

# Surveillance and Broadcast Services

ENRI International  
Workshop on ATM / CNS

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Federal Aviation  
Administration



# Agenda

- **Overview**
- **Dual Track Strategy**
- **Program Status**
- **Rulemaking Status**
  - Schedule
- **International Harmonization**
- **Applications**
- **Acquisitions and Agreements**
- **Next Steps**



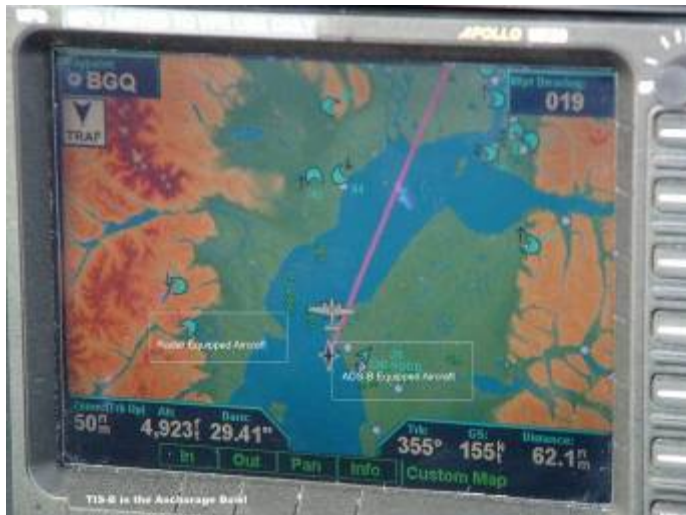
# Overview: Automatic Dependent Surveillance - Broadcast (ADS-B)

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



# Overview: Traffic Information Service - Broadcast / Flight Information Service - Broadcast

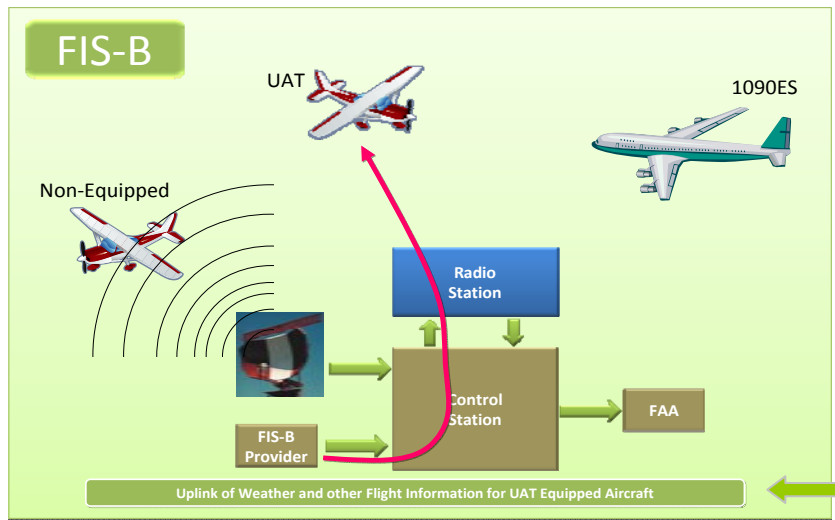
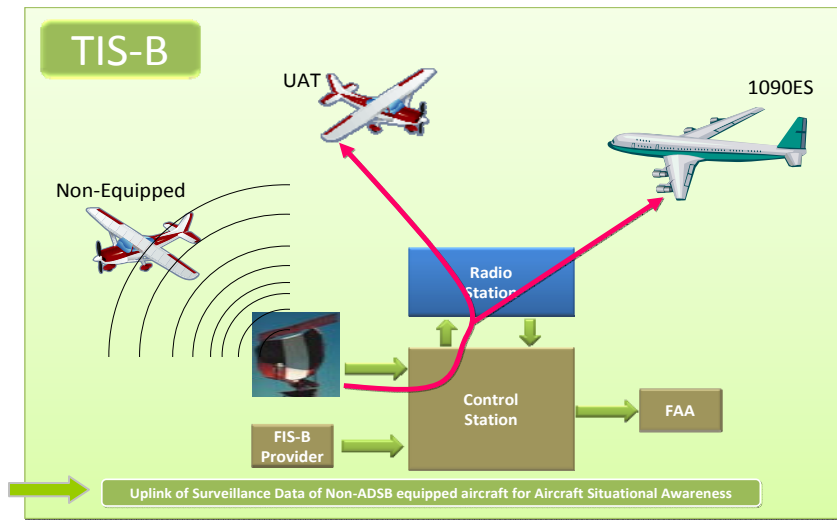
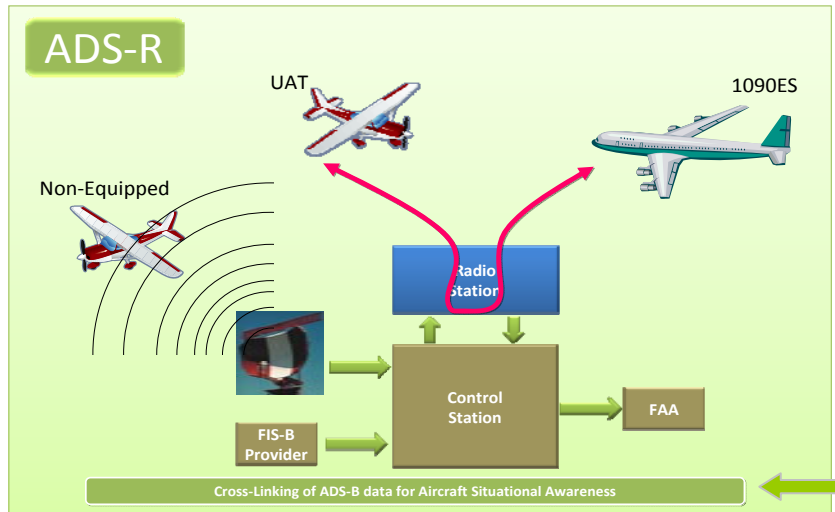
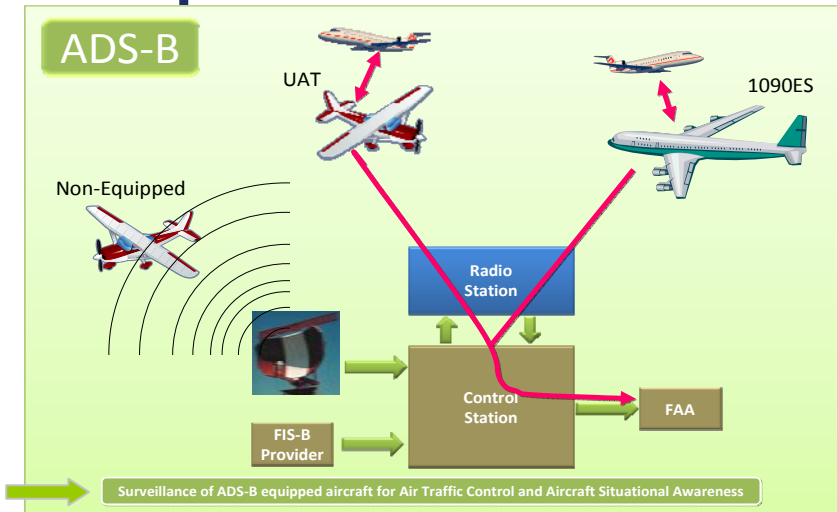
**TIS-B is a service which provides ADS-B equipped aircraft with position reports from secondary surveillance radar on non-ADS-B equipped aircraft.**



**FIS-B transmits graphical National Weather Service products, temporary flight restrictions (TFRs), and special use airspace.**

