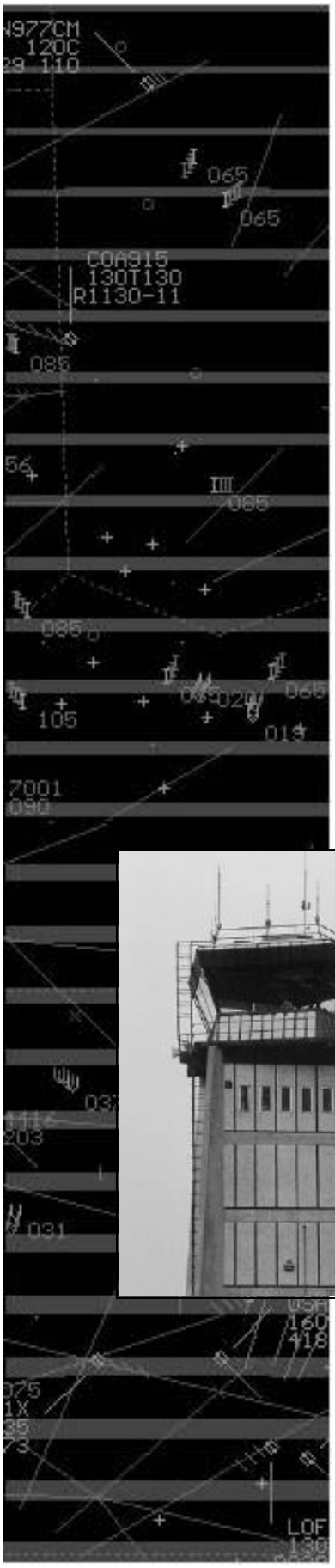


Air
Traffic
Services

Performance Plan

Fiscal Years 2000 – 2002

October 1999

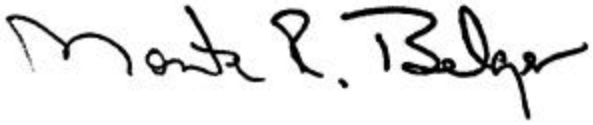
Preface

Air Traffic Services (ATS)
Performance Plan for Fiscal Years 2000–2002

I am pleased to present the *Air Traffic Services (ATS) Performance Plan for Fiscal Years 2000-2002*. Each year, ATS executives and staff assess the organization's performance and actions taken to improve aviation services during the previous 12 months, and evaluate the current and future challenges facing its customers. The Performance Plan is the result of these analyses. It reflects the strategic blueprint for ATS to meet the challenges facing the aviation community as we move into the 21st Century. It affirms our commitment to meet the changing needs of our aviation customers. In this plan we attempt to show our understanding of the communities' air traffic service needs and explain how we are planning to address those needs over the next 3 years.

This year's plan has been written to explicitly link ATS performance goals with the Federal Aviation Administration (FAA) mission goals of safety, security, and efficiency. The performance targets, strategies, and initiatives are largely focused on the challenge of simultaneously maintaining existing equipment while continuing to evolve to a modernized National Airspace System (NAS), with due consideration of the diligence that such an ambitious effort requires, and the promise it offers for improved performance.

My sincere thanks to those who have contributed to the development of this plan, and to those who will make it reality.



Monte R. Belger
Associate Administrator for Air Traffic Services

Table of Contents

Table of Figures

Introduction

The Office of Air Traffic Services (ATS) annual Performance Plan responds to the requirements of the Government Performance and Results Act (GPRA) of 1993 and reflects the organization's support of the FAA's mission goals. The ATS Performance Plan serves as a link between the Agency's long-term goals and the day-to-day work of the organization by:

- Providing a strategic overview and placing in context the environment in which ATS will operate;
- Linking ATS actions to the FAA's goals and customers' needs;
- Setting goals for ATS with measurable results to compare actual performance with goals; and
- Providing a framework and basis for future ATS operational plans and programs.

ATS executives and managers are held accountable for the outcomes contained in the plan through periodic reviews of performance and individual performance standards. Beginning in FY2000, a new performance-based compensation system for FAA executives and other non-union employees will further motivate ATS employees to contribute to the success of ATS.

This plan begins with an *Overview of the ATS Organization*, which includes a description of the mission, employees, services, and organizational structure of ATS. The plan continues with a *Strategic Overview* which presents data on trends in the aviation industry and a discussion of broad challenges faced by ATS over the next few years. The purpose of this review is to assure alignment of the organization's mission, resources, and activities with the operating environment.

The *Operational Performance Management* section describes ATS performance goals, strategies, and initiatives that support the broader FAA mission goals. This section also helps focus the ATS managers on specific outcomes and tasks, translates goals into achievable actions, and serves as a basis for establishing priorities within the organization.

The final section of the plan, *Performance Planning into the Future*, recognizes the uncertain nature of a future National Airspace System (NAS), and the dynamic nature of this document. As national policies and priorities change, customers' needs evolve, and new technologies are developed, this plan will be adjusted to reflect these changes and maintain ATS's focus on efficient and effective service delivery.

Overview of the ATS Organization

The FAA is responsible for providing a safe, secure, and efficient global aviation system that meets the needs of a wide range of customers and stakeholders. Within the FAA, seven primary lines of business and a number of staff offices work together to ensure that the agency meets its responsibility and provides the safest, most efficient, and most responsive aviation system in the world.

The mission of the ATS organization is to ensure the safe and efficient operation, maintenance, and use of the air transportation system today and meet tomorrow's challenges to increase system safety, capacity, and productivity. The men and women of ATS work as air traffic controllers, engineers, systems specialists, pilots, flight inspection personnel, procedures development specialists, business managers, accountants, administrators, managers, secretaries, and support. Our 36,500 employees:

- control over 200,000 aircraft takeoffs and landings per day;
- provide 24 hours of air traffic control daily;
- manage the NAS infrastructure by operating and maintaining approximately 38,000 facilities/systems;
- maintain 11,000 terminal instrument flight procedures and 9,000 airway segments;
- annually conduct over 11,000 flight inspections, nationally and internationally, to preserve the safety, quality, and reliability of the airspace system;
- assign and protect more than 50,000 aeronautical radio frequencies used in air traffic control;
- direct and evaluate the modernization of the NAS infrastructure;
- improve system operations and capacity while reducing environmental impacts.

The United States is recognized as the world's leader in aviation safety—largely through the professionalism and expertise of ATS employees. ATS employees work in many locations and types of facilities.

- **Air Route Traffic Control Centers (ARTCC).** There are 21 ARTCCs that control en route traffic for the United States and parts of the Atlantic and Pacific Oceans. A typical ARTCC has responsibility for more than 100,000 square miles of airspace that generally extends over a number of states. ATS workers not only control the air traffic, but also make sure the complex equipment is maintained and in working order.
- **Flight Service Stations (FSS).** Over 75 automated flight service stations (AFSS) and flight service stations (FSS) provide assistance to more than 600,000 licensed pilots who fly civilian aircraft in the United States, its territories, and holdings. General aviation pilots, as well as the military flyers, use FSSs and AFSSs to obtain information about terrain, preflight and in-flight weather information, suggested routes, altitudes, indications of turbulence, icing, and any other information important to the safety of their flight.
- **Airport Traffic Control Towers (ATCT).** Located at over 400 airports, ATS and contract employees direct the landing and takeoff of airplanes and control the ground traffic, as well as maintain the equipment.

- **Terminal Radar Approach Control (TRACON).** Over 185 TRACONs provide radar separation to arriving and departing flights. TRACONs operate in airspace approximately within a 30 mile radius and normally less than 15,000 ft. altitude, exclusive of ATCT airspace. Like other facilities, TRACONs have engineers and system specialists on-site to maintain and troubleshoot the equipment, software, and hardware.

- **Air Traffic Control System Command Center (ATCSCC).** The ATCSCC in Herndon, Virginia, monitors traffic flows nationally, regionally, and for specific airports. Through a process referred to as collaborative decision making, the ATCSCC works with ARTCCs, TRACONs, ATCTs, and airline operating centers (AOCs) to minimize congestion and delays due to adverse weather and other causes.

- **National Operations Control Center (NOCC).** The NOCC, co-located with the ATCSCC in Herndon, Virginia, manages the NAS infrastructure from a national perspective. The NOCC coordinates and allocates NAS resources to provide services that ensure safe and efficient operations in response to customers needs and performance expectations.

- **Airborne.** To ensure the safety of the system and to check the reliability of the navigation aids, ATS employees fly through the system 24 hours a day, using specially equipped airplanes.

ATS's Service Focus

ATS strives to provide high-quality, cost-effective services to meet the needs of its customers, the users of the air transportation system and employees, on a continuing basis. There are three broad classes of ATS services:

- **Primary Operational Services** include separation assurance, traffic management, aviation information, navigation, and landing. These services, which combine to form the NAS, are the most visible to the end user and comprise the largest investment of ATS human and equipment resources.

- **Management of National Resources Services** include airspace management and spectrum management. These services and resources are largely transparent to the aviation system user, but are nonetheless critical to safe and efficient flight. As custodian, ATS's role is to protect, justify, and plan for the efficient and environmentally sound use of these finite resources.

- **Other Services** include search and rescue (SAR) and aviation assistance services.

Figure 1 briefly describes the ATS services that fall under these three categories.

In addition to the services described above, many enabling activities provided by ATS contribute to the delivery of a service or services. These enabling activities may or may not be visible to external customers; however, all of these activities need to function efficiently and smoothly for effective service delivery to the end customer. For example, provision of primary operational services requires the following enabling activities:

- Performing studies and building models to evaluate potential system changes;

- Defining current and future requirements for improving service delivery;

- Performing independent operational test and evaluation (IOT&E) on new systems and equipment to ensure that operational requirements are met prior to a national deployment decision; and

- Installing, operating, maintaining, certifying, and flight inspecting equipment within the NAS.

To provide these services and activities, the ATS line of business incorporates the offices of Air Traffic (AAT), Airway Facilities (AAF)[1], System Capacity (ASC), Independent Operational Test & Evaluation (ATQ), and the Air Traffic System Requirements Service (ARS), into a single organization (Figure 2).

[1] Airway Facilities will be referred to by its common acronym AF for the remainder of the document.

Primary Operational Services

Separation Assurance	Ensure that aircraft maintain a safe distance from other aircraft, terrain, obstructions, and airspace not designated for routine travel. Air traffic controllers employ rules and procedures that define separation standards for each aircraft operating environment. The primary function of separation services is safety. Air traffic controllers rely on ATS system specialists to maintain the myriad of communication, radar, and computer systems required to provide separation assurance services.
Traffic Management	Coordinate the large number of aircraft using the air traffic management (ATM) system and the routes that they fly. Ensure the safe and efficient movement of aircraft under varying weather and traffic constraints. Traffic management activities include: use of ground stop and ground delay programs, formulating national flow management plans in coordination with Airline Operations Centers (AOC), and balancing the air traffic flow within an en route center's airspace.
Aviation Information	Gather, process, and disseminate aeronautical information such as weather data, aeronautical charts, and notices to airmen in support of the safe and efficient operation of aircraft.
Navigation and Landing	Establish, operate, and maintain a majority of the terrestrial navigation aids used by aircraft to determine their position en route and to/from the runway.

Management of National Resources

Airspace Management	Manage and modify the airspace structure and associated procedures and standards to ensure safe and efficient operations and address environmental concerns such as noise abatement.
Spectrum Management	Allocate radio frequencies required to support communications, navigation, and surveillance (CNS) systems in the NAS among competing aeronautical needs, while striving to conserve the available radio spectrum.

Other Services

Search and Rescue	Provide search and rescue information and direction to Rescue Coordination Centers after determining that an aircraft may be overdue, lost, or downed.
Aviation Assistance — Domestic and International	Provide a wide range of assistance to domestic and international agencies and private entities, including airspace and airport planning, training, flight inspection of aviation equipment, publishing of aviation documents and charts, and law enforcement information. ATS works with international organizations to develop international procedural and technical standards to ensure efficient and safe world-wide flight.

