



Federal Aviation  
Administration

# Capacity Needs in the National Airspace System

2007- 2025



An Analysis of Airports and  
Metropolitan Area Demand  
and Operational Capacity  
in the Future

May 2007



The MITRE Corporation  
Center for Advanced Aviation System Development

HQ-009107.0003

## Future Airport Capacity TASK (FACT)

*Background and  
Status*

**Airports Working  
Group**

February 17, 2009

## BACKGROUND WHAT IS FACT?

- In 2003, the Federal Aviation Administration (FAA) convened a team to begin the Future Airport Capacity Task (FACT).
- FACT is an assessment of the future capacity of the Nation's airports and metropolitan areas. Its goal is to determine which airports and metropolitan areas have the greatest need for additional capacity, even with planned or proposed capacity improvements.
- Because it is a system-wide analysis, it is intended to provide the FAA with data about the timing and need for infrastructure improvements at the national level for agency planning purposes.
- FACT 1 (published in 2004) addressed capacity needs in 2013 and 2020
- FACT 2 (published in 2007) addressed capacity needs in 2015 and 2025 and included planned NextGen improvements by 2025



# FACT 2 Results "CAPACITY NEEDS OF THE NATIONAL AIRSPACE SYSTEM"

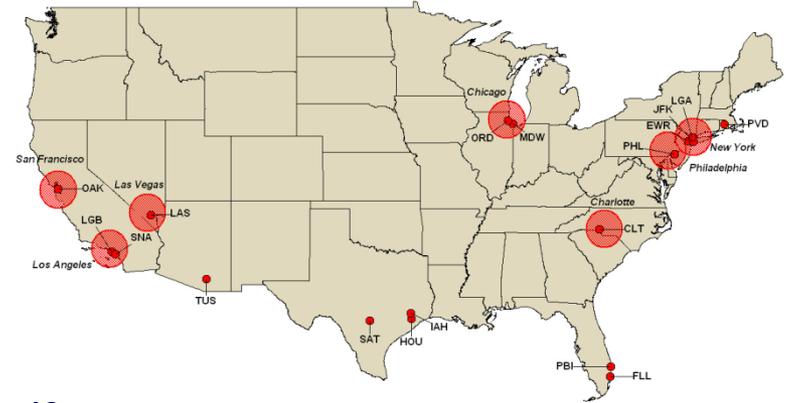
2015

After Planned Improvements



6 airports that need additional capacity  
4 metro areas that need additional capacity

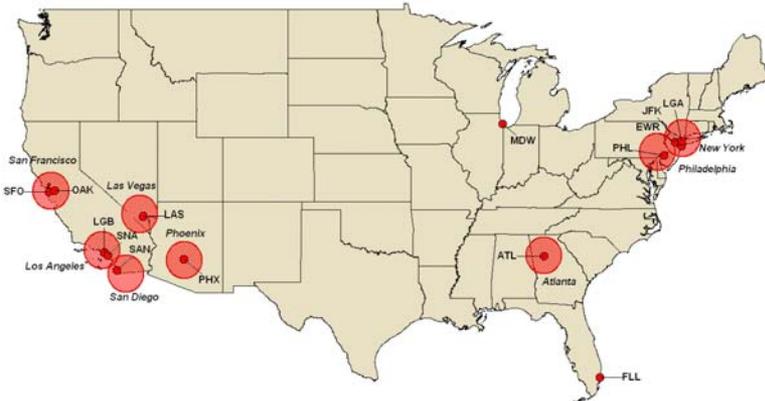
If Planned Improvements Do Not Occur



18 airports that need additional capacity  
7 metro areas that need additional capacity

2025

After Planned Improvements



14 airports that need additional capacity  
8 metro areas that need additional capacity

If Planned Improvements Do Not Occur



27 airports that need additional capacity  
15 metro areas that need additional capacity