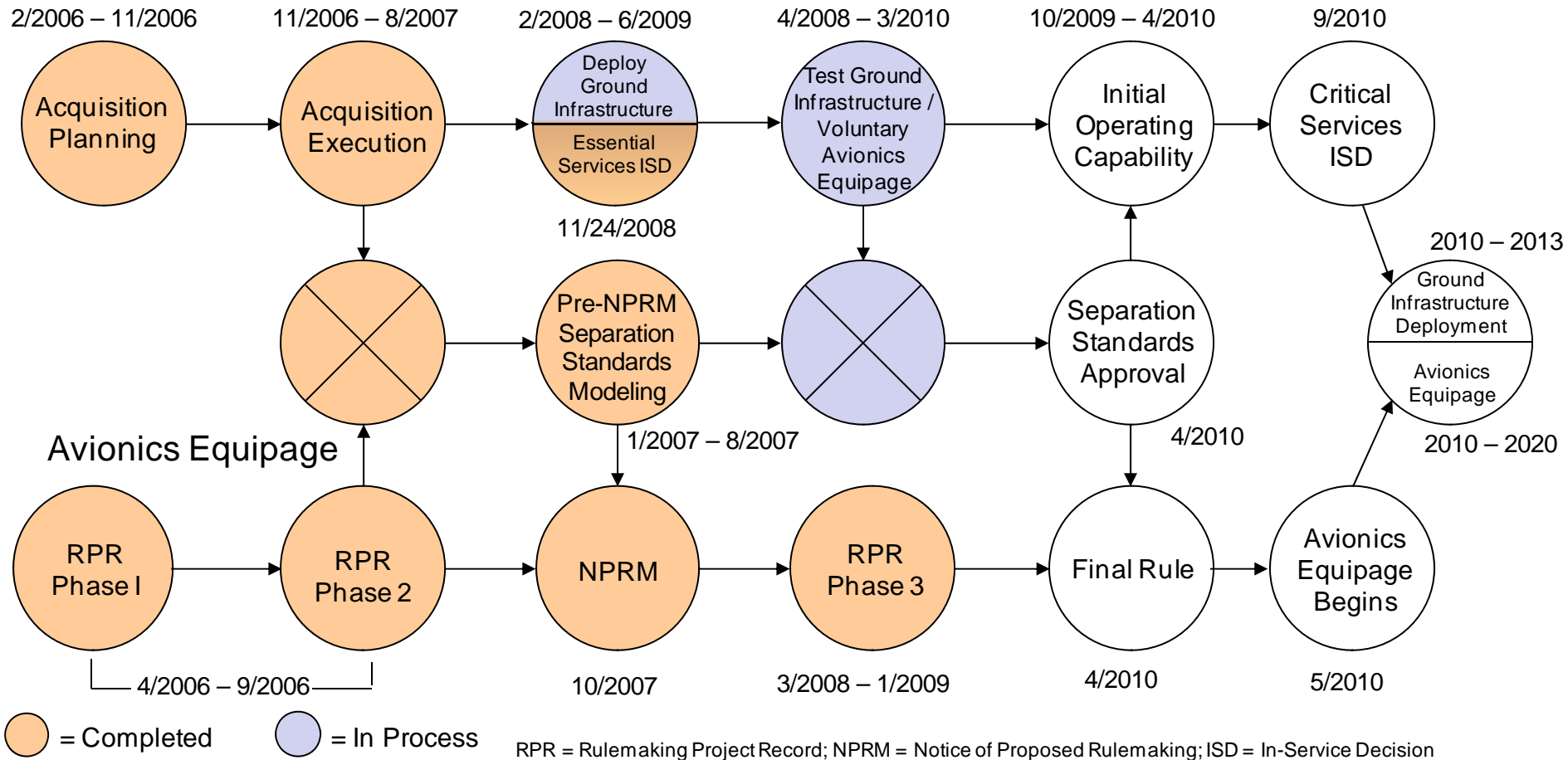


# Overview: Surveillance and Broadcast Service Descriptions



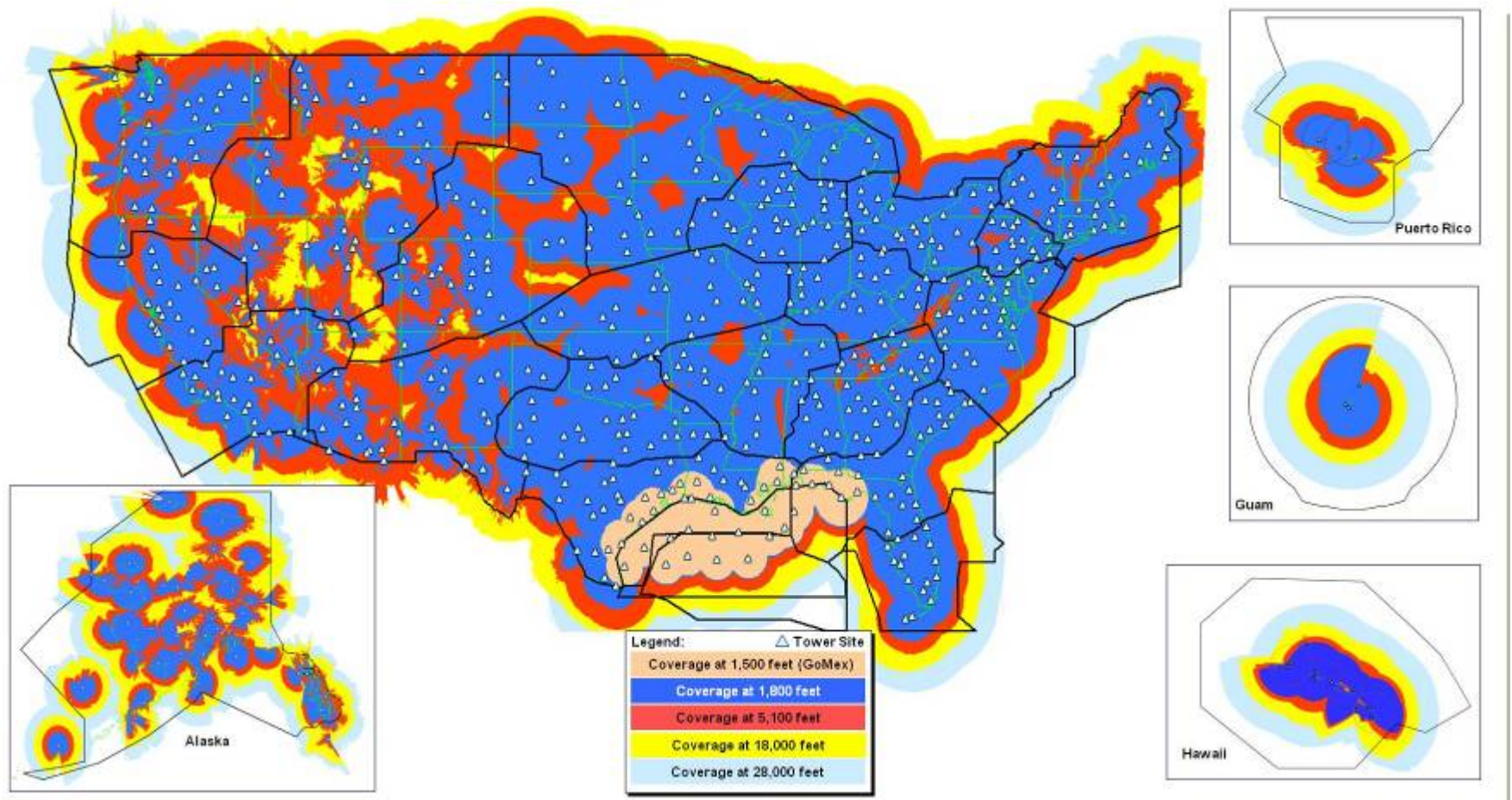
# Dual Track Strategy

## Ground Infrastructure





# Ground Infrastructure: 794 Ground Station Solution Provides National Coverage



# Rulemaking Next Steps: Schedule to Final Rule

Milestone	Planned Date of Completion	Status / Comments
FAA Rulemaking Team finalizes RPR Phase 3	January 14, 2009	Complete
RPR Phase 3 Submitted to ARM	January 21, 2009	Complete
Rulemaking Council Approval of RPR	January 27, 2009	Complete
Rulemaking Team Drafts Final Rule	May 2009	
Final Rule Economic Assessment	August 2009	
Final Rule Concurrence through Directors	October 2009	
Final Rule Concurrence through Associates	November 2009	
Final Rule Concurrence through Administrator	December 2009	
Final Rule Approved through OST	January 2010	
Final Rule Approved through OMB	April 2010	
Final Rule Published in Federal Register	April 2010	

