ADS-B Activity Report

for

October 2011

Document No: 5533-I001-11/2011

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Engility Corporation

Advanced Transportation Research & Engineering (ATR&E) Department

for

Volpe National Transportation Systems Center

Subcontract Number: 2009-1224

Honeywell Technology Solutions, Inc

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1 Introduction

This document is prepared in accordance with the requirements of Task Order CA 0505, Task 9: Data and Performance Monitoring. The document provides a summary of ADS-B activity observed at five 1090-ES receiver sites owned and operated by Honeywell, Inc; and one Honeywell provided site owned by the FAA and operated by Honeywell; as well as from data received from an FAA Ground Based Transceiver (GBT) site at Louisville, KY (SDF).

In order to improve visibility into growth in DO-260A equipage over time, Honeywell has included a chart (Figure 3-5) that shows the breakdown of the total ADS-B airframes by version (DO-260 and DO-260A) and plots the DO-260A airframes as a percentage of the total. This report also now includes charts to provide visibility into the breakout of DO-260A aircraft by owner (Figure 3-7) and by aircraft make (Figure 3-8).

As of October 2010 Honeywell began to see aircraft reporting version two of DO-260 (DO-260B). To date, eleven (11) DO-260B aircraft have been recorded via the system of Honeywell receivers.

This task began effective March 12, 2007 (under Task Order CS 6409). This report provides analysis of data collected prior to November 1, 2011.

2 Applicable Documents

Statement of Work	Task 9, Task Order CA9504, under prime contract DTRT57-08-D-30012
DO-260B	Minimum Operational Performance Standards for 1090 MHz Extended Squitter Automatic Dependent Surveillance – Broadcast (ADS-B) and Traffic Information Services – Broadcast (TIS-B)
NAS-IC-82298228	Interface Control Document - Capstone Communications and Control System Critical Services Unit (CCCS CSU) to the Micro-EARTS Gateway
FAA-E-2973	System Specification - Ground-Based Transceiver (GBT) For Broadcast Services Using the Universal Access Transceiver (UAT) Data Link
JHU Document	Format Definition for CRABS Messages File (CMS) dated May 2005

3 ADS-B Activity

This report provides data on ADS-B activity from November 2010 through October 2011. The data used to generate this report, along with much more information is available on-line at: http://www.dissrr.com/ADSB/.

Table 3-1 lists the sites used to generate the data for this report along with the reporting period for each site. This report integrates data from the five Honeywell receiver sites with data from one FAA GBT site to produce the summary statistics. Note that data from the Honeywell receiver sites contains both Mode-S and ADS-B information whereas data from the FAA GBT site only contains ADS-B information.

Table 3-1 Site Data Used for Reporting Period

Site	Reporting Period	Remarks
College Station, TX	Oct 21, 2004 - Present	
Englewood, CO	Oct 21, 2004 - Present	
Alexandria, VA	Nov 5, 2004 – Present	Data missing: 10/1/2011-10/19/2011 System repaired: 10/19/2011
Huntington Beach, CA	Dec 1, 2004 – Present	
Lafayette, LA	Mar 18, 2009 – Present	
Olathe, KS	February 2011-Present	
Atlantic City, NJ	Jan 2004 – Sep 2007	These sites were legacy GBT sites that have been deactivated. The cumulative data in this report includes information collected from these sites but there is no new data from these sites as of the end dates indicated.
Louisville, KY	Jan 2004 – Mar 2007, Oct 2007-May 2009	

Summary of Activity

Honeywell has processed the data from the Honeywell sites in the summary statistics of ADS-B activity.

Figure 3-1 shows a summary of all Mode S and ADS-B activity recorded from November 2010 through October 2011. Some key points to be noted regarding this data are:

- The counts reflect the cumulative number of unique ICAO addresses seen to date for both Mode S and ADS-B emitters.
- 89,813 Mode-S aircraft and 12,168 ADS-B/UAT aircraft and vehicles have been detected at the Honeywell 1090 Ground Stations and the GBT site.
- Of the 89,662 Mode-S aircraft observed at the 6 Honeywell sites, 12,004 or 13.39% were categorized as ADS-B aircraft.
- The Mode S count is primarily driven from the Honeywell receiver sites since the FAA GBT site does not provide Mode S data. The Mode S count does include ADS-B aircraft found in the FAA GBT data since those are, by definition, Mode S aircraft. Specifically, if the data indicated an emitter category of A*n* or B*n* then it was counted as a Mode S aircraft as well as an ADS-B aircraft.

Figure 3-2 shows the percentage of ADS-B Aircraft emitting positional data.

- Of the 12,004 ADSB equipped aircraft detected by the Honeywell receiver sites 6,725 (56.02%) emitted airborne position messages.

Figure 3-3 shows the makeup of the ADS-B count shown in Figure 3-1. Some key points to be noted regarding this data are:

- The ADS-B count includes emitters we have categorized as 1090-ES Non-Aircraft. This includes totals from both the Honeywell receiver sites and the GBT sites.
- Honeywell is focused on processing and integrating the 1090-ES data since it represents the vast majority of ADS-B emitters at this time.

Figure 3-4 shows the counts of Mode S and ADS-B airframes detected at the Honeywell sites over the past 3 years.

- The number of Mode S aircraft has increased from 57,708 in October 2008 to 89,662 in October 2011.
- The number of ADS-B aircraft detected has increased from 8,050 in October 2008 to 12,004 in October 2011.

Graphic of ADS-B Counts by ADS-B Version

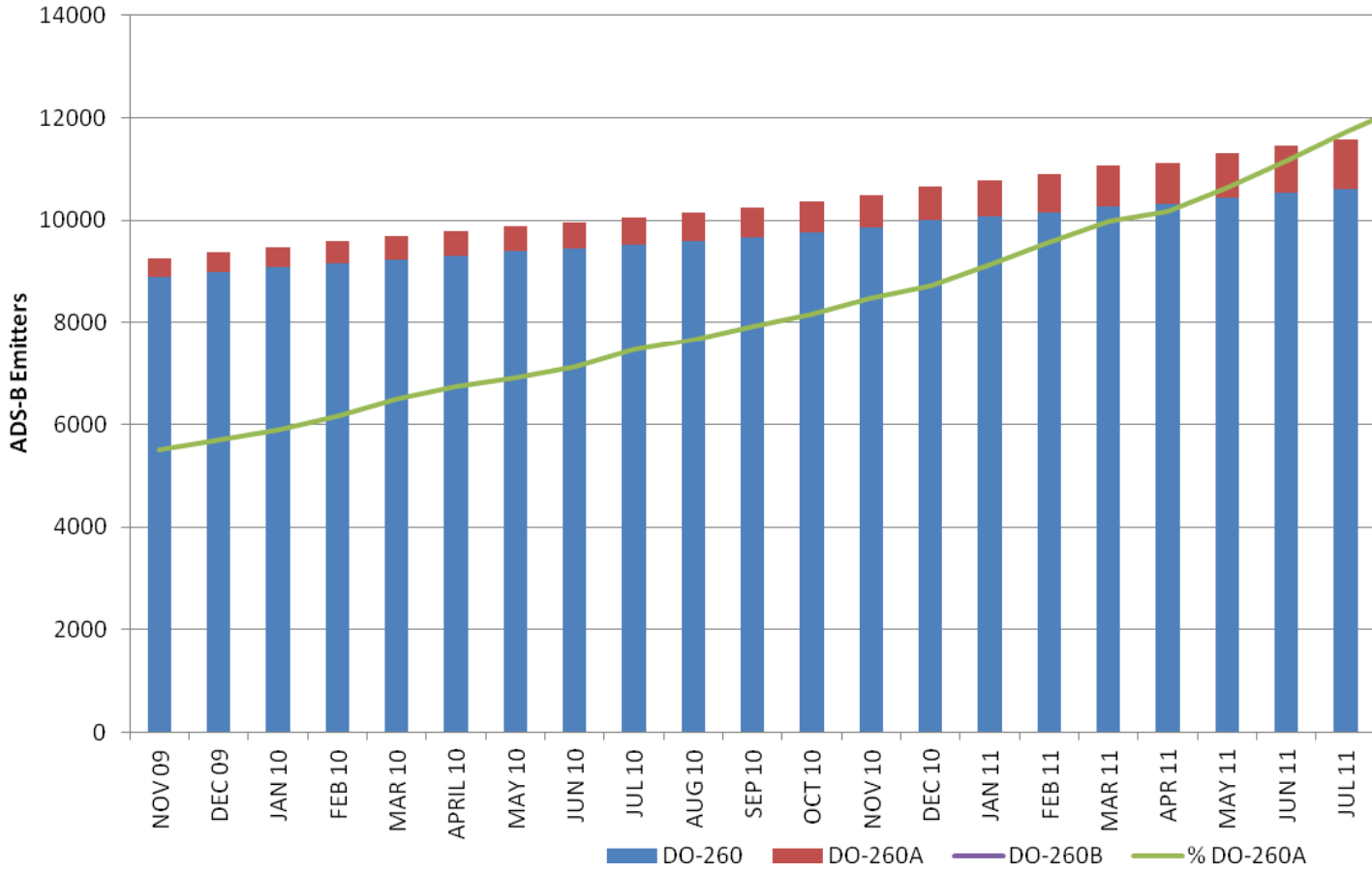


Figure 3-5 provides visibility into growth in DO-260A equipage since July 2008. It shows the breakdown of the total ADS-B airframes by version (DO-260 and DO-260A) and plots the DO-260A airframes as a percentage of the total.

- DO260A equipped aircraft have increased steadily in the number and percentage total of ADS-B aircraft. There have been 1138 DO-260A aircraft detected by the Honeywell 1090 Ground Stations. This has increased from 185 DO-260A aircraft detected as of September 2008.
- DO260A aircraft make up 9.48% of the total ADS-B aircraft detected at the Honeywell 1090 Ground Stations. This has increased from 3.92% 24 months ago.
- The complete list of the DO-260A aircraft that have been detected by the Honeywell receiver sites to this date can be found at http://www.dissrr.com/1090GS/DO260A_AircraftList.php

Table 3-2 Shows the DO260B equipped airframes detected at Honeywell sites.