## FACT 2 Toolbox of Potential Solutions

- Following the publication of the FACT 2 Report, the FACT Team worked with airports and local communities to develop a toolbox of potential solutions to address anticipated capacity shortfalls at the most congested airports (14 airports identified in 20205).
- Each toolbox contained 84 items grouped into nine categories. The nine categories include:
  - Airport (metro/regional)
  - Airport (policy/non-technical)
  - Airport (runway infrastructure)
  - Airport (taxiway infrastructure)
  - Airport (terminal infrastructure)
  - ATC (enroute)
  - ATC (local tower)
  - ATC (terminal airspace)
  - New Technology (NextGen)
- Each item was cross-referenced with the 2008 NextGen Implementation Plan and the 2008 NextGen Integrated Work Plan



# More Recent NextGen Assumptions Would Delay Congestion Even Further

- **NextGen (FACT 2)**

- FACT 2 assumptions primarily affected arrivals:

- Reduced radar separation
- Reduced wake separation for arrivals
- Precise arrival delivery to threshold

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- **NextGen (JPDO)**

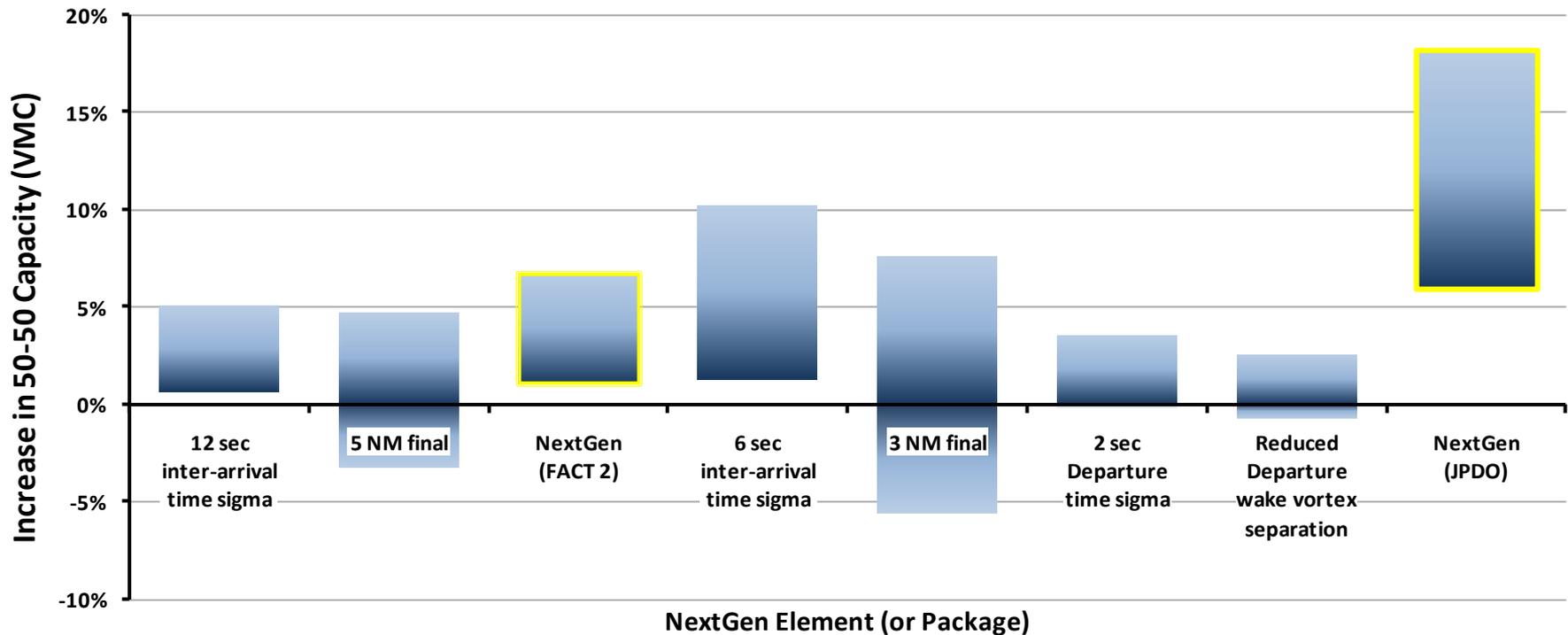
- High Density Test Case from SMAD included all the FACT 2 assumptions, plus additional departure improvements:

