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# INFORMATION TECHNOLOGY

## Census Bureau Needs to Improve Its Risk Management of Decennial Systems

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Highlights of [GAO-08-259T](#), a testimony before the Subcommittee on Information Policy, Census, and National Archives, Committee on Oversight and Government Reform, U.S. House of Representatives

### Why GAO Did This Study

For Census 2010, automation and information technology (IT) are expected to play a critical role. The Census Bureau plans to spend about \$3 billion on automation and technology that are to improve the accuracy and efficiency of census collection, processing, and dissemination. From February 2006 through June 2009, the Bureau is holding a “Dress Rehearsal” during which it plans to conduct operational testing that includes decennial systems acquisitions.

In October 2007, GAO reported on its review of four key 2010 Census IT acquisitions to (1) determine the status and plans, including schedule and cost, and (2) assess whether the Bureau is adequately managing associated risks. This testimony summarizes GAO’s report on these key acquisitions and describes GAO’s preliminary observations on the performance of handheld mobile computing devices used during the Dress Rehearsal.

### What GAO Recommends

In its report, GAO made recommendations that the Bureau strengthen its systems testing and risk management activities, including risk identification and oversight. The Bureau agreed to examine additional ways to manage risks, but disagreed with the view that a full complement of systems would not be tested, stating it planned to do so during the Dress Rehearsal or later; however, the test plans have not been finalized and it remains unclear whether this testing will be done.

To view the full product, including the scope and methodology, click on [GAO-08-259T](#). For more information, contact David A. Powner at (202) 512-9286 or [pownerd@gao.gov](mailto:pownerd@gao.gov).

## INFORMATION TECHNOLOGY

### Census Bureau Needs to Improve Its Risk Management of Decennial Systems

#### What GAO Found

As of October 2007, three key systems acquisitions for the 2010 Census were in process, and a fourth contract had recently been awarded. The ongoing acquisitions showed mixed progress in meeting schedule and cost estimates. Two of the projects were not on schedule. The award of the fourth contract, originally scheduled for 2005, was awarded in September 2007. In addition, one project had incurred cost overruns and increases to its projected life-cycle cost. As a result of the schedule changes, the full complement of systems and functionality that were originally planned will not be available for upcoming Dress Rehearsal operational testing. This limitation increases the importance of further system testing to ensure that the decennial systems work as intended.

The Bureau’s project teams for each of the four IT acquisitions had performed many practices associated with establishing sound and capable risk management processes, but critical weaknesses remained. Three project teams had developed a risk management strategy that identified the scope of the risk management effort. However, not all project teams had identified risks, established mitigation plans, or reported risks to executive-level officials. For example, one project team did not adequately identify risks associated with performance issues experienced by handheld mobile computing devices, even though Census field staff reported slow and inconsistent data transmissions with the device during the spring Dress Rehearsal operations. The magnitude of these difficulties is not clear, and the Bureau has not fully specified how it plans to measure the performance of the devices. Until the project teams implement key risk management activities, they face an increased probability that decennial systems will not be delivered on schedule and within budget or perform as expected.

**Performance of Risk Management Activities by Key Census Acquisition Projects**

Specific practices	Acquisition projects			
	1	2	3	4
<b>Preparing for risk management</b>				
Determine risk sources and categories	○	●	●	●
Define risk parameters	●	●	●	●
Establish and maintain a risk management strategy	○	●	●	●
Identify and involve the relevant stakeholders	○	○	●	○
<b>Identify and analyze risks</b>				
Identify and document the risks	●	○	●	○
Evaluate, categorize, and prioritize risks	○	●	●	●
<b>Mitigate risks</b>				
Develop risk mitigation plans	○	○	●	○
Monitor status and implement risk mitigation plans	○	○	●	○
<b>Executive oversight</b>				
Review status with executive-level management	○	○	●	●

● practice fully implemented ○ practice partially implemented ○ practice not implemented

Source: GAO analysis of Census project data against industry standards.

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Mr. Chairman and Members of the Subcommittee:

Thank you for the opportunity to participate in today's hearing on the 2010 Decennial Census Information Technology (IT) acquisitions that are an integral part of the reengineered census. As you know, the decennial census is mandated by the U.S. Constitution and provides data that are vital to the nation. These data are used to reapportion the seats of the U.S. House of Representatives, realign the boundaries of the legislative districts of each state, allocate billions of dollars in federal financial assistance, and provide a social, demographic, and economic profile of the nation's people to guide policy decisions at each level of government.

Carrying out the census is the responsibility of the Department of Commerce's Census Bureau, which is now preparing for the 2010 Census. The Bureau is required to count the population on April 1, 2010, and the Secretary of Commerce is required to report to the President on the tabulation of total population by state within 9 months of that date.<sup>1</sup>

The Bureau plans to rely on automation and technology to improve the coverage, accuracy, and efficiency of the 2010 Census, and has awarded four key IT contracts to that end. It is also holding what it refers to as a Dress Rehearsal, from February 2006 through June 2009, a period centering around a mock Census Day on April 1, 2008.<sup>2</sup> Planned Dress Rehearsal activities include operational testing of the 2010 Census systems in a census-like environment. The Bureau estimates that its IT acquisitions will absorb about \$3 billion of the total \$11.5 billion cost of the entire census.

As requested, our testimony today will summarize our report on the four key IT acquisitions. In the report, we (1) determined the status and plans, including schedule and costs, for four key IT acquisitions; and (2) assessed whether the Bureau is adequately managing the risks facing these key system acquisitions.<sup>3</sup> The report contains a detailed overview of the scope and methodology we used. As you also requested, our testimony today describes GAO's preliminary observations on the performance of handheld

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<sup>1</sup>13 U.S.C. 141 (a) and (b).

<sup>2</sup>Since issuance of our report in October 2007, the Bureau has tentatively moved the mock Census Day from April 1, 2008 to May 1, 2008.

