Federal Aviation Administration

FAA's

NextGen

IMPLEMENTATION PLAN

March 2011

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From the Administrator

March 2011

Dear Members of the Aviation Community:

The FAA made tangible and important NextGen progress in 2010. This was evident to me at the Experimental Aircraft Association's AirVenture in Oshkosh, Wis., this past year. People were asking, "What does NextGen mean for me?" That's significant. People are starting to see NextGen in action, and they want to know more about how the transformation of the National Airspace System (NAS) is going to enhance safety, increase access and efficiency, and improve aviation's overall environmental footprint.

NextGen is enjoying forward momentum right now, and that means all of us – the FAA and the entire aviation community – need to continue to work to sustain this exciting progress. That means more than new technology and procedures; it means a new approach to the way we do business in the NAS. Within the FAA, I've launched Destination 2025, a vision for both transforming our national aviation system and the agency responsible for making it happen. We're taking a hard look at how we do things, and making changes to ensure the FAA can meet the demands of a new century of aviation. We've elevated the executive leadership of NextGen to the deputy administrator level. With his confirmation last June, Michael Huerta became the highest ranking official with overall responsibility for NextGen in the federal government.

NextGen is helping usher in a new era of collaboration. We are building on the collaboration we began in 2009 through the RTCA task force with the newly established NextGen Advisory Committee, which Deputy Administrator Huerta is leading. Last April, the Department of Transportation chartered the Future of Aviation Advisory Committee, the membership of which spans the aviation community. Now, more than ever, the FAA and aviation stakeholders recognize that in order to succeed, NextGen must be a team effort. Everyone is being asked to make investments of time, money, equipage and human capital. I am encouraged that people from throughout the aviation community are doing their part.

In 2010, we also successfully integrated our new satellite-based aircraft tracking system, Automatic Dependent Surveillance-Broadcast (ADS-B), into all four air traffic control automation platforms at key sites across the country. We cleared the way to begin integrating ADS-B into FAA air traffic control facilities nationwide, and to train our workforce. We also issued our ADS-B Out rule requiring aircraft operating in most controlled airspace to be equipped to broadcast their position to the ADS-B network by the start of 2020. This rule allows manufacturers to start mass-producing certified ADS-B avionics, which we believe will drive prices down, addressing a key concern of the operators.

We have also been working hard at our nation's airports to reduce delays and improve the environment with NextGen initiatives that help curb fuel burn and emissions by improving surface efficiencies. We move forward with these initiatives knowing we might have to make adjustments due to new information, program interdependencies, realignment of priorities and other changes that can't always be anticipated as we pursue our mid-term operational vision.

2011 promises to be every bit as productive as last year. Design and implementation teams in Washington, D.C., and the Dallas area of north Texas will focus on streamlining arrival and departure traffic at clustered metroplex airports. Our work on Data Communications is setting the stage for the delivery of a NextGen technology that the 2009 RTCA task force identified as a priority. And the report of our ADS-B In rulemaking committee, due in September, will give us a clear indication of which cockpit-based ADS-B applications are most important to the aviation community.

The foundation of NextGen is collaboration and communication. NextGen will provide technology and tools, but NextGen will be delivered and operated by people. The dedication of people at every level of the aviation community will determine its success. I am certain that together, we will continue to meet the challenge of giving the world new ways to fly.

J. R. Babbitt

J. Randolph Babbitt
FAA 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 operators make better decisions. This data will assist operators 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

The NextGen Implementation Plan provides an overview of the FAA's ongoing transition to the Next Generation Air Transportation System. The Plan lays out the agency's vision for transforming the way things work in our nation's skies and at our nation's airports by the end of the mid-term. The Plan further provides a status report on the NextGen deployments, capabilities and benefits we have already introduced into the National Airspace System (NAS), as well as the goals we have set and commitments we have made in support of our mid-term vision. Additionally, the Plan addresses the harmonization work we are doing with the global aviation community to ensure aircraft operating globally receive the operational benefits in various international air traffic environments.

The primary goals of NextGen are to enhance the safety and reliability of air transportation, to improve efficiency in the NAS and to reduce aviation's impact on our environment.

NEXTGEN TODAY

The FAA is continuing to achieve multiple critical NextGen milestones. Our deployment of the ground infrastructure that will support Automatic Dependent Surveillance-Broadcast (ADS-B) surveillance is on time and on budget. We are continuing to improve airspace efficiency and airport access. And we have enjoyed success in our early efforts to leverage surface data sharing in support of collaborative surface traffic management at select locations.

One of the FAA's most important steps forward this year was its decision to approve the nationwide use of ADS-B to separate suitably equipped aircraft in areas with ADS-B coverage. Equally significant was our release of a final rule requiring aircraft operating in most controlled airspace to be equipped to transmit their position to the ADS-B network by Jan. 1, 2020.

Maintaining and enhancing safety remains fundamental to all NextGen improvements, as does the FAA's commitment to environmental stewardship. Airspace improvements including Performance Based Navigation (PBN) are already reducing fuel burn and emissions. A new, cleaner-burning biofuel is expected to be approved for use by commercial aircraft early this year.

We also are striving to streamline our own internal processes to ensure that the NextGen capabilities emerging from our test beds and research centers begin producing operator benefits as quickly and safely as possible.

NEXTGEN BENEFITS

As airports and operators reap the benefits of the investments and deployments we are making today, the FAA continues to sharpen its projections of the benefits we expect NextGen to provide during the mid-term. Our latest estimates, which are sensitive to traffic and fuel price forecasts, indicate that by 2018, NextGen will reduce total delays (in flight and on the ground) by about 35 percent compared with what would happen if we did nothing. That delay reduction will provide, through 2018, $23 billion in cumulative benefits to aircraft operators, the traveling public and the FAA. In the process, we will save about 1.4 billion gallons of aviation fuel during this period, reducing carbon dioxide emissions by 14 million tons.

The FAA expanded the demonstration activities and trials we use to develop NextGen capabilities, and which provide direct benefits to the members of the aviation community who partner with the FAA to conduct those activities. In Memphis, Tenn., both FedEx and Delta have reported savings from technologies and operational practices aimed at preventing long lines from forming at the end of the runway. Highly specialized Optimized Profile Descents known as Initial Tailored Arrivals have proven so successful, they are moving from demonstration to operational use at airports in San Francisco, Los Angeles and Miami. In addition to helping curb delays, surface management and Initial Tailored Arrivals help the environment by reducing fuel burn and emissions, and offering opportunities to manage noise.

NextGen technologies will work together to provide greater situational awareness both in the air and on the ground, enhancing safety throughout the system. Likewise, our efforts to collect, analyze and share information on aviation trends will assist us in identifying and mitigating any potential risk associated with NextGen implementation.

NEXTGEN: OPERATING IN THE MID-TERM

In this update, the FAA reiterates its vision for the operational capabilities we expect to have in place by the end of the mid-term. That vision includes changes at every phase of flight, and it fundamentally revamps 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 (Data Comm), combined with PBN, 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 NextGen capabilities over the next decade, the aviation community will continue to rely on Safety Management Systems, integrated safety cases and other proactive forms of management that allow us to assess the safety risk of all the proposed changes. Policies, 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 innovations that will fundamentally change air traffic automation, surveillance, communications, navigation and the way we manage information.

In addition to the advances we develop through the NextGen transformational programs and implementation portfolios, 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 modern air traffic management. FAA information and management systems must keep 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 AHEAD

Several milestones key to the NextGen mid-term vision are right around the corner.

This fall, an Aviation Rulemaking Committee is expected to submit initial recommendations on how the aviation community should move forward with the technology that brings ADS-B information into the cockpit (ensuring compatibility with the ADS-B Out avionics detailed in the 2010 final rule). We are also moving forward with the development of Data Comm, which is expected to provide initial tower capabilities in 2015.

Over the next few years, we will be making more NAS systems compatible with the network structure that will serve as the backbone for the digital exchange of NextGen information, and we expect to update our policies to leverage satellite navigation technology to increase the capacity of closely spaced parallel runways during poor visibility.

The FAA recognizes the magnitude of the effort necessary to achieve our NextGen goals, and we have provided a highly effective, structured management and governance architecture to ensure the timely, cost-effective delivery of all NextGen capabilities.

CHALLENGES

While the FAA remains confident we will achieve NextGen success, we recognize that many technical, programmatic and organizational challenges lie ahead. NextGen success depends on public and private stakeholder investments moving forward together. Operators must equip to take advantage of the capabilities we provide. Additionally, we must contend with varying timelines and levels of maturity among the incremental achievements that NextGen capabilities are built on. As we work to introduce new equipment and procedures into a NAS that is active 24 hours a day, seven days a week, we face limitations in terms of how much change the system can accommodate at any one time. Our key to successfully dealing with challenges is to anticipate them and incorporate mitigation strategies into our NextGen planning. For example, we are studying a number of financial and operational incentives aimed at encouraging operator equipage. Further, we have taken an integrated portfolio management approach that recognizes the interdependent nature of NextGen, rather than trying to administer NextGen as a series of individual programs and initiatives.

WHY NEXTGEN MATTERS

The advantages of NextGen will benefit almost everyone, whether they frequently travel by air or never fly at all. Those who do fly will enjoy fewer delays, the highest level of safety and more predictable trips. Many people who live in neighborhoods near airports will experience less aircraft noise and fewer emissions. And communities will make better use of their airports, strengthening their local economy. Our nation's economy depends on a healthy aviation industry. ■

Introduction

The NextGen Implementation Plan is the FAA's primary outreach tool for communicating with the stakeholders and aviation partners working with us to develop and deploy the Next Generation Air Transportation System. The Plan is intended to provide stakeholders with an overview of NextGen, including a status report on the deployments, capabilities and benefits it has introduced into the National Airspace System (NAS) to date. The Plan update, as always, is consistent with budget assumptions that were current at the time of publication. The Plan underscores our unwavering focus on the mid-term system. It provides aviation community decision makers with up-to-date information about the investments operators and airports need to make to benefit from NextGen capabilities (Appendix A). It also summarizes the milestones and critical work that will be ongoing in pursuit of our mid-term goals (Appendix B).

Users of our airspace won't have to wait until the mid-term to experience the advantages of NextGen. Across the country, operators are already reaping the benefits of NextGen capabilities. In Atlanta, arrivals making use of Performance Based Navigation (PBN) procedures have saved hundreds of thousands of gallons of fuel and thousands of tons of carbon dioxide and air pollutants. Similar fuel savings and reductions in emissions have resulted from the use of precise, continuous descents into Los Angeles and customized descents into San Francisco. Preliminary results from a surface management initiative in Boston point to a fuel savings of 5,100 gallons and a reduction in carbon dioxide emissions of 50 tons during periods of heavy congestion. Shared surface surveillance data coupled with aircraft metering techniques are creating taxi-out time savings of up to 7,000 hours a year at New York's John F. Kennedy airport and 5,000 hours a year at Memphis, Tenn. Equipped helicopters flying over the Gulf of Mexico are enjoying the safety and efficiency of radar-like coverage in poor weather conditions. And in Colorado, new surveillance technologies are enabling controllers to track aircraft flying through potentially treacherous mountain terrain.

These are just a few examples of early NextGen successes. In 2010, the FAA met 90 percent of our high-priority NextGen objectives. Many more benefits are still unfolding as the FAA and its partners continue to roll out new policies, procedures and technologies as part of the largest transformation of the NAS in history.

Since Congress passed the first NextGen budget appropriation in 2007, the FAA has been working aggressively with the broader aviation community to revolutionize the way things work at our nation's airports and in our nation's skies. We are deploying innovative technologies and procedures that improve efficiency both on the ground and in the air, while offering greater environmental protections. We are laying the groundwork for 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 are working with our international partners to make sure it all works seamlessly beyond our borders.

Our investment in that work is already paying dividends. Our deployment of Automatic Dependent Surveillance-Broadcast (ADS-B) ground stations is on time and on budget. ADS-B, our satellite-based successor to radar, more accurately tracks traffic in areas such as Philadelphia, Louisville, Ky., and Juneau, Alaska, as well as the Gulf of Mexico. Operators of aircraft equipped with first-generation ADS-B avionics are singing the praises of the increased situational awareness offered by the free in-cockpit traffic and weather information provided under the FAA's Surveillance and Broadcast Services program.

Across the country, operators are already reaping the benefits of NextGen capabilities.

Operators also are benefiting from the increased runway access enabled by new approaches the FAA has published for scores of runway ends throughout the country. These approaches integrate several approach procedures with a common path over the ground. Each procedure allows a different level of access based on aircraft capability. These approach procedures include Lateral Navigation (LNAV), Lateral and Vertical Navigation (LNAV/VNAV), and Localizer Performance with Vertical Guidance (LPV). Additionally, operators are taking advantage of PBN procedures that use satellite guidance to follow more precise arrival and departure paths. PBN remains a key component of our efforts to deconflict traffic flows over busy metroplex areas – metropolitan centers that contain multiple airports and municipalities, as well as a diverse set of aviation customers and stakeholders.

Our metroplex work also goes to the heart of the partnerships forged between the FAA and the aviation community. In direct response to recommendations made in 2009 by the RTCA[1] NextGen Mid-Term Implementation Task Force, two initial study sites – the Washington, D.C., and north Texas areas – served as prototypes for the broader implementation of PBN procedures in critical metroplex areas, and five additional study teams are being dispatched this year.

The NextGen success enjoyed by the FAA and its partners has garnered the support of the White House and Congress. Funding for NextGen has increased significantly since the first appropriation of $128 million in 2007. Today, our funding requests are approximately $1 billion. The White House and the U.S. Department of Transportation have declared NextGen a top national transportation and infrastructure priority.

There is good reason for that. Aviation is crucial to our nation's economy. As recently as 2009, civil aviation contributed $1.3 trillion annually to the national economy, and constituted 5.2 percent of the gross domestic product. It generated more than 10 million jobs, with earnings of $397 billion.[2]

NextGen is vital to protecting those contributions. The current system simply cannot accommodate anticipated growth in the aviation industry. Congestion continues to increase at many of our nation's busiest hub airports, a problem that will only be exacerbated now that traffic levels are starting to rebound from the impact of the economic recession.

NextGen has further provided additional opportunities for environmental stewardship. Our efforts are enhancing energy efficiency and reducing aviation's environmental footprint, while promoting increased energy security and diversity. Our plans promote the creation of green jobs, and support our nation's farmers through the creation of sustainable fuels.

By providing greater safety, efficiency and environmental performance, NextGen plays a critical role in protecting America's economic and environmental health.

While the FAA and the aviation community can take pride in all that NextGen has accomplished so far, we remain keenly aware of the challenges that remain. The interdependence of NextGen systems means that challenges faced by one program could create challenges for another. Some of the capabilities deployed by the FAA will not be able to provide benefits until sufficient numbers of operators have equipped to take advantage of them. New procedures implemented by the FAA will have no impact if controllers and pilots have not been trained in their proper execution. The FAA has anticipated these challenges and developed

[1] RTCA, Inc. is a private, not-for-profit corporation that develops consensus-based recommendations regarding communication, navigation, surveillance and air traffic management system issues. RTCA functions as a Federal Advisory Committee and includes roughly 400 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, and airport associations, labor unions, aviation services and equipment suppliers.

[2] "The Economic Impact of Civil Aviation on the U.S. Economy," FAA, March 2011.

risk mitigation strategies to keep NextGen on track and sustain its momentum.

With the publication of this 2011 update to the NextGen Implementation Plan, the FAA once again affirms its commitment to delivering the capabilities and benefits that comprise our mid-term operational vision, first outlined in 2009. At the same time, we remain focused on working with our partners to deliver early benefits leveraging existing aircraft capabilities. Key examples include our metroplex work, as well as our formation, in conjunction with the RTCA, of the NextGen Advisory Committee, a new senior-level advisory panel representing broad aviation community membership. This committee will focus on improvements to safety, airports, the environment and air traffic, as well as global harmonization. It also will work in conjunction with the FAA to develop performance metrics for measuring the success of NextGen initiatives. One addition to this year's Implementation Plan is a new chapter called NextGen Ahead, in which we highlight some of the most significant NextGen milestones included in Appendix B.

As an overview document, the NextGen Implementation Plan both drives and draws upon many other NextGen plans and documents from throughout the agency, including the agency's detailed NAS Enterprise Architecture. The NAS Enterprise Architecture is a robust, comprehensive planning tool that the FAA uses to understand the interdependencies of capabilities on systems, procedures and policies, and to ensure their alignment. While not a set of commitments itself, the Enterprise Architecture serves as a cornerstone upon which the FAA bases many of the commitments included in Appendix B.

Our 2011 reporting does not end with the publication of this document. Throughout the year, you can access updated news and information at www.faa.gov/nextgen. The Web site offers access to additional FAA documents, including NextGen-related fact sheets, the Enterprise Architecture and last year's FAA Response to the Recommendations of the RTCA NextGen Mid-Term Implementation Task Force.

The transformation of the NAS represents a monumental task. The challenges are great, but the need and the payoffs are even greater. Buoyed by the NextGen success we have achieved thus far, and backed by the confidence of our stakeholders, Congress and the administration, the FAA and the global aviation community are moving forward together, giving the world new ways to fly. ■

NextGen Today

Deploying Operational Benefits

During 2010, NextGen made flying safer by giving pilots nearly total access to stabilized approach procedures with three-dimensional precision using Performance Based Navigation (PBN). It made air transportation more efficient by moving aircraft in and out of airports faster and by making better use of airspace. It gave pilots and air traffic controllers new capabilities that will allow them to see the exact location of surrounding aircraft. It reduced aviation's environmental impact from some operations using capabilities that allow aircraft to burn less fuel, emit fewer greenhouse gases and reduce noise.

NextGen capabilities and technologies are strengthening the National Airspace System (NAS) today even as the FAA and its partners collaborate on further improvements that will benefit our aviation stakeholders in the mid-term and beyond. We made progress in many areas over the last year, including safety management, airport development, environmental management, international harmonization, workforce engagement and training, regulation and policy making, and incorporating the action plans laid out in our response[1] to the 2009 recommendations of the RTCA NextGen Mid-Term Implementation Task Force.

Since maintaining and enhancing safety is fundamental to everything we do, we introduced these improvements into the NAS only after using a stringent process to ensure they are safe, will target key risk areas to reduce accidents and incidents, and limit environmental impact. We set robust standards for the capabilities and demonstrated that they will provide the intended benefits. We collaborated with our international counterparts to continue to harmonize our efforts so that aircraft will be able to operate using the same concepts, systems and procedures throughout the world.

Infrastructure helps us provide added benefits. In 2010, we commissioned a new runway at Charlotte, N.C., which enables the airport to handle three independent instrument landings at once. Charlotte will accommodate 80,000 more annual operations, an increase of more than 15 percent, with an estimated delay reduction of 1.5 minutes per flight, saving operators $41 million annually. We also rehabilitated runways and taxiways at a number of other airports. The map on page 17 highlights some of our 2010 accomplishments.

1 The full response to the task force is available at www.faa.gov/nextgen.

BETTER AWARENESS WITH ADS-B

One of the most significant developments in the last year was the FAA's decision to approve the nationwide deployment of Automatic Dependent Surveillance-Broadcast (ADS-B). After extensive testing at four key sites, the FAA in September 2010 authorized air traffic controllers to use the foundational, satellite-based NextGen technology to separate suitably equipped aircraft in areas with ADS-B coverage. ADS-B will update activity on air traffic controller displays more frequently and with greater accuracy, providing information such as aircraft type, call sign, heading, altitude and speed. With ADS-B, controllers can use airspace more efficiently. The nationwide ADS-B ground infrastructure is expected to be completed in 2013.

In May 2010 we published a final rule that mandates aircraft broadcast ADS-B information in most airspace by Jan. 1, 2020. The FAA determined that the 2020 timeframe would give NAS users time to equip, with most air carriers using regularly scheduled maintenance to install or upgrade equipment, and it also would provide sufficient operational experience to make ADS-B the primary source of surveillance. The standards in the ADS-B Out avionics rule will ensure that aircraft are capable of providing air traffic control automation platforms with the precise position data necessary to support NextGen surveillance requirements.

In addition, research is being conducted into the appropriate role of ADS-B to contribute to the effort of safely incorporating Unmanned Aircraft Systems (UAS) into the NAS and to improving capacity on closely spaced parallel runways. A map of ADS-B surveillance coverage appears on page 16.

ENHANCING PERFORMANCE BASED NAVIGATION

The FAA produced a significant number of PBN routes and procedures, exceeding our fiscal year 2010 goal. PBN procedures help reduce fuel use, emissions and miles flown at high altitudes and while transitioning during the arrival or departure phase of flight. These revisions could reduce delays during inclement weather. We published 51 high-altitude Area Navigation (RNAV) routes and 90 RNAV arrival and departure routes. We also published 59 Required Navigation Performance Authorization Required (RNP AR) approach procedures. Production of additional RNP procedures will focus on those with the most significant benefit.

Of the 90 RNAV procedures published in fiscal year 2010, 10 were designed to accommodate an Optimized Profile Descent (OPD) for appropriately equipped aircraft. Traditional arrival procedures have multiple segments of level flight during the descent and each step down requires a change in power settings. OPD procedures enable arrival aircraft to descend from cruise altitudes to final approach with significantly fewer level-offs. Since aircraft can use lower and steady power settings, OPD procedures result in reduced fuel burn, lower emissions and reduced noise.

The various components of PBN facilitated more efficient design of airspace and procedures. This resulted in improved safety, airspace access and predictability of operations; led to reduced delays; and contributed to more efficient routes, reducing fuel use, emissions and noise. PBN is the cornerstone of the agency's metroplex effort, which seeks to deconflict traffic flows for more efficient operations in busy metropolitan areas with multiple airports (see sidebar on page 14).

Another type of OPD is the Initial Tailored Arrival (ITA). This type of procedure also saves fuel and reduces emissions and noise. Aircraft need to be equipped with Future Air Navigation System (FANS) avionics to fly an ITA so that the desired flight path can be sent to the flight deck as data just before descent. Most oceanic aircraft including Boeing, Airbus and some business jet models are equipped with FANS.

ITAs will become operational at some international gateways including Miami, San Francisco and Los Angeles beginning in spring 2011.

Especially beneficial for smaller airports, where general aviation aircraft often operate, are the RNAV Wide Area Augmentation System (WAAS) Localizer Performance with Vertical Guidance (LPV) approach procedures. We published 500 WAAS LPVs in fiscal year 2010, bringing the total to more than 2,300 throughout the NAS. With LPVs, aircraft often can land in lower visibility conditions than with the previous approaches, providing more access to those airports throughout the year. WAAS LPVs provide satellite-based approaches primarily to airports and runways where no ground-based instrument landing systems exist. This means that aircraft can land at those airports even when visibility is limited, such as during poor weather.

Operators are realizing the benefits of PBN: 92 percent of U.S. scheduled air carriers are equipped for some level of RNAV. About 53,000 general aviation aircraft are equipped with the Global Navigation Satellite System to utilize LPV approach procedures and RNAV.

THE SAFETY FACTOR

To reduce accident and incident rates, NextGen technologies will target key risk areas, such as the compatibility between the Traffic Alert and Collision Avoidance System (TCAS) and future operations. Risk areas are identified through the Aviation Safety Information Analysis and Sharing system (ASIAS), a powerful tool for NextGen and Safety Management System (SMS) transformation. It enables better safety information management and data sharing as it proactively extracts knowledge from public and non-public data sources throughout the NAS on subjects including accidents, incidents, regulations, aircraft, aircraft operators, voluntary reporting and statistics. ASIAS's advanced data-mining tools combined with system safety assessment analytical modeling and forecasting enable safety managers to identify and mitigate emerging risks.

We plan to increase the current 46 ASIAS safety databases to 64 by 2013, resulting in expanded trend analysis on critical risk factors as well as more in-depth hazard analysis capabilities. Thirty commercial carriers provide data to ASIAS through Aviation Safety Action Program (ASAP) and Flight Operational Quality Assurance (FOQA) programs, representing 80 percent of scheduled operations in U.S. airspace.

As of December 2010, more than 7 million FOQA flights, 86,000 ASAP reports and 16,000 reports from the FAA's non-punitive safety reporting system, the Air Traffic Safety Action Program, were aggregated into ASIAS, where the data are analyzed to pinpoint trends. We plan to increase participation in ASIAS by commercial carriers and also include domestic corporate general aviation, military and helicopter operations.

In addition to implementing safety-enhancing technologies, ensuring safety is fundamental to all of the improvements planned in NextGen. Each of our initiatives is developed and analyzed to ensure that operational capabilities are inherently safe and that NextGen technologies and operations won't be contributing causes to accidents. The FAA's SMS employs safety risk management, safety assurance, safety policy and safety promotion, which including our data-sharing efforts are essential components of NextGen's success and its ability to properly manage risk.

Because it operates under an SMS, the FAA identifies, assesses and manages the risks involved in changing the way we manage traffic in the NAS. Capabilities include installing, modifying and removing equipment, modifying and implementing procedures and airspace changes, and conducting demonstrations. As NextGen technologies are

Collaboration Drives NextGen Progress

The FAA's ongoing effort to make sure NextGen is a collaborative endeavor with all of our stakeholders is helping us provide early benefits with existing equipment as well as new capabilities with evolving technology.

We have spent the past year implementing the action plans that resulted from our work with the 2009 RTCA NextGen Mid-Term Implementation Task Force, a consortium of more than 300 members from the aviation community. Those action plans are fully integrated into the FAA's NextGen work. We adjusted our budgets to accomplish work proposed in our response, which was published in January 2010. Appendix B of this document, as it did last year, includes activities in support of the task force's operational recommendations.

We have made tremendous advances in a short time in implementing key recommendations on a wide range of topics that include metroplex and Relative Position Indicator (RPI) demonstrations, progress cited elsewhere in this document.

In our continuing approach to track progress, and as part of our NextGen portfolio management process, we have developed and used a tracking mechanism that allows us to assess our progress against the task force recommendations.

We have followed the same process to determine the business case for each of the new capabilities recommended by the task force. Once we determine a business case exists for a recommended capability, we evaluate each proposed location on a case-by-case basis. We will give priority to task force-recommended locations when determining a deployment rollout.

The FAA will continue to collaborate with the aviation community while maintaining our responsibility to ensure that any work we undertake is fully vetted and tested, meets all safety requirements, and is fiscally responsible. We have established the NextGen Advisory Committee, a broad-based, senior-level advisory panel to which we turn for expertise and guidance. One of the first actions we requested of this new committee is to form a working group to develop recommendations on outcome-based performance metrics and goals for NextGen.

introduced in the NAS, teams of safety experts throughout the FAA ensure that potential risks due to system changes are identified and adequately mitigated.

ENVIRONMENTAL STEWARDSHIP

As we develop NextGen capabilities, the FAA is addressing aviation's environmental impact up front and early.

Under the auspices of the International Civil Aviation Organization's (ICAO) Committee on Aviation Environmental Protection, the FAA continued to pursue several measures to decrease aviation's environmental footprint, including supporting development of an international standard for aircraft carbon dioxide emissions levels. The committee is working toward a 2013 completion date for the standard.

Through pilot studies and other stakeholder outreach, we worked to refine the NextGen Environmental Management System (EMS) framework. EMS allows the FAA to identify the environmental aspects and impacts of its operations, assess current performance, and formulate targets and plans to achieve improvements. We use this strategic approach to integrate NextGen environmental and energy objectives into the planning, decision making and operation of the NAS. The EMS framework is being coordinated among the various FAA lines of business, and with other government agencies and aviation community stakeholders.

The FAA has begun designing integrated airspace and new procedures to deconflict arrivals and departures in metroplexes, improvements recommended by the RTCA NextGen Mid-Term Implementation Task Force.

A new tool, the Aviation Environmental Design Tool (AEDT), established regional modeling capabilities that will enable us to quantify the interdependencies of aircraft fuel burn, noise and emissions in the review of airspace redesign projects. We also began using AEDT to analyze the environmental consequences of future NextGen scenarios in support of the Joint Planning and Development Office's (JPDO) NextGen vision and NASA's research into advanced vehicle concepts.

We started a new process using a noise screening software tool to help mitigate the noise impacts of new PBN procedures. Noise screening saves us time and effort in complying with environmental regulations and standards.

We made great strides in a number of partnership initiatives that focus on environmental and energy sustainability, including the Continuous Lower Energy, Emissions and Noise (CLEEN) industry/government consortium. CLEEN is a five-year effort to accelerate commercialization of green technology to help achieve NextGen environmental and energy goals. CLEEN seeks to reduce fuel burn by 33 percent, to reduce nitrogen oxide emissions by 60 percent and to reduce aircraft noise levels by a cumulative 32 decibels. In fiscal year 2010, we awarded cost-share contracts to five companies to demonstrate technologies that will reduce subsonic commercial jet aircraft fuel consumption, emissions and noise. Technologies include sustainable alternative aviation fuels, lighter and more efficient gas turbine engine components, noise-reducing engine nozzles, adaptable wing trailing edges, optimized flight trajectories using onboard flight management systems and open rotor and geared turbofan engines. CLEEN will accelerate development of this technology for potential introduction into aircraft and engines beginning in 2015.

We also are working to enable use of sustainable alternative aviation fuels in concert with the Partnership for Aviation Noise and Emissions Reduction, the Commercial Aviation Alternative Fuels Initiative (CAAFI) and the Transportation Research Board's Airport Cooperative Research Program. We are leveraging overall federal efforts by partnering with the Environmental Protection Agency, NASA and the U.S. departments of Defense, Energy and Agriculture to meet research and development goals and achieve consensus on environmental and fuel standards and deployment.

In fiscal year 2010, we completed research with our CAAFI partners to support the establishment of a standard for biofuel (hydrotreated renewable jet, HRJ). Qualification and certification testing is on track for approval of HRJ use in commercial aircraft in early 2011.

We have launched the Aviation Climate Change Research Initiative to better characterize aviation contributions to climate change and qualify relative importance and tradeoffs among non-carbon-dioxide aircraft emissions to determine options.

IMPROVING APPROVAL PROCESSES

In response to recommendations from the RTCA task force, the FAA focused on a number of initiatives to ensure consistent and efficient evaluations and approvals of NextGen technologies and operations. With industry, the total time from submission of an initial application for RNP Special Aircraft and Aircrew Authorization Required (SAAAR) approaches dropped to a typical time of 45 days, down from 18 months. This dramatic improvement is due to increased maturity of the applications themselves, as well as FAA improvements in standardizing and coordinating the applications. The FAA instituted procedures to keep operators informed of the status of their RNP applications, implemented a national tracking and data repository system for applications, and authorized two new RNP SAAAR consultancies with recognized expertise in helping operators comply with the criteria.

The FAA has prioritized its resources on NextGen aircraft projects ahead of other non-safety aircraft changes. New coordination mechanisms will enable a more rapid transfer of responsibility from headquarters to field offices and early involvement from aviation safety representatives to avoid later delays.

Due to the criticality of enhancing PBN delivery, the FAA completed a cross-agency navigation procedures project that was co-chaired by the FAA's Office of Aviation Safety and the Air Traffic Organization. The project reviewed all policies and processes used to request, prioritize, process, approve and implement operational air traffic navigation procedures. Resources are being identified to implement recommendations from the final report. Steps have already been taken to enhance the exchange of data, improve database management and advance the environmental compliance process.

Finally, the FAA continues to publish the plan for future NextGen standards (see Appendix A). This schedule provides transparency for manufacturers who are developing the equipment and operators who are interested in scheduling aircraft modifications to bundle the technologies and reduce the overall cost of implementation.

VALIDATING CONCEPTS

Once a concept is developed, we use simulations and demonstrations to pursue it further. The NextGen Integration and Evaluation Capability (NIEC) made its debut in June 2010 as an FAA research platform to explore, integrate and evaluate NextGen concepts through simulation activities. Located at the FAA's William J. Hughes Technical Center, the NIEC houses interconnected labs that represent every facet of the NAS, including UAS operations. Attention to human-automation interface issues during NextGen development is critical to good design and the orderly introduction of NextGen systems and procedures. Research into human factors, and Human-in-the-Loop testing and demonstrations, are essential tools to validate

Easing Congestion in Metroplex Airspace

The FAA is taking a major step to loosen key bottlenecks in metroplexes, the busy metropolitan areas where multiple airports and competing airspace lead to less-than-efficient operations.

We have begun designing integrated airspace and new procedures to deconflict arrivals and departures in an initiative that will reach 21 such areas by 2016. The 2009 RTCA NextGen Mid-Term Implementation Task Force recommended the concept, and the FAA included it in the 2010 response to the task force. We aim to deliver NextGen benefits to each area within three years of launching a study of potential improvements.

The improvements use existing aircraft equipment to enhance vertical profiles for descents and climbs, eliminating or reducing the need for airplanes to level off. They decouple traffic better between airports used mainly by commercial airlines and airports frequented by general aviation aircraft, provide more diverging departure paths that will get aircraft off the ground and heading toward their destination faster, and add more-direct high-altitude Area Navigation (RNAV) routes between two or more metroplexes.

The metroplex project takes a systems approach to Performance Based Navigation (PBN) initiatives and the design of airspace, providing a geographic focus to problem solving. A primary objective is to harness the full power of PBN to compound the benefits of individual routes by tackling entire areas or regions in an integrated manner. This approach will unlock new efficiencies in these areas where several busy airports operate in close proximity, often with smaller general aviation and military airports in the vicinity.

In 2010, we developed an integrated National Airspace and Procedures Plan to implement more-efficient operations in metroplex areas. Study teams with representatives of the FAA, the National Air Traffic Controllers Association and the aviation community will provide an expeditious but comprehensive, front-end strategic look at each metroplex.

They will analyze operational challenges, assess current and planned airspace and procedures efforts, and explore new opportunities for solutions that are tailored individually to each metroplex. Once a study team has come up with the right changes for its metroplex, a design and implementation team will develop the changes and put them in place.

We launched this process in September 2010 by creating prototype study teams for our first two metroplex projects, in the Washington, D.C., and north Texas areas. Working with local facilities and stakeholders, the teams made recommendations in December that include converting conventional procedures to PBN, removing level-offs on

NextGen concepts. NIEC's UAS integration simulations and demonstrations were conducted in collaboration with industry, government and academic partners.

In fiscal year 2010, the National Air Traffic Controllers Association (NATCA) engaged the operational workforce in participating in a number of research and demonstration activities to validate NextGen concepts in real-world scenarios. Twelve NATCA controllers participated in a recent demonstration at a Dallas/Fort Worth International Airport (DFW) tower to show how a new surveillance display called the Tower Flight Data Manager (TFDM) system would present surveillance, flight data, weather, airport configuration and other information critical to controller situational awareness in a consolidated manner on just two displays instead of up to a dozen different displays. The new surveillance display used Airport Surface Detection Equipment-Model X data to show all aircraft operating on the surface at DFW and on short final approach or departure. Data flowed between the TFDM surveillance display and the one carrying electronic flight data, which is intended to replace the paper strips used by most U.S. towers today.

