FAA'S MANAGEMENT AND MAINTENANCE OF AIR TRAFFIC CONTROL FACILITIES

Federal Aviation Administration

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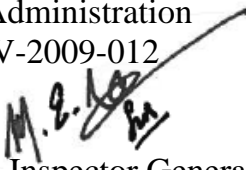
U.S. Department of Transportation

Office of the Secretary
of Transportation
Office of Inspector General

Memorandum

Subject:	<u>ACTION</u>: FAA's Management and Maintenance of Air Traffic Control Facilities Federal Aviation Administration Report Number AV-2009-012	Date: December 15, 2008
From:	David A. Dobbs Principal Assistant Inspector General for Auditing and Evaluation	Reply to Attn. of: JA-1
To:	Acting FAA Administrator	

This report presents the results of our audit of the Federal Aviation Administration's (FAA) management and maintenance of air traffic control facilities. The President has designated the National Airspace System (NAS) as a critical component for maintaining the security of the Nation, and FAA has invested billions of dollars in new equipment for handling increasingly higher levels of air traffic in more complex airspace. However, the facilities that house those systems are aging and showing signs of deteriorating physical conditions.

As FAA begins implementing plans for the Next Generation Air Transportation System (NextGen), which is targeted for completion in 2025, it will be critical to determine the type and number of facilities that will be needed to support the envisioned architecture. It will be equally important to identify and fund the maintenance needs of the existing infrastructure necessary to support the NAS until NextGen is in place.

We conducted this audit at the request of the Chairman of the House Committee on Transportation and Infrastructure, who expressed concerns about the overall state of FAA facilities. The objectives of our audit were to determine if FAA has (1) developed and implemented a comprehensive strategy to effectively manage the replacement, repair, and modernization of its air traffic control facilities and (2) allocated sufficient funds to carry out those activities.

During this audit, we visited 12 air traffic control terminal facilities, 2 en route centers, 1 FAA service area, and FAA Headquarters. Exhibit A details our audit scope and methodology. Exhibit B lists the specific organizations and facilities

we visited during the audit. We conducted this program audit in compliance with generally accepted <u>Government Auditing Standards</u> as prescribed by the Comptroller General of the United States.

BACKGROUND

FAA operates and maintains a vast network of facilities, radars, and communication networks to manage air traffic. FAA has three categories of air traffic control facilities, which are managed by three different service units within the Air Traffic Organization (ATO).

- Terminal Facilities: These facilities manage traffic in the vicinity of an airport. They consist of air traffic control towers (ATCT) and terminal radar approach control facilities (TRACON) and are managed by the Vice President of Terminal Services. Terminal Services is responsible for 397 facilities.[1]

- En Route Facilities: These facilities manage high-altitude traffic. They consist of air route traffic control centers (ARTCC) and are managed by the Vice President of En Route and Oceanic Services. En Route and Oceanic Services is responsible for 21 ARTCCs, as well as the San Juan and Guam Combined Center Radar Approach Controls (CERAP).

- Unstaffed Infrastructure Sustainment Facilities: These facilities consist of unmanned buildings and broadcast towers and are managed by the Vice President of Technical Operations.   Technical Operations maintains over 23,000 facilities. However, we limited our review to staffed FAA air traffic control facilities.

In total, FAA has full or partial responsibility for 420 staffed air traffic control facilities. FAA separates its management and maintenance responsibilities into three distinct categories: sustainment, replacement, and recurring.

- *Sustainment* refers to planned maintenance activities, such as completely replacing air conditioning systems or roofs at existing buildings. This is separate from *modernization*, which refers to large, costly projects, such as constructing additional wings to existing buildings or consolidating TRACON facilities.

- *Replacement* refers to building new facilities to replace existing ones. Both sustainment and replacement projects are capital expenses and are funded from FAA's Facilities and Equipment (F&E) account.

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[1] These include both FAA- and contractor-operated facilities.

- *Recurring maintenance* refers to day-to-day maintenance needs, such as plumbing, electrical, and cosmetic repairs. Recurring maintenance needs are routine expenses and are funded from FAA's Operations account.

FAA spends about $300 million annually on its en route, terminal, and unmanned facilities, or about 11 percent of its capital budget.

RESULTS IN BRIEF

Many of FAA's air traffic control facilities have exceeded their useful lives, and their physical condition continues to deteriorate. Most of the challenges FAA is encountering are a direct result of the decentralized, reactive approach FAA formerly used to maintain its facilities. After FAA created the ATO in 2004, it developed and implemented a process to better manage the replacement and sustainment of its existing air traffic control facilities. This process uses a more standardized approach for selecting and prioritizing projects. However, FAA still does not have adequate controls in place to ensure that its routine facility maintenance needs are sufficiently funded.

More importantly, FAA's newly developed processes for its capital maintenance needs are only short-term solutions that focus on sustaining the existing air traffic control infrastructure. This is because FAA has not made key decisions on facility consolidations and infrastructure needs related to NextGen. Until FAA makes those key, strategic decisions, it will be unable to define its long-term funding needs for the management and maintenance of its air traffic control facilities.

Many FAA air traffic control facilities have exceeded their useful lives, and their physical condition continues to deteriorate. While the average facility has an expected useful life of approximately 25 to 30 years, 59 percent of FAA facilities (249 of 420) are over 30 years old. The table below shows the average age of FAA's facilities by facility type.

Table. Average Age of FAA Facilities

Type of Facilities	Average Age
ATCTs	29 years
TRACONs	26 years
ARTCCs	43 years

Source: FAA

During our site visits to various air traffic control facilities, we observed obvious structural deficiencies and maintenance-related issues at several locations. These included water leaks, mold, tower cab window condensation, deterioration due to

poor design, and general disrepair. While the deficiencies we observed posed no immediate risk to the operations of the NAS, they could affect operations in the long term if they are not addressed.