Figure 1: ATS Services

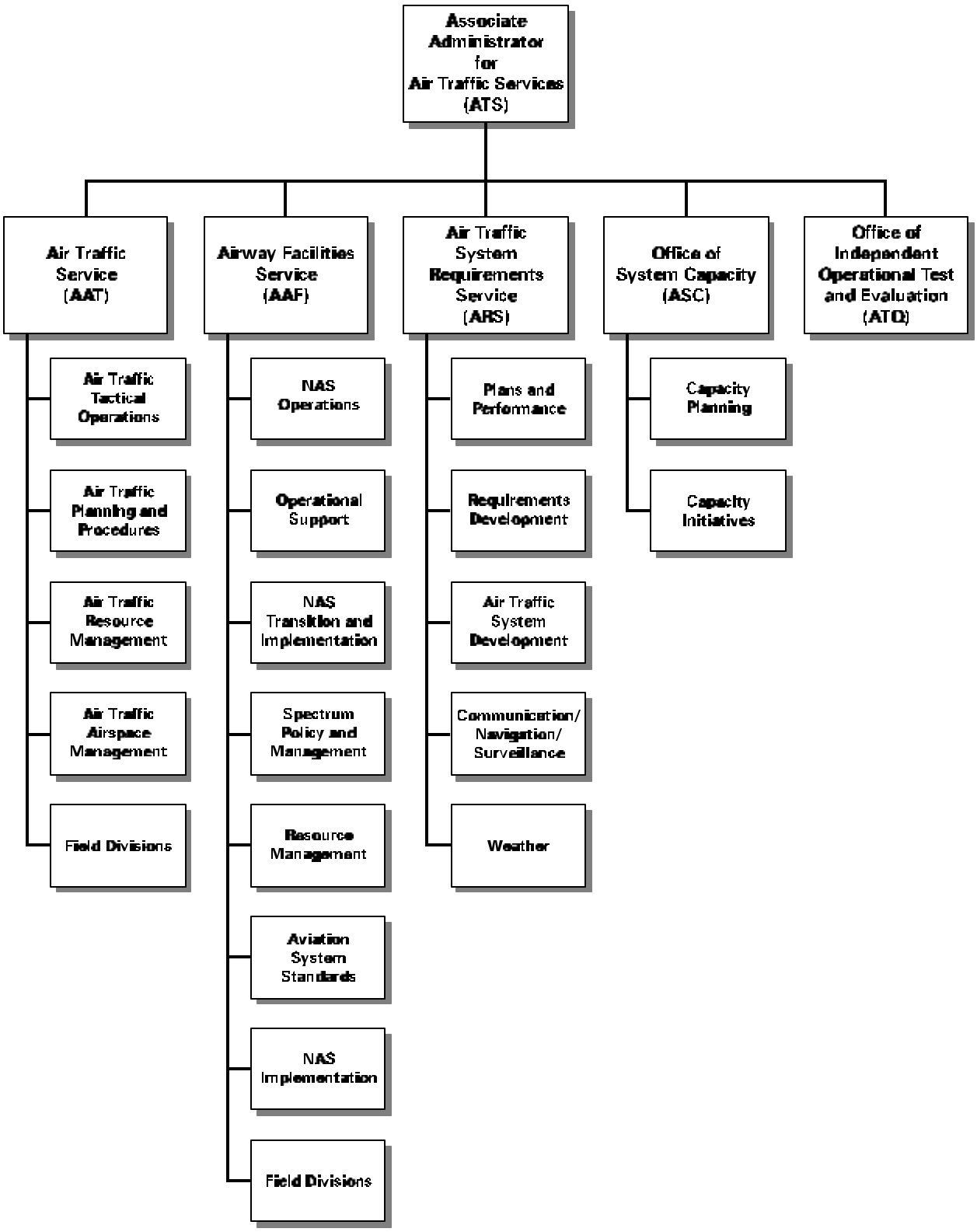


Figure 2: ATS Organization

Strategic Overview

Aviation Industry Growth

As the United States civil aviation community enters its second century of operation, a myriad of factors will challenge our ability to maintain the role of world leader in aviation safety and efficiency. World revenue passenger miles are expected to more than double over the next 20 years, with airlines carrying two and a half billion passengers each year. United States domestic passengers alone are expected to exceed one billion by 2020. Air cargo will also grow, averaging a 6-7 percent increase per year over the next two decades, while commuter/regional passengers will double. In addition to anticipated growth, users will be operating new and diverse civil and military aircraft and systems within the NAS, adding levels of complexity that are difficult to envision.

The market for new aircraft over the next 20 years will be over one trillion dollars—more than twice the size of the market during the past 20 years. Airline inventories will increase by 50 percent and will include larger, heavier aircraft. The size of the regional commuter fleets will nearly double and include a greater percentage of sophisticated aircraft. General aviation is expected to reverse its current downward trend to become more vibrant in the business and recreational sectors. The general aviation fleet is expected to increase approximately 20 percent over the same period. In the coming years, increased use of cockpit display of traffic information, automated dependent surveillance, and graphical weather will spur the demand for a next-generation of air traffic procedures.

ATS's Leadership Role

Over the next two decades, NAS users will need a system that is flexible enough to ensure the highest levels of safety even while it undergoes dynamic changes. Commercial users will continue to face the challenge of delivering convenient, on-time, low-cost services even as the volume of air traffic continues to rise. Non-scheduled carriers, military and business aircraft, and recreational users must also be accommodated within the NAS to keep aviation a viable transportation alternative and robust industry.

With a sharp increase in international travel also expected, both foreign and domestic air carriers will demand greater harmonization between United States and foreign air traffic management systems to ensure safe and efficient flight. The FAA has historically been at the forefront of technology application and procedural development in air traffic control (ATC), and in that role the FAA will continue to be an active participant in international forums aimed at enhancing air traffic safety and improving operational efficiency around the world.

The challenges to the ATS organization are three-fold:

- Operating the current system—the personnel, infrastructure, work environment—with constrained resources.
- Evolving to a Modernized Communication, Navigation, and Surveillance/Air Traffic Management (CNS/ATM) system with minimal risk and maximum benefits.
- Collaborating with users so that needs are continually and equitably addressed through strategic investment and business decisions.

Operating the Current System

The infrastructure required to support the NAS and operate the current system is vast. It consists of high-technology components such as computers, telecommunications equipment, radars, marker beacons, and controller workstations. It also comprises less glamorous—but no less critical—components such as buildings, power systems, fences, roads, bridges, and vehicles. And, most importantly, it consists of peo-

ple—the air traffic controllers, engineers, systems specialists, pilots, flight inspection personnel, procedures development specialists, business managers, accountants, administrators, managers, secretaries, and support staff who provide the service to the customer.

This infrastructure is inherently complex, with multiple levels of redundancy to assure availability of key services. A few statistics will illustrate both the age and growing complexity of the NAS:

- Over the past 10 years, aircraft operations have increased 8 percent from approximately 164,000 to 178,000 per day.
- The total number of NAS facilities and systems has grown 61 percent from 23,253 to 37,382 in that same 10-year period.
- The NAS comprises 192 different types of facilities/systems, up 22 percent in the past 10 years.
- The average age of buildings in the NAS is 30 years. ATCTs average 26 years, while ARTCCs average 35 years.

In addition, as new technology comes on line, many legacy systems must be maintained in order to provide service to customers who still rely on the older technology. Operating dual systems will present a challenge to the ATS workforce.

Modernizing the System

The FAA released its NAS Architecture Version 4.0 in January 1999. The NAS Architecture is a long-term plan for modernizing the NAS through implementation of new technologies that will allow enhanced capabilities for aviation customers and result in safer and more efficient services.

There are three basic elements to NAS modernization: sustaining the current system, adding safety features, and making changes that increase the capacity of the system. Each element is critical.

The first element involves sustaining our current system and renewing the infrastructure with systems that are easier and more cost-effective to maintain. This infrastructure improvement includes replacing the HOST computers and controller displays at 20 ARTCCs. It also includes the planned replacement of controller displays in the complex terminal environment. But NAS modernization is not just big-ticket items. During FY1998, for example nearly 300 facilities and services were commissioned. During that same time, the FAA installed more than 500 hardware and software upgrades.

The second element of ATC modernization is additional safety features. For example, the plan contains development and installation of several systems that will provide more precise and timely weather information that will help pilots to avoid potentially dangerous situations. The Integrated Terminal Weather System (ITWS) and Weather and Radar Processor (WARP) will provide terminal area and en route weather information, while the Terminal Doppler Weather Radar (TDWR) will be installed at major airports where windshear and microbursts are a problem.

The third element of modernization is making improvements that will increase the capacity and efficiency of the system. Programs such as Free Flight Phase One and Safe Flight 21 will focus on using new technologies to develop limited but critical capabilities, fielding these capabilities, and evaluating their effectiveness. Larger, more expensive programs aimed at transitioning the NAS to a modern state-of-the-art system will be defined based on the results of these limited initiatives and will be far more likely to succeed.

Working Collaboratively

ATS serves a diverse community of customers, ranging from large air carriers transporting thousands of passengers and tons of cargo daily, to GA pilots transporting themselves and a few other passengers at most. These customers require different and better types of services to remain economically viable and serve the ultimate public interest in safe, affordable air travel. ATS also bears a responsibility to American

taxpayers to provide these services to the industry and the flying public at a reasonable cost while protecting the environment. As the primary provider of services, ATS must listen to the needs of all NAS users, balance those needs, and then collaboratively act to meet those needs.

ATS has made great strides toward ensuring that NAS equipment users are actively involved in the development of new systems from beginning to end. The RTCA and the NAS Modernization Task Force initiatives have ensured that users are participating in discussions about operational priorities and tradeoffs. The International Civil Aviation Organization (ICAO) has had a demonstrative role in defining international standards and requirements for global harmonization. Roundtable discussions are frequent and ongoing with ATS as a key sponsor of these activities.

In this Performance Plan, ATS has used the recommendations and findings of these collaborative efforts to focus and refine its approach to setting performance targets for the future, and committing to actions for achieving these targets.

Operational Performance Management

ATS faces a unique challenge as compared to other Federal organizations. It must not only provide the services and infrastructure required by its customers, it must also ensure that the components of the NAS work together as a safe and efficient integrated system and provide the seamless delivery of information, direction, assistance or other cooperation needed by the system user. As a result ATS must address two essential performance issues: the performance of the individual infrastructure components and services, and the measurement of NAS-wide performance of the integrated system.

To ensure ATS is providing and developing the right type and level of services to its customers, it has worked closely with them to identify the operational benefits that they require. Providing these benefits to the users requires the FAA to execute many projects with specific outputs, such as the construction of new runways and facilities. However, ATS places emphasis on measuring outcomes, not outputs, to ensure customer needs are identified and met. ATS is committed to using outcomes and performance measures that are meaningful to its customers, and will continue to work with the user community to refine and improve both the measures and the underlying data on which they are based.

The *FAA's 1998 Strategic Plan* is focused on three mission areas: safety, security, and system efficiency. The FAA's mission goals are:

- **Reduce the fatal accident rate 80 percent by FY2007 as compared to 1994-1996 baseline data.**
- **Prevent security incidents in the aviation system.**
- **Provide an aerospace transportation system that meets the needs of users and is efficient in the application of FAA and aerospace resources.**

The *FY2000–FY2002 ATS Performance Plan* describes the steps that ATS is taking to ensure the FAA meets its mission goals. ATS plays a leading role in achieving the FAA's safety and efficiency goals, and a smaller role in improving security. Strategic approaches for accomplishing each ATS performance goal are described in this plan, as well as specific activities and initiatives that will assist in achieving the goal. These activities and initiatives will contribute to accomplishing the goal within the timeframe of this plan. Some initiatives, however, are longer-term projects with benefits that will not be realized until after FY2002. Several ATS goals and initiatives require cross-functional collaboration with another line of business. For example, the FAA Office of Research and Aquisitions (ARA) is working with ATS to ensure that new technologies, such as the Standard Terminal Automation Replacement System (STARS) and the Display System Replacement (DSR) are successfully implemented. ARA has also included these technologies in its Performance Plan.

Performance measures and annual targets for FY2001 and FY2002 have been established for the majority of the ATS goals. For some goals, such as reducing delays, most of the activities and initiatives will contribute to achieving the performance target. For other goals, such as improving system access, the performance measure (in this case the number of runways that are accessible in low-visibility conditions) is only one facet of a complex goal. While the associated activities and initiatives will contribute to achieving the goal, only a subset will contribute to achieving the target. ATS is working to develop better data sources and outcome measures to allow improved tracking of the effectiveness of ATS strategies and initiatives targeted at improving ATS performance. FY2000 targets were established in the *FY1998–FY2000 ATS Performance Plan*. Information on the FY2000 targets is included in the Appendix of this plan.

FAA MISSION GOAL: Increase System Safety

Reduce the fatal accident rate 80 percent by FY2007 as compared to the 1994-1996 baseline data.

ATS's primary responsibility is the day-to-day safe operation of the air traffic management system. ATS will not permit safety to be compromised as it strives to improve system efficiency. ATS is supporting the FAA Office of Regulation and Certification (AVR) in several strategic projects designed to improve safety, such as a comprehensive review of commercial aviation accidents related to controlled flight into terrain. ATS is also taking the lead on several initiatives to increase safety by reducing occurrences of violations of separation standards. ATS has safety goals related to reducing operational errors and runway incursions, and improving the accuracy and availability of weather information.