The FAA, Airservices Australia and Airways New Zealand established the Asia and Pacific Initiative to Reduce Emissions (ASPIRE) in 2008 to reduce the impact of aviation on the environment in those regions through technological innovation and best-practice air traffic management. The effort includes demonstrations and implementation of key NextGen technologies and practices, including reduced separation, more efficient flight profiles and Initial Tailored Arrivals.

Through the Atlantic Interoperability Initiative to Reduce Emissions (AIRE), a joint project involving the FAA, the European Commission, and U.S. and European airlines, we conducted flight trials demonstrating how NextGen technology and procedures increase fuel efficiency and reduce emissions and noise. Those procedures included continuous climb and descent profiles, optimized oceanic routing and Initial Tailored Arrivals. Similarly, we completed two demonstration flights with our partners from Japan and Singapore, who joined ASPIRE in 2009 and 2010, respectively.

arrivals, segregating arrival routes to deconflict flows, expediting departures and realigning airspace to support those changes.

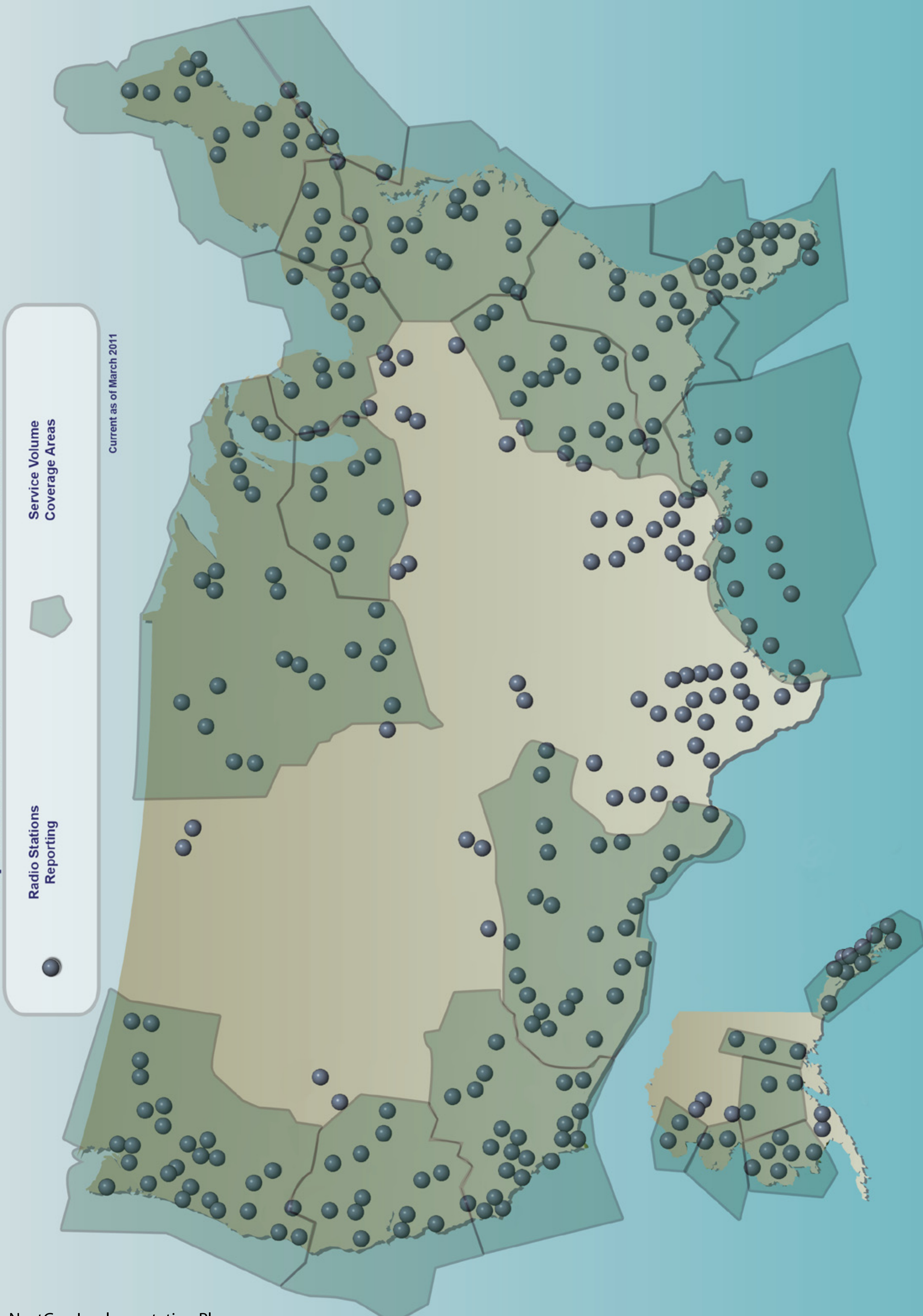
Following review and approval of these recommendations, design and implementation teams take over at each location. We expect to see operational change as early as March 2013.

In parallel with the prototype study team effort, the FAA continued to work collaboratively with industry through the NextGen Advisory Committee to develop a transparent, repeatable prioritization process to determine the study order for the remaining metroplexes. Using the prioritization criteria, we have selected the next five sites for deployment of study teams. These sites are Atlanta, Houston, Southern California, Northern California and Charlotte, N.C.

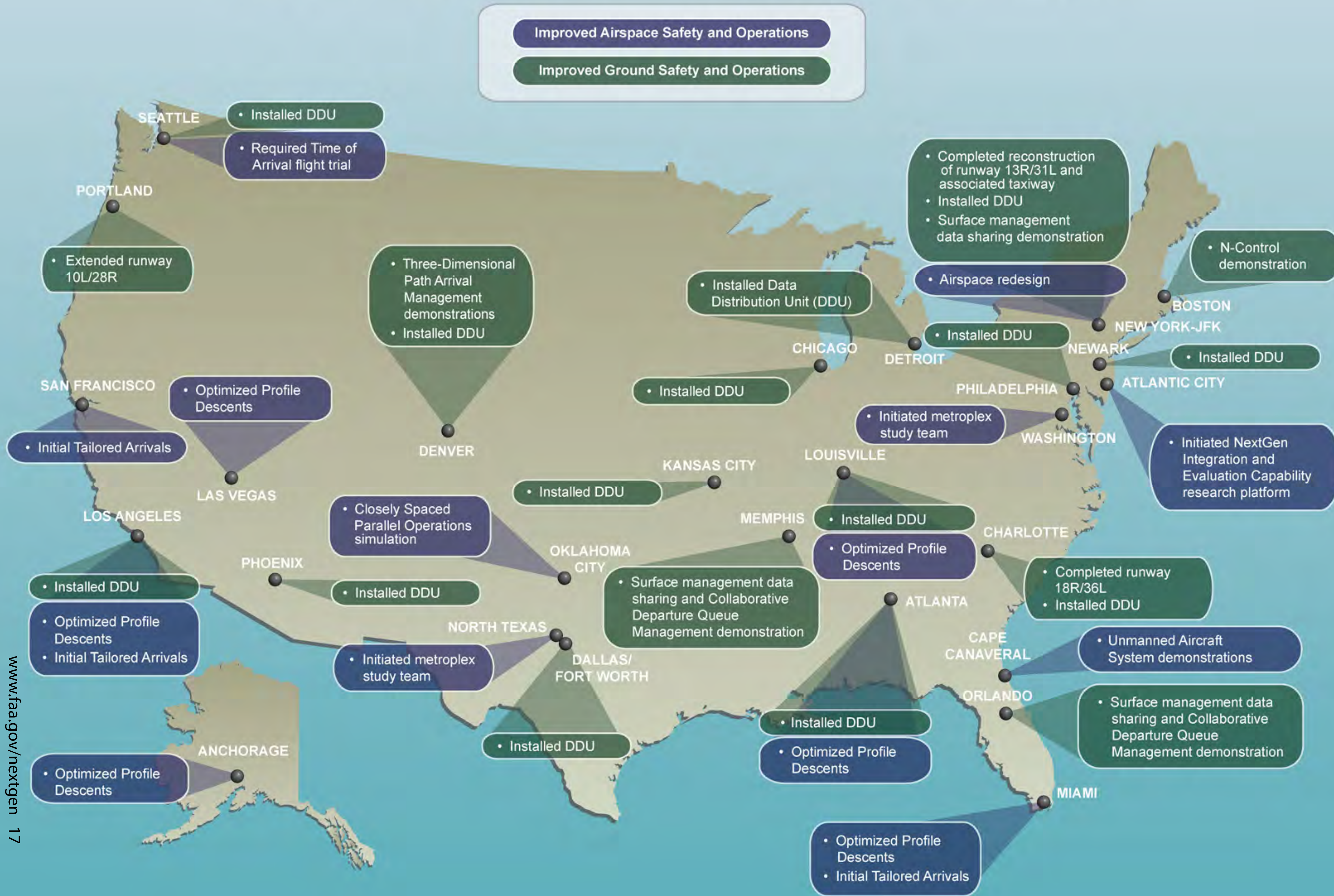
We are deploying study teams to all five sites this fiscal year. We expect to complete study team activities at all remaining metroplexes by 2013 and finish all implementation work by 2016.

This effort will help us improve today's busy metropolitan airspace by reducing route conflicts between airports, adding routes and avoiding reroutes, eliminating altitude restrictions and reducing restrictions due to special use airspace.

Expanded Satellite-Based Surveillance



Improved Airport Surface Operations and Airspace Access in 2010



Collaboration with several other government agencies including NASA and the departments of Defense and Homeland Security has helped us explore NextGen concepts. With NASA, we simulated implementing high-altitude airspace boundary changes in support of the NextGen Flexible Airspace concept of operations and conducted human factors testing of high-altitude RNAV operations. We also signed an interagency agreement with NASA to develop UAS modeling and simulation capabilities.

OPERATIONAL WORKFORCE

The FAA launched a new effort to train the operational workforce on NextGen capabilities as they are implemented. The technical controller training office is working with NextGen program offices and with the human factors group to ensure that controllers and technicians get the right training at the right time. Training for aviation inspectors, engineers and flight test pilots is also being developed to ensure effective oversight of implementation. Early collaboration has ensured that the training development process will be streamlined to meet the NextGen implementation process.

In addition, a representative of NATCA was assigned to headquarters in fiscal year 2010 to enhance workforce engagement. This representative and additional labor representatives will provide operational expertise in the full cycle of development for NextGen concepts as well as guidance on optimal labor participation in NextGen initiatives.

STAKEHOLDER COLLABORATION

NextGen is a collaborative endeavor, and the FAA is working with aviation community partners to lay the groundwork for successfully meeting our mid-term commitments. The FAA initiated a community engagement strategy involving a new senior-level advisory panel, the NextGen Advisory Committee, representing the broader aviation community on issues involving air traffic, safety, airports, the environment and international harmonization.

In June 2010, the FAA chartered an Aviation Rulemaking Committee to provide a forum for the aviation community to define a strategy for incorporating ADS-B In technologies into the NAS.

Through the JPDO, we are working closely with our interagency partners, NASA and the U.S. departments of Commerce, Defense and Homeland Security, to develop and deliver NextGen capabilities.

GIVING THE WORLD NEW WAYS TO FLY

The FAA continued to partner with its international counterparts to ensure that NextGen concepts, systems and procedures match those under development elsewhere. The goal is to provide safe, seamless, efficient and environmentally responsible operations worldwide.

The FAA continues to work with ICAO, industry standard-making bodies and international civil aviation authorities to harmonize standards for NextGen technologies and procedures.

The United States and the European Union also agreed to improve interoperability of NextGen and its European equivalent, the Single European Sky Air Traffic Management Research (SESAR), by cooperating on civil aviation research and development through a new memorandum of cooperation and associated annex for global interoperability. Future cooperation annexes may include aviation research and alternative fuels.

The capabilities and technologies that the FAA developed and implemented in 2010 represent significant milestones in the ongoing transformation of the NAS through NextGen. They pave the way for further progress in the coming year and in the mid-term. Our focus will continue to be on mitigating risk to provide the safest possible air traffic management system while working closely with our aviation community partners and international counterparts to fully realize the benefits of NextGen. ■

NextGen Benefits

Demonstrating Operational Savings and Improvements Today

The FAA has greatly expanded its work on demonstrations, trials and initial deployment of NextGen systems and procedures during the past year. National Airspace System (NAS) operators and users – particularly participants in the demonstrations and trials – are benefiting from them. But there is a chicken-and-egg nature to the economic and policy decisions that will have the most influence over the extent and timing of future benefits.

On the one hand, achieving NextGen's benefits depends heavily on aircraft operators and other stakeholders investing in the avionics, ground equipment, staffing, training and procedures they will need to exploit the infrastructure that the FAA puts in place to transform the aviation system in the coming decade and beyond.

On the other hand, the willingness of operators and other stakeholders to make these investments depends critically on the business case for them – analyses of how valuable these benefits will be, and a clear demonstration that the analyses will turn out to be valid.

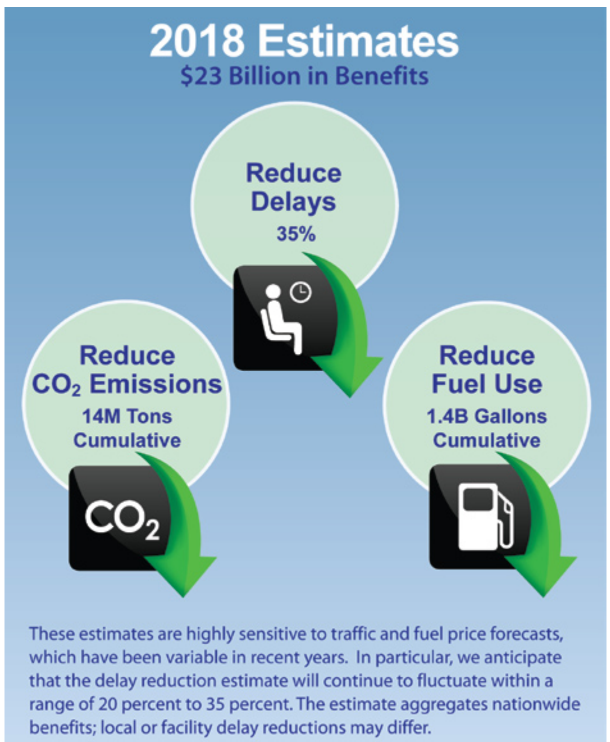
When costs are clear but benefits are even a little bit cloudy, there is an information gap that the FAA must help fill. We try to do this in two ways. First, we conduct broad, system-level analyses, estimating how integrated NextGen benefits will develop and grow over a period of years. This work draws on modeling and simulations of how NAS operations will change and what effects the changes will have.

Second, we conduct a wide range of demonstrations and operational trials of specific NextGen systems and procedures. These demonstrations, conducted in real-world settings by operations and development personnel using prototype equipment, serve many purposes. They mitigate program risks and show us whether we are on the right track in our technical approaches. They provide valuable insight into how equipment should be designed for operability, maintainability and a sound human-automation interface. And they are instrumental in advancing our understanding of the benefits to be gained from the capabilities being demonstrated.

Each demonstration is specific to a time, place and set of operating conditions. The demonstrations enable us to tally benefits in ways that consumers and the aviation community understand and value – increasing efficiency, saving time and money, and reducing fuel consumption, greenhouse gas emissions and noise.

This information from the demonstrations helps us refine our models of NAS operations and how these operations will change, and thus our overall estimates of NextGen benefits. Further, it provides direct measurements of the ways specific NextGen capabilities can benefit NAS stakeholders and the public, enabling stakeholders to improve their own estimates of the benefits and costs of buying equipment for NextGen, and to be more confident of their analyses.

Our latest estimates show that by 2018, NextGen air traffic management (ATM) improvements will reduce total delays, in flight and on the ground, about 35 percent compared with what would happen if we did nothing. The delay reduction will provide $23 billion in cumulative benefits from 2010 through 2018 to aircraft operators, the traveling public and the FAA. We will save about 1.4 billion gallons of aviation fuel during this period, cutting carbon dioxide emissions by 14 million tons.



These estimates are highly sensitive to traffic and fuel price forecasts, which have been variable in recent years. In particular, we anticipate that the delay reduction estimate will continue to fluctuate within a range of 20 percent to 35 percent. The estimate aggregates nationwide benefits; local or facility delay reductions may differ.

These estimates assume that flight operations will increase as projected in the FAA's Aerospace Forecast for Fiscal Years 2010-2030. The forecast depends in turn on economic growth projections that may affect the demand for air transportation and the price of fuel. Another assumption is that operators will equip their aircraft gradually during the decade to take advantage of NextGen capabilities.

We believe these benefit estimates are somewhat understated, and we continue to refine them. These benefit models include major NextGen air traffic management improvements, major airport infrastructure projects and the carbon dioxide emission reductions that result from our advanced systems and procedures. These models do not yet include other environmental effects, emissions benefits from sustainable alternative fuels, the fuel-efficiency benefits of airframe and engine improvements, security benefits and infrastructure projects at smaller airports. 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.

Aviation safety, the environment and airport operations throughout the NAS will benefit greatly from NextGen capabilities. At the same time, the FAA's safety, environment and airports organizations, with industry and other government partners, are contributing greatly to making NextGen a reality.

SAFETY

Many NextGen operational capabilities will make the NAS safer. For example, broadcast services will improve the ability of appropriately equipped aircraft to display directly to the flight deck information about nearby traffic, weather and flight-restricted areas. Automatic Dependent Surveillance-Broadcast (ADS-B) improvements in situational awareness – on the ground and in cockpits – will increase controllers' and pilots' individual and combined ability to avoid potential danger and provide valuable time savings in search and rescue efforts.

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 Safety Management System (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. Leveraging Airport Surface Detection Equipment-Model X (ASDE-X) surface radar coverage with ADS-B surveillance of aircraft and ground vehicles will increase situational awareness, particularly when linked with runway status lights. Collaborative decision making will increase everyone's understanding of what others are doing.

Starting with pre-takeoff advisories, departure instructions and reroutes for pilots, we will use data messages increasingly instead of most voice communications between pilots and controllers, reducing opportunities for error or misunderstanding. Voice channels will be preserved for the most critical information exchange.

ENVIRONMENT

As with safety, our work to enhance aviation's influence on the environment also benefits – and is a beneficiary of – NextGen. The operational improvements that reduce noise, carbon dioxide and other greenhouse-gas emissions from aircraft are the tip of the FAA's environmental iceberg. Equally important are the other four-fifths of the agency's environmental approach – aircraft and engine technology advances, sustainable fuels, policy initiatives and advances in science and modeling.

Environmental benefits of operational improvements are simple and direct. When we improve efficiency in the NAS, most of the time we save time and fuel. Burning less fuel produces less carbon dioxide and other harmful emissions. And some of our NextGen improvements, notably landing approaches in which aircraft spend less time maintaining level flight and thus can operate with engines at idle, reduce ground noise too. But operational benefits go only so far; their net system-wide effect can be offset by growth of the aviation system.

To accommodate system growth, we are looking to develop aircraft, engine and fuel technology. In 2009, we established the Continuous Lower Energy, Emissions and Noise program to bring promising new airframe and engine technologies to maturity, ready to be applied to commercial designs, within five to eight years. Similarly, we are part of a government-industry initiative, the Commercial Aviation Alternative Fuels Initiative, to develop sustainable low-emission alternative fuels and bring them to market.

We have developed and are using the NextGen Environmental Management System (EMS) to integrate environmental protection objectives into NextGen planning and operations. The EMS provides a structured approach for managing our responsibilities to improve environmental performance and stewardship. We also are analyzing the effect on aviation of environmental policy and standards and of market-based measures, including cap-and-trade proposals.

AIRPORTS

Many airports will benefit from substantial improvements in efficiency, access, surveillance, environment and safety. Surveillance, situational awareness and safety will improve at airports with air traffic control (ATC) radar services as we deploy ADS-B ground stations across the NAS and update our automation systems, and as operators equip their aircraft for it. The FAA also plans to publish Wide Area Augmentation System (WAAS) Localizer Performance with Vertical Guidance (LPV) approach procedures for all suitable runway ends by 2016.

Additional Performance Based Navigation capabilities in busy metroplex areas will provide efficiency and reliability improvements during inclement weather, and will relieve or eliminate conflicts among routes into or out of airports that are close to one another. At the busiest airports, air traffic controllers, operators and airport personnel will share surface situational awareness information to reduce taxi times collaboratively. And NextGen will make the entire system more flexible, enabling it to respond to changing demands on flight operations, including the continued evolution of space transportation operations, and of unmanned aircraft systems operating in the NAS.

FLIGHT OPERATIONS

All aircraft operators in the NAS will benefit from two major categories of improvements – efficiency and capacity, and access. Much of the time, efficiency and capacity go together. When we reduce the distance needed for the safe separation of aircraft, reduce delays from weather and other disruptions, and increase flight-path and procedures options for controllers as they maintain the flow of traffic, we improve capacity as well. Surface initiatives like the ones we describe below make important contributions across the board – they improve situational awareness and safety, they reduce fuel consumption and carbon dioxide emissions and they reduce tarmac delays. And by improving the efficiency of surface operations, they increase capacity.

Access issues center on runways at major airports, affecting mainly airlines, and airports and airspace that lack radar coverage, a problem for general aviation. NextGen will improve efficiency in operations that involve closely spaced parallel runways and converging and intersecting runways. Area Navigation (RNAV) and Required Navigation Performance (RNP) will improve efficiency and capacity in departures and approaches. For general aviation, ADS-B will enable controllers to track properly equipped aircraft in non-radar areas covered by ADS-B ground stations. General aviation operators equipped for ADS-B In will receive traffic and weather information directly in the cockpit, providing them with greater situational awareness. LPV approach procedures will give properly equipped aircraft Instrument Landing System (ILS)-like capability at non-ILS airports.

In the 2010 update of the NextGen Implementation Plan, we surveyed a wide variety of demonstration programs and operational trials that illustrated benefits to the NAS and its stakeholders. For this year's Plan, we will highlight surface collaboration and initial tailored arrivals, demonstration programs that advanced significantly during 2010.

SURFACE COLLABORATION

Getting aircraft into and out of our nation's airports safely and efficiently is essential for smooth operations, and it begins on the ground. Improving operations on runways, taxiways and ramps is an important part of NextGen.

We have a number of efforts under way showing how better situational awareness and pacing on the ground will give operators and the traveling public more reliability and save them time, while also managing environmental impacts. We can cut fuel consumption and emissions by reducing the time and number of aircraft idling on taxiways waiting for takeoff, or for open gate slots upon arrival. Also, we can reduce equipment wear – stop-and-go accelerations are hard on engines and other parts, and they also emit significant additional amounts of carbon dioxide into the atmosphere.

A major success of the year was the minimal disruption that occurred during a four-month runway resurfacing and widening project in one of the nation's busiest airspaces. The longest runway at New York John F. Kennedy International Airport (JFK) – 31L/13R, also known as the Bay Runway – had to be expanded to accomodate new, larger aircraft. The project also included taxiway improvements and construction of holding pads for parking delayed aircraft and enabling other aircraft to move ahead for takeoff.

To minimize disruption during construction, JFK's operators turned to a collaborative effort using departure queue metering, in which each departing aircraft from JFK's many airlines was allocated a precise departure slot and waited for it at the gate rather than congesting taxiways. The procedure limited delays so well, it was extended after the work on runway 31L/13R was completed. Preliminary estimates indicate that using this system could save 5 million gallons of fuel and 7,000 hours of taxi time a year. The runway improvements are estimated to reduce flight delays by 10,500 hours a year.

The JFK experience contributed to concepts of departure queue management. It drew on experience in an FAA demonstration of Collaborative Departure Queue Management (CDQM) in 2009 at Memphis International Airport in Tennessee, where we worked with FedEx. CDQM shares real-time data about the location of all aircraft and other vehicles on the airport surface among controllers, pilots, airline operations centers, airport operators and the FAA's Air Traffic Control System Command Center. We took the success of the JFK system as a demonstration that CDQM will work in operations involving multiple airlines.

Another step toward CDQM is N-Control, a NextGen-funded initiative to reduce fuel burn, carbon dioxide emissions and taxi-out times by holding aircraft at the gate, as at JFK. While metering operations at JFK dealt with a specific problem, N-Control is meant for business-as-usual situations, too. The N in N-control refers to the maximum number of aircraft authorized to push back and enter an airport's active movement area during a set time period. The goal is to feed the runway constantly, without getting into stop-and-go movement of aircraft. Preliminary findings from a one-month demonstration at Boston Logan International Airport, conducted August-September 2010, indicate reductions of nearly 18 hours of taxi-out time, 5,100 gallons of fuel and 50 tons in carbon dioxide emissions.

N-Control is meant to be a relatively simple, low-cost program for airports that may not require the highest CDQM capability, which entails more significant hardware/software investments and depends on surface decision support systems and user data-sharing interfaces. We are demonstrating such an advanced system at Memphis, where operators can manage their own takeoff slot allocations through automated metering. The demonstration reduced fuel consumption and carbon emissions during periods of heavy departure demand. Surface management demonstrations are continuing at Memphis, where we worked with Delta Air Lines as well as FedEx during 2010, and Orlando, Fla.

At JFK and Memphis, sharing surface surveillance data with airlines has reduced taxi times by more than one minute per departure on average. Surface metering techniques being demonstrated at these facilities appear to shift an additional minute from the taxiways to the gates, conserving additional fuel. These results suggest that the combined annual savings from increased data sharing and metering could be about 7,000 hours of taxi time at JFK and 5,000 hours at Memphis.

For CDQM, the next step beyond Memphis was Orlando, where we conducted field evaluations in 2010. The environments of the two airports differ greatly, enabling us to concentrate on different CDQM capabilities. At Memphis, FedEx conducts a massive hub operation overnight, when it is the only carrier operating there. During the day, Delta is the hub airline, with two high-density departure pushes. Delta and its regional affiliates account for nearly 85 percent of passenger-carrier departures at Memphis. By contrast, none of the airlines conduct hub operations at Orlando, and it takes the combined departures of Orlando's eight biggest airlines – of a total of 39 airlines that serve the airport – to account for as great a percentage of departures as Delta's at Memphis.

In these differing environments, we have pursued different objectives. Memphis is a test for systems to reduce departure queues in periods of high demand that involve essentially a single airline. Delta's and FedEx's ramp towers handle their own flights. The Memphis tower handles access for the other airlines at the airport.

At Orlando, the main focus of CDQM has been on automated identification of departure queue management issues involving traffic management initiatives – including flights with new estimated departure control times, flights affected by departure miles-in-trail restrictions and flights needing or already assigned approval requests – as well as extended departure delays related to weather and other disruptions, and surface data integrity.

All the surface data-sharing capabilities we are implementing support the development of the Tower Flight Data Manager (TFDM) system. TFDM will integrate a number of air traffic control tower systems and a suite of decision support tools, like CDQM, into a common information management platform and distribute the information on a common display platform. The various capabilities will be made available like applications on a smartphone, adding up to support for trajectory-based operations on the surface.

Our goal is not only a collaborative surface traffic management system that maximizes efficiency in surface traffic flow. We also seek increased situational awareness for controllers and pilots to improve safety.

Surface safety will be enhanced when we leverage modern ground-surveillance tools such as ASDE-X in combination with NextGen capabilities. In particular, the surveillance and situational awareness capabilities offered by ADS-B will enable pilots and controllers to see properly equipped ground vehicles as well as aircraft, even when weather reduces visibility. Using ASDE-X's detailed coverage of movement on runways and taxiways, controllers can detect potential runway incursions. We have installed ASDE-X at 32 commissioned airports, and we expect to add three more airports this year.

Better situational awareness and pacing on the ground will give operators and the traveling public more reliability and save them time, while also managing environmental impacts.

To further leverage ASDE-X surface-movement information, we have installed Data Distribution Units (DDUs) at many ASDE-X locations. DDU data are shared through a nationwide network that will give operators access to surface-movement information from a single System Wide Information Management interface. In 2010, we worked on policies for data rights and data release in support of surface data-sharing goals, and we expect to establish these policies in 2011.

The FAA has established standards for a comprehensive Geographic Information System (GIS) program for collecting and maintaining safety-critical and facility data for airports. Airport GIS is part of an FAA-wide initiative to strengthen data quality, improve industry efficiencies and reduce data collection and management costs. It is a single, robust, Web-based system for airport-related data.

Thirty-seven airports across the country are the first to collect and input data into Airport GIS. These data are laying the foundation for the creation of electronic Airport Layout Plans (eALPs). ALPs are scaled drawings of existing and proposed land and facilities needed to operate and develop the airport. They represent an understanding between the airport owner and the FAA on the development and operation of the airport. The eALP will be the basis for future collaborative decision making in airport development, and for ensuring safety through the implementation of safety management systems.

INITIAL TAILORED ARRIVALS

An Initial Tailored Arrival (ITA) is a pre-negotiated arrival path through airspace of multiple ATC facilities. The ITA limits vectoring and minimizes the time the aircraft spends maintaining level flight during its descent. The concept has matured during four years of demonstrations, and we will make the transition to normal operations this year.

The pilot initiates an ITA with a request to ATC while the aircraft still is in its cruise phase. If an ITA is available, the controller sends the pilot a clearance that includes a descent profile with speed and altitude restrictions, as applicable. The clearance is sent as data, which limits ITAs at present to aircraft equipped with the Future Air Navigation System (FANS) for communications over oceans. The pilot loads the clearance directly into the aircraft's flight management system, which controls the descent.

ITAs differ from other types of Optimized Profile Descents (OPDs) in that they are assigned by controllers to specific approaches and tailored to the characteristics of a limited number of FANS-equipped aircraft types – 747s, 777s, A330s, A340s and A380s. They begin at the top of the descent and, when completed, control the aircraft all the way down to the runway. By contrast, other types of OPDs, such as RNAV arrival procedures, are published for all users and must serve a wide variety of aircraft types.

Controllers monitor ITAs throughout the aircraft's descent. Traffic conflicts, unfavorable weather or other factors often cause them to discontinue an ITA while it is in progress, converting it to a conventional arrival. Data show that even partial ITAs are beneficial to operators and the environment. A key feature of an ITA is that the aircraft descends from its cruise altitude more continuously, with a minimal requirement to maintain level flight. If an aircraft needn't maintain level flight, its engines can be set at or near idle. This saves fuel and reduces emissions of carbon dioxide and other harmful gases.

We have conducted ITA flight demonstrations at San Francisco, Los Angeles and Miami, all in conjunction with our international green-aviation initiatives, the Asia and

Pacific Initiative to Reduce Emissions (ASPIRE) and the Atlantic Interoperability Initiative to Reduce Emissions (AIRE). Last fall, we completed a rough-order-of-magnitude life cycle business case estimate using data from 11,476 arrivals at San Francisco of 747-400 and 777-200 aircraft between December 2007 and September 2010.

We estimated that the 747s saved an average of 176 gallons of fuel per arrival in ITAs and 78 gallons per flight in partial ITAs, compared with conventional approaches. For 777s, the corresponding savings were 99 gallons in full ITAs and 43 gallons in partial ITAs.

To assess the business case, we estimated the costs of establishing ITAs and operating them through 2030 at 10 airports – the current three, plus Anchorage, Alaska; Honolulu; Orlando, Fla.; Portland, Ore.; San Juan, Puerto Rico; Seattle-Tacoma, Wash.; and Travis Air Force Base in California. Most Atlantic Coast airports are not near-term candidates now because the ITA clearance would have to be given in Canadian airspace.

We also estimated benefits over the 20-year period, based entirely on fuel savings. We did not try to put a value on the reduction in carbon dioxide emissions or noise.

We found very high benefit-to-cost ratios – 44:1, 33:1 and 22:1, depending on whether growth in Data Communications avionics equipage over 2010 levels is high, moderate or zero. In each case the payback year is 2012. The benefit-to-cost ratios are unusually high because the main driver of benefits is avionics – FANS and an advanced flight management system – and airlines already have incurred the cost of each. The remaining costs are very low relative to benefits.

When ITAs are fully operational, they still will be limited to aircraft with FANS. Also, ATC facilities still will need the Advanced Technologies and Oceanic Procedures system, which is the only automated platform that can send the ITA data messages. But all airlines with FANS-equipped aircraft, not just the airlines involved in the demonstration programs, will be able to use the procedure. And we will make it available at other international gateway airports. ■

NextGen PHASES OF FLIGHT Mid-Term

Federal Aviation Administration

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.

ENHANCED SURFACE TRAFFIC OPERATIONS

Pilots and controllers talk less by radio. **Data Communications** expedite clearances, reduce communication errors. Pilot and controller workloads reduced.

STREAMLINED DEPARTURE MANAGEMENT

RNAV and **RNP** precision allow multiple departure paths from each runway. Departure capacity increased.

EFFICIENT CRUISE

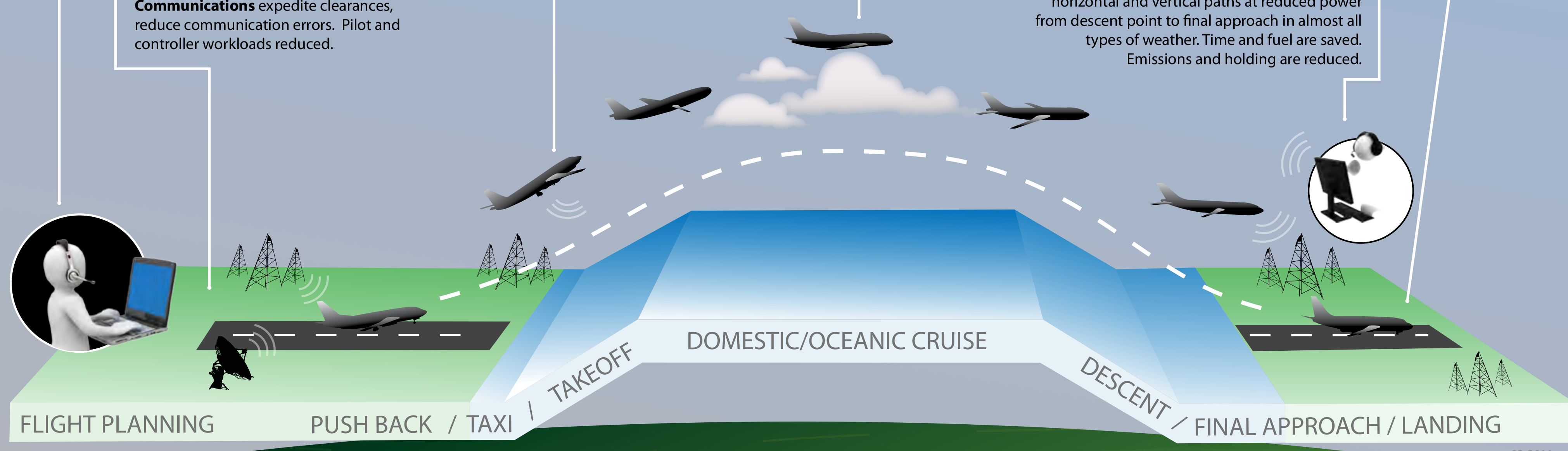
RNAV, **RNP** and **RVSM** utilize reduced separation requirements increasing airspace capacity. Aircraft fly most optimal path using trajectory-based operations considering wind, destination, weather and traffic. Re-routes determined with weather fused into decision-making tools are tailored to each 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.



