

# Mid-Term (2018) NAS ConOps Development

## FAA ATO Planning, Research & Technology Development Office

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Federal Aviation  
Administration



# Overview

- End to End Midterm NAS ConOps
- Data Communications (Segment 2)
- Surface Operations and NextGen Towers
- High Altitude
- Multi-Sector Planner
- Integrated Arrival and Departure Management

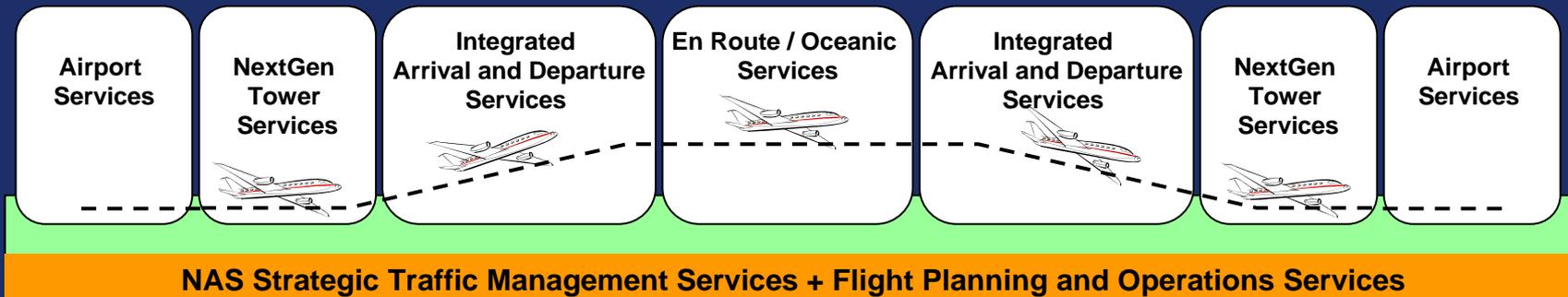


# “End-to-End” Midterm NAS Concept of Operations



# “End to End” Midterm NAS ConOps

- A complete architecture level concept of operations description of the NAS in the 2018 timeframe.
  - Describes operations and ATC services in all phases of flight
  - Pre-flight and strategic traffic management services
- Mid-Term Concept Scenarios and Narrative – April & June 2009 respectively for vetting

