Problem Reporting and System Performance Analysis

(ICAO Seminar/workshop on the implementation of Ground Ground and Ground Air data link in the SAM Region)

Lima, Peru 10 -12 September 2012

AIRWAYS NEW ZEALAND

Post Implementation Monitoring - the process

- GOLD Appendix D provides the guidance:
  - Obtaining the required data points from the FANS 1/A ACARS messages and the calculation of actual communication performance (ACP), actual communication technical performance (ACTP), pilot operational response time (PORT), and surveillance latency.
  - Graphical analysis
  - Data Filtering
  - Performance Reporting
  - Availability

Graphical Analysis (1)

- Graphical analysis is useful for depicting actual performance, and has proved extremely useful when identifying performance problems.
- Monitoring is done at a number of levels and can be used for both CPDLC and ADS-C performance monitoring. The following structure is in use in the SOPAC:
  - Monitoring Communication Media Performance.
    - Data from all aircraft via all Remote Ground Station (RGS) types.
    - Data from all aircraft via SATCOM RGS
    - Data from all aircraft via VHF RGS
    - Data from all aircraft via HF RGS
    - Data from all aircraft via HF and SATCOM RGS

Graphical Analysis (2)

- Monitoring Airline Fleet Performance.
  - An analysis of the observed performance of each type of aircraft operated by an operator:
    - Via SATCOM - Via SATCOM + HF
    - Via HF - Via VHF
    - Via All RGS
  - Comparative analysis of the observed performance from the same type of aircraft from different operators.
- Examples of this monitoring can be viewed on the ISPACG CRA website in the performance sections. Refer -

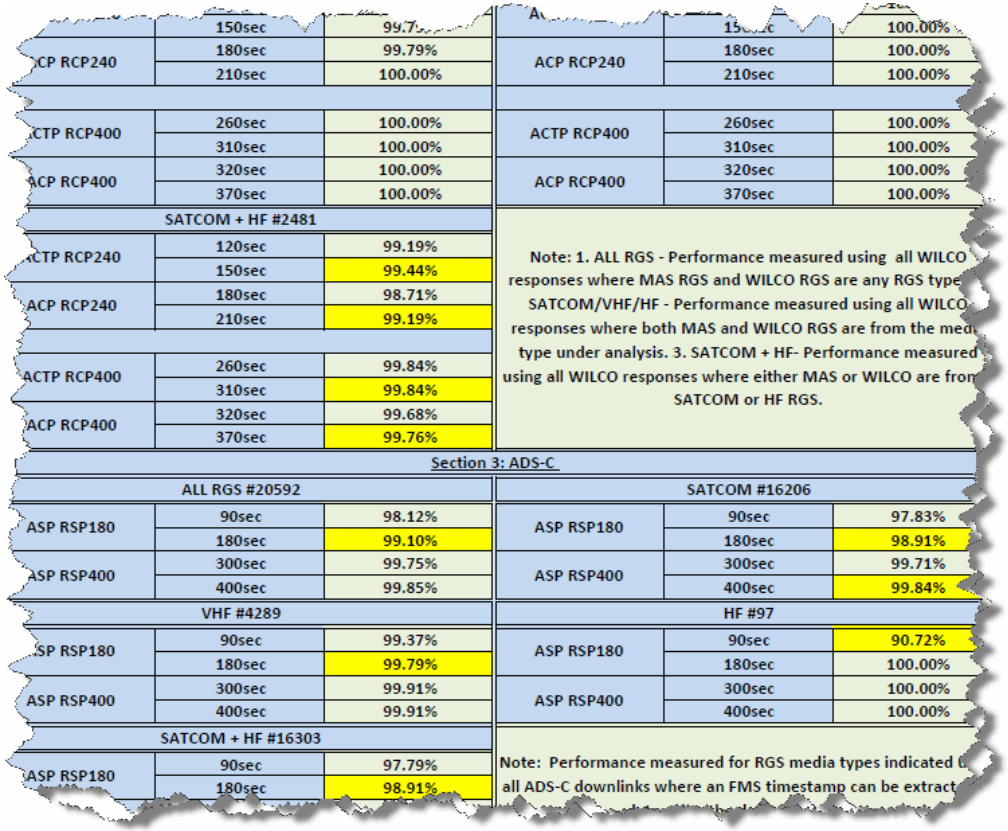
http://www.ispacg-cra.com/

Data filtering

- ATSP need to implement consistent data filtering to ensure we are using a common data baseline.
- Delayed reports during periods of known system outages should be filtered from the data before assessing CPDLC transaction performance or ADS-C latency.
- Numerous instances of duplicate ADS-C reports are observed in FANS-1/A data records. The duplicated reports should be filtered before assessing ADS-C latency.

Performance Reporting

- We are using monthly performance reporting to obtain system performance metrics.
- These reports will provide data on observed availability, ADS-C latency and CPDLC communications performance.
- See example on ISPACG CRA website



CP RCP240	150sec	99.7…
	180sec	99.79%
	210sec	100.00%
CTP RCP400	260sec	100.00%
	310sec	100.00%
ACP RCP400	320sec	100.00%
	370sec	100.00%
SATCOM + HF #2481		
CTP RCP240	120sec	99.19%
	150sec	99.44%
ACP RCP240	180sec	98.71%
	210sec	99.19%
ACTP RCP400	260sec	99.84%
	310sec	99.84%
ACP RCP400	320sec	99.68%
	370sec	99.76%

A…	15…c	100.00%
ACP RCP240	180sec	100.00%
	210sec	100.00%
ACTP RCP400	260sec	100.00%
	310sec	100.00%
ACP RCP400	320sec	100.00%
	370sec	100.00%

Note: 1. ALL RGS - Performance measured using all WILCO responses where MAS RGS and WILCO RGS are any RGS type SATCOM/VHF/HF - Performance measured using all WILCO responses where both MAS and WILCO RGS are from the medi type under analysis. 3. SATCOM + HF- Performance measured using all WILCO responses where either MAS or WILCO are fron SATCOM or HF RGS.

Section 3: ADS-C

ALL RGS #20592		
ASP RSP180	90sec	98.12%
	180sec	99.10%
ASP RSP400	300sec	99.75%
	400sec	99.85%
VHF #4289		
SP RSP180	90sec	99.37%
	180sec	99.79%
ASP RSP400	300sec	99.91%
	400sec	99.91%
SATCOM + HF #16303		
ASP RSP180	90sec	97.79%
	180sec	98.91%

SATCOM #16206		
ASP RSP180	90sec	97.83%
	180sec	98.91%
ASP RSP400	300sec	99.71%
	400sec	99.84%
HF #97		
ASP RSP180	90sec	90.72%
	180sec	100.00%
ASP RSP400	300sec	100.00%
	400sec	100.00%

Note: Performance measured for RGS media types indicated u… all ADS-C downlinks where an FMS timestamp can be extract…

Availability

- ANSP should report on CSP notified system outages and on detected outages that have not been notified.

- See example on ISPACG CRA website.

Monthly Report of Datalink Performance by Airways New Zealand NZZO FIR, July 2009