<sup>3</sup>GAO, *Information Technology: Census Bureau Needs to Improve Its Risk Management of Decennial Systems*, [GAO-08-79](#) (Washington, D.C.: Oct. 5, 2007).

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mobile computing devices used during address canvassing activities in the Dress Rehearsal.<sup>4</sup> The preliminary observations presented in this report are based on field work we have conducted at the two Dress Rehearsal sites (Stockton, CA and Fayetteville, NC), as well as a review of Bureau documentation of its own observations of the Dress Rehearsal. The work on which this testimony is based was performed in accordance with generally accepted government auditing standards.

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## Results in Brief

As of October 2007, three key systems acquisitions for the 2010 Census were in process, and a fourth contract had recently been awarded:

- In one project, the Bureau is modernizing the database that provides address lists, maps, and other geographic support services for the census. This project is on schedule to complete improvements by the end of fiscal year 2008 and is meeting cost estimates.
- In a second project, the Bureau is acquiring systems, equipment, and infrastructure for field staff to use in collecting census data. Deliverables provided to date include handheld mobile computing devices and installation of key support infrastructure. However, the schedule for this acquisition has been revised, resulting in delays in system development and testing of interfaces. Also, the life-cycle cost estimates for this program have increased, and we projected an \$18 million cost overrun by December 2008. According to the contractor, the overrun is due primarily to an increase in the number of system requirements.
- In a third project, the Bureau is acquiring a system for integrating paper, telephone responses, and field operations. The software development and testing are on schedule to provide (by December 2007) an initial system to process the major census forms during the Dress Rehearsal activities. However, the system development schedule was revised in October 2005, which is delaying some functionality. For example, a telephone-assistance system that was originally intended to be completed by fiscal year 2008 has been delayed. This acquisition is meeting current cost estimates.
- Finally, a contract to replace the current system used to tabulate and disseminate census data was recently delayed by about a year (it was

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<sup>4</sup>Address canvassing is a field operation to build a complete and accurate address list. In this operation, census field workers go door to door verifying and correcting addresses for all households and street features contained on decennial maps.

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ultimately awarded in September 2007). As a result, of the 1-year delay, the Dress Rehearsal activities will use the current tabulation and dissemination system rather than a modernized version.

The delays mean that the Dress Rehearsal operational testing will take place without the full complement of systems and functionality that was originally planned. As a result, further system testing will be necessary to ensure that the decennial systems work as intended. However, as of October 2007, Bureau officials had not finalized their plans for testing all the systems, and it is not clear whether these plans would include testing to address all interrelated systems and functionality, such as end-to-end testing.<sup>5</sup> According to officials, these plans will not be finalized until February 2008. Without sufficient testing of all systems and their functionality, the Bureau increases the risk that costs will increase further, that decennial systems will not perform as expected, or both.

As of October 2007, the four project teams managing the acquisitions had performed many practices associated with establishing sound and capable risk management processes. However, critical weaknesses remained. Specifically, three of the four project teams had developed risk management strategies identifying the scope of their risk management efforts; however, three project teams had weaknesses in identifying risks, establishing mitigation plans that identified planned actions and milestones, and reporting risk status to executive-level officials. For example, one project team did not adequately identify risks associated with performance issues experienced by handheld mobile computing devices. Further, in May and June 2007, both we and the Census Bureau observed the use of the handheld mobile computing device in Census-like conditions and these observations revealed a number of performance issues with the devices, such as slow and inconsistent data processing. The magnitude of these performance issues remains unclear. The Field Data Collection Automation (FDCA) contract anticipates the Bureau's need for data on the performance of the handheld mobile computing device; however, the Bureau has not fully specified the performance data it will use for the devices. As we have previously reported, a root cause of weaknesses in completing key risk management activities is the lack of

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<sup>5</sup>End-to-end testing is a form of operational testing that is performed to verify that a defined set of interrelated systems that collectively support an organizational core business function interoperate as intended in an operational environment. The interrelated systems include not only those owned and managed by the organization, but also the external systems with which they interface.

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policies for managing major acquisitions at the Bureau.<sup>6</sup> Until the project teams implement key risk management activities, they face an increased probability that decennial systems will not be delivered on schedule and within budget or perform as expected.

Because the entire complement of systems will not be available for Dress Rehearsal activities as originally planned, we recommended that the Census Bureau plan for and perform end-to-end testing so that all systems are tested in a census-like environment. Further, to help ensure that the three key acquisitions for the 2010 Census operate as intended, we recommended that the project teams strengthen risk management activities, including those associated with risk identification, mitigation, and oversight.

In written comments on a draft of our report, the department agreed to examine additional ways to manage risks and prepare a formal action plan in response to our final report. However, the department said it had a major disagreement with our findings with regard to not conducting operational testing on a full complement of the key decennial systems, stating it plans to test all critical systems and interfaces during the Dress Rehearsal or later. Nonetheless, the Bureau's test plans have not been finalized, and it remains unclear whether testing will address all interrelated systems and functionality in a census-like environment, as would be provided by end-to-end testing. Consistent with our recommendation, following up with documented test plans to do end-to-end testing will help ensure that decennial systems will work as intended.

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## Background

Conducting the decennial census is a major undertaking involving many interrelated steps including

- identifying and correcting addresses for all known living quarters in the United States (known as “address canvassing”);
- sending questionnaires to housing units;
- following up with nonrespondents through personal interviews;
- identifying people with nontraditional living arrangements;
- managing a voluminous workforce responsible for follow-up activities;

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<sup>6</sup>GAO, *Census Bureau: Important Activities for Improving Management of Key 2010 Decennial Acquisitions Remain to be Done*, [GAO-06-444T](#) (Washington, D.C.: Mar. 1, 2006).

