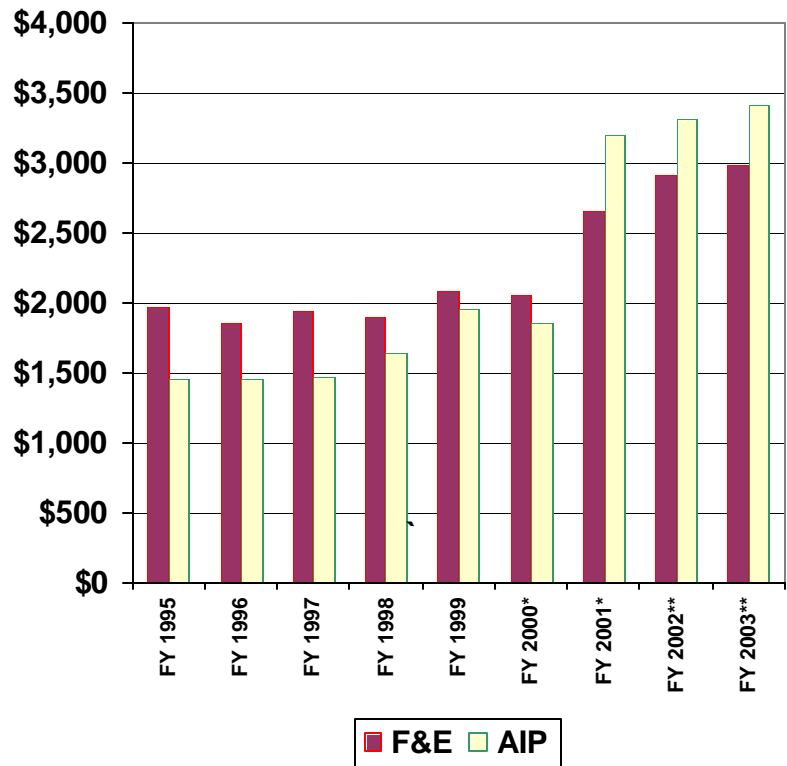


### 3. AVIATION SYSTEM CAPACITY AND AIR TRAFFIC CONTROL MODERNIZATION

Meeting the anticipated demand for air travel is an urgent issue because the National Airspace System is operating at the fringes of capacity — delays and consumer dissatisfaction are at all time highs. Complaints for the first 11 months of 2000 increased 16 percent (18,966 to 22,089) over complaints during the same period in 1999.

U.S. airlines transport over 600 million passengers annually, and this number is expected to grow to over 900 million by 2010. Scheduled operations for the top 10 carriers increased from 4.6 million for the first 9 months of 1999 to over 4.7 million for the same period in 2000.

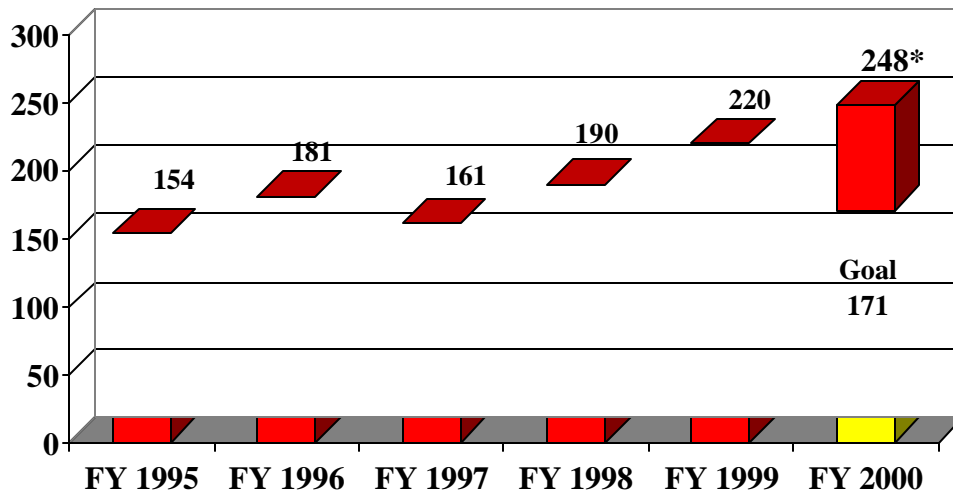
FAA's F&E and AIP Budgets FY 1995-FY 2003  
\$ in millions; \*=Appropriations; \*\*=Authorized under AIR-21



In January 2000, the Congress passed the Wendell H. Ford Aviation Investment and Reform Act for the 21<sup>st</sup> Century, more commonly known as “AIR-21”. AIR-21 will provide FAA with nearly \$8.6 billion to modernize the air traffic control system (the Facilities and Equipment (F&E) account) and almost \$10 billion in airport improvement program (AIP) funds from fiscal year (FY) 2001 through 2003.

