

GAO

Report to the Committee on Commerce,
Science, and Transportation,
U.S. Senate, and the Committee on
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BUSINESS MODERNIZATION

Disciplined Processes Needed to Better Manage NASA's Integrated Financial Management Program





Highlights of [GAO-04-118](#), a report to the Senate Committee on Commerce, Science, and Transportation, and the House Committee on Science

Why GAO Did This Study

The National Aeronautics and Space Administration (NASA) has struggled to implement a fully integrated financial management system. The lack of such a system has affected the agency's ability to control program costs, raising concerns about the management of its most costly programs, including the space shuttle program and the International Space Station.

In April 2000 NASA initiated the Integrated Financial Management Program (IFMP)—its third effort to improve the agencywide management of its resources. Implementation is expected by fiscal year 2006 with an estimated life-cycle cost of nearly \$1 billion.

This report (1) assesses NASA's methodology for preparing the current life-cycle cost estimate for implementing IFMP, (2) determines whether NASA's current schedule is reasonable, and (3) evaluates NASA's processes for ensuring adequate cost contingencies.

What GAO Recommends

GAO is recommending that IFMP follow best practices and NASA guidance in preparing and updating the life-cycle cost estimate and establish additional processes that would enable the agency to more accurately estimate program cost and predict the impact of possible undesired events. NASA concurred with GAO's recommendations for corrective action.

www.gao.gov/cgi-bin/getrpt?GAO-04-118.

To view the full product, including the scope and methodology, click on the link above. For more information, contact Allen Li at (202) 512-4841 or lia@gao.gov.

BUSINESS MODERNIZATION

Disciplined Processes Needed to Better Manage NASA's Integrated Financial Management Program

What GAO Found

The uncertain reliability of cost estimates, optimistic schedules, and insufficient processes for ensuring adequate funding reserves have put NASA's latest financial management modernization effort at risk. Over the past several years, IFMP's life-cycle cost estimates have fluctuated, and NASA's current estimate is 14 percent greater than the previous estimate. The reliability of these estimates is uncertain because disciplined cost-estimating processes required by NASA and recognized as best practices were not used in preparing them. For example, IFMP's current life-cycle cost estimate did not include the full cost likely to be incurred during the life of the program, including certain operations costs and costs to retire the system. In addition, NASA did not consistently use breakdowns of work in preparing the cost estimate, as recommended by NASA guidance. In cases where work breakdowns were used, the agency did not always show the connection between the work breakdown estimates and the official program cost estimate. This has been a weakness since the inception.

Although more than half of the IFMP modules have been implemented—including the Core Financial module, which is considered the backbone of IFMP—the system may not be fully implemented by the end of fiscal year 2006 as planned. Efforts to complete the integrated system as quickly as possible might have resulted in schedule margins that are insufficient to manage program challenges—such as personnel shortages, uncertainties about software availability, and Office of Management and Budget (OMB) initiatives to implement electronic systems for agency business processes governmentwide. These OMB initiatives have put IFMP in a reactive mode and are already affecting planning for the payroll, procurement, and travel components of the integrated system, which could result in additional schedule delays and cost growth.

Finally, reserve funding for IFMP contingencies may be insufficient, which is particularly problematic, given the program's unreliable cost estimates and optimistic schedule. One module—Budget Formulation—is already experiencing potential shortfalls in its reserves, and project officials expressed concerns that the module's functionality may have to be reduced. Yet the program continues to establish funding reserves based on reserve levels set by other high-risk NASA programs, such as NASA's space flight program—not on analyses of the potential cost impact of risks and unknowns specific to IFMP, as required by NASA guidance. Moreover, the program did not quantify the cost impact of high-criticality risks—also required by NASA—or link its risks to funding reserves to help IFMP develop realistic budget estimates.

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Abbreviations

GAO	General Accounting Office
IFMP	Integrated Financial Management Program
NASA	National Aeronautics and Space Administration
NSSC	NASA Shared Services Center
OMB	Office of Management and Budget
SAP	System Applications and Products
SEI	Software Engineering Institute
WBS	Work Breakdown Structure

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United States General Accounting Office
Washington, DC 20548

November 21, 2003

The Honorable John McCain
Chairman
The Honorable Ernest F. Hollings
Ranking Minority Member
Committee on Commerce, Science,
and Transportation
United States Senate

The Honorable Sherwood L. Boehlert
Chairman
The Honorable Ralph M. Hall
Ranking Minority Member
Committee on Science
House of Representatives

About 90 percent of the National Aeronautics and Space Administration's (NASA) annual budget is spent on contractors. Yet since 1990 we have identified NASA's contract management as a high-risk area—in part, because the agency has failed to implement a modern, fully integrated financial management system. As we reported in January 2003, the lack of such a system has hampered NASA's ability to oversee contracts; control program costs; and ensure an effective human capital management strategy, raising serious concerns about NASA's management of its largest and most costly programs, including the space shuttle program and the International Space Station.¹

In April 2000 NASA initiated its third and most recent effort to implement a modernized financial management system: the Integrated Financial Management Program (IFMP).² Through IFMP, NASA plans to employ multiple software applications to improve the agencywide management of its financial, physical, and human resources. NASA expects to complete IFMP's implementation in fiscal year 2006 with an estimated life-cycle cost

¹See U.S. General Accounting Office, *Major Management Challenges and Program Risks: National Aeronautics and Space Administration*, [GAO-03-114](#) (Washington, D.C.: January 2003).

²NASA abandoned two earlier efforts after spending about \$180 million over 12 years.

totaling nearly \$1 billion, including operations and maintenance costs. However, several of the system's modules remain to be developed, and the program faces significant challenges in completing them as planned. Given its previous failures, NASA is under tremendous pressure to ensure that IFMP is implemented quickly and can achieve its goals.