NextGen Operating in the Mid-Term

This section describes how the FAA envisions airspace system operations in the mid-term 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 mid-term 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 which 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 information 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 supply needs by the end of the mid-term, and this contribution will continue to increase in future years, improving air quality and reducing net carbon dioxide emissions while striving to achieve carbonneutral growth by 2020, using 2005 as the baseline.

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.

FLIGHT PLANNING	Key Ground Infrastructure
	• Data Communications (Data Comm) • En Route Automation Modernization (ERAM) • Modernized Aeronautical Information Management (AIM) • NextGen Network Enabled Weather (NNEW) • NextGen Weather Processor (NWP) • System Wide Information Management (SWIM) • Tower Flight Data Manager (TFDM) • Traffic Flow Management System (TFMS)

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, security, 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 National Airspace System 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 still will be accommodated. The investments for operators and airports 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

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 scheduled times of use for special activity airspace 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 personnel will have common access to this real-time information, shared via a secure network. This information will provide each group with improved situational awareness for planning and for the ability to predict and resolve conflicts. Improvements in calculated schedule 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 air traffic management, 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

As the time for the flight approaches, the final flight path agreement will be delivered to the flight crew as a data message. Data communications will provide pre-departure 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 the use of taxiways and runways more efficiently; choosing the best

PUSH BACK, TAXI AND DEPARTURE

Key Ground Infrastructure

- Automatic Dependent Surveillance-Broadcast (ADS-B) ground stations
- Airport Surface Detection Equipment-Model X (ASDE-X)
- Data Comm
- Integrated Departure and Arrival Coordination System
- Modernized AIM
- NNEW
- NWP
- Satellite Based Augmentation System (SBAS)
- Standard Terminal Automation Replacement System (STARS) enhancements
- SWIM
- TFDM
- TFMS

Avionics

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

runway and taxi paths based on 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 and the ability to revise departure clearances using data communications 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.

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 it climbs to its cruising altitude. The aircraft will be able to merge into the overhead stream with a minimum of additional maneuvers.

CLIMB AND CRUISE

Key Ground Infrastructure

- ADS-B ground stations
- Advanced Technologies and Oceanic Procedures
- Data Comm
- ERAM
- NNEW
- NWP
- Time Based Flow Management (TBFM)
- 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
- RNAV and RNP

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 spoken miscommunication. When weather affects many flights, clearances for aircraft equipped for data communications will be delivered automatically to the controller and uplinked, 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 voice communications and reduce one source of error in communications.

In oceanic operations, air traffic management 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, reduce noise, 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 agree on 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 reduced safely. 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, which may include precise inter-arrival spacing by the aircraft, will allow for more efficient transitions from cruise to the approach phase of flight into high-density airports. Controllers will be able to use multiple precision paths that maintain flows to each runway, using RNAV and RNP arrivals. Precise arrivals will save fuel and reduce emissions.

Today, the structure of arrival and departure routes does

DESCENT AND APPROACH

Key Ground Infrastructure

- ADS-B ground stations
- ASDE-X
- Data Comm
- Ground Based Augmentation System (GBAS)
- NNEW
- NWP
- SBAS
- STARS enhancements
- TBFM
- TFDM
- TFMS

Avionics

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

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
- Data Comm
- Integrated Departure and Arrival Coordination System
- Modernized AIM
- NNEW
- STARS enhancements
- SWIM
- TBFM
- 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 the mid-term with more precise routing and separation of departing and arriving aircraft. Throughput rates will be similar during all weather conditions. Updated procedures for closely spaced parallel operations will allow simultaneous arrivals. Airports may be able to site new runways with greater flexibility and make better use of existing runways. Overall, airports will balance surface, gate and terminal capacity with the improved runway capacity afforded by NextGen. Planned airfield improvements that are expected to come online in the next several years include the following:

NEW RUNWAYS
- Chicago (ORD)
- Columbus (CMH)

RUNWAY EXTENSIONS
- Anchorage (ANC)
- Atlanta (ATL)
- Fort Lauderdale (FLL)
- San Antonio (SAT)

AIRFIELD RECONFIGURATION
- Chicago (ORD)
- Philadelphia (PHL)

NextGen Ahead Working Toward Tomorrow

The FAA is moving forward in a coordinated, integrated manner to deliver the capabilities necessary to enable the agency's vision for NextGen.

Several important milestones are right around the corner. This section highlights a few of the key NextGen advances the FAA will be working on over the next couple years. Appendix B provides an overview of the FAA's NextGen-related work activities between now and the mid-term.

Also in this section, we offer a look at the governance structure the FAA has put in place to manage such a massive undertaking as NextGen, and ensure the timely, cost-effective delivery of NextGen capabilities and benefits.

ADS-B IN

The FAA last year chartered an Aviation Rulemaking Committee (ARC) to provide a forum for the aviation community to define a strategy for incorporating Automatic Dependent Surveillance-Broadcast (ADS-B) In technologies into the National Airspace System (NAS). ADS-B In capability, combined with a cockpit display, provides greater situational awareness to both high- and low-altitude operators by providing highly accurate traffic. ADS-B In further offers low-altitude users essential flight data such as weather and Special Activity Airspace (SAA) information. The ARC is composed of about two dozen representatives from various aviation user groups, as well as segments of industry and government.

The ADS-B In ARC's initial recommendations are due to the FAA leadership in fall 2011. Those findings are expected to provide a clear definition on how the aviation community should proceed with ADS-B In, while ensuring compatibility with the ADS-B Out avionics standards detailed in the ADS-B Out final rule published in May 2010. Feedback provided by the aviation community in response to those recommendations will be incorporated into an ARC final report due by June 2012 that will detail suggested next steps.

The ARC's work will set the stage for future ADS-B In applications, such as spacing and merging aircraft using flight deck interval management. This capability provides more precise aircraft-to-aircraft position information to the flight deck, enabling flight crews to line up their aircraft more efficiently on final approach, saving fuel and maximizing runway capacity. The FAA is currently working with industry on the initial development of flight deck interval management capabilities.

DATA COMMUNICATIONS

Data Communications (Data Comm) will enable digital air traffic control (ATC) information to be exchanged between controllers and pilots, and auto-loaded directly into aircraft flight management systems. This capability will decrease the reliance on voice communication and significantly reduce opportunities for error. On the ground, Data Comm will streamline departure clearances for aircraft sitting at the gate, and provide the ability to transmit revisions to those clearances. In the air, Data Comm will provide for the digital transmission of airborne reroutes. On arrival and landing, Data Comm will enable taxiway and gate assignment information to be sent directly to the flight deck.

A final investment decision slated for 2012 will enable us to contract with a vendor to provide the VHF radio network that will carry Data Comm messages. We also are moving forward with the development of Controller Pilot Data Link Communications, the application that will facilitate the integration of Data Comm into ATC automation platforms and the aircraft flight deck.

Towers are expected to begin offering departure clearances with revisions to Future Air Navigation System (FANS) 1/A+ equipped aircraft by 2015. En route centers are expected to be able to start issuing airborne reroutes via Data Comm in 2018. This planning date has been adjusted out two years as we continue to weigh the complexity of integrating enhancements into the NAS as well as budget adjustments.

SYSTEM WIDE INFORMATION MANAGEMENT

System Wide Information Management (SWIM) is the network structure that will carry NextGen digital information. SWIM will enable cost-effective, real-time data exchange and sharing among users of the NAS.

In October 2010, the Corridor Integrated Weather System (CIWS) became the first ATC system to share information via the SWIM interface. SWIM compliance means the weather information provided by CIWS to en route center traffic management units can now be made available to external users, such as airline operations centers, to create a common situational awareness. SWIM achieved the same milestone with the Integrated Terminal Weather System in January 2011. By 2015, all seven ATC systems targeted for SWIM's initial implementation phase are expected to be SWIM compliant.

Throughout 2011, the SWIM program will continue the development work necessary to gather and share airport surface data via SWIM surface information in 2012. By 2013, the SWIM program expects to have standardized its core information delivery service, meaning that custom interfaces will no longer have to be built for programs seeking SWIM compliance.

SPECIAL ACTIVITY AIRSPACE

The FAA is working closely with the Department of Defense (DoD) to improve information sharing on the status of Special Activity Airspace (SAA). Today, the DoD reserves large sections of airspace for mission purposes. Determining when that airspace is safely available for civilian use can be difficult. Being able to take advantage of unused SAA offers the potential to reduce congestion, particularly at peak times.

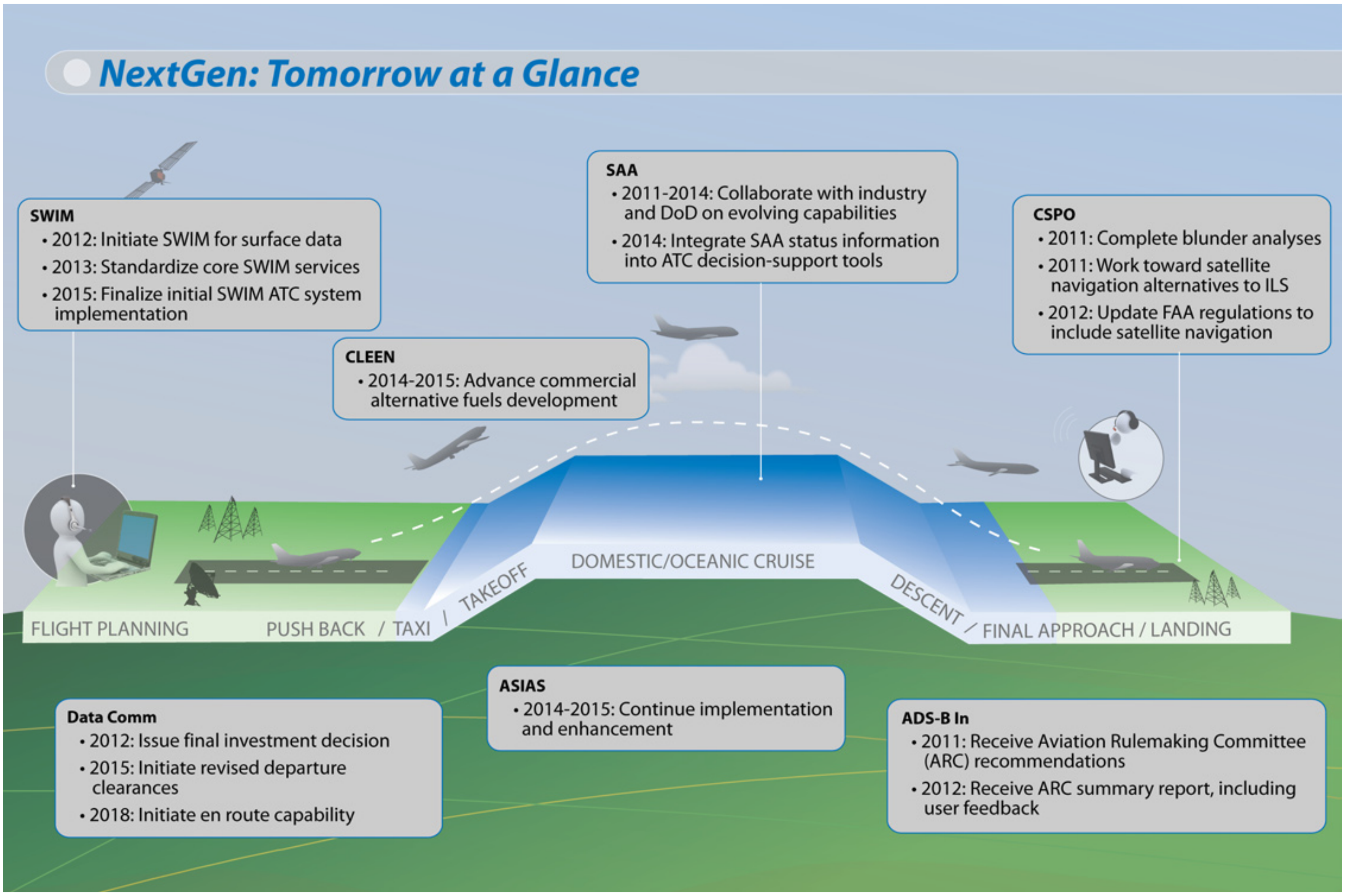
Between now and 2014, the FAA will continue working with the DoD and industry stakeholders to leverage evolving digital communication capabilities to increase awareness and predictability of SAA usage. Operators will be able to more reliably plan and use flight routes that cross inactive SAA without affecting DoD mission needs. By 2014, we plan to have SAA status information integrated into air traffic decision support tools.

CLOSELY SPACED PARALLEL OPERATIONS

Closely Spaced Parallel Operations (CSPO) – dual independent approaches to runways spaced fewer than 4,300 feet apart – hold the promise of getting more aircraft on the ground more quickly in adverse weather conditions.

The FAA is taking a phased, incremental approach to CSPO. Over the next several years, we will be working to use existing technology and procedures to improve the efficiency of closely spaced runways. As we move closer to the mid-term and beyond, we will work to leverage advanced technology and Performance Based Navigation.

In 2011, the FAA will complete the blunder analyses we began last year. A blunder occurs when an aircraft on an approach to a parallel runway intrudes into the established safety buffer between the two runways. New data about actual blunder rates, as well as the angle at which those blunders occur, could establish the safety case for operating simultaneous, independent approaches with closer runway spacing than is currently allowed.



Also this year, we will continue to conduct simulations and analyses in support of allowing the use of satellite-based procedures as an alternative to Instrument Landing System (ILS) approaches at airports that support such procedures. The option of satellite-based procedures would offer greater flexibility to both controllers and operators, and could potentially increase aircraft throughput under instrument conditions. Further, runways without ILS would not need to qualify for simultaneous or dependent approaches if satellite-based approaches were available. By 2012, we expect to be able to update FAA policies to approve simultaneous independent and dependent approaches to parallel runways for any combination of Area Navigation (with vertical navigation), Required Navigation Performance, Localizer Performance with Vertical Guidance, Ground Based Augmentation System Landing System and ILS.

The FAA is moving forward in a coordinated, integrated manner to deliver the capabilities necessary to enable the agency's mid-term vision for NextGen.

MAKING IT HAPPEN

These advances, and the milestones and commitments such as those documented in Appendix B, represent a complex set of interrelated undertakings. The management of such a massive endeavor calls for a highly effective management structure, and the FAA has provided one. The agency has taken a comprehensive, cross-agency portfolio approach to NextGen implementation that recognizes the implementation of NextGen as an integrated effort, rather than a series of independent programs. The NextGen portfolio includes six transformational programs (ADS-B, Data Comm, SWIM, NextGen Network Enabled Weather, NAS Voice System, and Collaborative Air Traffic Management Technologies), seven solution sets and – new this year – a suite of implementation portfolios.

The NextGen solution sets contain interdependent projects that work together to provide capabilities to targeted user groups and areas. The solution sets constitute the primary construct for NextGen pre-implementation budget development. Each solution set is administered by a qualified manager who coordinates all aspects of the projects that fall within his or her solution set, from concept to implementation readiness.

To provide even greater detail on our implementation activities of the NextGen mid-term, the FAA has introduced a series of implementation portfolios that are detailed in Appendix B.

Two teams of FAA executives, the NextGen Management Board and the NextGen Review Board, constitute a governance structure that works to ensure that the capabilities that grow out of the NextGen portfolio are delivered in a timely, coordinated and cost-effective manner.

The NextGen Management Board is chaired by the deputy administrator, the federal official with overall responsibility for NextGen. Composed of the heads of the FAA lines of business with primary responsibility for delivering NextGen, the Management Board provides executive oversight of NextGen progress and performance metrics, and makes strategic policy decisions that drive implementation forward. The Management Board is supported by the NextGen Review Board, which resolves cross-agency implementation issues and identifies and formulates positions on critical policy issues.

While we have crafted our governance structure to ensure our NextGen plans remain on track, we have also built in flexibility and adaptability commensurate with the challenges posed by the breadth and magnitude of the NextGen transformation, including varying maturity among interdependent systems and operator equipage rates. A deeper examination of these challenges can be found in the next chapter. As new information emerges, and alternative solutions arise from our various aviation community collaborations, our governance structure allows for course shifts as necessary to ensure the most timely, cost-efficient delivery of NextGen capabilities and benefits.

The NextGen progress made by the FAA, the goals the agency has set for itself, and the work plan we have committed to in pursuit of those goals are summarized in the document you are reading now, the NextGen Implementation Plan, which is updated annually. The Plan pulls together NextGen information from a number of other key FAA documents. The result is a high-level overview of all the FAA's NextGen planning and execution efforts in a plain-language document intended to inform a wide audience of NextGen stakeholders. ■

Integrating New Capabilities

NextGen capabilities aren't turned on all at once. Before the FAA can deliver each new capability, a myriad of activities has to be accomplished, some of which include:

- 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 the workload of FAA technicians, air traffic controllers and pilots;
- 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 the international community, including air navigation service 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, which is active around the clock.

Challenges

Tackling a Complex Suite of Initiatives

To accomplish an undertaking as large and complex as NextGen, the FAA must overcome many technical, programmatic and organizational challenges. Some are present from the start; others develop along the way. The key to success is to understand the many things NextGen depends on, anticipate the challenges and know what to do about them. We must manage complexity and uncertainty.

Taken together, FAA investments in NextGen will be unprecedented, but this is only the beginning. Even with unequivocal support for NextGen, budget constraints will continue to place pressure on FAA's funding levels. Our planning, as reflected in this plan, allows us to remain on track to deliver the FAA's core framework for NextGen implementation, particularly the capabilities requested by the aviation community. These core elements include improving surface operations, freeing up metroplex congestion and implementing ADS-B ground infrastructure, progress that focuses on delivering capabilities to operators and benefits to the public.

Just as we rely on funding for our own work as a Department of Transportation agency, we must synchronize our investments with those of other government agencies, airport authorities and the private-sector aviation community. If one of the major contributors falters in its commitment to NextGen, the effectiveness of the others' commitments could be at risk. In particular, achieving NextGen's promise requires that operators equip their aircraft to use the systems and procedures that NextGen delivers. For some capabilities, that means they also must invest in associated ground equipment, procedures development and personnel training.

The FAA is addressing this challenge in several ways. We are adhering to our schedules for deployment of NextGen infrastructure, showing operators that they can be confident that the capabilities for which they equip will be ready when their aircraft are ready. In support of the best-equipped, best-served concept, we are analyzing near-term opportunities that would provide meaningful operational incentives to operators that adopt NextGen avionics. We are exploring specific operational incentive candidates based on situation, location and operational capability. Also, in collaboration with the Department of Transportation and the White House, we continue to research potential mechanisms for financial incentives to reduce equipage costs.

Each of these measures is intended to improve the business case for investing in NextGen. Increasing benefits through operational incentives would increase the value of investing. Financial incentives might reduce the cost or address other business risks. Demonstrations can clarify NextGen capabilities, also reducing risk.

Capabilities, like investments, must be synchronized. Each NextGen system and procedure depends on previous or concurrent achievements, and each in turn helps establish a foundation for those that follow. It is an integrated, interdependent structure, available in this Plan and on the FAA's National Airspace System Enterprise Architecture Web site, https://nasea.faa.gov. But its interdependencies and complexities entail a risk – when so many capabilities depend on so many building blocks and so much coordination, a single problem could reverberate across the enterprise and require schedule changes or other adjustments. Proper recognition and management of uncertainty is a central feature of the overall approach to NextGen development and deployment.

The En Route Automation Modernization (ERAM) is a case in point. We have taken longer than originally planned with activation and operational testing of ERAM at the en route centers. We can't always predict that schedule shifts will occur, so we must respond swiftly and decisively when it does. The FAA is working to ensure we minimize the program risks as we move forward, and we are confident that our revised scheduled for ERAM will allow us to remain on track to deploy the core NextGen framework.

Bringing our technical concepts to maturity and integrating them into functioning systems and procedures are challenging tasks. We are prepared for the possibility that not everything we conceptualize will work as initially planned, and that some of these pieces might not work together easily. Only an incremental, adaptable implementation strategy can succeed over time.

We must also concern ourselves with implementation bandwidth, the organizational limits on our ability to introduce multiple new equipment and procedures into National Airspace System (NAS) operations simultaneously. We must consider how much equipment – ground and air, used by the FAA and operators – we can certify at once for safety and suitability. We must evaluate how many capability introductions we can accomplish in a given time, considering our capacity to train our operating and supporting personnel to use them. We also have to weigh the implementation bandwidth of all the other NAS stakeholders. Here, too, our incremental approach is vital.

NextGen's many interdependencies challenge us to manage NextGen as a portfolio of programs and initiatives, not as a collection of separate efforts. Central to this concept is the Enterprise Architecture, which integrates the plans and schedules of all NextGen acquisitions into a unified planning tool, and the NextGen solution sets, which are categories of interdependent operational changes across the NAS. As a technology matures, we apply it to NextGen programs that deliver advanced capabilities to the field.

Our approach to NextGen places many demands on the FAA workforce:

- We must integrate the disciplines and skills of the FAA's core communities – acquisition, operations, safety, environment, airports, international affairs, regulation and certification – into our overall planning and management of NextGen development and deployment. These disciplines all contribute to NextGen throughout our management system, starting with the NextGen Management Board. Working groups at all levels ensure that NextGen will reflect all our institutional points of view. We have launched an initiative to increase and improve the data we collect to measure and analyze the effectiveness of NextGen systems and procedures. Recognizing that our implementation plans call for multiple, sometimes simultaneous changes to the NAS, we have established teams of safety experts from each FAA line of business to identify and mitigate cross-cutting safety risks.

- We must recruit, train, engage and retain employees who have the capabilities we need, or acquire these capabilities by contracting with private companies. Late in 2008, the National Academy of Public Administration submitted recommendations on NextGen acquisition staffing needs that identified specific workforce skills that we should bolster. Since then, we have developed and implemented – and we continue to develop – staffing plans that follow the academy's advice. We are actively working on plans for training, development and human resources services throughout our workforce. For example, in 2010 our safety organization issued a plan to sustain its standards, certification and inspection workforce through retirements and attrition, and to accommodate increasing demands as NextGen proceeds. Also, during 2010, we issued a series of systems engineering contracts to industry that, taken together, comprise the largest support program of this type the FAA has ever undertaken.

- Attention to human-automation interface issues during development is critical to good design and the orderly introduction of NextGen systems and procedures into the NAS. Research into human factors, and Human-in-the-Loop testing and demonstrations, are essential tools to achieving this. Operators face corresponding challenges as they equip aircraft with cockpit systems their crews will have to operate, and the FAA will help them through standards and safety evaluations.

The FAA will continue to involve operating personnel earlier in the acquisition process, to obtain their insights into system requirements and to improve the ability of field personnel to operate and maintain the equipment once it is developed and deployed.

- We will adhere during NextGen deployment to our record of compliance with the National Environmental Policy Act (NEPA), but many of NextGen's operational improvements will require major environmental reviews. In addition, emerging issues such as climate and greenhouse gases raise new policy and analytical concerns. Some of our most valuable initiatives, such as precision-navigation departures and approaches, will have favorable impacts on greenhouse gases but mixed results regarding noise. We are working to increase our staff and develop analytical models to deal with these issues. Also, we are researching planned NextGen activities and the most efficient and effective approaches for completing environmental reviews required under NEPA.

- Our workforce must adapt our regulatory and administrative procedures to deliver NextGen initiatives incrementally, under a complex deployment schedule. We must work with industry and our global partners to develop timely standards, and continue to find ways to streamline the approval of new systems and procedures. Manufacturers of NextGen avionics and other products depend on us for the standards and certification processes they need to design and develop their equipment.

> **To achieve global aviation objectives and meet the needs of airspace users around the world, NextGen will have to be interoperable with corresponding systems throughout the international community.**

One of the most difficult challenges is inserting all the NextGen advances, from the simplest to the most complex, into an aviation system that continues to function 24 hours a day, 365 days a year. We cannot shut down the system while we upgrade it. When NextGen capabilities go operational, we will work incrementally. No one will throw a switch that turns on NextGen. Capabilities will come on line gradually. And we take a cautious approach to the infrastructure that enables NextGen advances. For example, we will continue to extract position, navigation and timing services from the Global Positioning System, but we will retain all necessary backup capabilities.

Similarly, we must develop and integrate NextGen capabilities into our air traffic facilities while still maintaining safe and reliable NAS operations. In 2010 we launched a dedicated program office to manage facilities transformation. Our goal is to align NextGen operational capabilities with facilities requirements, and ensure the safe transition between legacy and future services. The program office will design fit-for-purpose facilities that fully realize NextGen concepts, improve employee working conditions, meet environmental goals and provide resilient services. In addition, we will deploy configurable automation systems and robust communications to ensure service continuity.

The FAA will manage NAS operations for many years when NextGen capabilities are being introduced and deployed throughout the system, and when aircraft equipage for these capabilities is mixed. We have always accommodated aircraft of widely varying capabilities, and we will continue to do so where it does not compromise achieving our goals. This mixed equipage poses technical and operational challenges that we must overcome, due to the complexity of the mixed operation. A related challenge is the implementation of best-equipped, best-served incentives that would result in net efficiency enhancements but would disadvantage aircraft that are not equipped.

To achieve global aviation objectives and meet the needs of airspace users around the world, NextGen must be interoperable with corresponding systems throughout the international community. Key strategic areas are the harmonization of global air traffic management initiatives as well as the harmonization of standards for technologies that support communication, navigation, surveillance and air traffic management. The FAA and the Single European Sky Air Traffic Management Research (SESAR) Joint Undertaking are collaborating on air traffic management research, development and validation for global interoperability. ■

Appendix A NextGen Investments for Operators and Airports

NextGen system benefits depend on FAA ground-based systems, space-based systems, alternative fuels to reduce environmental impact, advanced avionics capabilities and airport infrastructure. This appendix outlines the opportunities for investment by operators and airports. It provides an overview of current and planned capabilities and relates them to the benefits that they enable.

This appendix uses enablers – Automatic Dependent Surveillance-Broadcast (ADS-B) Out or Localizer Performance with Vertical Guidance (LPV) avionics, for example – to describe the technologies required for an aircraft and operator, or an airport, to implement a NextGen capability. Each enabler is defined by a set of performance and functional requirements that allow market flexibility whenever possible. We guide operators in satisfying these requirements and deploying the enablers through Advisory Circulars (ACs) and Technical Standard Orders (TSOs). The enablers are linked to operational improvements that provide benefits and build on capabilities already installed or available for today's aircraft. This appendix provides an overview of the major categories of enablers for operators and airports.

Three different areas are targeted for aircraft operators: aircraft avionics; flight planning and routing support systems; and fuels and engines. Airports also will be an active participant in deployment of some improvements. For other improvements, such as ADS-B in the terminal area, the deployment of the system will take place without substantial actions by airports.

For each enabler, icons provide a quick look at key information, including:

- Target Users: The target users for each enabler can include air transport, business jet, general aviation

Icon Legend

Target Users	Air Transport
Target Users	Business Aviation
Target Users	General Aviation
Target Users	Rotorcraft
Target Areas	Nationwide
Target Areas	Metroplex Areas or Major Airports
Target Areas	Oceanic
Maturity	Available
Maturity	In Development
Maturity	In Concept Exploration

fixed-wing and rotorcraft. These categories of target users represent generalized modes of operation and may not apply exactly to every civil or military operator. The FAA does not limit the NextGen capabilities to these targeted users groups. In addition to the specified user groups, some users may still find it worthwhile to invest in a particular enabler in order to meet their specific operational objectives.

- Target Areas for Implementation: The general strategy for deployment can include nationwide, in oceanic areas or in metroplex terminal areas with large and medium hub airports and satellite airports.

- Maturity: An enabler may already be available for operator investment, in development (including standards development) or in concept exploration.

Tables throughout this appendix summarize the enablers. A description of each enabler can be found in *NextGen Operator and Airport Enablers*, a supplement to this appendix that is available at www.faa.gov/nextgen. Additional detail concerning the operational improvements, and the FAA implementation plan for each improvement, is provided in Appendix B. ADS-B Out capability is the only enabler selected as a mandatory capability for all aircraft in a given airspace. It will be required in designated airspace on Jan. 1, 2020.

In addition to expanding the scope of this appendix from last year's plan, there are several changes in schedule, notably:

- Surface Indications and Alerts: Deferred in concept exploration due to technical challenges receiving the ADS-B messages on the airport surface.

- Deconfliction guidance: Deferred in concept exploration due to need for further definition of the operational concept, including integration with trajectory operations.

- Data Communications: Aligned the third version of domestic data communications (Aeronautical Telecommunications Network Baseline 3) with European plans.

- Ground Based Augmentation System Landing System (GLS) III: Deferred in concept exploration due to operational challenges in fielding the Category I system and the need to align the schedule with an aircraft program.

PERFORMANCE BASED NAVIGATION

Performance Based Navigation (PBN) encompasses a set of enablers with a common underlying capability to construct a flight path that is not constrained by the location of ground navigation aids. There are varying performance and functional requirements in the PBN family, from the 10 nautical mile (nm) course width accuracy and few waypoints required by Required Navigation Performance (RNP) 10 to the 0.1 nm precision and curved paths of RNP 0.1 Authorization Required (AR) approaches. For oceanic en route navigation, RNP 10 and RNP 4 will continue to be the standards. Domestically, Area Navigation (RNAV) 2 provides the required capability en route.

RNAV 1 is the mainstay in the terminal area, except where obstacles or airspace conflicts demand the improved performance provided by RNP 1. To achieve access to runways during limited visibility (instrument conditions), three capabilities offer different advantages and costs. The most basic, RNP 0.3, is a conventional non-precision approach capability that can be achieved with GPS alone. Vertical guidance can be added with either barometric Vertical Navigation (VNAV), or with a Satellite Based Augmentation System (SBAS). A basic VNAV capability can be used with RNP 0.3, and tighter Lateral and Vertical Performance can provide access to RNP AR approaches. The lowest approach minima are typically offered by LPV, which provides a satellite-based equivalent to conventional Category I Instrument Landing Systems (ILS).

Overview of Aircraft Operator Enablers						
Avionics Enablers	Aircraft and Operator		Capability Overview	Target Users	Target Area	Maturity
	Guidance	Schedule				
Performance Based Navigation						
RNP 10	Order 8400.12A	Complete	Reduced oceanic separation			
RNP 4	Order 8400.33	Complete	Further reduced oceanic separation (in conjunction with FANS 1/A)			
RNAV 1, RNAV 2	AC 90-100A	Complete	Ability to fly on more efficient routes and procedures			
RNP with Curved Path	AC 90-105	Complete	Ability to precisely fly departure, arrival and approach procedures including repeatable curved paths			
Vertical Navigation	AC 90-105, AC 20-138A	Complete	Ability to fly defined climb and descent paths			
LPV	AC 20-138B	Complete	Improved access to many airports in reduced visibility, with an approach aligned to the runway			
RNP Approaches (Authorization Required)	AC 90-101	Complete	Improved access to airports in reduced visibility with an approach that can turn to the runway; improved procedures to separate traffic flows			

The current aircraft fleet is well equipped with PBN capability. For example, in the air transport community, the heart of the PBN capability is the Flight Management System (FMS). The FMS uses input from the Global Navigation Satellite System (GNSS) – either GPS or Wide Area Augmentation System (WAAS) sensor – or multiple Distance Measuring Equipment (DME). DME has coverage limitations, and will not be supported on every published procedure. Most FMS installations can support RNAV operations and RNP with curved path, but less than half can support RNP AR approaches. LPV requires a WAAS receiver and integration with the displays.

In the general aviation community, the PBN enablers are typically implemented in a GNSS navigator installed in an aircraft's instrument panel. These systems have become increasingly complex and capable, integrating other types of navigation, voice communication and uplinked weather information. Most of these installations can support RNAV, and those equipped with WAAS can support LPV. Some of these configurations have fully implemented RNP with curved path or RNP AR approach capability and others may be upgradeable to RNP with curved path capability.

The primary equipage strategy for the PBN enablers has been operational incentives; aircraft that equip obtain a direct efficiency and access benefit because of the new routes, procedures and approaches. However, in some instances the new route or procedure cannot be designed or used optimally because of the need to accommodate traffic that is not equipped with these enablers. In addition, the legacy ground infrastructure for navigation will not be fully replaced, so a further incentive for PBN capability will come through the reduction of services to the non-equipped aircraft.

AUTOMATIC DEPENDENT SURVEILLANCE-BROADCAST

There are many different ADS-B enablers, with different cost and benefit implications. The most basic participation with ADS-B is ADS-B Out, where the aircraft's position and certain other data are broadcast by avionics. Ground receivers and other aircraft within range can receive these broadcasts and use them for their own applications. ADS-B Out enables the next generation of air traffic surveillance. Using ground receivers across the country, controllers will receive and process precise ADS-B broadcasts to provide air traffic separation and advisory services.

Building on the ADS-B Out capability, ADS-B avionics can be integrated with different controls and displays to implement ADS-B In enablers. The most basic types of enablers provide enhanced situation awareness, improving the ability of the flight crew to identify where aircraft are around them and the direction they are headed. This technology works in the air or on the ground, although the ground capability may be limited by coverage issues and the availability of quality airport surveys (see airport enhancements on page 44). This basic type of display is referred to as a Cockpit Display of Traffic Information (CDTI). A CDTI may be a new display, or it may be integrated with a conventional Traffic Alert and Collision Avoidance System (TCAS) traffic display.

