

ADS-B Installation Challenges

July 13, 2017

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Federal Aviation
Administration



Agenda

- **ADS-B Out Mandate Equipage Enablers**
- **Installation Challenges**
- **Rule Performance Monitoring**
- **Common Installation & Performance Issues**
- **Backup Slides**

ADS-B Out Mandate Equipage Enablers

- March 2, 2016 AVS [Policy Memo](#) allows broader use of approved ADS-B Out transmitter/GPS pairing data on non-AML aircraft
- Revised process to streamline avionics certification projects (No PNL)
- [Policy Memo](#) to address impact of ADS-B Out equipage on RVSM & TCAS II certifications

ADS-B Out Mandate Equipage Enablers

- **Tech Paper under development for additional guidance on key areas of the ADS-B Out Policy Memo & other installation considerations**
 - **Modification/approval of AFMS/RFMS**
 - **ADS-B IN approvals guidance**
 - **To be published to AFS-300 Job Aid**
- **AFS-300 Major Repair/Alteration Job Aid revisions to clarify ADS-B field approval authority**

ADS-B Out Installation Challenges

- **FAA/Industry collaboration to define policy for reduced ADS-B Out performance during aerobatic maneuvering**
- **LSA owners report limited manufacturer approvals (LOA) available for ADS-B Out installations on out-of-production aircraft**
- **Some lingering issues with approving ADS-B Out installations that include ADS-B IN functionality (to be addressed in upcoming AFS-300 Job Aid revision)**

ADS-B Out Installation Challenges

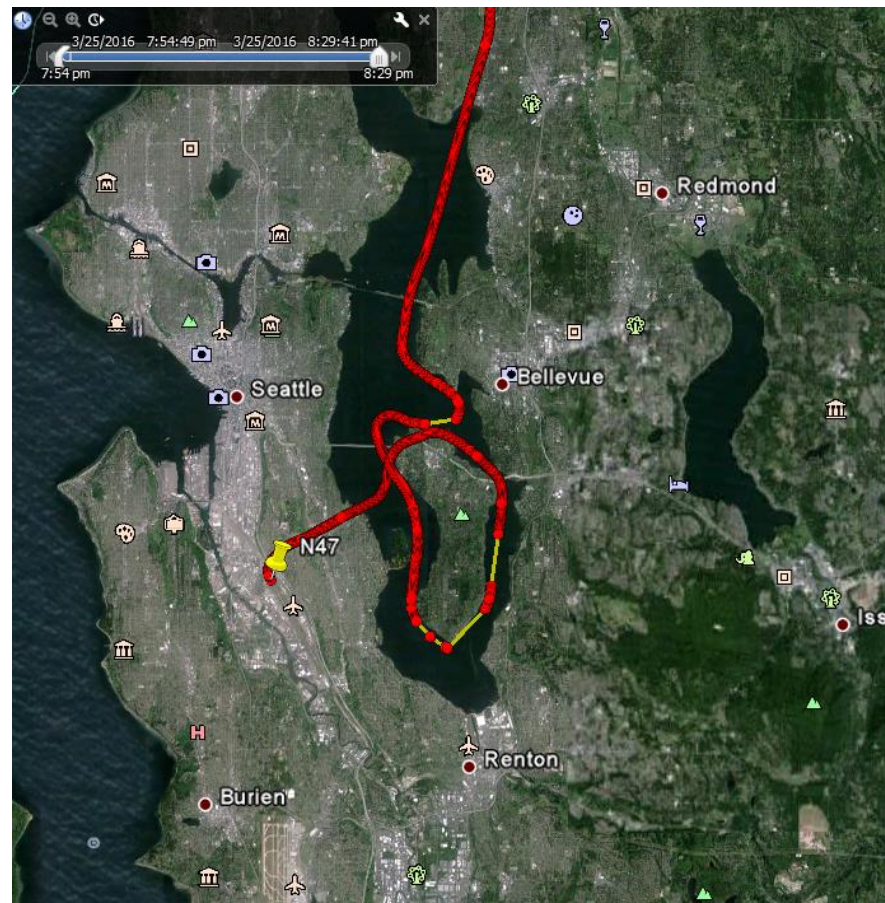
- Many calls/emails after 9 May 2017 cancellation of FAA Notice 8900.362 *National Policy for Installation of ADS-B OUT Systems*
- Notice for National Policy Memo publication was cancelled after 1 year but policy is still in effect per AVS Policy Memo available on Regulatory Guidance Library

