NextGen Objectives

INCREASE SAFETY
EXPAND CAPACITY
PROTECT THE ENVIRONMENT
INCREASE PRODUCTIVITY
INCREASE EFFICIENCY
SECURE THE NATION
ENSURE OUR NATIONAL DEFENSE
Which are the right concepts?

Only research will tell
CD&V Group Role in Research & Systems Analysis

- Develop & evaluate Concepts of Operations
  - Assess operational feasibility
  - Validate benefits
  - Identify safety risks, human factors issues, procedural, training & airspace implications
- Develop requirements and business cases
- Develop NAS EA Products
- Transition concepts and requirements to service units for implementation
Enterprise Level

Service or Sub-service Level

System Level
CD & V Process

JPDO Concept of Operations for NextGen

NAS EA Operational Improvements

JPDO Operational Improvements

NextGen Mid-Term CONOPS for the NAS

NextGen CONOPS for the NAS

2nd Level Concepts

2nd Level Concepts

Concept Validation and Refinement Activities

• Analysis of related CONOPS
• Analysis of EA
• Stakeholder feedback
• Cognitive Walkthroughs
• Part Task Studies
• Fast Time Simulations
• Human in the Loop Simulations (HITLs)
• Field Testing

Concept Requirements Transition

Operational Service Units

Implementation

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Concept Requirements Transition

Operational Service Units

Implementation
Concept Exploration & Development

• Concept Development Iterative Process
• Initial Concepts developed based on:
  – Literature / Research Review
  – Analysis of related (higher/lower level) CONOPS
    • JPDO, CAASD, Operational Svc Units, NASA, etc.
  – Analysis of EA OIs and Roadmaps
• Draft Concepts produced and vetted to obtain Stakeholder Feedback
• Concepts Revised based on stakeholder feedback and results of concept validation activities
Concept Validation

- Conducted to assess operational feasibility, benefits, and operational and technical requirements associated with concepts

- Concept Validation Process
  - Scenario Development – Vet the Scenarios
  - Develop & Vet Concept Validation Plan
  - Conduct Validation Studies
    - Part Task Simulations
    - Fast Time Simulations
    - Human In The Loop (HITL) Simulations
    - Field Testing / Demonstrations

- Revise the CONOPS and Develop Concept Level Requirements based on results
Role of Scenarios in CD&V

- Initially generated in concept development process to put the concept description into an operational context
- Form the top level basis of traffic scenarios generated for concept validation activities
- Goal is to develop a set of mid term and far term scenarios that will be used for all concept validation activities for a given concept/Operational Improvement
Scenario Example

• NextGen Context
• Assumptions
• Highlighted Operational Improvements (OIs)
• Operational Change
• OV-1s
• High-Level Activity Overview
• Detailed Scenario Activity Walk-Through
• OV-6c
• Issues and Gaps
Sample OV-6c: Operational Event Trace Description

**Step 0:** Volumetric constraints are identified (24+ hrs)

**Step 1:** Flight Planner creates initial intent (24-8 hrs pre-departure)

**Step 2:** Automation predicts constraints by flight (8-4 hrs)

**Step 3:** Flight Planner evaluates options using flight planning tools (8-4 hrs pre-departure)

**Step 4:** Distribute possible mitigation plans (4 hrs)

**Step 5:** Flight Planner responds with routing options or new intent (4-2 hrs pre-departure)

**Step 6:** Distributes updated constraints to the NAS (2 hrs)
Backup Slides
Enterprise Level CONOPS
Developing the Midterm CONOPS

**Trajectory Based Operations**
- Delegated Responsibility of Separation
- Ocean in Trail Climb & Decent
- Automation Support for Mixed Environment
- ADS-B Separation
- Initial Conflict Resolution Advisories

**Increased Arrival & Departure at High Density Airports**
- Improved Parallel Runway Operations
- Initial Surface Traffic Management
- Time Based Metering using RNP and RNAV route assignments

**Increased Flexibility in Terminal Environment**
- Wake Turbulence Mitigation for Departures (WTMD): Wind based wake procedures
- Ground Based Augmentation System (GBAS) Precision Approaches
- Wake Turbulence Mitigation for Arrivals: CSPRs
- Use optimized profile decent
- Low Visibility Surface Operations
- Low Visibility/Ceiling Approach Operations

**Improved Collaboration ATM**
- Continuous Flight Day Evaluation
- Traffic Management Initiatives with Flight Specific Trajectories
- Improved Management of Airspace for Special Use

**Reduce Weather Impact**
- Initial Integration of Weather Information into NAS Automation and Decision Making
- Initial Improved Weather Information from Non-Ground Based Sensors
- Deploy FIS-B Nationally

**Increase Safety**
- Enhance Emergency Alerting
- Aviation Safety Information Analysis & Sharing

**Increase Security**
- Operational Security Capability for Threat Detection and Tracking, NAS Impact Analysis and Risk-Based Assessment

**Increase Environmental Performance**
- NEXTGEN Operational Initiatives Implemented that Reduce Environmental Impacts

**Transform Facilities**
- Remotely Staffed Tower Services

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NextGen Midterm NAS CONOPS

- An 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
- 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
Staffed NextGen Towers (SNT)

- Provides surface and tower services without the requirement for direct visual observation by ANSP personnel from an airport tower cab
- 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
High Altitude

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

- **Generic Sectors**
  - Increased staffing efficiencies
  - 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

- 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 traffic management strategic planning and sector team tactical operations
- Fine tunes traffic management initiatives to increase efficiency, reduce delays, and ensure sectors do not exceed complexity thresholds
  - Supports redistributed functions and flexible workforce management options
  - Adapts to work where the demand is expected
  - Minimizes impact of reroutes, manages complexity and maximizes capacity
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 High-Density Ops
3D Path Arrival Management (3D PAM)

- An initial intervention in advance of NextGen 4D trajectory operations
  - Addresses congestion in arrival and departure streams for medium to large airports
- An efficient and predictable method to deliver aircraft from the Top of Descent to a metering fix
  - Optimum speed and altitude profiles
  - Reduced fuel burn, emissions and environmental impact
  - Increased flight path predictability and repeatability
  - Delay reduction
  - Reduced frequency and duration of voice communications
  - Increase controller productivity - reduced workload from trajectory clearances
Tailored Arrivals

- Take 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
- Trajectory is optimized vertically and laterally for an efficient and predictable arrival
- Tailored Arrivals are an initial step toward 4D trajectory operations
  - Emissions and noise reduction (near idle descent)
  - Flight duration reduced by several minutes
  - ~880 lb (400 kg) less fuel burn per flight
  - Dramatically reduced VHF voice communication
System Level (ConUse)
Data Communications Segment 2

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