

ATC Modernization a Global Perspective

August 11, 2017

Jens Hennig, VP Operations

Presented to Canadian Business Aviation Association
Abbotsford, BC



General Aviation Manufacturers
Association (GAMA)

Who is GAMA?

- GAMA Represents Manufacturers of General Aviation Aircraft and Equipment
 - Business Jets
 - Turboprops
 - Piston Engine Airplanes
 - Helicopters
- Founded in 1970
- Offices is Washington, DC and Brussels, Belgium



Briefing Overview

- Communications, Navigation, and Surveillance in Select Countries and Regions around World
 - Avionics Mandates
 - Status of Equipage
- Questions and Answers



General Aviation Manufacturers
Association (GAMA)

SURVEILLANCE



General Aviation Manufacturers
Association (GAMA)

What Is the Question Always Asked?

- Will the FAA Change or Delay the 2020 Mandate?

“...I have to talk about ADS-B... All aircraft flying in controlled airspace are going to need to be equipped with this technology by January 1, 2020.

That deadline hasn't – and won't – change.

And if you're planning to fly your plane after 2019, you're going to have to get on board with ADS-B – soon.”

Michael Huerta, FAA Administrator,
Oshkosh, WI, July 27, 2017



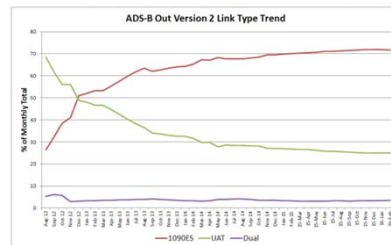
General Aviation Manufacturers Association (GAMA)

U.S. ADS-B Mandate



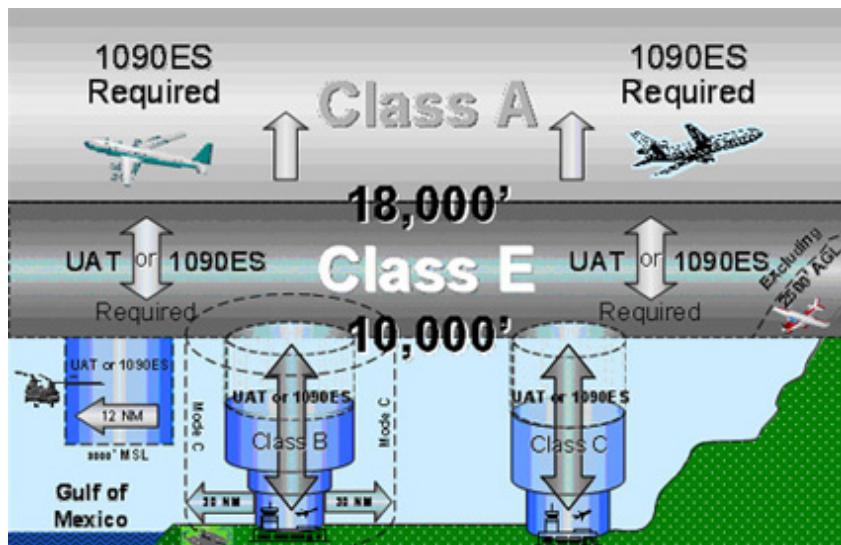
- January 1, 2020
 - 10 Years to Equip
 - FAA Stands Firm!
- Airspace-based Mandate
 - 1,339 Airports within or Under Rule Airspace
- Dual-Link 1090MHz and UAT
 - Transponder Considerations
- Performance-based Standards for Position Source

Rule Airspace Below 10,000 ft



General Aviation Manufacturers Association (GAMA)

U.S. ADS-B Regulated Airspace



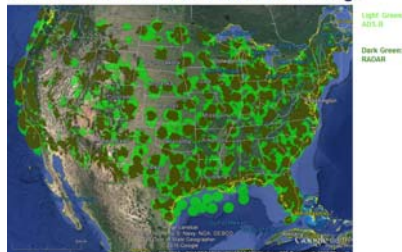
General Aviation Manufacturers Association (GAMA)

ADS-B – Where Required and Where Available

Rule Airspace Below 10,000 ft




500 Feet AGL ADS-B and RADAR Coverage




3000 Feet AGL ADS-B and RADAR Coverage



General Aviation Manufacturers Association (GAMA)

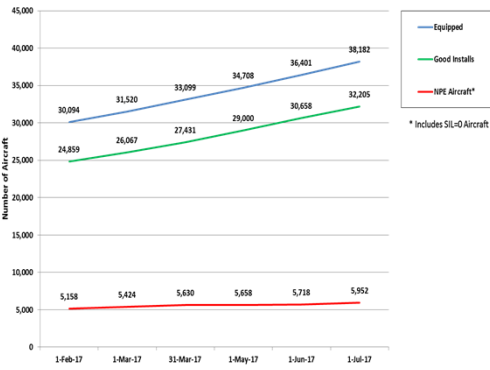


What is Equip 2020?




