STATUS OF FAA'S MAJOR ACQUISITIONS: COST GROWTH AND SCHEDULE DELAYS CONTINUE TO STALL AIR TRAFFIC MODERNIZATION

Federal Aviation Administration

Report Number: AV-2005-061
Date Issued: May 26, 2005

Memorandum

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

Subject: <u>ACTION</u>: Report on the Status of FAA's Major
Acquisitions: Cost Growth and Schedule Delays
Continue To Stall Air Traffic Modernization
AV-2005-061

Date: May 26, 2005

From: David A. Dobbs
Assistant Inspector General
   for Aviation and Special Program Audits

Reply to
Attn. of: JA-10

To: Federal Aviation Administrator

This is our third annual report on the Federal Aviation Administration's (FAA)
major acquisitions, which are part of its modernization effort. At the request of
the Committee on Transportation and Infrastructure, we conducted a review of
changes in FAA's overall approach to air traffic modernization and its potential
impact on capacity. Congress appropriated $2.5 billion in Facilities and
Equipment (F&E) funding for fiscal year (FY) 2005 to increase the capacity,
efficiency, security, and safety of the National Airspace System (NAS). The
objective of our review was to update the cost and schedule of major acquisitions
and identify key issues affecting their implementation. Exhibit A provides details
on our objective, scope, and methodology.

This report covers 16 major acquisition programs that have a current combined
estimated cost of about $14.5 billion in F&E funds. These projects include
developing new automated controller tools, acquiring new technologies to prevent
accidents on runways and taxiways, and modernizing FAA facilities that manage
large segments of airspace over the Atlantic and Pacific Oceans.

We found that cost growth, schedule delays, and performance shortfalls with
FAA's major acquisitions continue to stall air traffic modernization. Overall,
11 of the 16 projects we reviewed will experience a total cost growth of about
$5.6 billion, and 9 of the 16 will have schedule slips from 2 to 12 years, based on
current estimates. Two programs have also been deferred. Exhibit B provides
details of the cost and schedule variances for the 16 projects. Since we last

reported on these projects in June 2003,[1] the estimated cost of 6 of the 16 projects has increased by about $1.7 billion. While some cost growth can be attributed to FAA's efforts to update the cost, schedule, and performance baselines[2] of its major acquisitions, much work remains to be done before the Agency has accurate and reliable information for its acquisitions. We found that 9 of the 16 programs continue to have uncertain cost, schedule, or performance baselines. Many programs continue to be plagued by requirement changes, technical difficulties, or reduced performance capabilities. Consequently, it is not clear how much these programs will cost, how long it will take to complete them, or what capabilities they will finally deliver.

As we recently reported,[3] there has been cost growth with major acquisitions since the establishment of the new Air Traffic Organization (ATO), but the bulk of the cost growth represented by the $5.6 billion occurred before the establishment of the new organization. It is also a reflection of the ATO's efforts to re-baseline a number of projects, which identified costs that have been pent up for some time and have simply not been recognized.[4]

On May 4, 2005, we testified before the Committee on Transportation and Infrastructure Subcommittee on Aviation and provided our perspectives on the Aviation Trust Fund and financing the FAA. A major theme addressed in our testimony dealt with FAA getting a handle on major acquisitions and determining how much they will cost and when they will be completed. This is critical in order to establish current cash flow requirements and future funding requirements.

FAA recognizes the need to obtain reliable information for its major acquisitions and is planning to update a number of program baselines. It is important for FAA to complete these plans to re-baseline the programs within its major acquisition portfolio and ensure the accuracy and reliability of the program baselines. When baselines are not met, the Agency cannot accurately anticipate either future resource requirements or capabilities. Additionally, postponed benefits from un-fielded systems create inefficiency in the NAS.

FAA needs to develop a comprehensive strategy for modernizing the NAS, outlining how the Agency's major acquisition programs will address its mission of

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[1] OIG Report Number AV-2003-045, "Status of FAA's Major Acquisitions," June 26, 2003. OIG reports and testimonies can be found on our website: www.oig.dot.gov.

[2] For the purposes of our report, the term "baseline" will refer to the cost, schedule, and performance parameters of major acquisitions.

[3] OIG Testimony Number CC-2005-022, "Next Steps for the Air Traffic Organization," April 14, 2005.

[4] According to FAA officials, the Agency now requires technology refreshment cost for NAS equipment to be included in the acquisition program baseline in an effort to fully disclose a program's true F&E life-cycle cost. Technology refreshment is the periodic replacement of commercial off-the-shelf system components and commercially available software within the larger NAS system to assure continued supportability through an indefinite service life.

increasing capacity, efficiency, and safety in the NAS. FAA is requesting less for modernization than it did last year and has canceled or deferred several projects. At the same time, demand for air travel is returning to pre-September 11th levels, and some airports, such as Chicago O'Hare, have experienced increased delays that required FAA to impose restrictions on flight operations. It is important that FAA keep air traffic control modernization on track to help meet the demand for air travel.

Although the demand for air travel continues to rise, FAA is now emphasizing sustaining the NAS, as opposed to increasing capacity, through its major acquisitions portfolio. While FAA officials indicated budget reductions have forced the Agency to rethink its modernization strategy, cost growth and schedule delays with major acquisition projects have significantly affected FAA's efforts to modernize the NAS. In an era when F&E funding levels are down from previous levels, the crucial question is how FAA can address both capacity and affordability at the same time.

Given the cost growth and schedule slips with major acquisitions and the declining level of F&E funds, FAA must determine how to get the most out of its limited resources. The challenges facing FAA with respect to its major acquisition programs are developing reliable cost, schedule, and performance baselines for its existing projects and determining the total cost to complete implementation of the projects. FAA also needs to specify what capabilities and benefits each project provides the NAS, specify when the benefits will be delivered, and justify why the project should be continued.

In light of our finding, we are recommending that FAA develop a comprehensive strategy for modernizing the NAS to ensure major acquisitions are delivered within cost, schedule, and performance milestones. As FAA updates its major acquisition programs' cost and schedule baselines, the Agency needs to

- re-validate the capabilities and benefits that each project (i.e., STARS, WAAS, ASR-11, NIMS, ASDE-X, ADS-B, and ITWS[5]) is expected to provide the NAS and determine when the benefits will be delivered. If the expected benefits justify continuing the project, determine the cash flow requirements needed to complete implementation of the system, and

- report to Congress on the results of this re-validation effort, and provide future funding requirements for the F&E account for all major acquisition programs, including those that have been deferred.

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[5] See Exhibit C for a description of program acronyms.

On May 17, 2005, we met with FAA program officials to obtain their oral comments to our report. Based on FAA comments, we made changes to the report as appropriate. FAA officials generally agreed with our conclusions and recommendations. We are requesting that FAA provide written comments to the final report within 30 calendar days.

BACKGROUND

In the early 1980s, FAA initiated an effort to modernize its air traffic control system. The modernization effort includes the acquisition of new equipment for surveillance, automation, and communications systems. The total modernization effort is expected to cost $48.6 billion through 2007. Major acquisitions represent FAA's primary efforts to modernize or add new capabilities to the NAS.

Historically, a significant portion of FAA's investment in air traffic control modernization is for enhancing capacity and efficiency and replacing aging equipment in the NAS. However, FAA modernization projects have experienced considerable cost growth, schedule slips, and shortfalls in performance, which have shifted FAA's efforts from enhancing capacity in the NAS to sustaining the NAS.

FAA is requesting $2.4 billion in F&E funds to modernize the NAS for FY 2006, which is slightly less than the FY 2005 level of $2.5 billion and significantly less than the $2.9 billion level of FY 2004.

RESULTS IN BRIEF

FAA has made progress in updating the cost, schedule, and performance baselines of a number of major acquisitions, including the STARS, WAAS, and FTI programs. By updating the acquisition program baselines of these projects, FAA should be better positioned to anticipate resource requirements and determine whether capabilities can be delivered as scheduled. However, we found that cost growth, schedule delays, and performance shortfalls with major acquisition programs continue to stall air traffic modernization.

Our review of 16 major acquisitions shows 11 of these projects have experienced a total cost growth of over $5.6 billion (from $8.9 billion to $14.5 billion), which is more than double the amount of FAA's FY 2005 F&E funding level ($2.5 billion). Additionally, 9 of the 16 projects have had schedule delays ranging from 2 to 12 years, while two other projects (LAAS and NEXCOM) have been deferred pending further evaluation on the merits of moving forward with these projects. Not withstanding FAA's decision to defer NEXCOM, the Agency still must deal with a number of issues that the program was supposed to address, including how

to fund and sustain its aging radio control equipment and concerns about radio frequency depletion.

