STATUS OF THE FEDERAL BUREAU OF INVESTIGATION'S IMPLEMENTATION OF THE SENTINEL PROJECT

U.S. Department of Justice
Office of the Inspector General

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Introduction

On March 16, 2006, the Federal Bureau of Investigation (FBI) announced the award of a $305 million contract to Lockheed Martin Services, Incorporated (Lockheed Martin), as part of a $425 million project to develop the Sentinel information and investigative case management system. In its original plan, the FBI expected to develop Sentinel in four overlapping phases, each lasting 12 to 16 months. Each phase, when deployed, was to provide a stand-alone set of capabilities upon which subsequent phases would add further capabilities. The FBI originally scheduled the fourth and final phase of Sentinel to be completed by December 2009.

On June 19, 2007, the FBI announced that it had fully deployed Phase 1 of Sentinel. As a result of lessons learned during the development of Phase 1, however, the FBI and Lockheed Martin replanned the remaining phases of Sentinel before developing Phase 2. During this replanning, the FBI and Lockheed Martin adopted an incremental development methodology for the remaining portions of Sentinel that divided Phases 2 through 4 into segments, which were further divided into increments. A major reason for switching to this incremental development model was the FBI's desire to deliver new capabilities to users every 3 to 6 months.

At the request of the FBI Director and congressional committees, the Department of Justice Office of the Inspector General (OIG) has been performing reviews and reporting on the progress of the FBI's development of Sentinel. This report is the sixth in the series of reviews that the OIG has conducted to evaluate the FBI's progress in developing and implementing Sentinel.

In our previous reports we expressed concerns about Sentinel's overall progress, aggressive schedule, increased costs, and inability to satisfy user requirements. In our most recent report, issued in November 2009, we identified areas associated with the development of Sentinel that warranted continued monitoring, including the migration of case data into Sentinel, the level of user involvement throughout the remainder of Sentinel's development, and the staffing of the Sentinel Project Management Office (PMO).[1]

[1] U.S. Department of Justice Office of the Inspector General, *Sentinel Audit V: Status of the Federal Bureau of Investigation's Case Management System,* Audit Report 10-03 (November 2009).

During our current review, we have found significant issues that we believe could affect the successful implementation of Sentinel. Because of the significance of these issues, and the recent actions taken by the FBI regarding Sentinel, we are issuing this technical assistance report to report on these important issues in a timely manner and to recommend that the FBI address these concerns expeditiously.[2] Prior to issuing this report, we provided a draft to the FBI and Lockheed Martin for their review. Their comments were considered in drafting this final report.

OIG Results in Brief

We have serious concerns about the progress of the FBI's Sentinel project. As we have previously reported, the FBI has had difficulty establishing and maintaining a strict cost and schedule for the Sentinel project. The FBI originally estimated the project would cost $425 million and be completed by December 2009. However, we reported in our November 2009 audit report that Sentinel's overall project completion date had been extended to September 2010, 9 months later than originally planned, and the total projected cost of the project was $451 million, $26 million more than originally planned.

Our concerns about the FBI's ability to complete Sentinel in a timely and cost-effective manner have escalated. As of March 2010, the FBI does not have official cost or schedule estimates for completing Sentinel. The remaining budget, schedule, and work to be performed on Sentinel are currently being renegotiated between the FBI and Lockheed Martin. While the FBI does not yet have official estimates, FBI officials have acknowledged that the project will cost more than its latest revised estimate of $451 million and will likely not be completed until 2011.

