

Next**GEN**

JITI Aviation Seminar

Global Harmonization of the New Air Navigation system

Steve Bradford

NextGen Chief Scientist

Date: May 18th 2017



FAA

Delivering NextGen: Key Definition

What is NextGen:

- **Who** – Aviation community working together
- **What** – Modernization of technologies, policies and procedures in the national airspace system
- **Why** – Increase capacity, reduce delays and cancellations, reduce our environmental footprint, enhance safety, and make bad weather performance equal to good weather performance
- **How** – Use modern aircraft ability to fly very precise routes and times, and report where they are in order to manage where they will be

FAA Air Traffic Management Transformations Underway

Past Practices

- **Aircraft Routes:** Routing limited by ground-based navigational infrastructure
- **Aircraft Location:** Future time and position of the aircraft not known by all parties*
- **Information:** Controllers and operators do not have same information to inform decisions
- **Communications:** Controllers communicate by voice to each individual aircraft
- **NAS Efficiency and Traffic Flow:** Operational choke points across phases of flight
- **Operations:** Tactical and reactive air traffic control

NextGen Improvements

- **Aircraft Routes:** More efficient flight routes and aircraft performance based procedures using GPS navigation
- **Aircraft Location:** Future intended time and position of aircraft known for optimal flight and traffic flow
- **Information:** Shared information (e.g., weather, traffic, system status) for collaborative decision-making
- **Communications:** Controllers communicate via digital messages to multiple aircraft at a time
- **NAS Efficiency and Traffic Flow:** Operations integrated across phases of flight for gate-to-gate efficiency
- **Operations:** Strategic air traffic management

*Operators, aircrews, pilots, dispatchers, controllers, operations centers and traffic managers

NextGen Benefits

Current Benefits



MRO

We've safely reduced wake separation standards at 14 TRACONs and 28 airports around the nation, reducing aircraft fuel usage and emissions.

DATA COMM

56 towers equipped

Tower departure clearances provide more efficient rerouting.