FAA is encountering maintenance problems due to its previous, decentralized approach to facility maintenance and its practice of paying for recurring maintenance with residual, year-end funds. Prior to the creation of the ATO, FAA's nine regions exercised significant autonomy in selecting which maintenance projects to prioritize. This decentralized process made it difficult for FAA Headquarters to accurately gauge Agency-wide requirements and ensure that the work that was most needed nationally was the work actually being done.

In addition, FAA does not have a structured process in place to ensure that its recurring facility maintenance needs are sufficiently funded. According to FAA, it does not have a line-item budget for recurring maintenance. Instead, FAA relies on year-end, residual funds for recurring maintenance needs. As a result, FAA does not know how much Operations funding will be available for recurring maintenance projects until close to the end of each fiscal year. This is when FAA determines how much money will be available due to employee attrition (i.e., employees leave the Agency, which results in lower than expected salary costs). Once a residual amount is estimated, the money is distributed to individual facilities. Facility managers then have until September 30 to obligate the money.

This practice has hindered efforts to prioritize maintenance. Recurring maintenance needs, such as plumbing and electric repair, often went unfunded as scarce Operations funds were used almost entirely for budget items such as employee salaries and benefits. Further, the rush to get the money obligated before it expires is particularly problematic when the planned projects require letting a contract, which can be a lengthy process and could lead to contracts that are not cost effective. This lack of control over funds has contributed significantly to the deterioration of FAA's facilities and has resulted in a deferred maintenance backlog of $240 million, which is expected to climb to over $380 million by 2020.

FAA Terminal Services is developing a process to reserve Operations funds for recurring maintenance needs. This process involves using facility assessments it has performed on a sample of Terminal facilities and then estimating recurring maintenance costs by facility type and extrapolating those estimates across the total number of Terminal facilities. Terminal Services plans to begin using the new process for the fiscal year (FY) 2010 budget.

In our opinion, this process represents a significant improvement over the prior practice of funding recurring maintenance needs using residual, year-end funds. FAA needs to ensure the process is implemented and followed in both Terminal

and En Route Service Units to eliminate the current backlog of deferred maintenance.

FAA has recently implemented processes to better manage sustainment and replacement maintenance. FAA has historically focused on addressing maintenance problems as they arose, but it is beginning to move toward a proactive approach that merges facility-level priorities with better national oversight. We have seen the most improvement with the Terminal Services unit.

For example, Terminal Services now provides a structured process that requires managers to analyze each facility for potential modernization and replacement using similar metrics, such as standardized cost estimates. In October 2006, Terminal Services also eliminated the ability of its Service Areas to "reprogram" F&E funds without Headquarters approval.

In contrast, En Route Services only focuses on sustaining its existing facilities, not replacement. En Route Services needs to consider developing a replacement plan since its sustainment projects are not planned for completion until 2022, which means most of its facilities will be approximately 60 years old. Since NextGen is slated for completion in 2025, we note that a replacement plan must be carefully aligned with NextGen efforts.

Both the Terminal Services and En Route plans, however, are managed at the national level and provide more uniformity in prioritizing maintenance projects than the decentralized regional approach FAA previously used. This more defined structure allows FAA to estimate its capital funding (F&E) for sustainment and replacement needs with greater precision.

While FAA's newly developed processes are significant improvements, they are only short-term solutions until NextGen requirements have been defined. Because FAA has not made key decisions on facility consolidations and infrastructure needs related to NextGen, its new processes focus only on sustaining the existing air traffic control system. To ensure it has a system of facilities well-equipped for the long term, FAA will need to pursue several actions with regard to NextGen.

As we recommended[2] earlier this year, FAA needs to (1) conduct a gap analysis of the current NAS and future NextGen capabilities, (2) set expectations and establish NextGen funding priorities, and (3) develop an interim architecture for what can be accomplished by 2015. In conjunction with these actions, FAA needs

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[2] OIG Testimony Number CC-2008-043, "FAA's Fiscal Year 2009 Budget Request: Key Issues Facing the Agency," February 7, 2008, and OIG Report Number AV-2008-049, "Air Traffic Control Modernization: FAA Faces Challenges in Managing Ongoing Projects, Sustaining Existing Facilities, and Introducing New Capabilities," April 14, 2008.

to determine what type of facilities will be needed (i.e., Terminal versus En Route or a hybrid of the two), how many will be needed, and where they should be located to achieve optimum performance in support of NextGen. FAA also needs to determine the facility connectivity and information sharing requirements among those facilities since they will likely be key elements and potential cost drivers for future facility architecture.

A key aspect of the transition to NextGen will be consolidating and realigning air traffic control facilities. FAA points out that flexible ground communication networks do not require facilities to be near the traffic they manage. FAA often cites its aging facilities and the related expense of maintaining such a large number of facilities to justify consolidating the air traffic control system into a smaller number of facilities. However, there are technical and security prerequisites for major consolidation such as implementing new "voice switching" technology to allow for more flexible communication and enhanced automation.

FAA's reauthorization proposal called for a "Realignment and Consolidation of Aviation Facilities Commission" to conduct an independent review and make recommendations to the President. The House and Senate reauthorization proposals (H.R. 2881 and S. 1300) also recognized the issue of consolidation and the need for further examination.

FAA requested $17 million in FY 2009 to examine various alternatives for revamping its facilities. FAA should ensure that this analysis clearly addresses the technological and security prerequisites as well as key cost drivers, benefits, and logistical concerns associated with consolidations so decision makers in Congress and the Administration will know what can be reasonably accomplished. This is a critical action item because until key, strategic decisions are made regarding consolidations, FAA will be unable to define its long-term funding requirements for the management and maintenance of its air traffic control facilities.