Our November 2009 audit also reported that the FBI had accepted delivery of Sentinel's Phase 2 Segment 3, that the FBI and Lockheed Martin had encountered considerable challenges in deploying these deliverables, and that the FBI had deferred deployment of some of these deliverables to later stages of the Sentinel project. On March 3, 2010, because of significant issues regarding Phase 2 Segment 4's usability, performance, and quality delivered by Lockheed Martin, the FBI issued a partial stop-work order to Lockheed Martin for portions of Phase 3 and all of Phase 4. In

[2] This technical assistance report is not intended to comply with generally accepted government auditing standards, as a full-scale audit report would.

addition, the stop-work order returned Phase 2 Segment 4 of the project from operations and maintenance activities to the development phase.[3]

We are also concerned that the FBI conditionally accepted delivery of Phase 2 Segment 4 in December 2009, knowing that Sentinel had serious performance and usability issues and after receiving overwhelmingly negative user feedback during testing. Moreover, the FBI spent an additional $780,000 of discretionary operations and maintenance funds to correct Phase 2 defects after it accepted the product as delivered. Now the FBI does not have official cost or schedule estimates for completing Sentinel.

We found that the Phase 2 Segment 4 cost increase and schedule delay occurred for several reasons. First, there were significant problems with the usability of electronic forms that were developed for Sentinel. Second, there were 26 critical issues related to the functionality of Sentinel that required resolution before deployment. Third, Sentinel's utilization and compatibility with network security features in the FBI's Public Key Infrastructure (PKI) did not meet the FBI's expectations.[4] Fourth, an independent review conducted at the FBI's request concluded that Lockheed Martin had deviated from accepted systems engineering processes in developing the software code for Sentinel.

In addition to the cost and schedule changes, the FBI is having difficulty in ensuring that the Sentinel program is meeting established requirements, particularly in meeting user needs.

Because of these ongoing issues, the OIG has serious concerns about the progress of Sentinel.

March 2010 Partial Stop-Work Order

On March 3, 2010, the FBI issued a partial stop-work order for portions of Phase 3 and all of Phase 4 of Sentinel. The stop-work order directed Lockheed Martin to cease work on the development of all but three areas of Phase 3: data migration, system interfaces, and hardware. The

[3] The purpose of the development phase is to produce and test an IT system. The purpose of operations and maintenance is (1) to maintain and support functionality, and (2) to manage and implement necessary modifications to functionality after the conclusion of the development phase. An IT system normally moves sequentially from development to operations and maintenance, where it remains until obsolescence.

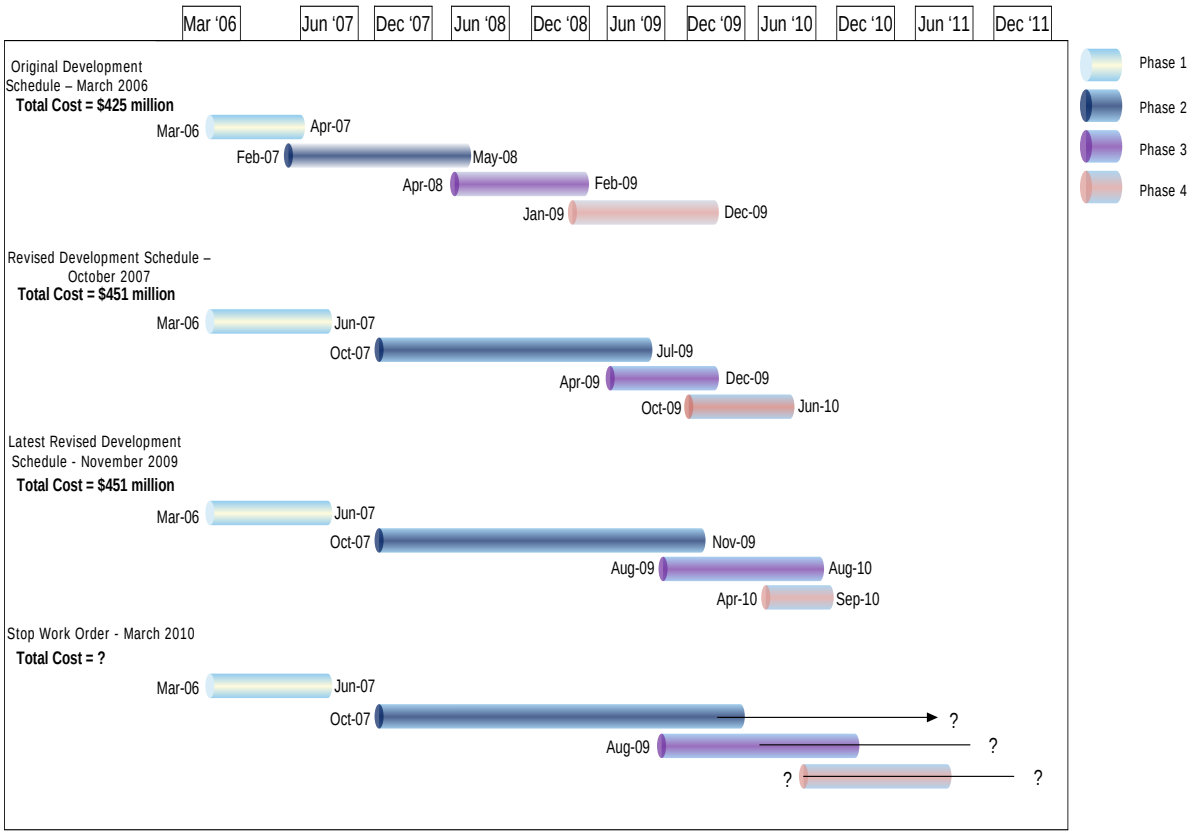
[4] The Public Key Infrastructure (PKI) uses smartcards and encryption to enhance network security. Sentinel's integration with PKI will enhance its security and also allow users to digitally sign documents.

