



ADS-B - A Boeing Perspective

ICAO ADS-B Seminar and SITF/14

Christchurch, New Zealand

14 April 2015

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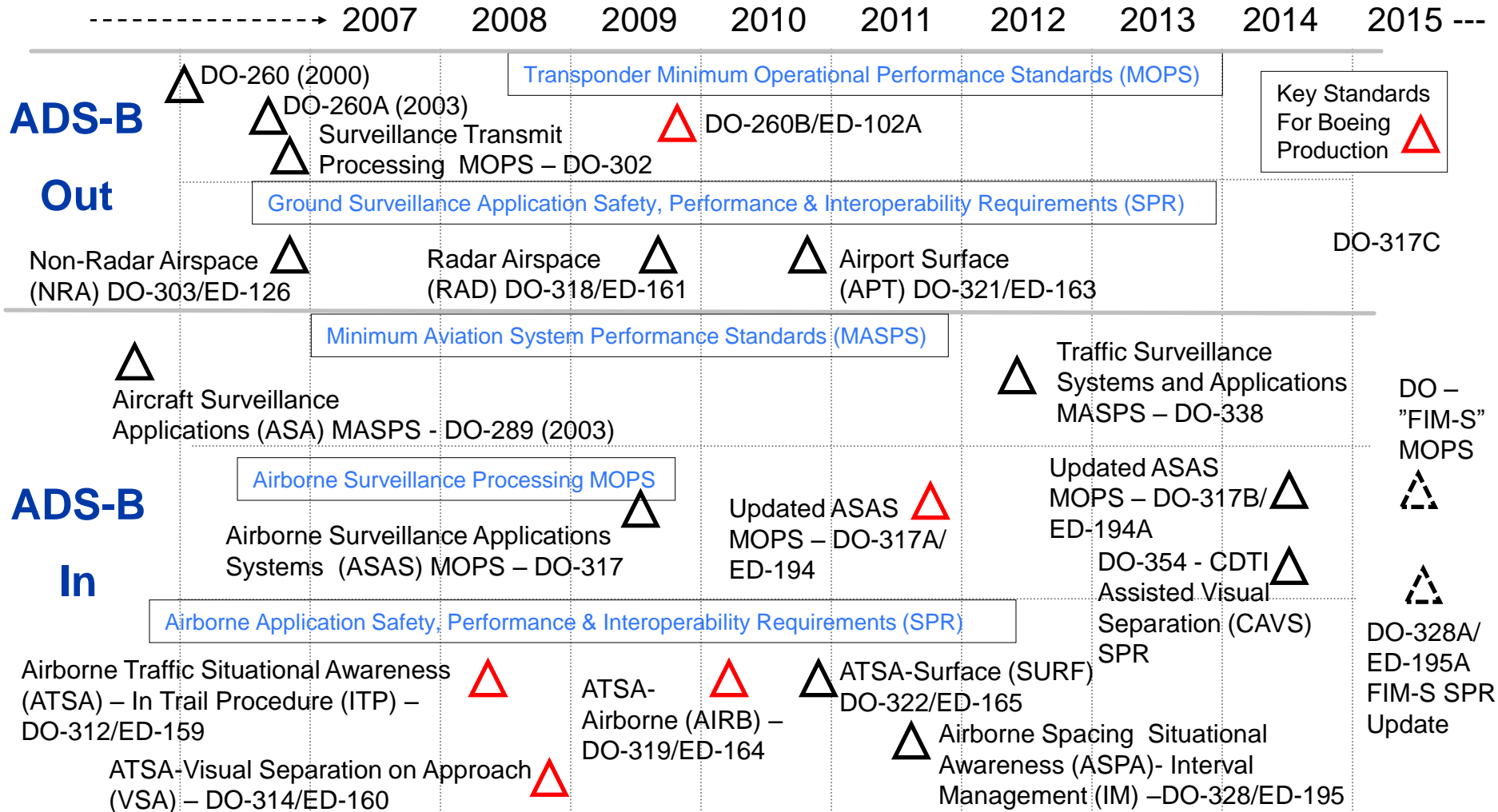
Agenda

