Federal Aviation Administration

FAA's

NextGen

IMPLEMENTATION PLAN

March 2010

From the Administrator

J. Randolph Babbitt

March 2010

Dear Members of the Aviation Community:

2010 will be a key year for NextGen.

In the Gulf of Mexico, our new satellite-based aircraft tracking system, Automatic Dependent Surveillance-Broadcast (ADS-B), in December began to make it possible for air traffic control services to be offered in an area of active airspace where surveillance has never before been possible. Controllers now have the ability to use this same technology to more accurately separate traffic in the skies above Louisville. Juneau and Philadelphia soon will follow suit, offering controllers in those areas greater flexibility while providing pilots of properly equipped aircraft access to unprecedented traffic and weather information at no additional charge. By 2013, satellite-based surveillance will be available to equipped operators nationwide.

Just as ADS-B is transforming surveillance, other components of the Next Generation Air Transportation System have begun revolutionizing the National Airspace System. Our safety management systems approach, more proactive and data-driven, will help us achieve the next level of safety for the flying public. Ongoing investments in airport infrastructure -- runways, terminals and technology -- will ensure we are able to take full advantage of the renovation in our fleets and air traffic system. And our investment in advanced engine and airframe technologies and sustainable alternative fuels -- as well as our new procedures -- will help aviation's environmental footprint lessen over time.

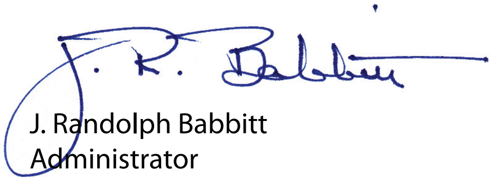
The successful implementation of ADS-B caps a banner NextGen year for both government and industry. In 2009, the FAA forged partnerships that were critical in demonstrating the real-world potential of many key NextGen technologies and procedures. For example, with help from industry we showed that surface surveillance and data-sharing technologies can measurably improve taxi-out time in Memphis and New York. We believe these results can be replicated across the country. Likewise, oceanic trajectory optimization and customized arrival procedures into Miami and other coastal sites have produced significant reductions in time, fuel, carbon and noise. These types of demonstrations prove that NextGen is both feasible and justified, and they spur us forward.

Because NextGen cannot be realized by government alone, much of the work outlined in this edition of the NextGen Implementation Plan will capitalize on partnerships with our stakeholders. As the FAA and our partners work to merge developing technologies, policies and procedures into operational capabilities, operators must be ready to equip their cockpits with the certified avionics necessary to realize the associated benefits. This year, despite tough economic circumstances, we have seen more operators make commitments to their part of the NextGen framework. Taken together, improvements to our air traffic control and airport infrastructure, in conjunction with new cockpit capability, new safety approaches, and innovation in environmental procedures and technology, will fundamentally change the way aircraft fly above the United States by 2018.

We're already well on our way. NextGen is a clear priority for President Obama's administration and the FAA. The RTCA's NextGen Mid-Term Implementation Task Force has made recommendations the aviation community believes will speed the delivery of benefits to the traveling public, and the FAA has embraced its efforts. You'll find our plan of action on the pages that follow.

The NextGen era is upon us. With this agency, this industry and this country now firmly committed to this path forward, it's time to roll up our sleeves and work together to maintain the NextGen momentum achieved over the past year.

I look forward to the work ahead.



J. Randolph Babbitt
Administrator

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NextGen
IMPLEMENTATION PLAN

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WHY NextGen MATTERS

NextGen is a comprehensive overhaul of our national airspace system to make air travel more convenient and dependable, while ensuring your flight is as safe, secure and hassle-free as possible.

In a continuous roll-out of improvements and upgrades, the FAA is building the capability to guide and track air traffic more precisely and efficiently to save fuel and reduce noise and pollution. NextGen is better for our environment, and better for our economy.

- NextGen will be a better way of doing business. Travel will be more predictable because there will be fewer delays, less time sitting on the ground and holding in the air, with more flexibility to get around weather problems.
- NextGen will reduce aviation's impact on the environment. Flying will be quieter, cleaner and more fuel-efficient, we'll use alternative fuels, new equipment and operational procedures, lessening our impact on the climate. More precise flight paths help us limit the amount of noise that communities experience.
- NextGen will help us be even more proactive about preventing accidents with advanced safety management to enable us, with other government agencies and aviation partners, to better predict risks and then identify and resolve hazards.
- NextGen boils down to getting the right information to the right person at the right time. It will help controllers and airlines make better decisions. This data will assist airlines in keeping employees and passengers better informed.
- Our nation's economy depends on aviation. NextGen lays a foundation that will continually improve and accommodate future needs of air travel while strengthening the economy with one seamless global sky.
- NextGen will help communities make better use of their airports. More robust airports can help communities attract new jobs, and help current employers expand their businesses. By doing this the U.S. will strengthen its economy and help communities realize all the benefits that aviation can bring.
- NextGen will allow us to meet our increasing national security needs and ensure that travelers benefit from the highest levels of safety.

EXECUTIVE SUMMARY

This NextGen Implementation Plan provides an overview of the FAA's ongoing transition to NextGen. The Plan lays out the agency's vision for the Next Generation Air Transportation System, now and into the mid-term, which is defined here as 2012-2018. The Plan further identifies the goals we have set for technology and program deployment and the commitments we have made in support of that vision. Through annual updates, it will document our work plan for meeting those goals.

Our primary goal is to provide new capabilities that make air transportation safer and more reliable, improve the capacity of the National Airspace System (NAS) and reduce aviation's impact on our environment.

NEXTGEN TODAY

The FAA already has achieved a number of critical NextGen milestones. We have initiated and expanded satellite-based surveillance, improved airport runway access, increased safety and efficiency on the ground, and enhanced airspace safety and operations. NextGen technologies and procedures, along with airspace redesign, have enabled more direct routes and more efficient operations, which use less fuel and reduce emissions.

The use of Automatic Dependent Surveillance-Broadcast (ADS-B) to control air traffic in the Gulf of Mexico in December 2009 was an important step forward. But many other recent improvements help lay a solid foundation for upcoming NextGen advances. Airfield construction and improvements around the nation, along with the continued deployment of surface safety technology such as Airport Surface Detection Equipment-Model X have helped increase runway safety and reduce delays.

Airspace redesign and Performance Based Navigation (PBN) procedures already are saving fuel, reducing emissions and managing noise in demonstrations with our domestic and international partners. The FAA has worked closely with European and Pacific Rim operators to ensure that aircraft operating globally are equipped with technology that can function and take advantage of operational benefits in various international air traffic environments. We also have moved forward new aircraft and energy technologies to further reduce emissions, achieving the approval of the first aviation alternative fuels specifications in 2009.

COLLABORATION: RTCA TASK FORCE RESPONSE

In September 2009, nearly 300 members of the aviation community who form the RTCA[1] NextGen Mid-Term Implementation Task Force issued a final report that included a number of recommendations that helped the FAA galvanize its plans to deliver tangible near-term benefits today as we build a foundation for the mid-term. The report represents the aviation community's commitment to NextGen, as well as its endorsement of the FAA's incremental approach to NextGen implementation.

The FAA's action plans support the operational capabilities the Task Force requested, such as sharing surface movement data for better collaborative decision making. We are working to help airports safely increase throughput on closely spaced as well as converging or intersecting runways. We also are working to safely increase access to the NAS for all operators, and provide controllers with the tools and operator procedures they need to enable the safest, most efficient, economical and environmentally friendly routes of travel.

Our nation's airports are among our most important partners in these endeavors. In the face of increasing demand, airports are being called on to provide additional capacity in a safe, efficient and environmentally responsible manner. We will realize significant benefits from integrated airport planning and terminal airspace redesign projects that deliver new airport infrastructure served by PBN capabilities. In this Plan, we highlight the critical contributions America's airports have made in support of the NextGen transformation.

[1] RTCA, Inc. is a private, not-for-profit corporation that develops consensus-based recommendations regarding communications, navigation, surveillance and air traffic management system issues. RTCA functions as a federal advisory committee and includes roughly 400 government, industry and academic organizations from the United States and around the world. Members represent all facets of the aviation community, including government organizations, airlines, airspace users, airport associations, labor unions, and aviation service and equipment suppliers. More information is available at www.rtca.org.

NEXTGEN 2018: OPERATING IN THE MID-TERM

This year's update reiterates our vision for the operational environment between now and 2018. That vision includes improvements at every phase of flight, and it fundamentally changes the way things work in the NAS. Common weather and system status information will dramatically improve flight planning. Technologies such as ADS-B and Data Communications, combined with PBN procedures and the policies that enable them, will increase safety and capacity and save time and fuel, decreasing carbon emissions and improving our ability to address noise.

With NextGen, we must continue to advance safety as we look ahead at increasing air traffic and the introduction of very light jets, unmanned aircraft systems and commercial space flights. To continue to minimize risk as we introduce a wave of new systems and procedures over the next decade, the aviation community will continue to rely on Safety Management Systems, integrated safety cases and other proactive management processes that allow us to assess the safety risk of all the proposed changes.

Policy, procedures and systems on the ground and in the flight deck enable the mid-term system. We make the most of technologies and procedures that are in use today, as we introduce new systems and procedures that will fundamentally change air traffic automation, surveillance, communications, navigation and the way we manage information.

In addition to the advanced systems and procedures we develop through the NextGen transformational programs and solution sets, the mid-term system depends on coordination with and support from FAA specialists on safety, airports, the environment, policy development and the other building blocks of a modern air traffic management system. FAA information and management systems must keep all these activities synchronized as we approach the mid-term, reach it and move forward. We will use a strategic Environmental Management System approach to integrate environmental and energy objectives into the planning, decision making and operation of NextGen. Under the Continuous Lower Emissions, Energy and Noise program, we are targeting partnerships with industry to advance noise and emissions reductions, while improving energy efficiency. We will continue to accelerate the certification and implementation of sustainable alternative fuels for use by aircraft fleets.

NEXTGEN BENEFITS

As airports and other segments of the greater aviation community already are starting to reap the benefits of NextGen capabilities, the best is yet to come. Our latest estimates indicate that by 2018, NextGen will reduce total flight delays by about 21 percent, providing $22 billion in cumulative benefits to the traveling public, aircraft operators and the FAA. During this same period, we expect to save more than 1.4 billion gallons of fuel from air traffic operations alone, cutting carbon emissions by nearly 14 million tons. These conservative estimates make the case for NextGen and affirm that the path we are traveling with our aviation partners is the right one.

As we move forward, we remain keenly focused on safety as the FAA's top priority. We will vet each new system and procedure through the agency's safety management system process. The FAA's Aviation Safety and Information Analysis and Sharing program, in use today, will monitor the NextGen operational capabilities to identify any precursor risks.

We know that NextGen's benefits are not limited to America's borders. Just as we are working with the international community to ensure that our technology systems work seamlessly with one another, we are working to standardize global operational procedures that better protect our environment.

CHALLENGES TO IMPLEMENTING NEXTGEN

The FAA remains confident it will achieve NextGen, but we are fully aware that the road to success will be challenging. Undertaking NextGen is extremely complex, in part because systems in various stages of development and maturity are interdependent and will be implemented in a variety of time frames. NextGen's increasing dependency on aircraft-centric capabilities means that we must rely on operators' willingness to equip. We will not see real performance improvements until operators are properly equipped to reap the benefits of those capabilities. We are managing the uncertainties inherent in such a large-scale undertaking by using a portfolio management approach for NextGen development and deployment.

WHY NEXTGEN MATTERS

Many people will benefit from the NextGen – whether they travel frequently by air or never fly at all. Travelers will enjoy fewer delays and safer, more predictable trips. People living in neighborhoods near airports will experience less aircraft noise and emissions. And communities will make better use of their airports, strengthening the local economy.

More information about NextGen implementation is available at www.faa.gov/nextgen.

Along with improved access, we are increasing runway safety and airport efficiency by putting in place tools to improve operations, surveillance and data sharing on the airport surface.

The FAA's operational workforce is essential for successful NextGen development and implementation. Air traffic controllers and technicians are involved in research, integration of NextGen technology into legacy equipment and operational key site testing.

INTRODUCTION

The journey toward the Next Generation Air Transportation System is defined by collaborative partnerships. From the Joint Planning and Development Office, which coordinates NextGen development efforts across multiple federal agencies and maintains the far-term NextGen vision, to the RTCA NextGen Mid-Term Implementation Task Force, which brought together every facet of the aviation community, each NextGen milestone achieved so far has been the result of FAA collaboration with its stakeholders.

Working in tandem with the broader aviation community, the FAA is revolutionizing the way things work at our nation's airports and in our nation's skies. We're working to increase safety. We are striving to improve our environment. We are deploying innovative technologies and procedures that make room in our nation's skies for more aircraft, while making improvements to our nation's airports to ensure that increased traffic doesn't get bogged down on the ground. We are working to create the communications and information sharing networks that will enable the FAA to collaborate with its stakeholders to align their preferences with the overall needs of the system. And we're working with our international partners to make sure it all works seamlessly beyond our borders.

For passengers, that means fewer delays, with less time sitting on the ground or holding in the air. For operators, it means more flight options, greater fuel efficiency, increased situational awareness and more flexibility to avoid weather-related issues. For the general aviation community, it means improved access to the system and more options for landing in reduced visibility conditions at a greater number of airports. And for the global community, NextGen means increased safety, cleaner air and less noise.

The NextGen transformation is as massive and complex an undertaking as any on which this nation has embarked. To achieve success, the FAA must sustain not only the partnerships it has forged with external stakeholders, but those within the agency, as well. More than any other previous effort, NextGen touches on every aspect of the FAA's mission. From safety to the environment, from air traffic to airports, from research to certification, from international relations to commercial space transportation, every FAA employee is critical to the realization of the NextGen goals we all now share.

Last year, we set our sights firmly on the mid-term operational capabilities we believe we can deliver by 2018. With the publication of this 2010 update to the NextGen Implementation Plan our commitment to that vision has only grown stronger. The recommendations included in the RTCA NextGen Mid-Term Implementation Task Force report have helped bring the agency's near- and mid-term planning and deployment efforts into even sharper focus.

Last year's NextGen Implementation Plan laid a foundation upon which consensus could be built. Now, with the aviation community committed to moving forward together, this year's Plan sets the stage for continued stakeholder collaboration that will ensure the timely, successful implementation of NextGen into the mid-term.

We are well on our way. In 2009, the FAA met more than 90 percent of our high-priority NextGen goals. As we pursue continued success in 2010, we remain keenly aware of the challenges posed in executing a transformation of such momentous proportions as NextGen. To meet those challenges, the FAA is committed to ongoing collaboration with the aviation community to refine our planning and adjust our timelines as necessary to remain firmly on target for reaching our 2018 goals. Thus, as part of the natural evolution of the NextGen planning process, some commitments made in last year's NextGen Implementation Plan have been adjusted and updated in this year's plan.

We know the stakes are high, particularly in these difficult times. As recently as 2007, civil aviation contributed $1.3 trillion annually to the national economy, and constituted 5.6 percent of the gross domestic product. It generated nearly 12 million jobs with earnings of $396 billion[1]. By providing greater capacity, safety, economy and environmental performance, NextGen plays a critical role in protecting our nation's economic health.

With a firm sense of responsibility and urgency, we are moving forward with NextGen implementation. We are building upon the spirit of collaboration that has gone hand-in-hand with NextGen since its inception to deliver results while maintaining transparency and accountability for our progress with our stakeholders, Congress, the administration and the flying public.

[1] "The Economic Impact of Civil Aviation on the U.S. Economy," FAA, November 2009.

Air traffic services are now available in areas where radar coverage was previously limited or non-existent. With the introduction of ADS-B in the Gulf of Mexico and wide-area multilateration in Colorado and Alaska, operators can now fly more safely and efficiently.

SECTION 1:

NextGen TODAY

DELIVERING OPERATIONAL CAPABILITIES AND OTHER ADVANCES

The goal of NextGen is to provide new capabilities that make air transportation safer and more reliable while improving the capacity of the National Airspace System (NAS) and reducing aviation's impact on our environment. Since the beginning of fiscal year 2009, the FAA has delivered some of those capabilities for operational use.

In December 2009, the FAA began controlling air traffic over the Gulf of Mexico, an area of active airspace where surveillance was never before possible, using the satellite-based technology, Automatic Dependent Surveillance-Broadcast (ADS-B).

It is a momentous achievement and one of our major NextGen highlights in the last year. Having a real-time visual representation of aircraft flying over the Gulf, where no radar coverage was available, means that air traffic controllers can safely and more efficiently separate air traffic. It also provides pilots with more safety benefits such as improved situational awareness, new weather information and additional voice communications.

Before making ADS-B critical services available nationwide, we are ensuring that it works with the various air traffic control automation systems the FAA uses. In addition to the Gulf of Mexico, the FAA achieved initial operating capability for ADS-B at Louisville, where ADS-B is integrated into the Common Automated Radar Terminal System automation system and where critical separation and surveillance services are now available. We will integrate and complete validation testing of ADS-B into the two remaining kinds of automation systems, Standard Terminal Automation Replacement System in Philadelphia and Microprocessor En Route Automated Radar Tracking System in Juneau, Alaska, during spring 2010.

It is also important to determine how air traffic controllers interact with ADS-B, as with any new technology. We conducted human-in-the-loop simulations to look at how a mixed equipage environment (with and without ADS-B) affects controller tasks and workload.

IMPROVED RUNWAY ACCESS

Improved safety and access to runways, especially when visibility is reduced by weather or geographical obstacles, is an important NextGen benefit. Satellite-based technologies, including the Wide Area Augmentation System (WAAS), are improving access to runways at both large and small airports.

We published directions and maps for more than 500 precision-like approaches enabled by WAAS. These Localizer Performance with Vertical Guidance (LPV) procedures improve access to airports in lower visibility conditions and where obstacles are present. They are particularly valuable for smaller airports used by general aviation. There are now nearly 1,100 LPV procedures available at runways where no Instrument Landing System is present.

We approved the Ground Based Augmentation System (GBAS) for Category I operations. The first satellite-based system approved for this category of precision approach, it enables instrument-based operations down to 200 feet above the surface even during reduced visibility. GBAS was installed at Memphis and Newark in 2009.

Multilateration, a ground-based surveillance technology, is also improving runway access. The FAA installed and is now using Wide Area Multilateration (WAM) systems to control air traffic in Juneau, Alaska, and at four airports in Colorado, enabling air traffic to be safely separated by five miles. Previously, each aircraft had to clear the airspace around these airports before the next could enter. WAM is expected to significantly increase the capacity at these airports, even during bad weather.

At Detroit, we put in place Precision Runway Monitoring-Alternative, which will improve capacity on parallel runways during bad weather. It is the first use of multilateration surveillance for this purpose.

Wake mitigation research findings made possible a new order authorizing 1.5-mile dependent staggered parallel approaches for closely spaced parallel runways (with centerlines less than 2,500 feet apart). These parallel approaches have the potential to improve runway access and enable a higher arrival rate at five airports: Seattle, Boston, Philadelphia, Cleveland and St. Louis.

IMPROVED GROUND SAFETY AND OPERATIONS

A number of airfield improvements are beginning to reduce delays around the NAS. New runways at Chicago O'Hare, Washington Dulles and Seattle opened in November 2008. We also completed taxiway extensions and improvements at New York John F. Kennedy (JFK), a runway extension at Philadelphia, and an end-around taxiway, which allows aircraft access to and from runways without crossing them, at Dallas/Fort Worth.

Along with improved access, we also increased runway safety and airport efficiency by putting in place tools to improve operations, surveillance and data sharing on the airport surface. Airport Surface Detection Equipment–Model X (ASDE-X) is an important tool in this effort. The system, which contributed to a 50 percent reduction in serious runway incursions in 2009, is now operational at 27 airports, including 10 since the beginning of fiscal year 2009.

Nine airports received ASDE-X Data Distribution Units, which improve surface traffic management and safety by sharing ASDE-X data with aircraft and airport operators. And in demonstrations at Seattle, we integrated ASDE-X and other ground surveillance technologies (including secondary surveillance radars, multilateration systems and airport radars) with ADS-B to monitor airport operations and issue collision alerts to controllers.

A number of improvements to further enhance surface operations and safety are improving situational awareness, making pilots, controllers and airport operators better aware of the precise location of every aircraft, vehicle and obstacle on the airport surface at any time. We conducted surface management data sharing demonstrations at JFK and Memphis, resulting in average reduced taxi-out times of 2-4 minutes. We also extended ASDE-X coverage into ramp areas at JFK to provide surface surveillance data sharing of ramp operations to further understand the business case. At Memphis, we conducted demonstrations of Collaborative Departure Queue Management (CDQM), a surface decision support tool that enables metering, or

NEXTGEN AND AIRPORTS

Over the next decade, air traffic operations are expected to rise by about 2 percent per year. This increase in demand will put pressure on our nation's airports to provide additional capacity but do so in a safe, efficient and environmentally responsible manner. NextGen technologies and procedures, along with infrastructure construction and improvements, will provide the tools for airports to accommodate future growth.

The FAA is currently improving airfield infrastructure at Charlotte, Chicago O'Hare, Fort Lauderdale and Portland, Ore. Those four are among the 21 airfield projects that, over the last decade, have provided 18 of the nation's 35 busiest airports with the potential to accommodate 1.9 million additional operations annually, decrease average delay per operation at these airports by about 5 minutes and reduce the potential for runway incursions.

New airport infrastructure will continue to play an important role in increasing capacity. However, the greatest benefits will come from integrated airport planning and terminal airspace redesign projects that deliver new airport infrastructure served by NextGen Performance Based Navigation (PBN) capabilities. Airport technology systems will need to be optimized to integrate NextGen weather and traffic flow tools into everyday operations, supporting active airport participation in surface management via collaborative decision making with air traffic control and airlines. Airports will need to balance surface, gate and terminal capacity with the improved runway capacity enabled by NextGen.

To help airports take advantage of NextGen benefits, the FAA has several planned and active initiatives under way:

FUTURE AIRPORT CAPACITY TASK

The FAA's Future Airport Capacity Task (FACT) is an assessment of the future capacity needs of the nation's airports and metropolitan areas to determine which areas have the greatest need for additional capacity. The FACT team published its second report, Capacity Needs in the National Airspace System, 2007-2025, or FACT-2, in 2007. The report identified 14 airports and eight metro areas that will have the greatest need for additional capacity in 2025. Since publication, the FACT team has been working closely with airport operators to develop toolboxes of potential solutions and action plans to address capacity shortfalls. Through ongoing coordination between the FAA and airport sponsors, FACT is identifying planned NextGen capabilities with potential benefits to airports. A summary of ongoing work will be completed in early fiscal year 2011. FACT-3 will expand the analysis. It will incorporate NextGen operational improvement plans that benefit runway capacity, as well as factors such as airspace, surface, gate and terminal/passenger flow constraints.

PLANNING AND DESIGN STANDARDS

As NextGen evolves, airport design standards will change. Several approaches to improving closely spaced parallel runway procedures are being evaluated. When the new flight procedures are complete, the FAA will revise its airport planning and design standards so that additional runway development alternatives will be available to airports, time-regulating the flow, of departing aircraft to the runway end. CDQM reduced taxi-out times by an additional two minutes per operation above benefits being accrued through situational awareness.

IMPROVED AIRSPACE SAFETY AND OPERATIONS

To get the most advantage of runway safety and airport access improvements, more efficient operations in surrounding airspace are necessary. NextGen technologies and procedures, along with airspace redesign, enable more direct routes, time- and fuel-saving procedures and more efficient use of available airspace throughout the NAS.

Leveraging already existing equipment, the FAA published a number of Performance Based Navigation (PBN) procedures to deliver more direct routes, saving time and fuel and reducing emissions. The new procedures include 55 Area Navigation (RNAV) Standard Instrument Departure and Standard Terminal Arrival Routes, more than 90 Q-, T-, and Global Positioning System Minimum En Route Altitudes RNAV routes, and 55 RNAV with Required Navigation Performance (RNP) approach procedures.

Using PBN procedures, we conducted demonstrations of Optimized Profile Descents (OPD) at Los Angeles, Atlanta, Miami and Charleston, S.C., proving their potential to significantly reduce fuel, flight time and environmental impact. An OPD allows an aircraft to fly a continuous descending path, rather than leveling off in steps, down to the runway. At Los Angeles, 300-400 OPDs per day have saved an average 25 gallons of fuel per flight and reduced average level-flight time during approaches by 26 percent. OPD procedure trials are ongoing at Anchorage.

We conducted demonstrations of Tailored Arrivals (TA), another PBN-supported procedure, at Miami, San Francisco and Los Angeles. TAs provide optimized profiles using

including the potential to build within existing property. NextGen improvements to precisely separate aircraft and redesign airspace should allow airports to maintain optimum (visual) runway throughput, using their existing runways, during inclement weather. Increased flexibility in gates, terminal designs and access should improve passenger flows to keep pace with capacity improvements of runways, taxiways and ramp areas.

GEOGRAPHIC INFORMATION SYSTEM

Geographic Information System (GIS) surveys are being conducted to provide detailed geospatial data about airports. The data will be used for new Localizer Performance with Vertical Guidance approaches, including obstruction analyses, as well as electronic Notices to Airmen and flight deck airport moving maps. The central database for airport GIS data enhances sharing of both safety-critical data (such as runway end points or the location of navigational aids) and non-safety-critical data (such as the location of a building on the airfield). In addition to providing users with current airport data, it will improve airport planning efforts with more efficient reviews of airport layout plan updates.

METROPLEX SYSTEMS

Many near- and mid-term NextGen capabilities will address capacity and delays at the busiest airports and in congested metropolitan areas. However, less congested airports also will see meaningful benefits from NextGen. With enhanced capabilities, general aviation and reliever airports may be part of potential regional solutions to capacity problems in congested metropolitan areas. For example, the satellite-based Wide Area Augmentation System provides precision approach capabilities to many airports where it was previously not practical using ground-based equipment. These new approaches can provide lower approach minimums and vertical guidance, thus improving safety and providing increased access, especially during periods of poor visibility. Automatic Dependent Surveillance-Broadcast can provide increased safety and efficiency at airports with precision surveillance of aircraft in the air and on the surface as well as improved situational awareness for pilots and airport operators. Surveillance technologies can improve access to airports in non-radar areas. Metroplex improvements that incorporate PBN can reduce airspace constraints and result in improved, efficient access to busy reliever airports.

SUSTAINABLE, GREEN AIRPORTS

As NextGen evolves, airports will become better neighbors. New flight procedures for aircraft have the potential to reduce emissions and noise near airports. Airports are looking at new ways of operating in an environmentally responsible manner. Programs such as the Voluntary Airport Low Emissions program provide funding from the Airport Improvement Program and Passenger Facility Charges to reduce ground emissions at commercial service airports through low-emission vehicles, refueling and recharging stations, gate electrification and other air quality improvements. To help airports plan for the future, the FAA is reviewing existing policies and guidance to see how sustainable planning, design and construction can be incorporated into airport development. ■

data communications to aircraft equipped with Future Air Navigation System from high-altitude airspace down to the runway, saving 60-90 gallons of fuel per arrival.