FBI's Deputy Chief Information Officer told us that work continues on these three areas of Phase 3 because they are lengthy efforts that involve multiple phases of Sentinel and because the FBI believes Lockheed Martin is making significant progress in each area.

The FBI stated that the purpose of the partial stop-work order is to focus Lockheed Martin's efforts on delivering Phase 2 Segment 4 in a form that the FBI finds acceptable. The FBI had conditionally accepted Phase 2 Segment 4 on December 2, 2009, which provided three electronic forms and the associated electronic workflows, the capability to transfer all of the administrative case files from ACS to Sentinel, and an on-line user help tool. However, the FBI never deployed the phase to FBI users because of FBI concerns with the system's performance, usability, and software code quality. The March 3, 2010 stop-work order also returned Phase 2 Segment 4 from operations and maintenance activities, which it entered when the FBI conditionally accepted the segment, back into the development phase.

The following sections of this report describe the status of Phases 2 and 3 before the FBI issued the partial stop-work order. As of March 15, 2010, the FBI and Lockheed Martin had not agreed to a new cost estimate and schedule for the completion of Sentinel.

Sentinel Schedule and Cost Adjustments



Source: OIG Analysis of Sentinel Project Documentation

Phase 2 Status

Sentinel's Phase 2, which is divided into four segments, was intended to deliver electronic forms, implement more efficient work processes, and migrate administrative case data currently in the FBI's Automated Case Support system (ACS) to Sentinel.[5] As we described in greater detail in our November 2009 report, the FBI accepted Segment 3 of Phase 2 in April 2009. This segment was planned to deliver eight forms to FBI users. However, because of overwhelming negative user feedback received during testing, including concerns about the usability of the forms that Lockheed Martin delivered, the FBI did not deploy the forms. As a result of these issues, the FBI redesigned the forms and replanned Segment 4 of Phase 2, a decision that increased the cost of Phase 2 by $2.9 million.

[5] Electronic forms are the Sentinel screens that agents, analysts, and staff will use to input case information. This information will then be loaded into and maintained by Sentinel.