SUMMARY OF RECOMMENDATIONS

Our recommendations focus on the actions FAA needs to take to maintain its existing air traffic control facilities and effectively transition to NextGen. They include (1) determining what types of facilities will be needed, how many facilities will be needed, and where they should be located to effectively support NextGen; (2) identifying target dates for realigning or consolidating facilities; and (3) establishing realistic funding requirements for maintaining existing sites until those dates. Our complete recommendations are listed on page 13.

SUMMARY OF AGENCY COMMENTS AND OFFICE OF INSPECTOR GENERAL RESPONSE

We provided FAA with our draft report on September 16, 2008. We received FAA's response on November 12, 2008. FAA concurred with our recommendations and provided planned actions and appropriate target completion dates for each recommendation. For example, FAA plans to issue an Enterprise Architecture to identify a segmented approach to deploying NextGen facilities by January 2009. FAA also plans to issue a final Investment Analysis that identifies the types, numbers, and locations of NextGen facilities by 2011.

FAA's comments and our response are fully discussed on page 14. FAA's entire response is included in the appendix to this report. FAA's planned actions are fully responsive to our recommendations, and we consider each recommendation resolved but open pending completion of the planned actions. We appreciate the courtesies and cooperation of FAA representatives during this audit. If you have any questions concerning this report, please contact me at (202) 366-1427 or Daniel Raville, Program Director, at (202) 366-1405.

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cc: FAA Deputy Administrator
 FAA Chief of Staff
 Anthony Williams, ABU-100

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Many of FAA's air traffic control facilities have exceeded their useful lives, and their physical condition continues to deteriorate. In some cases, facilities deteriorated so badly that they required urgent and repeated actions. It is important to note, however, that the maintenance issues we observed pose no immediate risk to the operations of the NAS.

Most of the problems FAA is encountering are a direct result of the decentralized, reactive approach it formerly used to maintain its facilities. After FAA created the ATO, it developed and implemented a process to better manage the replacement and sustainment of its existing air traffic control facilities. This process uses a more standardized approach for selecting and prioritizing projects.

However, FAA still does not have adequate controls in place to ensure that the Agency's routine facility maintenance needs are sufficiently funded. Although FAA has a structured process for estimating its funding requirements for its capital (F&E) account (used to fund facility replacements and large improvement projects), the same process does not exist for the Agency's Operations account (used to fund recurring facility maintenance). As result, FAA has a backlog of over $240 million in deferred maintenance.

More importantly, FAA's newly developed processes for its capital maintenance needs are only short-term solutions that focus on sustaining the existing air traffic control infrastructure. This is because FAA has not made key decisions on facility consolidations and infrastructure needs related to NextGen. Until FAA makes those key, strategic decisions, it will be unable to define its long-term funding needs for the management and maintenance of its air traffic control facilities.

Many of FAA's Air Traffic Control Facilities Have Exceeded Their Useful Lives, and Their Physical Condition Continues To Deteriorate

While the average facility has an expected useful life of approximately 25 to 30 years, many FAA facilities are significantly older. As of May 2007, the Agency had either full or partial responsibility for repair and maintenance of 420 facilities. Of these facilities, 249, or approximately 59 percent, were over 30 years old. Specifically, 138 were 31 to 40 years old, 96 were over 41 to 50 years old, and 15 were over 50 years old. Figure 1 on page 2 provides an analysis of the age of all 420 facilities.

Figure 1. Number of Facilities by Age
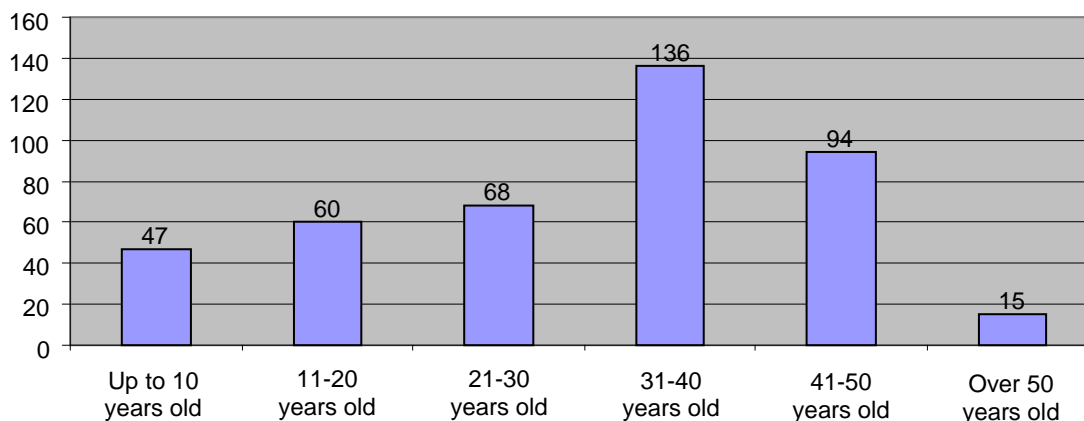
Source: FAA

We visited air traffic control facilities in Washington, DC; Chicago, Illinois; and Fort Lauderdale and Pensacola, Florida. During these visits, we observed obvious structural deficiencies and maintenance-related issues. Several of the facilities suffered damage due to water leaks; outdated heating, ventilating, and air conditioning (HVAC) systems; and poor facility design. We also observed line-of-sight issues that developed because the airport had been expanded after the tower was built, which made the height of the tower inadequate for controllers to see the entire airfield. The following are examples of the maintenance issues we observed at the visited locations.