To make more efficient use of busy airspace and make it ready for NextGen capabilities, we continued a number of airspace redesign projects, which include environmental impact studies and changes to flight paths, altitudes and air traffic control sectors. We established airspace and procedures enhancements in the Houston area, around Chicago O'Hare and Midway, in the New York/New Jersey/Philadelphia region and in high-altitude airspace. We also finalized airspace design for 42 procedures supporting Las Vegas McCarran optimization and initiated a procedure development process for southern Nevada.

NextGen capabilities like these are not turned on by the flip of a switch. Before the FAA can deliver each new capability, a myriad of activities have to be accomplished:

- safety management system and risk assessments;
- environmental management system and impact assessments;
- demonstrations to ensure the capability delivers its intended benefits;
- tests to determine how the capability affects air traffic controller workload;
- training so that controllers and operators know how to use the capability;
- identification, development and installation of needed infrastructure and software;
- development and installation of new aircraft equipment, if needed; and
- changes to orders and policies to conform to federal and international standards.

The development of NextGen capabilities is not carried out in a vacuum. Throughout the process, the FAA collaborates with aviation community stakeholders, including operators, equipment manufacturers, academia and other federal agencies. We work with international air navigation services providers to make sure that equipped aircraft can take advantage of similar capabilities around the world. And we carefully plan how to integrate new capabilities into the airspace system, which is active around the clock.

While a lot has to happen before new capabilities come online, the FAA is working with stakeholders to develop streamlined tactics to deliver them. For example, the FAA is taking a more strategic approach to putting PBN procedures in place where they can provide the greatest value. This includes the development of integrated procedures and airspace.

Effective NextGen implementation requires a coordinated cross-agency effort. The FAA has developed a portfolio to successfully implement this large-scale integration project, including an enterprise-wide emphasis on risk-mitigation solutions and balance between ground-based and airborne systems.

PRE-IMPLEMENTATION ACTIVITIES

While providing early operational benefits in the NAS, the FAA also moved forward with planning, engineering analyses, risk assessments and business case development essential for effective NextGen implementation. We established a new transformational program, Collaborative Air Traffic Management Technologies, which will provide operational enhancements to the existing Traffic Flow Management System infrastructure critical to NextGen.

We also conducted a number of pre-implementation activities to support the development of key NextGen capabilities. Across several of our transformational programs, we conducted sophisticated simulations and tests to investigate the integration of operational capabilities into existing systems and address human factors. This year, we examined the effect on controller workload of Data Communications and ADS-B through human-in-the-loop simulations.

IMPROVED PROCESSES AND STANDARDS

Steady improvements in the FAA's financial management and strategies for fielding new air traffic technology demonstrated the agency's commitment to keeping programs on track and moved the agency off the Government Accountability Office's high-risk list. We will continue this focused approach to put in place strategies to streamline the introduction of NextGen capabilities.

Technical and operational standards for ADS-B Out equipment, which is necessary for air traffic control critical services, have been approved. Through an accelerated process in collaboration with stakeholders, we updated ADS-B equipment standards and coordinated with Europe ensuring harmonization of standards. This paves the way for publication of a final ADS-B Out rule in May 2010. Information on other standards can be found in Appendix A.

ENHANCED SAFETY

Safety is the paramount consideration in everything we do. Along with capacity and environmental benefits, NextGen will enable an even safer NAS. As NextGen technologies and procedures are developed, we conduct safety and risk analyses at every step of the process.

Safe implementation and operation of NextGen improvements requires enhanced FAA capabilities for safety risk management and safety assurance. To support these enhanced safety capabilities, the FAA published a preliminary safety roadmap in fiscal year 2009. The safety roadmap details ongoing FAA activity for Safety Management System implementation, Safety Management Services and Aviation Safety Information Analysis and Sharing (ASIAS). Combined, these elements provide advanced prognostic and analytical safety capabilities that will help anticipate safety issues before they become incidents or accidents.

ASIAS is a suite of tools that extracts relevant knowledge from data sources throughout the NAS. It enables the FAA and aviation community partners to monitor the effectiveness of NAS enhancements and will ensure that the operational capabilities that produce capacity, efficiency and environmental benefits are safe. In 2009, we expanded ASIAS to include data from air traffic, and partnered with operators to expand the system to 27 airlines, up from 12.

IMPROVED ENVIRONMENT AND ENERGY

It is important that NextGen provide environmental performance and energy improvements to sustain aviation for the future. The FAA in 2009 adopted an Environmental Management System (EMS) framework to manage these aspects of NextGen. EMS provides a structured approach for setting goals and making continued improvements in performance. Using EMS, environmental and energy objectives are being integrated into NextGen planning, decision making and operations.

We are applying solutions including operational measures, new technologies, sustainable alternative fuels, scientific and modeling advances, and policies to address aircraft noise, air quality, water quality, climate impacts and energy. We are establishing aggressive performance improvement goals in each of these areas. In 2009, we established the Continuous Lower Energy, Emissions and Noise program to accelerate new technologies and sustainable alternative fuels. We achieved approval of the first aviation alternative fuels specification, working with government and industry partners in the Commercial Aviation Alternative Fuels Initiative. We moved forward on research recommendations from the Aviation Climate Change Research Initiative and led U.S. efforts at the International Civil Aviation Organization (ICAO) to address aviation's contribution to climate change. In 2009, ICAO adopted the first global approach to carbon emissions for any industry.

NEXTGEN WORKFORCE DEVELOPMENT

The acquisition of NextGen mission-critical technologies is a complex, resource-intensive undertaking that requires a highly skilled, flexible workforce. The FAA projects its core acquisition workforce needs to increase by 350 people, an increase of 35 percent between 2009 and 2011. In 2009, we developed and implemented an annual workforce plan to ensure the hiring, development, certification and retention of a workforce with enhanced competencies and skills to successfully implement NextGen.

We will continue to keep abreast of needs for the acquisition, technical and operational workforce as we move forward. We also will update certification requirements for key disciplines and address the attrition and potential retirements.

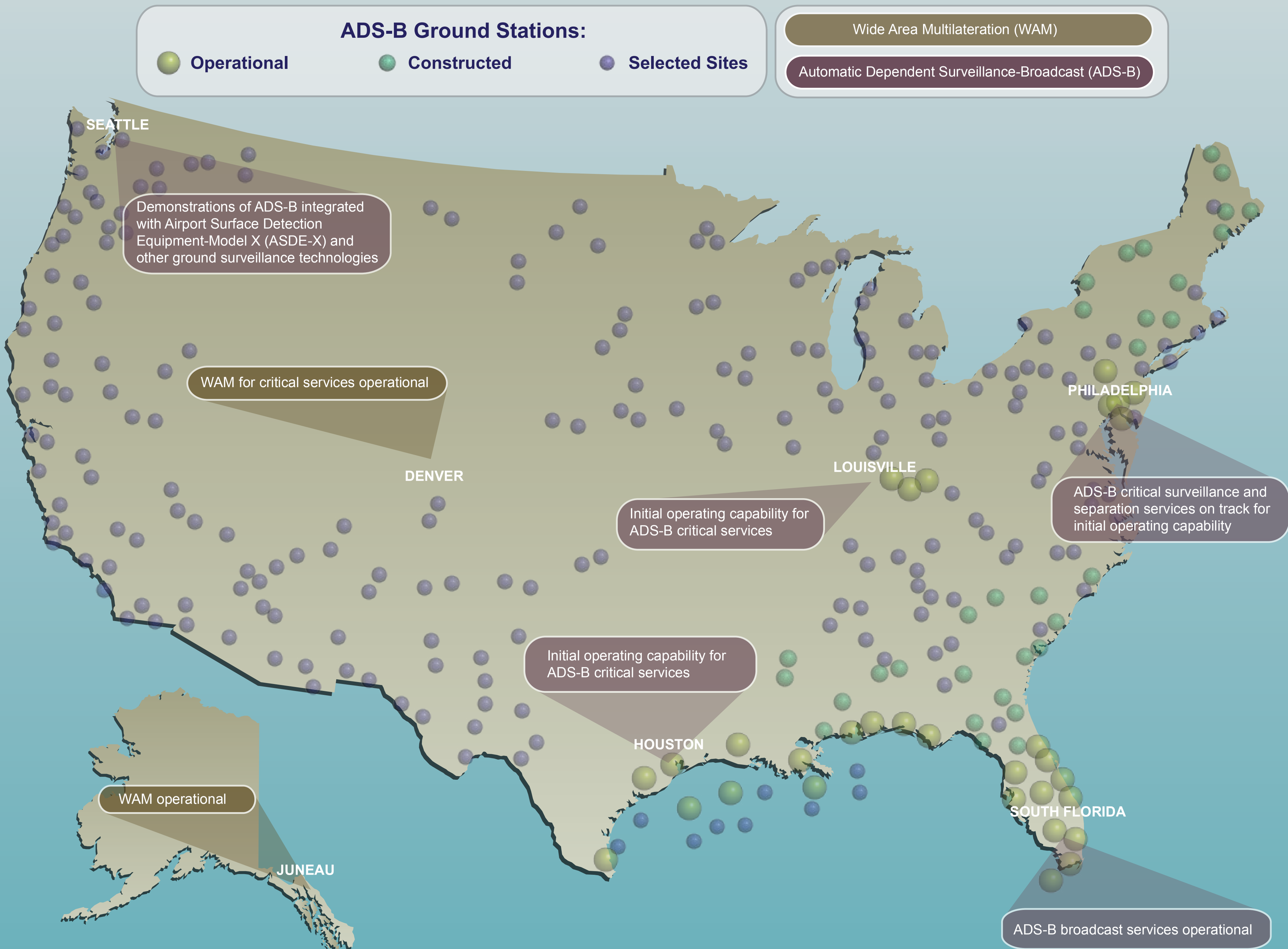
GLOBAL STRATEGY

The FAA is reaching out to global stakeholders such as ICAO, the Civil Air Navigation Services Organization (CANSO), civil aviation authorities, aircraft operators, industry groups and other air navigation service providers to participate in conceptual, operational, technical and strategic planning discussions. Additionally, we are targeting regional partnerships with our counterparts in China, Japan, Canada, Mexico, Europe, Australia and New Zealand.

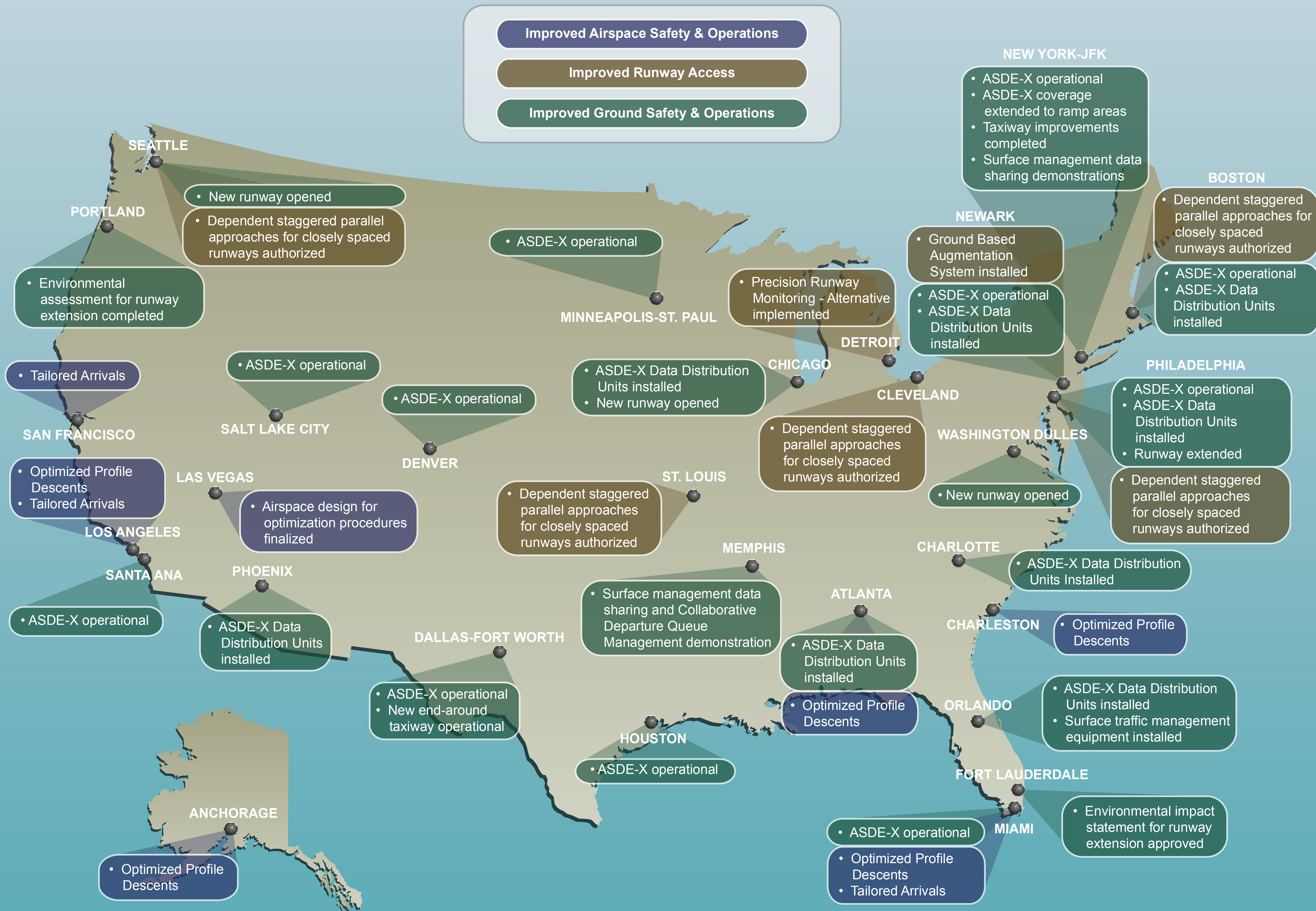
To ensure that aircraft operating globally are equipped with technology that can function and get operational benefits in various international air traffic environments, the FAA continued its collaboration with international partners. The FAA and the Single European Sky Air Traffic Management Research (SESAR) Joint Undertaking are working together to link SESAR and NextGen. We continued operational demonstrations with European and Pacific Rim operators and air traffic service providers under the Atlantic Interoperability Initiative to Reduce Emissions and the Asia and Pacific Initiative to Reduce Emissions partnerships.

These highlights are a few of the FAA's successes in the continuing transition to NextGen. With a focus on safety, increased efficiency and reduced environmental impact, they include capabilities that improved the NAS, or research activities that completed an important step in the programs that are paving the way for NextGen's mid-term operating environment. We focused on streamlining processes we will use to introduce new technology, procedures and equipage. To accomplish this, we collaborated closely with the aviation community to ensure that NextGen mid-term benefits will be available to all stakeholders.

Initiated Daily Use of Satellite-Based Surveillance



Improved Airport Surface Operations and Airspace Access



The FAA has worked closely with global partners to ensure that aircraft operating worldwide are equipped with technology that can take advantage of operational benefits in various international air traffic environments.

SECTION 2:

COLLABORATION

RTCA TASK FORCE RESPONSE

As we build upon the NextGen capabilities that we are deploying today in pursuit of our operational vision for the mid-term, it is clear that the FAA will not be able to go it alone. Full engagement with the NextGen stakeholder community will be essential for success. We need, and have acquired, the endorsement and participation of our aviation partners.

In February 2009, nearly 300 members of the aviation community came together to form a far-reaching consortium on NextGen implementation. Its members included representatives from commercial airlines, general aviation, the military, manufacturers and airports.

Seven months later, the RTCA NextGen Mid-Term Implementation Task Force issued its final report, which included a number of recommendations for providing near-term NextGen benefits leveraging current equipment and capabilities while building the foundation for mid-term capabilities. The report represents the aviation community's commitment to NextGen, as well as its endorsement of the FAA's incremental approach to NextGen implementation.

The partnerships the FAA continues to cultivate take many forms and are key to the success of NextGen. The FAA's partners make important contributions on a number of fronts: they serve in an advisory capacity, as demonstrated by the RTCA Task Force; they take an active role in the drafting of standards and requirements; they provide critical support to NextGen field demonstrations; and they take part in the operational testing of NextGen concepts and equipment. Most importantly, they ultimately implement the improvements into their operations, changing equipage, training and procedures as needed. The sheer volume and diversity of the FAA's stakeholder partnerships stand as a clear indication of industry's commitment to realizing the full promise of NextGen.

"If the FAA implements the elements of a recommended operational capability... the operators who requested that capability will commit to making all necessary investments...in coordination with a rational and definable plan..."

RTCA *NextGen Mid-Term Implementation Task Force Report,* September 2009

In response to the RTCA report, the FAA has adjusted its planning to address the Task Force's Tier One recommendations. Furthermore, the FAA is improving business processes to streamline its effectiveness and address the Task Force's recommendations.

The FAA's action plans support the operational capabilities the Task Force requested, such as sharing surface movement data for better collaborative decision making. We are working to help airports safely increase throughput on closely spaced as well as converging or intersecting runways. We also are working to safely increase access to the national airspace system for all operators, while providing the controller tools and operator procedures necessary to enable the safest, most efficient, economical and environmentally friendly routes of travel.

The FAA will do its part to deliver the desired capabilities and associated benefits to operators. The agency appreciates that the aviation community, through the Task Force report, has committed to doing the same. "All capabilities considered [by the Task Force] had at least one operator committed to invest in its implementation," the Task Force said in its report. "If the FAA implements the elements of a recommended operational capability for which it is responsible," the Task Force continued, "the operators who requested that capability will commit to making all necessary investments (e.g., training and equipage) in coordination with a rational and definable plan to be able to fly and achieve the benefits of such capability."

The agency's responses take into consideration funding allocations, scheduling constraints, investment decisions, standards, training and other critical work that will be required by the FAA and industry as well as the interdependencies that exist between systems. They also reflect differing levels of maturity among NextGen capabilities — some ripe for deployment and use today, and some still in development. In the latter case, we will conduct the work necessary to answer any open questions. In order to achieve success, the FAA and its partners will have to work together.

The agency's full response, which details its action plan for addressing Task Force recommendations, was published January 31, 2010. "FAA Response to Recommendations of the RTCA NextGen Mid-Term Implementation Task Force" is available at www.faa.gov/nextgen.

The recommendations included in the RTCA report were separated into operational areas including two that are crosscutting, Data Communications and Integrated Air Traffic Management. The remaining overarching recommendations were aimed at issues that impact the successful integration of all NextGen capabilities. The recommendation categories are depicted by the icons below:

A summary of the operational action plans is included in the foldout in this edition of the NextGen Implementation Plan.

On the outer pages of the foldout, we list each of the RTCA's specific Tier One recommendations along with the FAA's corresponding plan of action. Those recommendations and action plans are grouped under the same operational categories used in the RTCA report, and we identify each section using the icons depicted above.

On the inside pages of the foldout, we offer a broad summary of our response under each RTCA category. We also provide a graphical depiction showing how each of those categories aligns with the FAA's seven solution sets — managed portfolios of related operational capabilities that together will bring about the NextGen mid-term system.

Our Task Force response action plans — both operational and overarching — also can be traced in Appendix B, which summarizes our NextGen work plan for the next six years. Task Force response actions are highlighted in *italics*.

The work of the RTCA Task Force has proven invaluable in helping the FAA better define its near-term implementation goals as the agency continues to move steadily toward the mid-term system of 2018. The FAA is committed to continued collaboration with the greater aviation community as it works to carry out the action plans summarized in this document. Empowered by the spirit of cooperation and partnership that has come to define NextGen, we remain confident that — working together — the full promise of NextGen is well within our grasp.

Improving efficiency saves time and fuel. When we reduce fuel consumption, we reduce carbon dioxide and other emissions that contribute to poor air quality.


INTEGRATED SYSTEM-WIDE APPROACH (CDM/TFM/ATC) (47)

Continue to enhance the ability of aviation stakeholders to collaborate in real-time on responses to traffic flow, enabling the nation's air transportation interests to be served with a global and corporate perspective. This would include user flight planning system integration with FAA traffic management automation. As part of this effort, the FAA would develop requirements and schedules to implement improved decision-support and data-sharing capabilities as well as associated training.

Action Plan:

- 2010-2011: Continue the analysis necessary to develop the requirements needed to implement proven decision support tools and data sharing capabilities
- 2011: In collaboration with aviation stakeholders, deliver a mid-term traffic flow management (TFM) capabilities roadmap that outlines improvements that can be accomplished in the 2014-2018 timeframe
- 2012: Upgrade the existing traffic flow management system (TFMS) to include an initial electronic negotiation capability for more efficient flight planning

IMPROVE CATM AUTOMATION TO NEGOTIATE USER-PREFERRED ROUTES AND ALTERNATIVE TRAJECTORIES (7b, 8 & 46)

Use CATM automation to negotiate user-preferred routes and alternative trajectories.

Action Plan:

- 2011-2016: Deploy ability for traffic managers to electronically transmit reroutes from traffic flow management to en route automation for delivery to pilot, dispatcher:
  - 2011: Predeparture reroutes (Tower)
  - 2014: Airborne reroutes (En Route)
  - 2016: More complex Area Navigation (RNAV) clearances, Data Comm dependent
- 2011: Institute Time Based Flow Management (TBFM), enhancements to Traffic Management Advisor (TMA) (dependent on 2010 TBFM final investment decision)
- 2012: Upgrade the existing TFMS to include an initial electronic negotiation capability for more efficient flight planning

DIGITAL ATC COMMUNICATIONS FOR REVISED DEPARTURE CLEARANCES, REROUTES AND ROUTINE COMMUNICATIONS (16, 17, 39, 44 & 42)

Implement Segment 1 of the FAA's Data Comm program to deliver reroutes, routine clearances and revised departure clearances to Aeronautical Telecommunications Network (ATN) Baseline 1 and Future Air Navigation System (FANS) 1/A+ aircraft via VHF Data Link – Mode 2 (VDL-2). Continue to provide and expand the utilization of Tailored Arrivals at coastal airports.

Action Plan:

Data Comm Segment 1

- 2011: Deliver a final investment decision on Data Comm Segment 1
- 2014: Enable revised departure clearance capability in the tower environment via VDL-2 for aircraft equipped FANS 1/A+
- 2016: Enable revised departure clearance capability via VDL-2 for aircraft equipped with ATN
- 2016: Provide airborne reroutes for TFM in the en route environment for Data Comm equipped aircraft (FANS 1/A+ or ATN) via VDL-2

Tailored Arrivals

- 2011: Transition Tailored Arrivals from a demonstration project to full operational use (MIA, SFO, LAX)
- 2011: Identify potential required changes to automation platforms necessary to support operational implementation of use of Oceanic Tailored Arrivals
- 2011-2014: Collaborate with industry to identify additional coastal airports where there is a positive business case for the implementation of Tailored Arrivals. Due to the dependence of Tailored Arrivals on FANS equipment, these procedures are currently limited to use at airports that support transoceanic traffic.

SURFACE SITUATIONAL AWARENESS, PHASE 1 (40)

Deploy Airport Surface Detection Equipment – Model X (ASDE-X) or other ground infrastructure to capture surface activity in the movement and non-movement areas, including deployment of data distribution units. Provide policies, processes, procedures and standards for data exchange.

Action Plan:

- 2010-2011: Evaluate the benefit of FAA-funded infrastructure to provide surface surveillance coverage in non-movement areas, taking into consideration any radio spectrum capacity constraints
- 2010-2011: Develop data rights and data release policies in support of data sharing goals
- 2010-2013: Execute the current ASDE-X, Airport Surface Detection Equipment - Model 3 (ASDE-3)/Airport Movement Area Safety System/ Multilateration implementation programs at 34 of the OEP 35 airports, and at six additional non-OEP airports
- 2010-2013: Install data distribution units at ASDE-X and ASDE-3/Multilateration locations and provide initial data dissemination capability
- 2011+: Develop and implement the longer-term data dissemination capability needed to provide a more reliable and robust data infrastructure

TFM COMMON OPERATIONAL PICTURE (43) AND SURFACE CONNECTIVITY (38)

Define consistent views of operational data for collaborative decision making, and define interoperability standards and requirements for sharing surface data among flight operations centers (FOC) and the FAA.

Action Plan:

- 2010: Work with the Surface Collaborative Decision making Team (SCT) to define and gain consensus on a work plan to develop information exchange requirements
- 2011-2012: Conclude and execute information exchange requirements work plan
- 2012-2014: Work with SCT and Tower Flight Data Manager (TFDM) development team to define interoperability standards for surface operational data exchange
- 2013-2015: Test interoperability between the FAA and flight operations centers
- 2014-2016: Execute field implementation of surface operational data sharing

SURFACE SITUATIONAL AWARENESS, PHASE 2 (41)

Implement integrated airport movement management decision support tools, standards and processes to enable collaborative data sharing among FOCs and the FAA.

Action Plan:

- 2010-2014: Leverage existing R&D activities and development plans to field integrated airport surface standards, processes and decision support tools by 2018

INCREASE CAPACITY AND THROUGHPUT FOR CONVERGING AND INTERSECTING RUNWAY OPERATIONS (9)

Maximize the utilization of runways that converge or intersect, or whose flight paths converge or intersect.

Action Plan:

- 2010: Analyze operations at BOS, BWI and JFK to determine potential Converging Runway Display Aid (CRDA) operational benefit
- 2010: Demonstrate Relative Position Indicator (RPI) at a minimum of two terminal sites to support future NextGen capabilities
- 2011: Leverage data collected from demonstration activities to develop an RPI requirements document to enable field implementation in 2012

INCREASE USE OF STAGGERED APPROACHES (12)

Authorize dependent, staggered approaches to runways spaced less than 2,500 feet.

Action Plan:

- 2010: Approve additional dependent, staggered approaches (7110.308) for additional runway ends at airports already using the procedure, as well as at other qualifying airports: EWR, MEM, SEA (IAD and DEN are under review)

REVISE THE BLUNDER ASSUMPTIONS (13)

Conduct a study that establishes the safety case for operating simultaneous independent approaches to closer runway spacing than currently allowed.

Action Plan:

- 2010: Continue blunder testing for closely spaced parallel operations (CSPO)
- 2011: Complete blunder model analyses for CSPO and determine the operational impact in support of decreased minimums
- 2011: Implement an update to FAA Order 7110.65

CSPO MULTILATERATION (14)

Use Precision Runway Monitor – Alternative (PRM-A) for CSPO currently supported by Precision Runway Monitor (PRM).

Action Plan:

- 2010: Perform data collection to support a business decision on extended use of multilateration using PRM-A on a case-by-case basis
- 2011: Evaluate collected data in support of additional potential deployment

CSPO SATNAV OR ILS (37a)

Enable satellite navigation procedures as alternative to Instrument Landing System (ILS) during simultaneous, dependent approaches to closely spaced parallel runways (CSPR)

Action Plan:

- 2010: Conduct simulations and safety analysis of any combinations of ILS, RNAV, Required Navigation Performance (RNP), Localizer Performance with Vertical Guidance (LPV) and Global Navigation Satellite System Landing System (GLS) during simultaneous and/or dependent approaches to closely spaced parallel runways
- 2011: Update FAA Order 7110.65 to approve any combination of RNAV (with vertical navigation)/RNP/LPV/GLS/ILS for simultaneous independent and dependent approaches to CSPR

OPTIMIZE AND INCREASE THE USE OF RNAV OPERATIONS, INSTITUTE TIGER TEAMS THAT FOCUS ON QUALITY AT EACH LOCATION (32a & 29)

Implement RNAV terminal procedures that do not necessarily just overlay existing conventional procedures (unless that is the most efficient routing), and procedures that can connect to Q and T routes (where structure is needed) or that expand the use of the NRS to enable greater flexibility of routing in the en route phase (where structure is not needed).

