Automatic Dependent Surveillance-Broadcast (ADS-B)

Federal Aviation Administration

ADS-B Out Avionics Equipage & Installation Guidance

Presented at: AEA US East Region Meeting

By: Alex Rodriguez (AIR-132)

Date: September 16, 2014

Agenda

- Field Approvals
- Equipage and Implementation Update
- ADS-B Compliance Monitor
- Post Installation Performance Statistics
- Common Causes for Non-compliance
- Example Compliance Report
- Wrap Up

ADS-B Field Approval Policy Memo

- **Previous ADS-B policy restricted the approval method for ADS-B Out systems.**
  - Type Certificate (TC)
  - Amended Type Certificate (ATC)
  - Supplemental Type Certificate (STC)

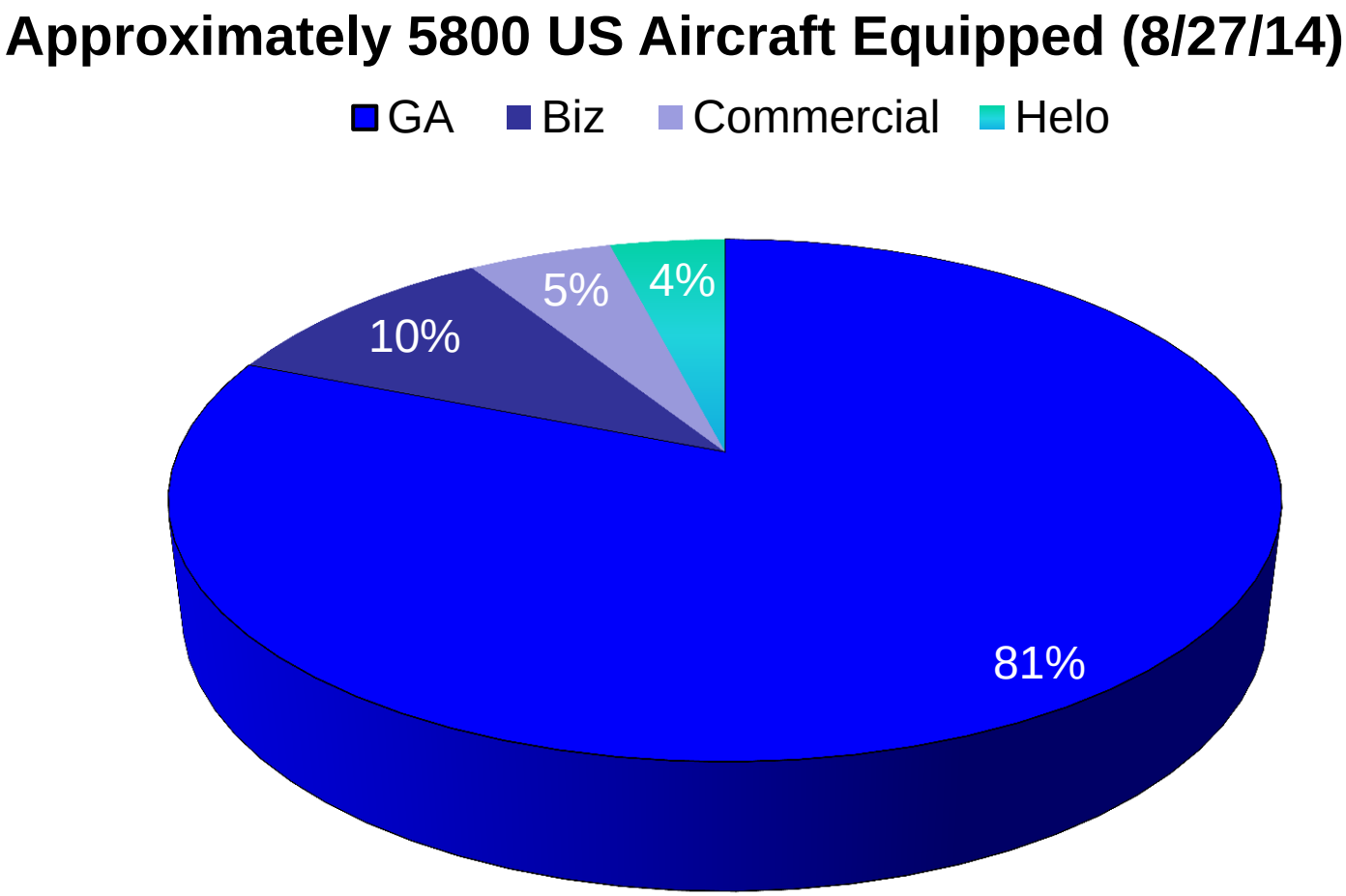
- **Policy Memo allows for field approvals under specified conditions.**
  - Released October 10, 2012
  - ADS-B Installation Policy Memorandum can be found on the FAA Regulatory and Guidance Website. (http://rgl.faa.gov/Regulatory_and_Guidance_Library/rgPolicy.nsf/0/A80D6DB0C3EE5ABA86257A940057FAC8?OpenDocument&Highlight=ads-b)

Conditions For Field Approvals cont.

- **In order to obtain a field approval the applicant must ensure:**
  - The installation is performed in accordance with the equipment manufacturer's installation guidance.
  - The installation is performed in accordance with AC 20-165A Chapter 3 and 4.
  - All other aspects of the installation qualify for installation under 14 CFR part 43.

- **The ADS-B Installation policy memo released 10-10-2012 supersedes all previous versions.**

Equipage Update



FAA-Approved V2 ADS-B Out Avionics, 1 of 3

as of 28-Aug-2014

** multiple STC dates; only earliest shown*

Surveillance Manufacturer	Model #	Approved Position Source(s)	Aircraft	Approval Date	AML Approved
Exelis / FreeFlight	FDL-978-TXG		VEHICLE	May 2012	Massport
ACSS	XS-950	RCI GLU-920 , RCI GLU-925	B767, B747, A300, MD11	STC Jan 2012*	Yes
Honeywell	XS-852	CMC CMA-4024-1 SBAS	Embraer 145, Learjet 45, Hawker 800, and Citation X	Jan 2012	No
Trig-Avionics	TT-31	FreeFlight WAAS 1201 Accord Technology NexNav™ Mini Garmin GNS 430W/530W	Mooney M20B-M20G, M20J & M20K	STC May 2012*	Yes
FreeFlight	FDL-978-TX	FreeFlight WAAS 1201	Agusta Westland 139 Cessna 172S	STC Jun 2012*	No Yes
ACSS	XS-950	RCI GLU-920 (A320), Thales TLS755-01-0101A/0102B (A330)	A320, A330	STC Jul 2012*	No
Honeywell	ISP-80A.1	Honeywell ADIRU Part#'s HG2030BE02, BE03 or BE04	A380	EASA TC Jul 2012	Yes via Production
Trig-Avionics	TT-22	FreeFlight WAAS 1201	King Air C-90A, Aviat/Pitts (aerobatic) S-76A/B/C (all variants)	STC Nov 2012*	No (King Air) Yes (Aviat/Pitts) No (S-76x)

