

Accomplishing NextGen

Research to Implementation

Establishing NASA-FAA Research Transition Teams



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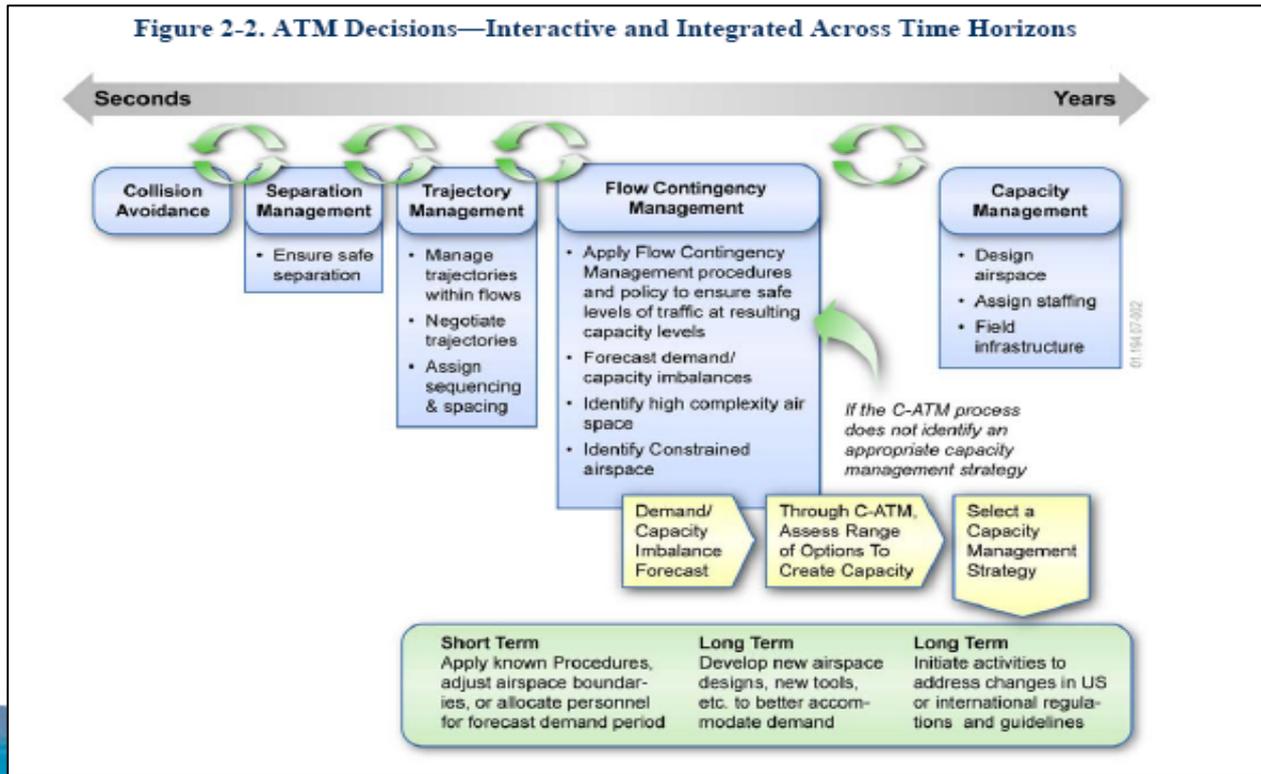
Approach

- Goal: Ensure that R&D needed for NextGen implementation is identified, conducted, and effectively transitioned to the implementing agency
- Objectives:
 - Provide a structured forum for researchers and implementers to constructively work together on a continual basis
 - Ensure that planned research results can be fully utilized and will be sufficient to enable implementation of NextGen Operational Improvements



ConOps and IWP Framework

- The ATM portion of NextGen is captured in the ConOps according to the following framework:
 - Separation Management (SM)
 - Trajectory Management (TM)
 - Flow Contingency management (FCM)
 - Capacity Management (CM)
- The IWP uses the same framework
- It is proposed that collaboration between researchers and implementers be organized along the same framework



Mapping NASA and FAA Plans to the ConOps/IWP Framework

OEP Solution Set	IWP Framework Key Research Topics	NASA RFAs Related to the IWP Framework	NASA Supporting RFAs
<p>Collaborative Air Traffic Management</p> <p>Initial Trajectory Based Operations</p> <p>Arrival/Departure High Density</p> <p>Transform Facilities</p>	<p>Separation Management</p> <ul style="list-style-type: none"> -Self Separation -Reduced Separation 	<p>Separation Assurance</p> <p>Safe and Efficient Surface Operations</p>	
<p>Initial Trajectory Based Operations</p> <p>Arrival/Departure High Density</p> <p>Reduce Wx Impacts</p> <p>Flexibility in Terminal</p>	<p>Trajectory Management</p> <ul style="list-style-type: none"> -Integrated Arrivals/Departures -Surface Operations -Trajectory Based Management 	<p>Super Density Operations</p> <p>Coordinate Arrival/Departure Operations Management</p> <p>Airport Transition and Integration Management</p> <p>Safe and Efficient Surface Operations</p>	<p>Trajectory Prediction, Synthesis, and Uncertainty</p> <p>System Level Design, Analysis, and Simulation Tools</p> <p>Performance Based Services</p> <p>Integrated Intelligent Flight Deck Technologies (from Safety Program)</p>
<p>Collaborative Air Traffic Management</p> <p>Reduce Wx Impacts</p>	<p>Flow Contingency Management</p> <ul style="list-style-type: none"> -Collaborative and Flexible FCM with Negotiations 	<p>Traffic Flow Management</p>	
<p>Collaborative Air Traffic Management</p> <p>Initial Trajectory Based Operations</p> <p>Transform Facilities</p>	<p>Capacity Management</p> <ul style="list-style-type: none"> -Dynamic Airspace Configurations 	<p>Dynamic Airspace</p>	



