FAA'S PROGRESS AND CHALLENGES IN MEETING FTI TRANSITION GOALS

Federal Aviation Administration
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Memorandum

U.S. Department of Transportation
Office of the Secretary
of Transportation
Office of Inspector General

Subject: ACTION: FAA's Progress and Challenges in Meeting FTI Transition Goals
Federal Aviation Administration
Report Number AV-2008-089

Date: September 30, 2008

From: David A. Dobbs
Principal Assistant Inspector General
for Auditing and Evaluation

Reply to Attn. of: JA-1

To: Acting Federal Aviation Administrator

This report presents the results of our follow-up audit of the Federal Aviation Administration's (FAA) Telecommunications Infrastructure (FTI) program. FTI is intended to replace seven FAA-owned and -leased telecommunications networks with a single network to reduce operating costs. FTI is a mission-critical program because its network carries National Airspace System (NAS) telecommunication services (e.g., voice, radar, and flight data communications) for air traffic control (ATC) operations.

In July 1999, FAA established the original program baseline to transition FTI into the NAS by September 2005. In July 2002, FAA awarded a contract to Harris Corporation to transition FTI into the NAS and to provide management and support functions for the FTI network. In December 2004, FAA re-baselined FTI, pushing the completion date to December 2007 and significantly increasing the program cost.

In April 2006, we reported that FTI was unlikely to meet its December 2007 completion date and that FAA needed to improve FTI management controls.[1] To determine whether FAA addressed our concerns, we began a follow-up review of the FTI program. The objectives of this review were to assess FAA's progress in (1) developing a realistic master schedule and an effective FTI transition plan and (2) mitigating technical risks to ATC operations before activating FTI services and disconnecting existing telecommunications services (by coordinating activities and

[1] OIG Report Number AV-2006-047, "FAA Telecommunications Infrastructure Program: FAA Needs To Take Steps To Improve Management Controls and Reduce Schedule Risks," April 27, 2006. OIG reports and testimonies are available on our website: www.oig.dot.gov.

verifying site-specific requirements). We also examined FAA's progress in responding to our April 2006 recommendations, including a recommendation that the Agency independently validate FTI cost and benefit estimates. Exhibit A details our audit scope and methodology. We performed our work in accordance with generally accepted Government Auditing Standards as prescribed by the Comptroller General of the United States.

In August 2006, FAA's Joint Resources Council[2] (JRC) met and subsequently approved a second re-baseline of FTI's cost and schedule goals, which extended the completion date for the FTI transition to December 2008 and increased overall program costs by over $100 million (from $3.3 billion to $3.4 billion[3]). FAA also reduced the total number of NAS services to be transitioned to FTI from 25,294 to 20,033. Since FAA first established the cost and schedule baselines for FTI in 1999, the JRC has approved several significant changes (see table 1).

Table 1. History of FTI Program Changes

Date	Purpose	FTI Sites Planned	FTI Services Planned	Planned Transition Completion Date	Program Completion Date Planned	Cost Estimate
Jul. 1999	Establish Baseline	1,374	Not Defined	Sept. 2005	2010	$1.9 Billion
Dec. 2004	First Re-baseline	4,463	25,294	Dec. 2007	2017	$3.3 Billion
Sept. 2006	Second Re-baseline	4,053	20,033	Dec. 2008	2017	$3.4 Billion

Source: FTI JRC Baseline Briefs and FTI National Implementation "Kickoff Team" Brief

Through the end of fiscal year (FY) 2007, we estimated that FAA cumulatively spent just over $1.9 billion on the FTI program. FAA spent about $1.2 billion for operating legacy telecommunications networks from 2002 to 2007. About $300 million was for FTI transition efforts funded from the Facilities and Equipment (F&E) account; another $445 million funded FTI operations costs from the Operations and Maintenance account (operations). Unlike most acquisitions, the majority of FTI is funded from the Operations account instead of the F&E account (capital). For FY 2008, FAA estimates it will need $320 million to support the program while continuing the FTI transition ($18.3 million to support the FTI transition, $210 million to support FTI operations, and $91 million to extend legacy network operations).

[2] The JRC is FAA's senior decision-making body for approving major acquisition program funding and schedules.

[3] The $3.4 billion reflects the cost within the scope of "FTI Case," which includes FTI facilities and equipment, operations and maintenance, and legacy operations costs affected by FTI. The "Base Case" reflects costs in the absence of FTI. According to FAA, cost avoidance is defined as the difference between the Base Case and the FTI Case.

RESULTS IN BRIEF

Since we last reported, FAA has made significant progress with the FTI transition, with 19,977 services cut over to operation as of March 31, 2008. FAA also transitioned the costliest legacy network that FTI will replace, which will help to control telecommunications costs.[4] Notwithstanding this important progress, several areas remain critical watch items for decision makers as FAA moves forward with FTI. These include shifting service requirements, the extent to which expected cost savings will be realized, and efforts to mitigate risks to air traffic operations—all of which have impacted FAA's ability to meet FTI's original program goals.

A key issue is that FAA will not replace all networks by December 2008, as originally planned. As a result, FAA will have to maintain existing equipment much longer than expected (e.g., digital equipment to support long-range radars and switching equipment to support high-altitude communications). The cost of doing so and the impact on potential FTI benefits remain uncertain.

Additionally, even though the last baseline significantly reduced the number of services planned for transition, this number has since climbed to 22,719. FAA attributes the increase to "emerging requirements,"[5] among other issues, and acknowledges that these will continue to increase, which will require adjustments to the FTI master schedule.

Further, the master schedule does not include requirements for moving forward with the Next Generation Air Transportation System (NextGen), which FAA classifies as "future requirements." We recognize that NextGen requirements are uncertain and future telecommunications needs will initially be funded by other programs. However, FAA will inevitably have to address these requirements through adjustments to FTI or another effort.

FAA's main goal for FTI was to reduce Agency operating costs. Yet, we found that costs for FTI remain uncertain since FAA still has not validated cost and benefit estimates as agreed after our 2006 report. We are concerned because FAA's last program baseline reduced the number of services planned but still increased the overall program cost estimate by more than $100 million. As costs escalate, FTI cost savings have eroded, with none achieved in FY 2007.

Finally, FAA facilities using FTI have experienced outages of primary and back-up services, which have disrupted ATC operations. In addition, we found that, FTI services are not meeting availability requirements or being restored within

[4] The largest and costliest network FTI will replace is the Leased Interfacility National Airspace System Communications System with over $600 million spent for operations from 2002 to 2007.

[5] These are requirements for new services, such as FAA's Flight Service 21 program.

contractual timeframes. As we reported in 2006, FAA must ensure that FTI services avoid these problems by meeting diversity requirements (adequate separation of primary and alternate services).

FAA has made significant progress with the FTI transition but will not replace all networks as planned. After FAA added a year to FTI's completion date, revising it to December 2008, it began making progress toward transitioning new services and replacing legacy systems. As of March 31, 2008, FAA replaced four of the seven legacy systems with FTI, including the costliest of those, the Leased Interfacility NAS Communications System (LINCS) network. Because the LINCS network had been fully decommissioned, FAA reported that March 31, 2008, would be the last time it would provide regular monthly reports on the FTI transition status. However, FAA has deferred replacing the following three networks beyond December 2008 due to technical challenges, such as prematurely installed FTI equipment needing upgrades and lack of an engineering solution to replace components for complex digital services:

- The Data Multiplexing Network (DMN), which supports long-range radar services.
- The National Airspace Data Interchange Networks Packet-Switched Network (NADIN-PSN),[6] which supports flight data and weather information services.
- The Bandwidth Manager (BWM) network, which supports NAS and National Defense Program services (e.g., voice, radar, and data).

The full impact of FAA's decision to defer transitioning these three networks is still unknown, but it means that FAA will not possess an integrated suite of services as originally planned. As a result, FAA must continue funding multiple systems, which will have cost, benefit, and operational ramifications that have yet to be determined. Currently, the FTI schedule does not yet reflect when the three networks will be transitioned to FTI.

In addition, FAA must ensure that all NAS programs requiring FTI services are included in FTI's schedule. We found that the number of services planned for transition to the FTI network continues to fluctuate. Although FAA planned to transition 20,033 services to the FTI network, this number rose to 22,719 (as of March 2008) due to emerging requirements and could still grow. Yet, as these requirements emerge, FAA is not accounting for all of them in the FTI schedule. For example, as of March 2008, the FTI master schedule did not include about 38 percent of needed Flight Service 21 (FS-21)[7] services. Moreover, key NextGen

[6] NADIN PSN is an X.25 packet-switched network that augments and functions in parallel with the NADIN Message-Switched Network. Packet-switching is a communications approach in which packets (discrete blocks of data) are routed between data link nodes shared with other network traffic.

[7] FS-21 is a new flight services operating system with 3 hubs and 16 continuing facilities.

services, such as Automatic Dependent Surveillance-Broadcast (ADS-B)[8] and System Wide Information Management (SWIM),[9] are not included in the FTI schedule. FTI program officials previously reported that these requirements would not be included in FTI's schedule because their baselines were not finalized or approved by FAA and were considered "future requirements." However, both programs now have established baselines, and FAA needs to add them to FTI's master schedule.

FAA has not validated FTI cost estimates, and the program costs and benefits remain uncertain. The FTI program has experienced cost growth, and benefits in terms of anticipated cost savings have eroded. In April 2006, we recommended that FAA validate all program estimates to determine whether FTI is still cost beneficial.

Table 2. FTI Life-Cycle Cost Estimates
(Dollars in Millions)

Cost Categories	JRC Dec. 2004	JRC Aug. 2006	Difference
F&E	$ 310.2	$ 318.8	+$8.6
Operations	$2,110.1	$1,954.4	-$155.7
Legacy Operations	$ 857.4	$1,117.3	+$259.9
Total FTI Lifecycle	**$3,277.7**	**$3,390.5**	**+$112.8**

Source: FTI Program Baseline Briefs

In August 2006, the JRC's approval of the second FTI re-baseline was contingent upon FAA's validation of revised cost estimates. By September 2006, FAA's Independent Evaluation Review (IER) team completed its assessment of various FTI cost elements, but did not validate the cost and benefit projections. Instead, the IER raised concerns about some of the costs. For example, the IER reported that the F&E baseline is masked by FTI business rules that allow F&E expenditures to be funded by the Operations account. Although the FTI estimates were not validated, the JRC still approved the new $3.4 billion estimate, which added over $100 million to the overall program cost despite reducing the number of services to be delivered (see table 2). We remain concerned about the accuracy of FTI cost and savings estimates for a number of reasons.

