The Next Generation Air Transportation System
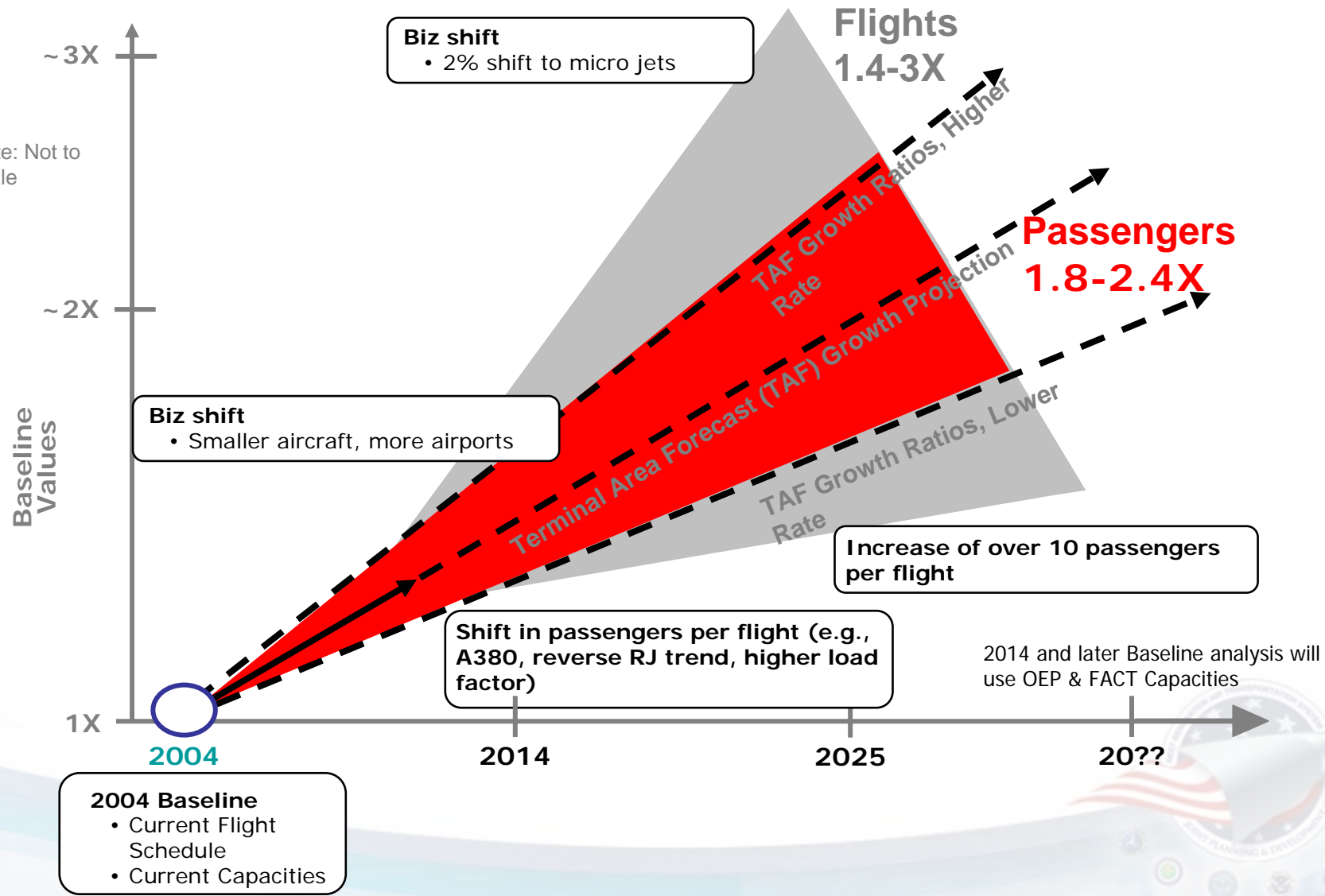
8 June 2006

