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Network Centric Systems

The Future of Terminal Airspace: An Airportal for 2025

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AMHS / Raytheon NCS
Marlborough, MA

Agenda

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- Virtual Airspace Modeling and Simulation (VAMS) Overview
- Terminal Domain Concepts and Core Ideas
- Blended Terminal Domain Concept

VAMS Future Concepts

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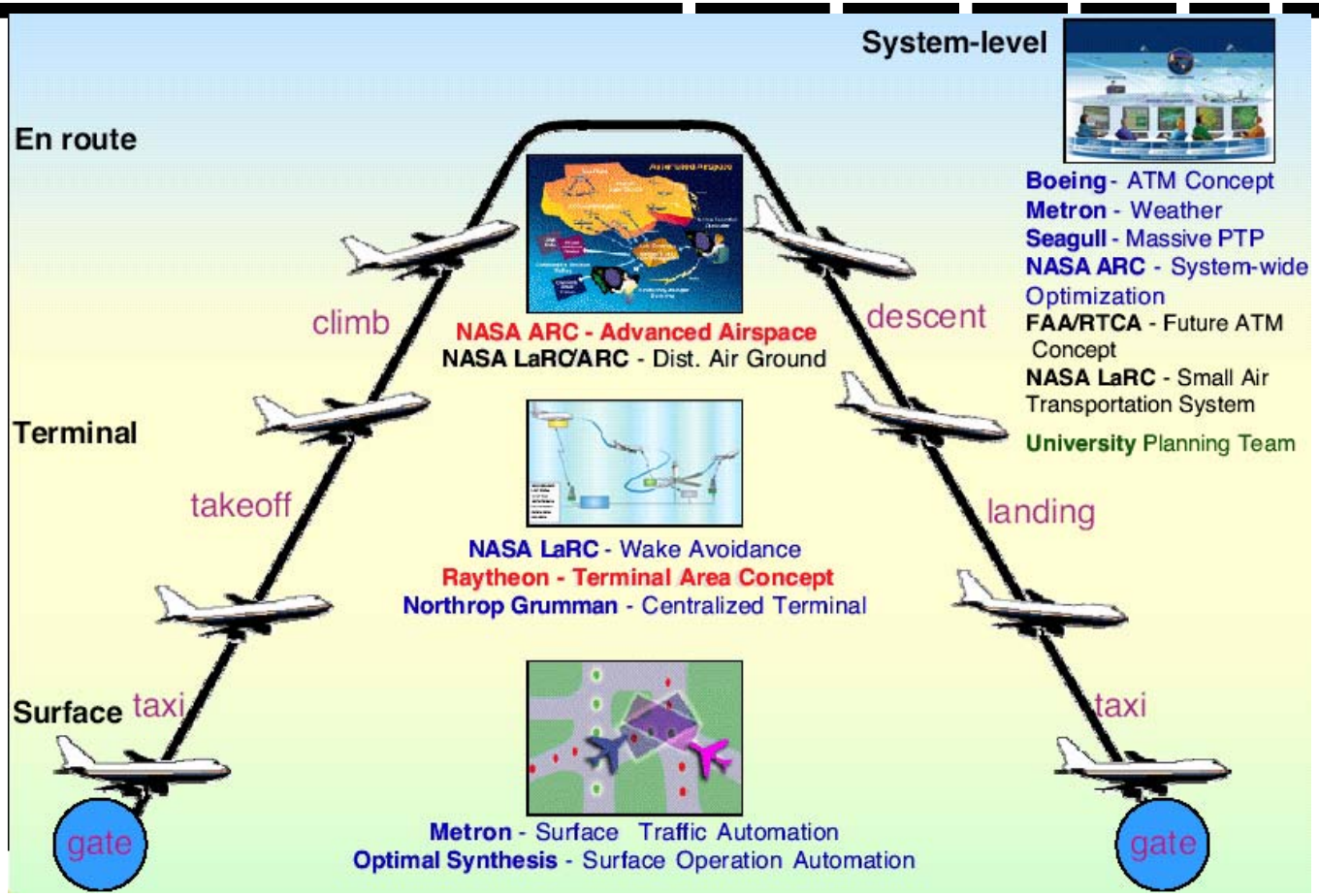

NASA VAMS Multi-Year Research and Technology Development Project

- Develop Capacity Increasing Concepts targeted for 2020/2025
- Enable throughput increases of 100% based on 1997 levels
- Raytheon supporting VAMS under a Space Act Agreement