Segment 4 Delivery and Conditional Acceptance

In November 2009, Lockheed Martin delivered the last segment of Phase 2 – Segment 4, which included the migration of administrative case data from ACS to Sentinel, the development of several electronic forms, a search capability within Sentinel, and interfaces to two FBI systems external to Sentinel. Despite serious performance and usability issues with Segment 4 deliverables, the FBI conditionally accepted Sentinel's Segment 4 from Lockheed Martin on December 2, 2009. At that time, however, the FBI directed Lockheed Martin to correct 26 critical performance and usability issues before the FBI would initiate the pilot deployment of Segment 4. To gather additional performance data and user feedback, the FBI plans to conduct a test deployment at two FBI field offices before it deploys Segment 4 to the entire FBI.

FBI officials told us that they conditionally accepted Segment 4 because they believed it met most of the FBI requirements. Additionally, the FBI's conditional acceptance of Segment 4 prohibited Lockheed Martin from incurring any additional Segment 4 development costs without specific written permission from the FBI's Contracting Officer. Consequently, Phase 2 moved into the operations and maintenance phase.

During FBI user testing of Segment 4 deliverables in November 2009, the FBI identified several issues with Sentinel's performance. For example, one tester reported that it had taken over 4 minutes to attach a picture file to a Sentinel form and there was no way to stop that process once it had begun. Additionally, a Sentinel PMO official stated that users experienced waiting times of over 30 seconds each for Sentinel to render a blank form for completion, and for Sentinel to save a completed form. FBI employee testers stated that if Sentinel were released at that time, it would decrease user productivity, have a detrimental impact on investigations, and lose credibility as a valuable case management tool. Ninety-one percent of the testers "did not succeed" when they tried to create one or more Electronic Communications, one of the documents most frequently used in the FBI to convey information between employees. Moreover, 82 percent of the testers stated that the Sentinel capabilities they tested would make the completion of the related tasks "much harder" than current FBI practices.

As a result of the user testing feedback and other concerns, Sentinel PMO officials decided to delay deployment of Segment 4 because they determined that the segment's deliverables did not function well enough to deploy to all Sentinel users. Additionally, pilot testing of the Segment 4 deliverables, which had been planned for November 16, 2009, was postponed because of the extensive negative tester feedback. Full

deployment of the Segment capabilities, originally scheduled for December 16, 2009, was also delayed. The pilot testing for Segment 4 has subsequently been delayed several times and the FBI does not have a current schedule for piloting the Segment 4 deliverables.

