Federal Aviation Administration

FAA's

NextGen

IMPLEMENTATION PLAN

Overview
2008

U.S. Department of Transportation
Federal Aviation Administration

Office of the Administrator

800 Independence Ave., S.W.
Washington, D.C. 20591

June 2008

Dear Members of the Aviation Community:

Without a foundation, there can be no plan. Without a plan, there is no hope for success.

FAA's NextGen Implementation Plan details this agency's efforts to make sure aviation has a firm foundation that addresses both today's front page and a forecast many years into the future. This plan, created with the aviation community's support, is the basis for a series of pivotal investment and policy decisions over the coming years that will shape our future air transportation system.

The effort to focus the United States government and industry on aviation's future was guided by the Joint Planning and Development Office (JPDO). This multi-agency organization developed the vision, building partnerships for success in the process. At FAA, we are building on the plans delivered by the JPDO as we begin to transform NextGen into an operational reality.

The foundational building blocks are in place. We are deploying the basis for satellite surveillance, Automatic Dependent Surveillance-Broadcast (ADS-B). Space-based navigation has demonstrated its ability to save lives, while saving millions in fuel, time and efficiency. Other innovations will deliver similar leaps for pilots and air traffic controllers alike.

This release of the Plan reflects the significant strides made over the past year to solidify NextGen's foundation. We have integrated early deployments and demonstrations of NextGen's capabilities and technologies and are focused on acceleration of these capabilities. Now our task is to build upon this foundation for success. We will continue to accelerate our efforts and to reflect this we will publish the next installment of the NextGen Implementation Plan in January 2009.

If past is a prologue, we know one thing is certain: aviation is resurgent. Even when storms form on the horizon—whether Mother Nature or economic doldrums—aviation finds a route to resurface, to reinvent, to rebound and to continue to grow. Through all of this uncertainty our nation relies on a sound aviation infrastructure: we must ensure NextGen is ready to meet the call.

Robert A. Sturgell
Acting Administrator

This page left blank intentionally.

The Next Generation Air Transportation System (NextGen) is a transformation of U.S. aviation using 21st century technologies to ensure future safety, capacity and environmental needs are met.

The Federal Aviation Administration (FAA) is accelerating the implementation of NextGen because a safer and more efficient National Airspace System (NAS) is so critical to our nation's economy.

This release of FAA's NextGen Implementation Plan reflects a significant shift in focus over the past year. The dialogue within the agency and with our partners has evolved from concept definition to tangible execution planning.

To better convey its mission, the FAA is changing the name of this management plan from the "Operational Evolution Partnership" (OEP) to the more direct "NextGen Implementation Plan". This plan addresses FAA's portion of the work needed to realize NextGen.

We have accelerated early deployments and demonstrations of NextGen's capabilities and technologies. We also recently reorganized our NextGen-related activities to improve integration as we focus on implementation.

The FAA will build upon proven cross-organizational management processes for committing the agency to delivering system improvements and for partnering with aviation stakeholders. These processes, established under the legacy OEP plan, have already put us on track to increase the capacity of the National Airspace System (NAS) by 30 percent by 2013, largely as a result of 11 new runway openings. We believe these processes will lead us again to success with NextGen.

The NextGen Implementation Plan contains firm, fully-funded near-term commitments to new operational capabilities, new airport infrastructure, and improvements to safety, security, and environmental performance. The plan's management process ensures these will be delivered by specific near-term dates. The FAA and its partners are also undertaking research, policy and requirements development, and other activities to assess the feasibility and benefits of additional proposed system changes that could be delivered in the mid-term (2012-2018). The goal of this plan is to turn these proposals into commitments, and to guide them into use.

Since last summer, the FAA has committed to delivering three new NextGen operational capabilities. Two of these provide increased information to pilots:

- **Weather Advisory Information to the Flight Deck via Flight Information Services-Broadcast (FIS-B),** which will increase the amount of weather information available in the cockpit of properly equipped aircraft, starting in Fiscal Year 2009.
- **Expanded Traffic Advisory Services Using Digital Traffic Data via Traffic Information Services-Broadcast (TIS-B),** which provides more information about surrounding traffic directly to the cockpit of properly equipped aircraft, starting in Fiscal Year 2012.

The third new operational capability allows the FAA to manage airspace more safely and efficiently:

- **Air Traffic Control Surveillance Service in Non-Radar Areas via Automatic Dependent Surveillance-Broadcast (ADS-B),** which will use reduced separation standards and improve surveillance in the Gulf of Mexico's non-radar airspace, starting in Fiscal Year 2010.

Working with industry, the FAA has also more completely described 34 additional NextGen mid-term operational capabilities, which are currently being evaluated through research, development and engineering activities. Significantly, through this effort the FAA has clearly identified the capabilities that would require avionics, which will help stakeholders begin to understand the implications for their operations.

To ensure our success, our task is to build upon this foundation. We will continue to accelerate our efforts, and to reflect this we will publish the next installment of the NextGen Implementation Plan in January 2009.

This page left blank intentionally.

Table of Contents

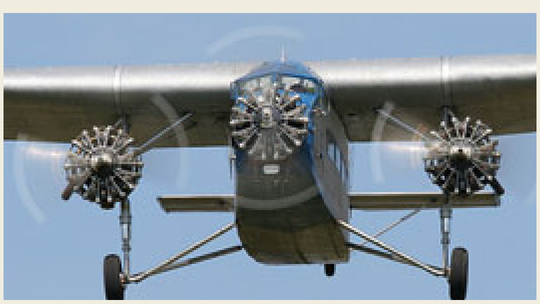
NextGen

This page left blank intentionally.

NextGen is a transformation of the National Airspace System (NAS), including our national system of airports, using 21st century technologies to support aviation's expected growth.

For the FAA, NextGen builds upon aviation's impressive safety record and improves its environmental performance through advanced aircraft capabilities and alternative fuels. It also evolves the way the agency provides air navigation services, in order to support future demand, which is expected to more than double.

With NextGen, FAA's role will transition from air traffic control to air traffic management. Today, the FAA is responsible for safe separation of aircraft, and, in most airspace, directs their movement on the ground and throughout flight. In the future, we will be able to predict an aircraft's trajectory—its position in any given space and time—more precisely than is now possible. FAA will negotiate with users on their preferred flight trajectories prior to and during the flight, so that flow is improved across the entire NAS. For this to be successful, the aircraft must be capable of predicting, communicating, and maintaining its agreed-upon trajectory. Future aircraft will also share responsibility for maintaining separation with other aircraft. As aircraft performance capabilities increase, overall system performance increases. This is critical particularly in our most congested airspace. Successfully achieving NextGen will depend on taking full advantage of capabilities already resident in aircraft, as well as identifying, integrating and implementing additional capabilities to meet NextGen goals.



In some ways, NextGen will return us to the freedom of the earlier days of aviation, when pilots charted their own courses, but with ever greater safety, security and environmental performance.

NextGen leverages aviation's move toward more precise navigation. More accurate and predictable flight paths, along with reduced runway to runway separation standards, will allow for greater flexibility in airport design and enhancement, allowing airports to build runways closer together. This provides new opportunities for expansion and development within existing airport footprints, which otherwise may be constrained by geography and costly land acquisition. Furthermore, precise departure and approach paths avoid environmentally sensitive areas without impacting airport capacity.

In the NextGen system, most communication will be through digital data, much of it transferred directly from computer to computer. Navigation will be satellite based, allowing for flight paths that are more precise than those dictated by today's ground-based infrastructure. Surveillance also will be primarily satellite based, providing full situational awareness of all aircraft to both controllers and equipped pilots. The airspace will be managed dynamically, with air traffic control services not tied to a geographic location. Probabilistic weather and demand information will be integrated into the automation, and aircraft will be able to land in low visibility with minimal supporting airport infrastructure using enhanced vision systems, which allow the flight crew to see through the weather. These changes will allow for "equivalent visual" operations during periods of reduced visibility.

Also in the NextGen environment, relevant information will be shared easily among system users through network-enabled information access. In other words, the right information will be available to the right people at the right time.

The challenge will be in integrating new systems into the foundation of today's NAS, and providing an efficient transition to new ways of providing services. The NextGen Implementation Plan and its supporting processes will guide the agency through this effort.

FAA's NextGen Management Structure

FAA's NextGen Implementation Plan focuses the agency and the aviation community to make firm commitments to implement new operational capabilities in a coordinated, timely fashion.

Within the FAA, NextGen implementation requires cross-agency planning and execution. Three key management structures are responsible for NextGen decision-making and progress monitoring:

NextGen Management Board

The NextGen Management Board, chaired by FAA's Deputy Administrator, takes an "enterprise approach" to developing and executing FAA's NextGen plan. With executives from all key agency lines of business, the Board has the authority to force timely resolution of emerging NextGen implementation issues. The Board's focus includes:

- Measuring the progress of deployments and of key activities that support decision-making.
- Ensuring essential resources are available, including reprioritizing resources as necessary.
- Issuing policies and guidance.
- Identifying specific leaders within their organizations who will be accountable for delivering specific system changes.

NextGen Review Board

The NextGen Review Board, which includes representatives of the key lines of business and staff offices, provides a more detailed assessment of initiatives before the portfolio is presented to the NextGen Management Board. Review Board members are responsible for annual NextGen resource planning, balancing the needs of today with plans for the future. The Review Board secured cross-organizational consensus on the mid-term operational capability definitions presented in this version of the NextGen Implementation Plan, and is expected to address transition planning into the future.

Senior Vice President for NextGen

The FAA's Senior Vice President for NextGen and Operations Planning has primary responsibility for the development and execution of the plan. This organization has three major elements:

- **NextGen Integration and Implementation Office,** which develops and maintains the NextGen Implementation Plan, will be deeply involved in NextGen system integration, monitoring the progress of NextGen development and implementation, and facilitating key collaboration processes.
- **Operations Planning,** which manages FAA's research and technical development, Enterprise Architecture, system engineering, performance modeling, and other key NextGen functions.
- **Joint Planning and Development Office (JPDO),** which, having developed the foundational NextGen documents, will focus on the long-term NextGen vision and on ensuring FAA's alignment with partner government agencies and other stakeholders that contribute to the overall NextGen effort.

NextGen cannot be realized by government's actions alone.

NextGen will require significant commitment from across the aviation community as well.

The FAA and the aviation community must work closely together to develop and prioritize the implementation of new operational capabilities so that benefits are maximized for all parties, especially the U.S. public at large. In our current economic environment, operators must have a firm understanding of requirements and benefits to commit to investments for avionics and training. Advancements that can save fuel and reduce delays must be accelerated because they impact the current environment.

More than anything else, the NextGen Implementation Plan is a promise to FAA's partners, enabling them to plan their future operations with confidence that the agency will provide specific new capabilities by specific dates. The FAA worked with key stakeholder groups to develop our current mid-term operational capability definitions. These stakeholders include:

- **RTCA, Inc.,** which develops consensus-based recommendations for FAA regarding communications, navigation, surveillance, and air traffic management system issues. The facilitator of several Federal Advisory Committees, RTCA serves as industry's voice to the NextGen Implementation Plan. The FAA has coordinated the mid-term operational capability definitions with the aviation community through RTCA's Air Traffic Management Advisory Committee. The team includes representatives of the National Business Aviation Association, Regional Airlines Association, Aircraft Owners and Pilots Association, as well as major airlines and equipment manufacturers.
- **Performance-Based Operations Aviation Rulemaking Committee (PARC),** which is a forum for the U.S. aviation community to discuss, prioritize, and resolve issues; provide direction for the U.S. flight operations criteria; and produce U.S. consensus positions for global harmonization.
- **Research, Engineering and Development Advisory Committee (REDAC),** which ensures that the FAA emphasizes the right types of research at each critical point along the way.
- **JPDO Working Groups,** which are co-chaired by government and industry leads. These groups are expected to continue focusing on targeted tasks that are fundamental to future planning.

Additionally, the FAA has worked closely with the Air Transport Association, the National Business Aviation Association, the Regional Airlines Associates, the Aircraft Owners and Pilots Association, and other key community groups as we have developed this plan.

The FAA continues to work with its Centers of Excellence and other universities to educate the workforce that will ultimately build NextGen. The agency also has established the Commercial Alternative Aviation Fuels Initiative (CAAFI), a partnership between airlines, manufacturers, airports, petroleum firms, and other federal agencies to accelerate the use of alternative fuels for commercial aviation. And most promisingly, the FAA is already working closely with the aviation community to assess NextGen concepts in the field. For more insight, turn to the section on *Demonstrating NextGen Concepts.*

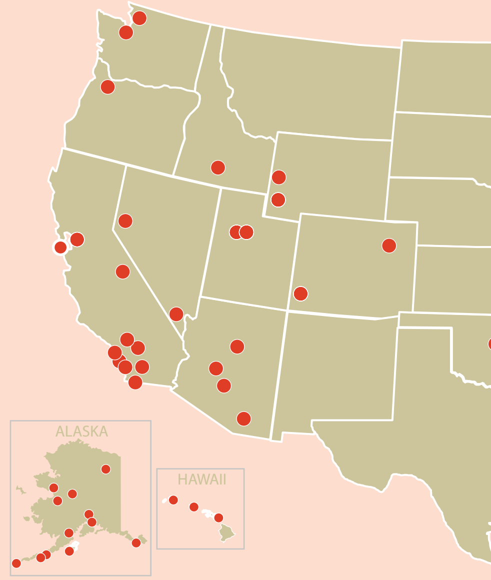
Aircraft Performance Based Mechanisms

Area Navigation (RNAV) & Required Navigation Performance (RNP). RNAV enables aircraft with specified operational performance requirements to fly more cost-effective automated trajectories. RNP introduces the requirement for onboard performance monitoring and alerting. Aircraft and controller performance increases are being realized. In Atlanta, for example, RNAV/RNP procedures have helped increase ATC productivity by 20-30%, which leads to as many as 10 additional departures per hour. Delta has estimated $36M savings annually at that location.