VAMS Domains and Concepts

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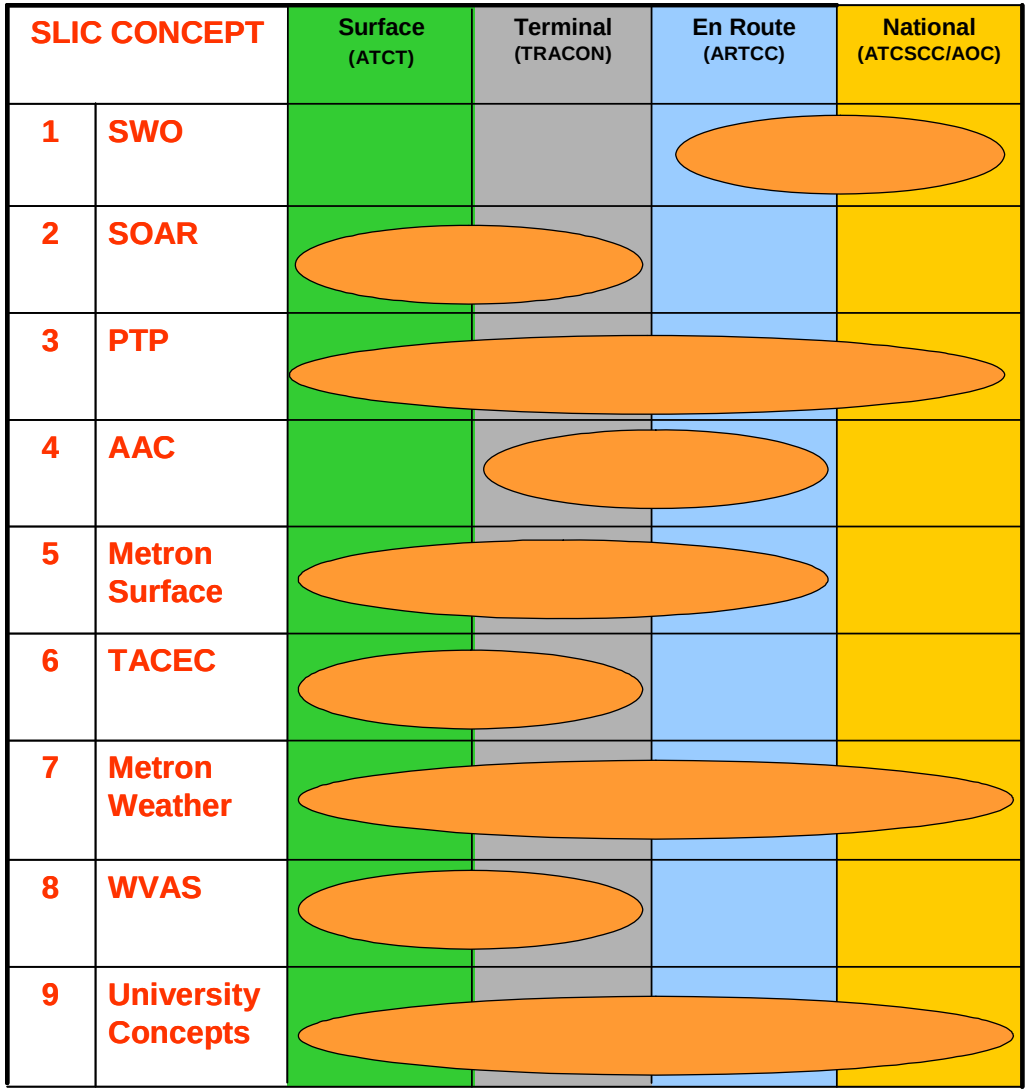

- System Wide Optimization (SWO)
- Surface Operation Automation Research (SOAR)
- Point-to-Point and On Demand Air Transportation System (PTP)
- Advanced Airspace Concept (AAC)
- Metron Surface
- Terminal Airspace Capacity Enhancing Concept (TACEC)
- Metron Weather
- Wake Vortex Avoidance System Concept (WVAS)
- University Concept (Optional Tube Concept)

Terminal Domain Core Ideas

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- **Terminal Airspace**
  - **“Metroplex” Includes both Major/Hub and Regional Airports**
- **Automation Integrates Planning & Control of Air and Surface Domains**
  - **Dynamically allocates meter fix (anchor points) to optimize weather/demand**
  - **Services aircraft based on level of equipage**
- **Very Closely Spaced Parallel Runway (VCSPR) Operation**
  - **Enables airports with existing VCSPR to operate in both IMC and VMC**
  - **Allows construction of additional runways within existing airport footprint**
- **Automation-Enhanced Regional Airports**
  - **Enables increased Point-to-Point operation**
  - **Reduces congestion at Hub airports**
- **Reduced In-Trail Wake Vortex Spacing**