In April 2003 we issued an interim report on IFMP,³ which found that NASA was not following key best practices for acquiring and implementing IFMP. As agreed, we continued our review in three areas: (1) whether NASA is acquiring and implementing IFMP in the context of an enterprise architecture, (2) the extent to which the Core Financial module will address NASA's external reporting requirements, and (3) NASA's life-cycle cost estimate and schedule for IFMP. We are responding to the first two issues in separate reports.⁴ This report addresses the third issue—IFMP's life-cycle cost estimate and schedule. Specifically, you asked that we (1) assess the reliability of NASA's methodology for preparing the current cost estimate for implementing IFMP, (2) determine whether NASA's current schedule is reasonable in terms of progress to date and available resources, and (3) evaluate NASA's processes for ensuring the adequacy of reserve funding for contingencies to mitigate the potential impact of identified program risks and unknowns. In addition, we have summarized our findings on the three areas previously cited in a separate report.⁵

Results in Brief

The uncertain reliability of cost estimates, optimistic schedules, and insufficient processes for ensuring the adequacy of funding reserves have put NASA's latest financial management modernization effort at risk of schedule delays and cost growth. The reliability of the current estimate—which is 14 percent greater than the previous estimate established in

³See U.S. General Accounting Office, *Business Modernization: Improvements Needed in Management of NASA's Integrated Financial Management Program*, [GAO-03-507](#) (Washington, D.C.: Apr. 30, 2003).

⁴See U.S. General Accounting Office, *Business Modernization: NASA's Integrated Financial Management Program Does Not Fully Address Agency's External Reporting Issues*, [GAO-04-151](#) (Washington, D.C.: Nov. 21, 2003). Also, see U.S. General Accounting Office, *Information Technology: Architecture Needed to Guide NASA's Financial Management Modernization*, [GAO-04-43](#) (Washington, D.C.: Nov. 21, 2003).

⁵See U.S. General Accounting Office, *Business Modernization: NASA Challenges in Managing Its Integrated Financial Management Program*, [GAO-04-255](#) (Washington, D.C.: Nov. 21, 2003).

February 2002—is uncertain because disciplined cost-estimating processes required by NASA and recognized as best practices were not used in preparing the estimate. Specifically, IFMP’s life-cycle cost⁶ estimate did not include the full cost of all resources likely to be incurred during the life of the program. In addition, NASA did not consistently use breakdowns of the work to be performed in preparing the cost estimate, as recommended by NASA guidance. Without using the work breakdowns to prepare the cost estimate, NASA cannot ensure that all costs are accounted for. In cases where work breakdowns were used, the agency did not always provide a clear audit trail between the work breakdown estimates and the program’s life-cycle cost estimate.

IFMP is scheduled for completion at the end of fiscal year 2006. However, efforts to complete the integrated system as quickly as possible might have resulted in schedule margins that are insufficient to manage program challenges—such as personnel shortages and uncertainties about software’s availability. In addition, Office of Management and Budget (OMB) initiatives to implement electronic systems for agency business processes—which are expected to improve agency operations governmentwide—are affecting planning for the payroll, procurement, and travel modules of the integrated system, which could result in additional schedule delays and cost growth.

Finally, reserve funding for IFMP contingencies may be insufficient—which is particularly problematic, given the uncertain reliability of cost estimates and optimistic schedule for the program—because the program did not consistently perform in-depth analyses of the potential cost impact of risks and unknowns specific to IFMP, as required by NASA’s guidance. Instead, the program established funding reserves on the basis of reserve levels set by other high-risk NASA programs. Moreover, the program did not quantify the cost impact of identified risks or link its risks to funding reserves.

To help decision makers better assess all costs associated with operating and implementing IFMP, we are recommending that the program use current processes dictated by best practices and NASA guidance for preparing and updating the life-cycle cost estimate as well as establish

⁶Life-cycle cost is the total of the direct, indirect, recurring, nonrecurring, and other related expenses incurred or estimated to be incurred in the design, development, verification, production, operation, maintenance, support, and retirement of a system over its planned life.

additional disciplined processes to better ensure that the agency more accurately estimate program cost, predict the impact of possible undesired events, and plan accordingly.

In written comments on a draft of this report, NASA's Deputy Administrator concurred with our recommendations for corrective action but noted that all IFMP projects completed to date stayed within budget, were completed ahead of schedule, and delivered the committed scope. We do not agree that this is the case for the Core Financial module, which NASA describes as the "backbone" of the program. When NASA announced the implementation of the Core Financial module at all of its centers, only about two-thirds of the financial events needed for day-to-day financial operations and external reporting had been implemented. In addition, we found that NASA deferred the implementation of other key Core Financial module capabilities and created new problems in recording certain financial transactions.⁷ Thus, full functionality of the system has been deferred, increasing the risk of additional costs and potentially affecting the implementation of future modules. NASA's detailed comments also noted that the program used a business case methodology and professional cost estimators to perform cost and risk assessments. As discussed in this report, the audit trail from these assessments to the program's cost estimates required by NASA guidance and best practices is not clear. NASA's detailed comments are included as appendix I.

⁷See [GAO-04-151](#).

Background

For more than a decade, we have reported that the lack of a modern integrated financial management system to produce accurate and reliable information has hampered NASA's ability to oversee contracts and develop good cost estimates for NASA's programs. In 1990 NASA's lack of effective systems and processes for overseeing contractor's activities prompted us to identify NASA's contract management as a high-risk area. In July 2002 we reported that the accuracy of NASA's \$5 billion cost growth estimate for the International Space Station was questionable and that the agency might have difficulty preparing a reliable life-cycle cost estimate because a modern integrated financial management system was not available to track and maintain the data needed for estimating and controlling costs.⁸ NASA's lack of a fully integrated financial management system has also hurt the agency's ability to collect, maintain, and report the full cost of its projects and programs. For example, in March 2002 we testified that NASA was unable to provide us with detailed support for the amounts that it reported to the Congress as obligated against space station and related shuttle program cost limits as required by the National Aeronautics and Space Administration Authorization Act of 2000.⁹

IFMP is designed as an integrated system to replace the separate and incompatible financial management systems used by NASA's 10 centers.¹⁰ According to the IFMP Program Director, the new system will provide better decision data, consistent information across centers, and improved functionality.