ADS-B Out Rule Performance Monitoring

- **Rule performance monitoring via ADS-B Performance Monitor (APM) by Flight Standards ADS-B Focus Team (AFT)**
- **Supports continued compliance of rule for all ADS-B Out equipped aircraft operating in US airspace**
- **AFT coordinates with owners, operators, and repair stations to correct aircraft with non-performing equipment (NPE)**
- **FAA email account & web-based Public ADS-B Performance Report (PAPR) service established to support avionics performance verification by public**

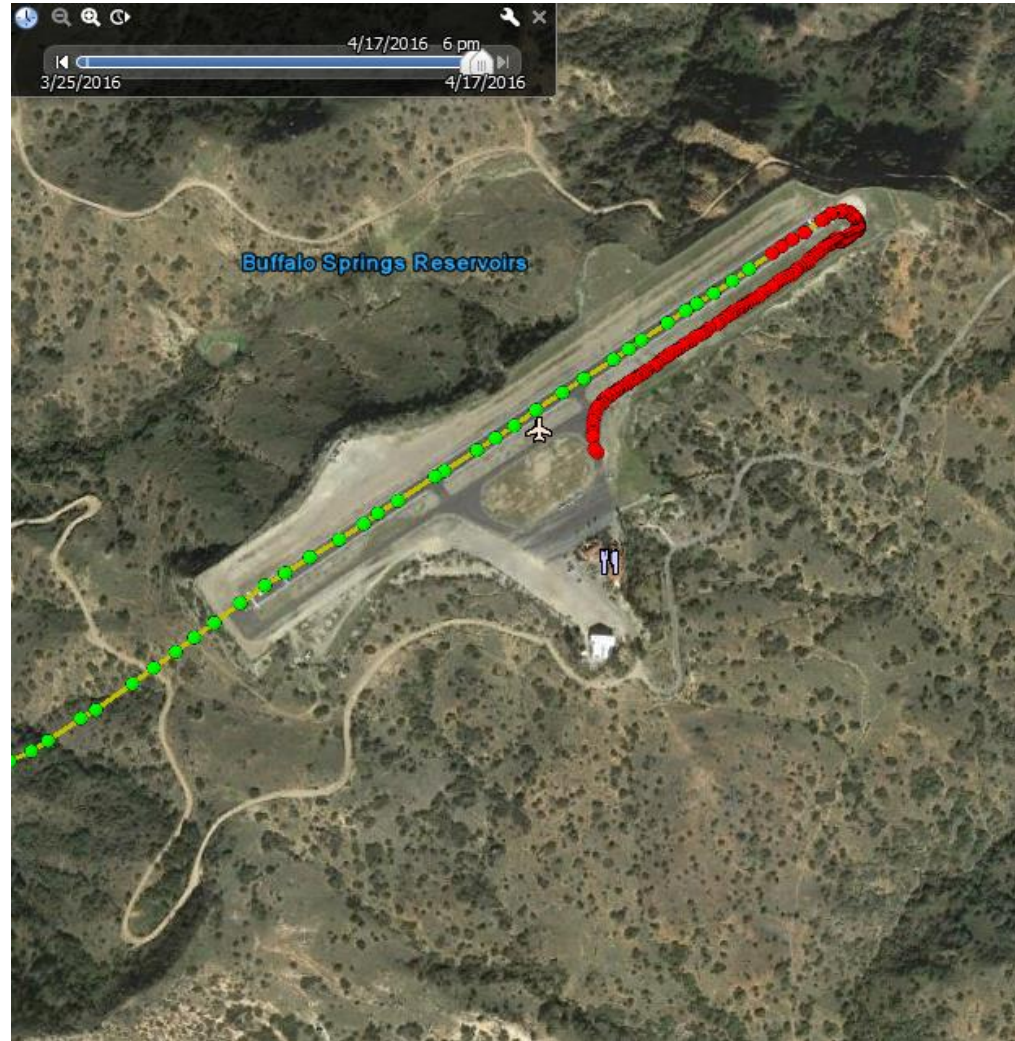
Common Installation Issues

- Invalid 24-bit ICAO addresses
 - Factory default hex codes transmitted (code not changed during installation)
 - 000000
 - 000001
 - 123456
 - A00000
 - FFFFFFFF
 - Fat-finger errors during ICAO configuration (A1234**6** vs A1234**5**)
 - Reports of avionics not retaining configuration settings after power cycle
 - Hazardous condition when two aircraft are operating in same ATC area & transmitting identical ICAO codes