VAMS Airspace

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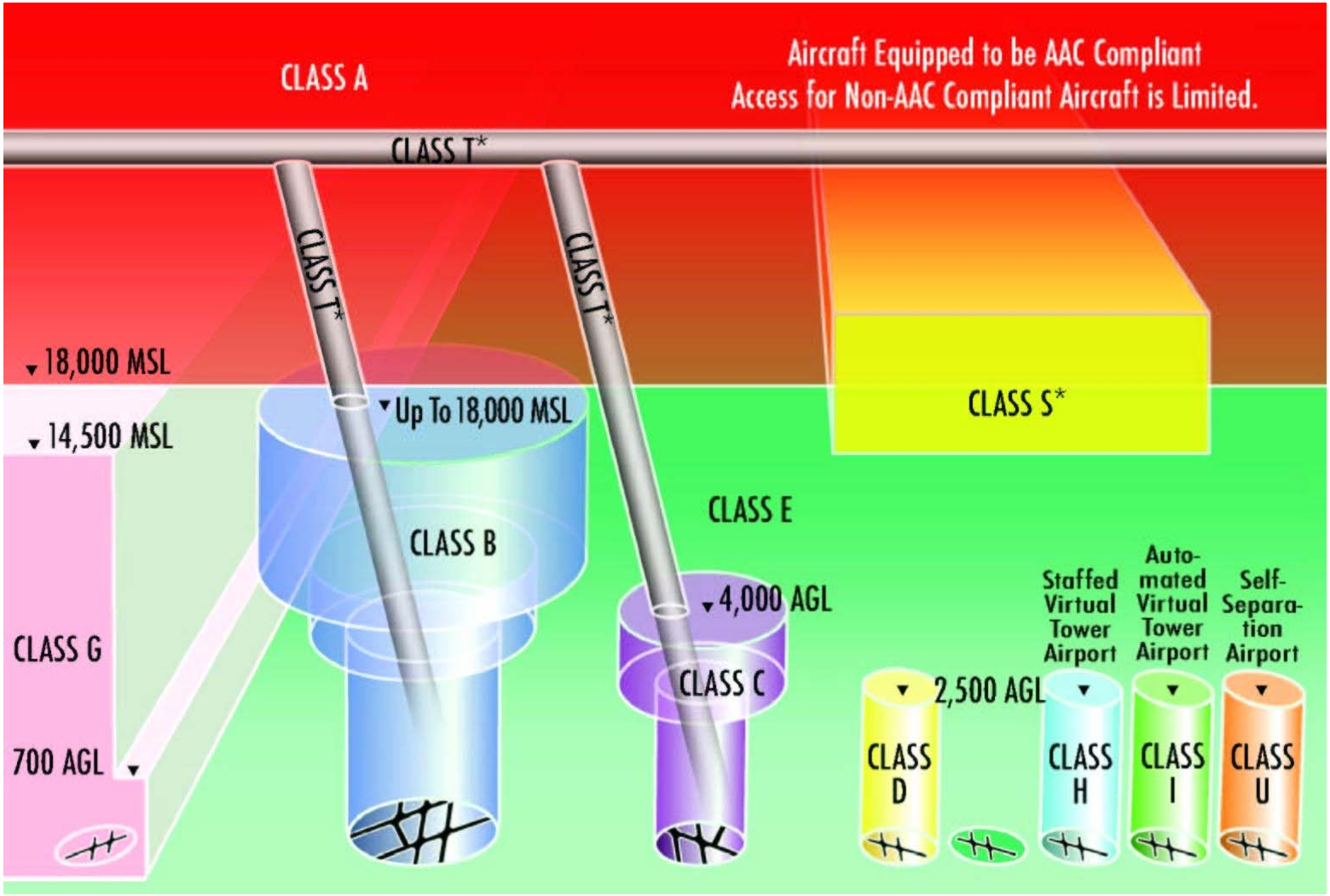

Airspace Class Equipage Levels

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- **Class A: Fully AAC equipped (including CPDLC, 4DFMS, ADS-X Mode S transponder)**
- **Class B: Fully AAC equipped (including CPDLC, 4DFMS, ADS-X Mode S transponder)**
- **Class C/D/E/H/I: Allow set number of non-AAC equipage within given airspace volume (sector)**
- **Class G: “see and avoid”**
- **Class U: Fully Class U equipped (CPDLC, 4DFMS, ADS-X Mode S transponder, TIS-X receiver, FIS-X receiver, MFD/CDTI, PFD Wake Visualization, Sensor Enhanced-Synthetic Vision System)**

Integrated Planning & Control Components

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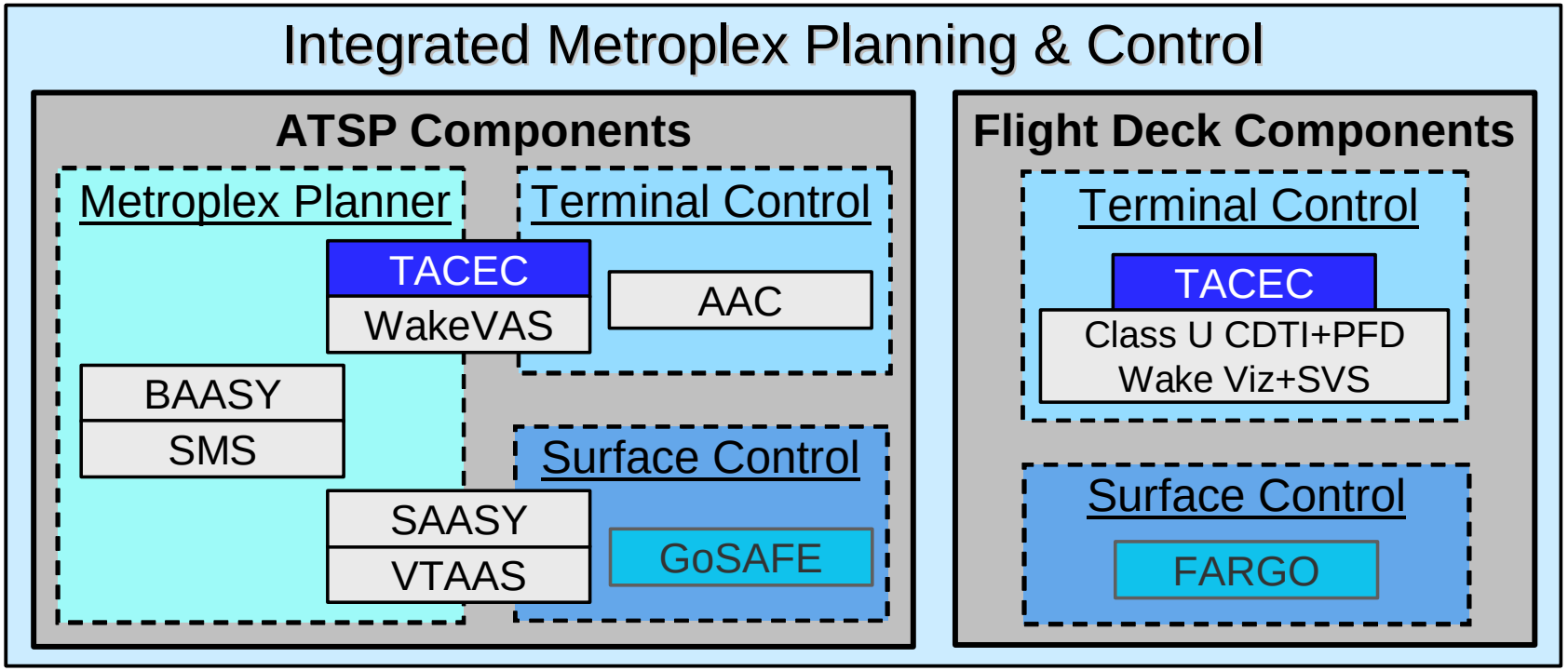