ATS SAFETY GOAL: Reduce Operational Errors

ATS applies separation standards that define minimum safe distances between multiple aircraft, aircraft and other physical structures, and aircraft and airspace. When an aircraft is allowed to violate these separation standards, an operational error occurs.

Strategies to Reduce Operational Errors

One of the major approaches to reducing operational errors is to provide a common understanding of procedures and policies among controllers and users. Training for controllers and pilots is central to this and will continue to be the focus of ATS safety strategies. Technological improvements such as deployment of modern displays, new decision support tools, and improved communication systems will support better determination of aircraft location and reduce miscommunication between pilots and controllers.

Activities and Initiatives for FY2000–2002

- Address and reduce repeat incidents by individuals through meaningful individual skill enhancement/remedial training.
- Increase identification of causal factors and provide refresher training on procedures for avoiding common types of operational errors.
- Implement a requirement for facilities to provide corrective action to significant problems identified by facility evaluations within 5 days.
- Conduct special assessments of selected facilities that have increases in the operational error rate.
- Conduct Quality Assurance Reviews (QAR) to identify and correct controller performance deficiencies prior to occurrence of an operational error or deviation. QARs provide the means to identify, investigate, and resolve performance deficiencies through corrective training.
- Implement annual controller skill checks to identify deficiencies and areas where special training is needed.
- Investigate use of the prototype conflict probe, User Request Evaluation Tool (URET), to provide controllers with advance notification of potential conflicts and reduce operational errors by FY2002.

- Investigate use of the initial deployment of Controller Pilot Data Link Communications (CPDLC) in FY2002 for improved communication between pilot and controller to reduce operational errors involving miscommunication.

Measuring Performance

ATS measures the number of operational errors per 100,000 facility activities. ATS has established the following targets for this performance goal:

- **In FY2001, maintain a Monthly Operational Error Rate below 0.60 per 100,000 activities for at least 10 months of the year.**
- **In FY2002, maintain a Monthly Operational Error Rate below 0.60 per 100,000 activities for at least 11 months of the year.**

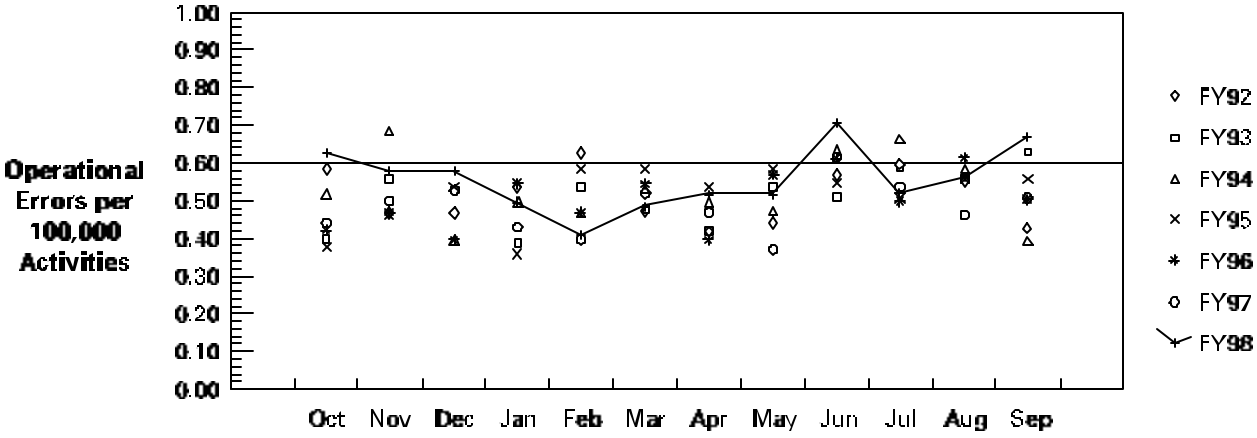


Figure 3: Monthly Operational Error Rates

Figure 3 shows monthly operational error rates for the past 7 years. The horizontal line at 0.60 operational errors per 100,000 activities is the operational error rate that ATS is striving to stay below. Showing several years of monthly data simultaneously allows air traffic managers to detect cyclical trends. ATS managers are focusing their attention and limited resources on events that occurred in the months that exceed the target rate, to prevent reoccurrence of those types of problems.

In past ATS Performance Plans, operational deviations were also tracked as a measure of system safety. After further consideration, ATS concluded that although they are violations of air traffic procedures, operational deviations are not necessarily indicators that safety was compromised. When an operational deviation results in a loss of separation, it is classified as an operational error and tracked under that measure.

ATS SAFETY GOAL: Reduce Runway Incursions

Runway incursions create extremely dangerous situations that can lead to serious accidents. A runway incursion occurs when an aircraft, ground vehicle, person, or object infringes on or crosses a runway that is in active use for takeoffs or landings, resulting in a loss of sepa-

ration or a collision hazard. Runway incursions can result from authorized or unauthorized entry onto a runway or within the runway safety area. Reducing the number of runway incursions will lessen the probability of surface accidents that potentially involve fatalities, injuries, and significant property damage. Runway incursions are most likely to occur at complex, high volume airports.

Strategies to Reduce Runway Incursions

The Runway Safety Program is a systemwide, multifaceted strategy to reduce incidents and accidents directly attributable to runway incursions and improve airport surface operations. The Airport Surface Operations Safety Action Plan identifies goals, objectives, and actions that address management and procedural changes; training and awareness initiatives; improvements in airport navigation aids, signs, and surface markings; and technology enhancements.

Activities and Initiatives for FY2000–2002

The Runway Incursion Program Implementation Plan was published in April 1999. The following actions are planned for the period covered by this ATS Performance Plan:

- Continue to enhance training and awareness of surface incident problems.
- Install AMASS production systems. AMASS will begin to provide information on airport surface safety hazards and will help protect against runway collisions.
- Increase the number of Runway Incursion Action Team (RIAT) visits and improve the capability for determining and disseminating RIAT trend and problem solution information.
- Continued airport surface safety campaigns, promoting pilot and airport operator involvement in surface incident awareness issues.

Measuring Performance

ATS has established the following targets for this performance goal:

- **By the end of CY2001, reduce the number of runway incursions to a level 3 percent below the CY2000 baseline of 248. The CY2001 target is at or below 241 runway incursions.**
- **By the end of CY2002, reduce the number of runway incursions to a level 3 percent below the CY2001 baseline of 241. The CY2002 target is at or below 234 runway incursions.**

Figure 4 illustrates the trend in runway incursions and targets for FY2000-2002.

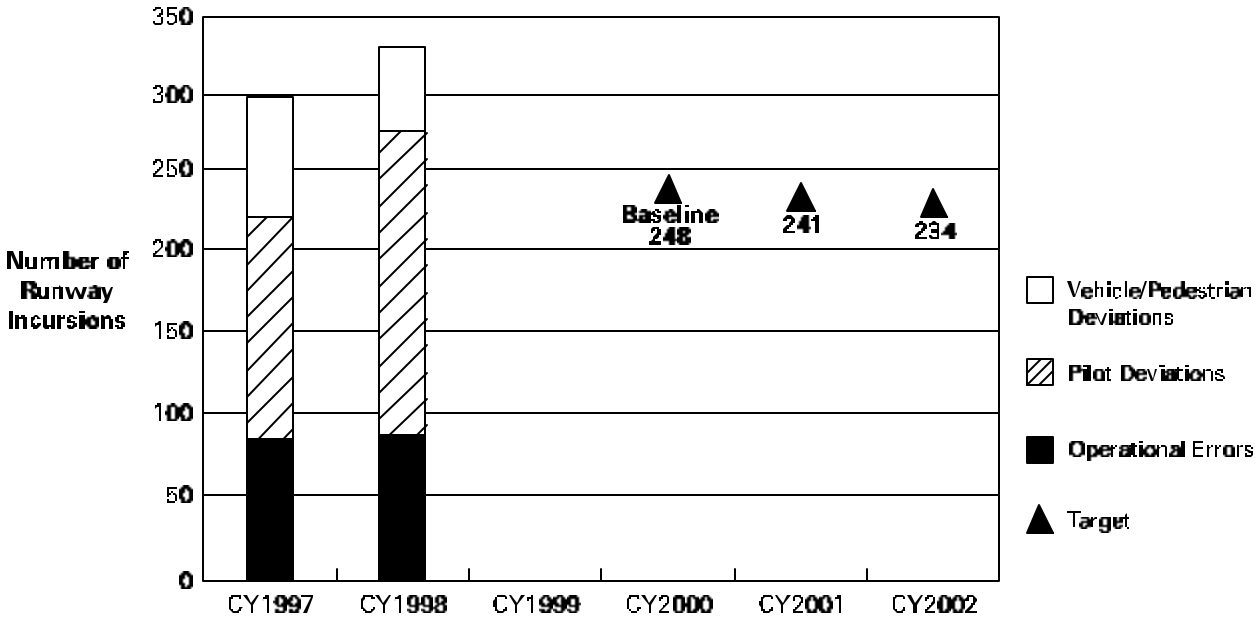


Figure 4: Runway Incursions

ATS SAFETY GOAL: Improve Quality and Availability of Weather Information

Weather has a continual impact on both the safety of aircraft in flight and the efficiency of operations throughout the NAS. Weather and weather decision-making are factors in approximately 23 percent of all aviation accidents costing the country an estimated $3 billion annually for accident damage and injuries, delays, and unexpected operating costs. ATS is striving to improve the accuracy, display, and timeliness of weather information, and the ability of controllers and pilots to use that information to fly safely and efficiently. In order to improve decision-making and reduce the number of weather-related accidents, aviation weather capabilities in the NAS must undergo major changes to convert today's weather sensors to systems in which all NAS providers and users receive the same weather information simultaneously.

Strategies to Improve Weather Information

The FAA is pursuing an aggressive schedule of developing and implementing a variety of technologies for improving the accuracy, timeliness, and usefulness of weather information, in combination with extensive training for pilots and ATS personnel on the use of new weather systems.

Activities and Initiatives for FY2000–2002

- Improve weather graphic and analysis capability through the implementation of WARP at all ARTCCs.
- Enhance hazardous weather information, microburst and windshear prediction capabilities by deploying the ITWS at 39 TRACONs and 46 ATCTs.
- Implement Flight Information Service (FIS) capabilities between ground facilities and the pilot by providing FAA-approved weather products and aerona u-

tical information to the cockpit via authorized commercial datalink providers

- Upgrade automated weather observing system (AWOS) and automated surface observation system (ASOS) to take advantage of evolving sensor technology.

- Upgrade TDWR with improved gust-front algorithms.

- Provide training to ATS personnel to properly operate and maintain new weather technologies.

- Establish requirement for training of pilots and dispatchers at all levels, in concert with the FAA Office of Regulation and Certification, and leading industry representatives.

- Utilize the NAS Infrastructure Management System (NIMS) and other automated support systems to increase the availability of weather-related equipment in FY2000.

- Upgrade ASR-9 with new weather system processor to provide windshear and microburst detection capability.

Measuring Performance

There are currently no quantifiable performance targets for this goal. Research is needed to measure how weather information enhances decision-making and reduces fatalities/injuries caused by weather. ATS is currently collecting and analyzing data to demonstrate the capability of new weather technologies.

FAA MISSION GOAL: Increase System Security

Prevent security incidents in the aviation system.

The U.S. and its citizens are often the targets for terrorist groups. Although the number of incidents of terrorism or other threats against aviation has been low, the potential losses associated with any such incident are unacceptable. Because terrorist acts destroy public confidence in the safety of air travel, the continued growth of commercial air transportation depends on the effectiveness of aviation security. ATS is a partner with Civil Aviation Security (ACS) in ensuring that its personnel, facilities, and services are secure against physical or operational threats as well as working closely with FAA's Chief Information Officer to ensure ATS effectively manages computer security for its ATC systems.

ATS SECURITY GOAL: Increase the Security of ATS Personnel

Personnel Security Program objectives are to ensure that employment or continued employment of persons in the FAA will promote the efficiency of the service and to safeguard the national security.

Strategies for Increasing the Security of ATS Personnel

ATS has allocated a position dedicated to Personnel Security as an addition to completing the risk management program for FAA facilities. This segment of the risk management program will work closely with ACS in correcting deficiencies identified by assessments and internal inspections.

Activities and Initiatives for FY2000–2002

- Baseline ATS personnel clearance activities and establish metrics to support ATS personnel security performance improvement initiatives.
- Complete required security awareness training for all ATS personnel.
- In compliance with FAA Order 1600.1D, review position sensitivity levels for employees and contractors at facilities to assure accurateness and consistency nationwide.
- Visit four or more facilities to evaluate effectiveness of the personnel security program.
- Review security clearance requirements for FAA personnel working in ARTCCs.
- Establish personnel security policies and procedures in accordance with FAA Order 1600.1D for ATS employees and contractors.
- Ensure policies and procedures are implemented and institutionalized at FAA facilities.
- Ensure that personnel security measures are incorporated into the facilities security assessment process.