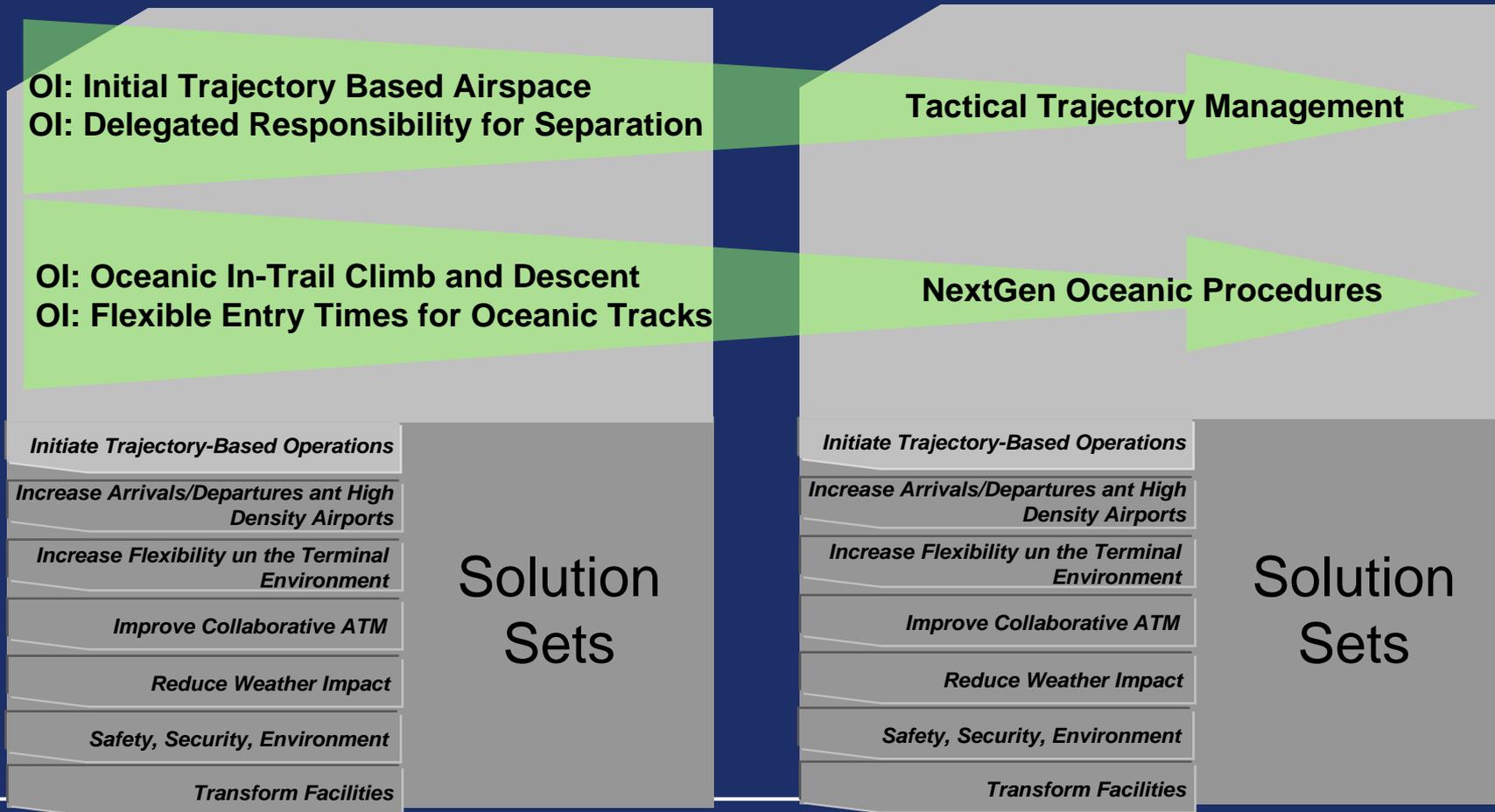


- Trajectory-Based Operations in Context
  - Flight plans become trajectories aggregated into the ATM system
  - Level of performance required (RNAV + RNP) driven by demand vs. capacity
  - User access determined through “best equipped” = “best served”
  - Some airspace may be exclusionary to trajectory based operations

