

# Surveillance and Broadcast Services

## Surveillance Roadmap – Evolution Decisions



Federal Aviation Administration

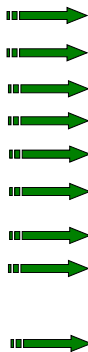


To: ICAO Surveillance Seminar  
 By: Jim Linney, Program Manager  
 Date: December, 2010

### NextGen: Improving Efficiency and Capacity

#### Today's National Airspace System

- Ground-based Navigation and Surveillance
- Air Traffic Control Communications By Voice
- Disconnected Information Systems
- Air Traffic "Control"
- Fragmented Weather Forecasting
- Airport Operations Limited By Visibility Conditions
- Forensic Safety Systems
- Focus on major airports



#### NextGen

- Satellite-based Navigation and Surveillance
- Routine Information Sent Digitally
- Information More Readily Accessible
- Air Traffic "Management"
- Forecasts Embedded into Decisions
- Operations Continue Into Lower Visibility Conditions
- Prognostic Safety Systems
- Focus on metropolitan areas




*Delivering safety, capacity, efficiency & environmental stewardship*



**Complexity and Viewpoint Affects Perception of NextGen**  
*We must take a broader view*

Surveillance and Broadcast Services  
 December 10, 2010




Federal Aviation Administration

3

## Surveillance Overview

- **Surveillance capabilities will be supported in all NAS operating domains for NextGen (beyond 2020)**
  - Oceanic, En Route, Terminal, Surface
- **Multiple technologies will be used to provide surveillance capabilities**
  - Primary radar
  - Beacon systems
  - Multilateration
  - Automatic Dependent Surveillance - Broadcast (ADS-B)
    - Both air-air and air-ground applications

Surveillance and Broadcast Services  
 December 10, 2010



Federal Aviation Administration

4

## Primary Radar - Current Status

- **En Route Primary**
  - Not required for providing en route air traffic separation services
    - However, if available, will be used to supplement beacon surveillance in en route
- **Terminal (ASR-8, ASR-9, ASR-11)**
  - Supports terminal separation services
    - Provides a “safety net” in cases where aircraft transponder is not responding to beacon interrogations
    - Also used as “gap fillers” for en route in many cases
  - Provides additional source of weather surveillance at most sites
  - ASR-9 undergoing Service Life Extension Program (SLEP); mobile ASR capability being procured
- **Surface (ASDE-3 (w/AMASS), ASDE-X (SMR), LCGS)**
  - Used at certain locations to provide surface situational awareness for ATC
    - Alerting also provided with most systems
  - LCGS in evaluation stage



## Primary Radar - Future Plans

- **En Route**
  - If available, will continue to use primary radar to supplement ADS-B and beacon surveillance in the future, but it is not required
- **Terminal**
  - Current roadmaps assume all terminal primary radar capabilities will remain in the NAS beyond 2020
    - Based on combined “safety net” and weather requirements, and an assumption of defense/security requirements
    - NextGen Surveillance and Weather Capability to be implemented starting 2023
  - Absent requirements from other agencies, terminal primary radar capabilities may be required by FAA only at certain locations in the future (see key issues)
    - “Safety net” may only be required in high and medium density terminal areas
    - Weather surveillance (from ATC primary radar) may only be required at certain locations
    - FAA (safety) study will be needed to validate future primary radar needs
- **Surface**
  - May no longer be required to support surface surveillance (see key issues)
    - Study to be conducted to determine future requirements
- **All Domains**
  - All radar/automation interfaces to be transitioned to IP/ASTERIX by 2018



## Beacon Systems - Current Status

- **En Route (Mode S, ATCBI-6)**
  - Primary means (and in many cases sole means) of surveillance in en route
    - Also used as backup surveillance for many terminal locations
    - Common Digitizer (CD-2) used at Mode S sites to provide interface to ATC automation if system reverts to “IBI” mode
  - Mode S undergoing SLEP
- **Terminal (ATCBI-5, Mode S, ASR-11)**
  - With collocated primary radar, supports safe terminal area operations
    - Required by FAA Order 7110.65 for many operations
    - Also used as “gap fillers” for en route in many cases
  - Mode S undergoing SLEP
- **Parallel Approaches (PRM)**
  - Required for certain (closely spaced) parallel approaches
  - PRM undergoing replacement (with Multilateration)