•RPR = Rulemaking Project Record





# International Harmonization



- **International Civil Aviation Organization (ICAO)**
  - Aeronautical Surveillance Panel (ASP)
  - Separation and Airspace Safety Panel (SASP)
  - Caribbean and South American Regional Planning and Implementation Group (GREPECAS)
  - Asia Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG)
- **Eurocontrol**
  - CASCADE: ADS-B is main focus of CASCADE, standardization, trials and implementation activities are being funded, and it is the largest EUROCONTROL partner in terms of budget and staff
  - Action Plan 23: exchange information and ideas for future airborne applications
  - Airborne Separation Assistance System Thematic Network 2 (ASAS –TN 2): European Commission funded forum
- **Requirements Focus Group (RFG)**
  - Joint RTCA / EUROCAE Working Group
- **Recurring Coordination Meetings**
  - Transport Canada
    - NAV CANADA
  - Civil Aviation Safety Authority
    - Airservices Australia
  - Eurocontrol

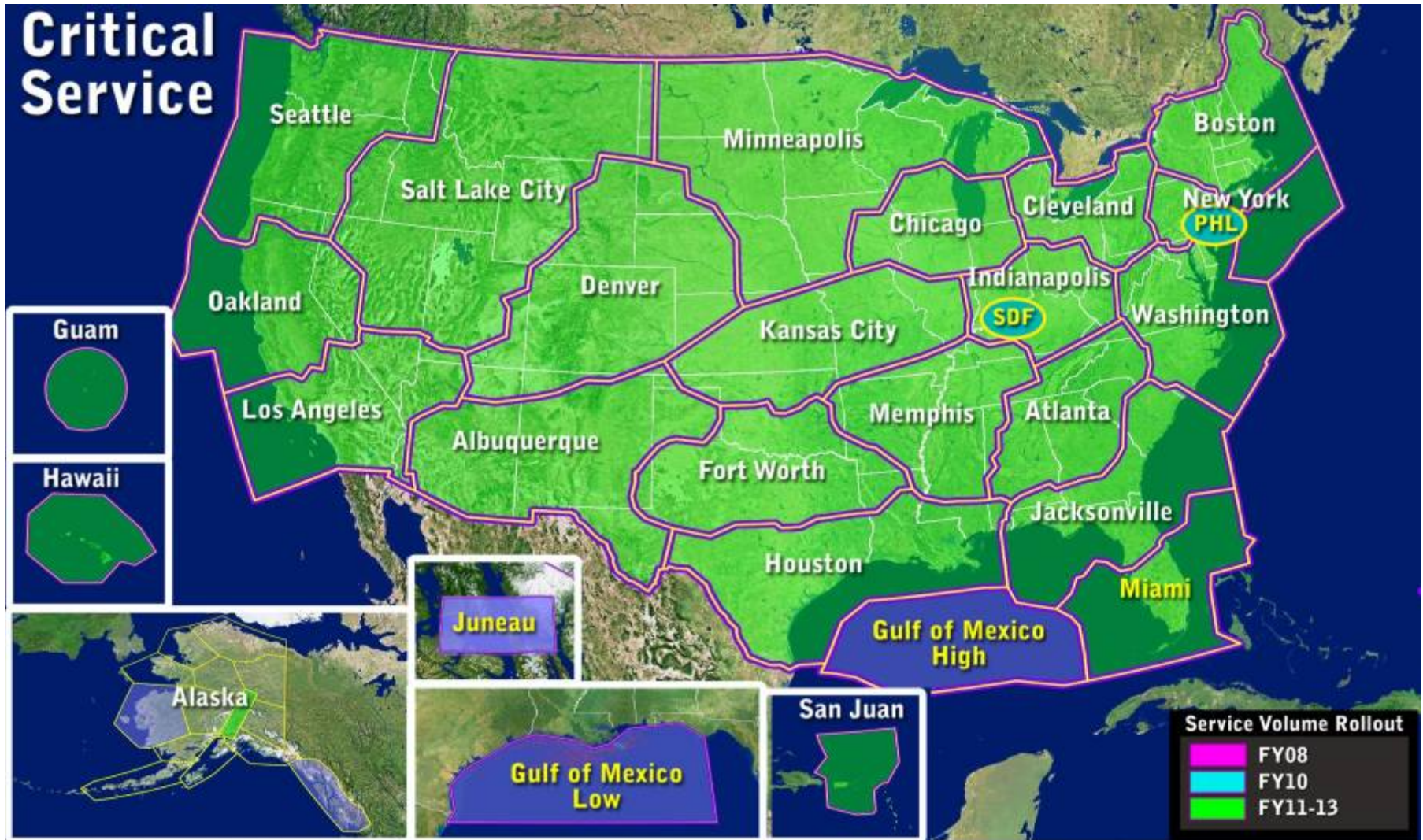


# Initial ADS-B Services and Applications

<b>Services:</b>
<b>Surveillance Broadcast Services (En Route, Terminal, Surface)</b>
<b>Traffic / Flight Information Broadcast Services</b>
<b>Applications:</b>
<b>Enhanced Visual Acquisition</b>
<b>Enhanced Visual Approaches</b>
<b>Final Approach and Runway Occupancy Awareness</b>
<b>Airport Surface Situational Awareness</b>
<b>Conflict Detection</b>
<b>Merging and Spacing</b>
<b>Cockpit Display of Traffic Information (CDTI) Assisted Visual Separation (CAVS)</b>