Overview of Aircraft Operator Enablers						
Avionics Enablers	Aircraft and Operator		Capability Overview	Target Users	Target Area	Maturity
	Guidance	Schedule				
Automatic Dependent Surveillance-Broadcast						
ADS-B Out	AC 20-165	Complete	Enables improved air traffic surveillance and automation processing			
Airborne/Ground CDTI (ADS-B In)	AC 20-172, TSO-C195	Complete	Improved awareness of other traffic			
Surface Indications/Alerts (ADS-B In)	AC, TSO	2014	Displays and provides alerts based on non-normal traffic status			
In-Trail Procedure (ITP) (ADS-B In)	Policy Memo	Complete	Oceanic in-trail climb/descent			
	AC, TSO	2011				
Interval Management (ADS-B In)	AC, TSO	2012	Display of along-track guidance, control and indications, and alerts			
Airborne-CDTI with Conflict Detection (ADS-B In)	AC, TSO	2014	Displays and alerts crew to airborne conflicts independent of TCAS alerting			
Paired Parallel Approach Guidance and Alerting (ADS-B In)	AC, TSO	2014	Guidance information for aircraft participating in paired approaches to closely spaced runways			

Another set of ADS-B In enablers uses the ADS-B data for speed or timing guidance, typically maintaining spacing or separation from another aircraft. This includes both algorithms for oceanic In-Trail Procedures (ITP) and display of along-track guidance cues for interval management. Beyond these lie advanced alerting to improve airport safety and reduce the risk of collision for aircraft without TCAS. Eventually, ADS-B integrated with other capabilities is expected to support all-weather access to closely spaced runways and to enable airspace with self-separation similar to visual operations today.

The equipage for ADS-B is just beginning, with rule-compliant ADS-B equipment gaining approval in late 2010.

In air transport aircraft, ADS-B is expected to be implemented as upgrades to the Mode S transponder and aircraft displays. This equipment can be upgraded or replaced to support ADS-B as well as their original function. The various ADS-B In capabilities reflect different levels of integration with the controls and displays in the cockpit. Situational awareness can be achieved with side-mounted displays that are not integrated, along-track guidance can be implemented with front-mounted displays that are not integrated, and longer-term capabilities will require integration with other navigation data in front of the flight crew.

For general aviation operating below 18,000 feet, ADS-B can be implemented through the transponder or through a new radio, called the universal access transceiver (UAT). The UAT also provides access to weather and other aeronautical data services provided by the FAA. ADS-B In capabilities are implemented in general aviation with displays similar to those in use by air transport.

The FAA mandated ADS-B Out equipage in most controlled airspace starting in 2020. The agency is encouraging operators to equip portions of their fleets with ADS-B before the nationwide rule goes into effect by providing early benefits. As the operators experience the operational benefits, they will have an incentive to accelerate and expand the ADS-B equipage to the rest of their fleet.

For air transport operators, this strategy uses memorandums of agreement to accomplish this goal, where each party provides in-kind contributions critical to the success of the project. Each agreement is unique, reflecting the specific operator's business model, route structure and existing avionics infrastructure, among other factors. For general aviation operators, deployment of Traffic Information Services-Broadcast (TIS-B) and Flight Information Services-Broadcast (FIS-B), uplinked over the UAT, will enhance benefits and motivation to equip. The FAA is also evaluating additional locations where surveillance may be provided through ADS-B.

In 2010, the FAA convened an Aviation Rulemaking Committee (ARC) to develop recommendations for the implementation of ADS-B In capabilities. The ARC is expected to complete a final report in 2012.

DATA COMMUNICATIONS

Data Communications were first deployed as part of the Future Air Navigation System (FANS) program. Boeing and Airbus developed integrated communication and navigation capabilities (FANS 1 and FANS A, respectively), providing a pilot-and-controller data link and the ability to autonomously send some data from the aircraft to the air traffic control (ATC) system through Automatic Dependent Surveillance-Contract (ADS-C). These new navigation and communication capabilities were primarily targeted to oceanic airspace, where they provided the greatest initial benefits, enabling a safe reduction in separation between aircraft from 100 nm to as low as 50 nm.

As the FAA moves forward with deploying a domestic ATC data link system, it is important to make use of the FANS capabilities already installed on many aircraft. As such, the domestic program will use an adaptation of FANS appropriate for high-density, surveilled environments through FANS 1/A+ over VHF Data Link (VDL) mode 2. These aircraft will be able to receive departure clearances and airborne reroutes.

A newer capability, called the Aeronautical Telecommunications Network (ATN), was developed through the International Civil Aviation Organization (ICAO) to provide a more universally capable and reliable ATC data communications system. The capability that will be needed for full participation in NextGen in continental U.S. airspace will be the third version, called ATN Baseline 3. The standards for this version are under development and are being harmonized internationally.

Two earlier versions of ATN provide interim capabilities. Europe has begun to implement ATN Baseline 1, which can be retrofitted into aircraft without modification of the navigation system. The FAA plans to implement ATN Baseline 2 with a larger set of operational capabilities, such as revised departure clearances, to provide greater incentive for retrofitting aircraft.

FANS 1/A for oceanic operations has already been adopted widely by the fleet of aircraft operating internationally. The implementation strategy for domestic ATC data communications is primarily based on providing operational incentives to equipped operators. The FAA is evaluating potential scenarios for best-equipped, best-served in which aircraft with this capability may receive more rapid or efficient reroutes during inclement weather.

LOW-VISIBILITY OPERATIONS

The FAA is supporting several different capabilities for operators who need to access an airport during low visibility – when the cloud ceiling is below 200 feet above the runway or the visibility is less than one-half surface mile. Enhanced Flight Vision Systems (EFVSs) provide the greatest level of access, enabling lower approach minima, regardless of the navigation aid or airport infrastructure, by enabling the flight crew to literally see through the clouds using the EFVS technology.

At many airports the FAA has approved the use of a heads-up display (HUD) on a precision approach to lower minima. While this capability does not provide the ubiquitous access of EFVS, it can be implemented in many aircraft at lower cost.

Another enabler is GLS. This program is researching the use of differential corrections to GPS to support Category II and III approaches. This capability will be the same as Category II and III ILS, without the need to restrict taxiing aircraft near antennas and at reduced cost to the FAA.

EFVS has been adopted by the high-end business community, while HUD has begun to spread to the air carrier fleet. The GLS program is still in research and

Overview of Aircraft Operator Enablers

Avionics Enablers	Aircraft and Operator		Capability Overview	Target Users	Target Area	Maturity
	Guidance	Schedule				
Data Communications						
FANS 1/A (Satcom)	AC 20-140A, AC 120-70B	Complete	Oceanic data communications and surveillance, transfer of communications			
FANS 1/A+ (VDL mode 2)	AC 20-140A, AC 120-70B	Complete	Expansion of FANS to domestic clearances			
ATN Baseline 2	AC 20-140B	2013	Clearances, terminal information			
	AC 120-70C	2014				
ATN Baseline 3	AC 20-140C	2015	Expansion of ATN to trajectory operations			

Overview of Aircraft Operator Enablers						
Avionics Enablers	Aircraft and Operator		Capability Overview	Target Users	Target Area	Maturity
	Guidance	Schedule				
Low-Visibility Operations						
HUD/ILS	Order	Complete	Reduced minima at qualifying runways			
EFVS	AC 20-167, AC 90-106	Complete	Uses enhanced flight visibility to continue approach below minimums			
GLS III	Project specific policy	2014	Autoland in very low visibility			
Avionics Safety Enhancements						
FIS-B	TSO-C157, TSO-C154c	Complete	Weather and aeronautical information in the cockpit			

development, but new aircraft are being manufactured with the basic capability to reduce the costs of transitioning from ILS when GLS is mature.

The low-visibility enablers are implemented through best-equipped, best-served incentives, so that aircraft with the capability can gain airport access when other operators cannot.

AVIONICS SAFETY ENHANCEMENTS

FIS-B provides ground-derived weather data to aircraft lacking airborne weather radar, and real-time National Airspace System (NAS) status information. These data are primarily intended to improve safety of operations for general aviation aircraft and are provided over the same UAT signals used for ADS-B.

EQUIPAGE LEVELS

The following table summarizes the current equipage levels of the mature avionics enablers among civil operators. These estimates are based on coordination with air transport operators and the annual FAA general aviation and air taxi survey. The high penetration of PBN enablers reflects the maturity of those capabilities, which have been delivered in various forms for over 10 years. Other enablers, such as ADS-B Out, are only recently available and have not been installed.

ENGINES AND FUEL TECHNOLOGIES

Alternative jet fuels research continues with the intent of approving a range of ASTM International-qualified "drop-in" fuels that reduce the carbon footprint of commercial aircraft operations without compromising safety or requiring changes in aircraft, engines or fuel supply infrastructure. Fischer Tropsch alternative fuels, made from a variety of feedstocks including sustainable biomass, blended with Jet A already are approved for commercial use by ASTM International. Blends of sustainable hydrotreated renewable jet (HRJ) alternative fuels are expected to be approved for use in 2011. We are beginning to test additional advanced alternative fuels in support of eventual approval. Operator investment is limited to purchasing alternative jet fuels and fuel blends as they become available in commercial quantities. Airlines already have signed agreements to do so.

Extensive research of unleaded aviation gasoline has not yet identified a drop-in replacement for leaded aviation gas. The deployment of new unleaded aviation gasolines may require modifications to the existing fleet of reciprocating-engine-powered aircraft.

Current Equipage Levels of Available Enablers		
Enabler	Air Transport	General Aviation
RNP 10	58%	<5%
RNP 4	58%	<5%
RNAV 1, RNAV 2	92%	80%
RNP with RF	57%	<5%
VNAV	45%	0%
LPV	<5%	30%
RNP AR	36%	<5%
ADS-B Out	0%	0%
Airborne/Ground CDTI	<5%	<5%
ITP	0%	0%
FANS 1A (Satcom)	36%	0%
FANS 1A+ (VDL mode 2)	12%	0%
HUD/ILS	15%	0%
EFVS	0%	<5%
FIS-B	0%	<5%

Overview of Aircraft Operator Enablers						
Enablers	Operator or Airport		Capability Overview	Target Users	Target Area	Maturity
	Guidance	Schedule				
Engine and Fuel Technologies						
Drop-In Renewable Jet Fuel	Modified ASTM specification	2011 2013 2015	Expansion of jet fuel specification to allow production via alternative processes and feedstocks			
Engine Efficiencies	Technology available for aircraft design	2015	Engine technology demonstrated with lower fuel burn, noise and emissions			

Some airframe and engine technologies may be retrofitted on existing aircraft in order to speed technology insertion. However, other technologies such as the high-bypass-ratio geared turbofan and open-rotor engines would only be expected on future generations of aircraft.

FLIGHT OPERATIONS CENTERS

Flight operations centers (FOCs) have a significant role in Collaborative Air Traffic Management (CATM) initiatives. The FOC could be specific to the operator (e.g., an airline) or a company providing value-added flight planning support. To fully participate in CATM, FOCs need to develop and maintain information technology systems to achieve three basic objectives: data connectivity to the FAA through Collaborative Information Exchange (CIX), processing of aeronautical status and weather information in flight planning software, and development of user-preferred routes. The FAA plans to implement a CIX to provide increased situational awareness and improved constraint prediction by incorporating data made available via System Wide Information Management (SWIM) mechanisms. Examples are Special Use Airspace (SUA) status and surface event information.

In the near term, the Flight Planning Services software will be enhanced to generate a prioritized list of trajectory options for each flight. These lists will be used by the FAA's Traffic Flow Management System (TFMS) to ensure that operator priorities are appropriately considered. These trajectory option sets can be forwarded to the TFMS when traffic management initiatives are issued due to volume or weather conditions. They can also be forwarded for reconsideration whenever operator flight priorities change.

AIRPORT ENHANCEMENTS

Airports are active participants in the implementation of NextGen across the NAS. While many investments in NextGen technologies are the responsibility of FAA or aircraft operators, airports will also have opportunities to advance NextGen.

PBN instrument flight procedures are a key component of NextGen because they can improve the efficiency of airport arrivals and departures. For general aviation operators and some regional air carriers, WAAS/LPV approach procedures can provide near Category I minimums. Business jet operators and air carriers are more commonly equipped for RNAV and RNP, which can support Category I minimums. The FAA may opt for an incremental phaseout of the ILS Category I installations by 2025, as both WAAS/LPV and RNAV/RNP provide for more cost-effective and flexible instrument approach procedures. In addition, in 2012-2014 the FAA will decide on the deployment of GBAS equipment, which is planned to provide Category II and III capabilities. As such, GBAS could augment or replace the existing ILS Category II and III installations at airports throughout the NAS.

Airports have the key role of discussing with their users the need for new or additional PBN procedures. A hub airport may serve air carriers that are actively seeking to expand the use of RNAV or RNP procedures, while a general aviation airport may benefit from a new WAAS/LPV approach procedure. An airport can request that the FAA initiate consideration and design of these procedures. Airports can facilitate the aeronautical survey, and obstruction-mitigation and runway-lighting actions that may be needed to achieve lower minimums. The surveys, obstruction mitigation and runway lighting could be eligible for Airport Improvement Program (AIP) funds.

Surface surveillance and management is another key area for airport involvement in NextGen. The FAA plans to complete deployment of Airport Surface Detection Equipment-Model X (ASDE-X) at 35 airports by 2013. Additionally, the agency aims to install enhancements to airport surface detection equipment at nine other airports by 2015. At these facilities, airports can install ADS-B squitters on airport-owned vehicles that regularly operate in the movement area. The squitters would broadcast vehicle positions to ATC, aircraft equipped with ADS-B In and the airport operations center. This would improve situational awareness and safety, particularly during construction

Overview of Airport Enablers						
Avionics Enablers	Operator or Airport Guidance		Capability Overview	Target Users	Target Area	Maturity
	Guidance	Schedule				
Airport Enhancements						
Geographic Information System	AC 150-5300-16,-17, -18	Ongoing	Detailed geospatial data on airports and obstructions			
ADS-B for Surface Vehicles	AC	2011	ADS-B squitter equipage for surface vehicles operating in the movement area	Airport rescue firefighting equipment, snowplows, inspection trucks		

projects and winter weather events. AIP eligibility for the ADS-B squitters is being evaluated.

FAA continues to research the need and technology options for non-movement area surface surveillance, particularly in support of NextGen surface traffic management concepts that are also still in development. For airports that will not receive ASDE-3/X, the FAA is also researching low-cost technologies and systems that could provide a surface surveillance capability.

Some airports have elected to install surveillance systems to complement ASDE-3/X and provide coverage of non-movement areas. Because airports are able to monitor operations on the airport surface more precisely, situational awareness is improved.

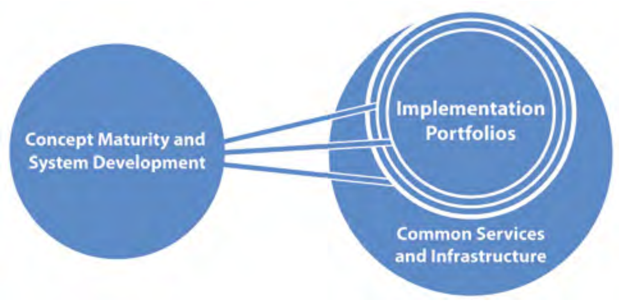
The FAA recognizes and appreciates the efforts of airports and vendors to develop systems and tools to improve surface situational awareness. To date, the results show substantial promise, but challenges with data sharing and dependencies have emerged. As a result, the FAA requests that airports considering investments in surface surveillance technologies coordinate with us in advance on system design – particularly for vendor systems that rely on FAA data sources such as ASDE-3/X. The FAA still is shaping the policy and processes to enable improved access to NAS data to support the emerging surface operational concepts under NextGen. We plan to streamline the approval processes to give aviation users access to NAS data through the new NAS Enterprise Services Gateway. With advance coordination, vendor systems can be designed with an architecture that is compatible with emerging FAA surface operational plans.

Because new runway and taxiway infrastructure is critical to capacity and efficiency, the continued transition of airport layout plans into the Airport Geographic Information System application will improve the airport planning process. The FAA is also proceeding with research to revise the separation standards for Closely Spaced Parallel Operations (CSPO) on parallel runways. The revisions to CSPO standards will be incremental throughout the mid-term and far-term periods to incorporate both existing and new technologies. An initial revision to the current 4,300-foot minimum separation for independent arrivals is planned for 2012 as a result of revisions to blunder standards and with use of existing technologies such as Dual ILS. Other revisions will follow and may be dependent on PBN and aircraft equipage. As revisions to CSPO standards become available, airports will be able to incorporate these improvements into their long-term planning. (Appendix B highlights the FAA's work on CSPO). ■

Appendix B Delivering the Mid-Term Vision

This appendix provides a timeline and a summary of the FAA's key work plans in support of delivering the operational improvements necessary to achieve our vision of operations for the NextGen mid-term. The integrated work plans developed by the agency to deliver the mid-term system support the required tracking, planning, reporting and execution needed to successfully implement an integration project of the magnitude of NextGen.

This year we have chosen an operational orientation for presenting the highlighted work activities that support our mid-term vision, rather than the budget orientation we offered last year. Our work activity tables do, however, provide a reference to the funding mechanisms which support those particular projects.



Each mid-term operational improvement, as identified in the National Airspace System Enterprise Architecture (NAS EA), has been broken down into a series of capabilities that can be deployed as they reach maturity. In many cases, these capabilities provide immediate user benefits while contributing to the development of the operational improvements they support. The capabilities we expect to achieve operational status or be available to NAS users by the mid-term have been defined and are organized into the following nine implementation portfolios:

- Improved Surface Operations
- Improved Approaches and Low Visibility
- Closely Spaced, Parallel, Converging, and Intersecting Runway Operations
- Performance Based Navigation
- Time Based Flow Management
- Collaborative Air Traffic Management
- Automation Support for Separation Management
- On-Demand NAS Information
- Environment and Energy

Additionally, our Common Services and Infrastructure portfolio documents cross-cutting enablers that support the capabilities included in the implementation portfolios.

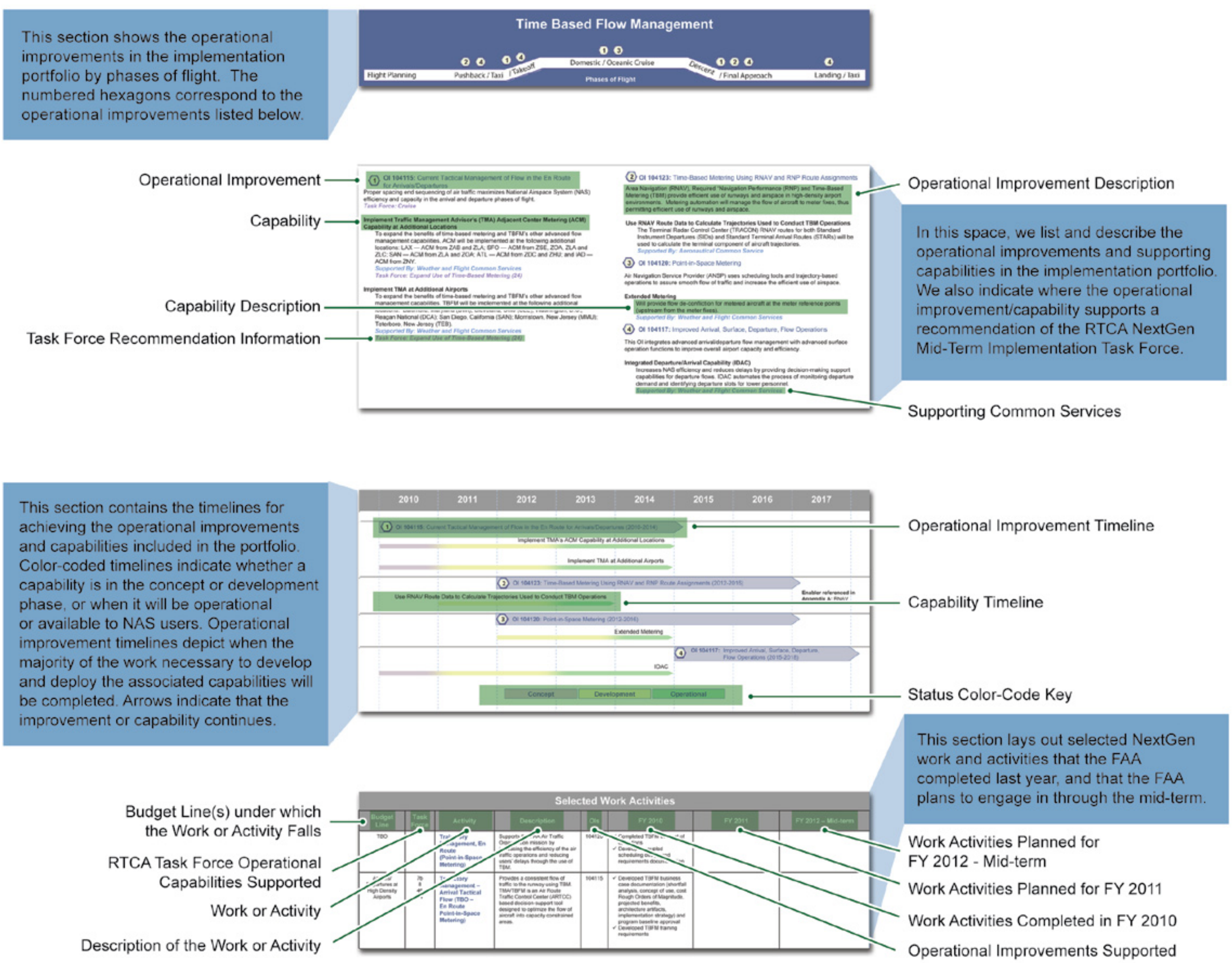
Operational improvements and associated capabilities that are still being clearly defined are included in our NextGen Maturity and System Development portfolio.

As we continue our development work in support of those later capabilities, we may need to make adjustments to our portfolio structure as well as our schedules. A variety of factors such as program interdependencies, a realignment of priorities or other external drivers could potentially impact the assumptions under which this work plan has been crafted.

At the top of each portfolio is a visual representation of the relationship between the operational improvements and affected phases of flight. Below this graphic is the list and description of the operational improvements and the supporting capabilities. Where appropriate, these descriptions include a reference to the supporting Common Services, as well as an indication as to whether that operational improvement or capability supports a recommendation of the RTCA NextGen Mid-Term Implementation Task Force.

In the next section, we provide timelines for the implementation of the operational improvements and supporting capabilities. Capability timelines are color-coded to make it easier to discern when a project is in the concept phase or the development phase, or when it will be operational or available for use in the NAS. Operational improvement timelines illustrate the date range during which the operational improvement will reach initial operational capability in the NAS. An arrow indicates that the improvement or capability continues in operation.

Finally, the bottom section lists selected elements of the work being done to achieve the NextGen mid-term operational vision. It also indicates an activity's budget line as well as the activity's relationship to the RTCA task force recommendations and to the NAS EA, as denoted by the operational improvements (OIs). ■



Improved Surface Operations

1 OI 104209: Initial Surface Traffic Management

Departures are sequenced and staged to maintain throughput. Air Navigation Service Provider (ANSP) automation uses departure-scheduling tools to flow surface traffic at high-density airports.
Task Force: Surface

Airport Configuration Management
To improve responsiveness and effective use of airport resources, and rapidly coordinate airport configuration changes across multiple ANSP activities, this capability provides automation assistance for setting up, assessing and changing the airport configuration.
Supported By: Aeronautical and Surveillance Common Services

Runway Assignments
To assist in efficient runway allocation and use, the automation assigns an aircraft to a runway based on the flight's departure fix and enables ANSP personnel to accept or modify the runway assignment.
Supported By: Aeronautical and Surveillance Common Services

Scheduling and Sequencing
The capability displays the departure surface sequence and runway queues as a recommendation to the controller to improve throughput. The capability provides Traffic Flow Management (TFM) constraints to tower controllers. The capability provides estimated flight-specific event times necessary to meet the departure surface sequence and schedule. These event times are shared with users.
Supported By: Aeronautical and Surveillance Common Services

Taxi Routing
For improved taxi route efficiency, this capability provides dynamic information on airport taxiways and runways integrated with controller displays.
Supported By: Aeronautical and Surveillance Common Services

Departure Routing
For improved departure operations, this capability provides tower controllers with electronic flight data management and an interface to assessments of weather and Traffic Management Initiative (TMI) impacts on departure routes and associated flights.
Supported By: Surveillance Common Service

External Data Exchange
The FAA will establish a data exchange infrastructure as well as integrated decision support tools, standards and processes that rely on agreed-to information exchange among stakeholders.
Supported By: Aeronautical, Flight and Surveillance Common Services
Task Force: Surface Situational Awareness Phase 1 (40), TFM Common Operational Picture (43), Surface Connectivity (38) and Surface Situational Awareness Phase 2 (41)

2 OI 103207: Improved Runway Safety Situational Awareness for Controllers

At large airports, current controller tools provide surface displays and can alert controllers when aircraft taxi into areas where a runway incursion could result. Additional ground-based capabilities will be developed to improve runway safety that include expansion of runway surveillance technology (i.e., Airport Surface Detection Equipment-Model X (ASDE-X)) to additional airports.
Task Force: Surface

ASDE-X to Additional Airports
This increment enables air traffic control (ATC) to detect potential runway conflicts by providing detailed coverage of movement on runways and taxiways.
Supported By: Surveillance Common Service
Task Force: Surface Situational Awareness, Phase 1 (40)

3 OI 103208: Improved Runway Safety Situational Awareness for Pilots

Runway safety operations are improved by providing pilots with improved awareness of their location on the airport surface as well as runway incursion alerting capabilities. Additional enhancements may include the depiction of other traffic within the airport surface environment.

Surface Indications and Alerts
Surface Indications and Alerts (SURF IA) is a runway safety application for flight crews of aircraft with Cockpit Display of Traffic Information (CDTI)/Traffic Information Services-Broadcast (TIS-B)/Automatic Dependent Surveillance-Broadcast (ADS-B), where situations that may lead to or already represent a collision risk are highlighted on the moving map. Avionics for SURF IA are likely to require software and display quality assurance levels higher than those for CDTI only.

Moving Map with Own-Ship Position
Cockpit displays, for instance Electronic Flight Bags (EFBs), may incorporate airport moving map displays that provide constantly changing views of an airport's runways, taxiways and structures to help pilots identify the airplane's location on the surface.
Supported By: Aeronautical Common Service

3 Cont'd

CDTI with TIS-B and ADS-B for Surface

Surface traffic information for moving map displays is available via TIS-B and from aircraft operating with approved ADS-B capability. Using TIS-B and ADS-B, CDTI will provide a graphical depiction of ground and air traffic, which will improve situational awareness for a variety of operations.

Supported By: Surveillance Common Service

Enhanced Vision Systems (EVSs) for Taxi

The FAA and industry are partnering to develop a taxi benefit for aircraft equipped with certified enhanced vision systems when ground visibility at a Part 139 airport is below the minimum visibility required for surface operations, as outlined in the airport's Surface Movement Guidance and Control System plan.

4 OI 104207: Enhanced Surface Traffic Operations

Terminal automation provides the ability to transmit automated terminal information, departure clearances and amendments, and taxi route instructions via data communications, including hold-short instructions.

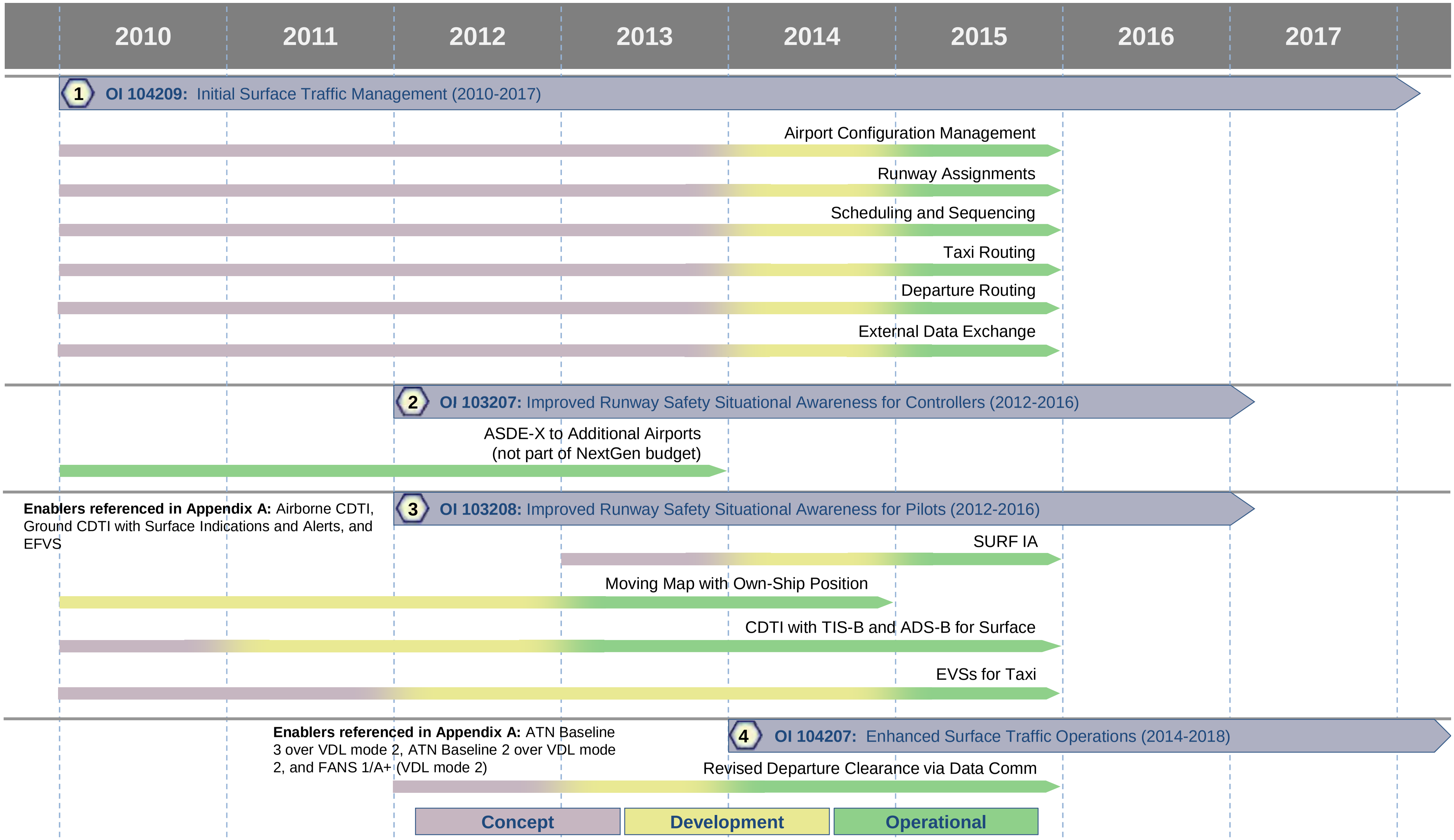
Task Force: Cross-Cutting

Revised Departure Clearance via Data Comm

A Revised Departure Clearance (DCL) Data Comm capability will allow the FAA to rapidly issue departure clearance revisions, due to weather or other airspace issues, to one or more aircraft equipped with Future Air Navigation System (FANS) waiting to depart.

Supported By: Communications Common Service

Task Force: Data Communications for Revised Departure Clearance, Weather Reroutes and Routine Communications (39)



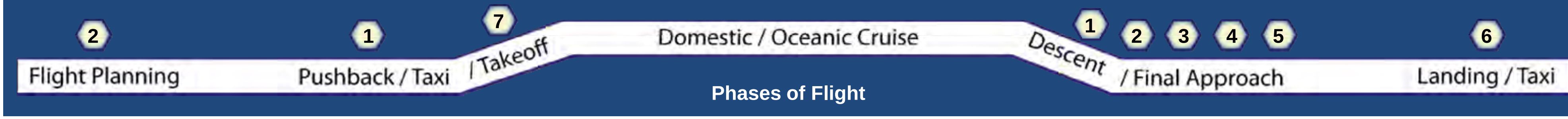
Improved Surface Operations (cont'd)

Selected Work Activities

Budget Line	Task Force	Activity	Description	OIs	FY 2010	FY 2011	FY 2012 – Mid-term
Arrivals/ Departures at High Density Airports	40 43 38 41	**Trajectory Management - Surface Tactical Flow**	Focuses on the development of surface-based trajectory operations and provides a roadmap for the development of a collaborative Surface Traffic Management System.	104209	✓ Conducted field evaluation of Flight Operation Surface Application (FOSA) version 2 and Collaborative Departure Queue Management (CDQM) version 2 at Memphis and Orlando (11/30/10)	• Conduct field evaluations of 2D Taxi Route Generation, Departure Runway Assignment, Airport Configuration, Departure Sequencing tools and Deice Tool	• Support technology transfer of mature surface capabilities to Tower Flight Data Manager (TFDM) system • Continue Surface Trajectory Based Operation (STBO) field evaluations at Memphis and Orlando • Conduct Human-in-the-Loop (HITL) simulation of Collaborative Departure Scheduling • Conduct HITL simulation of Time-Based Taxi Route Generation Tool • Begin HITL simulation of STBO Taxi Route Generation
Arrivals/ Departures at High Density Airports	40	**Trajectory Management - Surface Tactical Flow - Enhanced Data Exchange (EDX) for Airport Surface Data Distribution**	Establishes a net-centric approach to deliver ASDE-X to external aviation stakeholders.	104209	✓ Conducted operational prototype with ASDE-X data ready for external users	• Add additional airports to EDX capability • Enhance Infrastructure to improve reliability	
Flexible Terminal Environment	43 38 9 41	**Flight and State Data Management, Surface/Tower/Terminal Systems Engineering**	Redefines and extends the TFDM and Arrival/Departure Management Tool (A/DMT) concept of operations, funding will be used to update current analysis proposals and assess acquisition risks.	103207 104209 102406		• Conduct TFDM evaluations and demonstrations • Conduct HITLs to finalize TFDM concept of use	• Continue the development, installation, test and operation of a pre-production unit of A/DMT with appropriate interfaces with En Route Automation Modernization (ERAM)/Traffic Management Advisor (TMA), TFM/ Integrated Departure/Arrival Capability (IDAC), TRACON, Route Availability Planning Tool (RAPT) • Coordinate with an airport authority and aircraft/airlines at an operational site to support analysis and assessment of near-term benefits available from the A/DMT including: o Departure route assurance to reduce departure delays o Reduce departure queue lengths to reduce emissions/fuel burn o Taxi conformance monitoring to improve airport operations o Enhanced situational awareness to enhance airport safety • Develop concept of operations for TFDM Phase 2 • Develop TFDM Phase 2 prototype • Conduct demonstrations of TFDM Phase 2

Budget Line	Task Force	Activity	Description	OIs	FY 2010	FY 2011	FY 2012 – Mid-term
Arrivals/ Departures at High Density Airports		**Trajectory Management - Surface Conformance Monitoring**	Focuses on the potential safety and workload benefits that can be achieved through a comprehensive taxi route management and conformance monitoring capability.	104209	✓ Conducted second Surface Conformance (2D) HITL simulations using hold short and give way instructions	• Conduct third Surface Conformance (2D) HITL simulations	• Continue conducting Surface Conformance (2D) HITL simulations • Tech transfer of 2D Surface Conformance Monitoring concept of use, requirements, ATC Procedures to TFDM program • Initial HITL simulation of STBO Surface Conformance Monitoring • Update concept of use, requirements, ATC Procedures for STBO Surface Conformance Monitoring

Improved Approaches and Low-Visibility Operations



1 OI 107119: Expanded Low-Visibility Operations Using Lower RVR Minima

Lowering Runway Visual Range (RVR) minima from 2,400 feet to 1,800 feet (or lower, depending on the airport and requirement) at selected airports using RVR systems, aircraft capabilities, and procedural changes provides greater access to Operational Evolution Partnership (OEP), reliever and feeder airports during low-visibility conditions.