PTP Automation

- Basic Airport Automation System (BAASY) - Class U Airspace
- Smart Airport Automation System (SAASY) - Class I Airspace
- Virtual Tower Airport Automation System (VTAAS) - Class H Airspace

Integrated Metroplex P&C Functions

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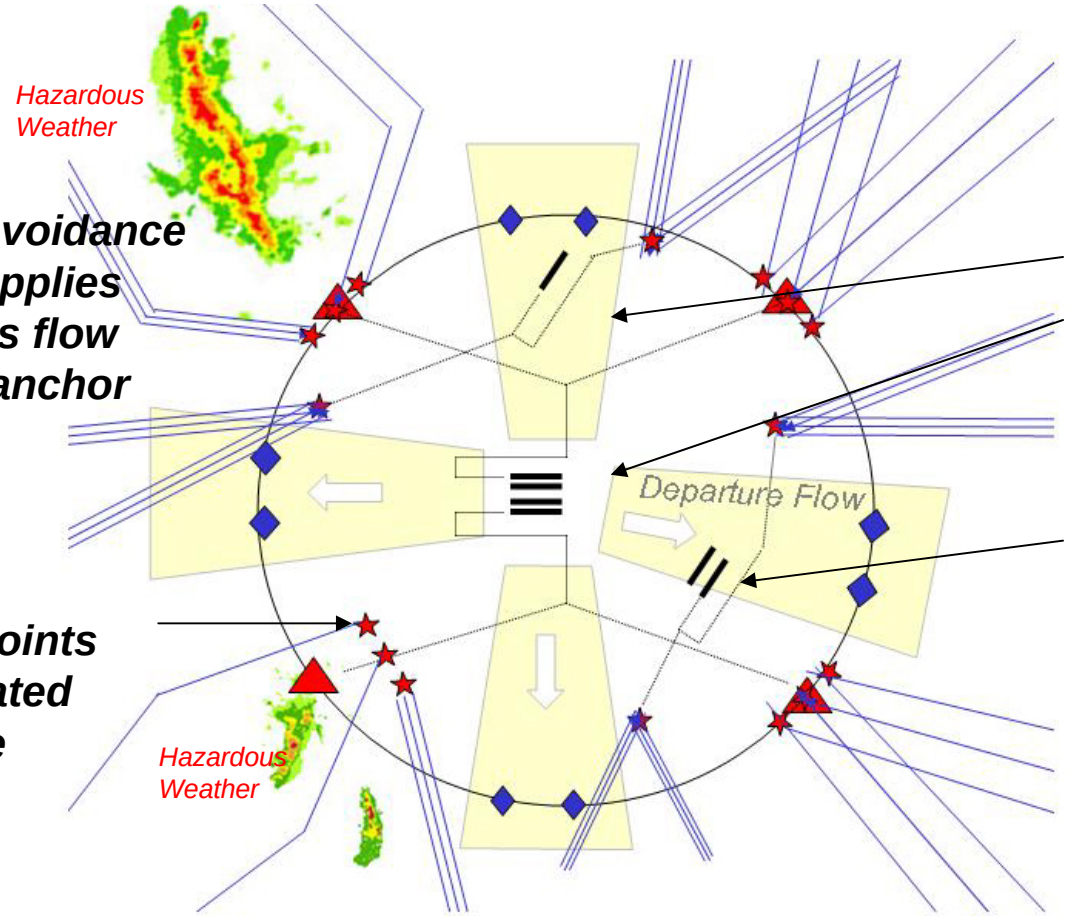

Weather Avoidance routing supplies continuous flow over all 3 anchor points

Anchor Points are relocated within the Terminal Airspace

Metroplex Planning and Control addresses the demand and capacity of large hub and spoke as well as small airports within the Metroxplex.