- **FAA Launched to Facilitate Industry Equipage**
 - WG1: Air Transport
 - **WG2: General Aviation**
 - WG3: Position Source
 - WG4: ADS-B IN
 - WG5: Certification and Installation Approvals

All US Aircraft Equipage & Avionics Performance



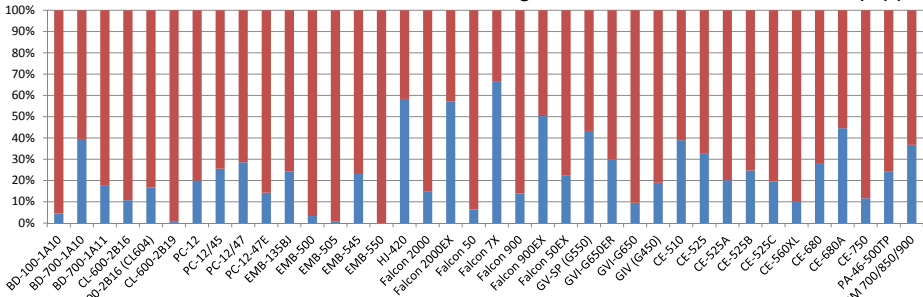
Date	Equipped	Good Installs	HPE Aircraft*
1-Feb-17	30,094	24,859	5,158
1-Mar-17	31,520	26,067	5,424
31-Mar-17	33,099	27,431	5,630
1-May-17	34,708	29,000	5,658
1-Jun-17	36,401	30,658	5,718
1-Jul-17	38,182	32,205	5,952

* Includes SiL+O Aircraft

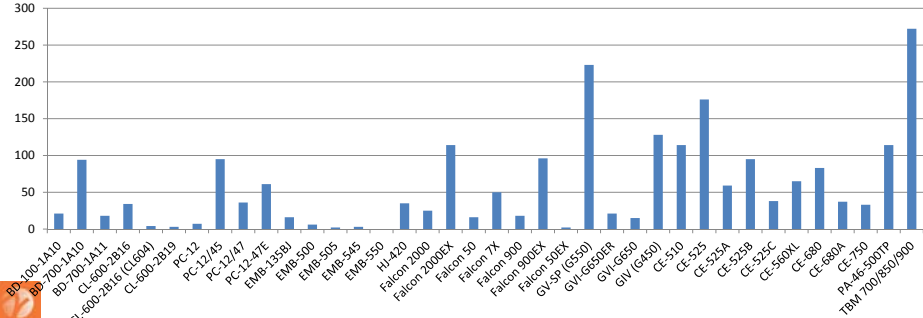


General Aviation Manufacturers Association (GAMA)

Current / Recent Production: Percent of N-Registered Turbine Fleet ADS-B Equipped




Current / Recent Production: Number of Turbine Airplanes ADS-B Equipped




Note: Data may be underestimated for current production models because aircraft registered by OEM may not have a compliant transponder.

Australia

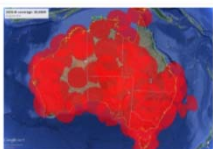
- February 2, 2017... but Accommodation through January 1, 2020 for Certain Private Aircraft
- **Equipage Rate:**
 - 94 percent of business jets;
 - 98 percent of turboprops;
 - 64 percent of helicopters; and
 - 89 percent of IFR A/C
- ...were compliant as of October 25, 2016



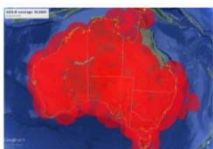
ADS-B coverage 5,000ft



ADS-B coverage 10,000ft




ADS-B coverage 20,000ft



ADS-B coverage 30,000ft


<http://www.airservicesaustralia.com/projects/ads-b/>



General Aviation Manufacturers Association (GAMA)