Doug Arbuckle, AATS IPT Director

Future Environment and Demand

Note: Not to scale

~3X

~2X

1X

Baseline Values

Biz shift
- 2% shift to micro jets

Flights 1.4-3X

TAF Growth Ratios, Higher Rate

Terminal Area Forecast (TAF) Growth Projection

Passengers 1.8-2.4X

Biz shift
- Smaller aircraft, more airports

TAF Growth Ratios, Lower Rate

Increase of over 10 passengers per flight

Shift in passengers per flight (e.g., A380, reverse RJ trend, higher load factor)

2014 and later Baseline analysis will use OEP & FACT Capacities

2004 **2014** **2025** **20??**

2004 Baseline
- Current Flight Schedule
- Current Capacities

Some JPDO Assumptions…

- Airspace is a National resource

- Government "mandates" are acceptable to meet "public good" objectives, but should be judiciously selected

- Free-market incentives should be used to improve ATM system performance wherever appropriate

- Today's ATM system supports a wide range of aircraft capabilities and range of aircraft capabilities is expected to broaden even more in future

- ATM system should enable aircraft to use their capabilities as much as possible while meeting safety, security, and environmental requirements

- …

2025 NGATS Concept

For full version, see: **jpdo.digiplaces.com/tech_hangar/**

Operating Principles

- **"It's about the users..."**
- **System-wide transformation**
- **Prognostic approach to safety assessment**
- **Globally harmonized**
- **Environmentally compatible to enable continued growth**

Key Capabilities

- **Net-Enabled Information Access**
- **Performance-Based Ops & Services**
- **Weather-Assimilated Decision Making**
- **Layered, Adaptive Security**
- **Broad-Area Precision Navigation**
- **Trajectory-Based Aircraft Operations**
- **"Equivalent Visual" Operations**
- **"Super Density" Operations**
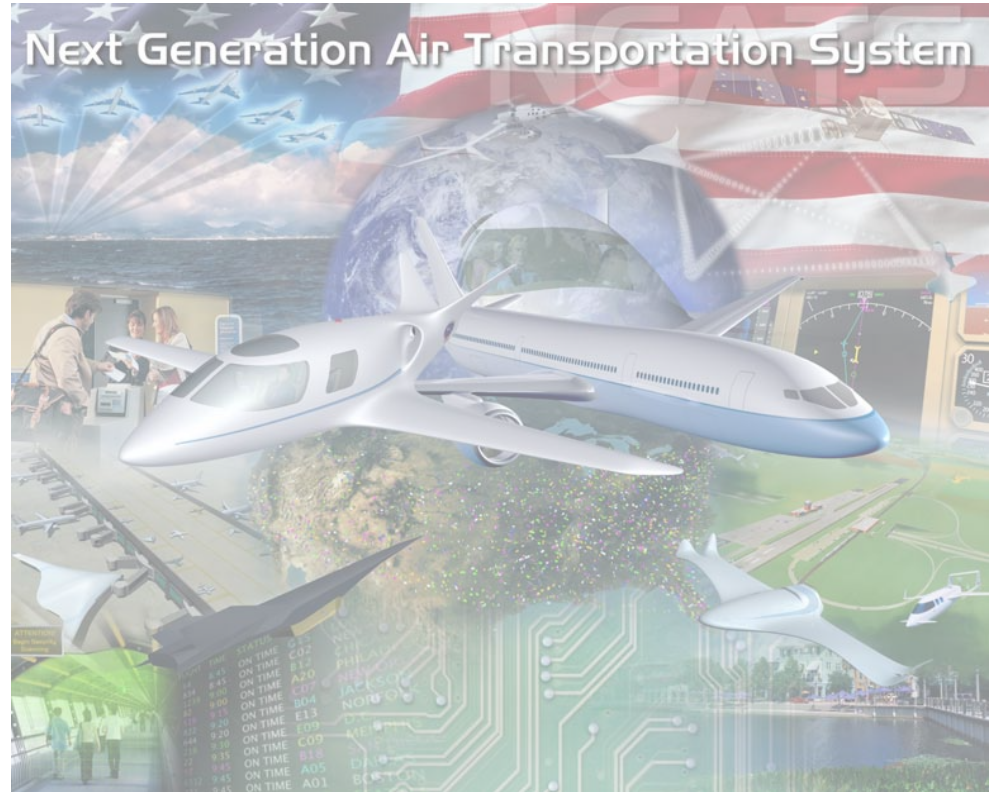
2025 NGATS ATM System View