Additional RVR Sensors

Supported By: Aeronautical and Weather Common Services

2 OI 107117: Low-Visibility/Ceiling Approach Operations

The ability to complete approaches in low-visibility/ceiling conditions is improved for aircraft equipped with some combination of navigation derived from augmented Global Navigation Satellite System (GNSS) or Instrument Landing System (ILS) and other cockpit-based technologies or combinations of cockpit-based technologies and ground infrastructure.

Enhanced Flight Vision System (EFVS) to 100 Feet

The FAA is engaged in making new rules to enhance the benefits of having EFVS capability by allowing operators to dispatch and begin instrument approaches in more weather conditions than currently authorized.

Synthetic Vision System (SVS) for Lower Than Standard Approach Minima Operations

The FAA is evaluating various concepts for allowing SVS technology to be used to conduct instrument approach procedures with lower than standard minima (e.g., Cat II, SA Cat I, SA Cat II), or in lieu of certain ground infrastructure.

3 OI 107103: Area Navigation (RNAV) Standard Instrument Departures (SIDs), Standard Terminal Arrival Routes (STARs) and Approaches

Task Force: NAS Access

Localizer Performance with Vertical Guidance (LPV) Approach Procedures

LPV approach procedures, which are available to aircraft equipped with GPS/ Wide Area Augmentation System (WAAS), are more cost-effective to implement in comparison with the installation of additional ground-based navigation aids (NAVAIDs) and the development of approach procedures for those NAVAIDs. In addition to LPV approach procedure implementation, the FAA will deliver LP approaches to runways that do not qualify for LPVs due to obstacles.

Supported By: Aeronautical Common Service

Task Force: Implement LPV Approach Procedures to Airports without Precision Approach Capabilities (22)

Required Navigation Performance (RNP) and RNP Authorization Required (AR) Approaches

A key feature of RNP and RNP AR approaches is the ability to use curved, guided path segments (known as radius-to-fix, or RF; currently, an optional capability in aircraft flight management systems). Another important advantage of RNP AR approaches is the potential for decoupling operations associated with adjacent runways or airports.

Supported By: Aeronautical Common Service

4 OI 104124: Use Optimized Profile Descent

Optimized Profile Descents (OPDs) permit aircraft to remain at higher altitudes on arrival to the airport and use lower power settings during descent.

Task Force: Cross-Cutting

OPDs Using RNAV and RNP STARs

OPD procedures are being implemented as RNAV STARs (eventually as RNP STARs, where necessary) with vertical profiles that are designed to allow aircraft to descend using reduced or even idle thrust settings from the top of descent to points along the downwind or final approach.

Supported By: Aeronautical Common Service

Initial Tailored Arrivals (ITAs)

ITAs are pre-planned, fixed routings assigned by oceanic air traffic control facilities and sent from the Oceanic Automation System (Ocean21) via data communications to suitably equipped (i.e., FANS 1/A) aircraft as an arrival clearance into coastal airports.

Supported By: Communications Common Service

Task Force: Communications for Revised Departure Clearance, Weather Reroutes and Routine Communications (42a)

5 OI 107107: Ground Based Augmentation System (GBAS) Precision Approaches

GBAS support precision approaches to Category I and eventually Category II/III minimums, for properly equipped runways and aircraft. GBAS can support approach minimums at airports with fewer restrictions to surface movement, and offers the potential for curved precision approaches. GBAS also can support high-integrity surface movement requirements.

GBAS Category I Non-Federal System Approval

GBAS Category I is being implemented as a non-federal system on a per-airport request basis.

GBAS Category II/III

ICAO-compliant standards for operational use of GBAS Category II/III systems will be published by 2015.

⑥ **OI 107118:** Low-Visibility/Ceiling Landing Operations

The ability to land in low-visibility/ceiling conditions is improved for aircraft equipped with some combination of navigation derived from augmented GNSS or ILS, and head-up guidance systems, EFVS, SVS, advanced vision system, and other cockpit-based technologies that combine to improve human performance.

EFVS to Touch down

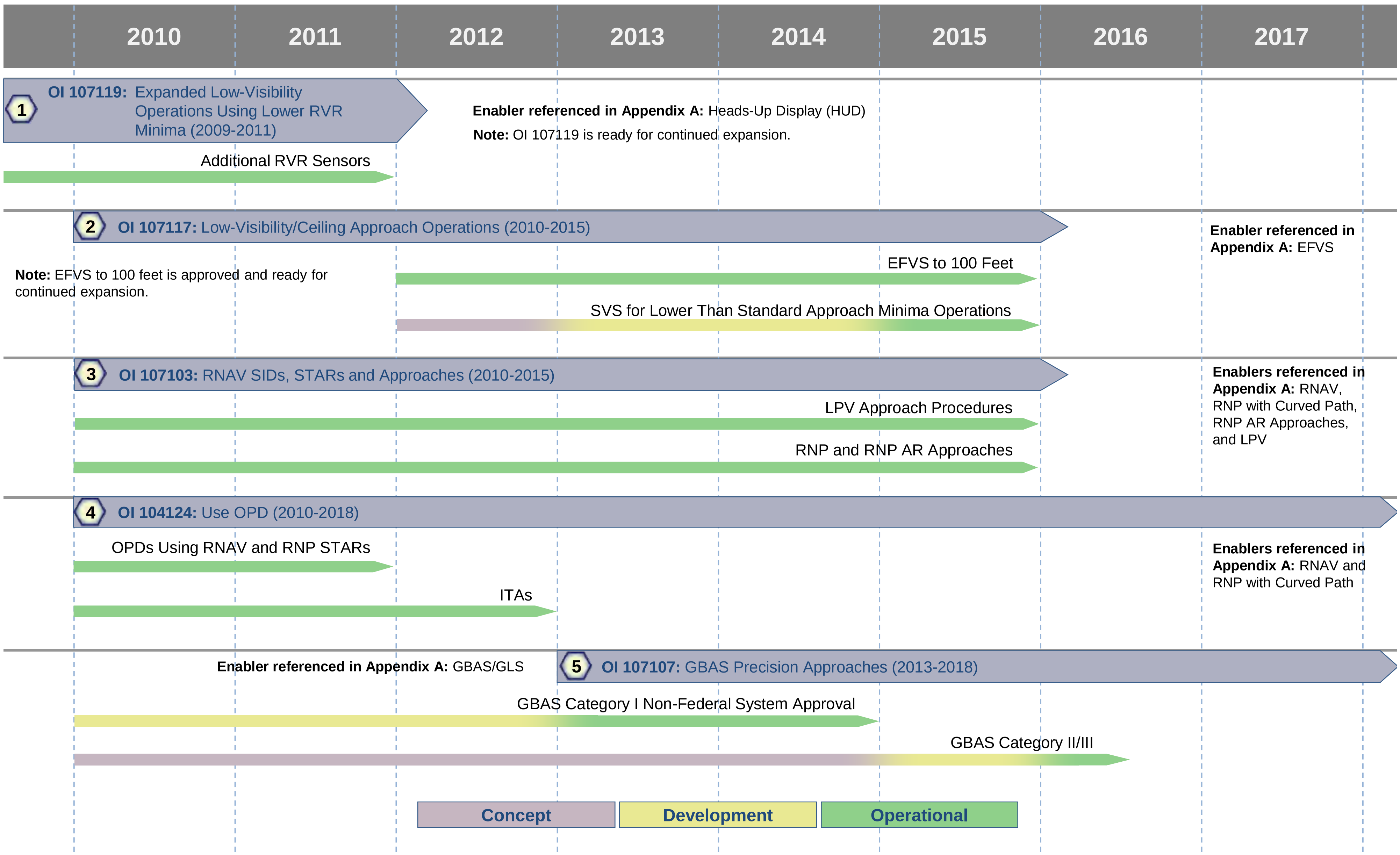
The FAA is engaged in rulemaking that would permit EFVS to be used to touch down.

⑦ **OI 107115:** Low-Visibility/Ceiling Take-off Operations

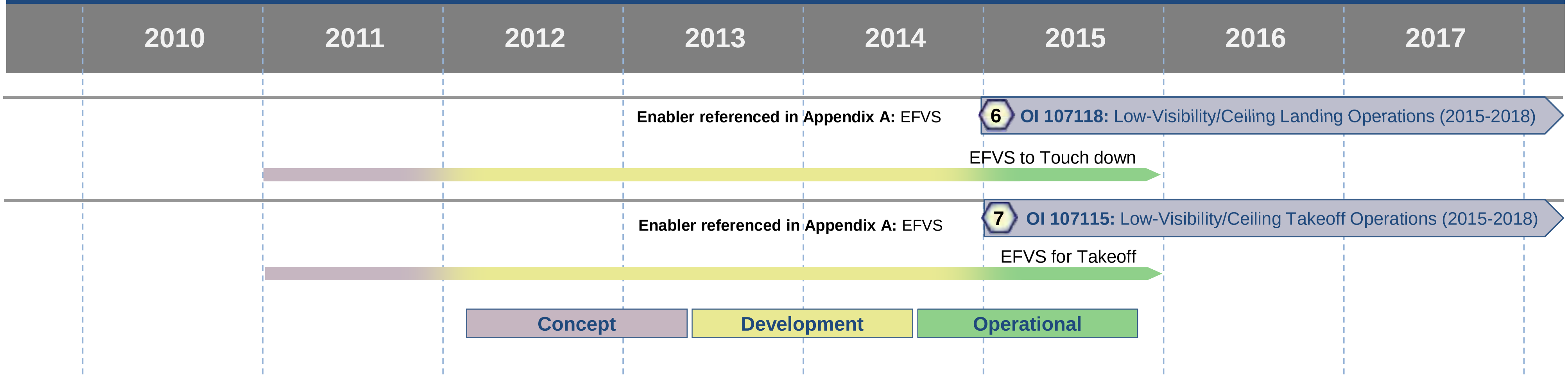
Leveraging a combination of head-up guidance systems, EFVS, SVS, or advanced vision system capabilities will allow appropriately equipped aircraft to conduct takeoff operations with lower visibility minima.

EFVS for Takeoff

The FAA is evaluating the use of EFVS for low-visibility takeoff operations.



Improved Approaches and Low-Visibility Operations (cont'd)



Selected Work Activities

Budget Line	Task Force	Activity	Description	OIs	FY 2010	FY 2011	FY 2012 – Mid-term
Flexible Terminal Environment		**Separation Management, Approaches, Ground Based Augmentation System (GBAS)**	Begins implementation of GBAS at the nation's busiest airports (OEP 35) to achieve capacity and efficiency benefits by integrating RNAV and RNP capabilities with the Category 1 GBAS Landing System capability.	107107	✓ Awarded Category II/III Local Area Augmentation System ground facility prototype contract		• Finalize Category III ground facility specification • Award contract to validate Category III avionics standards and interoperability • Complete operational feasibility determination
Flexible Terminal Environment		**Separation Management, Approaches, NextGen Navigation Initiatives**	Develops and baselines specifications and initiates solution development including acquisition and testing of navigation aid equipment.	107119	✓ Completed initial concept of operations for navigation surface requirements	• Implement lower RVR minimums at: o Philadelphia (PHL) 27R o San Francisco (SFO) 28L o Denver (DEN) 16R o Houston International (IAH) 9 o Cleveland (CLE) 24L	• Complete initial concept of operations for Navigation Surface Requirements • Based on the Flight Standards NAS-wide implementation schedule for terminal RNAV, devise the roll-out schedule for required navigation systems • 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

Budget Line	Task Force	Activity	Description	OIs	FY 2010	FY 2011	FY 2012 – Mid-term
Flexible Terminal Environment		**Separation Management, Approaches, Optimize Navigation Technology**	Develops and baselines specifications and initiates solution development including acquisition and testing of navigation aid equipment.	107118 107119	✓ Completed Enhanced Low Visibility operational improvements	• Continue initial development and design of Medium-Intensity Approach Lighting System with Runway Alignment Indicator (MALSR) Light-Emitting Diode (LED) Lamp Solution • Continue initial development and design of LED Precision Approach Path Indicator (PAPI) System Solution	• Complete MALSR LED/Infrared lamps prototype design • Complete functional configuration audit for LED PAPI
Demonstrations	42a	**High Density Airport Capacity and Efficiency Improvement Project**	Makes arrivals to high density airports more efficient; it has several implications such as reduced time and distance of flights including the optimization of the lateral and vertical paths.		✓ Continued TAs at LAX, SFO and MIA		

Closely Spaced, Parallel, Converging and Intersecting Runway Operations

1 OI 108209: Increase Capacity and Efficiency Using Area Navigation (RNAV) and Required Navigation Performance (RNP)

Both RNAV and RNP will enable more efficient aircraft trajectories. RNAV and RNP combined with airspace changes, increase airspace efficiency and capacity.
Task Force: Runway Access

Use Converging Runway Display Aid (CRDA)
This increment will add CRDA functionality into terminal automation systems and expand its use at more airports, as well as leverage the arrival/departure window tool.
Task Force: Increase Capacity and Throughput for Converging and Intersecting Runways (9)

2 OI 102140: Wake Turbulence Mitigation for Departures (WTMD): Wind-Based Wake Procedures

Procedures are developed at applicable locations based on the results of analysis of wake measurements and safety analysis using wake modeling and visualization. During peak demand periods, these procedures allow airports to maintain airport departure throughput during favorable wind conditions.

WTMD
Procedures are developed through analysis of wake measurements and safety analysis using wake modeling and visualization. During peak demand periods, these procedures allow airports to maintain airport departure throughput during favorable wind conditions. A staged implementation of changes in procedures and standards, as well as the implementation of new technology, will safely reduce the impact of wake vortices on operations. This reduction applies to specific types of aircraft and is based on wind blowing an aircraft's wake away from the parallel runway's operating area.

3 OI 102141: Improved Parallel Runway Operations

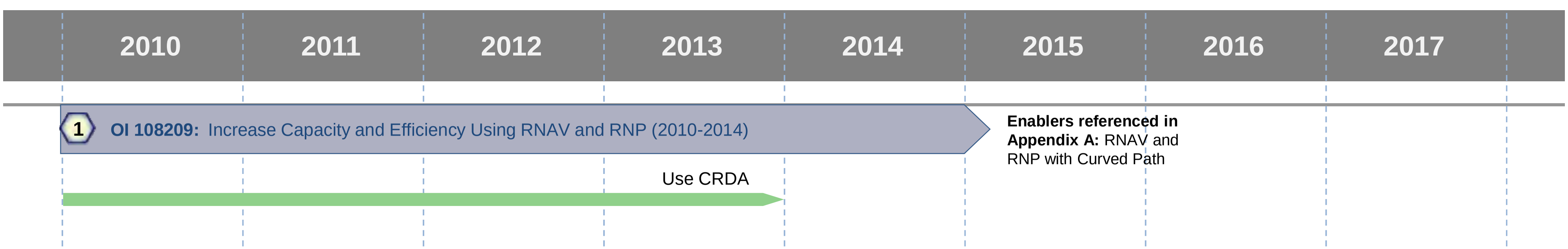
This improvement will explore concepts to recover lost capacity through reduced separation standards, increased applications of dependent and independent operations, enabled operations in lower visibility conditions and changes in separation responsibility between air traffic control (ATC) and the flight deck.
Task Force: Runway Access

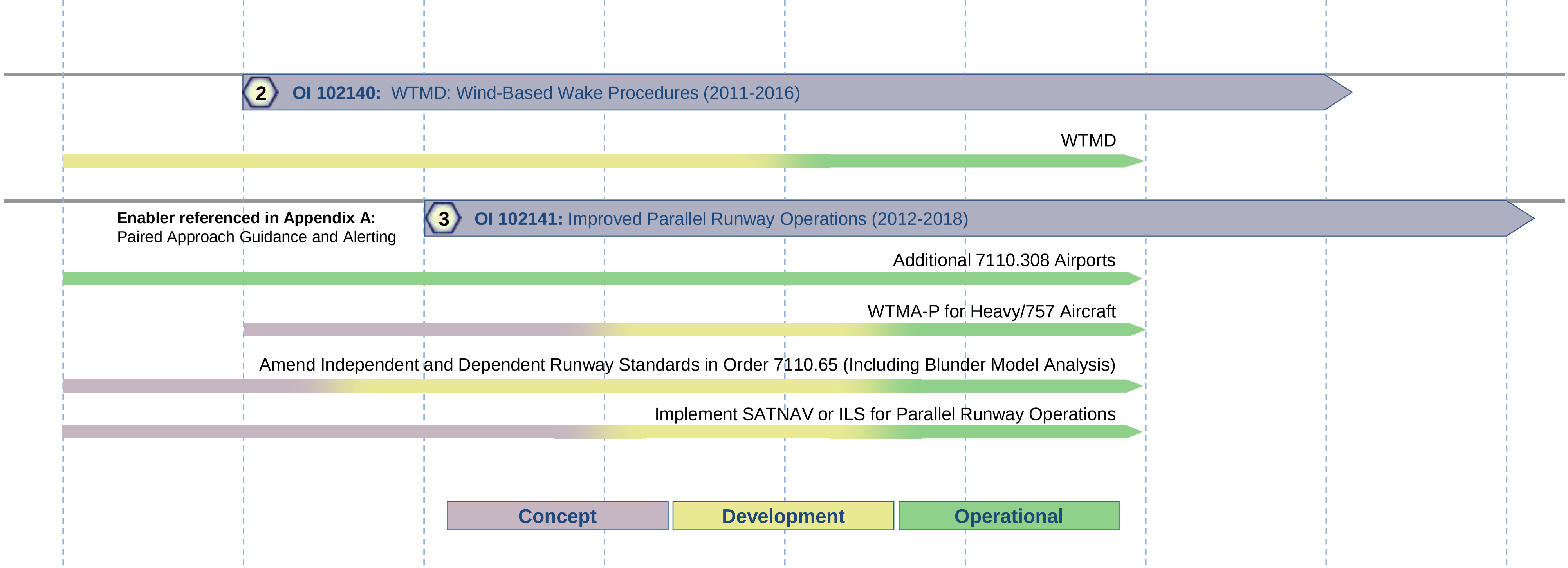
Additional 7110.308 Airports
This increment provides airports with maximum use of closely spaced parallel runways by authorizing participating aircraft to operate at reduced lateral and longitudinal spacing on dependent, instrument approach procedures to runways with centerline spacing less than 2,500 feet. This increment will expand the application of FAA Order 7110.308 beyond the locations and runway ends already approved.
Task Force: Increase Use of Staggered Approaches (12)

Wake Turbulence Mitigation for Arrivals-Procedures (WTMA-P) for Heavy/757 Aircraft
This increment expands the use of procedural dependent staggered approach separation to allow Boeing 757 and heavy aircraft to lead this procedure.

Amend Independent and Dependent Runway Standards in Order 7110.65 (Including Blunder Model Analysis)
This increment amends runway spacing standards to achieve increased access to parallel runways with centerline spacing less than 4,300 feet and implements this change at approved locations.
Task Force: Revise the Blunder Assumptions (13)

Implement SATNAV or ILS for Parallel Runway Operations
This increment will enable policy, standards and procedures to allow use of Satellite Navigation (SATNAV) or Instrument Landing System (ILS) when conducting simultaneous independent and dependent instrument approaches, and implement this new capability at approved locations.
Task Force: Implement CSPO: SATNAV or ILS (37a)





Selected Work Activities

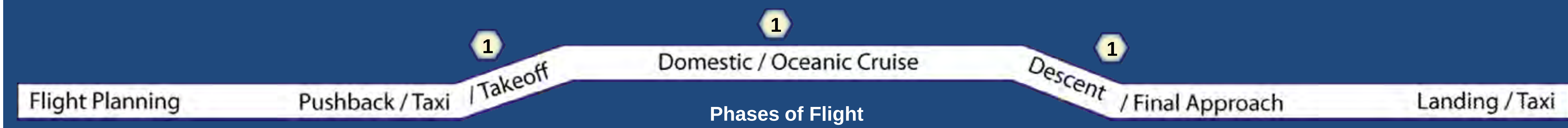
Budget Line	Task Force	Activity	Description	OIs	FY 2010	FY 2011	FY 2012 – Mid-term
Collaborative Air Traffic Management		**Flight and State Data Management, Concept Development for Integrated NAS Design and Procedure Planning**	Develops a framework for integrated National Airspace Design and Procedures planning, enhancements to existing infrastructure to support impact assessments, and develops initial concept for best-equipped, best-served.	108209 102141		• Initiate analysis of equipage and avionics capabilities required through the mid-term to support best-equipped, best-served	• Conduct feasibility assessment of simultaneous ILS, RNP AR descent • Conduct research and analysis associated with the feasibility of the elimination of the requirement of 1,000 feet of altitude separation during simultaneous turn onto final approach
Flexible Terminal Environment		**Separation Management, Wake Turbulence Mitigation for Arrivals (WTMA)**	Evaluates WTMA feasibility prototype at a candidate airport. Concludes detailed benefit and safety assessments for the implementation of WTMA procedures.	102141 102144		• Complete WTMA feasibility prototype evaluation using implementation on chosen simulated automation system	• Complete WTMA concept feasibility prototype evaluation in simulated candidate airport environments • Complete analyses and documentation of WTMA requirements • Evaluate wake mitigation technology solutions

Closely Spaced, Parallel, Converging and Intersecting Runway Operations (cont'd)

Selected Work Activities

Budget Line	Task Force	Activity	Description	OIs	FY 2010	FY 2011	FY 2012 – Mid-term
Flexible Terminal Environment		**Separation Management, Wake Turbulence Mitigation for Departures (WTMD)**	Performs safety risk management analysis, tests and evaluations of wake turbulence mitigation and departure procedures.	102141	✓ Completed prototype of WTMD demonstration system at William J. Hughes Technical Center	• Deliver demonstration to first site, Houston (IAH)	• Complete regional service center engineering and installation of WTMD components in Memphis (MEM) and San Francisco (SFO) ATC towers • Install data links necessary for WTMD operation at MEM and SFO • At IAH, MEM and SFO continue providing: WTMD software adaptation, software maintenance, hardware maintenance (preventive and corrective) on any WTMD unique system components, and daily service certification
Flexible Terminal Environment	37a 13	**Separation Management, Closely Spaced Parallel Runway Operations (CSPO)**	Examines alternate proposals for further reductions of separation standards in runway spacing, and conducts simulator trials to collect data and conduct analysis.	102141	✓ Upgraded CSPO modeling and simulation tool with version 2 software enhancements	• Complete first stage analyses to re-evaluate the blunder model for CSPO and determine the impact on reducing lateral runway separation standards	• Conduct further Human-in-the-Loop (HITL) tests to evaluate operational application for Dual ILS/RNAV/ Precision Runway Monitor (PRM)/ Wake/Blunder/ADS-B • Develop Safety Management System requirements for approaches at reduced separation standards in runway spacing • Determine minimum spacing for simultaneous independent approaches • Conduct demonstrations to validate concept and requirements and obtain buy-in from stakeholders • Develop and coordinate Safety Risk Management Document (SRMD) for approaches at reduced separation standards for runway spacing • Continue CSPO blunder model enhancements • Continue HITL activities to support CSPO • Continue to implement procedures for CSPO at additional airports

Performance Based Navigation



Phases of Flight

1 OI 108209: Increase Capacity and Efficiency Using RNAV and RNP

Area Navigation (RNAV) and Required Navigation Performance (RNP) can enable more efficient aircraft trajectories. RNAV and RNP, combined with airspace changes, increase airspace efficiency and capacity.
Task Force: Metroplex, Cruise and Overarching

Integrated Airspace and Procedures

Optimization of Performance Based Navigation (PBN) Procedures

Additional teams of stakeholders will be created to address short-term PBN procedures optimization.
Supported By: Aeronautical Common Service
Task Force: Optimize and Increase RNAV Procedures (32a and 29)

Large-Scale Redesign of Terminal and Transition Airspace Leveraging PBN

The Integrated Airspace and Procedures approach provides a geographic focus to problem solving, with a systems view of PBN initiatives, to the design of airspace.
Supported By: Aeronautical Common Service
Task Force: Integrate Procedure Design to Deconflict Airport, Implement RNP with RF Capability, and Expand Use of Terminal Separation Rules (4, 21a and 32b), Increase Capacity and Throughput for Converging and Intersecting Runways (9)

Transition to PBN Routing for Cruise Operations

This approach augments the conventional NAVAID-based Jet and Victor airways with RNAVs, including Q-routes and T-routes.
Supported By: Aeronautical Common Service
Task Force: Develop RNAV-Based En Route System (30)

Navigation System Infrastructure

NextGen En Route Distance Measuring Equipment (DME) Infrastructure

Additional DME coverage over the continental United States is needed to optimize and expand RNAV routes by closing coverage gaps at and above Flight Level 240.

Tools/Automation

Relative Position Indicator (RPI)

RPI is a tool that can assist both the controller and traffic management in managing the flow of traffic through a terminal area merge point.

Automated Terminal Proximity Alert (ATPA)

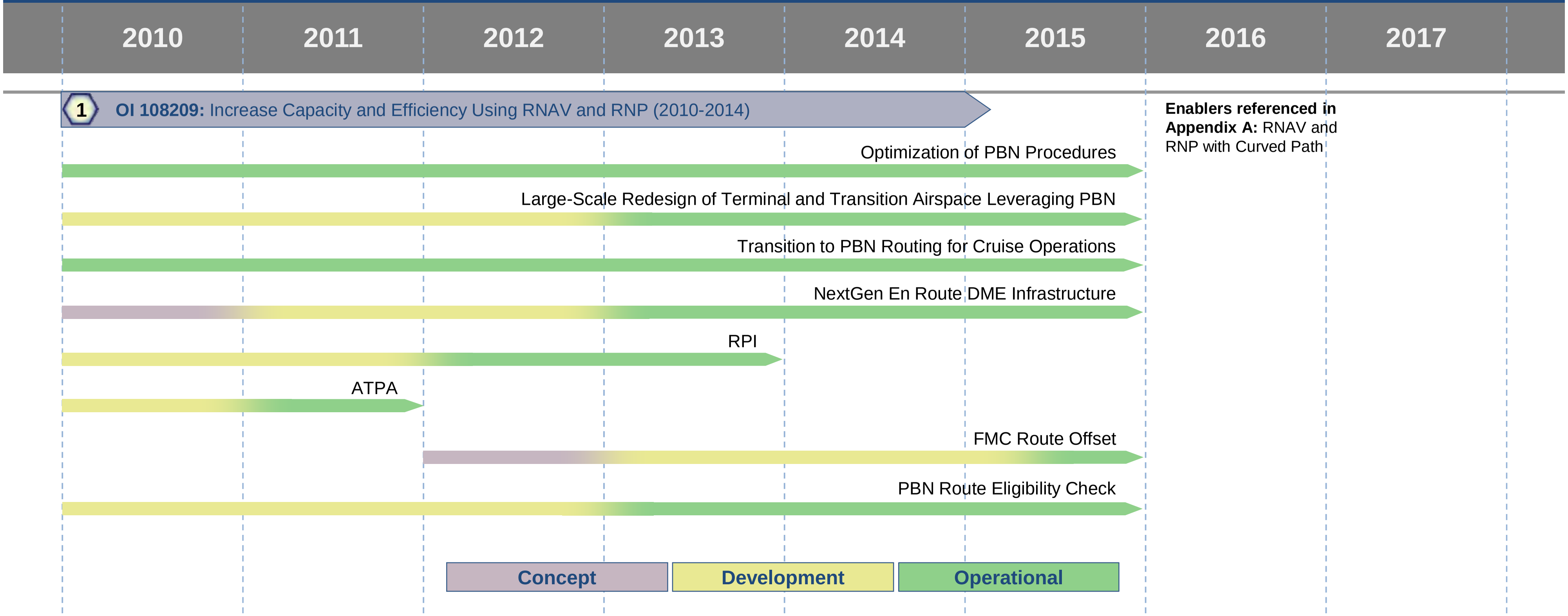
ATPA is an air traffic control (ATC) automation tool that provides situational awareness and alerts to controllers on color displays of Common Automated Radar Terminal System (CARTS) and on Standard Terminal Automation Replacement System (STARS) displays.
Task Force: Achieving Existing 3- and 5-Mile Separation Standards

FMC Route Offset

Automation provides controllers with support to amend an aircraft's flight plan to indicate that it has been placed on, or has been taken off, a Flight Management Computer (FMC) lateral offset.
Supported By: Flight Common Service

PBN Route Eligibility Check

En Route Automation will check the eligibility of aircraft to operate on performance-restricted routes.
Supported By: Flight Common Service



Selected Work Activities

Budget Line	Task Force	Activity	Description	OIs	FY 2010	FY 2011	FY 2012 – Mid-term
Operations	4 21a 32b	**New York/New Jersey/ Philadelphia Metropolitan Area Airspace Redesign**	Increases efficiency and reliability of the airspace structure and ATC to accommodate growth while enhancing safety, reducing delay and taking advantage of new technologies. This project encompasses a complete redesign of the airspace in the New York and Philadelphia metropolitan areas. It capitalizes on PBN, higher downwind segments for arrival aircraft, unrestricted departure climbs, fanned departure headings and holding in terminal airspace. The four implementation stages started in December 2007 and are planned through 2012.		✓ Completed initial designs supporting Stage 2A implementation decision	• Implement Stage 2A	• Implement remaining stages • Complete airspace designs for remaining stages
Operations	4 21a 32b	**Chicago Airspace Project**	Encompasses significant increases in en route departure throughput with several new departure routes planned (east, west and south) and supports the O'Hare Modernization Project (OMP) with new arrival routes and airspace to capitalize on the new runways at O'Hare. The project also includes efficiencies for other airports in the Chicago area. The three implementation stages started in March 2007 and are planned through 2013.		✓ Completed airspace design for Stage 3 High and Wide ✓ Completed environmental design review	• Initiate ZAU airspace divestitures to Grissom Air Reserve Base to enable a 10-sector low altitude redesign which will improve efficiency and reduce complexity	• Implement Stage 3 (coincident with OMP runway 10C/28C completion)

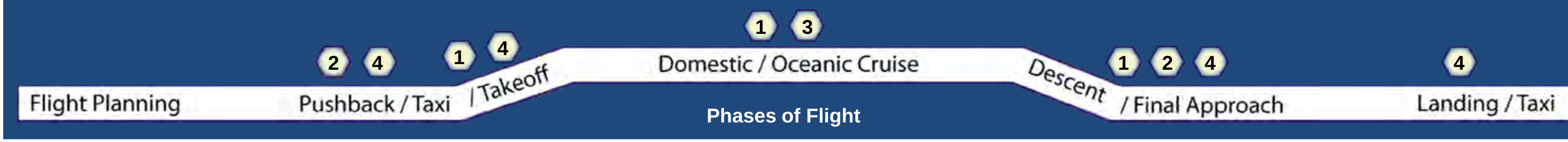
Budget Line	Task Force	Activity	Description	OIs	FY 2010	FY 2011	FY 2012 – Mid-term
Operations	4 21a 32b	**Las Vegas Optimization Project**	Provides near-term modification of airspace and procedures supporting the Las Vegas Valley. This effort is developing new PBN departure and arrival routes and realigning airspace to increase efficiency at McCarran International Airport and surrounding satellite airports. The implementation is planned to start in June 2011 and continue through 2013.		✓ Developed RNAV procedures for Henderson Executive Airport scheduled to be published in 2011 ✓ Modified 2 existing DME to accommodate current DME operational requirement	• Complete Las Vegas optimization environmental assessment • Complete Henderson procedure optimization	• Implement Las Vegas procedure optimization
Operations	32a 29	**Metroplex Optimization of Airspace and Procedures**	Expedites versions of Integrated Airspace and Procedures projects, but with an expedited life cycle of two to three years from planning to implementation. The focus of these efforts is on implementation of optimized PBN arrivals and departures and airspace changes to support optimal routings. This concept is based on a two-team approach: study teams and design/implementation teams.		✓ Simulated study team process to identify limitations and recommend modifications prior to deployment of actual study teams ✓ Initiated 2 prototype study teams in north Texas and Washington, D.C., metroplexes	✓ Selected next 5 sites for deployment of study teams. These sites are: Atlanta, Houston, Southern California, Northern California and Charlotte, N.C. • Initiate 2-3 design/ implementation teams to provide a systematic, effective approach to the design, evaluation and implementation of PBN-optimized airspace and procedures	• Continue design/implementation teams to provide a systematic, effective approach to the design, evaluation and implementation of PBN-optimized airspace and procedures
Operations	32a 29	**PBN Procedures**	Adds efficiency with new PBN procedures and optimizes existing initial capability PBN procedures. Most of the procedures have proponents from industry and/or ATC. These PBN procedures address location-specific safety issues and efficiencies.		✓ Implemented a total of 200 PBN routes and procedures including 51 routes, 90 RNAV Standard Instrument Departures (SIDs) and Standard Terminal Arrival Routes (STARs), and 59 RNP Authorization Required approach procedures ✓ Developed initial PBN routes and procedures designs for integrated procedures and airspace project at Denver	• Continue integrated design and implementation of the PBN procedures at Denver • Continue to implement PBN routes and procedures in the NAS	• Continue to implement user requested PBN procedures
Operations	30	**En Route PBN – Q-Routes**	Continues development and implementation of PBN Q-routes as the national routing infrastructure.		✓ Developed a draft Q-route implementation plan ✓ Initiated development of Q-routes	• Finalize the Q-route implementation plan and initiate the implementation process	• Continue the Q-route implementation plan

Performance Based Navigation (cont'd)

Selected Work Activities

Budget Line	Task Force	Activity	Description	OIs	FY 2010	FY 2011	FY 2012 – Mid-term
Operations		**National Airspace and Procedures Plan**	Represents the agreements and commitments of the FAA to modernize the airspace and procedures to solve problems in core areas. Also, it includes evolutionary activities such as concepts and demonstrations related to airspace and PBN.		✓ Published Version 1 as the baseline of the current NAS	• Continue Airspace Management Program legacy projects • Complete annual PBN procedure development goals; transition to benefits-based service goals • Focus on optimal altitude procedures • Use metroplex teams to drive optimization and decisions on Integrated Airspace and Procedures projects • Execute multi-year plan for Q-route development and implementation	• Transition to Integrated Airspace and Procedures approach for airspace and PBN procedures efforts • Use results of demonstration efforts and concept exploration experiments, which should be available to inform decisions about inclusion of future concepts (e.g., Integrated Arrival/Departure Operations and High Altitude Trajectory Based Airspace)
Trajectory Based Operations		**Capacity Management - NextGen DME**	Provides the necessary equipment enhancements, relocations, and replacements to ensure that DME facilities are available in accordance with the FAA's NextGen Implementation Plan.	108209		• Award contract	• Develop recommendation on future program plans based on FY 2010-2011 deliverables and associated requirements to fill the gaps to enable Performance Based Navigation in the high altitude route structure • Deploy NextGen DME
Flexible Terminal Environment	9	**Separation Management, Enhancing Terminals and Airports - Terminal Enhancements for RNAV ATC**	Performs analysis, systems engineering and support modifications and improvements to STARS and CARTS to support merging multiple RNAV routings in the terminal environment.	108209	✓ Developed demonstration/ Human-in-the-Loop (HITL) test plan	• Develop Prototype demonstration/HITL consolidated report • Conduct impact assessment – trade study for HITL	
Trajectory Based Operations		**Separation Management, Modern Procedures (Separation Automation Enhancements, Data-Side and Radar-Side)**	Performs pre-implementation activities necessary to transition separation management automation enhancements for implementation and continued functionality for PBN route eligibility checking for inclusion in En Route Automation Modernization Release 3.	108209	✓ Delivered variable separation concept of operations	• Continue development of PBN Conformance Monitor and Alert	• Develop, evaluate and validate improvements to the strategic conflict detection and prediction algorithms, the trajectory model, and the conflict alert algorithms • Develop, evaluate and validate the requirements for flight data display enhancements to support elimination of flight strips in non-surveillance airspace • Provide regulated access to specific aircraft using dynamic special activity airspace to promote fuller use of available airspace • Complete prototype development for FMC Route Offset
Demonstration		**RNAV/RNP Demonstration**	Demonstrates the safe and effective integration of public RNP operations in a mixed-equipage traffic environment at a small/medium airport.			• Initiate RNAV/RNP terminal area demonstration at a small/medium airport	• Conduct demonstrations and operational trials on technologies, supporting safety logic, air traffic management and aircraft performance to identify any uncertainty or deficiency (risks) to performance and/or to validate the integration and/or implementation of NextGen technologies, applications, procedures and/or standards

Time Based Flow Management



1 OI 104115: Current Tactical Management of Flow in the En Route for Arrivals/Departures

Proper spacing end sequencing of air traffic maximizes National Airspace System (NAS) efficiency and capacity in the arrival and departure phases of flight.
Task Force: Cruise

Implement Traffic Management Advisor's (TMA) Adjacent Center Metering (ACM) Capability at Additional Locations

To expand the benefits of time-based metering and Time Based Flow Management's (TBFM) other advanced flow management capabilities, ACM will be implemented at the following additional locations: LAX — ACM from ZAB and ZLA; SFO — ACM from ZSE, ZOA, ZLA and ZLC; SAN — ACM from ZLA and ZOA; ATL — ACM from ZDC and ZHU; and IAD — ACM from ZNY.
Supported By: Weather and Flight Common Services
Task Force: Expand Use of Time-Based Metering (24)

Implement TMA at Additional Airports

To expand the benefits of time-based metering and TBFM's other advanced flow management capabilities, TBFM will be implemented at the following additional locations: Baltimore, Md. (BWI); Cleveland, Ohio (CLE); Washington, D.C. (DCA); San Diego, Calif. (SAN); Morristown, N.J. (MMU); Teterboro, N.J. (TEB).
Supported By: Weather and Flight Common Services
Task Force: Expand Use of Time-Based Metering (24)

2 OI 104123: Time-Based Metering Using RNAV and RNP Route Assignments

Area Navigation (RNAV), Required Navigation Performance (RNP) and Time-Based Metering (TBM) provide efficient use of runways and airspace in high-density airport environments. Metering automation will manage the flow of aircraft to meter fixes, thus permitting efficient use of runways and airspace.

