IG-97-017

AUDIT REPORT

CONSTRUCTION OF FACILITIES PROJECTS

March 20, 1997

National Aeronautics and Space Administration

OFFICE OF INSPECTOR GENERAL

ADDITIONAL COPIES

To obtain additional copies of this audit report, contact the Acting Assistant Inspector General for Auditing at 202-358-1232

SUGGESTIONS FOR FUTURE AUDITS

To suggest ideas for or to request future audits, contact the Acting Assistant Inspector General for Auditing. Ideas and requests can also be mailed to:

Acting Assistant Inspector General for Auditing
NASA Headquarters
Code W
300 E St , SW
Washington, DC 20546

NASA HOTLINE

To report fraud, waste, abuse, or mismanagement, contact the NASA OIG Hotline by calling 1-800-424-9183, 1-800-535-8134 (TDD), or by writing the NASA Inspector General, P.O. Box 23089, L'Enfant Plaza Station, Washington, DC 20026. The identity of each writer and caller can be kept confidential upon request to the extent permitted by law

National Aeronautics and
Space Administration
Headquarters
Washington, DC 20546-0001

MAR 20 1997

Reply to Attn of: W

TO: J/Associate Administrator for Management Systems & Facilities

FROM: W/Acting Assistant Inspector General for Auditing

SUBJECT: Final Survey Report
Construction of Facilities Projects
Assignment Number A-KE-96-007
Report Number IG-97-017

Enclosed is the final survey report on the fiscal year 1997 Construction of Facilities (CoF) Projects. The survey did not disclose anything which would indicate that the CoF projects reviewed were not justified. As part of the survey, we also examined the effectiveness of the ongoing facility investment study (Study). We concluded that the Study approach should be incorporated into the NASA directive and handbook to enhance facility assessments by linking facility deficiencies to mission criticality and risk. The enclosed report concludes our efforts under this assignment.

We received and evaluated your February 24, 1997, response to the discussion draft report. Your planned actions are responsive to the recommendation, and it is considered closed for reporting purposes. Your response is shown after the report recommendation and included in its entirety as Appendix 2.

We appreciate the cooperation and assistance extended us by NASA officials at Headquarters and the Centers. If you have any questions or need additional information, please contact Lorne Dear, Program Director, Infrastructure and Support, at 818-354-3360; or Daniel J. Samoviski, Acting Director, Audit Division-A, or me at 202-358-1232.

Robert J. Wesolowski

Robert J. Wesolowski

Enclosure

cc:
DFRC/S. Meske
KSC/HM-CIC/J. Nary
MSFC/BE01/D. Walker
SSC/EA00/T. Franklin

INTRODUCTION

Construction of Facilities

A construction of facilities (CoF) project can span several years from initial planning to final completion. During this lengthy process, changes in NASA's structure and program responsibility can occur. As a result of such changes, some CoF projects may no longer be necessary. For fiscal year (FY) 1997, NASA planned 124 CoF projects valued at $163 million. The projects included new construction or rehabilitation, modification, or repair to existing facilities.

Facility Investment Study

In May 1996, the NASA Office of Management Systems & Facilities, Facilities Engineering Division (Code JX), initiated an agency-wide facility investment study (Study). The goal of the Study was to determine a level of capital investment necessary to ensure a reliable NASA infrastructure by linking facility conditions to mission criticality and risk. Code JX planned to complete the Study by March 1997.

Existing NASA Requirements

Policy and procedures for facility maintenance are covered in a NASA directive and handbook. Specifically, NASA Policy Directive 8400.1, *Management of Facilities Maintenance*, requires that Centers continuously assess facility conditions. Further, NASA Handbook 8831.2A, *Facilities Maintenance and Energy Management Handbook* (Handbook), provides guidance on performing facility condition assessments and estimating corrective costs.

OBJECTIVE, SCOPE, AND METHODOLOGY

OBJECTIVE

The original objective of the survey was to determine whether planned rehabilitation, modification, repair, and new construction projects for FYs 1997 through 2001 were justified and necessary.

Based on a discussion with NASA officials regarding the ongoing Study, we expanded our objective to include evaluating the effectiveness of the facility investment study.

SCOPE AND METHODOLOGY

We limited our review to FY 1997 CoF projects only. Projects for FYs 1998 through 2001 were either not well defined or not yet identified. As such, the projects in the outyears were subject to revision based on ongoing changes in NASA's structure.

For the FY 1997 projects, we reviewed 34 of the 42 projects submitted and approved at five locations (see Appendix 1). The locations were: Dryden Flight Research Center, California (Dryden); Kennedy Space Center, Florida (Kennedy); Marshall Space Flight Center, Alabama (Marshall); Michoud Assembly Facility, Louisiana (Michoud); and Stennis Space Center, Mississippi (Stennis). We excluded the eight projects involving compliance with environmental, safety, and disability access requirements.

Our survey methodology included:

- Reviewing applicable NASA directives and studies.
- Reviewing files to obtain project description, justification, and alternatives considered.
- Interviewing key personnel regarding the CoF projects and the Study.
- Evaluating the Study input prepared by Dryden, Kennedy, and Marshall.