- Honeywell has been tracking the appearance of DO260B aircraft since October 2010.
- To date 14 aircraft have been detected at the Honeywell 1090 Ground Stations
- Details of each D0260B operation can be found at the following URL http://www.dissrr.com/1090GS/SummaryOfDO260B_Ops.php

Table 3-2 DO260B Aircraft Detected at Honeywell 1090 Ground Stations

ICAO	Tail #	Make	Model	Owner
10589125	N200U	RAYTHEON AIRCRAFT CO	C90A	Ohio University
10709751	N31920	PIPER	PA-32RT-300T	CNS Aviation Services Corp
10576586	N189H	CESSNA	560	Honeywell Aircraft Leasing LLC
10862272	N47	BOMBARDIER INC	BD-700-1A11	FAA
10954060	N56HM	BEECH	58	Garmin International Inc
10953872	N56	LEARJET INC	60	FAA
10628836	N24NT	BEECH	58	Ohio University
10974713	N580AS			Unknown
10709746	N3192V	BEECH	35	Buttner MG
10882494	N49	CONVAIR	440	FAA
11071799	N6754H	BEECH	C90	Aviation Communication and Surveillance
14942379	E400AB			Unknown
10984205	N59	LEARJET INC	60	FAA
10709750	N3192Z			Unknown

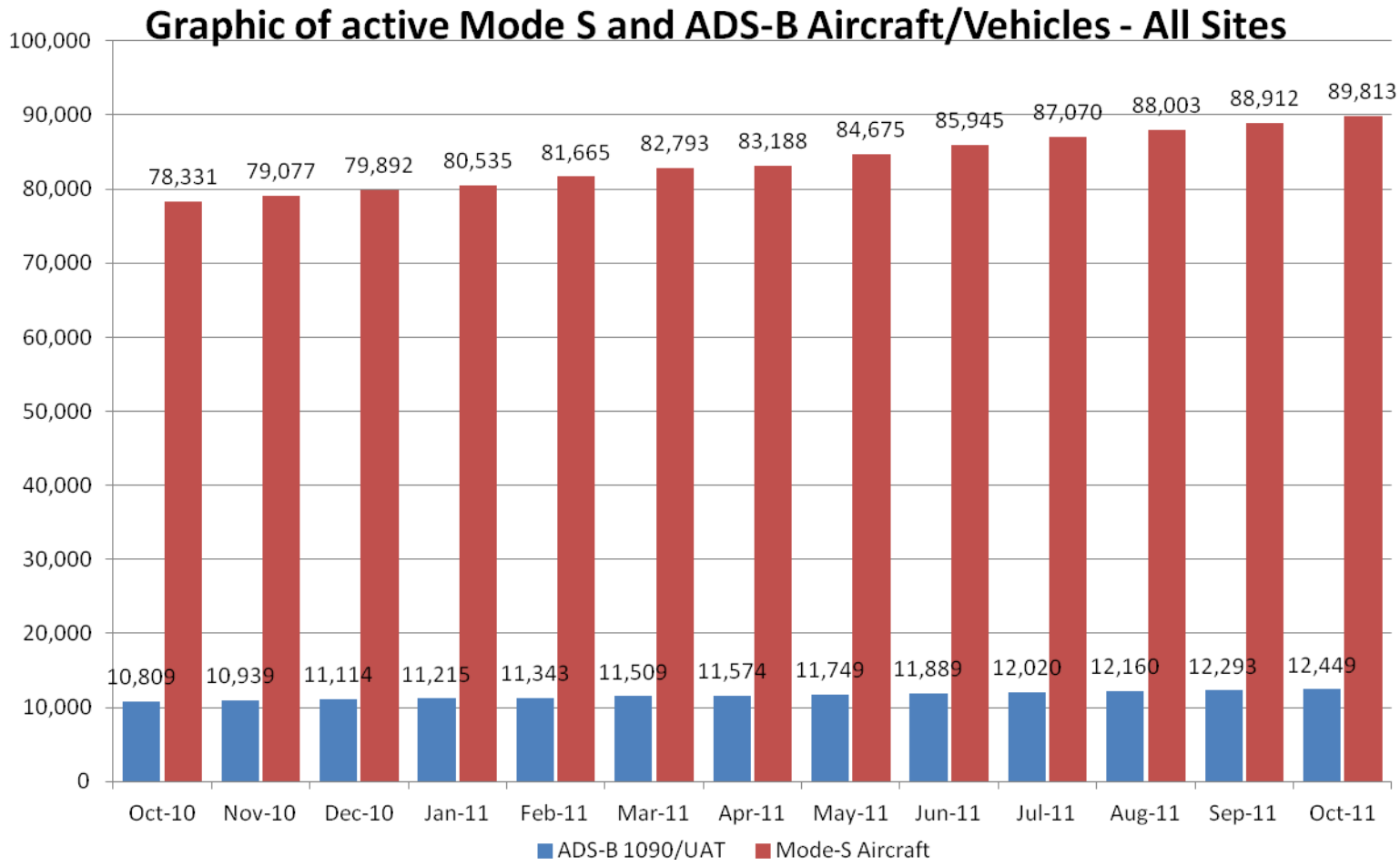


Figure 3-1 Summary of Mode S and ADS-B Activity

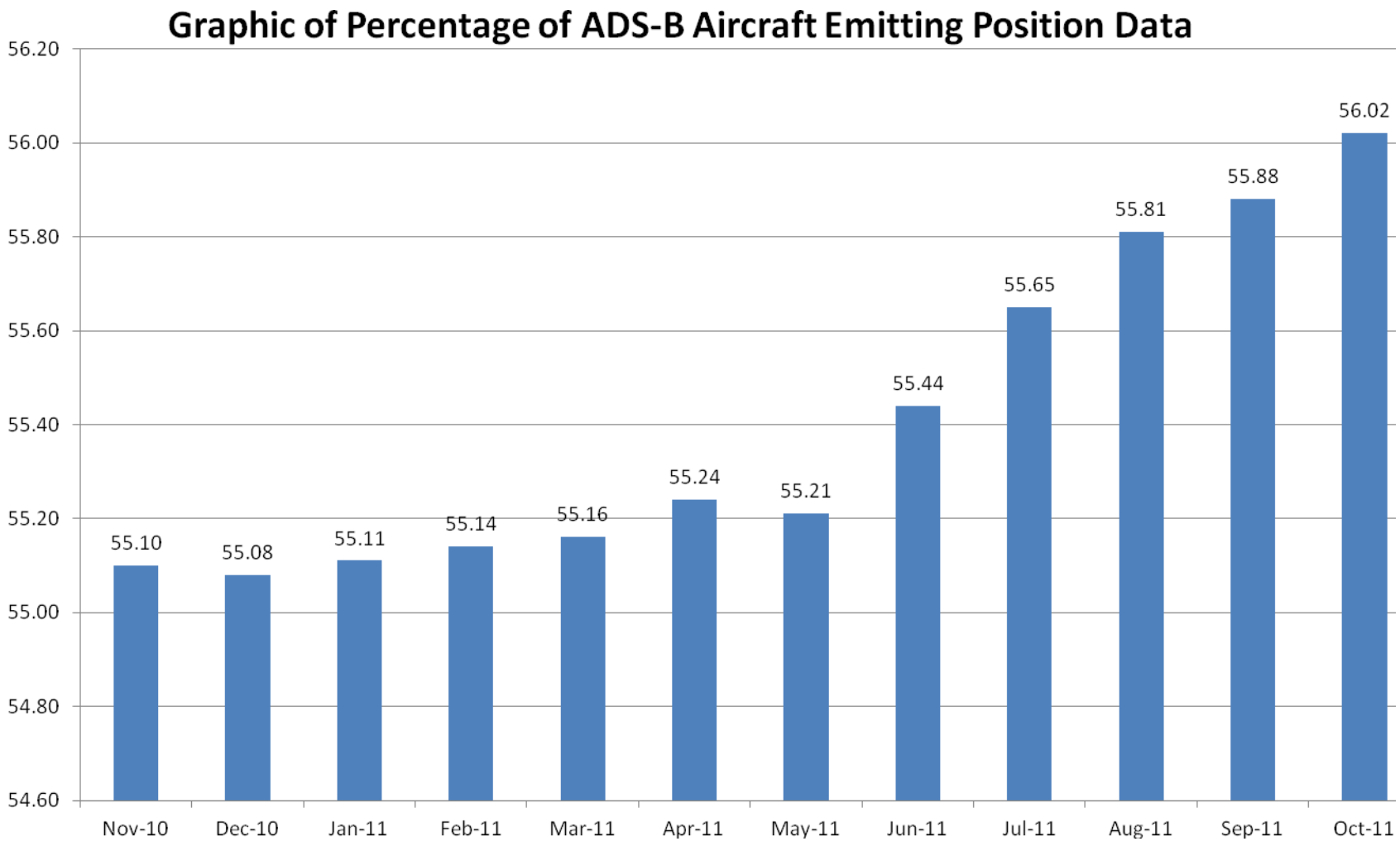

Graphic of Percentage of ADS-B Aircraft Emitting Position Data
56.20
56.00
55.80
55.60
55.40
55.20
55.00
54.80
54.60
55.10
55.08
55.11
55.14
55.16
55.24
55.21
55.44
55.65
55.81
55.88
56.02
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
Sep-11
Oct-11