Equipage-based Service

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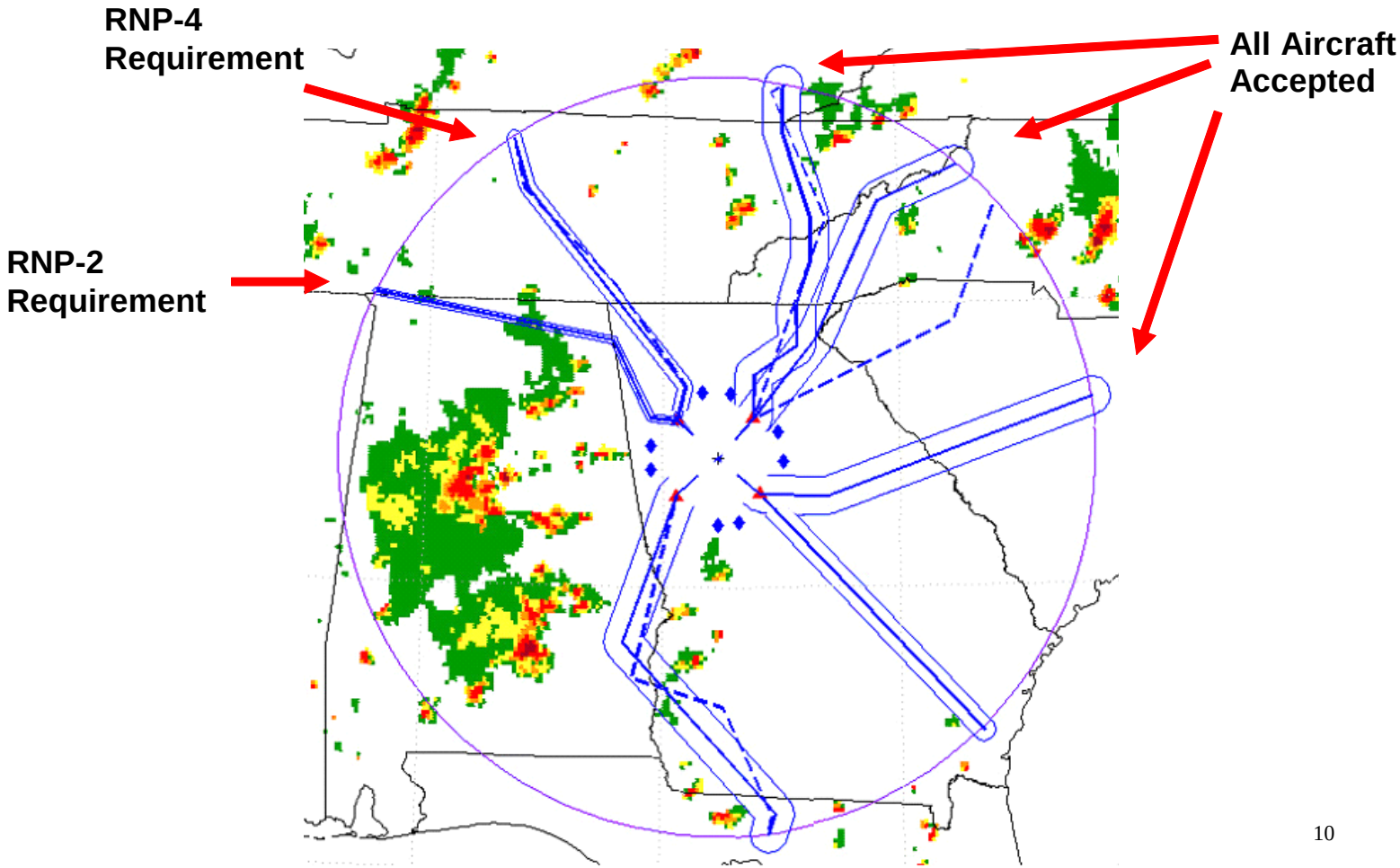
Aircraft are assigned arrival/departure rates based on their level of equipage



Very Closely Spaced Runway Operations

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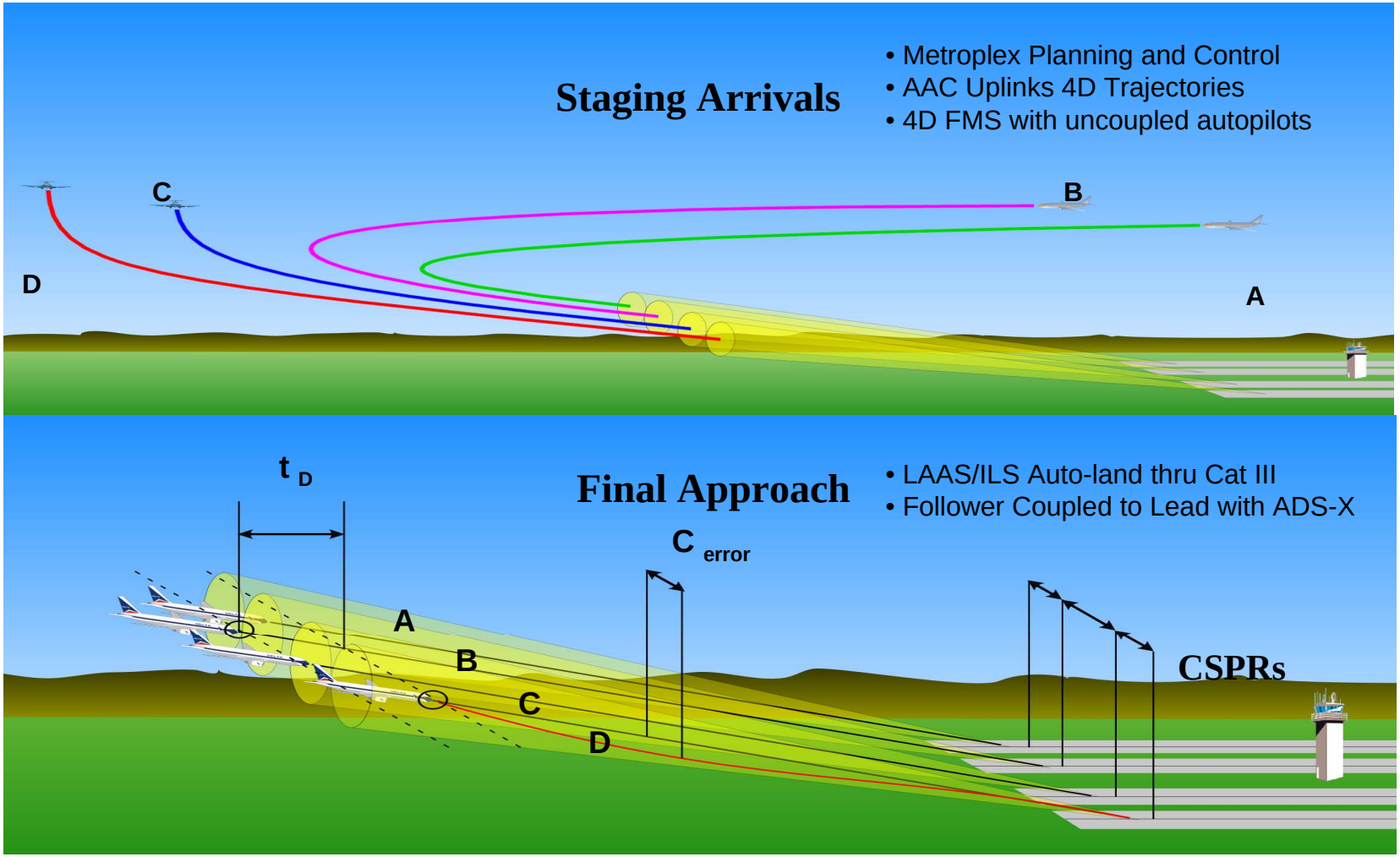