Since we last reported on these 16 projects in June 2003, the estimated cost of 6 of the 16 projects has increased by about $1.7 billion; this includes cost growth of about $1.1 billion for STARS and $400 million for WAAS. Although FAA updated the baselines for a number of these programs, we identified nine that do not have reliable cost, schedule, or performance baselines, meaning that FAA cannot effectively plan resource requirements, manage the programs, or meet expectations for improving the safety of the NAS and increasing its capacity.

These programs continue to be plagued by requirement changes, technical difficulties, or reduction in performance capabilities. Consequently, it is not clear how much these programs will cost, how long it will take to complete them, or what capability will finally be delivered. Table 1 highlights six projects requiring key Agency decisions before they can be fully implemented into the NAS, and Exhibit D provides details on the cost, schedule, and key issues affecting implementation of the 16 projects under review.

Table 1. Programs Requiring Key Agency Decisions Before FAA Completes Implementation

Program*	Estimated Program Costs (in Millions)		Percent Cost Growth	Implementation Schedule		Schedule Delay
	Original	Current		Original	Current	
Wide Area Augmentation System	$892.4	$3,339.6**	274%	1998-2001	2005-2013	12 years
Standard Terminal Automation Replacement System	$940.2	$2,760.4***	194%	1998-2005	2002-2012	7 years
FAA Telecommunication Infrastructure	$205.5	$310.2	51%	2002-2008	2004-2008	2 years
Airport Surveillance Radar-11	$743.3	$1,003.0	35%	2000-2005	2003-2013	8 years
Integrated Terminal Weather System	$276.1	$286.1	4%	2002-2003	2003-2009	6 years
En Route Automation Modernization	$2,154.6	$2,141.9	N/A	2009-2010	2009-2010	N/A

* A detailed listing of cost and schedule variances of all 16 systems can be found in Exhibit B.
**Cost includes $1.2 billion to acquire geostationary satellites.
***Cost of preferred STARS solution to deploy to 162 sites.

Even though FAA updated the cost, schedule, and performance baselines for STARS, WAAS, FTI, ASR-11, and ITWS, the Agency has a number of key decisions to make and implementation issues to resolve before these programs can be fully deployed in the NAS. For example:

- **The Standard Terminal Automation Replacement System (STARS)** program replaces controller and maintenance workstations with color displays, processors, and computer software. As we recently reported,[6] faced with additional cost growth in the STARS program, FAA is rethinking its terminal modernization approach—a long overdue step that should have been taken several years ago. FAA re-baselined the STARS program in April 2004, limiting deployment to 50 planned sites[7] for $1.46 billion, after receiving a revised cost estimate of more than $2 billion for all sites. FAA revised its terminal modernization plan by committing to (1) consider retaining Common ARTS at some sites as an alternative to STARS, and (2) re-evaluating STARS costs and deployments before considering further STARS purchases in FY 2005.

  FAA intends to re-baseline STARS again in June 2005. If the Agency implements its preferred STARS solution, which is to deploy STARS to 162 sites as originally planned, the cost would total $2.76 billion, which includes technology refresh. Thus, a program that was originally estimated to cost less than $1 billion could cost almost $3 billion, and deployment to all sites may not occur until 2012—a 7-year delay from its originally planned completion date.

  However, the cost to complete terminal modernization still remains uncertain, and FAA needs to make a decision about what technology will be expected to complete terminal modernization based on cost, time, and capabilities. Because of cost growth and schedule delays, of urgent concern is the state of aging displays at four large sites, such as Chicago and Denver. Under FAA's current plan, the Agency will not begin installing STARS and replacing the aging displays at the large sites until sometime in FY 2008.

- **The Wide Area Augmentation System (WAAS)** program provides the augmentation needed to make the Global Positioning System (GPS) satellite fully usable for en route, terminal, and non-precision approaches. FAA re-baselined WAAS in May 2004, and program costs increased from $2.9 billion to $3.3 billion. FAA now intends to provide a capability called "LPV" in late 2008, which is less than Category 1[8] performance. Key risks to WAAS implementation include the development of flight procedures and user equipage.

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[6] OIG Report Number AV-2005-016; "Terminal Modernization: FAA Needs To Address Its Small, Medium, and Large Sites Based on Cost, Time, and Capability, " November 23, 2004.

[7] FAA committed STARS deployment to 50 sites, but congressional language limited deployment to 47 sites.

[8] Category 1 precision approach has a 200-foot ceiling/decision height and visibility of ½ mile.

We note that WAAS will primarily benefit general aviation users, because commercial airliners already have on-board capabilities similar to WAAS. Additionally, it is still an open question whether FAA will reduce its operating costs with WAAS implementation because it has yet to determine which surface navigation aids will be replaced in favor of WAAS.

FAA still intends to pursue Category 1 capability and plans to make a formal decision in 2007. However, to provide Category 1 capability, FAA is now dependent on the Department of Defense (DOD) enhancement to GPS satellite (to include a second civil signal for aviation use). Given shifting benefits and uncertainty regarding DOD's plans, we question whether or not FAA should commit funds to develop Category 1 capabilities. A decision not to pursue Category 1 would significantly reduce WAAS's $3.3 billion cost.

- **FAA Telecommunication Infrastructure (FTI)** program is key to FAA's efforts to transition from supporting multiple telecommunication networks to a single network and thereby reducing operating costs. FAA re-baselined FTI in December 2004. We note that program costs have increased from $1.9 billion to $2.4 billion, the bulk of which ($2.1 billion) will be funded from the Operations account.

  Even though FAA re-baselined the FTI program, there are a number of issues that could affect its cost and schedule. For example, FAA has dramatically increased the number of sites scheduled to receive FTI from 1,374 to 4,463, and some sites are experiencing delays implementing FTI. FAA was planning to transition approximately 450 circuits to FTI operations by the end of November 2004; however the Agency was only successful in transitioning about 200 circuits—completing less than 50 percent of its planned schedule. A delay to the FTI implementation schedule would translate directly into increases in operations costs and reduced cost savings due to the prolonged sustainment of legacy networks. We note that FAA has already reduced FTI cost savings by $30 million ($820 million to $790 million) because of delays in implementing FTI.

- **The Integrated Terminal Weather System (ITWS)** provides air traffic managers with a forecast of weather conditions near airports. FAA re-baselined the ITWS program in May 2004, at which time FAA added a new enhancement to the production system, which provides more advance notification of when and where bad weather will occur. However, because production costs have increased from $360,000 to $1.1 million per system, only 22 of the planned 34 production systems will be deployed through 2009—6 years behind schedule. FAA plans to re-baseline ITWS in 2007, at

which time a deployment decision will be made regarding the remaining 12 systems.

It is important for FAA to complete its plans to re-baseline these programs within its major acquisition portfolio and to ensure the accuracy and reliability of the programs' baselines. When baselines are not met, the Agency cannot accurately anticipate either resource requirements or capabilities in the future. Additionally, postponed benefits from un-fielded systems create inefficiency in the NAS.

FAA is now in the unenviable position of funding projects that have been delayed for years while embarking on an ambitious $2.1 billion project called the En Route Automation Modernization (ERAM) program. ERAM is one of the largest and most complex acquisitions in FAA's modernization portfolio. In essence, ERAM replaces the brain and central nervous system for facilities that manage high-altitude traffic. By 2007, FAA will be spending $30 million per month alone on the program. FAA is pursuing ERAM through a long-term, cost-plus contract that places the majority of risk with the Government.

FAA's annual funding requirements for STARS, WAAS, ASR-11, and ERAM will increase from 26.9 percent to 53.6 percent over a 4-year period beginning in FY 2004 (see Figure 1). Consequently, a significant portion of the available funds used to support air traffic acquisitions through 2007 will be used to fund these four projects alone. Moreover, in June 2005, FAA is planning to make a decision on whether to acquire additional STARS and ASR-11 systems. A decision to acquire additional systems may require significant funding increases for the two programs, which will further reduce the available funds used to support air traffic acquisitions. This leaves little room for cost growth, schedule delays, or adding new initiatives.