Technology Transfer Strategy

- Initiate four pilot Research Transition Teams organized along the IWP Framework for near, mid, and far-term research goals
 - TMA Applications for near-term (TM)
 - Surface Management for mid-term (TM)
 - Dynamic Airspace Configuration for far-term (CM)
 - Multi-Sector Planner for near-term (FCM)

- Revitalize and formalize collaboration by forming a Technology Transfer Coordinating Committee co-chaired by NASA and FAA Technical Leads
 - Jointly develop research requirements by NASA and FAA
 - Provide technology pull from FAA
 - Allow NASA to provide clear understanding of the engineering rationale for design decisions which would make the FAA better equipped to plan the deployment process, evaluate deployment sites, establish guidelines for evaluation, manage user expectations, and address new technical challenges
 - Clearly define the metrics by which the research results/products will be evaluated
 - Provide good connections within the FAA to ensure success in moving from research to implementation

- Establish the Research Transition Teams whose NASA and FAA co-leads will interact with the Coordinating Committee within the Functional Area Framework
 - Enable integration of naturally closely coupled topics
 - Keeps the coordinating committee well informed of the RTT activities



Coordination and Oversight

JPDO representatives:

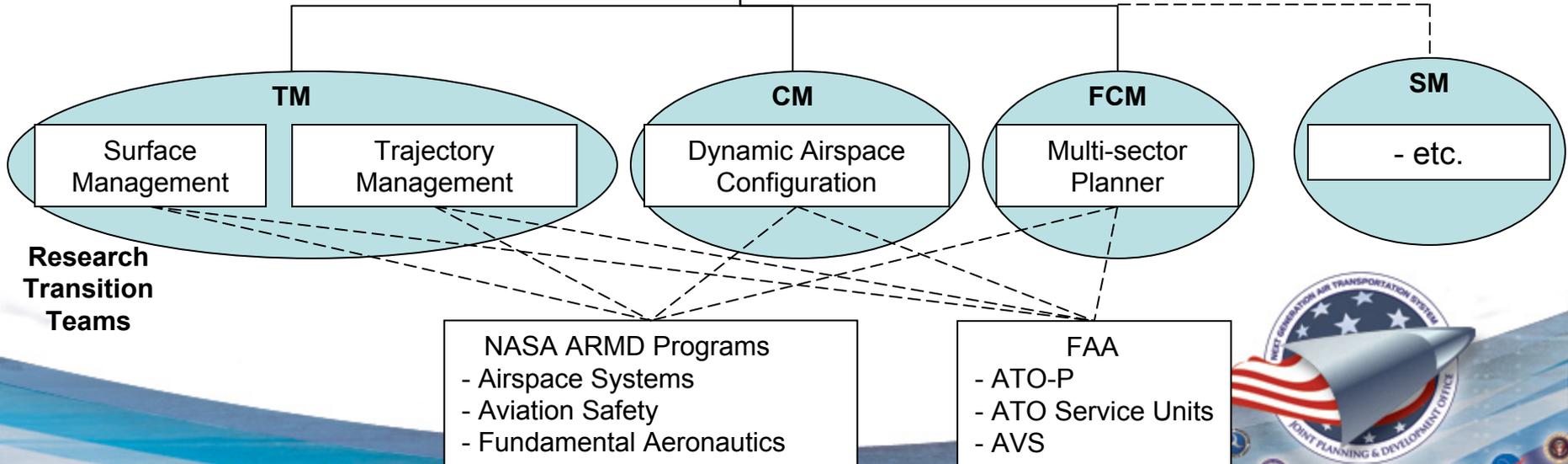
- Provide meeting preparation support to the RTT Leads (agendas, read-ahead materials, pre-meeting assignments, etc.)
- Support NASA/FAA members in preparing for meeting/workshop
- Document meeting activities and results (discussions, agreements, actions, etc.)
- Provide liaison with JPDO (recommended changes to IWP, JPDO support needed, follow-up, etc.)