- More precise arrival delivery to threshold
- Precise departure timing
- Reduced wake separation for departures



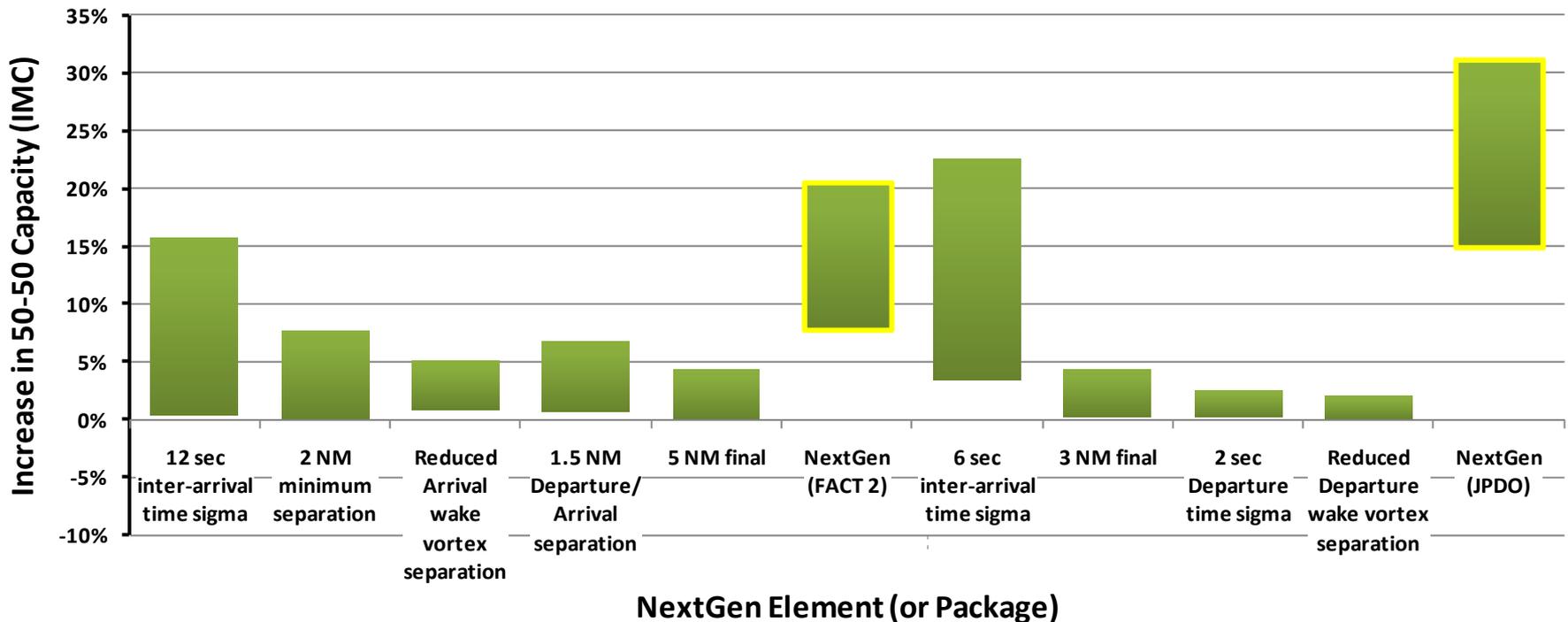
# Capacity Increase from NextGen Elements in VMC

- The capacity contribution of each individual NextGen element varied across the FACT 2 airports (chart shows range from min. to max. change in capacity)
- The combined benefit (highlighted) can be greater than the sum of the individual elements



# Capacity Increase from NextGen Elements in IMC

- The capacity contribution of each individual NextGen element varied across the FACT 2 airports (chart shows range from min. to max. change in capacity)
- The NextGen improvements increased the balanced capacity by a bigger percentage in IMC
- Individual elements might have a greater benefit in an arrival push or departure surge