SURVEY FIELD WORK

We conducted the survey from June to November 1996 in accordance with generally accepted government auditing standards.

OBSERVATION AND RECOMMENDATION

OVERALL EVALUATION

All FY 1997 CoF projects reviewed were adequately justified and necessary. In addition, our review showed that the facility investment study was effective in linking facility conditions to mission criticality and risk. We believe that the Study approach should be incorporated into the existing NASA directive and handbook to enhance facility assessments.

STUDY PARALLELED AND ADDED TO EXISTING FACILITY MAINTENANCE REQUIREMENTS

The Study and the existing NASA requirements, while similar in purpose, differed in their approach of obtaining quantitative data on facility conditions. We believe both approaches could be combined, resulting in more enhanced facility assessments.

Existing NASA requirements call for scheduled inspections of the facilities. These inspections encompass different facility components such as air conditioning, electrical, mechanical, and utility systems. At completion, the inspector estimates revitalization costs which are used to prepare Center maintenance and CoF budget requests.

To obtain quantitative data on facility conditions, the Study required Centers to complete these five steps:

1. Link each major facility to mission criticality
2. Assess facility deficiencies
3. Calculate the revitalization costs to bring the facility to a "good" condition
4. Assess the risk of deficiencies upon missions
5. Perform cost/benefit tradeoffs of investment needs against mission risk

Steps two and three of the Study paralleled the existing NASA requirements to assess facility conditions and estimate corrective costs. In fact, Dryden, Kennedy, and Marshall used their existing facility condition assessments and estimated corrective costs data in preparing their Study input.

The Study, however, went beyond the existing NASA requirements by requiring data on (1) mission criticality, (2) risk to missions, and (3) cost/benefit tradeoffs. Each Center had to characterize its major facilities as *mission direct, mission support, or center support.* The Centers also assigned a *high, moderate, or low* risk of

failure to each facility, depending upon the facility condition. The amount of dollars necessary to bring the various facilities to "good" condition were then summarized by category. The following submission from Kennedy shows how such data was reported:

FACILITY INVESTMENT NEEDS ($ X 1000)			
Mission Risk	Mission Direct Facility	Mission Support Facility	Center Support Facility
High	27,450	9,562	6,898
Moderate	87,432	8,679	23,725
Low	14,343	976	6,076

Information similar to that shown above, from each Center, will allow Code JX to perform cost/benefit tradeoffs of investment needs against mission risk NASA-wide. Code JX will be able to recommend the appropriate funding allocation among all Centers. For example, mission direct facilities with high risks of failure at all Centers may get funding priority over any center support facility with lower risk.

The link of facility deficiency to mission criticality and mission risk does not exist in the current NASA directive and handbook. In our opinion, such linkage is an effective tool for prioritizing CoF budget requests and allocating funding. To enhance future efforts, Code JX should incorporate the linkage factors of the Study into existing NASA requirements.

RECOMMENDATION

The Office of Management Systems & Facilities should update the existing directive and handbook to require the link of facility to mission criticality and mission risk.

Management's Response

"Concur with the intent. We are presently completing an Agencywide study titled 'NASA Facility Investment Study' which seeks to identify a cost-effective method to prioritize by mission criticality, CoF projects that are driven by the various facility condition assessment techniques that exist across the Agency. This study should be finished in early March of this year. The Office of Management Systems & Facilities intends to take whatever cost-effective methods that are identified and incorporate appropriate policy and guidance into our CoF or facilities maintenance

documents where it fits the best. We plan to complete the updates to our documents by the end of this fiscal year."

Evaluation of Management's Response

The action planned by the Office of Management Systems & Facilities is responsive to our recommendation, and we consider it closed for reporting purposes.