- *First, FAA increased the F&E cost for FTI by $8.6 million. In addition, we have identified additional network engineering costs (capital costs) that were charged to Operations instead of the F&E account.* We recommended in April 2006 that FAA update FTI business rules to properly charge these activities to the F&E account. Although FAA concurred, we found that FTI's true impact on the F&E baseline was masked by business rules that allowed F&E expenditures to be improperly charged to the operations account.

[8] ADS-B provides satellite-based technology that allows aircraft to broadcast their position to other aircraft and ground systems. ADS-B is a cornerstone technology for NextGen and has considerable potential for enhancing safety and boosting capacity.

[9] SWIM provides FAA with a web-based architecture that allows information sharing among airspace users. SWIM is a key transformational program for the development of NextGen.

- *Second, FAA predicated its investment in FTI on achieving savings through one consolidated telecommunications network.* Now that the Agency has decided to indefinitely retain three legacy networks, it is imperative that FAA recalculate the legacy operations cost and determine the impact on FTI's estimated cost savings. Further, FAA did not include about $200 million in prior operations costs, which were used to support the legacy networks, within the scope of the FTI program. When these costs are included, they increase the revised cost estimates for legacy operations (of $1.1 billion) by $57 million. FAA acknowledges that it did not include FY 2002 legacy operations costs in the updated baseline, but commented that the impact would be minimal. Nevertheless, in viewing the history of the FTI program, an accurate accounting of the legacy costs is important because delays with the FTI transition translate directly into reduced cost savings due to paying for legacy systems longer than planned.

- *Finally, expected savings have eroded, and considerable confusion exists about what level of savings will ultimately be realized.* The extent of FTI's cost savings is important because it is one of the few capital programs that promised to reduce operating costs.[10] When FAA first re-baselined the FTI program in 2004, the Agency estimated cost savings to be $672 million. At the second re-baseline in 2006, the JRC approved estimated savings of $596 million for the period FY 2005 through FY 2017. To add further confusion, FAA's independent assessment team did not validate FTI benefits approved by the JRC. The team calculated FTI benefits and estimated them to be $712 million (excluding prior investments) for the period FY *2007* through FY 2017.

  Our analysis of FTI cumulative benefits, which covers the period of performance from FY 2003 through FY 2017, shows that cost savings were reduced to $434 million (as calculated in then-year dollars). In current-year dollars, which are adjusted for inflation, we calculate that FTI benefits shrunk to $158 million through 2017.

  We recognize that Office of Management and Budget (OMB) guidance allows FAA to exclude prior investments when assessing cost and benefits and approving major acquisition baselines. However, this approach does not provide a complete picture of expected benefits in terms of savings to decision makers. Because the various estimates for FTI benefits we have seen excluded prior investments (as many as 4 years in some cases), benefits were overstated. FAA officials are confident that the Agency will realize savings from FTI given that the largest legacy network has been replaced. Nevertheless, costs

[10] Planning documents we reviewed supporting the FTI re-baseline in 2004 showed the program was estimated to save over $800 million.

and expected benefits should be reassessed so they can be accurately reported to congressional and departmental decision makers.

Until FAA develops accurate FTI cost estimates, independently validates them, and reports the correct figures, the true program benefits with respect to cost savings will remain unknown.

FAA must continue addressing technical and reliability issues that have impacted ATC operations. FTI technical problems are causing unscheduled outages and creating risks to air traffic control operations. In some cases, these outages have involved simultaneous loss of both primary and back-up FTI services, which not only disrupts air travel but also creates potential safety risks. In 2006, we reported that a loss of all FTI services led to numerous flight delays at Chicago O'Hare International Airport and that FAA needed to take action to ensure telecommunications diversity exists at facilities receiving FTI.

We found that diversity issues and technical problems persist.[11] According to an October 2007 internal FAA study on FTI diversity, several critical facilities are still vulnerable to outages because FAA has not ensured that its contractors and subcontractors adequately separate FTI primary and alternate services. The following are examples of significant FTI outages:

- On September 25, 2007, all FTI paths providing radar, flight, and voice communications were lost at the Memphis Air Route Traffic Control Center (ARTCC), blacking out air traffic control throughout the region for several hours and causing 566 flight delays. This occurred due to the catastrophic failure of a key component (an optical network ring) that is supposed to have built-in fault tolerance. According to FAA's investigation of this outage, FAA was vulnerable to the same type of failure at other critical ARTCC facilities, such as Atlanta and Jacksonville. In their comments on our draft report, FAA officials stated that the problem has been corrected at Memphis and other FAA facilities.
- On November 9, 2007, all primary and alternate FTI service paths were lost at the Jacksonville ARTCC, resulting in 85 flight delays. FAA is now in the process of ordering installation of additional FTI equipment here and at other critical ATC sites.

We also found that when FTI outages occur, the services are not always restored within contractual timeframes. For example, in March 2008, FTI contractor officials reported that an average of 7 percent of FTI services were not restored on time. While the FTI contract requires NAS services such as En Route Air to

[11] For the purposes of this report, we refer to diversity problems as instances where there is not adequate separation between FTI primary and alternative paths. We did not examine the overall FTI architecture or design.

Ground Communications to be restored within 3 hours, the FTI contractor was taking an average of almost 6 hours to do so.

To mitigate risks to ATC operations and meet reliability standards required by the contract, FAA must (1) ensure that all sites requiring primary and alternate paths meet FAA requirements for diversity, (2) improve controls over all FTI contractors' configuration of FTI equipment, and (3) take steps to prevent unscheduled outages and restore them on time.

SUMMARY OF RECOMMENDATIONS

Since we last reported, FAA has made significant progress with FTI and has transitioned the largest and costliest network to the new system. However, FAA will not meet all the FTI goals originally established for the program because some networks will not be transitioned and the expected level of cost savings will not be realized. As FAA moves forward with FTI, it must provide decision makers with an accurate account of FTI's expected benefits and costs for both the capital and operations accounts. FAA must also ensure FTI diversity requirements are met to prevent outages to ATC operations.

Our recommendations include (1) reassessing FTI program costs and benefits, as the current estimates do not include the cost to extend the use of legacy networks beyond December 2008; (2) updating the FTI schedule with an effective transition plan outlining when the DMN, NADIN-PSN, and BWM networks will be transitioned to FTI; (3) periodically conducting internal studies to ensure that contractors meet FTI diversity requirements to prevent outages; and (4) establishing an improved process that requires Harris's technicians to restore FTI services within established contractual timeframes to meet reliability standards. Our complete recommendations are listed at page 16.

AGENCY COMMENTS AND OFFICE OF INSPECTOR GENERAL RESPONSE

On June 30, 2008, we provided FAA with our draft report. In addition, we held an exit conference on July 3, 2008, and subsequent meetings with FAA officials responsible for managing FTI, including the Senior Vice President for Operations and Assistant Administrator for Financial Services who also serves as the Agency's Chief Financial Officer.

On September 19, 2008, FAA provided its formal response to our draft report and concurred with all six of our recommendations, which included the need to reassess network engineering costs, conduct periodic audits to ensure diversity,

and review internal procedures for reporting FTI outages. FAA also provided additional comments on various aspects of our report. FAA's response is included in its entirety in the appendix to this report. FAA's comments and our views on its comments are fully discussed on pages 17 through 20.

We appreciate the cooperation and assistance of FAA representatives during this audit. If you have any questions regarding this report, please contact me at (202) 366-1427 or Lou Dixon, Assistant Inspector General for Aviation and Special Program Audits, at (202) 366-0500.

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cc: FAA Acting Deputy Administrator
FAA Assistant Administrator for Financial Services and Chief Financial Officer
FAA Chief Operating Officer
OST Director Office of Audit Relations

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In August 2006, FAA's JRC met and subsequently approved a second re-baseline of FTI's cost and schedule goals, which extended the completion date for the FTI transition by 1 year to December 2008, increased overall program costs by over $100 million (from $3.3 billion to $3.4 billion), and reduced the total number of NAS services to be transitioned to FTI from 25,294 to 20,033. Since we last reported, FAA has made significant progress with the FTI transition, with 19,977 services cut over to operations as of March 31, 2008. FAA also transitioned the costliest legacy network that FTI was planned to replace.

However, FAA has decided to indefinitely defer the transition of three legacy networks beyond December 2008 due to technical challenges and other issues. As a result, FTI will not provide an integrated suite of NAS services as FAA originally planned. Further, FAA must continue funding multiple systems, which will have cost, benefit, and operational ramifications that have yet to be determined. Moreover, FAA is now addressing emerging requirements that were not included in the FTI baseline. Consequently, the total number of FTI services increased to 22,719; however, FAA has yet to update the FTI schedule to reflect all the additional services.

Further, FTI's costs and benefits remain uncertain. Although FAA completed its assessment of various FTI cost elements, concerns about how costs are charged to FAA Operations account persist to date. Moreover, FAA did not independently validate the $596.4 million estimated cost savings approved by the JRC. Until FAA develops accurate FTI cost estimates and independently validates them as agreed after our 2006 report, the true program benefits will remain unknown.

Finally, we found that FAA facilities using FTI have experienced outages of primary and back-up services, which have disrupted ATC operations. Further, these outages are not always restored within contractual timeframes. FAA must ensure that FTI services meet diversity requirements and reliability standards to avoid further ATC disruptions.

FAA Has Made Significant Progress Transitioning to FTI but Will Not Replace All Networks by December 2008 as Planned

Since we last reported in April 2006, FAA has made significant progress transitioning telecommunications services to the FTI network. FAA's current transition plan focuses on first decommissioning LINCS, the costliest legacy network; then implementing emerging service requirements; and, finally, implementing all services. To its credit, FAA replaced four of the seven legacy systems with FTI, including the LINCS network as of March 31, 2008 (see exhibit B). Additionally, because the LINCS network had been fully

decommissioned, FAA reported that March 31, 2008, would be the last time it would provide regular monthly reports on the FTI transition status.

Overall, FAA has made significant progress transitioning to FTI. For example, as of March 31, 2008, FAA reported that it accepted 90 percent of the FTI services (see table 3). FAA also reported that it disconnected about 82.1 percent of the planned legacy service disconnects. For comparison, when we last reported on these steps in April 2006, FAA had only accepted 6.3 percent of the services and disconnected only 3.1 percent of the legacy services.

Table 3. Status of FTI's Five Critical Steps
(as of March 31, 2008)

Transition Steps	Actual Tasks Reported	*Total Quantity Planned	Percent Complete
Site Acceptance	3,826	4,174	91.7 %
Service Acceptance	20,516	22,719	90.3 %
Service Cut Over	19,977	22,719	87.9 %
Legacy Service/Circuit Disconnects	14,113	17,191	82.1 %
LINCS A-Node Decommissions	160	160	100 %

* The total number of planned services and legacy circuit disconnects is provided in the March 2008 FTI master schedule.