Measuring Performance

There are currently no quantifiable performance targets for this goal.

ATS SECURITY GOAL: Increase the Security of ATS Facilities

The security of ATS facilities is measured against standards. Physical security accreditation of facilities is granted following formal assessment, when appropriate safeguards have been properly implemented and residual risk is acceptable.

Strategies for Increasing the Security of ATS Facilities

ATS has instituted a Facility Security Risk Management Program in the NAS Transition Implementation Service (ANS) to correct deficiencies identified by assessments and internal inspections. The Program Management Plan will organize funding, engineering, and implementation measures necessary to upgrade physical security of designated ATS staffed facilities.

Activities and Initiatives for FY2000–2002

- Develop requirements for technical training relating to security of the operational NAS.
- Complete required security awareness training for all ATS personnel.
- Procure security systems.
- Complete engineering design.
- Implement security upgrades at selected ARTCCs and/or large TRACONs.

Measuring Performance

ATS has established the following targets for this performance goal:

- **By the end of FY2001, implement security upgrades at 8 additional staffed facilities.**
- **By the end of FY2002, implement security upgrades at 15 additional staffed facilities.**

Figure 5 illustrates the targeted trend for physical security accreditation for FY2000-2002.

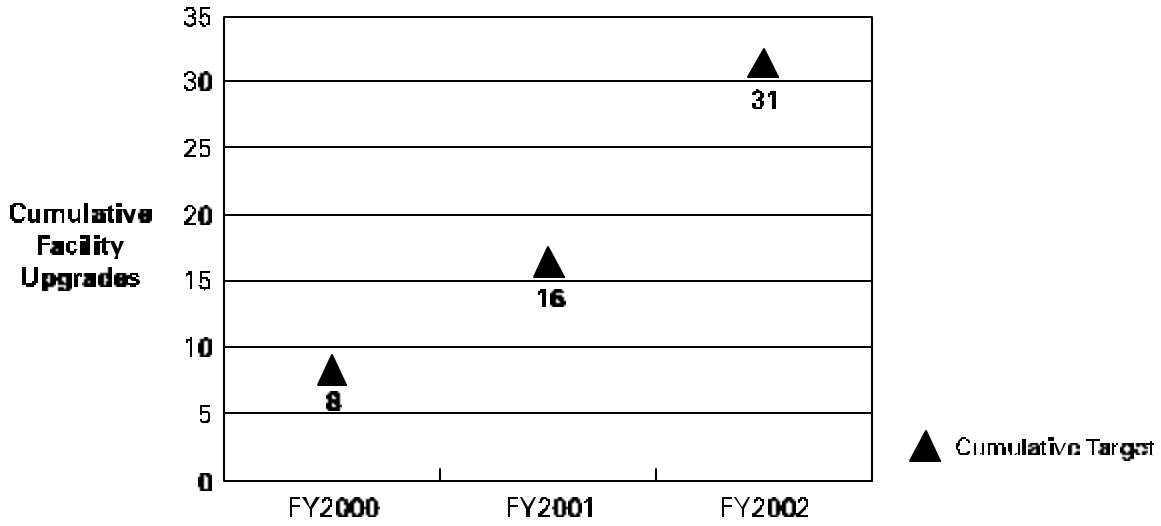


Figure 5: Security Upgrades at FAA Staffed Facilities

ATS SECURITY GOAL: Increase the Security of ATS Information Systems

The security of ATS information systems is measured against standards, and continued operation is authorized when compliance to standards has been demonstrated.

Strategies for Increasing the Security of ATS Information Systems

ATS is identifying the needed structure for a complete risk management program for security of operational NAS information systems. Once vulnerability assessments have been conducted, cost-effective mitigations will be implemented to reduce identified security risks. The system will then be certified to have an acceptable level of risk, and authorized for use.

Activities and Initiatives for FY2000–2002

- Establish a Computer Security Initial Response Capability for dealing with cyber threats to the NAS.
- Develop requirements for technical training relating to security of the operational NAS.
- Formalize the authorization process for new NAS operational information systems.
- Complete required security awareness training for all ATS personnel.
- Establish NIMS capabilities at the National Operations Control Center (NOCC) to manage security of infrastructure information in FY2000.
- Complete Risk Assessments and Information System Security Plans for four telecommunications programs annually through FY2002.

- Complete Certification and Authorization process for four telecommunications programs annually through FY2002.

- Complete 25 operational NAS system vulnerability assessments per year beginning in FY2001.

- Provide leadership and guidance to the Information Resource Management (IRM) Community in the area of Information Security for NAS Support Information Systems.

Measuring Performance

ATS has established the following targets for this performance goal:

- **By the end of FY2001, achieve operational authorization of 6 additional NAS information systems.**

- **By the end of FY2002, achieve operational authorization of 28 additional NAS information systems.**

Figure 6 illustrates targeted trends in operational authorizations of NAS information systems for FY2000–2002.

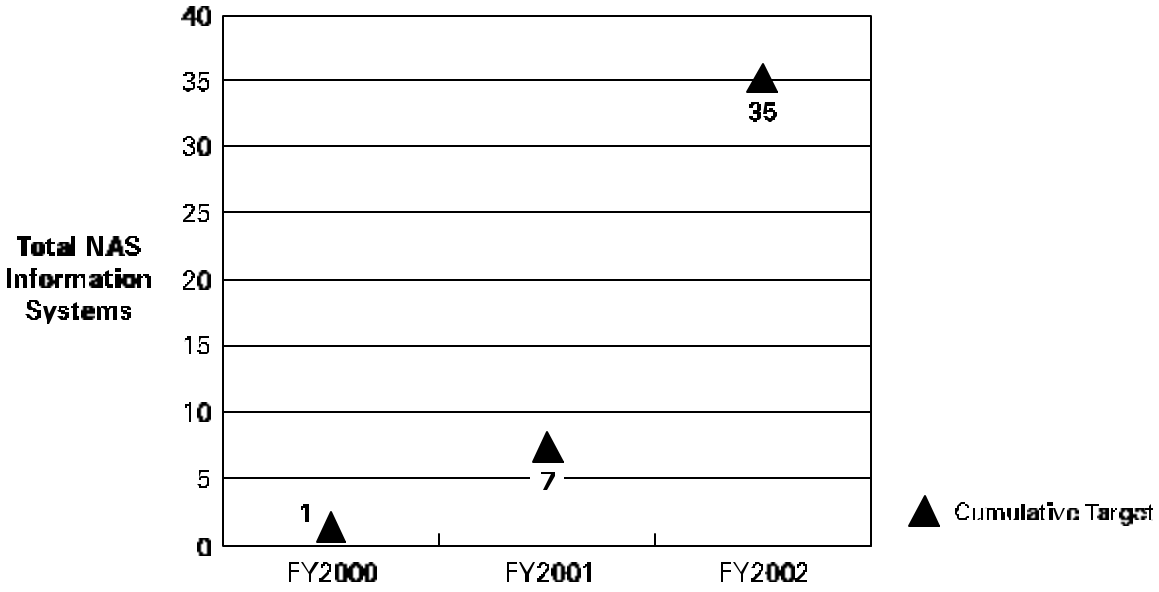


Figure 6: Cumulative Operational Authorizations of NAS Information Systems

FAA MISSION GOAL: Increase System Efficiency

Provide an aerospace transportation system that meets the needs of users and is efficient in the application of FAA and aerospace resources.

ATS plays a large role in maintaining the ability of the civil aviation system to efficiently govern the increasing level of air traffic. ATS is using its human and technological resources to address several categories of system efficiency: delay, access, flexibility, predictability, system availability, productivity, and NAS infrastructure.

It may not always be possible to improve all aspects of system efficiency simultaneously. Optimizing operational performance means that there may be times when it will be necessary to balance one aspect of system efficiency against another. Resource availability further constrains the pace of performance improvements. More importantly, there are tradeoffs between gains in system safety by reducing accident/incident risks and improvements in system efficiency measures. Moreover, the appropriate balance may change as ATS gains experience with these performance measures and, most importantly, when the needs of the user community change.

The following sections describe ATS performance goals and associated strategies and initiatives targeted at improving system efficiency.

ATS SYSTEM EFFICIENCY GOAL: Reduce Delays

A measure of ATM system efficiency is delay. Delay in the aviation system occurs when an activity does not occur within the planned, expected, or scheduled time. Delays to commercial aviation are estimated to cost the airlines over $3 billion per year. Passengers are directly affected by missed flight connections and meetings, and loss of personal time. Delays are not always avoidable. Weather can close a runway or entire airport making it impossible to take off or land at the scheduled time. ATS tracks delays caused by ATC equipment and volume as well as weather and other factors over which it has less control. Recognizing that any delay is a disruption in the expected level of service, ATS is committed to reducing all types of delays.

Strategies for Reducing Delays

Service improvements during the FY2000-2002 timeframe will focus on Free Flight Phase 1 tools, new runways, critical infrastructure replacement programs, and improvements in the aviation weather system. Airspace and airport capacity will be enhanced to improve throughput and allow aircraft to operate safely with minimal delay in congested areas. Beyond FY2002, refined implementation of AF's NAS Service Management System, implementation of new risk management and risk mitigation processes, and investments in the NAS Infrastructure Management System (NIMS) will increase operational availability of the NAS infrastructure, reducing equipment-related delays. Continuing to involve users in key decisions regarding national ground delay programs will reduce the impact of weather on flight schedules. While delays associated with weather are harder to influence, ATS is continuing to support collaborative decision making and the implementation of automated weather detection and forecasting tools to mitigate the negative impacts of these delays.

The ability to manage and reduce volume and equipment delays through specific actions is much more predictable than the reduction of weather related delays. The reduction of weather related delays is less predictable or attainable due to yearly climatic variability. Most of the weather prediction and avoidance initiatives are designed primarily to produce safety benefits and underlying efficiencies, and they may not inherently reduce the number of weather related delays.

Activities and Initiatives for FY2000–2002

- Conduct IOT&E of Center-TRACON Automation System (CTAS) Traffic Management Advisor (TMA) in FY2000.
- Implement CTAS TMA at seven ARTCCs including those located at Dallas-Ft. Worth, Los Angeles, Atlanta, Minneapolis, Oakland, Miami, and Denver, to assist controllers in the en route cruise and transition airspace. TMA provides ARTCC personnel with a means of optimizing the

arrival throughput of airports.

- Conduct IOT&E of CTAS passive Final Approach Spacing Tool (pFAST) in FY2000.

- Implement pFAST at TRACONs located at Dallas-Ft. Worth, Los Angeles, Atlanta, Minneapolis, and New York—JFK, and Newark. The pFAST component of CTAS is used by controllers and air traffic managers to manage the flow of arrivals through terminal airspace.

- Implement the Surface Movement Advisor tool (SMA) at seven locations (Chicago-O'Hare, Dallas-Ft. Worth, Atlanta, Detroit, Newark, Philadelphia, and Teterboro) by the end of FY2000. SMA uses Automated Radar Terminal Service (ARTS) III radar data to provide aircraft identification and real-time position information on flight arrivals to airport ramp control personnel. This will result in less congestion, reduced taxi delays, and more efficient use of crew and gate services in the ramp area.

- Implement new procedures that take advantage of existing and additional runways to fully utilize capacity increases at various locations. Make use of Converging Runway Display Aid (CRDA) at St. Louis and other selected sites to mitigate the effects of revised Land and Hold Short Operations (LAHSO) that may reduce airport throughput capacities.

- Continue to evaluate airspace and optimize usage with such initiatives as revised visual flight rules (VFR) routing through Class B and C airspace, increased usage of capacity-enhancing procedures such as "Dual CIVET" in Southern California, "Dry Heat" in Phoenix, and area navigation (RNAV) routes.

- As part of the National Airspace Redesign, analyze air traffic issues and develop a plan for redesigning airspace in the New York/New Jersey region to address delays.

- Continue IOT&E of the Standard Terminal Automation Replacement System (STARS).

- Continue installation and enhancement of DSR and STARS. Complete the final installation of DSR by the end of 2002.

- FAA is developing two major systems to improve weather reporting, processing, and dissemination. The ITWS will consolidate information from several sources, which is provided to airport towers. The WARP will report weather information and integrate weather radar data provided to the FAA centers.

- Continue to implement and improve existing weather sensors such as NEXRAD weather radar, TDWR, Low Level Wind Shear Alert System, a wind shear detection channel for the terminal radar, and the ASOS.

- FAA's weather research program is demonstrating storm growth and delay forecasting technology.