FY 1997 CoF Projects Reviewed

NO.	PROJECT TITLE	LOCATION	AMOUNT	SUBTOTAL BY LOCATION
1	Addition to Consolidated Warehouse	Dryden	720,000	
2	Modification of Aircraft Ramp and Tow Way	Dryden	3,000,000	
3	Rehab. Western Aeronautical Test Range	Dryden	970,000	
4	Repairs for Seismic Protection of Hangar 4826	Dryden	600,000	
5	Repair Central Compressed Air System	Dryden	600,000	
6	Restore Hangar Building 4801	Dryden	4,500,000	10,390,000
7	Construct Launch Complex 39 News Facility	Kennedy	740,000	
8	Rehab. Cranes & Hoists at Hangar AF	Kennedy	700,000	
9	Rehab. Indus. Area 13.2 kV Protective Relays	Kennedy	500,000	
10	Repair Railway Track at Hangar AF	Kennedy	350,000	
11	Repair Shuttle Landing Facility	Kennedy	910,000	
12	Repair Boilers 1 & 2, Cent. Heat Plant	Kennedy	700,000	
13	Replace DX Units w/Cent. Chilled Water Sys.	Kennedy	1,800,000	
14	Replace LC-39 Pad B Chillers	Kennedy	1,800,000	
15	Restore Pad B Elevator System	Kennedy	1,500,000	9,000,000
16	Modification of Chilled Water System	Marshall	6,700,000	
17	Rehabilitate Components Service Facility	Marshall	950,000	
18	Rehabilitate the Paint Shop	Marshall	900,000	
19	Mods. of Industrial Water Pump House	Marshall	300,000	
20	Repair Fire Alarm System	Marshall	950,000	9,800,000
21	Mods. of Underground Fire Water Mains	Michoud	850,000	
22	Rehabilitate Cell "F" Control System	Michoud	950,000	
23	Mods. of Steam & Chilled Water Piping	Michoud	600,000	
24	Rehabilitate Condenser Water System	Michoud	2,100,000	
25	Rehab. 480V Electrical Distribution System	Michoud	2,500,000	
26	Repair Fire Alarm Systems	Michoud	650,000	
27	Repair Sanitary Sewer Piping	Michoud	800,000	
28	Repair Manufacturing Area Fanhouses	Michoud	950,000	9,400,000
29	Rehabilitate Fire Alarm Systems	Stennis	700,000	
30	Rehab. Admin. & Engineering Bldg	Stennis	900,000	
31	Rehab. Uninterruptible Power Sup. Sys	Stennis	300,000	
32	Rehab. Energy Mgmt & Control Systems	Stennis	900,000	
33	Repair 480 Volt Electrical Systems	Stennis	900,000	
34	Restore High Pressure Industrial Water Plant	Stennis	2,500,000	6,200,000
		TOTAL	$44,790,000	$44,790,000

National Aeronautics and
Space Administration
Headquarters
Washington, DC 20546-0001

APPENDIX 2

FEB 24 1997

Reply to Attn of: JX

TO: W/Acting Assistant Inspector General for Auditing

FROM: J/Associate Administrator for Management Systems and Facilities

SUBJECT: Discussion Draft Survey Report
Construction of Facilities Projects
Assignment Number A-KE-96-007
Report Number IG-97-00X

We concur with the intent of your recommendation, "The Office of Management Systems & Facilities should update the existing directive and handbook to require the link of facility to mission criticality and mission risk."

As you are aware, we are presently completing an Agencywide study titled "NASA Facility Investment Study" which seeks to identify a cost-effective method to prioritize by mission criticality, CoF projects that are driven by the various facility condition assessment techniques that exist across the Agency. This study should be finished in early March of this year. We intend to take whatever cost-effective methods that are identified and incorporate appropriate policy and guidance into our CoF or facilities maintenance documents where it fits the best.

We plan to complete the updates to our documents by the end of this fiscal year and our point of contact for this action is Mr. Ralph S. Spillinger at 202-358-0161. Thank you for the overall positive view of our efforts in effectively prioritizing CoF in the Agency.

Benita A. Cooper

cc:
JM/H. Robbins
JX/B. Brubaker
JX/R. Spillinger

REPORT DISTRIBUTION

National Aeronautics and Space Administration (NASA) Officials-In-Charge
Code B/Chief Financial Officer
Code B/Comptroller
Code G/General Counsel
Code J/Associate Administrator for Management Systems and Facilities
Code JM/Management Assessment Division (10 copies)
Code L/Associate Administrator for Legislative Affairs

NASA Director, Field Installations
Dryden Flight Research Center
John F. Kennedy Space Center
George C. Marshall Space Flight Center
John C. Stennis Space Center
Manager, Michoud Assembly Facility

NASA Offices of Inspector General
Ames Research Center
Goddard Space Flight Center
Jet Propulsion Laboratory
Lyndon B. Johnson Space Center
John F. Kennedy Space Center
Langley Research Center
Lewis Research Center
George C. Marshall Space Flight Center
John C. Stennis Space Center

Non-NASA Federal Organizations and Individuals
Assistant to the President for Science and Technology Policy
Deputy Associate Director, Energy and Science Division, Office of Management and Budget
Budget Examiner, Energy Science Division, Office of Management and Budget
Associate Director, National Security and International Affairs Division,
General Accounting Office
Special Counsel, Subcommittee on National Security, International Affairs, and Criminal Justice

Chairman and Ranking Minority Member - Congressional Committees and Subcommittees
Senate Committee on Appropriations
Senate Subcommittee on VA-HUD-Independent Agencies
Senate Committee on Commerce, Science and Transportation
Senate Subcommittee on Science, Technology and Space
Senate Committee on Governmental Affairs
House Committee on Appropriations

House Subcommittee on VA-HUD-Independent Agencies
House Committee on Government Reform and Oversight
House Committee on Science
House Subcommittee on Space and Aeronautics

MAJOR CONTRIBUTORS TO THIS AUDIT

Jet Propulsion Laboratory	Mr. Lorne Dear, Program Director, Infrastructure and Support Ms. Phuong Quach, Auditor
Kennedy Space Center	Ms. Van Tran, Auditor-in-Charge
Marshall Space Flight Center	Ms. Rhoda Southerland, Auditor