** According to FTI program officials, all 160 LINCS A-Nodes were decommissioned by April 2008.

Source: FTI Program Office, "Metrics Report," as of March 31, 2008

We found, however, that FAA will not replace all legacy networks by December 2008 as planned since it has deferred transitioning three of the seven. As a result, FTI will not provide a fully integrated suite of NAS services as FAA envisioned. Further, as FAA moves forward with FTI, it must update the FTI master schedule to address the Agency's growing needs for telecommunications.

FAA Will Not Replace All Legacy Networks by the Planned December 2008 Transition Completion Date

FAA intended for FTI to replace seven existing FAA-owned or leased telecommunications networks with a single network by December 2008. However, FAA experienced technical challenges transitioning digital services (such as those that transmit critical radar and flight data) to FTI. As a result, FAA has deferred transitioning the following three networks, which support key NAS services, to FTI beyond the December 2008 completion date:

- **DMN, which supports long-range radar services:** DMN services transport radar information throughout FAA facilities. The technologies include (1) data multiplexing, which enables consolidation of several independent transmission requirements to a single circuit, and (2) automated network monitoring and controls, which enable real-time identification of failed NAS elements from central locations and circuit restoration.

  FAA will not replace the DMN modems until after December 2008. In the interim, FAA will continue to depend on older FAA equipment, such as DMN Codex modems. FAA's decision to defer the transition of specific services is related to uncertainty with the overall direction of related modernization efforts. For example, FAA has been transitioning some services from DMN, but it decided to leave surveillance services supporting long-range radars on DMN until it decides how surveillance data will be handled under NextGen.

- **NADIN-PSN, which supports flight data and weather information services:** The NADIN data communications network is a tool for aviation users in both the NAS and the international community. The network is used to store, handle, and edit flight planning and weather messages at FAA's facilities that manage high-altitude traffic.

  NADIN switches[12] will not be replaced by FTI at FAA centers until 2009 or 2010. FAA decided to avoid the custom development cost of establishing the same capability under FTI as the technology is becoming obsolete. In the interim, FAA will continue to depend on the older NADIN equipment.

- **BWM, which supports NAS and National Defense Program services:** The BWM network supports the transmittal of voice and radar data in and between FAA facilities. BWM provides bandwidth-on-demand, automatic restoration, switching, and intelligent routing of these services.

  The BWM transition to FTI will not occur until after December 2008, if at all. The Department of Defense raised interface concerns about replacing BWM with FTI. Moreover, the contractor has had to replace or upgrade other digital equipment, such as routers[13] that were installed but failed to meet requirements.

FAA needs to update the FTI schedule so that it details when the DMN, NADIN-PSN, and BWM networks will be replaced by FTI.

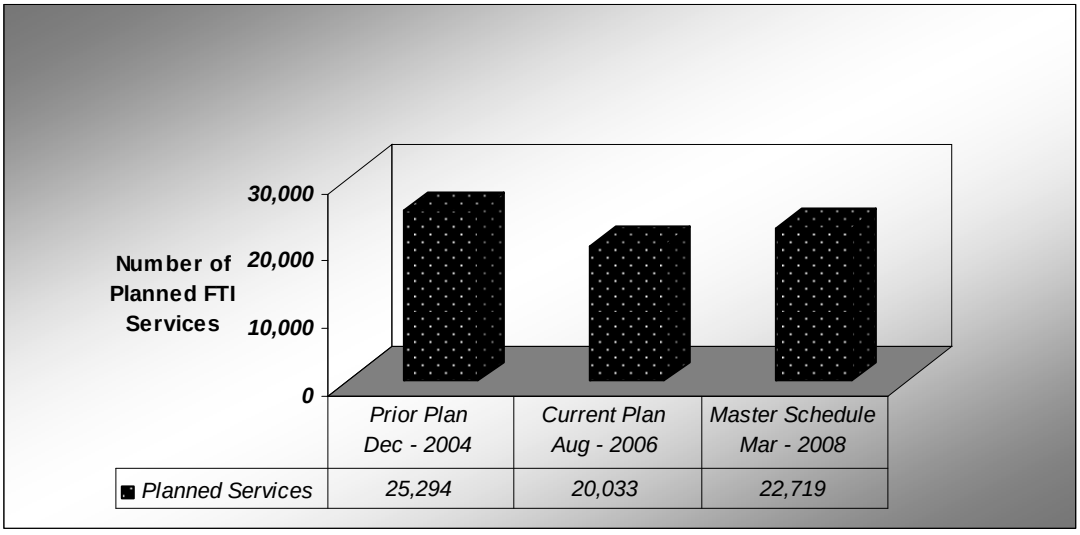
[12] A network switch is a computer networking device that connects network segments.
[13] A router is a device that determines the proper path for data to travel between different networks.

The Number of Services That Need To Be Transitioned to FTI Continues To Fluctuate

The FTI schedule continues to fluctuate even though FAA significantly reduced the number of services planned for transition to the FTI network. When FAA approved the FTI schedule in August 2006, it reduced the number of services to be transitioned from 25,294 to 20,033 (about a 20-percent reduction). FAA reduced the number of FTI services to be transitioned by re-categorizing the majority of them as future requirements. Since then, the total number of planned FTI services has begun climbing again and remains uncertain.

According to the FTI master schedule, as of March 2008, FAA now plans to transition 22,719 services to the FTI network (see figure 1). According to FTI program officials, the service count increased because they added mission support services, emerging service requirements (that had not been previously identified), and site-specific requirements.

Figure 1. FTI Planned Services Have Fluctuated Over Time



Source: OIG analysis of FTI current versus prior baseline schedules and the FTI master schedule

FAA must ensure that all NAS programs requiring FTI services are included in FTI's schedule, including those that FTI program officials classified as "emerging" and "future" requirements to effectively manage the transition and reduce the risks of schedule delays, cost growth, and risks to ATC operations. For example, FTI program officials classified services for FAA's FS-21 program as "emerging requirements" and began transitioning these services to the FTI network. When FAA issued its last report on FTI transition goals in March 2008, however, only 1,149 of 1,847 FS-21 services were included in the FTI schedule. The FTI master schedule still did not include about 700 remaining FS-21 services planned for transition.

Findings

Moreover, the master schedule does not include key services that FTI program officials classified as "future services" required for the NextGen system, such as ADS-B and SWIM. FTI program officials previously reported that these programs were not included in the FTI schedule because their baselines were not finalized and approved by FAA. However, we note that both programs received their baselines in 2007, and FAA needs to add them to FTI's master schedule. In addition, Mitre[14] estimates that about 4,000 services classified as "future requirements" need to be added to the total quantity to be implemented and transitioned to FTI. The cost of these future services is currently unknown.

FTI program officials acknowledge that the number of services to be transitioned to FTI will continue to increase and that adjustments to the schedule will be required to accommodate emerging and future services requirements. As FAA moves forward with FTI, it must update the FTI master schedule to reflect emerging and future NAS service requirements.

FAA Has Not Validated FTI Cost Estimates, and the Program Costs and Benefits Remain Uncertain

The FTI program has experienced cost growth, and its benefits have consequently eroded. We recommended in April 2006 that FAA validate all program estimates to determine whether FTI is still cost beneficial. FAA concurred and stated that it would complete a cost and benefit reassessment based upon actual and projected FTI and legacy costs and have the estimates independently evaluated.

In August 2006, FAA's JRC planned to approve a 1-year FTI schedule delay to December 2008 and increase the overall program costs to $3.4 billion. The JRC stated, however, that its approval was contingent on FAA's finance group, the Air Traffic Organization-Finance (ATO-F), validating the revised cost estimates.

In September 2006, FAA's Independent Evaluation Review (IER) team (within its ATO-F division) completed its assessment of various FTI cost elements but did not validate the cost and benefit projections. Instead, the IER team raised concerns about some of the baselined costs. For example, the IER team reported the F&E baseline is masked by FTI business rules that allow traditional F&E expenditures to be funded by the Operations account.

Although the FTI estimates were not validated, the JRC still approved the new baseline, which added over $100 million to the overall program cost estimate despite reducing the number of services. We do not understand why the JRC approved the revised FTI baseline without validating costs and expected benefits as agreed. As we reported in the past, FAA policy requires that FAA program

[14] Mitre is a federally funded research and development center under contract to FAA.

officials submit independently validated cost and benefit estimates for planned capital investments, such as FTI, to the JRC before the JRC approves a re-baseline request. Validating cost and benefit estimates is important because if the revised program costs are underestimated, cost growth will cause benefits to be reduced, possibly to the point of undermining the cost effectiveness of the investment.

We have several concerns regarding the accuracy and validity of FTI revised cost estimates because our analysis indicates that FAA has understated costs for the F&E and legacy categories. Due to this uncertainty with FTI revised costs, FTI estimated cost savings benefits remain questionable.

FTI Facilities and Equipment Costs Are Understated, and FAA Had Improperly Charged Activities to the Operations Account

FTI's revised F&E cost estimate of $318.8 million is underestimated due to additional F&E costs for network engineering activities (capital costs) that were charged to the Operations account.

We found that network engineering was the primary cost driver impacting F&E, which grew by more than $36 million over a 4-year period ending in FY 2007 (see table 4). In FY 2007 alone, we identified a nine-fold increase over FAA's original estimate of $1.5 million to $15.8 million for network engineering support.

Table 4. FTI Network Engineering Cost Growth Charged to FTI Operations Account

Contract Year	Contract Modification 4 (Apr. 27, 2004)	Contract Modification 12 (Nov. 20, 2006)	Cost Growth	Percent Increase
FY 2004/CY-2	$2,231,090	$ 4,401,683	$ 2,170,593	97%
FY 2005/CY-3	$2,305,557	$12,761,781	$10,456,224	454%
FY 2006/CY-4	$2,282,499	$11,700,000	$ 9,417,501	413%
FY 2007/CY-5	$1,548,163	$15,846,038	$14,297,875	924%
Totals	**$8,367,309**	**$44,709,502**	**$36,342,193**	--

Source: FTI Contract Modifications

FTI program officials acknowledge that some network engineering costs should have been charged to the F&E account and that the Agency did not reflect the increased network engineering costs in its F&E budget. Most of this cost growth occurred before FAA updated its business rules in July 2006. Cost growth during this time period was related to the additional cost incurred to pay for FTI network

implementation (which, as FAA states in its response, is normally funded by the F&E account).