Note: "N/A" indicates equipment has received TSOA, but has not received any other certification

FAA-Approved V2 ADS-B Out Avionics, 2 of 3

as of 28-Aug-2014

** multiple dates; only earliest shown*

Surveillance Manufacturer	Model #	Approved Position Source(s)	Aircraft	Approval Date	AML Approved
Garmin	GDL-88 GTX-23 GTX-33x w/ES GTX-330x GTX-3000 (GTX models require appropriate S/W rev)	Garmin GTN 625/635/650, GTN 725/750, GPS 400W, GNC 420W/420AW, GNS 430W/430AW, GPS 500W/530W (w/ or w/o TAWS) (all require appropriate S/W rev)	King Air C-90	STC Dec 2012*	Yes
Honeywell	MRC XPDR w/ADS-B Out	CMC CMA-3024 SBAS GNSSU MK II and CMA-4024 SBAS GNSSU	Agusta Westland 139	EASA TC Feb 2013	Yes via Production
Honeywell	XS-858B Transponder, P/N 7517402-970	Honeywell GPS module (made by CMC), P/N 245-604067-100	Gulfstream 450/550	TC amendment Feb 2013	Yes via Aircraft Service Change (ASC)
Honeywell	XS-858B P/N:7017401-970	CMC GNSS/MMR, P/N: 245-604067-100	Falcon 2000EX, 2000S, F900X	Mar 2013*	No
Honeywell	XS-858B P/N:7017401-970	Honeywell GNSS/MMR VIDL-G, P/N: 7026208-804	Falcon F7X	Apr 2013	No
NavWorx	ADS600-B	Accord Technology NexNav™ Mini GPS unit	Cessna	STC Jun 2014	Yes

Note: "N/A" indicates equipment has received TSOA, but has not received any other certification

FAA-Approved V2 ADS-B Out Avionics, 3 of 3

as of 28-Aug-2014

** multiple dates; only earliest shown*

Surveillance Manufacturer	Model #	Approved Position Source(s)	Aircraft	Approval Date	AML Approved
FreeFlight	FDL-978-XVR	FreeFlight WAAS 1201 (either external or integrated in FDL-978-XVR)	Bell-206 Fixed Wing	STC Feb 2014*	No Yes
Avidyne	AXP340	N/A	N/A	Feb 2014	No
Rockwell	TDR-94D-550	Universal UNS-1Fw	S-92A S-76C, S-92A	TC Feb 2014 STC Mar 2014*	Yes via Production No
BendixKing	KT-74	Accord NexNav™ Mini GPS unit FreeFlight WAAS 1201	M20C	STC Mar 2014	Yes
Honeywell	KXP 2290A	Honeywell KGS200	PC-12/47E	EASA TC Apr 2014	Yes via Production

Note: "N/A" indicates equipment has received TSOA, but has not received any other certification

FAA-Sponsored Projects that will result in Version 2 ADS-B Out Avionics

Surveillance Manufacturer	Model #	Planned Position Source(s)	Aircraft	Planned STC Availability	Operator
FreeFlight	FDL-978-XVR	FreeFlight WAAS 1201 (either external or integrated in FDL-978-XVR)	Rotorcraft MML	Q2 2014	Approximately 40 rotorcraft in Alaska
Rockwell	TPR 901-205	RCI GLU 925-001 RCI GLU 925-330	737-700/800/900 (aka “737NG”)	Boeing Service Bulletin Q4 2014*	United

* Boeing has provided UAL with a Service Bulletin to wire 737NG for ADS-B Version 2

All Boeing production aircraft have wiring provisions installed for ADS-B Version 2 as follows:
737NGs beginning with Line Number 4522 (YS115, 03-Jun-2013)
747-8 beginning with Line Number 1490 (RC510, 07-Oct-2013)
767 beginning with Line Number 1063 (VT558, 10-Oct-2013)
777 beginning with Line Number 1132 (WE166, 01-Aug-2013)

FAA-Approved Version 2 ADS-B In Avionics

** multiple dates; only earliest shown*

as of 28-Aug-2014

Manufacturer	Model #	Aircraft	STC Date	AML Approved
Honeywell	TPA-100B	B747-400	June 2011	No
Honeywell	TPA-100B	A330/340 A318/319/320/321	Dec 2011**	Yes via Production
ACSS	TCAS3000SP	A330/340 A318/319/320/321	Dec 2011**	Yes via Production
ACSS	TCAS3000SP	B767-300, A330	May 2012*	No
Garmin	GDL-88	King Air C-90	Dec 2012	Yes
NavWorx	ADS600-B	N/A	Jul 2013	No
FreeFlight	FDL-978-XVR	Bell 206 Fixed Wing	STC Feb 2014*	No Yes

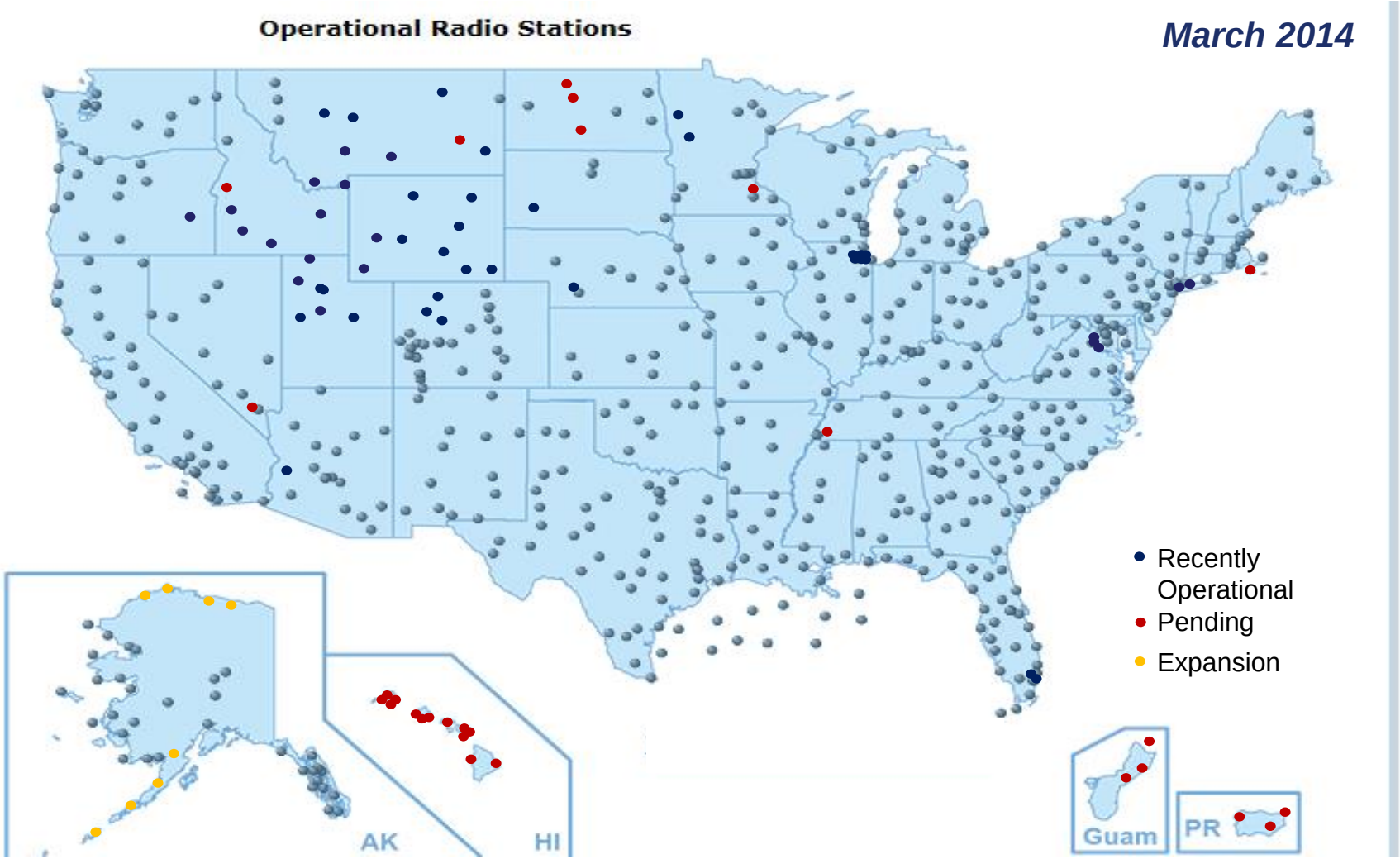
Note: "N/A" indicates equipment has received TSOA, but has not received any other certification

