

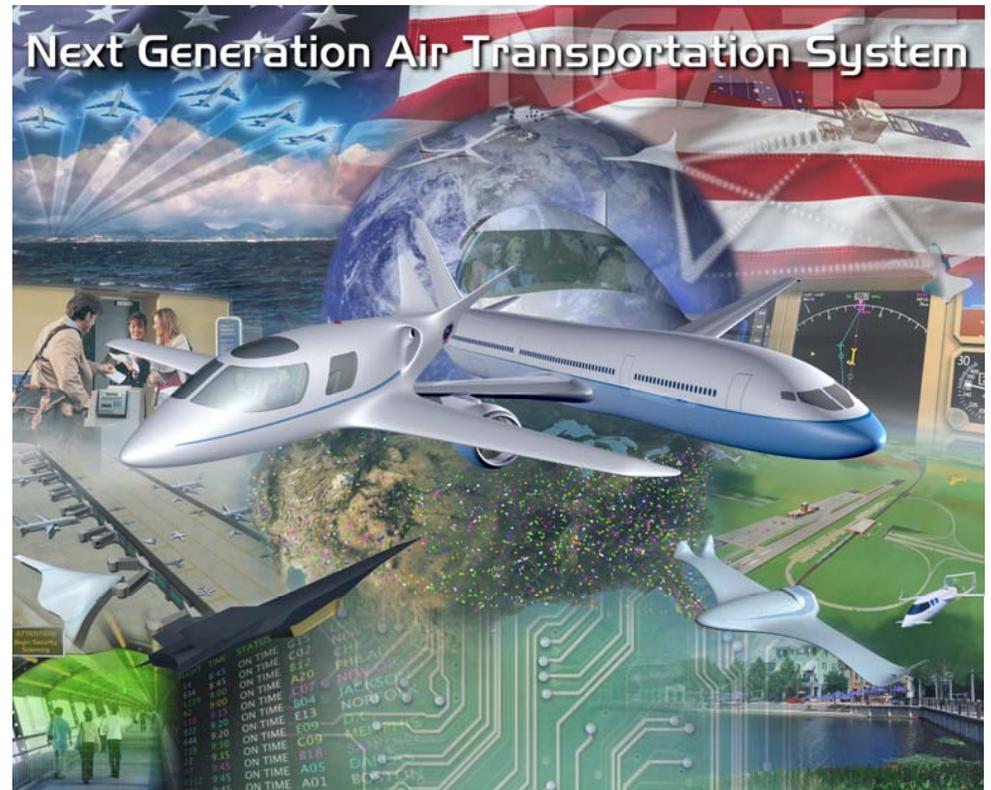
2025 NGATS Concept

Design Principles

- “It’s about the users...”
- System-wide transformation
- Prognostic approach to risk management
- Globally harmonized
- Environmentally **friendly** to foster continued growth

Key Capabilities

- Net-Enabled Information Access
- Performance-Based Services
- Weather-Assimilated Decision Making
- Layered, Adaptive Security
- Broad-Area Precision Navigation
- Trajectory-Based Aircraft Operations
- “Equivalent Visual” Operations
- “Super Density” Operations



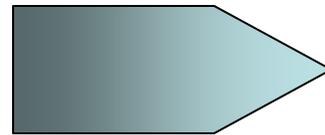
"It's about the Users"

A major shift in the information paradigm...

From

To

- Supplier dominated
- Owner pushes controlled info
- Sequential info flow



- User (consumer) dominated
- Owner posts info for appropriate classes of users
- Parallel information flow