Unlike NASA's previous efforts to modernize its financial management system, IFMP does not rely on a single contractor. NASA selected System Applications and Products (SAP) to provide its "best of suite" software¹¹

⁸See U.S. General Accounting Office, *Space Station: Actions Under Way to Manage Cost, but Significant Challenges Remain*, [GAO-02-735](#) (Washington, D.C.: July 17, 2002).

⁹See U.S. General Accounting Office, *National Aeronautics and Space Administration: Leadership and Systems Needed to Effect Financial Management Improvements*, [GAO-02-551T](#) (Washington, D.C.: Mar. 20, 2002).

¹⁰NASA is composed of headquarters offices; nine centers located around the country; and the Jet Propulsion Laboratory, which is operated by the California Institute of Technology. For the purpose of this report, we treat the Jet Propulsion Laboratory as a center.

¹¹When acquiring and implementing commercial hardware and software solutions, organizations can generally pursue one of two basic approaches: An organization can opt for a single package of already integrated software components, which is referred to as the "best of suite" approach, or it can opt for different software components from different vendors, which is referred to as the "best of breed" approach. "Best of suite" components are easier and less costly to integrate.

and contracted for implementation services under a separate contract. NASA has also broken the project into modules that will be implemented individually—instead of all at once—on the basis of the availability of proven commercial-off-the-shelf software products. IFMP initially segmented implementation into 14 modules but has since reorganized the program into 9. Some of these modules may be further broken out and others added, depending on the scope of OMB’s e-Government initiatives¹² and other considerations. Table 1 describes the modules that currently comprise the system and their status.

Table 1: IFMP’s System Modules and Their Status

Module	Description	NASA-reported status
Position Description Management	Web-based tool that enables the generation and classification of job descriptions and automatic generation of associated documents.	Implemented September 2002.
Resume Management	Web-based application that allows applicants to apply for jobs online.	Implemented November 2001.
Erasmus	Web-based system providing financial performance information on NASA’s programs and projects in a standardized format.	Implemented November 2002.
Travel Management	Comprehensive system to streamline and unify the NASA employee travel system and to improve traveler and vendor reimbursement.	Implemented April 2003.
Core Financial	Accounting and financial reporting system that serves as the “backbone” to the integrated system.	Implemented June 2003.
Budget Formulation	Web-based tool to formulate project, program, institutional, enterprise, and agency-level budget requirements.	Planned completion of February 2004.
Integrated Asset Management	System to manage NASA’s physical assets through functions such as physical inventory and financial reporting.	To begin in late 2003.
Contract Administration	Comprehensive tool to support procurement, receiving, invoicing, and payment of materials for NASA.	To begin in late 2004.
Human Resources Management	System allowing managers to fill positions with staff that possess the appropriate skill sets and career goals.	To begin in late 2004.

Source: NASA.

When NASA announced in June 2003 that the Core Financial module had been implemented at all of its centers, only about two-thirds of the financial events needed for day-to-day financial operations and external reporting had been implemented. In addition, we found that NASA deferred implementation of other key core financial module capabilities

¹²OMB’s Electronic Government—or “e-Government”—initiatives advocate the use of Internet-based technologies governmentwide for agency business processes, such as payroll, travel management, and recruiting. The goal of these initiatives is to eliminate redundant systems and improve the government’s quality of customer service.

and created new problems in recording certain financial transactions.¹³ Thus, full functionality of the system has been deferred, increasing the risk of additional costs and potentially affecting the implementation of future modules.

As we reported in April 2003, NASA is not following key best practices for acquiring and implementing IFMP. For example, NASA has not analyzed the interdependencies between selected and proposed IFMP components, and it does not have a methodology for doing so. By acquiring IFMP components without first understanding system component relationships, NASA has increased its risk of implementing a system that will not optimize mission performance and will cost more and take longer to implement than necessary. In addition, in implementing the Core Financial module, NASA faces risks in the areas of user needs and requirements management because the agency did not consider the information needs of key system users and is relying on a requirements management process that does not require the documentation of detailed system requirements prior to system implementation and testing.

Reliability of IFMP's Current Life-Cycle Cost Estimate Is Uncertain Owing to a Lack of Disciplined Processes

The reliability of the current life-cycle cost estimate—which has fluctuated since the initial estimate and is 14 percent greater than the previous estimate established in February 2002—is uncertain because disciplined cost-estimating processes required by NASA and recognized as best practices were not used in preparing the estimate. Specifically, IFMP's life-cycle cost estimate did not include the full cost likely to be incurred during the life of the program. In addition, breakdowns of work to be performed—or Work Breakdown Structure (WBS)¹⁴—were not consistently used in preparing the cost estimate. In cases where work breakdowns were used to prepare the estimate, the agency did not always provide a clear audit trail. NASA has made some improvements in the program's financial management, such as hiring personnel to provide oversight and consistency for the cost-estimating process. However, until NASA uses more disciplined processes such as breakdowns of work in preparing the program's cost estimate, the reliability of the life-cycle cost estimate will be uncertain and the program will have difficulty with controlling costs.