Figure 3-2 Percentage of ADS-B Aircraft Emitting Position Data

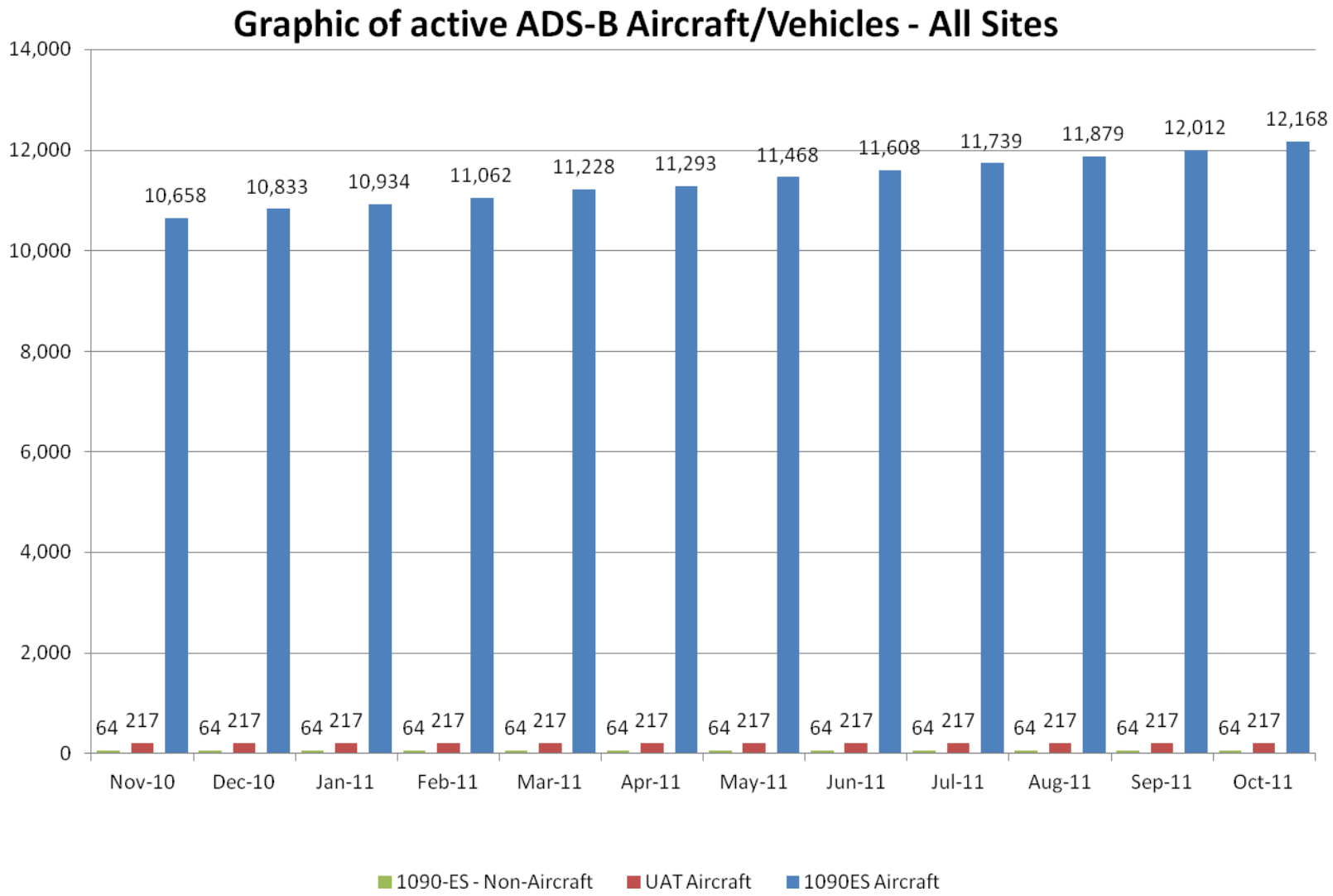


Figure 3-3 Summary of ADS-B Activity

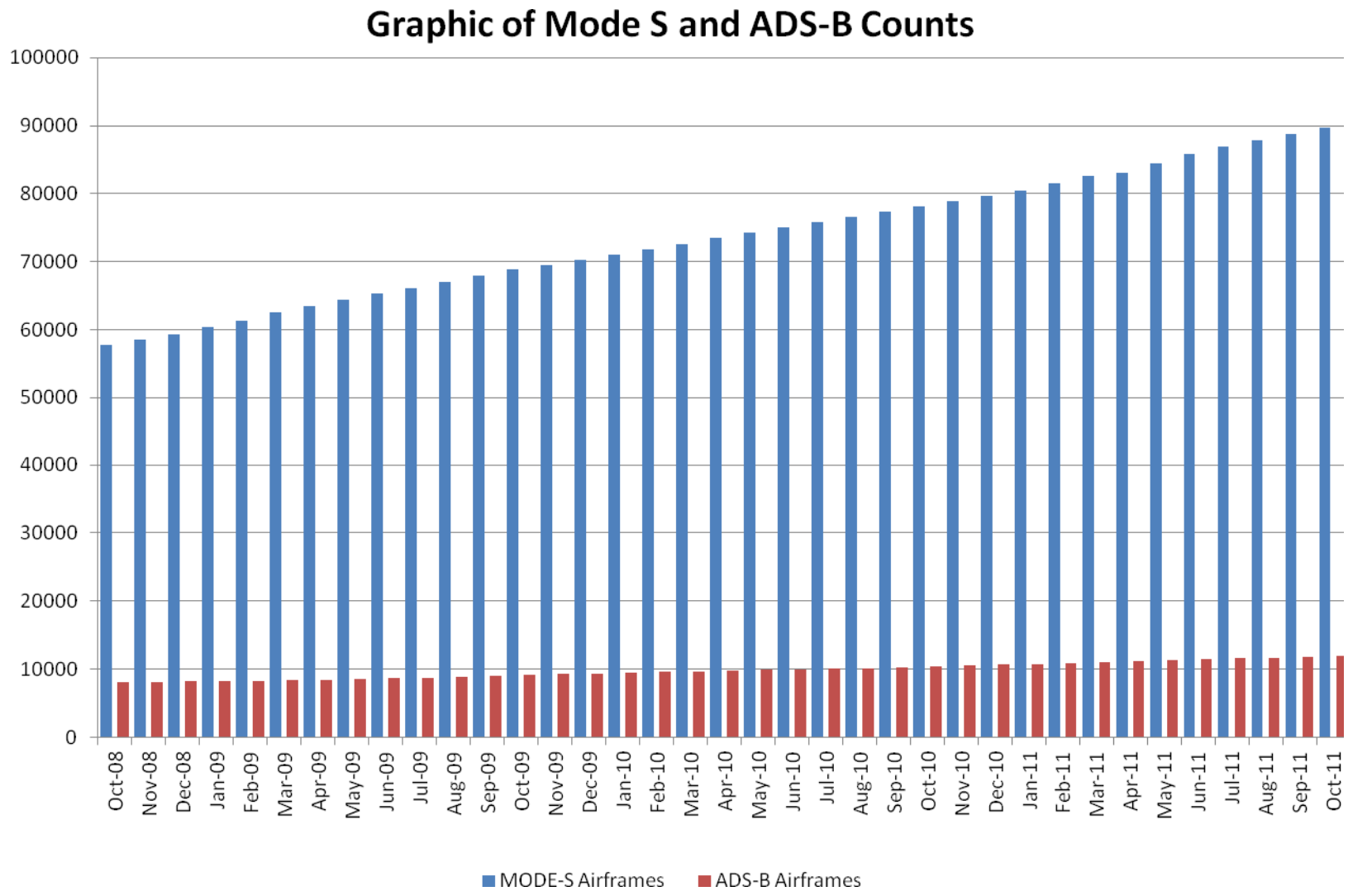


Figure 3-4 Mode S and ADS-B Aircraft Counts Over the Past 3 Years

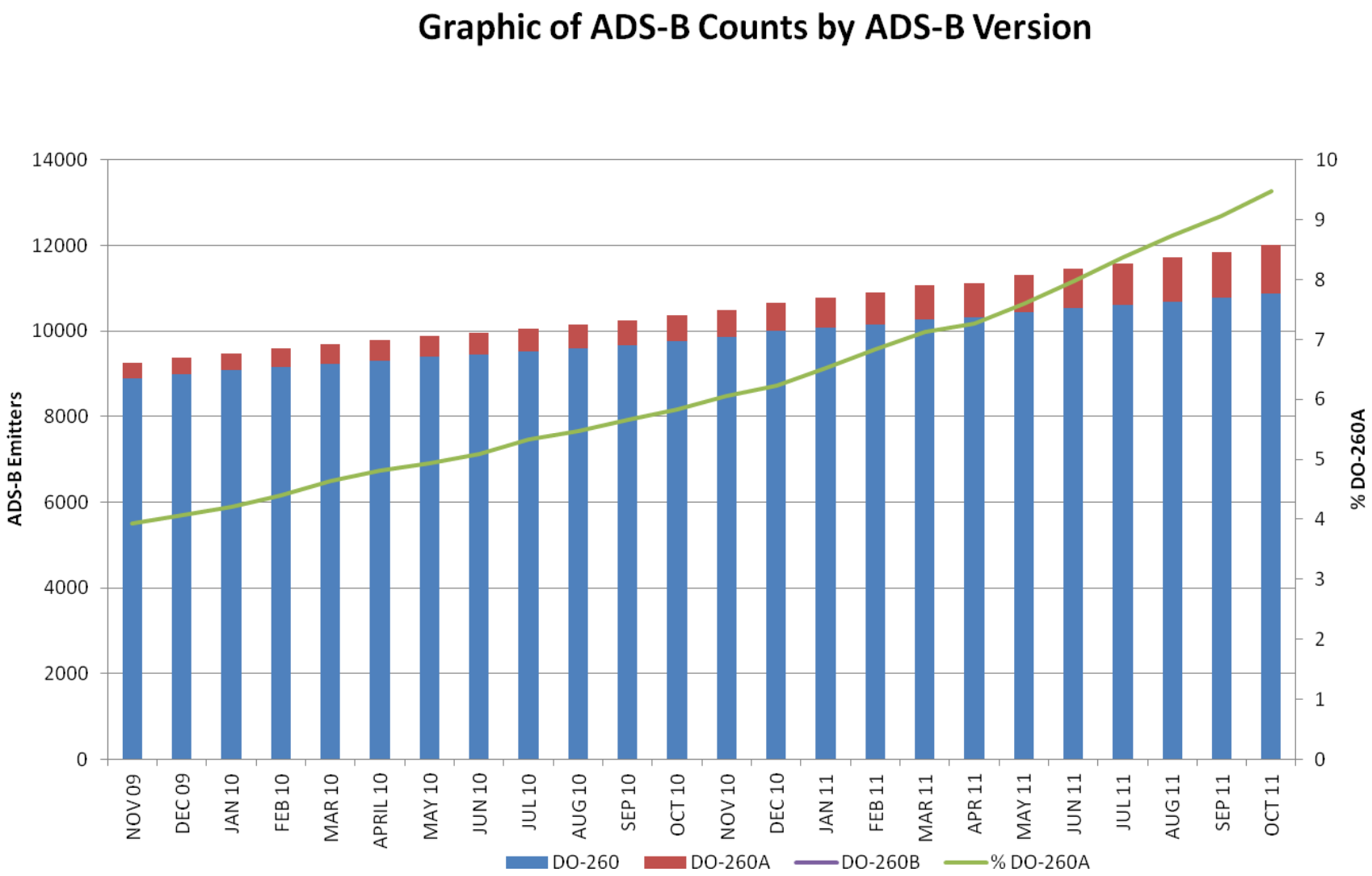


Figure 3-5 Counts and Percentages by ADS-B Version

3.1 Airframes by Registrant

Table 3-3 shows airframes by registrant per the Civil Aviation Registry and lists the top 10 groups. As of this report, this data only includes those airframes observed at the Honeywell receiver sites. Some key points of interest in this data are:

- Of the 12,004 ADS-B operational aircraft, 4,400 appear to be foreign aircraft,
- There are 1,595 aircraft that appear to be US aircraft that are not civil (US Mode-S code that does not decode into an "N" number, presumably military and law enforcement).
- Of the 6,010 ADS-B equipped US civil aircraft (decode into a valid N number), 1,689 are not in the latest version of the Civil Aviation Registry (CAR).