# Trajectory Based Operations: Building towards the Far-Term

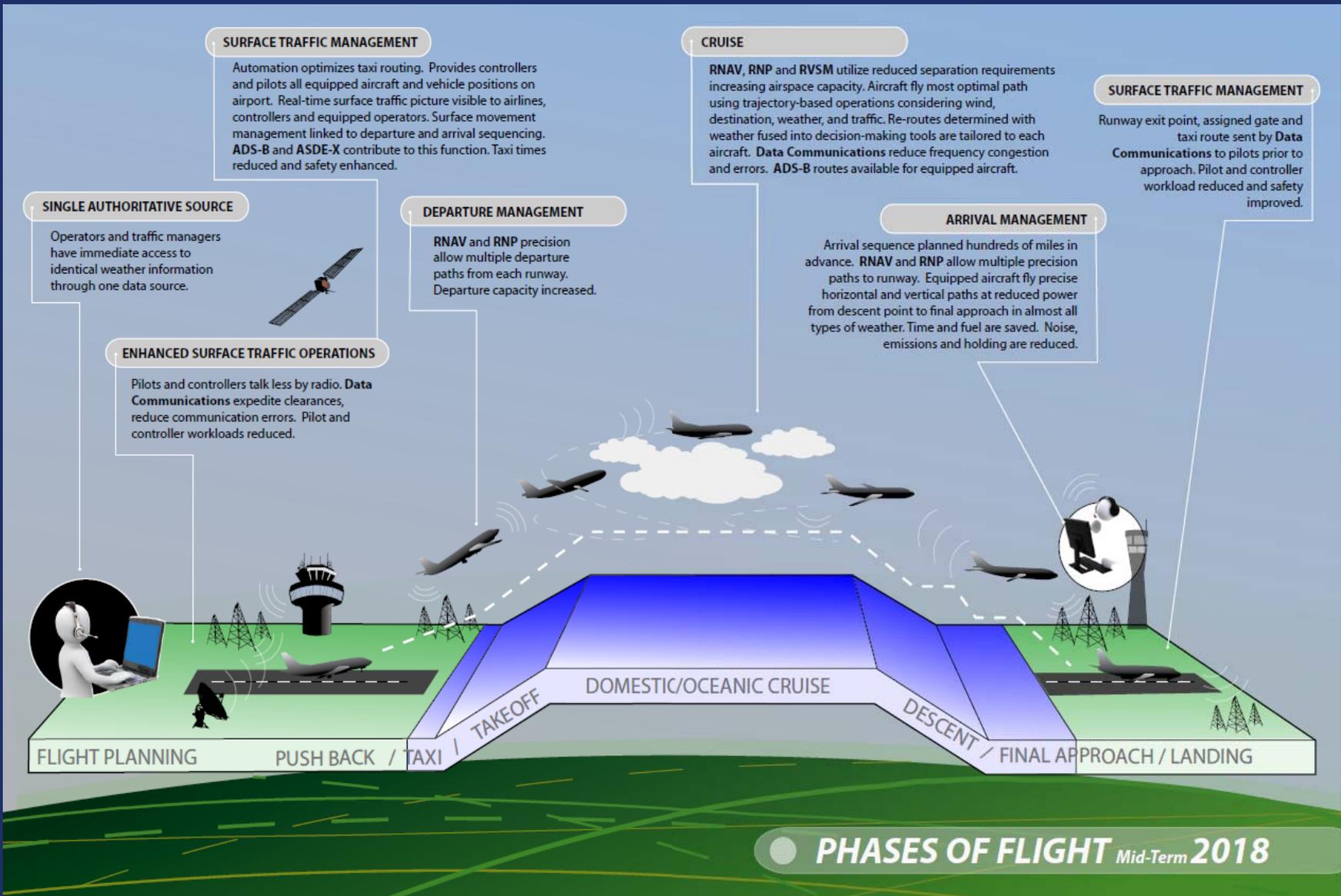
Mid-Term (2018)

Far-Term (2025+)



# Data Communications Segment 2





# Surface Operations and NextGen Towers



# Surface/Tower Operations

- Determine airport configuration based on traffic and weather
- Early planning for runway assignments shared with users
- User runway and gate preference known by ANSP
- Traffic management constraints known and included in plan
- Technology enhances controllers ‘visual’ observation of the situation
- Data link information to aircraft for weather, RVR, surface conditions, braking action, precipitation, wind shear, traffic flow initiatives, etc.
- Automatic update of trajectory times based on push-back, runway queues, taxi time and take-off time, etc.
- Pre-departure clearances and traffic flow information via data link