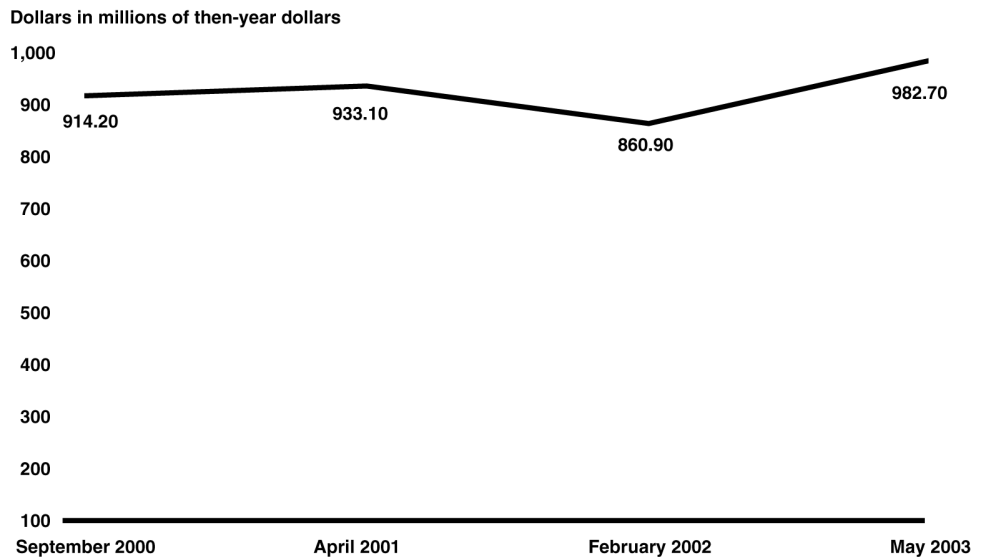
¹³See [GAO-04-151](#).

¹⁴A WBS is a method of organizing a program into logical subdivisions at lower and lower levels of detail.

IFMP's Life-Cycle Cost Estimates Show Overall Increase

Since the program began, cost estimates for IFMP's 10-year life cycle—fiscal years 2001 through 2010—have fluctuated and increased overall, as shown in figure 1.

Figure 1: IFMP's Life-Cycle Cost Estimate Trend



Sources: NASA (data); GAO (presentation).

NASA's current IFMP life-cycle cost estimate totals \$982.7 million—an increase of \$121.8 million, or 14 percent, over the previous IFMP life-cycle cost estimate. The estimate comprises IFMP direct program costs, NASA's enterprise support,¹⁵ and civil service salaries/benefits. (See table 2.)

¹⁵NASA is organized into six strategic enterprises that function as primary business areas for implementing NASA's mission. Each enterprise draws on the capabilities of several NASA centers, while each center contributes to multiple enterprises. For example, the Space Flight Enterprise has oversight over NASA's human space flight program and exercises management authority over the Johnson Space Center, Kennedy Space Center, Marshall Space Flight Center, and Stennis Space Center.

Table 2: IFMP's Cost Estimates for Life Cycle

Dollars in millions of then-year dollars				
IFMP's estimate component	Feb. 2002 estimate	May 2003 estimate	Change in dollars	Percent change
Direct program	\$644.8	\$635.3	\$(9.5)	(1.5)
Enterprise support	164.8	189.4	24.6	15.0
Civil Service salaries/benefits	51.3	158.0	106.7	208.0
Total life-cycle cost	\$860.9	\$982.7	\$121.8	14.1

Sources: NASA (data); GAO (analysis).

Although direct program costs decreased by \$9.5 million, these costs were shifted to the enterprise support component of the estimate with the program's decision to fund only 1 year's worth of operations and maintenance, rather than 2 years' worth from the direct program budget. In addition, NASA anticipates that operations costs for fiscal years 2007 through 2010—estimated at \$137.8 million—will be funded by the NASA Shared Services Center (NSSC), a planned initiative to consolidate various agency services such as purchasing and human resources. (See table 3.) As a result, the fiscal year 2004 budget for the IFMP direct program portion of implementing the system is \$497.5 million.

Table 3: IFMP's and NSSC's Share of Life-Cycle Costs in the May 2003 Budget for Fiscal Years 1999-2010

IFMP estimate component	Development and implementation (IFMP's share, FY 1999-2006)	Operations and maintenance (NSSC's share, FY 2007-2010)	Total
Direct program	\$497.5	\$137.8	\$635.3
Enterprise support	133.2	56.2	189.4
Civil Service salaries/benefits	125.3	32.7 ^a	158.0
Total life-cycle cost	\$756.0	\$226.7	\$982.7

Source: NASA.

^aThis number is not final and is still being reviewed by NASA.

In March 2003 an independent cost estimate team concluded that there is an 85 percent confidence level that the direct program portion can be successfully completed with the available funding of \$497.5 million. However, the direct program portion represents only about half of the total life-cycle cost estimate. In addition, the team's conclusion was contingent on two optimistic assumptions: that there would be no schedule disruptions and no increase in requirements.

Disciplined Processes Required by NASA Were Not Used in Preparing IFMP's Cost Estimates

Reflecting OMB guidance¹⁶ and the best practices of government and industry leaders, NASA requires that life-cycle cost estimates be prepared on a full-cost basis, that estimates be summarized according to the current breakdown of work to be performed, and that major changes be tracked to the life-cycle cost. OMB guidance calls for a disciplined budget process to ensure that performance goals are met with the least risk and the lowest life-cycle cost, which includes direct and indirect costs, operations and maintenance, and disposal. The Software Engineering Institute (SEI)¹⁷ echoes the need for reliable cost-estimating processes in managing software implementations—identifying tasks to be estimated, mapping the estimates to the breakdown of work to be performed, and having a clear audit trail are among SEI's requisites for producing reliable cost estimates.

