ADS-B Installation Challenges

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James Marks
ADS-B Focus Team Lead
FAA Flight Standards Service
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
    - FFFFFFF
  - Fat-finger errors during ICAO configuration (A12346 vs A12345)
  - 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)
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)
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
  — 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
  – 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-130flttest@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
Where Can I Go For Answers?

- FAA NextGen office Equip ADS-B website:

- Wide range of ADS-B topics
  - [Rebate](ADSBRebateHelp@faa.gov)
  - [Research](#)
  - [Installations](#)
  - [Capabilities](#)
  - [FAQs](#)
  - [Resources](#)
  - [Public Performance Request Form](#)

- AFT Contact: [adsbfocusteam@faa.gov](mailto:adsbfocusteam@faa.gov)