## Beacon Systems - Future Plans

- **En Route**
  - All existing en route beacons to be retained as backup surveillance (to ADS-B) after 2020
    - NextGen Backup Surveillance Capability to be implemented (terminal and en route) starting 2023
  - CD-2 to be removed
    - Need to verify that “IBI” mode is no longer required for ATC (see key issues)
- **Terminal**
  - Terminal beacons at the busiest 43 airports to be retained as backup to ADS-B after 2020
    - Includes 35 “OEP” airports + additional 8 airports (per 2009 FAA study)
    - Remaining terminal beacons to be decommissioned after 2020
- **Parallel Approaches**
  - Support for parallel approaches to be transitioned to ADS-B
    - Multilateration to be used as backup surveillance at certain locations
- **All Domains**
  - All beacon/automation interfaces to be transitioned to IP/ASTERIX by 2018
  - Potential congestion on 1090 MHz beyond 2020 needs to be mitigated (see key issues)



## Multilateration

- **Current Status**
  - En Route (e.g., WAM)
    - Wide Area Multilateration implemented in Colorado and Southeast Alaska
    - Additional work planned in Colorado, future additional sites TBD
    - Supports 5NM separation
  - Surface (e.g., ASDE-X)
    - Surface Multilateration is or will soon be implemented at all ASDE-3 and ASDE-X locations
- **Future Plans**
  - En Route
    - WAM can be implemented in other locations if it can be supported by a positive business case; no specific plans at this time
    - May serve as a possible alternative for the NextGen Backup Surveillance Capability acquisition (en route and/or terminal areas)
  - Surface
    - Surface Multilateration will continue to be used beyond 2020 as backup surveillance (to ADS-B) at selected locations
    - Some locations will no longer require collocated surface primary radar
  - Potential congestion on 1090 MHz beyond 2020 needs to be mitigated



## ADS-B - Current Status

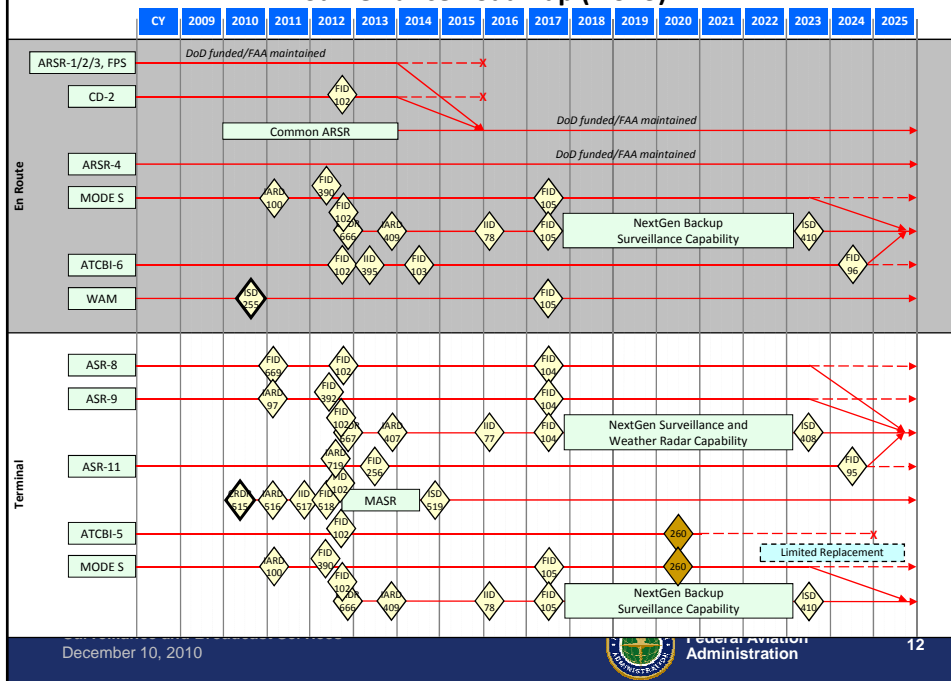
- **Details coming in Session 4**
- **ADS-B “Out”**
  - Airspace rule published in 2010
    - UAT, 1090 links
    - Avionics standards updated, equipage starting
  - Approved for use by ATC (for properly equipped aircraft)
- **ADS-B “In”**
  - Traffic / Flight Information Services - Broadcast (TIS-B / FIS-B) approved for airborne advisory/situational awareness applications late 2008
  - Additional airborne ADS-B applications in development
- **All Modes**
  - Ground infrastructure being implemented, full rollout expected by 2013
    - Supports “Critical Services” (e.g., separation services) and “Essential Services” (e.g., TIS-B, FIS-B)