Action Plan:

- 2010: Create initial set of stakeholder tiger teams to address Performance Based Navigation (PBN) procedure optimization at locations prioritized by need, cost benefit, budget and other considerations
- 2010: Assemble expert procedure design teams to facilitate the long-term development, integration and optimization of PBN procedures
- 2010: Continue to review existing work plans and make adjustments as appropriate to ensure the development of high-value procedures
- 2011: Create implementation teams that execute the results of the initial set of tiger teams
- 2011: Leverage expert design team structure to complete development on remaining scheduled legacy procedures
- 2012+: Leverage expert design team structure in moving toward implementation of integrated airspace procedures

INTEGRATE PROCEDURE DESIGN TO DECONFLICT AIRPORTS, IMPLEMENT RNP WITH RADIUS-TO-FIX (RF) CAPABILITY, AND EXPAND USE OF TERMINAL SEPARATION RULES (4, 21a &32b)

Undertake large-scale redesign of terminal and transition airspace leveraging PBN, including broader use of terminal separation rules and continuity of efficiency into the en route environment.

Action Plan:

- 2010-2012: Complete airspace redesign projects in New York, Chicago, Houston and Southern Nevada. These projects include the broad use of RNAV, the deconfliction of airports and the realignment of airspace to optimize flight and flows.
- 2010-2012: Initiate integrated airspace and procedure projects at key sites. Candidate sites include all metro areas cited in the recommendation. The concurrent development and implementation of RNAV Standard Instrument Departures (SIDs) and Standard Terminal Arrival Routes (STARs) will ensure an integrated approach to procedural optimization. Decouple operations between primary and secondary/satellite airports located in complex terminal airspace. Advanced features, such as RNP RF, may be required (initially with RNP 1).
- 2013-2015: Complete integrated airspace and procedure projects at key sites. Begin next increment of integrated airspace and procedure projects. Expand the use of three-mile separation and controller techniques as appropriate.
- 2013-2015: Complete studies and refine expanded use of reduced separation rules, surveillance data fusion and automation convergence for future NextGen applications.

EXPAND USE OF TIME-BASED METERING (24)

Expand use of Time Based Metering (TBM) to all Centers/OEP airports where TMA is available and not in regular use. Initiate training for both flight operators and FAA personnel. Ensure that Adjacent Center Metering (ACM) capabilities are in place to provide adequate data for efficient metering.

Action Plan:

- 2010: Conduct cost-benefit analysis of implementing ACM capabilities, which extends TBM beyond the boundaries of a single en route center.
- 2010-2015: Pending positive cost-benefit analysis results, expand ACM to: LAX, SFO, SAN, ATL, IAD
- 2012: Complete improved training program for FAA traffic management coordinators at sites where TMA is deployed, with the goal of increasing the consistent use of TBM
- 2012-2015: Dependent on first quarter calendar year 2010 final investment decision on TBFM and a positive cost/benefit analysis, deploy TMA to additional OEP airports: TPA, CLE, DCA, BWI, SAN
- 2013: Dependent on first quarter calendar year 2010 Final Investment Decision on TBFM, make a final investment decision on the integration of TMA data with the traffic flow management systems

UTILIZE REQUIRED TIME OF ARRIVAL (RTA) TO LEVERAGE COLLABORATIVE ARRIVAL PLANNING (CAP) (25)

Leverage aircraft RTA capabilities to meet meter fix times, and work with operators to develop CAP processes.

Action Plan:

- 2010: Analyze and review CAP performance at Memphis and Atlanta centers with the goal of expanding CAP to additional locations
- 2010: Develop data rights and sharing policies for CAP
- 2010: Work with industry to develop RTA/CAP performance metrics
- 2010: Deliver RTA Safety Management System (SMS) analysis
- 2011: Conduct RTA proof-of-concept demonstration
- 2011-2014: Leverage demonstration results to conduct engineering and analysis necessary to support the development of initial RTA capability
- 2015-2018: Implement limited RTA capability (dependent on the establishment of a positive business case, approved SMS analysis, automation system enhancements and aircraft equipage)

DEVELOP RNAV-BASED EN ROUTE SYSTEM (30)

Transition to performance-based routing for cruise operations, replacing the existing Jet and Victor airway system with RNAV and RNP-based routing systems, including Q routes, T routes, and NRS-based trajectories. Design routes as multi-highways connected to RNAV SIDs and STARs where appropriate. Publish low-altitude Navigation Reference System (NRS) waypoints and create performance-based routes to support use by low-altitude airspace users.

Action Plan:

- 2010: In collaboration with stakeholders, deliver a nationwide strategy for the implementation of RNAV Q (18,000 feet and above) and T (below 18,000 feet down to 1,200 feet) routes
- 2011: In collaboration with stakeholders, determine the usefulness of the NRS to the GA community, and/or determine an alternative for low-altitude users

SPECIAL ACTIVITY AIRSPACE (SAA) REAL-TIME STATUS AND SCHEDULING (35)

Increase the awareness and predictability of SAA usage so that flight operators can more reliably plan and utilize flight routes that transit inactive SAA without affecting Department of Defense (DoD) mission needs.

Action Plan:

- 2010-2014: Conduct business case assessments for implementation at RTCA recommended priority sites (MSP, DEN, ABQ, LAX, SEA, SLC) for implementation in coordination with the DoD and industry stakeholders
- 2010-2014: Conduct the following activities under the Aeronautical Information Management (AIM) modernization program:
  - 2010: In collaboration with the SAA community, develop a concept of operations to integrate diverse SAA functions
  - 2011: In collaboration with the SAA community, conduct an initial benefits analysis and review policy, and develop metrics and requirements
  - 2010-2014: Develop common digital information exchange services for coordinating and disseminating SAA usage and activation data for planning and tactical use
    - 2010: Enable System Wide Information Management (SWIM) exchange of SAA data
    - 2010-2011: Conduct demonstrations of SWIM exchange of SAA data to external users; Volk CRTC, Luke AFB, Jefferson Range, Eastern Air Defense Sector. Other sites under consideration for demonstration activity: Holloman AFB, Cannon Range, White Sands Missile Range
    - 2013-2014: Make integrated SAA data available to NAS systems such as En Route Automation Modernization (ERAM) and traffic flow management
  - 2011-2014: Implement a measurement system validating real-time use of SAA
  - 2014: Integrate SAA status information into air traffic decision support tools to enable strategic and tactical airspace management

LOW-ALTITUDE, NON-RADAR AIRSPACE (28)

Provide radar-like services for reduced time and distance flown in non-radar airspace at low altitudes (using Automatic Dependent Surveillance – Broadcast (ADS-B) out).

Action Plan:

- 2010-2013: Continue to deploy ADS-B ground infrastructure
- 2010+: Explore state and local cost-sharing partnerships which could expand surveillance services (e.g., Colorado WAM initiative) into low-altitude, non-radar airspace
- 2011+: Pursue ADS-B program expansion to provide surveillance services in non-radar airspace

IMPLEMENT LPV APPROACHES TO AIRPORTS WITHOUT PRECISION APPROACH CAPABILITIES (22)

At airports without precision approach minimums, improve airport access by publishing and using Localizer Performance with Vertical Guidance (LPV) procedures.

Action Plan:

- 2010-2015: Maintain a goal of at least 300 new LPV approaches per year, placing highest priority on the value of new procedures
- 2010: Work with the aviation community to prioritize the schedule of runway ends slated to receive LPV procedures

*Numbers by recommendations coincide with operational capabilities referenced in the RTCA Task Force report. Only solution sets impacted by Task Force recommendations are represented here. For more information, please visit www.faa.gov/nextgen.

*Airport identifier guide located after Appendix B.

ALIGNMENT OF FAA'S NEXTGEN IMPLEMENTA

SOLUTION SETS

Increase **Arrivals/Departures at High Density Airports**

Improve **Collaborative Air Traffic Management**

Increase **Arrivals/Departures at High Density Airports**

Increase **Flexibility in the Terminal Environment**

Improve **Collaborative Air Traffic Management**

TASK FORCE RECOMMENDATION AREAS

CROSS-CUTTING

DATA COMM

INTEGRATED ATM

SURFACE

FAA RESPONSES TO RTCA TASK FORCE

The FAA continues to enhance the ability of aviation stakeholders to collaborate on responses to traffic flow in real time. Leveraging new technologies and collaborative decision making with users helps to achieve efficiency goals. This includes user flight planning system integration with traffic management automation. Collaborative Air Traffic Management (CATM) will be deployed to negotiate user-preferred routes and alternative trajectories. The Data Communications (Data Comm) program will deliver reroutes, routine clearances and revised departure clearances. We will continue to provide Tailored Arrivals at coastal airports and expand utilization at additional sites. As part of this effort, the FAA will develop requirements and schedules to implement improved decision-support and data-sharing capabilities, as well as associated training.

This quick reference guide is an overview of the FAA's response to each of the RTCA NextGen Mid-Term Implementation Task Force's Tier One operational recommendations. The action plans are grouped under the same six categories used in the Task Force report and have been color coded for quick visual reference. We have linked the Task Force categories with the appropriate FAA NextGen solution sets, making it easier to follow how the recommendations fit it into the overall NextGen work plan, summarized in Appendix B. The Task Force response document is available at www.faa.gov/nextgen

The FAA is committed to improving the efficiency of surface operations by facilitating the sharing of common operational data among all key decision makers, including airline flight operation centers, air traffic controllers and airports. Shared situational awareness will enable a collaborative surface management environment that will provide increased safety while enabling greater throughput. Demonstration activities are underway today, and the agency expects to have defined data sharing requirements and standards by 2014. We are working with stakeholders to address ongoing challenges such as ensuring the security of proprietary information, surveillance in non-movement areas, and how to provide services at airports not currently scheduled for Airport Surface Detection Equipment-Model X (ASDE-X).

…ATION PLAN WITH TASK FORCE RESPONSES

Operational

Increase **Flexibility in the Terminal Environment**

Runway Access

Optimal National Airspace System (NAS) efficiency can only be achieved when the nation's runways are operating at their highest possible utilization rates — regardless of weather. Evaluations are underway to expand the use of Converging Runway Display Aids at airports with intersecting runways with a goal of minimizing lost capacity. The agency remains committed to improving capacity for Closely Spaced Parallel Operations (CSPO). Ongoing simulator trials are expected to broaden reduced CSPO separation standards by 2013, and we are aggressively pursuing demonstrations of the Relative Position Indicator — a tool aimed at establishing ILS equivalency for using Localizer Performance with Vertical Guidance during CSPO.

Increase **Arrivals/Departures at High Density Airports**

Increase **Flexibility in the Terminal Environment**

Metroplex

The FAA's efforts to deconflict arrival and departure traffic around multiple airports in congested metropolitan areas will move Area Navigation/Required Navigation Performance (RNAV and RNP) airspace and procedure design away from individual overlays into an Integrated Airspace and Procedures approach. The agency also is focusing on city pair networks with an emphasis on Performance Based Navigation (PBN). To facilitate the broad collaboration necessary for the efficient development and implementation of PBN procedures, the FAA is creating multi-disciplined stakeholder teams to address procedure development and optimization, especially related to a mixed equipage environment.

Initiate **Trajectory-Based Operations**

Increase **Arrivals/Departures at High Density Airports**

Increase **Flexibility in the Terminal Environment**

Improve **Collaborative Air Traffic Management**

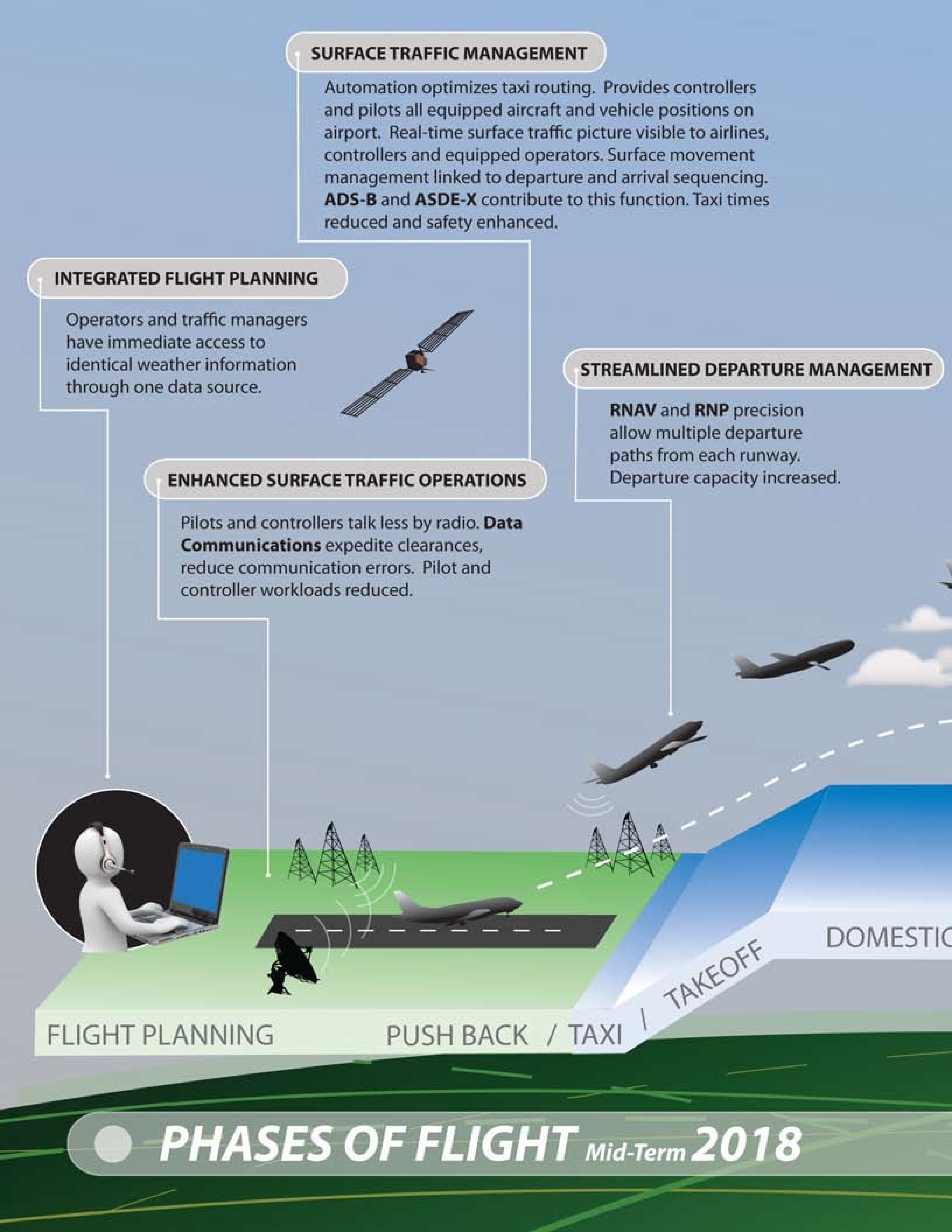
Cruise

As we transition to performance-based routing for cruise operations, the FAA is working to replace legacy route structures with RNAV and RNP-based routing systems, including Q-routes, T-routes and Navigation Reference System-based trajectories. A Q-route implementation plan is due out in 2010. Expanding the use of Time-Based Metering and advancing Required Time of Arrival (RTA) capabilities will enable a new level of predictability that will enhance collaborative planning. A final investment decision on the agency's Time Based Flow Management (TBFM) program is due out this year, and work is underway to deliver initial RTA capabilities by 2015. The agency also is working to facilitate improved data sharing regarding the status of Special Activity Airspace.

Increase **Flexibility in the Terminal Environment**

NAS Access

The FAA is committed to increasing NAS access, allowing for more predictable and efficient aircraft operations at non-OEP airports and in low-altitude airspace. Utilization of Automatic Dependent Surveillance-Broadcast (ADS-B) surveillance is one enabler that allows operators to move away from procedural separation and "one-in, one-out" at many airports. Another is Wide Area Multilateration (WAM), such as was recently installed in the mountains of Colorado. Added surveillance coupled with additional Localizer Performance with Vertical Guidance (LPV) procedures will extend the volume of airspace not currently covered and enhance accessibility to airports in low visibility conditions. In addition to maximizing currently deployed infrastructure, the agency will continue to entertain cost-sharing proposals from states willing to make surveillance investments.


SURFACE TRAFFIC MANAGEMENT
Automation optimizes taxi routing. Provides controllers and pilots all equipped aircraft and vehicle positions on airport. Real-time surface traffic picture visible to airlines, controllers and equipped operators. Surface movement management linked to departure and arrival sequencing. **ADS-B** and **ASDE-X** contribute to this function. Taxi times reduced and safety enhanced.
INTEGRATED FLIGHT PLANNING
Operators and traffic managers have immediate access to identical weather information through one data source.
STREAMLINED DEPARTURE MANAGEMENT
RNAV and **RNP** precision allow multiple departure paths from each runway. Departure capacity increased.
ENHANCED SURFACE TRAFFIC OPERATIONS
Pilots and controllers talk less by radio. **Data Communications** expedite clearances, reduce communication errors. Pilot and controller workloads reduced.
FLIGHT PLANNING
PUSH BACK / TAXI / TAKEOFF
DOMESTIC
PHASES OF FLIGHT Mid-Term 2018

Federal Aviation Administration

EFFICIENT CRUISE

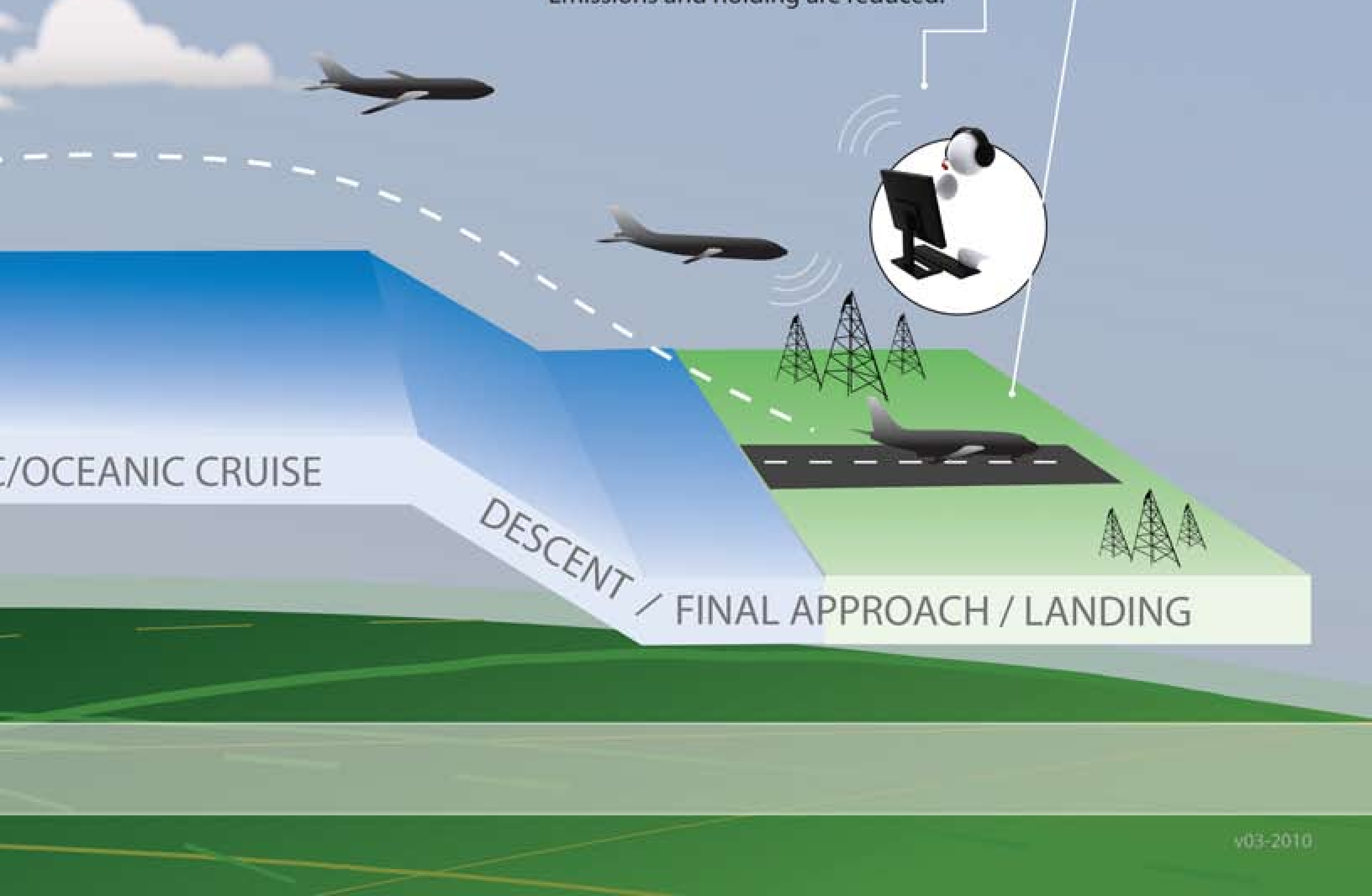
RNAV, **RNP** and **RVSM** utilize reduced separation requirements increasing airspace capacity. Aircraft fly most optimal path using trajectory-based operations considering wind, destination, weather and traffic. Re-routes determined with weather fused into decision-making tools are tailored to each aircraft. **Data Communications** reduce frequency congestion and errors. **ADS-B** supported routes available for equipped aircraft.

ENHANCED SURFACE TRAFFIC MANAGEMENT

Runway exit point, assigned gate and taxi route sent by **Data Communications** to pilots prior to approach. Pilot and controller workload reduced and safety improved.

STREAMLINED ARRIVAL MANAGEMENT

Arrival sequence planned hundreds of miles in advance. **RNAV** and **RNP** allow multiple precision paths to runway. Equipped aircraft fly precise horizontal and vertical paths at reduced power from descent point to final approach in almost all types of weather. Time and fuel are saved. Emissions and holding are reduced.



SECTION 3:

NEXTGEN IN 2018

OPERATING IN THE MID-TERM

OVERVIEW

This section describes how the FAA envisions airspace system operations in 2018 by showing what an aircraft operator will experience through all phases of flight. As we transition to this state over the next several years, operators and the flying public will continue to reap the benefits of NextGen, including improved safety, increased capacity and efficiency, and better environmental performance. The 2018 system, in turn, will provide a foundation for a further evolution of the airspace system in the long-term.

With NextGen, we must continue to advance safety in the face of increasing traffic and the introduction of very light jets, unmanned aircraft systems and commercial space flights. Further reductions in the accident rate are essential as the overall traffic increases, and achieving those reductions depends on focused safety initiatives and a pervasive approach to safety that is formalized through the safety management system.

NextGen will take full advantage of proactive safety management that allows us to analyze trends and uncover problems early on, so that preventive measures are put in place before any accident can occur. Our safety sharing and analysis tools will evaluate data from a variety of FAA systems, a multitude of operators, and international databases to monitor the effectiveness of safety enhancements and identify where new safety initiatives are warranted.

NextGen will accelerate efforts to improve aviation's environmental and energy performance to be able to sustain growth and add capacity. A strategic Environmental Management System approach will be used to integrate environmental and energy objectives into the planning, decision making and operation of NextGen. We will realize emissions, energy and noise benefits from advanced systems and procedures, but more improvements will be needed than can be operationally achieved. A major NextGen initiative, the Continuous Lower Energy, Emissions and Noise (CLEEN) program, helps accelerate the development and certification of promising new engine and airframe technologies and sustainable alternative fuels. Entry into service of successfully demonstrated CLEEN technologies is expected in the mid-term. We also expect that, aided by the government-industry Commercial Aviation Alternative Fuels Initiative, sustainable alternative fuels will supply some of the civil jet fuel needs by 2018, and this contribution will continue to increase in future years, improving air quality and reducing net carbon dioxide emissions.

This mid-term system is enabled by policy, procedures and systems both on the ground and on the flight deck. It makes the most of technologies and procedures that are in use today, while introducing new systems and procedures that fundamentally change air traffic automation, surveillance, communications, navigation and the way we manage information.

In addition to the advanced systems and procedures we develop through the NextGen transformational programs and solution sets, the mid-term system depends on coordination with and support from FAA specialists on safety, airports, the environment, policy development and the other building blocks of a modern air traffic management system. FAA information and management systems must keep all these activities synchronized as we approach the mid-term, reach it and move on.

Key ground infrastructure and avionics are included here in tables for each of the flight phases. A more detailed description of the mid-term system, including the FAA's NAS Enterprise Architecture and other documentation, is available on the FAA's NextGen Web site, www.faa.gov/nextgen.

While operators who adopt related new avionics will receive the greatest benefit in this time frame, lesser equipped operators will still be accommodated. The targeted aircraft avionics to support these operations are discussed in Appendix A. Through international collaboration on standards, we make certain that avionics developed to take advantage of NextGen or other advanced infrastructures worldwide will be interoperable.

FLIGHT PLANNING

KEY GROUND INFRASTRUCTURE

- Data Communications (Data Comm)
- En Route Automation Modernization (ERAM)
- Modernized Aeronautical Information Management System
- NextGen Network Enabled Weather (NNEW)
- System Wide Information Management (SWIM)
- Tower Flight Data Management (TFDM)
- Traffic Flow Management System (TFMS)

FLIGHT PLANNING

Flight planners in the mid-term will have increased access to relevant information on the status of the National Airspace System through a shared network-enabled information source. Operators will have access to current and planned strategies to deal with congestion and other airspace constraints. New information will include airspace blocked for military, security or space operations. It will describe other airspace limitations, such as those due to current or forecast weather or congestion. It also will show the status of properties and facilities, such as closed runways, blocked taxiways and out-of-service navigational aids. This shared information will enhance the ability of users to plan their flight operations according to their personal or business objectives. Updates will be available as individual flight-planning objectives are affected by changes in airspace system conditions. Operators will plan their flights with a full picture of potential limitations, from ground operations to the intended flight trajectory.

An outcome of this planning process will be an electronic representation of the operator's intended flight profile, updated for changing conditions that might affect the flight's trajectory. Operators and Air Traffic Management (ATM) personnel will have common access to this real-time information, shared via a secure network. This will provide each group with improved situational awareness and the ability to predict and resolve conflicts. Improvements in calculated scheduled arrival times will enhance system-wide planning processes. Accomplishing this will give controllers automated information on airport arrival demand and available capacity to improve sequencing and the balance between arrival and departure rates. Later analysis of a substantial body of data – a full day's, or more – will enable managers to apply lessons learned to future operations.

These advances will better accommodate operator preferences and improve the use of resources, even to the point of scheduling at the destination. For operators, they will mean more efficient traffic management and enhanced environmental performance by improving the ability to fine-tune and adjust schedules during planning and throughout the flight. For ATM, they will mean more comprehensive situational awareness, including user intent, and a capability to manage flights in groups as well as individually.