ADS-B



Enhanced surveillance in areas radar didn't reach

New routes

PBN



101 → 105
Departure increase / hour

Equivalent Lateral Spacing Operations (ELSO) saves time in Atlanta



1.8M
Gallons of fuel saved at Houston Metroplex

2030

\$161
Billion

Future Benefits

\$158 Billion

Estimated remaining benefits of NextGen through 2030

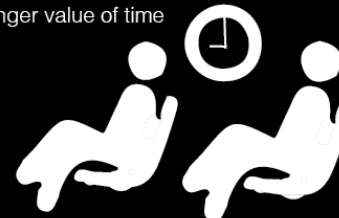
NAS Performance

2.8

billion gallons of fuel saved by 2030

\$114.2 Billion

Passenger value of time



NextGen ROI

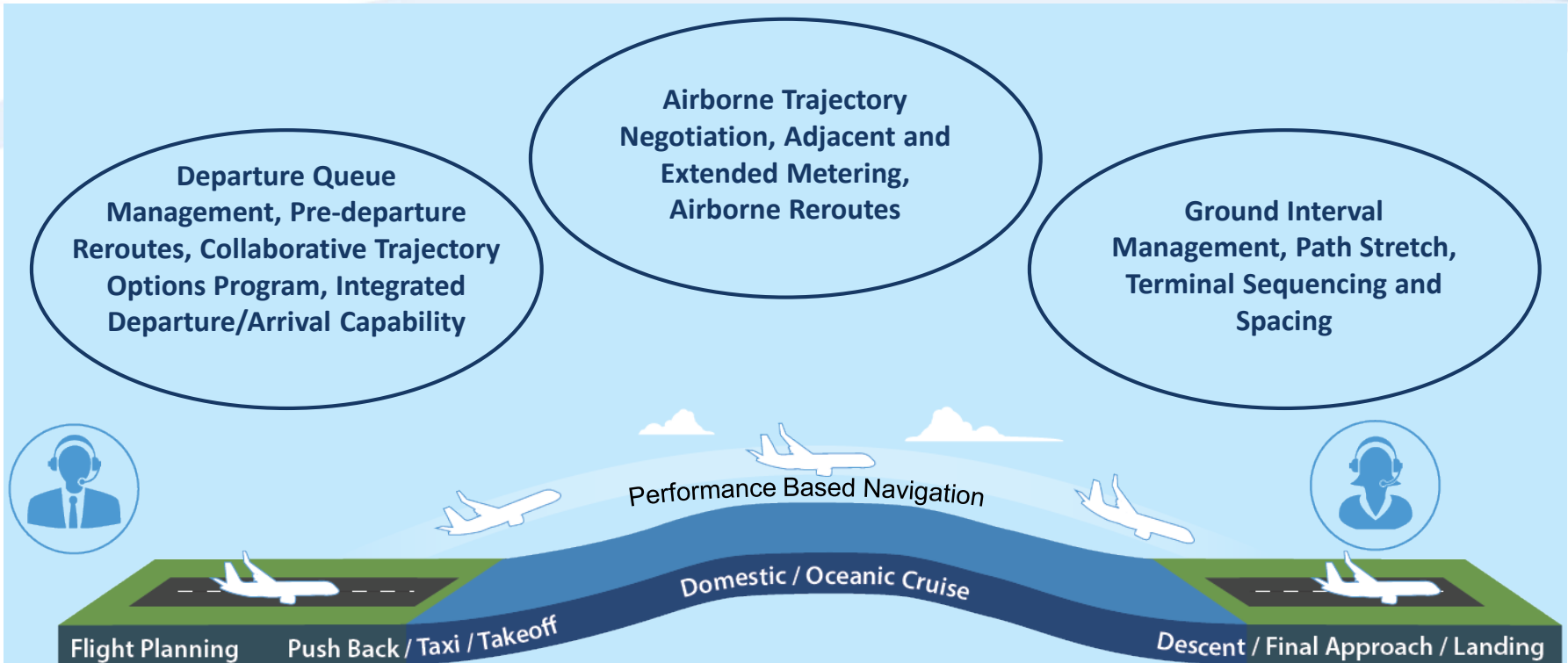
3:1

Benefit-to-cost ratio of \$35.8 billion investment, discounting to present value

\$1.6
Billion
2014

\$2.7
Billion
2016

Delivering NextGen Improvements



Communication, Navigation, Surveillance, Information Sharing, Weather

National Airspace System (NAS) Voice System (NVS), Data Communications (Data Comm), Automatic Dependent Surveillance-Broadcast (ADS-B), System Wide Information Management (SWIM), Common Support Services-Weather (CSS-Wx), NextGen Weather Processor (NWP)

Foundational Infrastructure

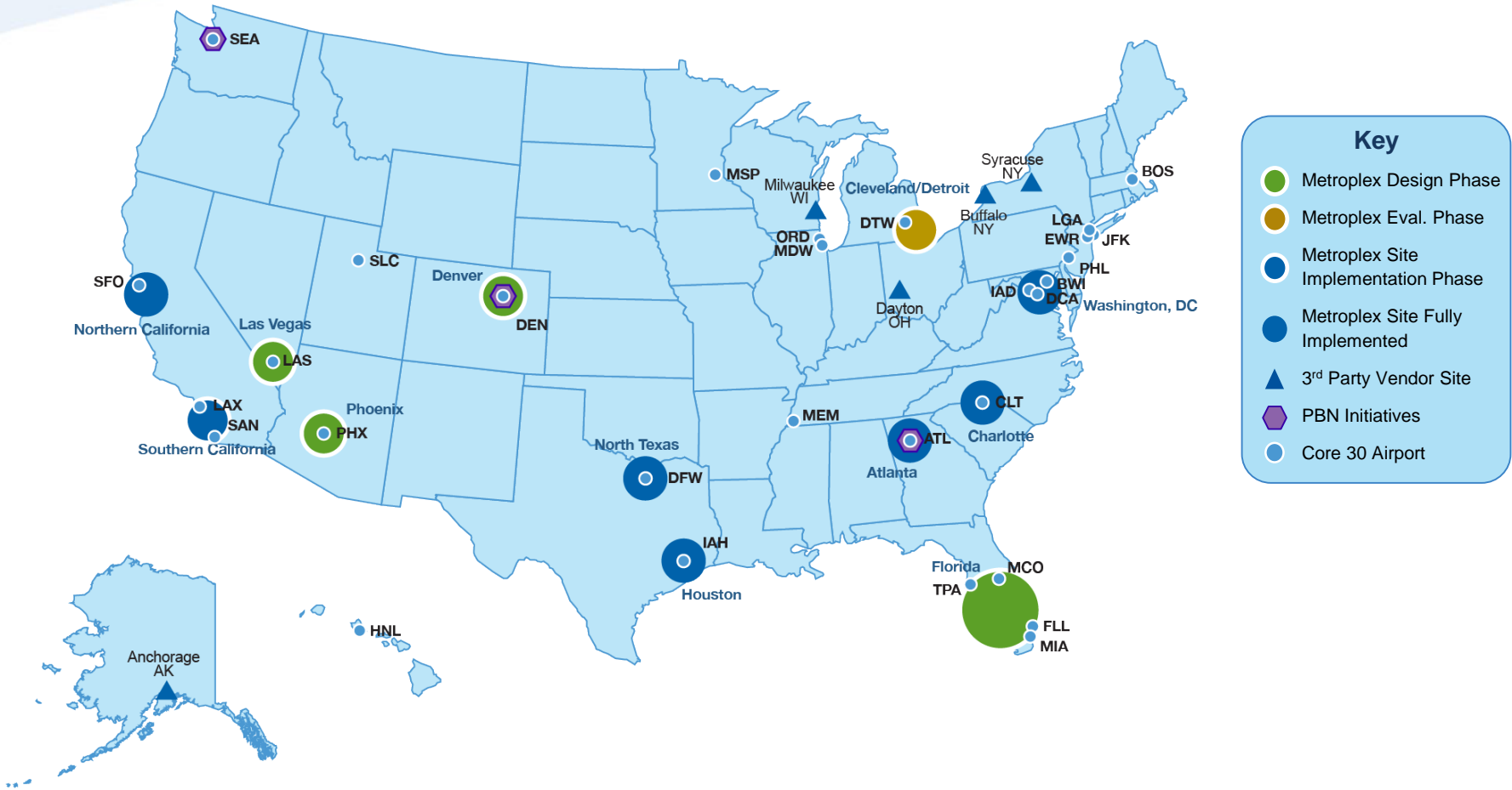
Terminal Flight Data Manager (TFDM)*, Time Based Flow Management (TBFM) Traffic Flow Management System (TFMS), Terminal Automation Modernization and Replacement (TAMR), En Route Automation Modernization (ERAM)