Water Leaks: Some of the facilities were experiencing water damage problems, generally with water entering the building via the buildings' roofs through improperly sealed windows or leaky pipes. For example, at the Midway ATCT in Chicago, water leaks ruined three offices in the base building. According to tower management, the water leaks were caused by a lack of insulation in the tower, humidity, and the frigid winter weather in Chicago. Additionally, several pipe leaks at the Washington Center have caused damage to the facility's ceiling (see figure 2).

Figure 2. Damage to Ceiling at Washington Center Due to Leaky Pipes

Source: OIG

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Outdated HVAC Systems: We also found problems due to outdated HVAC systems. Faulty HVAC systems can result in condensation forming on the tower cab windows, which makes it difficult for air traffic controllers to clearly see the airfield. Condensation problems were evident at Andrews Air Force Base, Chicago Midway, Milwaukee, and Chicago O'Hare. Figure 3 shows condensation on tower cab windows at Andrews Air Force Base.

Figure 3. Condensation on Tower Windows at Andrews ATCT Hinders Air Traffic Controllers' View of the Airfield

Source: Andrews ATCT Management

Poor Design: We also found problems that resulted from improper facility design. That is, facilities were constructed without consideration for differences in regional climates. For example, several facilities we visited in the Chicago area had been designed using specifications for facilities on the West Coast. As a result, these facilities were experiencing problems with roofing that could not withstand Chicago winters and buildings that did not have enough insulation. For instance, both the tower cab and the base building at the Chicago O'Hare ATCT have had roof replacements. According to FAA managers, the roofs were expected to last 20 years; however, they only lasted 10 years. FAA incurred over $370,000 in costs to replace both roofs.

The Chicago O'Hare tower cab also suffered from a lack of insulation, which caused condensation just above the ceiling to freeze in the winter. As a result, water dripped from the ceiling into the tower cab. To mitigate the effects of the water, a hose was attached to the ceiling to drain the water from the ceiling into a bucket. While this was a temporary solution, a final solution to the problem was not implemented until after our visit to the facility. In the end, insulation was sprayed on the ceiling to alleviate the problem. Figure 4 on page 4 shows the makeshift solution used at Chicago O'Hare.

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**Figure 4. Temporary Fix at Chicago O'Hare Tower Cab To Drain
Water From the Ceiling**

Source: Chicago O'Hare ATCT Management

Another example of improper facility design is the Fort Lauderdale Executive Airport ATCT. The ATCT was built with siding that is unsuitable for the South Florida climate, which is often threatened with hurricanes. During a 2005 hurricane, the siding was blown off of the building. As a result, water entered the tower and caused significant damage, with repairs totaling $156,000.

Line-of-Sight Issues: It is important to note that the maintenance issues we observed did not impact the safe operations at the facilities we visited. However, we did identify line-of-sight issues at air traffic control towers due to inadequate tower height, which could impact safety. Inadequate tower height was mainly an issue at older towers, such as the Baltimore-Washington International ATCT (commissioned in 1960) and the Rockford ATCT in Illinois (commissioned in 1958).

The airports in these locations have expanded since the towers were built. As a result of the expansions, there are areas of the airfield where controllers have obstructed views. According to FAA managers at Baltimore-Washington International ATCT, a new tower is tentatively scheduled to be commissioned in FY 2015; however, FAA has already pushed back the planned replacement date for this tower. In the case of Rockford, controllers do not have ground radar as a back-up to compensate for the inefficient view of the airfield. In these instances, FAA has made operational changes to compensate for the line-of-sight issues.

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The Rockford ATCT is particularly vulnerable to blind spots as the airport layout has changed significantly over the years. Yet, the facility is not included in FAA's current replacement schedule, which runs through FY 2015. While FAA is not primarily responsible for the existence of these line-of-sight issues, they did contribute to a 2005 operational error at the Rockford ATCT. In this case, the ground controller could not see an airplane on the runway due to the low height and location of the ATCT. Figure 5 shows the ATCT at the Rockford International Airport.

Figure 5. Rockford ATCT

Source: OIG

The problems that we observed during our site visits are similar to concerns raised by the National Air Traffic Controllers Association (NATCA). NATCA conducted a survey of controllers at 224 air traffic control facilities in July 2007. The survey identified three main areas of concern related to improper facility maintenance: mold and other contaminants, external leaks, and building ventilation/temperature controls.

Many of the Problems FAA Is Encountering Are a Direct Result of the Decentralized and Reactive Approach It Formerly Used To Maintain Facilities

Over the years, facility maintenance has been neglected as FAA took a reactive rather than proactive approach to sustaining its air traffic control facilities. For example, managers at several FAA facilities stated that FAA was only focusing on emergency repairs and fixing problems as they arose.

Prior to the creation of the ATO in 2004, the process of prioritizing maintenance projects at Terminal Services facilities was highly decentralized. FAA gave its nine regional offices a substantial amount of autonomy in selecting, prioritizing,

and funding projects. For example, on an annual basis, each of the nine regions was required to perform a "data call" and request the facilities in their respective regions to submit projects, repair, or improvements needed at their facilities. After receiving the submissions, the regions would prioritize the projects (without any specific guidance from FAA Headquarters) and send the prioritized list to FAA Headquarters. FAA Headquarters would then distribute funding to the regions based on the prioritized lists.

This decentralized process resulted in several problems. First, there was a lack of consistent information flow to Headquarters, making it difficult for FAA to accurately gauge its Agency-wide requirements. Second, resources were not always utilized efficiently; because the regions used their own prioritization methods, there was no way for Headquarters to validate that the work that was most needed nationally was actually the work being completed.

Finally, the regions were granted flexibility to reprogram funds to projects, which may not have been the projects that were initially submitted to Headquarters. As a result, FAA Headquarters was not always aware of which projects had been funded and completed and which projects still remained incomplete. This uncertainty made it difficult for FAA Headquarters managers to plan for future projects and accurately estimate their needs.