Figure 1. Funding Requirements of Four Key Modernization Projects in Relation to Available Air Traffic Control Modernization Funding*
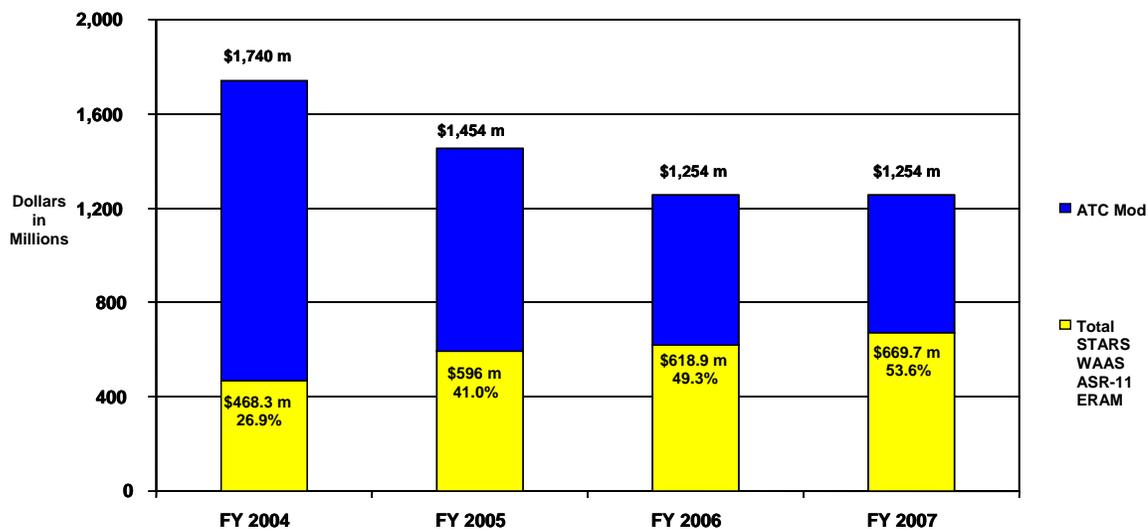
*The ATC Modernization amount represents a portion of the total F&E funding level. For example, in FY 2005, the F&E funding level was $2.5 billion. Of that amount, $1.4 billion was used to develop and acquire air traffic control modernization projects such as STARS, ERAM, WAAS, and ASR-11.

FAA needs to develop a comprehensive strategy for modernizing the NAS to ensure major acquisitions are delivered within cost, schedule, and performance milestones. As the demand for air travel continues to rise, FAA is now emphasizing sustaining the NAS, as opposed to increasing capacity. According to FAA officials, the Agency is planning to spend just over $230 million in 2005 on capacity enhancement projects such as WAAS and ASDE-X, which represents about 16 percent of the total funds used to develop and acquire air traffic control modernization projects.

While FAA officials indicated that budget reductions have forced the Agency to rethink its modernization strategy, cost growth and schedule delays with major acquisition projects have also significantly affected FAA's efforts to modernize the NAS. In an era when F&E funding levels are down, trade-offs must be made, so the crucial question is how FAA can address both capacity and affordability.

As FAA updates its major acquisition program baselines, the Agency needs to revalidate program benefits to determine what capacity benefits, if any, can be delivered. The Agency also needs to identify which technologies will be required to address its capacity needs and determine whether it is cost effective to continue funding programs that provide little or no benefit.

Given the cost growth and schedule slips with major acquisitions and the declining level of F&E funds, FAA must determine how to get the most out of its limited resources. The challenges facing FAA with respect to its major acquisition programs are developing reliable cost, schedule, and performance baselines for its existing projects and determining the total cost to complete implementation of the projects. FAA also needs to specify what capabilities and benefits each project provides the NAS, specify when they will be delivered, and justify why the project should be continued.
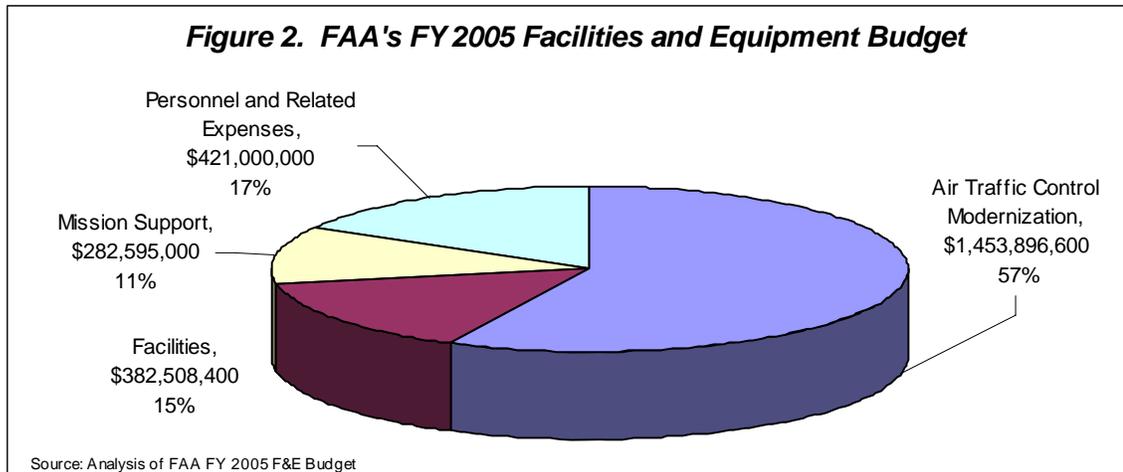
In summary, FAA needs to develop a comprehensive strategy for modernizing the NAS to ensure major acquisitions are delivered within cost, schedule, and performance milestones. As FAA updates its major acquisition programs' baselines, the Agency needs to re-evaluate the capabilities and benefits that STARS, WAAS, ASR-11, NIMS, ASDE-X, ADS-B, and ITWS are expected to provide the NAS, determine when benefits will be delivered, and justify why the project should be continued. If the expected benefits justify continuing the project, FAA should determine the cash flow requirements needed to complete implementation of the system, report its results to Congress, and provide future funding requirements for the F&E account for all major acquisition programs, including those that have been deferred.

FINDING AND RECOMMENDATIONS

Cost Growth and Schedule Delays of Major Acquisitions Continue To Stall NAS Modernization Efforts

Major acquisitions represent FAA's primary efforts to modernize or add new capabilities to the NAS. Historically, a significant portion of FAA's investment in air traffic control modernization projects has gone toward enhancing capacity and efficiency and replacing aging equipment in the NAS. The total modernization effort is expected to cost $48.6 billion through 2007, and FAA received a little more than $2.5 billion for FY 2005.

Of that $2.5 billion, a little more than $1.4 billion, or 57 percent, will be used to develop and acquire FAA's air traffic control modernization projects. The remaining funds support personnel and related expenses, mission support (support contracts), and FAA facilities (see Figure 2).

Figure 2. FAA's FY 2005 Facilities and Equipment Budget

Personnel and Related Expenses, $421,000,000 17%

Mission Support, $282,595,000 11%

Facilities, $382,508,400 15%

Air Traffic Control Modernization, $1,453,896,600 57%

Source: Analysis of FAA FY 2005 F&E Budget

We analyzed 16 FAA major acquisition programs with respect to cost, schedule, and key issues affecting their implementation. These projects include developing new automated controller tools, acquiring new technologies to prevent accidents on runways and taxiways, and modernizing FAA facilities that manage large segments of airspace over the Atlantic and Pacific Oceans. The 16 acquisitions we reviewed represent approximately $1.0 billion, or 71 percent, of the available funds used for developing and acquiring air traffic control modernization projects.

FAA has made progress in updating the cost, schedule, and performance baselines of a number of acquisitions, including the STARS, WAAS, and FTI programs. By updating the acquisition program baselines of these projects, FAA should be better positioned to anticipate resource requirements and determine when capabilities may be delivered. However, we found that continued cost growth, schedule delays, and performance shortfalls with major acquisitions have significantly delayed FAA's ability to obtain the benefits of new technologies and other improvements needed to increase safety, capacity, and efficiency of the NAS.

Our review of the 16 major acquisitions shows 11 of these projects have experienced cost growth of over $5.6 billion (from $8.9 billion to $14.5 billion), which is more than double the $2.5 billion amount of FAA's appropriations for modernization in FY 2005. Additionally, 9 of the 16 projects have schedule delays ranging from 2 to 12 years, while 2 other projects (LAAS and NEXCOM) have been deferred. Not withstanding FAA's decision to defer NEXCOM, the Agency still must deal with a number of issues that the program was supposed to address, including how to fund and sustain its aging radio control equipment and concerns about radio frequency depletion.