Despite NASA requirements and OMB and SEI guidance, IFMP did not prepare a full life-cycle cost estimate—that is, all direct and indirect costs for planning, procurement, operations and maintenance, and disposal were not included. For example, the life-cycle cost estimate does not include the following:

- the cost to operate and maintain the system beyond 2010;¹⁸
- the cost of retiring the system;
- enterprise travel costs, which are provided monthly by the NASA centers; and
- the cost of nonleased NASA facilities for housing IFMP.

In addition, IFMP did not prepare WBS estimates for active modules—that is, those currently being implemented. According to NASA guidance, breaking down work into smaller units helps facilitate cost estimating and project and contract management, and helps ensure that relevant costs are not omitted. The guidance also states that the WBS should encompass both in-house and contractor efforts. According to the IFMP Deputy Program Director, WBS estimates are not prepared for active modules because information such as contract task orders can be used to

¹⁶*Planning, Budgeting, Acquisition, and Management of Capital Assets*, OMB Circular A-11, Part 7 (June 2002).

¹⁷SEI is a government-funded research organization that is widely considered an authority on software implementations.

¹⁸NASA assumed a 10-year life cycle beginning in fiscal year 2001, but the actual retirement date for the system is unknown, according to the Deputy Program Director.

prepare the cost estimates. However, there is not one overriding contract where each module is considered a deliverable at a fixed price. Rather, numerous contracts at both the project and center level for a module's implementation—many of which can be awarded for a level of effort at agreed-upon fixed rates at various phases in the implementation. Without a WBS estimate for the project as a whole, NASA cannot ensure that all relevant contractor costs are included in the cost estimate. In addition, using contract task orders to prepare the cost estimate would not ensure that government in-house costs are included in the life-cycle cost estimate.

Finally, for modules in the planning phase, the program utilized NASA's subject matter experts and professional cost estimators to prepare business case analyses. However, although these analyses contained WBS cost estimates, the audit trail from the WBS estimate to the program's life-cycle cost estimate was not always clear. Without a clear audit trail, it is difficult to determine whether the differences between the detailed WBS estimates and the official program cost estimate are appropriate. The lack of a clear audit trail has been a weakness since the inception of the program. For example, IFMP was unable to provide us with traceable support for its baseline cost estimate for direct program costs.

NASA has made some improvements that should help the program prepare better cost estimates. In May 2002 the NASA Administrator appointed an executive to provide leadership and accountability in the direction and operation of the system. The NASA headquarters program office also hired a business manager to oversee and provide consistency for the cost-estimating process and provide an analyst to review enterprise support costs.

Program Schedule May Be Optimistic

Although NASA guidance requires sufficient program schedule margins to manage risks, efforts to complete the integrated system as quickly as possible might have resulted in a schedule that is too compressed to accommodate program challenges, such as personnel shortages and uncertainties about software's availability. If the program schedule margin is too compressed, the program could incur additional risks, including added cost growth as well as failure to meet IFMP's schedule objectives. OMB's e-Government initiatives—which aim to streamline agency business processes and eliminate redundant systems governmentwide—could also provide challenges for NASA's IFMP planning. As a result, the program schedule may be optimistic.

While implementing the Core Financial module (see table 1), IFMP has faced human resource challenges, and the program continues to face these challenges with other modules. For example, personnel shortages at Marshall Space Flight Center for several months affected the Core Financial project and other projects. In this case, a schedule slip was avoided, but during fiscal year 2002, the shortages resulted in nearly \$400,000 for extra hours worked by center employees. Human resource challenges are also affecting the Budget Formulation module. The simultaneous implementation of this module with the Core Financial module—an action advised against by a contractor conducting a lessons-learned study—placed heavy demand on already scarce resources and added complexity to the program. As a result the schedule for implementing the Budget Formulation module has already slipped. Sometimes, relying more on contractor personnel can alleviate shortfalls in civil service personnel, but a recent Budget Formulation project status report indicated that the implementation contractor might also have difficulties acquiring and/or retaining qualified personnel. The implementation schedules for the remaining modules overlap, putting the program at further risk of schedule slippages.

Uncertainty regarding software availability also puts the program at risk for completing the integrated system on schedule. For example, complete software solutions and requirements for IFMP's Contract Administration module have not yet been determined. Although contract-document-generation software is available and tailored to meet the unique interface and reporting requirements of the federal government,¹⁹ the "best of suite" software solution—SAP—does not currently meet these requirements. NASA faces the same challenge with IFMP's Human Resources Management module. NASA's monthly status reports show that the program is working with SAP to develop a software solution for the Human Resources Management module that will meet federal government requirements, but the outcome is uncertain. In addition, the program could adopt an e-Government solution for its Human Resources Management module rather than the SAP solution.

¹⁹For example, according to the current business case analysis, NASA's document-generation system would have to meet several federal requirements, including providing the General Services Administration's Federal Procurement Data System and the National Science Foundation's Federal Assistance Awards Data System with data, along with reports to the Department of Labor and the Small Business Administration.

Inserting e-Government solutions into IFMP planning—which calls for using “best of suite” software—could create more difficult interface development and a less-integrated system, thus interrupting the program’s cost and schedule. E-Government initiatives are already affecting NASA’s planning for the payroll, procurement, and travel modules in the integrated system. For example, the payroll function, which was once part of the Human Resources Management module, will likely become a separate module under e-Government. Similarly, the Contract Administration module has been split into two components: one for procurement document generation, for which software is available although requirements are not finalized, and one for the remainder of NASA’s Contract Administration requirements, for which requirements and software are currently unknown. Furthermore, e-Travel could replace the Travel Management module, which has already been implemented.

According to the program’s fiscal year 2002 Independent Annual Review, e-Government initiatives are forcing the program into a reactionary mode, thus increasing risk to the program’s success. The review specifically noted that (1) the benefits of a fully integrated system could be lost under e-Government, (2) the scope of IFMP and timing of future projects’ implementation have become uncertain, and (3) cost increases and schedule slippage to accommodate directives may occur.