Gather, Process, Use, Disseminate

Gather, Post, Process, Use

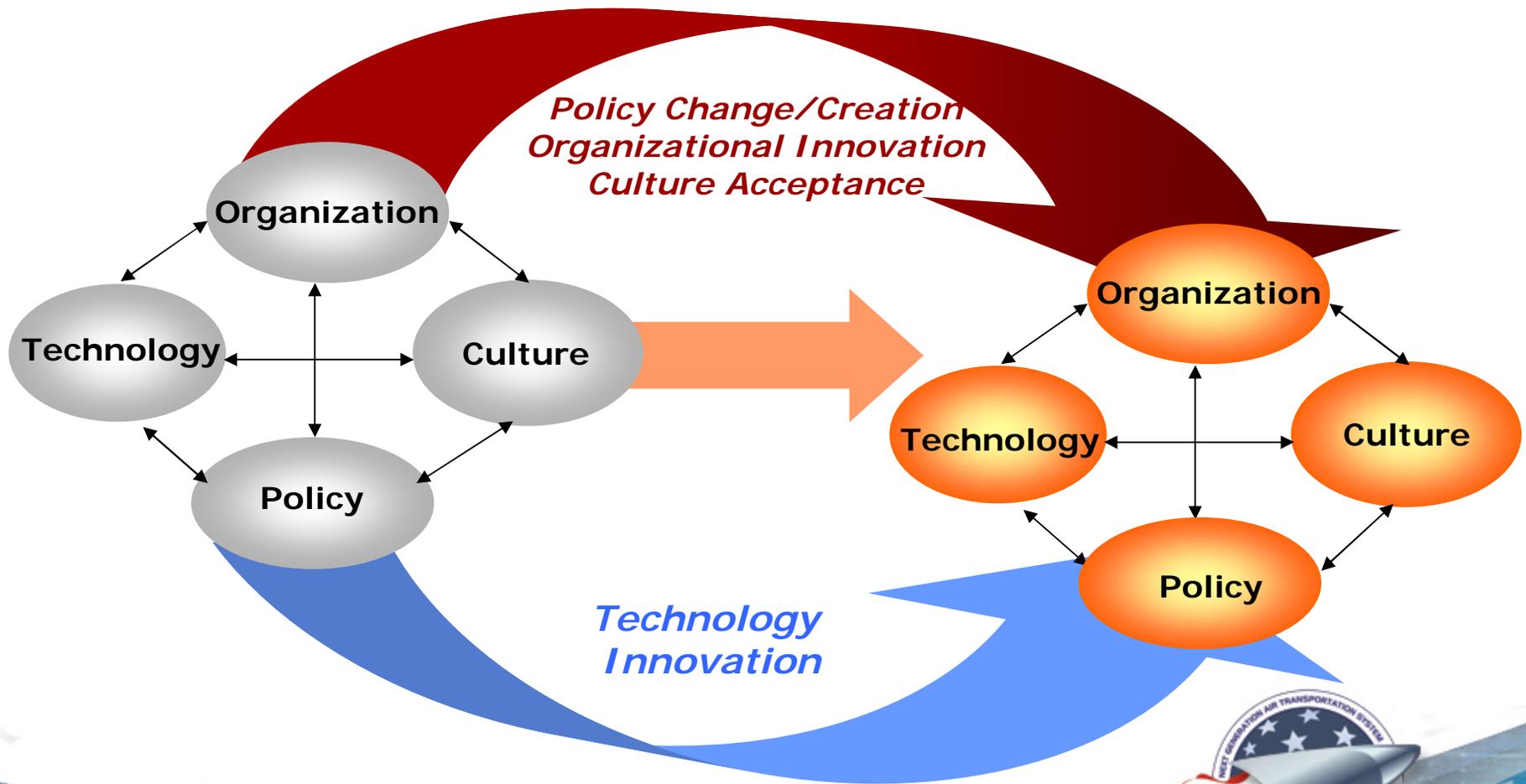
Payoffs

- *Better, Faster Decision Making (due to greater information base)*
- *Increased Collaboration, Reliability & Accuracy*
- *Greater Security*



System-Wide Transformation

Innovation Across All Lines of Development



Prognostic Approach to Safety

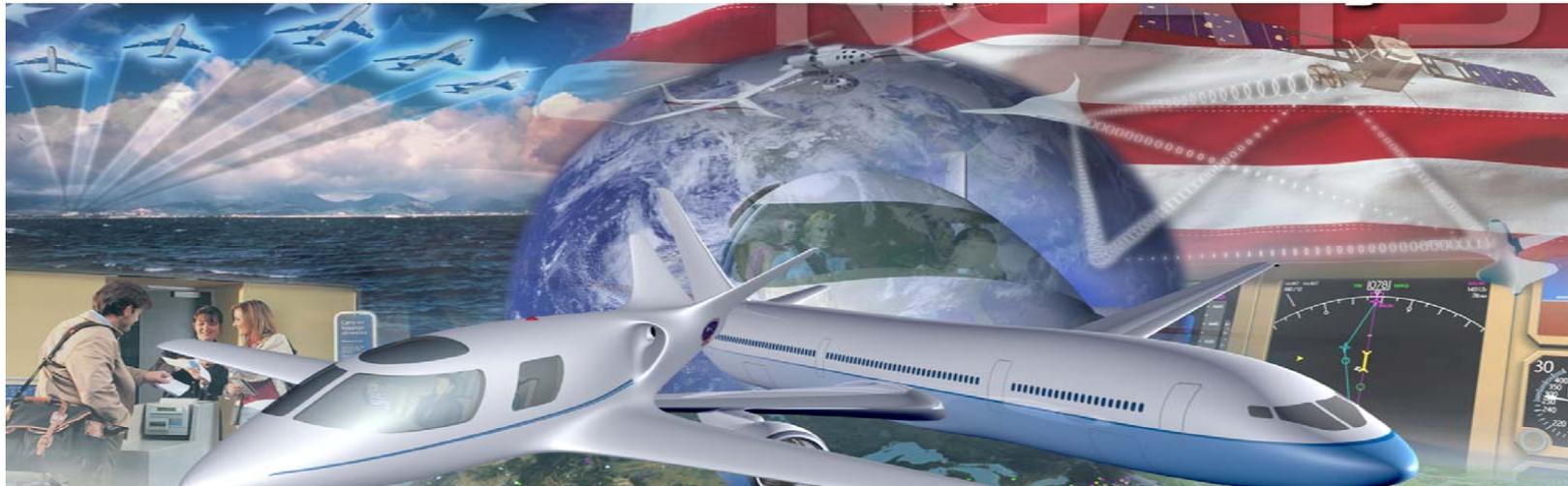
National Culture, Standards & Scope

- **National Safety Management Standard**
- **National Safety Culture**
 - Continuous Improvement
 - Accountability for establishing a safety culture & making risk-based, data driven decisions
 - “Just Culture”
 - Median between a “Punitive Culture” and a “Blameless Culture”
 - Non-Punitive reporting system
- **National Strategic Plan**
 - National Goals and Prioritization of Safety Research
- **Comprehensive Sharing and Analysis of Relevant Safety Information**



Global Harmonization

Exporting the NGATS concept and capabilities



- Harmonized systems, procedures for “borderless” interoperability
- Partnerships to promote common solutions for common problems
- Early, continuing participation in developing global standards, procedures to ensure satisfaction of US requirements
- Promote implementation of “best practices” worldwide
- Promote marketing of US products and services globally



Integrated Environmental Performance

Environmental protection compatible with aviation growth

- **Required Environmental Performance (REP) ensures absolute reduction of significant aviation-associated environmental impacts**
- **Analytical tools developed from environmental management systems**
 - Address effects, interrelationships, cost-effectiveness, as an overall approach.
 - Provide the best science-based information support to measure, monitor compliance
 - Foster research to mature key near-term technologies, develop future technologies to meet environmental targets
 - Integrate market-based options, incentives, and other policy approaches with traditional regulatory and technology approaches
 - Develop more effective metrics and methods to communicate aviation's environmental relationship to communities
- **Performance standards for individual equipment as well as fleet operations**