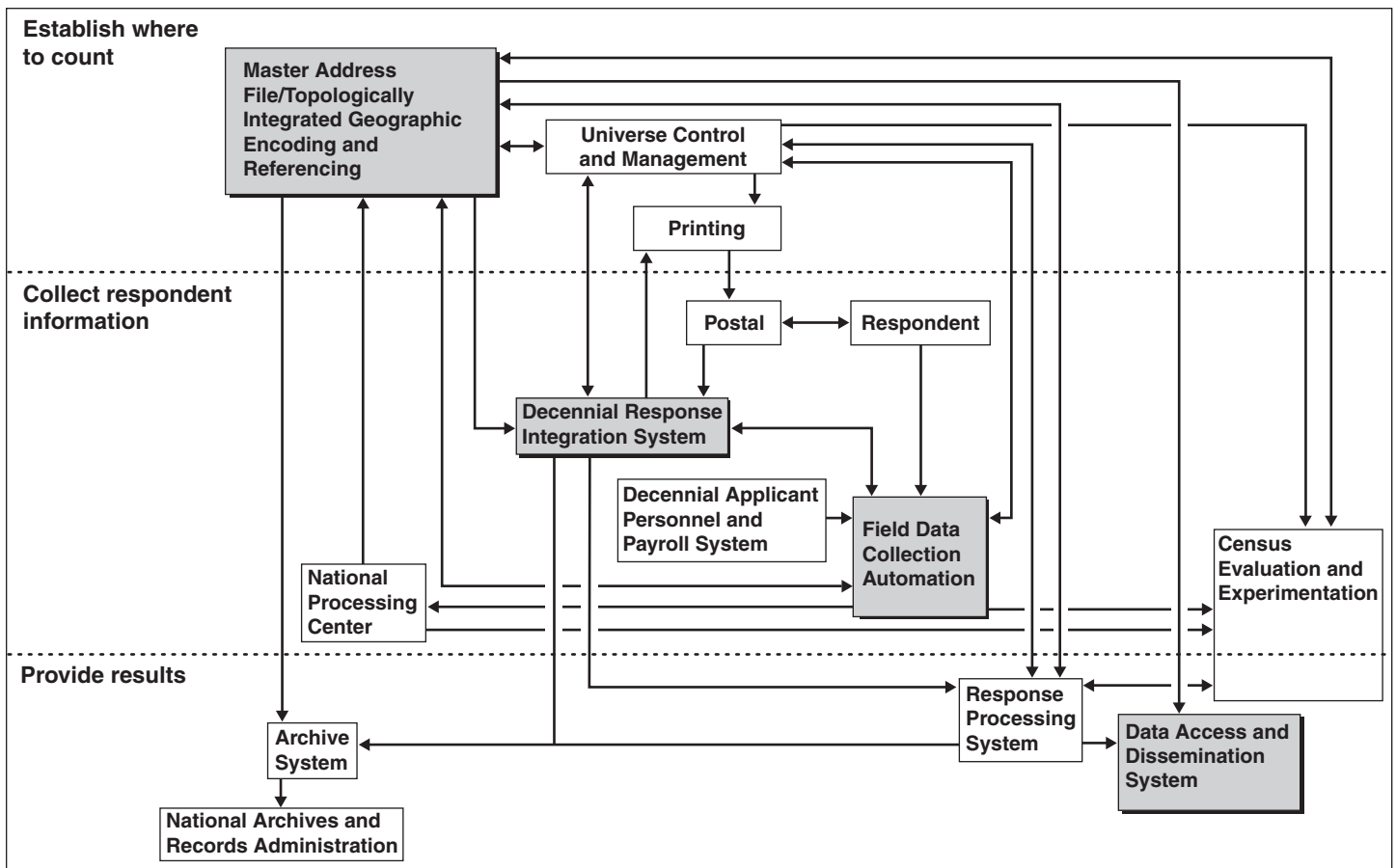
- 
- collecting census data by means of questionnaires, calls, and personal interviews;
  - tabulating and summarizing census data; and
  - disseminating census analytical results to the public.

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## Role of IT in the Decennial Census

The Bureau estimates that it will spend about \$3 billion on automation and IT for the 2010 Census, including four major systems acquisitions that are expected to play a critical role in improving coverage, accuracy, and efficiency. Figure 1 shows the key systems and interfaces supporting the 2010 Census, and highlights the four major IT systems we discuss today. As the figure shows, these four systems are to play important roles with regard to different aspects of the process.

**Figure 1: Key 2010 Census Systems and Interfaces**



Source: U.S. Census Bureau.

Note: Shaded boxes indicate systems discussed in the report.

To establish where to count (as shown in the top section of fig. 1), the Bureau will depend heavily on a database that provides address lists, maps, and other geographic support services. The Bureau’s address list, known as the Master Address File (MAF), is associated with a geographic information system containing street maps known as the Topologically Integrated Geographic Encoding and Referencing (TIGER®) database.<sup>7</sup>

<sup>7</sup>TIGER is a registered trademark of the U.S. Census Bureau.



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The MAF/TIGER database is the object of the first major IT acquisition—the MAF/TIGER Accuracy Improvement Project (MTAIP).

To collect respondent information (a process depicted in the middle section of fig. 1), the Bureau is pursuing two initiatives. First, the Field Data Collection Automation (FDCA) program is expected to provide automation support for field data collection operations as well as reduce costs and improve data quality and operational efficiency. This acquisition includes the systems, equipment, and infrastructure that field staff will use to collect census data, such as handheld mobile computing devices.<sup>8</sup> Second, the Decennial Response Integration System (DRIS) is to provide a system for collecting and integrating census responses from all sources, including forms, telephone interviews, and handheld mobile computing devices in the field. DRIS is expected to improve accuracy and timeliness by standardizing the response data and providing it to other Bureau systems for analysis and processing.

To provide results (see the bottom section of fig. 1), the Data Access and Dissemination System II (DADS II) acquisition is to replace legacy systems for tabulating and publicly disseminating data. The DADS II program is expected to provide comprehensive support to DADS. Replacement of the legacy systems is expected to

- maximize the efficiency, timeliness, and accuracy of tabulation and dissemination products and services;
- minimize the cost of tabulation and dissemination; and
- increase user satisfaction with related services.