Figure 3-6 graphically summarizes the aircraft registration information and points out that by using the Civil Aviation Registry we are only able to identify the registration of 37% of the ADS-B aircraft we have observed.

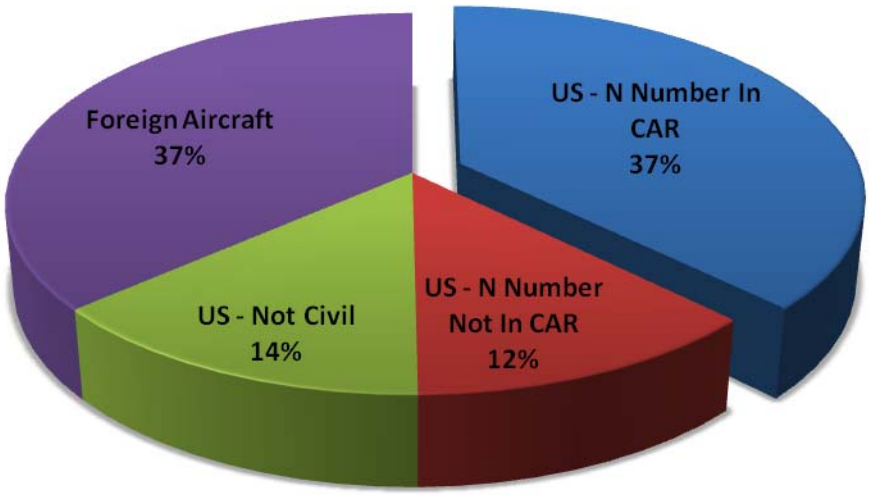


Figure 3-6 - Summary of Aircraft Registration Information

Table 3-3 Top Airframes by Registrant

#	FAA Registrant	Aircraft
1	-	7636
2	WELLS FARGO BANK NORTHWEST NA TRUSTEE	444
3	FEDERAL EXPRESS CORP	224
4	UNITED PARCEL SERVICE CO	200
5	AMERICAN AIRLINES INC	149
6	DELTA AIR LINES INC	121
7	CONTINENTAL AIRLINES INC	116
8	WILMINGTON TRUST CO TRUSTEE	103
9	FEDERAL EXPRESS CORPORATION	96
10	UNITED AIR LINES INC	82

Figure 3-7 shows DO-260A aircraft by registrant. Owners with only one aircraft are grouped together in the “Other” category. Aircraft with an AA code that does not decode to a valid tail number or tail numbers that cannot be found in the Civil Aviation Registry are grouped in the “Unknown” category.

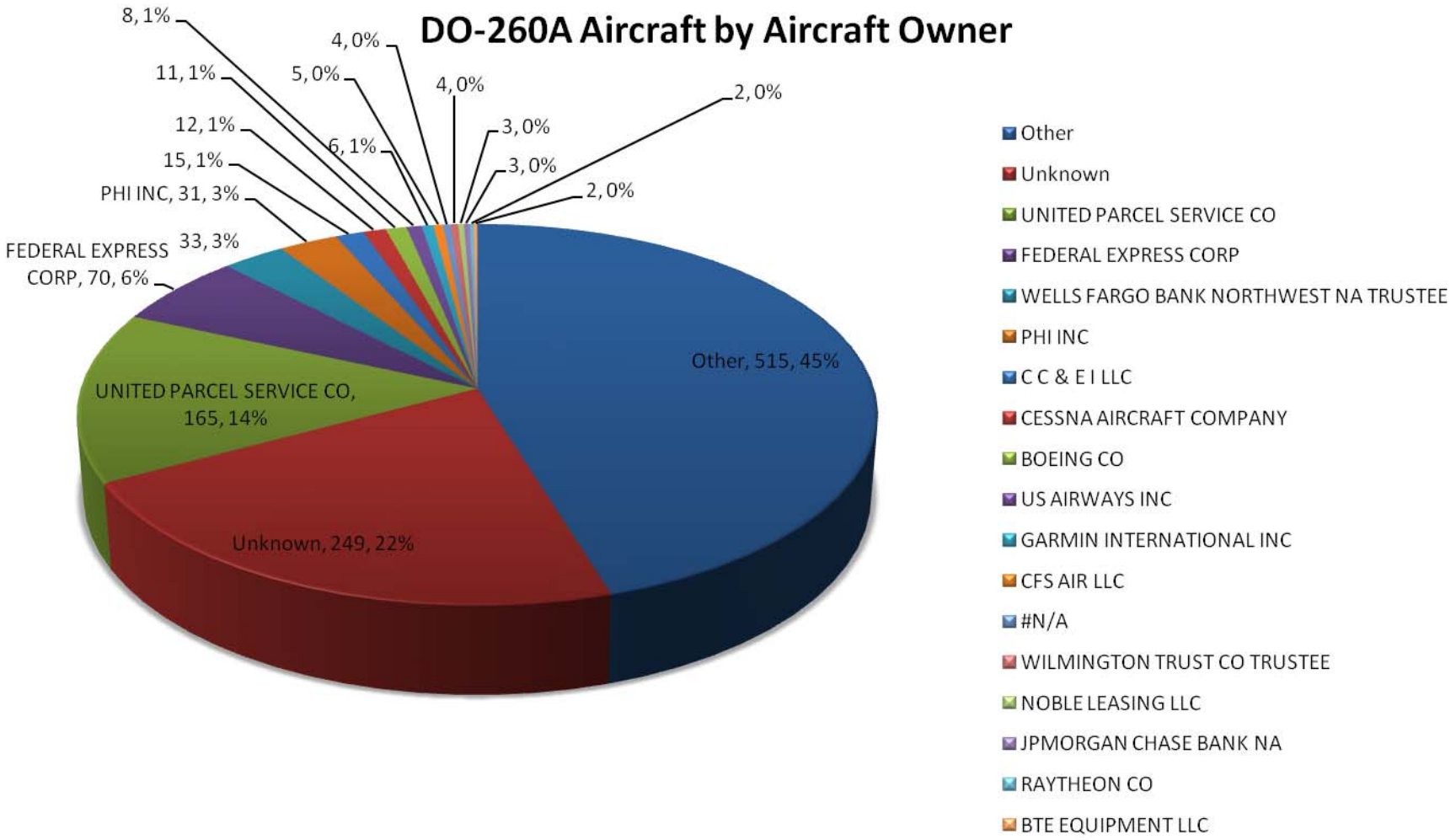


Figure 3-7 DO-260A Aircraft by Owner

3.2 Airframes by Operator

Table 3-4 shows airframes by Operator based on the first three letters found in the aircraft identification field and lists the top 10 groups. Of the 12,004 ADS-B airframes, 5,616 did not have aircraft identification information that would allow them to be grouped by tri-graph.

Table 3-4 Top Airframes by Operator

#	TriGraph	Operator	Aircraft
1	-	-	5616
2	RCH	Air Mobility Command	762
3	FDX	Federal Express Corporation	336
4	UPS	United Parcel Service Company	267
5	AAL	American Airlines	226
6	COA	Continental Airlines	170
7	DAL	Delta Air Lines, Inc.	144
8	AFR	Air France	137
9	BAW	British Airways	129
10	UAL	United Air Lines Inc.	112

3.3 Airframes by Make and Model

Table 3-5 shows airframes by Make and Model and lists the top 10. Aircraft type is obtained by linking to the Civil Aviation Registry so those airframes identified in paragraph 3.1 as not being traced to a registrant will also not have aircraft type information.

Table 3-5 Top Airframes by Make and Model

#	Make	Model	Aircraft
1	-	-	7636
2	GULFSTREAM AEROSPACE	G-IV	244
3	GULFSTREAM AEROSPACE	G-V	126
4	MCDONNELL DOUGLAS	MD-11F	111
5	BOMBARDIER INC	CL-600-2B16	96
6	AIRBUS INDUSTRIE	A320-232	91
7	CANADAIR LTD	CL-600-2B16	87
8	BOEING	737-823	87
9	ECLIPSE AVIATION COR	EA500	80
10	BOEING	757-24APF	75

Figure 3-8 shows DO-260A airframes by Make. For presentation purposes, the chart does not include Makes where there was only a single airframe for that Make.

Table 3-6 shows the complete list of DO-260A airframes by Make and Model. For aircraft that could not be linked to the Civil Aviation Registry the Make and Model information is shown as (blank).

