Fostering Aviation Safety & Infrastructure Development Through Government & Industry Partnerships

Federal Aviation Administration

2007 Pacific Aviation Directors Workshop

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Air Traffic Organization

Date: March 2007

The FAA Air Traffic Organization

A 50,000 people-strong global aviation authority with an unmatched safety record, modern systems and skilled implementation, using new technologies to provide air navigation services to the world.

Global Collaboration

- **FAA provides assistance to more than 100 nation states around the world to help improve aviation safety & systems**
  - Technical assistance
  - Supply & support agreements
  - ATC & technical training
  - Facility & systems assessments
- **Success through program governance focused on collaborative FAA, industry & international relationships**

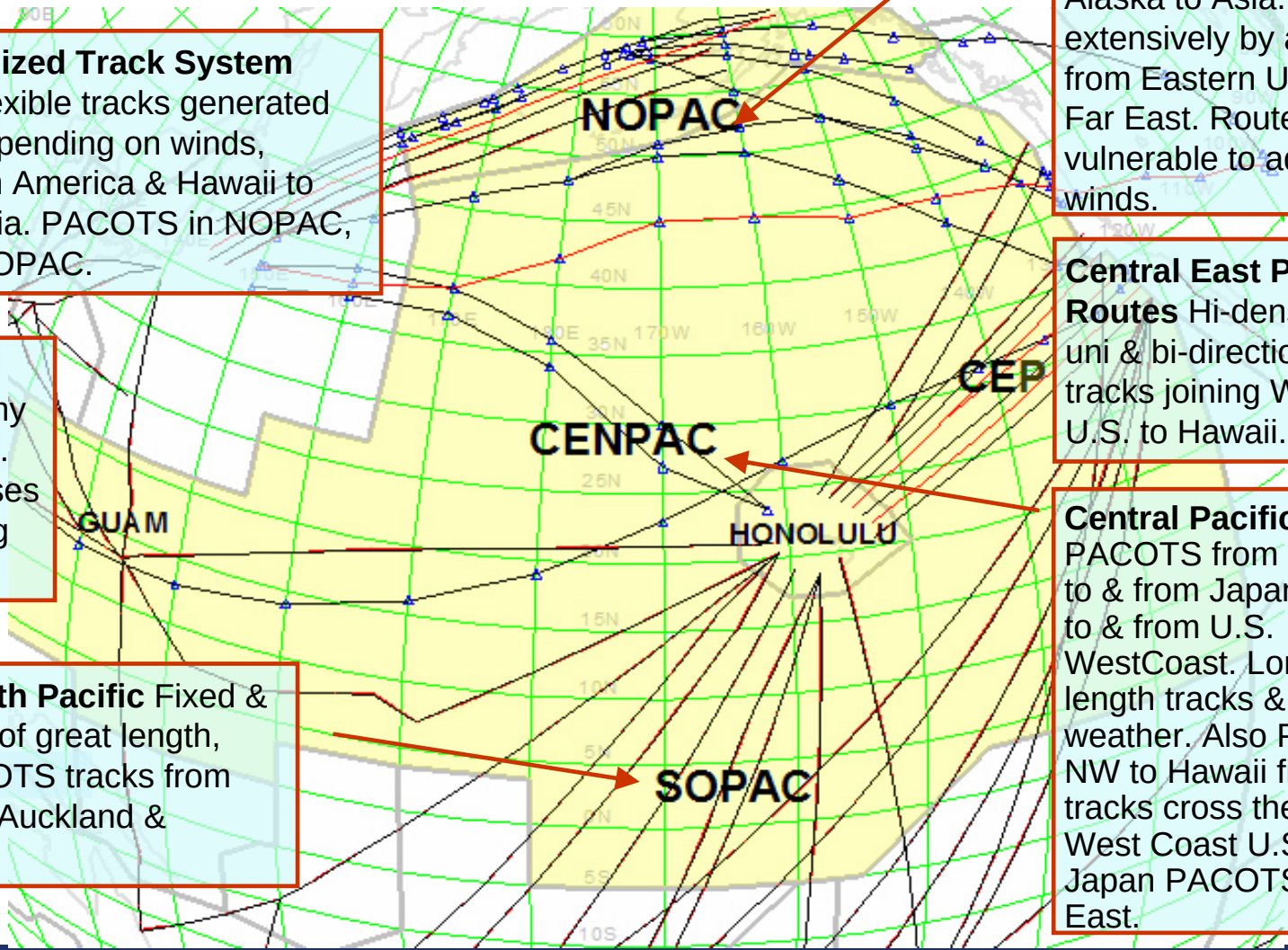
Pacific Operations

Controlled from Anchorage and Oakland Centers

Pacific Organized Track System (PACOTS) Flexible tracks generated twice daily, depending on winds, between North America & Hawaii to Asia & Australia. PACOTS in NOPAC, CENPAC & SOPAC.

Guam Fixed tracks with many crossing points. PACOTS crosses through, adding to complexity.

Hawaii to South Pacific Fixed & random tracks of great length, including PACOTS tracks from LAX & SFO to Auckland & Sydney.



Northern Pacific Routes Fixed tracks & transition routes joining Alaska to Asia. Used extensively by aircraft from Eastern U.S. to Far East. Routes long & vulnerable to adverse winds.

Central East Pacific Routes Hi-density fixed uni & bi-directional tracks joining Western U.S. to Hawaii.

Central Pacific Routes PACOTS from Hawaii to & from Japan; Japan to & from U.S. WestCoast. Long stage length tracks & complex weather. Also Pacific NW to Hawaii fixed tracks cross the U.S. West Coast U.S. to Japan PACOTS & Far East.