Against a backdrop of growing demand for air travel, there has been a rapid increase in flight delays and cancellations. Between 1995 and 1999, FAA reported a 58 percent increase in flight delays. Likewise, the Bureau of Transportation Statistics reported a 68 percent increase in cancellations. For the first 9 months of 2000, over 1 in 4 domestic flights—affecting approximately 119 million passengers—were delayed, canceled, or diverted, with the average delay exceeding 50 minutes.

**Flight Delays 1995 - 2000**  
**Rate per 100,000 Flight Operations**  
 \* = Preliminary



We see the key issues in this area as:

- Developing a strategy for addressing system efficiency, delays, and capacity in the short, intermediate, and long term;
- Establishing FAA's Air Traffic Services as a results-oriented organization;
- Monitoring airline commitments to customer service and DOT's enforcement of consumer protection laws;
- Managing FAA's efforts to use technology to increase the safety, efficiency, and capacity of the National Airspace System; and
- Assessing FAA's role in planning for nationwide airport infrastructure needs.

**Most Significant Open Recommendations and Issues:** Addressing flight delays, cancellations, and resulting consumer dissatisfaction will require a multifaceted approach, including new technology, airspace redesign, and airport infrastructure enhancements. Additional efforts, such as moving FAA toward a results-oriented organization, will not increase the likelihood of success unless the agency has a strong financial underpinning (a cost accounting system) and FAA staff are held accountable for achieving results within established metrics .

- Developing a Strategy for Addressing System Efficiency, Delays, and Capacity in the Short, Intermediate, and Long Ter . m

*Developing a Strategic Plan for Addressing Capacity Shortfalls.* The Congress, industry, and travelling public need to know what can be reasonably expected from various initiatives to address capacity (new technology and additional runways) in the short term (1 to 2 years), intermediate term (4 to 5 years), and long term (8 to 10 years). This is important because the modernization effort will provide only incremental capacity improvements in the short term. The window for sorting through options for the short term (as the spring and summer of 2001 approach) is extremely narrow. Open questions include whether airline scheduling discussions for specific airports should be permitted under antitrust supervision, whether peak-hour pricing (if legal) will provide any meaningful relief, and whether implementing a lottery for airport usage (such as LaGuardia) will work.

*Developing and Implementing a Uniform System for Tracking Delays, Cancellations, and their Causes.* DOT and FAA have started a number of actions (including the Spring/Summer 2000 initiative which enhanced communication between FAA and airlines) to address delays and cancellations. However, the Department's ability to address the increase in delays and cancellations has been hampered by the lack of a uniform system for tracking delays and cancellations and their causes – this has led to misleading and inconsistent data. While some progress has been made to develop a common reporting system, much work remains. A Secretarial-level task force made recommendations to improve the reporting process; now follow through and timeframes for implementation are needed. Until consistent delay and causal data reporting are available, examining the causes of delays and identifying effective long-term solutions will be problematic.

*Developing "Capacity Benchmarks."* An important first step in addressing the delay problem is to develop a set of "capacity benchmarks" for the Nation's top 30 airports. Establishing benchmarks is critical to understanding airline scheduling practices and what relief can be expected from technology and new runways. FAA is developing benchmarks and expects to complete them in January 2001. At the very least, benchmarks will provide a common framework for understanding what maximum arrival and departure rates can physically be handled under various conditions at each of the top 30 airports, by time of day.