FAA recently sought to be more realistic about the cost of some programs and is taking a more phased approach to major efforts. There has been cost growth with major acquisitions since the establishment of the new ATO, but the bulk of the

cost growth represented by the $5.6 billion occurred before the new organization was established. It is also a reflection of the ATO's efforts to re-baseline a number of projects, which identified costs that have been pent up for some time and have simply not been recognized.

Since we last reported on these projects in June 2003, the estimated cost of 6 of the 16 projects has increased by about $1.7 billion, which includes cost growth of about $1.1 billion for STARS and $400 million for WAAS. Although FAA updated the cost, schedule, and performance baselines for some of its major acquisitions, much work remains before the Agency has accurate and complete information for its major acquisitions.

We identified 9 of the 16 programs that do not have reliable cost, schedule, or performance baselines. In such instances, the baseline does not reflect the true cost or schedule to develop and deploy the system as originally planned. This means that FAA cannot effectively plan resource requirements, manage the programs, or meet expectations for improving the safety and increasing the capacity of the NAS.

We found FAA projects had unreliable costs for a number of reasons, including requirement changes (e.g., STARS, WAAS, FTI, ITWS, and ASR-11). In our opinion, unreliable project cost and schedule estimates are an outgrowth of attempting to develop and implement technologies before they are ready. Placing immature technologies in the acquisition cycle increases the cost of the technology and extends the completion date.

FAA recognizes the need to obtain reliable information for its major acquisitions. It plans to update the cost, schedule, and performance baselines of five programs and revalidate the STARS and WAAS baselines. However, FAA has yet to determine when it will re-baseline NEXCOM and LAAS, as is reflected in Table 2.

Table 2. Major Acquisition Programs To Be Re-Baselined

Programs*	Latest Re-Baseline	Planned Re-Baseline
ASR-11	July 2004	2005
ASDE-X	June 2002	2005
ADS-B	Never baselined	2005
NIMS	May 2000	2005
STARS	April 2004	2005
ITWS	May 2004	2007
WAAS	May 2004	2007
LAAS	September 1999	To be determined
NEXCOM	May 2000	To be determined

* See Exhibit C for a list of program acronyms

These programs continue to be plagued by requirement changes, technical difficulties, or reduction in performance capabilities. Cost growth and schedule delays continue with many of FAA's major acquisition programs, hindering the Agency's efforts to develop and deploy new technologies to address the capacity needs of the NAS. Primary drivers for cost growth and schedule delays include additional development work, changing requirements, replacement of obsolete technology, and extension of the service life of the program. These projects include STARS, WAAS, ITWS, and ASR-11. Consequently, it is not clear how much these programs will cost, how long it will take to complete them, or what capabilities will finally be delivered. For example:

- **The Standard Terminal Automation Replacement System** program replaces controller and maintenance workstations with color displays, processors, and computer software. As we recently reported, faced with additional costs growth in the STARS program, FAA is rethinking its terminal modernization approach—a long overdue step that should have been taken several years ago. FAA re-baselined the STARS program in April 2004, limiting deployment to 50 planned sites[9] for $1.46 billion, after receiving a revised cost estimate of more than $2 billion for all sites. FAA revised its terminal modernization plan by committing to (1) consider retaining Common ARTS at some sites as an alternative to STARS, and (2) re-evaluate STARS costs and deployments before considering further STARS purchases in FY 2005.

  FAA intends to re-baseline STARS again in June 2005, and if the Agency implements its preferred STARS solution, which is to deploy STARS to 162 sites as originally planned, the cost would total $2.76 billion, including technology refresh. Thus, the program that was originally estimated to cost

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[9] FAA committed STARS deployment to 50 sites, but congressional language limited deployment to 47 sites.

less than $1 billion could cost almost $3 billion, and deployment to all sites may not occur until 2012—a 7-year delay compared to its original planned completion date.

However, the cost to complete terminal modernization still remains uncertain, and a decision needs to be made about what technology will be expected to complete terminal modernization based on cost, time, and capabilities. Because of cost growth and schedule delays, of urgent concern is the state of aging displays at four large sites, including Chicago and Denver. Under FAA's current plan, the Agency will not begin installing STARS and replacing the aging displays at the large sites until sometime in FY 2008.

Additionally, more development work is required before STARS can replace Common ARTS throughout the NAS. Due to overall program delays, STARS components being purchased today are now facing obsolescence, even though they were modern in 1996. For example, recently purchased STARS computers contain refurbished (i.e., used) computer processors. To address this, FAA plans to begin modernizing STARS through a technology refresh program beginning in FY 2006, which is estimated to cost $596.6 million over the life of the program through the year 2031. Currently, FAA is negotiating with the STARS contractor for development of a replacement processor. However, FAA currently has little choice but to purchase refurbished processors while waiting for development of the new processor and software modifications to be completed.

- **The Wide Area Augmentation System** program provides the augmentation needed to make the GPS satellite fully usable for en route, terminal, and non-precision approaches. FAA re-baselined WAAS in May 2004, and program costs increased from $2.9 billion to $3.3 billion. FAA now intends to provide a capability called "LPV" in late 2008, which will provide less than Category 1 performance. Key risks to WAAS implementation include delays in the development of flight procedures and user equipage.

  We note that WAAS will primarily benefit general aviation users, because commercial airliners already have on-board capabilities similar to WAAS. Additionally, it is still an open question whether the Agency will reduce its operating costs with WAAS implementation because FAA has yet to determine which surface navigation aids will be replaced in favor of WAAS.

  FAA still intends to pursue Category 1 capability and plans to make a formal decision in 2007. However, to provide Category 1, FAA is now dependent on DOD enhancement to the GPS satellite (a second civil signal for aviation use). Given shifting benefits and uncertainty regarding DOD plans, we question whether FAA should commit funds for Category 1 development. A decision

not to pursue Category 1 would significantly reduce the WAAS program's $3.3 billion cost.

FAA is adding new software to work on resolving safety-critical technical and performance issues. FAA also issued a contract to Lockheed Martin to procure and place into orbit a new geostationary earth-orbit satellite to improve WAAS availability.

Prolonged schedule delays required FAA to request additional funds to support technology refresh efforts sooner than anticipated. For example, WAAS reference station equipment manufactured in the late 1990s is quickly becoming obsolete. FAA currently has a technology refresh effort underway to replace all old WAAS equipment with newer, more powerful equipment. FAA has been requesting and using funds as early as FY 2004 to purchase updated hardware and software to replace the equipment from the WAAS initial design and development cycle in 1996. This effort will be complete by 2007. According to the May 2004 revised baseline for WAAS, FAA will be requesting an additional $340 million, beginning in 2014, to support WAAS technical refresh efforts over the extended life of the program.

- **The FAA Telecommunication Infrastructure** program is key to FAA's efforts to transition from supporting multiple telecommunication networks to a single network, thereby reducing operating costs. FAA re-baselined FTI in December 2004. We note that program costs have increased from $1.9 billion to $2.4 billion, the bulk of which ($2.1 billion) will be funded from the Operations account.

  Even though FAA re-baselined the effort, there are a number of issues that could affect its cost and schedule. For example, FAA has dramatically increased the number of sites scheduled to receive FTI from 1,374 to 4,463, and some sites are experiencing delays implementing FTI. FAA was planning to transition approximately 450 circuits to FTI operations by the end of November 2004; however, the Agency was only successful transitioning about 200 circuits—completing less than 50 percent of its planned milestones. A delay to the FTI implementation schedule would translate directly into increases in operations costs and reduced costs savings due to the prolonged sustainment of legacy networks. We note that FAA has already reduced FTI cost savings by $30 million ($820 million to $790 million), due to delays implementing FTI.

- **The Airport Surveillance Radar-11** program replaces aging analog radars at small terminal facilities with digital radars. FAA re-baselined the ASR-11 program in July 2004. FAA updated the requirements and increased costs $87 million to include, among other things, digitizers at all sites where

STARS will precede the ASR-11 program, and to satisfy deployment requirements of approximately 89 of the 112 radars originally planned. The cost increase is attributable to updated program requirements and adjustments to account for prior year funding deferrals.

It remains unclear how much it will cost or how long it will take to deploy all 112 radars as originally planned. FAA plans to re-baseline ASR-11 again in June 2005 to request additional funding to support deployment of all 112 radars.