Common Installation Issues

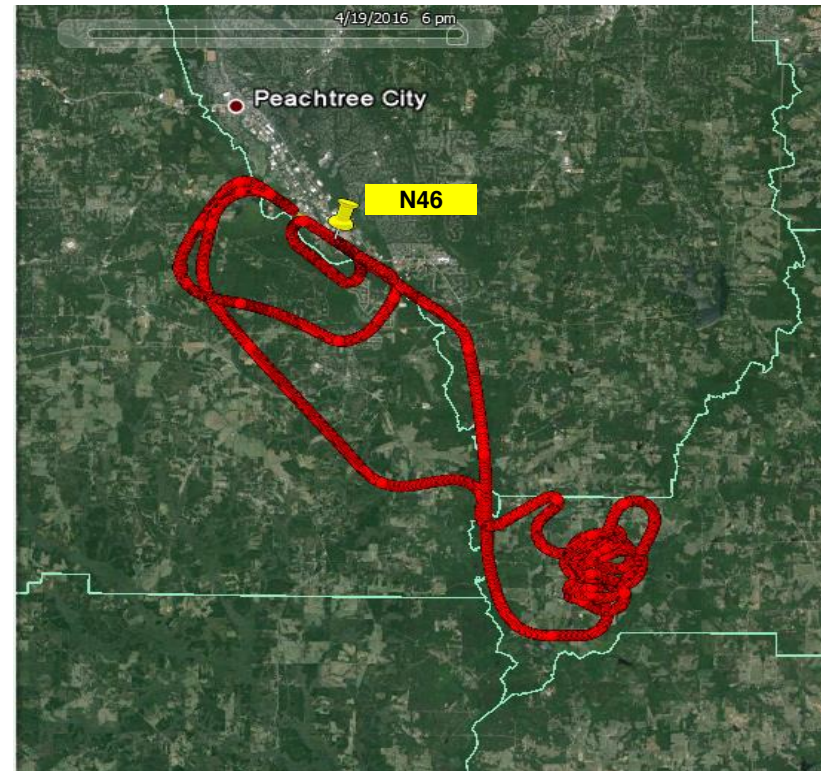
- **Air/ground determination**
 - Incorrect speed setting (GPS derived) for aircraft performance
 - Avionics initialize & remain in air mode while on surface
 - Squat switch issues
- **Some air/ground issues are due to avionics design**
- **Software updates available from some manufacturers to address certain errors**
- **FAA/Industry collaborating via special committee to improve air/ground performance**



Common Installation Issues

- **Flight Identification Code Configuration Errors (GA aircraft)**

- Transmitted Flight ID doesn't match aircraft registration number (GA aircraft)
- Spaces (e.g., N123 X)
- Blank Flight ID
- No "N"
- "N" only
- Illegal characters (e.g., N123_X)
- Fat-finger (N1234 vs N1235)



[Operation ID 42557872 Summary](#)