# Critical Services – Key Sites

## Gulf of Mexico, Philadelphia, Louisville, Juneau



# ADS-B Out: ATC Separation Services - Current Conditions (High)



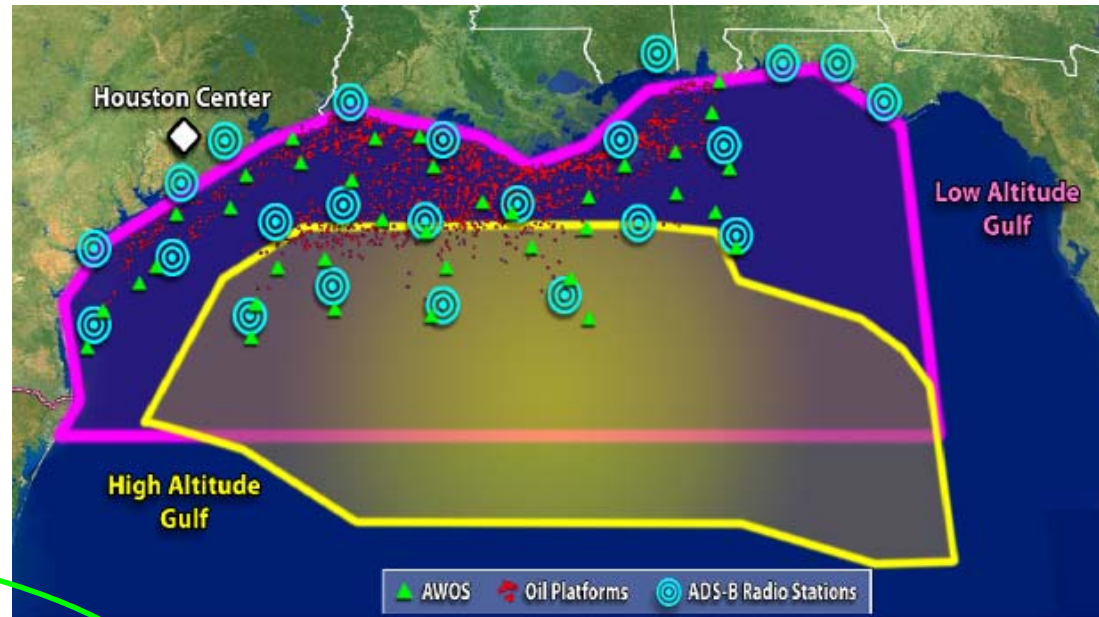


# ADS-B Out: ATC Separation Services - ADS-B Enabled (High)





# Gulf of Mexico Summary



## Infrastructure

- Approximately 22 ADS-B ground stations located on oil platforms and along the shore
- Approximately 35 Weather sensor stations
- 12 existing communication stations
- 7 new communication stations

## Services

- Air traffic control separation services
  - ADS-B / ADS-R for Low Altitude up to 24,000 ft.
  - ADS-B 1090-ES only for High Altitude above 24,000 ft.
- VHF Voice Communications (Air to Ground)
- Automated Weather Observation Services
- Flight Information Broadcast Services (FIS-B) Product Set 2 Low Altitude

## Service Volumes – (Communications and Surveillance)

- Low Altitude En Route Service Volume  
– 1,500 ft. - 3,000 ft. above mean sea level (MSL) over oil/gas platforms
- High Altitude En Route Service Volume  
– Floor: 28,000 ft. MSL, Ceiling: 60,000 ft. MSL

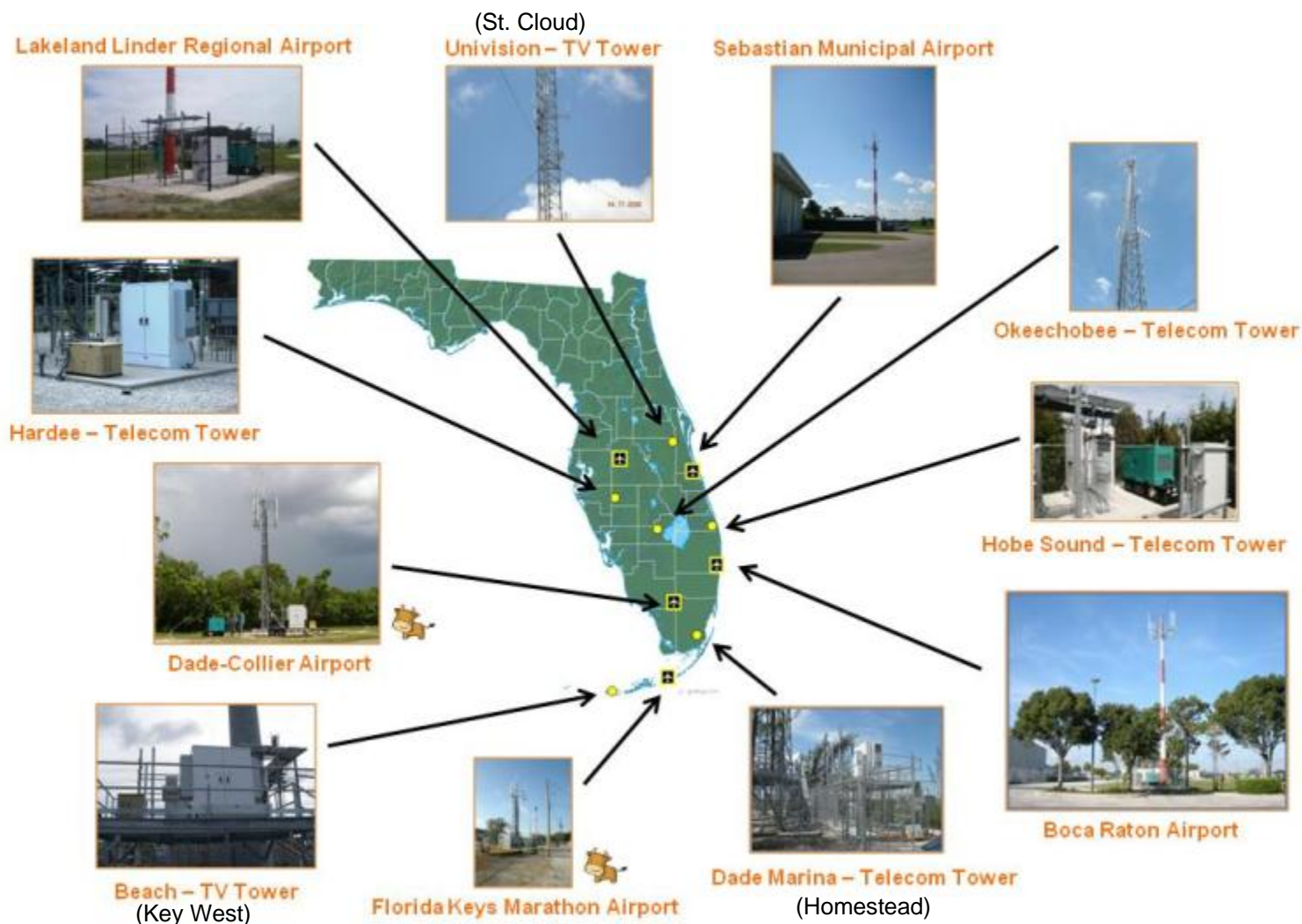
## Service Delivery Points (SDP)