Operating Principles

- "It's about the users..."
- Prognostic approach to safety assessment
- Globally harmonized
- Environmentally compatible to enable continued growth

Key Capabilities

Layered, Adaptive Security

"Super Density" Ops

"Equivalent Visual" Ops

Trajectory-Based Aircraft Ops

Weather-Assimilated Decision-Making

Performance-Based Airspace Operations & Services

Net-Enabled Information Access (Comm, Surveillance)

Broad-Area Precision Navigation
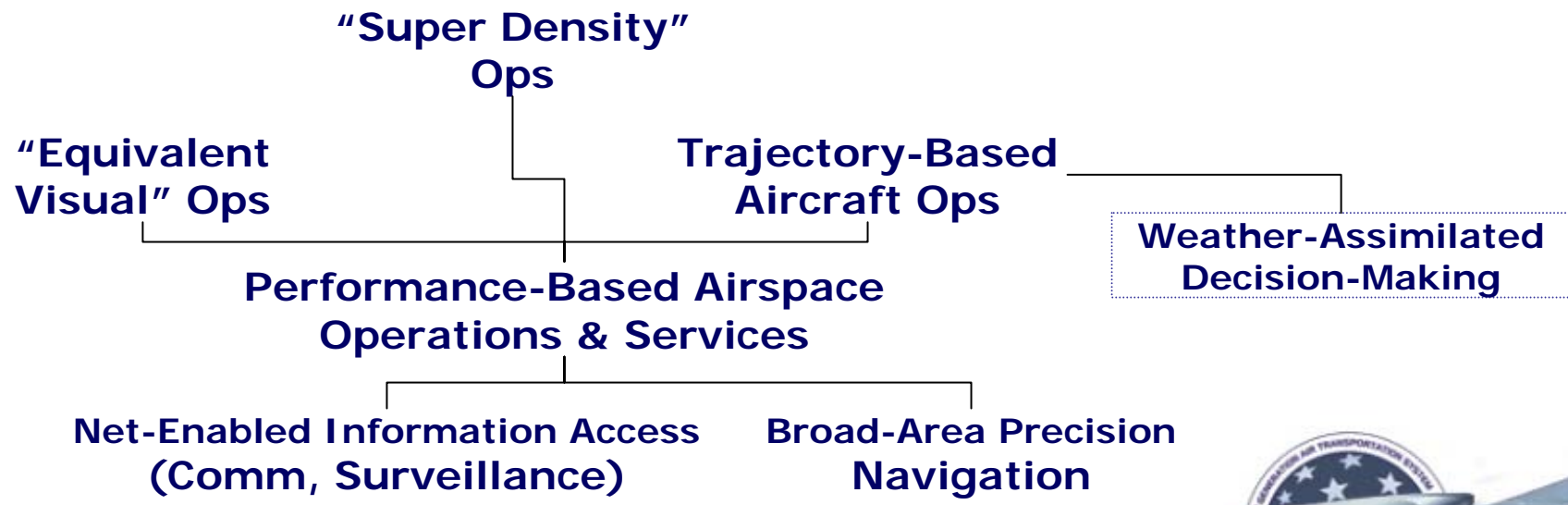
Net-Enabled Information Access
Global secure access, information handled according to "communities of interest"

- **"Shared Situation Awareness"**
  - ➢ **Real-time free-flow of info from private, commercial, & government sources, integrated internationally**
  - ➢ **Tailored, responsive and secure**
  - ➢ **Push/pull processes**
  - ➢ **Common awareness of day-to-day ops, events, crises**

- **Aircraft are integral "nodes" in network**

- **Integrated cooperative air traffic and non-cooperative national security surveillance**

Performance-Based Airspace Operations
R<CNS>P: the NGATS vision...