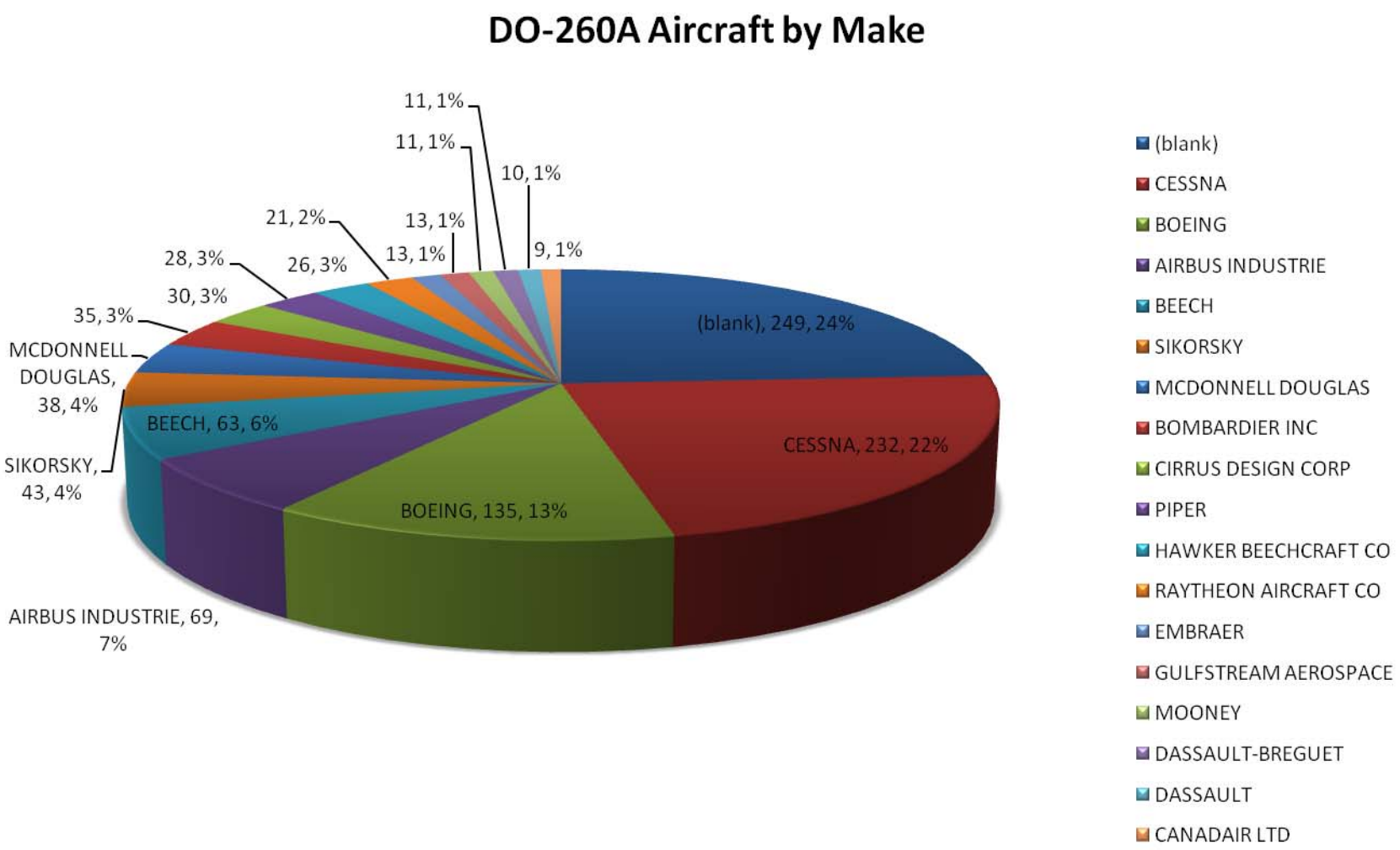


Figure 3-8 DO-260A Aircraft by Make

Table 3-6 DO-260A Aircraft by Make and Model

Make	Model	Total
(blank)	(blank)	249
(blank) Total		**249**
CESSNA	525B	46
	525C	42
	208B	39
	525A	27
	525	17
	560	10
	206H	6
	501	5
	421C	5
	340A	4
	414	4
	182P	3
	550	2
	414A	2
	P210N	2
	441	2
	T303	1
	551	1
	R182	1
	T210G	1
	U206G	1
	T310Q	1
	680	1
	650	1
	172G	1
	177B	1
	182F	1
	P210R	1
	172N	1
	T210N	1
	150M	1
	TR182	1
CESSNA Total		**232**
BOEING	757-24APF	46
	767-34AF	44
	757-236	6
	757-23A	6

	787-8	5
	757-28A	4
	757-204	3
	747-44AF	2
	747-4R7F	2
	757-2G5	2
	757-2T7	2
	757-232	2
	757-21B	2
	757-2B7	1
	757-230	1
	757-200 SERIES	1
	747-8R7F	1
	757-2S7	1
	757-2Q8	1
	757-2YO	1
	747-428F	1
	787-83Q	1
BOEING Total		**135**
AIRBUS INDUSTRIE	A300 F4-622R	53
	A330-323	9
	A330-243	7
AIRBUS INDUSTRIE Total		**69**
BEECH	B200	18
	200	9
	58	6
	A36	6
	F33A	3
	F90	3
	300	2
	400A	2
	C90A	2
	C90	2
	V35B	1
	77	1
	58P	1
	65-A90	1
	B200C	1
	B300	1
	95-B55 (T42A)	1
	V35	1
	58TC	1
	B-60	1

BEECH Total		**63**
SIKORSKY	S-76C	15
	S-92A	15
	S-76C-2	6
	S-76A	3
	S-76	2
	S-76B	1
	S-92	1
SIKORSKY Total		**43**
MCDONNELL DOUGLAS	MD-11F	38
MCDONNELL DOUGLAS Total		**38**
BOMBARDIER INC	CL-600-2B16	20
	BD-100-1A10	13
	CL600-2D24	1
	BD-700-1A11	1
BOMBARDIER INC Total		**35**
CIRRUS DESIGN CORP	SR22	14
	SR22T	14
	SR20	2
CIRRUS DESIGN CORP Total		**30**
PIPER	PA 46-350P	5
	PA-31T	2
	PA-24-260	2
	PA-30	2
	PA-32RT-300T	2
	PA-23-250	2
	PA-34-220T	1
	PA-32-260	1
	PA-32R-301T	1
	PA-31-350	1
	PA-28R-201	1
	PA-32-300	1
	PA-28-181	1
	PA-28-161	1
	PA-34-200T	1
	PA46-500TP	1
	PA-28-180	1
	PA-46-310P	1
	PA-28-236	1
PIPER Total		**28**
HAWKER BEECHCRAFT CO	G36	12
	G58	10
	HAWKER 900XP	2

	390-2	1
	400A	1
HAWKER BEECHCRAFT CO Total		**26**
RAYTHEON AIRCRAFT CO	B200	14
	390	1
	G36	1
	HAWKER 800XP	1
	400A	1
	A200CT	1
	58	1
	C90A	1
RAYTHEON AIRCRAFT CO Total		**21**
EMBRAER	EMB-120ER	13
EMBRAER Total		**13**
GULFSTREAM AEROSPACE	G-IV	10
	GIV-X	1
	GVI	1
	G-V	1
GULFSTREAM AEROSPACE Total		**13**
MOONEY	M20J	5
	M20R	3
	M20C	1
	M20M	1
	M20F	1
MOONEY Total		**11**
DASSAULT-BREGUET	FALCON 50	9
	MYSTERE FALCON 900	2
DASSAULT-BREGUET Total		**11**
DASSAULT	FALCON 900 EX	10
DASSAULT Total		**10**
CANADAIR LTD	CL-600-2B16	8
	CL600-2B16(CL601-3A)	1
CANADAIR LTD Total		**9**
DASSAULT AVIATION	FALCON 900EX	4
	MYSTERE FALCON 900	2
	FALCON 900B	1
DASSAULT AVIATION Total		**7**
LEARJET INC	60	6
LEARJET INC Total		**6**
KEYSTONE HELICOPTER	S-76C	5
KEYSTONE HELICOPTER Total		**5**

SOCATA	TBM 700	5
SOCATA Total		**5**
PILATUS	PC-12/45	4
PILATUS Total		**4**
ISRAEL AIRCRAFT INDU	GULFSTREAM 200	2
	1124	1
	1125 WESTWIND ASTRA	1
ISRAEL AIRCRAFT INDU Total		**4**
BELL HELICOPTER TEXT	429	2
	407	1
BELL HELICOPTER TEXT Total		**3**
PILATUS AIRCRAFT LTD	PC-12	2
	PC-12/45	1
PILATUS AIRCRAFT LTD Total		**3**
CIRRUS DESIGN CORPOR	SR22T	2
CIRRUS DESIGN CORPOR Total		**2**
FLIGHT DESIGN GMBH	CTLS	2
FLIGHT DESIGN GMBH Total		**2**
ROCKWELL INTERNATION	690B	1
	695	1
ROCKWELL INTERNATION Total		**2**
ISRAEL AEROSPACE IND	GULFSTREAM G150	1
	G200	1
ISRAEL AEROSPACE IND Total		**2**
CONVAIR	440	2
CONVAIR Total		**2**
CUBCRAFTERS INC	CC11-160	2
CUBCRAFTERS INC Total		**2**
MOONEY AIRCRAFT CORP	M20K	2
MOONEY AIRCRAFT CORP Total		**2**
DOUGLAS	A-20G	1
DOUGLAS Total		**1**
FREITAG WILLIAM W JR	RV-9A	1
FREITAG WILLIAM W JR Total		**1**
YAU JAY J	RV-7	1
YAU JAY J Total		**1**
HUGHES	269A	1
HUGHES Total		**1**
SEI VINCENT JOSEPH	F-1D ROCKET	1
SEI VINCENT JOSEPH Total		**1**

BELLANCA	17-31ATC	1
BELLANCA Total		**1**
COLUMBIA AIRCRAFT MF	LC41-550FG	1
COLUMBIA AIRCRAFT MF Total		**1**
DASSAULT/SUD	FAN JET FALCON SER F	1
DASSAULT/SUD Total		**1**
WOLSTENHOLME ROBERT	EVOLUTION	1
WOLSTENHOLME ROBERT Total		**1**
COMMANDER AIRCRAFT C	114-B	1
COMMANDER AIRCRAFT C Total		**1**
BRITISH AEROSPACE	BAE 125 SERIES 800A	1
BRITISH AEROSPACE Total		**1**
GOFF GEORGE V	RV-6A	1
GOFF GEORGE V Total		**1**
WHITCOMB JACK	RV-4	1
WHITCOMB JACK Total		**1**
CZECH SPORT AIRCRAFT	PIPER SPORT	1
CZECH SPORT AIRCRAFT Total		**1**
WALKER RYAN D	RANS S-6S COYOTE II	1
WALKER RYAN D Total		**1**
GATES LEAR JET CORP.	36	1
GATES LEAR JET CORP. Total		**1**
GROSS RYAN W	ARION LIGHTNING	1
GROSS RYAN W Total		**1**
AERO	L-39 ALBATROS	1
AERO Total		**1**
ALFHEIM III LLC	EPIC LT	1
ALFHEIM III LLC Total		**1**
LORENTZEN STEPHEN E	LANCAIR IV	1
LORENTZEN STEPHEN E Total		**1**
WACH JOHN N	GLASAIR III	1
WACH JOHN N Total		**1**
MITSUBISHI	MU-2B-40	1
MITSUBISHI Total		**1**
DOZIER JAMES C MD	LANCAIR 320/360	1
DOZIER JAMES C MD Total		**1**
LANCAIR COMPANY	LC-40-550FG	1
LANCAIR COMPANY Total		**1**
CHRISTOPHER STEPHEN	RV7	1
CHRISTOPHER STEPHEN Total		**1**
SWEARINGEN	SA226-T(B)	1