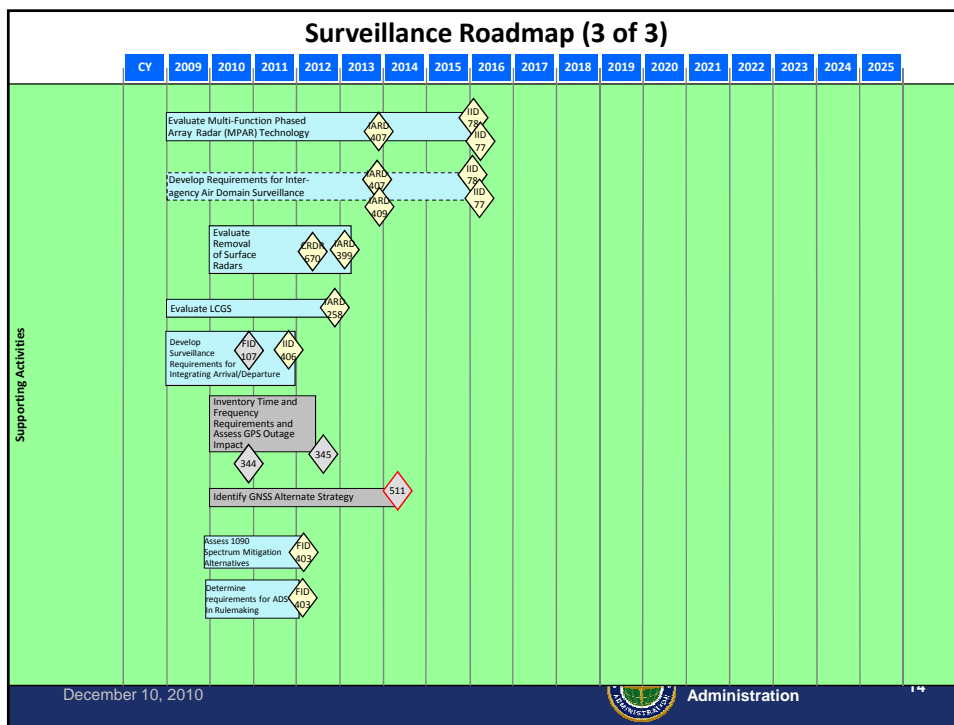
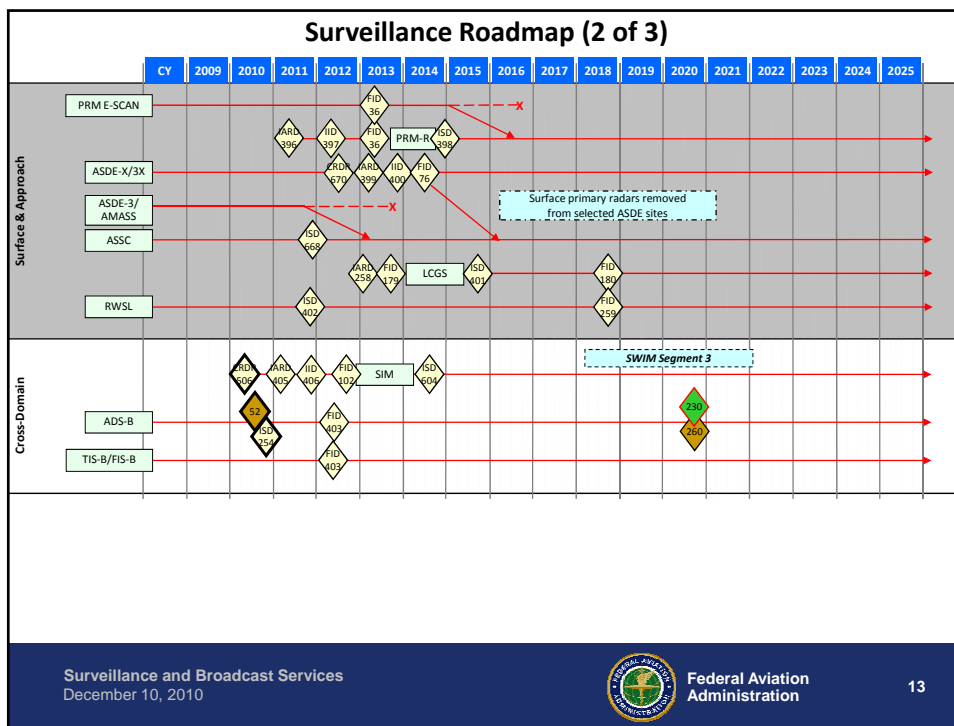