EU Surveillance Mandate

Current Status	Potential Changes
<ul style="list-style-type: none"> • Rule Published in 2011 • Regulation Covers <ul style="list-style-type: none"> – Mode S ELS – Mode S EHS – ADS-B • Delayed in March 2017 <ul style="list-style-type: none"> – Forward Fit: June 7, 2020 – Retrofit: June 7, 2020 	<ul style="list-style-type: none"> • EASA Tasked with Comprehensive Review <ul style="list-style-type: none"> – RMT.0679 Established in February 2016 – NPA Likely Superseded by EC Rule Proposal • Areas of Discussion <ul style="list-style-type: none"> – Applicability of Mandate – ANSP Responsibilities – Performance Requirements – New Compliance Date(s)



General Aviation Manufacturers Association (GAMA)

Other Surveillance Mandates for ADS-B

- Current Mandates and Guidance
 - Canada: Transport Canada AC 700-009 and NAV Canada AIC 21/09
 - China Taipei: AIC 02/12
 - Hong Kong: AIC 09/11
 - Indonesia: AIP Supplement 10/14
 - Seychelles: AIC 02/2014
 - Singapore: Civil Aviation Authority of Singapore, Aeronautical Information Circular 14/10
 - Vietnam: AIC 03/13
- Summary Overview of Other Mandates Accessible in [FAA AC90-114A](#) Appendix 6



General Aviation Manufacturers
Association (GAMA)

SPECIFIC EQUIPAGE CONSIDERATIONS FOR ADS-B



General Aviation Manufacturers
Association (GAMA)

Equipage Paths and Questions

- Do you plan to own your aircraft in 2020?
- Do you expect to fly in ADS-B regulated airspace?
- Do you just want to comply with the rule or also obtain traffic and flight information?
 - If traffic and weather, do you want installed or portable?
- What transponder do you currently have?
 - If Mode-S, can it be upgraded to ADS-B?
 - If Mode 3A/C, do you want to equip with UAT or shift to Mode-S / 1090?
- What capabilities do you want beyond surveillance compliance (NAV, COM... TAWS)?



General Aviation Manufacturers
Association (GAMA)

Available Version 2 ADS-B Avionics

Manufacturer	ADS-B Model Number	Approved Position Source(s)	User
ACSS	XS-950 NKT-800	For XS-950: RCI GLU 920/925, RCI GPS4000S, Thales TLS8755-01-0101A/0102B For NKT-800: RCI GLU-925	Air Transport
Avidyne	AXP340	Avidyne GPS (including R9), Garmin GNS430W/530W, GTN650/750 FreeFlight Model 1201/1204, Accord NextNav™ mini-T (external)	General Aviation
BendixKing	KT-74	Accord NextNav™ Mini GPS unit FreeFlight WAAS 1201	General Aviation
FreeFlight	FDL-978-TX, FDL-978-XVR FDL-1090-TX	FreeFlight WAAS 1201 (external or integrated in box with ADS-B equipment)	General Aviation
Garmin	GDL-88 GTX-23, GTX-33x w/ES GTX-330x, GTX-3000 (GTX models require 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)	General Aviation
Honeywell	XS-852	CMC CMA-4024-1 SBAS	Business Jet/Regional
Honeywell	MRC XPDR w/ADS-B Out	CMC CMA-3024 SBAS GNSSU MK II and CMA-4024 SBAS GNSSU	Business Jet/Regional
Honeywell	XS-858B Transponder, P/N 7517402-970	Honeywell GPS module (made by CMC), P/N 245-604067-100 CMC GNSS/MMR, P/N: 245-604067-100	Business Jet/Regional
Honeywell	ISP-80A.1	Honeywell ADIRU Part#s HG2030BE02, BE03 or BE04	Air Transport
Honeywell	KXP 2290A	Honeywell KGS200	General Aviation
L-3 Aviation Products	NGT-2000/2500	Integrated in NGT-2000/2500 only	General Aviation
NavVox	ADS600-B	Accord Technology NextNav™ Mini GPS unit	General Aviation
Rockwell	TDR-94/94D-501/550/551	Universal UNS-1Fw	Rotorcraft
Rockwell	TSS-4100	Awaiting STC	Business Jet/Regional
Trig-Avionics	TT-22, TT-31	FreeFlight WAAS 1201 (TT-22-31) Accord Technology NextNav™ Mini GPS unit (TT-31) Garmin GNS 430W/530W	General Aviation



General Aviation Manufacturers
Association (GAMA)