- CNS performance basis for operations (vs "equipment" basis)
  - Standards/requirements based on performance capability, not technology or equipment
    - Examples already exist (e.g., RNP-based operations)
  - Simplifies regulatory activities (cert, flt stds) in presence of technology proliferation
  - Opportunity to define "pre-approved" operations based on performance levels that are not yet obtainable with current technology (innovation incentive)
  - <u>Min</u>: Define level of {RNP, RCP, RSP} required to perform given operation in given airspace (approach type, separation standard, etc)

  <u>Max</u>: Explicit basis for trading off RxP for RyP to perform given operation

# Performance-Based Airspace <u>Services</u>
R<CNS>P: the NGATS vision…

- **Air traffic "service levels" aligned with specified aircraft CNS performance levels** (Performance-Based Airspace Ops exist)

  - ➤ **Services flexible to varying situations/needs**

  - ➤ **Operators free to choose CNS performance levels for their aircraft according to their needs**

  - ➤ **Replaces "binary access" and "first come, first served" with a flexible framework to segregate aircraft according to system needs**

  - ➤ **Developed by ANSP and airspace users in a public policy process**

  - ➤ **Opens opportunities trans-nationally and globally**

  - ➤ **Examples of use**

    - ➤ *Aircraft may be told: "To enter/transit this airspace/airportal at this time, you'll need to achieve these values of RNP, RCP, and RSP or show that the combination achieves RTSP…"*

    - ➤ Aircraft with lower levels of CNS capability may be moved to less efficient, less desirable flight paths

Aircraft Trajectory-Based Operations

Adjust airspace configuration to meet user needs
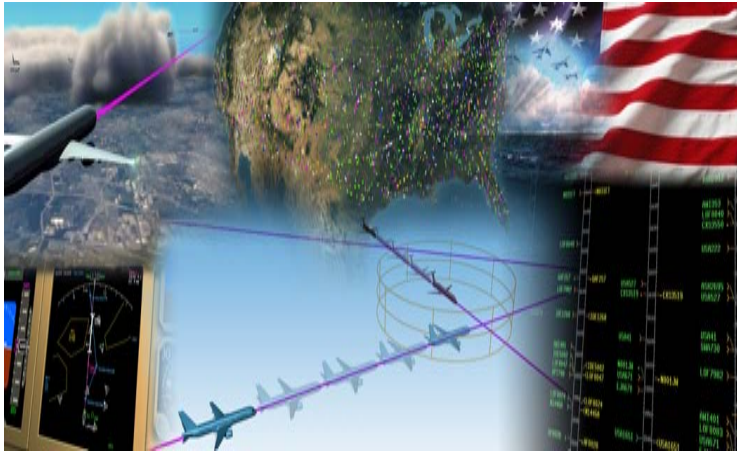
- 4D trajectories (including taxi and roll-out) are basis for planning and execution
- Machine-based trajectory analysis and separation assurance
- Includes environmental performance throughout all phases of aircraft ops
- Airspace configuration driven by: DoD/DHS requirements, domestic & international user needs, requirements for special-use airspace, safety, environment, overall efficiency
- Airspace reconfigurable during day of operations