* TFDM is the only foundational infrastructure program fully funded by NextGen

Delivering NextGen: Collaborative Opportunities and Commitments

Performance Based Navigation

FY17 Key Milestones



Path to Trajectory Based Operations (TBO)

Managing aircraft based on where they will be at “critical points in time”

Trajectory Based Operations is an air traffic management (ATM) concept to operate the NAS based on the aircraft’s ability to fly precise paths in time/space, and air navigation service provider’s ability to strategically manage and optimize trajectories throughout the operation.

Two Key Elements of TBO:

1. Time-Based Management
2. Performance Based Navigation

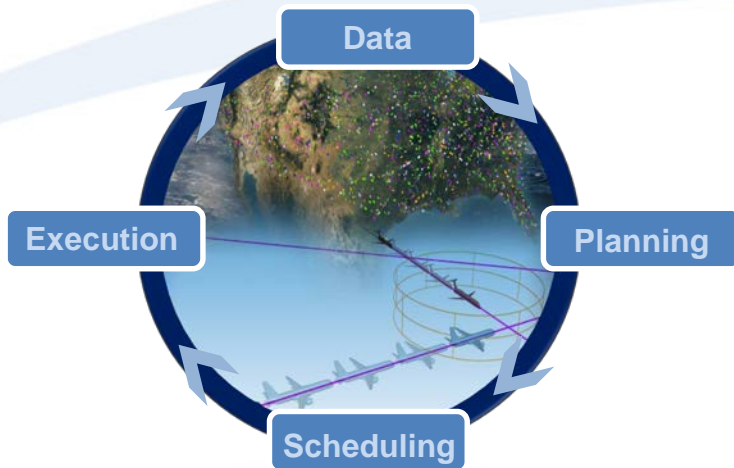
TBO Objectives:

- Improved flight efficiency
- Efficient use of capacity
- Improved schedule predictability
- Increased operational flexibility
- Increased ability to exchange trajectories with the users



Path to Trajectory Based Operations

Managing aircraft based on where they will be at "critical points in time"