PUSH BACK , TAXI AND DEPARTURE

KEY GROUND INFRASTRUCTURE

- Automatic Dependent Surveillance-Broadcast (ADS-B) ground stations
- Airport Surface Detection Equipment-Model X (ASDE-X)
- Common Automated Radar Terminal System/Standard Terminal Automation Replacement System (CARTS/STARS) enhancements
- Data Comm
- Integrated Departure and Arrival Coordination System
- Modernized Aeronautical Information Management System
- NNEW
- Satellite Based Augmentation System (SBAS)
- Surface traffic management decision support tool
- SWIM
- TFDM
- TFMS

AVIONICS

- ADS-B, Traffic Information Services-Broadcast (TIS-B), Flight Information Services-Broadcast (FIS-B)
- Data Comm
- Area Navigation (RNAV) and Required Navigation Performance (RNP)

PUSH BACK, TAXI AND DEPARTURE

As the time for the flight approaches, the flight crew will receive the final flight path agreement as a data message. Data communications will provide predeparture clearances that allow amendments to flight plans. When the aircraft taxis out, the flight crew's situational awareness will be improved by flight deck displays that portray aircraft movement on a moving map that indicates the aircraft's position on the airport surface, and at busy airports, the position of other aircraft and surface vehicles. In the tower, improved ground systems, such as surface-movement displays, will enable controllers to manage taxiways and runways more efficiently, choosing the best runway and taxi paths for the departing aircraft's intended flight path and the status and positions of all other aircraft on the airport surface and in the terminal area.

These flight deck and tower displays are important safety tools that will improve our prevention of runway incursions and other surface conflicts, especially when visibility is low. More efficient management will mean fewer radio transmissions, shorter wait times, fewer departure delays and reduced fuel consumption and emissions. Weather information will be integrated into decision making for surface management.

Departure performance will be improved by using multiple precise departure paths from each runway end through Area Navigation (RNAV) and Required Navigation Performance (RNP) procedures. Multiple departure paths will enable controllers to place each aircraft on its own separate track, avoiding known constraints, thunderstorms and other severe weather near the airport.

CLIMB AND CRUISE

KEY GROUND INFRASTRUCTURE

- ADS-B ground stations
- Advanced Technologies and Oceanic Procedures
- Data Comm
- Enhanced/Integrated Traffic Management Advisor
- ERAM
- NNEW
- Traffic Flow Management-Modernization
- TFMS

AVIONICS

- ADS-B In and Out, with associated displays like Cockpit Display of Traffic Information
- Data Comm, including integration with the Flight Management System
- Future Air Navigation System in oceanic airspace
- RNP

The ability to operate simultaneously on closely spaced parallel runways – through increased accuracy in surveillance and navigation, and through improved understanding of wake vortices – means airports in effect will gain capacity for their existing runways. Together, these capabilities will enhance safety, improve environmental performance, and reduce operators' delay and fuel costs.

Precise departure paths will optimize system operations for entire metropolitan areas, reducing delays by allowing each airport to operate more independently. This will better separate arrival and departure flows for airports in proximity to one another, which will provide more efficient access to both commercial service and general aviation airports in congested metropolitan regions. These precise departures also can be designed to support airports that are now limited by terrain and other obstacles or during periods of reduced visibility. Precise paths will reduce flight time, fuel burn and emissions. They may also decrease the impact of aircraft noise to surrounding communities.

CLIMB AND CRUISE

As the aircraft climbs into the en route airspace, enhanced processing of surveillance data will improve position information and enable the flight crew and controllers to take advantage of reduced separation standards. Because the flight crew will be able to monitor the position of other aircraft from their own aircraft's flight deck, air traffic personnel will be able to assign spacing responsibility to the flight crew as the aircraft climbs to its cruising altitude. The aircraft will be able to merge into the overhead stream with a minimum of additional maneuvers.

Data communications will provide routine and strategic information to the flight crew and automate some routine tasks for both pilots and controllers. Controllers will be able to focus on providing more preferred and direct routes and altitudes, saving fuel and time. Fewer voice communications also will reduce radio-frequency congestion and oral miscommunication. When weather affects many flights, clearances for aircraft equipped for data communications will be sent automatically, increasing controller and operator efficiency.

If a potential conflict with other aircraft, bad weather, homeland security interventions or other constraints develops along the aircraft's planned path, automation will identify the problem and provide recommended changes in trajectory or speed to eliminate the conflict. If the aircraft is equipped for data communications, the controller will send the pilot the proposed change via a data message. Pilot and controller will negotiate the change, in coordination with the flight operations center. Agreed-on changes will be loaded into both ground and aircraft systems. Improved weather information, integrated into controller decision support tools, will increase controllers' efficiency and greatly reduce their workload during bad weather.

At times, traffic delays, airspace restrictions or adverse weather will require additional changes to the flight path agreement. When rerouting is needed, controllers will be able to assign offsets to the published route. Tailored to each flight, these offsets will be a way of turning a single published route into a "multi-lane highway in the sky." Use of offsets will increase capacity in a section of airspace. Since the final agreement will be reached via data messaging, complex reroutes can be more detailed than those constrained by the limitations of

DESCENT AND APPROACH

KEY GROUND INFRASTRUCTURE

- ADS-B ground stations
- ASDE-X
- CARTS/STARS enhancements
- Data Comm
- Enhanced/Integrated Traffic Management Advisor
- Localizer Performance with Vertical Guidance, Global Navigation Satellite System Landing System
- NNEW
- SBAS
- TFDM
- TFMS

AVIONICS

- ADS-B In and Out
- Data Comm
- GBAS avionics
- RNAV and RNP
- Vertical Navigation

voice communications and reduce one source of error in communications.

In oceanic operations, ATM personnel will provide aircraft entering oceanic airspace with an optimized trajectory. Airspace entry will be specified by track entry time and the intended trajectory. As weather and wind conditions change, both individual reroutes and changes to the entire route structure will be managed via data communications.

DESCENT AND APPROACH

NextGen capabilities will provide a number of improvements to terminal area operations that save fuel, increase predictability and minimize maneuvers such as holding patterns and delaying vectors. Enhanced traffic management tools will analyze flights approaching an airport from hundreds of miles away, across facility boundaries, and will calculate scheduled arrival times to maximize arrival performance. These advances will improve the flow of arrival traffic to maximize use of existing capacity. Improvements in calculated schedule arrival times will enhance system-wide planning processes. Controllers will gain automated information on airport arrival demand and available capacity, enabling them to improve sequencing and the balance between arrival and departure rates.

Information such as proposed arrival time, sequencing and route and runway assignments will be exchanged with the aircraft via a data communications link to negotiate a final flight path. The final flight path will ensure that the flight has no potential conflicts, and that there is an efficient arrival to the airport, while maintaining overall efficiency of the airspace operation.

With the improved precision of NextGen systems, separation between aircraft can be safely reduced. Suitably equipped aircraft will be able to fly precise vertical and horizontal paths, called optimized profile descents, from cruise down to the runway. These precision paths will allow for more efficient transitions from cruise to the approach phase of flight into high-density airports and will reduce noise. Controllers will be able to use multiple precision paths that maintain flows to each runway, using RNAV and RNP arrivals. Precision arrivals will save fuel and reduce emissions.

Today, the structure of arrival and departure routes does not allow for the most efficient use of airspace. By redesigning airspace, new paths can be used to provide integrated arrival and departure operations. The FAA will provide users with better options to manage departure and arrival operations safely during adverse weather, maintaining capacity that otherwise would be lost. Poor-visibility conditions dramatically reduce the capacity of closely spaced runways, and the capacity losses ripple as delays throughout the airspace system. NextGen capabilities will make it possible to continue using those runways safely, by providing better-defined path assignments and appropriate separation between aircraft.

LANDING, TAXI AND ARRIVAL

KEY GROUND INFRASTRUCTURE

- ADS-B ground stations
- ASDE-X
- CARTS/STARS enhancements
- Data Comm
- Enhanced/Integrated Traffic Management Advisor
- Integrated Arrival and Departure Coordination Tool
- Modernized Aeronautical Information Management System
- NNEW
- Surface traffic management decision support tool
- SWIM
- TFDM
- TFMS

AVIONICS

- ADS-B, TIS-B
- Data Comm

LANDING, TAXI AND ARRIVAL

Before the flight lands, the assigned runway, preferred taxiway and taxi path to the assigned parking space or gate will be available to the flight crew via data communications. This capability will be enabled by a ground system that recommends the best runway and taxi path to controllers, based on the arriving aircraft's type and parking assignment, and the status and positions of all aircraft on the airport surface.

Flight deck and controller displays will monitor aircraft movement and provide traffic and incursion alerts, using the same safety and efficiency tools as during departure operations. This will reduce the potential for runway incursions. Appropriate surface and gate-area vehicle movement information will be shared among air traffic control, flight operations centers and the airport operator. Airport and airline ramp and gate operations personnel will know each inbound aircraft's projected arrival time at the gate. Operators will be able to coordinate push backs and gate arrivals more efficiently.

AIRFIELD IMPROVEMENTS

Existing runway capacity will increase through 2018 with more precise routing and separation of departing and arriving aircraft. Throughput rates will be similar during inclement weather and visual conditions. Updated procedures for closely spaced parallel operations will allow simultaneous arrivals on runways with reduced separation. Airports may be able to build new runways without expanding existing physical boundaries, reducing cost and impact on neighbors and natural habitat. Overall, airports will balance surface, gate and terminal capacity with the improved runway capacity afforded by NextGen. Planned airfield improvements include:

NEW RUNWAYS

- Houston (IAH)
- Denver (DEN)
- Chicago (ORD)

RUNWAY EXTENSIONS

- Fort Lauderdale (FLL)
- Portland (PDX)
- Atlanta (ATL)
- San Antonio (SAT)

AIRFIELD RECONFIGURATION

- Philadelphia (PHL)
- Chicago (ORD)
- Los Angeles (LAX)

Our latest estimates show that by 2018, NextGen will reduce total flight delays by about 21 percent while providing $22 billion in cumulative benefits to the traveling public, aircraft operators and the FAA.

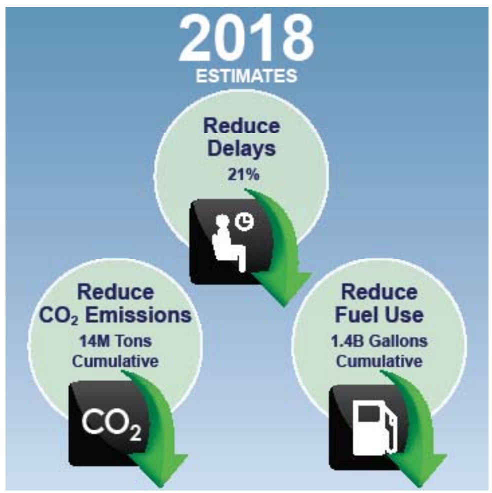
NextGen is here. With safety as our highest priority, improvements to our air traffic control and airport infrastructure are providing environmental and capacity benefits in the National Airspace System. Coupled with new cockpit capabilities, these systems are transforming the way we manage air traffic.

SECTION 4:

NextGen BENEFITS

TRACKING GAINS FROM DEMONSTRATIONS AND OPERATIONS

Implementing NextGen through the 2018 mid-term will enable significant safety, environmental and operational improvements. This is clearly seen through the range of our NextGen demonstrations, operational trials and deployments. This early work also has provided invaluable data and insight to enable the FAA to use modeling and simulation to assess integrated NextGen benefits, providing a powerful tool for both FAA and stakeholder decision making.



These activities help show in more detail how today's accomplishments, detailed in Section 1, already have begun to translate into our NextGen mid-term vision, illustrated in Section 3. The benefits are being tallied in ways that consumers and the rest of the aviation community value – dollars saved, gallons of fuel usage cut, emissions reduced and time saved.

Our latest estimates show that by 2018, NextGen will reduce total flight delays by about 21 percent while providing $22 billion in cumulative benefits to the traveling public, aircraft operators and the FAA. In the process, more than 1.4 billion gallons of fuel will be saved during this period, cutting carbon dioxide emissions by nearly 14 million tons. These estimates assume that flight operations will increase 19 percent at 35 major U.S. airports between 2009 and 2018, as projected in the FAA's 2009 traffic forecast.

It is important to note that we believe these estimates are understated, since we currently are modeling only a portion of the NextGen capabilities in our benefits calculations. For example, we include some of the capabilities enabled by the use of Automatic Dependent Surveillance-Broadcast (ADS-B), Data Communications (Data Comm) and improved performance-based navigation. However, our models do not yet account for improved integration of weather information and the operational improvements that this will enable. We will continue to update our integrated NextGen benefits estimates as we develop and validate improved modeling capabilities, and as new economic or operational conditions warrant. The benefits achieved for NextGen depend on underlying economic conditions that may affect the projected growth of aviation or the price of fuel. NextGen benefits also will depend on fleet equipage rates, which highlight the importance of the FAA continuing to work closely with industry as we advance NextGen implementation together while enhancing safety.

The FAA's highest priority is safety. We demand that it be paramount in everything we do. To continue to minimize risk as we introduce a wave of new systems and procedures over the next decade, the aviation community will continue to rely on safety management systems (SMS), integrated safety cases, and other proactive management processes that enable us to assess the safety impact of all proposed changes. Our safety assessments allow us to analyze trends and uncover problems early so that preventive measures are put in place to avoid accidents.

FAA's Aviation Safety Information Analysis and Sharing (ASIAS) program provides a suite of tools that extract relevant knowledge from multiple, disparate sources of safety information. ASIAS also helps the FAA and our industry partners monitor the effectiveness of safety enhancements. In use today, ASIAS will ensure that the operational capabilities that produce capacity, efficiency and environmental benefits are, first and foremost, inherently safe.

Specific operational capabilities also enhance safety. For example, ADS-B enables air traffic controllers – and pilots of equipped aircraft – to see airborne traffic, weather conditions and flight-restricted areas on their ground and cockpit displays. One benefit of this improvement in situational awareness is an increase in their individual and combined ability to avoid potential danger.

More precise tracking and information sharing will improve the situational awareness of pilots, enabling them to plan and carry out safe operations in ways they cannot do today.

Air traffic controllers will become more effective guardians of safety through automation, implementation of the SMS process and simplification of their most routine tasks, coupled with better awareness of conditions in the airspace they control.

Advances in tracking and managing operations on airport surfaces will make runway incursions less likely. Starting with pre-takeoff advice and instructions for pilots, our Data Comm initiative will replace most voice communications between pilots and controllers with data messages, eliminating multiple opportunities for error or misunderstanding. Voice channels will be preserved for the most critical information exchange.

Many of these safety advances will make National Airspace System (NAS) operations more efficient as well. For example, ADS-B will enable or contribute to more direct routings and optimized departures and approaches, which will increase capacity and save time and fuel. By tracking aircraft more precisely via ADS-B, the FAA will be able to reduce the separation between aircraft, thereby increasing system efficiency while maintaining or improving current safety levels. Fuel savings from more-direct trajectories will reduce greenhouse-gas emissions and other air pollutants. In December 2009, air traffic controllers at the Houston Center began using ADS-B to more efficiently and safely separate and manage air traffic flying over the Gulf of Mexico, an area that previously did not have radar coverage. The FAA will extend this capability by installing ADS-B ground equipment across the United States by 2013.

Supporting these modernization initiatives, our NextGen deployment activities, demonstrations and operational trials provide invaluable data and insights to enable the FAA to meet evolving NextGen systemic requirements. Demonstration programs and operational trials prove concepts in real-world settings, providing insight into how systems should be developed further and operated and supported in the field. In addition, they are instrumental in mitigating program risks. We feed data from demonstrations into our models of the NAS, making the models more precise and improving the estimates we draw from them. Demonstrations also provide direct measurements of the ways specific NextGen capabilities can benefit NAS stakeholders and the public, helping to make the business investment case for prospective users.

Although NextGen implementation is an evolutionary strategy, we are already seeing millions of dollars in benefits through demonstrations and the early stages of deployment, and billions of dollars in additional savings can be expected in the future. Drawing on data from demonstrations, trials and limited deployments, we can cite some concrete indications of what to expect from some of the principal NextGen initiatives.

SURFACE OPERATIONS

At the beginning of a flight, as the aircraft joins the departure queue, we are targeting operations on the airport surface to improve efficiency.

We have demonstrated, for example, that sharing surface movement information can reduce delays and save fuel at two existing surface test beds at Memphis and New York John F. Kennedy. Ongoing reductions in taxi times ranging from 1.3 minutes to 4.3 minutes were measured through the application of shared situational awareness between ramp and tower controllers. Additional efforts are under way to quantify benefits being accrued through extension of surface situational awareness to the traffic management coordinators located in the TRACONs and en route centers. Anecdotal evidence is pointing to a significant benefit pool, especially during atypical events, where the traffic management units are using surface management tools to identify opportunities to land aircraft that normally would have been put into holding. In Orlando, installation of a third test bed location is now complete, and preparations are under way for dedicated testing starting in March 2010.

Building on the Memphis surface management system demonstration, in September 2009 we conducted field trials of Collaborative Departure Queue Management (CDQM) with FedEx. CDQM seeks to confine departure delays to the gate rather than allowing aircraft to push back into a taxi delay. Cutting taxi delays reduces fuel burn, engine emissions, operating costs and congestion. During the demonstration, departure allocations were given to ramp controllers in FedEx's tower, which in turn allowed for a more metered demand to the runways during the company's massive arrival-and-departure cycle. Average taxi times were reduced about 15 percent during the three-day trial. Demonstrations will continue at Memphis in 2010, with plans to involve multiple major airlines and air traffic control.

TAKEOFF AND CLIMB

As aircraft take off toward their cruise trajectories, precision navigation will enable alternative climb paths, increasing safety and departure capacity at the airport. Precision navigation also will improve environmental performance and reduce costs to operators in time and fuel savings. As a result, operators are realizing meaningful benefits from diverging Area Navigation (RNAV) departures at Atlanta and Dallas/Fort Worth airports. Diverging departures increase available departure routes available to operators, boosting capacity and reducing delays. Operators saved about $34 million in the first year and $105 million in little more than three years since implementation at Atlanta, and $25 million at Dallas/Fort Worth in less than three years. Atlanta reduced its departure delays between 24 percent and 43 percent, and increased capacity by six departures per hour when the use of wake-vortex separation procedures was not required. Long-term RNAV departure benefits at Atlanta are estimated at 700,000 gallons of fuel savings and about 6,700 tons of carbon emissions per year.

CRUISE

The long, extended cruise portion of flight offers significant opportunity to improve performance. NextGen has been developing several capabilities in this segment of flight and exploring better ways to improve performance using systems currently deployed. At altitude, precision navigation offers further efficiency gains.

Alaska Airlines is saving more than 217 flight miles per day and nearly 200,000 gallons of fuel per year by using parallel flight routes, or Q routes, between Seattle, Portland and Vancouver on one end, and airports in the San Francisco Bay and Los Angeles basin areas on the other. The initial parallel routes were developed in 2004 in partnership with the FAA.

The FAA is a key player in two international partnerships that leverage existing data communications capabilities and other management techniques to demonstrate reductions in fuel consumption and emissions during transoceanic flight. The partnerships are the Atlantic Interoperability Initiative to Reduce Emissions (AIRE) and the Asia and Pacific Initiative to Reduce Emissions (ASPIRE).

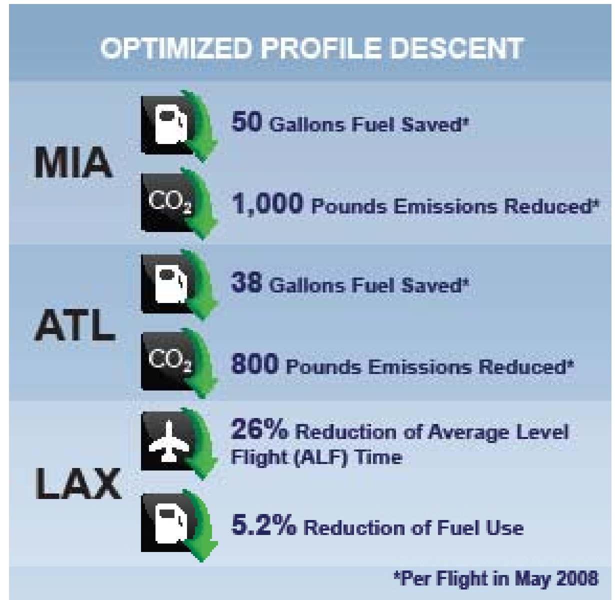
Beginning in May 2008 and continuing this year, the FAA's AIRE partnership with Europe has used aircraft with Future Air Navigation System (FANS) communications equipment and an Advanced Technologies and Oceanic Procedures (ATOP) system at the New York Air Route Traffic Control Center to reduce en route fuel consumption and emissions. The participants include American Airlines, Air France, Lufthansa and Air Europa. The FAA, in conjunction with these partners, developed revised routes adapting to real-time wind conditions over the Atlantic that differed from pre-flight forecasts.

Using ATOP conflict probe capabilities and improved communications techniques with the operators, a limited number of oceanic trajectory optimization demonstration flights were performed in 2008 in partnership with Air Europa. These demonstrations resulted in fuel savings of 0.5 percent-1 percent, validating the concept. During 2009, the additional partners participated in 119 oceanic optimization flights over the Atlantic. According to initial data analysis, the estimated fuel savings from reroutings on these flights averaged 1.4 percent, equivalent to about 230 gallons of fuel and more than 2 tons of carbon dioxide reductions per flight.

The 2008-09 demonstrations were limited to westbound routes and lateral rerouting. In 2010, the lateral reroute procedures tests will continue, and the FAA will initiate investigations on the benefits of vertical rerouting and eastbound routes. In addition, Automatic Dependent Surveillance-Contract climb and descent procedures will be conducted in an operational trial over the Pacific Ocean to examine a reduction in oceanic separation from 30 miles to 15 miles, in an effort to better accommodate more efficient and user-preferred routes.

The ASPIRE initiative was launched in 2008 by the United States, Australia and New Zealand. Japan joined it in October 2009 and Singapore in January 2010. United Airlines, Qantas and Air New Zealand flew the original demonstrations. Japan Airlines' first demonstration flight, a Boeing 747 operating from Honolulu to Osaka, explored NextGen concepts such as user-preferred route and dynamic airborne rerouting capabilities, plus a number of weight- and energy-saving techniques. In gate-to-gate demonstrations of emissions reduction on transpacific routes, the average fuel saving during en route operations was 2.5 percent.

In its annual report for 2009, issued before Japan joined, ASPIRE estimated that if all 156 transpacific flights per week between Australia, New Zealand, the United States and Canada operated under conditions adopted for its demonstrations, airlines would save more than 10 million gallons of fuel and avoid more than 100,000 tons of carbon emissions per year. Air New Zealand in October 2009 cited ASPIRE as a significant contributor to a fuel saving of



10 percent and a reduction of more than 385,000 tons of carbon emissions in its 2009 financial year compared with the previous year.

DESCENT, APPROACH AND LANDING

NextGen is pursuing multiple efforts to improve performance during the approach and landing phase of flight. In particular, key benefits are attainable as the aircraft descends from its cruise altitude and approaches its landing runway.

The basis of many of our near-term NextGen improvements for the approach phase is focused on the implementation of capabilities from RNAV and Required Navigation Performance (RNP). RNAV arrivals with continuous descent were implemented a few years ago at Phoenix, Los Angeles, San Diego and Las Vegas. Phoenix, with two RNAV arrival procedures since October 2006, has reduced time in level flight 38 percent, saving users about $4 million through 2008 and reducing carbon emissions more than 2,750 tons per year.

In addition, RNP procedures have been successfully applied to help deconflict congested airspace around airports such as Midway and O'Hare in Chicago. The RNP approach procedure we published at Midway for Runway 13C can improve access during bad weather for suitably equipped aircraft. The approach also can enable departures on Runway 22L and arrivals on 14R at O'Hare to continue while 13C is in use at Midway, a capability that hasn't been available. The conflict has caused 2,000 hours of departure and arrival delays per year at the two airports, costing airlines $4.5 million. Implementing the RNP approach at Midway will reduce these delays and costs. In response, the FAA published an RNP approach procedure for Runway 13C that would improve access for suitably equipped aircraft, without impacting operations at O'Hare.

We also accumulated experience through ongoing demonstrations of Optimized Profile Descent (OPD) procedures, in which aircraft can descend toward the runway more continuously, rather than having to maintain level flight during much of the approach, as they do now. This enables them to operate with their engines at or near idle, reducing

NEXTGEN AND THE ENVIRONMENT

The NextGen vision is to provide environmental protection that allows sustained aviation growth. Environmental management is increasingly complex, particularly with mounting domestic and international pressure to address climate change and reduce greenhouse gas emissions, and the associated scientific uncertainties. If not properly addressed, environmental impacts could constrain the industry in the future. Our challenge is to reduce aviation's environmental footprint, even with projected growth in air travel.

The FAA takes a comprehensive, five-pillar approach to mitigate aviation's environmental impact and address related energy issues: advances in science and modeling; operational improvements; new technologies; renewable fuels; and policy initiatives including the environmental management system (EMS).

NextGen will increase the efficiency of aircraft operations, both in the air and on the airport surface. Improving efficiency saves time and fuel. When we reduce fuel consumption, we reduce carbon dioxide and other emissions that contribute to poor air quality.

While operational benefits offer environmental performance improvements, the net system-wide effect can be offset by increased growth. Additional measures are needed, and we are aggressively pursuing these measures under NextGen as described below.

Historically most reductions in aviation's noise and emissions impacts have come from new technologies. Our vision is for a fleet of quieter, cleaner aircraft that operate more efficiently with less energy. Solutions that involve technology improvements in aircraft engines and airframes in a foreseeable time frame require successful maturation and certification of new technologies within five to eight years. The Continuous Lower Energy, Emissions and Noise (CLEEN) program has been established to mature and accelerate promising new technologies into the civil fleet.

The development and deployment of sustainable alternative fuels offer prospects for aviation environmental improvements, energy security and economic stability. Breakthroughs in sustainable alternative fuels are needed in addition to operational improvements and engine/ airframe technological advances to offset emissions from aviation growth. Fuels offer the most potential for aviation to address climate change effects. The FAA works with government and industry partners under the auspices of the Commercial Aviation Alternative Fuels Initiative (CAAFI) to support sustainable alternative jet fuels.

We also are analyzing policy and market-based measures, including cap-and-trade proposals. EMS is a key to integrate environmental protection objectives into NextGen planning and operations. EMS provides a structured approach for managing environmental responsibilities to improve fuel consumption, emissions and noise. In late 2007, the first publicly charted OPD procedure in the United States, the RNAV Standard Terminal Arrival Route (STAR), was implemented at Los Angeles LAX. Data analyzed from mixed-fleet arrival operations each year indicate that we are achieving average fuel savings of 25 gallons per flight and reducing average level-flight time during approaches by 26 percent for approximately 300-400 flights per day. The procedure saved about 50 gallons of fuel and avoided more than 1,000 pounds of carbon emissions per flight at Miami in May 2008; saved 38 gallons of fuel and avoided nearly 800 pounds of emissions per flight at Atlanta in May 2008; and saved 40-60 gallons of fuel and avoided more than 800 pounds of carbon per flight in 600 night-time descents at Atlanta in August-November 2008.