- Primary SDP: HOST / ERAM at Houston Center

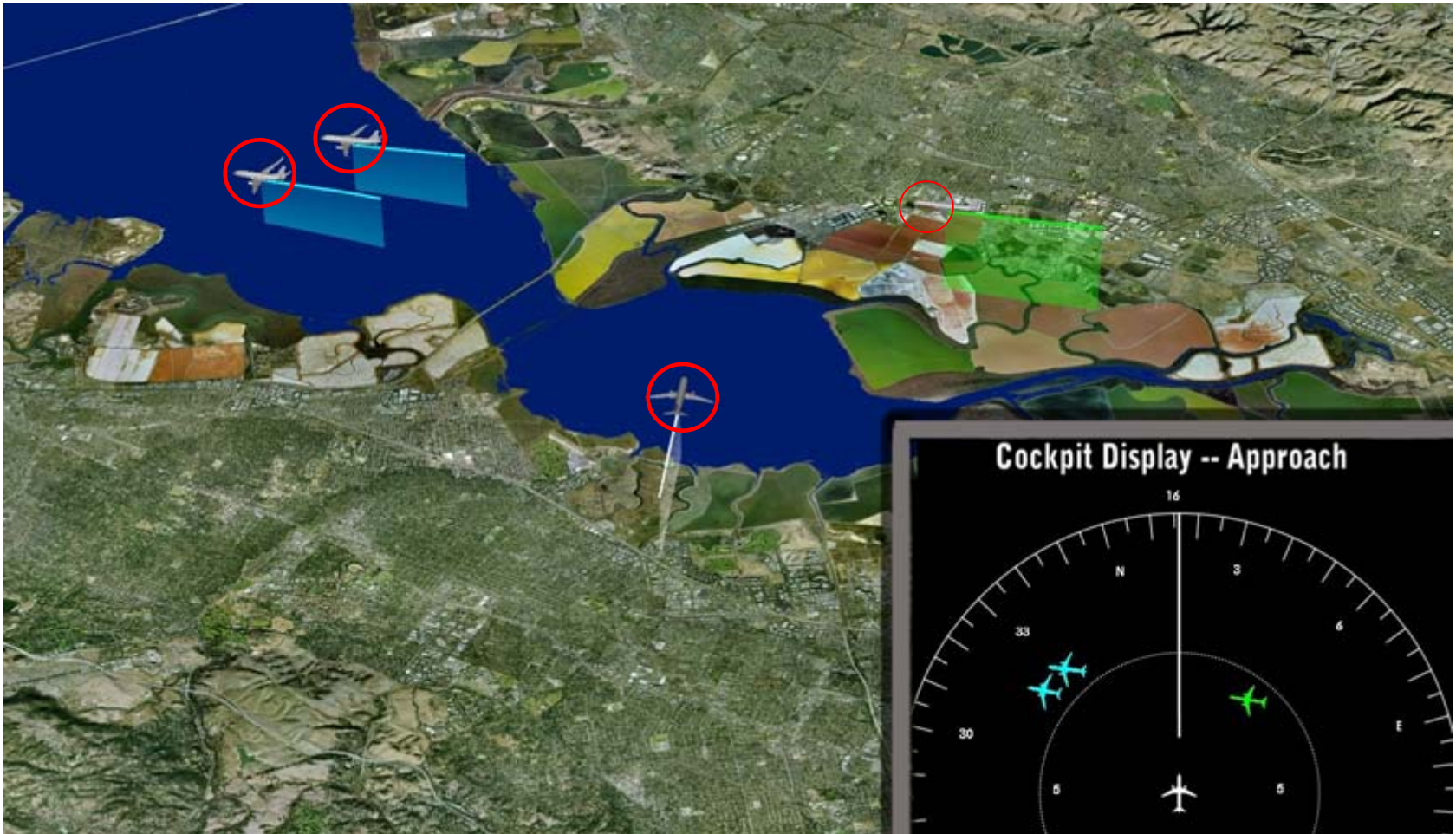
## Benefits

- High altitude
  - Increased capacity and Optimal routing
- Low altitude
  - Increased capacity and Reduction in weather related accidents