Net-Enabled Information Access

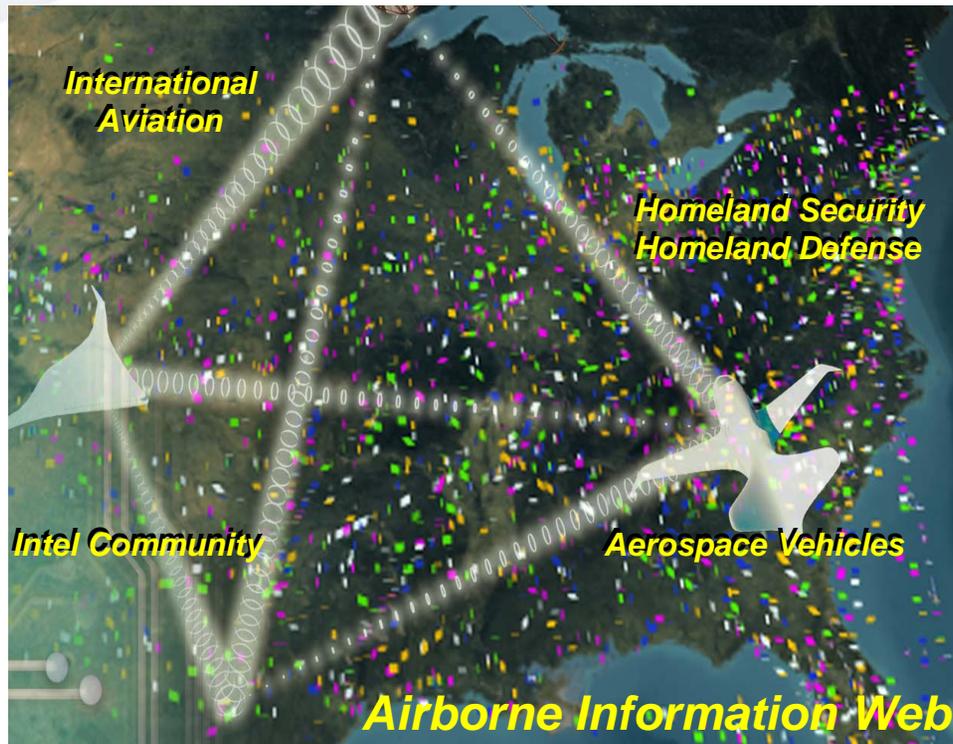
*Global secure access, information handled according to
"communities of interest"*



- **"Shared Situation Awareness"**
 - Real-time free-flow of info from private, commercial, & government sources, integrated internationally
 - Push/pull processes, secured according to needs and priorities
 - Common awareness of day-to-day ops, events, crises
- **Aircraft are integral "nodes" in network**
- **Integrated surveillance system across agencies and borders**



Net-Centric Operations: *NGATS Information Sharing*



- Sufficient bandwidth and infrastructure for broad-area broadband, data & voice
- Weather & surveillance infrastructure
- Information correlation
- Total Security Integration
- Tailored, responsive, and secured according to needs of users
- “Push/Pull” info sharing



Performance-Based Services

Service levels designed to capability performance

- **Multiple service levels aligned with specified user performance thresholds**
 - Provides choice to users depending on needs
 - Required Communication, Navigation and Surveillance performance
 - Environmental performance criteria
 - Security parameters, etc.
- **Services flexible to varying situations/needs**
 - Varies from area to area, in terms of airspace and “air portal” surfaces
 - Varies with time as needs dictate
 - Preference established based on user capability/equipage/training/security etc.
- **Performance-based approach used to analyze risks (safety, security, environment, etc) instead of “equipment-based” approaches**
- **Service guarantees let users align performance with needs**
 - Developed cooperatively by service providers and their users
 - Opens opportunities trans-nationally, globally



Weather Assimilated into Decisions

Common weather picture across NGATS

- Fuse global weather observations and forecasts into single database, dynamically update as needed
 - Tens of 1000's of sensors (airborne & ground) feed 100's of forecast models
- Learning automation accounts for weather and its uncertainties in managing aircraft trajectories
- Identify hazardous weather real-time
- Assimilated into NGATS "decision loops"
 - Total integration via machine-to-machine
 - Critical decision system time scales using both probabilistic and deterministic weather info
 - Optimized to maximize available weather-favorable airspace
 - Terminal weather impacts including ground/ramp ops and adaptability due to wind shift changes



Layered, Adaptive Security

Move people/goods expeditiously from "curb-to-curb" while ensuring protection from foreign & domestic threats

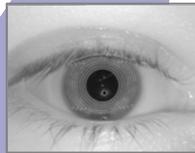
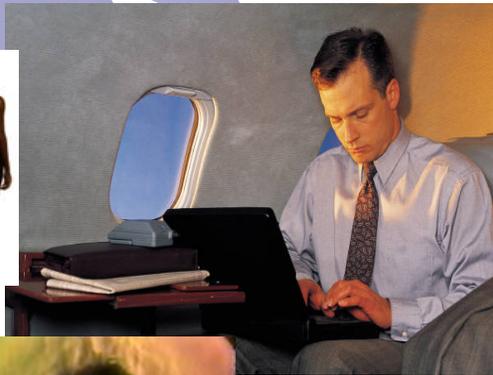
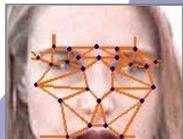


- Adaptive Security for People, Cargo, Airports and Aircraft
- Risk Assessment-Driven Evaluation and Response
- Positive Identification for People and Cargo
- Preventive Threat Detection and Mitigation