FAA Has Developed and Implemented a Process To Better Manage the Sustainment and Replacement of Its Air Traffic Control Facilities

FAA has developed a new process to better manage the sustainment and replacement of its existing air traffic control facilities. Terminal Services has processes in place for both sustainment and replacement, while En Route and Oceanic Services focuses solely on sustaining its existing facilities.

Improved Terminal Sustainment Process: According to FAA Terminal Services officials, after FAA created the ATO, Terminal Services began using a combination of tools to better manage the sustainment of its facilities. First, Terminal Services utilizes an Agency-wide tool known as the Needs Assessment Program (NAP) to capture the projects that need to be accomplished at each of its facilities. Terminal facility sustainment projects are entered by individual facilities into NAP.

Once entered into the NAP system, the projects are prioritized and grouped into categories, such as safety, HVAC, electrical, plumbing, or waterproofing. Next, projects are prioritized within each category based on their urgency and impact. Each Service Area[3] submits its prioritized list of projects to FAA Headquarters.

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[3] As part of the creation of the ATO, FAA consolidated its nine regions into three large Service Areas.

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FAA Headquarters then merges the lists together and validates the need for the projects. The new merged list then becomes FAA's nationwide sustainment requirements for its Terminal facilities.

In our opinion, this sustainment process provides a uniform prioritization and validation guidance to all three Service Areas and adds the structure and control that the process was lacking in the past.

Life-Cycle Assessments: FAA Terminal Services has also begun conducting life-cycle assessments at its facilities. These assessments identify and summarize backlogged maintenance items and establish a plan for future facility maintenance. In short, the plan created by the life-cycle assessment should become a "users manual" for the facility and help managers plan preventative maintenance in advance, rather than just fixing problems as they arise.

FAA began conducting life-cycle assessments in 1999 and has performed 98 to date. In our opinion, these assessments should allow Terminal Services to better plan and budget for its sustainment and repair needs. Lastly, in an effort to gain control over the sustainment of its facilities, Terminal Services eliminated the ability of its Service Areas to reprogram funds without Headquarters approval. On October 1, 2006, FAA issued guidance with strict procedures for reprogramming F&E funds.

Improved Terminal Replacement Process: In FY 2006, Terminal Services also implemented its Structured Facility Planning Process to better control requirements for replacing its facilities. This planning process also helps Terminal Services to determine which facilities to replace and what those facilities for sustainment until they are replaced.

Once possible facility replacements are identified, Terminal Services managers validate the need for a new facility, as it may cost less to modernize or refurbish the facility rather than replace it. However, if the facility does need to be replaced, managers develop a cost estimate for replacing it, solicit bids from contractors, select a contractor to perform the work, and subsequently award the contract. This process takes approximately 24 to 36 months.

According to FAA, over the next 7 years (FY 2009 through FY 2015), the Agency plans to replace 29 of the 397 Terminal facilities that it owns or operates. In our opinion, FAA's new structured facility planning process will give the Agency a better basis for which to make decisions regarding when and where to replace aging facilities.

In contrast to Terminal Services, which has almost 400 facilities with multiple designs, En Route and Oceanic Services has 21 standardized ARTCCs and

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2 CERAPs. The common design of these facilities allows for standard projects that can be performed at each facility and makes it easier to project future maintenance requirements. En Route Services continues to focus only on the sustainment of its facilities.

<u>En Route Sustainment Process</u>: The current sustainment plan for En Route Services was developed in 2001. The bulk of program funds (approximately 60 to 75 percent of total project funding) goes toward 13 standardized modernization projects. These projects are being completed at all 21 ARTCCs nationwide. Of these 13 projects, 9 projects have been completed at all En Route facilities (which focused on supporting new or upgraded air traffic control equipment). The remaining modernization projects are scheduled to be completed by 2022. However, by that time, the facilities managed by En Route services will be approximately 60 years old.

Like Terminal Services, En Route Services has also conducted life-cycle assessments at all 21 of its En Route Centers. In addition, it uses the same industry recognized rating system as Terminal Services to measure the amount of deferred maintenance that needs to be completed against the overall replacement value of the facility. Any score below 90 percent indicates that a facility needs attention.

In the En Route Services FY 2006 evaluation, 9 of the 21 ARTCCs scored below 90 percent, and no facility scored above 95 percent, which indicates a facility is considered to be in "good" condition. This means that nearly half (9 of 21) ARTCCs are in poor condition and in need of attention. However, En Route Services does not expect to complete its current sustainment efforts for these facilities until 2022, and FAA currently has no formal plan to replace them.

Given that its facilities will be approximately 60 years old by the time all 13 sustainment projects are completed, En Route Services should consider developing a replacement plan for its facilities. According to En Route Services managers, the replacement of its facilities is being discussed in conjunction with NextGen; however, until FAA makes key decisions regarding NextGen, En Route Services will continue to focus on sustainment.

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FAA Still Needs an Effective Process for Funding Recurring Facility Maintenance

FAA does not have adequate controls in place to ensure that its recurring facility maintenance needs are sufficiently funded. While it has an extensive process in place to determine funding needs for major improvement projects (i.e., sustainment and replacement) from its F&E account, there is no similar process in place for recurring maintenance needs, which are funded from its Operations account. This lack of controls over funds for recurring maintenance has contributed significantly to the deterioration of FAA's facilities and resulted in a deferred maintenance backlog of $240 million. Managers from both Terminal Services and En Route project that the backlog will increase at current funding levels. Based on their estimates, FAA could be facing a deferred maintenance backlog of over $380 million by FY 2020 if current funding levels continue.

According to Terminal Services managers, FAA does not know how much Operations funding will be available to pay for recurring maintenance projects until close to the end of each fiscal year. This is when FAA determines how much money will be available due to employee attrition (i.e., employees leave the Agency, which results in lower than expected salary costs).