## ADS-B - Future Plans

- **ADS-B “Out”**
  - Will become primary means (and in many cases sole means) of surveillance for ATC beyond 2020
    - Airspace rule compliance required by 2020
  - All en route and a limited set of terminal beacon systems will be retained to provide backup surveillance
    - In the event of an interruption of ADS-B services
- **ADS-B “In”**
  - More advanced airborne ADS-B applications will be developed and approved for use (e.g., interval management, 3NM separation in en route, etc.)
  - Airspace for ADS-B “In” capabilities being developed and prioritized with industry
- **All Modes**
  - Potential congestion on 1090 MHz beyond 2020 needs to be mitigated

### Surveillance Roadmap (1 of 3)





## Key Issues

- **Requirements for interagency Air Domain Awareness need to be defined**
  - Needed for approval of NextGen Surveillance System business case for ALL users (FAA, DoD, DHS, etc.)
    - Preliminary requirements needed by mid-2013, final by 2015
- **Requirements for surface primary radars need to be revisited**
  - Roadmap assumes that these systems can be retired in the future
- **Potential congestion on 1090 MHz beyond 2020 needs to be mitigated**
  - Impacts beacon systems, Multilateration, ADS-B and TCAS
  - Alternatives analysis to be completed by 2012
- **Requirements for potential “ADS-B In” rule need to be identified**
  - Capabilities will be required to support certain NextGen improvements



### Jim Linney

Program Manager - International,  
Surveillance & Broadcast  
Services

(W) 817-222-5655

(W) 202-385-6284 - HQ support  
(schedule, link to Program  
Office & data management)

[Jim.Linney@faa.gov](mailto:Jim.Linney@faa.gov)

[www.adsb.gov](http://www.adsb.gov)




### Surveillance Roadmap: Decision Points (1 of 2)

DP #	Target Date CY	High Priority	Domain	Name
36	2013 Q1	N		Final Investment Decision for migration of PRM to PRM-R (based on multilateration)
52	2010 Q2	N		Final Decision for Avionics Mandate/Rulemaking for ADS-B (out)/MODE-S/UAT (Completed)
76	2014	N		Final Investment Decision for removal or SLEP/replace ASDE surface primary radars (evolving requirements for safety and security may impact decision)
77	2016 Q1	N		Initial Investment Decision to implement a NextGen Surveillance and Weather Radar Capability for ATC
78	2016 Q1	N		Initial Investment Decision to implement a NextGen beacon/backup radar system for ATC
95	2024	N		Decision for replacement of terminal primary radars (ASR-11 PSR) and removal of terminal beacons (ASR-11 MSSR)
96	2024	N		Decision for replacement of en route beacons (ATCBI-6)
97	2011 Q1	N		Investment Analysis Readiness Decision for legacy radar (ASR-9) SLEP, through 2025
100	2011 Q1	N		Investment Analysis Readiness Decision for legacy beacon (Mode S) SLEP through 2025
102	2012 Q3	N		Final Investment Decision to implement SIM in terminal and en route legacy radar systems
103	2014	N		Final Investment Decision for technology refresh of beacons (ATCBI-6)
104	2017	N		Final Investment Decision to implement a NextGen Surveillance and Weather Radar Capability for ATC
105	2017	N		Final Investment Decision to implement a NextGen beacon/backup radar system for ATC
107	2010 Q4	Y	Automation	TAMR Phase 3 Final Investment Decision
179	2013	N		Combined Initial Investment Decision and Final Investment Decision for LCGS
180	2018	N		Final Investment Decision for ADS-B to assume LCGS function, or approve a Technology Refresh for LCGS
230	2020	Y	Navigation	Cut-over to dual frequency operations
254	2010 Q3	N		In-Service Decision for SBS Critical Services (ADS-B) NAS wide implementation, including backup strategy
255	2010 Q3	N		In-Service Decision for WAM (Alaska and Colorado)
256	2013	N		Final Investment Decision for ASR-11 Technology Refresh Segment 2 (through 2025)
258	2012 Q4	N		Investment Analysis Readiness Decision for LCGS
259	2018	N		Final Investment Decision for RWSL Technology Refresh
260	2020	N		Decision on ADS-B Rule Compliance
344	2010 Q4	N	Enterprise Services	Establish Requirements for a Backup Timing Source
345	2012 Q3	N	Enterprise Services	Implementation strategy decision for GPS timing backup
390	2012 Q2	N		Final Investment Decision for legacy beacon (Mode S) SLEP through 2025
392	2012 Q2	N		Final Investment Decision for legacy radar (ASR-9) SLEP through 2025
395	2013	N		Initial Investment Decision for Technology Refresh of ATCBI-6 beacon system
396	2011 Q2	N		Investment Analysis Readiness Decision for Precision Runway Monitor- Replacement