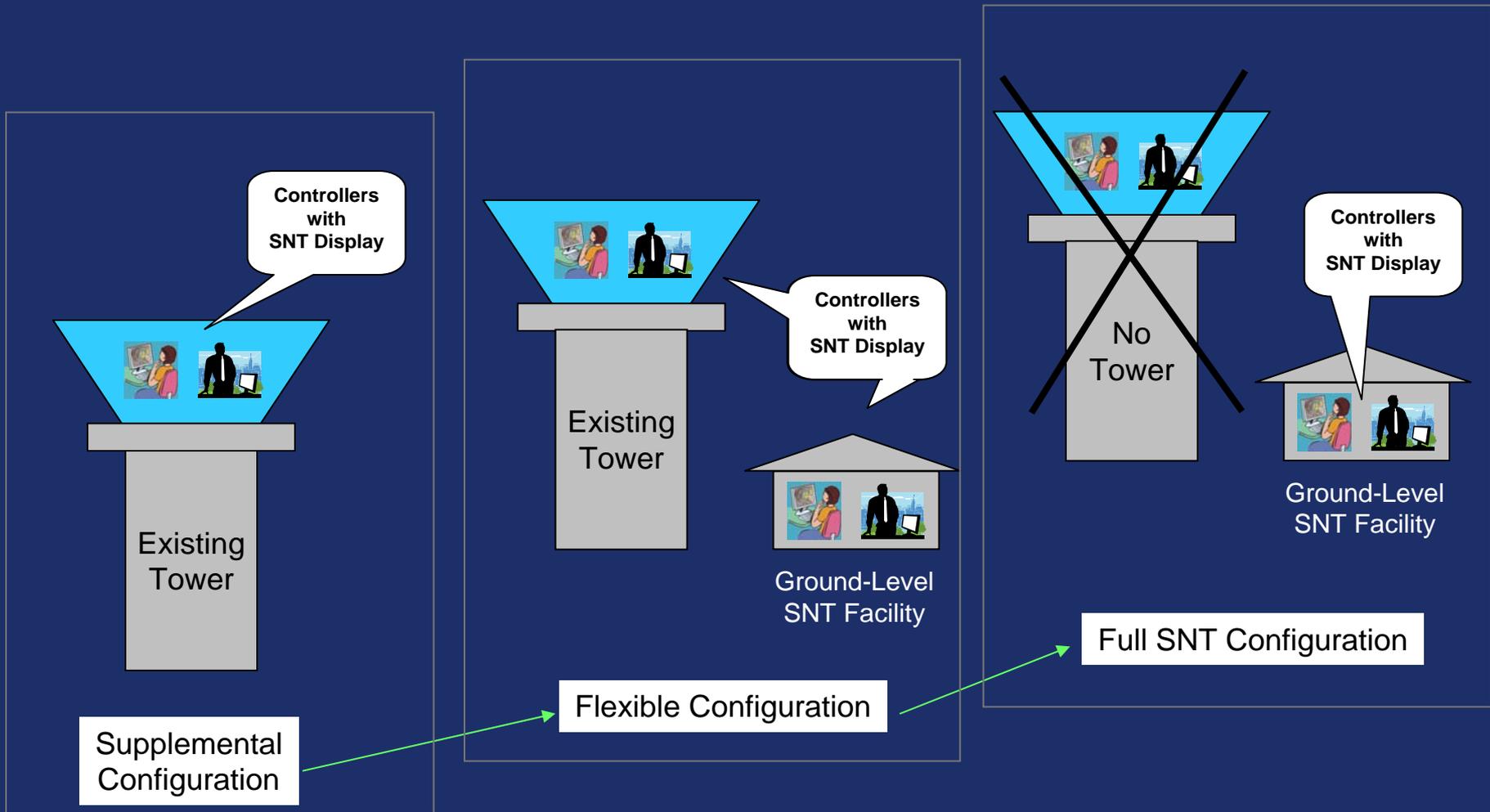


# Staffed NextGen (Virtual) Towers

- In lieu of out the window view, concept provides alternative target acquisition methods for functions such as issuing clearances, alerting of runway obstructions, and providing separation assurance
- Cost effective expansion of tower services
- Extended ATM service when tower closes
- Ability to 'see' new runways obstructed from view of tower cab
- Improved service in inclement weather and at night