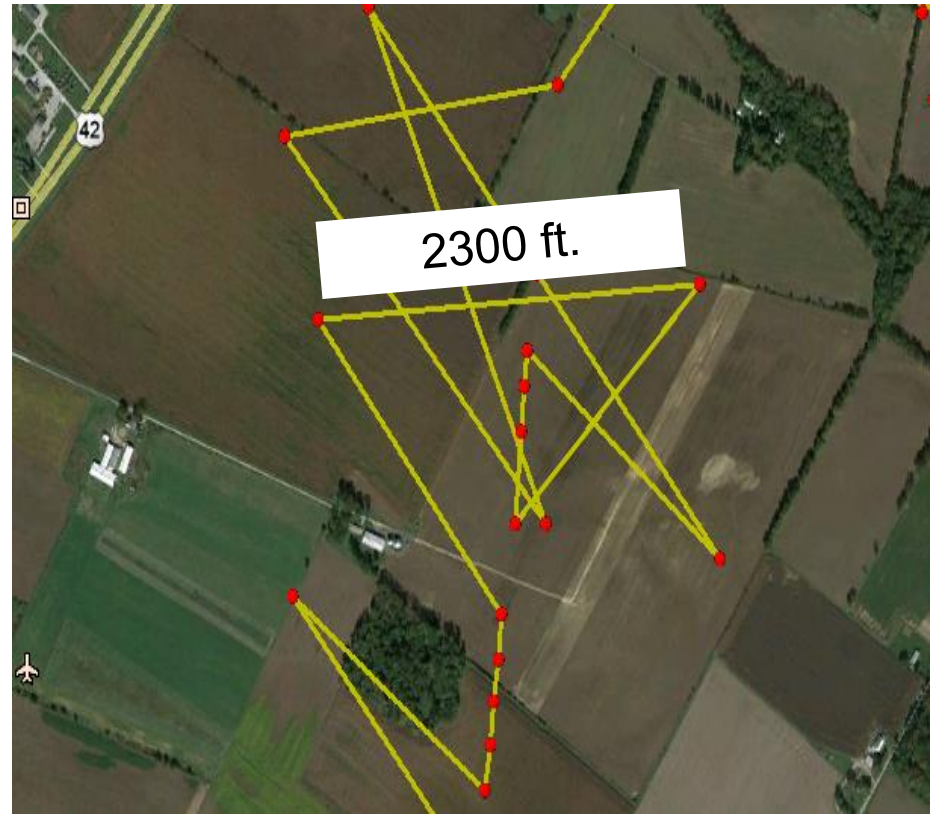
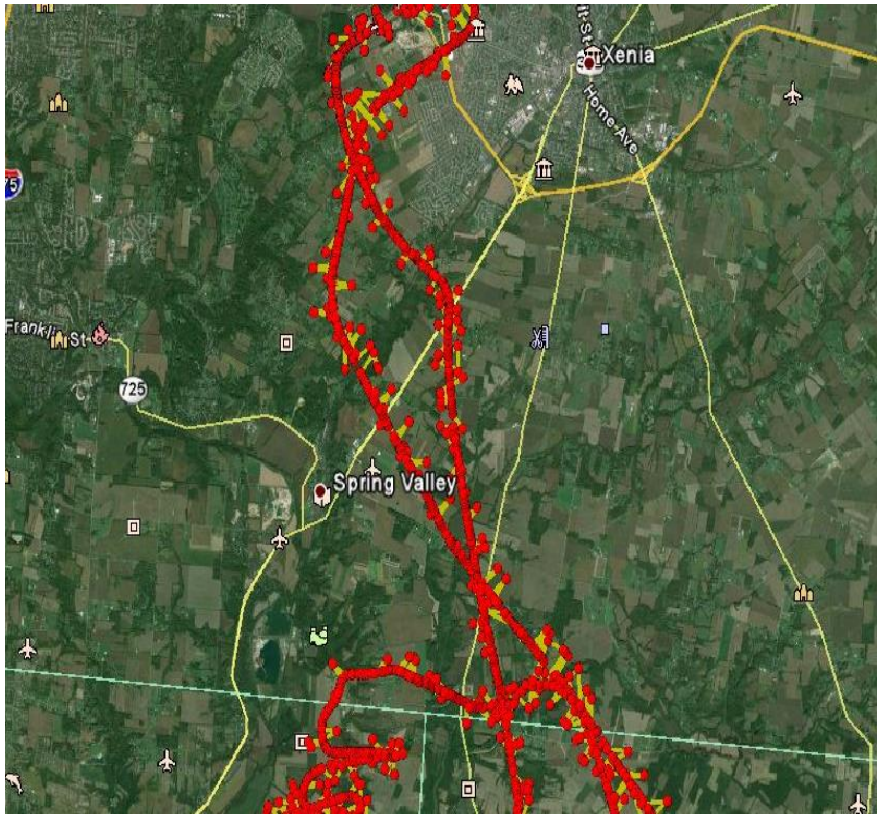
ICAO Reported			ICAO Assigned	Tail Number	Start Time	End Time	Dur	Dur-mod	Dur-rule	Reports	Best Msg
A5BEC0 (51337300)			A5BEC0 (51337300)	N47	06-29-2017 16:01:19	06-29-2017 16:28:00	00:26:40	00:24:10	00:22:49	4132	1118
Ver	OUT	IN	Country		Owner		Make	Model	Operator	Last Flight ID	
2	UAT	UAT	United States - Civil		FEDERAL AVIATION ADMINISTRATION		BOMBARDIER INC	BD-700-1A11	-	N46	
Western			Central	Eastern	Service Volume Initial		Service Volume Final		TIS-B Client %		Stationary
Yes			No	No	159 - Denver		159 - Denver		98.4%		No

Common Installation Issues

- **Mode 3/A code errors (UAT)**
 - Transponder sniffer issues (transmit of Mode 3/A code unstable or intermittent)
 - Mode 3/A code transmit function disabled (e.g., call-sign logic) at installation