Enhanced CNS and Automation Enable SuperDensity and VMC in IMC

Wake-Free 4D Trajectories Deliver Paired Aircraft to VCSPR Final Approach

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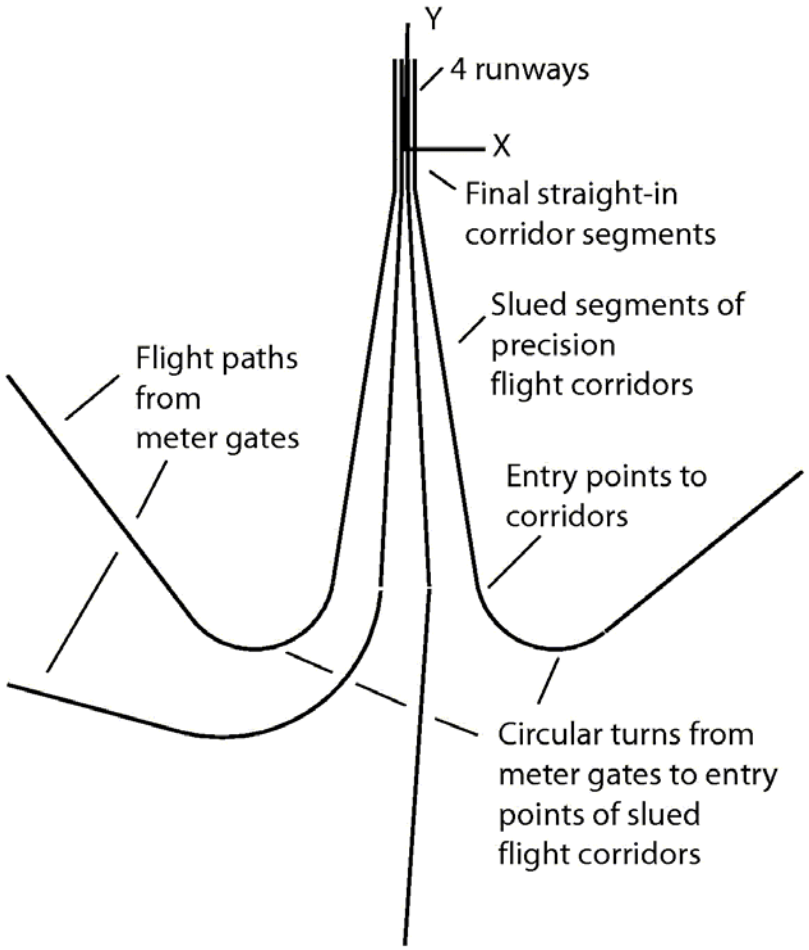
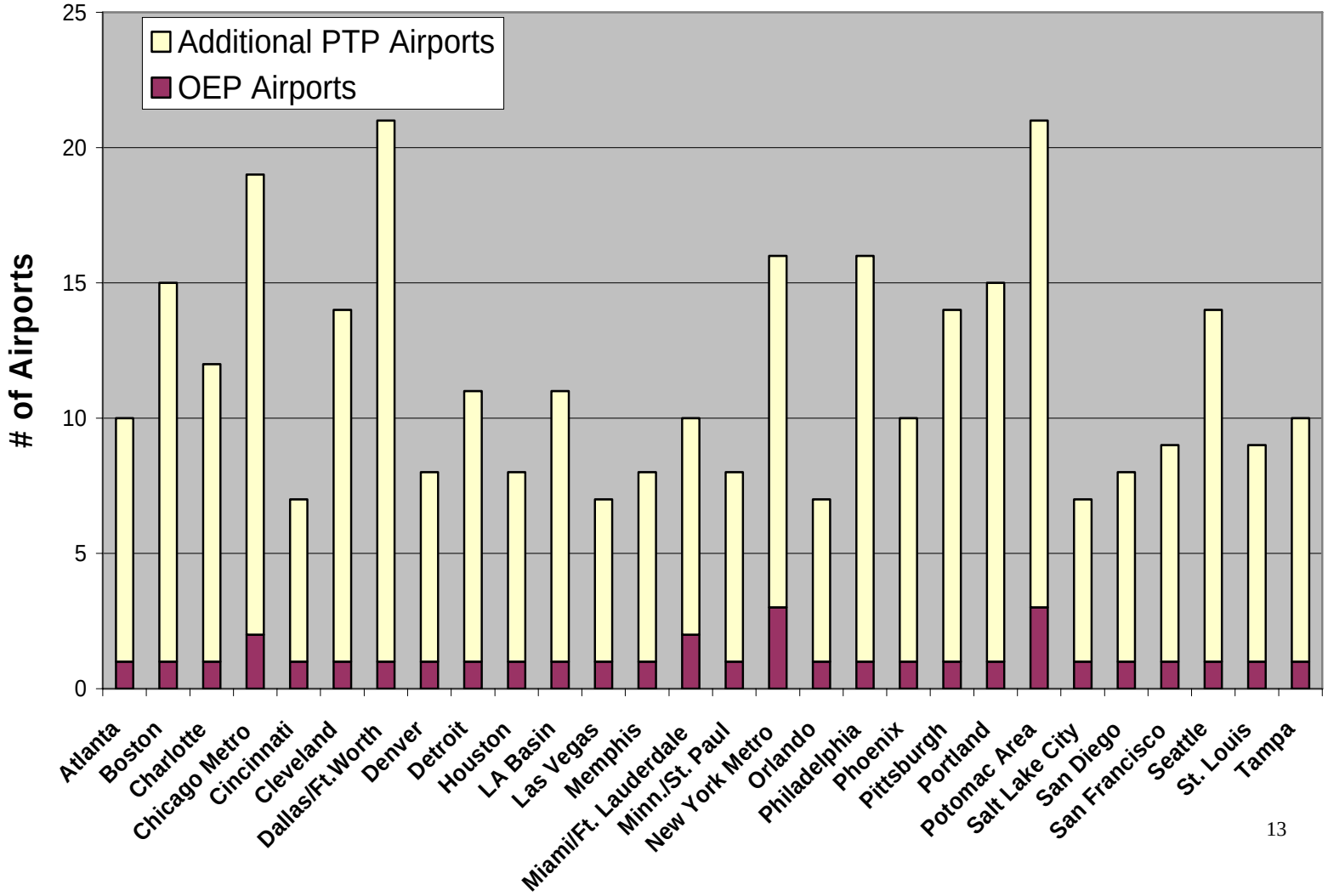