# Essential Services: Miami

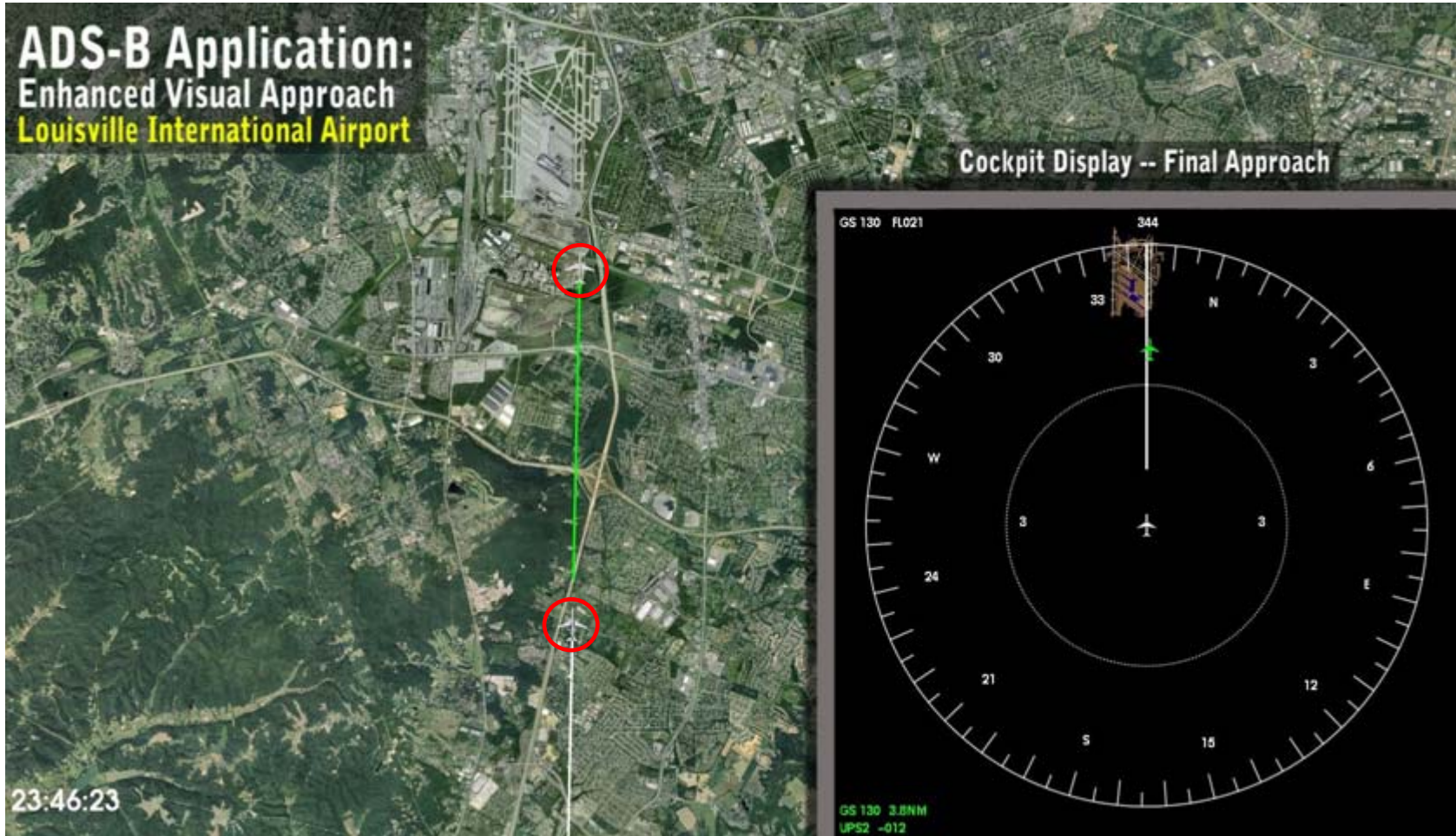


# ADS-B In: Program Baseline - Enhanced Visual Acquisition

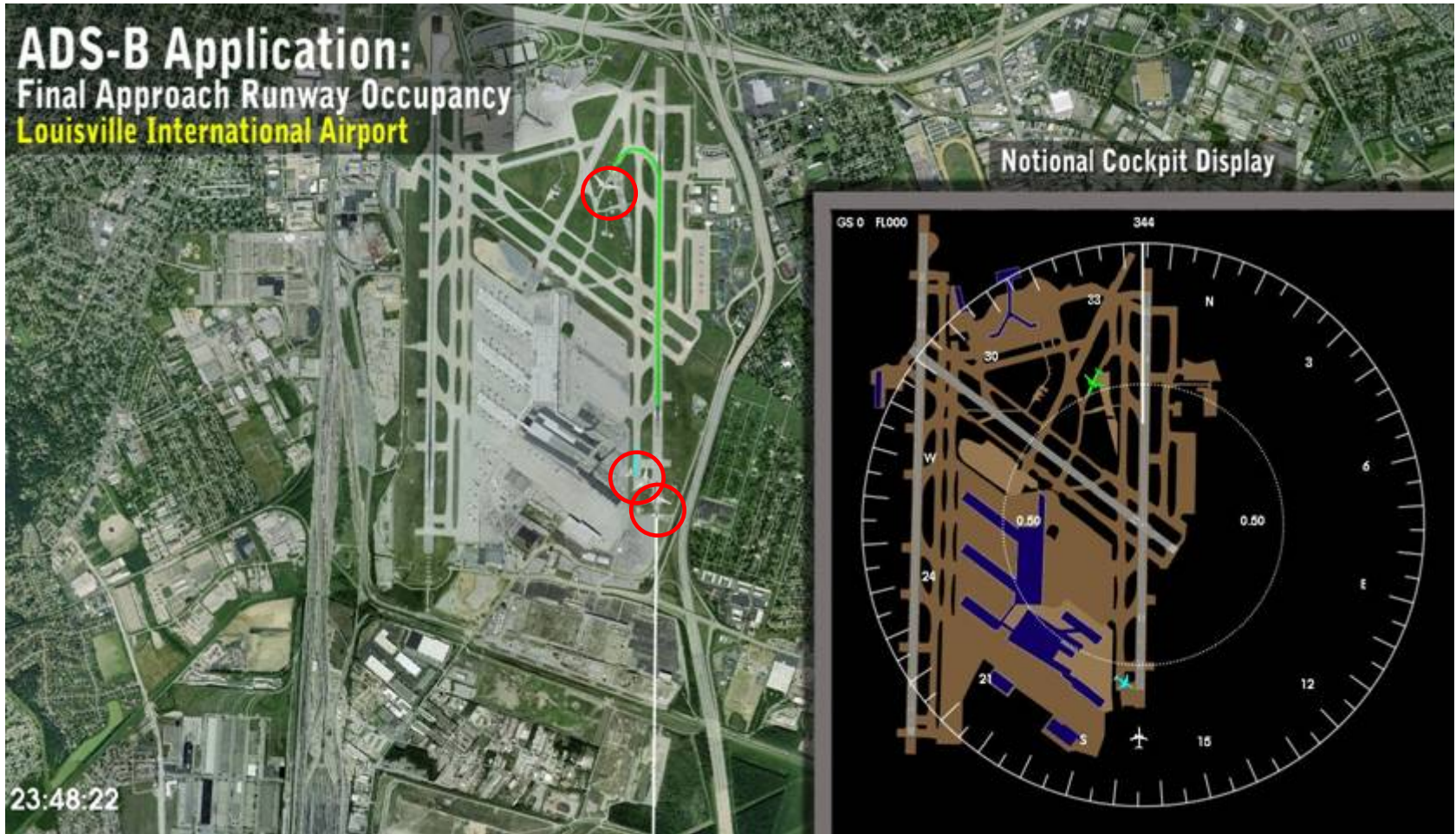




# ADS-B In: Program Baseline - Enhanced Visual Approaches



# ADS-B In: Program Baseline - Final Approach and Runway Occupancy

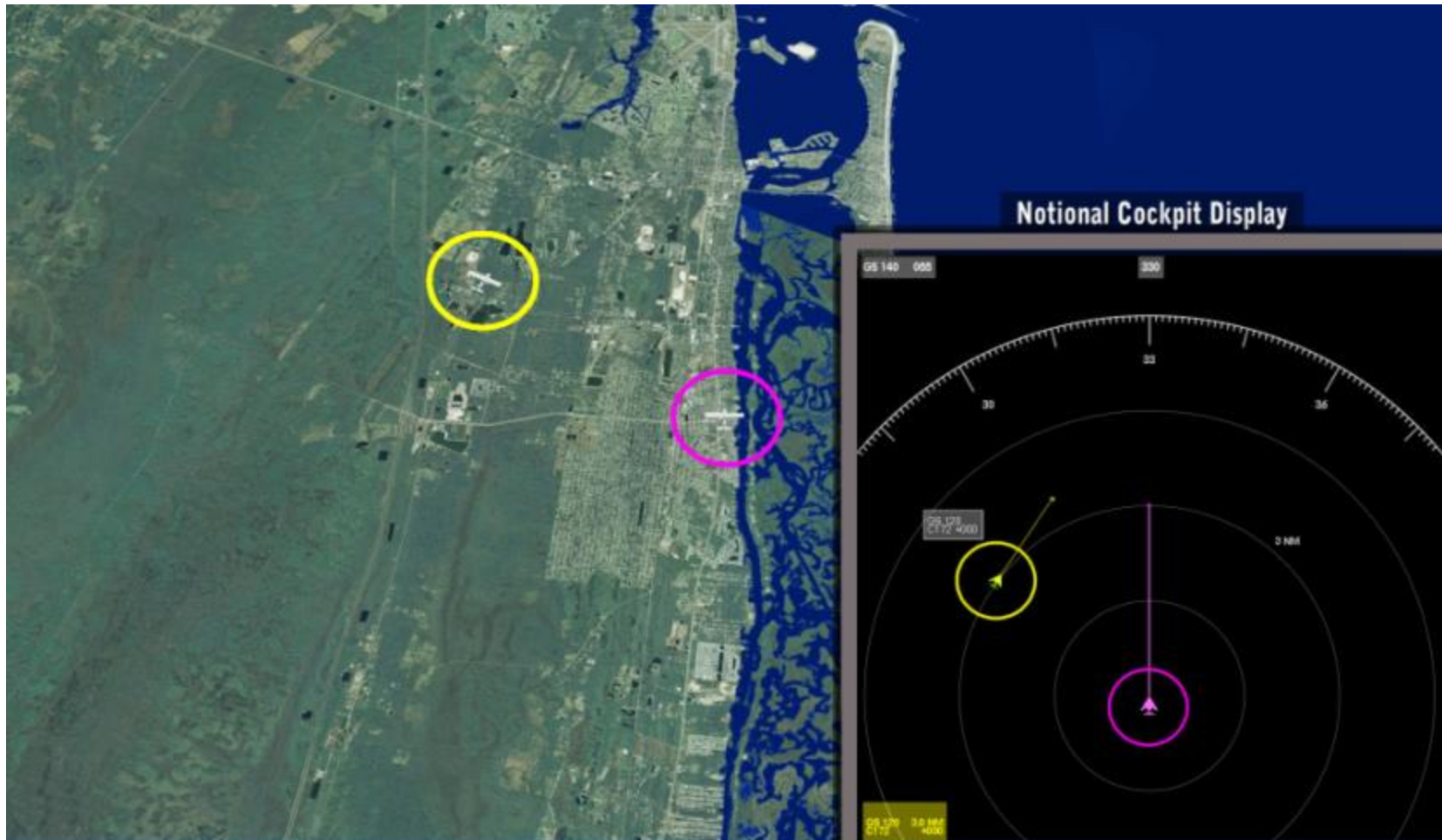