Boeing Commercial Airplanes – Avionics / Air Traffic Management

- **Standards Development/Certification Documents**
- **Boeing Plans – Ver. 2 ADS-B Out Schedule**
- **In-Service 787 ADS-B Out Position Error & Resolution Plan**
- **ADS-B In for 787**
- **Conclusions**

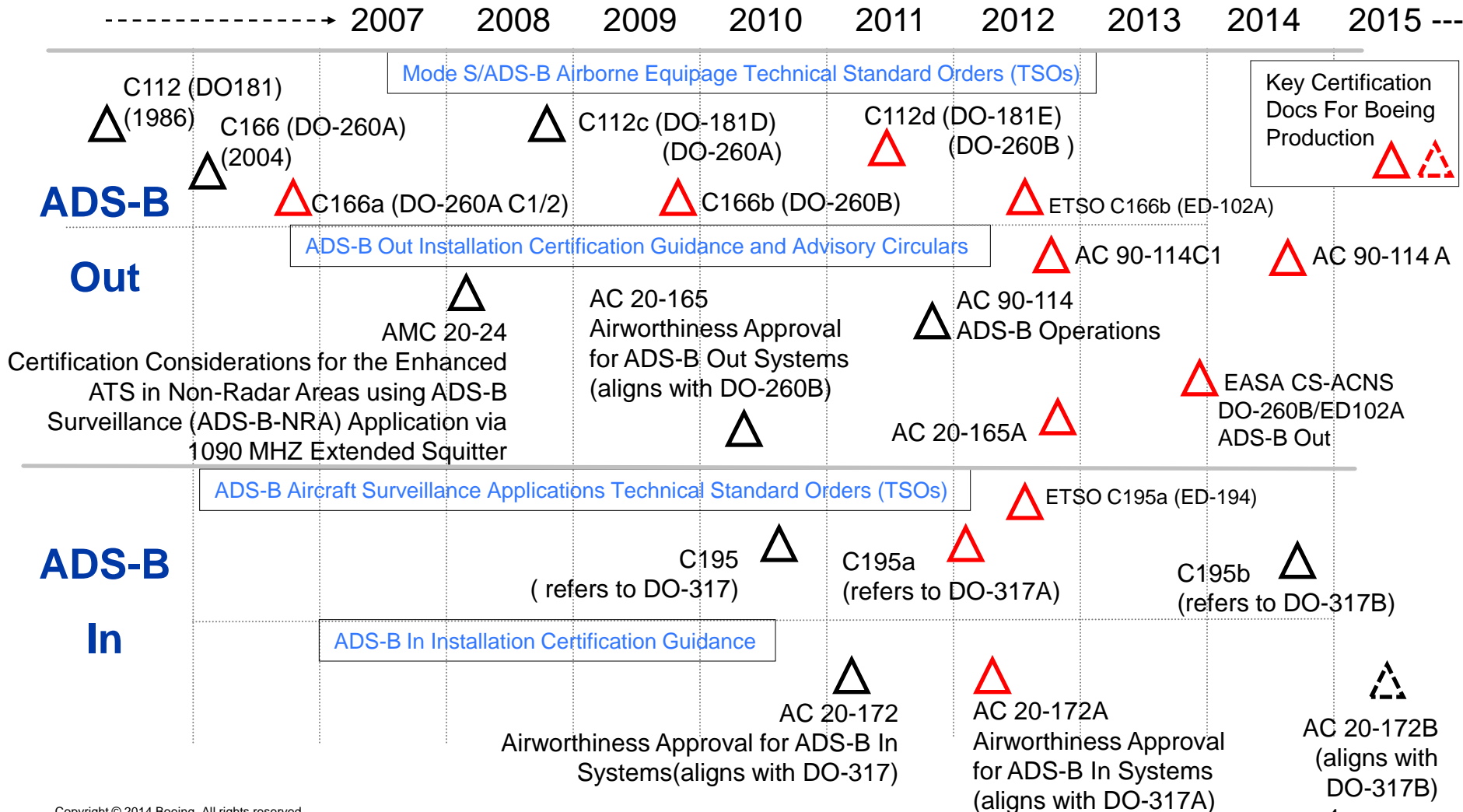
Standards Development

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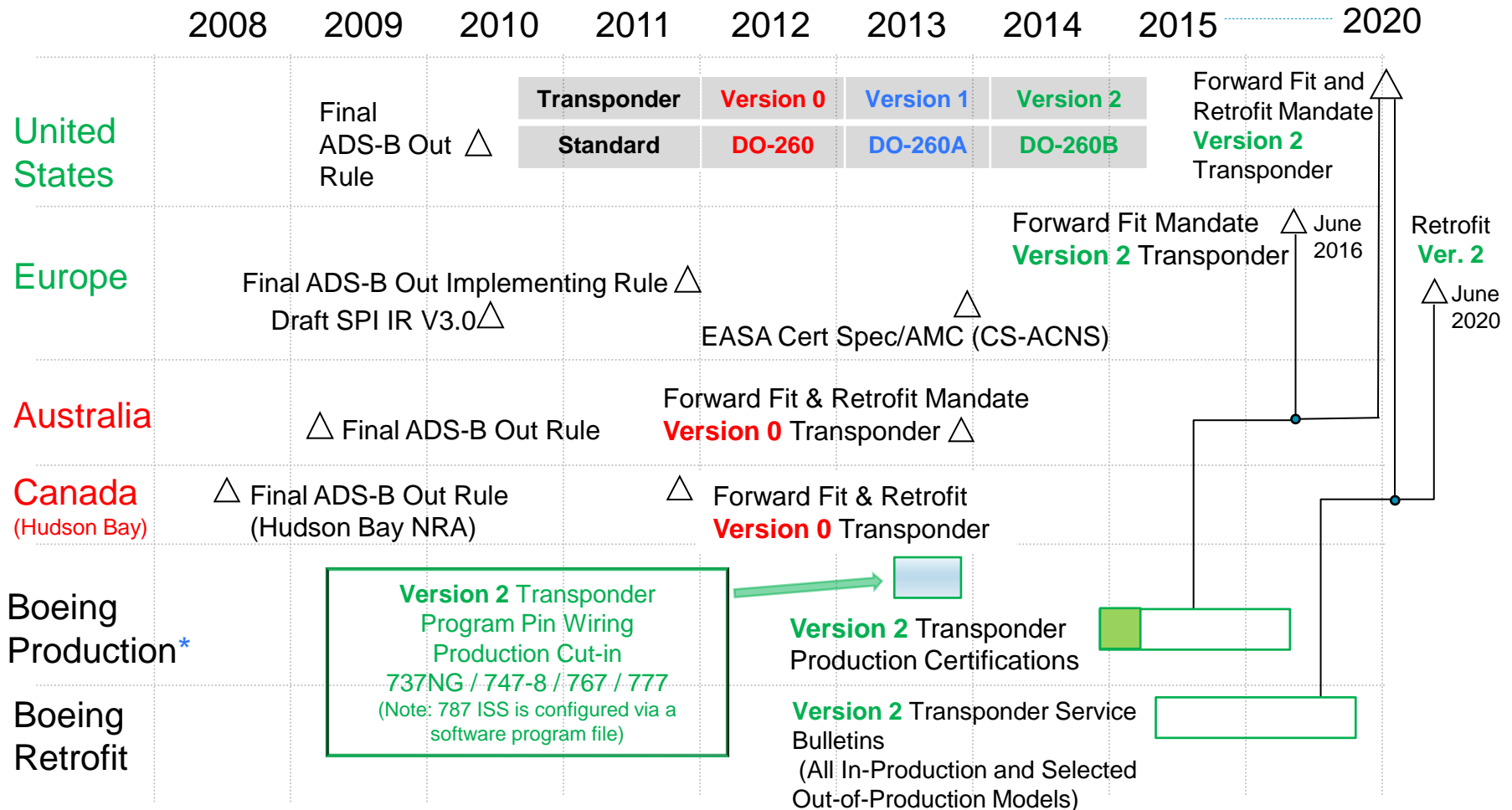
Certification Documents