FAA Oceanic Activities

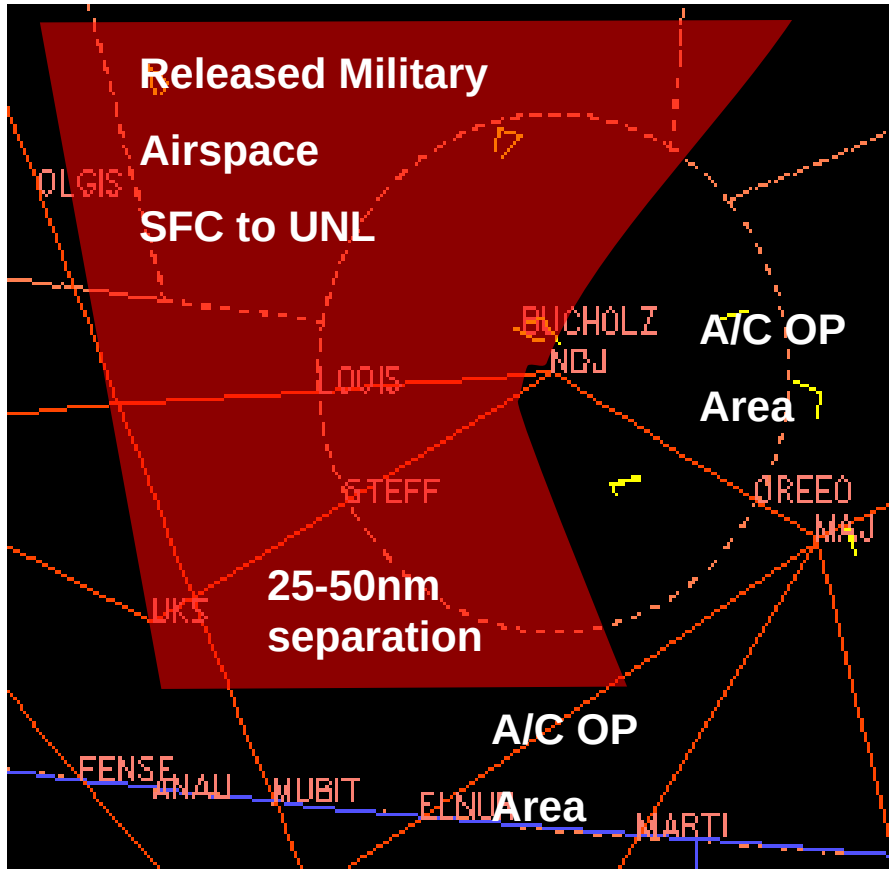
- **Kwajalein Radar**
- **ATOP/Ocean21**
- **Oceanic Separation**
- **Automatic Dependent Surveillance**
- **Next Generation Air Traffic Systems**

Kwajalein Radar

- **Located at Ronald Reagan Ballistic Missile Defense Test Site, Kwajalein Atoll, Republic of Marshall Islands**
  - Operated and maintained by U.S. Army Support Radar Team
- **ASR-11 with MSSR**
  - 180 NM+ range (up to 256 NM) on Monopulse Secondary Surveillance Radar (MSSR)
  - 60 NM range on primary
  - Interfaces with a DoD procured STARS as ATC automation system
    - STARS equipment delivered 2/06; Initial Operating Capability planned 4/07

Kwajalein Radar—Background

- FAA closed operations 1/8/06
- U.S. Army reopened Tower 9/25/06
- Traffic is severely impacted during military operations
- Oceanic separation standards do not allow for arrivals/departures into airports during military operations
- Aircraft would not be impacted by having to operate in marginal VFR conditions
- During normal operations, following Aircraft must wait 15 minutes to depart or until the lead Aircraft is laterally separated
- Radar services would benefit both civil and military missions



Kwajalein Radar Activities

- **Radar Facility at Kwajalein would**
  - Improve Airspace Efficiency, Services, Safety
- **U.S. Military has stated they do not have a mission need to provide radar services**
- **FAA considering solutions to providing radar ATC services**

ATOP/Ocean21

- A single, satellite based, integrated oceanic system at three oceanic Air Traffic Control Centers (New York, Oakland, Anchorage) which combines common procedures, training, maintenance & support.
  - Fully integrates flight & radar data processing
  - Automatic SIGMET/PIREP dissemination
  - Enhanced Conflict Probe detects aircraft to aircraft & aircraft to airspace conflicts

- Provides CPDLC, AIDC & ADS-B/C surveillance capabilities
- Electronic Flight Strips automatically updated
- Automates numerous manual processes

ATOP Site Status

Oakland Center

- Began daily operational use June 2004
- Achieved full 24/7 transition October 2005
- Procedural Non-Radar

New York Center

- Began initial live operations March 2005
- Achieved full 24/7 transition June 2005
- Procedural Non-Radar

Anchorage Center

- Began initial live operations April 2006
- Achieved full 24/7 transition March 2007
- Procedural & Radar