<https://www.faa.gov/nextgen/equipadsb/equipment/>

Source Material

- General Information:
<http://www.faa.gov/nextgen/programs/adsb/>
- [AC 20-165B](#) Airworthiness
- [AC 90-114A](#) Operations
- **Find out how your system is performing!**
Access performance report at
<https://adsbperformance.faa.gov/PAPRRequest.aspx> and
include your Registration-number, ADS-B transmitter & GPS
make/model numbers to find out.
- Other:
 - Duncan Aviation: <http://www.duncanaviation.aero/straighttalk/adsb/>
 - Free Flight: <http://adsbuniversity.com/ads-b-university>
 - Garmin ADS-B Academy: <http://www.garmin.com/us/intheair/ads-b>



General Aviation Manufacturers
Association (GAMA)

DATA LINK COMMUNICATIONS



General Aviation Manufacturers
Association (GAMA)

Data Link – Europe



- Link 2000
 - Regulation (EU) 29/2009
 - Article 14 Exemption Report Summer 2013
 - CS-ACNS In December 2013
 - FANS Exemption through 2014
- Technical Issues Tied to “Provider Aborts” Driving Shift to Multi-Frequency Deployment and “Best In Class” Avionics
- Schedule (Revised January 2015)
 - ~~Forward Fit: January 1, 2011~~ → 2020 (Exemptions / Suspended)
 - ~~Applicable: February 7, 2013~~ n/a
 - ~~Retrofit: February 5, 2015~~ 2020 (Old Aircraft 2022) (Suspended)
- EASA Starting Rulemaking Task RMT.0524
 - NPA Q4/2017
 - Final Rule by Q4/2019

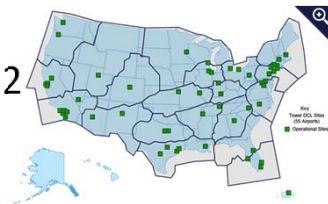


General Aviation Manufacturers Association (GAMA)

Data Link – United States



- FAA Awards Harris Corp. Deployment in September 2012
 - 2016: Towers Services
 - DCL at 55 Airports on December 9, 2016
 - 2019: Enroute Services
 - Note: Recent FAA Draft Advisory Circular
- 1,800+ Aircraft Equipped by Late 2016 including Business Aviation
 - Currently No Mandate



General Aviation Manufacturers Association (GAMA)

Data Link – North Atlantic



- 2009 Impact Assessment about Business Jets
 - Business Aviation: ~6.2 Percent of Flight Operations
 - Business Aviation Flies at FL400 and Above
 - Requirement Limited to Certain Flight Levels (FL350-390 Inclusive) to Accommodate Business Aviation in the Near Term
- Requirements: FANS 1/A (or Equivalent) CPDLC and ADS-C Equipment (see, FAA AC 20-140; 20-170)
 - 2013 Feb. 7: On specified tracks and Flight Levels within the NAT Organized Track System (OTS)
 - 2015 Feb. 5 Phase 2A: Specified portions of NAT minimum navigation performance specifications (NAT MNPS) airspace at FL350-390
 - 2017 Dec. 7 Phase 2B: ICAO NAT Region between FL350-390
 - 2020 Jan. 30 Phase 2C: FL290 and Above throughout NAT Region

Source: https://www.faa.gov/about/office_org/headquarters_offices/avs/offices/afs/afs400/afs470/media/NAT.pdf



General Aviation Manufacturers
Association (GAMA)

Does Data Communications Provided Business Aviation Benefits?

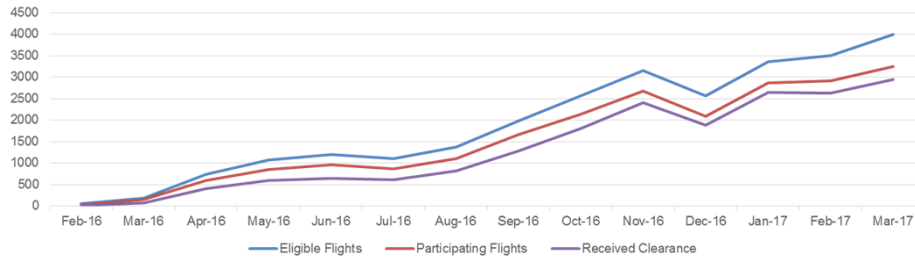
- Access Benefit: Access Maintained in North Atlantic and Europe
- Operational Benefit: Use of Data Communications at Key Business Aviation Airports:
 - Teterboro (TEB)
 - Westchester (HPN)
 - Van Nuys (VNY) (Proposed)



General Aviation Manufacturers
Association (GAMA)

Business Aviation Use of DCL in U.S.