Table 1 provides a brief overview of the four acquisitions.

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<sup>8</sup>Handheld mobile computing devices will be used to update the Bureau's address list, to perform follow-up at addresses for which no questionnaire was returned, and to perform activities to measure census coverage.

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**Table 1: Four Key IT Acquisitions Supporting Census 2010**

<b>IT acquisition</b>	<b>Purpose</b>
MAF/TIGER Accuracy Improvement Project (MTAIP)	Modernize the system that provides the address list, maps, and other geographic support services for the Census and other Bureau surveys
Field Data Collection Automation (FDCA)	Provide automated resources for supporting field data collection, including the provision of handheld mobile computing devices to collect data in the field, including address and map data
Decennial Response Integration System (DRIS)	Provide a solution for data capture and respondent assistance
Data Access and Dissemination System (DADS II)	Develop a replacement for the DADS legacy tabulation and dissemination systems

Source: GAO analysis of Census Bureau data.

Responsibility for these acquisitions lies with the Bureau's Decennial Management Division and the Geography Division. Each of the four acquisitions is managed by an individual project team staffed by Bureau personnel. Additional information on the contracts for these four systems is provided in appendix I of the report.

In preparation for the 2010 Census, the Bureau plans a series of tests of its (new and existing) operations and systems in different environments, as well as to conduct what it refers to as the Dress Rehearsal. During the Dress Rehearsal period, which runs from February 2006 through June 2009, the Bureau plans to conduct development and testing of systems, run a mock Census Day, and prepare for Census 2010, which will include opening offices and hiring staff. These Dress Rehearsal activities are to provide an operational test of the available system functionalities in a census-like environment, as well as other operational and procedural activities.

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## Decennial IT Acquisitions Were at Various Stages of Development and Showed Mixed Progress against Schedule and Cost Baselines

As of October 2007, three key decennial systems acquisitions were in process and a fourth contract had recently been awarded. The ongoing acquisitions (FDCA, DRIS) showed mixed progress in providing deliverables while adhering to planned schedules and cost estimates. The two ongoing projects had experienced schedule delays; the date for awarding the fourth contract was postponed several times. In addition, we estimated that one of the ongoing projects (FDCA) will incur about \$18 million in cost overruns. In response to schedule delays as well as other factors, including cost, the Bureau made schedule adjustments and planned to delay certain system functionality. As a result, Dress Rehearsal operational testing will not address the full complement of systems and functionality that was originally planned, and the Bureau has not yet finalized its plans for further system tests. Delaying functionality increases the importance of operational testing after the Dress Rehearsal to ensure that the decennial systems work as intended.

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## MTAIP Was Completing Improvements on Schedule and at Estimated Cost

MTAIP is a project to improve the accuracy of the MAF/TIGER database, which contains information on street locations, housing units, rivers, railroads, and other geographic features. We reported that MTAIP was on schedule to complete improvements by the end of fiscal year 2008 and was meeting cost estimates.

As of October 2007, the acquisition was in the second and final phase of its life cycle. In Phase II, which began in January 2003 and is ongoing, the contractor is developing improved maps for all 3,037 counties in the United States. We reported that the contractor had delivered more than 75 percent of these maps, which are due by September 2008. Beginning in fiscal year 2008, maintenance for the contract will begin. The contract closeout activities are scheduled for fiscal year 2009.

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## FDCA Had Provided Deliverables but Had Delayed Functionality and Was Experiencing Cost Increases

FDCA is to provide the systems, equipment, and infrastructure that field staff will use to collect census data. At the peak of the 2010 Census, about 4,000 field operations supervisors, 40,000 crew leaders, 500,000 enumerators and address listers, and several thousand office employees are expected to use or access FDCA.

As of October 2007, the contractor was in the process of developing and testing FDCA software for the Dress Rehearsal Census Day, and had delivered 1,388 handheld mobile computing devices to be used in address canvassing for the Dress Rehearsal. Also, key FDCA support infrastructure had been installed, including the Security Operation Center. In future

contract phases, the project will continue development, deploy systems and hardware, support census operations, and perform operational and contract closeout activities.

However, the Bureau revised FDCA's original schedule and delayed or eliminated some of its key functionality from the Dress Rehearsal, including the automated software distribution system. According to the Bureau, it revised the schedule because it realized it had underestimated the costs for the early stages of the contract, and that it could not meet the contractor's estimated level of first-year funding because the fiscal year 2006 budget was already in place. According to the Bureau, this initial underestimate led to schedule changes and overall cost increases.

According to the Bureau, FDCA was meeting all planned milestones on the revised schedule. For example, all sites for Regional Census Centers and Puerto Rico Area Offices had been identified. According to the Bureau, it is on schedule to open all these offices in January 2008.

The project life-cycle costs had increased. At contract award in March 2006, the total cost of FDCA was estimated not to exceed \$596 million. In May 2007, the life-cycle cost rose by a further \$23 million because of increasing system requirements, which resulted in an estimated life-cycle cost of about \$647 million. Table 2 shows the life-cycle cost estimates for FDCA as of October 2007.

**Table 2: FDCA Life-Cycle Cost Estimates**

Execution period	Start date	End date	Cost estimates (in millions)	
			September 2006	May 2007
Baseline planning period	March 31, 2006	June 30, 2006	\$11	\$11
Execution Period 1	July 1, 2006	December 31, 2008	200	225
Execution Period 2	January 1, 2009	September 30, 2011	319	318
Execution Period 3	August 1, 2010	End of contract	10	10
Leased equipment	N/A	N/A	12	12
Management reserve	N/A	N/A	7	5
Award fee	N/A	N/A	65	65
<b>Total</b>			<b>\$624</b>	<b>\$647</b>

Source: GAO analysis of Census Bureau data.

Note: Total may not add due to rounding.