*Quantifying the Benefits of Modernization Projects.* A significant portion of FAA's investment in air traffic control modernization is geared to enhancing safety or replacing aging equipment with modern technology that is easier to operate and maintain—not enhancing capacity. FAA will not have a good handle on the capacity-related benefits of Free Flight Phase

1 technologies (principally new automated controller tools) until 2002, when systems are fully deployed. New communications, navigation, and surveillance technologies offer benefits in terms of reduced flight times and more flexible routes, but they are longer term efforts. Benefits from these new technologies depend on synchronized investments by FAA (in new ground systems) and airspace users (in new avionics). Anticipated benefits will not accrue until large numbers of airspace users are equipped with new avionics, which can be costly. Without new runways, the capacity relief from new technology is likely to be incremental, not a quantum leap.

- Establishing FAA's Air Traffic Services as a Results-Oriented Organization.

*Increasing Accountability for Achieving Results.* Proposals for FAA to operate as a results-based organization are not new. They go back to at least 1996 (when FAA was exempted from Federal procurement and personnel rules and directed to establish a cost accounting system) and were reinforced in 1997 by the National Civil Aviation Review Commission. These proposals were again reinforced by AIR-21 which significantly increased FAA's budget and directed various "structural" reforms including an expanded role for the Management Advisory Council, the creation of an Air Traffic Services Subcommittee, and the appointment of a Chief Operating Officer. Most recently, on December 7, 2000, the President, through an Executive Order, directed that Air Traffic Services be reorganized into a "performance-based" organization.

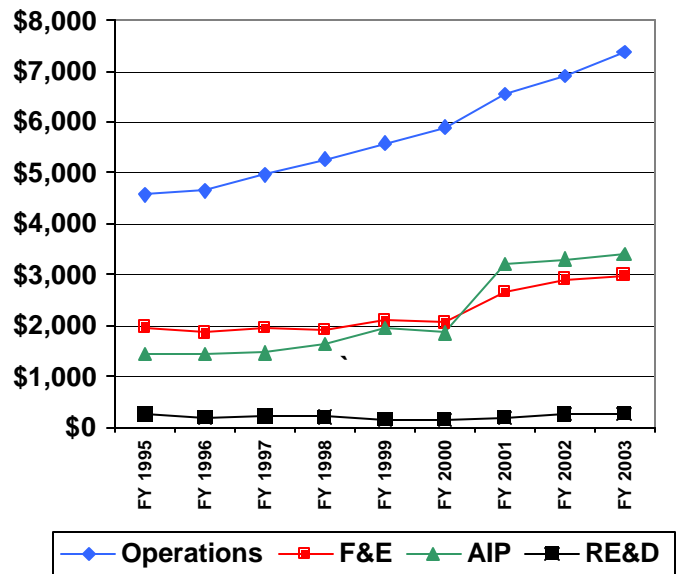
*Implementing AIR-21.* FAA is in the very early stages of implementing the various reforms directed by AIR-21, including forming the Management Advisory Council, and the Air Traffic Services Subcommittee (whose members were just named); however, a *Chief Operating Officer has not yet been selected*. While these measures have the potential to assist FAA in transitioning into a more results-oriented organization, it is much too early to tell if they will be successful.

*Preconditions to a Results-Oriented Operation.* For FAA to operate as a results-based organization, the agency needs meaningful aviation system efficiency metrics in place. FAA employees and its contractors must be held accountable for meeting goals approximately on time and approximately within budget. FAA also needs a cost accounting system (CAS) to identify areas of low productivity and high cost and, conversely, areas where operations are cost effective. When Congress exempted FAA from Federal procurement and personnel rules and increased the agency's budget, the expectation was that personnel and procurement reform would make the agency results-oriented and a CAS would be put in place.

-- Implementing a Cost Accounting System. FAA needs a CAS to accurately identify and allocate costs in order to make sound financial and managerial decisions. Identifying areas of waste and low productivity, as well as areas of high productivity and cost effectiveness, are good examples. A credible CAS would also provide FAA with a basis for establishing user fees if Congress and the Administration elect to restructure FAA's financing. Congress directed FAA to develop the CAS in 1996 and FAA originally planned to have the system in place by October 1998. FAA now plans to complete the system at the end of FY 2002 with an agency-wide labor distribution system to follow in 2003.