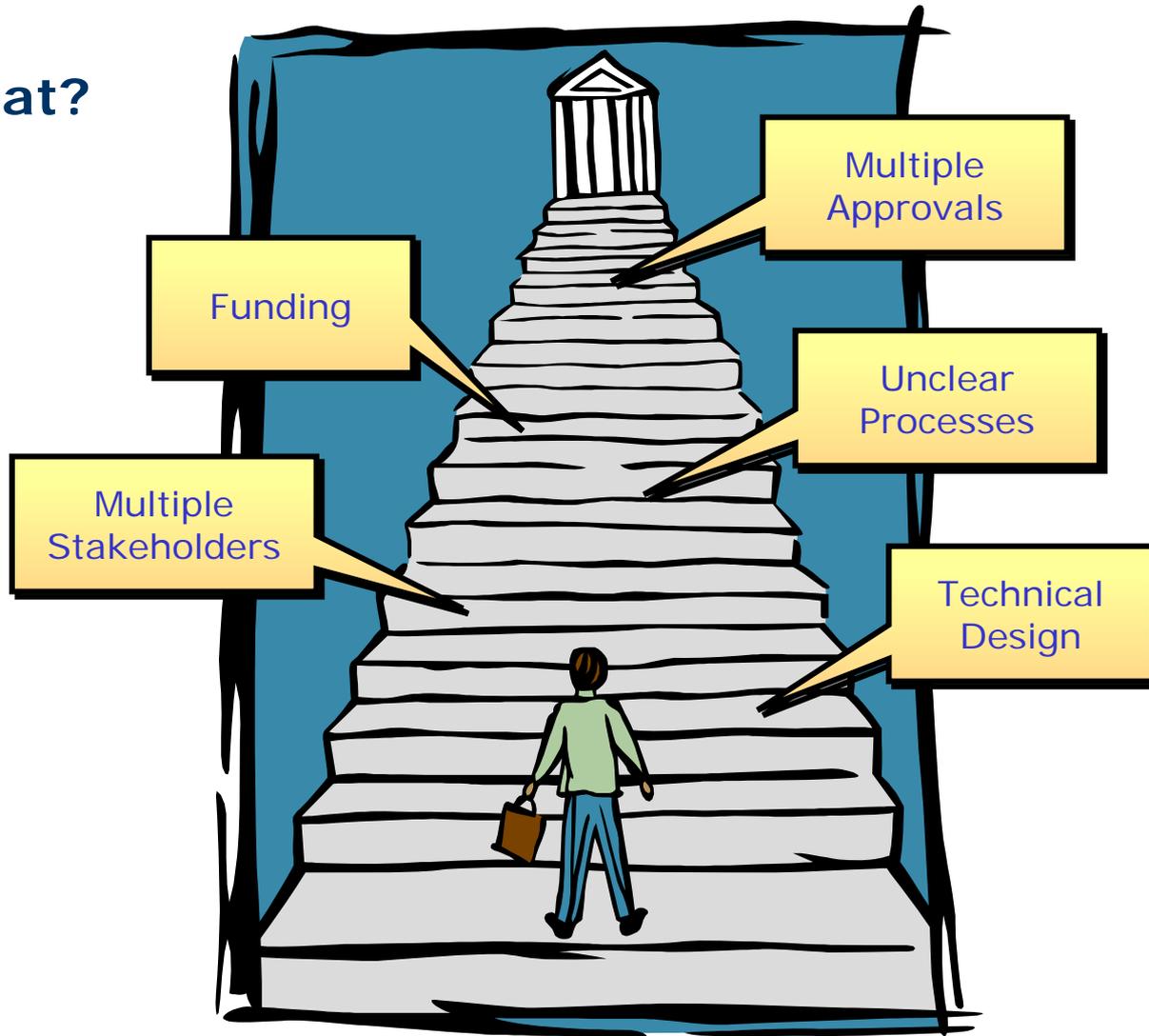
# Key NextGen Improvements Need to be Implemented ASAP

Seven NextGen related items from the FACT 2 Solutions Toolbox could greatly improve the capacity at the 14 airports. We need to implement these solutions as soon as possible.