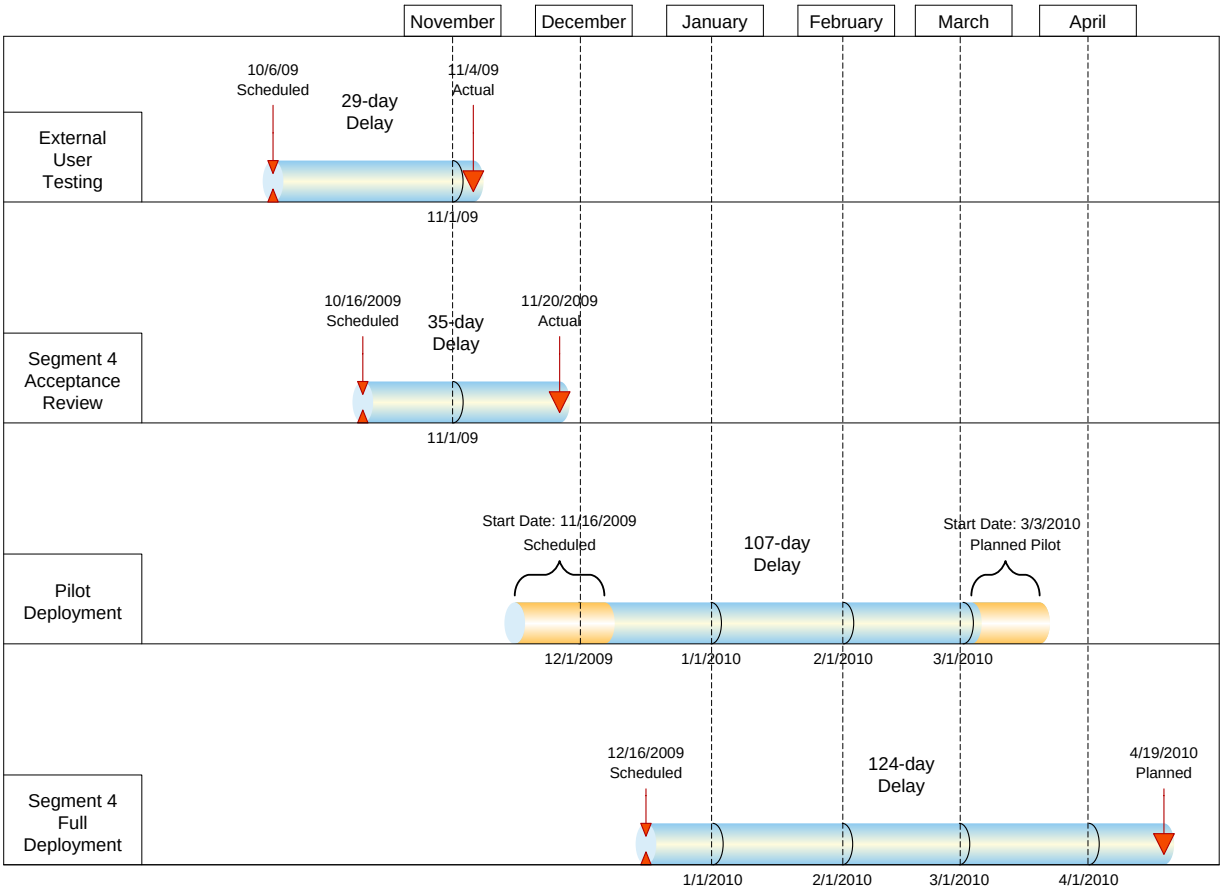
Segment 4 Budget and Schedule

At the time the FBI conditionally accepted Phase 2 Segment 4, its development budget, which had increased several times since the phase began, was $144.1 million. Lockheed Martin incurred $144.7 million in Phase 2 development costs, exceeding Phase 2's development budget by over $550,000. Phase 2's schedule was also extended several times. In total, Lockheed Martin took 35 days longer than allocated for Phase 2 in Sentinel's latest revised schedule to deliver Phase 2 Segment 4.[6]

[6] In the 2 months following the FBI's conditional acceptance of Phase 2 Segment 4 in December 2009, the FBI spent approximately $780,000 from the Phase 2 operations and maintenance budget for work Lockheed Martin performed in an effort to correct Sentinel's performance and usability issues. This type of work is typically charged to a project's development budget.

The following table shows the delays in the four activities necessary for the FBI and Lockheed Martin to complete Phase 2 Segment 4.

SEGMENT 4 DELAYS



Source: OIG Analysis of Sentinel Project Documentation

We identified four major factors that contributed to Phase 2's schedule delays and cost increases: (1) problems encountered with the development of Sentinel's electronic forms, (2) performance and usability issues, (3) complications with the integration of Sentinel with the network security features in the FBI's PKI program, and (4) inefficiencies in the software code.[7]

First, during Segment 4, Lockheed Martin and the Sentinel PMO encountered problems developing electronic forms for Sentinel. The November 2009 user testing produced overwhelmingly negative feedback on

[7] The inefficiencies described in the report refer to patterns in the software code that may result in decreased performance.

the forms that Lockheed Martin delivered. As a result, the usability of the forms was a significant factor in the FBI's decision to delay its pilot program and subsequent deployment of Segment 4.

Second, as part of its conditional acceptance of Segment 4, the FBI identified 26 critical performance and usability issues, which were documented in Defect Reports, that the FBI required Lockheed Martin to fix before it would proceed with the pilot.[8] Many of these issues addressed concerns about the need to display critical data, security, and the FBI's work processes. Also, a Sentinel PMO official told us that in addition to the 26 critical issues, the volume of outstanding Segment 4 Defect Reports also prompted the FBI to delay piloting and deploying Segment 4 to give Lockheed Martin time to remedy the identified functionality issues.