Layered, Adaptive Security: *Secure People and Cargo*

Risk Assessment



Network Centric Ops

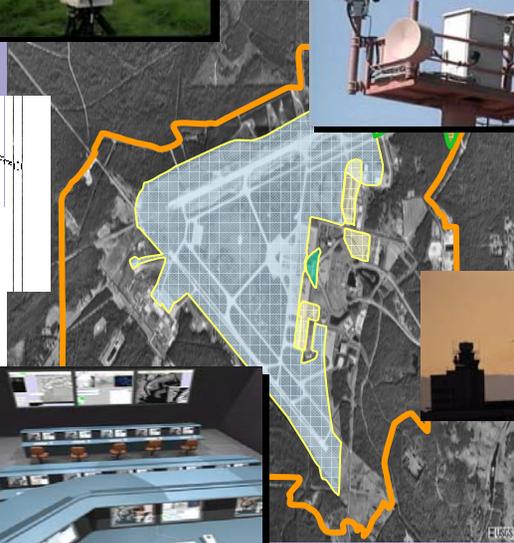
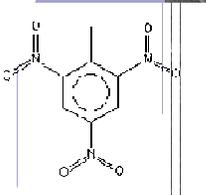
Needs New Graphic

- **Adaptive Security Envelopes**
 - Passengers, crew & employees
 - Secure Passenger Programs
 - Known and Unknown Shipper Processes
- **Positive Identification**
 - Check Points
 - Credentialing
 - Cargo Integrity
- **Int'l Correlation & Cooperation**
- **Threat Detection**
 - No-Impact Screening
 - Checked Bags
 - Cargo Screening



Layered, Adaptive Security: *Secure Airports & Aircraft*

Risk Assessment



Network Centric Ops

Needs New Graphic

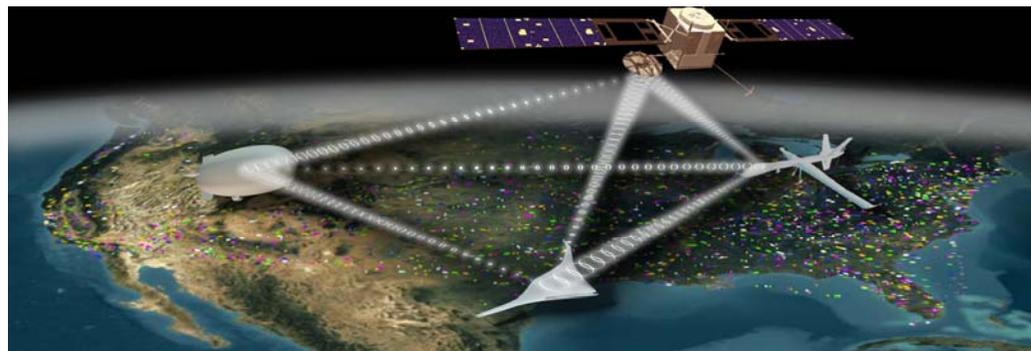
- **Facility Hardening**
 - Airport Access
 - Facility Surveillance
 - Perimeter Awareness
 - Airport Design
- **Aircraft Hardening**
 - Internal and External
 - Cabin/Cargo Chem/Bio, Rad/Nuc Sensors
 - Cabin/Cargo Surveillance
- **Mitigate Effects**
 - Intercept
 - Trained Cabin Attendants
 - Federal Air Marshals
 - Federal Flight Deck Officers
 - MANPAD Mitigation
- **International Standards**



Broad-Area Precision Navigation

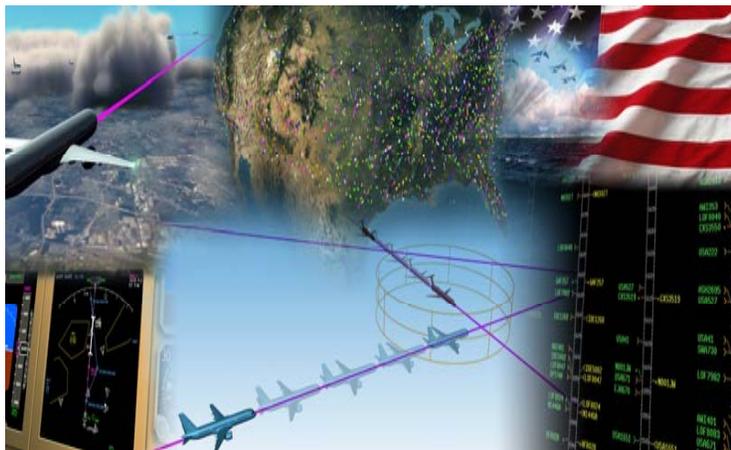
Large area precision enables flexibility

- **Navigation performance sufficient to enable precision approaches (CAT-I/II/III)**
 - Minimal/zero ground-based aids at any “air portal”
 - “Air portal”-specific, vice runway-specific
- **Broad-Area to Global Availability of Nav Services**
 - Meeting appropriate requirements for accuracy, integrity and continuity
- **Reduction/elimination of legacy systems & procedures**