**Airbus ATSAW (with and without ITP) received EASA approval in May 2011 as TC amendment; all A330/340s produced since Jan 2011 and all A320s produced since mid-2011 are ATSAW/ITP-capable

FAA-Sponsored Projects that will result in Version 2 ADS-B In Avionics

Manufacturer	Model #	Aircraft	Planned STC Availability	Operator
FreeFlight	FDL-978-XVR	Rotorcraft MML	Q2 2014	Approximately 40 rotorcraft in Alaska

Implementation Status



http://www.faa.gov/nextgen/flashmap/

ADS-B Compliance Monitor (CM)

- **CM Purpose**
  - **Primary purpose is to support AFS with compliance & enforcement of §§91.225 and 91.227**
  - **Identifies ADS-B equipped aircraft performing below the requirements defined in §91.227**
  - **Also supports:**
    - Aircraft Certification test flight process for new approvals
    - Monitors ADS-B equipage growth
    - Supports avionics performance trend analysis

ADS-B Compliance Monitor (CM)

- **Organizes ADS-B data into flight operations**
  - Flight data, coverage plot, and compliance metrics available within 30-45 minutes after flight termination
- **Generates compliance reports for all ADS-B monitored operations**
- **Identifies aircraft that do not comply with equipment performance requirements in §91.227:**
  - Checks for required message elements §91.227(d):
    - Lat/long, velocity, baro & geo alt, Mode 3/A, Flight ID, ICAO 24-bit address, Emitter Category, Length/Width code, etc
  - Checks integrity & accuracy of positioning §91.227(c): :
    - Compliant NIC, NACp, NACv, SIL, SDA
    - Uses service provider's independent validation information to identify potential problems

ADS-B Compliance Monitor (CM)

- **Performs reasonableness checks (Kinematics) on position, velocity, altitude**
- **Identifies Flight ID, Mode 3/A, and Mode S address mismatches**
- **Accumulates ADS-B Out/In equipage data**

Post Installation Performance Statistics

- **Approximately 20% (≈1150) of rule equipped aircraft are not fully compliant to §91.227 equipment performance requirements**

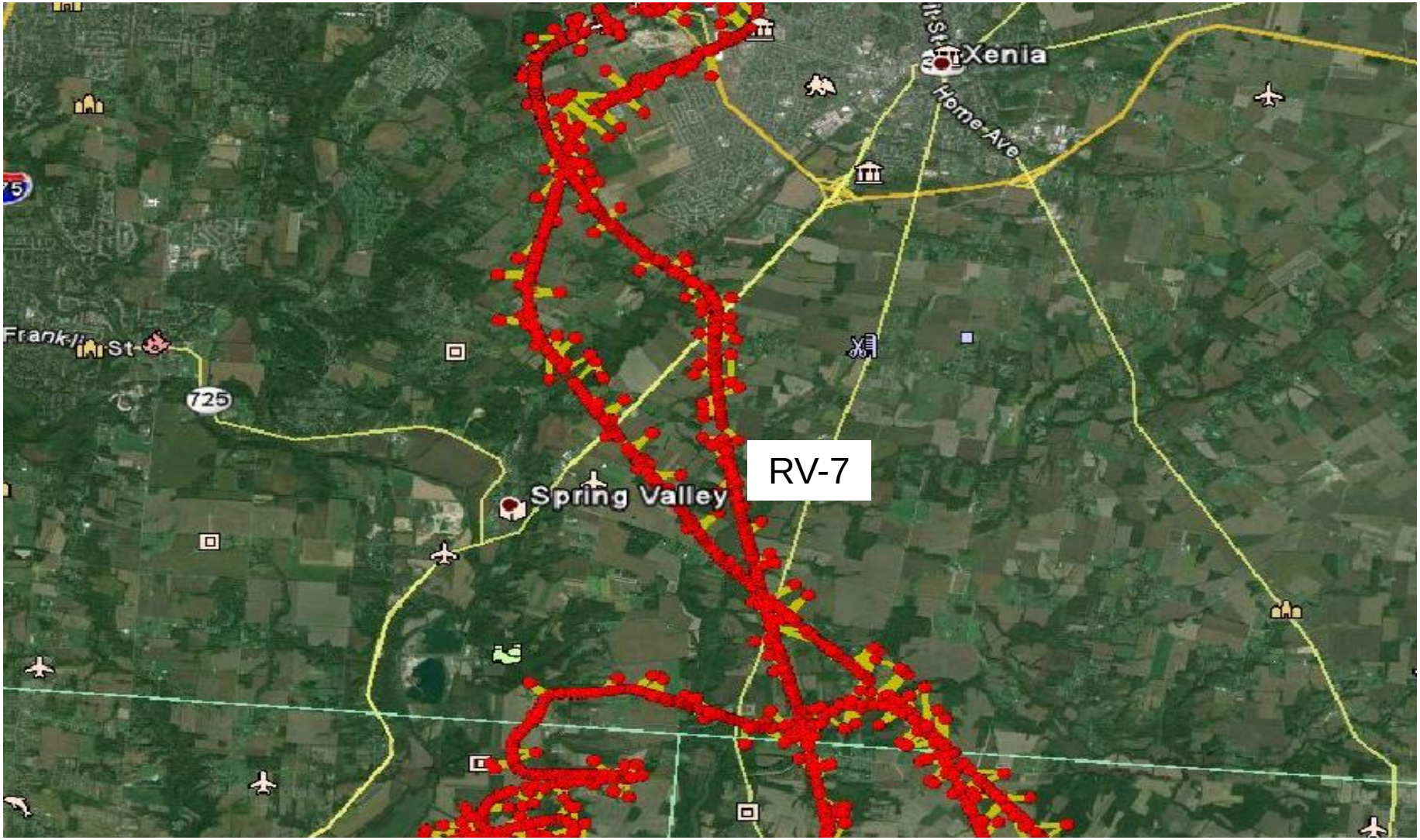
Common Causes for Non-Compliance

- **Mode 3/A issues, no transmit or UAT code disagrees with transponder code**
  - Majority are GDL 88s with UAT Call Sign ID Logic disabled
- **Software compatibility**
  - Can cause multiple issues including non-compliant SIL/SDA/NIC/NACp/NACv
  - Ensure transmitter & GPS software are at correct version level following installation.
- **Emitter category**
  - High number of “Light” aircraft (<15,500 lbs.) are configured to transmit as “Small >15,500 lbs.
  - Emitter Category 6 (High Performance) specified for Fighters.