Third, issues arose concerning how Sentinel integrated the FBI's PKI, a program on which Sentinel relies to ensure the integrity of Sentinel's data. Specifically, the integration mistakenly allowed users to create and use a fake identity to electronically sign documents.[9] This meant that Sentinel could not reliably track who had created or modified documents stored within Sentinel. In addition, Lockheed Martin and the FBI disagreed on how to interpret one of Sentinel's requirements concerning digital signatures. The Sentinel PMO interpreted it as a requirement that the digital signature must require confirmation that a user is authorized to electronically sign-off on the document on which the user worked. Lockheed Martin's interpretation of the same requirement was that it must provide assurance that the user who electronically signed the document had an active account. In our judgment, it is imperative that the FBI and Lockheed Martin agree on what must be accomplished to satisfy each of Sentinel's requirements. Without such an agreement, it is likely that Sentinel's cost and schedule will continue to increase as differences in interpretations result in deliverables that do not meet the FBI's expectations. In responding to this report, FBI and Lockheed Martin officials said they had resolved both the disagreement about the PKI requirements and the ability to create a fake identity.

Fourth, to resolve concerns the FBI had about the performance of Sentinel, the FBI contracted with an independent team to review Sentinel's

[8] Defect Reports document issues that were identified during testing and require additional work to be resolved.

[9] A digital certificate contains information about the user who was issued the certificate, as well as information about the certifying authority who issued it. When a digital certificate is used to sign documents, this information is stored with the signed item in a secure and verifiable form so that it can be displayed to authorized users in the future.

software code and related documentation.[10] The team concluded that Lockheed Martin had significantly deviated from accepted systems engineering practices, did not follow its own published documentation requirements, and had not adequately followed testing procedures. According to the team's report, these deficiencies resulted in over 10,000 inefficiencies in Sentinel's software code. The team found that while none of the 10,000 inefficiencies dramatically affected Sentinel's performance, collectively they could diminish Sentinel's performance. In its response to the report, the FBI stated that it is currently taking steps to determine if these inefficiencies affect Sentinel's performance and the resources required to repair the code as necessary.

Phase 2 Acceptance Criteria

While the FBI has established written criteria for accepting the delivery of Sentinel segments, similar criteria does not exist for acceptance of Sentinel phases or Sentinel as a whole. As each segment is completed, Lockheed Martin conducts testing that is intended to ensure the newly delivered segment properly interacts with the previous versions of Sentinel upon which the new segment was built.

We believe that testing at the segment level is not sufficient to ensure that a phase addresses the FBI's needs and requirements and that the FBI should develop criteria for accepting delivery of each phase, and Sentinel as a whole. Such criteria would help the FBI to ensure that all of the functionality delivered throughout the development of Sentinel work together to provide the desired system-wide functionality.

Moreover, in a December 2009 report, the team hired by the FBI to review Sentinel's software code and related documentation concluded that Lockheed Martin had either not conducted the required testing or conducted only limited testing for Phase 2 of the project. Officials from both the FBI and Lockheed Martin disagreed with this conclusion and said that Segment 4 met all of the testing requirements for the FBI's conditional acceptance.

Phase 3 Status

The planning for Phase 3 of Sentinel began in January 2009, and development was scheduled to be completed on June 23, 2010. However, as a result of the difficulties encountered with Phase 2, Lockheed Martin

[10] The independent review team was from Mitre, a Federally Funded Research and Development Center. Federally Funded Research and Development Centers assist the United States government with scientific research and analysis, development and acquisition, and systems engineering and integration.

reallocated staff intended for Phase 3 development to continue working on the development of Phase 2.

As of January 2010, Lockheed Martin estimated the development of Phase 3 was at least 12 weeks behind schedule and that it was not possible to complete development of Phase 3 by June 23, 2010, as scheduled in the latest project plan for Sentinel. As of January 2010, the FBI estimated that Phase 3 development would cost about $58 million, $13 million more than the latest Sentinel plan budgeted for this phase.