Aircraft Trajectory-Based Operations

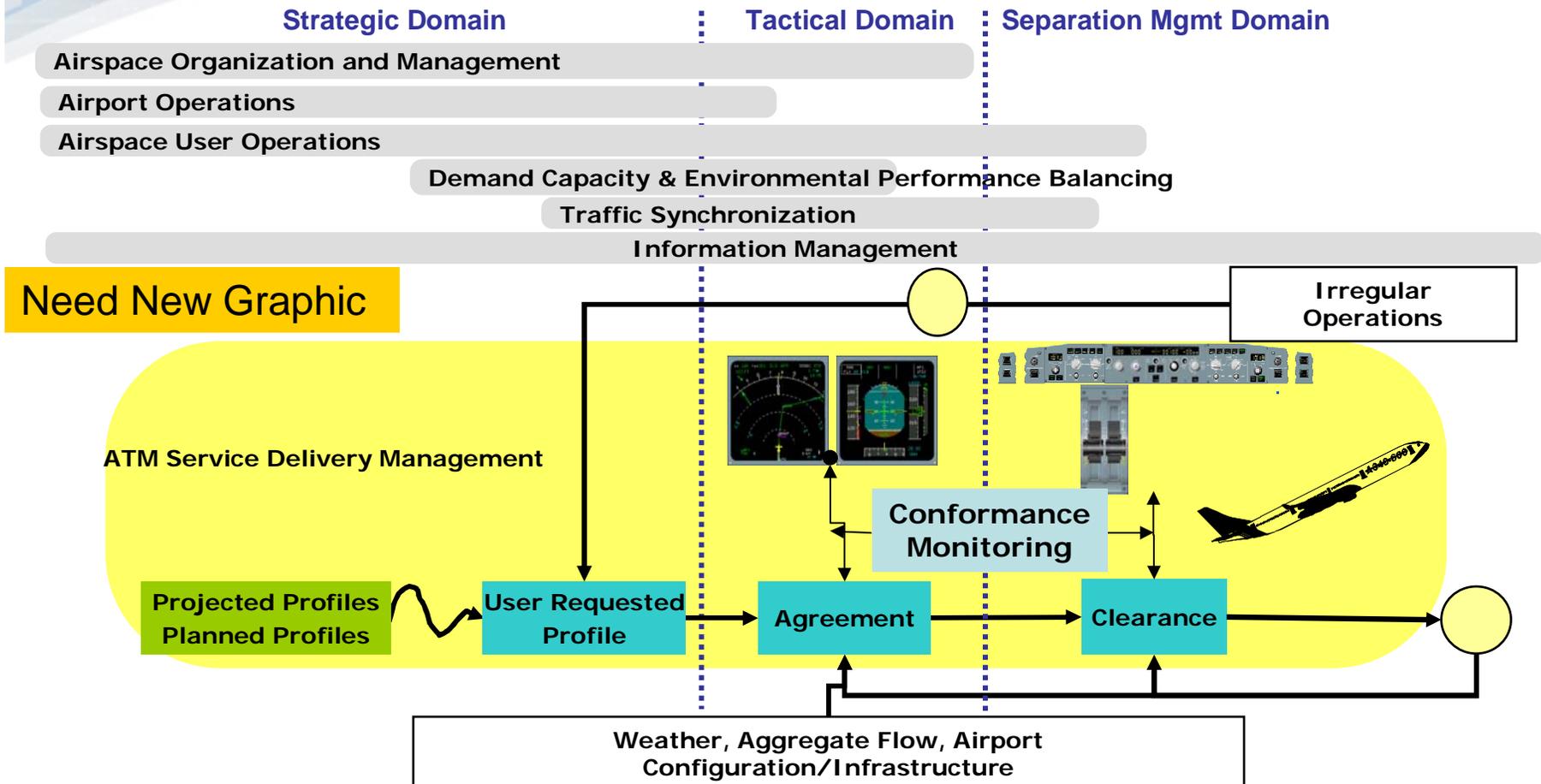
Adjust airspace configuration to meet user needs



- 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 operations
- 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
- Users “contract” for airspace access and service



Aircraft Trajectory-Based Operations: *Management-by-Trajectory*



Key Issues are functional allocation between:

- Automation and humans
- Aircraft operators and service provider



Aircraft Trajectory-Based Operations: *National Dynamic Airspace*

- Freedom from static geospatial constraints
- Airspace configured/allocated as a resource to meet demand
 - Temporal implementation of high-density, high demand corridors, etc
 - Creates options for service provider operations
 - Environmental parameters integral to allocation
- Single mechanism for implementing Special Use Airspace, TFR's, etc
 - Maximizes airspace access to all
 - Defense, Homeland Security needs are prioritized



Aircraft Trajectory-Based Operations: “Evaluator”



- Integrates/communicates weather, security, defense, environmental, safety, international considerations, other information
- Users “post”/update desired 4D trajectories in common system that continuously evaluates mutual compatibility
- Predicts potential “over demand” situations, in multiple “capacity dimensions”—traffic density, environmental, security, etc.
- Works across all time horizons from days/weeks/months prior to flight up to separation management (20 minutes or less)
- Supports distributed decision-making environment where players have clear, agreed-upon roles and interactions