- Introduced 64 published routes and procedures.
- Accelerated implementation at four high priority airports: Dallas-Ft.Worth, Chicago O'Hare, Houston's Bush Intercontinental, and New York's John F. Kennedy.

Wide Area Augmentation System (WAAS) Localizer Performance with Vertical Guidance (LPV) approaches give equipped aircraft a lower cost space-based, ILS-like approach option to runways with published LPV minimums.

- Integrated nine international reference stations.
- Deployed two new geostationary satellites.



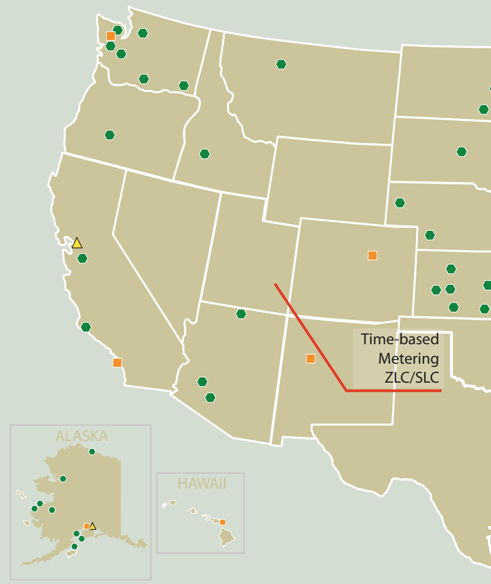
Airspace Capacity

Airspace Design and Improvement. Refining airspace design and procedures that increase use of air traffic management automation are part of our efforts to enhance system capacity, user efficiency and safety.

- Time-based Metering Procedures – four En Route centers.
- Initial Traffic Flow Management – Modernization (TFM-M).
- Airspace Redesign – Chicago.
- Airspace Redesign – New York New Jersey.
- Airspace Redesign – Houston.
- Adaptive Compression tool for the Airspace Flow Program (AFP).
- Advanced Technologies and Oceanic Procedures (ATOP) for the West Atlantic Route System, the Atlantic portion of Miami Oceanic, and the San Juan flight information region.

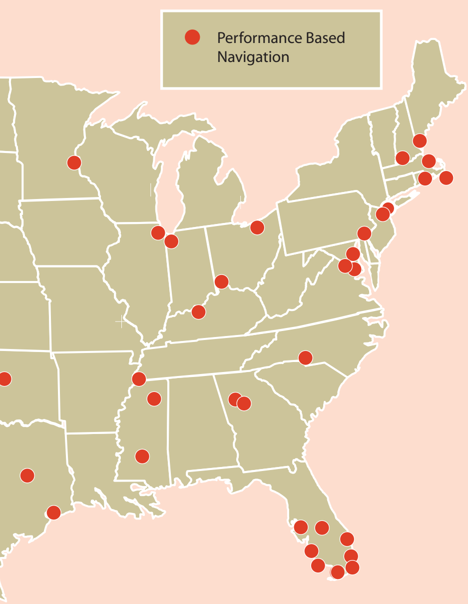
New York Initiatives. The FAA instituted a special office to focus attention on the airspace around New York. Partnering with industry, the FAA convened an Aviation Rulemaking Committee (ARC) that resulted in more than 70 recommended initiatives aimed at reducing delays here.

- De-conflict Newark arrivals over SHAFF intersection.



Airport Capacity

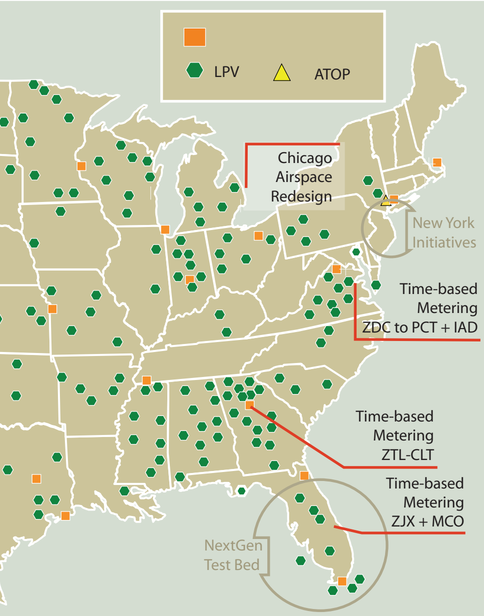
The largest capacity improvements for airports, building new runways and taxiways, require significant lead time (10-15 years) and substantial investment. NextGen technologies will allow greater design flexibility with closer simultaneous landing separations. Surface automation technology will improve situational awareness for all operators as well as lead to greater surface movement efficiencies.



- Published over 325 LPV approaches.
- Aug 08 – the number of LPV approaches expected to surpass the number of ILS approaches.

Optimized Profile Descent (OPD). These arrivals (also known as Continuous Descent Arrivals, or CDAs) provide the operator the ability to fly the aircraft's optimal vertical profile with a continuous descent. The FAA is currently designing, modeling, evaluating, and demonstrating procedures that accommodate OPD at several facilities in an effort to reduce noise and emissions, as well as increase fuel efficiency (estimated to be 100M gallons annually if implemented nationwide).

- Implemented one Standard Terminal Arrival Procedure (STAR) at Los Angeles that accommodates OPD (used by 25% of LAX traffic). Expected to implement two more STARs in July 2008 that will increase OPD availability to 50% of LAX traffic.
- Designed one STAR OPD procedure for San Diego, expected to be published in Nov 2008, that will be available to 50% of the traffic.
- RNAV STAR procedures designed for optimum profiles are available at six OEP airports.



- Simultaneous Visual Approaches to Runway 4L/R at Newark.
- Enhanced procedures for Caribbean arrivals.
- New procedures to allow arrivals to Runway 29, while landing Runway 4R at Newark.
- Simultaneous Approaches to Runways 31L/R at JFK.
- Accessing J134/J149 from ELIOT Intersection.

Improved ILS Runway Visual Range (RVR) Landing Capabilities. Due to advances in aircraft equipage and improvements in ILS ground system performance, the FAA was able to safely reduce landing visibility minimums, enhancing capacity and reducing the number of aircraft diversions.

- Reduced the required approach RVR from 2400 to 1800 feet for properly equipped aircraft (271 approaches at 190 airports).
- Authorized Category (CAT) II approach minimums to runways with CAT I ILSs that meet CAT II ILS performance criteria for properly equipped aircraft (three complete and 37 in progress).
- Reduced the minimum RVR required for takeoff on runways without centerline lighting from 1600 to 1000 feet (370 runways at 99 airports).
- Harmonized FAA takeoff minimums with European Joint Aviation Authority standards, reducing the RVR minimums required for takeoff from 600 to 500 feet.

- New Center Taxiway at Los Angeles, completing the airport's south airfield reconfiguration project that increases safety
- Airport Surface Detection Equipment – Model X (ASDE-X) declared operational at four sites this year to date. This enhanced surface surveillance provided by the 12 total deployed ASDE-X systems has reduced airport delays by one million minutes nationwide.

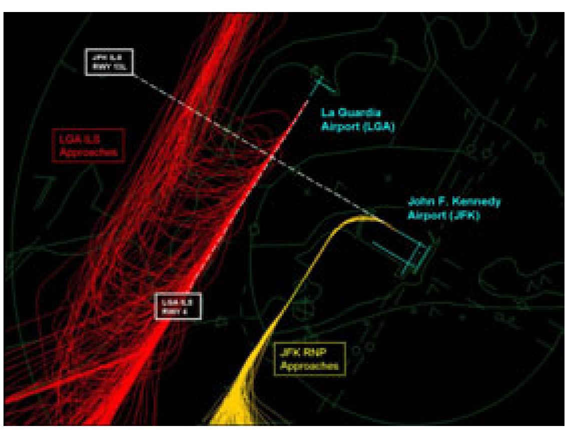
With oil prices at historic levels, some airlines are courting merger deals and others are leaving the market entirely. Meanwhile, the traveling public is bracing for another summer of delays, making it clear that the aviation industry needs relief sooner rather than later.

In February 2008, Secretary of Transportation Mary Peters challenged the FAA and its partner agencies to move aggressively to implement NextGen capabilities into the NAS. In response, the FAA accelerated existing commitments, targeting implementation in regions with the greatest delays.

Prioritizing Ongoing Efforts

The FAA is adjusting ongoing efforts to address the most urgent needs in the NAS today. The FAA has committed to deploying Airport Surface Detection Equipment, Model X (ASDE-X) to all 35 OEP airports by 2010. In the near-term, ASDE-X is considered a runway safety tool. The FAA is currently conducting demonstrations to expand this capability and provide efficiency benefits as well *(see next page)*.

The FAA also has prioritized the pipeline of Area Navigation (RNAV) procedures and routes and Required Navigation Performance (RNP) procedures to bring benefits sooner to the greater New York area as well as to Chicago and Dallas by deconflicting runways that are currently constrained by close placement of airports in these cities.



To access JFK's Runway 13L in low visibility, flights have used an Instrument Landing System approach, which intersects with LaGuardia traffic. As a result, this runway is under-utilized in those conditions. By using a new approach procedure, flights can bypass this traffic and increase capacity at JFK.

Chicago and New York

Because of the airports' proximity, air traffic routes for Chicago's O'Hare and Midway can interfere with one another. When visibility conditions require Midway to land flights on Runway 13C, O'Hare must stop using its Runway 22L for departures and Runway 14R for arrivals. In this situation, the two airports take turns stopping flights for periods of time to allow traffic in and out. Combined, this causes 60,000 minutes of departure delay and 65,000 minutes of arrival delay annually, and nearly 250 arrival and departure cancellations.

This year the FAA implemented a curved, vertically guided approach for Midway Runway 13C, which deconflicts this arrival stream from O'Hare departures on 22L. The agency estimates it will reduce arrival and departure delays by 2,000 hours annually. The approach requires both aircraft and the flight crew to be authorized to use the procedure; it has been published and is awaiting authorized users.

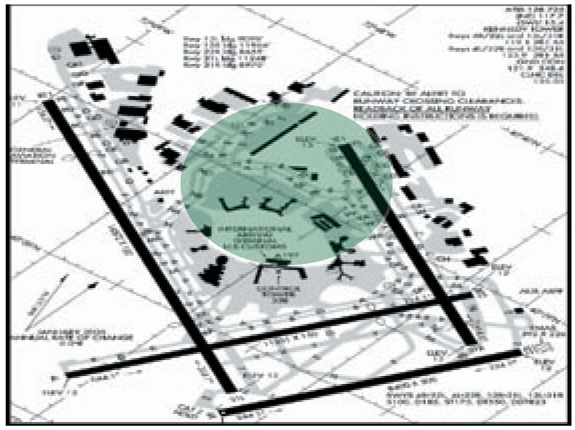
Likewise, in New York, a similar approach at John F. Kennedy International Airport allows greater use of Runway 13L for arrivals during bad weather. This airspace had previously conflicted with LaGuardia traffic. JetBlue is currently using this new procedure.

Dallas

Aircraft with advanced navigation systems can also make use of more efficient departure routes. Curved radius to fix RNAV departure procedures reduce the distance flown; 45 percent of today's commercial aircraft have the ability to use these procedures. When implemented at Dallas-Fort Worth International Airport, this procedure is estimated to provide $1 million in fuel savings annually.

The FAA has established an integrated demonstration capability in Florida where, working with a wide range of partners, the agency is evaluating NextGen concepts by leveraging existing technologies and testing prototypes.

Florida is an optimal location for the NextGen integration activities due to its robust mix of general aviation, business, and commercial traffic. This includes high-density operations at airports like Miami International; oceanic traffic with well-equipped domestic and international aircraft; consistent convective weather; and partners eager to engage in a real-world exploration of NextGen concepts. The resulting data, from Florida and other demonstration sites like Denver, will be used to evaluate integration and deployment issues.



ASDE-X has been deployed at 12 airports, with futures plans for 35 additional airports by 2010. At the JFK demonstration, ASDE-X will improve safety for airlines by providing surface information into the ramp area.

Modernizing Traffic Management on the Airport Surface

Demonstrations at John F. Kennedy International Airport (JFK), August 2008

Increased shared situational awareness is a NextGen hallmark for advancing the efficiency and environmental performance of U.S. airports. In 2007 alone, aircraft in the U.S. spent more than 63 million minutes taxiing to their gates, and more than 150 million minutes taxiing out for departure. Taxiing aircraft burn fuel and contribute to surface emissions of carbon dioxide, hydrocarbons, nitrogen oxides, sulfur oxides, and particulate matter.