2020

Arrival TBO

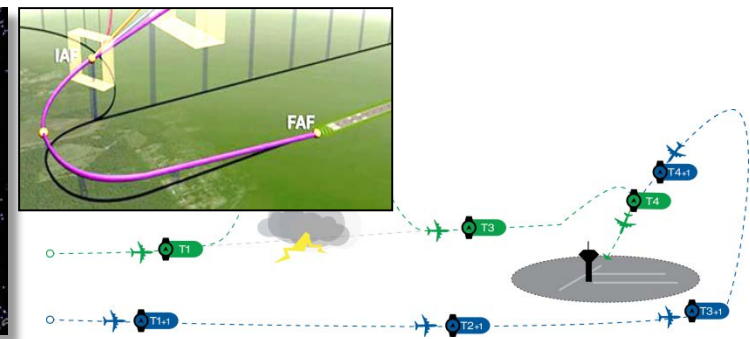
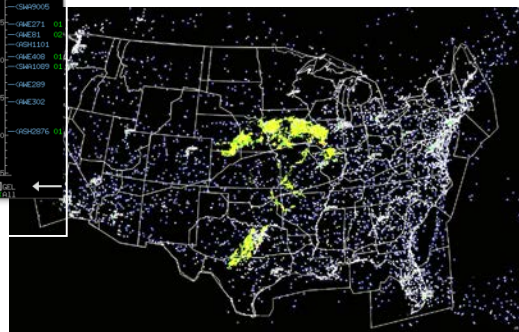
- ADS-B Out mandate
- Performance Based Navigation at nine metroplex sites
- New tower automation
- Initial Data Comm (tower and en route)
- New voice communications
- Improved weather information
- New automated tool to support surface/terminal environment

2025

Gate to Gate TBO

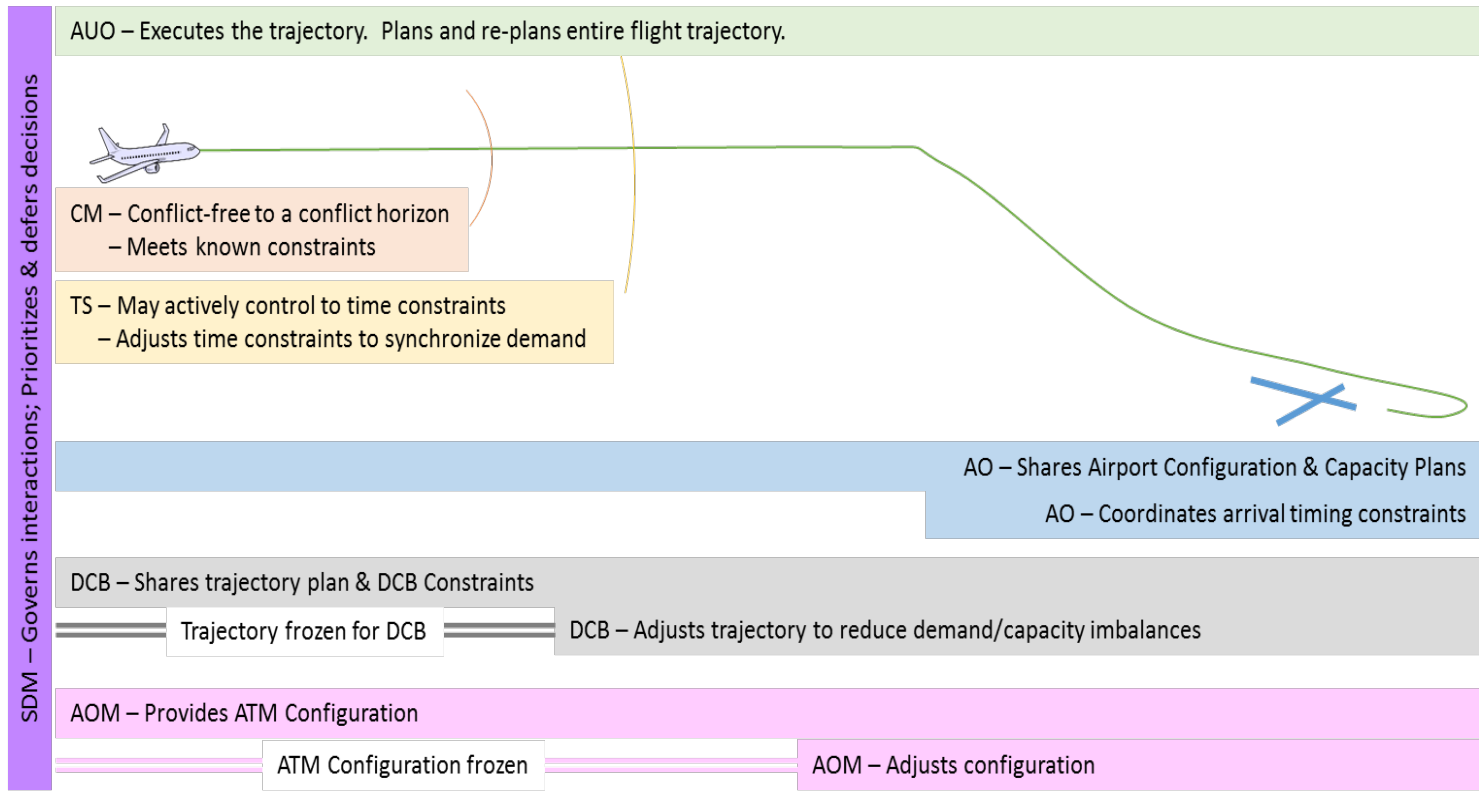
- Improved voice communication across the NAS
- ADS-B In
- Data Comm full capability
- Aircraft equipage alignment with new standards
- New automated tools (all phases of flight)