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

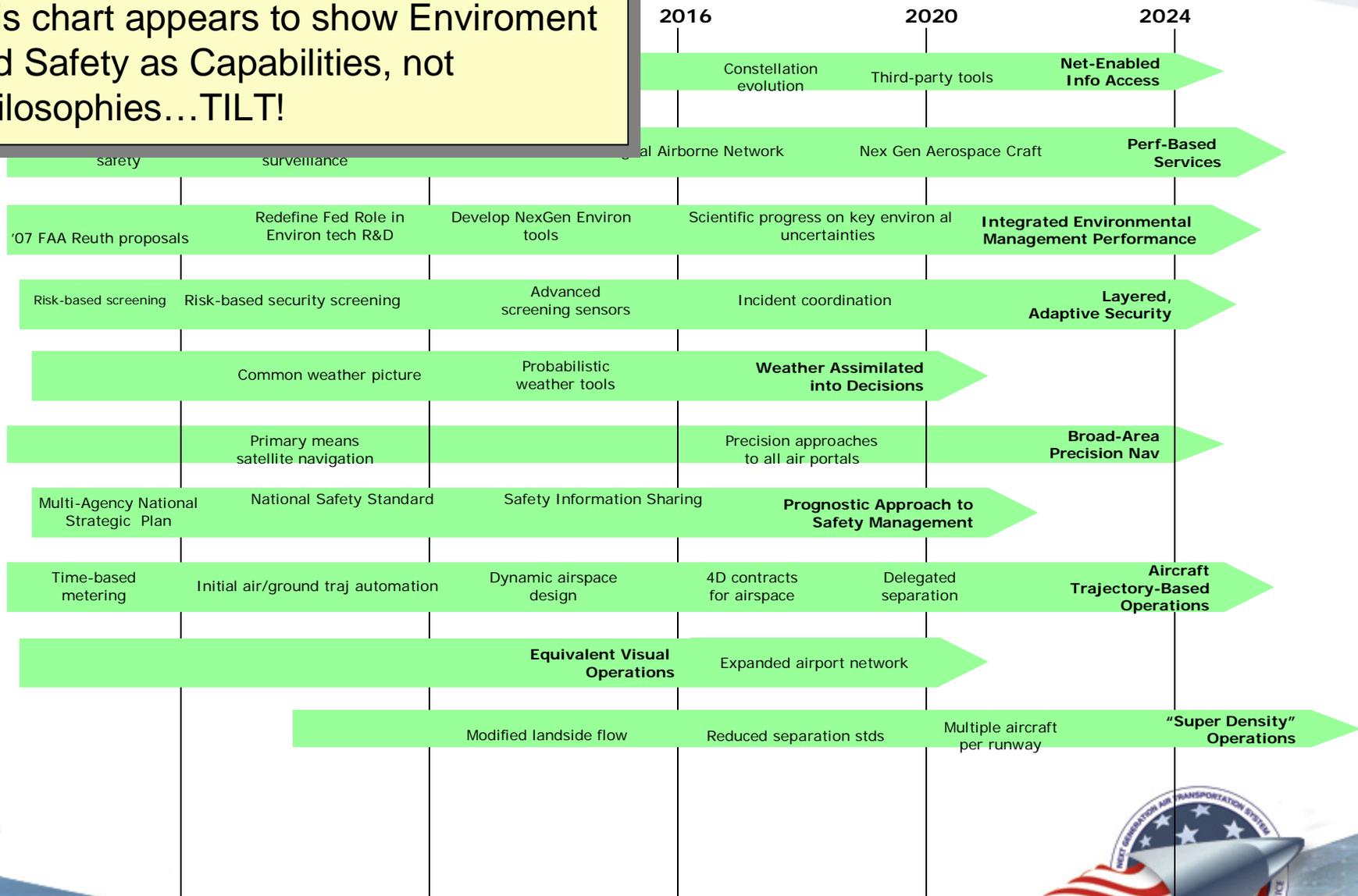


Doug Arbuckle:

This chart appears to show Environment and Safety as Capabilities, not Philosophies...TILT!