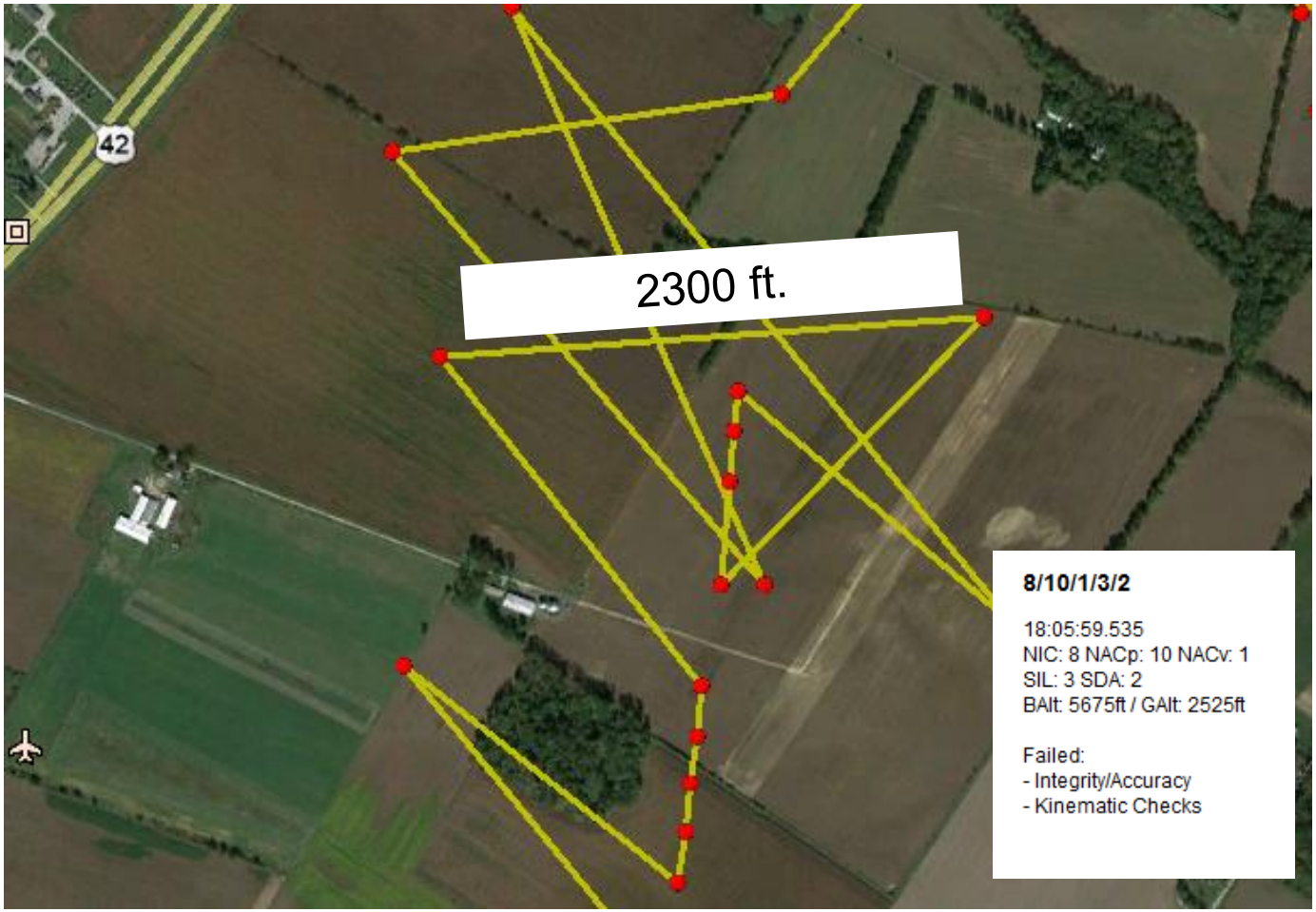
Common Causes for Non-Compliance

- **Baro/Geo drop/spike**
  - No common fault identified
- **Mode S address errors**
  - Results in “No Data Found” when requesting CM report for specific N-number
  - Errors with initial configuration, Owner/N-number change
- **Missing Flight ID**
  - Not entered during initial system configuration or not entered by pilot on subsequent flights