- **The Integrated Terminal Weather System** provides air traffic managers with a forecast of weather conditions near airports. FAA re-baselined the ITWS program in May 2004. At that time, the Joint Resources Council approved the addition of the Terminal Weather Forecast product, which provides more advance notification of when and where bad weather will occur, in the ITWS production baseline. However, because production costs have increased from $360,000 to $1.1 million per system, only 22 of the planned 34 production systems will be deployed through 2009—6 years behind schedule. FAA plans to re-baseline ITWS in 2007, at which time a deployment decision will be made regarding the remaining 12 systems.

It is important for FAA to complete its plans to re-baseline the programs within its major acquisition portfolio and to ensure the accuracy and reliability of the programs' baselines. When baselines are not met, the Agency cannot accurately anticipate either resource requirements or capabilities in the future. Additionally, postponed benefits from un-fielded systems also create inefficiency in the NAS.
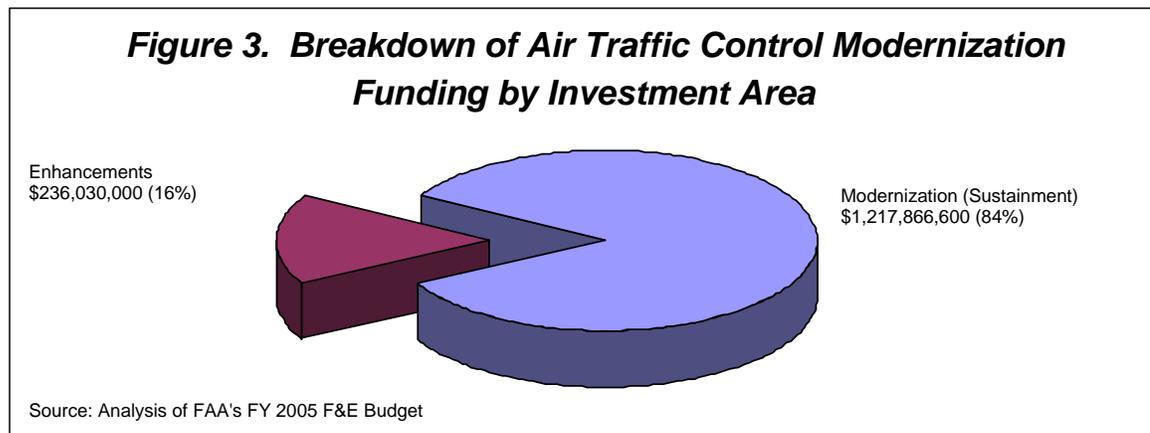
FAA is now in the unenviable position of funding projects that have been delayed for years while starting the ambitious $2.1 billion ERAM program. ERAM is one of the largest and most complex acquisitions in FAA's modernization portfolio. In essence, ERAM replaces the brain and central nervous system for facilities that manage high-altitude traffic. By 2007, FAA will be spending $30 million per month alone on the program. FAA is pursuing ERAM through a long-term cost-plus contract that places the majority of risk with the Government.

Progress is being made with the first ERAM deliverable: a back-up system for the Host computer. However, the bulk of the work focuses on development of the first major ERAM software release, which involves developing over 1 million lines of code. We note that the first software release for ERAM has experienced some modest software code growth of 70,000 lines. FAA can take steps now to reduce risk of ERAM by relying more on fixed-price agreements and deferring later software builds that have yet to be defined or priced.

FAA annual funding requirements for the STARS, WAAS, ASR-11, and ERAM programs will increase from 26.9 percent to 53.6 percent over a 4-year period beginning in FY 2004. Consequently, a significant portion of the available funds used to support air traffic acquisitions through 2007 will be used to fund just these four projects. Moreover, in June 2005, FAA is planning to make a decision on whether to acquire additional STARS and ASR-11 systems. A decision to acquire additional systems may require significant funding increases for the two programs, which will further reduce the funds available to support air traffic acquisitions. This leaves little room for cost growth, schedule delays, or adding new initiatives.

FAA Needs To Develop a Comprehensive Strategy for Modernizing the NAS To Ensure Major Acquisition Programs Are Delivered Within Cost, Schedule, and Performance Milestones

As the demand for air travel continues to rise, FAA is now emphasizing sustaining the NAS, as opposed to increasing capacity in the NAS. According to FAA officials, the Agency is planning to spend just over $230 million on capacity enhancement projects in 2005, which represents about 16 percent of the total funds used to support air traffic control modernization projects (see Figure 3).

Figure 3. Breakdown of Air Traffic Control Modernization Funding by Investment Area

Enhancements
$236,030,000 (16%)

Modernization (Sustainment)
$1,217,866,600 (84%)

Source: Analysis of FAA's FY 2005 F&E Budget

Of the $1.4 billion funded in FY 2005 to acquire and develop air traffic modernization projects, FAA plans to spend $236 million, or 16 percent, on three programs the Agency concluded will provide capacity to the NAS. The three programs are Free Flight Phase 2 ($88 million), ASDE-X ($48 million), and WAAS ($100 million). The remaining $1.2 billion will be used to support sustainment and modernization activities such as the ERAM and STARS programs.

FAA officials indicated budget reductions have forced the Agency to rethink its modernization strategy and reduce or eliminate funding for several acquisition

programs (including NEXCOM and LAAS) through 2008. However, we concluded that cost growth of over $5.6 billion and schedule delays ranging from 2 to 12 years with major acquisition projects has also significantly affected FAA's efforts to modernize the NAS.

In an era when F&E funding levels are down, trade-offs must be made. So the crucial question is how FAA can address both capacity and affordability. As FAA updates its major acquisition program baselines, it needs to revalidate the program benefits as well. FAA needs to determine whether the planned capacity gains for its acquisition programs still exist, when increased capacity will be delivered, and whether it is cost beneficial to continue investing in the programs.

Given the cost growth and schedule slips with major acquisitions and the declining level of F&E funds, FAA must determine how to get the most out of its limited resources. The challenges facing FAA with respect to its major acquisition programs are developing reliable cost, schedule, and performance baselines for its existing projects and determining the total cost to complete implementation of the projects. FAA also needs to specify what capabilities and benefits each project provides the NAS, when the benefits will be delivered, and why the project should be continued. Until the new baselines are established and FAA revalidates program benefits, FAA will not be in position to manage its overall modernization portfolio or set expectations for what can be accomplished within existing and projected funding levels.

RECOMMENDATIONS

In light of our finding, we are recommending that FAA develop a comprehensive strategy for modernizing the NAS to ensure major acquisitions are delivered within cost, schedule, and performance milestones. As FAA updates its major acquisition program baselines, the Agency needs to:

1. Re-validate the capabilities and benefits that each project (i.e., STARS, WAAS, ASR-11, NIMS, ASDE-X, ADS-B, and ITWS) is expected to provide the NAS and determine when the benefits will be delivered. If the expected benefits justify continuing the project, determine the cash flow requirements needed to complete implementation of the system, and

2. Report to Congress on the results of this re-validation effort and provide future funding requirements for the F&E account for all major acquisition programs, including those that have been deferred.

AGENCY COMMENTS

On May 17, 2005, we met with FAA program officials from the ATO—Finance, En Route and Oceanic Service, Terminal, and Communications offices—to obtain their oral comments to our report. Based on FAA comments, we made changes to the report as appropriate. FAA officials generally agreed with our conclusions and recommendations.

ACTIONS REQUIRED

In accordance with Department of Transportation Order 8000.1C, we would appreciate receiving your written comments on this report within 30 calendar days. If you concur with the finding and recommendations, please indicate the specific action taken or planned for the recommendations and the target date for completion. If you do not concur, please provide your rationale. You may provide alternative courses of action that you believe would resolve the issues presented in this report.

We appreciate the courtesies and cooperation of representatives from the FAA, and in particular its Air Traffic Organization-Finance staff, during this audit. If you have any questions concerning this report, please call me at (202) 366-0500 or Kevin Dorsey, Program Director, at (202) 366-1518.

#

cc: FAA Deputy Administrator
        FAA Chief of Staff
        Anthony Williams, ABU-100
        Martin Gertel, M-1

EXHIBIT A. SCOPE, METHODOLOGY, AND PRIOR AUDIT COVERAGE

We performed our review of FAA's major acquisitions from September 2004 through March 2005. Specific programs were selected for review based on their having F&E cost estimates of $150 million or more and schedule completion dates in FY 2005 or later. We focused primarily on project funding from the F&E account because those funds are used to support FAA's air traffic modernization efforts. This review was performed in accordance with Government Auditing Standards as prescribed by the Comptroller General of the United States.