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In addition, FDCA had already experienced \$6 million in cost overruns, and both our analysis and the contractor's analysis expected FDCA to experience additional cost overruns. Based on our analysis of cost performance reports (from July 2006 to May 2007), we projected that the FDCA project will experience further cost overruns by December 2008. The FDCA cost overrun was estimated between \$15 million and \$19 million, with the most likely overrun to be about \$18 million. The contractor, in contrast, estimated about a \$6 million overrun by December 2008.

According to the contractor, the major cause of projected cost overruns was the system requirements definition process. For example, in December 2006, the contractor noted a significant increase in the requirements for the Dress Rehearsal Paper Based Operations in Execution Period 1. According to the cost performance reports, this increase has meant that more work must be conducted and more staffing assigned to meet the Dress Rehearsal schedule.

The Bureau agreed that cost increases occurred in some cases because of the addition of new requirements, most of which related to the security of IT systems, but added that in other cases, increases occurred from the process of the contractor converting high-level functional requirements into more detailed specific requirements. However, the process of developing detailed requirements from high-level functional requirements does not inevitably lead to cost increases if the functional requirements were initially well-defined.

The FDCA schedule changes have increased the likelihood that the systems testing at the Dress Rehearsal will not be as comprehensive as planned. The inability to perform comprehensive operational testing of all interrelated systems increases the risk that further cost overruns will occur and that decennial systems will experience performance shortfalls.

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### After a Schedule Revision, DRIS Was Delivering Reduced Functionality at Projected Cost

DRIS is to provide a system for collecting and integrating census responses, standardizing the response data, and providing it to other systems for analysis and processing. The DRIS functionality is critical for providing assistance to the public via telephone and for monitoring the quality and status of data capture operations.

Although DRIS was currently on schedule to meet its December 2007 milestone, the Bureau revised the original DRIS schedule after the contract was awarded in October 2005. Under the revised schedule, the

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Bureau delayed or eliminated some functionality that was expected to be ready for the Dress Rehearsal mock Census Day.

According to Bureau officials, they delayed the schedule and eliminated functionality for DRIS when they realized they had underestimated the fiscal years 2006 through 2008 costs for development. As shown in table 3, the government's funding estimates for DRIS Phase I were significantly lower than the contractor's.

**Table 3: DRIS Cost Estimates for Phase I (as of March 2006)**

Fiscal year	Cost estimates (in millions)	
	Contractor	Government
2006	\$18.6	\$11.2
2007	53.3	23.8
2008	48.7	31.5
<b>Total</b>	<b>\$120.6</b>	<b>\$66.5</b>

Source: GAO analysis of Census Bureau data.

Originally, the DRIS solution was to include paper, telephone, Internet, and field data collection processing; selection of data capture sites; and preparation and processing of 2010 Census forms. However, the Bureau reduced the scope of the solution by eliminating the Internet functionality. In addition, the Bureau has stated that it will not have a robust telephone questionnaire assistance system in place for the Dress Rehearsal. As of October 2007, the Bureau was also delaying selecting sites for data capture centers, preparing data capture facilities, and recruiting and hiring data capture staff.

Although Bureau officials told us that the revisions to the schedule should not affect meeting milestones for the 2010 Census, the delays mean that more systems development and testing will need to be accomplished later. Given the immovable deadline of the decennial census, the Bureau is at risk of reducing functionality or increasing costs to meet its schedule.

The DRIS project was not experiencing cost overruns, and our analysis of cost performance reports from April 2006 to May 2007 projected no cost overruns by December 2008. As of May 2007, the DRIS contract value had not increased.

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## DADS II Contract Had Recently Been Awarded after a Delay

The DADS II acquisition is to replace the legacy DADS systems, which tabulate and publicly disseminate data from the decennial census and other Bureau surveys.<sup>9</sup> The DADS II contractor is also expected to provide comprehensive support to the Census 2000 legacy DADS systems.

The DADS II contract award date had been delayed multiple times. The award date was originally planned for the fourth quarter of 2005, but the date changed to August 2006. On March 8, 2006, the Bureau estimated it would delay the award of the DADS II contract from August to October 2006 to gain a clearer sense of budget priorities before initiating the request for proposal process. The Bureau then delayed the contract award again by about another year. In January 2007, the Bureau released the DADS II request for proposal, and the contract was finally awarded in September 2007. Because of these delays, DADS II will not be developed in time for the Dress Rehearsal. Instead, the Bureau will use the legacy DADS system for tabulation during the Dress Rehearsal. Nonetheless, the Bureau plans to have the DADS II system available for the 2010 Census.

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## Delayed Functionality Increases the Importance of Further Operational Testing

Operational testing helps verify that systems function as intended in an operational environment. However, for operational system testing to be comprehensive, system functionality must be completed. Further, for multiple interrelated systems, end-to-end testing is performed to verify that all interrelated systems, including any external systems with which they interface, are tested in an operational environment. However, as described above, two of the projects had delayed planned functionality to later phases, and one project contract had just recently been awarded in September 2007. As a result, the operational testing that is to occur during the Dress Rehearsal period around April 1, 2008, will not include tests of the full complement of decennial census systems and their functionality. As of October 2007, the Bureau had not yet finalized its plans for system tests. If further delays occur, the importance of these system tests will increase. Delaying functionality and not testing the full complement of systems increases the risk that costs will rise further, that decennial systems will not perform as expected, or both.

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<sup>9</sup>The DADS II contract was originally planned to establish a new Web-based system that would serve as a single point for public access to all census data and integrate many dissemination functions currently spread across multiple Bureau organizations.

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## The Bureau Was Making Progress in Risk Management Activities but Critical Weaknesses Remained

The project teams varied in the extent to which they followed disciplined risk management practices. For example, three of the four project teams had developed strategies to identify the scope of the risk management effort. However, three project teams had weaknesses in identifying risks, establishing adequate mitigation plans, and reporting risk status to executive-level officials. These weaknesses in completing key risk management activities can be attributed in part to the absence of Bureau policies for managing major acquisitions, as we described in an earlier report.<sup>10</sup> Without effective risk management practices, the likelihood of project success is decreased.

