



Airports Authority of India

Automatic Dependent Surveillance-Broadcast (ADS-B)

28 January, 2010

New Delhi, India



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Managing Director

India Operations

Boeing Commercial Airplanes

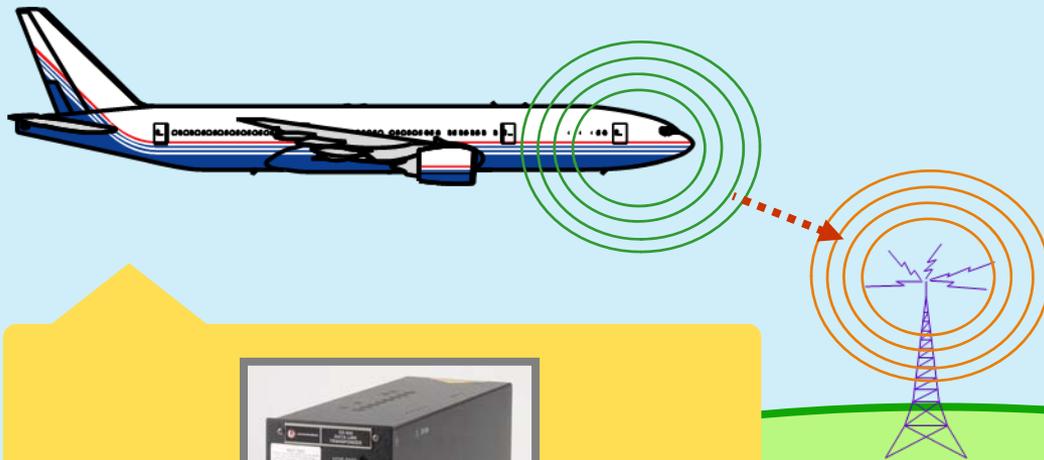
Topics

- **ADS-B: An Airplane's Perspective**
- **ADS-B Equipage**
- **Next Steps to Implement ADS-B**

1: Mode S

Mode S: Transmitting a signal
Out on interrogation

- Altitude, Code, AC Addr
- Flight ID
- Selected Altitude
- TAS, IAS, GS, Mach
- Magnetic Heading
- Roll Angle
- Track Angle, Track Angle Rate