Common Installation Issues

- **Positioning errors**
 - Improper component software versions



Common Installation Issues

- **Incorrect Emitter Category setting (aircraft type/weight/performance)**
- **Most are “Light” aircraft (<15,500 lbs) transmitting as “Small” aircraft (15,500-75,000 lbs)**

Civil Registry:

Type Aircraft: Fixed-Wing Single Engine FAA Link	Type Engine: 4 Cycle	Engines: 1
Certification: Light Sport	Airworthiness Date: 9/23/2013	
Cert Date: 8/2/2013	Expiration: 8/31/2016	Classification: Light Sport
Make: FLIGHT DESIGN GMBH	Year: 2013	
Model: CTLS	Serial: F-12-05-04	

Air Frame:

Country: United States - Civil Emit Cat: 15 - Space/Trans-Atmospheric	SAF: 1	LWC:
SDA: 0 - Not a Certified Installation	Link Version: 2	ADS-B Out: 1090

Backup Slides



ADS-B Focus Team (AFT)

- **ADS-B Focus Team (AFT) established January 28, 2015**
- **Chartered to “foster consistency in the interpretation and application of related regulations, policy, and guidance to achieve and sustain a high level of efficiency within AFS during ADS-B Out mandate equipage.”**
- **Team comprised of Avionics Safety Inspectors and Aviation Analysts**
- **Primary responsibilities:**
 - **Monitor compliance of ADS-B Out rule performance requirements**
 - **Coordinate resolution of non-compliant avionics**
 - **Mitigate equipage barriers**
 - **Outreach**

Additional ADS-B Policy & Guidance

- **Advisory Circulars**

rgl.faa.gov

- **AC 90-114A Change 1, ADS-B Operations**

- Provides guidance and information on ADS-B Out in accordance with 14 CFR 91.225 and 91.227. No OPS approval is required for ADS-B Out.

- **AC 20-165B, Airworthiness Approval of ADS-B Out Systems**

- Addresses installation and certification barriers identified through Equip2020.

- **AC 20-172B, Airworthiness Approval of ADS-B In Systems and Applications**

- Provides installation guidance for ADS-B In systems and applications

ADS-B Performance Monitor (APM)

- **AFT APM Functions & Capabilities:**
 - **Collects performance data on all ADS-B Out operations in US airspace**
 - **Mandate equipage & avionics performance tracking**
 - **Avionics & Repair Station (RS) Registry**
 - Associates ADS-B avionics equipage (transmitter/GPS make/model) to each aircraft
 - Associates installer (RS ID or A&P #) to each aircraft
 - **ADS-B Trend Analysis Tool (ATAT):**
 - Summary of avionics performance for up to last 10 flights for each ADS-B equipped aircraft monitored
 - Supports trending analysis for aircraft, avionics, installer, and other relevant areas