The deviation in the Phase 3 schedule was so significant that the FBI had to report to the Office of Management and Budget a complete analysis of the reasons for the schedule slippage, a list of actions planned to correct the problem, and an estimated completion date and cost. In January 2010, the FBI directed Lockheed Martin to develop the new budget and schedule for Phases 3 and 4, which was due by the end of January 2010. However, by the time the FBI issued the partial stop-work order on March 3, 2010, Lockheed Martin and the FBI still had not agreed on a revised budget and schedule for Phases 3 and 4.

FBI officials told us that they expect the completion of Sentinel to be delayed at least 11 weeks and that the overall cost will exceed the $451 million currently budgeted for the project. FBI officials also stated that the revised budget and schedule will include a plan to reduce the overlap of Phases 3 and 4 because of the difficulties Lockheed Martin encountered with allocating staff to multiple phases under the previous plan.

However, the FBI has not provided a specific estimate of what it projects the total cost of Sentinel, or when it expects Sentinel to be completed. FBI officials have stated that in order to meet any increased funding requirements, the FBI plans to request congressional approval to redistribute funds from other FBI information technology programs to Sentinel.

Additional Areas of Major Concern

We identified the following additional major issues that, in our judgment, will continue to affect Sentinel's development in the future. We believe that these issues, if not closely monitored and effectively addressed by the FBI, will add to Sentinel's cost and schedule, affect the functionality of the system, and result in a diminished level of user acceptance of and satisfaction in the system.

Data Migration

A significant area of risk for the Sentinel project continues to be the successful migration of data from the FBI's current ACS system to Sentinel. According to FBI officials, Lockheed Martin successfully migrated administrative case data from ACS to Sentinel during Phase 2. However, it took 4 days to migrate administrative case data, which constituted only about 2 percent of the data in ACS. According to Sentinel independent verification and validation staff, migrating the investigative case file data using the same method could take up to 200 days. The FBI and Lockheed Martin agreed that because the method used to migrate the administrative case data would take too long, a new migration strategy is needed to transfer the remaining investigative case files to Sentinel.

The FBI has yet to document a strategic data migration plan for investigative case files that ensures a reliable estimate of the time required to migrate the data and, just as important, that guarantees the data in Sentinel will be usable and inclusive of all of the links between the FBI's cases. We believe that without a documented strategic plan for data migration, the Sentinel PMO cannot ensure that Lockheed Martin has adequate resources or time allocated to successfully migrate the remaining ACS data. While the FBI and Lockheed Martin have discussed various approaches, they have not agreed upon a methodology. However, in response to a draft of this report, both the FBI and Lockheed Martin said they were confident they could migrate the remaining data in substantially fewer than 200 days.

Defect Report Prioritization

Despite written criteria for assessing the severity of defects, Sentinel PMO officials told us that the FBI and Lockheed Martin do not always agree on which Defect Reports are the highest priority. Lockheed Martin prioritizes Defect Reports based on whether they affect Lockheed Martin's ability to satisfy a requirement, while the FBI focuses on whether a Defect Report affects the users' ability to do their job. In our judgment, the FBI and Lockheed Martin need to agree on a set of criteria for the prioritization of Defect Reports generated during testing, and the criteria should focus on the functionality and usability of Sentinel capabilities. In response to our draft report, the FBI said that this issue was recently resolved, and when the FBI and Lockheed Martin personnel do not agree on the priority a defect should receive, one of the Sentinel Deputy Program Managers will make the final determination on its priority level.

Program Reporting

During the periods when Sentinel has experienced significant schedule delays and cost increases, some of the FBI's internal assessments of Sentinel's progress have either been late, infrequent, or non-existent. For example, for the past year the Sentinel PMO has been an average of 30 days late in completing Sentinel's monthly earned value management reports, which provide the FBI, Department of Justice, and the Office of Management and Budget with an assessment of Sentinel's progress toward meeting its schedule and cost goals. As a result of delayed reports, the FBI's ability to perform real-time evaluations of the program's development and apply risk management tactics is hindered.