roadmap

Next Generation Air Transportation System
Joint Planning and Development Office



BACKUP CHARTS



03-Aug-05



Version 4.6a - JPDO Working Document



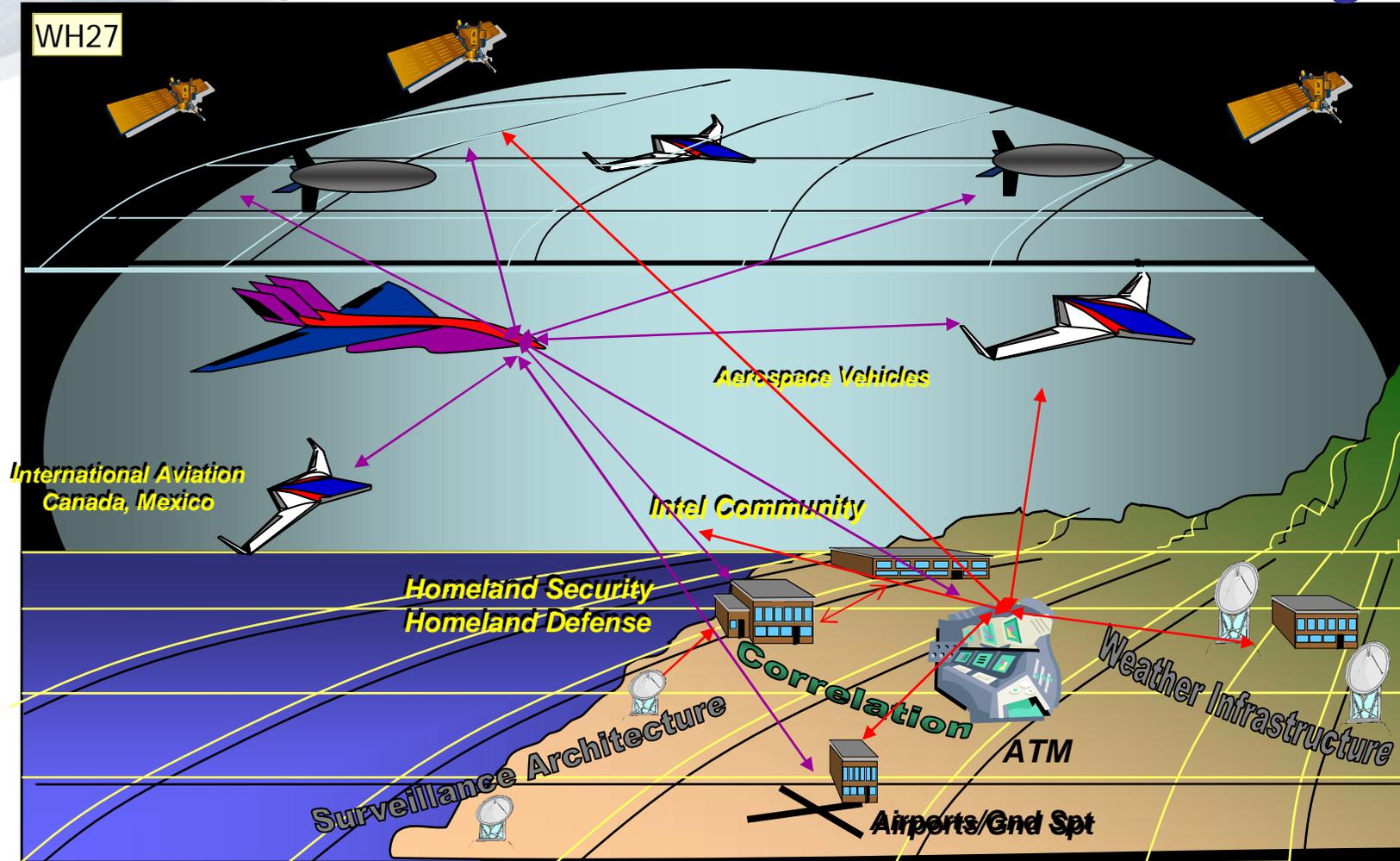
Proactive Safety Management



- National Safety Culture
- Multi-Agency National Strategic Plan for Safety
- National Safety Management System Standard
- Prognostic Approach to Safety through Risk Based Management
- Focus Resources on Highest Priority Risk
- Comprehensive Sharing & Analysis of Relevant Safety Information



Net-Centric Operations: *NGATS Information Sharing*



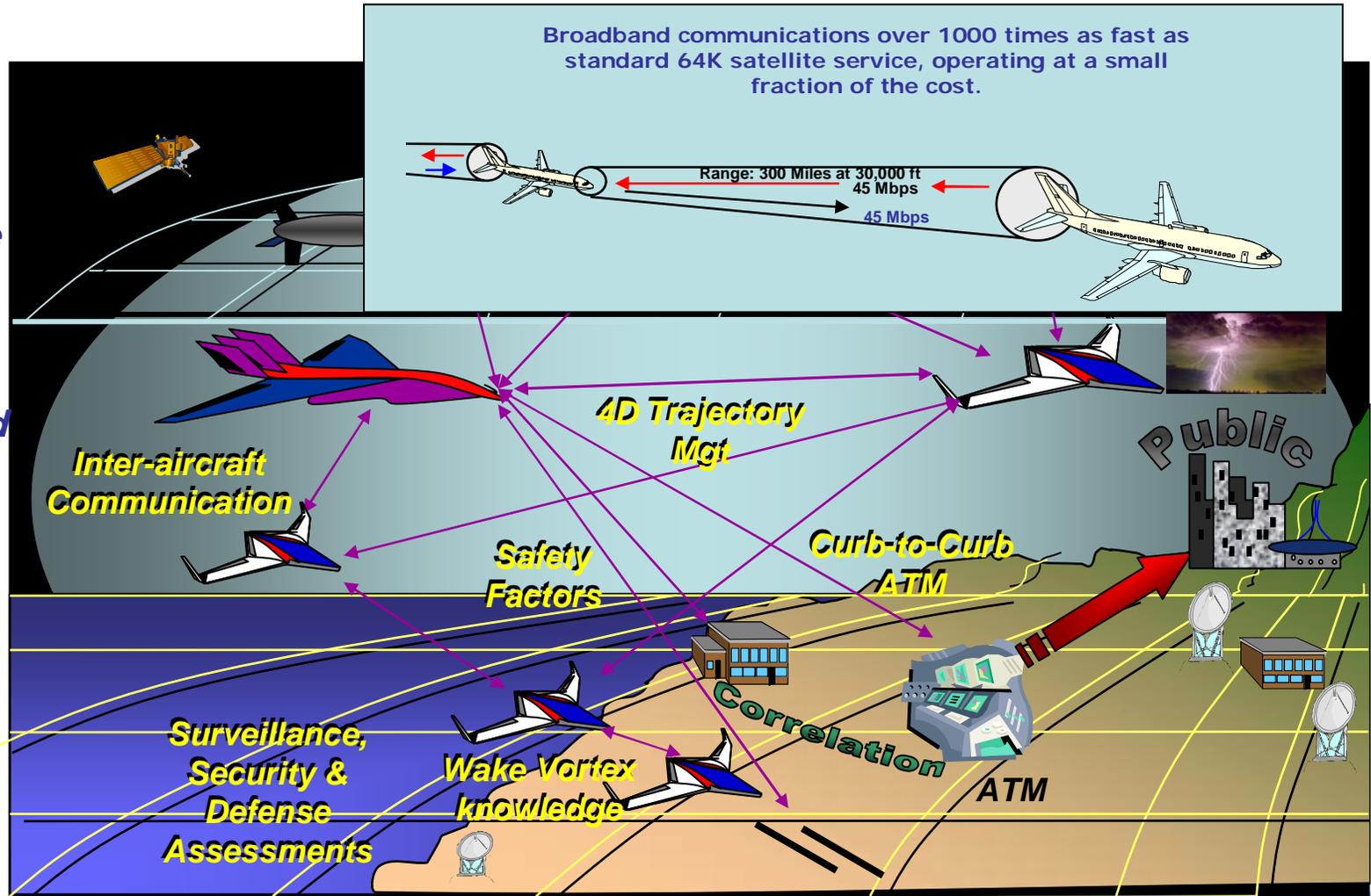
2025 Assumptions

- Sufficient bandwidth exists
- Sufficient infrastructure
- Total Security Integration
- Broad-Area Precision navigation
- Tailored, secured according to needs of users
- "Push/Pull" information sharing via NEO