Software Compatibility



Software Compatibility



Baro/Geo Altitude Spikes

Rule	Missing Ele	Int & Acc	Kinematics	Other Chks

NIC	NACp	NACv	SIL	SDA

Missing Elements

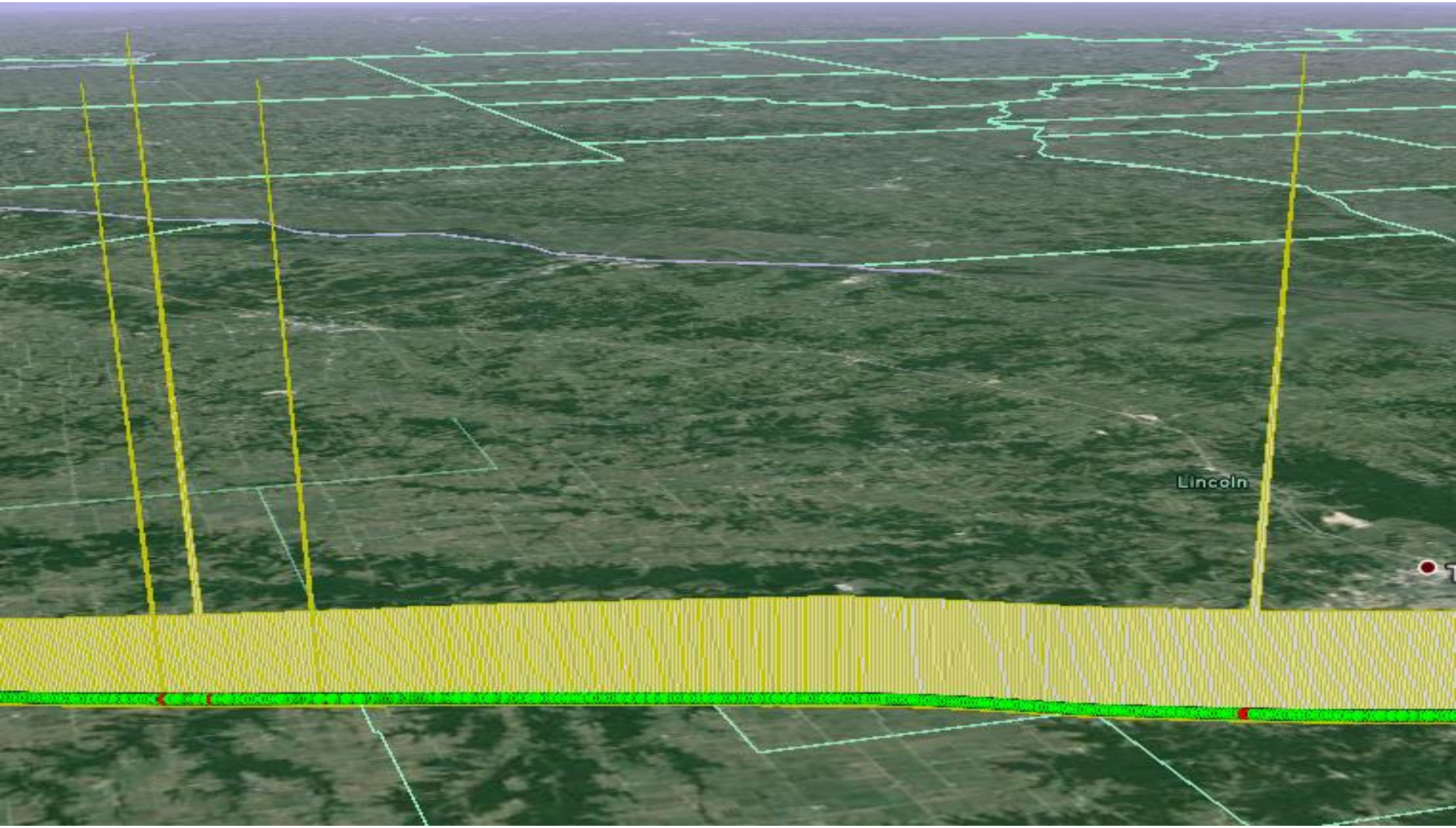
Integrity & Accuracy

Kinematics

	Baro Alt	Baro Alt Δ	Geo Alt	Geo Alt Δ	Velocity	Position Δ
% Fail	0.00%	1.09%	0.02%	1.31%	0.00%	0.00%
MCF	0	2	1	4	0	0

Other

Baro/Geo Altitude Spikes



Aircraft Reporting Wrong ICAO Addresses

http://registry.faa.gov/aircraftinquiry/

Aircraft Reporting Wrong ICAO Addresses

FAA REGISTRY

N-Number Inquiry Results

N3642 is Assigned

Data Updated each Federal Working Day at Midnight

Aircraft Description			
Serial Number	6466	**Status**	Valid
Manufacturer Name	Alex Rodriguez	**Certificate Issue Date**	11/04/1998
Model	JR ACE	**Expiration Date**	10/31/2015
Type Aircraft	Fixed Wing Single-Engine	**Type Engine**	Reciprocating
Pending Number Change	None	**Dealer**	No
Date Change Authorized	None	**Mode S Code (base 8 / oct)**	51016706
MFR Year	1985	**Mode S Code (base 16 / hex)**	A41DC6
Type Registration	Individual	**Fractional Owner**	NO

Mode S Code (base 16 / hex)	A41DC6

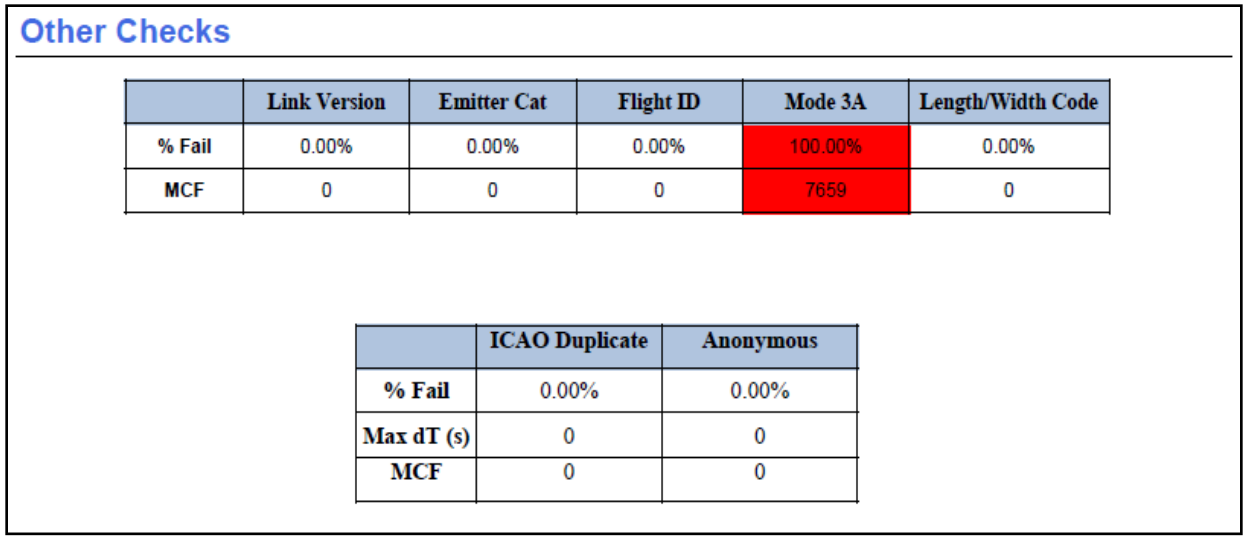
Common UAT/1090 Installation Issues

- **The majority of compliance failures that we have seen thus far have been caused by improper configuration of the equipment.**
- **There are two transponder settings and one UAT setting that are frequently misconfigured.**
- **The incorrect settings usually result in a 100% failure rate of one of the performance criteria, and hence are easy to identify.**

This content provided by: Garmin

GDL 88 UAT Call Sign ID Logic Configuration

- **The GDL 88 Call Sign ID Logic must be enabled, allowing the pilot-entered Mode 3/A Code to be transmitted to FAA ground stations. If not enabled, the FAA-provided *ADS-B Aircraft Operation Compliance Report* will indicate a Mode 3/A failure of 100%* in the 'Other Checks' section on Page 3 of the report:**



Other Checks

	Link Version	Emitter Cat	Flight ID	Mode 3A	Length/Width Code
% Fail	0.00%	0.00%	0.00%	100.00%	0.00%
MCF	0	0	0	7659	0

	ICAO Duplicate	Anonymous
% Fail	0.00%	0.00%
Max dT (s)	0	0
MCF	0	0

*In dual band installations (GDL 88 UAT plus GTX w/ES transponder), failure may be only 50%.

This content provided by: Garmin

GDL 88 UAT Call Sign ID Logic Configuration

- **For GDL 88 and GTN 6xx/7xx installations:**
  - The UAT Call Sign ID Logic is enabled in the GTN's Configuration Mode.
- **For other GDL 88 installations:**
  - The UAT Call Sign ID Logic is enabled using Garmin's PC Install Tool.