According to the Software Engineering Institute (SEI), the purpose of risk management is to identify potential problems before they occur. When problems are identified, risk-handling activities can be planned and invoked as needed across the life of a project in order to mitigate adverse impacts on objectives. Effective risk management involves early and aggressive risk identification through the collaboration and involvement of relevant stakeholders. Based on SEI's Capability Maturity Model<sup>®</sup> Integration (CMMI<sup>®</sup>), risk management activities can be divided into four key areas

- preparing for risk management,
- identifying and analyzing risks,
- mitigating risks, and
- executive oversight.

The discipline of risk management is important to help ensure that projects are delivered on time, within budget, and with the promised functionality. It is especially important for the 2010 Census, given the immovable deadline.

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<sup>10</sup>[GAO-06-444T](#).



**Project Teams Had Usually Established Risk Preparation Activities, but Some Improvements in These Activities Were Needed**

Risk preparation involves establishing and maintaining a strategy for identifying, analyzing, and mitigating risks. The risk management strategy addresses the specific actions and management approach used to perform and control the risk management program. It also includes identifying and involving relevant stakeholders in the risk management process. Table 4 shows the status of the four project teams' implementation of key risk preparation activities as of October 2007.<sup>11</sup>

**Table 4: Risk Management Preparation Activities Completed for the Key 2010 Census Systems**

Specific practices	MTAIP	FDCA	DRIS	DADS
Determine risk sources and categories	○	●	●	●
Define parameters used to analyze and categorize risks and parameters used to control risk management efforts	●	●	●	●
Establish and maintain the strategy to be used for risk management	◐	●	●	●
Identify and involve the relevant stakeholders of the risk management process as planned	◐	◐	●	◐

- practice fully implemented
- ◐ practice partially implemented
- practice not implemented

Source: GAO analysis of project data.

As the table shows, three project teams had established most of the risk management preparation activities. However, the MTAIP project team had implemented the fewest practices. The team did not adequately determine risk sources and categories or adequately develop a strategy for risk management. As a result, the project's risk management strategy was not comprehensive and did not fully address the scope of the risk management effort, including discussing techniques for risk mitigation and defining adequate risk sources and categories. In addition, three project teams (MTAIP, FDCA, and DADS II) had weaknesses regarding stakeholder involvement. The three teams did not provide sufficient evidence that the

<sup>11</sup>This analysis primarily addresses project teams' implementation of risk management processes. According to our analysis, the contractors for the three contracts awarded (MTAIP, FDCA, and DRIS) had implemented adequate risk management processes involving risk preparation, risk identification and analysis, and risk mitigation.

relevant stakeholders were involved in risk identification, analysis, and mitigation activities; reviewing the risk management strategy and risk mitigation plans; or communicating and reporting risk management status.

These weaknesses can be attributed in part to the absence of Bureau policies for managing major acquisitions, as we described in our earlier reports.<sup>12</sup> Without adequate preparation for risk management, including establishing an effective risk management strategy and identifying and involving relevant stakeholders, project teams cannot properly control the risk management process.

## The Project Teams Had Identified and Analyzed Risks but Not All Key Risks Were Identified

Risks must be identified and described in an understandable way before they can be analyzed and managed properly. This includes identifying risks from both internal and external sources and evaluating each risk to determine its likelihood and consequences. Table 5 shows the status of the four project teams' implementation of key risk identification and evaluation activities at the time of our October 2007 report.

**Table 5: Risk Identification and Evaluation Activities Completed for the Key 2010 Census Systems**

Specific practices	MTAIP	FDCA	DRIS	DADS
Identify and document the risks	●	◐	●	◐
Evaluate and categorize each identified risk using the defined risk categories and parameters, and determine its relative priority	◐	●	●	●

- practice fully implemented
- ◐ practice partially implemented
- practice not implemented

Source: GAO analysis of project data.

<sup>12</sup>GAO, *Information Technology Management: Census Bureau Has Implemented Many Key Practices, but Additional Actions Are Needed*, [GAO-05-661](#) (Washington, D.C.: June 16, 2005) and GAO, *Census Bureau: Important Activities for Improving Management of Key 2010 Decennial Acquisitions Remain to be Done*, [GAO-06-444T](#) (Washington, D.C.: Mar. 1, 2006).

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As of July 2007, the MTAIP and DRIS project teams were adequately identifying and documenting risks, including system interface risks. For example, the MTAIP project team identified significant risks regarding potential changes in funding and the turnover of contractor personnel as the program nears maturity, and the DRIS project team identified significant risks regarding new system security regulations, changes or increases to Phase II baseline requirements, and new interfaces after Dress Rehearsal.

In contrast, the FDCA project team had not identified or documented any significant risks related to the handheld computers that will be used in the 2010 Census, despite problems arising during the Dress Rehearsal. The computers are designed to automate operations for field staff and eliminate the need to print millions of paper questionnaires and maps used by temporary field staff to conduct address canvassing and nonresponse follow-up. Automating operations may allow the Bureau to reduce the cost of operations; thus, it is critical that the risks surrounding the use of the handheld computers be closely monitored and effectively managed to ensure their success. However, the Bureau has not identified or documented risks associated with a variety of handheld computers performance problems that we identified through field work conducted at your request. Specifically, we found that during Dress Rehearsal activities between May 2007 and June 2007, as the Bureau tested a prototype of the handheld computers, field staff experienced multiple problems. For example, the field staff told us that they experienced slow and inconsistent data transmissions from the handheld computers to the central data processing center. The field staff reported the device was slow to process addresses that were a part of a large assignment area. Bureau staff reported similar problems with the handheld computers in observation reports, help desk calls, and debriefing reports. In addition, our own analysis of Bureau documentation revealed problems with the handheld computers:

- Bureau observation reports revealed that the Bureau most frequently observed problems with slow processing of addresses, large assignment areas, and transmission.
- The help desk call log revealed that field staff most frequently reported issues with transmission, the device freezing, mapspotting and assignment areas.
- Debriefing reports illustrated the impact of the handheld mobile computing problems on address canvassing. For example, one

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participant commented that the field staff struggled to find solutions to problems and wasted precious time in replacing the devices.