# ADS-B In: Program Baseline - Airport Surface Situational Awareness



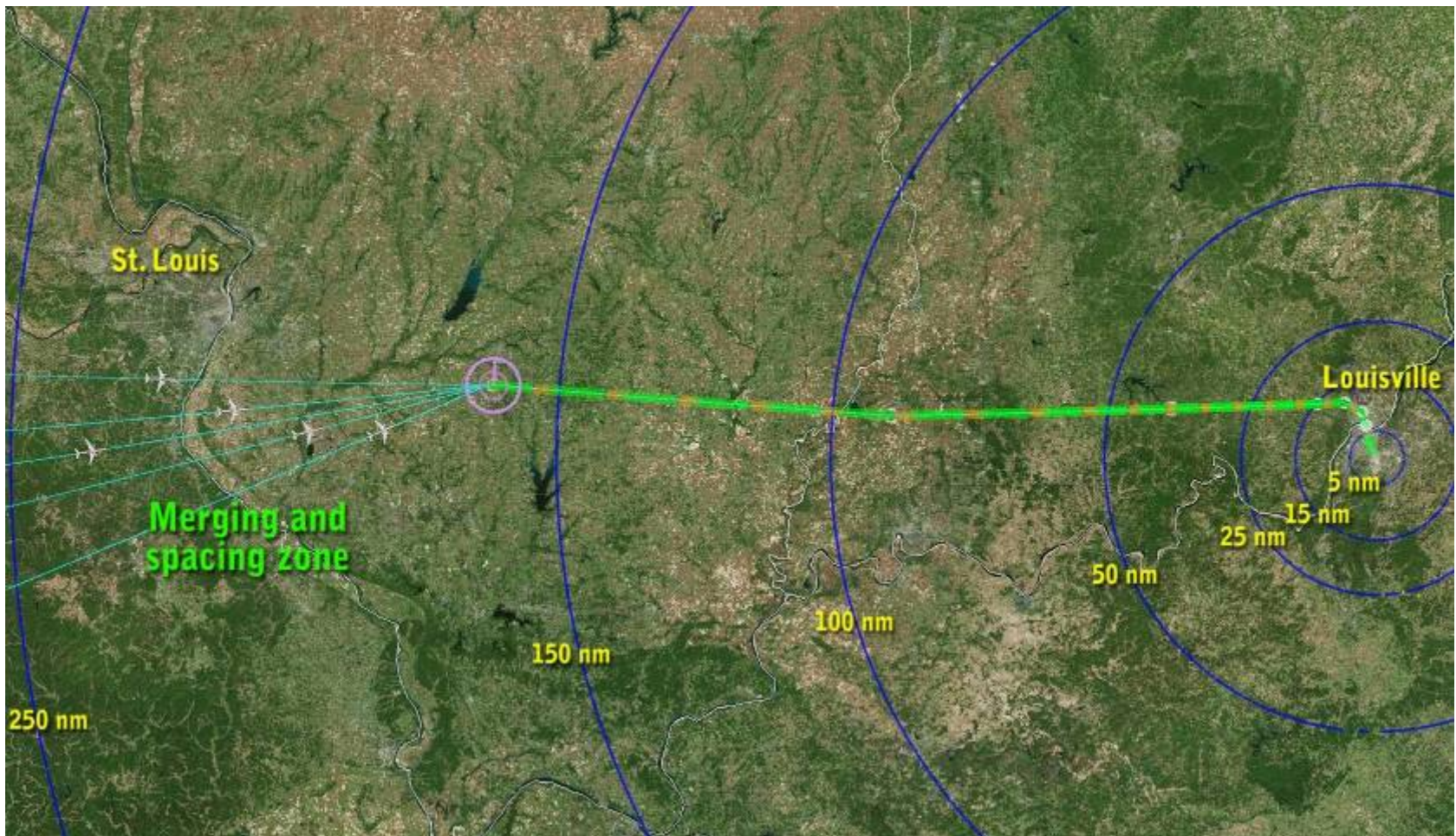
# ADS-B In: Program Baseline - Conflict Detection



Note: Working Group 1 will not have the complete set of documents complete prior to In-Service Decision.