We initially selected 17 major acquisitions for review. However, during our survey, we determined that the Airport Movement Area Safety System program was completed and that no further review was required. To update the costs and schedules of the remaining 16 major acquisitions selected for review, we obtained, analyzed, and documented cost and schedule information of acquisition program baseline documents and monthly variance reports. We updated the status of the programs from inception to March 2005. We spoke with key personnel responsible for developing and implementing these programs and evaluated monthly program status reports, team meeting minutes, and Joint Resources Council (a key Agency decision-making body) decisions. In addition, we obtained and analyzed acquisition program expenditures and obligations from FAA program offices.

We identified the main issues affecting implementation of acquisition programs through discussions with FAA acquisition program staff, our review of program documentation obtained from FAA, and our review of the *Capital Investment Plan, FAA Flight Plan 2004-2008,* the *Operational Evolution Plan*, and other relevant FAA documents. Upon completion of the updated matrixes, we forwarded the information to FAA for review and incorporated its comments where necessary.

We have issued two prior audit reports on the status of FAA's major acquisition programs. In our most recent report,[10] we recommended that FAA update its major acquisition baselines and develop and use performance goals to assess progress with its major acquisitions. We met with the Director of FAA's Capital Expenditures Programs to obtain information on the status of the recommendations and FAA's F&E budget process. FAA has updated several major acquisition baselines and is making progress developing and implementing performance goals for assessing the progress of major acquisitions.

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[10] OIG Report Number AV-2003-045, "Status of FAA's Major Acquisitions," June 26, 2003.

FAA established a performance goal to assess the progress of its critical major acquisitions. Beginning in FY 2005, FAA plans to complete 80 percent of its acquisitions on schedule and within 10 percent of budget. By FY 2009, FAA plans to increase its target completion rate to 90 percent. However, we found FAA's success criteria for meeting its goals are much different than how we measure the cost and schedule variances for FAA's major acquisitions. Our costs and schedule variances are based on a comparison of FAA's approved baselines at the program's inception compared to the current program baselines. FAA is using updated program cost and schedule milestones to measure its performance goals and is making no comparison to the original program milestones.

Additionally, FAA's *Flight Plan* established Agency performance goals, is tied directly to Agency funding decisions, and will be updated annually. Under the plan, employee incentive payout requires that employees meet at least 90 percent of the *Flight Plan* goals. However, much work remains before FAA can truly assess how major acquisitions funds are spent.

FAA is attempting to develop a budget process for major acquisitions consistent with Agency goals and plans to begin this process in FY 2007. FAA is planning to implement a better process for linking its budget to meeting Agency goals of increasing safety, providing greater capacity, international leadership, and organizational excellence. The Agency plans to use its *Flight Plan* to drive the budget. Programs will be prioritized based on recommendations of an Executive Council, which the Agency plans to form. FAA will also attempt to factor the operations costs of major acquisition programs into its decision-making process.

Exhibit A. Scope, Methodology, and Prior Audit Coverage

EXHIBIT B. COST AND SCHEDULE VARIANCES FOR EXISTING PROGRAMS

Program*	Estimated Program Costs (in Millions)		Percent Cost Growth	Implementation Schedule		Schedule Delay
	Original	Current		Original	Current	
WAAS	$892.4	$3,339.6	274%	1998-2001	2005-2013	12 years
STARS	$940.2	$2,760.4	194%	1998-2005	2002-2012	7 years
NEXCOM	$406.0	$986.4	143%	2002-2008	2002-TBD	Deferred
FTI	$205.5	$310.2	51%	2002-2008	2004-2008	2 years
OASIS	$174.7	$251.0	44%	1998-2001	2002-2005	4 years
ADS-B	$215.1	$294.8	37%	2001-TBD	2001-TBD	N/A
ASR-11	$743.3	$1,003.0	35%	2000-2005	2003-2013	8 years
NIMS	$273.7	$362.3	32%	1997-2000	2001-2010	10 years
LAAS	$530.1	$696.1	31%	2002-TBD	TBD	Deferred
ASDE-X	$424.3	$505.2	19%	2003-2007	2003-2009	2 years
ITWS	$276.1	$286.1	4%	2002-2003	2003-2009	6 years
ATCBI-6	$281.8	$282.3	N/A	2000-2004	2002-2009	5 years
FFP 2	$546.2	$495.8	N/A	2003-2007	2003-2007	N/A
ERAM	$2,154.6	$2,141.9	N/A	2009-2010	2009-2010	N/A
ECG	$315.1	$315.1	N/A	2003-2005	2004-2005	N/A
ATOP	$548.2	$ 548.2	N/A	2004-2006	2004-2006	N/A
Total	**$8,927.3**	**$14,578.4**				**2 to 12 years**

*See Exhibit C for a list of program acronyms
Source: Project-specific acquisition program baselines or FAA's Capital Investment Plan
N/A: Not applicable
TBD: To be determined

Exhibit B. Cost and Schedule Variances for Existing Programs

EXHIBIT C. DEFINITIONS OF PROGRAM ACRONYMS

Program	Definition
WAAS	Wide Area Augmentation System: Provides the augmentation needed to make the GPS satellite signal fully usable for en route, terminal, and non-precision approaches.
STARS	Standard Terminal Automation Replacement System: Replaces controller and maintenance workstations with color displays, processors, and computer software at terminal air traffic control facilities.
NEXCOM	Next Generation Air/Ground Communications: Replaces existing analog radios and related equipment with digital systems and is expected to meet the radio frequency needs of the NAS.
FTI	FAA Telecommunications Infrastructure: Replaces older telecommunications systems with one provider responsible for operating and maintaining FAA's telecommunications infrastructure.
OASIS	Operational and Supportability Implementation System: Replaces the current Model One Full Capacity system at the 61 Automated Flight Service Stations and will provide an integrated system that will increase operational capabilities such as Flight Data Processing and Weather Graphics.
ADS-B	Automatic Dependent Surveillance—Broadcast: An air-to-air-to-ground communications, navigation, and surveillance technology that relies on GPS to broadcast the positions of properly equipped aircraft and surface vehicles.
NIMS	NAS Infrastructure Management System: Provides a centralized management system to improve the remote maintenance monitoring system capability and other airway facilities services provided to the NAS.
ASR-11	Airport Surveillance Radar-11: Replaces aging analog radar with digital radar at small terminal facilities.
LAAS	Local Area Augmentation System: Provides the augmentation needed to make GPS fully usable for Category 1, 2, and 3 precision approaches and landings.
ASDE-X	Airport Surface Detection Equipment-X: Provides surveillance equipment to prevent runway incursions at airports.
ITWS	Integrated Terminal Weather System: Acquires and integrates weather data from multiple sensors and provides traffic management units with a graphic display of weather information that needs no meteorological interpretation.
ATCBI-6	Air Traffic Control Beacon Interrogator-6: A ground-based system that interrogates transponders, receives and processes replies from transponders, determines the range and direction to/from aircraft, and forwards the information to appropriate air traffic control automation systems.
FFP 2	Free Flight Phase 2: Includes a set of automated tools (User Request Evaluation Tool and Traffic Management Advisor) that helps controllers detect potential conflicts between aircraft and transition aircraft from en route to terminal airspace. Collaborative Decision Making is also used to improve air traffic management through links with the Command Center and Airline Operations Centers.
ERAM	En Route Automation Modernization: Replaces the Host computer hardware and software, including the Host back-up system and associated support infrastructure, at 20 air route traffic control centers.
ECG	En Route Communications Gateway: Replaces the existing communications gateway at 20 en route facilities that control high-altitude air traffic.
ATOP	Advanced Technologies and Oceanic Procedures: Modernizes FAA facilities that are responsible for managing large segments of airspace over the Atlantic and Pacific Oceans.