Use RNAV Route Data to Calculate Trajectories Used to Conduct TBM Operations

The Terminal Radar Approach Control (TRACON) RNAV routes for both Standard Instrument Departures (SIDs) and Standard Terminal Arrival Routes (STARs) will be used to calculate the terminal component of aircraft trajectories.
Supported By: Aeronautical Common Service

3 OI 104120: Point-in-Space Metering

Air Navigation Service Provider (ANSP) uses scheduling tools and trajectory-based operations to assure smooth flow of traffic and increase the efficient use of airspace.

Extended Metering

Will provide flow deconfliction for metered aircraft at the meter reference points (upstream from the meter fixes).
Supported By: Weather and Flight Common Services

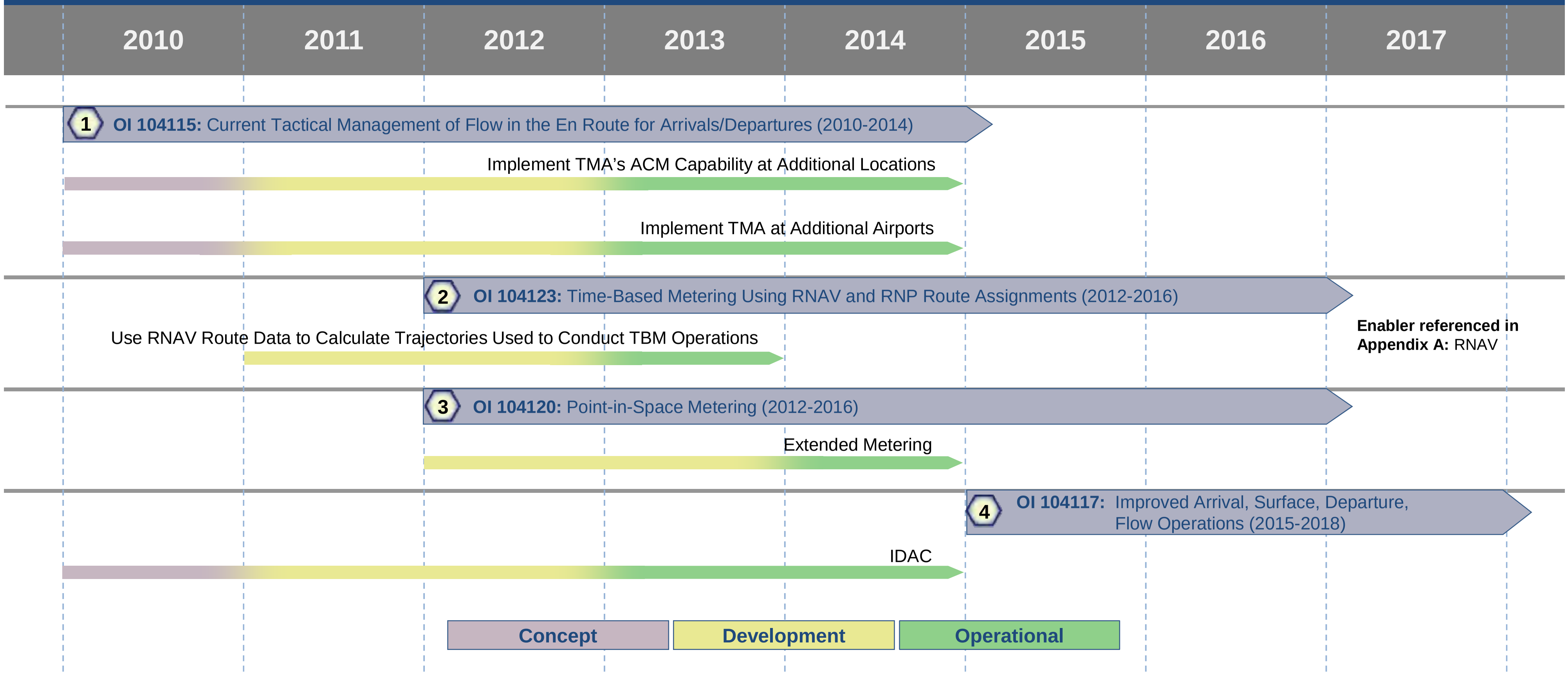
4 OI 104117: Improved Arrival, Surface, Departure, Flow Operations

This integrates advanced arrival/departure flow management with advanced surface operation functions to improve overall airport capacity and efficiency.

Integrated Departure/Arrival Capability (IDAC)

Increases NAS efficiency and reduces delays by providing decision-making support capabilities for departure flows. IDAC automates the process of monitoring departure demand and identifying departure slots for tower personnel.
Supported By: Weather and Flight Common Services

Time Based Flow Management (cont'd)



Selected Work Activities

Budget Line	Task Force	Activity	Description	OIs	FY 2010	FY 2011	FY 2012 – Mid-term
Trajectory Based Operations		**Trajectory Management, En Route (Point-in-Space Metering)**	Supports the FAA Air Traffic Organization mission by increasing the efficiency of the air traffic operations and reducing users' delays through the use of TBM.	104120	✓ Completed TBFM concept of operations ✓ Developed coupled scheduling design and requirements documentation		
Arrivals/ Departures at High Density Airports	7b 8 46 24	**Trajectory Management – Arrival Tactical Flow (TBO – En Route Point-in-Space Metering)**	Provides a consistent flow of traffic to the runway using TBM. TMA/TBFM is an Air Route Traffic Control Center (ARTCC)-based decision-support tool designed to optimize the flow of aircraft into capacity constrained areas.	104115	✓ Developed TBFM business case documentation (shortfall analysis, concept of use, cost Rough Orders of Magnitude, projected benefits, architecture artifacts, implementation strategy) and program baseline approval ✓ Developed TBFM training requirements		

Budget Line	Task Force	Activity	Description	OIs	FY 2010	FY 2011	FY 2012 – Mid-term
Time Based Flow Management		**Time Based Flow Management (TBFM)**	Provides a consistent flow of traffic to the runway using TBM. TMA/TBFM is an ARTCC-based decision-support tool designed to optimize the flow of aircraft into capacity constrained areas.	104115		• Develop, test and deploy coupled scheduling capability, incorporating deconflicted metering points in ARTCC airspace and enabling the subsequent extended metering capability • Initiate site survey and adaptation activities to implement ACM at additional locations and TMA at additional airports • Initiate development of detailed requirements analysis for the IDAC	• Develop, test and deploy extended metering, IDAC and the capability to apply RNAV routes to calculate trajectories • Deploy ACM and the TMA capabilities to additional locations in the NAS
Flexible Terminal Environment	43 38 9 41	**Flight and State Data Management, Surface/Tower/ Terminal Systems Engineering**	Redefines and extends the Tower Flight Data Manager (TFDM) and Arrival/Departure Management Tool (A/DMT) concept of operations. Funding will be used to update current analysis proposals and assess acquisition risks.	104117	✓ Completed TFDM Investment Analysis Readiness Decision	• Conduct TFDM evaluations and demonstrations • Conduct Human-in-the-Loop tests to finalize TFDM concept of use	• Develop concept of operations for TFDM Phase 2 • Develop operation evaluation model • Develop TFDM Phase 2 prototype • Conduct demonstrations of TFDM Phase 2
Collaborative Air Traffic Management	35	**Flight and State Data Management, Common Status and Structure Data**	Addresses information and capability gaps within aeronautical information to achieve NextGen shared situational awareness.	104117	✓ Developed concept of operations and Enterprise Architecture for a national Special Activity Airspace	• Deliver digital airport structure and configuration information to support situational awareness	• Develop concepts for common adaptation to support base information for TBFM activities • Initiate limited deployment of standards-based common adaptation to NAS
Demonstrations		**Demonstrations and Infrastructure Development**	Tests and demonstrates emerging technologies as they are developed to allow the FAA to meet the NextGen mid-term goals and objectives.		✓ Conducted 2D Aircraft Flight Trial in Denver		

Collaborative Air Traffic Management

1 OI 105302: Continuous Flight Day Evaluations

Continuous (real-time) constraints are provided to Air Navigation Service Provider (ANSP) traffic management decision-support tools and the National Airspace System (NAS) users.

Enhanced Congestion Prediction

The Enhanced Congestion Prediction increment provides improved capabilities to assess the impact of a set of reroutes on the level of demand and other performance metrics for a point of interest.
Supported By: Aeronautical and Weather Common Services

Automated Congestion Resolution

The Automated Congestion Resolution increment recommends reroutes for flight-specific Traffic Management Initiatives (TMIs). This allows the traffic manager to adjust the target parameters and evaluate the required trajectory adjustments.
Supported By: Aeronautical and Weather Common Services

2 OI 101102: Provide Full Flight Plan Constraint Evaluation

Constraint information that impacts the proposed route of flight is incorporated into ANSP automation, and is available to users.
Task Force: Integrated Air Traffic Management

Electronic Negotiations

The Electronic Negotiations increment provides flight planners with information about congestion along their intended routes and proposes flight-specific rerouting.
Supported By: Weather Common Service
Task Force: Integrated System-Wide Approach (CDM/TFM/ATC) (47) and Improve CATM Automation to Negotiate User-Preferred and Alternative Trajectories (7b, 8 and 46)

3 OI 105208: TMIs with Flight-Specific Trajectories

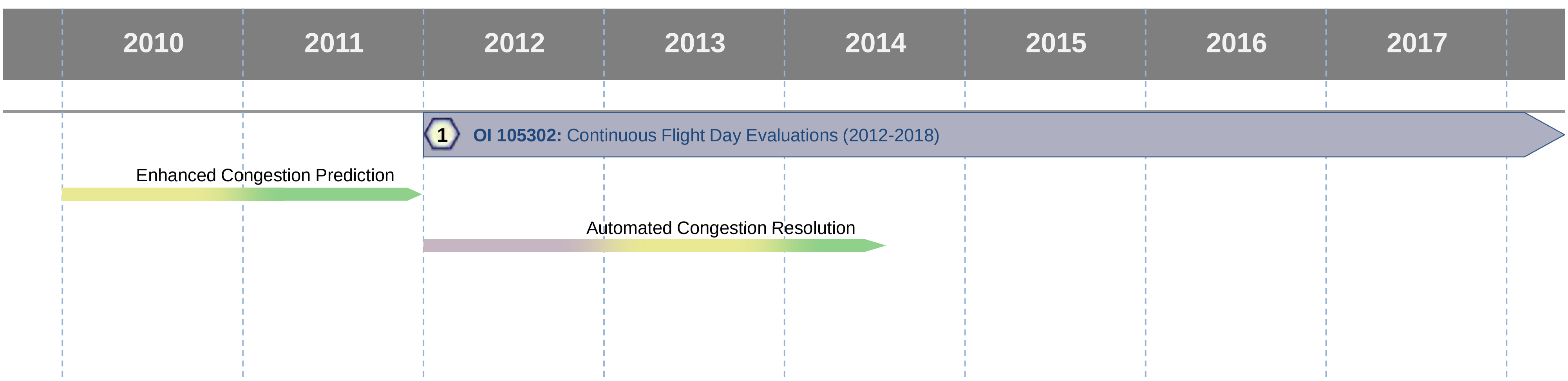
This capability will increase the agility of the NAS to adjust and respond to dynamically changing conditions such as impacting weather, congestion and system outages.
Task Force: Integrated Air Traffic Management and Data Comm

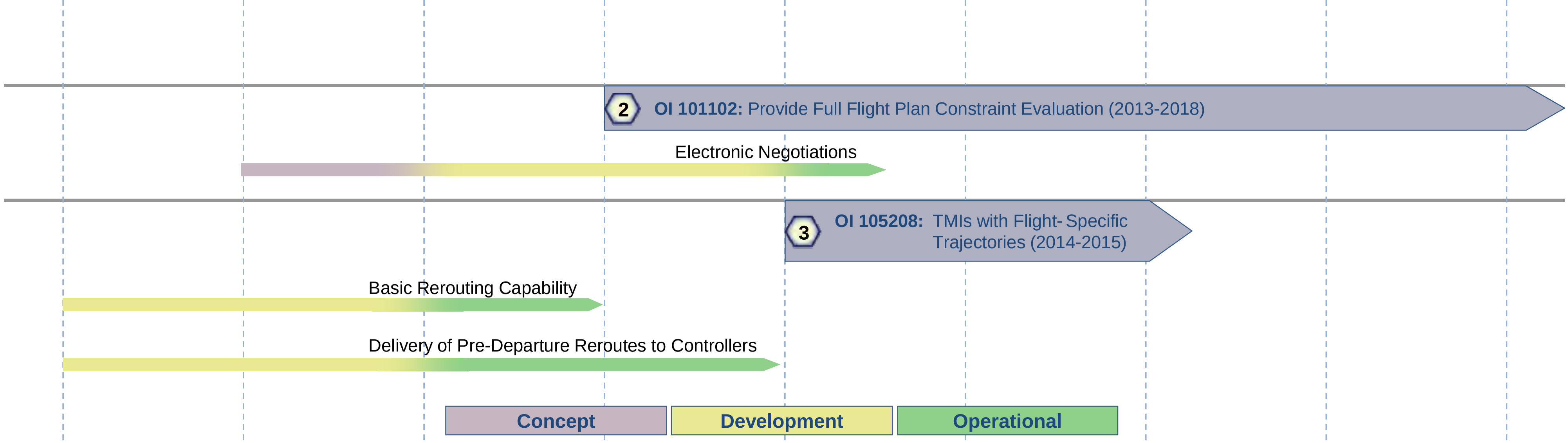
Basic Rerouting Capability

This capability is the means by which Traffic Flow Management System (TFMS)-generated reroutes are defined and transmitted via System Wide Information Management (SWIM).
Supported By: Flight and Weather Common Services

Delivery of Pre-Departure Reroutes to Controllers

This increment will give En Route Automation Modernization (ERAM) additional capabilities to receive amended routes pre-departure and provide updated flight data to the tower.
Supported By: Flight Common Service
Task Force: Improve CATM Automation to Negotiate User-Preferred Routes and Alternate Trajectories (7b, 8 and 46) and Digital Air Traffic Control Communications for Revised Departure Clearances, Reroutes and Routine Communications (39)





Selected Work Activities

Budget Line	Task Force	Activity	Description	OIs	FY 2010	FY 2011	FY 2012 – Mid-term
Collaborative Air Traffic Management	7b 8 46	**Flow Control Management, Strategic Flow Management Integration (Integration Execution of Flow Strategies into Controller Tools)**	Refines active aircraft reroutes concepts; develops active aircraft reroute requirements; analyzes, simulates and develops white papers on active aircraft reroutes.	105208	✓ Developed concept of operations for airborne reroutes, altitude modification, etc.	• Conduct analysis for airborne reroute requirements	• Conduct risk reduction analysis and integration engineering products for strategic flow use of airborne reroutes in support of integrated arrival/departure management • Implement pre-departure reroutes in ERAM with no automated coordination with Terminal and simulations of airborne reroute procedures
Collaborative Air Traffic Management	47	**Flow Control Management, Strategic Flow Management Enhancement (Enhancing the Strategic Flow Program)**	Refines concept of operations for strategic flow management, analysis and white paper of strategic flow management, and modeling and simulation.	105208 101102	✓ Developed initial Traffic Flow Management (TFM) concept of operations document	• Initiate demand and capacity balancing demonstration • Deliver report that evaluates the business logic for balancing capacity and demand predictions	• Develop more efficient and tailored combinations of traffic management initiatives for strategic flow management through concept engineering, including prototypes traffic analysis tools and Human-in-the-Loop (HITL) simulations
Collaborative Air Traffic Management	47	**Flight and State Data Management, Common Status and Structure Data**	Addresses information and capability gaps within aeronautical information to achieve NextGen shared situational awareness and Trajectory Based Operations vision.	105302 105208	✓ Developed concept of operations and Enterprise Architecture for a National Special Activity Airspace	• Deliver digital airport structure and configuration information to support situational awareness	• Develop concepts for common adaptation to support base information for CATM activities • Begin limited deployment of standards-based common adaptation to NAS

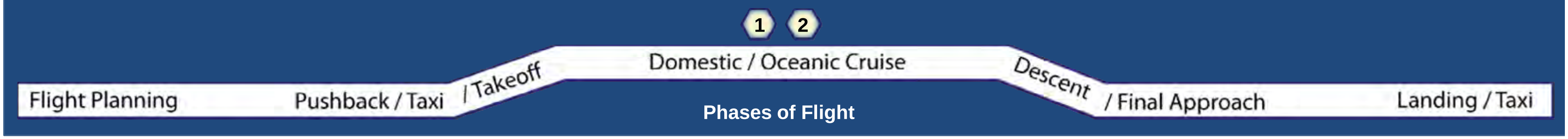
Collaborative Air Traffic Management (cont'd)

Selected Work Activities

Budget Line	Task Force	Activity	Description	OIs	FY 2010	FY 2011	FY 2012 – Mid-term
Collaborative Air Traffic Management		**Flight and State Data Management, Advanced Methods**	Integrates weather into air traffic management (ATM); probabilistic TFM Area Flow Program will develop advanced algorithms to support the area flow support tool. Creates a unified flight planning filing by continuing assessment of fuzzy performance and common reference to the ATM domain.	105302 105208 101102	✓ Developed requirement recommendations for integrated weather in ATM	• Apply industry standards exchange formats for inclusion in decision-support tools	• Complete prototypes, concepts of use and demonstrate unified flight planning and filing making use of constraint management through a hypercube and supporting probabilistic TFM models with integrated weather
Collaborative Air Traffic Management		**Flight and State Data Management, Flight Object**	Facilitates the sharing of common flight information between systems and enables collaboration using common reference framework. The Flight Object is an extensible and dynamic collection of data elements that describes an individual flight throughout its life cycle. It is the single common reference for all system information about that flight. It associates and merges disparate data into a cohesive picture of the flight. Authorized system stakeholders and the ANSP may electronically access consistent flight data that is tailored to their specific need and use. A Flight Object is created for each proposed flight. The Flight Object description does not include environment or weather information since these are system-wide elements which affect multiple flights.	101102	✓ Hosted the Flight Object Industry Day ✓ Completed development of an initial Flight Object Data Dictionary	• Deliver the Flight Object global flight identifier report • Deliver the high-level Flight Object benefit approach report	• Continue to develop Flight Object Data Dictionary • Continue to model Flight Object data • Host joint Flight Object and aeronautical information Industry Days • Conduct international demonstration of Flight Object with Asia Pacific partners
System Development		**ATM Requirements, Airborne System Wide Information Management (SWIM)**	Develops concepts and requirements for an airborne exchange of NAS information via the SWIM network for flight, aeronautical and weather information between aircraft and ground-based FAA systems.	105302	✓ Developed and delivered initial airborne SWIM concept of use ✓ Developed white paper identifying technical impacts to SWIM portals	• Conduct airborne access to SWIM concept of use v2 (Industry Review) • Conduct airborne access to SWIM Operational and Technical Requirements Industry Day	• Conduct airborne access to SWIM laboratory simulations • Conduct airborne access to SWIM Initial Verification and Validation

Budget Line	Task Force	Activity	Description	OIs	FY 2010	FY 2011	FY 2012 – Mid-term
Collaborative Air Traffic Management		**Dynamic Airspace and Capacity Management**	Provides the tools to air traffic managers to reconfigure airspace, expand or contract control sectors to match the overall level of activity in the facility's airspace, and to dynamically deactivate restrictions. The Airspace Resource Management System (ARMS) will provide the tools for controlling the reconfiguration of the NextGen networked communications infrastructure in response to an operational requirement for reconfigurable airspace.		✓ Developed multi-year program plan	• Develop preliminary ARMS concept of operation document • Deliver white paper on ARMS functional description	• Develop ARMS evaluation model • Conduct demonstration of ARMS prototype
System Development		**ATC/Technical Operations Human Factors, Controller Efficiency/Air Ground Integration**	Centers on the human element in the transformation of the NAS leading to the achievement of the NextGen vision.	101102	✓ Developed initial air/ground integration simulation roadmap	• Develop NextGen common workstation demo display simulation	• Demonstrate Collaborative Air Traffic Management efficiencies enabled by common situational awareness between flight operators and controllers

Automation Support for Separation Management



1 OI 102108: Oceanic In-Trail Climb and Descent

Air Navigation Service Provider (ANSP) automation enhancements will take advantage of improved communication, navigation and surveillance coverage in the Oceanic domain. When authorized by the controller, pilots of equipped aircraft use established procedures for climbs and descents.

Automatic Dependent Surveillance-Contract (ADS-C) Oceanic Climb/Descent Procedure (CDP)

The ADS-C CDP (previously known as ADS-C In-Trail Procedure (ITP)) is a new concept that allows a properly equipped aircraft (e.g., Future Air Navigation System (FANS) 1/A equipage) to climb or descend through the altitude of another properly equipped aircraft with a reduced longitudinal separation distance (compared with the required longitudinal separation minima for same-track, same-altitude aircraft). This procedure allows more aircraft to reach their preferred altitude.

ADS-C Automation for Oceanic CDP

The automation enhancements to Ocean21 include capabilities to allow a controller to select two aircraft and ensure they are eligible for ADS-C CDP, send concurrent on-demand position reports to two aircraft, determine if the minimum separation distance between the two aircraft is greater than the ADS-C CDP separation distance (e.g., greater than 15 nautical miles (nm)), display the ADS-C CDP conflict probe results to a controller, and build an uplink clearance message to the ADS-C CDP requesting aircraft and an uplink traffic advisory message to the blocking aircraft.

Automatic Dependent Surveillance-Broadcast (ADS-B) Oceanic ITP and Automation

The ADS-B ITP will enable aircraft equipped with ADS-B and appropriate onboard automation to climb and descend through altitudes where current non-ADS-B separation standards would prevent desired altitude changes.

Supported By: Surveillance Common Service

2 OI 102137: Automation Support for Separation Management

ANSP automation provides the controller with tools to manage aircraft in a mixed navigation and wake performance environment.

Aircraft-to-Aircraft Alerts for 3-nm Separation Areas

En route conflict alert will be enhanced to support wake vortex separation requirements in 3-nm separation areas and transition airspace. Problem detection and trial planning capabilities will also be enhanced to support aircraft-to-aircraft alerts in 3-nm separation areas and transition airspace, to include alerts based on wake vortex separation requirements.

Wake Vortex Separation Indicator

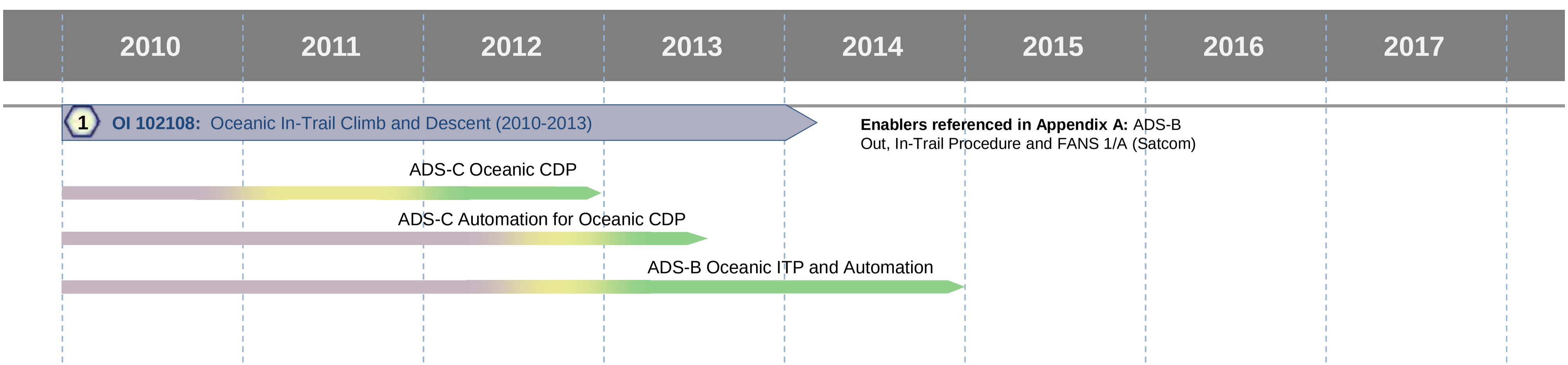
To support the en route controller in applying wake turbulence separation standards, the radar display will indicate static wake vortex separation requirements for any given pair of aircraft.

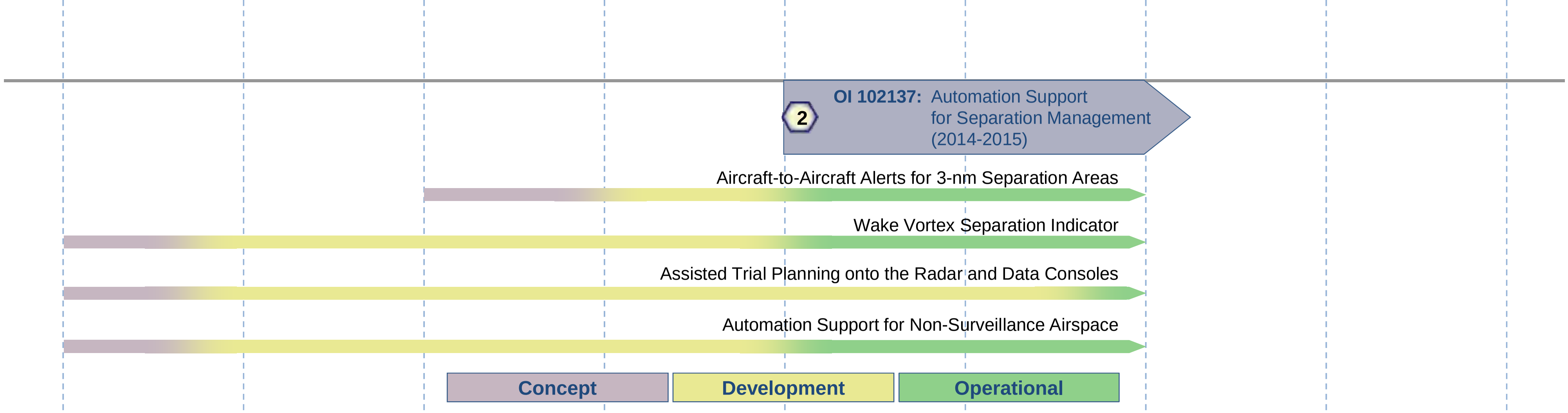
Assisted Trial Planning Onto the Radar and Data Consoles

Assisted Trial Planning will be integrated on the en route radar and the data consoles. Integrating this capability into the consoles assists radar controllers in determining possible problem-free flight plan changes without having to use the data consoles to create trial plans. A controller will also be able to use this capability to simultaneously examine the problem status of a set of possible clearances.

Automation Support for Non-Surveillance Airspace

The en route automation will provide an indication of possible non-surveillance separation violations using a base set of non-surveillance separation rules. This capability will also utilize electronic flight data, eliminating the need for paper flight strips.

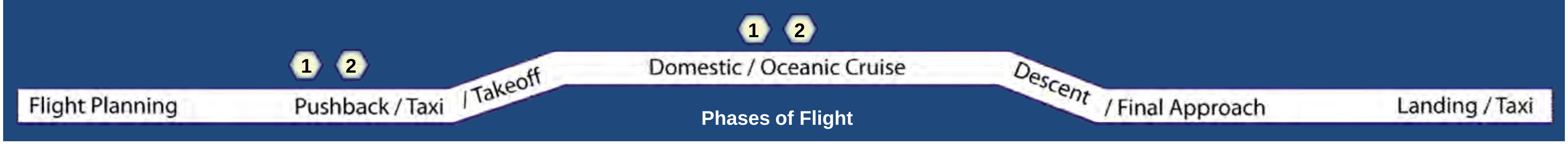




Selected Work Activities

Budget Line	Task Force	Activity	Description	OIs	FY 2010	FY 2011	FY 2012 – Mid-term
Trajectory Based Operations		**Oceanic Tactical Trajectory Management**	Addresses current performance gaps in the areas of capacity, productivity, efficiency, safety and environmental impacts in oceanic environment.	102108	✓ Delivered concept of operations for In-Flight Operations Re-Profile Alert capability	• Initiate planning for 2012 operational trials	• Complete functional requirements for ADS-C climb and descent procedure • Complete preliminary requirements for pre-departure and Web-enabled Collaborative Trajectory Planning (CTP) • Conduct lab demonstration for pre-departure CTP • Initiate operational trial for Trajectory Feedback In-Flight Operations
Demonstration		**International Air Traffic Interoperability**	Contributes directly to NextGen concepts and supports international collaboration and harmonization, thus assisting the FAA and international communities to validate 4D Trajectory Based Operations alternatives (AIRE/ASPIRE).		✓ Conducted joint gate-to-gate demonstration with Single European Sky Air Traffic Management Research (SESAR)	• Conduct trans-oceanic optimization demonstrations	• Conduct trans-oceanic optimization demonstrations • Deliver trans-oceanic demonstration report • Deliver trans-oceanic demonstration metrics report • Collaborate internationally
Trajectory Based Operations		**Separation Management, Modern Procedures (Separation Automation Enhancements, Data-Side and Radar-Side), Vertical Separation**	Develops a separation management concept of operations. Develops initial automation requirement to assist in separation of aircraft in traditional traffic situations.	102137	✓ Delivered separation management concept of operations	• Initiate pre-implementation prototype development for Wake Vortex Separation and extend 3-nm separation	• Develop, evaluate and validate improvements to the strategic conflict detection and prediction algorithms, the trajectory model, and the conflict alert algorithms • Develop, evaluate and validate the requirements for flight data display enhancements to support elimination of flight strips in non-surveillance airspace • Dynamic special activity airspace to promote the fuller use of available airspace by providing regulated access to specific aircraft

On-Demand NAS Information



1 OI 108212: Improved Management of Airspace for Special Use

Changes to status of airspace for special use are readily available for operators and Air Navigation Service Providers (ANSPs). The status changes are transmitted to the flight deck via voice or Data Communications. Flight trajectory planning is managed dynamically based on real-time use of air-space.