In recent years, airlines have begun to purchase surface management systems for their own use at key airports. These systems provide decision support capabilities to improve the efficiency and flexibility of airport surface traffic management. Over the next two years, the FAA will prototype a surface decision support system for high-density airports that could combine data from these systems and from FAA automation systems, enhancing collaboration among air traffic control, the airport, operators, and the Department of Homeland Security.

Surface management systems draw information from ASDE-X, as well as from airline ramp sensors, and share information via data management tools. Use of such systems can be expanded to additional airports by substituting ADS-B data for ASDE-X data. While ADS-B is used most frequently as a surveillance tool for safe separation of aircraft in transit, the benefits of using it for more efficient surface operations could be an incentive to some airlines for early equipage of their fleet.

The project will examine a method for sharing airport information such as queue length and predicted takeoff time, and operator information such as gate location, predicted pushback time, and dispatch status, through a data network that would be available to all relevant parties at a given airport. This real-time view of the movement of aircraft and other vehicles at gates, ramps, taxiways, and runways would improve the flow of traffic on the surface, which, in turn, also could improve airspace efficiency by providing a predictable stream of traffic on and off the runways. The FAA estimates this may save 2.8 million minutes of annual delay, with fuel savings in the order of $40 million annually, resulting in both an economic and environmental benefit. Initial testing of this concept has been underway at Memphis International Airport with FedEx and is being expanded to include other airlines. Deployment of ASDE-X at JFK is being accelerated, and additional demonstrations will commence later this year at both JFK and Orlando International Airport.

Demonstrating NextGen Concepts

Improving Flight Efficiency at Airports

The FAA is developing a tool box of enhanced arrival capabilities that may be implemented at a variety of airports. Many of these tools would decrease fuel consumption, thereby reducing cost and engine emissions that impact local air quality and contribute green house gases. The tool box also considers procedures that may be modified to regain airport capacity that is lost today due to low-visibility weather conditions.

Optimized Profile Descent (OPD) is an umbrella term for environmentally-friendly and energy-efficient aircraft arrival procedures aimed at improving operations while reducing fuel consumption, engine emissions, and noise, with minimal impact to operations. They have also been referred to as Continuous Descent Arrivals and Tailor Arrivals, each of which is a slight variation on the overall concept. To fly these new procedures, aircraft descend from an en route altitude with minimum thrust, avoiding the inefficiencies of level flight at low altitudes to the extent permitted by the safe operation of the aircraft, and in compliance with published procedures and air traffic control instructions.

OPD procedures keeps an arriving aircraft at its more operationally efficient cruise altitude as long as possible before beginning the descent to destination. Today's standard arrival flight path typically includes a series of stepped descents. By comparison, the aircraft executing an OPD descends from cruise altitude (at top-of-descent) to the final approach using low or idle thrust. Using the aircraft's flight management computer and modern RNAV capabilities, the OPD procedure descends and turns without requiring a change in thrust settings. OPDs enable significant noise and emissions reductions, demonstrations have shown.

AIRE and ASPIRE: International partnerships for "greening" aviation

Introduced in 2007, the Atlantic Interoperability Initiative to Reduce Emissions (AIRE) program is an international government, airline, and industry initiative to minimize aviation's global environmental impact. The AIRE program is working to accelerate the development and implementation of oceanic procedures that result in environmentally friendly operations such as reduced emissions and noise. Flight trials in 2008 are testing new capabilities for airport surface operations, tailored arrivals and trans-oceanic flights *(see main text)*. In 2009, the AIRE program will focus on expanding the partnership to include additional U.S. and European stakeholders.

The FAA has formed a similar working agreement with Airservices Australia and Airways New Zealand. This new partnership, called the Asia and South Pacific Initiative to Reduce Emissions (ASPIRE), will support new air navigation technologies and procedures in the Pacific Oceanic environment to reduce fuel burn and carbon dioxide emissions. ASPIRE plans to showcase the region's leadership in global aviation emissions reductions and its commitment to advancing the implementation of ASPIRE along key Asian and South Pacific routes.

Continuous Descent Arrivals

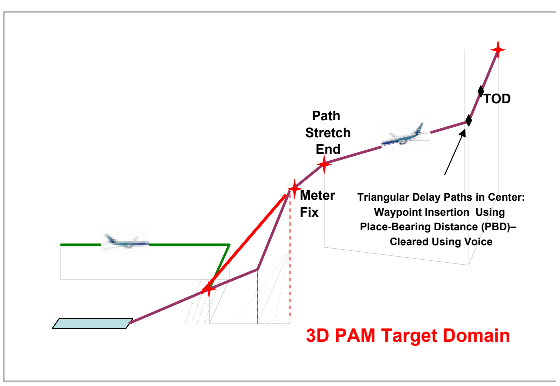
Flight Trials at Hartsfield-Jackson Atlanta International Airport (ATL), May 2008

Flight Trials at Miami International Airport (MIA), June 2008

Early implementation of Continuous Descent Arrival procedures has already occurred at Los Angeles International Airport, Phoenix Sky-Harbor International Airport and others. These initial procedures are RNAV Standard Terminal Arrivals (STARS) that incorporate altitude constraints or windows that allow most aircraft equipped with flight management systems to fly a continuously descending arrival path. Implementation of these procedures are continuing at additional locations.

Additional demonstrations were recently conducted in May at Atlanta with airline leadership provided by Delta Airlines, and at Miami with airline leadership provided by American Airlines. These examined how to incorporate these procedures into high-density operations. The next phase of the project will start in September. Results of the Atlanta and Miami demonstrations will be used by FAA and European officials to determine the benefits and trade-offs of implementing these procedures at more airports throughout the U.S. and Europe.

In our demonstrations, the estimated benefits in fuel savings per arrival were in the range of 50-135 gallons (or just under 1%). With the prices of jet fuel, the cumulative savings will be significant in an economic as well as environmental sense.



The 3D PAM concept integrates a new automation decision support tool into today's Traffic Management Advisor system that would provide controllers with optimal flight path advisories to the metering fixes surrounding larger airports. 3D PAM is expected to more predictably deliver aircraft to the airport.

Three-Dimensional Path Arrival Management

Simulations, September 2008

Flight Trial at Denver International Airport (DEN), September 2009

Significant congestion exists today in the arrival and departure streams of many medium and large airports. The FAA currently uses traffic flow management procedures such as ground stops, traffic diversions, and miles-in-trail restrictions to mitigate this congestion. Though tactically effective, these techniques ultimately diminish the capacity and efficiency of affected airports. The Three-Dimensional Path Arrival Management (3D PAM) demonstration will test an OPD that delivers aircraft from the top of descent to a metering fix with greater predictability. The concept integrates a new automation decision support tool into today's Traffic Management Advisor (TMA) system that would provide controllers with optimal flight path advisories to the metering fixes surrounding larger airports. This, in turn, would allow controllers to provide a conflict-free, fuel-efficient clearance so that the aircraft will arrive at the fix at the scheduled time of arrival. While the demonstration will feature clearances delivered by voice, the ideal use would have the clearance sent directly to the aircraft's flight management system via Data Communication. This demonstration will be conducted in partnership with National Aeronautics and Space Administration (NASA) Ames Research Center, Boeing, Sensis, Continental Airlines, and American Airlines.

Tailored Arrivals

Flight Trial at MIA, September 2008

The CDA procedure developed for Miami will also be incorporated into another OPD demonstration called Tailored Arrivals, scheduled for late 2008. The Tailored Arrival seeks to optimize an individual aircraft's arrival flight path horizontally and vertically, and will build upon prototype demonstrations conducted at San Francisco International Airport with United Airlines earlier this year. This demonstration will integrate automation tools and Data Communications to provide a cleared trajectory path, which will be uplinked to the aircraft and flown by its flight management system with pilot concurrence. The FAA will partner with NASA's Ames Research Center, the Boeing Company, Sensis Corporation, and American Airlines, for this project.

Increasing Airspace Efficiency

Airspace constraints can limit the use of available runway capacity and cause unnecessary delay, fuel burn and emissions. The FAA is pursuing new ways of building and managing airspace.

Predictive Weather Demonstration

FY09: Initial system concept demonstration at Daytona Beach International Airport (DAB)

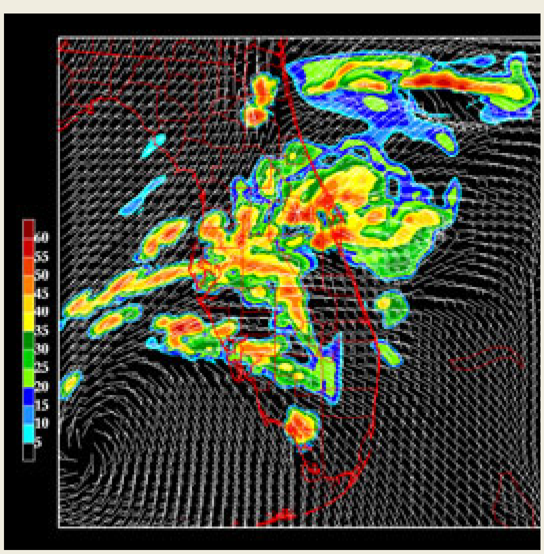
The FAA will work with a consortium of organizations (Lockheed Martin, Jeppesen, Sensis Corporation, Computer Sciences Corporation, Ensco, Embry-Riddle Aeronautical University, and the Daytona Beach International Airport) to develop a prototype “Airport of the Future.” The integrated airport project, to be implemented over a three-year period, will showcase emerging technologies in safety, security, capacity, and overall efficiency for the next generation of airports. Initially, the FAA plans for a System Wide Information Management (SWIM)-enabled demonstration of Predictive Weather integrated into TMA. SWIM is an information technology program that will ensure interoperability between NAS systems, improving operational decision-making because it will be easier to share data between systems. The intent is to demonstrate improved decision making to reduce the impact of weather on the arrival flow.

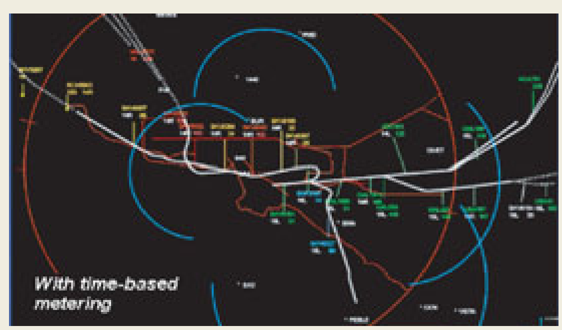
Oceanic Enhancements

Flight Trial at MIA, May 2008

In May 2008, the FAA initiated a series of trans-Atlantic flight demonstrations to test and validate the benefits for improved oceanic flight trajectories. These demonstrations establish environmentally-friendly operations and reduce overall fuel consumption for oceanic flights. By optimizing trajectories and leveraging existing technologies, oceanic flights can take advantage of user-preferred and more fuel-efficient routes. These routes may conserve operator and service provider resources, and have the potential to significantly reduce the environmental footprint over the ocean. These oceanic demonstrations are part of the Atlantic Interoperability Initiative to Reduce Emissions (AIRE) program *(see page 14)*.

Trans-Atlantic flight trials, conducted May 19-28, 2008, were made possible through a partnership among FAA, NAV Portugal, the European Commission, and Air Europa. The flight trials used a selected number of Air Europa revenue flights. These flights took off from Madrid, Spain, and flew through Santa Maria, New York, and Miami oceanic airspace to various destinations in the Caribbean. During the flights, Air Europa's Airline Operation Center, New York's Air Route Traffic Control Center and Portugal's Santa Maria Center used existing oceanic technologies to periodically improve flight trajectories, saving fuel and emissions. The results of these demonstrations will help accelerate the development of improved oceanic operational procedures and standards on both sides of the Atlantic Ocean.





The Predictive Weather Demonstration will use the System Wide Information Management system to integrate weather information into Traffic Management Advisor (above). The test will evaluate how this improves decision-making and improves arrival flows in poor weather.

Leveraging the Potential in Today's NAS

Initially, NextGen aims to extract the most benefit out of the tools—on the ground and onboard aircraft—that are already at our disposal. The NextGen concepts under evaluation build on NAS systems such as:

Airport Surface Detection Equipment, Model X (ASDE-X)

ASDE-X is a runway safety tool that can provide efficiency benefits as well. It uses data from surface movement radar located on the air traffic control tower or remote tower, multilateration sensors, ADS-B, the terminal automation system, and aircraft transponders. By fusing the data from these sources, ASDE-X is able to determine the position and identification of aircraft and transponder-equipped vehicles on the airport movement area, as well as of aircraft flying within five miles of the airport.

Controllers in the tower see this information presented as a color display of aircraft and vehicle positions overlaid on a map of the airport's runways, taxiways and approach corridors. The system creates a continuously updated map of the airport movement area and contains safety logic that controllers use to spot potential conflicts. It is especially helpful to controllers at night or in bad weather when visibility is poor. The agency is also pursuing additional lower cost alternatives for smaller airports that have need for safety and efficiency improvements.

Area Navigation (RNAV) and Required Navigation Performance (RNP)

RNAV and RNP are two of the components of performance-based navigation. RNAV enables aircraft to fly on any desired flight path within the coverage of ground- or spaced-based navigation aids, within the limits of the capability of the self-contained systems, or a combination of both capabilities. As such, RNAV aircraft have flexibility for point-to-point operations. RNP is RNAV with the addition of an onboard performance monitoring and alerting capability. The defining characteristic of RNP is the ability of the aircraft navigation system to monitor the navigation performance and inform the crew if the requirement is not met during an operation. This onboard monitoring and alerting capability enhances the pilot's situation awareness and can enable reduced obstacle clearance requirements or closer route spacing without intervention by air traffic control.