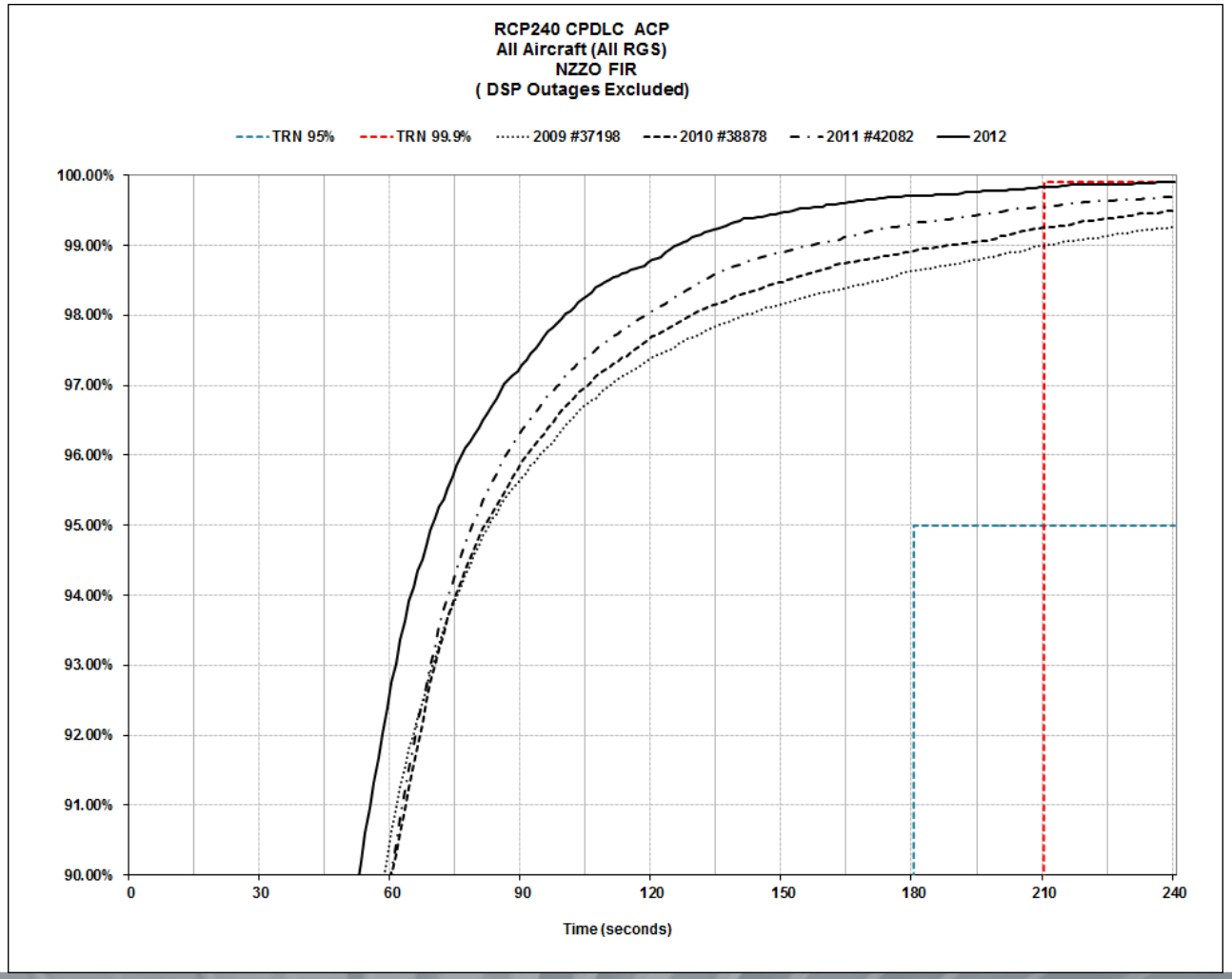
Section 1: Availability

CSP Notification	CSP Name	Outage Type	Start	End	Duration (Mins)
200907061735	ARINC	SATCOM	200907061702	200907962254	292
Note: This reported outage had no impact on NZZO operations					

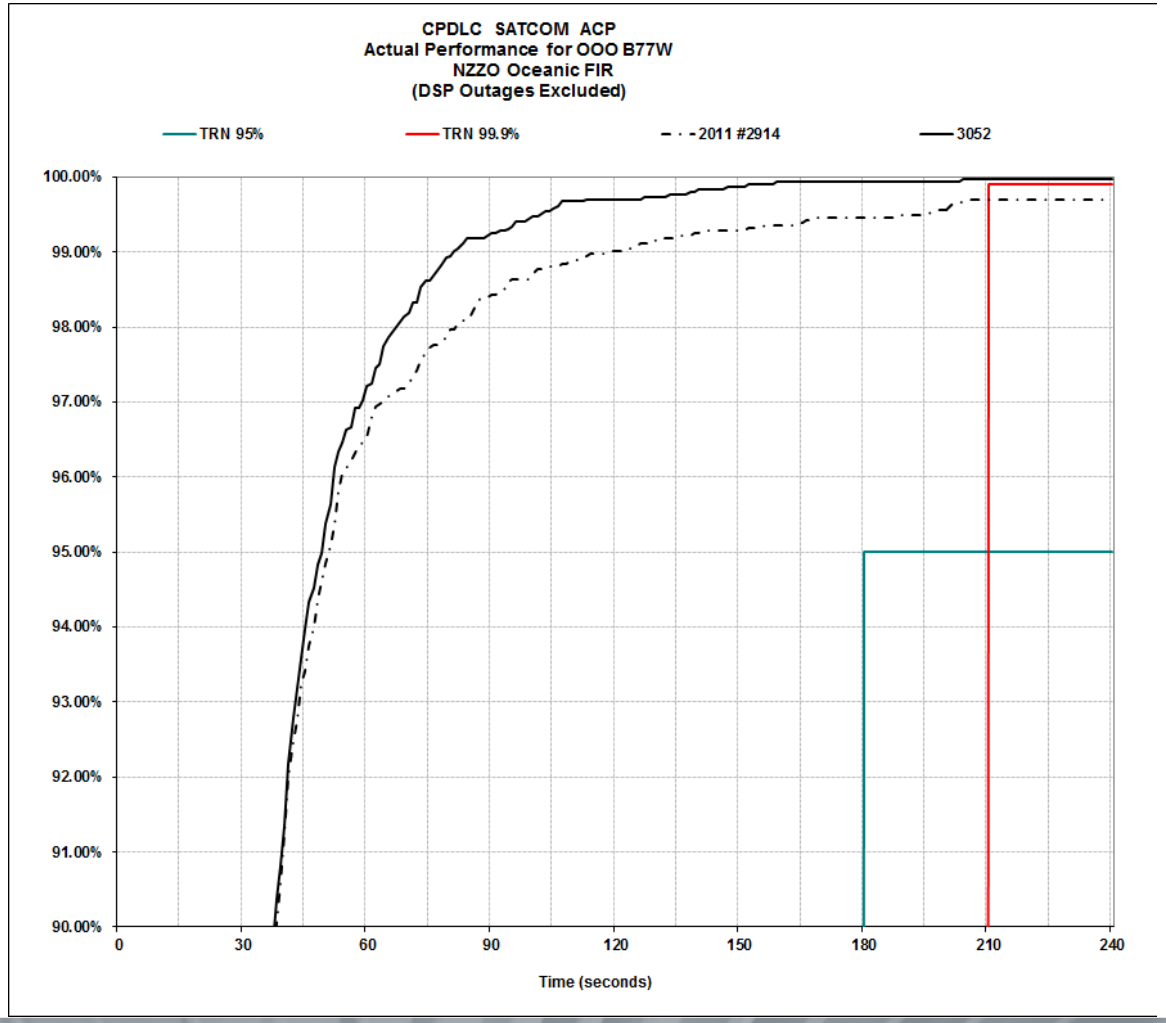
Continuous Performance Improvement

- Monitoring shows that the FANS1/A system is capable of meeting the RCP240 and RSP180 requirements.
- However, not all aircraft are meeting the requirements.
- For aircraft not meeting the requirements we are seeking to improve their performance by:
  - Identifying the performance problems by monitoring.
  - Reporting performance problems through a Central Reporting Agency that has buy in from all stakeholders.
  - Resolving the identified performance problems.
  - Providing feedback to stakeholders.
- Promote a culture that emphasizes continuous performance improvement.