Exhibit C. Definitions of Program Acronyms

EXHIBIT D. STATUS OF FAA'S MAJOR ACQUISITIONS (AS OF MARCH 2005)

Program Name, Description, Purpose, and Contractor Name	Original Program Cost Estimate	Current Program Cost Estimate	Original Deployment Schedule	Current Deployment Schedule	Status and Key Issues Affecting Implementation
Advanced Technologies and Oceanic Procedures (ATOP): Modernizes FAA facilities that are responsible for managing large segments of airspace over the Atlantic and Pacific Oceans. FAA plans call for an integrated system for flight data processing, detecting conflicts between aircraft, data link, and surveillance capabilities. **Contractor: Lockheed Martin**	$548.2 Million	$548.2 Million (Total obligated as of January 2005: $305.6 million)	Start: 2004 Finish: 2006	Start: 2004 Finish: 2006	Almost 4 years ago in June 2001, FAA awarded a $217 million fixed-price contract to Lockheed Martin to provide oceanic systems in Anchorage, New York, and Oakland. Although FAA began initial operations for ATOP at Oakland in June 2004, FAA continues to experience problems with the system and is only using ATOP on a limited basis in Oakland. Last year, FAA increased the ATOP contract by $11 million to fix software problems and maintain its schedule and has recently modified the contract and provided an additional $21 million to address similar problems.
Airport Surface Detection Equipment-X (ASDE-X): ASDE-X provides surveillance equipment to prevent runway incursions at airports. Implementation of these systems will improve controller situational awareness of the airport movement area. **Contractor: Sensis Corp.**	$424.3 Million	$505.2 Million (Total obligated as of January 2005: $249 million).	Start: 2003 Finish: 2007	Start: 2003 Finish: 2009	ASDE-X is an important safety initiative to reduce accidents on runways. It was initially designed to provide a low-cost alternative to FAA's ASDE-3 radar systems. The program has evolved and now includes 28 ASDE-X sites and 7 ASDE-3 sites that will receive ASDE-X upgrades. We note that nearly half of the 35 sites planned will have schedule slips, due to changes in system design and additional requirements. FAA plans to re-baseline the ASDE-X program in June 2005.

Exhibit D. Status of FAA'S Major Acquisitions (as of March 2005)

Program Name, Description, Purpose, and Contractor Name	Original Program Cost Estimate	Current Program Cost Estimate	Original Deployment Schedule	Current Deployment Schedule	Status and Key Issues Affecting Implementation
Airport Surveillance Radar (ASR-11): Replaces aging analog radar with digital radar at small terminal facilities. ASR-11 can be used by Common ARTS and STARS. This is a joint effort with the Department of Defense. **Contractor: Raytheon**	$743.3 Million	$1.0 Billion (Total obligated as of January 2005: $537.2 million)	Start: 2000 Finish: 2005	Start: 2003 Finish: 2013	FAA re-baselined the ASR-11 program in July 2004. Program cost increased by $87 million from $916.2 million to approximately $1 billion to deploy approximately 89 radars. It remains unclear how much it will cost or how long it will take to deploy all 112 radars, as originally planned. FAA plans to re-baseline ASR-11 again in June 2005.
Air Traffic Control Beacon Interrogator (ATCBI-6): A ground-based system that interrogates transponders, receives and processes replies from transponders, determines the range and direction to/from aircraft, and forwards the information to appropriate air traffic control automation systems. Replies from aircraft provide transponder identification and altitude data, which are displayed on the controller's screen. **Contractor: Raytheon**	$281.8 Million	$282.3 Million (Total obligated as of January 2005: $187.8 million)	Start: 2000 Finish: 2004	Start: 2002 Finish: 2009	The ATCBI-6 is replacing aging en route surveillance radar equipment (ATCBI Models 4 and 5) to maintain operational capability and decrease maintenance costs. Only 33 of 126 operational sites have been commissioned. Funding shortfalls could cause additional delays in the program.

Exhibit D. Status of FAA'S Major Acquisitions (as of March 2005)

Program Name, Description, Purpose, and Contractor Name	Original Program Cost Estimate	Current Program Cost Estimate	Original Deployment Schedule	Current Deployment Schedule	Status and Key Issues Affecting Implementation
Automatic Dependent Surveillance-Broadcast (ADS-B): ADS-B is an air-to-air, air-to-ground communications, navigation, and surveillance technology that relies on GPS to broadcast the positions of properly equipped aircraft and surface vehicles. It is part of the *Safe Flight 21 Program.* **Contractors: Chelton Flight Systems, Garmin AT, Inc., Sensis Corp, Helipro Corp International**	$215.1 Million (Part of Safe Flight 21)	$294.8 Million (Total obligated as of January 2005: $181.8 million)	Start: 2001 (Limited deployment to Bethel, Alaska) Finish: To be determined Airspace users must equip to obtain benefits.	Start: 2001 Finish: To be determined	FAA is currently developing and testing, ADS-B avionics/technologies in Alaska and the Ohio River Valley. We note that increased cost of the effort from $268.4 million to $294.8 million is attributable to, among other things, the statewide expansion of the ground infrastructure in Alaska and the integration of ADS-B with surface moving map displays. ADS-B is a key element in other FAA programs, including the ASDE-X effort to help prevent accidents on runways. FAA plans to baseline the ADS-B program for NAS-wide deployment in the lower 48 states by the end of FY 2005.
En Route Automation Modernization (ERAM): Replaces the Host computer hardware and software, including the Host back-up system and associated support infrastructure, at 20 en route centers. **Contractor: Lockheed Martin and Raytheon**	$2.1 Billion	$2.1 Billion (Total obligated as of January 2005: $332 million)	Start: 2009 Finish: 2010	Start: 2009 Finish: 2010	With an estimated cost of $2.1 billion, ERAM is one of the largest and most complex acquisitions in FAA's modernization portfolio. Progress is being made with the first ERAM deliverable—a back-up system for the Host computer. However, the bulk of the work focuses on development of the first major ERAM software release, which involves developing over 1 million lines of code. We note that the first software release for ERAM has experienced some modest software code growth of 70,000 lines. FAA can take steps now to reduce risk to ERAM by relying more on fixed-price agreements and deferring later software releases that have yet to be defined or priced.

Exhibit D. Status of FAA'S Major Acquisitions (as of March 2005)

Program Name, Description, Purpose, and Contractor Name	Original Program Cost Estimate	Current Program Cost Estimate	Original Deployment Schedule	Current Deployment Schedule	Status and Key Issues Affecting Implementation
En Route Communications Gateway (ECG): ECG will replace the existing communications gateway at 20 en route facilities that control high-altitude air traffic. The program will provide a more robust infrastructure to support future en route systems, such as the En Route Automation Modernization program. **Contractor:** **Lockheed Martin**	$315.1 Million	$315.1 Million (Total obligated as of January 2005: $196 million)	Start: 2003 Finish: 2005	Start: 2004 Finish: 2005	ECG is one of the first initiatives aimed at modernizing en route automation. The program is on schedule and under budget. FAA has delivered 24 systems overall and 15 systems are operational (including support facilities).
FAA Telecommunications Infrastructure (FTI): FTI is designed to replace older telecommunications systems with one provider responsible for operating and maintaining FAA telecommunications infrastructure. **Contractor:** **Harris Corporation**	$205.5 Million	$310.2 Million (Total obligated as of January 2005: $146.1 million)	Start: 2002 Finish: 2008	Start: 2004 Finish: 2008	FTI is key to FAA's efforts to transition from multiple telecommunication networks to a single network, thereby reducing operating costs. FAA re-baselined FTI in December 2004. We note that program cost have increased from $1.9 billion to $2.4 billion, the bulk of which ($2.1 billion) will be funded from the Operations account. Even though FAA re-baselined FTI, there are a number of issues that could impact cost and schedule. For example, FAA has dramatically increased the number of sites scheduled to receive FTI from 1,374 to 4,463, and some sites are experiencing delays implementing FTI. A delay to FTI's implementation schedule would increase operations costs and reduce costs savings due to the prolonged sustainment of legacy networks.