Convening Authority	
NASA	FAA
Dr. Lisa Porter Associate Administrator	Victoria Cox V-P ATO-P

Coordinating Committee	
Co-chairs: Akbar Sultan (NASA) Steve Bradford (FAA)	
Members: Steve VanTrees (FAA AVS) NASA Aviation Safety (TBD) John Scardina (JPDO)	

Functions:

- Provide overall guidance to RTTs
- Coordinate RTT activities
- Resolve cross-team issues
- Ensure adequate agency resources are made available
- Monitor progress of teams (quarterly)
- Report progress to management (as requested)



Start-up Activities

- **Coordinating Committee Co-Chairs:**
 - Propose 4 topics for initial NASA-FAA collaboration via startup workshops
 - Within 3 weeks of go-ahead, appoint Co-Leads for each workshop
 - Initiate additional future RTTs via startup workshops
- **Workshop Co-Leads:**
 - Plan workshop: agenda, scope, date, participants and their responsibilities
 - Conduct workshop in 2nd Quarter FY08.
- **The workshops will:**
 - Pilot the Research Transition Teams whose NASA and FAA co-leads will interact with the Coordinating Committee within the Functional Area Framework
 - Identify the specific scope, objectives, products, timelines, and methods for the technology transition
 - Identify operational sub-elements to be addressed
 - Identify the risks and mitigation plans associated with each RTT topic
- **After workshop, Co-Leads meet with the coordinating committee to:**
 - Finalize the scope of the Research Transition Team (RTT)
 - Select the RTT Co-Leads
 - Review lessons learned
- **RTT Co-leads:**
 - Plan activities (work shops, etc.) for the coming year and submit plan to the coordinating committee
 - Continue collaboration process to achieve efficient, effective technology transfer



RTT Membership Responsibilities

Co-Leads

- Identify all collaboration efforts required and prioritize the work program for the RTT
- Plan, schedule and conduct structured and focused meetings to achieve desired outcomes
- Identify required meeting participants and support needed from participating agencies

FAA

- Provides Planning (ATO-P) personnel that can represent FAA plans (e.g., OEP) NAS Architecture and infrastructure roadmaps
- Provides Operational Service Unit personnel that can describe the barriers to implementation and issues requiring resolution before an investment decision can be made
- Provides Flight Standards/Certification personnel to represent AVS and the FAA's oversight processes

NASA

- Provides APIs and researchers that are planning and conducting the research needed to implement NextGen
- Provide details of research plans including schedules and products



NASA-FAA Collaboration Activities

- Examine and organize the NextGen improvements assigned to the RTT according to the enabling research required.
- Develop realistic estimates of when the implementation process can formally begin by examining the implementation strategy and infrastructure roadmaps.
- Given the desired schedule for implementation, determine if sufficient time and resources are available to conduct the needed research and other significant preoperational activities. If not, determine viable alternatives.
- Discuss barriers to implementation and other significant issues requiring resolution and ensure an approach exists to resolving these concerns during the conduct of the research.
- Discuss and agree to the substance, form, and timing for the transfer of research products to the implementation agency and discuss how these products will be incorporated into the implementation process.
- Analyze the IWP for completeness and alignment with the actual research/pre-implementation plan.



Backup



Separation Management

Key Research Topics and OIs in IWP Framework				
IWP Framework	Key Research Topic	Count of OIs	OIs in Key Research Topic	NASA Research Focus Areas (and Support)
Separation Management	Self Separation	7	<u>Flow Corridors</u> 0310 Improved General Aviation Access to Traverse Terminal Areas 0337 Flow Corridors - Level 1 Static 0368 Flow Corridors - Level 2 Dynamic <u>Delegated Separation</u> 0356 Delegate Separation - Pair-wise maneuvers 0359 Delegate Separation - Oceanic 0362 Self-Separation - Self-separation airspace 0363 Self-Separation - Complex procedures	SA
	Reduced Separation	15	<u>Wake Vortex</u> 0323 Wake-based Departure Operations for Parallel Runways 0324 Wake-based Spacing - Level 1 Static Subsequent Arrival/Departures 0328 Wake-based Spacing - Level 2 Dynamic Drift Only 0336 Wake-based Spacing - Level 3 Dynamic Drift and Decay <u>Runway Incursion Prevention</u> 0332 Ground-based and On-board Runway Incursion Alerting Equipment <u>Parallel Runways</u> 0334 Independent Parallel or Converging Approaches in IMC 0335 Dependent Multiple Approaches in IMC <u>Reduced Separation</u> 0316 Enhanced Visual Separation for Successive Approaches 0348 Reduced Separation- High density terminal, less than 3 nm 0343 Reduced Separation - High density en route 3 nm 0344 Reduced Oceanic Separation - 30 nm for Pair-wise Maneuvers 0347 Reduced Separation - Non-radar airspace 5 nm 0349 Special Aircraft Variable Separation Standards 0353 Reduced Oceanic Separation - Altitude change Pair-wise Maneuvers 0354 Reduced Oceanic Separation - Co-Altitude Pair-wise Maneuvers	SESO (SA, IIFDT, TPSU)
	Separation Management Subtotal		22	