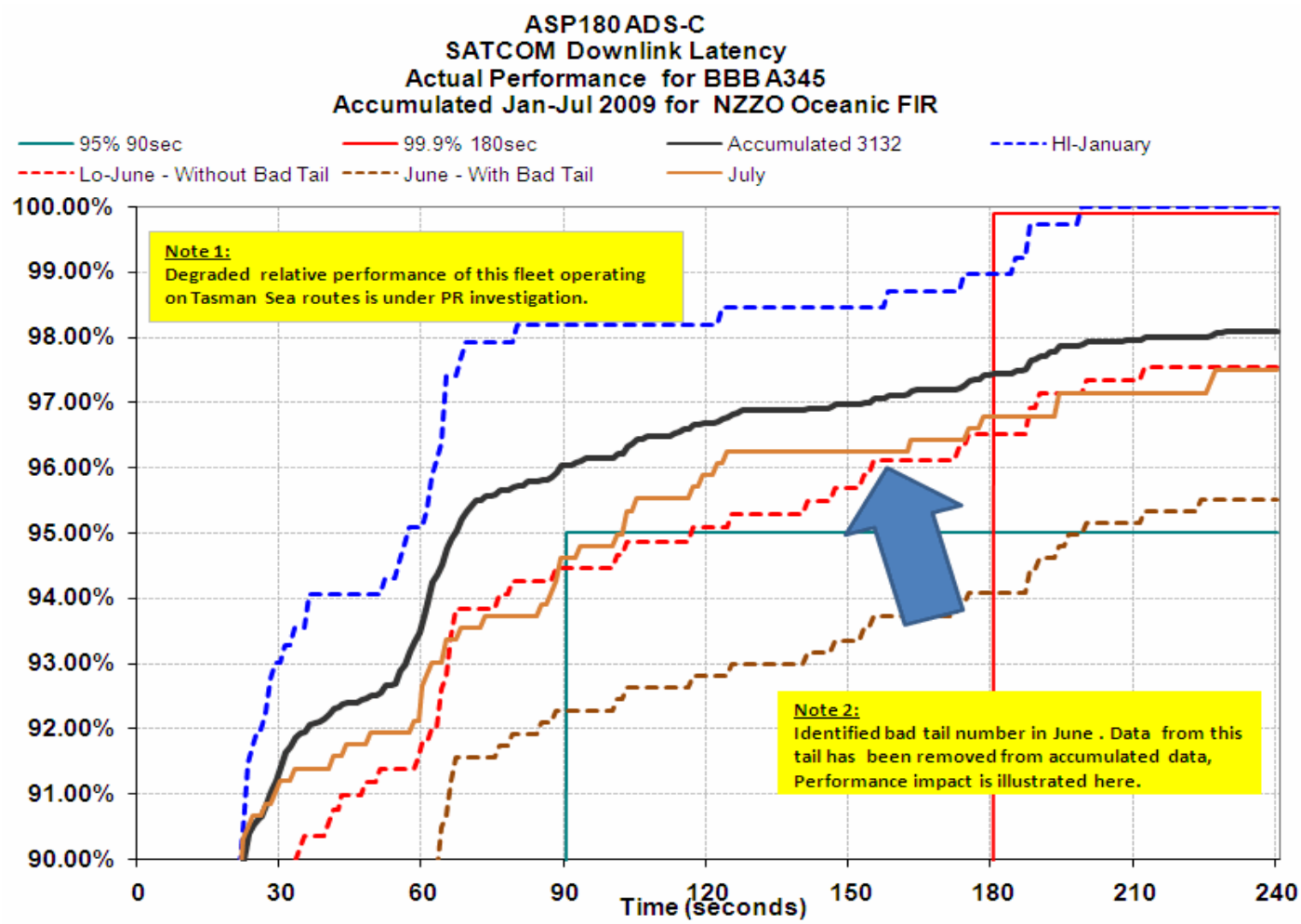
The system can meet the standards



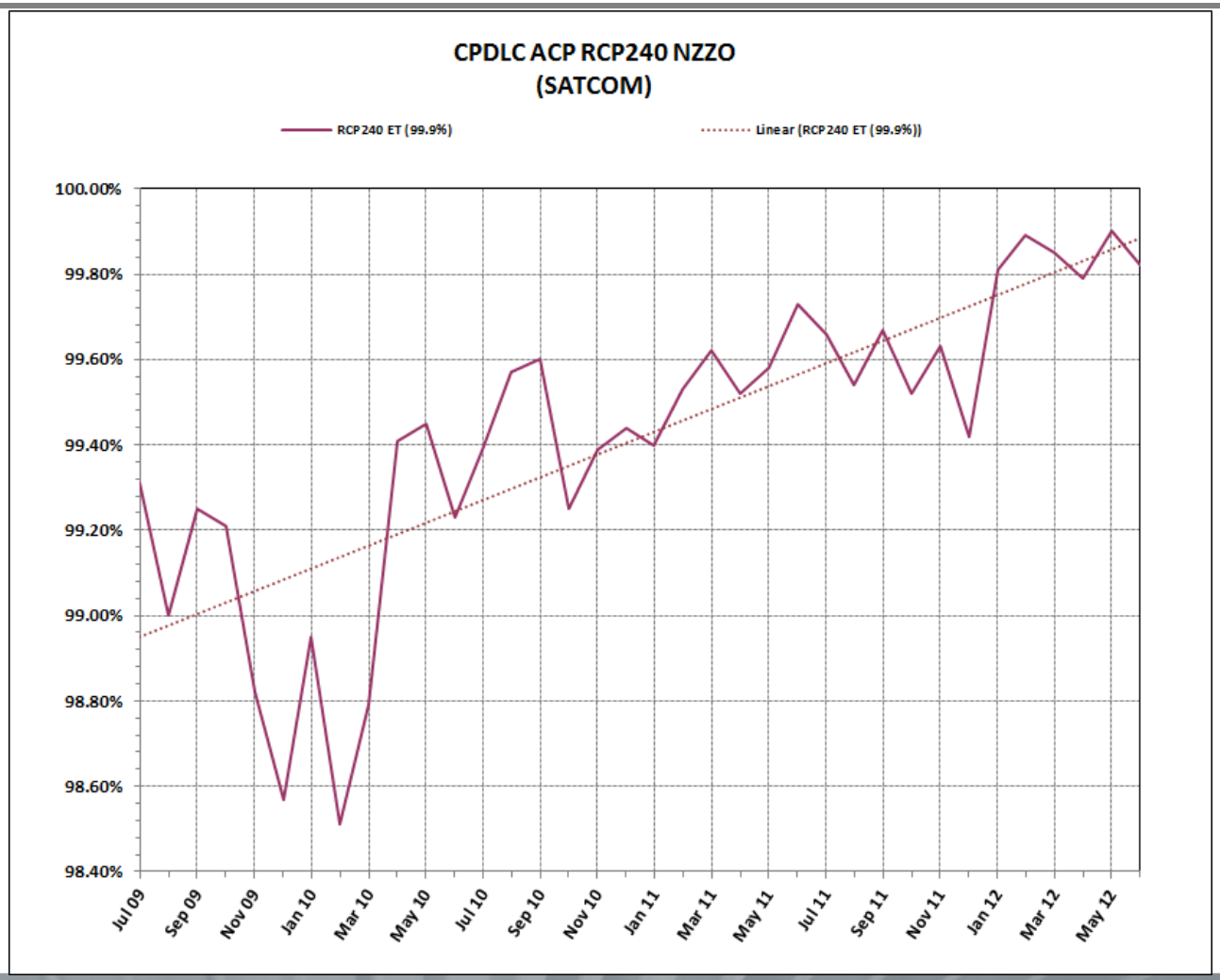
The system can meet the standards



But there is always some work to do.....



Continuous Performance Improvement

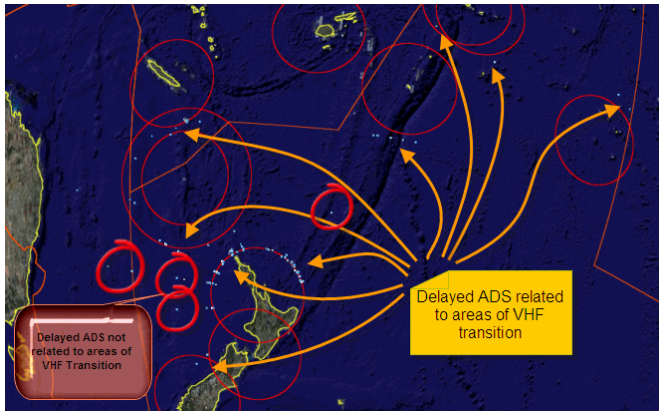


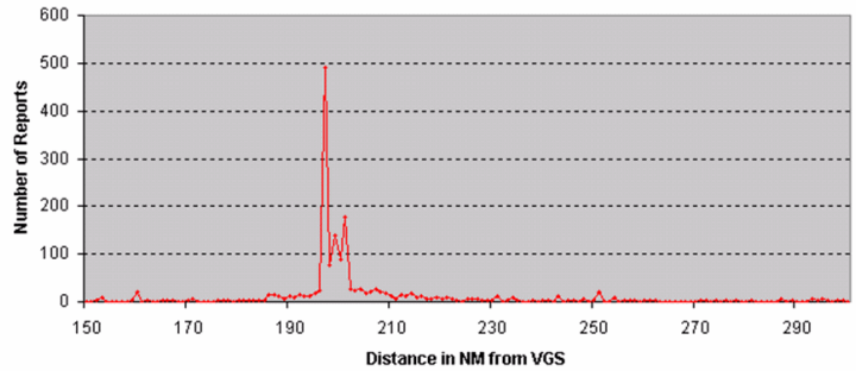
Some performance initiatives (1)

- Use of High Speed ACARS Channels
  - All AES using high-gain antennas have the option to enable high speed 10.5 kb/sec channels for both ground-to-air calls on P-channel and air-to-ground calls on R and T-channels.
  - High speed channel use is selectable by individual airlines in the aircrafts Operational Requirements Table.
  - A number of fleets have been identified as still using the low speed 600/1200 bits per second channels. This can cause performance degradation.