Traffic Management Advisor (TMA)

TMA helps optimize the flow of arrivals to an airport. TMA computes the estimated time of arrival (ETA), the sequences and scheduled times of arrival (STA) to the outer meter arc, meter fix, final approach fix and runway threshold for each aircraft to meet sequencing and scheduling constraints entered by the Traffic Management Coordinators. This information is presented to controllers by graphical displays and alerts, increasing situational awareness. TMA generates statistics and reports about the traffic flow for use by Traffic Management Coordinators. TMA also assigns each aircraft to a runway to optimize the STA. TMA continually updates its results at a speed comparable to live radar updates in response to changing events and controller inputs. Demonstrations that will occur in 2008-2009 for this technology will include adding predictive weather into the system.

Traffic Flow Management – Modernization (TFM-M)

TFM-M improves the FAA's ability to manage the efficient flow of traffic through the NAS. It encompasses modernization of the TFM infrastructure as well as the addition of new collaborative air traffic management technologies. The automation and communication mechanisms provided by the TFM system support the decision making process that ultimately impacts routes and flight schedules for all NAS users. The TFM system enables traffic managers and flight operations centers to use common data and automation to collaborate and generate daily traffic flow strategies that balance FAA responsibilities while preserving the economic flexibility afforded to the customer.

Organization of the Plan

The NextGen Implementation Plan takes a holistic approach to addressing the future needs of U.S. aviation. To meet expected demand, we need proactive and coordinated changes to airports, to air traffic management services, and to the aircraft.

The NextGen Implementation Plan is divided into domains representing those three key areas. Each domain may be further divided into Solution Sets, which group related transformative activities. The Plan lists agency commitments to new operational capabilities, new airport infrastructure, and improvements to safety, security, and environmental performance.

The FAA and its partners are also undertaking research, policy and requirements development, and other activities, to assess the feasibility and benefits of additional proposed system changes that could be delivered in the mid-term (2012-2018). The goal of this plan is to turn these proposals into firm commitments, and to guide them into use. Our progress in each domain is described in subsequent sections.

Airport Development Domain

Though NextGen is often thought of as a series of changes to air traffic systems and operations, meeting aviation's future capacity and efficiency demands will continue to call for improvements to airport infrastructure. NextGen operational changes, particularly to runway separation standards, will allow different development opportunities in the future, like building new runways closer together. Doing so could increase the use of existing airports that are geographically constrained. Both solution sets in this domain include activities to relieve pressure on today's most congested airports, including those in New York and Chicago.

- **OEP 35 Airports,** which describes airfield improvements under construction or under consideration at the nation's busiest airports, through which 73 percent of passengers flow annually.
- **OEP Metropolitan Areas,** which focuses on planning improvements for systems of hub and supporting airports in what are expected to be the most congested areas of the country within the next two decades. The intention of this effort is to marry airfield improvements with NextGen operational changes to create the required capacity.

Air Traffic Operations Domain

NextGen calls for a transformation of the way we communicate, navigate, and track flights. More modern tools will allow us to manage air traffic more efficiently, create greater capacity where needed, and offer better access to all users. NextGen's goal is to make U.S. aviation ever safer and more environmentally friendly, while supporting our nation's security objectives. The NextGen Implementation Plan breaks its operational capability and supporting policy and standards into seven solution sets within this domain:

- **Initiate Trajectory-Based Operations,** which focuses primarily on advancements in en route cruise operations, although the effects of the trajectory-based operations will be felt in all phases of flight.
- **Increase Arrivals/Departures at High Density Airports,** which captures operational capabilities that will improve the capacity, efficiency and safety at the nation's busiest airports and surrounding airspace.
- **Increase Flexibility in the Terminal Environment,** which includes additional capabilities that will improve performance at a broader range of airports.
- **Improve Collaborative Air Traffic Management,** which focuses on delivering new tools for planning flight operations and managing traffic flows.
- **Reduce Weather Impact,** which improves the way we access and use weather information.
- **Improve Safety, Security and Environmental Performance,** which describes a series of initiatives that underpin the delivery of the operational capabilities.
- **Transform Facilities,** which considers the optimal configuration of NAS facilities.

Aircraft & Operator Requirements Domain

As the roles and responsibilities of aircraft systems and the operator evolve, maintaining operational safety is a challenging and pervasive objective. This domain will define the performance requirements that aircraft and operators must meet to participate in NextGen. By collating the aircraft- and operator-related expectations of FAA's near-term commitments along with the mid-term capabilities described in other solution sets, the agency can better assure that required safety and standardization activities are accomplished in a timely manner. As planning matures, this domain will provide sufficient detail on aircraft capabilities that will allow manufacturers and operators to identify related avionics investments and plan a logical migration for their aircraft.

NextGen Implementation Plan Online Content

The Plan's details are fully described in Smart Sheets posted on the NextGen Implementation Plan Web site, *www.faa.gov/nextgen*. Each Smart Sheet consists of the following information:

- **Background:** Describes the problems in the current air traffic control system that this solution set aims to resolve.
- **Operational Description:** Describes how a given NAS environment would evolve.
- **Commitments:** Defines the near-term operational commitments, which are fully-funded program activities with well-defined implementation dates.
- **Near-Term Demonstrations:** Describes demonstrations and flight trials related to this solution set.
- **Timeline:** Depicts the delivery timeframes for the near-term commitments and proposed operational capabilities.
- **Benefits:** Provides a qualitative assessment of benefits received by implementing the operational capabilities.
- **Dependencies:** Identifies key technologies, programs, avionics, policies, or other considerations on which the success of this solution set hinges.
- **FY09 Key Enabling Activities:** Provides the programmatic activities that are needed to implement the near-term activities and mid-term capabilities. Additional details can be found in FAA's FY09 Capital Investment Plan.
- **FY09 Key Research:** Details relevant FY09 research needed to implement the mid-term and far-term capabilities. Additional details can be found in FAA's 2008 National Aviation Research Plan.
- **Mid-Term (2012-2018) Operational Capability Descriptions:**
  - *Needs/Shortfall:* Describes the operational shortfall that this capability is intended to address.
  - *Operational Concept:* Describes how the capability would be used in an operational environment. Addresses changes in roles and responsibilities experienced on the ground and in the air, in addition to policies, procedures and airspace changes.
  - *Aircraft & Operator:* Describes the impact on the aircraft and operator.
  - *Design/Architecture:* Describes the technology solution for this capability, if any. Additional details can be found in FAA's NAS Enterprise Architecture.
  - *Key Enabling Programs:* Lists infrastructure changes and key decisions that will affect committing to the capability (per the NAS Enterprise Architecture).
  - *Dependencies*: Lists other activities that this capability requires for implementation.
  - *Benefits:* Describes qualitative benefits in terms of capacity, safety, efficiency, environment, productivity when a capability is implemented.
  - *Initial Operational Capability:* Provides the timeframe for the initial availability of this capability in the NAS.
  - *Champions:* Identifies an accountable FAA person and/or a user person who will champion this capability through its lifecycle, if applicable.

A sample of a mid-term operational capability description can be found on page 28.

The commitments and proposed operational capabilities described in this plan will result in a NextGen mid-term system with significantly improved operations that target key problems in the system.

The FAA is targeting three improvement themes in the mid-term:

- Providing more landing and takeoff capacity at airports
- Reducing airspace and taxi constraints to using landing and takeoff capacity
- Better handling of uncertainty in the system.

Some of these improvements do not involve avionics; others make use of avionics that are commonly available today. Others involve new advanced avionics that are just coming into the fleets. The aviation community has made it clear that they want maximum advantage taken of existing avionics, and FAA's proposed mid-term state does that. All avionics associated with capabilities are optional: if an operator wants to take advantage of the benefits of an avionics based capability, it must equip, but it doesn't have to.

The proposed operational capabilities that would enable these benefits are defined later in this section. More detail on the optional equipage that is needed to get benefits from capabilities appears in the detailed online plan.

Providing more landing and takeoff capacity

New capacity allows aviation demand to be met with fewer delays and with less fuel and emissions per flight. This plan continues to support new runways as a primary source of additional capacity. In addition, there are a number of non-concrete capacity improvements. Revised wake separation standards for closely space parallel runways and new wind based wake procedures on departure will both increase capacity; neither of these require any avionics. For appropriately equipped aircraft, a number of improvements *(shown in the table below)* will help with runway capacity, either in certain weather situations or in certain closely spaced parallel runway situations.

Reducing airspace and taxi constraints to using landing and takeoff capacity

Airspace and taxi constraints can limit the use of available runway capacity and cause unnecessary delay, fuel burn and emissions. The proposed mid-term capabilities will improve flows to runways. Airspace will be redesigned, more T-routes will provide better passage of general aviation aircraft through busy terminal airspaces, and more RNAV procedures will provide more efficient and predictable routing.

Integrated Arrival/Departure Management provides new, improved and additional routing for flights. Participating aircraft will be required to equip with a suitable RNAV system. Also, late in the mid-term, Time Based Metering Using RNP/RNAV Route Assignments will improve the metering function in the transition airspace if enough people are equipped.

In the en route airspace, Flexible Airspace Management will allow airspace to be better allocated to demand. Automation based capabilities such as conflict resolution advisories, metering to points in space (instead of just to airports), and other tools to help manage more diverse fleets and more complex traffic situations will improve operations. For those who are appropriately equipped, benefits will be available for early optimized profile descents, RNAV and RNP routes, and limited delegated cockpit responsibility for separation.

In the oceanic and offshore airspaces benefits are provided for those who are appropriately equipped.

Avionics-based Runway Capacity Improvements

- New closely-spaced parallel runway capability
- Enhanced flight vision, lowering minimum decision height
- Additional LPV and RNP approaches
- Providing GBAS precision approaches
- Lowering ceiling for WAAS-based approaches to 200 feet

Oceanic track entry will be made more flexible and in trail climbs and descents will be provided; both of these assume FANS-equipped aircraft, but require no other new avionics. Appropriate navigation capabilities will allow users to benefit from 50 nautical miles lateral separation in West Atlantic Route Systems (WATRS) and Anchorage oceanic airspace. ADS-B Out-equipped aircraft will benefit from radar-like separation in the Gulf of Mexico.

Surface traffic management system capabilities will be introduced. For those equipped, digital taxi clearances will be available to reduce errors and workload.

Better handling of uncertainty in the system

There will always be some uncertainty in the aviation system, whether from unpredicted weather events, a problem that temporarily closes a runway or taxiway, a maintenance problem with an aircraft or air traffic control equipment, or a sudden freeing/closing of Special Use Airspace (SUA). Better handling of such uncertain events can provide significant benefits to the aviation community. These benefits include improved throughput, efficiency, predictability and fuel use and emissions.

Incorporating weather information into en route, terminal, and flow management decision support systems will be a key improvement. New and improved functionality in flow management automation will include the Airspace Flow Program and Reroute Impact Assessment. A big step in improving the handling of uncertainty will be the "Go Button"; this capability identifies flight specific flow resolutions and sends them to the appropriate person for execution. Security and incident management systems and procedures will be enhanced and evaluations of flow programs will occur automatically during the execution day.

One of the key ways to improve system performance in the face of uncertainty is to make better information available to more stakeholders more quickly and to use that information to their benefit. Integrating surface data into flow management tools is one key improvement. This will provide improved estimates of down-stream demand which will allow more appropriate flow decisions. In addition, Full Flight Plan Constraint Evaluation with Feedback will identify to flight plan filers, the expected problems with that flight plan when they file it and will update them as those expectations change. Filers can choose to try to address those constraints themselves (for example through rerouting or changing flight times) or they can choose to let the system resolve the constraints for them according to the system's algorithms. On Demand NAS Information will provide more and improved National Airspace System information more quickly and in more ways. Better SUA status information will also be available through improved automation, procedures and communication. If equipped with FIS-B, SUA status and portions of the NAS status information can also be available in the cockpit. Weather and traffic information will also be provided directly to the cockpit through Surveillance Based Services improvements, if equipped.

As was shown earlier in the document, ASDE-X will provide improved information primarily at OEP airports. Additional improvements to surface surveillance are also planned. For those equipped, surface moving map information will improve taxi operations and safety.

The following sections of this document explore the work FAA has underway to realize this mid-term system.

The airport capacity development cycle averages ten years from initial planning to project commissioning. The FAA is assessing where demand on the ground will grow most dramatically, and is working to introduce new NextGen concepts into airport planning today.

OEP 35 Airports

On September 25, 2008, Chicago O'Hare will commission a 2,856-foor runway extension of existing 9R/27L, which will be redesignated 10L/28R. On November 20, 2008, two additional runways will open at OEP airports, at Washington Dulles and Seattle-Tacoma. With these three projects, the agency and local communities will deliver to the NAS the potential to accommodate an additional 305,000 airport operations per year, an extraordinary accomplishment.