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ADS-B Out – Meeting the Mandates

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* 787-8 & 747-8 aircraft have Version 1 transponder and SA-Aware GNSS receiver since Entry into Service (EIS)

Version 2 ADS-B Out Production Certification Schedule (by Model) – New ATC Transponders

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	737NG		747-8	767		777		787
BFE	ACSS	May 2015	N/A	ACSS	Certified Nov. 2014	ACSS	June 2015	N/A
	Honeywell	Nov. 2016		Honeywell	No Customer	Honeywell	Nov. 2016	
	Rockwell Collins	Nov. 2015		Rockwell Collins	No Customer	Rockwell Collins	May 2016	
SFE	N/A		Rockwell Collins April 2016 ⁽¹⁾	N/A		N/A		Rockwell Collins ISS-2100 ⁽²⁾ Aug 2015

(1) Same unit as Buyer Furnished Equipment

(2) Integrated Surveillance System (ISS) includes ATC Transponder, ADS-B Out, TCAS/ACAS, Terrain Awareness, and Weather Radar. Ver. 2 ADS-B Out is an onboard loadable software update.

BFE – Equipment selected/provided by buyer
SFE – Equipment basic to airplane

Supplier	Model	Part No.
ACSS	NXT-800	9008000-10000
Honeywell	TRA-100B	066-01212-0301
Rockwell Collins	TPR-901	822-1338-205

Boeing Service Bulletins available approx. 4 - 6 months after production certification

ADS-B Out – Multi-Mode Receivers (MMRs) to be Certified in Combination with Ver. 2 Transponders

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Boeing in-production Multi-mode receiver (MMR) capability

	737NG/MAX	747-8	767	777	787
Buyer Furnished Equipment (BFE)	Honeywell (RMA-55B SA On)		Honeywell (RMA-55B SA On)	Honeywell (RMA-55B SA On)	
	<div style="border: 1px solid blue; padding: 2px;"> Stop production in 2016 Thales (TLS-755 SA Aware) </div>		<div style="border: 1px solid blue; padding: 2px;"> Stop production in 2016 Thales (TLS-755 SA Aware) </div>	<div style="border: 1px solid blue; padding: 2px;"> Stop production in 2016 Thales (TLS-755 SA Aware) </div>	
	Rockwell (RCI) (GLU-920-001/002 SA On) (GLU-920-004 SA Aware) (GLU-925 SA Aware)		Rockwell (RCI) (GLU-920-001/002 SA On) (GLU-920-004 SA Aware) (GLU-925 SA Aware)	Rockwell (RCI) (GLU-920-001/002 SA On) (GLU-920-004 SA Aware) (GLU-925 SA Aware)	Rockwell (RCI) (GLU-920-001/002 SA On) (GLU-920-004 SA Aware) (GLU-925 SA Aware)
Supplier Furnished Equipment (SFE)		Rockwell ⁽¹⁾ (RCI) (GLU-925 SA Aware)			Honeywell INR ⁽²⁾ (SA-Aware)

- (1) Same unit as Buyer Furnished Equipment
- (2) Integrated Navigation Receiver – SA Aware