- Better use of Closely Spaced Parallel Runways (CSPR)
- Converging Approaches (SCIA and DCIA)
- Reduced longitudinal separations
- Independent parallel departures with RNP
- Reduced wake vortex separations
- Reduce delivery variability (more precise separation)
- Runway occupancy reduction

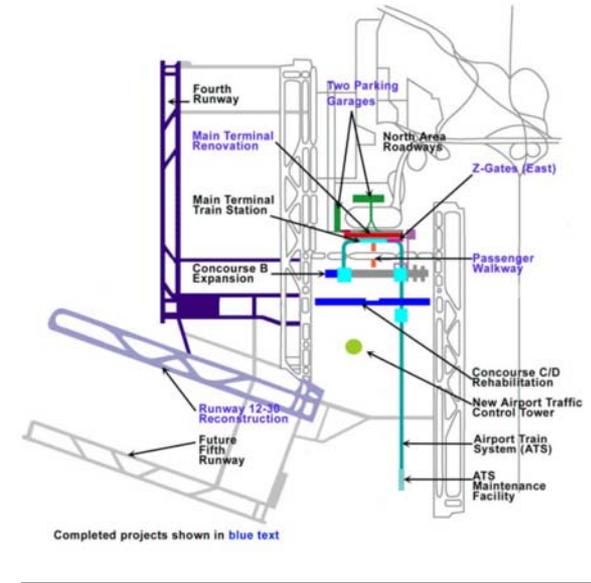


## Now What?



# Runway Template Action Plan (RTAP)

- Standard framework for implementing a new runway
- Very successful
- Model for other improvements?



Runway Schedule Summary

Task Name	Start	Finish	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	
✓ G - Develop Master Plan	10/90 (A)	3/02 (A)	█																				
✓ G - Environmental Process	11/00 (A)	11/05 (A)																					
✓ G - Design Runway	4/04 (A)	8/07 (A)																					
█ G - Runway Construction	11/05 (A)	11/08																					
█ G - Commission Runway / Full Operational Capability (CAT I)	11/08	11/08																					◆ 11/08
█ G - Commission CAT II / IIIA	3/09	3/09																					◆ 3/09

\* Cat II/III capability subject to successful completion of the ILS burn-in requirement.



## Proposal for Airport Improvement Action Plans

- Learn from RTAP strengths
  - Cross-cutting team
  - Regular high-level review
- Apply to other improvements
  - Implementation team includes stakeholders
  - Process identified early
  - Coordination with local FAA (ADO, ATC)
  - Coordination with Washington (Air Traffic, NextGen I&I, JPDO)
- Include
  - General concept (description, links to other plans)
  - Local details (known issues, expected costs and benefits)



## Standardized Process Should Ease Implementation

- Is this a reasonable expectation?
- How can the Action Plans be most useful?
- Discussions with individual airports will begin shortly



# Thank you!



# NextGen Air Traffic Management assumptions used in the FACT 2025 Analysis

NextGen Concept	Today's ATC System	FACT Assumptions for 2025 (examples)
Revision of separation standards	• 2.5 NM on final	• 2.0 NM
Independent operations on parallel runways spaced more closely than possible today	• 3000 ft runway spacing (with offset localizer)	• 2500 ft runway spacing (duals and triples)
Reduction of in-trail wake vortex separation requirements	• 4/5/6 NM (based on lead/trail weight classes)	• 3/4/5 NM
Use of "equivalent visual" techniques	• Visual separation in VMC	• Visual separation in marginal conditions (MMC)

- 2025 modeling assumptions were reviewed with Agile ATM IPT and coordinated with Evaluation and Analysis Division
- Details of 2025 ATC system are still evolving and will require continued coordination with JPDO

*Although 2025 ATM assumptions show a positive effect in the FACT analysis, FACT should not be considered a detailed analysis of NextGen benefits*