This content provided by: Garmin

GTX 23/33/33D/330/330D w/ES GPS Source Configuration

- **The RS-232 serial output of the Garmin GTN 6xx/7xx unit or GNS 4xxW/5xxW unit that is connected to the transponder must be configured to one of the special '+' formats in order to provide compliant GPS source data. If configured to the wrong format, the *ADS-B Aircraft Operation Compliance Report* will indicate 100% failure rates* of NIC, NACp, NACv, NIC_SVT, and NACp_SVT in the 'Integrity & Accuracy' section on Page 3 of the report:**

Integrity & Accuracy

Category	NIC	NACp	NACv	SIL	SIL Sup	SDA	NIC_SVT	NACp_SVT	Val	eVAL	eVal NIC
% Fail	100.00%	100.00%	100.00%	0.02%	0.00%	0.02%	100.00%	100.00%	0.00%	0.00%	0.00%
Max dT(s)	6128	6128	6128	1	0	1	6128	6128	0	0	0
MCF	4341	4341	4340	1	0	1	4341	4341	0	0	0

*In dual band installations (GDL 88 UAT plus GTX w/ES transponder), failure may be only 50%.

This content provided by: Garmin

GTX 23/33/33D/330/330D w/ES
GPS Source Configuration

- **For GTX and GTN 6xx/7xx installations:**
  - Ensure that the RS-232 output that is connected to the transponder is set to one of the following:

    ADS-B+ **GTX Mode S+ #1/#2**

    GTX w/TIS+ #1/#2 **Panel GTX w/TIS+ #1/#2**

- **For GTX and GNS 4xxW/5xxW installations:**
  - Ensure that the RS-232 output that is connected to the transponder is set to the ‘ADS-B OUT +’ format.

This content provided by: Garmin

GTX 23/33/33D/330/330D w/ES
GPS Integrity Configuration

- The transponder GPS Integrity configuration setting must be 1E-7 when the transponder is connected to a GTN 6xx/7xx unit or a GNS 4xxW/5xxW unit. If configured to the wrong setting, the *ADS-B Aircraft Operation Compliance Report* will indicate SIL with a 100% failure rate* in the 'Integrity and Accuracy' section on Page 3 of the report:

Integrity & Accuracy

Category	NIC	NACp	NACv	SIL	SIL Sup	SDA	NIC_SVT	NACp_SVT	Val	eVAL	eVal NIC
% Fail	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Max dT(s)	0	0	0	6248	0	0	0	0	0	0	0
MCF	0	0	0	6182	0	0	0	0	0	0	0

*In dual band installations (GDL 88 UAT plus GTX w/ES transponder), failure may be only 50%.

This content provided by: Garmin

GTX 23/33/33D/330/330D w/ES
GPS Integrity Configuration

- **For panel-mounted GTX 330/330D w/ES units:**
  - Set GPS Integrity to 1E-7 in the unit configuration mode.

- **For remote-mounted GTX 33/33D w/ES units controlled by a GTN 6xx/7xx:**
  - Set GPS Integrity to 1E-7 on the transponder settings page in the GTN configuration mode.

- **For remote-mounted GTX 23/33/33D w/ES units controlled by a G3X display:**
  - Set GPS Integrity to 1E-7 on the remote transponder configuration page in the G3X configuration mode.

This content provided by: Garmin

GTX 23/33/33D/330/330D w/ES
GPS Integrity Configuration

- **Ensure the connected GPS source has the correct software revision:**
- **GTN 6xx/7xx: Main SW v3.00 or later and WAAS SW v5.0 or later.**
- **GNS 4xxW/5xxW: Main SW 5.03 or later and WAAS SW v5.0 or later.**

This content provided by: Garmin

When is a Failure not a Failure?

- **The FAA-provided *ADS-B Aircraft Operation Compliance Report* may highlight failures of 0.1% - 2.0% in red. These seem to be related to brief data dropouts due to maneuver induced antenna shading. These are not *real* failures.**

Category	NIC	NACp	NACv	SIL	SIL Sup	SDA	NIC_SVT	NACp_SVT	Val	eVAL	eVal NIC
% Fail	0.11%	0.01%	0.00%	0.00%	0.00%	0.00%	0.11%	0.01%	0.00%	0.93%	0.93%
Max dT(s)	17	1	0	0	0	0	17	1	0	139	139
MCF	17	1	0	0	0	0	17	1	0	139	139

This content provided by: Garmin

When is a Failure not a Failure?

- **If the transponder is placed in a non altitude reporting mode (ON) during the flight, the FAA report will show a missing Baro Alt failure and likely an integrity failure.**

Missing Elements

Category	NACp	NACv	Vel	Baro Alt	Geo Alt	Flight Id	Mode 3A	Emit Cat	Len/Wth
% Fail	0.00%	0.00%	0.03%	1.13%	0.03%	0.00%	0.00%	0.00%	0.00%
Max dT(s)	0	0	2	677	2	0	0	0	0
MCF	0	0	1	21	1	0	0	0	0

Integrity & Accuracy

Category	NIC	NACp	NACv	SIL	SIL Sup	SDA	NIC_SVT	NACp_SVT	Val	eVAL	eVal NIC
% Fail	1.27%	0.03%	0.00%	0.00%	0.00%	0.00%	1.27%	0.03%	0.00%	0.26%	0.26%
Max dT(s)	677	1	0	0	0	0	677	1	0	9	9
MCF	23	1	0	0	0	0	23	1	0	9	9

This content provided by: Garmin

Experimental and Amateur Built Aircraft

- **Use of uncertified transmitter or GPS on experimental amateur built (e-AB) or experimental light sport aircraft (e-LSA).**
  - Equipment meets the requirements of TSO-C166b or TSO-C154c.
  - Per FAA policy SIL/SDA must be set to zero to prevent data of unknown integrity/accuracy from interacting with ADS-B In equipped aircraft and ATC.
  - SIL/SDA of zero still allows use of FAA ADS-B traffic (TIS-B) and weather (FIS-B) services.

Example Compliance Report

U.S. Department of Transportation
Federal Aviation Administration
ADS-B Compliance Monitor

ADS-B Aircraft Operation Compliance Report

ICAO: A5BEC0 (51337300) **Tail Number:** N47 **Flight Id:** N47

Period: 08-28-2014 13:05:08 to 08-28-2014 14:03:29

Aircraft: 2005 - BOMBARDIER INC BD-700-1A11
Year - Make / Model

Non-Compliance Issues Identified

Items high-lighted in red within this report indicate the ADS-B Out system installed on this aircraft failed to meet the corresponding performance requirement as specified in § 91.227. The owner/operator must take corrective action and verify ADS-B Out system performance prior to operation of this aircraft in the airspace specified in § 91.225. Requests for authorization to deviate from 91.225 to support movement of the aircraft to effect ADS-B Out system repairs and testing may be made to the appropriate ATC facilities per §91.225(g).