BFE – Equipment selected/provided by buyer
SFE - Equipment basic to airplane

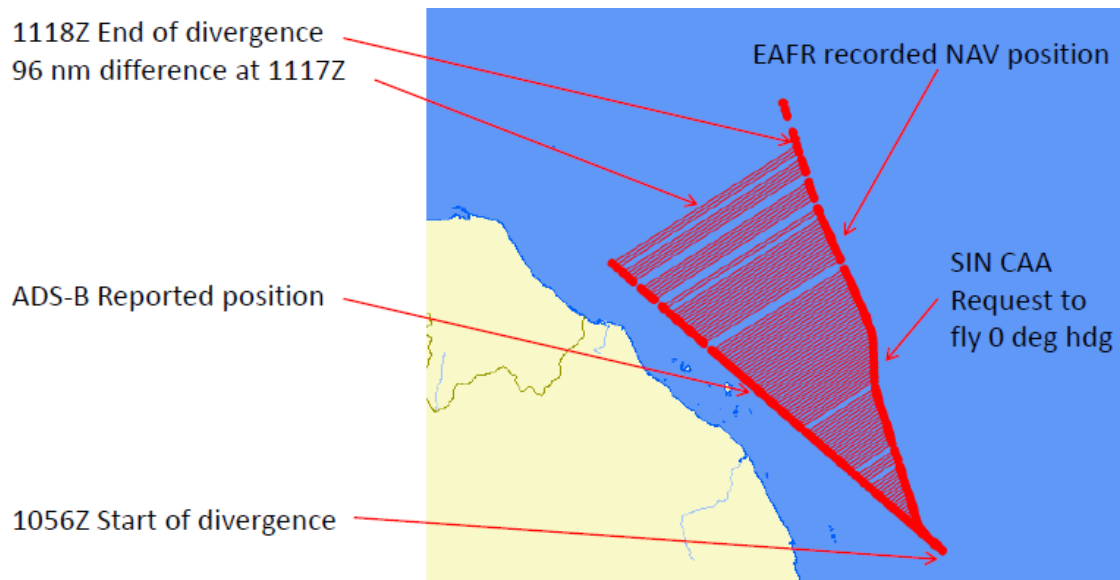
***Certified ATC Transponder/MMR combination on 737NG/MAX, 767, and 777
is dependent on customer BFE selections!***

787 Intermittent ADS-B Position Reporting Error

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Issue Description:

- The ADS-B aircraft position data transmitted to ATC from an operator airplane slowly deviated from track (and from the true position of the aircraft) over a variable period of time. At some variable time later the track jumped back to the correct position.
- To-date, issue identified on 15 flights on 7 different aircraft
 - First notified by Air Services Australia on Oct. 29, 2014
- The flight crew did not report any issue and the aircraft was always on the proper track.