-- Controlling FAA's Operating Costs. FAA's budget has risen from \$8.2 billion in 1995 to over \$12.5 billion in FY 2001, largely due to the airport improvement program and sharply rising costs of FAA's operations account. The operations account (which is salary driven) represented \$5.9 billion or nearly 60 percent of FAA's FY 2000 budget. New pay systems, developed as a result of FAA's personnel reform efforts, have helped to fuel the increase. For example, FAA estimates the new pay system negotiated with NATCA will require nearly \$1 billion in additional funding over the 5-year life of the agreement. Now, other FAA workforces want pay increases as well, which must be negotiated under FAA's reform authority. To offset the additional costs of the NATCA agreement and increase productivity, FAA and NATCA negotiated a series of workplace changes. However, the productivity changes are not yet in place system-wide; FY 2001 and 2002 will determine to what extent they are implemented and quantified.

**FAA's Budget FY 1995 - FY 2003**  
\$ in millions;



- Monitoring Airline Commitments to Customer Service and Enforcing Consumer Protection Laws.

*Airline Customer Service Commitments.* In 1999, the Air Transport Association and its member airlines executed a document known as the Airline Customer Service Commitment to demonstrate the airlines' dedication to improving air travel. The airlines agreed to implement 12 provisions, such as improved communication with passengers, quoting the lowest available fare, timely return of lost baggage, and taking care of passengers during extended onboard aircraft delays. However, the Commitment does not address underlying reasons for customer dissatisfaction such as extensive flight delays, baggage not showing up on arrival, and long check-in lines. Until these areas are effectively addressed by FAA, airlines, and airports, there will continue to be discontent with air travel.

Congress directed the OIG to review airline implementation of the 12 provisions for improving air travel. Airlines have been making a clear and genuine effort to strengthen attention paid to customer service, but bottom-line results (as of our interim report date) have been mixed. In our June customer service report, we noted that efforts to turn the tide were frustrated by record delays, which translated into customer discontent. Airlines have a ways to go to restore customer confidence. We will be issuing another report to the Congress and the Secretary in early 2001. By this time, the airlines will have had a full year to implement their commitments.

*Staffing for Enforcement of Consumer Protection Laws.* DOT resources devoted to consumer protection and competition concerns have declined sharply at a time when complaints and competition issues have reached record highs. The need for adequate staffing is particularly acute considering the challenges DOT faces with respect to rapid development of ticketing through internet sites, airline mergers and alliances with foreign and domestic carriers, and unfair competitive practices. In 1985, the office responsible for handling airline customer complaints was staffed at 40. In 1995, this staff was down to 20, and in 2000, it was down to 17 staff members.

- **Managing FAA's Efforts to Use New Technology to Increase Safety, Efficiency, and Capacity.**

*Strengthening the Management of Major System Acquisitions.* In 1995, Congress exempted FAA from Federal procurement regulations that the agency argued hindered its ability to effectively modernize the National Airspace System. Since then, FAA has made progress with some modernization efforts. Elements of Free Flight Phase 1 have been deployed and FAA completed the Display System Replacement program, which

modernized domestic en route centers by replacing aging display equipment. FAA acknowledges past problems and is addressing them with a more incremental approach ("*build a little, test a little*") to some acquisitions. However, software-intensive efforts such as WAAS and STARS continue to experience significant schedule slippage and large cost growth.

### **STATUS OF SELECTED FAA ACQUISITIONS**

<b>Project</b>	<b>Original Estimate</b>	<b>Current Estimate</b>	<b>Original Operations</b>	<b>Current Operations</b>	<b>Status</b>
Wide Area Augmentation System (WAAS): Provides the augmentation needed to make GPS fully usable for en route, terminal, non-precision, and Category 1 precision approaches.	\$892.4 Million	\$2.9 Billion	1998	To be determined	<i>The big cost and schedule driver focuses on resolving WAAS integrity concerns. A clear picture of WAAS performance, cost, and schedule will not be available until early 2001 when independent technical reviews are complete.</i>
<b>Standard Terminal Automation Replacement System (STARS):</b> Replaces controller and maintenance workstations with color displays, processors, and computer software at over 170 terminal air traffic control facilities.	\$940.2 Million	\$1.4 Billion	1998	2002.	While FAA has successfully deployed the Early Display Configuration at two sites, this does not provide the full level of STARS. <i>A major risk still remains in deploying all STARS systems by 2008.</i>
<b>Free Flight Phase 1 (FFP1):</b> Composed of new information exchange systems and automated controller tools (Center TRACON Automation System and Conflict Probe).	\$722 Million For Limited Deployment	\$722 Million For Limited Deployment	2002 For Limited Deployment	2002 Cost and schedule for national deployment have yet to be determined	Progress is being made, but the most difficult work for the new automated controller tools lies ahead. Program costs reflect costs for limited deployment at select locations. <i>Cost to implement FFP1 technologies nationwide is uncertain but substantial.</i>