Once a residual amount is estimated, the money is distributed to individual facilities. Facility managers then have until September 30 to obligate the money. This rush to get the money obligated proves to be problematic when the planned project requires letting a contract, which can be a very lengthy process. Additionally, the rush to obligate the money before it expires may also lead to the facility entering into a contract that is not in the best interest of the Government (i.e., the facility may not be able to negotiate a contract that is cost effective).

Further, funding for recurring maintenance must compete with other needs that are funded out of the Agency's Operations account, such as employees' salaries and benefits, which always take priority. As we have reported since 1999, FAA faces a significant risk that increases in operations costs may "crowd out" other critical Agency functions. For example, we have found several instances since 1999 in which FAA had to use F&E funds to finance many operations-related activities, including salaries, employee relocations, and new system maintenance. As a result, it now appears that other line items within the Operations account (such as facility maintenance) are being crowded out.

In an effort to provide a more uniform distribution of excess operations funding, Terminal Services has begun monitoring attrition three times a year and distributing excess funding at these times. Although this new process may give facilities more time to obligate funding and make better choices on where to spend

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the money, it still does not address the issue of establishing a designated amount (within the Operations account) to fund recurring maintenance.

A lack of dedicated funding has led to delays in completing recurring maintenance and small repair projects. At most of the facilities we visited, managers stated that inadequate funding was a factor in the condition of their facilities and was likely to lead to larger problems in the future.

Terminal Services is developing a process that will allow it to budget for recurring maintenance in advance out of the Operations account. This process uses facility life-cycle assessments to establish budget requirements for facility maintenance and repair. Terminal Services takes the facility assessments it has performed (on a sample of Terminal facilities) and breaks them down by facility type.

The costs identified in each facility assessment (including a one-time remediation cost to bring the facility up to the appropriate standard and to perform the maintenance and repair backlog) are then averaged and extrapolated across the total number of Terminal Services facilities. The resulting number is the amount that Terminal Services would like designated from the Operations account for recurring maintenance. Terminal Services plans to use this process to formulate its budgetary requirements for FY 2010.

In our opinion, this process is a significant improvement over the former method FAA used for funding recurring maintenance, which essentially entailed waiting until year-end to see if residual funds would be available for maintenance needs. FAA needs to ensure the process is implemented and followed in both Terminal and En Route Services to eliminate the backlog of deferred maintenance and ensure that existing facility maintenance needs are met until requirements for NextGen are clearly defined. FAA must also ensure that there are sufficient resources dedicated to support this new process.

FAA's Newly Developed Processes Are Only a Short-Term Solution Until Key Decisions About NextGen Are Made

While these new processes are significant improvements, it is important to recognize that they are only short-term solutions. FAA's new processes focus only on sustaining the existing air traffic control system because FAA has not made key decisions regarding facility consolidations and NextGen infrastructure needs. Until FAA makes those key, strategic decisions, it will be unable to define its long-term funding needs for the management and maintenance of its air traffic control facilities. This is a multibillion-dollar undertaking planned for completion in 2025 that will dominate FAA's capital account for years to come.

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The system is based on satellite navigation and control, digital non-voice communication, and advanced networking. Flight crews will have increased control over their flight trajectories, and ground controllers will become traffic flow managers. As we recommended in our April 2008 report on air traffic control modernization, FAA needs to pursue the following actions now in order to transition to NextGen.

- **Conduct a gap analysis of the current NAS and future NextGen capabilities.** FAA's NextGen architecture does not detail how FAA will transition from the present NAS and the future NextGen architectures, which will have considerably different capabilities and performance parameters. Until FAA completes a gap analysis, it will not be able to determine (1) technical requirements that translate into reliable cost and schedule estimates for major acquisitions and (2) what type of facility (i.e., Terminal versus En Route or a hybrid of the two) will be needed, how many of these facilities will be needed, and where to locate them to effectively support NextGen.

- **Set expectations and establish NextGen funding priorities.** At this point, it is difficult for decision makers and FAA to determine what to invest in first or what can be accelerated with regard to NextGen. FAA needs to better understand costs and benefits and then identify the high priority improvements and reflect those priorities in budget requests. A key issue will be identifying target dates for realigning existing facilities and establishing realistic funding requirements for maintaining sites from now until the targeted dates.

- **Develop an interim architecture for what can be accomplished by 2015.** Because of the significant differences between the present system and the NextGen architecture and concept of operations, FAA should develop an interim architecture for the 2015 timeframe. This would help FAA to determine reasonable goals, establish priorities, fully identify adjustments to existing projects, refine requirements for new systems, and understand complex transition issues. As part of this architecture, FAA needs to determine if the existing facilities managed by Terminal and En Route Services will be sufficient to support NextGen through 2015.

A key aspect of these decisions will be the extent to which FAA consolidates or realigns its air traffic control facilities as a result of modern information sharing technology. FAA points out that flexible ground communication networks do not require facilities to be near the traffic they manage. FAA often cites its aging facilities and the related expense of maintaining such a large number of facilities to justify consolidating the air traffic control system into a smaller number of facilities. However, there are technical and security prerequisites for major

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consolidation. These include new "voice switching" technology to allow for more flexible communication and enhanced automation as well as associated costs, benefits, and logistical concerns that need to be fully analyzed. FAA also needs to determine the facility connectivity and information sharing requirements among those facilities since they will likely be key elements and potential cost drivers for future facility architecture.

Because of the controversial nature of the related staffing implications, some have advocated a base closure commission to help FAA and Congress make decisions on FAA facilities. FAA's reauthorization proposal called for a "Realignment and Consolidation of Aviation Facilities Commission" to conduct an independent review and make recommendations to the President.