# Staffed NextGen Towers (SNT) General Implementation Phases



# High Altitude



# High Altitude Concept Features

- Concept blends the principles of Ultra High Altitude (generic sector) Airspace with Trajectory Based Operations
- Airspace will be exclusive to aircraft that are TBO capable
- TBO aircraft are RNAV capable and Data Comm equipped
- Principal enabling technology is Data Communications (Segment 2)
- Designed to more effectively respond to daily events (e.g., weather, SUA activation), as well as seasonal changes in traffic demand



# High Altitude Concept Benefits

- **Generic Sectors**
  - Increased staffing efficiencies/interchangeability
  - Reduced controller training time
  - Improved options to allocate resources in response to traffic demand
- **Adaptable Airspace**
  - Improved management of demand-capacity imbalances
  - More efficient use of airspace
  - Better distribution of ANSP workload
- **Trajectory Based Operations**
  - Increased User-preferred routing
  - Reduced coordination between ANSP and Users
  - Improved traffic management (within sectors and at merge points)
  - Improved fuel efficiency



# Multi-Sector Planner



# Multi-Sector Planner

- Envisioned as a New Staffed Position in High Altitude Airspace (initially)
- First step toward Trajectory and Flow Contingency Management in Mid-Term
- 4D Intent Data helps MSP bridge the gap between the strategic planning of traffic management and the tactical operations of the en route sector team
- MSP creates efficient trajectory-based solutions by fine tuning traffic management initiatives to increase efficiency, reduce delays, and ensure that sectors under their management do not exceed complexity thresholds. The MSP:
  - Supports redistributed functions and flexible workforce management options
  - Adapts to work where the demand is expected (not assigned to a static position)
  - Minimizes impact of reroutes, manages complexity and maximizes capacity