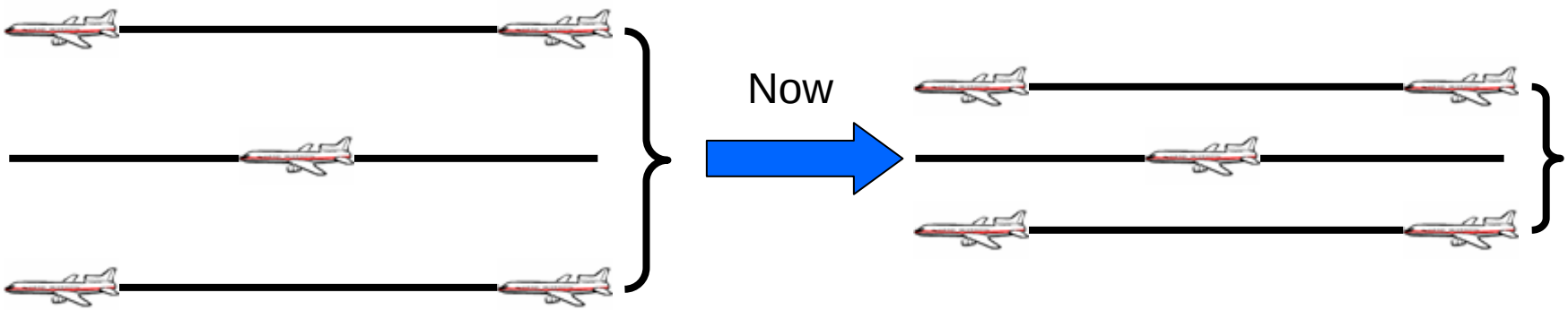
ATOP Benefits

Most advanced procedural ATC system in the world

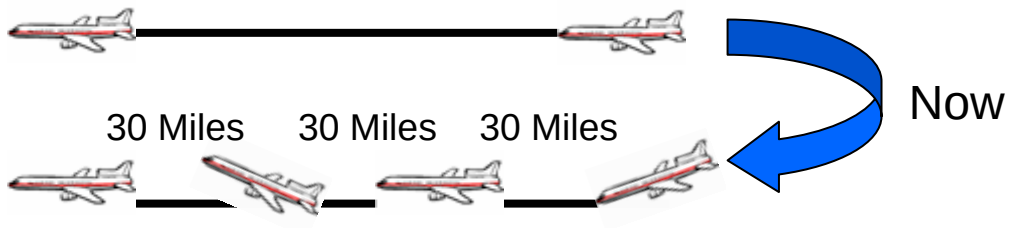
- First system to use dual channel architecture
  - Provides critical 24/7 functionality even during maintenance activities
- Communications no longer solely reliant on HF voice
  - Electronic Flight Progress Strips & Position Reporting on ATOP
- 90% more altitude change request granted at ZOA & ZNY
  - Sep. 2005 vs. Sep. 2006
- Reduced lateral/longitudinal separation standards
  - Pacific: 50 or 30 latitude & 50 or 30 longitude
  - Atlantic: Working to reduce 90 & 60 lateral to 50 lateral
- Supports User Preferred Routes (UPR)
  - Routinely results in savings of 2,000 to 4,000 pounds of fuel per flight
- Supports Dynamic Airborne Route Planning (DARP)
  - Currently used in SE Pacific

Working to Realize ATOP Benefits through Reduced Separation Standards

Lateral Separation



Longitudinal Separation

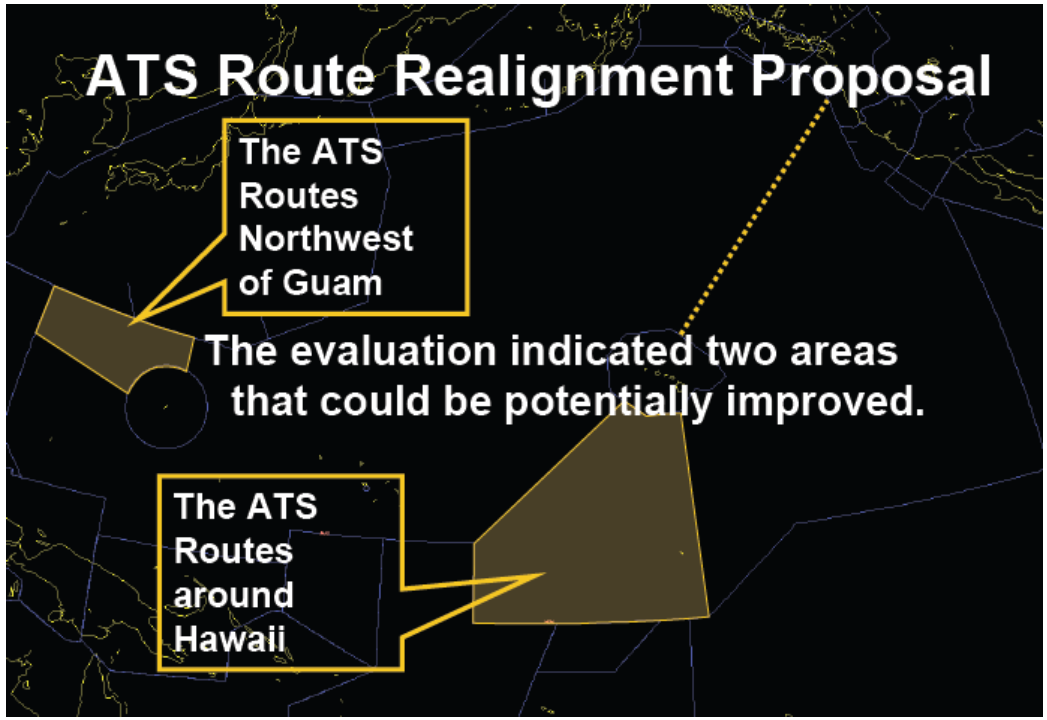


Oceanic Operations Standards

- **More efficient oceanic ATC services (reduced separation, better coordination, better airspace use) through implementation of new procedures**
  - Expanding User Preferred Routes (UPRs)
  - Expanding Dynamic Airborne Route Planning (DARP)
  - Redesigning airspace
    - Hawaii non-radar airspace to Oakland Ocean21 coverage
    - Guam routes streamlined for shorter distances
  - Applying Safety Management System risk analysis to Oceanic Quality Assurance processes