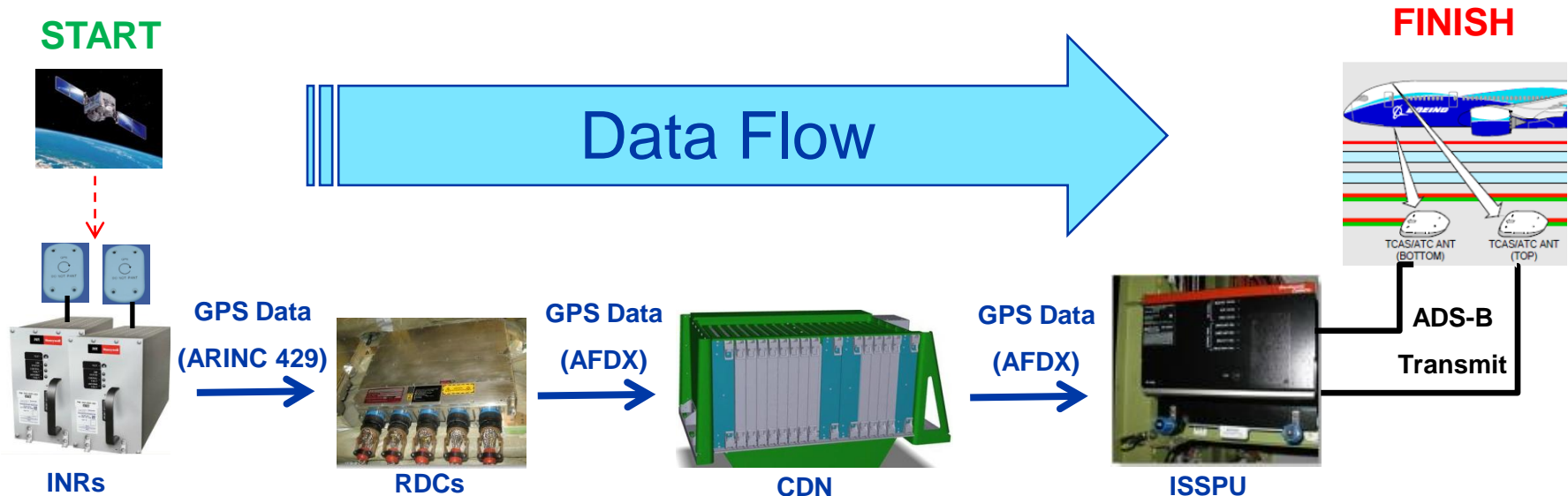


787 Intermittent ADS-B Position Reporting Error

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Issue Explanation:

- Root cause of the issue has been determined to be an integration issue between the Integrated Surveillance System (ISS) and the GPS position data (received via the Remote Data Concentrator (RDC))
- When GPS latitude & longitude data are split across multiple network (AFDX) data packets, the ADS-B position extrapolator will not update its position with fresh, valid GPS data
- ADS-B position will deviate from the point at which latitude & longitude were in the same AFDX packet
- Probability of occurrence, and its duration, vary



787 Intermittent ADS-B Position Reporting Error

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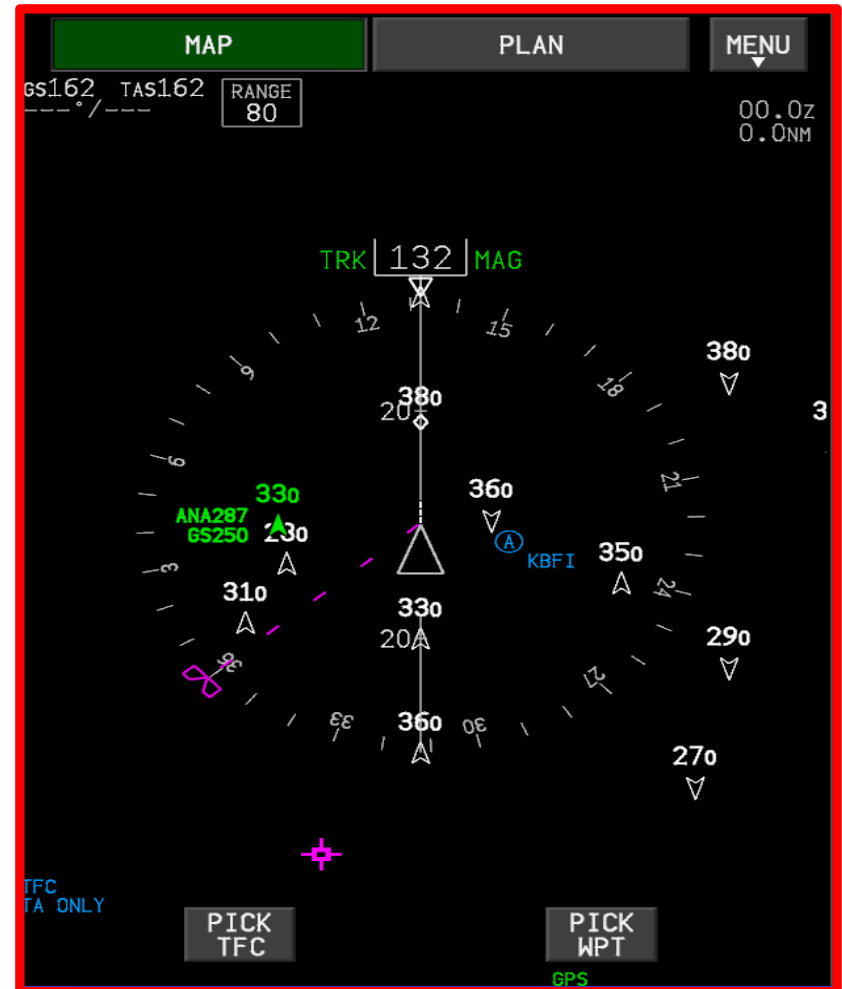
Production & Retrofit Fix:

- **Fix implemented in new ISS ADS-B Out (DO-260B/Ver. 2) ISS software already under development**
 - **New software does NOT have this issue (confirmed by design review and integrated Boeing Avionics lab testing)**
 - **Currently scheduled for production & retrofit deployment in August 2015**

787 ADS-B In

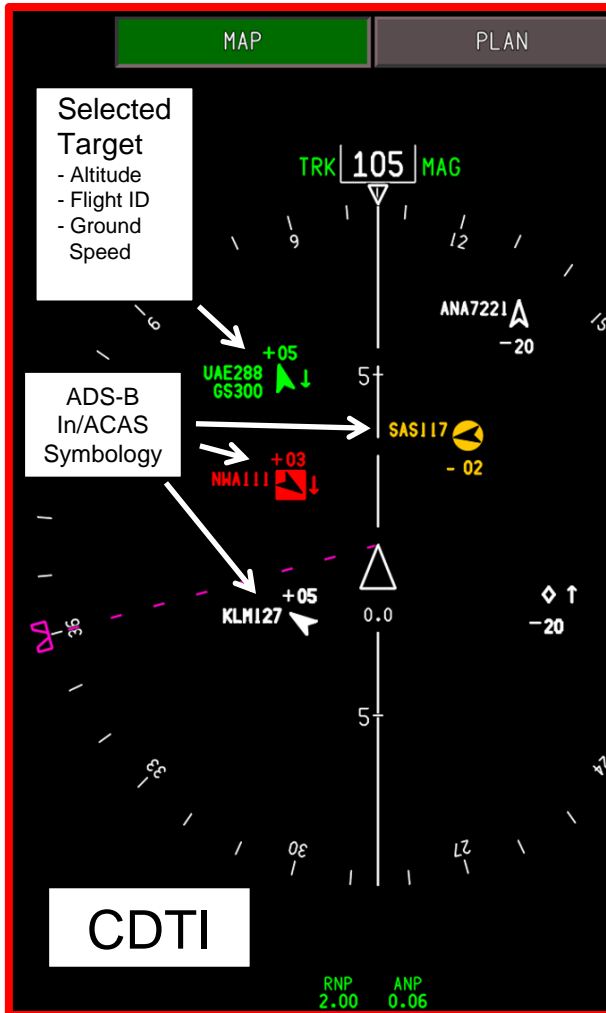
Boeing Commercial Airplanes – Avionics / Air Traffic Management

- Provides suite of situational awareness applications
 - Airborne Traffic Display (AIRB)
 - Visual Separation on Approach (VSA)
 - In Trail Procedure (ITP)
- Certification scheduled for August 2015



787 CDTI & VSA

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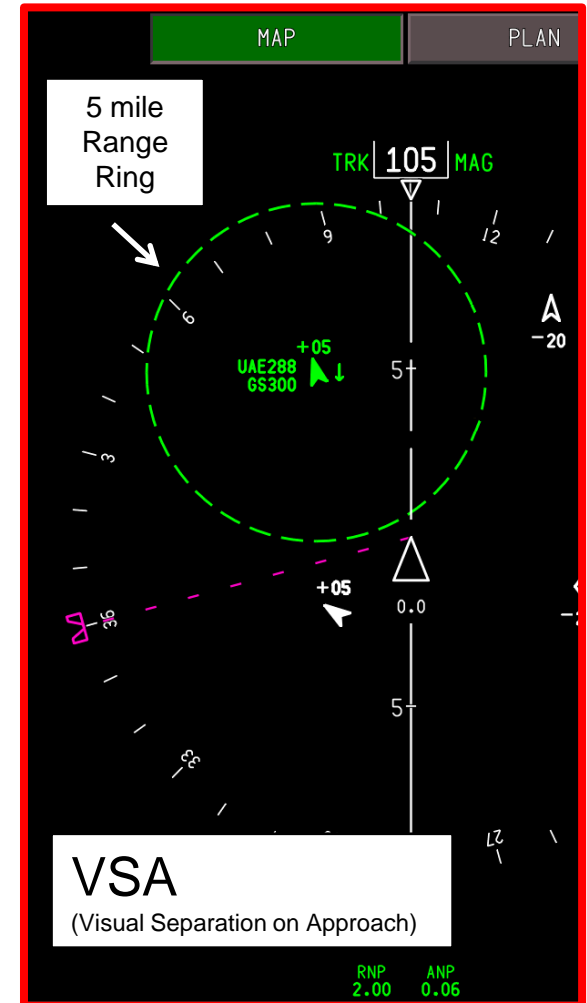
Traffic List