**STATUS OF SELECTED FAA ACQUISITIONS**  
**(Continued)**

<b>Project</b>	<b>Original Estimate</b>	<b>Current Estimate</b>	<b>Original Operations</b>	<b>Current Operations</b>	<b>Status</b>
<b>Airport Movement Area Safety System (AMASS):</b> AMASS is a software enhancement for the Airport Surface Detection Equipment (ASDE-3), which is designed to monitor airport surface traffic and alert air traffic controllers to potential collisions at 34 airports.	\$59.8 Million	\$152 Million	1996	2001	FAA has been developing AMASS to address an NTSB recommendation made in 1991. <i>AMASS has been delivered to 33 airports, but is not yet operational anywhere.</i> The first system is scheduled to be operational in June 2001, and the last system is scheduled to be operational in September 2002.
<b>Weather and Radar Processor (WARP):</b> WARP provides meteorologists and air traffic controllers at en route facilities with more accurate graphic weather information to help identify weather conditions that may adversely impact air traffic control and aircraft operations.	\$125.6 Million	\$143.6 Million	1999	To be determined	The first operational WARP system for controller displays has been delayed by 2 years. A number of complex technical and human factors issues remain unresolved. Additional cost and schedule changes are likely.

*Contract Oversight.* Our work on a diverse set of FAA acquisitions shows that the agency needs to strengthen contract oversight. In some cases, we found that Government cost estimates were prepared by the contractor or were not prepared at all. FAA needs to make greater use of earned value management techniques and cost controls (cost ceilings). In addition, FAA needs to analyze variances between agency and contractor cost estimates to ensure costs are fair and reasonable. Greater use of the Defense Contract Audit Agency for assessing costs is also needed to protect the Government's interests. FAA needs to use the procurement and personnel flexibility granted in 1996 to hold contractors and FAA staff more accountable.

*Major Decision Points for Several High Profile, Multi-Billion Dollar Modernization Efforts Are on the Horizon for 2001.* These efforts include WAAS (satellite navigation), STARS (new controller displays and software for terminal facilities), and Oceanic Modernization (for facilities that control traffic over large segments of the Pacific and Atlantic Oceans).

-- Defining and Implementing Plans for Transitioning to Satellite-Based Navigation and Landing Systems. The transition to satellite-based systems for navigation offers the potential to enhance capacity by



providing more flexible routes and closer spacing of aircraft. In the past year, WAAS experienced a number of setbacks; and new cost, schedule, and performance baselines have not yet been developed. Key decisions will be needed in the first 6 months of this year that focus on determining how to proceed with WAAS and establishing realistic cost and schedule baselines. We recommended that FAA reduce WAAS contract expenditures (about \$4 million a month) until solutions have been identified; obtain independent, scientific advice on complex technical issues; and task the Defense Contract Audit Agency to conduct a series of audits (including floor checks to assess labor charges) on the WAAS contract.

The key cost and schedule driver for WAAS now focuses on the integrity of the new system, i.e. the ability of the system to alert the pilot when the system should not be used. Local Area Augmentation System (LAAS), specifically developed for providing precision approach capability, is taking on a more prominent role in FAA's plans. A key decision focuses on how to accelerate the development and implementation of LAAS.

- Replacing Aging Equipment with Modern Technology. A key decision this year focuses on defining a deployment strategy for STARS. STARS will replace air traffic controller and maintenance workstations with digital, color displays, as well as computer software and processors, at FAA's 172 terminal air traffic control facilities. STARS was designed to provide the software and hardware platform necessary to support future air traffic control enhancements. While this acquisition was intended to maximize the use of commercially available equipment, unanticipated extensive human factors revisions and software development have changed STARS to a developmental system. FAA estimates that STARS will cost an additional \$462 million over initial estimates and the last full-service STARS will be deployed by September 2008, over 3½ years behind schedule.