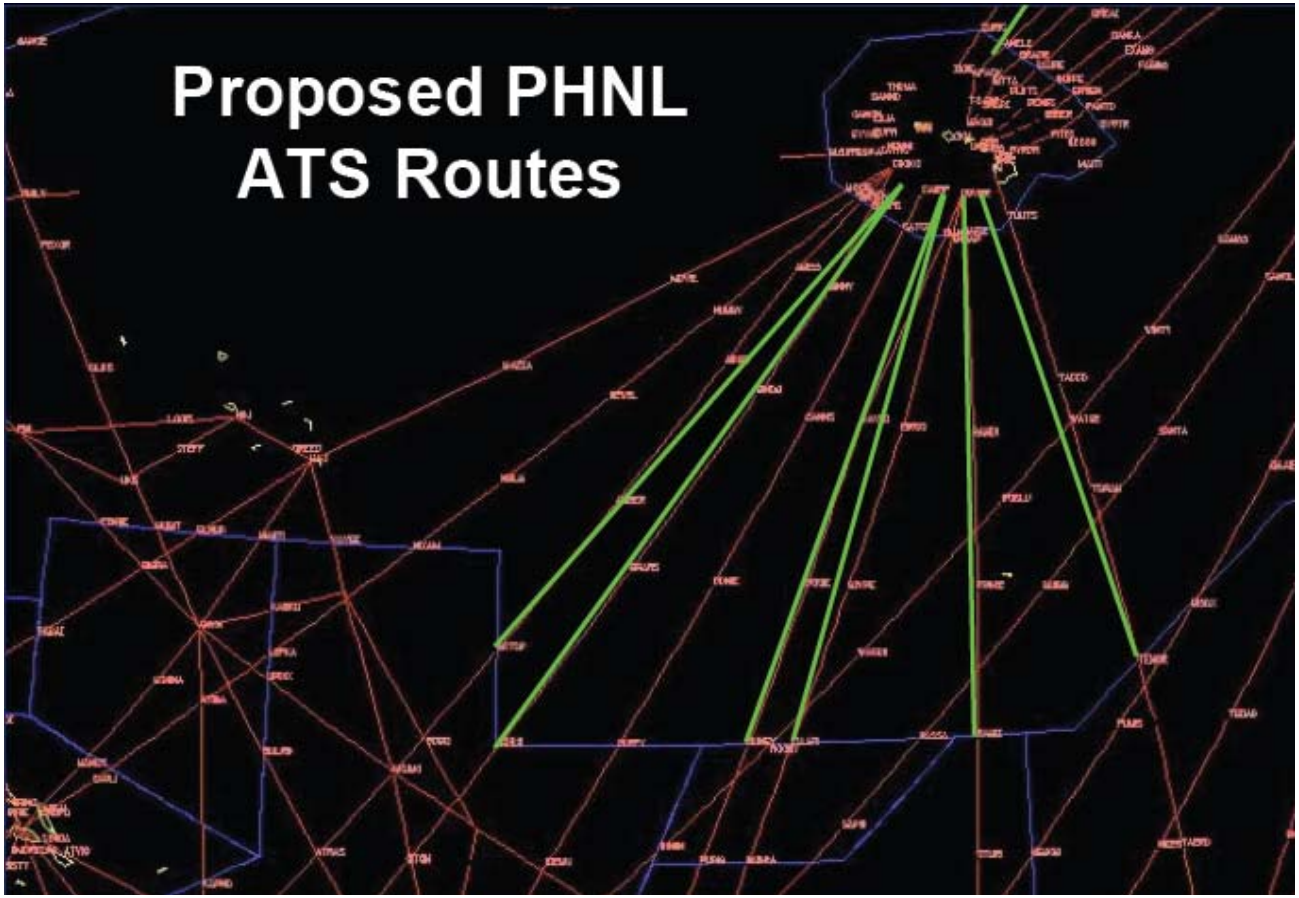
Oceanic Operations Standards

- **Current Oakland FIR ATS Route structures based on 100nm separation standard**
- **ATC operating environment has changed**
  - **RNP-10 operations (50 lateral)**
  - **Ocean21 automation system**
- **Review indicated 2 areas that could be improved**