# Capacity Assumptions—OEP Airports

## Detailed Improvements Modeled in 2025

	ATL	BOS	BWI	CLE	CLT	CVG	DCA	DEN	DFW	DTW	EWB	FLL	HNL	IAD	IAH	JFK	LAS	LAX	LGA	MCO	MDW	MEM	MIA	MSP	ORD	PDX	PHL	PHX	PIT	SAN	SEA	SFO	SLC	STL	TPA		
Reduced Separation Standards -- use visual separation in MMC -- use 2/3/4/5 NM in IMC	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x*	x	x	x	x	◇*	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Improved threshold delivery accuracy	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇
1.5 NM Departure/Arrival separation (IMC) -- spacing < 2500 ft or same runway	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Independent parallel approaches (IMC) -- spacing 2500-4299 ft												x												▲		x		x			x				▲		
Triple indep. parallel approaches (IMC)	▲					▲		▲	▲	x				◇	▲					◇					◇									x			
"Mixed triple" independent/dependent parallel approaches (IMC)					x																																
Paired approaches, e.g. SOIA -- MMC (spacing 700-2499 ft) -- IMC (spacing 1200-2499 ft)	x	◇		▲							◇						x	x					x			◇						◇	▲				
Dependent Approaches -- MMC/IMC (700-2500 ft spacing) -- 1.5 NM diagonal behind Small, Large -- wake vortex sep behind B757/Heavy											x						x			x													x		◇	x	
LAHSO (all weather) if >7000 ft to intersection		▲											x				x							x													
Simultaneous Converging Approaches (IMC)																	x							x													
Standard Departure/Departure separations (no departure constraints)		x										x				◇	x									x				x		x	x				
Independent parallel departures (IMC) -- no wake vortex separation behind Small/Large (700-2500 ft spacing)											x						x			x			x										x		◇	x	
New/extended runways (since 2002)	▲	◇	x	▲	x	▲		▲	▲			◇		◇	▲					▲			▲	▲	◇		◇					◇			▲	x	

▲ Included in 2006 capacity  
◇ 2015 capacity improvement  
x 2025 capacity improvement

x\* Visual separations applied in VMC and MMC (2025)  
◇\* Visual separations applied in VMC (2015)