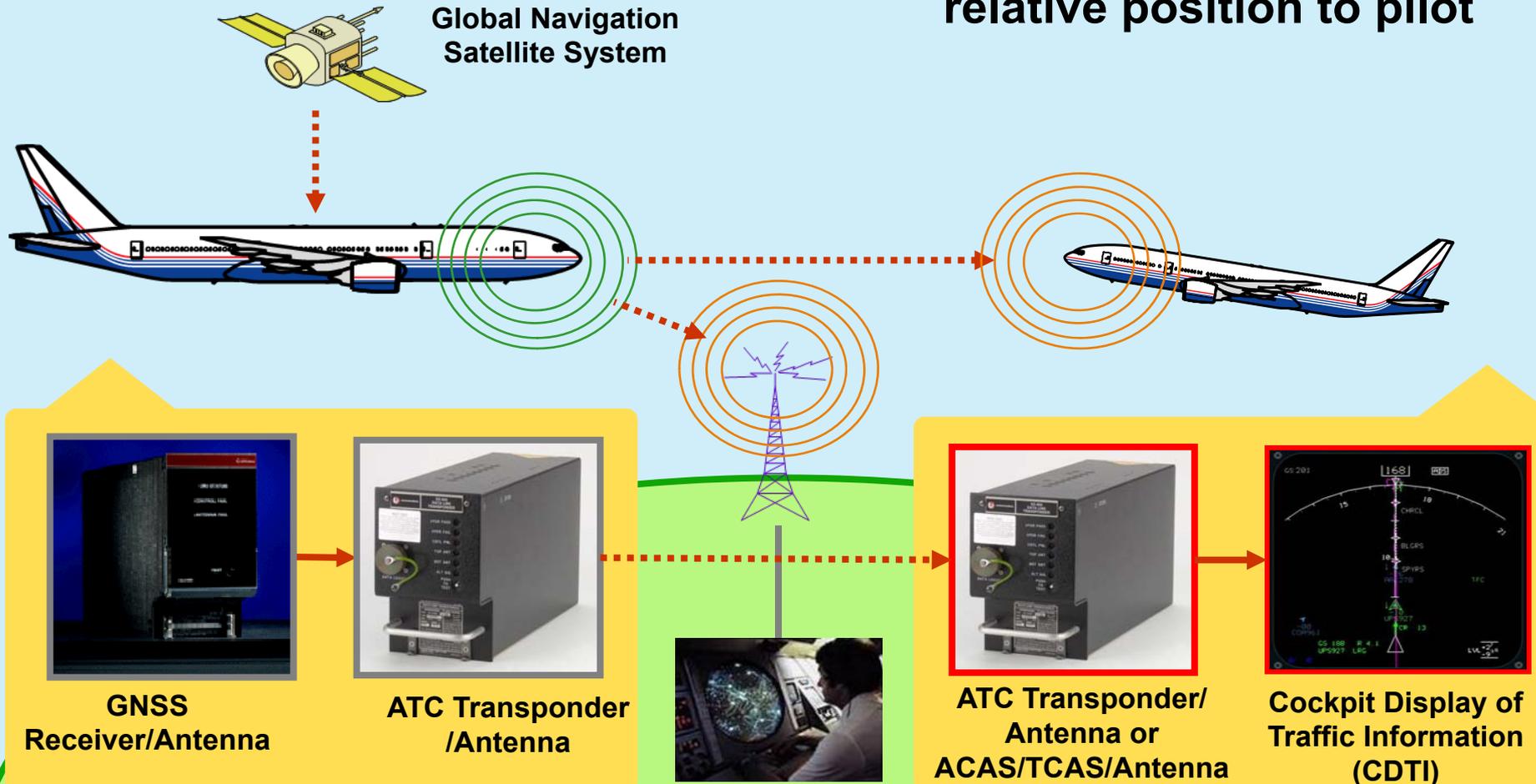
ATC Transponder
/Antenna



2: ADS-B Out and 3: ADS-B In

ADS-B Out: Transmitting a signal **Out** (position, velocity, ID)

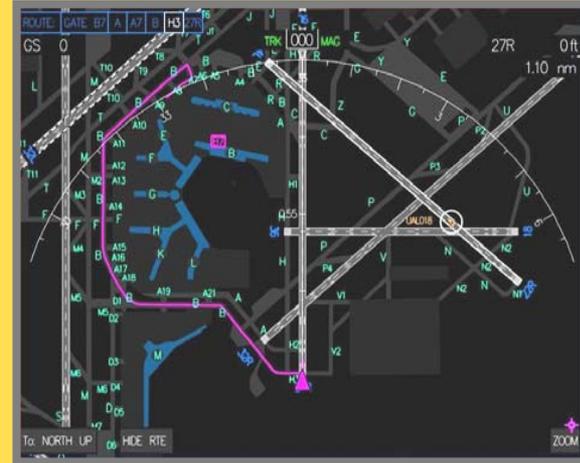
ADS-B In: Receiving a signal **In** and displaying relative position to pilot



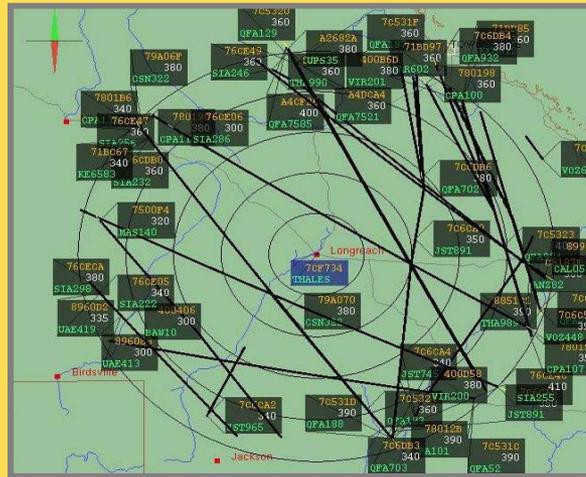
Benefits

- Reduced separation in radar and non-radar areas
- Enhanced airport surface surveillance
- Airborne traffic Situational Awareness
- Airborne spacing applications