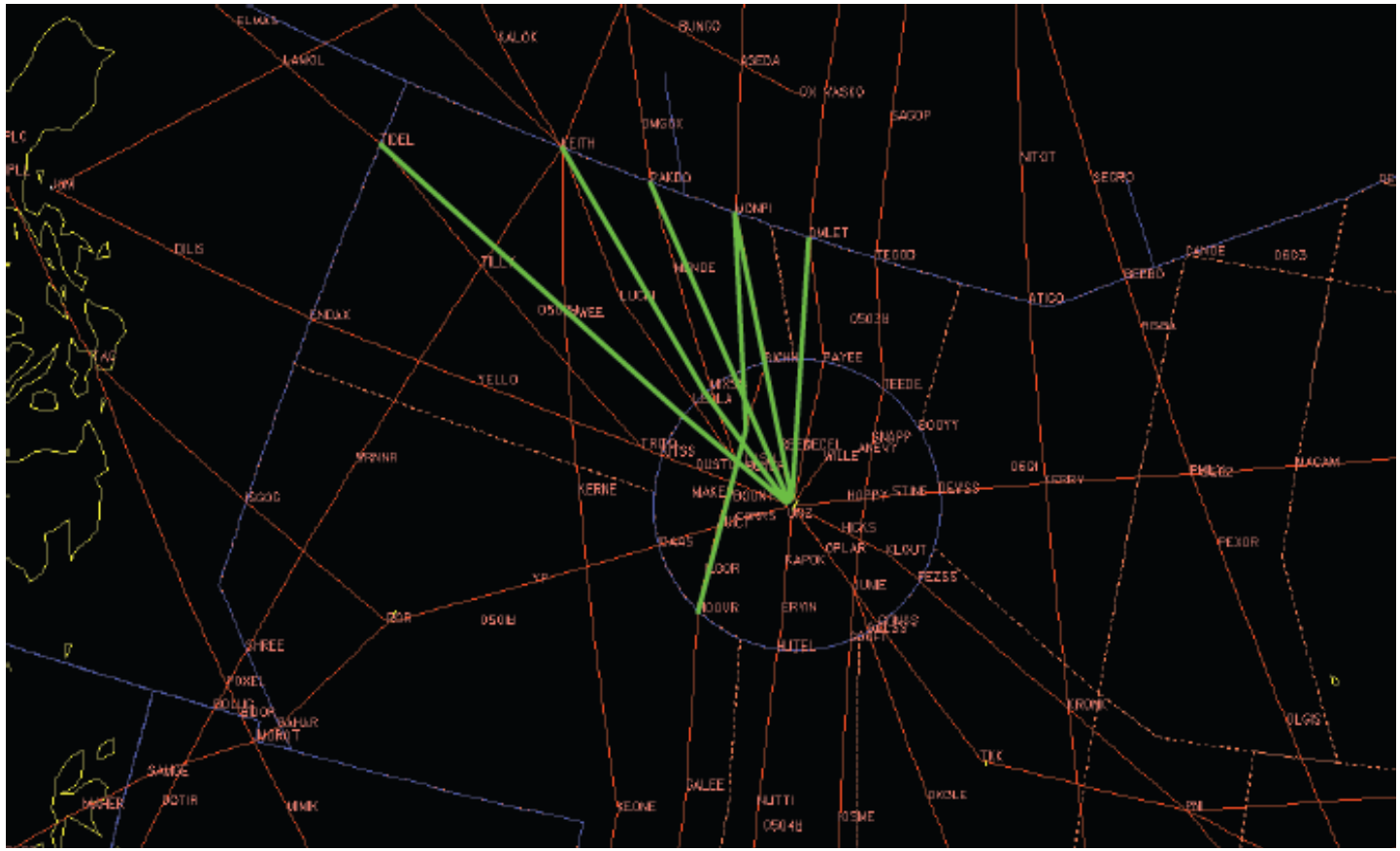
Proposed Honolulu ATS Routes

- **Proposed realignments save 3 to 28 NM per route**



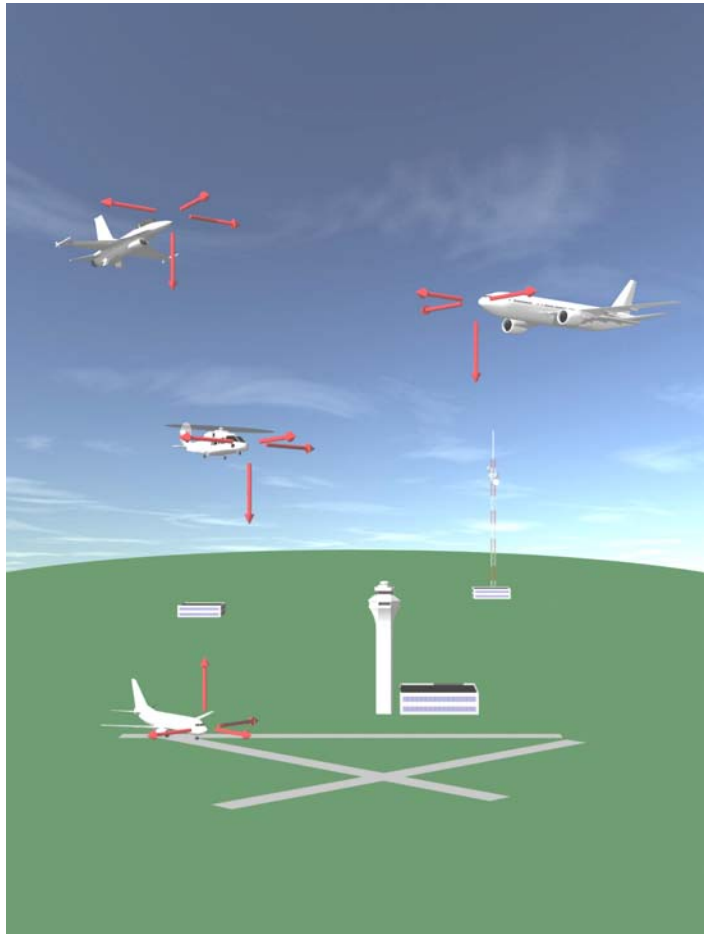
Proposed Guam ATS Routes

- **Proposed realignments save 9 to 20 NM per route**



Automatic Dependent Surveillance-Broadcast (ADS-B)

- **Automatic**
  - Periodically transmits information with no pilot or operator input required
- **Dependent**
  - Position & velocity vector derived from GPS or Flight Management System (FMS)
- **Surveillance**
  - A method of determining position of aircraft, vehicles or other asset
- **Broadcast**
  - Transmitted information available to the appropriate receiving equipment