# Capacity Assumptions–Non-OEP Airports

## Detailed Improvements Modeled in 2025

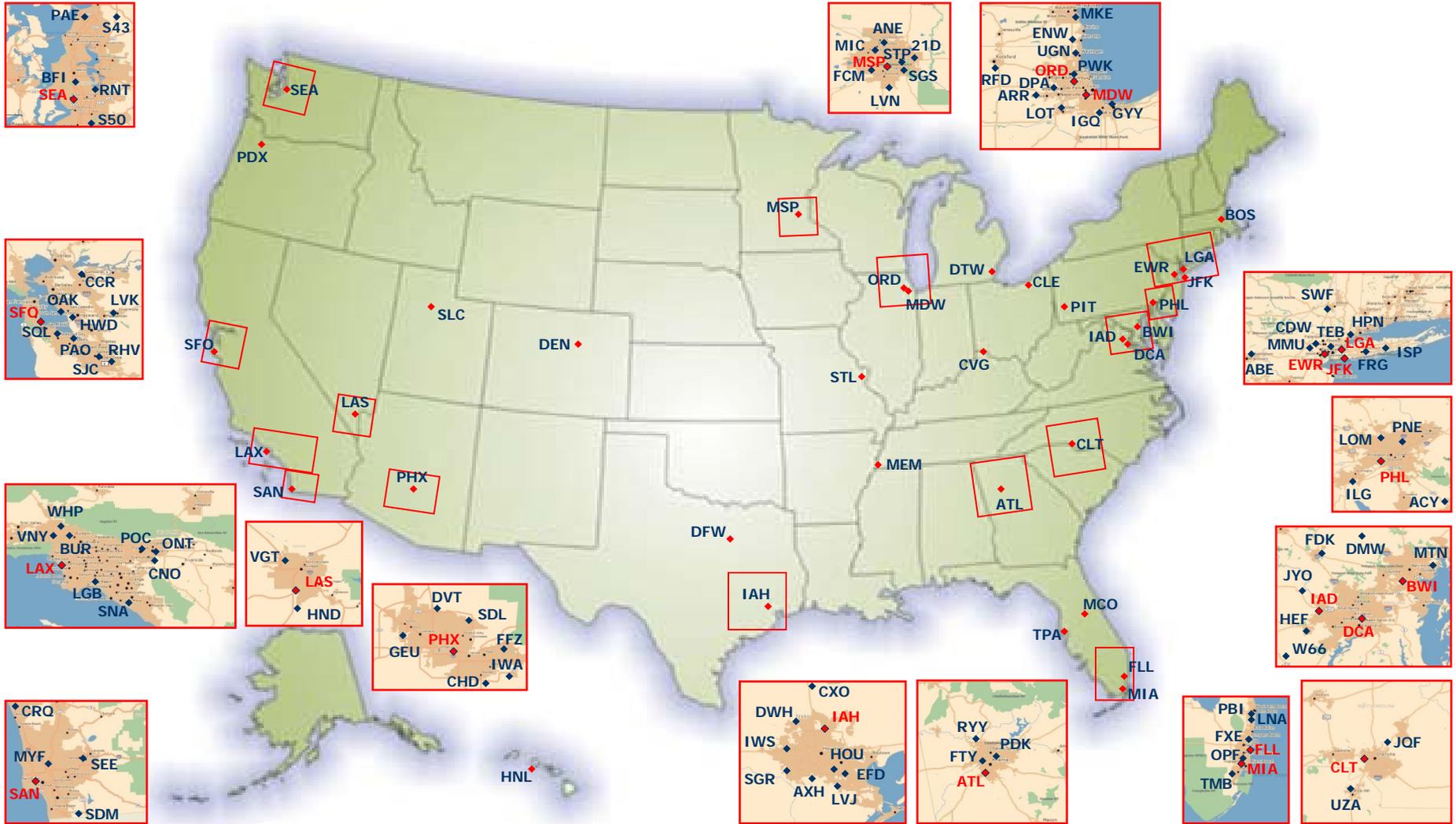
	ABQ	AUS	BDL	BHM	BUR	GY	HOU	HPN	ISP	LGB	MKE	OAK	ONT	PBI	PVD	RFD	SAT	SJC	SNA	SWF	TUS	
Reduced Separation Standards -- use visual separation in MMC -- use 2/3/4/5 NM in IMC												x										
Improved threshold delivery accuracy												x										
1.5 NM Departure/Arrival separation (IMC) -- spacing < 2500 ft or same runway												x										
Independent parallel approaches (IMC) -- spacing 2500-4299 ft																						
Triple independent parallel approaches (IMC)																						
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Paired approaches, e.g. SOIA -- MMC (spacing 700-2499 ft) -- IMC (spacing 1200-2499 ft)												x										
Dependent Approaches -- MMC/IMC (700-2500 ft spacing) -- 1.5 NM diagonal behind Small, Large -- wake vortex sep behind B757/Heavy												x										
LAHSO (all weather) if >7000 ft to intersection																						
Simultaneous Converging Approaches (IMC)												x										
Standard Departure/Departure separations (no departure constraints)																						
Independent parallel departures (IMC) -- no wake vortex separation behind Small/Large (700-2500 ft spacing)												x										
New/extended runways (since 2002)							x				◇			◇			x					◇