Trajectory Management

Key Research Topics and OIs in IWP Framework				
IWP Framework	Key Research Topic	Count of OIs	OIs in Key Research Topic	NASA Research Focus Areas (and Support)
Trajectory Management	Integrated Arrival/Departures	14	<u>Integrated Arrivals/Departures</u> 0311 Enhance Arrival/Departure Routing and Access 0331 Integrated Arrival/Departure and Surface Traffic Management 0339 Integrated Arrival/Departure and Surface Traffic Management for Metroplex <u>Merging and Spacing</u> 0326 Airborne Merging and Spacing - Single Runway 0329 Airborne Merging and Spacing with CDA 0333 Airborne Merging and Spacing for Multiple Runways 0338 Airborne Merging and Spacing for Metroplex 0341 Limited Simultaneous Runway Occupancy 0355 En Route Airborne Merging and Spacing <u>Time Based Metering with CDA</u> 0309 Limited Continuous Descent Arrivals 0318 Arrival Time-Based Metering - Controller Advisories 0319 Time-Based Metering into En Route Streams 0325 Arrival Time-Based Metering via ANSP/Aircraft Collaboration 0330 Time-Based and Metered Routes with CDA	CADOM, TFM, SDO (TPSU, SA)
	Surface Operations	9	<u>Virtual Towers</u> 0313 Virtual Towers - Level 1 Sequencing, Separation, and Spacing 0315 Virtual Towers - Level 2 Sequencing, Separation, Spacing, Surface Mgmt. <u>All Weather Access</u> 0317 All Weather Airport Access 0381 Near-all Weather Airport Access <u>Surface Management</u> 0320 Surface Management - Level 1 Initial Surface Scheduling 0321 Surface management - Level 2 Datalink/Departures 0327 Surface Management - Level 3 Arrivals/Winter Ops/Runway Configuration 0322 Low Visibility Surface Operations 0340 Zero-Visibility Surface Operations	SESO (TPSU)
	Trajectory Based Management	8	0304 Improved Collaborative Oceanic Routing 0350 Flexible Routing 0352 Automated Clearance Delivery and Frequency Changes 0357 Trajectory-Based Management - Level 1 Route/Trajectory Digital Exchange 0358 Trajectory-Based Management - Level 2 Trajectory Management Decision Support 0360 Trajectory-Based Management - Level 3 Automation-Assisted Trajectory Negotiation 0369 Trajectory-Based Management - Level 4 Automated Negotiation/Separation Management	SDO, SESO (TPSU, PBS, SA)
Trajectory Management Subtotal		31		

Flow Contingency Management and Capacity Management

Key Research Topics and OIs in IWP Framework				
IWP Framework	Key Research Topic	Count of OIs	OIs in Key Research Topic	NASA Research Focus Areas (and Support)
Capacity Management	Dynamic Airspace Configurations	8	<u>Airspace Reconfiguration</u> 0351 Airspace Reconfiguration - Level 1 - Limited Dynamic En Route 0307 Airspace Reconfiguration - Level 2 - Limited Dynamic Arrival/Departure 0367 Airspace Reconfiguration - Level 3 - Dynamic En Route 0342 Airspace Reconfiguration - Level 4 - Dynamic Arrival/Departure 0361 Flexible Resource Allocation for Airspace Management 0366 Dynamic Airspace Reclassification <u>Special Use Airspace</u> 0346 SUA Airspace Management - Level 1 - Real-time Scheduling Information 0365 SUA Airspace Management - Level 2 - Improved Coordination	DAC (PBS)
			Capacity Management Subtotal	8
Flow Contingency Management	Collaborative and Flexible FCM with Negotiations	5	0300 Improved Collaborative Pre-Flight Rerouting 0302 Initial Collaborative In-Flight Rerouting 0303 Improved Collaborative Traffic Management Initiatives 0305 Traffic Flow Management Alternatives Analysis 0306 Automation - Assisted Flight Plan Negotiation	TFM (TPSU)
			Flow Contingency Management Subtotal	5