Some performance initiatives (2)

- B777 VHF-SATCOM transition delays
  - Reported issue with significant ADS-C downlink delays in VHF transition areas in 2009.





  - Boeing identified an issue with transitions into SATCOM from SITA VHF coverage.
  - Software fix was implemented in the AIMS Block Point 14 upgrade

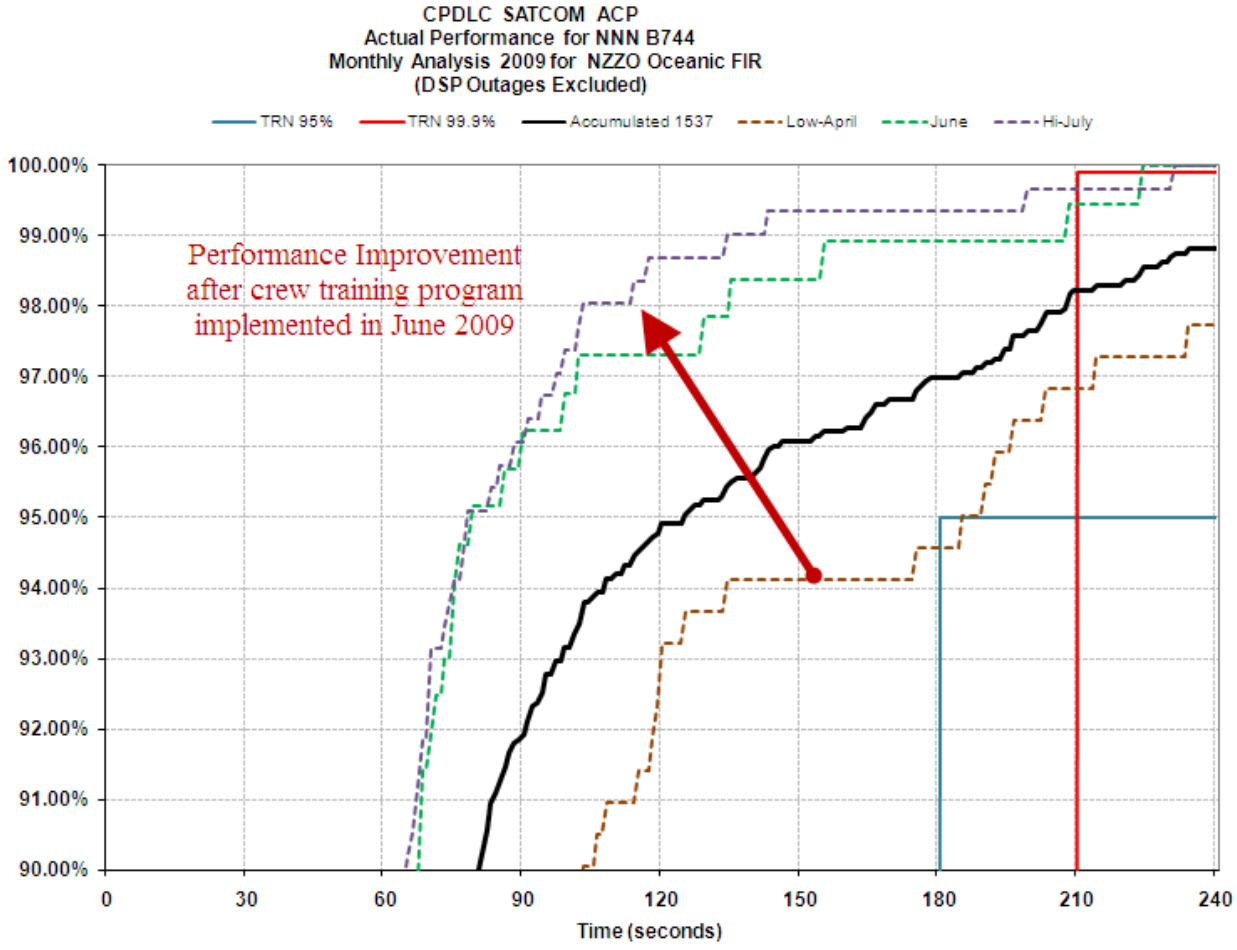
Some performance initiatives (3)

- ADS-C Contract Management
  - For aircraft that have multiple contracts with different ATSPs we are seeing 10-15 second delays between transmission of waypoint reports to different ATSPs.
  - Longer delays can be seen when aircraft utilize low speed ACARS channels.
  - For those regions where aircraft operate on routes hemstitching different FIR and where contracts are established by multiple FIR this can have an impact on performance figures.
  - Contract Management is important. If you don’t need it then cancel the contract.

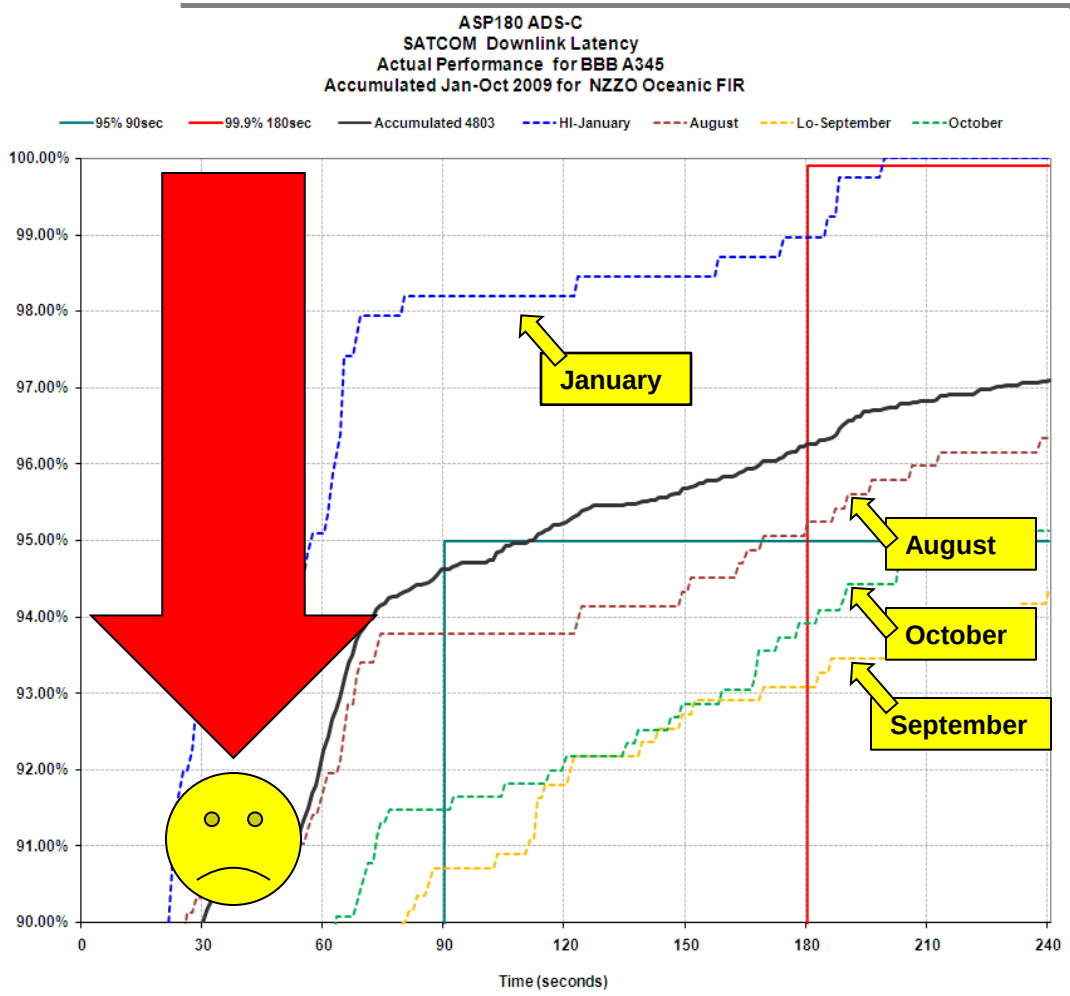
Some performance initiatives (4)

- Pilot Operational Response Times
  - The Oceanic SPR allows 60secs at 95% for pilot response to an uplink.
  - Generally monitoring shows good response times.
  - One airline that was showing actual performance well below that seen from other airlines implemented a training advisory on the need for prompt responses to ATC uplinks.
  - A significant improvement has been seen in performance.
  - Refer following slide for improvement in ACP due improvement in PORT.