We previously reported on this problem in 2006 and identified about $11 million that FAA had improperly charged to the Operations account instead of the F&E account. We recommended that FAA update FTI business rules to properly charge the F&E account for FTI transition activities.

Although FAA concurred and revised its business rules, it continued to allow charges to its Operations account that should have been charged to the F&E account. For example, although FAA updated FTI business rules in July 2006 and added $7 million in F&E funding for network engineering, FAA's own IER team found that most of the network engineering cost increase from FY 2004 through FY 2006 was absorbed in the operations appropriation. Moreover, the IER team reported that the adjusted business rules did not establish a clear boundary between F&E- and operation-funded activities.

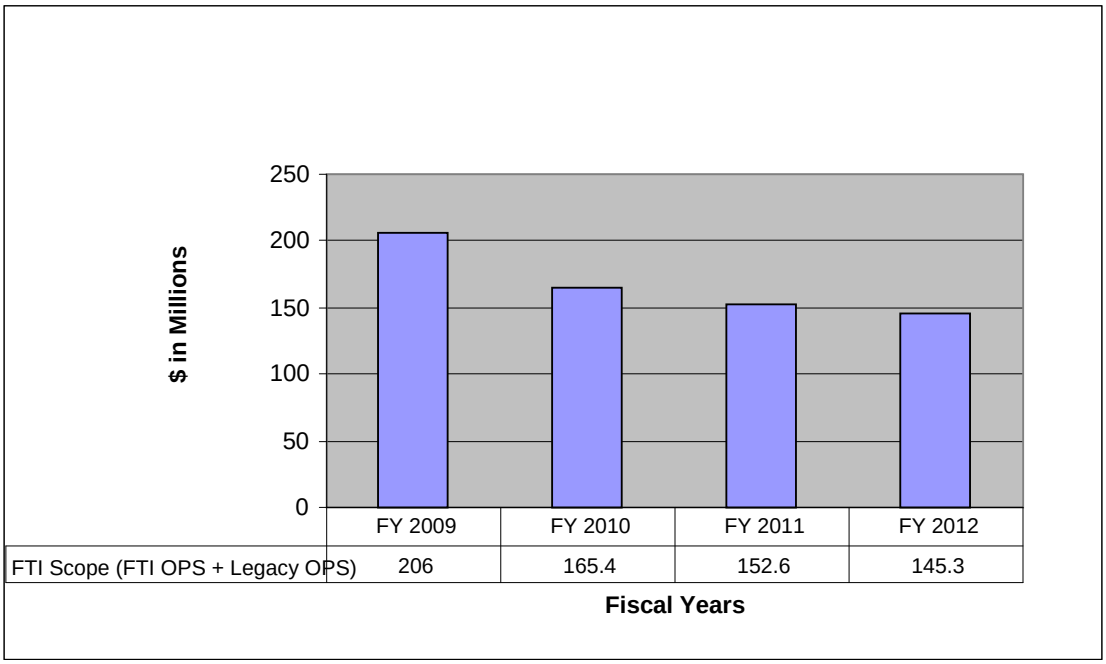
In addition, when the IER team assessed FTI costs in September 2006, it found that $24.7 million in network engineering cost was charged to the Operations account through the end of FY 2006. The IER team also found that FTI's impact on the F&E baseline is masked by business rules that allow F&E expenditures to be funded from the Operations account.

Ultimately, assigning some of these network engineering costs to the Operations account understates the true F&E costs for the FTI program. Because FTI program officials did not discontinue this practice after changing their business rules, it is difficult for decision makers to understand the actual cost to transition to FTI. Until FAA reassesses the network engineering costs paid from the Operations account to the F&E account, the true transition costs for FTI will remain unknown.

FAA Will Have To Account for Increased Telecommunications Operating Costs Due to the Increased Number of FTI Services

The FTI revised operations cost estimate of $1.95 billion was planned to support 20,033 services, but this estimate did not consider the cost to support additional services such as "emerging requirements." FAA has increased the number of FTI services to 22,719. According to FAA officials, the majority of these requirements will be paid for by other programs. This explains why FAA's planned operations costs for FTI over the next 4 years (between FY 2009 and FY 2012) show a steady state of decline (see figure 2 on page 8).

Figure 2. FTI Planned Operations Cost Are Declining While the Demand for FTI Services Is Increasing (FY 2009 – FY 2012)



Source: FTI Metrics Report and OMB Exhibit 300 (Budget Year 2009)

It is important to note that FTI's costs do not reflect all of the Agency's telecommunications costs. Since the cost of emerging services is not part of the FTI cost baseline, FAA will need to account for the cost of those services within the individual programs that are the sources of the requirements. Regardless of whether FAA includes the additional funding for these services in revised FTI cost estimates, funding for these requirements will inevitably need to be reflected, either through adjustments to FTI or in the Agency's total operating budget for telecommunications services.

FTI Cost Savings Have Eroded, and FAA Needs To Reassess Its Revised Benefits

When FAA first re-baselined the FTI program in 2004, we found that FTI's estimated cost savings decreased from $820 million to $672 million through 2017. In October 2005, we received an updated status report from the Program Office showing that FTI benefit estimates had been reduced to $672 million. As a result of cost growth in the FTI program, FAA's cumulative cost benefit estimates continued to erode, with no cost savings achieved in FY 2006 or FY 2007.

As we previously noted, FAA did not validate FTI benefits (cost savings) before the JRC approved the baseline. Moreover, considerable confusion exists about the

expected savings from FTI because we have seen various estimates and different periods of performance used to calculate the benefits.

When FAA established a second re-baseline in 2006, we estimate that FTI cumulative benefits were further reduced from $672 million to $434 million (as calculated in then-year dollars) for the period FY 2003 through FY 2017. In current-year dollars, which are adjusted for inflation, we calculate that FTI benefits shrunk to $158 million (see table 5).

Table 5. Changes in FTI Cost Savings Estimates in Then-Year and Current-Year Dollars
(Dollars in Millions)

FTI Cost Savings (then-year)	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013-2017	Total
December 2004	$-60.4	$-67.5	$-131.7	$-111.5	$-84.9	$14.7	$67.3	$97.8	$111.4	$129	$708.2	**$672.4**
September 2006	*N/A	*N/A	-83.1	-133.4	-140.6	-73	39	83.6	105.2	123.9	674.8	596.4
OIG Calculation	-45.4	-97.1	-92.1	-127.1	-157.4	-73	39	83.6	105.2	123.9	674.9	**434.4**
FTI Cost Savings (current-year)												
December 2004	-60.4	-67.5	-131.7	-108.5	-77.4	12.8	56	77.6	84.4	93.3	445.5	326.1
September 2006	*N/A	*N/A	-83.1	-133.4	-140.6	-69.5	35.3	72.2	86.4	97	455.8	320.1
OIG Calculation	$-45.5	$-97.1	$-92.1	$-127.1	$-157.4	$-69.5	$35.3	$72.2	$86.4	$97	$455.8	**$158**

*FAA's calculation of cost savings for the current baseline in 2006 excludes sunk costs reported in FY 2003 and FY 2004. Our calculations of FTI cost savings for the current baseline in 2006 include all sunk costs, and we relied on actual costs from 2003 to 2007 to estimate savings.
Source: FTI basis of estimates in 2004 and FTI Program Office cost savings estimates in 2006.

Moreover, according to program officials, FTI benefits approved by the JRC included estimates for the period FY 2005 through FY 2017 and totaled $596.4 million. However, FAA's independent assessment did not validate the estimates approved by the JRC. Instead, FAA used estimates for the period FY 2007 through FY 2017 to calculate FTI benefits, which totaled $712.8 million.

We recognize that OMB guidance allows FAA to exclude prior investments when reporting benefits to OMB; however, this approach does not provide a complete picture of FTI cumulative benefits to decision makers. In our view, FAA should include prior investments in its calculations of estimated savings when reporting FTI cumulative benefits to decision makers. Because FAA's assessment excluded 4 years from its calculations, FTI benefits were overstated and should be

reassessed to be accurately reported to congressional and departmental decision makers.

Another cause for concern with FAA's projection of FTI cost savings involves legacy operations costs. FAA predicated its investment in FTI on achieving savings through one consolidated telecommunications network. Now that the Agency has decided to continue operating a portion of three legacy networks beyond December 2008, it is imperative that FAA recalculate the legacy operations cost and determine its impact on FTI's estimated cost savings.

Additionally, in September 2006, FAA added $259.9 million to the baseline cost for operating legacy telecommunications networks within the scope of the FTI program. This resulted in a revised legacy cost total of about $1.1 billion. We found, however, that the revised total was underestimated because FAA did not include about $200 million in its revised estimate. As a result, based on our calculation of actual legacy costs through June 2007, FAA already expended about $57 million more than planned ($1,174 million spent versus $1,117 million planned). FTI program officials acknowledged that they did not include FY 2002 legacy operations costs in the updated baseline. In viewing the history of the FTI program, an accurate accounting of the legacy costs is important as delays with the FTI transition translate directly into reduced cost savings due to paying for legacy systems longer than planned. Moreover, this is a key omission on FAA's part that must be fully disclosed to accurately report the true legacy cost within the scope of the FTI program.

Because FAA has yet to correct these issues, we continue to question the accuracy of FAA's cost projections for FTI. In fact, at the end of FY 2006, FAA expenditures for the year totaled $372 million for telecommunications services—$27 million more than the $345 million the Agency planned to spend. In FY 2007, FAA spent $397 million—$37 million more than planned. We note that every dollar spent above FAA's annual cost estimates is a dollar directly deducted from FAA's projected FTI cost savings. In FY 2008, through FAA's last reporting period for FTI (which ended March 31, 2008), the Agency spent about $160 million to support the program.

FAA Must Continue Addressing Technical and Reliability Issues That Have Impacted ATC Operations

We found that FAA facilities using FTI have experienced unscheduled service outages, which have disrupted ATC operations and caused flight delays. Because of these outages, several FTI services are not meeting availability requirements or being restored within contractual timeframes. As we reported in 2006, FAA must

ensure that FTI services avoid these problems by meeting diversity requirements (adequate separation of primary and alternate services) and reliability standards.

FTI Services at Critical Locations Have Experienced Outages and Caused Flight Delays

One of the primary technical risks occurring with FTI services is unscheduled service outages. In some cases there has been a simultaneous loss of primary and alternate telecommunications paths. Unscheduled outages in which both primary and back-up FTI services are lost not only disrupt and delay air travel but also have critical safety implications. We reported in 2006 that FAA needed to pay special attention to ensuring telecommunications diversity after a loss of all FTI services led to numerous flight delays at Chicago O'Hare International Airport.