### Surveillance Roadmap: Decision Points (2 of 3)

DP #	Target Date CY	High Priority	Domain	Name
400	2013 Q4	N		Initial Investment Decision for removal or SLEP/replace ASDE surface primary radars
401	2015	N		In-Service Decision for Low Cost Ground Surveillance system
402	2011 Q3	N		In-Service Decision for Runway Status Light system
403	2012 Q1	N		Final Investment Decision for SBS Implementation of Advanced ADS-B Applications
405	2011 Q1	N		Investment Analysis Readiness Decision for SIM in terminal and en route legacy radar systems
406	2011 Q4	N		Initial Investment Decision for SIM in terminal and en route legacy radar systems
407	2013 Q4	N		Investment Analysis Readiness Decision for NextGen Surveillance and Weather Radar Capability
408	2023	N		In-Service Decision for NextGen Surveillance and Weather Radar Capability
409	2013 Q4	N		Investment Analysis Readiness Decision for New Beacon/Backup System
410	2023	N		In-Service Decision for New Beacon/Backup System
506	2010 Q1	N		Concept and Requirements Definition Readiness (CRDR) Decision for SIM in Terminal and En Route Legacy Radar Systems (Complete)
511	2014	Y	Navigation	Decision on GNSS Alternate Strategy
515	2010 Q2	N		Concept and Requirements Definition Readiness (CRDR) Decision for a Mobile/Transportable Airport Surveillance Radar (MASR) (Complete)
516	2011 Q1	N		Investment Analysis Readiness Decision (IARD) for a Mobile/Transportable Airport Surveillance Radar (MASR)
517	2011 Q4	N		Initial Investment Decision (IID) for a Mobile/Transportable Airport Surveillance Radar (MASR)
518	2012 Q2	N		Final Investment Decision (FID) for a Mobile/Transportable Airport Surveillance Radar (MASR)
519	2014 Q4	N		In-Service Decision (ISD) for a Mobile/Transportable Airport Surveillance Radar (MASR)
604	2014 Q2	N		In-Service Decision (ISD) for SIM in Terminal and En Route Legacy Radar Systems
666	2012 Q4	N		Concept and Requirements Definition Readiness (CRDR) Decision for New Beacon/Backup System
667	2012 Q4	N		Concept and Requirements Definition Readiness (CRDR) Decision for NextGen Surveillance and Weather Radar Capability
668	2011 Q4	N		In Service Decision for Airport Surface Surveillance Capability
669	2011 Q1	N		Final Investment Decision for legacy radar (ASR-8) facility improvements
670	2012 Q2	N		Concept and Requirements Definition Readiness (CRDR) Decision for removal or SLEP/replace ASDE surface primary radars
719	2012	N		Investment Analysis Readiness Decision (IARD) for ASR-11 Technology Refresh Segment 2 (through 2025)

Surveillance and Broadcast Services  
December 10, 2010



**Federal Aviation  
Administration**

18