- A time-and-motion study conducted by the Census Bureau indicated that field staff reported significant downtime in two test locations—about 23 percent in one location and about 27 percent in another location. The study, which is a draft that is subject to change, also described occurrences of failed transmissions and field staff attempts to resolve transmission problems.

Collectively, the observation reports, help desk calls, debriefing reports, and time-and-motion study raised serious questions about the performance of the handheld computers during the address canvassing operation. According to the Bureau, the contractor has used these indicators to identify and address underlying problems during the Dress Rehearsal. Still, the magnitude of handheld computers performance issues throughout the Dress Rehearsal remains unclear. For example, the Bureau received analyses from the contractor on average transmission times. However, the contractor has not provided analyses that show the full range of transmission times, nor how this may have changed throughout the entire operation.

In addition, the Bureau has not fully specified how it will measure performance of the handheld computers, even though the FDCA contract anticipates the Bureau's need for data on the performance of the handheld computers. The FDCA contract outlines the type of data the contractor will provide the Bureau on the performance of the handheld computers. Specifically, sections of the FDCA contract require the handheld computers to have a transmission log with what was transmitted, the date, time, user, destination, content/data type, and the outcome status. Another section of the Bureau's FDCA contract states that the FDCA contractor shall provide near real time reporting and monitoring of performance metrics and a "control panel/dash board" application to visually report those metrics from any Internet enabled PC. However, the contractor and the Bureau are not using a dashboard for Dress Rehearsal activities. Rather, during the Dress Rehearsal, the Bureau plans to identify what data and performance they would need for tracking the performance of the handheld computers in 2010 operations.

In order for the Bureau to ensure that the FDCA handheld computers are ready for full scale operations, it will have to identify risks on a tight time frame. We recommended in a report on the Bureau's earlier version of the handheld computers that the Bureau define specific, measurable

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performance requirements for the handheld computer and other census-taking activities that address such important measures as productivity, cost savings, reliability, durability, and that the Bureau test the device's ability to meet those requirements in 2006.<sup>13</sup> We also recommended in a March 2006 testimony that the Bureau validate and approve FDCA baseline requirements.<sup>14</sup> The Bureau is working within a compressed time frame. By law, the decennial census must occur on April 1, 2010, and the results must be submitted to the President in December 2010. These dates cannot be altered, even if preparations are delayed. Access to real-time performance metrics via a "control panel/dash board" would assist Bureau management in assessing the handheld computer's performance and maximize the amount of time the Bureau and the contractor would have to remedy any problems identified during operations. Further, the Bureau's tight 2010 Decennial Operations Schedule allows little time for fixing problems with the device, raising the importance of the Bureau's access to these performance indicators. Such data would help fully inform stakeholders of the risks associated with the handheld computer, and allow project teams to develop mitigation activities to help avoid, reduce, and control the probability of these risks occurring.

Finally, the FDCA and DADSII project teams did not provide evidence that specific system interface risks are being adequately identified to ensure that risk handling activities will be invoked should the systems fail during 2010 Census. For example, although the DADS II will not be available for the Dress Rehearsal, the project team did not identify any significant interface risks associated with this system.

One reason for these weaknesses, as mentioned earlier, is the lack of Bureau policies for managing major acquisitions. If risks are not adequately identified and analyzed, management may be prevented from monitoring and tracking risks, and taking the appropriate mitigation actions, increasing the probability that the risks will materialize and magnifying the extent of damage incurred in such an event.

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<sup>13</sup>GAO, *2010 Census: Basic Design Has Potential, but Remaining Challenges Need Prompt Resolution*, [GAO-05-9](#) (Washington, D.C.: January 12, 2005).

<sup>14</sup>[GAO-06-444T](#).

## Three of Four Project Teams' Risk Mitigation Plans and Monitoring Activities Were Incomplete

Risk mitigation involves developing alternative courses of action, workarounds, and fallback positions, with a recommended course of action for the most important risks to the project. Mitigation includes techniques and methods used to avoid, reduce, and control the probability of occurrence of the risk; the extent of damage incurred should the risk occur; or both. Table 6 shows the status of the four project teams' implementation of key risk mitigation activities.

**Table 6: Risk Mitigation Activities Completed for Key 2010 Census Systems**

Specific practices	MTAIP	FDCA	DRIS	DADS
Develop a risk mitigation plan for the most important risks to the project, as defined by the risk management strategy	◐	◐	●	○
Monitor the status of each risk periodically and implement the risk mitigation plan as appropriate	◐	◐	●	◐

- practice fully implemented
- ◐ practice partially implemented
- practice not implemented

Source: GAO analysis of project data.

Three project teams (MTAIP, FDCA, and DADS II) had developed mitigation plans that were often untimely or included incomplete activities and milestones for addressing the risks. Some of these untimely and incomplete activities and milestones included the following:

- The FDCA project team had developed mitigation plans for the most significant risks, but the plans did not always identify milestones for implementing mitigation activities. Moreover, the plans did not identify any commitment of resources, several did not establish a period of performance, and the team did not always update the plans with the latest information on the status of the risk. In addition, the FDCA project team did not provide evidence of developing mitigation plans to handle the other significant risks as described in their risk mitigation strategy. (These risks included a lack of consistency in requirements definition and insufficient FDCA project office staffing levels).
- The mitigation plans for DADS II were incomplete, with no associated future milestones and no evidence of continual progress in working towards mitigating a risk. In several instances, DADS II mitigation plans were listed as “To Be Determined.”