- FAA is implementing an experimental demonstration program called Collaborative Convective Forecast Product (CCFP) at the Air Traffic Control System Command Center (ATCSCC) as a part of the CDM to improve forecast products used for traffic management purposes.

- Departure Spacing Program (DSP) will be used with ITWS to improve the procedures used for severe weather avoidance program (SWAP). Traffic Management summits are being conducted with the purpose of standardizing training and procedures for SWAP routes to encourage routing below 10,000 ft. to avoid severe weather and traffic congestion, and

to expedite the flow of traffic for reducing delays.

- Continue to implement technologies and procedures to improve air traffic delay during FY2000-2002. In the Western Pacific Region, a major initiative is underway to make operational data more readily available for timely analysis of NAS performance. Additionally, the ATCSCC will continue its daily reporting on the utilization of average arrival and departure rates at the busiest U.S. airports.

- Extend management of high impact outage events from 5 to 7 days per week and ensure coordination of duty personnel and proper interfacing with Air Traffic personnel, Air Transport Association (ATA), and others.

- Develop and implement a process to minimize the impact of scheduled and unscheduled Global Positioning System (GPS) outages.

- Conduct IOT&E for the host/oceanic computer system replacement (HOCSR) Phase 2 in FY2000.

Measuring Performance

Figure 7 shows the actual weather, volume and equipment-related delay rates from FY1992 through FY1998 and FY2001-2002 targets. ATS has established the following targets for this goal:

- **By the end of FY2001, maintain the combined weather, volume and equipment- related delay rate at the 1994-1998 baseline of 161 delays per 100,000 activities.**

- **By the end of FY2002, maintain the combined weather, volume and equipment- related delay rate at the 1994-1998 baseline of 161 delays per 100,000 activities.**

The combined baseline is an average of the performance established during the 5-year period FY1994-FY1998. Rates are calculated as the number of weather, volume and equipment-related aircraft delays per 100,000 air traffic activities.

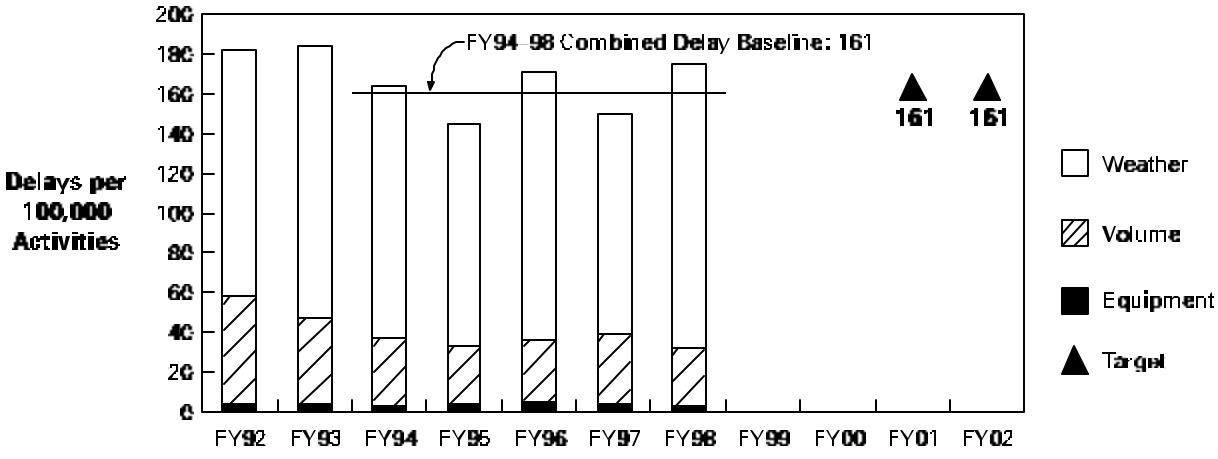


Figure 7: Weather, Volume, and Equipment Annual Delay Rates

There are recognized limitations to the methodology currently used by ATS to measure delays in the aviation system. One issue is this method does not track any delays less than 15 minutes. ATS records the number of flights delayed 15 minutes or more within an air traffic facility. For example, if a flight is delayed during takeoff by 16 minutes, that delay is re-

corded. Similarly, if the same flight is delayed 17 minutes on landing, that delay is also recorded. If the landing delay were only 12 minutes, that delay would not be counted.

An alternative to delay as a measure of system efficiency is the hourly arrival and departure rates at the major airports. Hourly arrival and departure rates are dependent on a number of factors; chiefly weather and airport configuration during that hour. The FAA is in the process of developing safe and reasonable target arrival and departure rates for eleven airports for different weather and configuration patterns. This work is expected to be completed in time for the next ATS Performance Plan.

ATS SYSTEM EFFICIENCY GOAL: Increase User Access

Access to airports, airspace, and ATS services are basic needs of all airspace users. While there are many aspects of system accessibility that impact end users, ATS is focusing on increasing the availability of vertical descent guidance for precision approaches during low visibility weather conditions. For aircraft to land in restricted visibility, the airport must have published procedures for a precision approach and the electronic guidance to insure the aircraft is able to follow the published approach. The FAA's navigation and landing systems are evolving from ground-based navigation aids to a satellite-based system. The system consists of the Global Positioning System (GPS) augmented by the Wide Area Augmentation System (WAAS), and the Local Area Augmentation System (LAAS). GPS/WAAS and LAAS will provide precision approaches to selected airports.

Strategies for Improving Access

As described above, ATS's primary strategy for increasing user access is increased availability of vertical descent guidance. In addition, ATS plans to improve the quality and quantity of information available for flight planning and execution by all NAS users through the modernization of aviation information services.

Activities and Initiatives for FY2000–2002

- Implement WAAS in FY2000-2002.
- Promote the accuracy, availability and reliability of GPS as a component of the Global Navigation Satellite System (GNSS) by securing, through the ICAO and International Telecommunications Union process, a second civil GPS frequency suitable for aviation use.
- Plan for transition to Next Generation Air-Ground Communication System (NEXCOM) from existing domestic air-ground system (VHF radios, backup emergency communications, and radio control equipment) in FY2000-FY2002.
- Expand on the practice of rerouting calls from busy AFSSs to facilities with shorter waiting times.
- Begin Operational and Supportability Implementation System (OASIS) operational test and evaluation (OT&E) in FY2000.
- Continue working with the Department of Defense (DOD) to develop an interface between FAA's Special Use Airspace (SUA) Management System (SAMS) and DOD's Military Airspace Management System (MAMS). Continue developing procedures and systems to allow dispersing current SUA status information from SAMS to end users in real time.

Measuring Performance

There are nearly 4,000 public use airports in the U.S. Currently, about 600 of these airports have an instrument landing system (ILS) for precision approaches during low visibility conditions. Because many of these airports have more than one runway, the total number of runways with precision landing guidance (which includes altitude guidance) is approximately 1,080. Developing precision approaches requires accurate survey information for airport runway location and any obstacles near the flight path for approach. These surveys are done by the National Geodetic Survey.

The FAA is transitioning from ground-based landing aids such as ILS's, to an augmented Global Positioning System. Increasing low-visibility access depends on both having a published approach and increasing the number of aircraft equipped to make precision approaches. To maximize the benefits to aviation users, ATS will need to develop approaches for all qualifying airports that do not currently have electronic aids to support an instrument approach and aircraft not presently equipped will need to install a Global Positioning System Wide Area Augmentation System (WAAS) receiver. The ATS performance target is:

- **By the end of FY2001, increase the number of runways that are accessible in low-visibility conditions by 10 percent over the FY1999 baseline.**

- **By the end of FY2002, increase the number of runways that are accessible in low-visibility conditions by 15 percent over the FY1999 baseline.**

Figure 8 illustrates the FY2001 and FY2002 targets for increasing the number of runways that are accessible in low-visibility conditions.

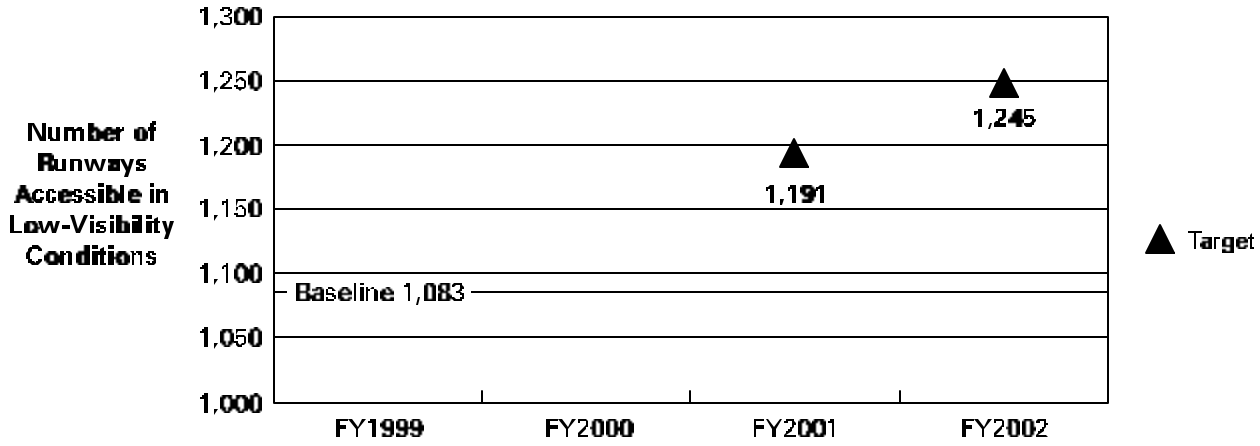


Figure 8: Number of Runways Accessible in Low-Visibility Conditions

ATS SYSTEM EFFICIENCY GOAL: Increase System Flexibility

Improved system flexibility allows for dynamic application of existing capabilities and permits real time and advance planning. A dynamic flexible system enhances performance safety, capacity, access, and predictability, while reducing impediments and delays. Flexibility in flight planning offers users significant benefits with the potential for more efficient routing, improved scheduling efficiency, and reduced flight miles. Measuring flexibility in the system allows ATS to evaluate its ability to permit users to adapt their operations to changing conditions. Users de-

sire the capability to optimize their operations based on their own objectives and constraints that vary flight-by-flight and user-by-user.

Strategies to Increase Flexibility

For increased flexibility of flight operations in the NAS, ATS has implemented a number of initiatives designed to continue the evolvement toward the free flight concept of operations. The North American National Route Program (NRP) and its components, the Preferred Route Reduction Program (P2R2), the Departure Procedures/ Standard Terminal Arrival Route (DP/STAR) program and Restriction Performance Management (RPM) program, are traffic management initiatives designed to offer flexible, cost-effective routing options. Each of the component programs operates as an independent element with ongoing activities and efforts related to all elements.

Activities and Initiatives for FY2000–2002

- As part of the National Airspace Redesign, analyze air traffic issues and develop a plan for redesigning airspace in the New York/New Jersey region.

- Work with aviation users in the review and redesign of the national airspace.

- Continue to eliminate unnecessary ATC preferred routes. The ATCSCC, field facilities, the National Air Traffic Controllers Association (NATCA), and ATA will meet periodically until all preferred routes have been assessed as to their necessity to the NAS.

- Continue to publish departure procedures (DP) and standard terminal arrival routes (STAR) as ingress and egress points to the North American Route Program (NRP) to reduce the 200 NM radius exclusion zones around origin and destination airports. The DPs and STARs allow increased flexibility while operating in the terminal area for NRP participants.

- Conduct IOT&E for the User-Request Evaluation Tool (URET) in FY2002.

- Implement URET at seven ARTCCs (Chicago, Atlanta, Indianapolis, Memphis, Washington, DC, Cleveland, and Kansas City) by FY2002. URET is intended to improve en route flexibility through the reduction of procedural restrictions. For aircraft operating in the affected airspace, more optimal altitudes may be utilized and unnecessary maneuvers will be reduced.

- Implement Reduced Vertical Separation Minima (RVSM) in parts of the Pacific by February 2000. Extend RVSM to the rest of the Atlantic and Pacific by FY2002. This will allow aircraft to fly more optimal altitude profiles, and will increase airspace capacity.

- Continue implementation of Collaborative Decision Making (CDM) at the ATCSCC and airline operations centers. Implement two additional CDM capabilities, Initial Collaborative Routing (ICR) and NAS Status Information (NASSI). These enhancements will increase the FAA's ability to coordinate with users regarding the scheduling and operation of flights subject to unforeseen constraints.

- Continue working with DOD to evolve MAMS as an internet-based system that allows authorized users up-to-date SUA schedule information. Continue to use SAMS to maintain historical and analytical information about SUA usage.

- Continue to enhance RPM to maximize system flexibility while moderating traffic flows where and when required to ensure safety.