Mountainous terrain prevents some areas from being served adequately by radar. In September 2009, in partnership with the state of Colorado, we deployed Wide Area Multilateration (WAM) in one of the state's major ski areas. Multiple WAM ground stations provide the equivalent of radar coverage, enabling the Denver Air Route Traffic Control Center to track and guide flights to and from airports in the area. This radar-like capability provides access to WAM-area airports in bad weather and eliminates the need to observe restrictive rules for areas that lack radar coverage. The no-radar limitations increase separation requirements and prevent controllers from handling more than one flight at a time. We expect WAM in Colorado to reduce or eliminate delays affecting as many as 75 flights per day between November and April.

Our measured validation of NextGen benefits will continue as more hardware and software reaches the field for demonstrations and in deployments, and as more operators equip their aircraft to take advantage of NextGen capabilities. As we amass data from the field, we will become increasingly capable of showing NAS stakeholders what NextGen offers them, and how they can position themselves to make the most of NextGen's promises. NextGen investment decisions by NAS users will come to be based increasingly on the operational experiences of real-world operators.

environmental performance and stewardship. All five pillars of the FAA's approach to sustainability are needed to address the environmental and related energy pressures facing the aviation industry.

Like other sectors of the economy, aviation will be called on to contribute its share in reducing man-made contributions to climate change. The FAA is leading U.S. efforts at the International Civil Aviation Organization (ICAO) to limit and reduce international aviation emissions. In 2009, ICAO adopted the first global approach to carbon emissions for any industry. It consists of a global, aspirational goal of 2 percent annual fuel efficiency improvement from 2009 to 2050, a basket of measures from which nations can choose to contribute to the global goal, a requirement that all nations report traffic and fuel burn data to ICAO in order to monitor progress, and development of a global carbon emissions standard for aircraft. ICAO has agreed to explore more ambitious goals for aviation, such as carbon-neutral growth in the mid-term and reductions in the long-term, for consideration at the ICAO Assembly in 2010.

Financially pressed airlines face difficult decisions on when and how to invest in new equipage and newer generations of aircraft. As national and international frameworks for limiting carbon emissions become clearer and more definitive, and other emissions and noise reduction pressures remain strong, the business case for NextGen investments is all the more favorable.

Here are some of the ways the FAA addressed environmental challenges in 2009:

- We established the CLEEN program to mature and accelerate clean and quiet technologies and fuels. CLEEN and NASA's Environmentally Responsible Aviation project are guiding coordinated efforts to mature new technologies that reduce fuel burn, emissions and noise.

- We worked with government and industry partners in CAAFI to achieve approval of the first alternative-fuels specification. It allows use of up to 50-percent blends of Fisher-Tropsch processed fuels with conventional Jet A fuel. The specification opens the way for potential suppliers to market alternative fuels to the commercial aviation sector. In 2010, CAAFI will work with ASTM International, a standards development organization, to gain approval for 50-percent blends of Hydrotreated Renewable Jet fuel, which may offer greater carbon reductions.

- We began implementing recommendations from the Aviation Climate Change Research Initiative to research effects of non-carbon-dioxide emissions on the Earth's climate. NASA, the Environmental Protection Agency, the National Oceanic and Atmospheric Administration and others support this work. We continued developing an advanced integrated noise and emissions modeling capability to find more effective approaches to mitigate overall impacts.

The FAA remains confident it will achieve NextGen, but we are fully aware that the road to success will be challenging. Undertaking NextGen is complex, in part because systems that are in various stages of development and maturity are interdependent and will be implemented in a variety of time frames.

SECTION 5:

CHALLENGES

NEXTGEN INTEGRATION A COMPLEX ENDEAVOR

NextGen is not a single system or program that can be turned on all at once. Moving from today's National Airspace System to one that is even safer and more efficient while enhancing capacity and environmental performance is an extremely complex endeavor. NextGen's multiple capabilities, both those we already are benefiting from and those that are in development, are interdependent on one another and will be incorporated into our airspace over varying time frames. This calls for a deliberate and incremental approach not only in technology and infrastructure development but also the FAA policies, standards and operational practices that ensure our careful approach to the Next Generation Air Transportation System.

Safety, security and environmental performance enhancement must remain the center of our planning as we improve our airfields; call for cleaner and quieter aircraft and sustainable alternative fuels; make changes to the way we manage surveillance, navigation, communications and traffic flow; and provide new uses for automation, information sharing and other infrastructure on the ground and in the air. These new challenges come at an evolution in time when new types of vehicles such as very light jets, unmanned aircraft systems and commercial space flights are being introduced into the system. Furthermore, the needs and capabilities of the extremely diverse elements of the aviation community vary across and within sectors and by locality. The FAA is aware that these are complex and sometimes competing factors.

Part of the challenge of NextGen is that not everything will be brand new at the same time nor be required in all segments. We will incorporate some new capabilities with existing infrastructure, and transition others over time. Deployments under way today provide tangible near-term benefits while forming a foundation to leverage for the mid-term, targeted for 2018. Working with our stakeholders, the mid-term system will provide fundamental change in our aviation infrastructure and the environmental and energy technologies that will be available, the safety management approach used, and the way operations will be conducted. It also provides a solid foundation to build even greater NextGen capabilities over the long-term.

Variable maturity time for interdependent projects is just one of the elements of uncertainty in the evolving NextGen plan that must be successfully managed to attain success. The communication challenge that results from perceptions about complexity and uncertainty tasks the FAA with continually ensuring that our intent, commitment and timing remain clear to all stakeholders as we move forward together with NextGen.

Proper recognition and management of uncertainty must be a central feature of the overall approach to NextGen development and deployment. Failure to do so would increase risk, placing NextGen capabilities, benefits and costs in jeopardy. For example, premature specification of detailed requirements for distinct NextGen systems could artificially constrain both industry and the FAA by locking in specific technical solutions when more cost-effective alternatives could emerge through NextGen development activities. Rarely is there only one option because capabilities often can be realized through combinations of operational practices, policies, systems and technologies. The FAA must fully explore these possibilities both with our stakeholders and in our internal business practices to ensure the most effective solutions.

As we make our respective investment decisions, the FAA and the private sector must consider the full context of capabilities and benefits, rather than focusing only on specific systems or deployments in isolation. In the FAA's case, that necessitates revisions to our acquisition management system so that NextGen can be deployed in an integrated way. Likewise, private sector stakeholders must use their own internal processes to commit to investing in NextGen capabilities. A thorough understanding of expected benefits and costs will help solidify the sound business cases both the FAA and individual stakeholders need to justify investment decisions. The FAA and stakeholders must work closely together and remain flexible to adjust to factors, whether environmental, economic or global conditions, that drive those decisions.

The challenge of getting a diverse fleet equipped with various capabilities will present additional challenges to air traffic controllers who will have to manage aircraft with very different capabilities. Ensuring international harmonization of aircraft equipage is another complex endeavor.

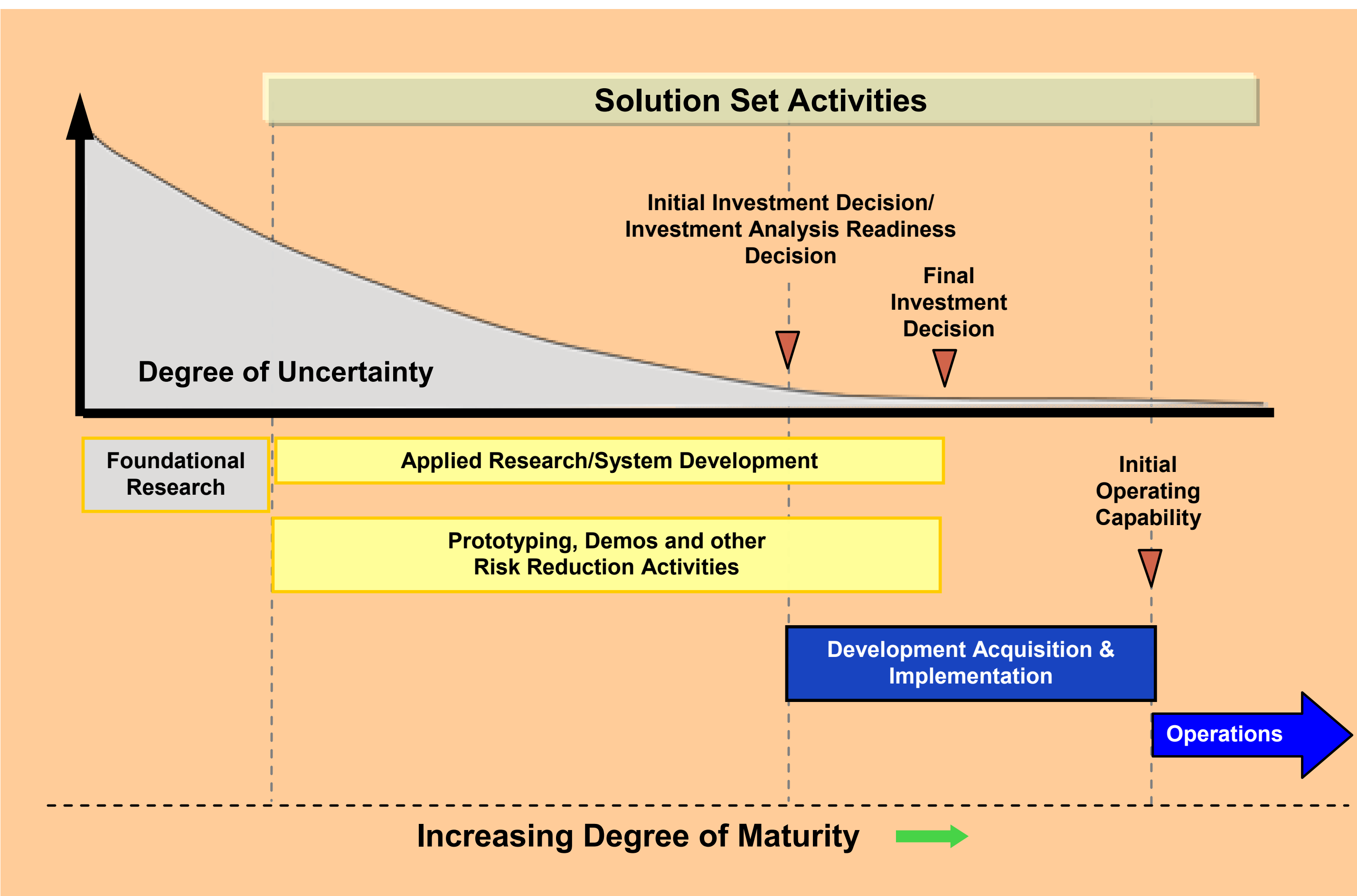
Partnership is an integral component of FAA's strategy for NextGen. Stakeholder engagement is a way to manage priorities and risks collaboratively by getting to a common understanding of what to implement and where, when and how benefits will result. By leveraging opportunities for demonstrations and other critical work with willing partners, together we gain extremely valuable insight into NextGen benefits, which can reduce uncertainty. Benefits can be clearly measured in a real world, operational environment. Solutions to integration issues can be accelerated, and specific programmatic requirements and operational and certification standards can crystallize outcomes that can help solidify the case for follow-on investments.

Operational demonstrations and prototypes also present solutions to uncertainties due to local factors, such as unique airport or airspace considerations. These and other local, technical or political factors may require implementation teams tasked with working out a specific local implementation plan guided by an overarching national framework. A properly managed and effective mix of FAA and stakeholder participants is needed to ensure bilateral implementation of respective NextGen capabilities. These types of teams may also be instrumental in developing local applications of emerging best-equipped/best-served principles to stimulate higher levels of aircraft equipage.

Successful implementation also depends on a change in operations. We are implementing extensive airspace and procedural improvements required or enabled by the new capabilities. Careful review and analysis is necessary to ensure their safety. We are working to ensure that controllers and pilots will transition to the new operations to capitalize on NextGen benefits.

Complexity and uncertainty cannot be an excuse for inaction. NextGen implementation is a long-term endeavor. Implementing solutions that offer near-term benefits by building on today's needs and capabilities while providing a foundation for even greater capabilities and benefits over the mid- and long-term necessitates a deliberate, incremental, building-block approach for NextGen.

The FAA groups bundles of related investments, or portfolios, to perform the required planning, executing, reporting and tracking needed to successfully implement a large-scale, complex integration project like NextGen.



Transformational programs provide the infrastructure needed to achieve NextGen. For management purposes, the overall NextGen portfolio is divided into seven solution sets, each focusing on a series of related operational capabilities that together will bring about the mid-term system. The solution sets contain work with varying levels of maturity, from the early exploration of concepts to operational implementation in the field. Significant components of the work conducted under each solution set are referred to as enabling activities. Enabling activities focus on the development of concepts of use and technical requirements for proposed new systems or enhancements to existing systems, along with prototypes and demonstration activities to mature these capabilities. These activities are keys to reducing uncertainty as a capability matures. This principle is outlined in the accompanying figure, which maps the transition from applied research, through system development, to field implementation for acquisition systems. A similar approach applies to the evolution of advanced operational procedures concepts to their daily operational use.

Enabling activities may take several years as promising research and concepts undergo engineering analyses, modeling and simulation; human factors studies and human-in-the-loop simulations; and prototype assessments and demonstrations. Additional pre-acquisition risk reduction activities include system requirements development and cost/benefit estimates; software engineering risk analysis and assessment; safety assessments; as well as key policy and business decisions. As the level of program certainty increases, decisions will undoubtedly reflect greater confidence and commitment to move toward acquisition and implementation. Due to the extended time frames involved with conducting enabling activities, ongoing evaluation of operational needs is critical for both the FAA and stakeholders.

These activities are aimed at reducing operational and technical risk as well as supporting acquisition, safety and environment management system requirements. All of this work prepares the FAA and stakeholders to implement known, well understood solutions.

To assist in overall NextGen portfolio planning and management, the FAA uses a robust NAS Enterprise Architecture[1] to understand the interdependencies of capabilities on systems, procedures and policies and to ensure their alignment. The Enterprise Architecture's 14 interconnected infrastructure roadmaps outline the time-based evolution of the NAS in areas such as systems, human integration, airspace, procedures and aircraft capability. These roadmaps are cross-linked to each of the NextGen solution sets. This valuable tool ensures clear visibility of NextGen's wide array of dependencies, allowing the FAA to quickly assess scenarios when reviewing work products or examining potential modifications to NextGen plans.

[1] The FAA's NAS Enterprise Architecture is available online. It can be accessed through the NextGen Web site, www.faa.gov/nextgen

“In order to work, NextGen will require the implementation of new technology, both in terms of cockpit equipage and infrastructure. General aviation pilots have always been quick to adopt new technology, particularly when the safety and utility of that technology is evident.”

Craig Fuller, president, Aircraft Owners and Pilots Association
October 28, 2009, testimony,
U.S. House Transportation and Infrastructure Committee, Subcommittee on Aviation

APPENDIX A

AIRCRAFT EQUIPAGE FOR THE MID-TERM

This appendix outlines the avionics equipage that the FAA is targeting for near- and mid-term operations as described in Section 3 of the NextGen Implementation Plan and the NAS Enterprise Architecture. The targeted avionics build on many of the capabilities that are either installed or available for today's aircraft. These avionics will provide years of useful capability and benefits for equipped operators, leading to a positive return on their investment.

As NextGen moves forward in creating new system capacity and efficiencies through the development of ground-based systems, aircraft will need to be equipped with advanced avionics in order to achieve full system benefits of NextGen capabilities.

The FAA is greatly involved in the development of both domestic and international standards and associated guidance material. These standards and guidance provide a pathway for stakeholders to develop NextGen avionics equipage in pursuit of airworthiness and operational certification.

Maintaining our high level of safety is paramount, and a NextGen-equipped environment continues to enhance that foundation. The governing principles for accelerating NextGen equipage published in the 2009 NextGen Implementation Plan stand unchanged and remain as guidance as we move forward to leverage and maximize the benefits of existing technologies. You can find the Governing Principles for Accelerating NextGen Equipage at www.faa.gov/nextgen.

The RTCA NextGen Mid-Term Implementation Task Force addressed how a best-equipped/best-served philosophy, introduced in the governing principles, might support the various operational recommendations. The Task Force members noted that best-equipped/best-served may provide incentives for early adopters of NextGen avionics.

LEVERAGING EXISTING AIRCRAFT CAPABILITIES

The NextGen implementation plan takes advantage of the following existing aircraft capabilities throughout the mid-term:

- **Performance Based Navigation (PBN):** The transition from conventional instrument flight operations to those based on PBN will continue and additional policies[1] encouraging this shift will be delineated in FAA guidance. Advanced avionics features resident in some aircraft today will be leveraged via Required Navigation Performance (RNP) procedure designs at select locations with targeted benefits.

- **Area Navigation (RNAV) and RNP Terminal Procedures and Routes:** A high percentage of aircraft is already qualified for RNAV 1 and 2 operations, allowing for widespread use of RNAV departures, arrivals and routes across the NAS. Use of PBN terminal procedures and routes will continue to expand and transition to RNP 1 operations. By the end of the mid-term, PBN will be the predominant means[2] for Instrument Flight Rules (IFR) en route and terminal operations. At locations with more demanding considerations, such as terrain challenges and constrained airspace, advanced RNP terminal procedures will be employed to achieve benefits over RNAV 1 and RNP 1.

- **RNAV, RNP and RNP Special Aircraft and Aircrew Authorization Required (SAAAR) SAAAR/AR Approach Procedures:** To improve safety and access, all instrument runways will have RNP approaches, titled RNAV (GPS), with Lateral Navigation (LNAV), LNAV/Vertical Navigation (VNAV), Localizer Performance (LP) or Localizer Performance with Vertical Guidance (LPV) lines of minima. LPV procedures provide vertically guided approach service down to 200 feet. LPV capability

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[1] Advisory Circular 90-RNAV Use of Suitable Area Navigation (RNAV) Systems on Conventional Routes and Procedures will describe methods for "RNAV Substitution", promoting higher levels of GPS equipage and broader use of RNAV systems in the NAS. Policy changes will also enable greater use of RNP approaches at alternate airport (when required). Use of PBN on visual approach operations will be further encouraged via an FAA Order on Special Area Navigation (RNAV) Visual Flight Procedures.

[2] A number of ground-based navigational aids and conventional procedures will be retained to provide limited reversionary capability.

currently is available on more than 30,000 general aviation and business/regional aircraft equipped with Wide Area Augmentation System (WAAS). We expect this WAAS equipage will continue to grow as more avionics for transport category aircraft are approved. As is the case with terminal procedures, advanced RNP or RNP SAAAR/AR (charted as RNAV (RNP)) approach procedures will continue to be implemented where operational benefit over RNP approaches is achievable.

- **VNAV:** Currently, there is a large population of aircraft with the ability to use barometric altitude, through a flight management system (FMS), to fly a specified vertical profile. Its use is currently limited to approach operations (LNAV/VNAV), where lower minima can be achieved for suitably equipped and approved operators. By accounting for this capability in the design of arrival and departure procedures, traffic flows can be deconflicted more efficiently. The use of this capability will be focused on major airports as an important component of integrated arrival and departure management.

- **Curved-path capability (radius-to-fix (RF)):** This capability allows for precise tracking through turns, providing significant safety, efficiency and environmental benefits. It has been available in air transport aircraft for a number of years and the percentage of capable aircraft continues to increase. Arrival and departure routes at certain airports will take full advantage of this feature, so that eventually a critical mass will be achieved and aircraft without this capability will be the exception. Throughout the NAS, departure, arrival and approach procedures with curved-path transitions will provide operational incentives for aircraft to equip.

- **Electronic flight bags (EFB):** EFB will be used in nearly all air carrier and taxi operations to provide the flight crew with charts, manuals and weather data. Portable EFBs will enhance safety by allowing pilots to see their own aircraft's position on surface moving map displays. Installed EFBs, integrated with the rest of the cockpit, and supplied with authoritative sourced aeronautical information, provide this safety enhancement and a platform that can be used to support some of the advanced capabilities for initial implementation.

- **Enhanced Flight Vision System (EFVS):** EFVS, sensors onboard aircraft, will provide an enhanced real-time view of runways, approach lighting, airport surface lighting and surrounding environments at airports, allowing access that otherwise would be denied due to low-visibility conditions.

- **Data Communications (FANS-1/A+, ATN):** Basic capabilities will be provided initially with a harmonized data communications system. Initial capabilities will be provided through globally harmonized initial data communications capabilities (Future Air Navigation System (FANS)-1/A+ and Aeronautical Telecommunications Network (ATN)) for domestic en route operations supported by a mix of FMS-integrated and Communications Management Unit-based aircraft implementations.

- **Flight Information Services-Broadcast (FIS-B):** FIS-B will be adopted by a number of IFR aircraft that lack weather radar.

INTRODUCTION OF AIRCRAFT CAPABILITIES

Coupled with the capabilities described in the previous section, the following new aircraft capabilities are targeted for initial implementation in the mid-term:

- **Data Communications:** Builds on initial capabilities, providing widespread FMS integration and advanced applications. FANS 1/A+ will be expanded for use over VDL-2 for domestic operations.

- **ADS-B Out:** ADS-B Out provides high accuracy and frequent aircraft position reports that can be used by ATC to provide radar-like separation in non-radar areas. A Notice of Proposed Rulemaking was issued in 2008 and final rule is expected in 2010.

- **ADS-B In:** ADS-B In provides information to the cockpits of properly equipped aircraft that can be used for multiple applications, including:

  Cockpit Display of Traffic Information (CDTI): A graphical depiction of air traffic, which will improve situational awareness for a variety of operations.

  Ground: The graphic display of relative horizontal positions of aircraft and surface vehicles, including ownship position and moving map.

  Ground with Surface Indications/Alerts: CDTI (Ground) enabler implementation with the addition of alerts for non-normal traffic status displayed in the primary field of view and/or via aural alerts.

  Airborne: The graphic display of relative horizontal and vertical positions of aircraft and other airspace information.

Airborne with Conflict Detection: CDTI (Airborne) enabler implementation with the addition of algorithms to process ADS-B reports from airborne aircraft to provide indications and/or alerts of potential conflicts that are independent of traffic advisories provided from Traffic Alert and Collision Avoidance System (TCAS).

Along Track Guidance: Displays of along-track (i.e., speed and/or distance) guidance, control and indications, and alerts derived from information provided to achieve a given spacing between aircraft that is large enough to mitigate collision risk.

Deconfliction Guidance: ADS-B reports and provides guidance, control and indications and alerts for en route and terminal operations between two or more aircraft operating under a delegated separation clearance within a limited range of closure rates and relative geometries.

Paired Approach Guidance and Alerting: Provides guidance, control and indications, and alerts for operations between two or more aircraft on a dependent or independent approach at a relative separation where TCAS resolutions are ineffective and a restricted relative geometry may be required for wake avoidance.

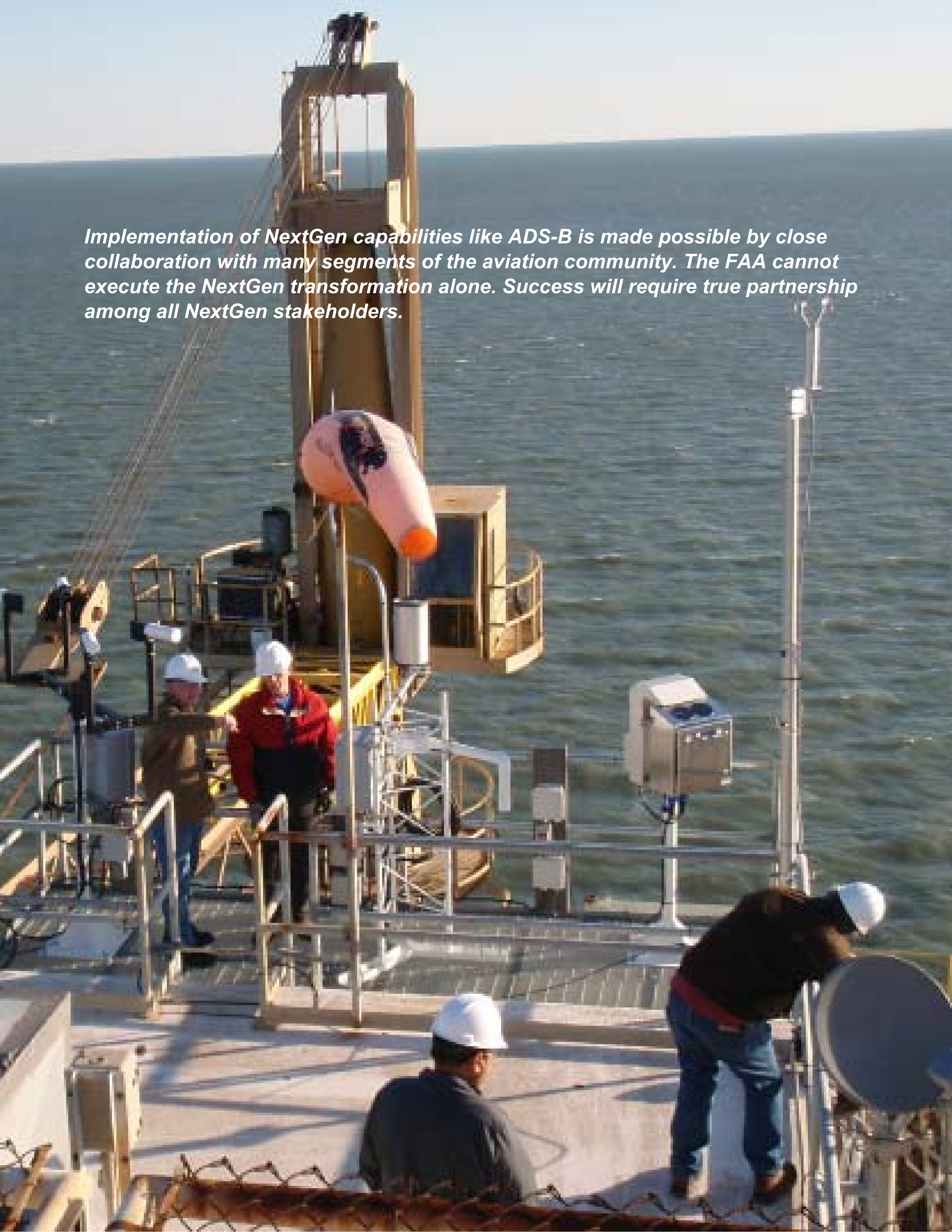
- **GLS:** GNSS Landing System capability will be available to properly equipped aircraft. Category III GLS is expected to achieve initial implementation.

PLAN FOR NEW AIRCRAFT CAPABILITY GUIDANCE

This table shows when the standards for various avionics equipage will be published.