# Integrated Arrival / Departure Management

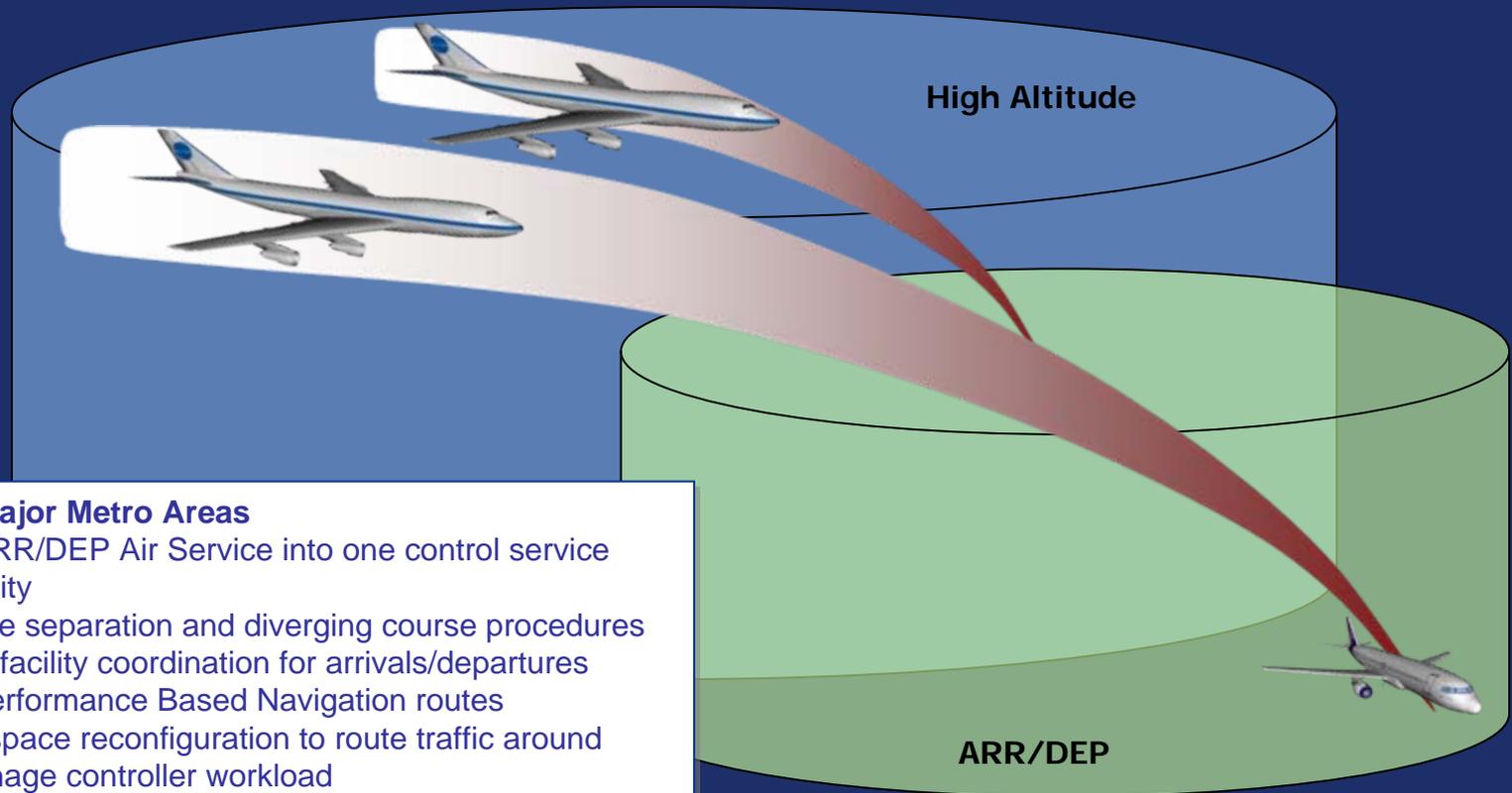


# Integrated Arrival and Departure Services

- Digital communications make tower to TRACON to center transitions seamless
- More RNAV/RNP based SIDs and STARs organize traffic and expedite flows
- Decision Support Tools facilitate consistent departure spacing
- Climb out profile defined in trajectory
- Optimized descent profiles permit aircraft to remain at higher altitudes on arrival and use lower power settings
- Improved procedures – e.g., many speed and altitude restrictions are eliminated, parallel runway operations improvements and reduced separation with better wake prediction
- SWIM enables sharing of NAS advisory data i.e., weather, wind, gust fronts, wind shear, equipment outages, etc.