Some performance initiatives (4)



Some performance initiatives (5)

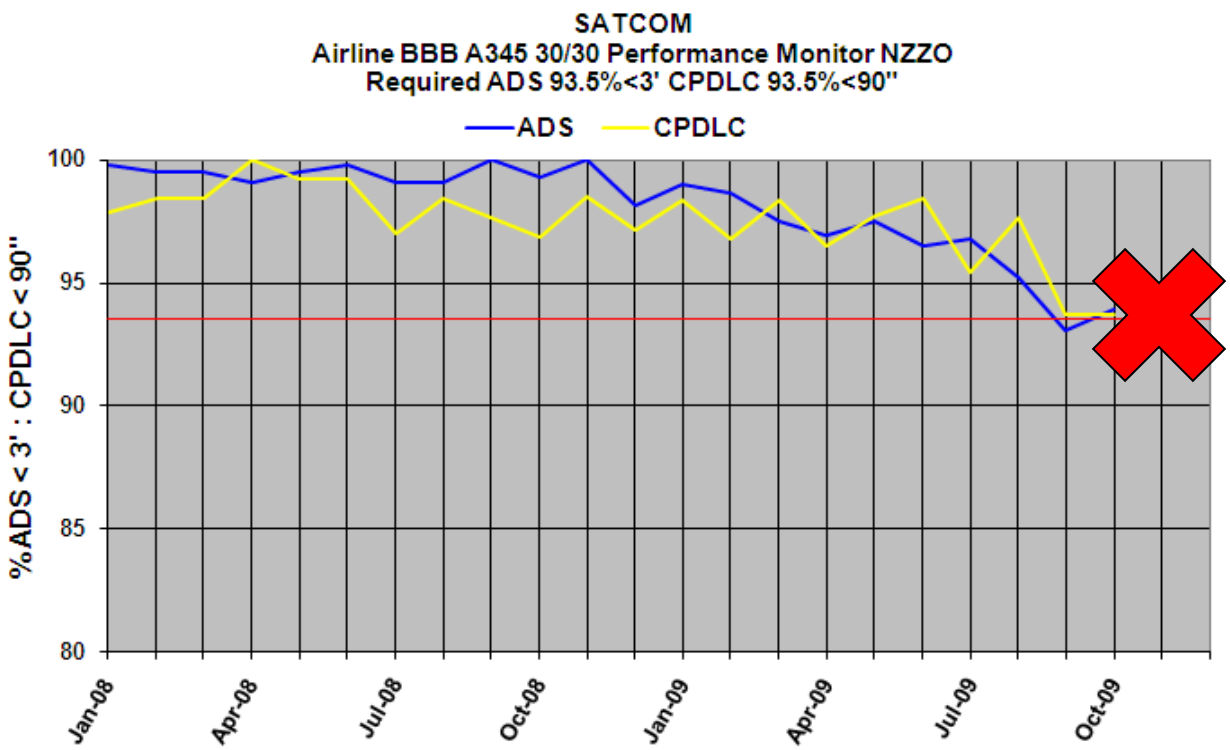


- This A345 fleet was gradually fitted with new cabin services using Data 3 from December 2008

- After FANS Problem Report investigation deterioration identified as being caused by an interaction between ACARS Data 2 and Data 3 cabin services.

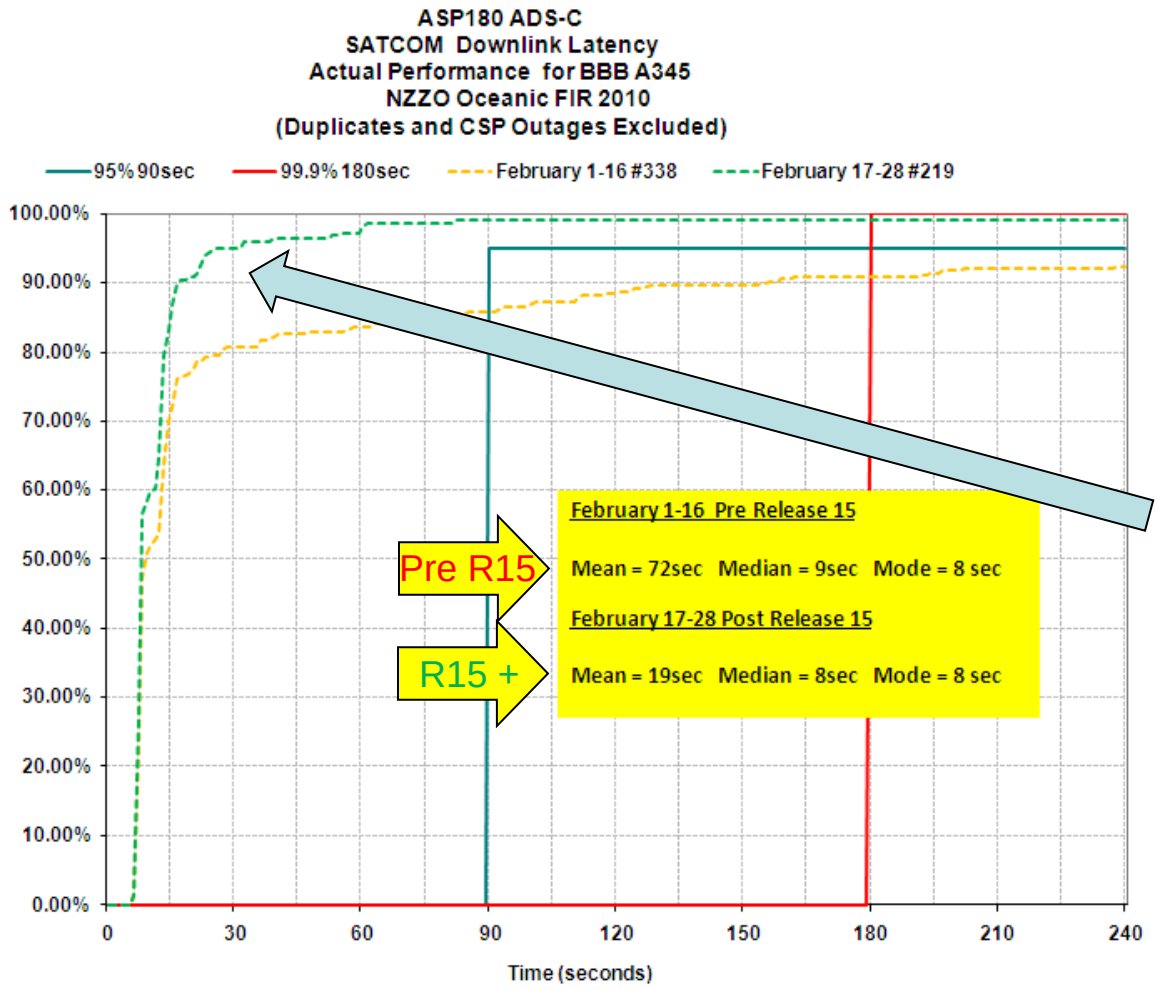
Some performance initiatives (5)

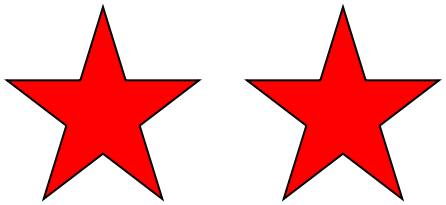
- Because of the performance deterioration NZZO withdrew reduced distance based separations from this fleet in October 2009.



- Before RSP180 and RCP240 requirement for D30 separation was achieving 93.5% of ADS downlinks in < 3’ and 93.5% of CPDLC downlinks in < 90”.
- Operationally the decision points are similar.