AVIONICS ENABLERS	AIRCRAFT AND OPERATOR GUIDANCE		AIRCRAFT IMPLICATIONS
	GUIDANCE	SCHEDULE	
Data Communications (FANS 1/A+, ATN)	AC20-140A	2012	FANS 1/A+ over VDL-2 for domestic operations and Satcom for oceanic operations
Data Communications (ATN)	AC20-140B, AC120-70C	2012	Based on SC-214
Ground-CDTI (ADS-B In)	AC, TSO	2010	Enhanced surface situational awareness by the display of ADS-B data
Surface Indications/Alerts (ADS-B In)	AC, TSO	2012	Displays and provides alerts based on non-normal traffic status
Airborne-CDTI (ADS-B In)	AC, TSO	2010	Displays surrounding air traffic data as well as other airspace information
Airborne-CDTI with Conflict Detection (ADS-B In)	AC, TSO	2014	Displays and alerts crew to airborne conflicts independent of TCAS alerting
Along Track Guidance/ITP (ADS-B In)	AC, TSO	2012	Display of along-track guidance, control and indications, and alerts
De-confliction Guidance (ADS-B In)	AC, TSO	2014	Guidance information ensures aircraft remains well clear of other aircraft
Parallel Approach Guidance and Alerting (ADS-B In)	AC, TSO	2014	Guidance information for aircraft participating in dependent or independent approaches (still in research)
EFVS	AC	2010	Sensors provide enhanced views of the runway environment
GLS III	Project specific policy	2012	GBAS Landing System (CAT III)

Implementation of NextGen capabilities like ADS-B is made possible by close collaboration with many segments of the aviation community. The FAA cannot execute the NextGen transformation alone. Success will require true partnership among all NextGen stakeholders.



APPENDIX B

NextGen COMMITMENTS AND MILESTONES

This appendix provides a summary of the FAA's key work plans in support of delivering the NextGen mid-term operational vision. This appendix highlights work in those areas of the NextGen portfolio that will fundamentally change the way we manage air traffic by 2018, including the six NextGen transformational programs, airspace enhancements and procedures, airfield development, capabilities from our NextGen solution sets, overall system development and NextGen demonstrations. We also indicate where our responses to the recommendations of the RTCA NextGen Mid-Term Implementation Task Force fit into the agency's specific plans.

The integrated work portfolio developed by the agency to deliver the mid-term system supports the required tracking, planning, reporting and execution needed to successfully implement an integration project of the magnitude of NextGen.

The projects and programs within the integrated portfolio are at various levels of maturity, and are funded through a variety of revenue streams. Some programs, such as ADS-B, are being implemented today. We refer to such fully funded, fully planned program milestones as implementation commitments. Other projects involve work that will inform future agency decisions, and are required by the FAA's acquisition management process. Such projects include the development of engineering requirements, human factors research and investment analysis. We refer to these activities as milestones.

Our implementation commitment tables provide deployment schedules for our transformational programs, airspace enhancements and procedures, and airfield development. These commitments include existing and upcoming programs that provide a foundation for NextGen mid-term capabilities.

The six transformational programs form the core of the NextGen transformation, and will fundamentally change the way we manage air traffic, communicate and exchange data. New in this year's plan is our sixth transformational program, Collaborative Air Traffic Management Technology, which recently received a final investment decision.

The seven NextGen solution sets represent portfolios of inter-related NextGen capabilities that, taken together, will render our mid-term operational vision. Each solution set table is preceded by a detailed overview of that particular portfolio's goals and objectives. These solution set work plans include activities in support of the RTCA Task Force operational recommendations — these activities are highlighted in *italics*.

Our system development table highlights projects that have broad applicability across the solution sets and to NextGen overall. Such projects include work in support of safety management systems, environment and energy management systems, as well as human factors research and testing and computer modeling aimed at validating operational concepts.

The projects documented in our NextGen demonstrations tables provide the proof-of-concept work and real-world validation necessary for the advancement of NextGen concepts and prototypes. In many cases, immediate benefits are provided to the stakeholders who partner with the FAA to conduct these demonstrations, while the agency gains information critical to carrying out the work of the solution sets.

Finally, our overarching table details the management and policy actions we are undertaking to meet the overarching recommendations of the RTCA Task Force, including consistently achieving 3- and 5-mile separation, incentivizing equipage and streamlining FAA processes. A more thorough examination of these recommendations and the FAA's response is available in the document "FAA Response to Recommendations of the RTCA NextGen Mid-Term Implementation Task Force," at www.faa.gov/nextgen.

Implementation Commitments

Project	FY09	FY10	FY11	FY12-15
Automatic Dependent Surveillance-Broadcast (ADS-B)	✓ Implemented Traffic Information Services-Broadcast (TIS-B) and Flight Information Services-Broadcast (FIS-B) in Miami area	• Complete In-Service Decision for Critical Services • *Continue to deploy ADS-B ground infrastructure* • Provide Initial Operating Capability: ✓ Louisville ✓ Houston/Gulf of Mexico o Philadelphia o Juneau • Publish final ADS-B Out rule in Federal Register • *Begin exploring state and local cost-sharing partnerships which could expand surveillance services (e.g., Colorado WAM initiative) into low-altitude, non-radar airspace*	• *Continue to deploy ADS-B ground infrastructure* • *Pursue ADS-B program expansion to provide surveillance services in non-radar airspace*	• *Complete NAS-wide deployment of ADS-B, TIS-B and FIS-B* • Provide Initial Operating Capability for Surface Alerting
System Wide Information Management (SWIM)	✓ Completed a final investment decision for Segment 1B	• Develop and test the Aeronautical Information Management portion of the Special Use Airspace (SUA)	• Provide Corridor Integrated Weather System publication • Provide Reroute Data Exchange Capability • Provide Flight Data Publication Initial Flight Data Services • Provide Integrated Terminal Weather System publication	• Publish data for the following: o Pilot Weather Report o Traffic Flow Management (TFM) o Flight Data o Runway Visual Range • Provide Terminal Data Distribution Capability • Provide Flight Data Services with PUB/SUB • Provide Flight Data Publication HADDS/FDIO and AIM SUA Client
Data Communications (Data Comm)	✓ Conducted operational and regulatory activities ✓ Conducted operations and human factors research	• Release solicitation for Data Comm Network Service Provider	• Initiate development of revised departure clearance capability in tower • *Deliver a final investment decision on Data Comm Segment 1*	• Initiate development of en route automation enhancements • *Enable revised departure clearance capability in the tower environment via VHF Data Link – Mode 2 (VDL-2) for aircraft equipped with Future Air Navigation System (FANS) 1/A+* • *In 2016, enable revised departure clearance capability via VDL-2 for aircraft equipped with Aeronautical Telecommunications Network (ATN)* • *In 2016, provide airborne reroutes for TFM in the en route environment for Data Comm equipped aircraft (FANS 1/A+ or ATN) via VDL-2*

NextGen **Transformational Programs** (cont'd)				
NextGen Network Enabled Weather	✓ Published weather data standards and Web services guidelines ✓ Demonstrated data sharing of the 4-D Weather Data Cube, including interagency interoperability	• Conduct demonstration to validate interoperability data standards and Web services with the development of the interagency 4-D Weather Data Cube • Complete weather data and design standards	• Begin service adaptor development for candidate systems	• Complete development of service adaptors for key FAA weather systems (e.g., Automated Surface Observing System) to ensure operational compatibility within the 4-D Weather Data Cube • Final investment decision for proposed implementation of the FAA's portion of the interagency 4-D Weather Data Cube
NAS Voice Switch			• Complete initial investment decision • Release screening information request	• Complete final investment decision • Deliver system and initial operating capability
Collaborative Air Traffic Management Technologies (CATMT)		• Complete CATMT Work Package 1 with the development of the Impact Assessment and Resolution capability • *Initiate the analysis necessary to develop the requirements needed to implement proven decision support tools and data sharing capabilities*	• Continue CATMT Work Package 3 concept engineering and planning to support the following capabilities: o Modernization of the decision support tool suite o Collaborative information exchange • *Continue the analysis necessary to develop the requirements needed to implement proven decision support tools and data sharing capabilities*	• Deploy CATMT Work Package 2 capabilities to include: o Arrival uncertainty management o Weather integration o Collaborative airspace constraint resolution o Airborne reroute execution • *Upgrade the existing Traffic Flow Management System to include an initial electronic negotiation capability for more efficient flight planning*

Airspace Enhancements and Procedures

Implementation Commitments

Project	FY09	FY10	FY11	FY12-15
Airspace Enhancements	New York/New Jersey/Philadelphia Stage 1 ✓ Established procedural changes in core facilities and RNAV overlays Chicago Airspace Project Stage 2: South Enhancements ✓ Added southbound departures ✓ Published Southeast high and wide arrival procedures for Chicago O'Hare west flow (supports triple arrivals from east with new Runway 09L/27R) Houston Area Airspace Transition System (HAATS) Phase 3B ✓ Added third eastbound departure route ✓ Created New Severe Weather Avoidance Plan (SWAP) arrival route from the southeast ✓ Realigned southeast arrivals and departures to accommodate new routes High Altitude Airspace Management Program ✓ Transitioned point-to-point second J80 route to Q42 ✓ Started transition of New York choke point routes to point-to-point navigation routes using Navigation Reference System (NRS) ✓ Started transition of national playbook routes to point-to-point navigation using NRS	*New York/New Jersey/Philadelphia Stage 2* • Relocate and expand west airways • Reconfigure Philadelphia airspace *Western Corridor – Southern Nevada Airspace* • Optimize existing airports and airspace *HAATS Phase 3C* • Expand airspace to the west by establishing College Station approach control services at Houston TRACON and modifying certain airspace boundaries • Provide third westbound departure route • Shift southwest arrivals to Houston International and Houston Hobby southwest of current location to support new departures • Provide new SWAP arrival route from the southwest • Provide dual capacity arrival routes from the northwest	*New York/New Jersey/Philadelphia Stage 3* • Relocate and expand north airways • Facilitate Stage 4 elements	*New York/New Jersey/Philadelphia Stage 4* • Relocate and expand south and east airways • Change altitude restrictions • Create optimal descent procedures *Chicago Airspace Project Stage 3* • Provide west and north enhancements • Provide additional westbound departures • Provide high and wide arrival procedures for Chicago O'Hare east flow (supports triple arrivals from west with new Runway 10C/28C)

Airspace Enhancements and Procedures (cont'd)

RNAV and RNP	✓ Published 50 RNAV Standard Instrument Departures (SIDs) and Standard Terminal Arrival Routes (STARs) including: o Chicago O'Hare o Newark o San Diego o Teterboro ✓ Developed helicopter route implementation plan for Simultaneous Non-Interfering Operations ✓ Published 50 Required Navigation Performance (RNP) Authorization Required (ARs) including: o Monterey o Chicago Midway o Houston o Phoenix ✓ Published 12 RNAV routes	• Begin development and implementation of an integrated procedures concept for Performance Based Navigation (PBN) with the goal of moving toward NextGen capabilities • *Create initial set of stakeholder tiger teams to address PBN procedure optimization at locations prioritized by need, cost benefit, budget and other considerations* • *Assemble expert procedure design teams to facilitate the long-term development, integration and optimization of PBN procedures* • *Continue to review existing work plans and make adjustments as appropriate to ensure the development of high-value procedures* • *Initiate integrated airspace and procedures projects at key sites, considering recommended metro areas, an integrated approach to procedural optimization, decoupling of operations between airports, and advanced features* • Continue to develop RNAV STARs with Optimized Profile Descents (OPDs) where feasible • *In collaboration with stakeholders, deliver nationwide strategy for implementation of RNAV Q and T routes*	• *Create implementation teams that execute the results of the initial set of tiger teams* • *Leverage expert design team structure to complete development on remaining scheduled legacy procedures* • *Continue integrated airspace and procedures projects at key sites, considering recommended metro areas, an integrated approach to procedural optimization, decoupling of operations between airports, and advanced features* • Expand implementation of OPDs • Apply RNP SIDs and STARs where user equipage (e.g. advanced features) supports and RNAV implementation cannot maximize benefits • Include RNAV (GPS) and RNP approaches within existing standards for parallel dependent and simultaneous independent operations • *In collaboration with stakeholders, determine the usefulness of the NRS to the GA community, and/or determine an alternative for low altitude users*	• *Leverage expert design team structure in moving toward implementation of integrated airspace procedures* • Expand en route PBN capabilities between metroplexes and selected city pairs to improve capacity and access to overhead streams to move toward implementation of integrated airspace procedures • *Continue implementation and evaluation of PBN-based routes to support NextGen transition to a primarily satellite-based navigation National Airspace System for cruise operations* • *Continue implementation of PBN integrated procedures/ routes/ airspace* • Complete safety case studies to support closer runway spacing for simultaneous independent approaches • Complete research and development for Paired Approach concept using RNP and ADS-B to operate closely spaced parallel approaches
Localizer Performance with Vertical Guidance (LPV)/Localizer Performance (LP) Procedures	✓ Published 500 LPV/LP procedures	• *Maintain a goal of at least 300 new LPV approaches per year, placing highest priority on the value of new procedures* • *Work with the aviation community to prioritize the schedule of runway ends slated to receive LPV procedures*	• *Consistent with priorities established with the aviation community, maintain a goal of at least 300 new LPV approaches per year, placing highest priority on the value of new procedures*	• *Consistent with priorities established with the aviation community, maintain a goal of at least 300 new LPV approaches per year, placing highest priority on the value of new procedures*

Airfield Development

Implementation Commitments

Project	FY09	FY10	FY11	FY12-15
Airfield Development	✓ Completed Washington Dulles Runway 1L/19R ✓ Completed Seattle-Tacoma Runway16R/34L ✓ Completed Chicago O'Hare Runway 9L/27R ✓ Completed Dallas-Fort Worth end-around taxiway ✓ Completed Philadelphia Runway 17/35 extension ✓ Completed New York (JFK) airfield improvements o Taxiway YA extension o JFK Taxiway K/KA ✓ Obtained Record of Decision for extension of Fort Lauderdale Runway 9R/27L ✓ Completed environment assessment for Portland Runway 10L/28R extension	• Complete FACT-2 next steps, to include coordination of airport action plans and integration with NAS Enterprise Architecture and NextGen Implementation Plan • Complete Charlotte Runway 17/35 • Fund metro area airport infrastructure improvements at other than OEP airports • Continue Southern Nevada supplemental environmental impact statement (EIS) • Continue Philadelphia EIS • Continue Houston International EIS • Continue West Palm Beach EIS • Complete Phase II of the San Francisco Bay Area Regional Airport Plan • Conduct a Phase II study providing feasibility analysis for potential airport sites that can aid Atlanta to accommodate future unmet demand • Continue surveys to support development of WAAS/LPV approaches to increase access to airports. Consider obstruction removal needs so that airports with LPV approaches can achieve lower minimums	• Begin FACT-3, including update of the NAS-wide analysis of constrained airports in consideration of taxiways, gates, airspace as well as initial evaluation of curb-to-gate issues • Continue fiscal year 2010 planning and environmental projects	• Complete FACT-3 and identify follow on strategic planning initiatives • Continue planning and environmental projects • Complete Chicago O'Hare Runway 10C/28C • Complete Fort Lauderdale/ Hollywood International Runway 9R/27L

NextGen Portfolios

FAA activities leading to NextGen operational improvements are planned and categorized by the overarching solutions that they support. These "solution sets" provide the framework for NextGen budgeting, planning and execution. They comprise the NextGen portfolio along with activities performed under the NextGen System Development, NextGen Demonstrations and NextGen Research and Development (R&D) budget lines as well as the NextGen transformational programs. Each solution set carries its own budget line item (BLI) in the President's Budget Request. Overviews of the seven solution sets, system development and demonstrations are described below along with a brief description of activities planned in the fiscal year 2011-2015 time frame.

Funded activities take multiple forms including concept development, validation and documentation; prototype assessments and demonstrations; test and evaluation, including human-in-the-loop testing, of candidate capabilities; pre-acquisition activities such as system requirements development and cost/benefit estimates; modeling and simulation; software engineering and assessment; and safety assessments. These activities are aimed at reducing operational and technical risks as well as supporting acquisition, safety and environment management system requirements. Activities may be carried out in-house, by major system vendors, other vendors, universities and other government agencies, and through technical support contracts. Activities under the NextGen portfolio are managed and executed across the FAA. Commitments are managed and tracked via Project Level Agreements between the NextGen Integration and Implementation Office and the executing organization.

The information presented here is at a summary level. Each section provides an overview of the solution sets, system development, demonstrations, and the specific projects that will lead to new NextGen operational capabilities. This discussion is supplemented by a summary listing of the operational improvements that are supported by these activities, along with their reference identifiers within the FAA NAS Enterprise Architecture (EA). This is followed by a presentation of selected milestones for each project, highlighting the work that is already under way and the work planned for the coming years. The planned work will evolve based on initial results. It is important to remember that this presentation is summary in nature and does not include all of the details of the solution set work program. Those wishing to see more specific information about all NextGen operational improvements can visit the FAA's NextGen Web site, www.faa.gov/nextgen. In particular, those wishing to see additional context and description or more details on milestones and performance goals should refer to the FAA Fiscal Year 2011-2015 Capital Investment Plan (CIP), while those looking for greater information on the integration and evolution of systems and procedures should examine the FAA NAS EA.

Initiate Trajectory Based Operations (TBO)

The Trajectory Based Operations solution set focuses primarily on high-altitude cruise operations in en route airspace. TBO will provide the capabilities, decision-support tools and automation to manage aircraft movement by trajectory. This shift from clearance-based to trajectory-based air traffic control will enable aircraft to fly negotiated flight paths necessary for full Performance Based Navigation, taking both operator preferences and optimal airspace system performance into consideration.

NextGen funded activities leading to TBO Capabilities include:

- **Modern Procedures (Separation Automation Enhancements, D- & R-Sides):** Developing automation enhancements to existing separation management functions resident on systems such as En Route Automation Modernization (ERAM), User Request Evaluation Tool (URET) and the Host Computer system to support NextGen procedures.
- **High Altitude:** Improving high altitude separation management through development and validation of concepts that explore the use of generic sectors, flexible airspace and dynamic resource management in a high performance, trajectory-based environment.
- **Automation Risk Mitigation Interface Requirements:** Mitigating risks associated with interfacing ADS-B to potential future automation platforms beyond those planned for the FY2010 In-Service Decisions.
- **Oceanic Tactical Trajectory Management:** Addressing critical NextGen performance gaps in capacity, productivity, efficiency, safety and environmental impact in the oceanic environment through initiatives that investigate Automatic Dependent Surveillance in-trail procedures, Web-enabled collaborative trajectory planning and four-dimensional oceanic trajectory management.
- **Conflict Advisories:** Analyzing, developing and conducting pre-implementation evaluation of computer-generated conflict resolution advisories.
- **NextGen Distance Measuring Equipment (DME):** Procuring DME to support RNAV and RNP en route operations (Q and T routes).

Note: The CATM, FLEX and HD solution sets support TBO-related recommendations of the RTCA Task Force, so there are no highlighted links below.

These activities support implementation of the following NextGen Operational Improvements (OI):

Oceanic In-Trail Climb and Descent: OI 102108
Automation Support for Mixed Environments: OI 102137
Point-in-Space Metering: OI 104120
Increase Capacity and Efficiency using RNAV and RNP: OI 108209

Selected milestones from each of these projects include:

Project	FY09	FY10	FY11-15
Modern Procedures (Separation Automation Enhancements, D- & R-Sides)	✓ Initiated activity to support ERAM Post ✓ Release 3 final investment decision. These deliverables include program requirements, implementation strategy and planning, a concept of operations (CONOPS) and a business case analysis report.	• Complete development to support final investment decision for ERAM Post Release 3. This material will include system requirements, business case, alternatives analysis, safety case and enterprise architecture elements.	• Conduct separation management engineering activities necessary to support the en route NextGen mid-term baseline. Candidate functional areas include PBN, conflict probe enhancements, conflict alert enhancements, and flight data display enhancements to support future investment decisions.
High Altitude	✓ Developed High Altitude CONOPS ✓ Initiated preliminary airspace design analyses	• Develop requirements for display information and decision support tool for Phase I of High Altitude Airspace Specialty • Prototype and evaluate display change requirements and decision support tools for early transition to support Phase I of High Altitude Airspace Specialty	• Conduct pre-task HITLs, fast-time simulations, safety and cost-benefit and airspace design analyses to continue to derive display, information and decision support tool requirements for High Altitude TBO operations • Finalize requirements to support the investment decision and proposed implementation of advanced concepts in High Altitude Airspace
Automation Risk Mitigation Interface Requirements			• Identify risks associated with interfacing to ARTS IIE sites, TAMR, ERAM and ATOP • Develop mitigation strategies for associated risks
Oceanic Tactical Trajectory Management	✓ Completed a demonstration plan for Automatic Dependent Surveillance – Contract (ADS-C) In-Trail Procedures (ITP) to support the Pacific operational trial ✓ Developed Oceanic Trajectory Management-4D (OTM-4D) in-flight metrics baseline	• Conduct ADS-C ITP operational trials • Develop initial requirements for Pre-Departure OTM-4D capability • Develop initial requirements for In-Flight OTM-4D capability • Develop CONUSE for Web-enabled Collaborative Trajectory Planning • Develop oceanic airspace management concept	• Expand operational trials to support ICAO adoption of ADS-C ITP procedures for pre-departure OTM-4D • Develop prototype to conduct In-Flight OTM-4D human-in-the-loop simulation, and operational trials
Conflict Advisories		• Prototype conflict resolution advisory capabilities (such as pre-probed altitude and speed amendments) that can be transferred verbally by controllers • Evaluate the impact that simple conflict resolution advisories have on the Computer-Human Interface design	• Continue engineering evaluations and prototyping of conflict resolutions for more basic aircraft maneuvers • Continue engineering evaluations and prototyping of approaches to implement aircraft conflict resolution advisories for more complex maneuvers with higher equipage and more data communications • Conduct safety and benefit assessments of aircraft conflict resolution advisories automation
NextGen Distance Measuring Equipment (DME)	✓ Initiated business case activities in support of NextGen DME. This material includes shortfall analysis, a concept of use, initial requirements and safety analysis.	• Procure 23 of 51 DME systems • Establish service availability for approximately 3 DMEs in support of RNP	• Procure final 28 of 51 DME systems • Establish service for approximately 28 DMEs in support of RNP

Increase Arrivals/Departures at High Density Airports (HD)

The High Density Airports solution set provides capabilities that improve arrival and departure capacity for multiple airports and runways in high-demand airspace. The combination of precision procedures, decision support tools, enhanced surface management and improved coordination and information sharing will allow for maximum usage of all runways and airspace at close-proximity airports. This solution set takes advantage of performance based navigation, traffic flow management capabilities in the Collaborative Air Traffic Management solution set and builds on the capabilities of the Flexible Terminals and Airports solution set.

NextGen funded activities at high density airports include:

- **Surface Tactical Flow:** Conducting evaluations, demonstrations, human-in-the-loop simulations and other related activities to enable the development of requirements for trajectory-based operations on the airport surface. The activities will support and leverage Tower Flight Data Manager (TFDM) capabilities and explore the concepts of 2D taxi route generation, departure runway assignment, airport configuration and collaborative departure management between air traffic control and aircraft operator facilities. The benefits and constraints of FAA-funded infrastructure to provide surface surveillance coverage in non-movement areas also will be examined. *These activities support the response to the RTCA Task Force's Surface recommendations.*
- **Surface Conformance Monitoring:** Demonstrating and validating the potential safety and workload benefits that can be achieved through a comprehensive taxi route management and conformance monitoring capability to support the development of trajectory-based operations on the airport surface. The activities will support and leverage TFDM capabilities.
- **Surface Data Sharing:** Developing and implementing the technical infrastructure, operational procedures and data governance policies to facilitate the exchange of surface-related data needed to enhance system efficiency, reduce delays and foster increased collaborative decision making between the Air Navigation Service Provider, the flying community and other airport stakeholders. This activity will leverage the ongoing deployment schedule of Airport Surface Detection Equipment (ASDE-X and ASDE-3) at OEP airports. *These activities support the response to the RTCA Task Force's Surface recommendations.*
- **Arrival Tactical Flow:** Building on Traffic Management Advisor (TMA) capabilities to provide complete time-based metering solutions across all phases of flight, including pre-departure and post-arrival through the follow-on Time Based Flow Management (TBFM) program. TBFM will incorporate NextGen concepts such as RNAV and RNP, weather integration, and point-in space or extended metering, while expanding adjacent center metering. TBFM also will examine future capabilities such as incorporation of Continuous Descent Approaches, integration of surface information, and terminal time-based metering. *These activities support the response to the RTCA Task Force's Cruise recommendations.*
- **Oceanic Tailored Arrivals:** Transitioning Oceanic Tailored Arrivals from demonstration to a fully implemented operational capability at selected coastal sites. The transition work supports business case assessments to identify priority locations. *These activities support the response to the RTCA Task Force's Data Comm recommendations.*
- **Integrated Arrival and Departure Airspace Management:** Conducting engineering assessments, safety assessments, procedures and scenario development, human-in-the loop simulations, and other advanced development work to define the transition plans and associated requirements to enable expanding the lateral and vertical boundaries of arrival and departure airspace to add transition airspace. This would allow using 3-mile separation standards, implementing dynamic airspace reconfiguration to accommodate bi-directional arrival/departure

Increase Arrivals/Departures at High Density Airports (cont'd)

routes, and improving traffic flow management throughout the expanded airspace to improve operational efficiencies in major metropolitan areas. *These activities support the response to the RTCA Task Force's Metroplex recommendations.*

These activities support implementation of the following NextGen Operational Improvements (OI):

Improved Parallel Operations: OI 102141
Time Based Metering using RNAV and RNP Route Assignments: OI 104123
Initial Surface Traffic Management: OI 104209
Improved Management of Arrivals/Surface/Departure Flow Operations: OI 104117

Selected milestones from each of these projects include:

Project	FY09	FY10	FY11-15
Surface Tactical Flow	✓ Developed concept of operations (CONOPS) for surface trajectory based operations ✓ Developed demonstration plan for collaborative departure queue management ✓ Completed demonstration of collaborative departure queue management at Memphis ✓ Completed the installation of surface prototype capabilities at Orlando	• *Demonstrate collaborative departure queue management at Memphis and Orlando to refine concept of use (CONUSE) and develop functional requirements and procedures* • *Initiate evaluation of the benefit of FAA-funded infrastructure to provide surface surveillance coverage in non-movement areas, including taking into consideration any radio spectrum capacity constraints*	• Continue Surface Trajectory Based Operations requirements development for Data Comm, Surveillance, Weather and NAS Data systems • Refine the 2D Taxi Route Generations, Departure Runway Assignment, and Airport Configuration CONUSE • Conduct field demonstrations at Memphis and Orlando to support business case development • *Complete evaluation of the benefit of FAA-funded infrastructure to provide surface surveillance coverage in non-movement areas, including taking into consideration any radio spectrum capacity constraints*
Surface Conformance Monitoring	✓ Developed CONOPS for surface conformance monitoring ✓ Developed plan for an initial surface conformance monitoring simulation	• Conduct human-in-the-loop simulations to refine the surface conformance monitoring CONUSE and develop functional requirements and procedures	• Continue Surface Trajectory Based Operations requirements development for Data Comm, Surveillance, Weather and NAS Data systems • Finalize documentation for proposed implementation decision of surface conformance monitoring
Surface Data Sharing		• *Deploy initial data dissemination infrastructure for current Data Distribution Units (DDUs) equipped ASDE-X locations to enable surface data sharing via a single SWIM interface* • *Initiate development of data rights and data release policies in support of data sharing goals*	• Develop and implement the longer term data dissemination capability needed to provide a more reliable and robust data infrastructure • *Continue installing DDUs, leveraging the plan for ASDE-X and ASDE-3/Multilateration locations (34 of the 35 OEP airports) and at six additional non-OEP airports* • Complete information-sharing governance policies for the dissemination of surface event data • *Complete development of data rights and data release policies in support of data sharing goals*

Increase Arrivals/Departures at High Density Airports (cont'd)

Project	FY09	FY10	FY11-15
Arrival Tactical Flow	✓ Developed CONOPS for Point-in-Space metering and metering with RNAV and RNP ✓ Completed documentation for concept and requirements definition phase ✓ Completed the investment analysis readiness phase ✓ Completed development of the documentation for final investment decision phase ✓ Completed the update to the Time-Based Flow Management program (TBFM) concept engineering plan	• *Achieve a final investment decision for TBFM. Conduct cost-benefit analysis for:* *o Implementation of additional Adjacent Center Metering (ACM) capabilities, which extends TBM beyond the boundaries of a single en route center.* *o Deployment of TMA to additional airports* *o Integration of TMA data with traffic flow management systems* • *Analyze and review CAP performance at Memphis and Atlanta centers with the goal of expanding CAP to additional locations* • *Develop data rights and sharing policies for CAP* • *Work with industry to develop RTA/CAP performance metrics* • *Deliver RTA Safety Management System (SMS) analysis*	• *Dependent on positive cost benefit analyses:* *o implement ACM* *o deploy TMA to additional airports* *o integrate TMA data with traffic flow management systems* • Extend the arrival metering horizon beyond today's capability and implement the integrated arrival and departure capability via the TBFM program • Achieve an investment decision for the integrated enterprise solution to initiate integration of metering functionality into NAS automation systems • *Complete an improved training program for FAA traffic management coordinators at sites where TMA is deployed, with the goal of increasing the consistent use of TBM*
Oceanic Tailored Arrivals		• Develop a transition plan and business case to implement Oceanic Tailored Arrivals at additional coastal locations	• Implement automation changes necessary to optimize the use of Oceanic Tailored Arrivals • Expand the use of Tailored Arrivals at additional locations • *Transition Tailored Arrivals from a demonstration project to full operational use (Miami, San Francisco, Los Angeles)* • *Identify potential required changes to automation platforms necessary to support operational implementation of use of oceanic Tailored Arrivals* • *Collaborate with industry to identify additional coastal airports where there is a positive business case for the implementation of Tailored Arrivals. Due to the dependence of Tailored Arrivals on FANS equipment, these procedures are currently limited to use at airports that support transoceanic traffic*
Integrated Arrival and Departure Airspace Management		• Conduct a preliminary operational safety assessment and develop functional automation requirements	• Complete software engineering analysis for automation system software changes including Surveillance Data Processing, Traffic Management Advisor, Conflict Probe and Flight Data Processing upgrades and Computer-Human-Interface changes to support integrated arrival/departure management with operations • *Complete studies and further refine expanded use of reduced separation rules, surveillance data fusion and automation convergence in support of future NextGen applications*

Increase Flexibility in the Terminal Environment (FLEX)

The Flexible Terminals and Airports solution set provides capabilities necessary to increase access to and manage the separation of aircraft in the terminal environment at and around all airports – large and small. FLEX addresses initial surface management capabilities, procedures that improve access to runways in low visibility, and new automation that will support and maximize the use of available data to enable surface trajectory-based operations. These capabilities will improve safety, efficiency and overall capacity in reduced visibility.