In addition, there are four other airfield projects at OEP airports (runways at Philadelphia and Charlotte and taxiways at Dallas-Ft. Worth and Boston) under construction. These projects will be commissioned by 2010 and will provide these airports with the combined potential to accommodate an additional 80,000 annual operations, reduce delays, and improve efficiency.

Planning for Future Needs

To meet growing demand, the FAA and local stakeholders must continue to pursue new airfield infrastructure that provide significant capacity, efficiency, and safety improvements. Currently, there are environmental impact studies for proposed runway extensions at Fort Lauderdale International Airport and Portland International Airport, as well as an airfield reconfiguration at Philadelphia International Airport. Houston's Bush Intercontinental Airport is expected to begin the environmental process this year to examine alternatives to increase runway capacity. Salt Lake City International Airport is expected to begin an environmental study within the next few years to examine the impact of a runway extension. Looking forward, when O'Hare's third project in Phase 1 (Runway 10C/28C) is completed, which is anticipated in late 2011, the airport will begin to consider Phase 2. Phase 2 includes construction of two runways, one runway extension, and three terminal buildings.

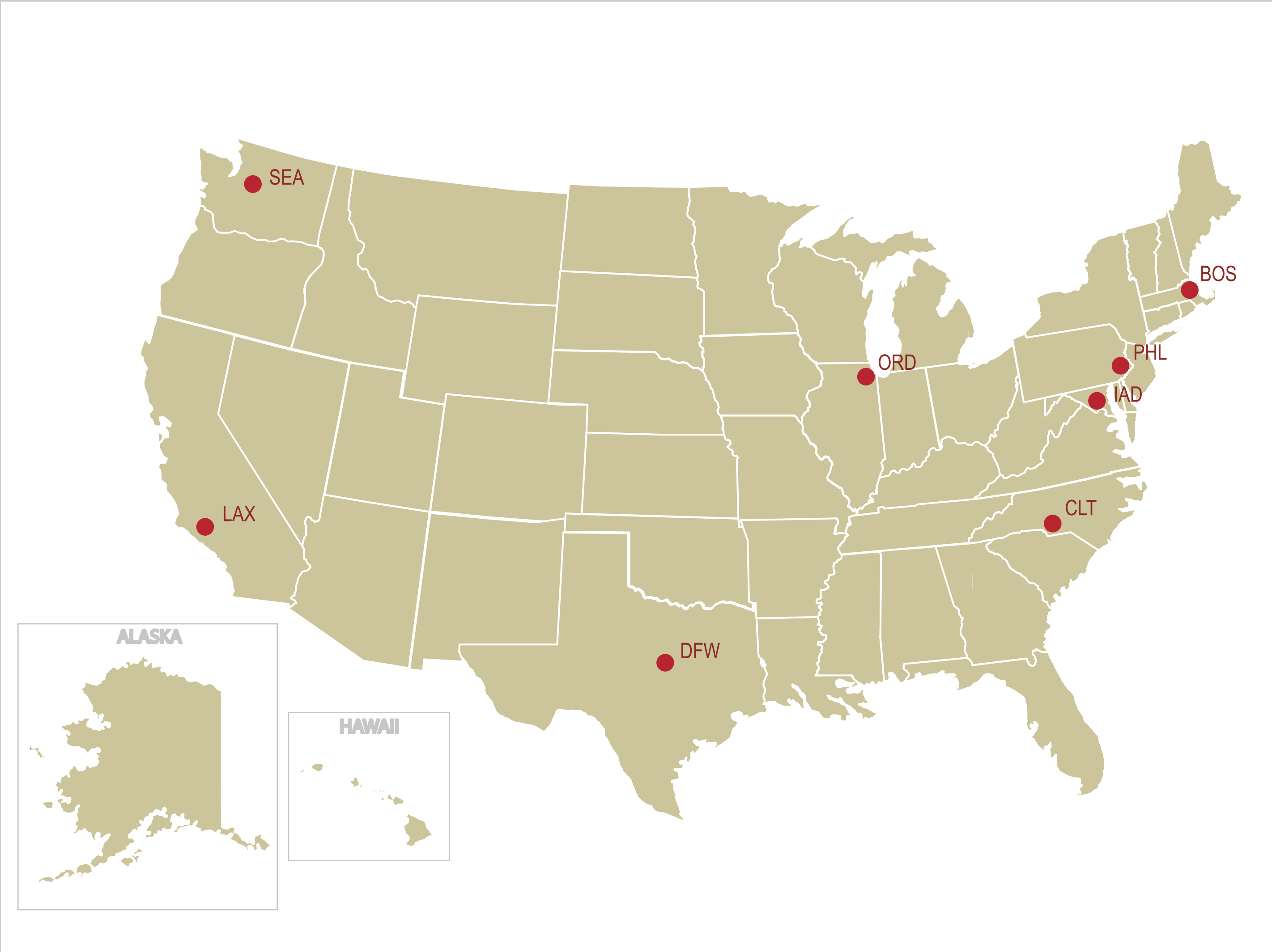
OEP Metropolitan Areas

Meeting the future capacity needs of the nation's airports will require innovative approaches, as well as continued emphasis on airport expansion and technological improvements. The FAA's "Capacity Needs of the National Airspace System: 2007-2025" identifies 15 metropolitan areas that will experience significant population gains and economic growth and will need additional capacity by 2025. Within these 15 metropolitan areas the FAA must: promote regional planning; monitor aviation infrastructure investment; and identify additional airports with potential to accommodate future demand. The FAA and the local communities currently are focusing on eight of these metropolitan areas, and the 14 OEP airports within them, which are expected to have the greatest capacity shortfalls. The agency is working with these airports to develop a toolbox of potential solutions to address these future capacity shortfalls. FAA expects to have initial results in September 2008.

This material is explored in greater detail in the "Capacity Needs of the National Airspace System: 2007-2025," which is available online at FAA's Web site. More information can be found in the appendix and at *www.faa.gov/nextgen*.

In the interim, the FAA will continue to refer to the "OEP" 35 airports and Metropolitan Areas even though the plan's name has changed.

Airport Development Near-Term Commitments



LOCATION	CITY	PROJECT	TO OPEN	INCREAS IN ANNUAL OPS
LAX	Los Angeles	New Center Taxiway	Jun 24 2008	
SEA	Seattle	8,500' / Runway 16R/34L	Nov 20 2008	175,000
IAD	Washington	9,400' / Runway 1L/19R	Nov 20 2008	70,000
ORD	Chicago	7,500' / Runway 9L/27R Runway Extension 2,856 104/28R Relocated RW 10C/28C	Nov 20 2008	70,000
DFW	Dallas-Ft. Worth	End-Around Taxiway	Dec 14 2008	
PHL	Philadelphia	1,040' Runway Extension 17/35	Mar 2009	
BOS	Boston	9,300' Centerfield Taxiway	Nov 2009	
CLT	Charlotte	9,000' Runway / 17/35	Feb 2010	80,000

Air Traffic Operations Domain

NextGen

The FAA is committed to implementing a series of NextGen-related system improvements that benefit the NAS today.

	Air Traffic Operations Near-Term Commitments		
FY 2008	**Weather Advisory Information to the Flight Deck via Flight Information Services-Broadcast (FIS-B).** FIS-B will increase the amount of weather information available in the cockpit of properly equipped aircraft.	**Airspace Flow Programs.** These reduce en route congestion due to weather by equitably managing departure times by assigning ground delays to a specific airspace volume.	*Additional 2008 commitments have been completed and are discusses in the FY08 Accomplishments graphic.*
FY 2009	**Time-based Metering Procedures.** These provide the Traffic Management Advisor capabilities to radar controllers so that they can better match aircraft flows to airport resources. **National Aviation Safety Policy.** This defines how the agency will manage safety as an integral part of its operations. **National Standard for Safety Management.** **Initial System-wide Integrated Assessments.** Coordinated initial system-wide integrated assessments among all stakeholders for near-term NextGen investments. **Airspace Redesign projects for New York and Chicago.**	**Data Fusion Demonstration.** ASIAS integrated data systems will provide an analytical demonstration of the alignment of accident or incident data with geographical information, environmental conditions, and air-traffic, aircraft and human performance data. **Data Fusion From All Sources Enabled.** This is an extension of the case-study methodology for NAS-wide data implementation for FY09. Incorporation of continuous air traffic data observation with ASIAS baseline information anticipates development of enterprise-level risk identification. **ASDE-X deployments.** **RNAV STAR-based OPDs.**	**Integrated Surface Data.** Better surface flight event knowledge will be integrated into decision-support tools, to improve accuracy of down-stream demand estimation and improve the use of flow management tools. **Vision Systems in Reduced Visibility Conditions.** Vision systems will enable more aircraft to land, roll out, taxi, and take off in reduced visibility conditions, thus increasing access, efficiency, and capacity**.** **RNAV Standard Instrument Departures (SIDs) and Standard Terminal Arrival Routes (STARs).** 50 per year. **RNP SAAARs.** 25 per year. **LPV approaches.** 300 per year.
FY 2010	**Reroute Impact Assessment and Resolution.** Automation will be provided to support identification of flight-specific reroutes for weather related congestion and assessing the impact of those planned reroutes in resolving the congestion problem. **Airspace Redesign projects for New York and Houston.** **ASDE-X deployments.**	**Air Traffic Control Surveillance Service in Non-Radar Areas via ADS-B.** Satellite-based ADS-B will be used in non-radar airspace to reduce separation standards and improve surveillance. **RNAV SIDs and STARs.** 50 per year . **RNP SAAARs.** 50 per year. **LPV approaches.** 300 per year.	**National Standard for Safety Management.** Additional elements. **Full implementation of the Safety Management System for FAA's Air Traffic Organization.** **Integrated Surface Data.**
FY 2011	**Execution of Flow Strategies.** Exchange of Aircraft-specific reroutes (required to resolve en route congestion) between TFM and ATC automation. **Integrated Surface Data.**	**RNAV SIDs and STARs.** 50 per year. **RNP SAAARs.** 50 per year**.** **LPV approaches.** 300 per year.	**Airspace Redesign project for New York.** **National Standard for Safety Management.** Additional elements.
FY2012	**Expanded Traffic Advisory Services.** Using Digital Traffic Data via Traffic Information Services-Broadcast (TIS-B), which provides more information about surrounding traffic directly to the cockpit of properly equipped aircraft.		

The NextGen Implementation Plan now describes the proposed operational capabilities that FAA is pursuing for the 2012-2018 timeframe.

Initiate Trajectory-based Operations

Flexible Airspace Management: Air Navigation Service Provider (ANSP) automation supports reallocation of trajectory information, surveillance, communications, and display information to different positions or different facilities.

Increase Capacity and Efficiency Using RNAV and RNP: RNAV and RNP enable more efficient aircraft trajectories. Combined with airspace changes, they increase efficiency and capacity.

Delegated Responsibility for Separation: Enhanced surveillance and new procedures enable the ANSP to delegate aircraft-to-aircraft separation. Improved display avionics and broadcast positional data provide detailed traffic situational awareness to the flight deck. When authorized by the controller, pilots will implement delegated separation between equipped aircraft using established procedures.

Automation Support for Mixed Environments: ANSP automation provides the controller with tools to manage aircraft in a mixed equipage environment.

Initial Conflict Resolution Advisories: The ANSP conflict probe is enhanced to not only recognize conflicts but to provide rank-ordered resolution advisories to the provider, who may select one of the resolutions to issue to the aircraft. Automation enables the ANSP to better accommodate pilot requests for trajectory changes by providing conflict detection, trial flight planning, and development of resolutions and an optimal ranking of resolutions.

Point-in-Space Metering: The ANSP uses scheduling tools and trajectory-based operations to assure a smooth flow of traffic and increase the efficient use of airspace.

Oceanic In-trail Climb and Descent: ANSP automation enhancements will take advantage of improved communication, navigation, and surveillance coverage in the oceanic domain. When authorized by the controller, pilots of equipped aircraft will use established procedures for climbs and descents.

Flexible Entry Times for Oceanic Tracks: Flexible entry times into oceanic tracks or flows will allow greater use of user-preferred trajectories.

Increase Arrivals/Departures at High-Density Airports

Integrated Arrival/Departure Airspace Management: New airspace design will take advantage of expanded use of terminal procedures and separation standards. This is particularly applicable in major metropolitan areas supporting multiple high-volume airports. This capability will increase aircraft flows and introduce additional routes and flexibility to reduce delays. ANSP decision-support tools currently schedule and stage arrivals and departures based on airport demand, aircraft capabilities, and gate assignments.

Improved Operations to Closely-Spaced Parallel Runways: Enhanced procedures (including cockpit and ground improvements) will allow improvements in operations to parallel runways. This will reduce the impact to airport/runway throughput in lower visibility conditions.

Time-Based Metering Using RNP and RNAV Route Assignments: RNAV, RNP, and time-based metering provide efficient use of runways and airspace in high-density airport environments. RNAV and RNP provide users with more efficient and consistent arrival and departure routings and fuel-efficient operations. Metering automation will manage the flow of aircraft to meter fixes. This will provide more efficient use of runways and airspace.

Initial Surface Traffic Management: Departures are sequenced and staged to maintain throughput. ANSP automation will use departure-scheduling tools to flow surface traffic at high-density airports. Automation will provide surface sequencing and staging lists for departures and average departure delay (current and predicted).