Some performance initiatives (5)





This was the fleet from which reduced separations were withdrawn in October 2009.

The achieved RSP180 requirements following the R15 release at Santa Paula.

Application of reduced separations on this fleet has been restored.

Thank you

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Post-implementation monitoring and compliance status:

GOLD Appendix D

ICAO Seminar/Workshop on the Implementation of Ground-ground and Air-ground Data Links in the SAM Region

Lima, Peru

10 - 12 September 2012

Federal Aviation Administration

Outline

- **Tracking system outages – to monitor AVAILABILITY**
- **Overview of performance analysis described in Appendix D of the GOLD – to monitor TIME / CONTINUITY**
  - RCP performance measures
  - RSP performance measures
- **Interpreting graphical analysis recommended in Appendix D of the GOLD**
- **Examples of performance analysis**
  - General – to examine status of performance
  - Exploratory – attempt to identify cause of poor performance

Tracking System Availability

- The AVAILABILITY aspect is ensured initially in contract/service agreements with the CSP and with approval of aircraft data link equipment
- Post-implementation monitoring evaluates service AVAILABILITY from unplanned outage events on a per center basis if the outage exceeds 10 minutes and if it affects multiple aircraft
- The service AVAILABILITY requirements are allocated exclusively to the CSP, and assume that failed data link components within the ANSP would not significantly contribute to loss of the data link service

Specification: RCP 240/D, Application: CPDLC, Component, CSP			
Availability parameter	**Efficiency**	**Safety**	**Compliance means**
Service availability (A_{CSP})	0.9999	0.999	Contract/service agreement terms
Unplanned outage duration limit (min)	10	10	Contract/service agreement terms
Maximum number of unplanned outages	4	48	Contract/service agreement terms
Maximum accumulated unplanned outage time (min/yr)	52	520	Contract/service agreement terms
Unplanned outage notification delay (min)	5	5	Contract/service agreement terms

Specification: RCP 400/D, Application: CPDLC, Component, CSP			
Availability parameter	**Efficiency**	**Safety**	**Compliance means**
Service availability (A_{CSP})	N/A	0.999	Contract/service agreement terms
Unplanned outage duration limit (min)	N/A	20	Contract/service agreement terms
Maximum number of unplanned outages	N/A	24	Contract/service agreement terms
Maximum accumulated unplanned outage time (min/yr)	N/A	520	Contract/service agreement terms
Unplanned outage notification delay (min)	N/A	10	Contract/service agreement terms

GOLD Analysis Overview: CPDLC Message Set

- According to the guidance in the Global Operational Data Link Document (GOLD) only a specific message set in considered
  - All uplink communications transfer messages and typical intervention messages such as climb clearances with an observed CPDLC “WILCO” response attribute are assessed
  - These messages are considered to be intervention messages critical to the communications used when applying reduced separation standards
  - ❖ This message set is currently being re-considered

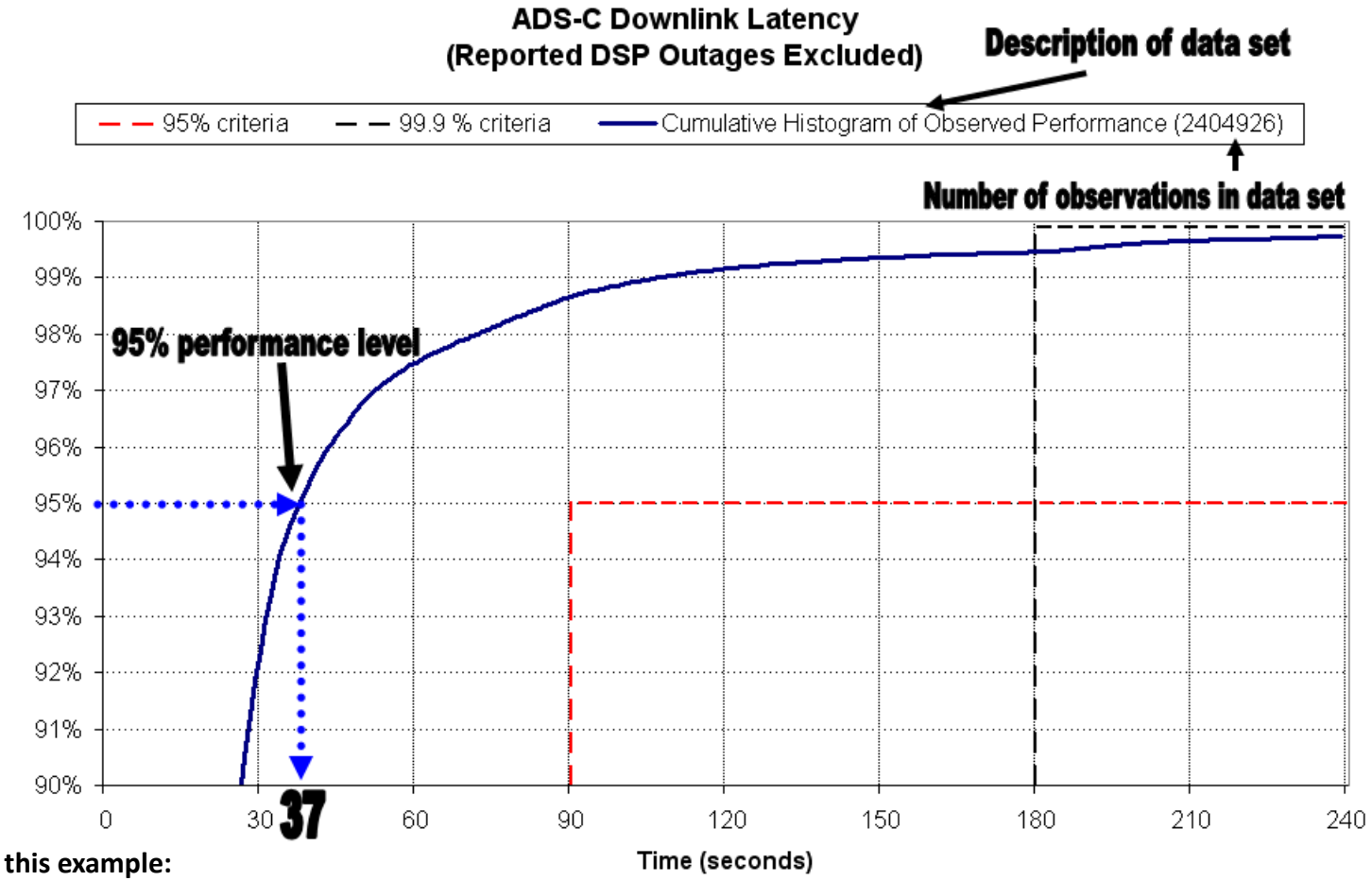
GOLD Analysis Overview: CPDLC Performance Measures

- **Actual Communication Performance (ACP)**
  - Total time required by the communication transaction
  - Begins when the CPDLC uplink message is sent to aircraft
  - Ends when the WILCO is received
- **Actual Communication Technical Performance (ACTP)**
  - Time required for the message delivery part of the communication transaction, includes:
    - CPDLC clearance uplink transit time
    - WILCO downlink transit time
- **Pilot Operational Response Time (PORT)**
  - Time required for crew response
  - Estimated by ACP - ACTP

GOLD Analysis Overview: ADS-C Messages and Performance Measure

- **Surveillance Latency**
  - All downlink ADS-C messages are included
    - ❖ Duplicate messages are filtered out
  - Measures transit time for downlink message delivery
  - Begin time estimated by timestamp of aircraft when sent (position time)
  - End time estimated by timestamp of ATC receipt

GOLD Analysis Overview: Interpreting GOLD Charts



In this example:

- → **the observed performance meets the 95% criteria but does not meet the 99.9% criteria,**
- → **the latency of 95% of downlink ADS-C messages in data set is within 37 seconds**
- → **the latency of 99.9% of downlink ADS-C messages in data set is not shown because it is greater than the 240 seconds included on the chart**

