructed asset project development and design.
- Partnering (including teaming and alignment) to promote relationships among project stakeholders.
- Sustainability, which includes the following:

  Sustainable design

  Maintainable design (reliability centered building and equipment acceptance, or RCB&EA)

  Total building commissioning

  Safety and security

  U.S. Green Building Council; a leadership in energy and environmental design (LEED) Silver rating is required.

- Construction safety (ongoing), which includes developing safety metrics and best practices following the features found in three studies by the Construction Industry Institute:

  Design for Safety (Research 101)

  Safety Plus: Making Zero Accidents A Reality (Research 160)

  The Owner's Involvement in Safety (Research 190) (Preliminary release).

- NASA Maintenance Best Practices
  - *Reliability centered maintenance (RCM)*. The RCM philosophy employs preventive maintenance (PM), predictive testing and inspection (PT&I), repair (or reactive maintenance), and proactive maintenance techniques in an integrated manner to increase the probability that a machine or component will function in the required manner over its design life cycle. NASA has adopted a streamlined approach to the traditional, or rigorous, RCM process practiced in some industries. It adopted this approach because of the high analysis cost of the rigorous approach, the relative low impact of failure of most facilities systems, the type of systems and components maintained, and the number of redundant systems in place. Underlying NASA's RCM approach is the concept that maintenance actions should result in real benefits in terms of improved safety, required operational capability, and reduced life-cycle cost. It recognizes that unnecessary maintenance is counterproductive and costly and can lead to increased chance of failure.
  - *Predictive maintenance technologies, or predictive testing and inspection*. This practice calls for performing intrusive maintenance work only when necessary and correcting incipient failures before their unplanned occurrence, using airborne ultrasonics, thermography, vibration analysis, oil analysis, and various types of sophisticated electrical testing.
  - *Commercial computerized maintenance management software (CMMS)*. Used for maintenance management.
  - *Reliability centered building and equipment acceptance (RCB&EA)*. Uses modern predictive testing techniques to identify and correct latent defects in new construction and major repairs.
  - *Condition assessment system*. A system for tracking property condition.
  - *Facilities maintenance planning*. Starts at the master planning level to develop plans for maintaining facilities.
  - *Constructed asset maintenance standards*. Sets standards and actions to achieve them, including documents such as the standardized *Facilities Preventive Maintenance Work Task Guide*.
  - *Annual work plan*. Centers use templates developed by the Computerized Maintenance Management Systems with Center input and review to plan annual work.

- *Real property inventory system (RPI)*. An online feature that allows NASA to track its real property inventory.
- *Industry and government coordination*. Uses national venues—such as the National Research Council's Federal Facilities Council—to stay abreast of property management issues and innovations. NASA coordinates with numerous other organizations including the International Facility Management Association (IFMA), National Institute of Building Sciences (NIBS), Association for Facilities Engineering (AFE), Society for Machinery Failure Prevention Technology (MFPT), Society for Maintenance & Reliability Professionals (SMRP), Society of American Military Engineers (SAME), Federal Facilities Council (FFC), Association of Higher Education Facilities Officers, Real Estate Executive Board, National Institute of Standards and Technology (NIST), U.S. Green Building Council (USGBC), and Infrastructure Security Partnership (TISP).
- *Performance-based contracting (PBC) and best-value principles*. Ensure NASA gets the best performance at the lowest cost.
- *Guide performance work statement (GPWS)*. Supports developing comprehensive or reduced Center operations support services (COSS) performance-based specifications.
- *Quality assurance* (QA). Focuses on best QA practices of private industry and other Federal organizations.
- *Continual analysis of internal functions and data*. Develops trends and associated improvement reports, such as:
  - NASA Deferred Maintenance Report, which describes NASA's Mission Directorate, Center, and individual facility condition index (FCI) and deferred maintenance (DM) repair needs by major constructed asset system; facilities condition goals, using analytical methods; estimates of required capital investments to achieve various levels of facilities conditions; significant observations; lessons learned; suggestions for future improvements; and quality assurance of the NASA real property inventory system data.
  - Facility sustainment model (FSM). A parametric estimating tool, adopted from DoD to estimate zero-based annual sustainment requirements.
  - Annual functional performance metrics.
- Contract incentives (per NASA Plexus Report for best practices).
- *Training.* Facilities Engineering and Real Property Division supports and offers training to NASA employees for a number of areas including:
  - Managing construction of facilities
  - Reliability-Centered Building and Equipment Acceptance Criteria
  - Reliability-Centered Maintenance and Predictive Testing and Inspection Technologies
  - Construction of facilities best practice – sustainable design

- Computer-aided design/geographic information systems
- Real property management
- ECONPAK – Life cycle cost analysis training