Cross-Agency Focus Areas

Cross-Agency Research Transition Teams

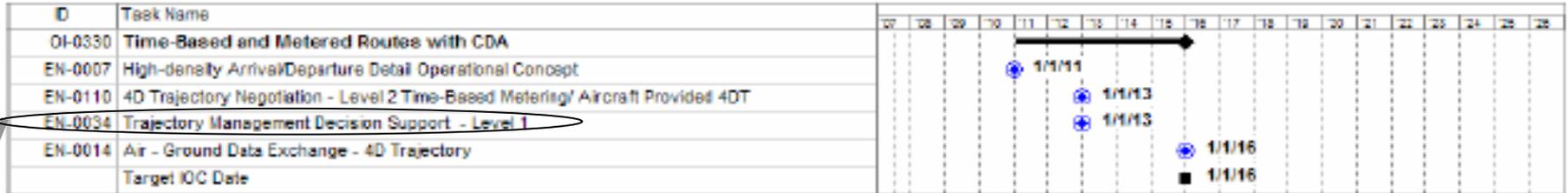
NASA Aeronautics Research	NextGen	FAA OEP Solution Sets	ATO Operations Planning	ATO Service Units	AVS Aviation Safety
<p>Airspace Systems Program</p> <ul style="list-style-type: none"> - NGATS ATM: Airspace Project <ul style="list-style-type: none"> • <i>Dynamic Airspace Configuration</i> • <i>Traffic Flow Management</i> • <i>Separation Assurance Operations</i> • <i>Super Density Operations</i> • <i>Performance-Based Services</i> • <i>Trajectory Prediction, Synthesis & Uncertainty</i> • <i>System Level Design, Analysis & Simulation Tools</i> - NGATS ATM: Airportal Project <ul style="list-style-type: none"> • <i>Safe & Efficient Surface Operations</i> • <i>Coordinated Arrival/Departure Operations</i> • <i>Airportal Transition and Integration Management</i> <p>Aviation Safety Program</p> <ul style="list-style-type: none"> - Integrated Vehicle Health Management - Integrated Resilient Aircraft Control - Aging Aircraft and Durability - Integrated Intelligent Flight Deck Technologies <p>Fundamental Aeronautics Program</p> <ul style="list-style-type: none"> - Subsonic Fixed Wing - Subsonic Rotary Wing - Supersonics - Hypersonics 	<p>Goals</p> <ul style="list-style-type: none"> - <i>Global Leadership</i> - <i>Capacity</i> - <i>Safety</i> - <i>Environment</i> - <i>Defense</i> - <i>Security</i> <p>(19 Objectives)</p> <p>Operational Improvements (200+)</p> <p>IWP OI groupings</p> <ul style="list-style-type: none"> - <i>Trajectory and Performance Based Operations</i> <ul style="list-style-type: none"> ▪ <i>Trajectory Management</i> ▪ <i>Separation Management</i> - <i>Air Navigation Support</i> <ul style="list-style-type: none"> ▪ <i>Capacity Management</i> ▪ <i>Flow Contingency Management</i> - <i>Flight Operations</i> <ul style="list-style-type: none"> ▪ <i>Aircraft Flight Operations</i> ▪ <i>Aircraft Surface Operations</i> ▪ <i>Aircraft Fleet Management</i> - <i>Airport Operations and Support</i> - <i>Shared Situational Awareness Services</i> - <i>Environmental Management</i> - <i>Safety Management</i> 	<ul style="list-style-type: none"> ▪ Trajectory Based Operations ▪ High Density Terminals ▪ Flexible Terminals ▪ Collaborative Air Traffic Management ▪ Reduced Weather Impact ▪ Safety, Security and Environment ▪ Transformed Facilities ▪ Aircraft & Operator Requirements ▪ OEP 35 Airports ▪ OEP Metro Areas 	<p>•Operational Domains</p>	<ul style="list-style-type: none"> •System •En Route •Terminal •Infra-structure 	

Sample OI Roadmaps (from IWP)

(Placeholder)

OI-0330

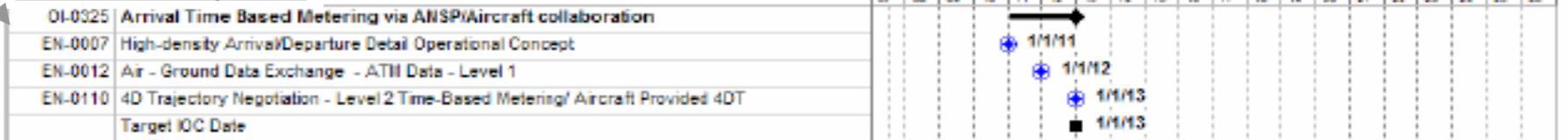
Time-Based and Metered Routes with CDA



Other OIs Supporting OI-0330:

- OI-0309 Limited CDA Arrivals
- OI-0311 Enhance Arrival/Departure Routing and Access
- OI-0325 Arrival Time Based Metering via ANSP/Aircraft Collaboration

Enablers Supporting OI-0325



Prerequisite Enablers (example for EN-0034):

- EN-0016 Separation/Trajectory Management Detail Operational Concept
- EN-1006 Integrated Cooperative Surveillance Information – Level 1
- EN-1302 Net-enabled Information management – Level 2 (SWIM Segment 2)
- EN-2010 Net-enabled Weather Information – Level 1 Initial 4d Wx Cube

R&D Activities Supporting OI-0330:

- R-0370 Research on traffic spacing management...
- D-0920 Develop traffic spacing management components