- ☑ **Required Message Elements Checks**
- ☑ **Integrity And Accuracy Checks**
- ☐ **Kinematics Checks**
- ☐ **Other Checks**

Prepared For Owner of Record:

FEDERAL AVIATION ADMINISTRATION
WILLIAM J HUGHES TECHNICAL CENTER
FLIGHT PROGRAM-BLDG 301 HANGAR
ATLANTIC CITY, NJ 08405-0001

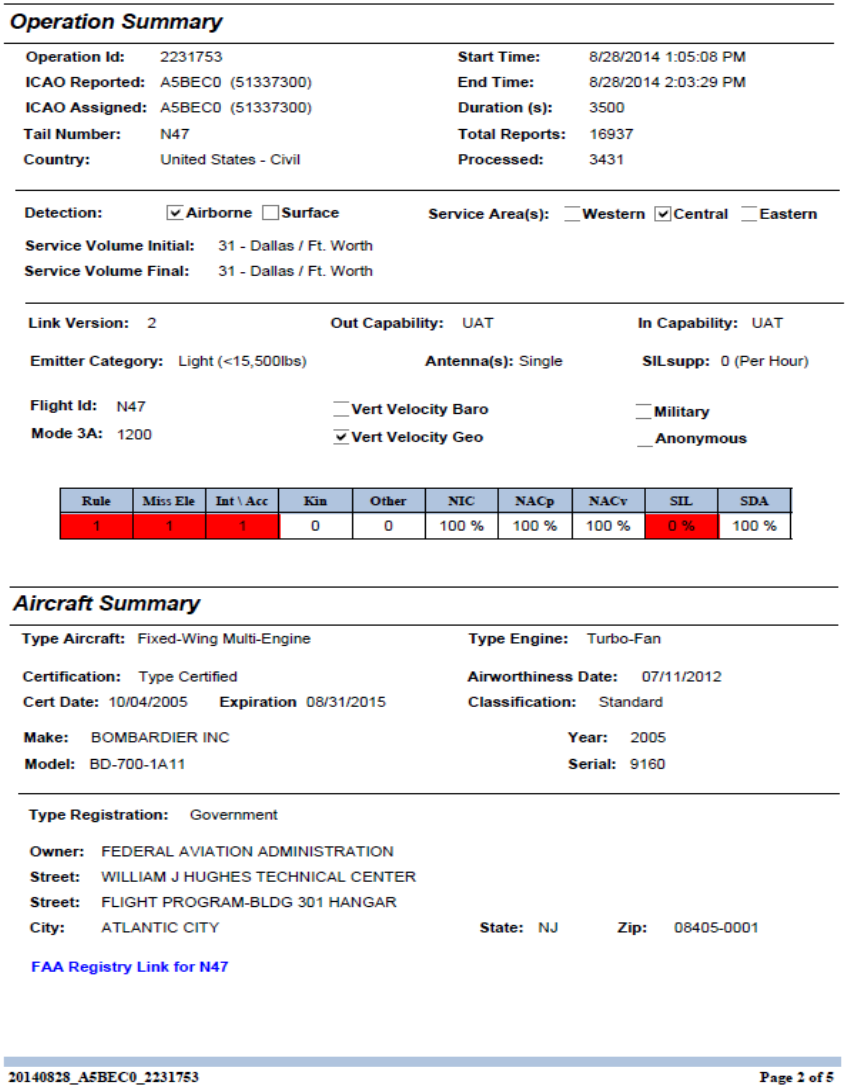
Prepared By

Surveillance and Broadcast Services (SBS) Program
ADS-B Compliance Monitor

August 28, 2014

20140828_A5BEC0_2231753 Page 1 of 5

Example Compliance Report



Operation Summary

Operation Id:	2231753	**Start Time:**	8/28/2014 1:05:08 PM
ICAO Reported:	A5BEC0 (51337300)	**End Time:**	8/28/2014 2:03:29 PM
ICAO Assigned:	A5BEC0 (51337300)	**Duration (s):**	3500
Tail Number:	N47	**Total Reports:**	16937
Country:	United States - Civil	**Processed:**	3431

Detection: ☑ Airborne ☐ Surface **Service Area(s):** ☐ Western ☑ Central ☐ Eastern

Service Volume Initial: 31 - Dallas / Ft. Worth
Service Volume Final: 31 - Dallas / Ft. Worth

Link Version: 2 **Out Capability:** UAT **In Capability:** UAT

Emitter Category: Light (<15,500lbs) **Antenna(s):** Single **SILsupp:** 0 (Per Hour)

Flight Id: N47 ☐ Vert Velocity Baro ☐ Military
Mode 3A: 1200 ☑ Vert Velocity Geo ☐ Anonymous

Rule	Miss Ele	Int \ Acc	Kin	Other	NIC	NACp	NACv	SIL	SDA
1	1	1	0	0	100 %	100 %	100 %	0 %	100 %

Aircraft Summary

Type Aircraft: Fixed-Wing Multi-Engine **Type Engine:** Turbo-Fan

Certification: Type Certified **Airworthiness Date:** 07/11/2012
Cert Date: 10/04/2005 **Expiration** 08/31/2015 **Classification:** Standard

Make: BOMBARDIER INC **Year:** 2005
Model: BD-700-1A11 **Serial:** 9160

Type Registration: Government

Owner: FEDERAL AVIATION ADMINISTRATION
Street: WILLIAM J HUGHES TECHNICAL CENTER
Street: FLIGHT PROGRAM-BLDG 301 HANGAR
City: ATLANTIC CITY **State:** NJ **Zip:** 08405-0001

FAA Registry Link for N47

20140828_A5BEC0_2231753 Page 2 of 5

Example Compliance Report

Missing Elements

Category	NACp	NACv	Vel	Baro Alt	Geo Alt	Flight Id	Mode 3A	Emit Cat	Len/Wth
% Fail	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Max dT(s)	0	0	0	3440	0	0	0	0	0
MCF	0	0	0	3431	0	0	0	0	0

Integrity & Accuracy

Category	NIC	NACp	NACv	SIL	SIL Sup	SDA	NIC_SVT	NACp_SVT	Val	eVAL	eVal NIC
% Fail	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	2.30%	0.00%	0.00%
Max dT(s)	0	0	0	3440	0	0	0	0	22	0	0
MCF	0	0	0	3431	0	0	0	0	22	0	0

Category	NIC	NACp	NACv	SIL	SDA
Avg	8.0	9.0	3.0	0.0	2.0
Min	8	9	3	0	2
Max	8	9	3	0	2

Kinematics

	Baro Alt	Baro Alt Δ	Geo Alt	Geo Alt Δ	Velocity	Position Δ
% Fail	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
MCF	0	0	0	0	0	0

Other Checks

	Link Version	Emitter Cat	Flight ID	Mode 3A	Length/Width Code
% Fail	0.00%	0.00%	0.00%	0.00%	0.00%
MCF	0	0	0	0	0

	ICAO Duplicate	Anonymous
% Fail	0.00%	0.00%
Max dT (s)	0	0
MCF	0	0

Notes:
MCF - Maximum Consecutive Failures

Example Compliance Report

Distributions

NIC - Horizontal Containment Bound

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Unkn	< 20NM	< 8NM	< 4NM	< 2NM	< 1NM	< .6NM	< .2NM	< .1NM	< 75m	< 25m	< 7.5m	XXX	XXX	XXX	XXX
0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
0	0	0	0	0	0	0	0	3431	0	0	0	0	0	0	0