INFO MENU IN TRAIL PROCEDURE TRAFFIC LIST

ADS-B TRAFFIC LIST

FLY #	DIST	CAT	GND SPEED	RANGE RING
UAE288	5.6 NM	HVY	300 KTS	5
ANA111	2.9 NM	HVY	240 KTS	--
KLM127	3.3 NM	HVY	440 KTS	--
SAS117	3.9 NM	HVY	240 KTS	--
ANA7221	8.0 NM	MED	440 KTS	--
AAL123	57 NM	HVY	325 KTS	--
ANA722	107 NM	MED	209 KTS	--
HVN344	113 NM	HVY	241 KTS	--
JAL256	121 NM	MED	231 KTS	--
KAL851	122 NM	HVY	162 KTS	--
SIA677	127 NM	HVY	259 KTS	--
QTR257	142 NM	HVY	190 KTS	--
CPA118	149 NM	MED	202 KTS	--
UAE2687	154 NM	HVY	194 KTS	--
ANA2687	174 NM	MED	294 KTS	--

FLT # Search: -----



787 In Trail Procedure (ITP)

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INFO MENU
IN TRAIL PROCEDURE
TRAFFIC LIST

IN-TRAIL PROCEDURES

SEPARATION CRITERIA

ALONG TRACK NM VERTICAL FT

CALC ALT

FLIGHT LEVEL LIST

FLT LVL	TCAS TRAFFIC	TIME
FL400	---	---
FL390	---	01:37z
FL380	SAS12345	01:34z
FL370	AAL123	12:45z
FL360	---	---
FL350	ANA23456	12:39z
FL340	JAL456 ANA56789	12:47z
FL330	---	12:55z
FL320	---	01:05z

REFERENCE AIRPLANE LIST

FLT LVL	FLT #	ITP DIST	ITP SPD DIFF
FL380	SAS12345	16 NM DECR	14 KTS
FL370	AAL123	15 NM INCR	10 KTS

CREATE REQUEST

Vertical Display

Comm Page

ATC
FLIGHT INFORMATION
COMPANY

REVIEW
MANAGER
NEW MESSAGES

1843z ITP LEVEL REQUEST

LEVEL : FL390

16 NM AHEAD OF SAS12345

15 NM BEHIND AAL123

FREE TEXT : _____

SEND
PRINT
RESET
RETURN
EXIT

MAP
PLAN

TRK 228 MAG

1843z ITP LEVEL REQUEST

LEVEL : FL390

16 NM AHEAD OF SAS12345

15 NM BEHIND AAL123

FREE TEXT : _____

SEND
PRINT
RESET
RETURN
EXIT

Nav Display

Conclusions

Boeing Commercial Airplanes – Avionics / Air Traffic Management

- Meeting production/retrofit mandates for ADS-B Out
- Developing ADS-B In solutions which maximize value of equipage
- Coordinating with Air Navigation Service Providers (Canada, Australia, Europe, US, others) to ensure common airborne requirements global harmonization and resolve any reported in-service issues
- Engaging with industry and certification authorities on rulemaking around the world
- Continuing industry standards support

Questions