ANSP Real-Time Status for Special Use Airspace (SUA)

Airspace use is optimized and managed in real time, based on actual flight profiles and real-time operational use parameters. Airspace reservations for military operations, unmanned aircraft systems flights, space flight re-entry and restricted or warning areas are managed on as-needed basis.

Supported By: Aeronautical Common Service

Special Activity Airspace (SAA) Forecast of Capacity Constraints

This increment translates the SUA activation schedule and knowledge of the airspace configurations into predicted traffic flow constraints.

Supported By: Aeronautical Common Service

2 OI 103305: On-Demand NAS Information

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

Broadcast Flight and Status Data to Pilots/Airline Operations Centers (AOCs)

This increment provides nationwide service coverage to deliver Traffic Information Services-Broadcast (TIS-B) for both Universal Access Transceiver (UAT) and 1090 MHz Mode S Extended Squitter (1090 ES).

Supported By: Surveillance and Weather Common Services

Provide Improved Flight Planning and In-Flight Advisories for Flight Operations Centers (FOCs)/AOCs

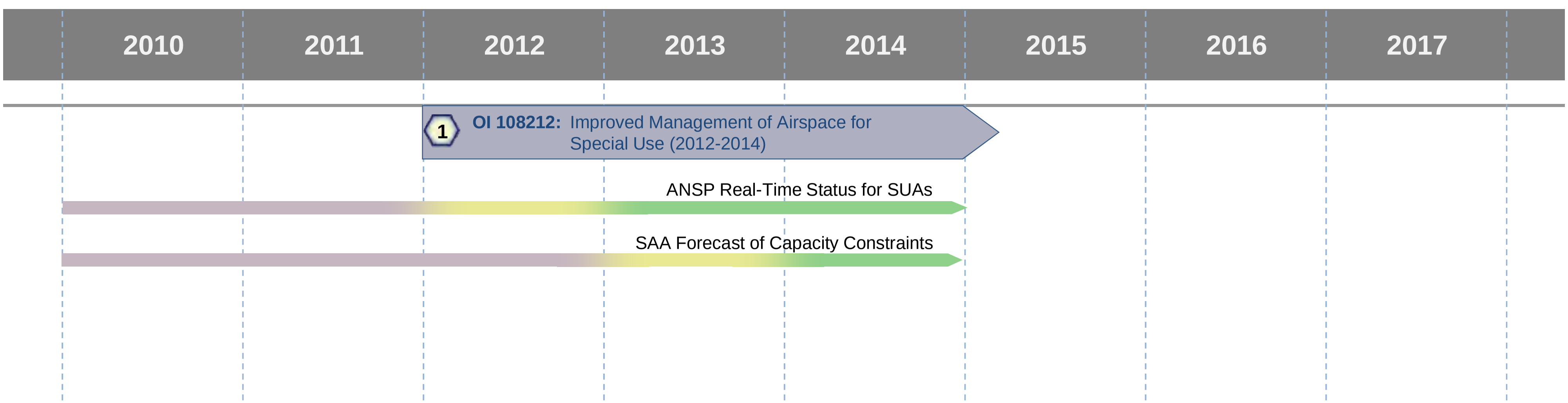
This increment ensures that NAS and aeronautical information is consistent, allowing users to subscribe to and receive the most current information from a single source. Information is collected from ground systems and airborne users (via ground support services), aggregated and provided through system-wide information environment, Data Communications, or other means.

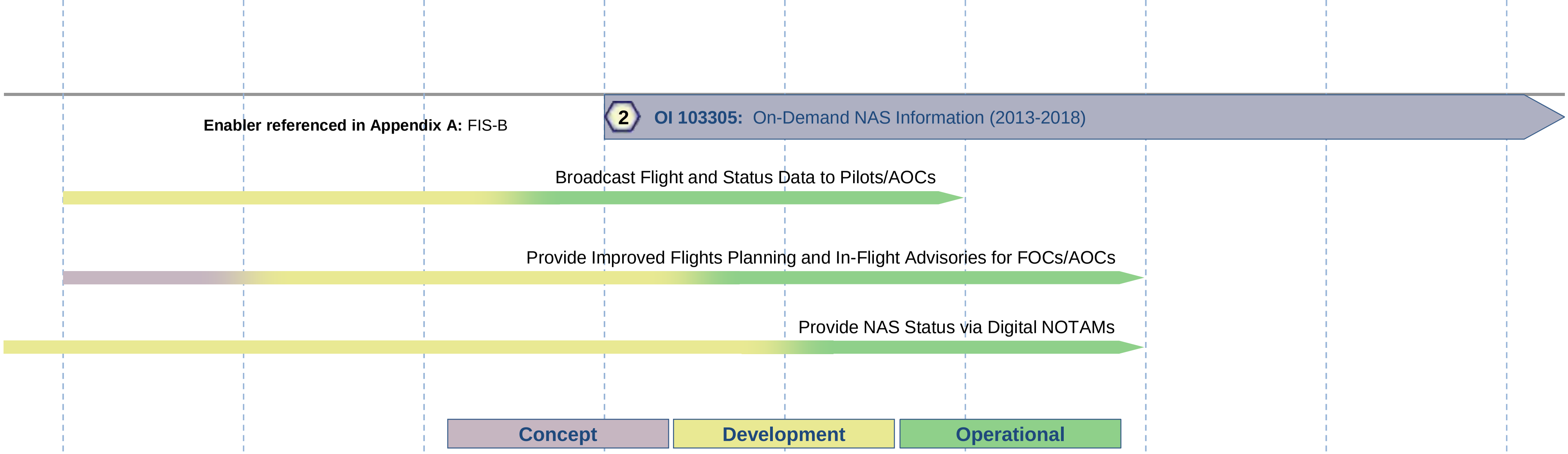
Supported By: Aeronautical and Weather Common Services

Provide NAS Status via Digital Notices to Airmen (NOTAMs)

This increment enables the issuance of Digital NOTAMs for those airspace constraints affecting a flight based on its trajectory. The initial implementation includes internal distribution within ANSP of those notices that would be distributed via the Flight Information Services-Broadcast (FIS-B) service.

Supported By: Aeronautical Common Service





Selected Work Activities

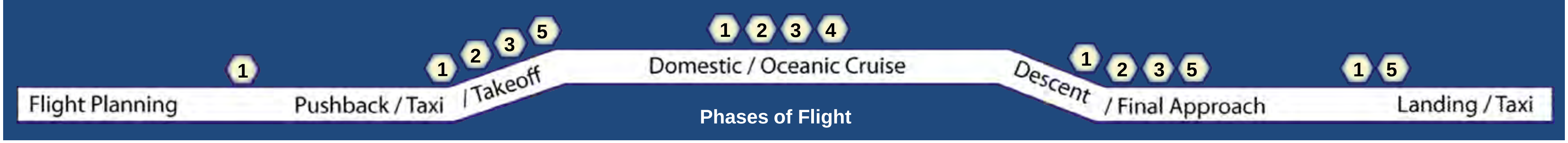
Budget Line	Task Force	Activity	Description	OIs	FY 2010	FY 2011	FY 2012 – Mid-term
Collaborative Air Traffic Management	35	**Flight and State Data Management, Common Status and Structure Data**	Addresses information and capability gaps within aeronautical information to achieve NextGen shared situational awareness.	103305 108212	✓ Conducted concept of operations and Enterprise Architecture for a National SAA	• Deliver digital airport structure and configuration information to support situational awareness	• Develop concepts for common adaption to support base information for On-Demand NAS activities • Limited deployment of standards-based common adaptation to NAS
Demonstration		**Joint Network Enabled Operations (NEO) Program (Spiral 3)**	Develops information exchange protocol and architecture with interagency aviation stakeholders, and conducts flight operational trials as needed.	108212		• Conduct initial program plan for data exchange demonstration combining net-centric capabilities and applications with Unmanned Aircraft Systems (UAS)	• Initiate concept of operations or concept of use for applying net-centric concepts to UAS • Initiate the development of a concept of operations describing NEO operations in UAS environment • Initiate safety and hazard analysis • Initiate demonstration strategies • Conduct demonstration to illustrate NEO capabilities operating in UAS environment

On-Demand NAS Information (cont'd)

Selected Work Activities

Budget Line	Task Force	Activity	Description	OIs	FY 2010	FY 2011	FY 2012 – Mid-term
System Development		**New Air Traffic Management (ATM) Requirements, Airborne System Wide Information Management (SWIM)**	Develops concepts and requirements for an airborne exchange of NAS information via the SWIM network for flight, aeronautical and weather information between aircraft and ground-based FAA systems.	103305 108212	✓ Developed and delivered initial airborne SWIM concept of use ✓ Developed white paper identifying technical impacts to SWIM portals	• Conduct airborne access to SWIM concept of use v2 (industry review) • Conduct airborne access to SWIM Operational and Technical Requirements Industry Day	• Conduct airborne access to SWIM laboratory simulations • Conduct airborne access to SWIM initial verification and validation
Collaborative Air Traffic Management		**Flight and State Data Management, Flight Object**	Facilitates the sharing of common flight information between systems and enables collaboration using common reference framework. The Flight Object is an extensible and dynamic collection of data elements that describes an individual flight throughout its life cycle. It is the single common reference for all system information about that flight. It associates and merges disparate data into a cohesive picture of the flight. Authorized system stakeholders and the ANSP may electronically access consistent flight data that is tailored to their specific need and use. A Flight Object is created for each proposed flight. The Flight Object description does not include environment or weather information since these are system-wide elements which affect multiple flights.	103305	✓ Hosted the Flight Object Industry Day ✓ Completed development of an initial Flight Object Data Dictionary	• Deliver the Flight Object global flight identifier report • Deliver the high-level Flight Object benefit approach report.	• Continue to develop Flight Object Data Dictionary • Continue to model Flight Object data • Host joint Flight Object and aeronautical information industry days • Conduct international demonstration of Flight Object with Asia Pacific partners

Environment and Energy



1 OI 109309: Implement EMS Framework

Enable the use of the Environmental Management System (EMS) framework, including environmental goals and decision-support tools, to address, plan and mitigate environmental issues.

Environmental Policy
This increment will refine and formalize NextGen environmental and energy policy including NextGen environmental goals.

Environmental Targets
This increment will explore, test and refine quantitative NextGen environmental targets for noise, air quality, climate, energy and water quality.

National Environmental Policy Act (NEPA) Strategy and Processes
This increment establishes effective strategic approaches for addressing the NEPA requirements of NextGen improvements.

Decision Support Assessment
This increment addresses mission-level NextGen decision support capabilities (e.g., capabilities that support FAA planning decisions such as those related to capacity management) and operational-level capabilities (e.g., those related to flow contingency management and trajectory flow).

Improved Scientific Knowledge
This increment will improve knowledge of aircraft source-level noise and emissions of air pollutants and greenhouse gases, their atmospheric evolution, and impacts on human health and welfare and climate change.

Analysis to Support International Environmental Standard-Setting
Analysis and benefit assessment will be performed to support the development and implementation of International Civil Aviation Organization environmental standards, such as for aircraft carbon dioxide emissions and more stringent noise levels.

Aviation Environmental Portfolio Management Tool - Economics
Capabilities of the aviation environmental portfolio management tool will be enhanced continuously through 2015 to enable analysis of airline and aviation market responses to environmental mitigation and policy options, and for analyzing U.S. environmental issues critical to NextGen under various fleet growth and evolution scenarios.

Aviation Environmental Design Tool (AEDT) – Regional
AEDT will provide capabilities for integrated environmental analysis at regional levels for fuel burn, emissions and noise.

Environmental Goals and Targets Performance Tracking System
A system will be established that will support the systematic identification of environmental benefits across the National Airspace System (NAS), enabling the FAA to measure progress toward achieving NextGen environmental goals. This system may include business practices, automation capabilities and interfaces with other automation systems.

NextGen EMS Frameworks and Stakeholder Collaboration
Standardized approaches will be identified for aviation stakeholders (e.g., manufacturers, airports, airlines and the FAA) to identify and address key environmental issues critical to stakeholder environmental programs or EMSs. These approaches are intended to allow aviation stakeholders to collaborate and address cross-cutting environmental challenges.

AEDT – Airport
AEDT will provide capabilities for integrated environmental analysis at airport levels for fuel burn, emissions and noise.

2 OI 109315: Implement NextGen Environmental Engine and Aircraft Technologies

Reductions in aircraft noise, emissions and fuel burn through improvements in aircraft engine and airframe technologies and alternative fuels. Technologies will be at sufficient readiness levels to achieve the goals of the FAA's Continuous Lower Energy, Emissions and Noise (CLEEN) program.

Open Rotor
Twin Annular Premixing Swirler II Lean Combustor
Adaptive Trailing Edges
Ceramic Matrix Composite Turbine Blade Tracks
Ceramic Matrix Composite Acoustic Nozzle
Engine Weight Reduction and High-Temperature Impeller
Dual-Wall Turbine Blade
Flight Management System (FMS) - Air Traffic Management (ATM) Integration
Ultra High-Bypass Ratio Geared Turbo Fan

3 OI 109316: Increased Use of Alternative Aviation Fuels

Determine the feasibility and market viability of alternative aviation fuels for civilian aviation use. Obtain ASTM certification of hydrotreated renewable jet (HRJ) fuels from fossil and renewable resources that are compatible with existing infrastructure and fleet thus meeting requirement to be a “drop-in” alternative fuel.

Drop-In HRJ Blend Fuels

This increment will result in ASTM approval in 2011 of a 50-50 blend of HRJ and Jet-A alternative fuels. This increment also explores other blends for environmental and performance feasibility through air quality and life-cycle emissions analyses, engine performance evaluation, and ground tests and flight demonstrations by 2013. These efforts will advance deployment of these sustainable alternative fuels, including environmental acceptability and ASTM approval.

Other Advanced Aviation Alternative Fuels

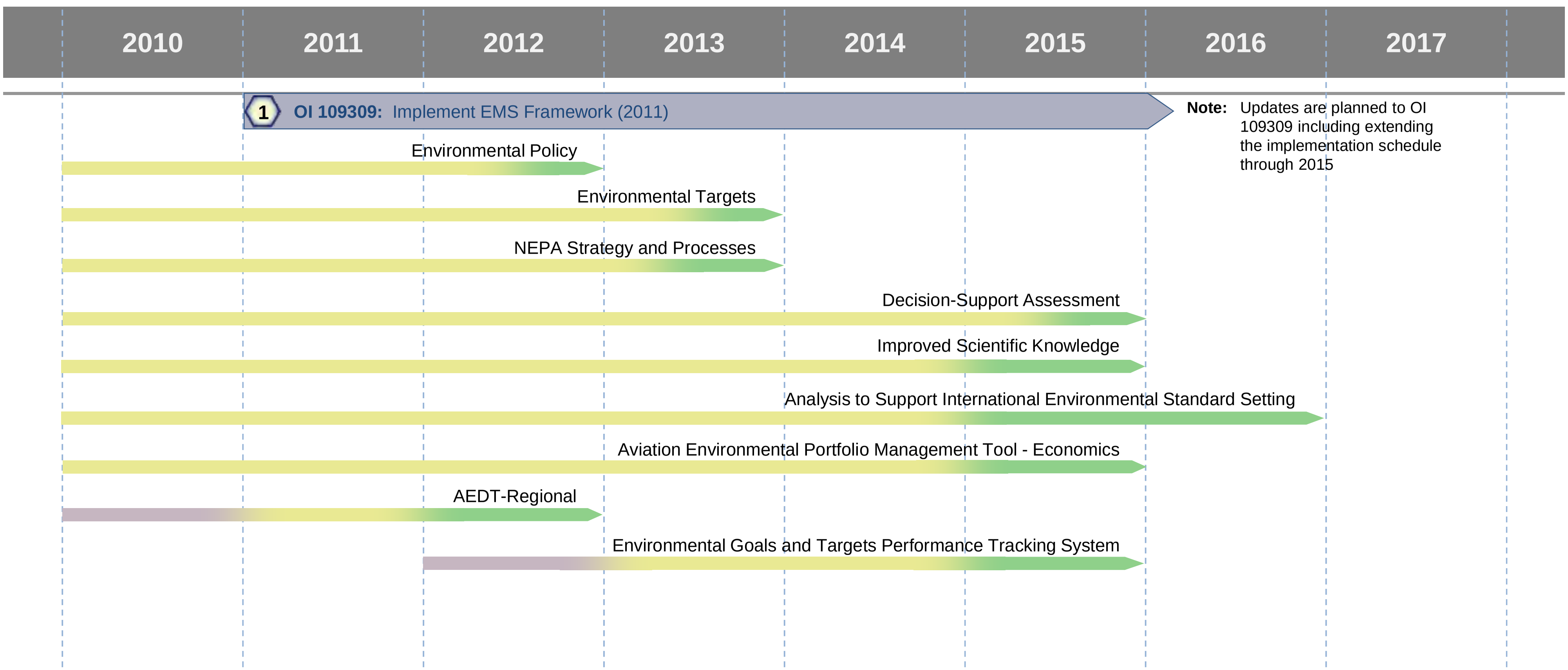
This increment will explore and qualify additional classes of sustainable aviation alternative fuels blends that use novel feedstocks and conversion processes (e.g., advanced fermentation, alcohol oligomerization, pyrolysis, etc.). Efforts include environmental and performance feasibility through air quality and life-cycle emissions analyses, fuel properties analysis, engine performance evaluation, and ground tests and flight demonstrations by 2015. These efforts will advance deployment of these sustainable alternative fuels, including environmental acceptability and ASTM approval.

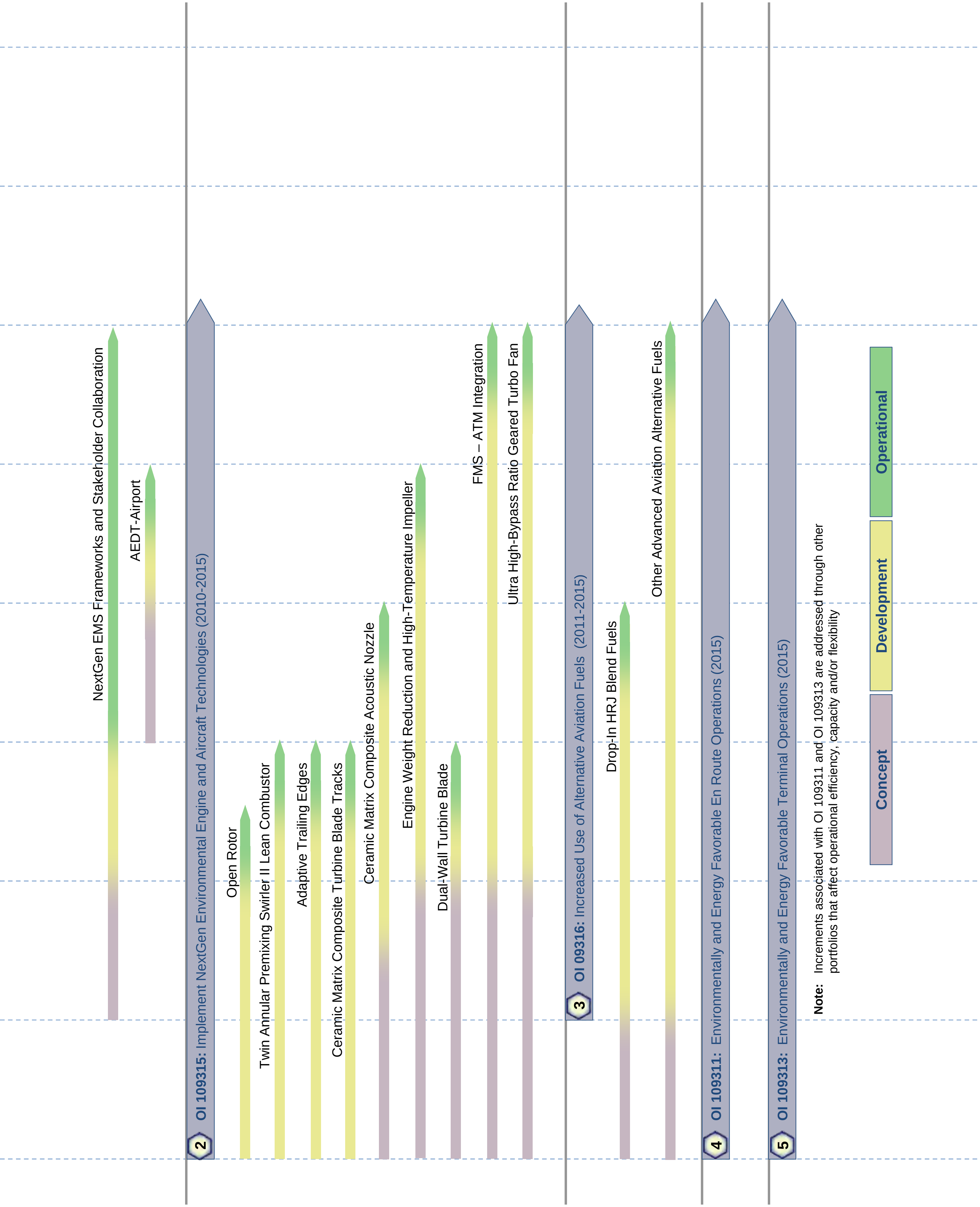
4 OI 109311: Environmentally and Energy Favorable En Route Operations

This will optimize en route operations to reduce emissions, fuel burn and noise. New operational capabilities will be applied, such as advanced aircraft technologies, including capabilities for FMS and avionics to achieve more efficient en route operations. Improved efficiency in operations will provide system-wide benefits, including benefits to sensitive areas (e.g., national parks).

5 OI 109313: Environmentally and Energy Favorable Terminal Operations

Optimize aircraft arrival, departure and surface operations to reduce emissions, fuel burn and noise through the use of environmentally friendly procedures. Develop Standard Terminal Arrival Route (STAR) procedures that permit use of the Optimized Profile Descent (OPD) technique (also known as Continuous Descent Arrival). Develop Area Navigation (RNAV) Standard Instrument Departure (SID) procedures that minimize level segments on climb-out. Develop enhanced surface operation mechanisms and procedures to maximize airport throughput while further reducing aircraft fuel burn and emissions.




NextGen EMS Frameworks and Stakeholder Collaboration
AEDT-Airport
2 OI 109315: Implement NextGen Environmental Engine and Aircraft Technologies (2010-2015)
Open Rotor
Twin Annular Premixing Swirler II Lean Combustor
Adaptive Trailing Edges
Ceramic Matrix Composite Turbine Blade Tracks
Ceramic Matrix Composite Acoustic Nozzle
Engine Weight Reduction and High-Temperature Impeller
Dual-Wall Turbine Blade
FMS – ATM Integration
Ultra High-Bypass Ratio Geared Turbo Fan
3 OI 09316: Increased Use of Alternative Aviation Fuels (2011-2015)
Drop-In HRJ Blend Fuels
Other Advanced Aviation Alternative Fuels
4 OI 109311: Environmentally and Energy Favorable En Route Operations (2015)
5 OI 109313: Environmentally and Energy Favorable Terminal Operations (2015)
Note: Increments associated with OI 109311 and OI 109313 are addressed through other portfolios that affect operational efficiency, capacity and/or flexibility
Concept
Development
Operational

Environment and Energy (cont'd)

Selected Work Activities

Budget Line	Task Force	Activity	Description	OIs	FY 2010	FY 2011	FY 2012 – Mid-term
System Development		**Environment and Energy-EMS and Advanced Noise and Emission Reduction**	Manages environmental impacts of NextGen through EMS based on development and demonstration of solutions to mitigate noise and emissions as well as increasing fuel burn efficiency. Research, development, demonstration and testing help support operation implementation by 2015.	109309 109310 109311 109313 109315 109316	✓ Developed report on EMS framework development; activities of CLEEN Consortium; metrics for carbon dioxide emissions standard; and opportunities for operational procedures	• Conduct EMS refinement and pilot studies • Test, demonstrate and evaluate NAS-wide environmental benefits of CLEEN aircraft and fuel technologies	• Research potential policies and procedures to reduce environmental impacts beyond current set of operational procedures • Finalize NextGen EMS implementation in initial FAA organizations • Assess the impacts on NAS-wide operations (including environmental performance) of aircraft standards for noise and emissions • Assess the NAS-wide benefits of CLEEN aircraft technologies and alternative fuels • Identify opportunities for environmental gains for taxi/ramp, terminal • Demonstrate environmental control algorithms used in taxi/ramp, terminal, and en route procedures • Perform analysis for EMS environmental impacts and metrics • Analyze NEPA compliance within the EMS framework

Common Services and Infrastructure

Phases of Flight

Surveillance Common Service

New surveillance infrastructure, technologies and applications will be deployed to improve situational awareness.

New Services: Surface Surveillance, Surface Sensors and Indicators, Surface Traffic Broadcast, Surface Automation Decision-Support Tools, Surface External Data Exchange Service, Surface Broadcast Flight and NAS Status Information to Pilots, Oceanic Automation Support for Separation Management
Task Force: NAS Access

Communications Common Service

New International Civil Aviation Organization (ICAO)-compliant digital communications infrastructure and technologies will provide a supplemental means for two-way exchange between controllers and flight crews for air traffic control (ATC) clearances, instructions, advisories, flight crew requests and reports.

New Services: Tower Data Communications for Revised Departure Clearances, Oceanic Data Communications
Task Force: Cross-Cutting

Aeronautical Common Service

New Aeronautical Information Management automation infrastructure will be acquired and implemented in a standardized enterprise-compliant fashion, providing a single authoritative source for aeronautical data management.

New Services: Airspace Configuration, Status Information, and Route/Procedures Data, Static Airport Data Management, Digital Notices to Airmen (NOTAMs)
Task Force: Surface and Cruise

Flight Common Service

New Flight Information Management automation infrastructure will be acquired and implemented in a standardized enterprise-compliant fashion, providing a common interface among National Airspace System (NAS) automation systems, service providers and users.

New Services: Terminal Data Distribution, Flight Data Publication, Reroute Data Exchange, Flow Information Publication, Track Information Service
Task Force: Cross-Cutting

Weather Common Service

New weather infrastructure will provide improved weather information in a standard enterprise-compliant fashion.

New Services: Common Weather Picture, Net-centric Dissemination, Proactive Notification of Significant Weather Changes, Enhanced Forecasts for Aviation, Winds and Temperatures for Trajectory Modeling, Tailored Volumetric Retrievals of Forecast and Observation Information, Characterizations of Potential Weather-Constrained Airspace

Common Services and Infrastructure (cont'd)

Selected Work Activities

Budget Line	Task Force	Activity	Description	FY 2010	FY 2011	FY 2012 – Mid-term
ADS-B	28	**Automatic Dependent Surveillance-Broadcast (ADS-B) NAS-wide Implementation**	Provides highly accurate and more comprehensive surveillance information via a broadcast communication link. ADS-B receives flight data from aircraft, via a data link, derived from on-board position-fixing and navigational systems. Aircraft position (longitude, latitude, altitude and time) is determined using GPS, an internal inertial navigational reference system, or other navigation aids.	✓ Completed In-Service Decision for Critical Services ✓ Continued to deploy ADS-B ground infrastructure ✓ Provided Initial Operating Capability: o Philadelphia o Juneau ✓ Published final ADS-B Out rule in Federal Register ✓ Completed Phase 1 of the Colorado Wide Area Multilateration System covering the En Route Services supporting Yampa Valley, Craig-Moffat, Steamboat Springs and Garfield County Regional airports	• 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, Traffic Information Services-Broadcast (TIS-B) and Flight Information Services-Broadcast (FIS-B) • Provide Initial Operating Capability for Surface Alerting
Data Comm	16 17 39 44 42	**Data Communications (Data Comm)**	Implements Data Comm capabilities that provide new methods for delivery of departure clearances, revisions and taxi instructions in the terminal environment, specifically in the tower. In the en route environment, Segment 1 will provide the basic capabilities for controllers and flight crews to transfer ATC clearances, requests, instructions, notifications, voice frequency communications transfers and flight crew reports as a supplement to voice.		• 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 (VDL) mode 2 for aircraft equipped with Future Air Navigation System (FANS) 1/A+

Budget Line	Task Force	Activity	Description	FY 2010	FY 2011	FY 2012 – Mid-term
NVS		**NAS Voice System (NVS)**	Provides the connectivity for efficient communications among air traffic controllers, pilots and ground personnel. It connects incoming and outgoing communication lines via a switching matrix to the controller's workstation.	✓ Completed cost analysis for business case analysis report ✓ Completed required sections of implementation strategy and planning document ✓ Completed business cost analysis report	• Initiate preliminary development of documentation for JRC decisions	• Achieve final JRC decision to proceed with program • Award production contract • Install at key site • Achieve Initial Operating Capability of systems
SWIM	40 35	**System Wide Information Management (SWIM)**	Provides policies and standards to support data management, secure its integrity, and control its access and use.	✓ Developed and tested the Aeronautical Information Management (AIM) portion of the Special Use Airspace (SUA)	✓ Provided 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 TFM o Flight Data o Runway Visual Range • Provide Terminal Data Distribution Capability • Provide Flight Data Services with Publish/Subscribe • Provide Flight Data Publication Host Air Traffic Management Data Distribution System/Flight Data Input/Output and AIM SUA Client
CATMT	47	**Collaborative Air Traffic Management Technologies (CATMT)**	Identifies cognitive support and displays change requirements necessary for a transition to a high-altitude specialty that addresses the FAA's Flight Plan goals for capacity and organization excellence.	✓ Completed CATMT Work Package 1 with the development of the Impact Assessment and Resolution capability ✓ Initiated 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
NNEW		**NextGen Network Enabled Weather (NNEW)**	Provides common, universal access to aviation weather data.	✓ Conducted demonstration to validate interoperability data standards and Web services with the development of the interagency 4D weather data cube ✓ Completed weather data and design standards	• Perform functional analysis • Develop alternative analysis report	• Initial Investment Decision for NNEW Segment 1

Common Services and Infrastructure (cont'd)

Selected Work Activities

Budget Line	Task Force	Activity	Description	FY 2010	FY 2011	FY 2012 – Mid-term
Demonstrations	28	**Colorado Wide Area Multilateration Phase 2**	Supports the Denver Air Route Traffic Control Center's ability to provide en route air traffic separation services to the following Colorado airports: Durango, Gunnison, Montrose, Telluride.		• Approval of design covering critical and multilateration Services for Colorado Phase 2 Service Volumes	
Networked Facilities		**Integration, Development, and Operations Analysis Capability**	Continues to enhance, operate and maintain the operations analysis capability to support the development of iterative designs to evaluate concepts and alternatives. This will provide for an integrated environment ranging from low- to high-fidelity capabilities to support NextGen concept validation and requirements, which are required to facilitate the transition of NextGen technologies in the NAS.	✓ Completed support to the Unmanned Aircraft System (UAS) initial NAS Integration and Staffed NextGen Tower studies	• Enhance and sustain the NextGen Integration and Evaluation Capability (NIEC) at the Technical Center • Focus on integrating new technologies into existing NIEC capabilities that will enable the customer to: o Iteratively evaluate design concepts and alternatives o Determine quantitative metrics to define and validate human performance, usability, workload and safety indicators o Design and conduct experiments to assess software, hardware and prototypes for research, system analyses and/or definition and refinement of requirements • Provide interfacility capabilities • Enhance NIEC data collection capabilities	• Complete full initial capability of the NIEC • Integrate cockpit simulator into the NIEC • Continue to integrate additional capabilities into the NIEC display area
Networked Facilities		**NextGen Test Bed/ Demonstration Sites**	Continues to expand the NextGen Test Bed capabilities in Daytona Beach, Fla., and initiate planning activities in Texas. This program will continue integration activities between the NextGen Test Beds, increase system capabilities and improve operational fidelity of the environment. The NextGen Test Bed is a multi-domain demonstration and testing facility that integrates individual airspace domains and allows for end-to-end demonstrations, evaluations and testing at one or more physical sites in line with the NextGen gate-to-gate concept.	✓ Supported Transform Facilities Solution Set ✓ Completed Florida Test Bed Segment 1 Implementation Plan, site engineering/ design package, system delivery and system capability briefing package	• Complete Florida Test Bed Segment 2 System Requirements Document	• Continue to expand NextGen Test Bed capabilities in Florida to support future demonstrations • Establish information exchange capabilities with other NextGen Test Bed and stakeholder sites • Initiate NextGen interactivity between Florida and NASA North Texas Research Station for enhanced terminal and surface capabilities • Expand telecommunication infrastructure to allow improved live data capabilities • Expand site integration capabilities among all three sites • Establish telecommunication circuits for initial live data capability • Support standards and alternatives development

Budget Line	Task Force	Activity	Description	FY 2010	FY 2011	FY 2012 – Mid-term
Networked Facilities		**Future Facilities Investment Planning**	Supports optimization of FAA's air traffic service provider resources. Considers infrastructure alternatives and associated benefits which include improved work environment, reduced time and cost to train controllers, seamless information exchange, and reduced overall air traffic service provider costs while still increasing the level of service.		• Prepare initial business case for segment 1	
Airport Improvement Program* *Not considered NextGen funding		**Airfield Development**	Continues the development of new runways and extensions to increase capacity and efficiency.	✓ Conducted Future Airport Capacity Task 2 (FACT2) next steps, including coordination of airport action plans ✓ Completed Charlotte-Douglas International runway 18R/36L ✓ Completed reconstruction of New York JFK runway 13R/31L and associated taxiway improvements	✓ Completed Portland International runway 10L/28R Extension ✓ Completed Philadelphia International Environmental Impact Statement and signed a Record of Decision • Begin FACT3 to identify capacity-constrained airports in 2020 and 2030 • Complete Anchorage International runway 7R/25L extension • Continue New York JFK taxiway improvements • Complete Phase II of the San Francisco Bay Area Regional Airport Plan • Complete Phase II of the Atlanta Metropolitan Aviation Capacity Study • Continue surveys to support development of Wide Area Augmentation System (WAAS)/Localizer Performance with Vertical Guidance (LPV) approach procedures to increase access to airports. Consider obstruction removal needs so that airports with LPV approach procedures can achieve lower minimums • Fund metro area airport infrastructure improvements at other than OEP airports	• Complete Atlanta Hartsfield-Jackson International runway 9L/27R extension • Complete FACT3 and identify follow-on strategic planning initiatives • Continue planning and environmental projects • Complete San Antonio International runway 3/21 extension • Complete Port Columbus International Airport runway 10R/28L relocation • Complete Chicago O'Hare runway 10C/28C • Complete Fort Lauderdale/Hollywood International Airport runway 9R/27L

NextGen Concept Maturity and System Development

1 **OI 102114:** Initial Conflict Resolution Advisories

Automation enables the Air Navigation Service Provider (ANSP) to better accommodate pilot requests for trajectory changes by providing conflict detection, trial flight planning, and development and rank-ordering of resolutions taking into account aircraft capabilities and pilot and ANSP preferences.