The House and Senate reauthorization proposals (H.R. 2881 and S. 1300) also recognized the issue of consolidation and the need for further examination. While there are some technical prerequisites, how to best realign or consolidate FAA facilities is a policy issue for Congress.

FAA requested $17 million in FY 2009 to examine various alternatives for revamping its facilities. FAA should ensure that this analysis clearly addresses the technological and security prerequisites as well as the costs, benefits, and logistical concerns associated with consolidations so decision makers in Congress and the Administration will know what can be reasonably accomplished. This is a critical action item because until key strategic decisions are made regarding consolidations, FAA will be unable to define its long-term funding requirements for the management and maintenance of its air traffic control facilities.

Findings

RECOMMENDATIONS

FAA faces significant challenges in maintaining facilities that are essential to manage air traffic throughout the United States. A key cost driver for NextGen is to what extent FAA can realign and consolidate its facilities. We recognize this is a complex, controversial matter and ultimately a policy call for Congress. Nevertheless, the transition to NextGen represents an opportunity to examine how FAA can use technology to realign and consolidate facilities and reduce equipment without degrading safety, security, or the level of air traffic services to a wide range of airspace users. We are making recommendations to improve how FAA manages its facilities in the short and long term.

We recommend the following actions to FAA:

1. Ensure that the newly developed process for budgeting recurring maintenance (out of the Operations account) is implemented as designed and develop appropriate procedures for ensuring compliance within *both* Terminal and En Route Services to (a) eliminate the current backlog of deferred maintenance and (b) make certain that existing facility maintenance needs are met until NextGen is in place.

2. Identify target dates for realigning or consolidating facilities and establish realistic funding requirements for maintaining existing sites from now until the targeted consolidation dates.

3. Determine what types of facilities (i.e., Terminal versus En Route or a hybrid of the two) will be needed, how many of these facilities will be needed, and where they should be located to effectively support NextGen.

4. Ensure the planned 2009 analysis of various alternatives for revamping its facilities clearly addresses the technological and security prerequisites of consolidations as well as the associated costs, benefits, and logistical concerns.

AGENCY COMMENTS AND OFFICE OF INSPECTOR GENERAL RESPONSE

We provided FAA with our draft report on September 16, 2008. We received FAA's comments on November 12, 2008. FAA concurred with our recommendations and provided planned actions and appropriate target completion dates for each recommendation. FAA also submitted minor, editorial revisions, which we incorporated as appropriate. FAA's response is summarized below and included in its entirety in the appendix to this report.

Recommendation 1: FAA concurred and stated that it is developing a more diligent process to assess needs, set priorities, and coordinate plans associated with budgeting recurring maintenance needs from the Operations account across all services. FAA plans to implement the process by the end of FY 2010.

Recommendation 2: FAA concurred and stated that it will develop an Enterprise Architecture to provide a segmented approach to deploying NextGen facilities. FAA plans to have the initial roadmap available in January 2009.

Recommendation 3: FAA concurred and stated that it is developing an investment analysis to determine the range of NextGen facilities to be completed by February 2009. FAA plans to have a final investment decision by 2011.

Recommendation 4: FAA concurred and stated that technological and security prerequisites along with costs, benefits, and logistical concerns will be included in its investment analysis.

FAA's planned actions are fully responsive to our recommendations, and we consider each recommendation resolved but open pending completion of the planned actions.

EXHIBIT A. SCOPE AND METHODOLOGY

We conducted this performance audit in accordance with generally accepted Government Auditing Standards prescribed by the Comptroller General of the United States. As required by those standards, we obtained evidence that we believe provides a reasonable basis for our findings and conclusions based on our audit objectives. We used the following scope and methodology in conducting this review.

We conducted this audit between June 2007 and March 2008. The review included site visits to 12 Terminal Services facilities (ATCT/TRACON), 2 En Route Services facilities (ARTCC), 1 Service Area, FAA Headquarters, the National Air Traffic Controllers Association, and the General Services Administration's Public Building Services.

To determine if FAA has developed and implemented a comprehensive strategy to effectively manage the replacement, repair, and modernization of its air traffic control facilities, we interviewed officials from FAA Headquarters (ATO-Terminal-Planning and Execution, ATO-En Route and Oceanic Services-Facilities Management and Unstaffed Infrastructure Office) and obtained, reviewed, and analyzed facility planning documentation.

We also conducted site visits and interviewed FAA Air Traffic Control Managers from En Route and Terminal facilities in Washington, DC; and Chicago, Illinois; and Pensacola and Fort Lauderdale, Florida. These locations were judgmentally selected by the audit team, and therefore the selection of these locations was not based on any type of statistical sampling.

Finally, to obtain FAA Service Area officials' perspectives and additional evidence regarding the Agency's plan to manage the replacement, repair, and modernization of its facilities, we interviewed the Eastern En Route Director and the Technical Operations Director during our site visit of the Eastern Service Area in Atlanta, Georgia.

To determine if FAA has allocated sufficient funds to effectively manage the replacement, repair, and modernization of its air traffic control facilities, we obtained and reviewed budget data for both the Terminal and En Route lines of business from FAA's Headquarters in Washington, DC.

We also analyzed facility planning documents and budget data and interviewed FAA Headquarters officials (ATO-Terminal-Planning, Execution and Finance and ATO-En Route and Oceanic Services-Facilities Management) to determine if FAA has identified the cost of the Agency's modernization and replacement needs.

We met with the NATCA President and Vice President to identify conditions at specific air traffic control facilities that are causing disruptions in operations and unhealthy working conditions for employees and conducted site visits at selected locations to verify alleged conditions.

We also interviewed officials from the General Services Administration's Public Building Services to determine if the criteria FAA uses to evaluate the physical condition of its air traffic control facilities are based on industry best practices or internally developed policies and procedures.