While FAA has successfully deployed an Early Display Configuration at two smaller sites, this does not provide the full level of STARS. The early display configuration is primarily a display replacement and does *not* provide air traffic controllers and maintenance technicians with a full replacement of the 30-year old automation system currently in use. Moreover, new digital controller displays are critical for implementing Free Flight Phase 1's automated controller tools. A major risk still remains in obtaining the resources necessary to deploy all STARS systems by 2008 - decisions are needed now on how and when to deploy STARS.

- Implementing International Civil Aviation Organization (ICAO) Delegations to Provide Modernized Air Traffic Control Services over the Pacific and Atlantic Oceans. The United States is responsible for providing air traffic control services to aircraft operating in large segments of airspace over the Pacific and Atlantic Oceans. Past FAA efforts to modernize its facilities to provide these services met with little success. In 1995, FAA awarded a contract to develop and produce an advanced Oceanic Automation System. However, due to funding limitations and contract performance issues, the contract scope was dramatically reduced in 1998 to include only limited elements of the program. FAA has now embarked on a significant acquisition to take advantage of commercially available technology. FAA intends to award a contract by the end of FY 2001. Although this effort is a comparatively less costly acquisition than WAAS or STARS, FAA needs to stay on schedule with this effort because of the significant ramifications for the growing international aviation market.

*Moving Forward with Airspace Redesign.* The U.S. domestic airspace system is a patchwork network (based on existing ground-based systems) that has evolved since the end of World War II. There is general agreement that the design of the National Airspace System must be revamped to meet the anticipated demand for air travel. This is important because the full benefits from new automated controller tools as well as new communication, navigation, and surveillance technologies cannot be realized until new air traffic control procedures and airspace redesign efforts are complete.

In the past year, FAA has initiated a number of efforts to revamp airspace associated with key air traffic control “choke points”—all of which are east of the Mississippi River. FAA needs to clarify what can realistically be done with respect to airspace redesign coupled with new technology and revised procedures in the short, intermediate, and long term.

*Addressing Cultural Issues That Continue to Hinder FAA’s Ability to Manage Acquisitions.* FAA has implemented a new team approach to managing acquisitions, called the Integrated Product Development System or “IPDS for short. This team concept integrated all necessary disciplines throughout the acquisition process to manage and resolve program issues. However, FAA has struggled with implementing this team concept because the agency’s culture reflects a vertical management hierarchy that is inconsistent with a team approach. We surveyed over 1,000 FAA team members involved in developing new technology and found that improvements are needed to address: (1) additional training,

(2) organizational barriers to communication, (3) lack of authority to make program decisions, and (4) perceptions that senior management is not fully supportive of the team concept.

- **Assessing FAA’s Role in Planning for Nationwide Airport Infrastructure Needs.**

*Infrastructure Development.* Quantum leaps in capacity and corresponding reductions in delays will be achieved mostly through new infrastructure – *new runways and airports.* Between 1991 and 2000, a total of 6 new runways were added at the 29 largest airports, with another 15 either proposed or under construction. Most of these new runways will not be open for several years (assuming current projections hold). Two new airports have been built - Denver, which is very successful, and Mid-America, which has had little commercial passenger or cargo traffic thus far.

**New Runways at Large Hub Airports, 1991 through 2007**

<b>City, State</b>	<b>Estimated Opening Date</b>	<b>Status</b>
Las Vegas, NV	1991	Completed
Detroit, MI	1993	Completed
Salt Lake City, UT	1995	Completed
Dallas/Ft. Worth, TX	1996	Completed
Philadelphia, PA	1999	Completed
Phoenix, AZ	2000	Completed
Detroit, MI	2001	Under Construction
Minneapolis, MN	2003	Under Construction
Orlando, FL	2003	Under Construction
Denver, CO	2003	Under Construction
Houston, TX (Runway 15R/33L)	2003	Under Construction
Miami, FL	2003	
Charlotte, NC	2003	
Houston, TX (Runway 8L/26R)	2004	
Atlanta, GA	2005	
Cincinnati, OH	2005	
Dallas/Ft. Worth, TX	2005	
St. Louis, MO	2006	
Boston, MA	2006	
Seattle, WA	2006	Under Construction
Los Angeles, CA	2007	

*Funding Is Not the Problem.* AIR-21 provides unprecedented funding for airports – a multi-billion dollar budget increase and authorization for increased Passenger Facility Charges. On the other hand, decisions to build new runways or airports ultimately rest with state and local authorities. Both the Administration and Congress face a decision whether FAA should move from a passive role (essentially distributing grant funds) to a more active one of proposing a strategic view of the national airspace and airport system, leveraging grant funds to capacity-constrained locations, and helping to resolve local opposition.