- Install multi-sector oceanic data link at New York and Oakland ARTCCs.

Measuring Performance

Eliminating preferred routes provides flexibility to the industry by allowing more efficient routing, improved scheduling efficiency, and reduced flight miles. A baseline of 1,976 high altitude routes was established in 1998, along with a total multiyear reduction goal of 24 percent by end of FY2002. ATS has established the following performance targets for this goal:

- **By the end of FY2001, reduce the number of ATC preferred routes to a level 19 percent below a 1998 baseline of 1,976 routes. The FY2001 target is at or below 1,601 ATC preferred routes.**

- **By the end of FY2002, reduce the number of ATC preferred routes to a level 24 percent below a 1998 baseline of 1,976 routes. The FY2002 target is at or below 1,502 ATC preferred routes.**

Figure 9 illustrates the targeted number of ATC preferred routes for FY2001–FY2002.

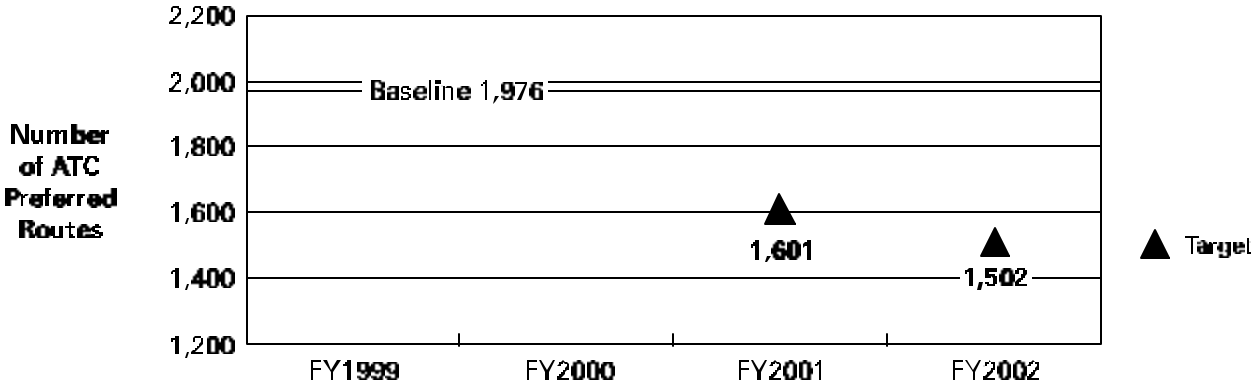


Figure 9: ATC Preferred Routes

ATS SYSTEM EFFICIENCY GOAL: Increase System Predictability

System predictability allows users to plan and manage their resources efficiently. The majority of system users rely on schedules that define when aircraft takeoff and when aircraft land. These schedules are central to the operations of most commercial flights, driving crew scheduling, ground service operations, and other operational components. Near-term decisions such as scheduling and planning flights, as well as longer-term decisions such as fleet sizes, airframe types, and hubbing decisions, are all impacted by the day-to-day variation of NAS performance. Scheduled operations are very dependent on system predictability since relatively small deviations from scheduled operations can cause drastic impacts, especially when the ripple effects throughout the system are taken into account.

Strategies to Increase Predictability

Increasing information flow to system users is a key ingredient to improved system predictability. Collaborative planning between ATS and all NAS users is a strategy being pursued during this timeframe. As weather is a main contributor to the uncertainty in the ATM system, improvements in obtaining and disseminating weather products will be made. These improvements will supply consistent information to both pilots and controllers so they can realize

the same degree of situational awareness.

Activities and Initiatives for FY2000–2002

- Continue implementation of CDM as described under system flexibility. Rapid communication of information on air traffic and flight conditions will increase the user's predictability of NAS operations.

- Implement CTAS pFAST, as described under system delay. Increased situational awareness, provided by pFAST, is expected to increase runway utilization. The variability between an airport's capacity and its actual arrival rate would also be reduced by pFAST.

- Implement SMA for increased surface movement efficiency, as described under system delay. SMA benefits include more consistent taxi-out times, reduced gate delays, and more optimal utilization of ground and ramp resources.

- Conduct IOT&E for the Weather and Radar Processor (WARP) Stage 1 in FY2000.

- Implement WARP and ITWS to provide more timely and accurate weather information, enabling users and ATS to predict the effect of weather on operations with greater accuracy. Conduct site testing for ITWS in FY2000, and achieve Phase 1 capability at the ARTCCs and the ATCSCC by FY2002.

Measuring Performance

Over the past few years, ATS has measured variability in ground movement times at the 25 busiest U.S. airports as an indicator of system predictability. This year, ATS has decided not to report on or establish a target for this metric, because the extent to which ATS controls the variability in ground movement times is not well-identified or agreed upon. Many factors, such as airline schedules and severe weather, are known to cause some of the variability in the system. Efforts to identify other key factors, and to pinpoint the extent to which ATS can mitigate these factors is still underway. ATS is considering the development of alternative predictability measures, while continuing to monitor the predictability of ground movement times.

ATS SYSTEM EFFICIENCY GOAL: Sustain Operational Availability of NAS Capabilities

The NAS is an inherently complex system with multiple levels of redundancy to assure availability of key services. During the 1980s and into the 1990s, the availability of key NAS services remained high due to technological improvements, improved maintenance techniques, and the high-level of redundancy. Due to the complexity and redundancy of the NAS, sophisticated performance tracking tools will be required to provide management with the more detailed information required to accurately assess the health of the NAS and plan appropriate responses. Automated tools have recently become available to measure key performance parameters of the NAS equipment against established metrics. With the information these emerging tools provide, we are beginning to better understand the performance of the NAS and quickly pinpoint specific causes of poor performance. This information will enable our managers to focus resources on areas that need attention.

Strategies to Sustain or Increase Operational Availability of NAS Capabilities

ATS will sustain or improve service performance by identifying causes for service failures, conducting supportability studies, and in-

fluencing operations and capital investment decisions. Beyond FY2002, investments made during FY2001 and FY2002 in AF's NAS Infrastructure Management System (NIMS) will enable ATS to increase operational availability.

Activities and Initiatives for FY2000–2002

- Maintain telecommunications service availability at contractually specified levels for all contract networks.
- In FY2000, provide enhanced centralized monitoring, event management, restoration, coordination, and performance reporting of operational infrastructure activities over large geographical areas or domains from National Operations Control Center (NOCC) and Operations Control Centers (OCC) (which are to be established in three locations).
- In FY2001, establish Service Operations Centers (SOC) in ARTCCs and large TRACONs to provide more localized monitoring, event management, restoration, and coordination of operational infrastructure activities in critical locations.
- Provide improved infrastructure restoration response time by enhancing management and utilization of remote maintenance, monitoring, and analysis capabilities in the OCCs, SOCs, and field workforce locations (work centers), in FY2001.
- Initiate investment analyses for non-performing services.
- Conduct supportability studies to identify opportunities to reduce total life cycle costs.
- Define all NAS services in terms internal and external customers can clearly relate to.

Measuring Performance

In order to gauge the capability of the NAS to deliver quality services, ATS will measure the availability of reportable facilities required to deliver automation, communication, navigation/ landing, surveillance, and weather capabilities. Costs will also be captured for these capabilities through the FAA cost accounting system.

ATS has established the following targets for this performance goal:

- Sustain the FY1994-1998 5-year average composite operational availability of reportable facilities required to deliver automation, communication, navigation/ landing, surveillance, and weather capabilities through the end of FY2001.
- Sustain the FY1994-1998 5-year average composite operational availability of reportable facilities required to deliver automation, communication, navigation/ landing, surveillance, and weather capabilities through the end of FY2002.

Figure 10 illustrates trends in operational availability of NAS capabilities and targets for FY2001 and FY2002.

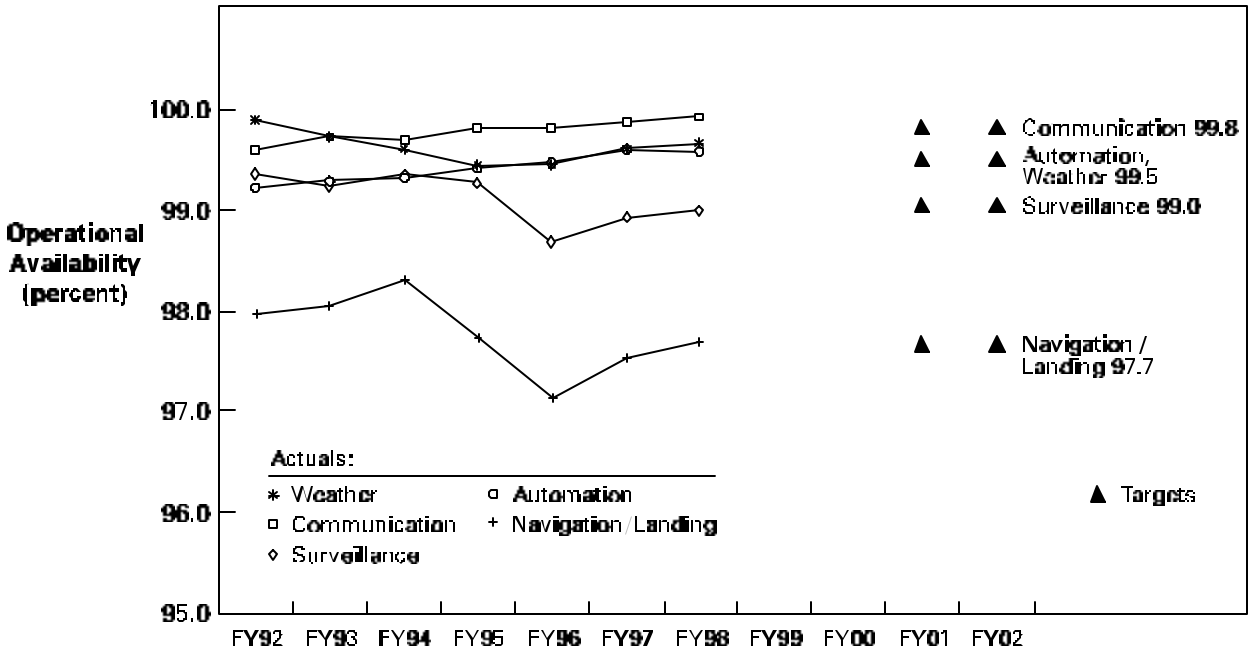


Figure 10: Operational Availability of NAS Capabilities

ATS SYSTEM EFFICIENCY GOAL: Increase Productivity

ATS is one of the few government organizations that provide direct service to the public. This service is providing traffic separation, information, and navigation assistance to the flying public. Productivity and good stewardship of the resources supporting the Air Traffic Services organization have never been more important than they are today. Initiation of a performance-based organization, and the transition to a fee-for-service environment will challenge ATS to be more aggressive in managing its resources while providing better services. In a performance based organization or fee-for-service environment, the long-term goal of ATS will be to maximize benefits to the customer while also assuring a safe system.

Strategies to Increase Productivity

ATS plans to reduce both the numbers and levels of management. Increased capabilities will be established to manage information and system/ automation resources. ATS organizations will become more streamlined, void of unrelated functions, to ensure focus on specific activities to achieve organizational outcomes. Employees will be empowered, using high productivity teams to the maximum extent possible.

The NAS Infrastructure Management System (NIMS) will evolve the ATS maintenance approach from an equipment-based system to proactive service management. Using a combination of commercial-off-the-shelf (COTS) resource management software and existing maintenance management applications, infrastructure management information will be entered, collected, stored and made available to AF headquarters, regional and field organizations. The NOCC, OCCs, SOCs, work centers, field, regional and headquarters management offices will collaborate on and manage all infrastructure

activities using the shared information.

Activities and Initiatives for FY2000–FY2002

- Use high productivity teaming.
- Deploy major CNS/ATM automation capabilities; e.g., LAAS/WAAS, STARS, Data Link, etc.
- Improve the efficiency and effectiveness of AF personnel by improving, documenting, and standardizing key business processes.
- Provide timely, accurate, and user-friendly Internet web sites and home pages to provide optimum knowledge of AF programs, services, and resources.
- Establish OCCs and SOCs which provide centralized infrastructure management capabilities, improved information sharing and collaboration, more effective decisions, and reduced costs beginning in FY2000.
- Utilize NOCC, OCCs, SOCs, work centers, management, support functions and NIMS to enhance AF capabilities to manage the NAS infrastructure, services, and resources in FY2000.
- Utilize NIMS resource management (COTS) capabilities, existing maintenance management and remote maintenance monitoring applications, shared information, centralized management and reporting, help desk support and collaborative decisions to improve utilization of AF personnel resources and infrastructure assets in FY2000.
- Provide technical refresh of NIMS resources to improve AF personnel productivity.
- Complete the national deployment of Regional Information System (REGIS) in FY2000.
- In FY2001, through the National Data Center (NDC) and REGIS, provide senior executives, managers and employees the mission critical information necessary for effective decision making.
- Incorporate National Data Center's (NDC) information and interoperability standards with CIO's standards by FY 2001. Incorporate full Intranet data query capability for customers of the NDC by FY2001. Continue to incorporate legacy systems and expand the customer base for the NDC in FY 2000 and FY2001.