Processes Insufficient to Ensure Adequate Funding Set Aside for Contingencies

In addition to the uncertain reliability of IFMP’s life-cycle cost estimates and optimistic schedules, NASA cannot ensure that the funding set aside for program contingencies is sufficient because the program did not consistently perform in-depth analyses of the potential cost impact of risks and unknowns specific to IFMP, as required by NASA guidance. Moreover, the program did not quantify the cost impact of identified risks, link its risks to funding reserves, or consistently set aside cost contingencies for these risks.

In-Depth Analysis Not Performed in Establishing Cost Contingencies

NASA guidance stipulates that programs incorporate financial reserves, schedule margins, and technical performance margins to provide the flexibility needed to manage risks. According to the guidance, financial reserves are to be established and maintained commensurate with programmatic, technical, cost, and schedule risks. In other words, cost contingencies should be tailored to the specific risks associated with a

particular program or project. In addition, NASA guidance suggests that tools such as Probabilistic Risk Assessment²⁰ can help in analyzing risk.

Although NASA's business case analyses include a risk assessment and recommended reserve levels, we found no evidence that these recommended levels were used in establishing the actual reserve levels for the IFMP module projects. Regardless, the actual levels established did not match the recommended levels in the business case analyses in most cases. We found that reserves for some IFMP modules—both in the planning and active phase—were based not on IFMP-specific risks but on reserve levels for other high-risk NASA programs. For example, for a number of IFMP modules, reserves were set at levels used for spacecraft implementations—typically about 30 percent—because industry experience showed that large cost overruns in system implementations such as IFMP are common. Yet it is unclear whether this reserve margin is adequate for IFMP because the effect of IFMP-specific risks and assumptions—such as uncertainties relating to software, schedule, and OMB's e-Government initiatives—were not analyzed. In addition, some of the enterprises supporting the module projects described their method of establishing funding reserves as a combination of rules of thumb and guesswork.

The Budget Formulation module has already experienced shortfalls in its reserves, and project officials expressed concerns that the module's functionality may have to be reduced. As of April 2003, the module had expended its baseline reserves, which were established at about 20 percent on the basis of the level of risk for space flight missions—not on the risks specific to the module. Although the project was able to bring its budget back into balance by obtaining an agreement with SAP to limit overtime pay to time in excess of 50 hours per week, its remaining reserves total only \$83,000 to cover all contingencies—including those that could require changes to the Budget Formulation module.

²⁰Probabilistic risk assessment is a method of systematically examining complex technical systems to measure both the likelihood that an undesired event will occur and the consequences that will result.

Cost Impact of Identified Risks Not Quantified or Linked to Cost Contingencies

NASA requires programs to quantify the cost impact of high-criticality risks²¹ and to determine to what extent reserves may be exhausted, should the risks become reality. According to SEI, estimating the potential cost and schedule impact for all identified risks is an element of good estimating practice. Quantifying the cost impact of identified risks and clearly and consistently linking the risk database to funding reserves helps programs develop realistic budget estimates.

While IFMP identifies program risks, analyzes their severity, and plans mitigation actions, the program typically does not prepare a cost impact analysis for identified risks nor does it consistently link identified risks to funding reserves to ensure that funds are available, should the risk occur. For example, in February 2003, the Travel Management Project found that some components of the Travel Management module might not satisfy individual centers, be funded, or be technically feasible. However, the cost impact of this risk, as well as others, was not quantified. Similarly, in June 2003, the Budget Formulation module did not quantify the cost impact of a number of identified risks.²² Without estimating the potential cost impact of these risks, NASA cannot determine whether it has sufficient reserves to cover the risks—which is particularly problematic for Budget Formulation, since virtually no reserves remain for this module.

Furthermore, in its July 2003 monthly status report, the IFMP headquarters office identified three high-criticality risks that could have a cost impact on the overall program; however, no liens²³ were set aside against reserves for these risks:

- Reductions to out-year budgets could affect the implementation of future integrated modules or the ongoing evolution of existing modules.

²¹Risk criticality is a function of the likelihood that an event will occur and the severity of the consequences if the event does occur. The criticality of each risk will be identified as low, medium, or high. Risks with high criticality are also known as primary risks and typically have a high likelihood of occurrence and a high magnitude of impact.

²²A mitigation plan for the Budget Formulation module indicated that the project was in the process of assessing the potential cost impact of four of its six high-criticality risks, which the project manager confirmed.

²³A lien is a potential cost to a project, direct or indirect, which may or may not come to fruition, for which a portion of funding reserves is set aside.

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- An e-Government solution may be adopted for human resources management rather than the IFMP solution, resulting in more difficult interface development and a less-than-integrated solution.
 - E-Government initiatives and policy decisions could disrupt IFMP modules, resulting in delays or additional resource impacts.

An independent cost estimate team identified and quantified the impact of two IFMP program risks, indicating that the cost and schedule impact of a risk on a program or project can be sizeable. First, the team identified a high-probability risk that NASA’s “full cost requirement”—in which all direct and indirect agency costs, including civil service personnel costs, are tied to individual programs and projects—could affect the Budget Formulation module.²⁴ The team estimated this risk at \$2 million to \$3 million, with a potential schedule slip of 3 to 6 months. The Budget Formulation Project is currently trying to determine what impact it may have. The second risk identified by the independent cost review team—that the Core Financial module may be transitioned to operations before all integration points are addressed—could be more costly. The team estimated this risk at \$10.5 million to \$20 million, also with a potential 3- to 6-month schedule slip. However, the team considered this risk as having a low probability of occurrence.