NACp - 95% Horizontal Accuracy Bound (EPU)

NA	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	≥ 10NM	< 10NM	< 4NM	< 2NM	< 1NM	< .5NM	< .3NM	< .1NM	< .05NM	< 30m	< 10m	< 3m	XXX	XXX	XXX	XXX
0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
0	0	0	0	0	0	0	0	0	0	3431	0	0	0	0	0	0

NACv - 95% Horizontal Velocity Error

NA	0	1	2	3	4	5	6	7
	≥ 10m/s	< 10m/s	< 3m/s	< 1m/s	< .3m/s	Reserved	Reserved	Reserved
0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%
0	0	0	0	0	3431	0	0	0

SIL - Source Integrity Level

0	1	2	3
> 1x10-3	≤ 1x10-3	≤ 1x10-5	≤ 1x10-7
100.0%	0.0%	0.0%	0.0%
3431	0	0	0

SILs - SIL Supplement

0	1
/Hour	/Sample
100.0%	0.0%
3431	0

SDA -System Design Assurance

0	1	2	3
> 1x10-3	≤ 1x10-3	≤ 1x10-5	≤ 1x10-7
0.0%	0.0%	100.0%	0.0%
0	0	3431	0

GVA - Geometric Velocity Accuracy

0	1	2	3
>150m	≤ 150m	≤ 45m	Reserved
0.0%	0.0%	100.0%	0.0%
0	0	3431	0

Example Compliance Report

Validation

0	1	2	3
Unknown	Invalid	Reserved	Valid
0.0%	2.3%	0.0%	97.7%
0	79	0	3352

Enhanced Validation

0	1	2	3
Unknown	Invalid	Reserved	Valid
100.0%	0.0%	0.0%	0.0%
3431	0	0	0

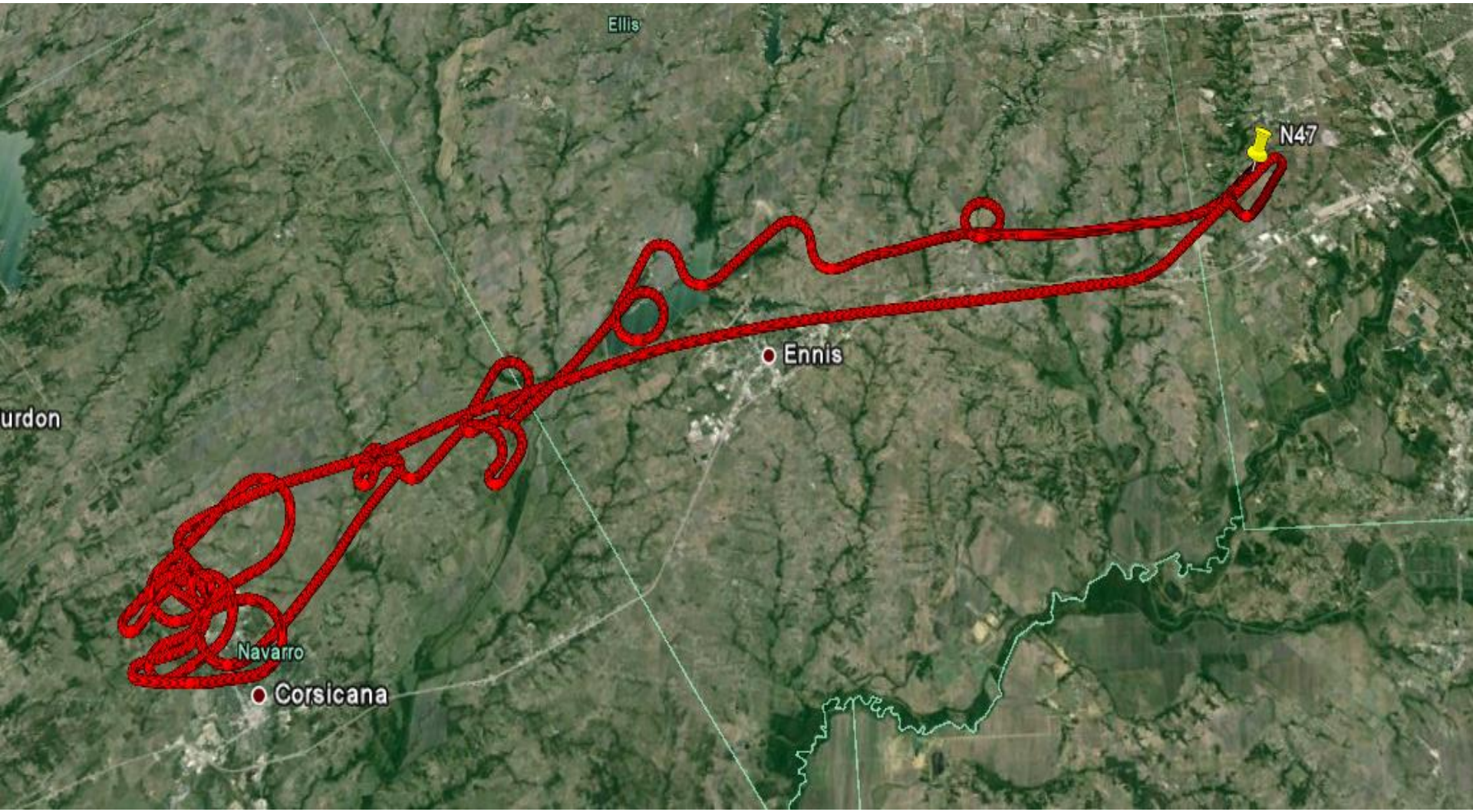
NIC Baro

0	1	2	3
Not XCheck	X Check	Reserved	Reserved
100.0%	0.0%	0.0%	0.0%
3431	0	0	0

SQL - Signal Quality Level

Category	0	1	2	3	4	5	6	7
1090 ES	≤ -90dBm	≤ -87dBm	≤ -84dBm	≤ -81dBm	≤ -78dBm	≤ -72dBm	≤ -66dBm	> -66dBm
UAT	≤ -96dBm	≤ -93dBm	≤ -90dBm	≤ -87dBm	≤ -84dBm	≤ -78dBm	≤ -72dBm	> -72dBm
	0.8%	1.1%	3.0%	5.5%	10.0%	40.2%	27.0%	12.5%
	27	38	103	189	342	1378	925	429

Example Compliance Report



Corrective Actions

- **AIR in conjunction with SBS and AFS will be working to educate the public on ADS-B**
  - Seminars/briefings @ trade & industry events
  - Coordination of related articles in trade & industry publications

- **ADS-B Avionics Check**
  - 9-AWA-AFS-300-ADSB-AvionicsCheck@faa.gov

- **Investigate compliance issues**
  - Operators and installers contacted by AFS
  - Manufacturers contacted by AIR

Alex Rodriguez

FAA AIR-130

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