Increase Flexibility in the Terminal Environment

Use Optimized Profile Descent: Optimized Profile Descents (OPDs) will permit aircraft to remain at higher altitudes on arrival at the airport and use lower power settings during descent. OPD arrival procedures will provide for lower noise and more fuel-efficient operations. The air navigation service provider procedures and automation accommodate OPDs will be employed, when operationally advantageous.

Provide Full Surface Situation Information: Automated broadcast of aircraft and vehicle position to ground and aircraft sensors/receivers will provide a digital display of the airport environment. Aircraft and vehicles will be identified and tracked to provide a full comprehensive picture of the surface environment to the ANSP, equipped aircraft, and Flight Operations Centers.

Wake Turbulence Mitigation for Departures: Changes to wake rules will be implemented based on wind measurements. Procedures will allow more closely-spaced departure operations to maintain airport/runway capacity.

Ground-Based Augmentation System (GBAS) Precision Approaches: Global Positioning System (GPS)/GBAS will support precision approaches to Category I (as a non-federal system), and eventually Category II/III minimums for properly equipped runways and aircraft. GBAS can support approach minimums at airports with fewer restrictions to surface movement and offers the potential for curved precision approaches. GBAS also can support high-integrity surface movement requirements.

Enhanced Surface Traffic Operations: Data communication between aircraft and ANSP will be used to exchange clearances, amendments, requests, NAS status, weather information, and surface movement instructions. At specified airports data communications is the principle means of communication between ANSP and equipped aircraft.

Improve Collaborative Air Traffic Management

Trajectory Flight Data Management: Trajectory Flight Data Management will improve the operational efficiency by increasing the use of available capacity. Advanced flight data coordination between facilities will maintain access to airports by facilitating reroutes, and supporting more flexible use of controller/capacity assets. By managing data based on volumes of interest, airspace/routings can be redefined to accommodate change. Trajectory Flight Data Management will also maintain continuous monitoring of the status of all flights, quickly alerting the system to unexpected termination of a flight and rapid identification of last known position.

Provide Full Flight Plan Constraint Evaluation with Feedback: Timely and accurate NAS information will enable users to plan and fly routings that meet their objectives. Constraint information that will impact proposed flight routes will be incorporated into ANSP automation, and available to users for their pre-departure flight planning. Examples of constraint information include special use airspace status, Significant Meteorological Information, infrastructure outages, and significant congestion events.

On-Demand NAS Information: NAS and aeronautical information will be available to users on demand. NAS and aeronautical information will be consistent across applications and locations, and available to authorized subscribers and equipped aircraft. Proprietary and security sensitive information will not be shared with unauthorized agencies/individuals.

Traffic Management Initiatives with Flight Specific Trajectories (Go Button): Individual flight specific trajectory changes resulting from Traffic Management Initiatives (TMIs) will be disseminated to the appropriate ANSPs air traffic control automation for tactical approval and execution. This capability will increase the agility of the NAS to adjust and respond to dynamically changing conditions such as bad weather, congestion, and system outages.

Continuous Flight Day Evaluation: Performance analysis where throughput is constrained will be the basis for strategic operations planning. Continuous (real-time) constraints will be provided to ANSP traffic management decision support tools and NAS users. Evaluation of NAS performance will be both a real-time activity feedback tool and a post-event analysis process. Flight day evaluation metrics will be complementary and consistent with collateral sets of metrics for airspace, airport, and flight operations.

Improved Management of Airspace for Special Use: Airspace for special use assignments, schedules, coordination, and status changes will be conducted automation-to-automation. Changes to status of airspace for special use will be readily available for operators and ANSPs. Status changes will be transmitted to the flight deck via voice or data communications. Flight trajectory planning will be managed dynamically, based on real-time use of airspace.

Reduce Weather Impact

Trajectory-Based Weather Impact Evaluation: Weather information and its expected impact on individual four-dimensional trajectories will be integrated into decision-oriented automation where it will be translated into operational impacts to support tactical and strategic decisions on individual and group flights. This will improve overall flight efficiency and capacity. Decision-support strategies include automation-to-automation integration with the ANSP, and decision-support capabilities with those of users, where appropriate.

Increase Safety, Security, and Environmental Performance

Safety Management System (SMS) Implementation: Provides NAS-wide baseline criteria and safety performance benchmarks for acceptance of and implementation of new procedures and technologies. FAA's SMS calls for early identification of safety risks allowing intervention strategies to avoid accidents and incidents, along with timely acceptance of proposed new safety-enhancing technology, procedures, and training products.

Safety Management Enterprise Services: Enterprise-wide safety management would be developed as part of the NextGen program to fully integrate safety into all phases of NextGen. During design, the ability to evaluate the performance of individual systems in the context of their net impact on risk and the impact on overall system risk would be required. The combination of individual assessments and integrated analysis would promote the capability to support SMSs.

Aviation Safety and Information Analysis and Sharing (ASIAS): The integration and sharing of high-quality, relevant, and timely aviation safety information is critical to the operational success of the SMS. Implementation of ASIAS will promote the ability to identify future safety risk, conduct a causal analysis of those risks, and recommend solutions for the commercial aviation sector. By developing new analytical techniques and leveraging state-of-the-art information technology, the FAA and its industry partners will be able to monitor the effectiveness of implemented safety enhancements, establish baselines and trending capability for safety metrics, and identify emerging risks. To do this, ASIAS provides a suite of tools that extract relevant knowledge from large amounts of disparate safety information.

Operational Security Capability for Threat Detection and Tracking, NAS Impact Analysis and Risk-Based Assessment: Airspace security risk flight detection and monitoring functions are automated through flight-specific risk levels provided by the Department of Homeland Security, and by trajectory-based risk assessment algorithms that include probing against security element volumetric expressions. Airspace security measures are planned and implemented taking into account NAS impacts, and post-event analysis capabilities providing feedback on overall impacts and areas for improvement.

Shared Situational Awareness and Information Systems Security Integrated Incident Detection and Response: Cyber security incidents and operational security events are managed as part of a risk-informed, integrated prevention-response-recovery framework. Automation assists in detection and correlation of incidents and events so operators can more rapidly identify threats that may emanate from multiple sources.

Information on System Security and Surveillance Integration/Protection: The processing, access, and integration of surveillance information within the NAS, including trajectory-based security information, will be protected by robust information security system capabilities.

National Environmental Management System (EMS): The FAA and other stakeholders will implement EMS to manage the environmental impacts of the air transportation system. The FAA will implement, collaboratively with industry, operational procedures that mitigate NextGen environmental impact through environmental-friendly technologies and and procedures, and alternative fuels.

Transform Facilities

NextGen redesigns air traffic control systems to make them flexible, scalable, and maintainable. It breaks down the geographical boundaries that characterize air traffic control and leads to a more seamless view of traffic, organized not by geographically-oriented sectors, but by aircraft trajectories. To address this, the Facilities component of NextGen focuses on optimization of ANSP resources. This includes the physical number and type of facilities; the allocation and training of staff; service continuity; and the use of more cost-effective and flexible systems for information sharing and back-up.

Example of a Mid-Term Operational Capability Description

The NextGen Implementation Plan Web site, www.faa.gov/nextgen, contains descriptions of all proposed mid-term operational capabilities. Below is an example.

Solution Set: *Increase Flexibility in the Terminal Environment*

Operational Capability: Use Optimized Profile Descent

Background: Optimized Profile Descents (OPDs) permit aircraft to remain at higher altitudes on arrival to the airport and use lower power settings during descent. OPD arrival procedures provide for lower noise and more fuel-efficient operations. The air navigation service provider procedures and automation accommodate OPDs when operationally advantageous.

Needs/Shortfall: In most of the NAS, published arrival procedures contain combinations of descending and level segments to define paths from cruise/transition airspace to a transition to an instrument approach procedure. Level segments require use of higher engine power settings, resulting in excess fuel consumption and noise. There is a need for procedures that are more optimized for aircraft fuel efficiency leading to reduced user operating costs and fewer emissions and less noise.

An initial step toward providing more optimized procedures is to design conventional or RNAV STARs, designed to allow most aircraft equipped with flight management system (FMS) vertical navigation (VNAV) to fly a more fuel-efficient and quieter trajectory.

Far-term options for more-optimized vertical profiles may allow for additional benefit, with the addition of air and ground capabilities.

Operational Concept: An OPD, in its most beneficial form, is an arrival where an aircraft is cleared to descend from cruise altitude to final approach using a best-economy power setting at all times. Aircraft start descent through a window of a predetermined height and distance based on published arrival procedures to the final approach. Thrust may be added to permit a safe, stabilized approach, on speed, and at recommended flap configurations, down a vertical path to the runway.

As an initial step, conventional or RNAV STARs can be defined with vertical constraints incorporated as crossing restrictions. Careful selection of the location of the constraints allows most aircraft FMS VNAV systems to calculate a continuously descending flight path, although the flight path may require a slightly non-optimal power setting. In addition, static spacing guidance based on weight class, winds, and use of speed commands for descending traffic allow the STAR to be used with minimal impact to airport throughput (although with a slight additional environmental penalty compared to the ideal STAR OPD).

At busy airports, achieving full fuel/emissions/noise benefits will be difficult without impacting capacity, unless advanced avionics and/or ground capabilities, and perhaps larger-scale airspace redesign are added.

Aircraft & Operator: In the near-term, aircraft participating in OPD are required to have RNAV route capability, barometric VNAV capability, and the ability to determine a fuel-efficient descent.

Design/Architecture: This initial step only requires the design of a STAR that incorporates well-chosen crossing restrictions, along with FMS VNAV capability (e.g., as found in much of the air carrier fleet today). The ANSP can be provided static guidance for spacing based on winds and aircraft wake turbulence category, and can also issue speed commands to minimize impact on throughput at a slight environmental penalty from optimum.

This capability can be implemented immediately at low-density airports, and can also be added to medium- and high-density airports, provided the overall airspace design can accommodate or be reconfigured to permit design of a suitable STAR. In medium- and high-density applications more advanced metering and spacing tools than are currently available may be required.

Benefits: Reduced noise, reduced fuel burn and lower engine emissions

Initial Implementation: 2010–2017

NextGen's success depends on complementary improvements to ground systems and aircraft avionics, which taken together, will allow for new operational capabilities.

Without careful coordination between ground and air communities, the full benefits of a transformed system cannot be realized. While initial NextGen advances should be based on aircraft capabilities that are already deployed in some aircraft, it is possible that every existing aircraft will require avionics changes to fully participate in the NextGen end-state. While 2025 seems distant, more than 30 percent of the air transport fleet operating in 2025 is already in service today. For every year that the detailed NextGen avionics requirements are unknown, the costs to achieve NextGen increase dramatically as more aircraft are designed and delivered that will require modification that are costly in both dollars and the time the aircraft spends out of service.

In a significant effort to help the aviation community better understand the impact of NextGen, this plan's mid-term operational capability definitions now indicate whether or not avionics would be necessary to support implementation. For example, Optimized Profile Descents require aircraft to have RNAV route capability, barometric VNAV capability, and the ability to determine a fuel-efficient descent. In contrast, new wind-based wake turbulence procedures that allow expanded use of closely-spaced parallel runways would not require avionics. These avionics requirements are summarized for all the near-term and mid-term commitments and capabilities in the *Aircraft and Operator Domain* Smart Sheet.

In 2008, the FAA developed the framework for a NextGen aircraft equipage strategy. The framework considered the inputs from RTCA's Air Traffic Management Advisory Committee (ATMAC) Requirements and Planning Working Group and the JPDO Aircraft Concept Working Group. It describes the process to evaluate potential avionics requirements. The steps in that process are as follows:

1. **For every operational capability, identify any required avionics function to the degree it can be defined.** Consider variations of the capability, which might reduce the avionics burden without compromising the desired outcome (including consideration of the international compatibility, where a sophisticated ground infrastructure may not be available).
2. **As appropriate, group the capabilities based on maturity of the avionics functions** (near-term capabilities should not involve any new equipage; mid-term capabilities may involve new equipage of existing technology; far-term capabilities generally consist of those that require new technology).
3. **Evaluate the following metrics for each avionics function,** taken individually and collectively in the timeframes described above:
   a. Costs and benefits, including the apportionment of those costs and benefits among stakeholders. Stakeholders include the owner/operator, the FAA, passengers and flight crew, and society.
   b. Whether or not the capability can be implemented for a single equipped operator, or is dependent on majority equipage.
   c. Schedule maturity.
4. **Develop a NextGen equipage plan** based on the metrics, to be approved in 2010.

NextGen transformational programs provide new infrastructure to support the mid-term operational capabilities. We are deploying the first of these, ADS-B, and will make investment decisions on the other programs over the next two years.

Automatic Dependent Surveillance-Broadcast

Automatic Dependent Surveillance-Broadcast (ADS-B) uses the U.S. NAVSTAR GPS to broadcast the position and intent of the aircraft. It then automatically transmits this information — with more precision than radar — to air traffic managers and pilots. Through more accurate surveillance, ADS-B will allow for more efficient separation of planes. In the cockpit, pilots also will have access to information on weather, traffic and flight restrictions.

Since the late 1990s, aircraft equipped with ADS-B technology have been participating in an FAA test program in southeastern Alaska called Capstone. In preliminary estimates, accident rates for both general aviation and commercial carriers participating in Capstone have dropped 40 percent when compared to aircraft operating elsewhere in Alaska. Delivery company UPS is also currently using ADS-B technology. This has allowed UPS to save millions of dollars in jet fuel, reduce emissions by 34 percent and noise by 30 percent at its hub airport in Louisville, Kentucky.