Estimated Time of Arrival (ETA)	Scheduled Time of Arrival (STA)	Delay Value
SHW004	SHW004	00:00
SHW005	SHW005	00:00
SHW006	SHW006	00:00
SHW007	SHW007	00:00
SHW008	SHW008	00:00
SHW009	SHW009	00:00
SHW010	SHW010	00:00
SHW011	SHW011	00:00
SHW012	SHW012	00:00
SHW013	SHW013	00:00
SHW014	SHW014	00:00
SHW015	SHW015	00:00
SHW016	SHW016	00:00
SHW017	SHW017	00:00
SHW018	SHW018	00:00
SHW019	SHW019	00:00
SHW020	SHW020	00:00
SHW021	SHW021	00:00
SHW022	SHW022	00:00
SHW023	SHW023	00:00
SHW024	SHW024	00:00
SHW025	SHW025	00:00
SHW026	SHW026	00:00
SHW027	SHW027	00:00
SHW028	SHW028	00:00
SHW029	SHW029	00:00
SHW030	SHW030	00:00
SHW031	SHW031	00:00
SHW032	SHW032	00:00
SHW033	SHW033	00:00
SHW034	SHW034	00:00
SHW035	SHW035	00:00
SHW036	SHW036	00:00
SHW037	SHW037	00:00
SHW038	SHW038	00:00
SHW039	SHW039	00:00
SHW040	SHW040	00:00
SHW041	SHW041	00:00
SHW042	SHW042	00:00
SHW043	SHW043	00:00
SHW044	SHW044	00:00
SHW045	SHW045	00:00
SHW046	SHW046	00:00
SHW047	SHW047	00:00
SHW048	SHW048	00:00
SHW049	SHW049	00:00
SHW050	SHW050	00:00



All elements of the system continuously working together to improve flight efficiency, efficient use of capacity, improve schedule predictability, increase operational flexibility, and increase ability to exchange trajectories with the users.

ICAO - Trajectory Based Operations



Accomplishments Overview

Infrastructure

- En Route Automation Modernization
- Automatic Dependent Surveillance–Broadcast
- Data Communications Tower Services
- System Wide Information Management
- Surface Operations and Data Sharing
- Terminal Flight Data Manager
- Time Based Flow Management

People

- Customer-Focused Air Traffic Management
- Community Outreach
- Controller and Pilot Training — New Technology, Airspace, and Procedures

Equipage

- Automatic Dependent Surveillance–Broadcast
- Data Communications
- Performance Based Navigation

Policy, Processes and Procedures

Optimizing Airspace:

- Performance Based Navigation
- Time Based Flow Management
- Traffic Flow Management System
- Separation Management

Collaborative Progress:

- RTCA Task Force 5
- NextGen Advisory Committee (NAC)
- NAC Priorities Joint Implementation Plan
- Airspace Technology Demonstrations
- SESAR Harmonization
- Mini Global Demonstrations
- Equip 2020
- PBN NAS Navigation Strategy

Safety and Environment:

- Aviation Safety Information Analysis & Sharing
- Engine, Aircraft Technologies
- Environmental Design Tool

NextGen Planned Priorities

New Rolling Plan 2017-2019

http://www.faa.gov/nextgen/media/NG_Priorities_Joint_Implementation_Plan.pdf



Data Communications

- Complete deployment of tower services
- En route initial services first site IOC
- Framework for non-VDL (VHF Digital Link) (Mode 2 In en route)
- Industry equipage (1,900 aircraft)



Multiple Runway Operations

- Wake Recategorization at 9 more sites
- Amend national standards for Vertical Navigation (VNAV) for simultaneous independent parallel approaches
- Research on time-based wake mitigation



Performance Based Navigation

- Established on RNP
- Optimized Profile Descents
- Advanced procedures
- Implementing Time Based Flow Management (TBFM)
- Metroplex (ATL, CLT, LAS)



Surface

- Implementing departure management demonstration at Charlotte
- Data sharing via System Wide Information Management (SWIM)
- Industry providing new data to FAA
- Individual airports committing to data sharing
- Initiate deployment of Terminal Flight Data Manager (TFDM)

Keys to NextGen Success