Traffic Information Service - Broadcast
Flight Information Service - Broadcast

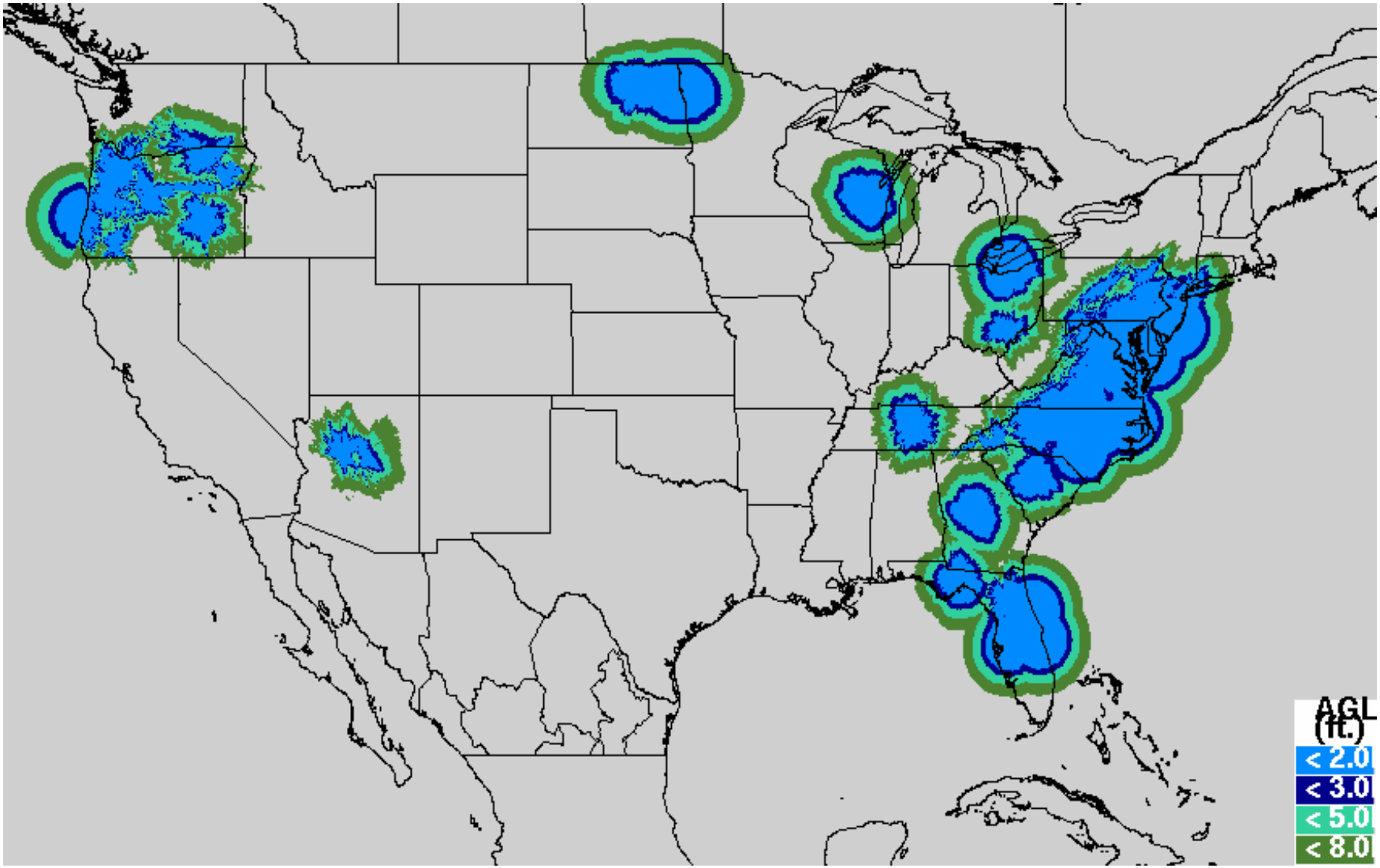
TIS-B Service provides ADS-B-equipped aircraft with position reports from secondary surveillance radar on non-ADS-B equipped aircraft

FIS-B transmits graphical National Weather Service products, temporary flight restrictions & special use airspace