*Environmental and Noise Issues.* Concerns abound about the time and process required to secure environmental and noise clearances for airport infrastructure projects. This is referred to by some as “environmental streamlining”, but others fear this means short-circuiting or bypassing environmental protections and an infringement of property rights. Opportunities exist here to fashion solutions with airport, highway, transit, and rail interests, who face a common challenge of moving projects forward expeditiously while making sure environmental issues and mitigation are properly addressed.

*Capacity Constrained Airports.* Of immediate concern is the issue of what to do with airports where demand substantially exceeds capacity and the airlines schedule more flights than can possibly be handled, resulting in significant delays and cancellations. LaGuardia Airport is the most well known example where a lottery for airport use was recently established to address the phenomena of “demand greatly exceeding capacity.” For airports that are severely capacity constrained with no realistic near-term hope for expansion, solutions under consideration run the gamut from “do nothing and let the market straighten things out,” to peak hour or congestion pricing, authorizing airline scheduling discussions under antitrust supervision, and lotteries – which is really just another form of slot control.

**Key OIG Contact:** David A. Dobbs, Deputy Assistant Inspector General for Aviation, 202-366-0500.

### 3. Aviation System Capacity and Air Traffic Control Modernization

**Dark Grey** = Top Priority Task for 2001

**Light Grey** = Include in 2001 Top Management Challenges Efforts

**White** = Tasks Deleted from Top Priority List

First Year Issue  
Raised in OIG  
Management  
Challenges  
Report

Was Significant  
Progress made  
in last year?

<ul style="list-style-type: none"> <li>Place a high priority on funding and conducting human factors studies early in the acquisition process. Establish a mechanism for making the necessary trade-off between an ideally human oriented design and a design that is technically and financially feasible.</li> </ul>	1998	Y
<ul style="list-style-type: none"> <li>Strengthen the capacity to oversee multi-billion dollar software-intensive development efforts such as STARS and WAAS. Establish contract cost mechanisms such as earned value management or Defense Contract Audit Agency audits that will ensure products are delivered on time and within agreed upon budget. The WAAS monthly contract expenditure rate should be reduced.</li> </ul>	1998	Some
<ul style="list-style-type: none"> <li>Develop uniform system for tracking delays, cancellations, and associated causes.</li> </ul>	New Issue	New Issue
<ul style="list-style-type: none"> <li>Work with airlines to establish credible tracking system for compliance with each provision and the implementing Airline Plan, buttressed by performance goals and measures.</li> </ul>	New Issue	New Issue
<ul style="list-style-type: none"> <li>Complete development of capacity benchmarks for the Nation's 30 largest airports.</li> </ul>	New Issue	New Issue
<ul style="list-style-type: none"> <li>Quantify the capacity benefits expected from new air traffic control technology (e.g., Free Flight).</li> </ul>	New Issue	New Issue
<ul style="list-style-type: none"> <li>Clarify airspace redesign requirements for near-, mid-, and long-term goals.</li> </ul>	New Issue	New Issue
<ul style="list-style-type: none"> <li>Periodically assess FAA's progress to improve IPDS team operations, using our survey results as a benchmark, and take required actions to make improvements.</li> </ul>	New Issue	New Issue
<ul style="list-style-type: none"> <li>Develop a strategic plan for addressing capacity shortfalls.</li> </ul>	New Issue	New Issue
<ul style="list-style-type: none"> <li>Define and implement plans for transitioning to satellite-based navigation and landing systems.</li> </ul>	New Issue	New Issue
<ul style="list-style-type: none"> <li>Implement ICAO delegations to provide modernized air traffic control services over the Pacific and Atlantic Oceans.</li> </ul>	New Issue	New Issue

estimates and the contractor's proposed cost estimates.

- Evaluate whether FAA's role in planning for nationwide airport infrastructure should move from a passive role to a more active one of facilitating a strategic view of airport expansion, leveraging grant funds to capacity-constrained locations, and helping to resolve local opposition.

New Issue

New Issue