ADS-B will next be deployed at key sites in the U.S. by 2010, including the Gulf of Mexico, Louisville, Juneau and Philadelphia. The nationwide infrastructure will be rolled out by around 2013. Aircraft will be required to be equipped with ADS-B Out by 2020.

Major milestones

- In service decision for broadcast services (Traffic Information Service – Broadcast and Flight Information Service Broadcast), November 2008
- Louisville Initial Operating Capability of Surveillance Services, October 2009
- Gulf of Mexico Initial Operating Capability of Surveillance Services, December 2009
- Philadelphia Initial Operating Capability of Surveillance Services, February 2010
- Juneau Initial Operating Capability of Surveillance Services, April 2010

System-Wide Information Management

System-Wide Information Management (SWIM) is an information technology program that identifies industry standards and commercially-available products to ensure interoperability between NAS systems. This will improve operational decision making because it will be easier to share data between systems. The program's first segment will focus on applications related to flight and flow management, aeronautical information management, and weather data dissemination. The NextGen Network Enabled Weather (NNEW), Network Enabled Operations (NEO), and National Information Sharing efforts are all interrelated.

Major Milestones

- Final Investment Decision on segment 1B of SWIM, June 2009
- Final Investment Decision on segment 2 of SWIM, June 2010
- Initial Operating Capability of Automated Special Use Airspace Aeronautical Status Exchange in Aeronautical Information Management (AIM) System, September 2010

NextGen Data Communications

NextGen Data Communications will give controllers and flight crews a way to exchange both operationally critical (e.g. air traffic clearances and instruction) and routine information (e.g. advisories, and flight crew requests and reports). Today's voice-only communications will not support the NextGen vision of network-enabled information access and exchange and aircraft trajectory-based operations. In the near-term, the program's focus will be on requirements and architecture.

Major Milestones

- Initial Investment Decision on segment 1 and segment 2, August 2008
- Final Investment Decision on segment 1, April 2010

NextGen Network Enabled Weather

NextGen Network Enabled Weather (NNEW) will serve as the infrastructure core of the NextGen aviation weather support services, providing access to a NAS-wide common weather picture. NNEW will identify, adapt and use standards for system-wide weather data formatting and access. Utilizing NEO capabilities, a virtual 4-D Weather Data Cube with aviation weather information from multi-agency sources will be developed. The virtual 4-D Weather Data Cube provides improved aviation weather data which can be directly and commonly accessed by and integrated into user decision support tools. The virtual database will consolidate a vast array of ground-, airborne-, and space-based weather observations and forecasts. This will provide a single, national—eventually global—picture of the atmosphere, updated as needed in real-time and distributed using NEO capabilities to authorized users. The direct machine access and integration by decision support tools will reduce the need for interpretation of aviation weather data and enable better air transportation decision-making. The National Weather Service will have primary responsibility for operational management, while the FAA will define requirements and coordinate and implement changes to FAA infrastructure that support the 4-D Weather Data Cube.

Major Milestones

- Initial Investment Decision, first quarter FY2009
- Final Investment Decision, April 2010

National Airspace System Voice Switch

National Airspace System Voice Switch (NVS) is a program to replace current voice switches, some of which are more than 20 years old. Current voice architecture is very limited. Current linkage does not support sharing of airspace within and across facility boundaries; reconfiguration capability of controller position to radio frequency and volume of airspace is inflexible; and reconfigurations can not be done quickly.

The NVS program is expected to reduce projected operating costs by reducing the number of equipment components needing to be inventoried and by reducing the number of switch types; reducing acquisition, training, and maintenance costs by reducing the number of voice-switch designs; improving equipment availability and related inventory issues by reducing obsolete equipment; and reducing potential costs to users from air traffic delays due to projected outages of the existing systems and increased user demand.

The NVS program supports the evolution to NextGen capabilities and will allow the FAA's air traffic control to achieve a network-based infrastructure as well as evolve into a more flexible communications system. The NVS program will allow the FAA to achieve voice switching modernization objectives such as network-based infrastructure, and evolution of ATC toward a flexible communications routing that support dynamic re-sectorization, resource reallocation, airspace redesign and the NextGen vision.

Major Milestones

- Initial Investment Decision, April 2009
- Final Investment Decision, April 2010

Additional elements of FAA's NextGen Portfolio

Along with the transformational programs, FAA's NextGen portfolio includes test and evaluation activities such as those described in the *Demonstrating NextGen Concepts* section. It also includes solution set enabling activities, which address the "connective tissue" that integrates the transformational programs and the existing NAS infrastructure so that we can deliver the mid-term operational capabilities. These activities are listed in the Smart Sheets.

Other key resources for understanding FAA's portion of NextGen's development are the NAS Enterprise Architecture, and the National Aviation Research Plan. (A select group of Enterprise Architecture decision points that are critical to NextGen are listed in Appendix C.) The Smart Sheets incorporate relevant portions of both documents for each Solution Set. The Plan's Web site also links to the source documents.

Challenges & Next Steps

The FAA is now shifting its focus from concept definition to execution. Integrating new NextGen systems and operations into the foundation of the NAS will be like renovating a house while living in it.

While this version's detailed online plan provides a window into the proposed mid-term capabilities and the key enablers needed to realize them, upcoming system engineering work will determine exactly which releases of which systems will provide the functional requirements for each capability. This information, combined with our NextGen research and development portfolio, the aircraft equipage strategy and other key work, will allow us to execute based on a thorough, integrated implementation plan.

With this work well underway, the FAA must also focus on the less technical aspects of NextGen implementation, including performance analysis, policy development, staffing and training, environmental planning, and transition planning.

Performance Analysis

Defining the anticipated benefits of NextGen capabilities is a critical next step. The agency has developed the modeling framework that allows us to assess the impact of operational capabilities.The FAA will also need to demonstrate its effectiveness at delivering new systems and measure how the NAS is performing in response to new implementations.

Policy

Initial drafts of the JPDO's Integrated Work Plan identify more than 30 NextGen policy issues that require FAA action in the near-term. These include decisions such as the balance of responsibility between humans and automation, environmental management processes, and global harmonization strategies. JPDO's analyses show that the implementation of many mid-term capabilities would be substantially delayed if these issues are not addressed in a timely, coordinated fashion. The agency is currently validating and prioritizing these for action within the appropriate organizations and work groups.

Acquisition Workforce Staffing

According to the Federal Acquisition Institute, more than 40 percent of workers with intermediate to advanced level proficiency in both technical and general business competencies will be leaving the overall government acquisition workforce over the next 10 years. This includes program managers, systems engineers, contracting officers, researchers, and financial business managers, the very disciplines that are responsible for NextGen's implementation work.

The FAA's Air Traffic Organization (ATO) has reestablished its Acquisition Workforce Council, which is charged with ensuring that FAA hires and trains the right personnel to manage a projected $5.6 billion investment over the next five years, and in the years beyond.

To that effect, the FAA is working with leading universities like Georgia Institute of Technology to attract prospective new employees to FAA's acquisition workforce. The agency has also expanded its graduate certificate program in systems engineering to advance the current workforce. A partnership with Stevens Institute of Technology in New Jersey, the program emphasizes the discipline's best practices with a careful focus on ensuring proper integration among the new NextGen systems. The FAA continues to work with its Centers of Excellence to educate its future workforce.

Environmental Planning

Environmental performance is a fundamental constraint on NAS growth. There is escalating evidence that local restrictions have grown by orders of magnitude in the last decade, and lawsuits stop or delay growth. If the FAA and our partners do not mitigate aviation's impact on noise, emissions and climate, the growth of the NAS will be limited. Efforts on this front are moving forward, as are detailed in the *Increased Safety, Security and Environmental Performance* Smart Sheet.

Security

As the advanced technologies that will enable NextGen are designed, their security capabilities must also be addressed. These include secure communication, identity management, message encryption and others to ensure that NextGen is protected, to the greatest extent possible, from information system viruses, hackers, and other sources of system disruption. NextGen will employ state-of-the art security measures to ensure the reliability and message integrity critical to its operation.

Transition

As we begin deployment of ADS-B and make investment decisions on the other NextGen transformational programs, the FAA and our aviation community partners must begin to identify major transition challenges and strategize solutions. The FAA will have an early look at the challenges of large-scale transition as it accelerates implementation of performance-based navigation procedures. The FAA is reviewing the breadth of the current system and its ability to absorb new instrument flight procedures, like RNAV, RNP, and localizer-performance with vertical guidance LPVs approaches. From an administrative perspective, procedural implementation requires changes to databases, training programs, and navigation charts. From an operational perspective, ATO's facilities must provide training for controllers and implement procedures in the NAS. From a safety perspective, the introduction of new procedures must be vetted carefully through FAA's Safety Management System, which requires additional time and resources. System changes involving new hardware and software would present additional complexities.

Looking forward, as we prepare to shift from planning to actual implementation in the field, the FAA will also have to examine how to balance increased training needs with operational staffing demands, as will our industry counterparts. Currently, FAA is deploying new tower simulators, which provide high-fidelity, site-specific training with 360-degree imagery of the airfield, simulated traffic, obstacles, and weather. These are being delivered to key facilities, such as Miami and JFK, where NextGen concepts are being tested. These simulators are expected to increase the effectiveness and reduce the duration of future training programs. Similar consideration would need to given for installation, maintenance, and decommissioning activities.

In July 2008 the ATO will reorganize to better address technical training, strategic planning and other areas key to successfully implementing NextGen.

The Next Version of the NextGen Implementation Plan

The FAA will update the NextGen Implementation Plan in January 2009.

Appendix A

OEP 35 Airports

OEP airports are commercial U.S. airports with significant activity. These airports serve major metropolitan areas and also serve as hubs for airline operations. More than 70 percent of passengers move through these airports. Delays at the OEP 35 airports have a ripple effect to other locations. The 35 OEP airports were compiled in 2000 based on lists from FAA and Congress, and a study that identified the most congested airports in the U.S.

Airport	ID	Airport	ID
Hartsfield-Jackson Atlanta International	ATL	Memphis International	MEM
Baltimore-Washington International	BWI	Miami International	MIA
Boston Logan International	BOS	Minneapolis-St Paul International	MSP
Charlotte/Douglas International	CLT	New York John F. Kennedy International	JFK
Chicago Midway International	MDW	New York LaGuardia	LGA
Chicago O'Hare International	ORD	Newark Liberty International	EWR
Cincinnati-Northern Kentucky	CVG	Orlando International	MCO
Cleveland-Hopkins International	CLE	Philadelphia International	PHL
Dallas-Fort Worth International	DFW	Phoenix Sky Harbor International	PHX
Denver International	DEN	Portland International	PDX
Detroit Metro Wayne County	DTW	Ronald Reagan Washington National	DCA
Fort Lauderdale-Hollywood International	FLL	Salt Lake City International	SLC
George Bush Intercontinental	IAH	San Diego International Lindbergh	SAN
Pittsburgh International	PIT	San Francisco International	SFO
Honolulu International	HNL	Seattle -Tacoma International	SEA
Lambert St. Louis International	STL	Tampa International	TPA
McCarran International	LAS	Washington Dulles International	IAD
Los Angeles International	LAX		

OEP Metropolitan Areas

Over next 20 years, U.S. population and economic growth is expected to be strongly focused in 15 metropolitan areas. These regions will shape the need for air transportation. The FAA and the aviation community will need a long-term strategy to prepare to meet this future demand. Within these 15 metropolitan areas the FAA must: promote regional planning; monitor aviation infrastructure investment; and identify additional airports with potential to accommodate future demand. The 15 metropolitan areas were identified in the second version of the "Capacity Needs of the National Airspace System" report. A full list of all the hub and secondary and reliever airports contained in each metropolitan areas can be found on the plan's Web site.

- Atlanta
- Charlotte
- Chicago
- Houston
- Las Vegas
- Los Angeles
- Minneapolis
- New York
- Philadelphia
- Phoenix
- San Diego
- San Francisco
- Seattle
- South Florida
- Washington-Baltimore

NextGen Management Board

The NextGen Management Board (formerly called the OEP Associates Team), chaired by FAA's Deputy Administrator, takes an "enterprise approach" to developing and executing FAA's NextGen plan. With representatives from all key agency lines of business, the Board has the authority to force timely resolution of emerging NextGen implementation issues. The Board's focus includes:

- Measuring the progress of deployments and of key activities that support decision-making
- Ensuring essential resources are available, including reprioritizing resources as necessary
- Issuing policies and guidance
- Identifying leaders within their organizations who will be accountable for delivering system changes

Ruth Leverenz	Acting Deputy Administrator
Hank Krakowski	ATO Chief Operating Officer
Nick Sabatini	Associate Administrator for Aviation Safety
Catherine Lang	Deputy Associate Administrator for Airports
Paula Lewis	Acting Assistant Administrator for Regions and Center Operations
Ramesh Punwani	Assistant Administrator for Financial Services/Chief Financial Officer
Nancy LoBue	Assistant Administrator for Aviation Policy Planning & Environment (acting)
David Bowen	Assistant Administrator for Information Services & Chief Information Officer
Eugene Juba	ATO Senior Vice President, Financial Services
Victoria Cox	ATO Senior Vice President, NextGen and Operations Planning Services
Rick Day	ATO Vice President, En Route and Oceanic Services
Bruce Johnson	ATO Vice President, Terminal Services
Nancy Kalinowski	ATO Vice President, System Operations Services
Steve Zaidman	ATO Vice President, Technical Operations Services
Robert Tarter	ATO Vice President, Safety Services
Michael Romanowski	Director, NextGen Integration and Implementation Office
Fred Pease	Department of Defense Liaison
Agam Sinha	MITRE Center for Advanced Aviation System Development
Charles Leader	Director, Joint Planning and Development Office
Patrick Forrey	President, National Air Traffic Controllers Association
Tom Brantley	President, Professional Aviation Safety Specialists

Appendix B

NextGen Review Board

The NextGen Review Board provides oversight, status, prioritization, and guidance on existing and proposed NextGen initiatives. The NextGen Review Board offers the opportunity for the entire FAA to have a "big picture" view of the transition to NextGen. This will help all involved understand the interconnections between the various activities and will assist with integration, timely rulemaking, identification of required policy changes and understanding of funding impacts. It assesses funded research and development programs and drives R&D budget plans. The NextGen Review Board provides recommendations to the NextGen Management Board.