Our current review found, however, that diversity problems persist with the FTI program. An October 2007 internal study completed by the FTI prime contractor found that several critical NAS locations continue to lack adequate diversity between primary and alternate telecommunications paths. Therefore, the potential to simultaneously lose all primary and alternate FTI services remains at those sites, and this could result in a loss of ATC operations.

We identified key FAA facilities in the New York metropolitan area that lack FTI diversity: the Kennedy Airport tower, the New York Terminal Radar Approach Control Center, and the New York ARTCC. The FTI services at these facilities were all routed through a single switching center operated by a single telephone company. No FTI services for these facilities were routed through an alternate switching center to provide back-up should an outage occur at the primary switching center.

The primary cause of these diversity problems is inadequate coordination between FTI's prime contractor and its subcontractors when designing and installing FTI services. FAA must continually review the implementation of critical services to ensure that diversity requirements are being met. We found that the diversity problems and other issues continue to result in flight delays. For example,

- On November 9, 2007, when FTI service was interrupted at Jacksonville ARTCC, all primary and alternate paths were lost, which resulted in 85 flight delays. FAA is now in the process of ordering installation of additional FTI equipment in New York, Jacksonville, and other critical ATC sites where FTI diversity was found to be inadequate.

- On September 25, 2007, all FTI primary and alternate paths providing radar, flight, and voice communications were lost at the Memphis ARTCC, blacking out air traffic control throughout the region for several hours and causing

566 flight delays. The problem was caused by the catastrophic failure of a key component (an optical network ring) that is supposed to have built-in fault tolerance. According to FAA's investigation of this outage, FAA was vulnerable to the same type of failure at other critical FAA facilities, including Atlanta and Jacksonville. The Memphis outage could have been prevented if the alternate telecommunications path was routed differently. FAA officials stated that the problem has been corrected at Memphis and other facilities.

- On July 27, 2007, FAA lost primary and back-up FTI services providing en route communications (ECOM) between air traffic controllers and pilots over North Carolina. Primary service was not restored for about 7 hours, and it took over 6 hours for back-up service to be restored.

In addition to inadequate diversity of services, we have identified several other causes for outages. Table 6 provides examples of critical FTI outages and their causes that disrupted ATC operations.

Table 6. Examples of Critical FTI Outages That Disrupted Air Traffic Control Operations

Location	Date	Duration	Details	Arrival/ Departure Delays
Chamblee, GA	05/15/08	3.8hrs	FTI circuit failure resulted in loss of multiple services.	41
San Diego, CA	04/12/08	2.2hrs	Teleco failure resulted in loss of services.	5
Leesburg, VA	03/24/08	1.08 hrs	Service between Washington and Jacksonville failed. No definitive cause has been identified.	60
Merrimack, NH	12/04/07	1.95hrs	Cables dislodged from the patch panel interrupted multiple services.	49
Jacksonville, FL	11/09/07	38 minutes	Inadequate physical diversity resulted in loss of service.	85
Memphis, TN	9/25/07	3 hours	Inadequate physical diversity resulted in loss of service.	566
Chicago, IL	5/23/07	3.5 hours	Improperly configured FTI equipment resulted in loss of service.	77
Los Angeles, CA ATCT	3/30/07	5 minutes	Display services interrupted during FTI troubleshooting.	25
Salt Lake, UT ARTCC	1/09/07	3 hrs	FTI maintenance supervisor failed to follow established procedures.	92
Orlando, FL ATCT	12/11/06	1.3 hrs	Improper configuration caused loss of service.	63
San Juan, PR CERAP	12/04/06	20 hrs	Underwater cable cut caused loss of service.	60
Atlanta, GA ATCT	09/28/06	1.25 hrs	Defective equipment caused the loss of multiple services.	8

Source: FAA NOCC Reports

Findings

The causes of other outages include defective or improperly configured equipment, and poor reliability of installed equipment. For example, on May 23, 2007, improperly configured FTI equipment in Chicago caused the loss of all radar service, forcing air traffic controllers to implement a local ground stop that caused 77 flight delays. Another incident occurred on December 4, 2006, in San Juan, Puerto Rico, which resulted in the loss of an FTI circuit and caused 60 flight delays.

To prevent additional FTI outages caused by inadequate physical separation of primary and alternate services, FAA needs to require that its prime contractor periodically conduct internal studies to ensure all sites requiring primary and alternate paths meet FAA requirements for diversity.

FAA Needs To Ensure the FTI Contractor Responds to FTI Outages More Efficiently

At FAA sites we visited, regional officials told us that the FTI contractor's responses to service outages are unacceptable. For instance, without informing FAA regional technicians, the FTI contractor has dispatched its own or local telephone company technicians to sites in response to outages. This results in inefficient use of resources as the contractor technicians must wait for an FAA escort before they can begin working. Moreover, any time waiting for the FAA escort to arrive counts as "customer time" and is not included in the reported outage time.

In addition to slow and uncoordinated responses, FTI technicians have left sites before completing repairs. For example, in some cases, technicians did not know how to repair services or did not have the correct parts or testing equipment. This means that, in those instances, multiple site visits are required for the technicians to restore the service. For example, FAA experienced several outages at the Duluth Radio Communication Air to Ground facility in Minnesota. Here, response times ranged upwards of 20 hours. Another problem hampering customer service is that service restoration sometimes depends on the local telephone companies that are not aware of the criticality of the FTI network. As a result, FAA's own technicians have become critical links in restoring FTI services by providing assistance to the FTI contractor and its subcontractors.

Another challenge that FTI program officials need to address is the lack of communication between the contractor and FAA when outages occur. FAA field personnel at sites we visited reported difficulty receiving updates and information from Harris's command center regarding the status of FTI outages. For example, we witnessed an outage at the Albuquerque ARTCC that FAA had to report to

Harris, when Harris should have detected it and reported it to FAA. Also, after receiving the report, Harris did not provide any updates for over 2 hours.

In another instance, poor workmanship at the Boeing Field tower in Seattle led to an FTI outage that caused the tower to close and transfer local air traffic control to another location. The outage went unnoticed by Harris's command center. Instead, FAA technicians had to notify Harris of the problem. It then took 3 days for Harris's subcontractor to visit the site to determine the cause of the incident.

FAA and the FTI prime contractor have taken a number of steps to improve FTI processes and procedures for reporting and resolving problems with outages. However, additional work is needed to ensure that FTI outages are restored in a timely manner and meet contractual requirements.

FAA Must Ensure That FTI Services Are Meeting Reliability Standards

We found that some FTI services are not meeting contractual reliability, maintainability, and availability requirements (RMA requirements).[15] For example, in March 2008, FTI contractor officials reported that an average of 7 percent of FTI services experienced outages and were not restored on time to meet their availability requirements.

There are seven different levels of RMA services being provided by FTI. For instance, RMA-1 services,[16] such as radars, are required to be restored within 6 seconds; however, we found the contractor took an average of 1 minute and 32 seconds in March 2008 to restore them.

Key RMA-4 services, such as En Route Air to Ground Communications, account for about 75 percent of all FTI services (see exhibit C). FAA requires that these services be restored within 3 hours. We found, and FAA acknowledged, that there was a problem in restoring these services in a timely fashion. FAA determined that since there would be a significant amount of RMA-4 services, meeting the requirements would be essential to improving overall FTI performance. Nevertheless, as of March 2008, we found the condition persists, with the FTI contractor taking an average of 5 hours and 47 minutes to restore RMA-4 services.

FAA must improve its processes and procedures for restoring FTI outages and ensure that FTI technicians restore services within established contractual timeframes to meet the availability requirements. When FTI technicians do not meet those timeframes, FAA should impose penalties against the FTI prime contractor. FAA should also develop improved procedures and controls for

[15] The FTI contract requires the contractor to issue credits to FAA when services do not met contractual specifications.

[16] RMA refers to reliability, maintainability, and availability, which are FAA performance measures for operational services.

contractor coordination, equipment installation, and configuration of FTI equipment to assist with improving the reliability of FTI services.

FAA Needs To Assess Controls Over FTI Reporting To Ensure FAA Senior Management Has Full Visibility Into All FTI Outages

In reviewing FAA's outage reports, we identified concerns regarding whether FAA senior management is aware of all FTI-related outages. While FAA's National Operational Command Center (NOCC) reports provide some visibility into FTI outages, FAA procedures call for many outages to be filtered out as they are reported up the management chain. Based on the Agency's NOCC reports between December 2006 and August 2007, we identified 21 unscheduled outages that resulted in flight delays and 38 other outages that did not result in delays.

According to Professional Airways System Specialists, or PASS (FAA's union representing its technicians), the number of FTI outages was different from what was identified in the NOCC reports. On May 9, 2007, PASS testified before the House Committee on Transportation and Infrastructure that, over a 9-day period, 60 unscheduled FTI-related outages occurred in the Central Service Area alone, while the NOCC reported only 8 outages during the same time period.

Based on a limited analysis of FAA's Central Service Area daily outage reports, we found that more than 60 FTI-related outages occurred during the 9-day period—not 8, as FAA reported in the NOCC. In its comments on our draft report, FAA stated that all FTI outages are logged and reported to the appropriate operational points-of-contact for the affected services. Notwithstanding FAA's position, our work shows that some FTI outages go unreported and that additional steps are needed to clarify and strengthen reporting requirements.

While FAA procedures require that outages resulting in air traffic delays be reported to senior management, we believe that decision makers must have accurate data about FTI outages that could impact ATC operations. Therefore, FAA needs to review internal procedures over NOCC reporting and ensure that all critical, FTI-related outages resulting in ATC delays that the regions include in daily outage reports are included in the NOCC report. Ultimately, this will help FAA to target solutions to the most vulnerable facilities and provide an accurate picture of FTI operations to senior decision makers.

RECOMMENDATIONS

As FAA moves forward with FTI, it must provide decision makers with an accurate account of FTI's expected benefits and cost impact on FAA's capital and operations funds. Additionally, FAA needs to ensure that FTI diversity requirements are met to prevent outages to ATC operations. We recommend that FAA:

1. Reassess network engineering cost growth that was associated with the FTI transition during FY 2004 to FY 2007 but paid from the operations account to accurately report the true F&E costs associated with developing and transitioning to FTI.

2. Document the planned schedule for completing the FTI transition for services remaining on the DMN, NADIN PSN, and BWM networks beyond the current baseline transition end date of December 2008 and those emerging services that were identified but not yet included in the schedule during the last reporting period for FTI.