Measuring Performance

ATS will use two productivity measures, one for Air Traffic and one for AF.

The Air Traffic measure is: air traffic activity divided by the Air Traffic workforce. Activity is defined as the sum of flight service activities, en route aircraft operations, airport operations, and instrument operations. Workforce is defined as all air traffic full-time employees. This information is readily available at the national and facility level. Productivity, as described in this metric, is a total of the human resources utilized to provide air traffic control services to the customer. The performance target for this goal is:

- **By the end of FY2001, increase Air Traffic productivity by 0.25 percent from the FY1998 baseline of 7,416 activities per Air Traffic employee.**
- **By the end of FY2002, increase Air Traffic productivity by 0.50 percent from the FY1998 baseline of 7,416 activities per Air Traffic employee.**

New and more accurate Air Traffic productivity measures and data are being identified. These data include a complete review of how air traffic activity is defined and counted as well as

a complete analysis of the costs of providing air traffic services. ATS is using a phased approach to develop new productivity goals. The first phase will include the collection and analysis of additional data for air traffic productivity, especially the data from the FAA Cost Accounting System (CAS). CAS will incorporate Facilities and Equipment (F&E), Research, Engineering, and Development (RE&D), operational, overhead, and depreciation costs in the FY2000 time frame. It is anticipated that this will increase the number of targets of opportunity for productivity improvement (e.g., direct, indirect, overhead costs, etc) in FY2001 and beyond.

Figure 11 illustrates trends in Air Traffic productivity.

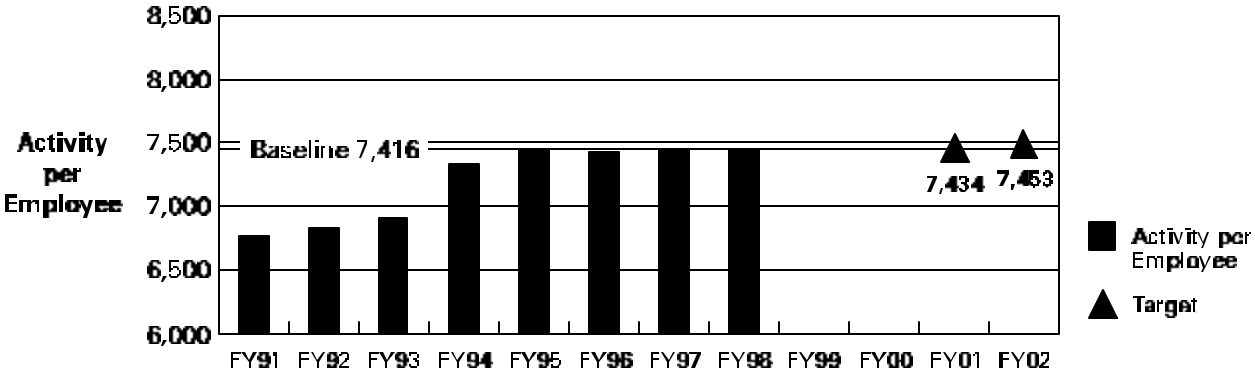


Figure 11: Air Traffic Productivity

The AF productivity measure is the number of facilities delivering NAS automation, communications, navigation/landing, surveillance, and weather capabilities divided by the AF workforce. Number of facilities delivering NAS capabilities is defined as the sum of the reportable facilities included in the automation, communications, navigation/landing, surveillance, and weather capability categories. The AF workforce is defined as all AF full-time employees. This information is readily available at the national and field levels.

The performance target for this goal is:

- **By the end of FY2001, increase AF productivity by 0.25 percent from the FY1998 baseline of 1.706 facilities per person.**
- **By the end of FY2002, increase AF productivity by 0.50 percent from the FY1998 baseline of 1.706 facilities per person.**

Figure 12 illustrates trends and targets for AF productivity.

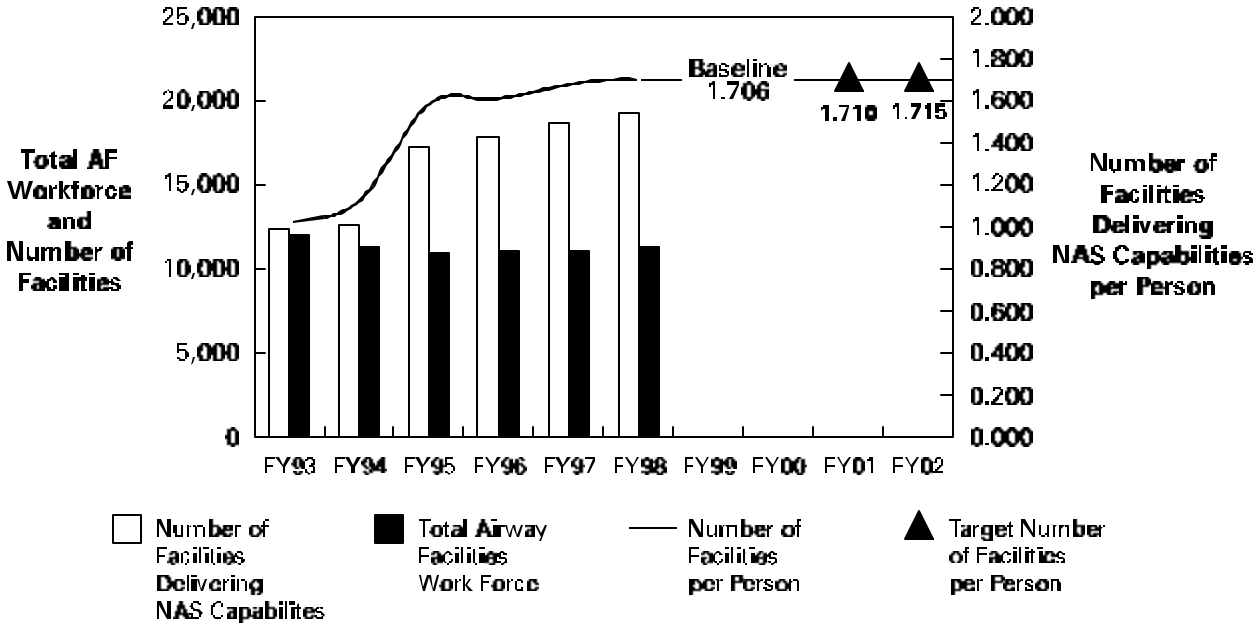


Figure 12: AF Productivity

ATS SYSTEM EFFICIENCY GOAL: Restore NAS Infrastructure

The foundation for all NAS modernization is jeopardized because land-based structures are plagued with unstable power, limited space, and leaky roofs. Building modernization or facility sustainment has been deferred for so many years that there are increasing risks of NAS equipment outages resulting from the aging building infrastructure and plant equipment. The majority of the building plant equipment (air conditioning, power systems, cables, boilers, sewer/water piping, etc.) have reached or exceeded their service life. Continuous shortfalls in the building infrastructure modernization and sustainment funding have significantly impacted each building's ability to meet new equipment operational and reliability requirements. Free Flight Phase 1 tools depend on infrastructure improvements such as Host/Oceanic Computer System Replacement (HOCSR), Display System Replacement (DSR), and Standard Terminal Automation Replacement System (STARS). However, the current condition of our power systems will not ensure stable power and grounding needed by these modernized capabilities. Further, we will not be able to effectively protect Agency investments in the NAS such as Operational and Supportability Implementation System (OASIS). Revitalization of the FAA's NAS infrastructure is imperative to remain accountable for the public's investment in our nation's aviation system.

Strategies to Maintain and Improve the NAS Infrastructure

ATS will work aggressively with FAA Integrated Product Teams (IPT) to accelerate the necessary hardware product deliveries required to ensure current levels of service within the NAS. In addition to interventions in the NAS modernization effort, ATS will implement the RESTORE Project (Revitalize Existing Structures, Technology, and Operational Resources) to preclude irrevocable damage to NAS buildings, systems, and equipment, or reduced capabilities to sustain support service performance.

Activities and Initiatives for FY2000–2002

- Improve processes for managing NAS in-service systems and equipment, fully integrating NAS in-service management processes and activities into FAA Acquisition Management System processes and activities.

- Utilize NIMS to prioritize infrastructure needs, based on service quality and customer needs, beginning in FY2001.

- Award the FAA Telecommunications Infrastructure/FAA Integrated Communications System for the 21st Century (FTI/FICS-21) contract, by December 2000, to sustain the telecommunications infrastructure, achieve requisite performance, and avoid substantial cost increases.

- Improve/rebuild access roads, on-site cabling, electrical power improvements, energy conservation, flooring, grounding and lighting protection, heating, ventilation, and air conditioning, painting, roofing, safety improvements, siding, antenna towers, etc.

- Remove asbestos from ARTCCs, replace chillers, power conditioning, engine generators, carpet, etc.

- Improve ATCTs/TRACONs/AFSSs to include additional space, re-roofing, painting, safety improvements, siding, flooring, grounding and lighting protection, energy conservation, electrical power improvements and other basic infrastructure improvements.

- Complete national assessment and analysis of 21 ARTCCs, creating an ongoing process for identifying and prioritizing all maintenance and repairs required to sustain and revitalize FAA buildings.

Measuring Performance

A life cycle based condition assessment process is under development, which will predict and justify the revitalization of FAA's buildings. This process includes in-depth quantitative analyses of maintenance and repair requirements for FAA buildings to include costs of preventive maintenance, minor repairs, unscheduled maintenance, and renewal and replacement. The index model currently takes into account various factors associated with facility condition. Age and condition of ancillary building systems (e.g., generators, etc.) will be integrated into future phases of process development.

A model has been complete for the en route program and will be validated at five locations. Results will be extrapolated for the remaining locations. Estimated completion date is September 30, 2000.

Within the terminal facilities program there is a plan to assess nine airport traffic control towers (ATCT). Four ATCTs will be evaluated during FY2000. The remainder is projected for completion during FY2001 (pending funds availability). Results will be extrapolated for the terminal facilities program.

ATS SYSTEM EFFICIENCY GOAL: Enabling Process Improvement Using FAA integrated Capability Maturity Model (iCMM)

ATS is participating in a joint ATS/ARA goal to institutionalize mature processes that enable high quality solutions to FAA and user needs, predictable cost and schedule, and increased productivity. The FAA developed an integrated Capability Maturity Model (FAA-iCMM) to capture best practices generally observed in government/industry and increase the

efficiency and the effectiveness of FAA processes. The model describes the stages that processes progress through as they are defined, implemented, and improved. In partnership with ARA and AIO, ATS will support efforts to achieve FAA-iCMM maturity level 2 for selected teams/organizations/systems.

Strategies to Enable Process Improvement

ATS will improve operational processes in support of overall life-cycle management process improvement.

In support of joint AIO/ARA/ATS efforts to improve the maturity of FAA acquisition and in-service processes, ATS will ensure cross-functional processes are fully matured. Candidate systems and process areas are inclusive of both acquisition and in-service systems and processes. ATS will ensure FAA efforts represent the entire life-cycle, balancing successful organizational results and outcomes for both the FAA operations and acquisition processes.

Activities and Initiatives for FY2000-FY2002

- Establish ATS process improvement leadership group.
- Develop selection criteria for participant teams/organizations/systems.
- Participate in joint AIO/ARA/ATS efforts to achieve FAA-iCMM maturity level 2.
- Continue internal process improvements using FAA-iCMM to achieve FAA-iCMM capability level 3 in selected process areas.

Measuring Performance

ATS has established the following targets for this performance goal:

- **By the end of FY2001, selected teams/organizations/systems will achieve FAA-iCMM capability level 2 for specific process areas.**
- **By the end of FY2002, selected teams/organizations/systems will achieve FAA-iCMM maturity level 2.**

ATS INTERNAL PERFORMANCE GOAL: Create a Model Work Environment

ATS works continually toward achieving the ATS vision—to maintain a productive, rewarding, fair, safe, and satisfying work environment.

ATS employees will be able to focus on mission accomplishment if the workplace is free from discrimination, harassment, and occupational safety and health hazards; promotes and values diversity; and supports employee partnerships.

Moreover, a diverse workforce produces effective business teams and more creative and viable approaches to problem solving. ATS must foster employee involvement and creative partnerships to realize a productive and customer-focused operating environment.