NextGen funded activities leading to flexible terminals and airports include:

- **Wake Turbulence Mitigation for Departures (WTMD):** Developing technologies that leverage a national rule change allowing increased departures from Closely Spaced Parallel Runways when WTMD technology is being utilized.
- **Wake Turbulence Mitigation for Arrivals (WTMA):** Evaluating concept feasibility prototypes for WTMA decision support tools, designed to enable reduction of wake mitigation separation between aircraft during arrivals.
- **Surface/Tower/Terminal Systems Engineering:** Developing and evaluating prototype tools to deliver ground surface traffic management operations and enhanced surface situational awareness capabilities. *These activities support the response to the RTCA Task Force's Surface recommendations.*
- **Approaches, Ground Based Augmentation Systems (GBAS):** Developing a system that uses existing GPS single civil frequency to provide Category I GBAS service for airport arrivals and design improvements to this architecture to support future Category II/III service. *These activities support the response to the RTCA Task Force's Runway Access recommendations.*
- **Closely Spaced Parallel Operations:** Providing increased arrival, departure and taxi operations to airports with closely spaced parallel runways in all weather conditions. The FAA is targeting enhanced procedures that will allow dependent operations to closely spaced parallel runways or converging approaches to runways closer than 2,500 feet, as well as supporting independent operations to parallel runways between 2,500 feet and 4,300 feet. *These activities support the response to the RTCA Task Force's Runway Access recommendations.*
- **Approaches, NextGen Navigation Initiatives:** Increasing capacity during Instrument Meteorological Conditions (IMC) with improvements supporting terminal and approach phases of flight as well as improved situational awareness on the airport surface including
  - Enabling a reduction of required Runway Visual Range minimums during IMC
  - Implementing significant changes to the national standard for Distance Measuring Equipment (DME) usage to expand the service volume of DME-DME area navigation (RNAV) without the need for an inertial reference unit . (Note, the current standard dates to 1982)
  - Investigating the use of ADS-B, ASDE-X, GPS augmentation systems such as GBAS and the Wide Area Augmentation System (WAAS) and other systems providing RNAV and RNP to provide information to the cockpit aimed at improving situational awareness on the airport surface

  These activities support the response to the RTCA Task Force's Metroplex recommendations.
- **Approaches, Optimize Navigation Technology:** Developing new technologies for existing navigation systems, including approach lighting systems, other lighted navigation aids, precision and non-precision approach systems, and terminal and en route navigation systems that improve reliability and lower energy usage and cost of operations. Efforts include analyses of the physical, electrical and economic characteristics.

Increase Flexibility in the Terminal Environment (cont'd)

- **Terminal Enhancements for RNAV ATC (TERA):** Developing new tools to ensure efficient use of RNAV and RNP procedures during arrivals and departures to include display aids to assist the controller in determining separation conformance and for spacing and sequencing aircraft on or near assigned trajectory merge points. Early implementation will include the Relative Position Indicator (RPI) and enhancements to the Converging Runway Display Aid (CRDA) function of terminal automation platforms. Future tools will be developed to complement aircraft Flight Management Systems and will support the use of Data Comm to allow separation through ground/air automation interactions. This capability also supports the TBO and FLEX solution sets. *These activities support the response to the RTCA Task Force's Runway Access recommendations.*
- **Arrivals (RNAV and RNP with 3D Required Time of Arrival (RTA)):** Developing RTA capability that will ensure the safe and efficient transition of aircraft from en route to terminal airspace with appropriate sequencing and spacing. *These activities support the response to the RTCA Task Force's Cruise recommendations.*

These activities support implementation of the following NextGen Operational Improvements (OI):

Wake Turbulence Mitigation for Arrivals: CSPRs: OI 102144
Improved Runway Safety Situational Awareness for Controllers: OI 103207
Improve Runway Safety Situational Awareness for Pilots: OI 103208
GBAS Precision Approaches: OI 107107
Low Visibility/Ceiling Approach Operations: OI 107117
Use Optimized Profile Descent: OI 104124
Enhanced Surface Traffic Operations: OI 104207

Selected milestones from each of these projects include:

Project	FY09	FY10	FY11-15
Arrivals (RNAV and RNP with 3D Required Time of Arrival)	✓ Developed a CONOPS for RNAV and RNP with 3D Required Time of Arrival (RTA)	• Complete initial report on human-in-the-loop (HITL) simulation of Air-Ground Synchronization • Develop proposed standards to support RTA • Deliver initial business case report on RTA capability	• Begin limited implementation of 4D FMS Trajectory Based Operations using new ground automation support if available • Analyze human factors and flight deck automation requirements to support the safety management assessment • Conduct RTA proof-of-concept demonstration • Leverage demonstration results to conduct engineering and analysis necessary to support the development of initial RTA capability • Implement limited RTA capability (dependent on the establishment of a positive business case, approved SMS analysis, automation system enhancements and aircraft equipage)

Increase Flexibility in the Terminal Environment (cont'd)

Surface/Tower/ Terminal Systems Engineering	✓ Completed development of preliminary requirements necessary for the system design, scope and specifications for the Tower Flight Data Management (TFDM) engineering model	• *Initiate leveraging existing research and development activities and initiate development of plans to field integrated airport surface standards, processes and decision support tools.* • Develop TFDM engineering model and prototype initial Arrival/Departure Management Tools to support future operational demonstrations • *Work with the Surface Collaboration Decision Making Team (SCT) to define and gain consensus on a work plan to develop information exchange requirements* • Develop trajectory modeling in the terminal area for requirements and prototype design • Develop functional requirements through HITL simulation and a field demonstration at one site	• *Continue leveraging research and development activities and development of plans to field integrated airport surface standards, processes and decision support tools by 2018.* • Conduct HITL simulations and field demonstrations at additional sites to collect data to finalize TFDM CONOPS, functional requirements, benefits projections, cost estimates, safety analysis, procedures, training curriculum, and enterprise architecture elements • *Conclude and execute information exchange requirements work plan* • *Work with the SCT and the TFDM development team to define interoperability standards for surface operational data exchange* • *Conduct interoperability testing between the FAA and flight operations centers* • *Complete final investment decision and initiate deployment of the TFDM across the NAS* • *Execute field implementation of surface operational data sharing*
Closely Spaced Parallel Operations (CSPO)	✓ Chartered cross-agency team to integrate all CSPO-related activities ✓ Initiated safety analyses to update FAA order 7110.65 for RNAV/RNP/LPV or ILS ✓ Completed HITL tests to evaluate operational application for dual ILS and data collection for evaluating blunder assumptions ✓ Completed safety analyses for FAA order 7110.308 for dependent operations for Newark 4/22, Memphis, Seattle 34C/16C	• Conduct analysis to evaluate target level of safety for CSPO operations, leveraging: o *Current program plans to implement Converging Runway Display Aid at Memphis and Newark and evaluate for proposed use at Boston, Baltimore and New York (JFK).* o *Approval of additional dependent staggered approached (7110.308) for additional runway ends at airports already using the procedure as well as at other qualifying airports* o *Safety analyses to update FAA order 7110.65 to allow any combination of RNAV/RNP/LPV/GLS or ILS* • Perform data collection to support a decision on extended use of multilateration using Precision Runway Monitor – A • Continue Blunder Testing for CSPO	• *Complete analyses to re-evaluate the blunder model and determine operational impacts, refine blunder assumptions via modeling and analyses* • Approve Wake Turbulence Mitigation for Arrival procedures at additional airports and additional airport runway pairs using 7110.308 for dependent staggered approaches • Develop performance requirements for independent and paired approaches • *Implement an update to FAA Order 7110.65* • *Evaluate collected data in support of additional potential deployment* • *Update FAA Order 7110.65 to approve any combination of RNAV (with vertical navigation)/RNP/LPV/GLS/ILS for simultaneous independent and dependent approaches to closely spaced parallel runways*
Approaches, Ground Based Augmentation Systems (GBAS)	✓ Completed GBAS system design approval and approved GBAS for use in the NAS ✓ Completed Safety Risk Management for CAT I ✓ Initiated draft of CAT III System Specification	• Conduct cost and benefits analysis • Update CAT III concept of operations • Update CAT III requirements document	• Finalize CAT III ground facility specification and complete validation of CAT III avionics interoperability standards

***Increase* Flexibility in the Terminal Environment** (cont'd)

Project	FY09	FY10	FY11-15
Approaches, Optimize Navigation Technology	✓ Initiated draft specifications for Medium-Intensity Approach Lighting System with Runway Alignment Indicator (MALSR) and Precision Approach Path Indicator (PAPI) Light Emitting Diode (LED) to meet the Energy and Security Act of 2007 ✓ Completed PAPI implementation strategy plan	• Continue development and design of MALSR and PAPI LED Lamp Solution • Determine a test strategy and coordinate development of standards for conversion to LED	• Develop and design a Solid-State LED based MALSR Solution • Develop and design of ALSF-2 LED Lamp Solution • Continue development and design of: Solid-State LED based MALSR Solution, and ALSF-2 LED Lamp Solution
Approaches, NextGen Navigation Initiatives	✓ Initiated demonstration activities for lower visibility minima approaches using special authorization	• Add navigation infrastructure, i.e. Runway Visual Range, to complete implementation of FAA Order 8400.13D at additional airports • Procure subsystems to support RNAV approaches at limited sites • Begin test and demonstration for RNAV DME-DME in terminal area	• Define current arrival variability, runway occupancy times (day/light, clear/low-visibility) as a baseline to improving exiting from the runway • Define a future set of taxi-out and taxi-in time-based performance requirements that reduce variability in surface operations. Use these requirements to assess the current performance at OEP airports to define how much change will be needed and the feasibility of those changes
Wake Turbulence Mitigation for Departure (WTMD)	✓ Developed investment plan	• Prototype WTMD demonstration system at William J. Hughes Technical Center	• Continue evaluations of WTMD to support investment decision
Terminal Enhancements for RNAV ATC (TERA)		• *Demonstrate Relative Position Indicator at a minimum of two terminal sites*	• *Leverage data collected from demonstration activities to develop an RPI requirements document to enable field implementation in 2012* • Complete operational evaluation and deployment of RPI • Provide initial operating capability for RPI
Wake Turbulence Mitigation for Arrival		• Install WTMA feasibility prototype in simulated airport environment	• Complete WTMA feasibility prototype evaluation.

Improve Collaborative Air Traffic Management (CATM)

The Collaborative Air Traffic Management solution set provides capabilities to improve traffic flow management system-wide as well as at the tactical, or location-based, level. This solution set focuses on delivering services to accommodate flight operator preferences to the maximum extent possible. CATM develops capabilities that support both system-level (strategic) and location-specific (tactical) traffic flow management. CATM supports a more flexible air traffic system capable of in flight adjustment to alternate, more favorable, routings and altitudes as well as the ability to shift traffic operations to match airspace and airport capacity. CATM pulls together NAS status information into a common, electronic format available from multiple automation systems (e.g., weather, runway and airspace availability restrictions, etc.) to enable improved flight planning. Advanced automation will take into account operator preferences and identify routing strategies that effectively use airspace and airport capacity. CATM activities begin to set the parameters for data gathering and dissemination from all phases of flight and provide tools to enable automated decision making capabilities. Developing a common structure and status will ensure that data such as Special Activity Airspace availability can be accurate, timely and shared in the right format. Identifying the unique characteristics of each aircraft, or its Flight Object, throughout the phases of flight in domestic and international automation systems will help us evolve toward 4-dimensional trajectory planning that considers both space and time. Advanced methodologies (under Advanced Methods) will be explored to determine routing options, dynamic airspace sector boundaries and configurations to grant more flexibility in managing traffic.

NextGen funded activities leading to collaborative air traffic management include:

- **Strategic Flow Management Integration:** Implementing ERAM modifications necessary to receive and process traffic management initiatives in the ERAM baseline timeframe (releases 2 and 3) to allow automatic identification of aircraft affected by Traffic Flow Management (TFM) initiatives, electronic communication of traffic management information in a timely manner to relevant Air Traffic Control operational positions, monitoring of aircraft conformance and suggested controller actions to achieve flow strategies. Conducting requirements definition, investment analysis and risk mitigation for increments of flow strategy integration in the post ERAM release 3 time frame. *These activities support the response to the RTCA Task Force's Cross Cutting recommendations.*
- **Strategic Flow Management Enhancement:** Developing tools to allow traffic management specialists to automatically explore various reroute options and the impact of multiple traffic management initiatives and how they fit with efforts to accommodate NAS customer preferences. By automating this process, much more rapid flight reroutes can be developed, which will lead to fewer delays and less congestion. The tools will also support electronic negotiation of routing with aviation users to manage congestion. *These activities support the response to the RTCA Task Force's Integrated ATM recommendations.*
- **Common Structure and Status Data:** Developing a "common status and structure data" format to enable the FAA to provide integrated management of the aeronautical information necessary to support:
  - Capturing and maintaining digital information about flow constraints, traffic management initiatives and other status information affecting operations
  - Publishing aeronautical status information digitally using international standards
  - Providing value-added services using aeronautical status information such as improved flight planning and briefing services
  - Using the status information to improve operational performance metrics calculations and forecasting of airspace system performance.

  These activities support the response to the RTCA Task Force's Cruise recommendations.
- **Advanced Methods:** Developing advanced enhancements to TFM capabilities, including the use of probabilistic tools to improve the management of uncertainty; the integration of weather information into TFM capabilities; and exploiting a unified approach to flight planning and flight filing consistent with international standards.

***Improve* Collaborative Air Traffic Management** (cont'd)

- **Flight Object:** Implementing a single common reference for all system information about a flight, the Flight Object. The Flight Object will be consistent with ICAO standards and contain up-to-date information about an aircraft's capabilities and intent, as well as the operator's preferences and constraints. The Flight Object will improve flight notification, collaborative decision making, traffic flow management initiative planning, Air Traffic Control flight coordination, search and rescue operations. *These activities support the response to the RTCA Task Force's Integrated ATM recommendations.*
- **Integrated NAS Design & Procedure Planning:** Establishing new systematic methods for integrated airspace and procedures development, to speed delivery of capabilities and support application of enhanced services using best-equipped best served principles. *These activities support the response to the RTCA Task Force's Metroplex recommendations.*
- **Dynamic Airspace:** Conducting the engineering and advanced concepts activities to enable the development of tools for dynamically reconfiguring airspace for demand and capacity considerations over varying time scales (e.g., hours, months, years).
- **Joint Network Enabled Operations (NEO):** Investigating information sharing and collaboration across multi-agencies by leveraging existing technology and investments planned for the NextGen transformation.

These activities support implementation of the following NextGen Operational Improvements (OI):

Traffic Management Initiatives with Flight Specific Trajectories: OI 105208
Continuous Flight Day Evaluation: OI 105302
Improved Management of Airspace for Special Use: OI 108212
Provide Full Flight Plan Constraint Evaluation with Feedback: OI 101102
On-Demand NAS Information: OI 103305

***Selected milestones* from each of these projects include:**

Project	FY09	FY10	FY11-15
Strategic Flow Management Integration	✓ Continued to develop pre-departure reroute initial capability from Traffic Flow Management (TFM) to Air Traffic Control (ATC) to aircraft	• Develop CONOPS for airborne reroutes and altitude modification • Continue development of algorithms for pre-departure reroute capability from TFM to ATC to aircraft	• *Deploy the ability for traffic managers to electronically transmit reroutes from the traffic flow management automation to en route automation for delivery to the pilot and dispatcher: 2011- Predeparture reroutes (tower), 2014- Airborne reroutes (en route), 2016- More complex RNAV clearances, dependent on Data Comm* • Implement pre-departure and airborne reroute capability in ERAM • Support Terminal Automation investment decisions by conducting requirements analyses and developing the business case for airborne reroutes

Improve **Collaborative Air Traffic Management** (cont'd)			
Strategic Flow Management Enhancement	✓ Completed a field evaluation of marine stratus algorithm for ground delay program (GDP) at San Francisco ✓ Initiated route blockage and congestion as part of an integrated departure management decision support tool (DST)	• Develop a TFM road map and components integration plan • Develop San Francisco GDP with probabilistic forecast stratus field evaluation report • Develop final findings on information analysis for Departure Feedback • Develop departure route planning prototype cost-benefit analysis and implementation plan	• Develop San Francisco GDP with probabilistic forecast stratus field implementation plan • Conduct demonstrations to evaluate the business logic for balancing capacity and demand predictions • Develop integrated TFM CONOPS document • Design, develop and deploy an automated strategic flow enhancement capability • *In collaboration with aviation stakeholders, deliver a mid-term traffic flow management capabilities roadmap that outlines improvements that can be accomplished in the 2014-2018 timeframe*
Common Structure and Status Data	✓ Initiated analysis for use of aeronautical data and information exchange capability and developed initial CONOPS ✓ Initiated analysis for enterprise architecture elements for digital Letter of Agreements and Standard Operating Procedures (LOA/SOP) leading to an investment decision for AIM modernization ✓ Initiated information modeling efforts for candidate data elements such as LOA/SOP, runway configurations and status	• Develop Aeronautical Information Exchange Model to support the movement of digital LOA/SOP data, which will lead to an investment decision for AIM modernization • Develop CONOPS and enterprise architecture for national Special Activity Airspace (SAA) • Demonstrate capability to provide standardized, consistent and managed digital SAA definitions for external stakeholders and users • *Initiate SAA business case assessments for implementation at RTCA recommended priority sites (Minneapolis, Denver, Albuquerque, Los Angeles, Seattle, Salt Lake City) for implementation in coordination with the Department of Defense (DoD) and industry stakeholders based on a concept of operations developed in collaboration with the SAA community*	• Support the investment analysis decision that enables the implementation of airport, airspace and pilot briefing systems resulting from the pre-implementation work developed in this program • Complete data model and concept for digital capture of constraints and rules contained in facility location-specific digital LOA/SOP • *Provide common services for aeronautical data delivery and performance metrics calculations* • Support improvements for digitally managing, coordinating and scheduling airspace for SAA • *Complete SAA business case assessments for implementation at RTCA recommended priority sites (Minneapolis, Denver, Albuquerque, Los Angeles, Seattle, Salt Lake City) for implementation in coordination with the DoD and industry stakeholders* • *In collaboration with the SAA community, conduct an initial benefits analysis and review policy, and develop metrics and requirements* • *Develop common digital information exchange services for coordinating and disseminating SAA usage and activation data for planning and tactical use* • *Integrate SAA status information into air traffic decision support tools to enable strategic and tactical airspace management*

Improve Collaborative Air Traffic Management (cont'd)

Project	FY09	FY10	FY11-15
Advanced Methods		• Develop flight data service CONOPS	• Develop and refine advanced algorithms and requirements for display to support the area flow and planner DSTs • Refine advanced algorithms to support the area planner DST
Flight Object	✓ Demonstrated initial flight object (surface movements) interaction with international ANSP ✓ Developed CONUSE for NAS flight object	• Update CONUSE for NAS flight object • Host Flight Object industry day – technical interchange meeting with industry on FAA plan for Flight Object activities and standards development • Develop initial Flight Object Data Dictionary	• Design preliminary requirements, standards, and access rights for operational Flight Object Management System to support information sharing of flight object data. • Demonstrate the international Flight Object usage outside the laboratory environment • Obtain investment decision for proposed Flight Object implementation
Integrated NAS Design & Procedure Planning			• Develop concepts for best-equipped, best-served • Initiate analyses and procedures on airspace and procedures design • Assess concepts and procedures • Conduct human in the loop simulations • Develop functional requirements
Dynamic Airspace		• Develop concepts of operations for the Airspace Resource Management System (ARMS) • Analyze ARMS system interdependencies	• Define requirements and criteria/metrics for evaluating radio spectrum coverage • Evaluate processes for moving sector boundaries and airspace configurations
Joint Network Enabled Operations (NEO)	✓ Developed NEO concept of use ✓ Developed NEO system architecture ✓ Developed NEO program plan	• Initiate concept of operations for applying NetCentric concepts to Unmanned Aircraft Systems • Initiate safety and hazard analysis • Initiate demonstration strategies and program roadmap	• Develop Unmanned Aircraft Systems 4D ATM research plan • Develop enterprise architecture human factors assessment • Conduct Spiral 3 flight trials and update deliverables with Communities of Interest

Reduce Weather Impact (RWI)

The Reduce Weather Impact solution set supports the integration of a broad range of weather information into air traffic decision making. In the mid-term, new operational improvements and technologies will mitigate the effects of weather resulting in safer and more efficient and predictable day-to-day NAS operations.

NextGen funded activities leading to reduction in weather impacts in the NAS include:

- **Observation Improvements:** Performing a gap analysis to determine the optimal quantity and quality of weather observation capabilities including ground-, air- and space-based sensors necessary to support NextGen operations via shared weather information as well as integration of weather data into decision support tools.
- **Forecast Improvements:** Improving weather forecasting including probabilistic forecasts that can be used in air traffic and traffic flow management and evaluating the most effective solution for a weather processor architecture to support decision making and shared weather information.

These activities support implementation of the following NextGen Operational Improvements (OI):

Initial Integration of Weather Information into NAS Automation and Decision Making: OI 103119

Selected milestones **from each of these projects include:**

Project	FY09	FY10	FY11-15
Observation Improvements	✓ Completed master plan on the optimization of weather sensors to support activities and decisions required for the sensors network to meet mid-term and far-term milestones	• Complete sensor gap identification report for ground-based and airborne sensors for the terminal, en route and airborne areas • Continue evaluation of Multi-Phased Array Radar for weather and surveillance needs	• Develop NextGen right-sizing prototypes, and conduct demonstrations based on strategy report to enable improvement in weather observation quality and to inform future investment decisions • Develop NextGen concept for automatic adaptive sensing to field a sensor network that automatically responds to weather conditions to generate the required observations, on-demand rather than on-schedule, resulting in savings to operations and maintenance • Initiate strategy for optimization of volcanic ash sensing improvements impacting Alaska and Pacific routes. Complete prototyping for optimization of volcanic ash sensing improvements impacting Alaska and Pacific routes • Initiate concept for space weather in NextGen to enable efficient use of transpolar routes • Initial investment decision for surface observations consolidation

***Reduce* Weather Impact** (cont'd)

Project	FY09	FY10	FY11-15
Forecast Improvements	✓ Completed establishment of 0-6hr advanced convective forecast summer demonstration capabilities	• Conduct advanced convective weather forecast demonstration to provide further information (benefits, HITL) on weather integration requirements for decision support tools for collaborative decision making • Complete ATM-Weather Integration Plan v2 to provide concept of weather integration into NextGen Solution Set activities (e.g., CATM)	• Conduct prototyping weather integration activities for the ATM Integrated Departure Route Planning tool and implement into weather integration portion of the tool in operations to reduce workload and obtain higher quality predictions of constraints and capacity in departure routes • Develop, test and finalize ATM requirements for a 0-8hr convective weather forecast for use in FAA systems and decision support tools • Develop NextGen concept of weather impact translation to automate a weather-related ATM impact statement to be used directly by decision makers and decision support tools to enable optimal use of airspace in both the terminal and en route airspace. Develop prototype NextGen weather impact translator, evaluate capability and provide software for proposed implementation

Improve Safety, Security and Environmental Performance (SSE)

Improving safety, security and the environment is an inherent part of the FAA's overall mission and is embedded in the activities of individual programs agency-wide. This solution set involves activities directly related to ensuring that NextGen systems contribute to steadily reducing risks to safety and information security while mitigating adverse effects on the environment and ensuring environmental protection that allows sustained aviation growth.