Exhibit A. Scope and Methodology

EXHIBIT B. ACTIVITIES VISITED OR CONTACTED

During this audit, we interviewed FAA Air Traffic Control Managers and NATCA representatives and visited the following En Route and Terminal Services facilities:

Terminal Facilities (Air Traffic Control Tower [ATCT] and TRACON)

- Baltimore (BWI) ATCT
- Washington Reagan (DCA) ATCT
- Andrews Air Force Base (ADW) ATCT
- Chicago O'Hare (ORD) ATCT
- Midway (MDW) ATCT
- Rockford (RFD) ATCT/TRACON
- DuPage (DPA) ATCT
- Milwaukee (MKE) ATCT/TRACON
- Chicago TRACON (C90)
- Pensacola (PNS) ATCT
- Pensacola TRACON (P49)
- Fort Lauderdale Executive (FXE) ATCT

En Route Facilities (Air Route Traffic Control Centers, or ARTCC)

- Washington (ZDC) ARTCC
- Chicago (ZAU) ARTCC

FAA Service Area

- Eastern Service Area-Atlanta

Third Parties

- National Air Traffic Controllers Association, Washington, DC
- General Services Administration's Public Building Services, Washington, DC

EXHIBIT C. MAJOR CONTRIBUTORS TO THIS REPORT

Name	Title
Daniel Raville	Program Director
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Exhibit C. Major Contributors to This Report

APPENDIX. AGENCY COMMENTS

Federal Aviation Administration

Memorandum

Date: November 7, 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 Management and Maintenance of Air Traffic Control Facilities

Thank you for the opportunity to review the subject draft report. The Federal Aviation Administration (FAA) concurs with all the recommendations contained in the report. The planned action for addressing each recommendation is as follows:

OIG Recommendation 1: Ensure that the newly developed process for budgeting recurring maintenance (out of the operations account) is implemented as designed and develop procedures for ensuring compliance within both Terminal and En Route Services to (a) eliminate the current backlog of deferred maintenance and (b) make certain that the existing facility maintenance needs are met until NextGen is in place.

FAA Response: Concur. The FAA acknowledges the recommendation and has accepted the charge to budget recurring maintenance out of the operations account. We are further developing a more diligent process to assess needs, set priorities for remediation, and coordinate implementation plans within and across services. This will be implemented by the end of fiscal year (FY) 2010.

OIG Recommendation 2: Identify target dates for realigning or consolidating facilities and establish realistic funding requirements for maintaining existing sites from now until the targeted consolidation dates.

FAA Response: Concur. The NAS Enterprise Architecture (EA) Facility Infrastructure Roadmaps provide a segmented approach to the deployment of NextGen Facilities. The FY 2009 roadmaps are currently under formal revision and will be available in January 2009. The EA provides major acquisition milestones as well as a relational framework 10 other NextGen programs. In the near term, the FAA will continue to realign facilities within its authority and in accordance with best business practices. The FAA will continue to strengthen sustainment and modernization processes to ensure that projects are identified, prioritized, and budgeted for as facilities are replaced, realigned or consolidated.

OIG Recommendation 3: Determine what types of facilities (i.e., Terminal versus En Route or a hybrid of the two) will be needed, how many of these facilities will be needed, and where they should be located to effectively support NextGen.

FAA Response: Concur. The range of alternatives for the NextGen Facilities Project is under development. This effort is currently in the Concept and Requirements Definition phase of the Acquisition Management System. We are planning for a February 2009 Investment Analysis Readiness Decision. The subsequent Investment Analysis will determine the types, number and location of NextGen Facilities. A Final Investment Decision is planned for 2011.

OIG Recommendation 4: Ensure the planned 2009 analysis of various alternatives for revamping its facilities clearly addresses the technological and security prerequisites of consolidations as well as the associated costs, benefits, and logistical concerns.

FAA Response: Concur. Technological and security prerequisites along with costs, benefits and logistical concerns are integral to the Investment Analysis process. The Investment Analysis process is scheduled for completion in 2011.

Appendix. Agency Comments

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 Management and Maintenance of Air Traffic Control Facilities

Section 508 Compliant Presentation

Table. Average Age of Federal Aviation Administration (FAA) Facilities

The average age of FAA's air traffic control towers is 29 years.

The average age of FAA's terminal radar approach control facilities is 26 years.

The average age of FAA's air route traffic control centers is 43 years.

Source: FAA

Figure 1. Number of Facilities by Age

FAA has 47 facilities that are up to 10 years old.

FAA has 60 facilities that are 11 to 20 years old.

FAA has 68 facilities that are 21 to 30 years old.

FAA has 136 facilities that are 31 to 40 years old.

FAA has 94 facilities that are 41 to 50 years old.

FAA has 15 facilities that are over 50 years old.

Source: FAA

Figure 2. Damage to Ceiling at Washington Center Due to Leaky Pipes

Photograph showing staining and damage to ceiling tiles caused by water leaks.

Source: Office of Inspector General

Figure 3. Condensation on Tower Windows at Andrews Air Traffic Control Tower Hinders Air Traffic Controllers' View of the Airfield

Photograph showing clouded viewing glass due to condensation at the Andrews air traffic control tower.

Source: Andrews Air Traffic Control Tower Management

Figure 4. Temporary Fix at Chicago O'Hare Tower Cab To Drain Water From the Ceiling

Photograph showing hose was attached to the ceiling to drain the water from the ceiling into a bucket to mitigate effects of water dripping from the ceiling into the tower cab at Chicago O'Hare.

Source: Chicago O'Hare Air Traffic Control Tower Management

Figure 5. Rockford Air Traffic Control Tower

Photograph showing an outside view of the air traffic control tower at the Rockford International Airport.

Source: Office of Inspector General