SWEARINGEN Total		**1**
WALLACE DONALD A	RV9A	1
WALLACE DONALD A Total		**1**
AEROSPATIALE	SA315B	1
AEROSPATIALE Total		**1**
JUDGE ANDREW L	VELOCITY ELITE	1
JUDGE ANDREW L Total		**1**
CANADAIR	CL-600-1A11	1
CANADAIR Total		**1**
SHORT BROTHERS PLC	S312 TUCANO T MK1	1
SHORT BROTHERS PLC Total		**1**
AIRBORNE AUSTRALIA	REDBACK	1
AIRBORNE AUSTRALIA Total		**1**
GATES LEARJET CORP.	35A	1
GATES LEARJET CORP. Total		**1**
ESTEB E/TOLCHIN S	RUTAN LONG EZE	1
ESTEB E/TOLCHIN S Total		**1**
ASBERRY MEL	A&M-6	1
ASBERRY MEL Total		**1**
EUROCOPTER DEUTSCHLA	EC 135 P2+	1
EUROCOPTER DEUTSCHLA Total		**1**
SCHEPPERS FRIEDRICH	JABIRU J-400	1
SCHEPPERS FRIEDRICH Total		**1**
NANCHANG CHINA	CJ-6	1
NANCHANG CHINA Total		**1**
NYS JOHN M	RV-12	1
NYS JOHN M Total		**1**
BARTELS JOSEPH	LANCAIR EVOLUTION	1
BARTELS JOSEPH Total		**1**
CONRY MICHAEL A	CONRY MICHAEL A/RV7	1
CONRY MICHAEL A Total		**1**
GAYLOR STEVEN C	VANS RV-8	1
GAYLOR STEVEN C Total		**1**
FITZPATRICK TIMOTHY	VANS AIRCRAFT INC RV	1
FITZPATRICK TIMOTHY Total		**1**
JCB 5 INC	EVOLUTION	1
JCB 5 INC Total		**1**
AERO COMMANDER	690	1
AERO COMMANDER Total		**1**
HASKINS SCOTT K	VANS RV-7A	1
HASKINS SCOTT K Total		**1**

WACO CLASSIC AIRCRAF	YMF-F5C	1
WACO CLASSIC AIRCRAF Total		**1**
COLUMBIA AIRCRAFT MI	LANCAIR EVOLUTION	1
COLUMBIA AIRCRAFT MI Total		**1**
WRIGHT MICHAEL E	VANS RV-7	1
WRIGHT MICHAEL E Total		**1**
NORTH AMERICAN	NA-265-50	1
NORTH AMERICAN Total		**1**
OSTERTAG WALTER G	VELOCITY RG	1
OSTERTAG WALTER G Total		**1**
Grand Total		**1138**

3.4 Airframe ADS-B Capabilities

The web site provides the capability to drill down on a tail number to view detailed information on that particular airframe. In addition to information about the airframe make, model, registration, and operator, the page gives details about how many Mode S and ADS-B operations were recorded for that airframe. It also provides insight into the ADS-B capabilities of the airframe by breaking down what types of information (ME message types) have been received from that airframe. Figure 3-9 shows a sample aircraft detail page. For the airframe shown, we have received identification, type, position, barometric altitude, and airborne velocity information.

N450FE

Aircraft	AA Code - 10842782
	Make - AIRBUS INDUSTRIE
	Model - A310-222
	Type - A312
	Year - 1984
Registration	FEDERAL EXPRESS CORPORATION
Operator	Federal Express Corporation [FDX]
Mode-S	Operations - 638
	First - 2004-11-06
	Last - 2008-02-29
COMM-B	Operations - 479
ADS-B	Operations - 433
	First - 2006-06-15
	Last - 2008-02-29

ADS-B CAPABILITIES (Derived From ADS-B 1090-ES Messages)					
Unknown Position	**ID & Type**	**Surface Position**	**Airborne Position w/BAROHeight**	**Airborne Velocity**	**Airborne Position w/GEOHeight**
ME0	**ME1 - ME4**	**ME5 - ME8**	**ME9 - ME18**	**ME19**	**ME20 - ME22**
FALSE	TRUE	TRUE	TRUE	TRUE	FALSE

Figure 3-9 Sample Aircraft Detail Page

4 Status Summary

The data collection continues and the data is processed and loaded into the database to produce the statistics for this report. Ongoing efforts include data collection and processing to produce these reports each month along with database, tools, and web site maintenance and improvements to support near real time compliance assessment. With the release of the Final Rule in May of 2010, Honeywell has made changes to our database and to the compliance assessment web pages to support the requirements of the Final Rule.

At the end of October the Honeywell receiver in Alexandria, VA recorded for the first time an aircraft reporting version to of DO-260 (DO-260B). The data can be viewed on new pages added to the Honeywell web site (see Section 4.2 below).

4.1 Database Development

Honeywell restructured elements of the database to support collection of data consistent with DO-260B.

4.2 Web Development

The Honeywell website (www.dissrr.com) has been updated to provide a summarization of the ADS-B received through October 2011. To date, fourteen (14) DO-260B aircraft have been recorded via the system of Honeywell receivers. The web site (http://www.dissrr.com/1090GS) continues to provide data on avionics conformance per the requirements of the ADS-B Out Final Rule, May 2010. Nine (9) of the 14 DO-260B aircraft have displayed fully compliant operations for the parameters checked at this time. The following links provide compliance assessment for the DO-260B aircraft:

Summary of Rule Conformance by Active DO-260B Aircraft

Summary of Rule Conformance By Recorded DO-260B Aircraft

Honeywell's backend databases and support processing have been expanded to provide analysis of ADS-B data received via the ITT network of sensors feeding the FAA's SBS Monitor. This new data set contains both DO-260B and DO-282B aircraft data, which will allow analysis of both 1090ES and UAT deployment. SBS data are now being periodically extracted from the SBS monitor and uploaded to the Honeywell servers. These "plot" data are fused into operations, and summary statistics are computed on these operations. Web page presentations are available at http://www.dissrr.com/1090GS/ITT. These web pages are not available to the general public and are only accessible via a secure web page interface.

Based on a request from Pat Zelechoski Honeywell developed a special web page to provide access to data recorded by the Honeywell system on 7 airplanes that were removed from access to Australian airspace due to ADS-B performance issues witnessed by Air Services Australia. This link continues to provide the ability to analyze and plot individual flights for each of these 7 specific aircraft over Google Earth. The link to the web page is:

http://www.dissrr.com/1090GS/SummaryOfAircraft.php?Q=TailNumber%20IN%20('N104UA','N107UA','N117UA','N119UA','N121UA','N122UA','N128UA')

4.3 Timeliness Study

Honeywell had begun a 1090ES ADS-B "Timeliness Study" to examine the intervals at which messages are being received as compared to the transmission schedules in the MOPS. The purpose of the study was to try to assess what type of message losses are being experienced in various airspaces due to

transmissions at 1090 MHz. This study was been placed on hold based on other priorities. No further activity is planned in this area.

4.4 Duplicate Mode S Code Study

This study has been completed and the final report was delivered in mid February of 2009. The study showed that there are a very small percentage of duplicate Mode-S codes operating in the NAS. The study was unable to confirm any instances of duplicate codes operating concurrently within range of a single receiver.

4.5 Data Age/Currency Analysis

Honeywell has now been collecting Mode S and ADS-B data for over six years and the statistics in this report reflect cumulative counts of aircraft observed over that period of time. Previously we had not examined how many of the 89,662 Mode-S aircraft and 12,004 ADS-B aircraft observed at the Honeywell sites may no longer be active. We have done some initial work on methods to determine how many aircraft in the cumulative database are presently active. We applied a "sliding window" method of analysis and developed charts showing Mode-S and ADS-B airframe counts corresponding to 12, 24, and 36 month windows (see **Appendix A**). The hypothesis is that by aging the data in this manner we will gain visibility into how much of the cumulative airframe count represents "stale" data – aircraft that are no longer active. The cumulative counts in the charts reflect airframes detected up to 12, 24 or 36 months in the past from the labeled month. The 24 and 36 month sliding window charts show a reduction in total numbers of airframes seen in the last 6 months when compared to Figure 3-1 which covers almost 60 months of data. Further analysis is required to determine if these charts are truly indicating that there are a smaller number of active airframes or if there is some other explanation, such as aircraft no longer flying routes visible at the ADS-B receiver locations.

4.6 Assessment of Compliance against the ADS B Out Final Rule

The ADS-B receiver that had been at JFK was installed at the PHI facility in Lafayette, LA on March 18, 2009. As part of the effort to support the start up of ADS-B operations in the Gulf of Mexico, Honeywell developed a set of web pages, database capabilities, and tools to capture and analyze data on PHI helicopters that were being equipped with DO-260A transponders. The web pages provide summary and detailed assessments of performance against a set of compliance criteria. The web pages provide the capability to drill down to an individual flight and to extract the message data for that flight. The web page also provides a capability to view the entire track history over Google Earth.

With the ability in place to identify what percentage of messages from a DO-260A aircraft meet a set of criteria Honeywell has begun to further examine this data for aircraft that show significant variations in performance (e.g., large variations in NIC/NAC/SIL). For example, one of the questions of interest is, for aircraft that normally have high accuracy and integrity values but show some small number of zero values; what is the distribution of those lower values over time (e.g., are they spread out over the time of the flight or clustered together in time)? We have also begun to look at the data to look for position anomalies. Although we do not have a source of "truth" data for the data set we are examining, we can look for obvious discontinuities in position data. At this time we have not yet developed ways for automatically detecting and presenting this information. However, in our initial sampling of some aircraft with large variations in integrity and accuracy parameters we have noted some behaviors in the data that are potentially of interest:

- Aircraft whose NIC/NAC/SIL parameters drop to zero and zero value reports are clustered in time (e.g., may last 15 to 20 seconds).

- Position errors (sometimes extreme) during the time when the NIC/NAC/SIL values are zero.

- We have seen several instances where, when the NIC/NAC/SIL parameters are zero, the aircraft switches velocity reporting methods from reporting velocity over ground to reporting airspeed and heading.