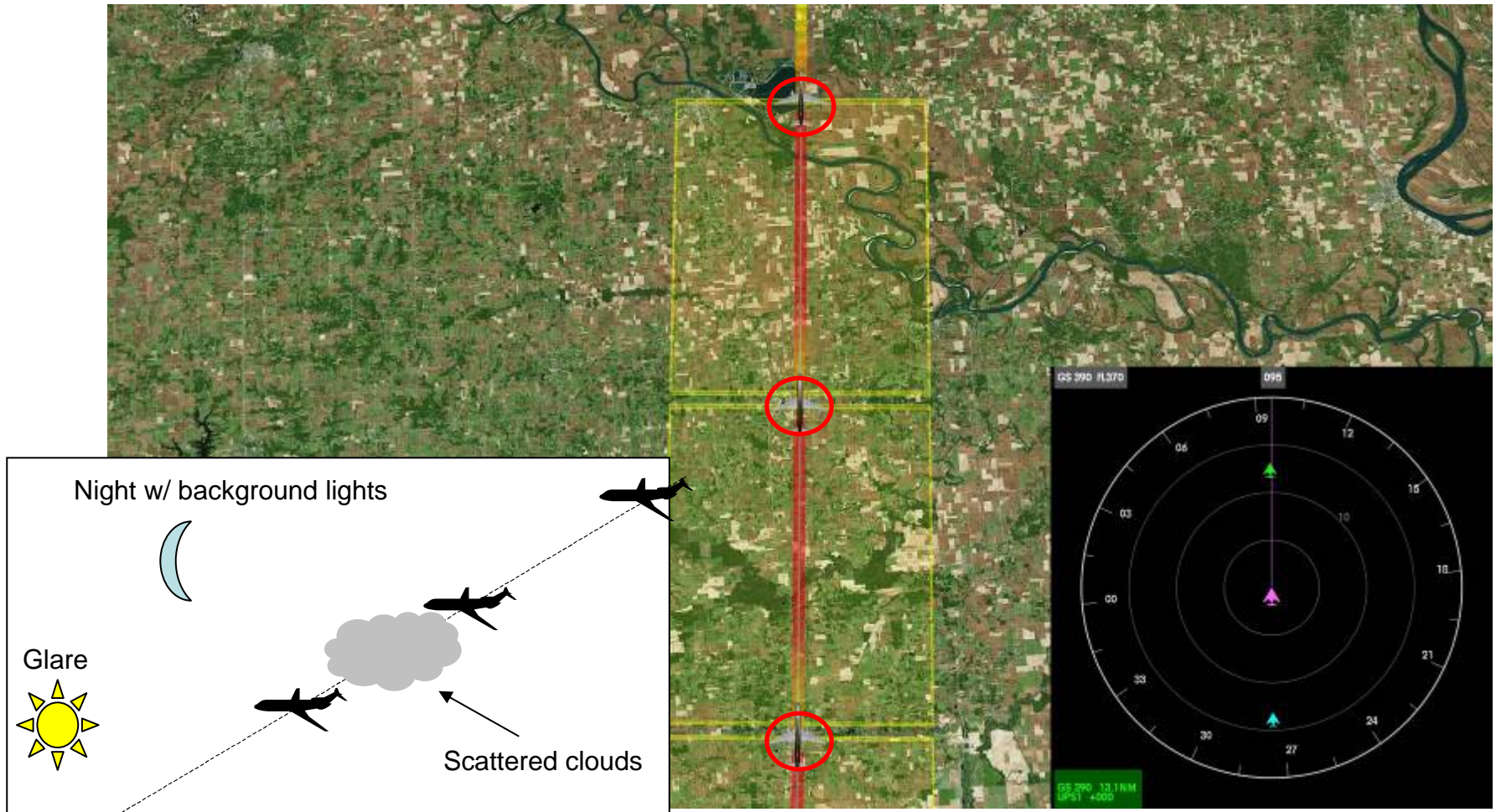


# ADS-B In: Program Baseline - Merging and Spacing





# ADS-B In: Program Baseline - Cockpit Display of Traffic Information (CDTI) Assisted Visual Separation (CAVS)

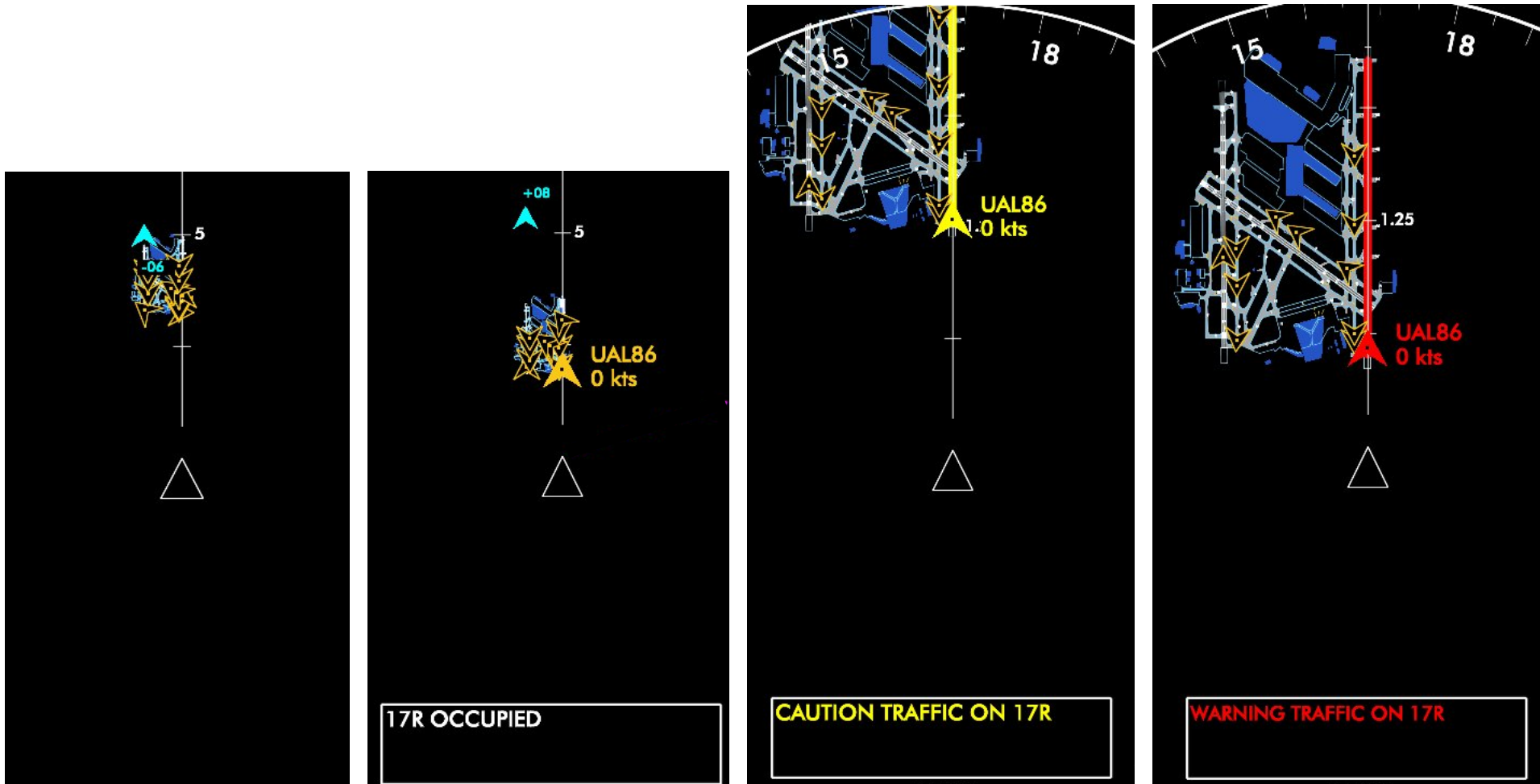


# \$9.3M Acquisition

- **The FY08 Conference Report accompanying H.R. 3074 has provided additional funding to the ADS-B program "specifically to expedite air to air capabilities"**
- **FAA intends to utilize this funding to demonstrate ADS-B capabilities in the areas of surface conflict detection and cockpit alert capabilities**



# Surface Conflict Detection and Cockpit Alerting



# \$9.3M Acquisition: Awards

On November 3, 2008 the FAA announced awards to two different vendors



# \$9.3M Acquisition: Honeywell Award

- **Award:** \$3M
- **Proposal:** Develop requirements, standards and human factors analysis
- **Location(s):**
  - Seattle Tacoma
  - Snohomish County Paine Field
- **Aircraft (experimental):**
  - 1 Cessna Sovereign
  - 1 Beechcraft King
- **Display:** EFB and MFD
- **Pilots:**
  - JetBlue Airways
  - Alaska Airways



# \$9.3M Acquisition: ACSS Award

- **Award:** \$6M
- **Proposal:** Create standards, flight demonstrations and prototypes
- **Partner:** US Airways
- **Location:** Philadelphia
- **Aircraft (2 experimental, 19 revenue service):**
  - King Air C90 (1)
  - Airbus 330 (20)
- **Display:** Class 2 EFB / AGD





# Other Agreements: NextGen

- **January 13, 2009 agreement between FAA, US Airways and ACSS**
  - Agreement establishes a public-private collaboration to develop a plan and endeavor to establish subsequent agreements to integrate implementation of Next Generation Air Transportation System (NextGen) capabilities in selected locations in the National Airspace System (NAS)
  - First Agreement Implementation Committee (AIC) meeting is scheduled for February 2, 2009



# Next Steps: FY2009 / FY2010 Schedule

Milestone	Planned Date of Completion / Status
<b>FY2009</b>	
Louisville Service Acceptance Test (SAT)	April 2009
Gulf of Mexico Weather Service Acceptance Test (SAT)	June 2009
Gulf of Mexico Service Acceptance Test (SAT)	June 2009
Philadelphia Service Acceptance Test (SAT)	August 2009
Gulf of Mexico Comm. and Weather Initial Operating Capability (IOC)	September 2009
<b>FY2010</b>	
Juneau Service Acceptance Test (SAT)	October 2009
Louisville IOC of Surveillance Services	October 2009
Gulf of Mexico IOC of Surveillance Services	December 2009
Philadelphia IOC of Surveillance Services	February 2010
Juneau IOC of Surveillance Services	April 2010
Final Rule Published	April 2010
Surveillance Services ISD for ADS-B	September 2010



# Backup





# Spectrum Analysis: Background

- **Spectrum Risk Identified: February 2006**
  - *Due to the numerous ATC systems competing for 1090 MHz spectrum along with the potential growth of air traffic contributing additional 1090 MHz users to the environment, the possibility exists that the 1090 MHz frequency will be congested to the point that existing and future systems will not meet the required performance levels to conduct air traffic and other surveillance related NAS operations.*
- **Completion of Phase 1 Spectrum Analysis Report: August 2008**
  1. *Removal of Terra Fix (as recommended prior to 2020)*
  2. *Reduction of Mode S Interrogation Sequence (as recommended prior to 2020)*
  3. *Removal of SSRs as outlined in SBS backup strategy (per FAA Enterprise Architecture initial removal list)*

**Note: Studies have shown that there is not an issue with radar or multilateration. The only issue identified is with TCAS.**

# Spectrum Analysis: Phase 2 Analysis Goals

- **Assess Performance of 1090 MHz systems (ADS-B, TCAS, SSR) in 2035**
- **Assess ADS-B Air-to-Air Performance for ranges of 20 NM, 45 NM, 60 NM, and 90 NM**
  - 95% Update Rate at 20 NM < 7 sec (ADS-B MASPS)
  - 95% Update Rate at 40-90 NM < 12 sec (ADS-B MASPS)

# Spectrum Analysis: Initial Look at Mitigating 2035 Interference Environment

Case	Mode S	ATCRBS
Baseline	14,558	68,009
All SSR to Monopulse	14,558	33,367
TCAS Hybrid Surv. <sup>2</sup>	11,004	68,009
Remove all SSRs (Passive Multilat) <sup>1</sup>	12,286	3,714
Remove all SSRs + TCAS Hybrid Surv. <sup>2</sup>	9,271	3,714
Change all SSRs and AC to Mode S	19,800	0

Notes:

1. Calculated with revised assumptions (e.g. Passive MLAT can be performed on both UAT and 1090-ES)

2. Assumes 60% reduction in TCAS interrogations when aircraft implement hybrid surveillance. Does not consider TCAS Hybrid Surveillance using UAT.

[Link to 2035 Interference](#)

# Spectrum Analysis: Next Steps

- **ADS-B Air to Air**
  - Performance Results were confirmed by comparing two analyses (JHU/APL and LL)
    - Follow-on efforts will compare all cases for final results
- **Additional Mitigations to Consider**
  - ADS-B only TCAS
  - Using ADS-R to do TCAS Hybrid Surveillance
- **Identify break-point for when the baseline interference does not support the applications**
- **Briefing of Results to Aviation Rulemaking Committee**
  - February 24 (tentative)