Many Public-Use Airports Available within 30 nm of OEP Airports



Automation-Enhanced Regional Airports

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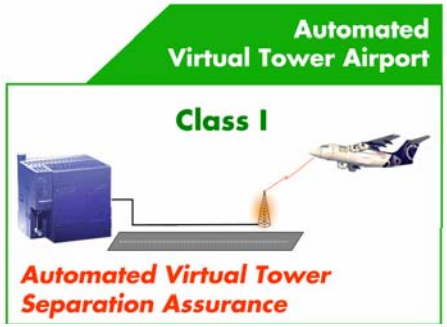
- **Separation assurance from remote virtual tower controller staff using:**
  - **Electronic surveillance and VHF radio or Datalink**
- **Access for all aircraft with Mode C transponder and VHF radio**



- **Automated separation assurance from ground-based automation system using:**
  - **Voice Synthesis and Datalink**
- **Access for all aircraft with Mode C transponder and VHF radio**

- **Aircraft self-separation and self-merging using:**
  - **ADS-B, CDTI, Synthetic Vision with Vortex Prediction**
- **Ground-based automated sequencing**
- **Access restricted to highly-equipped aircraft**

Reduced In-Trail Wake Vortex Spacing

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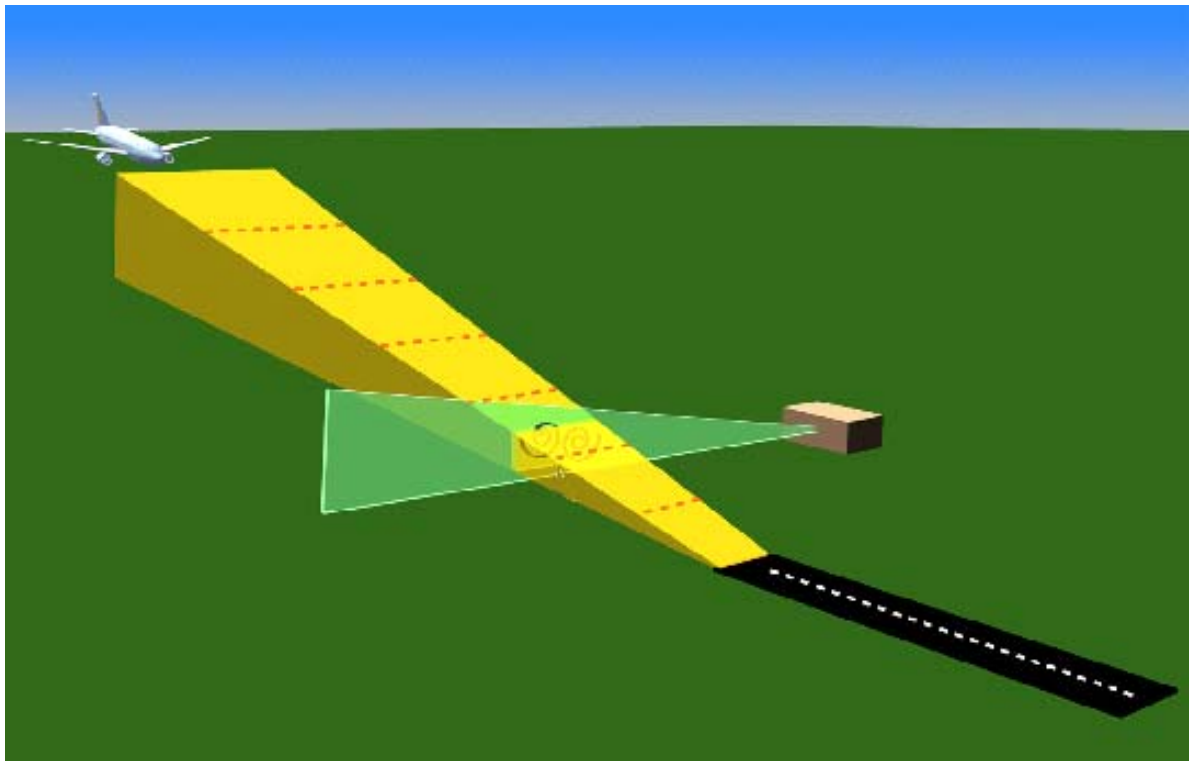
Ground-based wake vortex sensors, advanced data fusion/weather prediction, and improved aircraft position and intent data enable reduced longitudinal wake vortex spacing