As a sample of some of the behavior we have observed, Figure 4-1 shows two plots for an aircraft with multiple anomalies in position reporting coupled with multiple changes in NIC, NACp, and SIL values. The plot in the upper left shows a plot of latitude vs. longitude and multiple position shifts are visible. These position shifts are on the order of 0.2 mi. The plot in the lower right of the figure displays latitude, longitude, NIC and NACp values over time. This shows a clear correlation between changes in NIC/NACp values and the position shifts in longitude. This aircraft also toggled back and forth between reporting velocity over ground and reporting airspeed and heading.

We are continuing to look at ways to further refine the identification of aircraft of interest (aircraft with significant variation in various outputs) as wells as ways to present that information effectively.

4.7 Compliance Monitor System

Honeywell continues working with the SBS Systems Engineering team and the SBS Monitor team on the definition of the SBS Compliance Monitoring system. Near-term emphasis will support the completion and acceptance of the SBS Compliance Monitor Concept of Operation and Requirement Documents, as well as the development of prototype analysis capabilities for the ITT / SBS ADS-B data collection.

Honeywell personnel attended a meeting with Systems Engineering and AJW personnel in Oklahoma City on 10/25 and 10/26 to review the requirements for the Compliance Monitor and to begin discussions on the software development plan and start of implementation. The meeting covered the following:

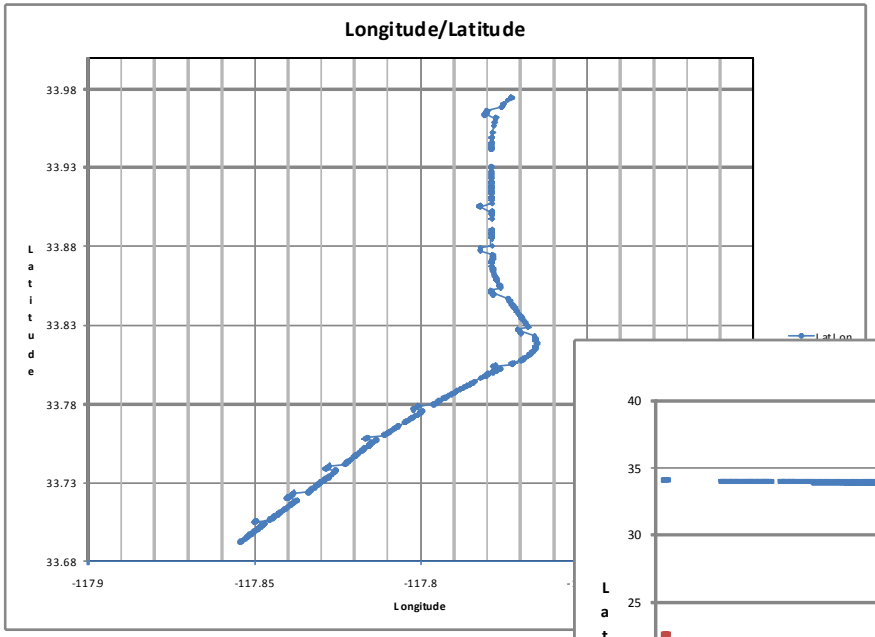
- Level 1 requirements for the Compliance Monitor have been incorporated in the SBS Monitor System Requirements Specification which is being circulated for approval at the NAS level. The team reviewed more detailed requirements included in a functional requirements document developed by Systems Engineering.
- The team reviewed the current capabilities of the Honeywell web site that is being used to prototype some concepts for presentation of compliance information.

- The team discussed the SBS Monitor Architecture and concepts for integration of the Compliance Monitor functionality into the SBS Monitor. Since the SBS Monitor architecture is Service Volume oriented, one of the key areas that will need to be considered in the design is how to aggregate data for Compliance Monitor reporting to provide a coherent picture of compliance for an aircraft flight (which will usually cross multiple service volumes).

- Based on discussions of the SBS Monitor architecture, it appears that the most logical place for the Compliance Monitor to “plug in” to the SBS Monitor to receive data is the Performance Monitor Service (PMS). The team began looking at the SBS Monitor code to examine who existing SBS Monitor services tie in to PMS. AJW provided a copy of the SBS Monitor source code to Honeywell for further study.

- The team had preliminary discussions on the environment that Honeywell will need to setup to do development. Honeywell will work with AJW to refine the requirements and then will prepare a cost estimate to obtain funding to procure the development environment.

- The team will begin working on putting together the Software Development Plan. Based on current planned SBS Monitor activities and builds, the team discussed a tentative target of September 2012 for the release of the first build of the Compliance Monitor



- Track plot shows multiple position anomalies
- Aircraft is switching between reporting velocity over ground and airspeed/heading
- Plot of NIC and NACp over time along with Lat and Lon shows correlation between position changes and NIC and NACp changes