Summary of RCP/RSP Specifications for Time/Continuity

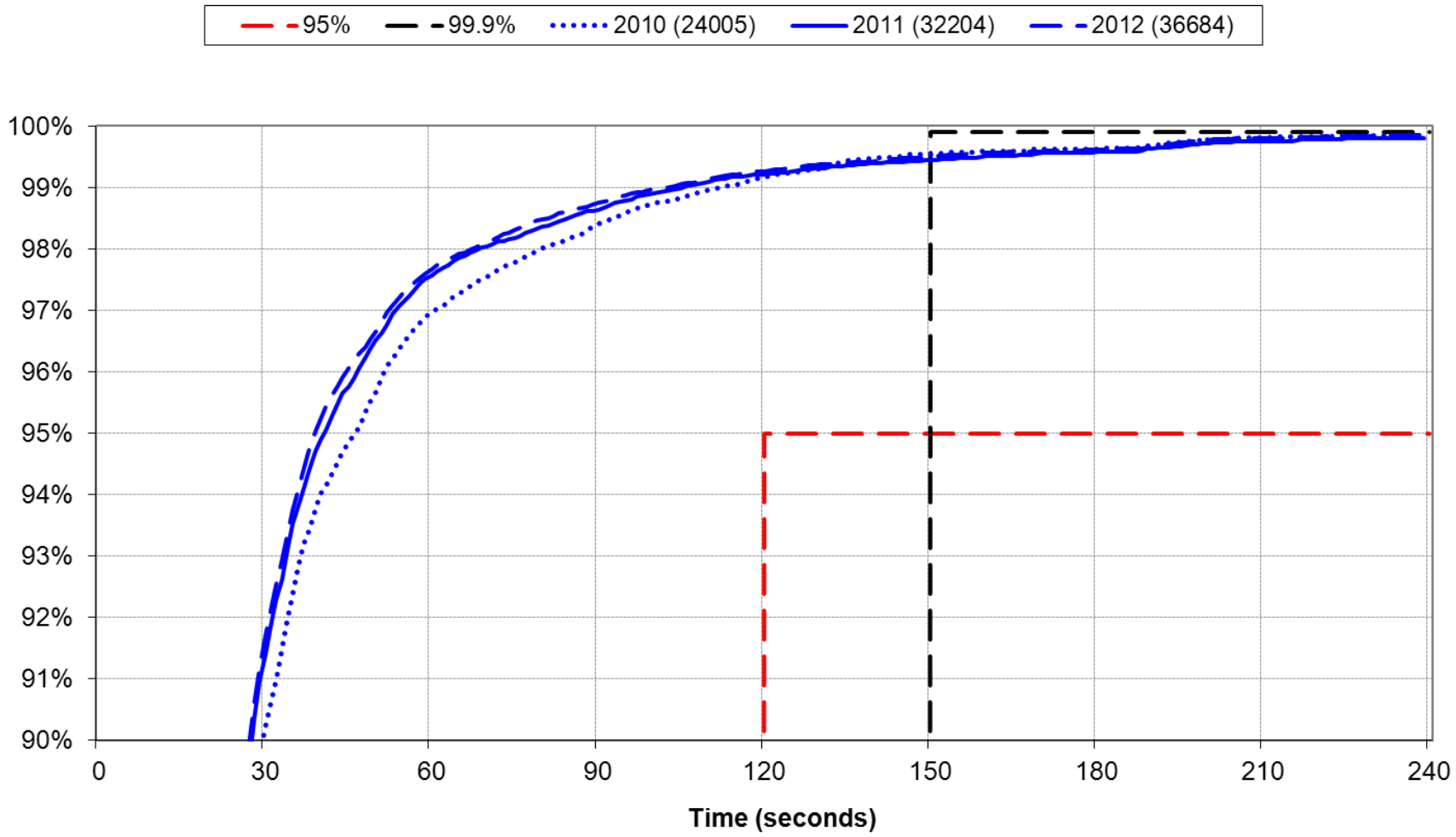
Performance Measure	Percent of Messages Required to Meet Criteria	RCP240 Criteria (sec)	RCP400 Criteria (sec)	RSP180 Criteria (sec)	RSP400 Criteria (sec)
ADS-C Latency	95%	--	--	90	300
	99.9%	--	--	180	400
ACTP	95%	120	260	--	--
	99.9%	150	310	--	--
ACP	95%	180	320	--	--
	99.9%	210	370	--	--
PORT	95%	60	60	--	--

General Performance Analysis

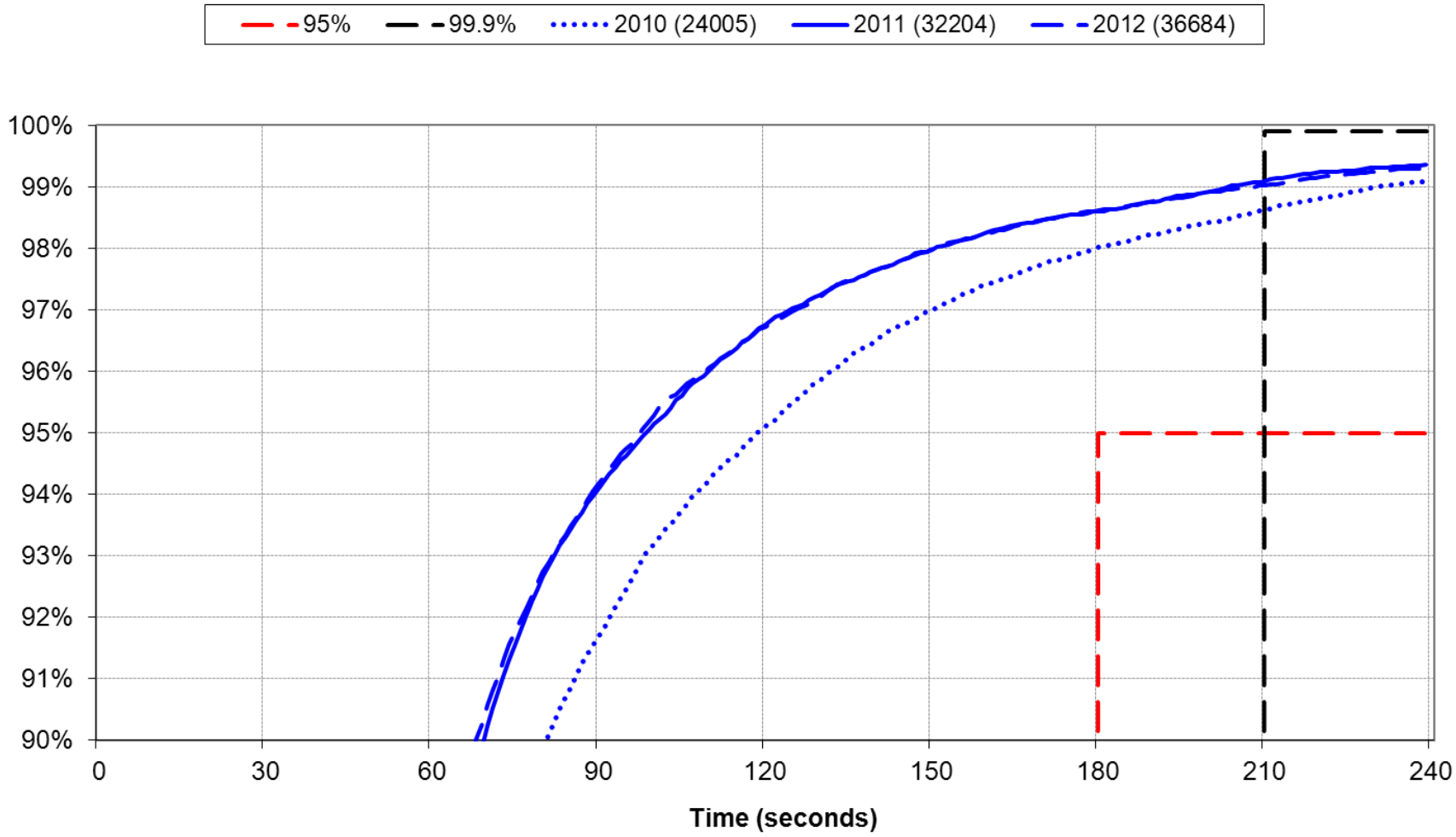
- **Performance data is analyzed on a monthly basis to assess the "health" of the data link system in terms of TIME / CONTINUITY**
- **Analysis is performed on the aggregate data set (i.e. data link transactions from all media types – satellite, VHF, HF) for the defined analysis period and on subsets of interest (e.g. satellite transactions only)**
- **The data is analyzed in various ways:**
  - By increments of time (one month, six months, year)
  - By media type
  - By FIR
  - By Station ID
  - By Operator