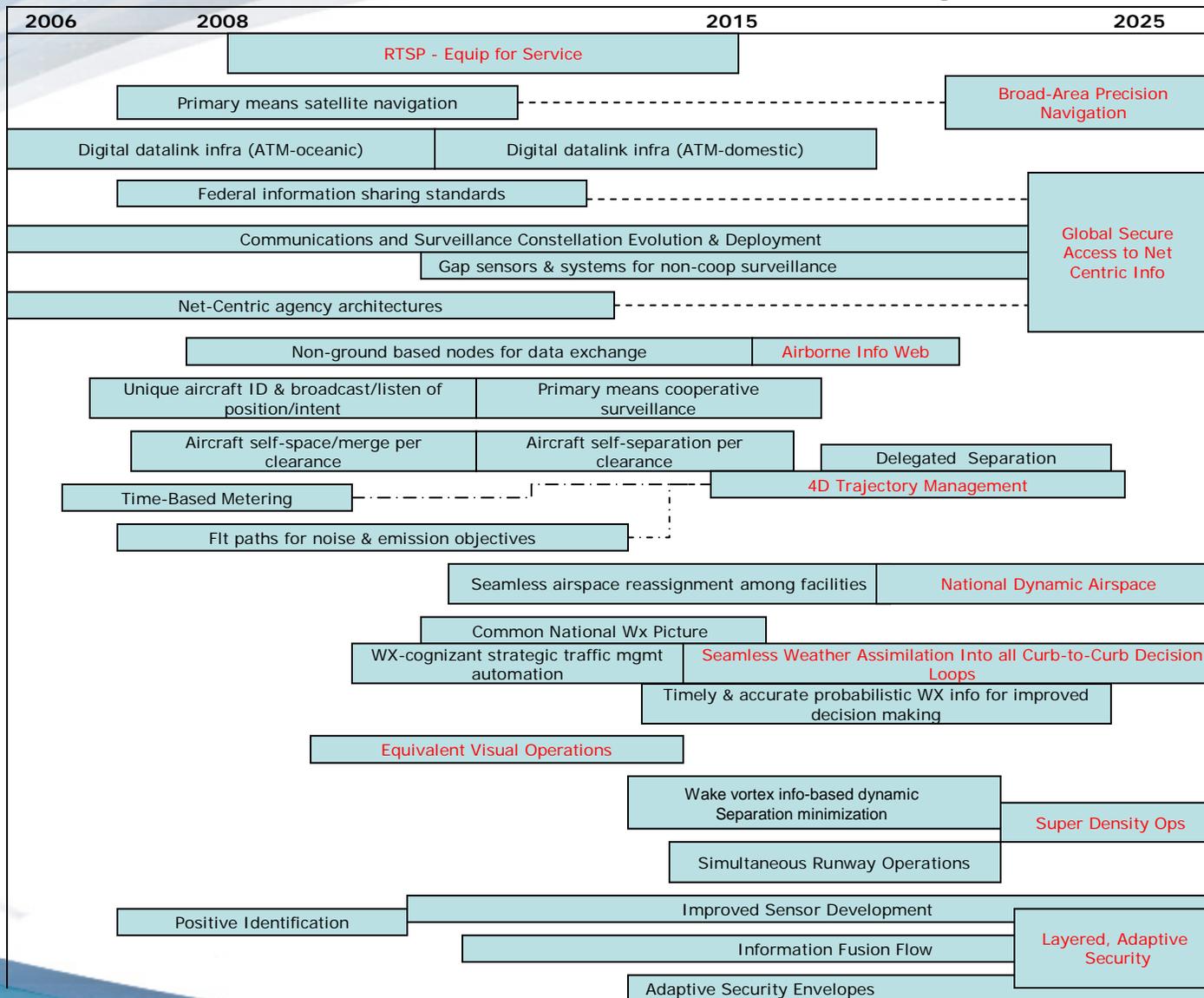


Net-Centric Operations: *Airborne Information Web*

- Broad-area broadband
- Data & Voice
- Surveillance
- Secured
- Responsive
- User-tailored



"Curb-to-Curb" Capability Roadmap



NGATS 2025: Initial Needed Activities

| CAPABILITY | Major FY06-07 Activities |
|--|--|
| Network-Enabled Information Access | <ul style="list-style-type: none"> • Policy changes and standards adoption • Research technology alternatives, explore COTS • Non-ground based info sharing constellation |
| Performance-Based Services | <ul style="list-style-type: none"> • Continue current RNP activities • R&D to complete definition of RTSP, aligned service levels, potential preference framework |
| Layered, Adaptive Security | <ul style="list-style-type: none"> • Adaptive Security Envelopes, positive people & cargo ID • Improved threat detection, aircraft & facility hardening |
| Weather Assimilated Into Decisions | <ul style="list-style-type: none"> • Modify current weather models to produce common formatted output • Synchronize common weather information network development efforts |
| Broad-Area Precision Navigation | <ul style="list-style-type: none"> • Engage GPS JPO around Block III requirements • Research requirements and system alternatives |
| Aircraft Trajectory-Based Operations | <ul style="list-style-type: none"> • Modernization activities (Time-Based Metering, ERAM, Common 4D Geospatial Information, Airspace design toolset for ERAM, etc) • Research "design issues" and requirements |
| "Equivalent Visual" Operations | <ul style="list-style-type: none"> • Initiate ADS-B implementation • Research leading to Wake Vortex prediction |
| "Super Density" Operations | <ul style="list-style-type: none"> • <i>Policy decisions on existing airports</i> • <i>Determine modernization of existing airports, operations</i> • <i>Determine security requirements, impacts on airport infrastructure</i> |
| Integrated Environmental Performance Management System | <ul style="list-style-type: none"> * New regulatory and policy approaches • Federal role in technology environmental R&D * Proposals for FAA Reauthorization in 2007. • Financing schemes to implement noise and emissions measures. • Develop v1 next generation environmental tools. • Scientific progress on key environmental uncertainties. * Develop US positions for ICAO in 2007. |