Aircraft Trajectory-Based Operations:
Management-by-Trajectory

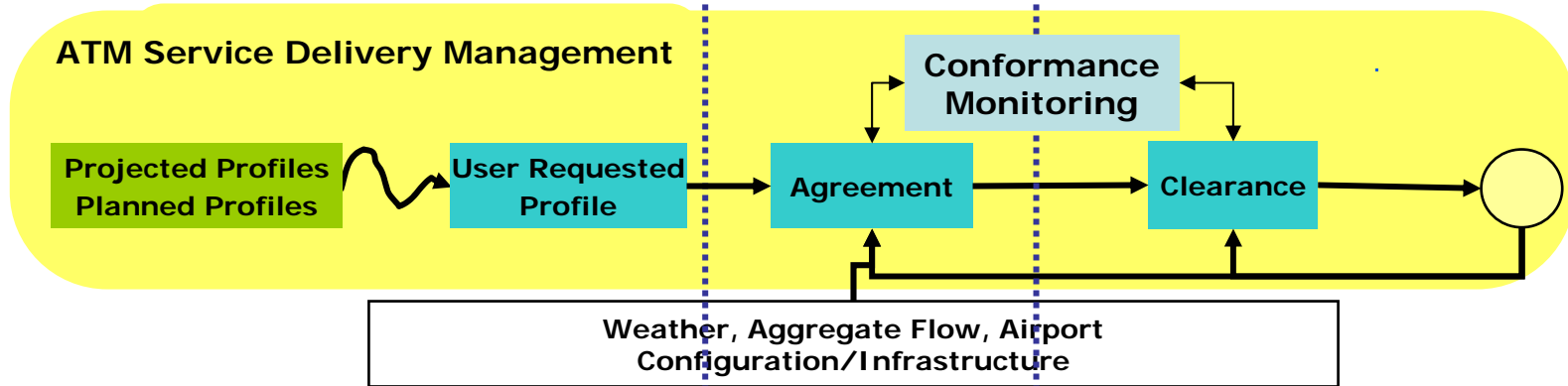**Strategic** | **Tactical** | **Separation Mgmt**

Airspace Organization and Management

Airport Operations

Airspace User Operations

Demand & Environmental Performance Balancing

Information Management

ATM Service Delivery Management

Projected Profiles Planned Profiles → User Requested Profile → Agreement → Clearance →

Conformance Monitoring

Weather, Aggregate Flow, Airport Configuration/Infrastructure

## Key Issues are functional allocation between:
➢ **Automation and humans**
➢ **Aircraft operators and service provider**

Equivalent Visual Operations

Increasing capacity from today's non-visual conditions

- Aircraft perform *"equivalent visual"* operations in non-visual conditions (achieve "VFR capacity" under these conditions)

- ATM provider delegates *"maintain separation"* responsibility to aircraft operators
  - ➢ Requires timely, high fidelity information on nearby aircraft, weather, etc

- System-wide availability at all air portals
  - ➢ With appropriately capable "landside" (including security)

- Greater predictability of operations at busy airports, including ground operations
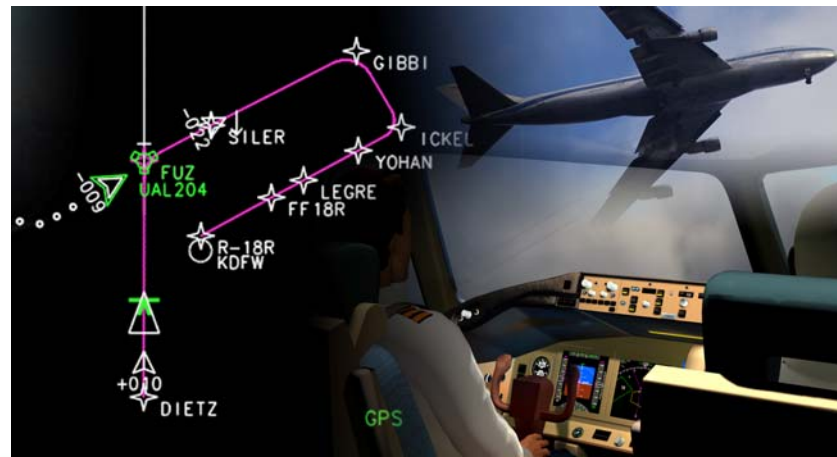
Super Density Operations

Peak performance for the busiest airports

- **Maximized, environmentally acceptable runway capacity**
  - ➢ **Reduced arrival/departure spacing**
  - ➢ **Equivalent Visual capability**
  - ➢ **Predictable detection/integration of wake vortex hazards**

- **Reduce Runway Occupancy Time**
  - ➢ **Aircraft energy management during rollout coupled with optimum turnoff selection**
  - ➢ **Situational awareness of "nearby" surface traffic and intent for high-speed turnoff**

- **Simultaneous operations on single runway**
  - ➢ **Multiple aircraft operate on single runway when sufficient "separation" exists**
  - ➢ **High-update rate surveillance info available to all aircraft**

- **Incorporates required environmental performance during all operations**

- **Airport "landside" (including security) sized accordingly**