◇ 2015 capacity improvement  
x 2025 capacity improvement

**Note: 2025 ATM improvements are assumed only for airports that would otherwise be capacity-constrained**



# Metro Areas (OEP and Non-OEP Airports)



# TOOLBOX DEVELOPMENT (Example-Partial Listing)

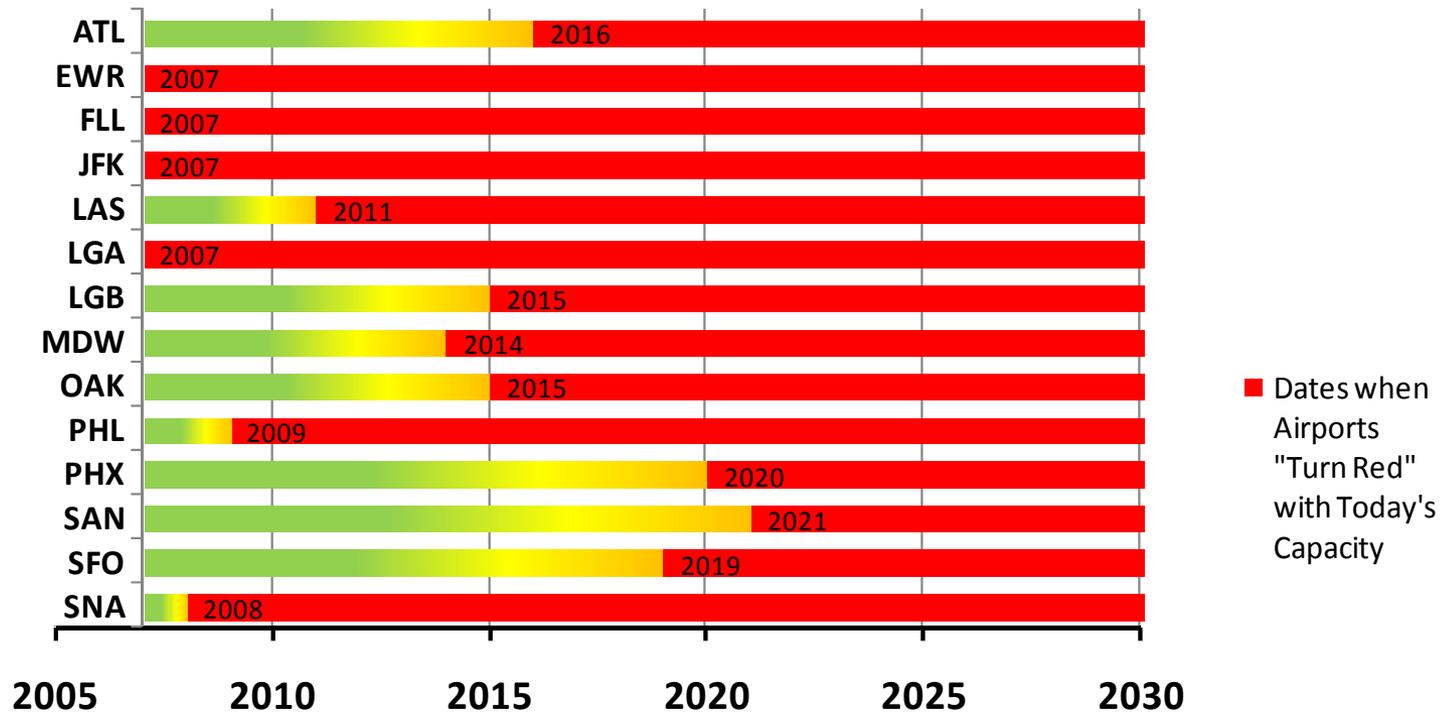
Multiple Categories

Category	Enhancement	Timeframe: Near-Term, Mid-Term (2012-2018), Far-Term	OEP Wedge	OEP Capabilities	NextGen Primary OI	NextGen Secondary/Support OI
Airport (Metro-Regional)	New commercial-service airport (possibly converted from military or non-commercial)	Near-Term	OEP Metro Areas		new	OI-5004
Airport (policy non-technical)	Reduce configuration rotation program	Far-Term			OI-6012, OI-6023, OI-0329, OI-0330	
Airport (Runway Infrastructure)	New runways	Near-Term	OEP 35 Airports	Runways	new	OI-5004
Airport (Runway Infrastructure)	Eliminate intersections	Near-Term	OEP 35 Airports	Runways	new	OI-5004
Airport (Taxiway Infrastructure)	End around taxiway	Near-Term	OEP 35 Airports	Runways	new	OI-5004
Airport (Terminal Infrastructure)	Expand terminal building, gates, apron	Near-Term			new	OI-5005
ATC (Enroute Airspace - Center)	Reduce restrictions due to Special Use Airspace	Far-Term			OI-346, OI-365	
ATC (Local - Tower)	Reduce obstacle clearance requirements (and reduce minima)	Far-Term			no	OI-0317, OI-0381
ATC (Terminal Airspace - TRACON)	Additional arrival fixes, departure gates	Near-Term	ATO - High Density	?	new	
New Technology	Lower minima for use of visual separations	Mid-Term	ATO - High Density	Implement CAVS	OI-0316	OI-0334, OI-0335, OI-0348



# Why we need to expedite the implementation of NextGen

Most FACT 2 airports need greater NextGen benefits well before 2025



NOTE: Based on FACT 2 analysis (March 2006 TAF demand forecast)