Airport Surface Surveillance



Enhanced positional accuracy and positive control

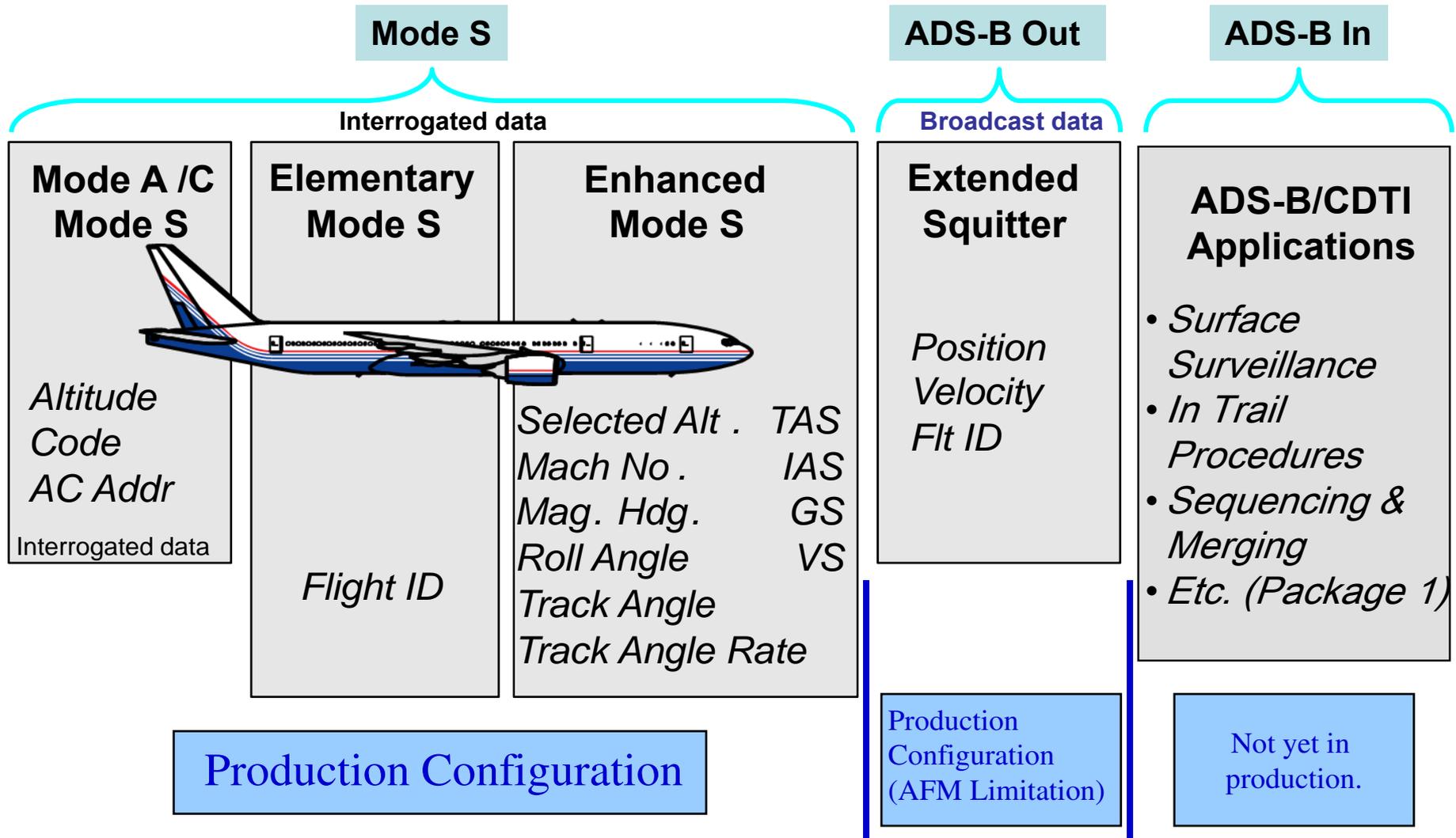


Flight Deck Situational Awareness



ADS-B Equipage

Boeing Production Status



ADS-B Out Being Mandated



Nav Canada is mandating ADS-B Out for Hudson Bay between FL350 and FL400 inclusive in Nov 2010

- Current production equipage meets requirements



Eurocontrol/EASA draft rule mandates ADS-B Out in production on 1 Jan 2012 and for entire European airspace (retrofit) on 5 Feb 2015

- Publicly stated production mandate will not be before 2013
- Requires new transponder standard (DO-260B)