Conclusion

NASA is at a critical juncture and faces major challenges in improving contract management and controlling costs. These challenges seriously affect the agency’s ability to effectively manage its largest and most costly programs. A modern integrated financial management system, as envisioned in IFMP, is critical to ensuring that NASA has accurate and reliable information to successfully meet these challenges. NASA has made some improvements during the past year, such as hiring personnel to provide the cost-estimating process with oversight and consistency. However, if IFMP continues to ignore disciplined processes in estimating program costs and impacts, it is unlikely that the program will meet its goals.

Recommendations for Executive Action

To ensure that IFMP’s life-cycle cost estimate conforms to NASA guidance and best practices, we recommend that the NASA Administrator direct IFMP to do the following:

²⁴NASA was to implement its full cost initiative October 1, 2003.

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- Prepare cost estimates by the current Work Breakdown Structure for the remaining modules.
 - Provide a clear audit trail between detailed WBS estimates and the program's cost estimate for the remaining modules.
 - Prepare a full life-cycle cost estimate for the entire IFMP that meets NASA's life-cycle cost and full cost guidance.

To ensure that contingencies are funded in accordance with NASA guidance and best practices, we recommend that the NASA Administrator direct IFMP to do the following:

- Utilize a systematic, logical, and comprehensive tool, such as Probabilistic Risk Assessment, in establishing the level of financial reserves for the remaining module projects and tailor the analysis to risks specific to IFMP.
- Quantify the cost impact of at least all risks with a high likelihood of occurrence and a high magnitude of impact to facilitate the continuing analysis necessary to maintain adequate reserve levels.
- Establish a clear link between the program's risk database and financial reserves.

Agency Comments and Our Evaluation

Although NASA concurred with our recommendations for corrective action, NASA indicated that its current processes are adequate for (1) preparing WBS cost estimates, (2) estimating life-cycle costs, and (3) establishing reserves on the basis of IFMP-specific risks. The agency cited its business case analyses as the methodology through which it is accomplishing these tasks.

We disagree that NASA's current processes are adequate, and our recommendations are aimed at improving these processes. As discussed in this report, while NASA prepares WBS cost estimates for IFMP modules in the planning phases by using business case analyses, it does not prepare WBS cost estimates for active modules. And although IFMP indicates that preparing cost estimates by using contract task orders is an appropriate methodology, this approach will not ensure that all relevant costs, including both contractor and government in-house costs, are included in the life-cycle cost estimate. Regarding contract costs, there is not one overriding contract where each module is considered a deliverable at a fixed price. Rather, there are numerous contracts at both the project and center level for implementing modules—many of which can be awarded for a level of effort at agreed-upon fixed rates at various phases in the implementation. Without a WBS estimate for the project as a whole, NASA cannot ensure that all relevant contractor costs are included in the cost

estimate. In addition, using contract task orders to prepare the cost estimate would not ensure that government in-house costs are included in the life-cycle cost estimate.

According to NASA, IFMP will improve its business case analyses by providing better estimates of operational costs through the expected life of the module, retirement costs, and other full life-cycle costs. However, as discussed in this report, an audit trail is needed between the detailed estimates contained in the business case analyses and the program's life-cycle cost estimate to ensure that these improvements are reflected in the program's official cost estimate.

Finally, as discussed in this report, although NASA's business case analyses include recommended reserve levels, we found no evidence that these recommended levels were used in establishing the actual reserve levels for the IFMP module projects. Regardless, the actual levels established did not match the recommended levels in most cases. We found that the program established funding reserves on the basis of reserve levels set by other high-risk NASA programs, rather than on IFMP-specific risks as required by NASA guidance.

Scope and Methodology

To assess the reliability of NASA's methodology for preparing the current cost estimate for IFMP, we reviewed program and project-level documentation to obtain an understanding of NASA's current cost estimate and its major components and the methodology used to develop the estimate. We also interviewed program and project officials to clarify our understanding of the cost estimate and how NASA derived it. In addition, we compared the program's cost-estimating methodology with SEI best practices, OMB requirements, and NASA's own procedures and guidance. Finally, we reviewed internal and independent analyses of the cost estimate. We did not attempt to validate NASA's estimate; rather, we reviewed NASA's processes for preparing its estimate.

To determine whether NASA's current schedule is reasonable in terms of progress to date and available resources, we reviewed the program's schedule objectives and NASA's policies for managing program and project schedules. We monitored the schedule and risks to the schedule through our review of the program's monthly status reports and internal NASA briefings. We interviewed program and project officials to ascertain NASA's progress against the schedule.

To evaluate NASA's processes for ensuring the adequacy of cost contingencies to mitigate the potential impact of identified program risks and unknowns, we reviewed governmentwide and NASA policies and SEI best practices for managing risk and establishing cost contingencies. We also interviewed program officials at NASA headquarters and project managers to obtain an understanding of how reserve levels were established and maintained for the program. We then compared IFMP's processes for ensuring adequate cost contingencies with processes dictated by OMB and NASA guidance and by best practices.

To accomplish our work, we visited NASA headquarters, Washington, D.C.; Marshall Space Flight Center, Alabama; and Goddard Space Flight Center, Maryland. We also contacted officials at Glenn Research Center, Ohio.

We performed our review from April through September 2003 in accordance with generally accepted government auditing standards.

As agreed with your offices, unless you announce its contents earlier, we will not distribute this report further until 30 days from its date. At that time, we will send copies to interested congressional committees; the NASA Administrator; and the Director, Office of Management and Budget. We will make copies available to others upon request. In addition, the report will be available at no charge on the GAO Web site at <http://www.gao.gov>.

If you or your staff have any questions concerning this report, please contact me at (202) 512-4841 or lia@gao.gov. Key contributors to this report are acknowledged in appendix I.