We also found that the FBI has discontinued its monthly Program Health Assessments, which provided an independent assessment of Sentinel's risks and whether the project's schedule accurately reflects the amount of work necessary to successfully complete the project. In responding to our draft report, FBI officials said that the Program Health Assessments had not been discontinued, but that assessments of all FBI IT systems are now conducted quarterly rather than monthly. We believe the FBI should reinstitute monthly health assessments of Sentinel. Additionally, as of March 2010 the Department of Justice's Investment Review Board has not received an update on Sentinel's status in 6 months. In the past, the board had requested and received quarterly updates on Sentinel's status.

Sentinel PMO Staffing

As of October 2009, the Sentinel PMO had 76 full time employees, who were charged with ensuring that Sentinel addresses FBI users' needs and Lockheed Martin meets its contractual obligations. Due to the scope and importance of the project, Sentinel requires a highly-skilled and experienced Sentinel PMO staff. From December 2008 through October 2009, however, the Sentinel PMO experienced a 26 percent turnover rate. In light of the FBI's aggressive development and deployment schedule for Sentinel, we are concerned that a continuation of high staff turnover will negatively affect the Sentinel PMO's ability to properly oversee the project. FBI officials said that they believed that the Sentinel PMO's turnover rate was normal and that some of the turnover had allowed the Sentinel PMO to better address its changing needs.

Sentinel User Help

Sentinel will represent a significant shift in the way the FBI documents investigations and case analysis by providing an electronic database for cases rather than a paper-based system. Although Sentinel will significantly change the way FBI personnel perform their jobs, the FBI does not plan to establish a dedicated helpdesk to assist Sentinel users with operational issues, at least during the initial implementation of the program. Instead, the FBI plans to develop an online help tool to use as its primary troubleshooting and training resource for Sentinel users. We do not believe that this online tool will provide adequate assistance to the thousands of first time Sentinel users. In commenting on our draft report, the FBI said that online assistance will include a variety of formats and that extra staff will be available when significant changes are deployed to FBI users.

Conclusion

As a result of our ongoing review of the Sentinel project, we have significant concerns with the rate and cost at which Sentinel's development is progressing. The FBI will require significant additional time and funding to address these issues.

In previous reports we have expressed concern that Sentinel's original schedule was very optimistic, and Phase 2 of Sentinel is now nearly 2 years behind the FBI's original schedule. Recently, because of significant issues regarding Phase 2's usability and performance, the FBI issued a partial stop-work order to Lockheed Martin for portions of Phase 3 and all of Phase 4. In addition, it has been over 2 years since Sentinel users have received a significant upgrade in functionality.

After more than 3 years and $334 million expended on the development and maintenance of Sentinel, the cost to Sentinel is rising, the completion of Sentinel has been repeatedly delayed, and the FBI does not have a current schedule or cost estimate for completing the project.

Given the importance of Sentinel to the future of FBI operations, particularly in moving FBI agents and analysts from a paper-based system to a modern computer-based system, the FBI must ensure that its revisions to Sentinel's budget, schedule, and requirements are realistic, achievable, and satisfactory to its users. The FBI must also ensure that users' concerns and perspectives are integrated into all phases of the remaining development of Sentinel.

The FBI is taking some steps to improve Sentinel's chances for success, including independent assessments, performed by other contractors, of Lockheed Martin's deliverables. However, we are concerned that the FBI conditionally accepted Phase 2 of the project despite its knowledge of significant problems with the product Lockheed Martin delivered. We believe the FBI must determine where its processes failed when it conditionally accepted Phase 2. We also have concerns with the FBI's ability to complete the challenges that Sentinel's future will likely bring, such as data migration and user acceptance. As part of our oversight for this project, we will continue to monitor and periodically report on the funding of Sentinel.