3. Calculate how updates to the transition schedules for the DMN, NADIN PSN, and BWM network components remaining in operation will impact FTI's life-cycle cost and benefits baselines.

4. Conduct periodic internal audits to ensure that adequate physical diversity exists at all facilities requiring separation of primary and alternative access paths.

5. Develop an action plan for (a) reducing the time to restore FTI services so that it conforms with contractual requirements and (b) improving the percentage of FTI services that meet availability specifications.

6. Review internal procedures over NOCC reporting and ensure all critical FTI-related outages resulting in ATC delays that are reported in daily outage reports by the regions are included in the NOCC report.

AGENCY COMMENTS AND OFFICE OF INSPECTOR GENERAL RESPONSE

On June 30, 2008, we provided FAA with our draft report. In addition, we held an exit conference on July 3, 2008, and subsequent meetings with FAA officials responsible for managing FTI, including the Senior Vice President for Operations and Assistant Administrator for Financial Services who also serves as the Agency's Chief Financial Officer. Based on FAA's initial comments, we made a number of technical adjustments to our report where appropriate and revised the recommendations to clarify our intent and more accurately describe the corrective actions that FAA needs to take with respect to FTI.

On September 19, 2008, FAA provided formal comments to our draft report and concurred with all six of our recommendations.

Recommendation 1: FAA stated that it will reassess network engineering cost growth that was associated with the FTI transition during FY 2004 to FY 2007 but paid from the operations account. FAA stated it will report on its findings by November 29, 2008.

Recommendation 2: FAA stated that it will document the planned schedule for completing the FTI transition for services remaining on the DMN, NADIN PSN, and BWM networks beyond December 2008. FAA also stated it would document the planned schedule for completing the FTI transition for those emerging services that were identified but not yet included in the schedule during the last reporting period for FTI. FAA stated it will report on the schedule by November 29, 2008.

Recommendation 3: FAA stated that it will calculate how updates to the transition schedules for the DMN, NADIN PSN, and BWM network components remaining in operation will impact FTI's life-cycle cost and benefit baseline. FAA stated that it will report on its findings by November 29, 2008.

Recommendation 4: FAA stated that it will conduct periodic, internal audits to ensure that adequate physical diversity exists at all facilities requiring separation of primary and alternative access paths. FTI program officials pointed out that they are already conducting some diversity audits.

Recommendation 5: FAA stated that it will develop an action plan for (a) reducing the time to restore FTI services so that it conforms with contractual requirements and (b) improving the percentage of FTI services that meet availability specifications. FAA stated it will complete the action plan by November 29, 2008.

Recommendation 6: FAA stated that it will review internal procedures over NOCC reporting to ensure that critical, FTI-related outages resulting in ATC delays that regions include in daily outage reports are included in the NOCC report. FAA stated that it will provide the results of the review by November 29, 2008.

When successfully implemented, FAA's planned actions will meet the intent of our recommendations and provide greater transparency into the Agency's plans to address the remaining challenges in meeting FTI transition goals.

FAA General Comments

FAA also included four general comments about FTI and our report.

FAA's Comments on FTI Business Rules: FAA disagreed with our conclusions that all network engineering costs through FY 2007 should have been charged to the F&E account and that FAA continued to allow Operations costs to be charged to the F&E account. FAA stated that it follows the July 2006 revised business rules.

We question FAA's position because our report does not state that all network engineering costs should have been charged to the F&E account. FTI program officials agree that FTI's revised F&E cost estimate of $318.8 million is underestimated due to additional network engineering activities (capital costs) that were charged to the Operations account. We found that network engineering was the primary cost driver impacting F&E, which grew by more than $36 million over a 4-year period ending in FY 2007. In FY 2007 alone, we identified a nine-fold increase over FAA's original estimate of $1.5 million to $15.8 million for network engineering support.

Moreover, FTI program officials acknowledge that some network engineering costs should have been charged to the F&E account and that increased network engineering costs were not reflected in its F&E budget. We note that most of the cost growth occurred before FAA updated its business rules in July 2006. For these reasons, we recommended, and FAA agreed, that FAA assess the cost growth to determine the true F&E costs associated with transitioning to FTI.

FAA's Comments on Legacy Network Operating Costs: FAA disagreed with our conclusion that it would have exceeded its life-cycle cost estimate for legacy operations by $57 million if legacy operations costs from 2002 were included. FAA states that its year-by-year reporting shows that the actual costs are $43.7 million less than the plan to date and $231.2 million below the life-cycle estimate.

We maintain that the analysis in our report is correct because FAA did not include about $200 million in prior operations costs used to support the legacy networks within the scope of the FTI program. When these costs are included, they increase the revised cost estimates for legacy operations (of $1.1 billion) by $57 million. FAA acknowledges that it did not include FY 2002 legacy operations costs in the updated baseline. In viewing the history of the FTI program, an accurate accounting of the legacy costs is important because delays with the FTI transition translate directly into reduced cost savings due to paying for legacy systems longer than planned.

We have not reviewed FAA's most recent projections of actual costs for legacy network operations in detail. However, we found a $50 million variance in the actual costs being reported for legacy network operations. For example, when comparing actual costs incurred for legacy operations through FY 2007, FTI metrics report totaled $948 million, but FTI program officials' updated projections totaled $898 million. This type of inconsistency is the reason we continue to question the accuracy and validity of FTI program officials' projections of FTI costs and benefits.

FAA's Comments on Projections of FTI Cost Savings Benefits: FAA disagreed with our calculation of FTI cost savings benefits. FAA has developed an updated projection of cost savings using all actual costs incurred to date and a revised projection for FY 2008 to reflect the early completion of the LINCS transition. FAA's revised projections show that the FTI program remains on track to produce nearly $600 million in cost savings.

As noted in our report, cost and benefits for FTI remain uncertain, and we have seen various estimates that rely on different periods of performance. In April 2006, we recommended that FAA independently validate FTI cost projections to ensure that there was an objective assessment of FTI cost and benefit information. However, the Agency did not validate the cost and benefit projections. An internal FAA assessment raised concerns about some of the baselined costs and reported that the F&E baseline was masked by FTI business rules that allow traditional F&E expenditures to be funded by the Operations account.

In our analysis of FTI expected savings, we included prior investments (e.g., sunk costs) as well as the cost of operating legacy systems longer than planned. We continue to believe that decision makers need a complete picture of costs for FTI given that it was one of the few acquisitions expected to reduce the Agency operating costs.

We do not understand why the JRC approved the revised FTI baseline in 2006 without validating costs and expected benefits as agreed. FAA policy requires that Agency program officials submit independently validated cost and benefit

estimates for planned capital investments, such as FTI, to the JRC before a re-baseline request is approved. Validating costs and benefits estimates is important because if the revised program costs are underestimated, cost growth will cause benefits to be reduced, possibly to the point of undermining the cost effectiveness of the investment. Finally, until FAA calculates what impact the three remaining legacy networks will have on FTI's life-cycle cost and benefit baselines, FAA's projections of FTI cost savings benefits will remain uncertain.

FAA's Comments on the Reporting of FTI Outages: FAA disagreed that some FTI outages may be going unreported. Our report states that FAA needs to ensure FAA senior management has full visibility into all FTI outages. While FAA's NOCC reports provide some visibility into FTI outages, FAA procedures call for many outages to be "filtered" as they are reported up the management chain. Based on a limited analysis of FAA's daily outage reports, we found that more than 60 FTI-related outages occurred during a 9-day period—not 8, as FAA reported in the NOCC. For this reason, we recommended, and FAA agreed, that FAA review internal procedures over NOCC reporting and ensure all critical FTI-related outages are reported.

ACTION REQUIRED

We consider FAA's actions taken or planned to be responsive to the intent of our recommendations. In accordance with Department of Transportation Order 8000.1C, we consider the recommendations addressed but open until FAA completes all planned actions.

EXHIBIT A. OBJECTIVES, SCOPE, AND METHODOLOGY

Our audit objectives for this audit were to (1) assess FAA's progress in developing a realistic master schedule and an effective FTI transition plan and (2) determine if FAA is mitigating technical risks to air traffic control operations by coordinating activities and validating site-specific requirements before activating FTI services and disconnecting existing telecommunication services.

To achieve our objectives, we obtained FTI monthly status reports, master schedules, reliability reports, outage reports, budget data, planned and actual cost expenditure data, revised cost and schedule projections, independent evaluations, and other supporting documentation from FAA. We also acquired relevant contractor financial and performance reports from Harris Corporation. We analyzed FAA's FTI master schedule and budget and cost estimates. We reviewed FAA's FTI transition strategy documents for reasonableness. We analyzed Harris's financial and performance reports to determine if FTI equipment was performing and being maintained as required. We examined FAA's expenditures data for FTI and for FAA's legacy telecommunications networks to determine if FTI is achieving cost and benefit goals.

While conducting this review, we interviewed key FAA and FTI program officials at the Agency's Headquarters in Washington, DC, including FAA officials responsible for Telecommunications, Acquisition, and Finance, as well as FAA staff members in organizational units reporting to these officials. We interviewed FTI prime contractor officials at Harris's primary FTI location in Melbourne, Florida. We also met with officials from Mitre. Additionally, we visited numerous FAA locations in the Agency's Western Pacific, Northwest Mountain, Southwestern, Southern, and Great Lakes Regions and interviewed numerous FAA regional officials, engineers, managers, and technicians involved with acquiring or operating FAA telecommunications or FTI equipment.

We performed our audit work from May 2006 through July 2008. We performed our work in accordance with generally accepted Government Auditing Standards as prescribed by the Comptroller General of the United States.

EXHIBIT B. STATUS OF FTI REPLACEMENT OF SEVEN LEGACY TELECOMMUNICATION NETWORKS (AS OF MARCH 31, 2008)

Network Acronym	Network Name / Description	FTI Transition Status	Comments
LINCS*	Leased Inter-Facility National Airspace Communications System – Provides connectivity to all NAS facilities via leased services on a point-to-point basis.	Complete	160 out of 160 LINCS A-nodes Decommissioned.
NADIN PSN	National Airspace Data Interchange Network – Part of the data switching sub-element that provides high speed data communication between subsystems in the NAS.	Not Complete	Interim solution pending replacement of NADIN II equipment. Not anticipated to be complete until 2009 to 2010 timeframe.
DMN	Data Multiplexing Network – Provides a simple multiplexing function for digital data transfer across narrow band.	Not Complete	DMN supporting long-range radars remain. Interim solution pending replacement of DMN equipment. To be replaced after December 2008.
BWM	Bandwidth Manager – Provides multiplex sub-rate and data streams primarily on ARTCC-to-ARTCC circuits.	Not Complete	National Security Issue - Interim solution pending replacement of BWM equipment. Likely to be completed after December 2008.
FTS2000 /2001*	Federal Telecommunications System 2000 and 2001 – Leased (GSA-provided) connectivity for administrative voice, data, and video connectivity.	Complete	FTS dedicated circuits will be transitioned to FTI.
FAATSAT*	FAA Telecommunication Satellite System – Provides leased point-to-point connectivity between facilities using satellite transmission.	Complete	FAATSAT network has been decommissioned. Transition of FAATSAT services to FTI was completed in September 2006.
ADTN	Administrative Data Telecommunications Network – Carries all of the administrative infrastructure data and video traffic, including financial and personnel data and e-mail.	Complete	ADTN network has been decommissioned. The transition of services from ADTN to the new FTI Mission Support Network was completed in September 2006.