Trajectory Based Operations

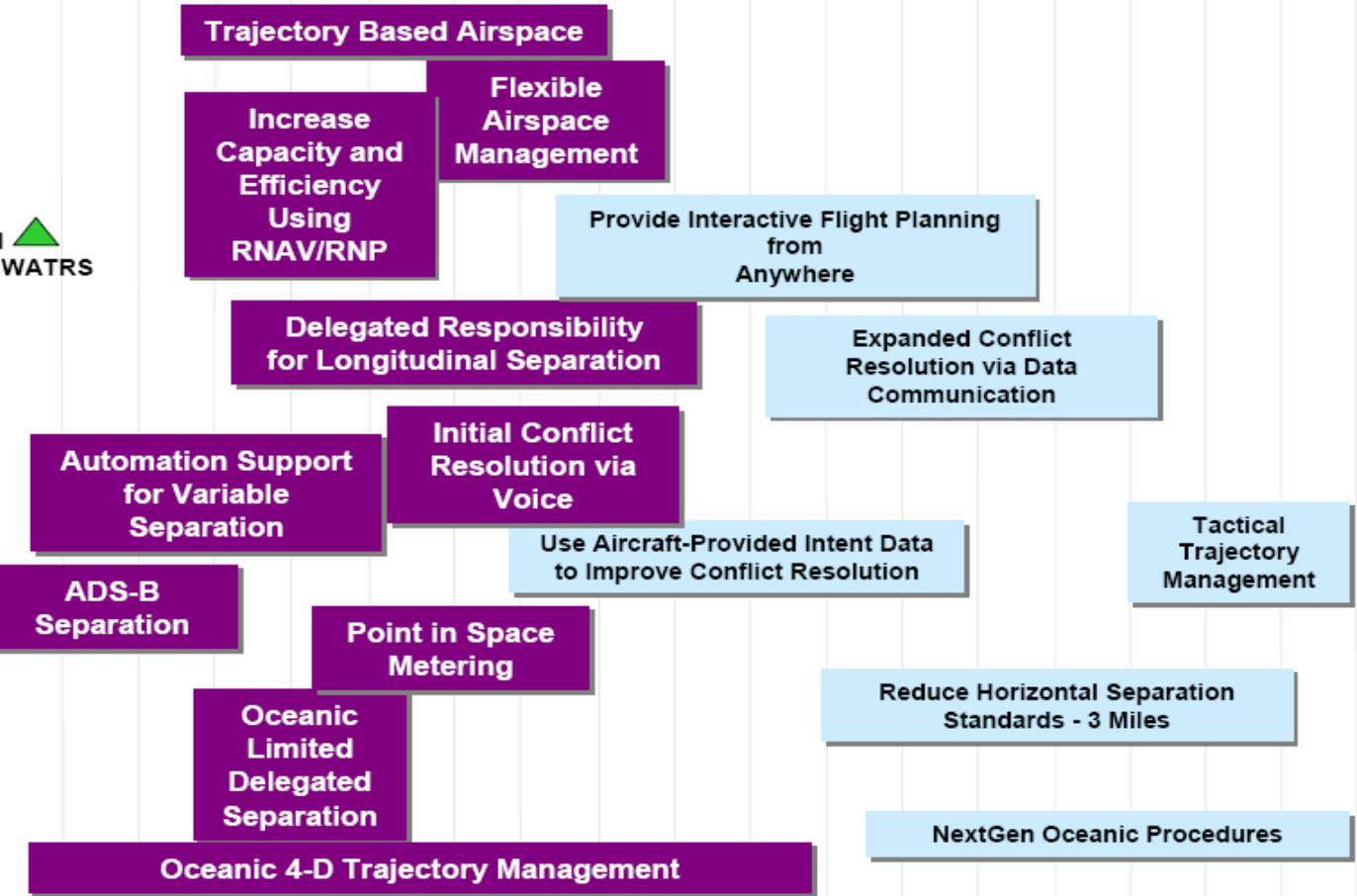
OEP Operational Capabilities

FY 2006 2007 2008 2009 2010 2011 2012 2013 2014 2025

Operational Use of 30/30 Separation In Oakland airspace



50 nmi Lateral Separation in WATRS



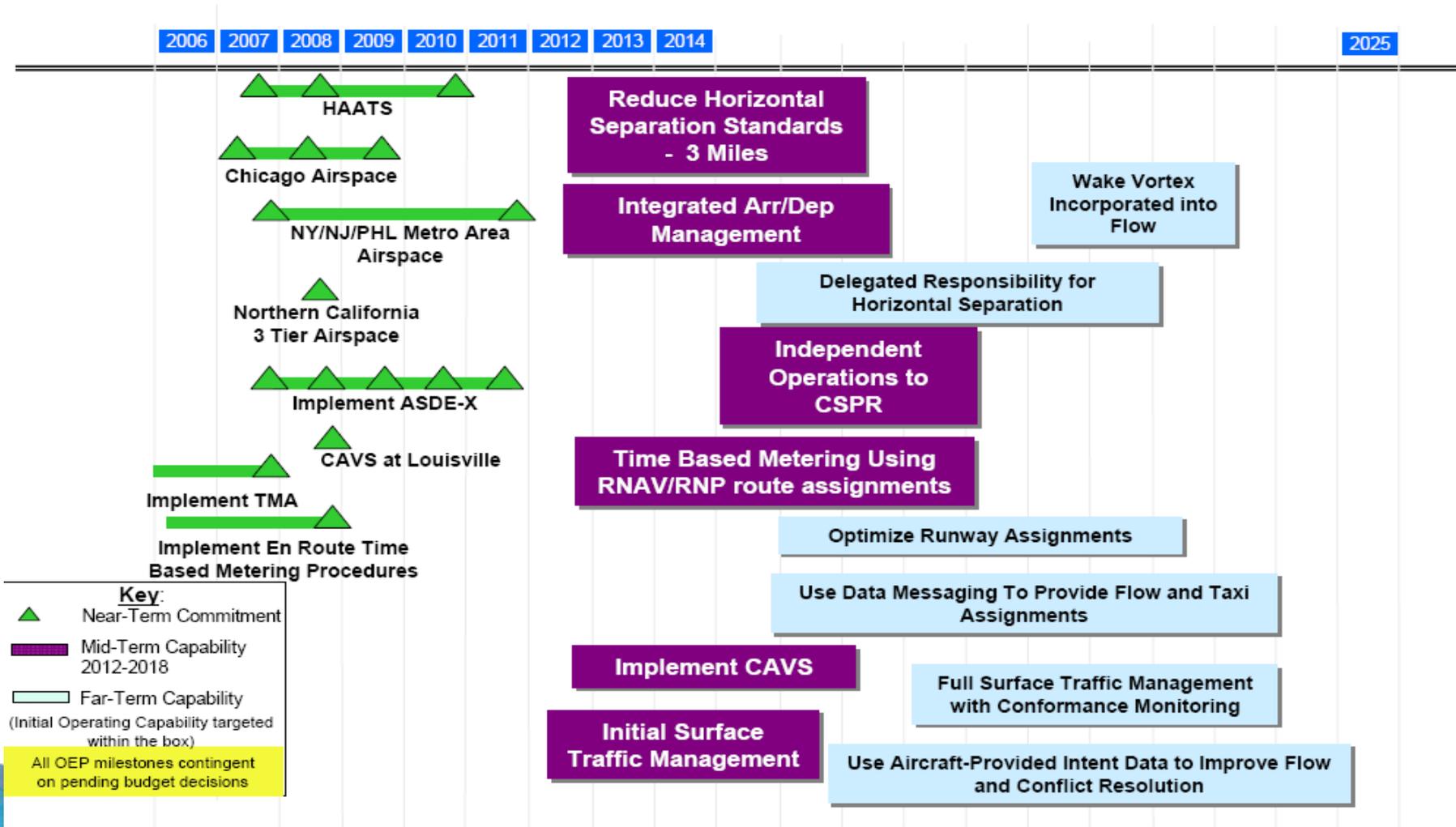
Key:

- Near-Term Commitment
- Mid-Term Capability 2012-2018
- Far-Term Capability (Initial Operating Capability targeted within the box)

All OEP milestones contingent on pending budget decisions

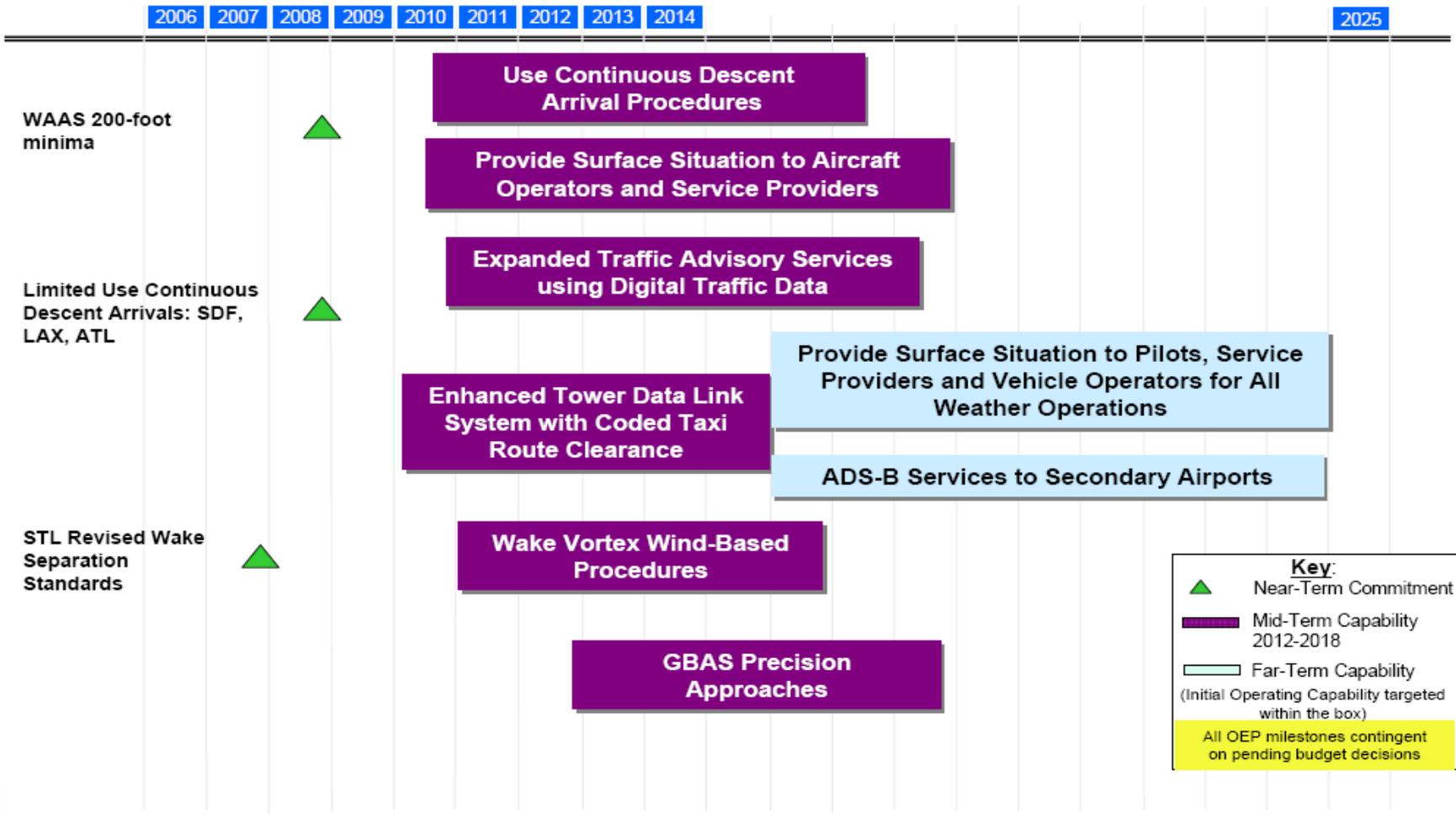
High Density Airports

OEP Operational Capabilities



Flexible Terminals

OEP Operational Capabilities



Key:

- ▲ Near-Term Commitment