Michael Romanowski	Director, NextGen Integration and Implementation Office (co-chair)
Charles Leader	Director, JPDO (co-chair)
John McGraw	Office of Aviation Safety, Flight Standards Service
Ben DeLeon	Office of Airports
Angela Freeman	Office of Regions and Center Operations
Robert Nassif	Office of Budget
Nan Shellabarger	Office of Aviation Policy, Planning and Environment
Luis Ramirez	ATO En Route and Oceanic Services
Rich Jehlen	ATO Systems Operation Services
Raul Trevino	ATO Terminal Services
Jim Eck	ATO Technical Operations
Maria DiPasquantonio	ATO Financial Services
Jim Williams	ATO Operations Planning, System Engineering
Huan Nguyen	ATO Safety Services
Lourdes Maurice	Office of Environment and Energy
John Pyburn	FAA FFRDC, MITRE CAASD
Kris Burnham	JPDO, Portfolio Management
Jay Merkle	JPDO, Chief Architect
Jesse Wijntjes	FAA Chief Architect
Diana Young	Office of Information Services
Gisele Mohler	Director, NextGen Planning Staff
Art Politano	Office of Aviation Safety, Air Traffic Safety Oversight
Dan Murphy	ATO Operations Planning, Performance Analysis
Barry Scott	Director of Research and Development

FAA's Critical Upcoming Enterprise Architecture Decisions

FAA's NAS Enterprise Architecture roadmaps show the evolution of major FAA investments and programs in today's NAS to meet the future demand. Below are the key decisions (KD) related to the NextGen mid-term capabilities. The number preceding each description denotes the key decision identifier from the roadmaps, which can be further explored at *www.nas-architecture.faa.gov*. The next published update of FAA's Enterprise Architecture is expected in January 2009.

Automation

En Route Automation Modernization (ERAM): ERAM Releases 3 and 4 add new air traffic control automation functions to the foundation provided by the initial two releases. These new capabilities include functions that take advantage of new capabilities being developed in parallel. These includes Surveillance and Broadcast Services, SWIM, and Traffic Flow Management System (TFMS).

- Approval of Release 3 package contents (EA KD #43) is targeted for 2009. This the last of the three software releases in the initial baseline of ERAM. In addition to planned R3 capabilities, any external capabilities upon which ERAM Release 2 was dependent but which failed to be implemented as planned, will be absorbed into ERAM Release 3.
- Approval of the mid-term work package requirements and Release 4 package contents (EA KD #31) is targeted for 2011. Candidates for the mid-term En Route Automation include: Transition surveillance sources to Internet Protocol, exchange data with Terminal and TFMS automation via SWIM services. The ERAM mid-term work package targets improvements for between 2013 and 2016.

Traffic Management Advisor (TMA): TMA is an important system that increases situational awareness through its graphical displays and alerts, and also generates statistics and reports about the traffic flow. It keys on the efficiencies and sequencing of aircraft as they flow into space constrained arrival airspace.

- Decision to Award a follow on contract for TMA Upgrades (EA KD #108) is targeted for 2008. TMA Point in Space Metering enhancements have been identified to support NextGen and Include: TMA scheduling to Dynamic Metering Points with manual input and TMA scheduling to Dynamic Metering points with automated input.
- Approve migration of TMA to ERAM and/or TFMS initial investment (EA KD #44) is targeted for 2012 timeframe. TMA can be removed as a DSS by migrating its functions to either the ERAM and/or TFMS modern platform
- Approve migration of TMA to ERAM and/or TFMS final investment (EA KD #57) is targeted for 2013 timeframe. TMA can be removed as a DSS by migrating its functions to either the ERAM and/or TFMS modern platform

Aeronautical Information Management (AIM) Modernization: The AIM system represents the evolution of the acquisition, storage, processing, and dissemination of aeronautical information (AI) in the NAS. AI is defined as any information concerning the establishment, condition, or change in any component (facility, service, procedure, or hazard) of the NAS.

- Segment 1 investment decision (EA KD #2) is targeted for 2008. Segment 1 will comply with SWIM governance for the distribution of Special Activity Airspace (SAA) information. In addition, the Federal Notices to Airmen System will then be enhanced to disseminate data based on the Aeronautical Information Exchange Model (AIXM) protocols. In addition, AIM modernization SAA information is constructed from the Military Airspace Management System (MAMS), Special Use Airspace Management System (SAMS) and the central Altitude Reservation Function (CARF) data. It represents both FAA and Department of Defense (DOD) special use area restrictions.
- Segment 2 investment decision (EA KD #121) is targeted for 2013 timeframe. Segment 2 expands the capabilities in Segment 1 and enables additional SWIM users to obtain AI using the AIXM standard. Enhanced capabilities include distribution of: airport Geographic Information System (GIS) and other fixed assets from the National Airspace System Resource (NASR) system.

The Traffic Flow Management System (TFMS):

TFMS is a key element of the FAA's automated air traffic management environment, focused specifically on strategic traffic flow problem identification and resolution. It will provide efficient and equitable solutions to National Airspace System capacity constraints.

- Approval work package 2 (EA KD #19) is targeted for 2008. The TFM Work Package 2 will contain departure flow management, integration of weather products, collaborative reroute capability, and re-engineering for the traffic situational display.

NextGen Staffed Virtual Tower: Staffed Virtual Towers (SVT) will provide services similar to existing towered airports. The benefits of SVT operations include the ability to provide tower services remotely, thereby servicing a larger number of airports than today, significantly reduced physical infrastructure costs. Because more airports will have sequencing and separation services, the system is capable of additional throughput compared to one-in-one-out operations at non-towered airports today.

- Investment decision (EA KD #58) is targeted for 2013 timeframe. The automation required to support the goal of staffed virtual towers will be defined.

Communication

Data Communications: This program allows operationally critical information to be shared by digital communications.

- Determine the FAA's initial investment strategy for the data communications program and the concomitant rulemaking strategy for airborne equipment. (EA KD #35) is targeted for 2008. Defining the strategy will ensure synchronized government and user investments to provide data communications capabilities to support NextGen.

NAS Voice Switch: NVS provides air/ground and ground/ground voice communications services for controllers, at new and existing facilities.

- Investment decision (EA KD #47) is targeted for 2008.

System Wide Information Management (SWIM) Program: SWIM is an information technology infrastructure programs that supports NextGen goals.

- Investment decision for SWIM ground segment 1b Implementation (Baseline for FY 11 - 13) (EA KD #128) is targeted for 2009. Input from the communities of interest will assist in defining the requirements for Segment 1. Deployment of pilot reports (PIREPS) and Integrated Terminal Weather System (ITWS) publications for weather, as well as runway visual range (RVR), Flight Data, and Flow Information publications; Reroute Data exchange and Terminal Data Distribution are planned.

Surveillance

- Decision to implement the NextGen primary radar systems, which includes weather surveillance (EA KD #77) is targeted for 2011. It is dependent on the decision for the ADS-B backup strategy and air traffic surveillance security and weather requirements.

Low Cost Ground Surveillance (LCGS): The out-the-window view of the air traffic controller and voice communication with pilots are the primary means of avoiding conflicts and maintaining operational capacity and safety in airport towers. If visibility is reduced due to weather conditions, then capacity and safety may be severely restricted without some means of surface surveillance. To address this, two different LCGS candidates are under evaluation: the Critical Area Management System and the NOVA 9000 Air Traffic Control System.

- Investment decision for LCGS (EA KD #179) is targeted for 2009 timeframe. LCGS will integrate with airport surveillance systems, such as ASDE-X, Runway Status Lights (RWSL), and Precision Runway Monitor Alternate (PRM-A) system.

Weather

- Final investment decision to acquire & deploy first wake turbulence capability for mitigating departures (WTMD) for closely spaced parallel runways (CSPR) (EA KD #40) is targeted for 2010 timeframe. It is estimated that 10 of 35 OEP Airports have CSPRs and would be able to increase departure capacity using WTMD. This begins the process of reducing aircraft separation during take offs on CSPR Runways to mitigate decreased airport acceptance rates due to increased separation for trailing aircraft from large aircraft.
- Investment decision to fund FAA portion of

NextGen 4-D weather cube (EA K Don #48) is targeted for 2010 timeframe. The 4-D Weather Data Cube will provide universal access to virtually all weather information (sensor data and forecast weather) using standards specified under NNEW. Data/information from the FAA, the National Weather Service and the Department of Defense (U.S. Air Force and U.S. Navy) plus certain data sets from commercial sector will be included. The 4-D Weather Data Cube will retain these weather data/information for subsequent extraction by weather processor(s) and/or data mining by NextGen Decision Oriented Support Tools that require gridded weather information to optimize their algorithms. The initial operating capability of the 4-D Weather Data Cube is anticipated FY2012.

- Investment decision for NextGen Weather Processor (NWxP) Work Package 1 (WP1) (EA KD #89) is targeted for 2010 timeframe. The NWxP WP1 will not only subsume the functionality of the Weather and Radar Processor (WARP) system but will ingest additional data sets to include surface-, airborne-, and space-based data sets to meet the expanded weather requirements of NextGen. The NWxP WP1 is the initial implementation of the consolidation of weather processing required to support advanced automated forecast capabilities. Over time, other legacy weather processing capabilities will also be subsumed by NWxP. The capability will likely to be a distributed capability, providing weather data generation where needed. The initial operating capability of NWxP WP1 is anticipated FY2012.

Appendix D

Acronyms

3D PAM	Three-Dimensional Path Arrival Management
ADS-B	Automatic Dependent Surveillance - Broadcast
AIM	Aeronautical Information Manual
AIRE	Atlantic Interoperability Initiative to Reduce Emissions
ANSP	Air Navigation Service Provider
ASDE-X	Airport Surface Detection Equipment – Model X
ASPIRE	Asia and South Pacific Initiative to Reduce Emissions
ASIAS	Aviation Safety Information Analysis and Sharing
ATL	Hartsfield-Jackson Atlanta International Airport
ATMAC	RTCA's Air Traffic Management Advisory Council
ATO	Air Traffic Organization
CAAFI	Commercial Alternative Aviation Fuels Initiative
CSPR	Closely Spaced Parallel Runways
DAB	Daytona Beach International Airport
DEN	Denver International Airport
EMS	Environmental Management System
EFVS	Enhanced Flight Vision System
ERAM	En Route Automation Modernization
ETA	Estimated Time of Arrival
FAA	Federal Aviation Administration
FIS-B	Flight Information Services – Broadcast
FMS	Flight Management System
FY	Fiscal Year
GBAS	Ground-based Augmentation System
GPS	Global Positioning System
ICAO	International Civil Aviation Organization
ITWS	Integrated Terminal Weather System
JFK	John F. Kennedy International Airport
JPDO	Joint Planning and Development Office
LPVs	Localizer Performance with Vertical Guidance approaches
NAS	National Airspace System
NASA	National Aeronautics and Space Administration
NEO	Network-enabled Operations
NextGen	Next Generation Air Transportation System
NNEW	NextGen Network Enabled Weather
NVS	NAS Voice Switch
NWxP	NextGen Weather Processor
OPD	Optimized Profile Descent
PRM-A	Precision Runway Monitor - Alternate
REDAC	FAA's Research, Engineering and Development Advisory Committee
RNAV	Area Navigation
RNP	Required Navigation Performance
RTCA	Aviation industry group; www.rtca.org
RVR	Runway Visual Range
RWSL	Runway Status Lights
SAAAR	RNP Special Aircraft and Aircrew Authorization Required procedure
SIDS	RNAV Standard Instrument Departures
SMS	Safety Management System
STA	Scheduled Time of Arrival
STARS	RNAV Standard Terminal Arrival Routes
SVS	Synthetic Vision System
SWIM	System-Wide Information Management
SUA	Special Use Airspace
TFM-M	Traffic Flow Management - Modernization
TIS-B	Traffic Information Services - Broadcast
TMA	Traffic Management Advisor
VNAV	Vertical Navigation
WARP	Weather and Radar Processor
WATRS	Western Atlantic Route System
WTMD	Wake Turbulence Mitigating Departures