NextGen funded activities supporting safety, security or environment include:

- **Security Integrated Tool Set:** Deploying SITS, an automated system to identify airborne security threats in the NAS and communicate that information to the appropriate information system or agency. SITS will collect and analyze appropriate data to determine whether anomalous aircraft behavior represents a security threat. *Additional specific safety, security and environmental activities are funded and outlined under the NextGen System Development budget line.*

These activities support implementation of the following NextGen Operational Improvements (OI):

Enhance Emergency Alerting: OI 106202

Selected milestones **from each of these projects include:**

Project	FY09	FY10	FY11-15
Security Integrated Tool Set (SITS)	✓ Completed development of SITS air domain security program requirements document ✓ Completed development of initial enterprise architecture elements for SITS in support of investment decision	• Conduct an evaluation of preliminary engineering development candidate concepts and systems, refine operational concepts and requirements, and obtain investment analysis readiness decision for SITS • Initiate the design and development of the SITS system	• Continue evaluation of preliminary engineering development candidate concepts and systems, refine operational concepts and requirements, and obtain initial investment decision for SITS • Complete the design and development, and initiate deployment of the SITS system

Transform Facilities (FAC)

The Transform Facilities solution set focuses on capabilities that enable a network of integrated facilities designed to support the delivery of safer and more efficient operations system-wide. It enables a facilities infrastructure that supports NextGen capabilities as they are integrated into the current system and as they mature over time. Business continuity is built into the system and provides for a more resilient infrastructure, better contingency operations and a higher degree of service. FAC includes multi-discipline laboratories and test beds to support NextGen requirements development and risk-mitigation efforts.

NextGen funded activities leading to transformed facilities include:

- **Future Facilities Investment Planning:** Conducting the detailed engineering necessary to develop comprehensive requirements for future NextGen facilities that provide expanded services, improved flexibility and service continuity.
- **Integration, Development and Operational Analysis Capability:** Building and fully leveraging the capabilities of the NextGen Integration and Evaluation Capability (NIEC) at the FAA William J. Hughes Technical Center. The NIEC gives the FAA the capability to leverage the unique systems capabilities at the Technical Center and other external laboratories to rapidly prototype and assess the transition to NextGen capabilities and conduct human-in-the loop simulations in a highly integrated environment.
- **Test Bed Demonstration:** Establishing three real-world test and demonstration environments to integrate testing of operational improvements during all phases of flight to allow multi-domain, end-to-end NextGen demonstrations and evaluations. The Test Bed sites will allow the integration of new and emerging technologies or applications into existing or planned NAS enhancements and foster partnerships with other government agencies and users, including open access for industry users and vendors so that new capabilities can be more rapidly harnessed.

Selected milestones from each of these projects include:

Project	FY09	FY10	FY11-15
Future Facilities Investment Planning	✓ Developed enterprise architecture elements and other supporting engineering documents to assess network facilities concepts	• Conduct comprehensive analyses to support the NextGen facilities concepts and objectives	• Complete requirements analysis for NextGen facilities
Integration, Development and Operational Analysis Capability	✓ Developed initial operational capability of the NIEC in support of FAA unmanned aircraft system simulation	• Focus on integrating new technologies into existing NIEC capabilities that will enable the customer to: o Validate iterative designs to evaluate concepts and alternatives o Design and conduct experiments to assess software, hardware and prototypes for research, system analyses, and/or definition and refinement of requirements • Provide inter-facility capabilities	• Enhance and sustain the NIEC at the Technical Center • Provide inter-facility capabilities
Test Bed Demonstration	✓ Completed alternatives assessment for location of NextGen Test Bed	• Conduct planning activities to establish initial Test Bed infrastructure (Florida) for NextGen Test Bed: o Develop initial operational concept o Develop near-term strategy o Define initial system requirements	• Perform site installation, maintenance and capability upgrades • Establish interconnectivity between sites • Perform arising NextGen technology integration and demonstration activities

NextGen System Development

The FAA maintains a System Development budget line to fund projects that have broad applicability across the solution sets and to NextGen overall.

NextGen-funded activities under System Development include:

- **ATC/Tech Ops Human Factors:** Conducting system engineering and other technical support to fully integrate human factors considerations into the NextGen portfolio and to conduct focused human factors studies in areas such as controller workload and work station interfaces.
- **New ATM Requirements:** Conducting research across all solution sets, focused on maturing concepts and technologies targeting application towards the end of the NextGen mid-term.
- **Ops Concept Validation Modeling:** Developing and validating future end-to-end (flight planning through arrival) operational concepts with special emphasis on researching changes in roles and responsibilities between the FAA and airspace users (e.g., pilots and airlines), as well as the role of the human versus systems, that will increase capacity and improve efficiency and throughput. Activities are focused on identifying procedures that can decrease workload and increase reliance on automation for routine tasking to increase efficiency of the NAS.
- **Staffed NextGen Towers:** Demonstrating the concept of, and developing the necessary requirements, specifications and supporting documentation for Staffed NextGen Towers. Staffed NextGen Towers may allow for the cost-effective expansion of services to a larger number of airports, and reduce tower construction costs.
- **Environment & Energy – Environmental Management System and Advanced Noise and Emissions Reduction:** Exploring, using simple demonstrations, as well as other methods to integrate environmental impact mitigation and energy efficiency options with the NextGen infrastructure in a cost-beneficial and verifiable manner. Activities also will focus on developing and verifying advanced tools for Environmental Management Systems (EMS) implementation. An EMS approach will manage, mitigate and verify progress toward achieving the environmental goals in an iterative manner based on planning, implementing, measuring the effects of, and adjusting solutions that are based on well developed and demonstrated environmental impacts metrics. The EMS approach will allow optimization of advance options for noise, fuel burn and emissions reduction to enable the air traffic system to handle growth in demand.
- **Wake Turbulence Re-categorization:** Developing new sets of tailored "leader aircraft" and "follower aircraft" wake separation standards whose application would depend on flight conditions and aircraft performance to enable increased capacity of flights into and out of airports to accommodate future demands.
- **Safety Management System Transformation:** Developing tools and supporting processes leading to a comprehensive and proactive approach to aviation safety in conjunction with implementation of NextGen capacity and efficiency capabilities. The implementation of these capabilities will require changes in the process of safety management, the definition and implementation of risk management systems, and management of the overall transformation process to ensure that safety is not only maintained but improved. Activities support:

NextGen System Development (cont'd)

- o Developing and implementing the Aviation Safety Information Analysis and Sharing (ASIAS) system, which provides the capability to integrate data from public and non-public sources spanning commercial aviation, while maintaining data protection. This capability and the use of advanced data mining tools allow the early identification and mitigation of emerging risks to the aviation system.
- o Using ASIAS data and its capabilities in System Safety Analyses.
- o Advancing Safety Risk Management processes and taxonomy, analytical methods and integrated evaluation applications to ensure highly capable and consistent risk assessment processes.
- o Developing new methods to ensure continual surveillance of Design Approval Holder compliance with Safety Management System (SMS) requirements.

- **Operational Assessments:** Conducting integrated assessments to ensure that safety, environmental and system performance considerations are properly addressed throughout the integration and implementation of NextGen.

These activities support implementation of the following NextGen Operational Improvements (OI):

Remotely Staffed Tower Services: OI 109402
ASIAS – Information Sharing and Emergent Trend Detection: OI 109304
Enhanced Aviation Safety Information Analysis and Sharing: OI 109304
Implement EMS Framework – Level 1: OI 109309
Environmentally and Energy Favorable En Route Operations – Level 1: OI 109311
Environmentally and Energy Favorable Terminal Operations – Level 1: OI 109313
Implement NextGen Environmental Engine and Aircraft Technologies – Level 1: OI 109315
Increase Use of Alternative Aviation Fuels: OI 109316

Selected milestones **from each of these projects include:**

Project	FY09	FY10	FY11-15
ATC/Tech Ops Human Factors	✓ Completed Initial Human Factors Plan and Gap Analysis ✓ Conducted initial simulation of Future Terminal Workstation. ✓ Completed Human Error database and results of Preliminary Human Hazard Analysis ✓ Conducted initial Strategic Job Analysis	• Deliver initial NextGen common workstation requirements document • Deliver initial human error safety analysis of mid term operations • Deliver initial tower workstation requirements	• Measure efficiency improvements from implementation of a NextGen common workstation that incorporates human factors requirements • Demonstrate collaborative ATM efficiencies enabled by common situational awareness • Demonstrate efficiencies through new procedures to enable introduction of 4D dynamic air traffic environment

***NextGen* System Development** (cont'd)			
New ATM Requirements	✓ Completed Future Collision Avoidance System (CAS) Logic Research ✓ Developed Concepts of use for C-band airport surface wireless communications, including preliminary requirements and supporting architecture documentation. ✓ Conducted operational evaluation of SWIM Enhanced Data Exchange	• Provide recommendations for an aeronautical mobile airport communications system standard • Define baseline Requirements for Future Traffic Alert and Collision Avoidance System • Develop initial airborne SWIM concept of use	• System architecture and requirements definition for common trajectory implementation • Determine conflict resolution approaches using aircraft intent data • Conduct trade studies to determine approaches to future air-ground and ground-ground communications requirements implanting flexible terminal management
Ops Concept Validation Modeling	✓ Completed NAS Mid-term end-to-end Operational Concept Narrative ✓ Developed Data Communications (Data Comm) Segment 2 Preliminary Requirements ✓ Developed Data Comm Research Management Plan	• Develop detailed operational scenarios for the mid-term • Refine Mid-term NextGen Concept of Operations • Develop Time Based Flow Management Integrated Research Plan • Conduct Part-task Human-in-the-loop simulations of Trajectory Based Operations • Begin developing detailed scenarios for 2025	• Develop Data Comm Segment 2/3 requirements • Conduct human in the loop simulations of trajectory based operations for integrated time-based flow management • Validate concepts through detailed analyses including analytical modeling, fast-time simulations, and human-in-the loop simulations and demonstrations
Staffed NextGen Towers	✓ Developed a comprehensive research management plan for NextGen towers ✓ Continued ASDE-X certification tests at DFW ✓ Completed concept development activities such as cognitive walkthrough, functionality analysis, and scenario development to support field demonstration	• Conduct demonstration activities • Continue detailed engineering analysis and requirements validation activities	• Continue to develop and evaluate quantitative metrics to define and validate human performance, usability, workload and safety • Continue detailed engineering analysis and requirements validation activities • Design and conduct experiments to assess software, hardware and prototypes for research, system analyses
Environment & Energy - Environmental Management System (EMS) and Advanced Noise and Emissions Reduction	✓ Evaluated potential benefits of Continuous Lower Energy Emissions and Noise (CLEEN) aircraft technologies and alternative fuels on the NAS ✓ Conducted analysis to explore advanced algorithms and integrated approaches for surface, terminal and en route operations that reduce noise and emissions and to quantify potential environmental benefits ✓ Initiated expansion of integrated models to analyze regional noise and emissions impacts of NAS operations ✓ Applied new metrics for health and climate impacts of aviation to advance EMS	• Assess NAS-wide benefits of CLEEN aircraft technologies and alternative fuels, developed under R&D programs • Identify opportunities for environmental gains for surface (taxi/ramp) and terminal area operations, and conduct a significant exploration and demonstration of environmental control algorithms for en route procedures • Analyze NextGen environmental impacts and metrics for EMS application • Conduct analysis, planning, and testing to develop and refine EMS	• Mature NAS-wide analysis of environmental impacts of CLEEN technologies and alternative fuels, developed under R&D programs • Mature significant exploration and demonstration of environmental control algorithms for surface and terminal areas and en route procedures • Continue to explore NAS-wide implications of environmental standards, policies and market measures to mitigate aviation environmental impacts • Refine and implement facets of EMS • Analyze environmental impacts and metrics for use in NextGen EMS and NEPA compliance

***NextGen* System Development** (cont'd)

Project	FY09	FY10	FY11-15
Wake Turbulence Re-categorization	✓ Developed Program Plan ✓ Developed initial safety arguments ✓ Developed initial benefits Case ✓ Delivered initial set of safe wake categories and associated separation minima	• Develop recommendation for an alternative set of wake separation standards • Provide recommendation to ICAO for action	• Determine optimal set of aircraft flight characteristics and weather parameters for use in setting wake separation minima • Develop metrics for setting tailored leader/ follower aircraft wake mitigation separation standards • Determine changes to FAA ATC systems necessary for the ICAO implementation of revised wake separation standards • Complete development of leader/follower aircraft wake mitigation separation standards along with implementation planning for procedures and processes
Safety Management System Transformation	✓ Continued to refine and document the ASIAS enterprise architecture artifacts ✓ Continued to integrate the first commercial carrier data into ASIAS	• Begin implementing enhanced ASIAS, including the selected support architecture and requirements for information security, near real-time operations, and new and expanded participants	• Complete implementing enhanced ASIAS, including the selected support architecture and requirements for information security, near real-time operations, and new and expanded participants • Provide ability for ASIAS stakeholders to conduct custom analyses using selected ASIAS-provided fused data and tools • Expand ASIAS to achieve statistically significant coverage of NAS operations
Operational Assessments		• Develop and apply models to support the operational performance, safety and environmental integrated assessments of NextGen airspace/procedure and system changes	• Develop model enhancements to support the operational, safety and environmental assessment of NAS-wide airspace and procedural changes • Apply integrated operational assessments of proposed NextGen airspace/procedure and system changes.

NextGen Demonstrations

Activities under the NextGen Demonstrations budget line support a number of operational and laboratory demonstrations of advanced NextGen capabilities across the solution sets. Projects that support international interoperability goals and objectives by demonstrating advanced NextGen concepts with global partners such as the Atlantic Interoperability Initiative to Reduce Emissions (AIRE) and the Asia and Pacific Initiative to Reduce Emissions (ASPIRE) are funded under the NextGen Demonstrations budget line. Likewise, the Unmanned Aircraft Systems (UAS) 4D Trajectory Based Demonstration is also conducted with funding from the NextGen demonstration budget line.

Selected milestones from each of these projects include:

Project	FY09	FY10	FY11-15
NextGen Demonstrations	✓ Conducted over 1000 Tailored Arrival (TAs) Flights in San Francisco, Miami and Los Angeles (LAX) ✓ Conducted surface conformance (2D) HITL Simulation ✓ Collected 3D Path Arrival Management Flight Trial Data ✓ Demonstrated optimized profile descent of Trans-Atlantic flight into Miami ✓ Conducted Surface Management Flight Operator Surface Application (FOSA) interface and Collaborative Departure Queue Management at Memphis ✓ Initial UAS demonstration coupled with 4D Trajectory Based Operations Flight Management System (7/09)	• Conduct of Integrated UAS demonstration plan: o Enabling Technologies, ADS-B/4DT FMS o Incorporating ADS-B and NVS • Conduct Joint Gate-to-Gate Demo with Single European Sky Air Traffic Management Research (SESAR) • Conduct 2D Aircraft Flight Trial in Denver • Continue TAs at LAX, San Francisco and Miami • Perform HITL simulation of Surface Conformance (2D) plus hold short and give way instructions • Conduct second demonstration of Surface Management FOSA interface and Collaborative Departure Queue Management at Memphis • Evaluate Collaborative Departure Queue Management concept at Orlando and Memphis. • Perform HITL simulation of 2D Taxi Route Generation Tool and of decision support tools for Departure Runway Assignment, Airport Configuration and Departure Sequencing • Evaluate Flight Operator Surface Application (FOSA) Version 2 Interface concept, Collaborative Departure Queue Management Version 2 concept, and Weather Data Integration at Memphis and Orlando. • Demonstrate Staffed NextGen Tower at Dallas/ Fort Worth	• Conduct of integrated UAS demonstration plan • Demonstration of advanced avionics systems • Demonstration of synthetic vision systems • Conduct of collaborative end-to-end domain systems and management , including oceanic 4D trajectory management • Standards and alternatives development

Task Force Overarching Commitments

Activity	Actions	Date
Post-Task Force Recommendations	Provide a comprehensive proposal for future NextGen engagement with the aviation community	Spring 2010
	Initiate work with the aviation community to determine which metrics to use and/or develop in order to track NextGen performance, both from a programmatic and an operational perspective	Spring 2010
Consistently Achieving 3- and 5-Mile Separation	Complete Air Traffic Safety Action Plan implementation	Spring 2010
Streamlining	Develop program plan for Navigation Procedures Project	March 2010
	Begin implementation of all Lean process changes for Navigation Procedures Project	September 2010
	Complete initial review of National Environmental Policy Act (NEPA), and make recommendations on the most efficient scale, scope and processes for NextGen NEPA activities	September 2010

Task Force Overarching Commitments (cont'd)

Specific actions that the FAA is taking regarding the areas of concern identified by the streamlining operations approval subgroup of the Task Force follow.

Standardization	**Plan for NextGen Standards** The FAA agrees that timely and cost-effective standards for new capabilities are essential. As part of the NextGen Implementation Plan, the FAA will maintain a plan for all of the standards for aircraft systems and operational approval. This plan (Appendix A) is coordinated as a part of the NextGen program in an effort to provide the standards at the right time, when sufficiently mature to achieve safe and cost-effective solutions.	✓ January 2010
Headquarters/Field Coordination	**Coordination: Operational Approvals** The Flight Standards Service will implement NextGen branches in each Regional Office. These branches will concentrate experts in new technologies and procedures to support the operational review and approval of NextGen throughout the region. They will also work with other NextGen branches, and their activities will be coordinated through a National NextGen focal point in the office of Flight Technologies and Procedures.	✓ Fall 2009
	Coordination: Aircraft Certification The Aircraft Certification Service will implement a NextGen Policy Team to coordinate across the Directorates (responsible for different types of aircraft), and will identify, in 2011, NextGen specialists in aircraft certification offices with significant NextGen activity. In FY10, the implementation plan for NextGen specialists will be completed including the number and location of specialists.	✓ January 2010
	Coordination: System Safety Assessments The FAA will create a cross-agency team responsible for coordinating across all lines of business and performing organizations. This team will facilitate timely integration and execution of safety assessments. The cost and schedule risks associated with ensuring a safe system can best be mitigated by addressing safety from the onset of the program. This ensures that the requisite performance, robustness, human factors and mitigations are built into the system and the operation.	✓ Fall 2009
	Procedures for Coordination of New Technology Certification Projects The FAA will publish new procedures for coordinating aircraft certification projects that introduce new NextGen technologies, to ensure coordination between the field office conducting the project and the offices responsible for NextGen standards (through issue papers). Through early coordination, we will be able to provide more effective feedback on innovative projects early in their application process, as well as utilize the experience from these projects in developing national policy. (FAA Order on Standardized Usage of Issue Papers)	June 2010

Task Force Overarching Commitments (cont'd)

Activity	Actions	Date
Tracking/ Transparency	**Tracking Operational Applications** The FAA will provide status reports at certain milestones to applicants for operational approvals that require Flight Standards Service Regional Office and/or Headquarters level concurrence. At a minimum, these updates should be provided monthly; upon receipt of an application package at regional and headquarter levels; and once final concurrence is provided. Note: These and other applicants may receive an update within three days of a request for status.	September 2010
Industry Coordination	**Coordination of Policy** The FAA commits to coordinate draft policy and guidance material with appropriate industry forums during development of the policy when possible. For example, the FAA will continue to coordinate PBN documents with the Performance-Based Operations Aviation Rulemaking Committee. Recognizing that no single forum represents all industry stakeholders, the FAA will also provide for public comment on all draft policy.	✓ January 2010
Training	**Aviation Safety- Communication** The FAA will develop a Web site to describe and coordinate progress of NextGen-related projects and policy within the Office of Aviation Safety.	September 2010
	Aviation Safety- Training Plan The FAA will develop a training plan to identify NextGen training requirements for the Office of Aviation Safety workforce.	September 2010
Bundling Applications/ Approvals	**Consolidated, Electronic Application Process** A review of the capabilities of Web-based automated Operations Safety System will be conducted to determine the feasibility of multiple, electronic applications for various NextGen operations.	September 2010
Re-Examining Approval Process	**Process Review: Lean Process Review for Instrument Flight Procedures** The FAA will conduct a review of processes, tools and procedures related to standards, policies, development, approval, publication and utilization of instrument flight procedures such as RNAV and RNP. A cross-agency team with representation from all affected offices will review the end-to-end process with the objective of establishing a Lean process that provides efficiency and consistency for development and implementation of all instrument flight procedures.	December 2010
Adequate Resources	**Aviation Safety Plan for NextGen** The Office of Aviation Safety will develop an integrated plan for the activities, schedules and resources needed to support the timely implementation of NextGen. The plan will encompass all safety oversight activities within the office and include plans for required policy, resources, training, etc.	March 2010
Early Adopter Programs	**Early-Adopter Procedure for Coordination** The FAA will develop coordination procedures for all projects to ensure early involvement of aviation safety representatives when the FAA is funding development or implementation of technology or procedure.	September 2010

AIRPORT IDENTIFIERS

OEP AIRPORTS

ATL	Atlanta
BOS	Boston
BWI	Baltimore/Washington
CLE	Cleveland
CLT	Charlotte
CVG	Cincinnati/Northern Kentucky
DCA	Washington National
DEN	Denver
DFW	Dallas/Fort Worth
DTW	Detroit
EWR	Newark
FLL	Fort Lauderdale
HNL	Honolulu
IAD	Washington Dulles
IAH	Houston International
JFK	New York Kennedy
LAS	Las Vegas
LAX	Los Angeles
LGA	New York LaGuardia
MCO	Orlando
MDW	Chicago Midway
MEM	Memphis
MIA	Miami
MSP	Minneapolis/St. Paul
ORD	Chicago O'Hare
PDX	Portland (Ore.)
PHL	Philadelphia
PHX	Phoenix
PIT	Pittsburgh
SAN	San Diego
SEA	Seattle/Tacoma
SFO	San Francisco
SLC	Salt Lake City
STL	St. Louis
TPA	Tampa

ADDITIONAL AIRPORTS

SAT	San Antonio

ACRONYMS

ACM	Adjacent Center Metering
ADS-B	Automatic Dependent Surveillance-Broadcast
ADS-C	Automatic Dependent Surveillance-Contract
AFB	Air Force Base
AIM	Aeronautical Information Management
AIRE	Atlantic Interoperability Initiative to Reduce Emissions
ALSF-2	Approach Lighting System with Sequenced Flashing Light-Model 2
AR	Authorization Required
ARMS	Airspace Resource Management System
ARTS	Automated Radar Terminal System
ASDE-3	Airport Surface Detection Equipment-Model 3
ASDE-X	Airport Surface Detection Equipment-Model X
ASIAS	Aviation Safety Information Analysis and Sharing
ASPIRE	Asia and Pacific Initiative to Reduce Emissions
ATC	Air Traffic Control
ATM	Air Traffic Management
ATN	Aeronautical Telecommunications Network
ATOP	Advanced Technologies and Oceanic Procedures
ATSAP	Air Traffic Safety Action Program
BLI	Budget Line Item
CAAFI	Commercial Aviation Alternative Fuels Initiative
CANSO	Civil Air Navigation Services Organization
CAP	Collaborative Arrival Planning
CARTS	Common Automated Radar Terminal System
CAS	Collision Avoidance System
CAT	Category
CATM	Collaborative Air Traffic Management
CATMT	Collaborative Air Traffic Management Technologies
CDM	Collaborative Decision Making
CDQM	Collaborative Departure Queue Management
CDTI	Cockpit Display of Traffic Information
CIP	Capital Investment Plan
CLEEN	Continuous Lower Energy Emissions and Noise
CONOPS	Concept of Operations
CONUSE	Concept of Use
CRDA	Converging Runway Display Aid
CRTC	Combat Readiness Training Center
CSPO	Closely Spaced Parallel Operations
CSPR	Closely Spaced Parallel Runways
CY	Calendar Year
Data Comm	Data Communications
DDU	Data Distribution Unit
DME	Distance Measuring Equipment
DoD	Department of Defense
DST	Decision Support Tool
EA	Enterprise Architecture
EFB	Electronic Flight Bag
EFVS	Enhanced Flight Vision System
EIS	Environmental Impact Statement
EMS	Environmental Management System
ERAM	En Route Automation Modernization
FAA	Federal Aviation Administration
FAC	Transform Facilities
FACT	Future Airport Capacity Task
FANS	Future Air Navigation System
FDIO	Flight Data Input/Output
FIS-B	Flight Information Services-Broadcast
FLEX	Flexibility in the Terminal Environment
FMS	Flight Management System
FOC	Flight Operations Center
FOSA	Flight Operator Surface Application
FY	Fiscal Year
GA	General Aviation
GBAS	Ground Based Augmentation System
GDP	Ground Delay Program
GIS	Geographic Information System
GLS	GNSS Landing System
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HAATS	Houston Area Airspace Transition System
HADDS	Host Air Traffic Management Data Distribution System
HD	High Density Airports
HITL	Human-in-the-Loop
ICAO	International Civil Aviation Organization
IFR	Instrument Flight Rules
ILS	Instrument Landing System
IMC	Instrument Meteorological Conditions
ITP	In Trail Procedures
LED	Light Emitting Diodes
LNAV	Lateral Navigation

LOA	Letters of Agreement
LP	Localizer Performance
LPV	Localizer Performance with Vertical Guidance
MALSR	Medium-Intensity Approach Lighting System with Runway Alignment Indicator
MEA	Minimum En Route Altitudes
MEARTS	Microprocessor En Route Automation Radar Tracking System
NAS	National Airspace System
NASA	National Aeronautics and Space Administration
NEO	Network Enabled Operations
NEPA	National Environmental Policy Act
NextGen	Next Generation Air Transportation System
NIEC	NextGen Integration and Evaluation Capability
NNEW	NextGen Network Enabled Weather
NRS	Navigation Reference System
NVS	NAS Voice Switch
OEP	Operational Evolution Partnership
OI	Operational Improvement
OPD	Optimized Profile Descents
Ops	Operations
OTM-4D	Oceanic Trajectory Management-4D
PAPI	Precision Approach Path Indicator
PBN	Performance Based Navigation
PRM	Precision Runway Monitor
PRM-A	Precision Runway Monitor-Alternative
PUB	Publication
R&D	Research and Development
RF	Radius-to-fix
RNAV	Area Navigation
RNP	Required Navigation Performance
RPI	Relative Position Indicator
RTA	Required Time of Arrival
RTCA	Aviation industry group; www.rtca.org
RWI	Reduce Weather Impact
SAA	Special Activity Airspace
SAAAR	Special Aircraft and Aircrew Authorization Required
SATNAV	Satellite Navigation
SBAS	Satellite Based Augmentation System
SC	Special Committee
SCT	Surface Collaborative Decision Making Team
SESAR	Single European Sky Air Traffic Management Research
SID	Standard Instrument Departure
SITS	Security Integrated Tool Set
SMS	Safety Management System
SOP	Standard Operating Procedures
SSE	Safety, Security and Environmental Performance
STAR	Standard Terminal Arrival Route
STARS	Standard Terminal Automation Replacement System
SUA	Special Use Airspace
SUB	Subscribe
SWAP	Severe Weather Avoidance Procedure/ Program
SWIM	System Wide Information Management
TA	Tailored Arrivals
TAMR	Terminal Automation Modernization and Replacement
TBFM	Time Based Flow Management
TBM	Time Based Metering
TBO	Trajectory Based Operations
TCAS	Traffic Alert and Collision Avoidance System
TERA	Terminal Enhancements for RNAV ATC
TFDM	Tower Flight Data Manager -or- Management
TFM	Traffic Flow Management
TFMS	Traffic Flow Management System
TIS-B	Traffic Information Services-Broadcast
TMA	Traffic Management Advisor
TRACON	Terminal Radar Approach Control
UAS	Unmanned Aircraft Systems
URET	User Request Evaluation Tool
VDL-2	VHF Data-Link Mode 2
VHF	Very High Frequency
VNAV	Vertical Navigation
WAAS	Wide Area Augmentation System
WAM	Wide Area Multilateration
WTMA	Wake Turbulence Mitigation for Arrivals
WTMD	Wake Turbulence Mitigation for Departures

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