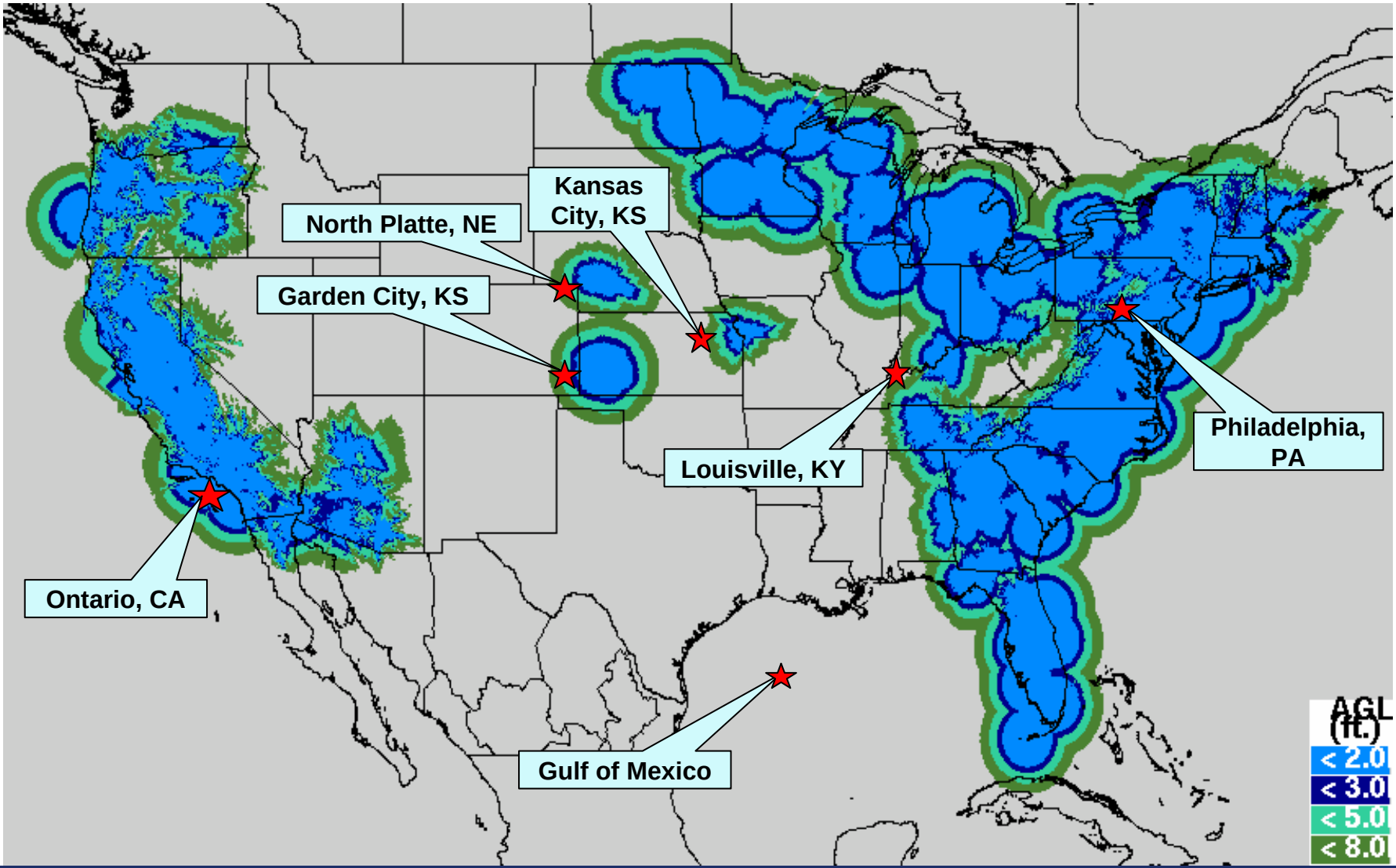
ADS-B Deployment

Country	Coverage	Timeline	Link Decision
United States	• Segment One (2010) deploys ADS-B at various pockets in the U.S., including Gulf of Mexico (previously no ATC coverage) This allows vigorous testing • Segment Two (2013) NAS-wide implementation	• Notice of Proposed Rulemaking (2007) • Final Rule: 2010 • Segment One (2010) • Segment Two (2014) NAS-wide deployment • 100% Equipage (2020)	• Dual Link Decision: 1090 Mode S Extended Squitter for commercial aircraft and 978 MHz Universal Access Transceiver (UAT) for general aviation aircraft
Australia	• **Airservices** will deploy ADS-B where no ATC coverage exists. ADS-B will allow for some level of service to be provided at reasonable cost in locations where justified	• Under the upper airspace program, 28 ADS-B ground stations will be installed and operating by mid-2007	• Single Link: 1090 Mode S Extended Squitter
Canada	• **NavCanada** deploying ADS-B in the North and moving southward (Hudson Bay area). This will address high level non-radar airspace first where benefits are maximized for customers	• Hudson Bay ADS-B Out (2008) • Expand ADS-B throughout the North (2011)	• Dual Link Decision: 1090 Mode S Extended Squitter for commercial aircraft and 978 MHz Universal Access Transceiver (UAT) for general aviation aircraft
EUROCONTROL	• **EUROCONTROL** ADS-B in two phases called Streams. Currently twelve countries involved, incl. Sweden, Spain, France, Italy Ireland	• Stream 1 initial implementation (2008) • Implementing Rule (2009) • Stream 2 implementation (2011) • 100% Equipage (2015-2020)	• Single Link: 1090 Mode S Extended Squitter

Current Coverage



Expansion Segment One Coverage



Initial ADS-B Services and Applications

Services / Applications
Surveillance Broadcast Services (En Route, Terminal, Surface)
Traffic / Flight Information Broadcast Services
Enhanced Visual Acquisition
Enhanced Visual Approaches (1)
Final Approach and Runway Occupancy Awareness
Airport Surface Situational Awareness
Conflict Detection

(1) Merging and Spacing and Cockpit Display of Traffic Information (CDTI) Assisted Visual Separation (CAVS) are a part of the Enhanced Visual Approaches Application

Schedule Segment One (2006-2010)

Milestone	Projected Completion
Screening Information Request (SIR) Issued	November 2006
Segment 2 JRC	February 2007
Request for Offer Released	March 2007
Contract Award	July 2007
Notice of Proposed Rulemaking Issued	September 2007
Key Site Initial Operating Capability (IOC) of Broadcast Services	July 2008
In-Service Decision (ISD) of Broadcast Services	November 2008
Gulf of Mexico Comm. and Weather IOC	September 2009
Louisville IOC of Surveillance and Broadcast Services	October 2009
Final Rule Published	November 2009
Gulf of Mexico IOC of Surveillance and Broadcast Services	December 2009
Philadelphia IOC of Surveillance and Broadcast Services	February 2010
Juneau IOC of Surveillance and Broadcast Services	April 2010
Surveillance and Broadcast Services ISD for ADS-B	September 2010

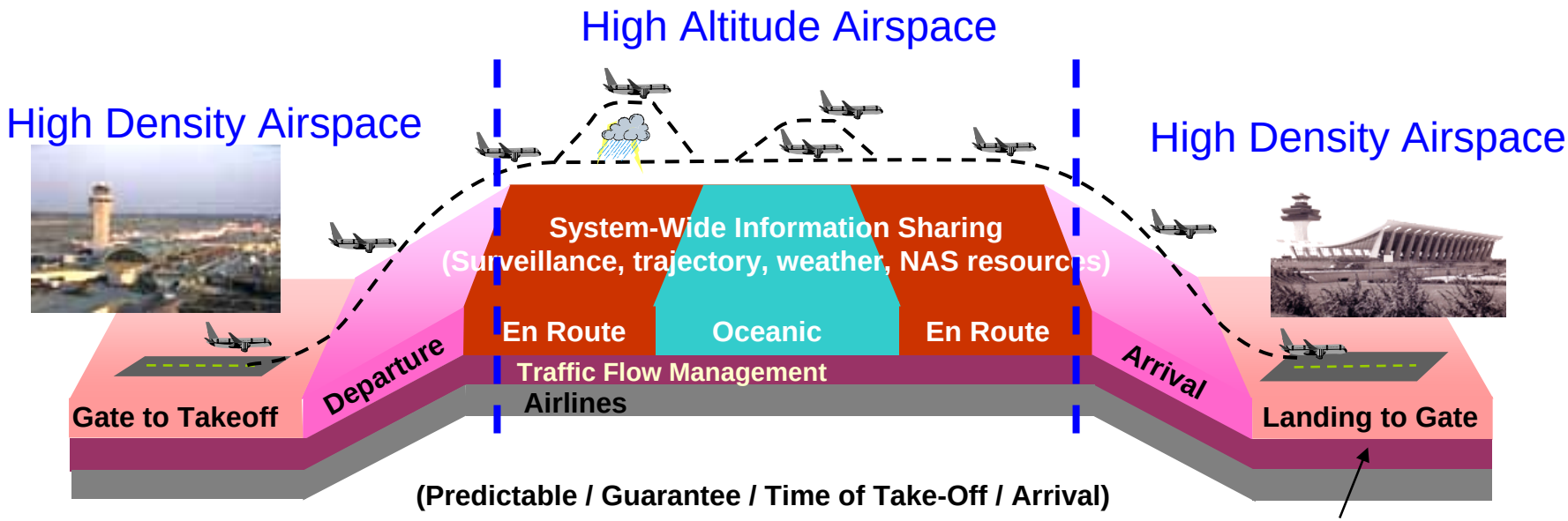
Schedule - Segment Two (2009-2014)