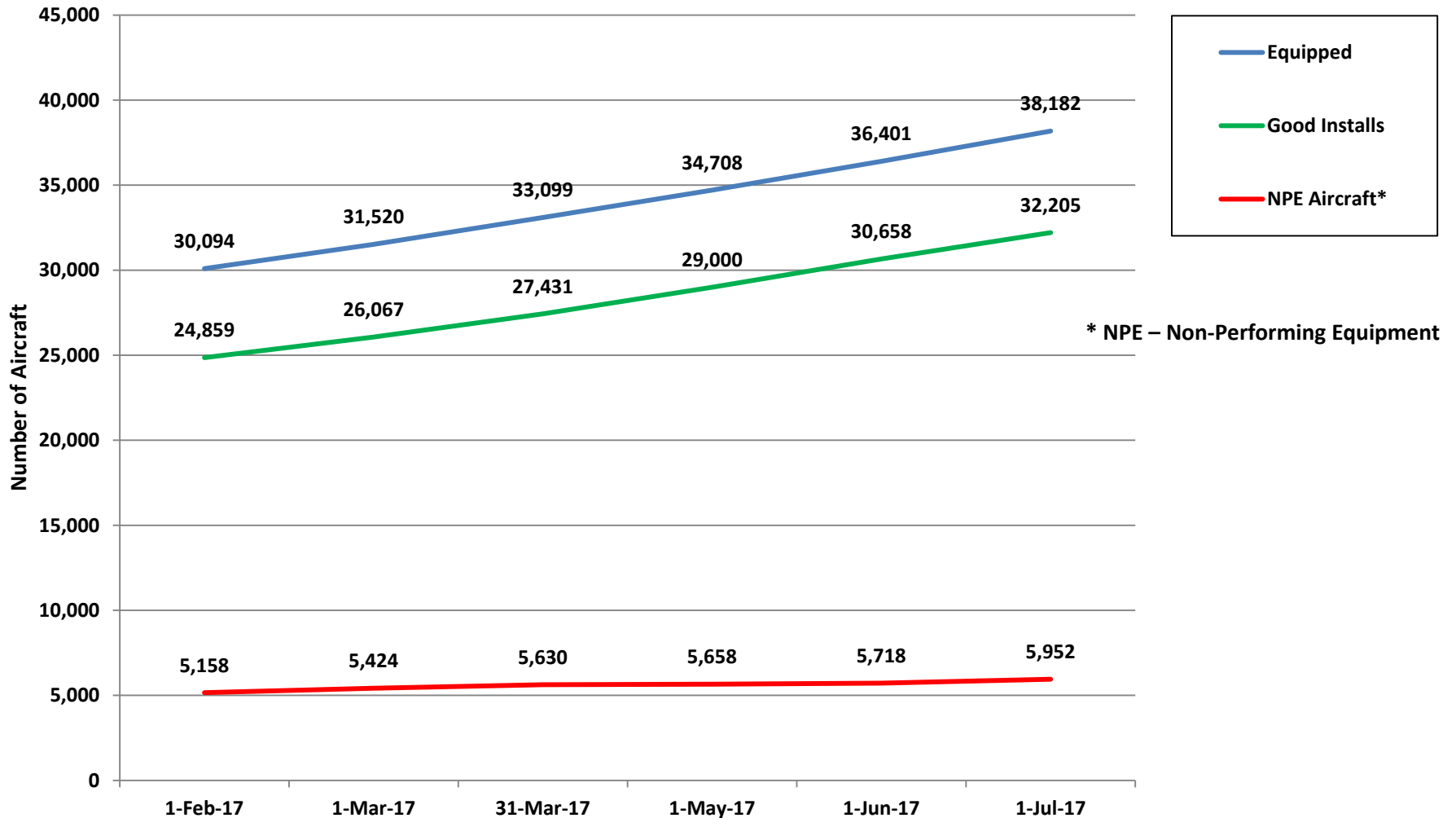
ADS-B Performance Monitor (APM)

- **Generates ADS-B Out Performance Reports to support various requirements:**
 - Internal FAA ADS-B equipage & performance reporting
 - Public ADS-B performance reports (PAPR, GAIRP)
- **Performance reports support post-installation performance & rule compliance verification**
 - Web-based PAPR: <https://adsbperformance.faa.gov/PAPRRequest.aspx>
 - Email: 9-AWA-AFS-300-ADSB-AvionicsCheck@faa.gov
- **Certification reports support ADS-B certification flight tests per AC 20-165()**
 - Email: 9-avs-air-130fltttest@FAA.gov

Equipage & Avionics Performance Chart Explanation

- **Data from ADS-B Performance Monitor - Avionics Trend Analysis Tool (ATAT)**
- **Chart Trend Line Legend:**
 - **Equipped:** Aircraft monitored in past 12 months with rule compliant avionics (1090ES and/or UAT)
 - **Good Installs:** Aircraft with avionics that meet all equipment performance requirements of 91.227
 - **Non-Performing Equipment (NPE):** Aircraft with avionics that fail to meet the equipment performance requirements of 91.227
- **Good Install/NPE assessment criteria:**
 - Required message elements transmitted?
 - Avionics comply with Integrity & Accuracy requirements?
 - Kinematics (position validation checks)?
 - Correct 24-bit ICAO address (Mode S code)?
 - Correct/Valid Flight Identification code?
- **NPE trend lines do not include aircraft with air/ground issues**

All US Aircraft Equipage & Avionics Performance



Where Can I Go For Answers?

- **FAA NextGen office Equip ADS-B website:**
<http://www.faa.gov/nextgen/equipadsb/>
- **Wide range of ADS-B topics**
 - [Rebate](mailto:ADSRebateHelp@faa.gov) (ADSRebateHelp@faa.gov)
 - [Research](#)
 - [Installations](#)
 - [Capabilities](#)
 - [FAQs](#)
 - [Resources](#)
 - [Public Performance Request Form](#)
- **AFT Contact:** adsbfocusteam@faa.gov