2 **OI 102118:** Delegated Responsibility for In-Trail Separation

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

3 **OI 102123:** Automatic Dependent Surveillance-Broadcast (ADS-B) Separation

ANSP automation uses ADS-B in non-radar airspace to provide reduced separation and flight following. Improved surveillance enables ANSP to use radar-like separation standards and services.
Task Force: NAS Access

4 **OI 102144:** Wake Turbulence Mitigation for Arrivals: Closely Spaced Parallel Runways (CSPRs)

Changes to wake separation minima are implemented based on measured and predicted airport area winds. Supporting procedures, developed at applicable locations based on analysis of wake measurements and safety, allow more closely spaced arrival operations increasing airport/runway capacity in Instrument Meteorological Conditions.
Task Force: Runway Access

5 **OI 102406:** Provide Full Surface Situation Information

Surface Situation Information will complement visual observation of the airport surface. Decision support system algorithms will use enhanced target data to support identification and alerting of those aircraft at risk of runway incursion.
Task Force: Surface

6 **OI 103104:** Deploy Flight Information Services-Broadcast (FIS-B) Nationally

FIS-B weather processors generate graphical and textual products for broadcast to equipped aircraft in coverage areas. FIS-B products include precipitation, convective activity, in-flight icing, low-ceiling/visibility maps, turbulence information and site-specific weather reports and forecasts.

7 **OI 103116:** Initial Improved Weather Information from Non-Ground-Based Sensors

Additions to the sensor network from non-ground-based sensors (e.g., satellite and aircraft) provide operators and the ANSP with enhanced weather information to improve flight and clearance planning, trajectory-based operations and flow management.

8 **OI 103119:** Initial Integration of Weather Information into National Airspace System (NAS) Automation and Decision Making

Advances in weather information content and dissemination provide users and/or their decision support with the ability to identify specific weather impacts on operations (e.g., trajectory management and impacts on specific airframes, arrival/departure planning) to ensure continued safe and efficient flight.

9 **OI 103206:** Expanded Traffic Advisory Services Using Digital Traffic Data

Equipped aircraft receive broadcasts and display traffic data to the flight crew. Ground-based systems receive surveillance broadcast reports and provide them to the surveillance data network for distribution.

10 **OI 104122:** Integrated Arrival/Departure Airspace Management

New airspace design takes advantage of expanded use of terminal procedures and separation standards. This capability expands the use of terminal separation standards and procedures (e.g., 3 nm, degrees divergence) within the newly defined transition airspace. It extends further into current en route airspace (horizontally and vertically).
Task Force: Integrated ATM

11 **OI 104128:** Time-Based Metering in the Terminal Environment

Aircraft are time-based metered inside the terminal environment, enhancing efficiency through the optimal use of terminal airspace and surface capacity. This extends current metering capabilities into the terminal environment and furthers the pursuit of end-to-end metering and trajectory-based operations.
Task Force: Integrated ATM

12 **OI 106202:** Enhance Emergency Alerting

Controllers and search and rescue support, using ADS-B to provide location information and discrete aircraft identification, are able to quickly locate distressed or downed aircraft without resorting to 1,200 beacon tracks and support from Civil Air Patrol search flights.

13 **OI 107116:** Low-Visibility/Ceiling Departure Operations

Leverages augmented Global Navigation Satellite System capabilities to allow appropriately equipped aircraft to depart in low-visibility conditions. Due to onboard avionics the aircraft will be able to depart in low-visibility conditions using Area Navigation (RNAV)/Required Navigation Performance (RNP) Standard Instrument Departures, Electronic Flight Vision System, Synthetic Vision System, or advanced vision systems.

14 **OI 107202:** Low-Visibility Surface Operations

Aircraft and ground vehicle movement on airports in low-visibility conditions is guided by accurate location information and moving map displays.
Task Force: Surface

15 **OI 108206:** Flexible Airspace Management

ANSP automation supports reallocation of trajectory information, surveillance, communications, and display information to different positions or different facilities.

16 **OI 109302:** Security – Operational Capability for Threat Detection and Tracking, NAS Impact Analysis and Risk-Based Assessment

The Operational Security Personnel of the ANSP address NAS security threats by more effective and efficient prevention, protection, response and recovery based on net-enabled shared situational awareness and a risk-informed decision-making capability. Flight risk profiles are derived from trajectory-based risk assessment provided by the ANSP and risk levels provided by the Security Service Provider.

17 **OI 109304:** Enhanced Aviation Safety Information and Analysis and Sharing (ASIAS)

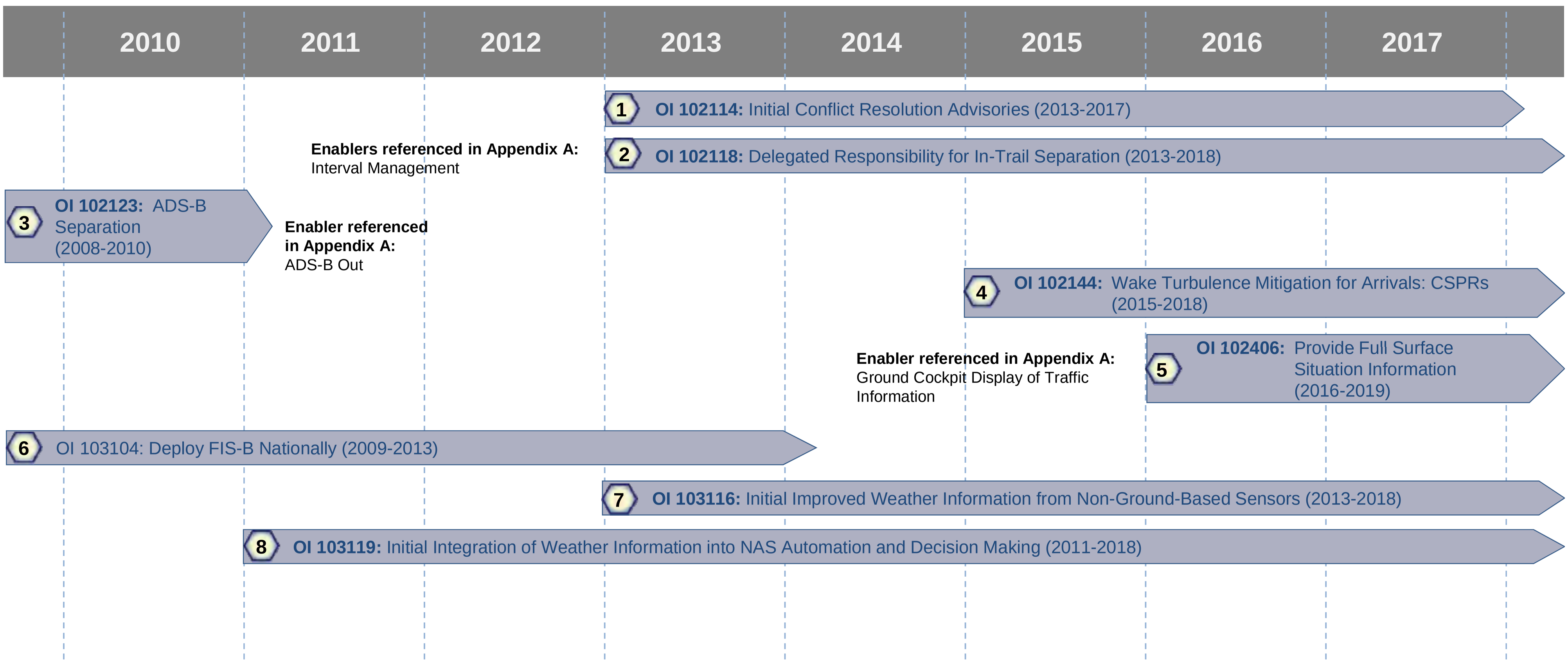
ASIAS will improve system-wide risk identification, integrated risk analysis and modeling, and implementation of emergent risk management.

18 **OI 109305:** Improved Safety for NextGen Evolution

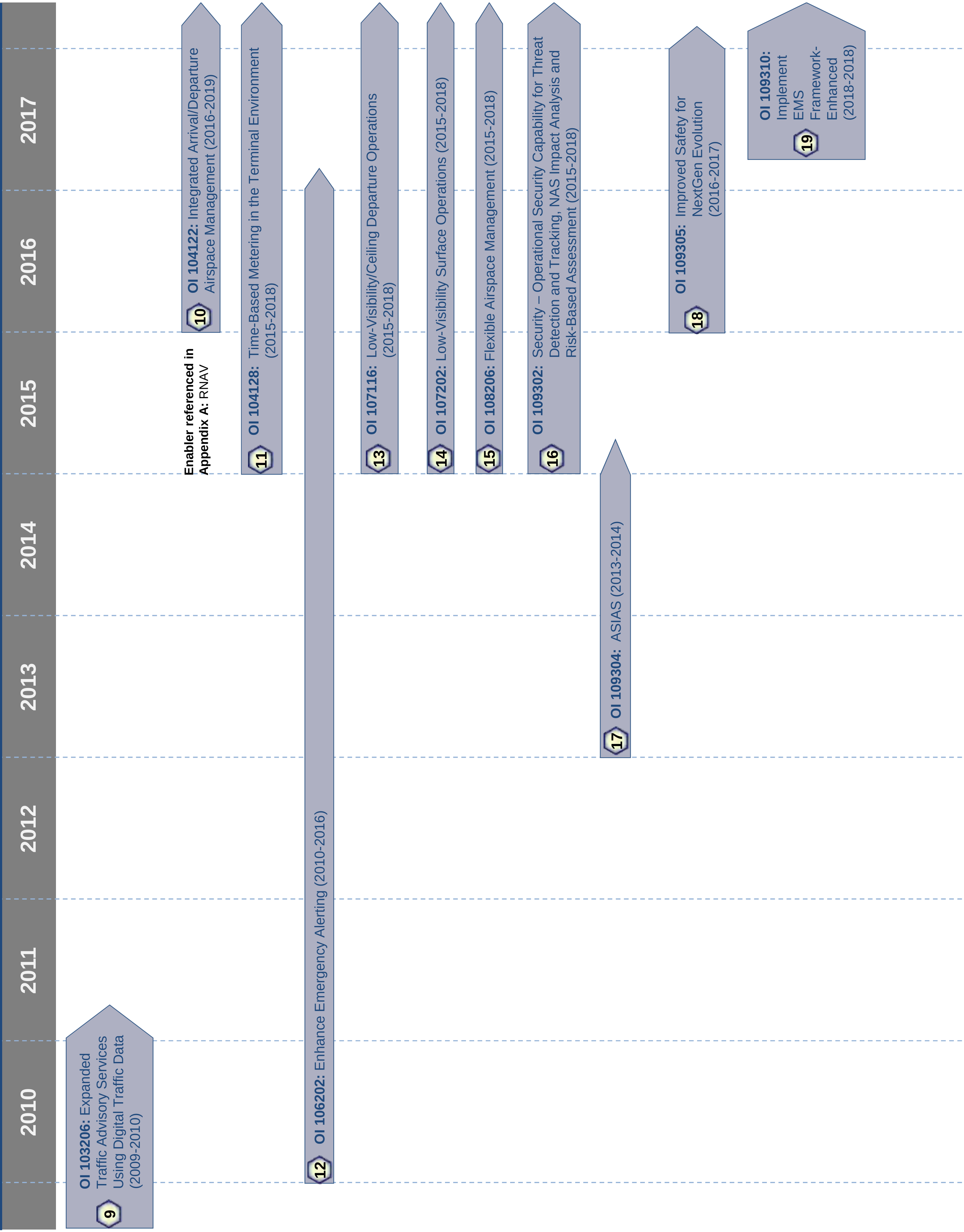
This OI mitigates safety risk associated with the evolution of NextGen by providing enhanced safety methods that support making changes to the air transportation system, including: advanced capabilities for integrated, predictive safety assessment; improved validation and verification processes supporting certification; an enhanced focus on safe operational procedures; and enhanced training concepts for safe system operation.

19 **OI 109310:** Implement Enhanced EMS Framework

Further enable the use of the Environmental Management System (EMS) framework for subsequent applications, including refined environmental goals and decision-support tools, to address, plan and mitigate environmental issues through implementation of ongoing EMS improvements and availability of enhanced environmental information.



NextGen Concept Maturity and System Development (cont'd)



Selected Work Activities

Budget Line	Task Force	Activity	Description	OIs	FY 2010	FY 2011	FY 2012 – Mid-term
Collaborative Air Traffic Management		**Capacity Management, Dynamic Airspace**	Provides the tools to air traffic managers to reconfigure airspace to expand or contract control sectors to match the overall level of activity in the facility's airspace and to dynamically deactivate restrictions. The Airspace Resource Management System (ARMS) will provide the tools for controlling the reconfiguration of the NextGen networked communications infrastructure in response to an operational requirement for reconfigurable airspace.	108206	✓ Initiated multi-year program plan	• Develop preliminary ARMS concept of operation document • Deliver white paper on ARMS functional description	• Develop ARMS evaluation model • Conduct demonstration of ARMS prototype
Collaborative Air Traffic Management		**Flight and State Data Management, Concept Development for Integrated NAS Design and Procedure Planning**	Develops a framework for integrated National Airspace Design and Procedures planning, enhancements to existing infrastructure to support impact assessments, and develop initial concept for best-equipped, best-served.	108209		• Initiate analysis of equipage and avionics capabilities required through the mid-term to support best-equipped, best-served	• Adapt existing automation displays to provide airport surface surveillance • Develop "blended airspace" procedures
Arrivals/ Departures at High Density Airports	4 21a 32b	**Capacity Management - Integrated Arrival and Departure Operations (Big Airspace)**	Provides an integrated approach to arrival and departure management throughout the major metropolitan airspace by incorporating terminal and transition airspace and procedures into one service volume.	104122	✓ Completed a preliminary operational safety assessment and an assessment of procedural changes needed to support this concept		• Develop and mature initial automation, surveillance and flight data requirements • Conduct technical transfer of automation, surveillance and flight data requirements • Support airspace design/analysis, transition strategy plans and procedures development for initial selected locations
Arrivals/ Departures at High Density Airports		**Capacity Management - Integrated Arrival and Departure Control Service**	Provides an integrated approach to arrival and departure management throughout the major metropolitan airspace by incorporating terminal and transition airspace and procedures into one service volume.	104122	✓ Conducted pre-implementation analyses on flight data processing due to the large volume of airspace and the integration of terminal, transition and overflight environments		
Trajectory Based Operations		**Separation Management, High Altitude**	Identifies cognitive support and display change requirements necessary for a transition to a high-altitude specialty that addresses the FAA's Flight Plan goals for capacity and organization excellence.	108209	✓ Conducted Fast-Time Analyses for Trajectory Based Operations (TBO) in high-altitude airspace	• Conduct integrated Human-in-the-Loop (HITL) simulation of high-altitude concept	• Conduct concept validation activities to support refinement of high-altitude concept elements such as generic airspace and flexible airspace • Refine the High-Altitude Research Management Plan as required based on the findings of concept validation activities • Update the high-altitude concept of operations to reflect results of completed high-altitude simulations, fast-time analyses and other research activities • Develop recommendations on future program plans based on FY 2011-2012 findings

NextGen Concept Maturity and System Development (cont'd)

Selected Work Activities

Budget Line	Task Force	Activity	Description	OIs	FY 2010	FY 2011	FY 2012 – Mid-term
Flexible Terminal Environment	25	**Trajectory Management, Arrivals (RNAV/RNP) with 3D and Required Time of Arrival (RTA)**	Evaluates the ability of aircraft to accurately meet vertical constraints and time of arrival. Evaluates the advantages and disadvantages with imposing vertical constraints and RTA in different congestion scenarios. Also evaluates Data Comm capabilities for aircraft messaging for RTA, and reroutes.		✓ Performed initial 4D Flight Management System (FMS) TBO concept validation and analysis of performance capabilities and standards	• Conduct RTA proof of concept demonstration	• Perform initial 4D FMS TBO concept validation and analyses of performance capabilities and standards • Evaluate the ability of aircraft to accurately meet vertical constraints and required time of arrival • Evaluate the advantages and disadvantages associated with imposing vertical constraints and required time of arrival in different congestion scenarios from the aircraft operator and air traffic management (ATM) perspectives • Evaluate Data Comm for aircraft messaging for RTA, reroutes and waypoint verification data integrity • Evaluate ground merging and sequencing tools that will employ control by time of arrival (identify enabling requirements) • Conduct human factors analysis shifting to control by time of arrival through controller-in-the-loop simulations and field trials • Conduct analysis of human factors and flight deck automation requirements to minimize errors and provide integrity assurance
Demonstration		**Unmanned Aircraft Systems (UAS) Demonstration**	Proves the viability of UAS to operate safely in the NAS without undue risk.	102137	✓ Conducted UAS demonstration incorporating two NextGen technologies, ADS-B and NAS Voice System (NVS), to mitigate operational issues: o Enhanced traffic situational awareness from a cockpit display of traffic information (CDTI) o Proof of concept for NVS	• Initiate UAS demonstration that will explore NextGen 4D trajectory concepts	• Demonstration 4: Conduct integrated operational UAS demonstration with 4DT FMS, ADS-B/Traffic Information Services-Broadcast (TIS-B)/FIS-B and NVS-prototype Voice over Internet Protocol
Reduce Weather Impact		**Reduce Weather Impact (NextGen Weather Processor)**	Provides improved weather observations and forecasts and tailors weather data for integration into decision support tools for collaborative and dynamic NAS decision making		✓ Established NextGen Weather Processor test bed	• Risk reduction activities • Market survey for NextGen Weather Processor capabilities	• Initial investment analysis • Complete NextGen Weather Processor risk mitigation strategy Phase 2

Budget Line	Task Force	Activity	Description	OIs	FY 2010	FY 2011	FY 2012 – Mid-term
Safety, Security and Environmental Performance		**Security Integrated Tool Set (SITS)**	Finalizes the business case, safety management document, NAS enterprise architecture artifacts, and requirements documents.		✓ Completed SITS concept exploration and business case methodology/ analysis	• Develop an implementation strategy and planning document	• Award contract for SITS development, and initiate development activities • Continue development of initial SITS capabilities • Transition to initial operational capability
System Development		**Operational Assessments**	Conducts integrated assessments to ensure that safety, environmental and system performance considerations are properly addressed throughout the integration and implementation of NextGen.		✓ Developed and applied models to support the operational performance, safety and environmental integrated assessments of NextGen airspace/procedure and system changes	• Assess and integrate the local, regional, NAS-wide analysis capability of Aviation Environmental Design Tool (AEDT) and develop plans for further enhancements • Assess and integrate the local, regional, NAS-wide analysis capability of Aviation Portfolio Management Tool (APMT) and develop plans for further enhancements • Develop options to integrate environmental assessment capability with NextGen NAS models • Develop NextGen NAS-wide environmental mitigation and cost-beneficial options for decision support • Enhance safety model to support NextGen operational assessments • Enhance operational performance model to support NextGen operational assessments	• Develop, evaluate and implement further enhancements for the NextGen local, regional, NAS-wide scale analysis capability in the AEDT • Develop, evaluate and implement further enhancements for the NextGen local, regional, NAS-wide scale analysis capability in the APMT • Perform NextGen environmental analyses for fleet and operations sequencing • Enhance safety model to support NextGen operational assessments • Enhance operational performance model to support NextGen operational assessments
System Development		**Air Traffic Control (ATC)/Tech Ops Human Factors**	Conducts system engineering and other technical support to fully integrate human factors considerations into the NextGen portfolio and conducts focused human factors studies in areas such as controller workload and work station interfaces.		✓ Delivered initial NextGen common workstation requirements document ✓ Delivered initial human error safety analysis of mid-term operations ✓ Delivered initial tower workstation requirements	• Develop common automation platform requirements development and simulation • Develop Traffic Flow Management human factors operational sequences • Develop air/ground integration HITL simulation plan	• Complete a strategic job analysis of the new roles of air traffic service providers using a highly automated system, sharing separation responsibilities with pilots, and moving toward performance-based services • Demonstrate collaborative air traffic management efficiencies • Demonstrate integration of air and ground functional capabilities • Identify changes in controller procedures to support pilot separation responsibility when using cockpit display of traffic information • Demonstrate controller use of NextGen concepts, capabilities and procedures supporting transition of self separation responsibility to pilots

NextGen Concept Maturity and System Development (cont'd)

Selected Work Activities

Budget Line	Task Force	Activity	Description	OIs	FY 2010	FY 2011	FY 2012 – Mid-term
System Development		**Systems Safety Management Transformation**	• Develops 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. • Develops and implements the 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. • Creates system-wide risk baselines, and annual impact assessment of changes, including NextGen, on safety risk. • Ensures highly capable and consistent risk assessment processes through Safety Risk Management (SRM) processes and taxonomy, analytical methods and integrated evaluation applications. • Develops new methods to ensure continual surveillance of Design Approval Holder compliance with Safety Management System (SMS) requirements.		✓ Began implementing enhanced ASIAS, including the selected support architecture and requirements for information security, near real-time operations and new and expanded participants	ASIAS • Provide capability across all commercial aviation nodes to fuse data from public and non-public sources while maintaining data protection • Evolve more sophisticated text mining capabilities across data sources, including flight operations, maintenance, dispatch, ATC operations and aviation safety reporting system • Provide initial ability to automatically monitor for unknown risk based on complex text mining capabilities and seamless data sources • Integrate data from at least one additional class of operations in the U.S. domestic airspace • Conduct demonstration project with limited set of Joint Planning and Development Office participants for analysis of safety metrics and directed studies System Safety Assessment (SSA) • Develop user and system requirements for system baseline risk estimation • Develop standard user requirements for development and installation of a risk analysis function and application to NextGen concept in surface operations into the operational ASIAS platform SMS • Develop a method that can be used for continual surveillance of Design Approval Holder compliance with SMS SRM • Develop guidance on taxonomy, analytical methods and integrated evaluation applications that ensure that consistent risk assessment processes are employed throughout the FAA Office of Aviation Safety	• Create policy, process standards, risk assessment/management tools, analysis infrastructure and rudimentary safety assurance framework • Demonstrate a national-level SSA working prototype that will proactively identify emerging risk across the NextGen • Develop proof of concept for NextGen SMS including a prototype to implement on a trial basis with selected participants that involve a cross-section of air service providers

Budget Line	Task Force	Activity	Description	OIs	FY 2010	FY 2011	FY 2012 – Mid-term
System Development		**New ATM Requirements**	Conducts research across all solution sets, focused on maturing concepts and technologies targeting application toward the end of the NextGen mid-term.		✓ Provided recommendations for an aeronautical mobile airport communications system standard ✓ Defined baseline Requirements for Future Traffic Alert and Collision Avoidance System ✓ Developed initial airborne SWIM concept of use	• Conduct system design for future air-ground data communications requirements implementing flexible airspace management • Begin requirements definition for common trajectory implementation • Conduct initial analysis of common trajectory needs and develop initial implementation strategy • Conduct engineering trade study for weather radar replacement • Provide analysis, requirements, pseudo-code-supports for effective collision risk safety net in an environment of closely spaced parallel RNP route from top-of-descent to the runway	Terminal Collision Avoidance System • Define baseline requirements for future Collision Avoidance Systems • Develop an integrated approach between separation assurance and collision avoidance with special attention to safety Trajectory Modeling • Determine conflict resolution approaches using aircraft intent data • Develop evaluation model to assess common trajectory • Develop NAS-wide trajectory prediction requirements in the mid-term • Develop common trajectory message format and standard • Develop safety assessments Weather Radar Replacement • Complete technology demonstration development and conduct evaluations • Prototype demonstration
System Development		**Operations Concept Validation, Validation Modeling**	Addresses developing and validating future end-to-end operational concepts with special emphasis on researching changes in roles and responsibilities between the FAA and airspace.	108206	✓ Generated Time Based Flow Management (TBFM) transient analysis results on the effectiveness of various alternatives to mitigate the impact of transient events on TBFM	• Develop draft 2nd level NextGen concept of operations for the NAS (2025)	• Conduct HITL simulations of trajectory based operations for integrated TBFM • Validate concepts through detailed analyses including analytical modeling, fast-time simulations, and HITL simulations and demonstrations
System Development		**Staffed NextGen Towers (SNT)**	Demonstrates the concept of, and develops the necessary requirements, specifications and supporting documentation for, SNT. SNT may allow for the cost-effective expansion of services to a larger number of airports, and reduce tower construction costs.		✓ Conducted demonstration activities ✓ Continued detailed engineering analysis and requirements validation activities	• Develop performance standards and SNT alternatives • Develop initial investment decision documentation including business case analysis report, implementation strategy and planning, and basis of estimate • Update Enterprise Architecture products and amendments • Maintain SNT equipment at field site (Dallas/Fort Worth)	• Continue development of standards and alternatives • Begin development of an implementation strategy for SNT • Conduct system design activities including electronic data distribution integration, Data Comm integration and sub-system engineering activities • Procure and install Decision Support Tools (DST) for conformance monitoring, including hardware and software • Continue procurement and installation of DST • Support the development of concept of operations for flexible SNT and validation of flexible SNT

NextGen Concept Maturity and System Development (cont'd)

Selected Work Activities

Budget Line	Task Force	Activity	Description	OIs	FY 2010	FY 2011	FY 2012 – Mid-term
System Development		**Wake Turbulence Recategorization**	Develops 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.		✓ Developed recommendation for an alternative set of wake separation standards ✓ Provided recommendation to International Civil Aviation Organization (ICAO) for action	• Determine optimal set of aircraft flight characteristics and weather parameters for use in setting wake separation minimums • Develop metrics for setting tailored leader/follower aircraft wake mitigation separation standards	• Determine changes to FAA air traffic control systems that will be required in the ICAO implementation of the revised wake separation standards developed earlier by this program • Develop a sample set of leader/follower aircraft wake mitigation separation standards • Determine the changes to FAA air traffic control systems required to implement the leader/follower tailored aircraft wake separation standards • Complete development of the leader/follower tailored aircraft wake separation standards along with the planning for implementing the associated procedures and processes • Continue development of wake separation processes that account dynamically for the wake generated by the lead aircraft • Develop enhancements to modeling that will enable their use in evaluating the proposed dynamic wake mitigation separation processes • Perform simulations to validate the operational feasibility of dynamic wake separation processes and procedures

Airport and Facility 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-Hollywood
HNL	Honolulu
IAD	Washington Dulles
IAH	Houston Intercontinental
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 (Oregon)
PHL	Philadelphia
PHX	Phoenix
PIT	Pittsburgh
SAN	San Diego
SEA	Seattle-Tacoma
SFO	San Francisco
SLC	Salt Lake City
STL	St. Louis
TPA	Tampa

OTHER AIRPORTS

ANC	Anchorage
CMH	Columbus (Ohio)
MMU	Morristown (New Jersey)
SAT	San Antonio
TEB	Teterboro (New Jersey)

FAA FACILITIES

ZAB	Albuquerque ARTCC
ZAU	Chicago ARTCC
ZDC	Washington ARTCC
ZDV	Denver ARTCC
ZHU	Houston ARTCC
ZLA	Los Angeles ARTCC
ZLC	Salt Lake City ARTCC
ZNY	New York ARTCC
ZOA	Oakland ARTCC
ZSE	Seattle ARTCC

Acronyms

2D	Two-Dimensional
4D	Four-Dimensional
4DT	Four-Dimensional Trajectory
A/DMT	Arrival/Departure Management Tool
AC	Advisory Circular
ACM	Adjacent-Center Metering
ADS-B	Automatic Dependent Surveillance-Broadcast
ADS-C	Automatic Dependent Surveillance-Contract
AEDT	Aviation Environmental Design Tool
AIM	Aeronautical Information Management
AIP	Airport Improvement Program
AIRE	Atlantic Interoperability Initiative to Reduce Emissions
ALP	Airport Layout Plan
ANSP	Air Navigation Service Provider
AOC	Airline Operations Center
APMT	Aviation Portfolio Management Tool
AR	Authorization Required
ARC	Aviation Rulemaking Committee
ARMS	Airspace Resource Management System
ARTCC	Air Route Traffic Control Center
ASAP	Aviation Safety Action Program
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
ASTM	Standard-setting organization
ATC	Air Traffic Control
ATM	Air Traffic Management
ATN	Aeronautical Telecommunications Network
ATPA	Automated Terminal Proximity Alert
CAAFI	Commercial Aviation Alternative Fuels Initiative
CARTS	Common Automated Radar Terminal System
CATM	Collaborative Air Traffic Management
CATMT	Collaborative Air Traffic Management Technologies
CDM	Collaborative Decision Making
CDP	Climb/Descent Procedure
CDQM	Collaborative Departure Queue Management
CDTI	Cockpit Display of Traffic Information
CIWS	Corridor Integrated Weather System
CIX	Collaborative Information Exchange
CLEEN	Continuous Lower Energy, Emissions and Noise
CO_2	Carbon Dioxide
CRDA	Converging Runway Display Aid
CSPO	Closely Spaced Parallel Operations
CSPR	Closely Spaced Parallel Runways
CTP	Collaborative Trajectory Planning
Data Comm	Data Communications
DCL	Departure Clearance
DDU	Data Distribution Unit
DME	Distance Measuring Equipment
DoD	Department of Defense
DST	Decision Support Tool
eALP	Electronic Airport Layout Plan
EDX	Enhanced Data Exchange
EFB	Electronic Flight Bag
EFVS	Enhanced Flight Vision System
EMS	Environmental Management System
ERAM	En Route Automation Modernization
ES	Extended Squitter (Mode S)
EVS	Enhanced Vision System
FAA	Federal Aviation Administration
FACT	Future Airport Capacity Task
FANS	Future Air Navigation System
FIS-B	Flight Information Services-Broadcast

FMC	Flight Management Computer
FMS	Flight Management System
FOC	Flight Operations Center
FOQA	Flight Operational Quality Assurance
FOSA	Flight Operator Surface Application
FY	Fiscal Year
GBAS	Ground Based Augmentation System
GIS	Geographic Information System
GLS	GBAS Landing System
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HITL	Human-in-the-Loop
HRJ	Hydrotreated Renewable Jet
HUD	Heads-Up Display
ICAO	International Civil Aviation Organization
IDAC	Integrated Departure/Arrival Capability
ILS	Instrument Landing System
ITA	Initial Tailored Arrival
ITP	In-Trail Procedure
JPDO	Joint Planning and Development Office
JRC	Joint Resources Council
LAAS	Local Area Augmentation System
LED	Light-Emitting Diode
LNAV	Laternal Navigation
LP	Localizer Performance
LPV	Localizer Performance with Vertical Guidance
MALSR	Medium-Intensity Approach Lighting System with Runway Alignment Indicator
MHz	Megahertz
NAS	National Airspace System
NASA	National Aeronautics and Space Administration
NAS EA	National Airspace System Enterprise Architecture
NATCA	National Air Traffic Controllers Association
NAVAID	Navigation Aid
NEO	Network Enabled Operations
NEPA	National Environmental Policy Act
NextGen	Next Generation Air Transportation System
NIEC	NextGen Integration and Evaluation Capability
NM	Nautical Miles
NNEW	NextGen Network Enabled Weather
NOTAM	Notice to Airmen
NVS	NAS Voice System
NWP	NextGen Weather Processor
Ocean21	Oceanic Automation System
OEP	Operational Evolution Partnership
OI	Operational Improvement
OMP	O'Hare Modernization Project
OPD	Optimized Profile Descent
PAPI	Precision Approach Path Indicator
PBN	Performance Based Navigation
RAPT	Route Availability Planning Tool
RF	Radius-to-fix
RNAV	Area Navigation
RNP	Required Navigation Performance
RPI	Relative Position Indicator
RTA	Required Time of Arrival
RTCA	Aviation industry group
RVR	Runway Visual Range
RVSM	Reduced Vertical Separation Minimum
SAA	Special Activity Airspace
SAAAR	Special Aircraft and Aircrew Authorization Required
Satcom	Satellite Communications
SATNAV	Satellite Navigation
SBAS	Satellite Based Augmentation System
SESAR	Single European Sky Air Traffic Management Research
SID	Standard Instrument Departure
SITS	Security Integrated Tool Set
SMS	Safety Management System
SNT	Staffed NextGen Towers
SRM	Safety Risk Management
SRMD	Safety Risk Management Document
SSA	System Safety Assessment
STAR	Standard Terminal Arrival Route
STARS	Standard Terminal Automation Replacement System
STBO	Surface Trajectory Based Operations
SUA	Special Use Airspace
SURF IA	Surface Indications and Alerts
SVS	Synthetic Vision System

SWIM	System Wide Information Management
TBFM	Time Based Flow Management
TBM	Time Based Metering
TBO	Trajectory Based Operations
TCAS	Traffic Alert and Collision Avoidance System
TFDM	Tower Flight Data Manager
TFM	Traffic Flow Management
TFMS	Traffic Flow Management System
TIS-B	Traffic Information Services-Broadcast
TMA	Traffic Management Advisor
TMI	Traffic Management Initiative
TRACON	Terminal Radar Approach Control
TSO	Technical Standard Order
UAS	Unmanned Aircraft System
UAT	Universal Access Transceiver
VDL	VHF Data Link
VHF	Very High Frequency
VNAV	Vertical Navigation
WAAS	Wide Area Augmentation System
WTMA	Wake Turbulence Mitigation for Arrivals
WTMA-P	Wake Turbulence Mitigation for Arrivals-Procedures
WTMD	Wake Turbulence Mitigation for Departures

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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.**
- **NextGen will reduce aviation's impact on the environment.**
- **NextGen will help us be even more proactive about preventing accidents with advanced safety management.**
- **NextGen will get the right information to the right person at the right time.**
- **NextGen will lay a foundation to continually improve air travel and strengthen the economy.**
- **NextGen will help communities make better use of their airports.**
- **NextGen will enable us to meet our increasing national security and safety needs.**
- **NextGen will bring about one seamless global sky.**

NextGen

Giving the world new ways to fly

U.S. Department of Transportation

Federal Aviation Administration

NextGen Integration and Implementation Office
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