Business Jet CPDLC DCL Operations



March 2017 CPDLC DCL Metrics

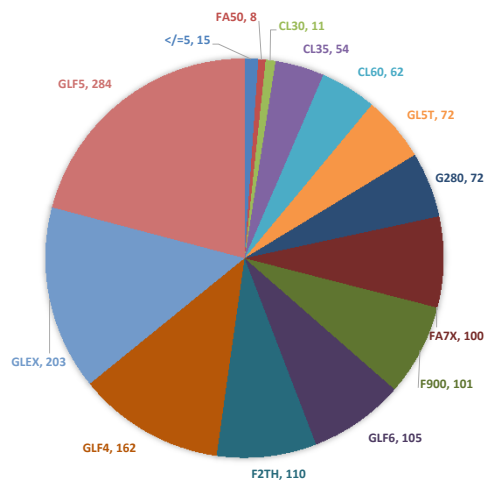
	Eligible	Participating %	Received %	Participating	Received Clearance
Business Jet	3,996	81.41%	90.59%	3,253	2,947
All Other Operators	112,276	98.97%	97.43%	111,116	108,258



Source: Harris Corporation

Business Aviation by Unique Tail Count

AC_Type	Total	US	Non US
Global 5000	72	56	16
Gulfstream V/G550	285	251	34
Falcon 7X	100	36	64
Global 6000	203	156	47
Gulfstream VI/G650	105	91	14
Challenger 350	54	51	3
Challenger 600	62	53	9
Gulfstream IV	162	156	6
Falcon 2000	110	93	17
Falcon 900	101	87	14
Falcon 8X	3	2	2
Gulfstream G280	72	68	4
Falcon 50	8	8	0
Challenger 300	11	11	0
Piper 31	1	1	0
Legacy 600/650	4	4	0
Challenger 650	1	1	0
Citation CE-680	1	1	0
Legacy 1000	2	2	0
King Air C90	1	1	0
Total	1,358	1,129	230



Source: Harris Corporation

NAVIGATION



General Aviation Manufacturers
Association (GAMA)



PBN – A Snap Shot



U.S. Status

- No Regulation Mandating Certain Equipage
- Revised Navigation Strategy Published in Oct. 2016
 - Leverage Evolving Aircraft Capabilities
 - Enable New Operations
 - Reduce Dependence on Legacy Navigation Infrastructure
- https://www.faa.gov/nextgen/media/pbn_nas_nav.pdf

EU Status

- 2012 Consultation included Equipment Mandate...
- EASA Opinion 10/2016
 - RNP APCH at All Instrument Runway Ends by Jan. 30, 2020
 - Use RNAV 1 and RNP 1 to Meet Local Performance Objectives
- Work Underway to Develop a Navigation Strategy
 - Workshop March 20, 2017



General Aviation Manufacturers
Association (GAMA)

Required Equipage

Mandate	Region	New aircraft date	Fleet aircraft date
Link 2000+ (FANS 1/A)	Europe FL285	1 st Jan 2011...	5 th Feb 2020? FANS retrofit exemption ended January 2014
Link 2000+ (PM CPDLC)	Europe FL285	1 st Jan 2014...	
FANS 1/A	N. Atlantic tracks	Feb 2013 limited airspace, Feb 2015 – Jan 2020	
Data Link Recording	FAA registered aircraft with CPDLC	Datalink installs if CofA or ASC cert. after : Part 135 – Dec 2010 and Part 91 – Apr 2012, but Accommodation	
	EASA	April 2014	Not Required
Performance Based Nav.	Europe	TBD	TBD
ADS-B Out	Various locations	Europe – June 2020 Australia – Dec 2013 / 14 US – 2020	Europe – June 2020 Australia – Dec 2013 / 17 US – 2020
ADS-B In	US	TBD	TBD
TCAS 7.1	Europe	1 st Mar 2012	1 st Dec 2015



General Aviation Manufacturers Association (GAMA)

Source: Original Analysis by Gulfstream Aerospace Corp. (adapted by GAMA)

Jens C. Hennig
 VP, Operations
 Phone (+1) 202-393-1500
 Email jhennig@GAMA.aero

OTHER ISSUES? QUESTIONS?



General Aviation Manufacturers Association (GAMA)