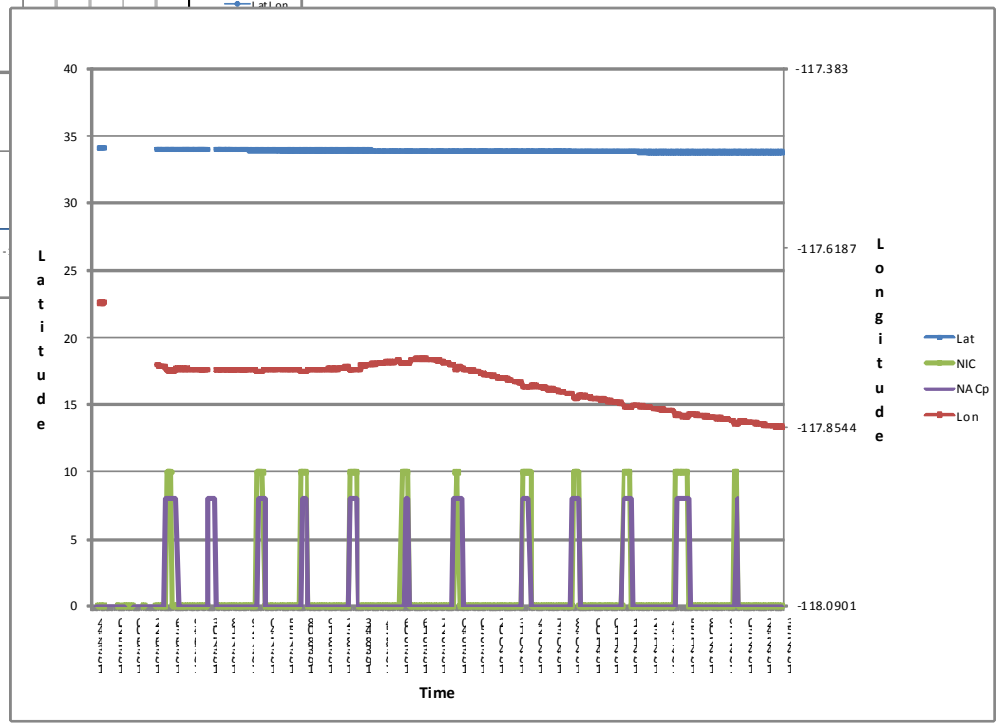
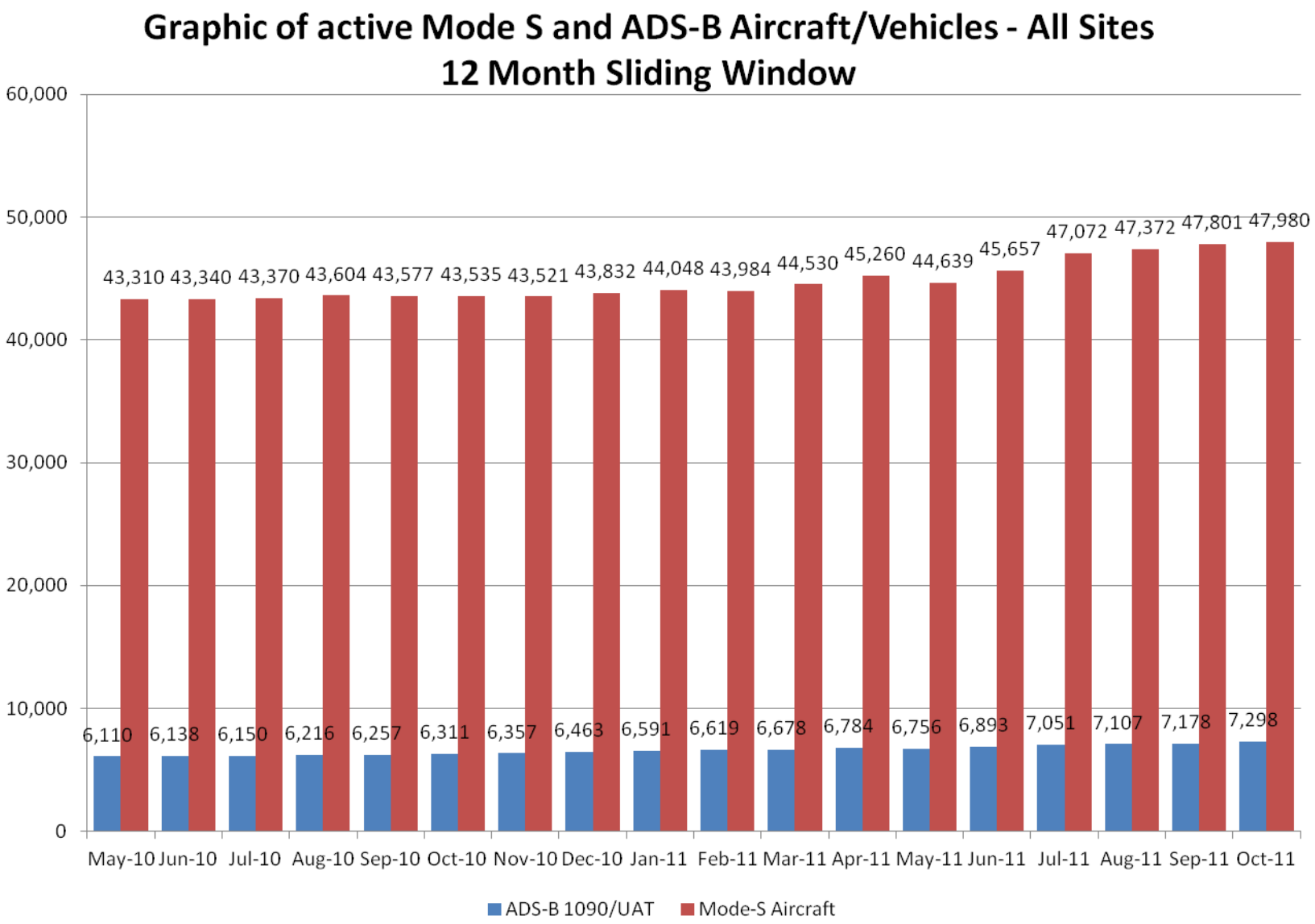
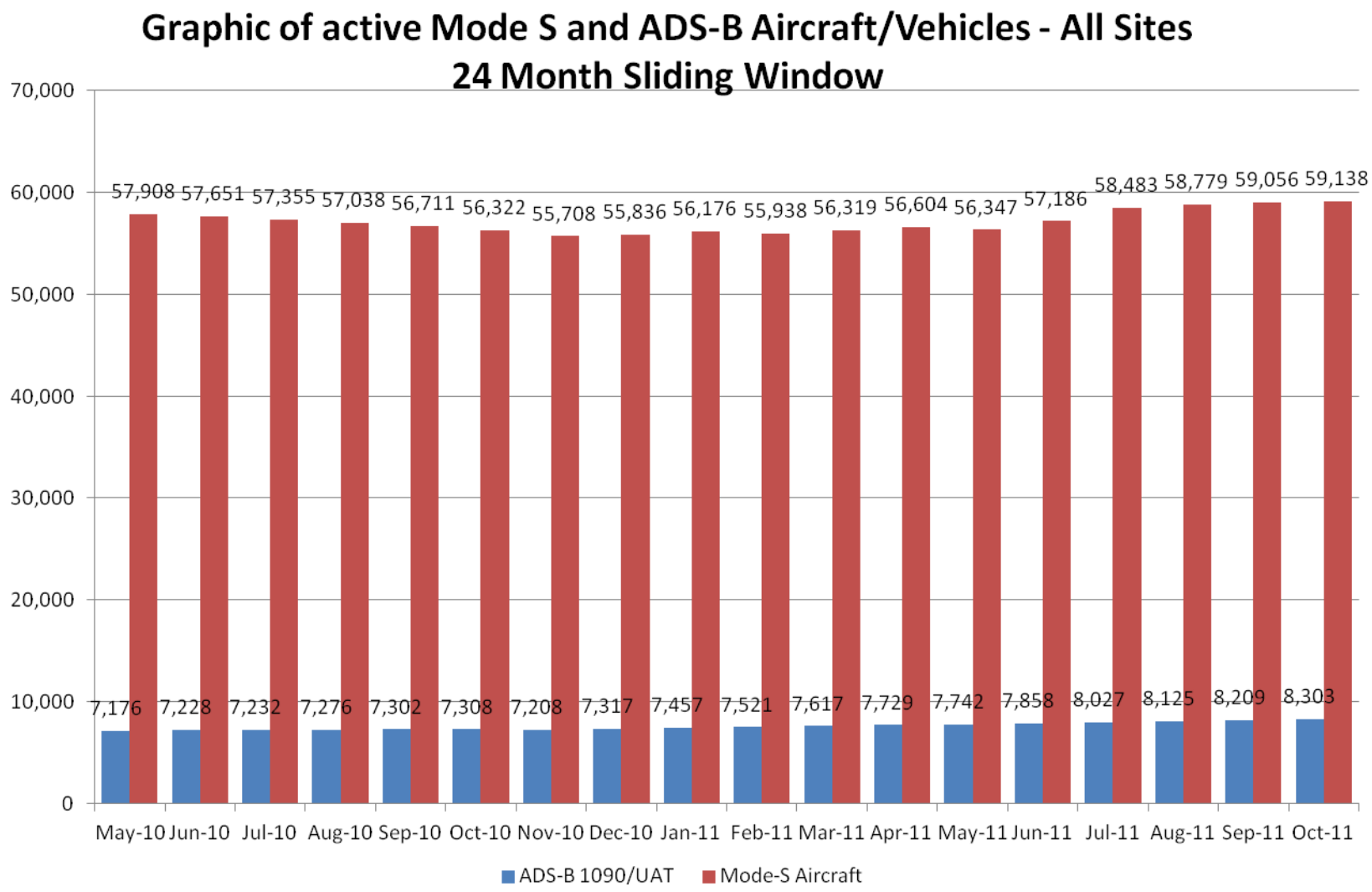
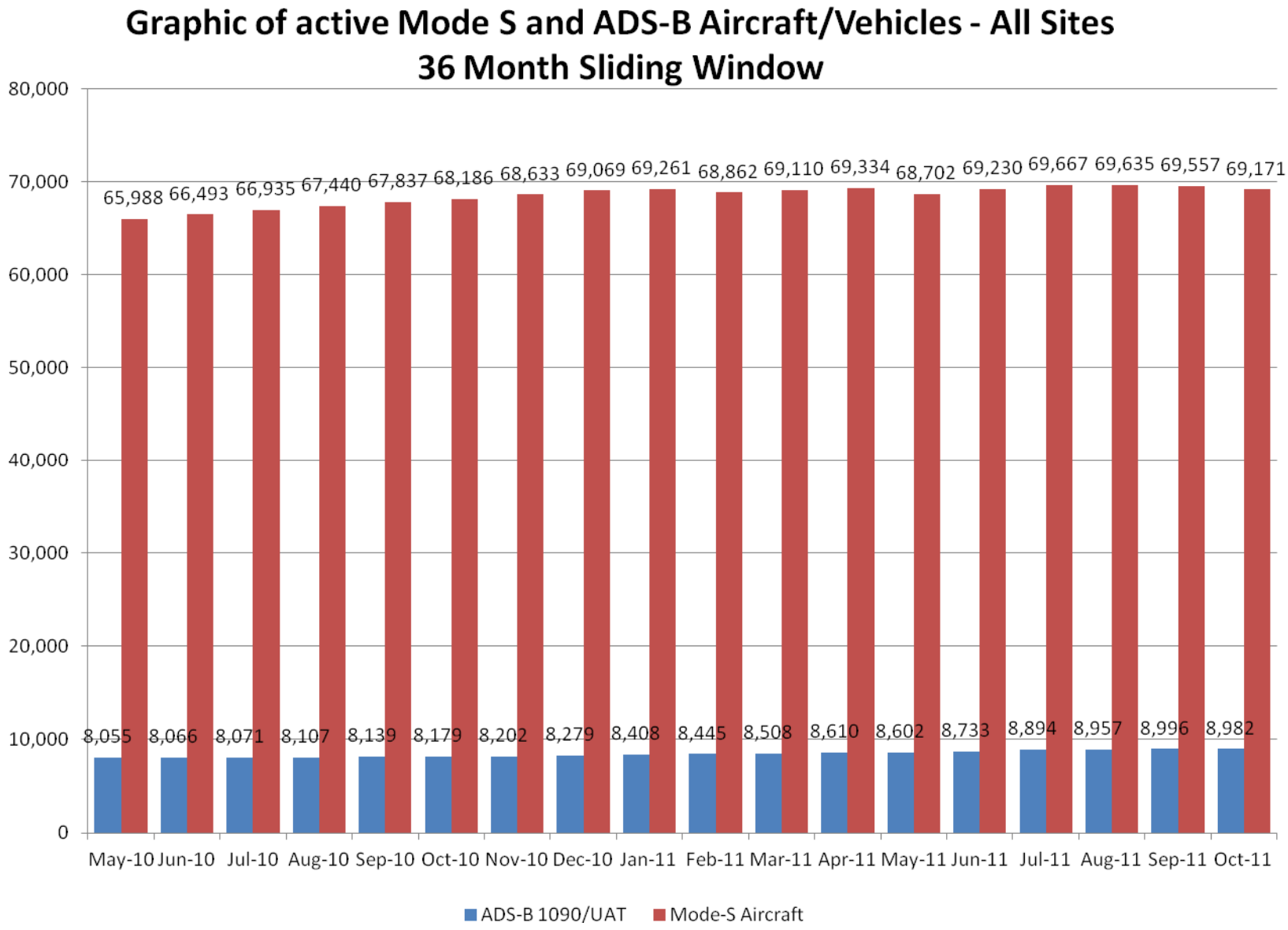


Figure 4-1 Sample Plots For Aircraft with Position Anomalies

Appendix A – Sliding Window Count Chart


Graphic of active Mode S and ADS-B Aircraft/Vehicles - All Sites
12 Month Sliding Window
60,000
50,000
40,000
30,000
20,000
10,000
0
43,310 43,340 43,370 43,604 43,577 43,535 43,521 43,832 44,048 43,984 44,530 45,260 44,639 45,657 47,072 47,372 47,801 47,980
6,110 6,138 6,150 6,216 6,257 6,311 6,357 6,463 6,591 6,619 6,678 6,784 6,756 6,893 7,051 7,107 7,178 7,298
May-10 Jun-10 Jul-10 Aug-10 Sep-10 Oct-10 Nov-10 Dec-10 Jan-11 Feb-11 Mar-11 Apr-11 May-11 Jun-11 Jul-11 Aug-11 Sep-11 Oct-11
ADS-B 1090/UAT
Mode-S Aircraft


Graphic of active Mode S and ADS-B Aircraft/Vehicles - All Sites
24 Month Sliding Window
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
57,908 57,651 57,355 57,038 56,711 56,322 55,708 55,836 56,176 55,938 56,319 56,604 56,347 57,186 58,483 58,779 59,056 59,138
7,176 7,228 7,232 7,276 7,302 7,308 7,208 7,317 7,457 7,521 7,617 7,729 7,742 7,858 8,027 8,125 8,209 8,303
May-10 Jun-10 Jul-10 Aug-10 Sep-10 Oct-10 Nov-10 Dec-10 Jan-11 Feb-11 Mar-11 Apr-11 May-11 Jun-11 Jul-11 Aug-11 Sep-11 Oct-11
ADS-B 1090/UAT
Mode-S Aircraft


Graphic of active Mode S and ADS-B Aircraft/Vehicles - All Sites
36 Month Sliding Window
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
65,988 66,493 66,935 67,440 67,837 68,186 68,633 69,069 69,261 68,862 69,110 69,334 68,702 69,230 69,667 69,635 69,557 69,171
8,055 8,066 8,071 8,107 8,139 8,179 8,202 8,279 8,408 8,445 8,508 8,610 8,602 8,733 8,894 8,957 8,996 8,982
May-10 Jun-10 Jul-10 Aug-10 Sep-10 Oct-10 Nov-10 Dec-10 Jan-11 Feb-11 Mar-11 Apr-11 May-11 Jun-11 Jul-11 Aug-11 Sep-11 Oct-11
ADS-B 1090/UAT
Mode-S Aircraft