Federal Aviation Administration

FAA's

NextGen

APPENDIX B

IMPLEMENTATION PLAN

March 2010

APPENDIX B

NextGen COMMITMENTS AND MILESTONES

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

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

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

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

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

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

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

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

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

TRANSFORMATIONAL PROGRAMS

AIRSPACE ENHANCEMENTS AND PROCEDURES

AIRFIELD DEVELOPMENT

NEXTGEN PORTFOLIO

OVERARCHING COMMITMENTS

NextGen Transformational Programs

Implementation Commitments

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

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

Airspace Enhancements and Procedures

Implementation Commitments

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

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

Airfield Development

Implementation Commitments

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

NextGen Portfolios

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

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

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

Initiate Trajectory Based Operations (TBO)

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

NextGen funded activities leading to TBO Capabilities include:

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

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

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

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

Selected milestones from each of these projects include:

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

Increase Arrivals/Departures at High Density Airports (HD)

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

NextGen funded activities at high density airports include:

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

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

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

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

Selected milestones from each of these projects include:

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

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

Increase Flexibility in the Terminal Environment (FLEX)

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

NextGen funded activities leading to flexible terminals and airports include:

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

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

Increase Flexibility in the Terminal Environment (cont'd)

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

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

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

Selected milestones from each of these projects include:

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

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

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

Improve Collaborative Air Traffic Management (CATM)

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

NextGen funded activities leading to collaborative air traffic management include:

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

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

Improve Collaborative Air Traffic Management (cont'd)

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

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

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

Selected milestones from each of these projects include:

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

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

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

Reduce Weather Impact (RWI)

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

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

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

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

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

Selected milestones from each of these projects include:

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

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

Improve Safety, Security and Environmental Performance (SSE)

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

NextGen funded activities supporting safety, security or environment include:

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

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

Enhance Emergency Alerting: OI 106202

Selected milestones from each of these projects include:

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

Transform Facilities (FAC)

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

NextGen funded activities leading to transformed facilities include:

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

Selected milestones from each of these projects include:

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

NextGen System Development

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

NextGen-funded activities under System Development include:

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

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

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

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

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

Selected milestones from each of these projects include:

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

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

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

NextGen Demonstrations

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

Selected milestones from each of these projects include:

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

Task Force Overarching Commitments

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

Task Force Overarching Commitments (cont'd)

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

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

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