# Big Airspace Concept

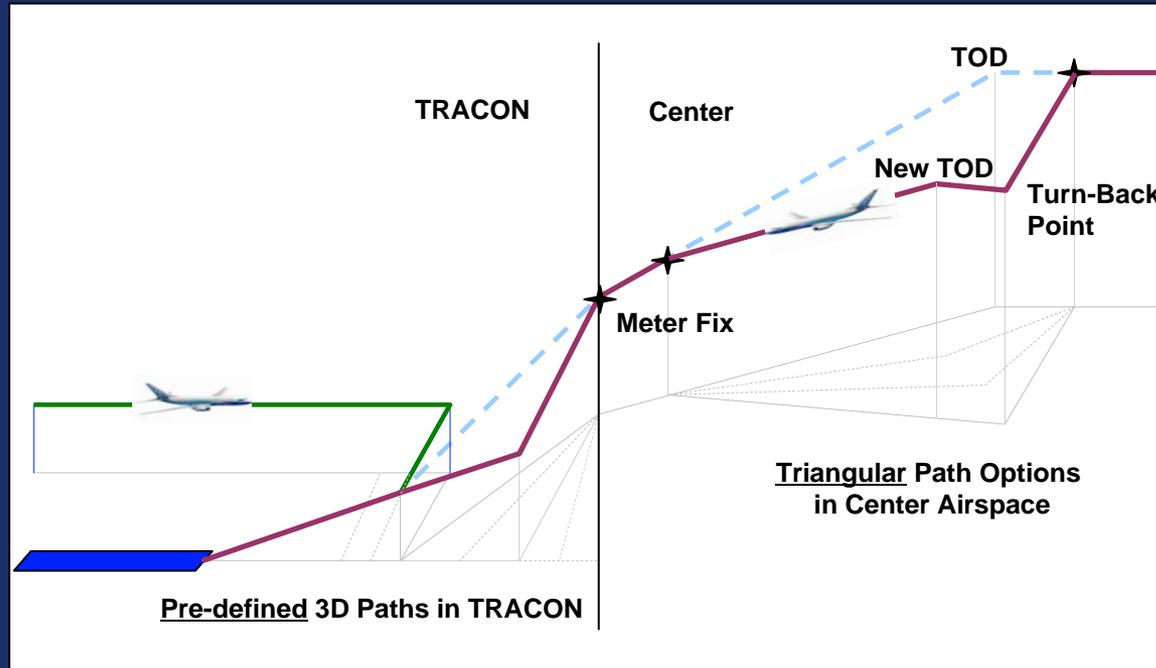


## Concept for Major Metro Areas

- ✓ Integrates ARR/DEP Air Service into one control service and one facility
- ✓ Applies 3 mile separation and diverging course procedures
- ✓ Reduce inter-facility coordination for arrivals/departures
- ✓ Additional Performance Based Navigation routes
- ✓ Dynamic airspace reconfiguration to route traffic around WX and manage controller workload
- ✓ Integrated flow management directives smooth transition
- ✓ Initial step to achieve NextGen Super-Density Ops

# 3D Path Arrival Management (3D PAM)

*Graphic courtesy of Boeing*



- Significant congestion exists today in the arrival and departures streams of medium to large airports
- 3D PAM operational concept is an initial intervention in advance of NextGen 4D trajectory operations to address this problem
- 3D PAM is an efficient and predictable method to deliver aircraft from the Top of Descent to a metering fix

# 3D PAM Expected Benefits

- **Improved flight efficiency:**
  - Reliable / Efficient routing
  - Optimum speed and altitude profiles
  - Reduced fuel burn, emissions and environmental impact
- **Increased flight path predictability and repeatability**
  - Flight path execution with airplane navigation accuracies
  - Improved air/ground situational awareness
- **Operational efficiency improvements:**
  - Improved meter fix delivery accuracies
  - Delay reduction
  - Reduced frequency and duration of voice communications
- **Increase controller productivity**
  - Reduced workload from trajectory clearances



# Tailored Arrivals

*Graphic  
courtesy of  
Boeing*



- Tailored Arrivals is a concept that takes advantage of under-utilized avionics in modern oceanic aircraft equipped with integrated Future Air Navigation System (FANS) 1/A equipment.
- Pre-planned RNAV routes are data-linked to the aircraft well before TOD and the trajectory can be flown uninterrupted between multiple facilities and sectors
- The trajectory is optimized vertically and laterally for an efficient and predictable arrival
- Tailored Arrivals is an initial step toward 4D trajectory operations

# Tailored Arrivals Expected Benefits

- Noise significantly decreased (near idle descent)
- Emissions reduction
- Flight duration reduced by several minutes
- ~880 lb (400 kg) less fuel burn per flight
- Dramatically reduced VHF voice communication
- Improved efficiency and predictability of flight path



# Concept Development

## Key Dates

- NAS Midterm Operational Concept
  - Scenarios & Narrative Summer 2009
- DataComm Segment 2
  - Concept Validation 6/09 – 6/10
  - Concept Level Requirements 7/10
- Staffed NextGen Towers
  - Operational Concept 9/08
  - Concept Validation HITLS/Demos FY09/FY10
- High Altitude
  - Concept Narrative Spring 2009
  - Validation activities begin Spring 2009
- Big Airspace
  - Preliminary Requirements and automation alternatives 04/09
- 3D-PAM/Tailored Arrivals
  - Miami TA Demos started 9/08; continuous flight trials begin 6/09
  - LAX TA flight trials begin summer 09, preliminary trial conducted 3/09
  - Denver 3D PAM Trials start 9/09