Allen Li
Director
Acquisition and Sourcing Management

Appendix I: Comments from the National Aeronautics and Space Administration

National Aeronautics and
Space Administration
Office of the Administrator
Washington, DC 20546-0001



October 31, 2003

Mr. Allen Li
Director
Acquisition and Sourcing Management Team
United States General Accounting Office
Washington, DC 20548

Dear Mr. Li:

Thank you for the opportunity to review and comment on the draft report entitled, *BUSINESS MODERNIZATION: Disciplined Processes Needed to Better Manage NASA's Integrated Financial Management Program* (GAO-04-118). We appreciate the General Accounting Office's (GAO) continued interest in this vital program and desire to see this undertaking successfully completed.

Enclosed are NASA's responses to the draft report. NASA concurs with all six of the GAO's recommendations for corrective action. We acknowledge that the Integrated Financial Management Program is engaged in a high-risk endeavor and that we will continue to improve our processes. We respectfully request that the GAO, in producing its final report on this matter, also indicate that all five IFMP projects completed to date stayed within budget, were completed ahead of schedule, and delivered the committed scope. We also ask that the report recognize that the program did use a business case methodology and professional cost estimators to perform cost and risk assessments prior to starting each project. We believe that this process has been a key component of our success to date.

My point-of-contact for this matter is Mr. Bobby German, Deputy Program Director for NASA's Integrated Financial Management Program. He may be contacted by e-mail at bobby.german@nasa.gov, or by telephone at (202) 358-2498.

Cordially,

A handwritten signature in black ink that reads "Frederick D. Gregory".

Frederick D. Gregory
Deputy Administrator

Enclosure

Enclosure

**NASA Response to Draft General Accounting Office (GAO) Report:
BUSINESS MODERNIZATION: Disciplined Processes Needed to Better Manage
NASA's Integrated Financial Management Program (GAO-04-118), dated
October 1, 2003**

1. General Accounting Office (GAO) Recommendation: Prepare cost estimates by the current Work Breakdown Structure (WBS) for the remaining modules.

NASA Response to GAO Recommendation 1: Concur. The business cases developed for every Integrated Financial Management Program (IFMP) module have included full-cost estimates by Work Breakdown Structure (WBS). NASA will continue to follow this practice. It should be noted, however, that once an implementation contractor is selected, the module project has the ability to update the work breakdown structure to match the finalized implementer methodology. It should be further noted that the majority of IFM costs are incurred through fixed-price contracts with the module implementers (e.g., Accenture). The methodology for cost reporting in a fixed-price contract environment is focused on contract deliverable performance rather than work breakdown structure.

2. GAO Recommendation: Provide a clear audit trail between detailed WBS estimates and the program cost estimate for the remaining modules.

NASA Response to GAO Recommendation 2: Concur. IFMP will take steps to ensure that there is increased documented traceability linking the estimates in the business cases to the initial project estimates.

3. GAO Recommendation: Prepare a full life-cycle cost estimate for the entire IFM Program that meets NASA's established life-cycle cost and full-cost guidance.

NASA Response to GAO Recommendation 3: Concur. For each module project, the IFM Program has developed detailed business case analyses (BCA's) that included full cost 10-year life-cycle estimates at low levels of the work breakdown structure. Although the program did not estimate how long each module would be operational, 10-year was option selected to ensure that the decision processes for the projects appropriately balanced development and operations costs. Nevertheless, the program will ensure that future BCA's provide better estimated operational costs through the expected life of the module, retirement costs, and any other full-life cycle costs, as appropriate. The IFM Program will also continue to submit to Office of Management and Budget (OMB) its Exhibits 300 and 53 in compliance with Agency and OMB guidance.

4. GAO Recommendation: Use a systematic, logical, and comprehensive tool, such as Probabilistic Risk Assessment, in establishing the level of financial reserves for the remaining module projects and tailor the analysis to risks specific to IFMP.

NASA Response to GAO Recommendation 4: Concur. The IFM Program will enhance its risk evaluation methodology as part of each module project's business case analysis (BCA). A comprehensive risk assessment analysis, using eight different criteria, is currently performed in each BCA. Those results are subsequently used to develop individual project budgets, inclusive of reserves. The IFM Program will continue to enhance this process, which is, nevertheless, currently fully compliant with NASA policies in this area. Furthermore the program will undertake a review of expenditures against reserves in past projects to identify particular areas in which future projects should focus their risk identification and quantification efforts.

5. GAO Recommendation: Quantify the cost impact of at least all risks with a high likelihood of occurrence and a high magnitude of impact to facilitate the continuing analysis necessary to maintain adequate reserve levels.

NASA Response to GAO Recommendation 5: Concur. The IFM Program will update its risk management policies to ensure that the program and its individual projects analyze more consistently and better document the cost impacts of high severity risks (which are classified as high probability and high impact risks). Over the past 3 years, the program has already identified and mitigated several hundred risks associated with individual projects. Each risk carried a probability assessment rating and an impact assessment rating, which were periodically updated until the risk was either retired or mitigated. Additionally, detailed individual costs assessments were computed for certain risks when it became apparent that the mitigation efforts would not be successful in fully retiring the risk. In most cases, reserves were used on those tasks. Cost estimates are reflected as liens to the reserves or application of reserves in the monthly status for the projects and program.

6. Establish a clear link between the program's risk database and financial reserves.

NASA Response to GAO Recommendation 6: Concur. The IFM Program will provide more documentation and traceability on risks and other factors that form the basis for cost reserves. Also, see above responses to Recommendations 2 and 5.

Appendix II: GAO Contact and Staff Acknowledgments

GAO Contact

Allen Li (202) 512-3600

Acknowledgments

Staff making key contributions to this report were Jerry Herley, Erin Schoening, LaTonya Miller, and Karen Sloan.

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