Milestone	Projected Dates
Implementation	
Continue Initial Aircraft to Aircraft Application Deployment	FY 2010 – FY 2014
Additional Aircraft to Aircraft Application Deployment	FY 2010 – FY 2014
Additional Aircraft to Aircraft Requirements Definition	FY 2010 – FY 2014
Continue / Complete TIS-B / FIS-B Deployment	FY 2009 – FY 2012
Continue / Complete ADS-B NAS Wide Infrastructure Deployment	FY 2010 – FY 2013
Complete 26% Avionics	FY 2014
Lifecycle	
Targeted Removal of Legacy Surveillance	FY 2016 – FY 2020
Complete 100% Avionics	FY 2020
Complete Removal of Targeted Legacy Surveillance	FY 2023
Complete Targeted Removal of TIS-B	FY 2025

ADS-B Next Steps

- **Operational Implementation**
  - Performance Based System
    - Avionics
    - Ground infrastructure
    - Pilot / Controller
  - Policy
    - Airport Improvement Program
    - Preferred routes
  - Separation Standards Development
    - Demonstrate current separations standards and better

NextGen Route of Flight



RNAV/RNP In High Density

Oceanic 4D Trajectories

Enroute 4D Trajectories

NNEW

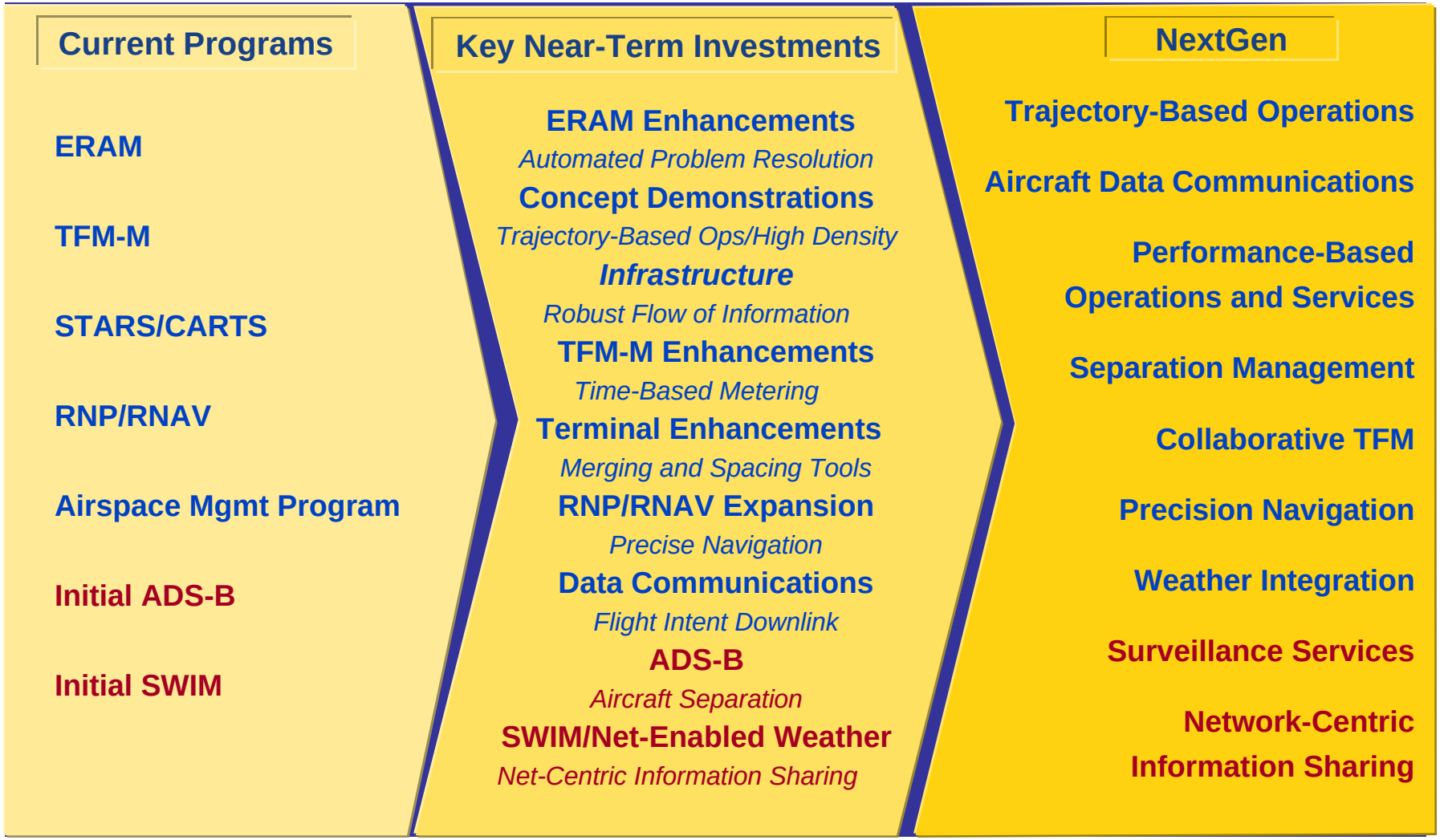
NEO

Other Agency

Industry Sponsored

Integrates Foundational NextGen Technologies (SWIM, ADS-B, RNP) with New Procedures and Operations Across the Route of Flight

FAA Next Steps: Transition to NextGen



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202-385-8501

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