- Mid-Term Capability 2012-2018
- Far-Term Capability (Initial Operating Capability targeted within the box)

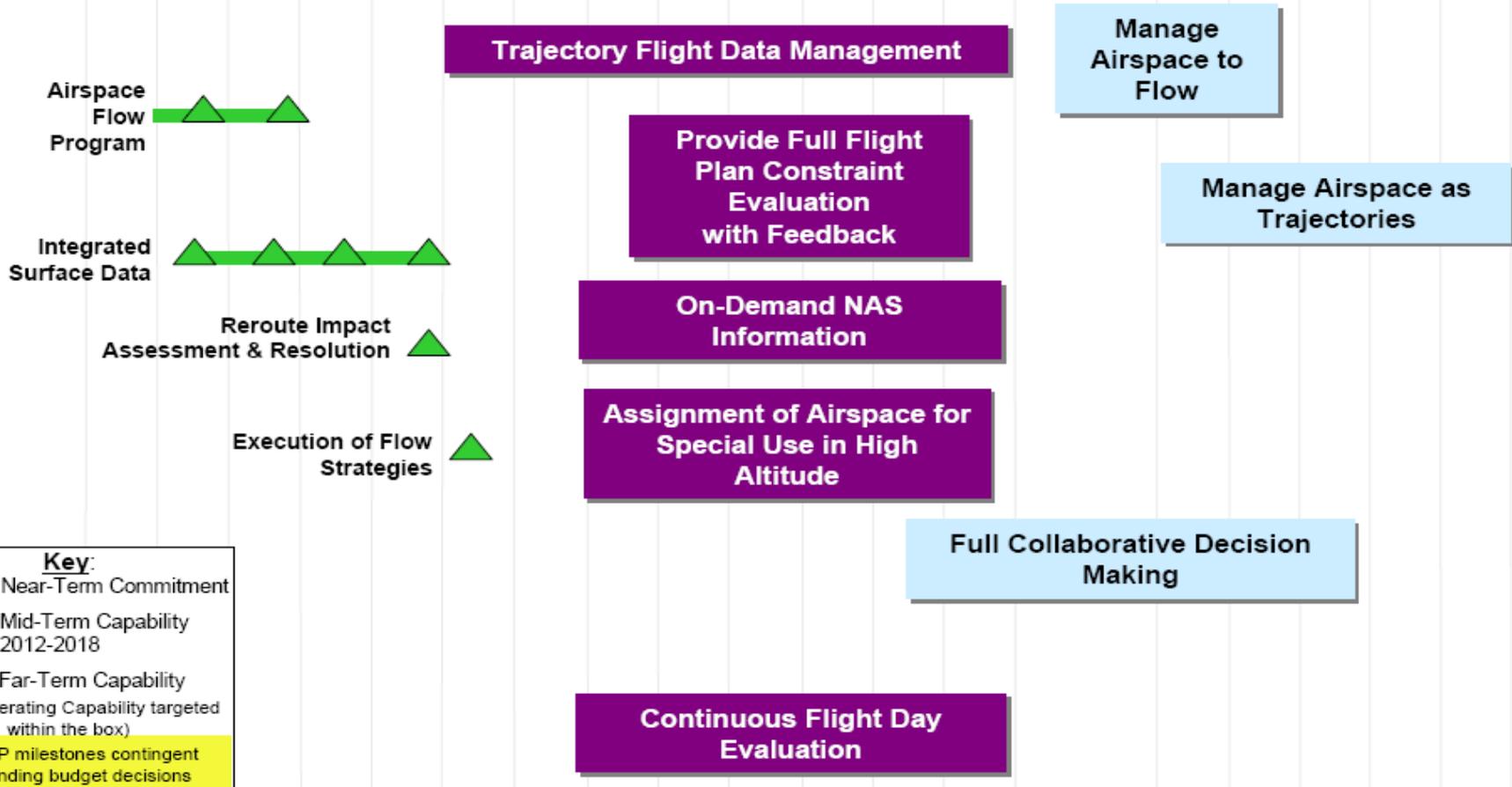
All OEP milestones contingent on pending budget decisions



Collaborative ATM

OEP Operational Capabilities

2006 2007 2008 2009 2010 2011 2012 2013 2014 2025



Reduced Weather Impact

OEP Operational Capabilities