ATS is committed to providing its employees with ongoing, clear, and concise communications and information about issues that affect them, thereby, enabling employees to be effective participants in driving operational requirements.

Strategies to Create a Model Work Environment

Each ATS organization will ensure that their activities and initiatives are developed in accordance with the following objectives:

- Improve the leadership skills and competencies of employees.

- Ensure accountability for competent work and appropriate behavior. Identify and reward outstanding performance.

- Establish and use systems that are fair and performance-based. Eliminate non-merit barriers.

- Develop and implement plans to make facilities work accessible.

- Assess employees' level of satisfaction with their quality of work life. Continue to communicate with employees regarding their level of satisfaction.

Activities and Initiatives for FY2000–2002

- Design a process to develop corporate model work environment activities and initiatives by FY 2000.

- Develop a model work environment database by FY2000.

- Design a training strategy to support the development of model work environment action plans that include policy and guidance by FY2001.

- Develop an infrastructure to determine critical success factors against which model work environment effectiveness will be measured by FY2002.

- Ensure that all new facilities meet requirements for people with disabilities (ongoing).

- Implement Environmental and Occupational Safety and Health (EOSH) compliance throughout ATS (ongoing).

Measuring Performance

ATS is currently collecting and analyzing data to determine metrics and performance targets for model work environment vision and goals.

Performance Planning into the Future

While the ATS Performance Plan is only updated once a year, performance management is an ongoing process. ATS managers regularly compare their current performance to the goals set out in the Performance Plan and modify their staffing and procedures appropriately to address problem areas. By mid-2000 the importance of performance planning will increase when the FAA adopts a performance-based pay system for non-union employees. ATS personnel will become even more focused on achieving ATS goals, and the Performance Plan itself will become a more meaningful document, vital to organizational success and meeting user needs. The importance of performance planning will also increase as Congress begins to rely more heavily on documentation of goals and strategies to support budget requests.

In future years the ATS Performance Plan will continue to support the FAA Strategic Plan and the DOT Performance Plan, as well as correlating with the goals and metrics included in AAT, AAF, ARS, ASC, ATQ and facility plans. Developing linkages between lower-level and higher-level goals, metrics and initiatives, and providing more facility-specific performance and cost data to ATS field managers will allow FAA employees to better assess and influence their role in improving system-wide performance. In addition, more effort will be made to work across ATS organizations to identify common goals, metrics, and targets, so goals will take into account the contribution of all ATS organizations. Furthermore, ATS will work with ARA to ensure that both organizations are in agreement regarding projected schedule and outcomes for new technologies, in accordance with the integrated product development system (IPDS) framework. Finally, ATS will continue to obtain input from users on developing measures and strategies that reflect their priorities. In these ways, ATS will continue to strive to provide better service through performance planning, measurement, and management.

Appendix: FY2000 Performance Targets from the FY1998–2000 ATS Performance Plan

Performance targets from FY2000 are reported in this section, since the FY2000–2002 Performance Plan only contains performance targets for FY2001–2002. Each performance target is presented together with an explanation of any changes to the target proposed for the FY2000–2002 Plan.

FY2000 Performance Targets	Differences Between FY2000 and FY2001–2002 Targets
Increase System Safety	
▪ Reduce the rate of operational errors by 10 percent from 1994 baseline. FY2000 target is 0.48 errors per 100,000 operations.	Beginning in FY2001, ATS will track monthly (rather than annual) error rates and work to reduce seasonal increases in operational errors. ATS's targets are to maintain a monthly operational error rate below .60 per 100,000 facility activities for at least 10 months of the year in FY2001, and at least 11 months of the year in FY2002.
▪ Reduce the rate of operational deviations by 10 percent from 1994 baseline. FY2000 target is .096 deviations per 100,000 operations.	Operational deviations will not be tracked as a safety measure after FY2000. Although they are violations of air traffic procedures, operational deviations are not necessarily indicators that safety was compromised. When an operational deviation results in a loss of separation, it is classified as an operational error and tracked under that measure.
▪ Reduce the total number of runway incursions by 15 percent from CY 1997 baseline. CY2000 baseline is 248 runway incursions.	By the end of CY2001, reduce the number of runway incursions to 3 percent below the CY2000 baseline of 248. The CY2001 target is at or below 241 runway incursions. By the end of CY2002, reduce the number of runway incursions to 3 percent below the CY2001 baseline of 241. The CY2002 target is at or below 234 runway incursions. A goal was added to improve the quality and availability of weather information, but no performance indicators have been established.
Increase the Security of ATS Personnel	
▪ This goal was not included in the ATS FY1998-2000 Performance Plan.	There are currently no quantifiable performance targets for this goal.

FY2000 Performance Targets	Differences Between FY2000 and FY2001–2002 Targets
Increase the Security of ATS Facilities	
▪ This goal was not included in the ATS FY1998-2000 Performance Plan. ▪ The FY2000 goal is to implement security upgrades at 8 FAA staffed facilities.	By the end of FY2001, implement security upgrades at 8 additional staffed facilities. By the end of FY2002, implement security upgrades at 15 additional staffed facilities.
Increase the Security of ATS Information Systems	
▪ This goal was not included in the ATS FY1998-2000 Performance Plan. ▪ The FY2000 goal is to achieve operational authorization of 1 NAS information system.	By the end of FY2001, achieve operational authorization of 6 additional NAS information systems. By the end of FY2002, achieve operational authorization of 28 additional NAS information systems.
Decrease System Delays	
▪ Reduce the rates of volume and equipment related delays by 20 percent from 1994 baseline. FY2000 target is 32.86 delays per 100,000 operations.	ATS has recalculated the baseline as a 5-year average covering FY1994-FY1998. By the end of FY2001, maintain the combined weather, volume, and equipment related delay rate at the 1994-1998 baseline of 161 delays per 100,000 activities. By the end of FY2002, maintain the combined weather, volume and equipment related delay rate at the 1994-1998 baseline of 161 delays per 100,000 activities.
Increase User Access	
▪ Publish a minimum of 500 GPS approaches in FY2000.	ATS's new access goal is to improve access to airports in IFR conditions. ATS's new performance targets are to increase the number of runways that are accessible in low visibility conditions by 10 percent over the FY1999 baseline by the end of FY2001, and by 15 percent over the FY1999 baseline by the end of FY2002.

FY2000 Performance Targets	Differences Between FY2000 and FY2001–2002 Targets
Increase System Flexibility	
▪ Reduce the amount of extra flight plan miles associated with ATC preferred routes by 10 percent from 1994 baseline. ▪ Increase the percentage of flight segments flown off of ATC preferred routes to over 80 percent from 1996 baseline.	ATS's new flexibility metric is the number of ATC preferred routes. By the end of FY2001, reduce the number of ATC preferred routes to a level 19 percent below a 1998 baseline of 1,976 routes. The FY2001 target is at or below 1,601 ATC preferred routes. By the end of FY2002, reduce the number of ATC preferred routes to a level 24 percent below a 1998 baseline of 1,976 routes. The FY2002 target is at or below 1,502 ATC preferred routes.
Increase System Predictability	
▪ Monitor the variability in ground movement times, and set a performance target in FY1999.	ATS will continue to monitor monthly variability in ground movement times but has not set a target.
Sustain Operational Availability of NAS Capabilities	
▪ Maintain operational availability of equipment at 99.2 percent overall.	The new metric is the average annual composite availability of reportable facilities required to deliver automation, communication, navigation/landing, surveillance, and weather capabilities. The targets for FY2001 and FY2002 are to sustain the FY1994-1998 average composite availability of reportable facilities.
Increase Productivity	
▪ In previous years, ATS used two productivity metrics: number of aircraft operations per controller; and number of facilities maintained per system specialist.	ATS has modified the productivity metrics. The Air Traffic metric is: Air Traffic activity divided by total Air Traffic workforce. The AF metric is: number of facilities delivering NAS capabilities divided by the total AF workforce.
▪ ATS did not set a productivity target for FY2000.	Both the Air Traffic and the AF targets are to increase productivity by 0.25 percent from the FY1998 baseline by the end of FY2001, and by 0.50 percent by the end of FY2002.
Restore NAS Infrastructure	
▪ This goal was not included in the ATS FY1998-2000 Performance Plan.	There are currently no quantifiable performance targets for this goal.

FY2000 Performance Targets	Differences Between FY2000 and FY2001–2002 Targets
Enabling Process Improvement Using FAA integrated Capability Maturity Model (iCMM)	
▪ This goal was not included in the ATS FY1998-2000 Performance Plan.	By the end of FY2001, selected teams / organizations / systems will achieve FAA-iCMM capability level 2 for specific process areas. By the end of FY2002, selected teams / organizations / systems will achieve FAA-iCMM maturity level 2.
Create a Model Work Environment	
▪ No performance target established.	No performance target established.

Acronym List

A

ACS	Civil Aviation Security, FAA
AAF	Airway Facilities Service
AAT	Air Traffic Service
AF	Airway Facilities, FAA
AFSS	Automated Flight Service Station
AIO	Office of Information Services, FAA
AMASS	Airport Movement Area Surveillance System
ANS	NAS Transition Implementation Service, FAA
AOC	Airline Operations Center
ARA	Office of Research and Acquisition, FAA
ARS	Systems Requirements Service, FAA
ARTCC	Air Route Traffic Control Center
ARTS	Automated Radar Terminal Service
ASC	Office of System Capacity, FAA
ASOS	Automated Surface Observation System
ATA	Airport Transport Association
ATC	Air Traffic Control
ATCSCC	Air Traffic Control System Command Center
ATCT	Air Traffic Control Tower
ATM	Air Traffic Management
ATQ	Independent Operational Test and Evaluation, FAA
ATS	Air Traffic Services, FAA
AVR	Regulation & Certification, FAA
AWOS	Automated Weather Observation System

C

CAS	Cost Accounting System
CCFP	Collaborative Convective Forecast Product
CDM	Collaborative Decision Making
CNS	Communication, Navigation, and Surveillance
COTS	Commercial-off-the-shelf
CPDLC	Controller Pilot Data Link Communications
CRDA	Converging Runway Display Aid
CTAS	Center-TRACON Automation System
CY	Calendar Year

D

DOD	Department of Defense
DOT	Department of Transportation
DP	Instrument Departure Procedures
DSP	Departure Spacing Program
DSR	Display System Replacement

E

EOSH	Environmental and Occupational Safety and Health

F

FAA	Federal Aviation Administration
F&E	Facilities and Equipment
FIS	Flight Information Services
FMS	Flight Management System
FSS	Flight Service Station
FTI/FICS-21	FAA Telecommunications Infrastructure/FAA Integrated Communications System for the 21st Century FY Fiscal Year

G

GA	General Aviation
GNSSP	Global Navigation Satellite System Panel
GPRA	Government Performance and Results Act
GPS	Global Positioning System

H

HOCSR	Host/Oceanic Computer System Replacement

I

ICAO	International Civil Aviation Organization
iCMM	integrated Capability Maturity Model
ICR	Initial Collaborative Routing
IOT&E	Independent Operational Test and Evaluation, FAA
IPDS	Integrated Product Development System
IPT	Integrated Product Team
IRM	Information Resource Management
ITWS	Integrated Terminal Weather System

L

LAAS Local Area Augmentation System

LAHSO Land and Hold Short Operations

M

MAMS Military Airspace Management System

N

NAS National Airspace System

NASSI NAS Status Information

NATCA National Air Traffic Controllers Association

NDC National Data Center

NEXCOM Next Generation Air/Ground Communication

NEXRAD Next-Generation Weather Radar

NIMS NAS Infrastructure Management System

NOCC National Operations Control Center

NRP North American Route Program

O

OASIS Operational and Supportability Implementation System

OCC Operations Control Center

OT&E Operational Test and Evaluation

P

P2R2 Preferred Route Reduction Program

pFAST passive Final Approach Spacing Tool

Q

QAR Quality Assurance Reviews

R

RE&D Research, Engineering, and Development

REGIS Regional Information System

RESTORE Revitalize Existing Structures, Technology, and Operational Resources

RIAT Runway Incursion Action Team

RNAV Area Navigation

RPM Restriction Performance Management

RVSM Reduced Vertical Separation Minima

S

SAMS SUA Management System

SAR Search and Rescue

SMA Surface Management Advisor

SOC Service Operations Centers

STAR Standard Terminal Arrival Route

STARS Standard Terminal Automation Replacement System

SUA Special Use Airspace

SWAP Severe Weather Avoidance Program

T

TDWR Terminal Doppler Weather Radar

TMA Traffic Management Advisor

TRACON Terminal Radar Approach Control

U

URET User-Request Evaluation Tool

V

VFR Visual Flight Rules

VHF Very High Frequency

W

WAAS Wide Area Augmentation System

WARP Weather and Radar Processor