With regard to the second practice in the table (periodically monitoring risk status and implementing mitigation plans), the MTAIP, FDCA, and DADS II project teams were not always implementing the mitigation plans as appropriate. For example, although the MTAIP project team has periodically monitored the status of risks, its mitigation plans do not include detailed action items with start dates and anticipated completion dates; thus, the plans do not ensure that mitigation activities are implemented appropriately and tracked to closure. The FDCA and DADS II project teams did not identify system interface risks nor prepare adequate mitigation plans to ensure that systems will operate as intended. Because they did not develop complete mitigation plans, the MTAIP, FDCA, and DADS II project teams cannot ensure that for a given risk, techniques and methods will be invoked to avoid, reduce, and control the probability of occurrence.

### Project Teams Were Inconsistent in Reporting Risk Status to Executive-Level Management

Reviews of the project teams' risk management activities, status, and results should be held on a periodic and event-driven basis. The reviews should include appropriate levels of management, such as key Bureau executives, who can provide visibility into the potential for project risk exposure and appropriate corrective actions. Table 7 shows the status of the four project teams' implementation of activities for senior-level risk oversight at the time of our prior report.

**Table 7: Executive-Level Risk Oversight Activities Completed for the Key 2010 Decennial Systems**

Specific practices	MTAIP	FDCA	DRIS	DADS
Review the activities, status, and results of the risk management process with executive-level management, and resolve issues	○	○	●	●

- practice fully implemented
- ◐ practice partially implemented
- practice not implemented

Source: GAO analysis of project data.

The project teams were inconsistent in reporting the status of risks to executive-level officials. DRIS and DADS II did regularly report risks; however, the FDCA and MTAIP projects did not provide sufficient evidence to document that these discussions occurred or what they covered. Failure to report a project's risks to executive-level officials

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reduces the visibility of risks to executives who should be playing a role in mitigating them.

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## Implementation of GAO Recommendations Should Help Improve the Bureau's Risk Management

To help ensure that the Bureau's four key acquisitions for the 2010 Census operate as intended, we made several recommendations in our report. First, to ensure that the Bureau's decennial systems are fully tested, we recommended that the Secretary of Commerce require the Director of the Census Bureau to direct the Decennial Management Division and Geography Division to plan for and perform end-to-end testing so that the full complement of systems are tested in a census-like environment.

In written comments on a draft of our final report, the department disagreed with our findings that a full complement of systems would not be tested, stating it plans to do so during the Dress Rehearsal or later. Nonetheless, the Bureau's test plans have not been finalized, and it remains unclear whether testing will address all interrelated systems and functionality in a census-like environment, as would be provided by end-to-end testing. Consistent with our recommendation following up with documented test plans to do end-to-end testing will help ensure that decennial systems will work as intended.

Further, we recommended that the Secretary direct the Director of the Census Bureau to ensure that project teams strengthen risk management activities associated with risk identification, mitigation, and oversight. The department agreed to examine additional ways to manage risks and is working on an action plan to strengthen risk management activities.

In summary, the IT acquisitions planned for 2010 Census will require continued oversight to ensure that they are achieved on schedule and at planned cost levels. Although, as of October 2007, the MTAIP and DRIS acquisitions were currently meeting cost estimates, FDCA was not. In addition, while the Bureau was making progress developing systems for the Dress Rehearsal, it was deferring certain functionality, with the result that the Dress Rehearsal operational testing would address less than a full complement of systems. Delaying functionality increases the importance of later development and testing activities, which will have to occur closer to the census date. It also raises the risk of cost increases, given the immovable deadline for conducting the 2010 Census.

Further, the Bureau's project teams for each of the four acquisitions had implemented many practices associated with establishing sound and capable risk management processes, but they were not always consistent:



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the teams had not always identified risks, developed complete risk mitigation plans, or briefed senior-level officials on risks and mitigation plans. At this stage, we are particularly concerned about managing the risks associated with the handheld mobile computing devices, the numerous systems interfaces, and the remaining systems testing. Regarding the handheld mobile computing devices, it is critical that performance of these devices is clearly specified, measured, and that deficiencies in performance is effectively addressed. Until the project teams and the Decennial Management Division implement appropriate risk management activities, they face an increased probability that decennial systems will not be delivered on schedule and within budget or perform as expected.

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Mr. Chairman and members of the subcommittee, this concludes our statement. We would be happy to respond to any questions that you or members of the subcommittee may have at this time.

If you have any questions on matters discussed in this testimony, please contact David A. Powner at (202) 512-9286 or Mathew Scirè at (202) 512-6806 or by e-mail at [pownerd@gao.gov](mailto:pownerd@gao.gov) or [sciremj@gao.gov](mailto:sciremj@gao.gov). Other key contributors to this testimony include Mathew Bader, Thomas Beall, Jeffrey DeMarco, Richard Hung, Barbara Lancaster, Andrea Levine, Signora May, Cynthia Scott, Niti Tandon, Amos Tevelow, Jonathan Ticehurst, and Timothy Wexler.

# Appendix I: Key 2010 Census Information Technology Acquisitions

<b>IT acquisition</b>	<b>Contractor</b>	<b>Purpose</b>	<b>Contract type</b>	<b>Contract award</b>
MAF/TIGER Accuracy Improvement Project (MTAIP)	Harris Corporation	Modernize the system that provides the address list, maps, and other geographic support services for the Census and other Bureau surveys	Cost plus award fee	June 2002
Field Data Collection Automation (FDCA)	Harris Corporation	Provide automated resources for supporting field data collection, including the provision of handheld mobile computing devices to collect data in the field, including address and map data	Cost plus award fee with some firm fixed price elements	March 2006
Decennial Response Integration System (DRIS)	Lockheed Martin Corporation	Provide a solution for data capture and respondent assistance	Cost plus award fee with some firm fixed price elements	October 2005
Data Access and Dissemination System (DADS II)	IBM	Develop a replacement for the DADS legacy tabulation and dissemination systems	To be determined	September 2007

Source: GAO analysis of Census Bureau data.

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