Exhibit D. Status of FAA'S Major Acquisitions (as of March 2005)

Program Name, Description, Purpose, and Contractor Name	Original Program Cost Estimate	Current Program Cost Estimate	Original Deployment Schedule	Current Deployment Schedule	Status and Key Issues Affecting Implementation
Free Flight Phase 2 (FFP 2): FFP 2 includes the User Request Evaluation Tool (URET), Traffic Management Advisor (TMA) Single Center, and Collaborative Decision Making (CDM). It introduces Controller Pilot Data Link Communications (CPDLC). **Contractor: Lockheed Martin; (URET) Computer Sciences Corporation CSC (TMA-SC) METRON, Volpe and CSC (CDM)**	$546.2 Million	$495.8 Million Total Costs (Total obligated as of January 2005: $272.4 million)	Start: 2003 Finish: 2007	Start: 2003 Finish: 2007	FFP 2 is a geographical expansion of the successful FFP 1 program. FAA has dissolved the Free Flight office, and the programs have been reassigned to various offices within the new FAA Air Traffic Organization. Due to funding considerations, FAA has deferred plans for implementing URET at the last two sites until 2006. FAA is refocusing efforts to use TMA as a multi-center tool to sequence and transition aircraft through multiple centers and enhance benefits. TMA relies on a procedural change referred to as Time Based Metering to obtain maximum benefits. Currently, only six Air Route Traffic Control Centers use the technique on a regular basis. We note that FAA canceled the CPDLC program and plans to complete closeout activities by April 2005.
Integrated Terminal Weather System (ITWS): Acquires and integrates weather data from multiple sensors and provides traffic management units with a graphic display of weather information that needs no meteorological interpretation. Includes (1) a display of terminal winds aloft, and (2) a 20-minute prediction of convective weather. **Contractor: Raytheon**	$276.1 Million	$286.1 Million (Total obligated as of January 2005: $207.3 million)	Start: 2002 Finish: 2003	Start: 2003 Finish: 2009	FAA re-baselined the ITWS program in May 2004. At that time, the Joint Resources Council approved the addition of the Terminal Weather Forecast product in the ITWS production baseline. However, because production costs have increased from $360,000 to $1.1 million per system, only 22 of the planned 34 systems will be deployed through 2009. FAA plans to re-baseline ITWS in 2007, at which time a deployment decision will be made regarding the remaining 12 systems.

Exhibit D. Status of FAA'S Major Acquisitions (as of March 2005)

Program Name, Description, Purpose, and Contractor Name	Original Program Cost Estimate	Current Program Cost Estimate	Original Deployment Schedule	Current Deployment Schedule	Status and Key Issues Affecting Implementation
Local Area Augmentation System (LAAS): LAAS is a new precision approach and landing system that is expected to boost airport arrival rates under all weather conditions. It provides the augmentation needed at 160 airports to make GPS fully usable for Categories 1, 2, and 3 precision approaches at selected airports. **Contractor: Honeywell**	$530.1 Million	$696.1 Million (cost are under review) (Total obligated as of January 2005: $162.6 million)	Start: 2002 Finish: To be determined *Airspace users must equip to obtain benefits.*	Start: To be determined Finish: To be determined	FAA has deferred LAAS. Some reasons include additional development work, evolving requirements, and unresolved issues regarding system certification. We note that Congress provided $10 million for FY 2005 to provide early LAAS Category 1 capability. The more demanding Category 2/3 service is now a research and development effort. FAA has yet to determine when LAAS will be re-baselined or when it will be delivered.
NAS Infrastructure Management System (NIMS): Provides a centralized management system to improve the services provided to the NAS, as well as to operate and maintain the facilities, systems, and equipment that make up the NAS infrastructure, such as communications equipment, radars, and navigation aids. **Contractor: Digicom**	$273.7 Million	$362.3 Million (Total obligated as of January 2005: $119 million)	Start: 1997 Finish: 2000	Start: 2001 Finish: 2010 (under review)	FAA believes NIMS is an important effort to help the Agency maintain and support many elements of the NAS, such as radars. Cost increases are attributable to increased requirements added in 2000. We note that FAA has reprogrammed NIMS funds to other projects. FAA intends to re-baseline the NIMS (principally Phase 2) cost and schedule in 2005.

Exhibit D. Status of FAA'S Major Acquisitions (as of March 2005)

Program Name, Description, Purpose, and Contractor Name	Original Program Cost Estimate	Current Program Cost Estimate	Original Deployment Schedule	Current Deployment Schedule	Status and Key Issues Affecting Implementation
Next Generation Air/Ground Communications (NEXCOM): Replaces existing analog radios and related equipment with digital systems, including multi-mode digital radios. It is expected to meet the radio frequency needs of the NAS well past 2030. Later phases of NEXCOM are expected to allow the exchange of both voice and data communication on the same channel within the existing frequency spectrum. **Contractor: ITT**	$406 Million	$986.4 Million (Total obligated as of January 2005: $165.5 million)	Start: 2002 Finish: 2008 (key site)	Start: 2002 Finish: 2010 (radios only)	In March 2004, FAA deferred major elements of NEXCOM. FAA will spend $230 million less than planned on NEXCOM through 2008. NEXCOM is now essentially a radio replacement program—the Agency continues to procure the new multi-mode digital radios. Not withstanding FAA's decision to defer NEXCOM, it still must address a number of issues including how to fund and sustain its aging radio control equipment and how to address concerns about frequency depletion. Because of these concerns, FAA was directed to report to Congress how it intends to meet the near- and long-term communications needs of the NAS. FAA has yet to determine when NEXCOM will be re-baselined.
Operational and Supportability Implementation System (OASIS): Replaces the current Model One Full Capacity (M1FC) system at the 61 Automated Flight Service Stations and will provide an integrated system that will increase operational capabilities such as Flight Data Processing and Weather Graphics. **Contractor: Harris Corp.**	$174.7 Million	$251 Million (Total obligated as of January 2005: $130.2 million)	Start: 1998 Finish: 2001	Start: 2002 Finish: 2005	On February 1, 2005, FAA contracted out management of FAA's Automated Flight Service Station services to Lockheed Martin. Lockheed plans to assume operations in October 2005. Consolidation of 58 sites located in the continental United States, Puerto Rico, and Hawaii will begin in April 2006. No further installations are planned beyond the 19 OASIS sites. FAA plans to phase out OASIS between March 2006 and March 2007 in accordance with the Lockheed Martin transition plan.

In the NEXCOM row, within the deployment schedule area: a boxed note reads "Users must equip with new radios."

Exhibit D. Status of FAA'S Major Acquisitions (as of March 2005)

Program Name, Description, Purpose, and Contractor Name	Original Program Cost Estimate	Current Program Cost Estimate	Original Deployment Schedule	Current Deployment Schedule	Status and Key Issues Affecting Implementation
Standard Terminal Automation Replacement System (STARS): Replaces controller and maintenance workstations with color displays, processors, and computer software at terminal air traffic control facilities. STARS require digital radar data input. **Contractor: Raytheon**	$940.2 Million	$1.46 Billion* *This cost is to complete only Phase 1 of STARS. To complete the program through Phase 3, the total costs is $2.76 billion (Total obligated as of January 2005: $1.16 billion)	Start: 1998 Finish: 2005	Start: 2002 Finish: 2007* *This is the completion year to deploy the first 50 sites, while 2012 is FAA's estimate to complete deployment to all 162 sites.	STARS has a long history of cost increases and schedule slips. As we recently reported, FAA re-baselined the STARS program in April 2004, limiting deployment to 50 planned sites, after receiving a revised cost estimate of more than $2 billion for all sites. Because of cost growth and schedule delays, of urgent concern is the state of aging displays at four large sites, such as Chicago and Denver. Under FAA's current plan, the Agency will not begin installing STARS and replacing the aging displays at the large sites until sometime in FY 2008. FAA intends to re-baseline STARS again in June 2005. The cost to complete terminal modernization remains uncertain.
Wide Area Augmentation System (WAAS): Provides the augmentation needed to make the Global Positioning System (GPS) fully usable for en route, terminal, and non-precision approaches. **Contractor: Raytheon**	$892.4 Million	$3.3 Billion (includes sunk costs) (Total obligated as of January 2005: $959.2 million)	Start: 1998 Finish: 2001 Airspace users must equip to obtain benefits.	Start: 2005 Finish: 2013 (depending on GPS upgrade)	FAA re-baselined WAAS in May 2004, and program costs increased from $2.9 billion to $3.3 billion. FAA now intends to provide a capability called "LPV" in late 2008 which is less than Category 1 performance. Key risks to WAAS implementation are the development of flight procedures and user equipage. FAA still intends to pursue Category 1 and plans to make a formal decision in 2007. However, to provide Category 1 capability, FAA is now dependent on DOD enhancement to GPS satellites (a second civil signal for aviation use). Given shifting benefits, and uncertainty regarding DOD plans, we question whether or not FAA should commit funds for Category 1 development. A decision not to pursue Category 1 would significantly reduce WAAS's $3.3 billion cost.

Exhibit D. Status of FAA'S Major Acquisitions (as of March 2005)

EXHIBIT E. MAJOR CONTRIBUTORS TO THIS REPORT

THE FOLLOWING INDIVIDUALS CONTRIBUTED TO THIS REPORT.

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