* LINCS, FTS2000/2001, FAATSAT, and ADTN were leased telecommunications networks.
** NADIN PSN, DMN, and BWM are FAA-owned assets.

EXHIBIT C. TOTAL PLANNED FTI SERVICES DISTRIBUTION BY RMA LEVEL

RMA Level*	Example of Services	Number of Services Planned	Percent of Total
RMA1	Radar, WAAS	202	1%
RMA2	Interphone, ATC Computer Circuits	1331	6%
RMA3	Flight and Weather Data, Air Traffic Management	883	4%
RMA4	En Route Air to Ground Communication, Remote Maintenance Monitoring	16,400	**75%**
RMA5	ASOS Weather Sensor, High Capacity (T1) Circuits	1999	9%
RMA6	FTI Mission Support	820	4%
RMA7	FTI SAT	236	1%
Total		**21,871****	**100%**

* RMA 1-3 Diverse: dual path implementation, RMA 4-5 Avoided: single path implementation.

**Total of 21,871 represents FAA planned services by RMA levels, while the 22,719 services we note throughout the report represent estimates to completion at a given point in time.

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APPENDIX. AGENCY COMMENTS

Federal Aviation Administration

Memorandum

Date: September 19, 2008

To: Lou E. Dixon, Assistant Inspector General for Aviation and Special Program Audits

From: Ramesh K. Punwani, Assistant Administrator for Financial Services/CFO

Prepared by: Anthony Williams, x79000

Subject: OIG Draft Report: FAA's Progress and Challenges in Meeting FTI Transition Goals Federal Aviation Administration

Thank your for the opportunity to review your most recent draft of the subject report. We concur with all recommendations contained in the report. The Agency's planned action for addressing each recommendation is stated below. However, despite the changes that have been made since the original draft, we continue to have concerns with the accuracy of your findings in four areas: business rules; legacy network operating costs; projections of Telecommunications Infrastructure (FTI) costs savings benefits; and reporting of FTI outages. As such, we have included statements outlining our concerns and positions, and request you consider these statements when preparing your final report.

OIG Recommendation 1: Reassess network engineering costs growth associated with the Telecommunications Infrastructure transition during fiscal year (FY) 2004 to FY 2007, but paid from the operations account, to accurately report the true F&E costs associated with developing and transitioning to FTI.

FAA Response: Concur. The Agency will reassess network engineering costs growth associated with the FTI transition during FY 2004 to FY 2007, but paid from the operations account, to accurately report the true F&E costs associated with developing and transitioning to FTI. The Agency will provide a report on its findings by November 29.

OIG Recommendation 2: Document the planned schedule for completing the transition to FTI of services remaining on the DMN, NADIN PSN, and BWM networks beyond the current baseline transition end date of December 2008, and those emerging services that were identified but not yet included in the schedule during the last reporting period for FTI.

FAA Response: Concur. The Agency will document the planned schedule for completing the transition to FTI of services remaining on the DMN, NADIN PSN, and BWM networks beyond the current baseline transition end date of December 2008, and those emerging services that were

identified but not yet included in the schedule during the last reporting period for FTI. The Agency will provide a report on the schedule by November 29.

OIG Recommendation 3: Calculate how updates to the transition schedules for the DMN, NADIN PSN, and BWM network components remaining in operation will impact FTI's life cycle cost and benefits baselines.

FAA Response: Concur. The Agency will calculate how updates to the transition schedules for the DMN, NADIN PSN, and BWM network components remaining in operation will impact FTI's life cycle cost and benefits baselines. The Agency will provide a report on its findings by November 29.

OIG Recommendation 4: Conduct periodic internal audits to ensure that adequate physical diversity exists at all facilities requiring separation of primary and alternative access paths.

FAA Response: Concur. The Agency will conduct periodic internal audits to ensure that adequate physical diversity exists at all facilities requiring separation of primary and alternative access paths. FTI is already performing regularly scheduled diversity audits. Results of these audits can be made available upon request.

OIG Recommendation 5: Develop an action plan for: (1) reducing the time to restore FTI services so that it conforms with contractual requirements; and (2) improving the percentage of FTI services that meet availability specifications.

FAA Response: Concur. The Agency will develop an action plan for: (1) reducing the time to restore FTI services so that it conforms with contractual requirements; and (2) improving the percentage of FTI services that meet availability specifications. The Agency will complete the action plan by November 29.

OIG Recommendation 6: Review internal procedures over National Operations Command Center (NOCC) reporting and ensure all critical FTI-related outages resulting in ATC delays that are reported in daily outage reports by the regions are included in the NOCC report.

FAA Response: Concur. The FAA will review internal procedures over NOCC reporting and will continue to ensure all critical FTI-related outages resulting in ATC delays that are reported in daily outage reports by the regions are included in the NOCC report. The results of the review will be provided by November 29.

Comments on the findings in the report:

Business Rules

FAA Comments: The FAA does not agree with the OIG conclusions that: (1) all Network Engineering costs through FY2007 should have been charged to the F&E account; and (2) the FAA continued to allow Operations costs to be charged to the F&E account. With respect to the first conclusion, the FAA agrees that implementation-related costs should be funded by the F&E account, **but not all Network Engineering activities are related to network implementation.** Thousands of FTI services have been in operation since 2005 and a significant portion of Network Engineering activities are appropriately funded by the Operations account because they are related to network optimization and changes to services that are already in operation, i.e., they are not related to network implementation.

With respect to the second conclusion, in April 2006, the DOT OIG issued an audit report recommending that FTI business rules should be revisited since the transition was running behind schedule and significant implementation-related activities were still ongoing. Consistent with the OIG recommendation, the FTI business rules were updated to specify that implementation-related Network Engineering activities should be funded by the F&E account and operations-related activities should be funded by the Operations account. The FAA follows the revised business rules. For this reason, the FAA disagrees with the OIG finding that the FAA continued to allow charges to the Operations account that should have been charged to the F&E account.

Legacy Network Operating Costs

FAA Comments: The FAA disagrees with the OIG conclusion that FAA would already have exceeded its life cycle cost estimate for legacy operations costs by $57 million if the legacy operations costs from 2002 were included. The FAA's year-by-year reporting shows that the **actual costs are $43.7 million less than the plan to-date and $231.2 million below the life cycle estimate.**

Projections of FTI Costs Savings Benefits

FAA Comments: The FAA does not agree with the OIG calculation of FTI costs savings benefits. The FAA has developed an updated projection of cost savings benefits using all actual costs incurred to-date and a revised projection for FY2008 to reflect the early completion of the LINCS transition. The revised projection shows that the FTI program remains on track to produce nearly $600 million in then-year cost savings which equates to $375 million in discounted dollars using the prevailing discount rate published by the OMB.

Reporting of FTI Outages

FAA Comments: FAA does not agree with the OIG assertion that some FTI outages may be going unreported. The FAA has defined procedures for reporting outages and those procedures are followed for FTI. All FTI outages are logged and reported to the appropriate operational points-of-contact. In addition, all FTI outages that impact air traffic control operations are reported to FAA senior management.

The following pages contain textual versions of the graphs and charts included in this document. These pages were not in the original document but have been added here to accommodate assistive technology.

FAA's Progress and Challenges in Meeting FTI Transition Goals

Section 508 Compliant Presentation

Table 1. History of FTI Program Changes

In July 1999, FAA established the FTI baseline. This baseline included 1,374 planned FTI sites. FTI services planned were not defined in this baseline. This baseline also included a planned transition completion date of September 2005, a planned program completion date of 2010, and a cost estimate of $1.9 billion.

In December 2004, FAA re-baselined FTI, with 4,463 FTI sites planned, 25,294 FTI services planned, a planned transition completion date of December 2007, a planned program completion date of 2017, and a cost estimate of $3.3 billion.

In September 2006, FAA did a second FTI re-baseline, with 4,053 FTI sites planned, 20,033 FTI services planned, a planned transition completion date of December 2008, a planned program completion date of 2017, and a cost estimate of $3.4 billion.

Source: FTI JRC Baseline Briefs and FTI National Implementation "Kickoff Team" Brief

Table 2. FTI Life-Cycle Cost Estimates

In December 2004, FAA's Joint Resources Council approved $310,200,000 for FTI facilities and equipment costs. In August 2006, the Joint Resources Council approved $318,800,000 in FTI facilities and equipment costs. This increased FTI facilities and equipment costs by $8,600,000.

In December 2004, FAA's Joint Resources Council approved $2,110,100,000 for FTI operations costs. In August 2006, the Joint Resources Council approved $1,954,400,000 for FTI operations costs. This decreased FTI operations costs by $155,700,000.

In December 2004, FAA's Joint Resources Council approved $857,400,000 for FTI legacy operations costs. In August 2006, the Joint Resources Council approved $1,117,300,000 for FTI legacy operations costs. This increased FTI legacy operations costs by $259,900,000.

In December 2004, FAA's Joint Resources Council approved $3,277,700,000 in total FTI life-cycle costs. In August 2006, the Joint Resources Council approved

$3,390,500,000 in total FTI life-cycle costs. This increased total FTI life-cycle costs by $112,800,000.

Source: FTI Program Baseline Briefs

Table 3. Status of FTI's Five Critical Steps as of March 31, 2008

Site Acceptance	3,826 actual tasks reported	4,174 total quantity planned	91.7 percent complete
Service Acceptance	20,516 actual tasks reported	22,719 total quantity planned	90.3 percent complete
Service Cut Over	19,977 actual tasks reported	22,719 total quantity planned	87.9 percent complete
Legacy Service/Circuit Disconnects	14,113 actual tasks reported	17,191 total quantity planned	82.1 percent complete
LINCS A-Node Decommissions	160 actual tasks reported	160 total quantity planned	100 percent complete

Note 1: The total number of planned services and legacy circuit disconnects is provided in the March 2008 FTI master schedule.