CASA (Australia) rule mandates ADS-B Out for upper airspace (\geq FL290) in Dec 2013

- Current production equipage meets transponder requirements
- GPS requirements may require receiver upgrade



FAA draft rule mandates ADS-B Out (DO-260B) for airspace on 1 Jan 2020

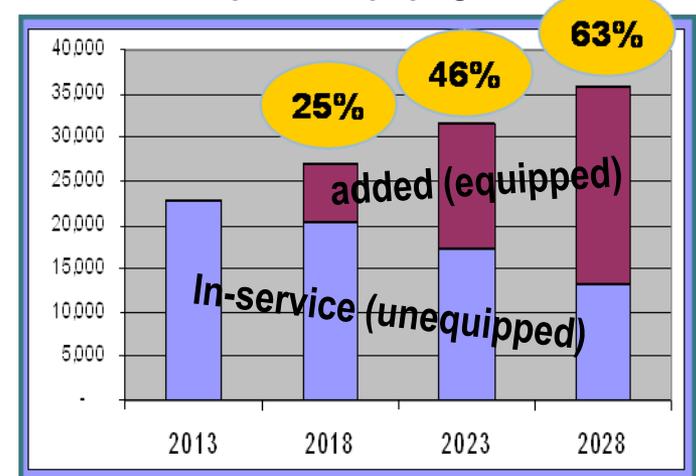
- FAA final rule published in Apr 2010

ADS-B In Has a Longer Road Ahead

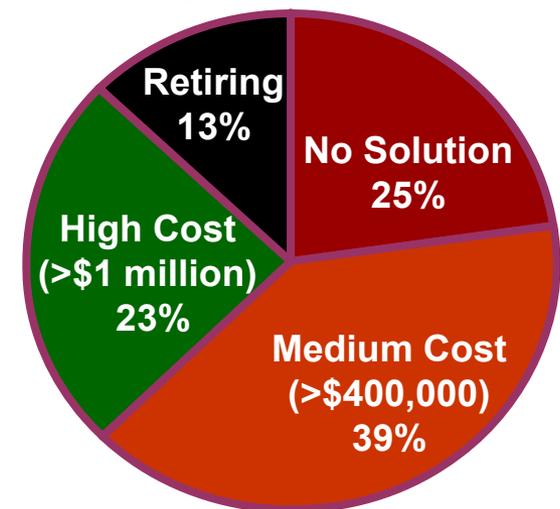
- Significant ADS-B In equipage levels are required to achieve benefits.
- Integrated Forward Field of View (FFOV) displays are preferred.
- Yet, even if ALL airplanes coming off the production line were ADS-B In equipped with integrated FFOV displays, equipage penetration is slow
- And, retrofit solutions, with integrated FFOV, are expensive

Other display options must be considered to achieve necessary equipage rates

FFOV New Airplane Equipage Penetration



Estimated Per Airplane Cost for Integrated FFOV Displays Upgrade (Year 2018)



Potential Option: Electronic Flight Bag



Class 1

- COTS-Specs provided
- Power Outlet SB



Class 2

- Power Bus
- ARINC 429
- Network File Server
- TWLU
- ACARS
- Printer



Class 3

- Power Bus
- ARINC 429
- Network File Server
- TWLU
- ACARS
- Printer
- Avionics-Grade H/W
- Highly Integrated

Key Features

Airplane Models

All

Production: 737NG
 Retrofit: 737NG, 747*,
 757*, 767*, MD-xx*

Production: 777, 787,
 737NG, 747-8
 Retrofit: 777, 737NG, 747,
 757, 767, MD-xx*

*offerability subject to market demand

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Next Steps to Implement ADS-B

Boeing Position on ADS-B

- **Supporting ADS-B Out.** We will meet ADS-B Out mandates.
- **Supporting ADS-B In.** We must maximize the value of equipage solutions, while recognizing that retrofit equipage upgrades are complex and expensive.
- **Coordinating with ANSPs (Canada, Australia, Eurocontrol, US)** to ensure common airborne requirements for Non-radar application using current equipage.
- **Actively supporting DO-260B installation.**
- **Targeting Situational Awareness and Separation ADS-B In Applications** in the near term.
- **Working aggressively to find retrofit equipage solutions.**
- **Engaging with airlines and industry partners on rulemaking around the world.**
- **Continuing industry standards support.**

Thank You