VAMS Blended Terminal Domain

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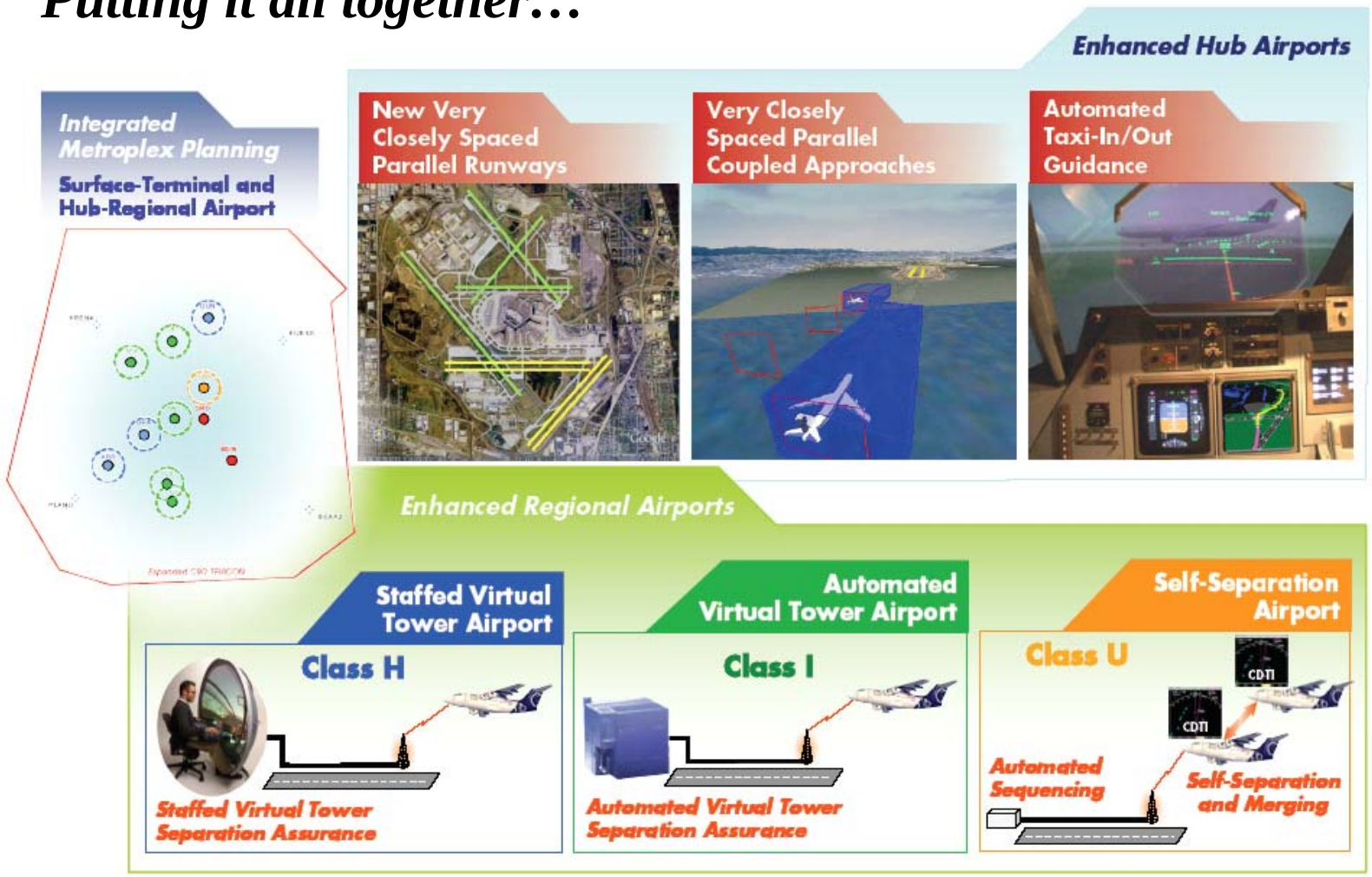
Putting it all together…



Questions?