Note 2: According to FTI program officials, all 160 LINCS A-Nodes were decommissioned by April 2008.

Source: FTI Program Office, "Metrics Report," as of March 31, 2008

Figure 1. Number of FTI Planned Services Have Fluctuated Over Time

In the December 2004 FTI plan, there were 25, 294 planned FTI services. In the August 2006 FTI plan (the current plan), there are 20, 033 planned FTI services. In the March 2008 FTI master schedule, there are 22, 719 planned FTI services.

Source: OIG analysis of FTI current versus prior baseline schedules and the FTI master schedule

Table 4. FTI Network Engineering Cost Growth Charged to FTI Operations Account

- FTI Contract Modification 4 (dated April 27, 2004) estimated network engineering costs for fiscal year 2004 at $2,231,090. FTI Contract Modification 12 (dated November 20, 2006) estimated network engineering costs for fiscal year 2004 at $4,401,683. This represents a cost growth of $2,170,593—a 97 percent increase.

- FTI Contract Modification 4 (dated April 27, 2004) estimated network engineering costs for fiscal year 2005 at $2,305,557. FTI Contract Modification 12 (dated November 20, 2006) estimated network engineering costs for fiscal year 2005 at $12,761,781. This represents a cost growth of $10,456,224—a 454 percent increase.

- FTI Contract Modification 4 (dated April 27, 2004) estimated network engineering costs for fiscal year 2006 at $2,282,499. FTI Contract Modification 12 (dated November 20, 2006) estimated network engineering costs for fiscal year 2006 at $11,700,000. This represents a cost growth of $9,417,501—a 413 percent increase.

- FTI Contract Modification 4 (dated April 27, 2004) estimated network engineering costs for fiscal year 2007 at $1,548,163. FTI Contract Modification 12 (dated November 20, 2006) estimated network engineering costs for fiscal year 2007 at $15,846,038. This represents a cost growth of $14,297,875—a 924 percent increase.

- FTI Contract Modification 4 (dated April 27, 2004) estimated total network engineering costs for fiscal year 2004 through fiscal year 2007 at $8,367,309. FTI Contract Modification 12 (dated November 20, 2006) estimated total network engineering costs for fiscal year 2004 through fiscal year 2007 at $44,709,502. This represents a total cost growth for the 4-year period of $36,342,193.

Source: FTI Contract Modifications

Figure 2. FTI Planned Operations Cost Are Declining While the Demand for FTI Services Is Increasing (Fiscal Year 2009 to Fiscal Year 2012)

Fiscal Year 2009	FTI planned operations costs are $206 million.
Fiscal Year 2010	FTI planned operations costs are $165.4 million.
Fiscal Year 2011	FTI planned operations costs are $152.6 million.
Fiscal Year 2012	FTI planned operations costs are $145.3 million.

Source: FTI Metrics Report and OMB Exhibit 300 (Budget Year 2009)

Table 5. Changes in FTI Cost Savings Estimates in Then-Year and Current-Year Dollars

FTI Cost Savings (then-year) as calculated in December 2004 are as follows:

Fiscal Year 2003	-$60.4 million
Fiscal Year 2004	-$67.5 million
Fiscal Year 2005	-$131.7 million
Fiscal Year 2006	-$111.5 million
Fiscal Year 2007	-$84.9 million
Fiscal Year 2008	$14.7 million
Fiscal Year 2009	$67.3 million
Fiscal Year 2010	$97.8 million
Fiscal Year 2011	$111.4 million
Fiscal Year 2012	$129 million
Fiscal Year 2013 through 2017	$708.2 million
Total	**$672.4** million

FTI Cost Savings (then-year) as calculated in September 2006 are as follows:

Fiscal Year 2003	N/A
Fiscal Year 2004	N/A
Fiscal Year 2005	-$83.1 million
Fiscal Year 2006	-$133.4 million
Fiscal Year 2007	-$140.6 million
Fiscal Year 2008	-$73 million
Fiscal Year 2009	$39 million
Fiscal Year 2010	$83.6 million
Fiscal Year 2011	$105.2 million
Fiscal Year 2012	$123.9 million
Fiscal Year 2013 through 2017	$674.8 million
Total	$596.4 million

FTI Cost Savings (then-year) as calculated by the Office of Inspector General are as follows:

Fiscal Year 2003	-$45.4 million
Fiscal Year 2004	-$97.1 million
Fiscal Year 2005	-$92.1 million
Fiscal Year 2006	-$127.1 million
Fiscal Year 2007	-$157.4 million
Fiscal Year 2008	-$73 million
Fiscal Year 2009	$39 million
Fiscal Year 2010	$83.6 million
Fiscal Year 2011	$105.2 million
Fiscal Year 2012	$123.9 million
Fiscal Year 2013 through 2017	$674.9 million
Total	**$434.4** million

FTI Cost Savings (current-year) as calculated in December 2004 are as follows:

Fiscal Year 2003	-$60.4 million
Fiscal Year 2004	-$67.5 million
Fiscal Year 2005	-$131.7 million
Fiscal Year 2006	-$108.5 million
Fiscal Year 2007	-$77.4 million
Fiscal Year 2008	$12.8 million
Fiscal Year 2009	$56 million
Fiscal Year 2010	$77.6 million
Fiscal Year 2011	$84.4 million
Fiscal Year 2012	$93.3 million
Fiscal Year 2013 through 2017	$445.5 million
Total	$326.1 million

FTI Cost Savings (current-year) as calculated in September 2006 are as follows:

Fiscal Year 2003	$ N/A
Fiscal Year 2004	$ N/A
Fiscal Year 2005	-$ 83.1 million
Fiscal Year 2006	-$ 133.4 million
Fiscal Year 2007	-$140.6 million
Fiscal Year 2008	-$ 69.5 million
Fiscal Year 2009	$35.3 million
Fiscal Year 2010	$72.2 million
Fiscal Year 2011	$86.4 million
Fiscal Year 2012	$97 million
Fiscal Year 2013 through 2017	$455.8 million
Total	$320.1 million

FTI Cost Savings (current-year) as calculated by the Office of Inspector General are as follows:

Fiscal Year 2003	**-$**45.5 million
Fiscal Year 2004	-$97.1 million
Fiscal Year 2005	-$92.1 million
Fiscal Year 2006	-$127.1 million
Fiscal Year 2007	-$157.4 million
Fiscal Year 2008	-$69.5 million
Fiscal Year 2009	$35.3 million
Fiscal Year 2010	$72.2 million
Fiscal Year 2011	$86.4 million
Fiscal Year 2012	$97 million
Fiscal Year 2013 through 2017	$455.8 million
Total	**$158** million

Note: FAA's calculation of cost savings for the current baseline in 2006 excludes sunk costs reported in FY 2003 and FY 2004. Our calculations of FTI cost savings for the current baseline in 2006 include all sunk costs, and we relied on actual costs from 2003 to 2007 to estimate savings.

Source: FTI basis of estimates in 2004 and FTI Program Office cost savings estimates in 2006.

Table 6. Examples of Critical FTI Outages That Disrupted Air Traffic Control Operations

Chamblee, Georgia	05/15/08	3.8 hours duration	Reason: FTI circuit failure resulted in loss of multiple services.	Caused 41 arrival or departure delays
San Diego, California	04/12/08	2.2 hours duration	Reason: Teleco failure resulted in loss of services.	Caused 5 arrival or departure delays
Leesburg, Virginia	03/24/08	1.08 hours duration	Reason: Service between Washington and Jacksonville failed. No definitive cause has been identified.	Caused 60 arrival or departure delays
Merrimack, New Hampshire	12/04/07	1.95 hours duration	Reason: Cables dislodged from the patch panel interrupted multiple services.	Caused 49 arrival or departure delays
Jacksonville, Florida	11/09/07	38 minutes duration	Reason: Inadequate physical diversity resulted in loss of service.	Caused 85 arrival or departure delays

Memphis, Tennessee	9/25/07	3 hours duration	Reason: Inadequate physical diversity resulted in loss of service.	Caused 566 arrival or departure delays
Chicago, Illinois	5/23/07	3.5 hours duration	Reason: Improperly configured FTI equipment resulted in loss of service.	Caused 77 arrival or departure delays
Los Angeles, California Air Traffic Control Tower	3/30/07	5 minutes duration	Reason: Display services interrupted during FTI troubleshooting.	Caused 25 arrival or departure delays
Salt Lake, Utah Air Route Traffic Control Center	1/09/07	3 hours duration	Reason: FTI maintenance supervisor failed to follow established procedures.	Caused 92 arrival or departure delays
Orlando, Florida Air Route Traffic Control Center	12/11/06	1.3 hours duration	Reason: Improper configuration caused loss of service.	Caused 63 arrival or departure delays
San Juan, Puerto Rico Combined En-Route and Approach	12/04/06	20 hours duration	Reason: Underwater cable cut caused loss of service.	Caused 60 arrival or departure delays
Atlanta, Georgia Air Traffic Control Tower	09/28/06	1.25 hour duration	Reason: Defective equipment caused the loss of multiple services.	Caused 8 arrival or departure delays

Source: FAA National Operational Command Center Reports

Exhibit C. Total Planned FTI Services Distribution by Assigned Reliability-Maintainability-Availability (RMA) Level

RMA1	Example of Services : Radar, Wide Area Augmentation System (WAAS)	Number of Services Planned: 202	Percent of Total: 1%
RMA2	Example of Services : Interphone, Air Traffic Control Computer Circuits	Number of Services Planned: 1331	Percent of Total: 6%
RMA3	Example of Services : Flight and Weather Data, Air Traffic Management	Number of Services Planned: 883	Percent of Total: 4%
RMA4	Example of Services : En Route Air to Ground Communication, Remote Maintenance Monitoring	Number of Services Planned: 16,400	Percent of Total: 75%
RMA5	Example of Services : Automated Surface Observing Systems (ASOS) Weather Sensor, High Capacity (T1) Circuits	Number of Services Planned: 1999	Percent of Total: 9%
RMA6	Example of Services : FTI Mission Support	Number of Services Planned: 820	Percent of Total: 4%
RMA7	Example of Services : FTI SAT	Number of Services Planned: 236	Percent of Total: 1%

Total number of services planned: 21,871.

Note 1: RMA 1-3 Diverse: dual path implementation, RMA 4-5 Avoided: single path implementation.

Note 2: Total of 21,871 represents FAA planned services by RMA levels, while the 22,719 services we note throughout the report represent estimates to completion at a given point in time.