Aggregate Performance
New York FIR
February to July
2010, 2011 and 2012

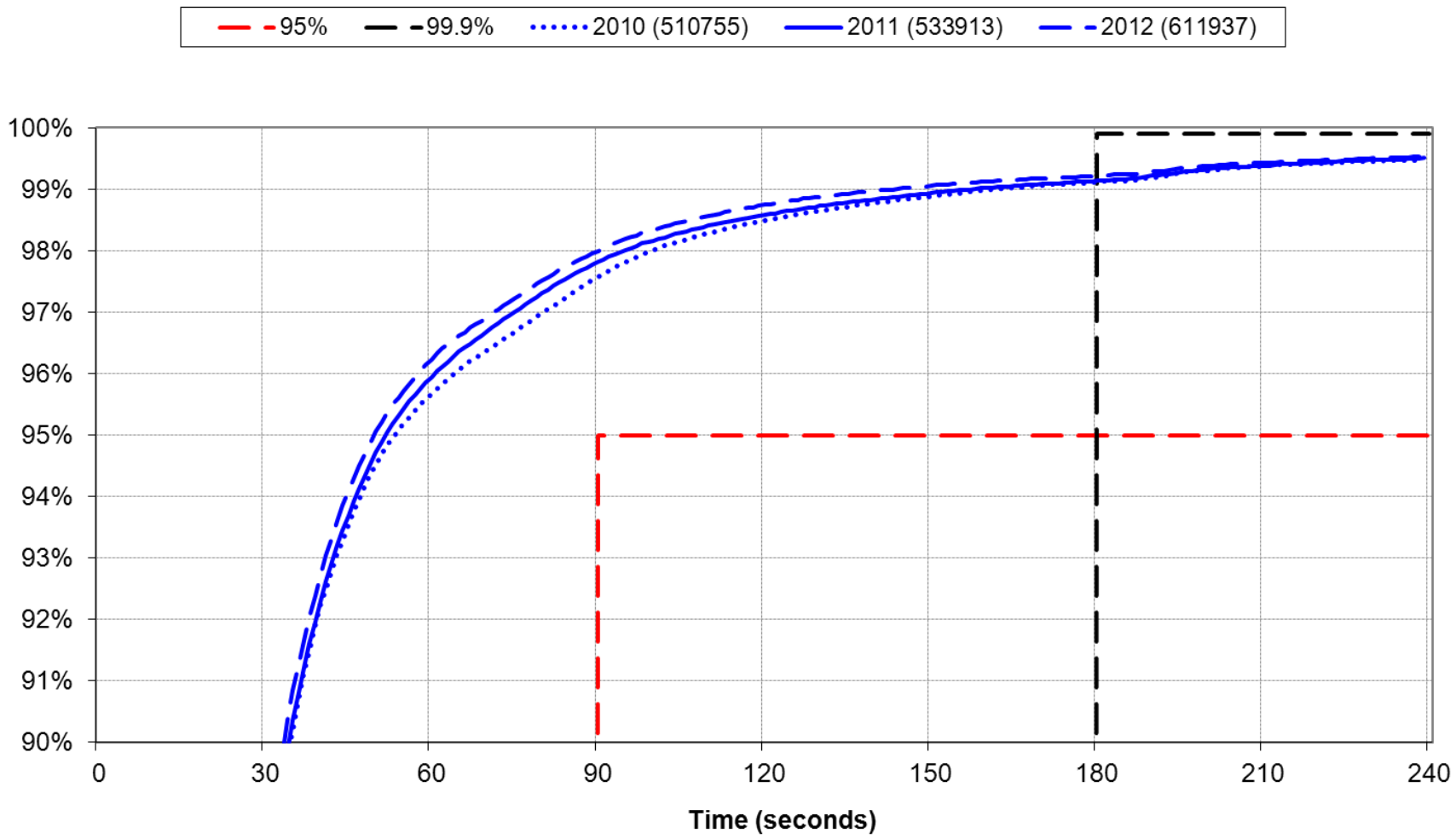
Datalink Performance - All Media - February to July 2010, 2011, 2012
CPDLC Actual Communication Technical Performance (ACTP)
(Reported DSP Outages Excluded)



Datalink Performance - All Media - February to July 2010, 2011, 2012
CPDLC Actual Communication Performance (ACP)
(Reported DSP Outages Excluded)

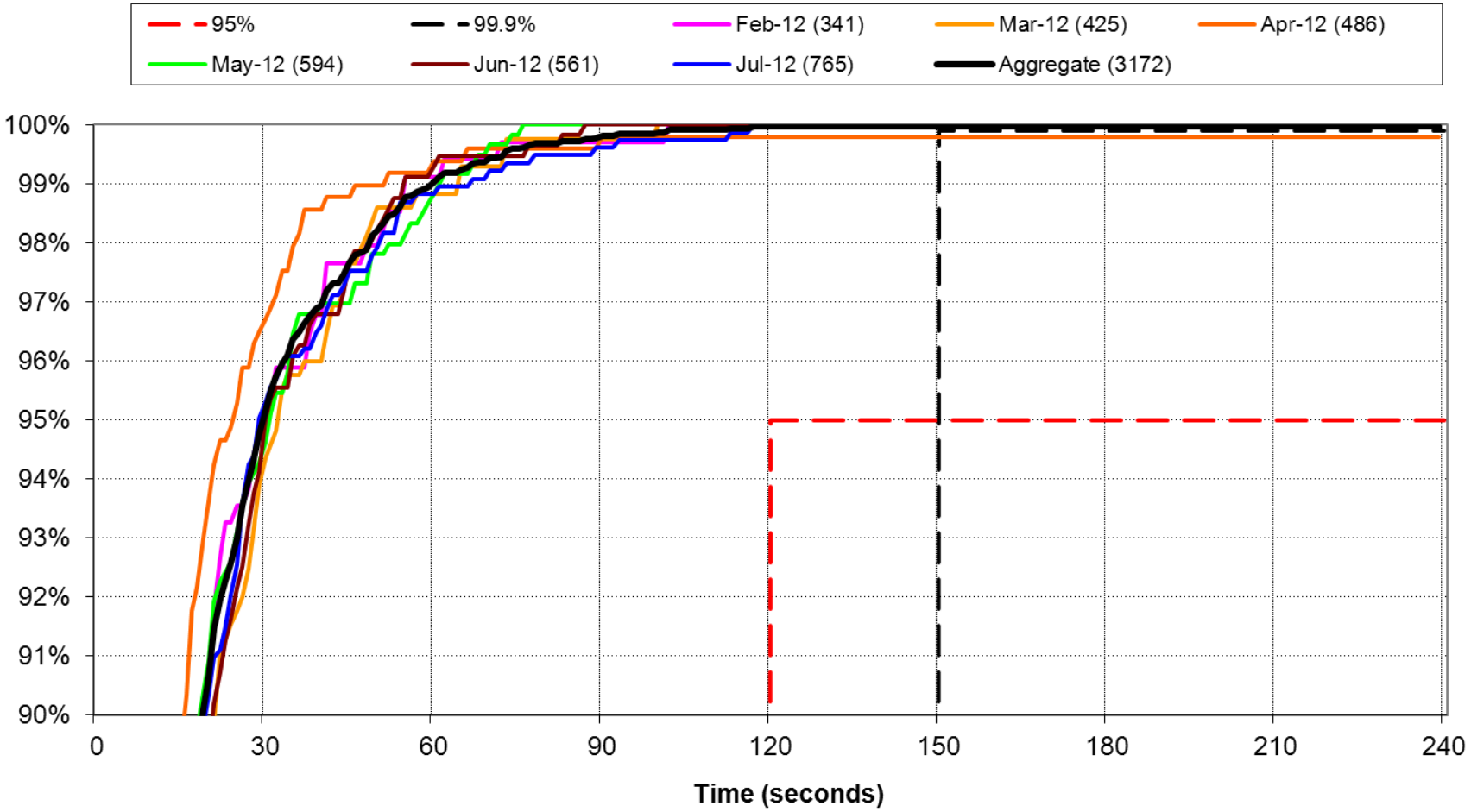


Datalink Performance - All Media - February to July 2010, 2011, 2012
ADS-C Downlink Latency
(Reported DSP Outages Excluded)

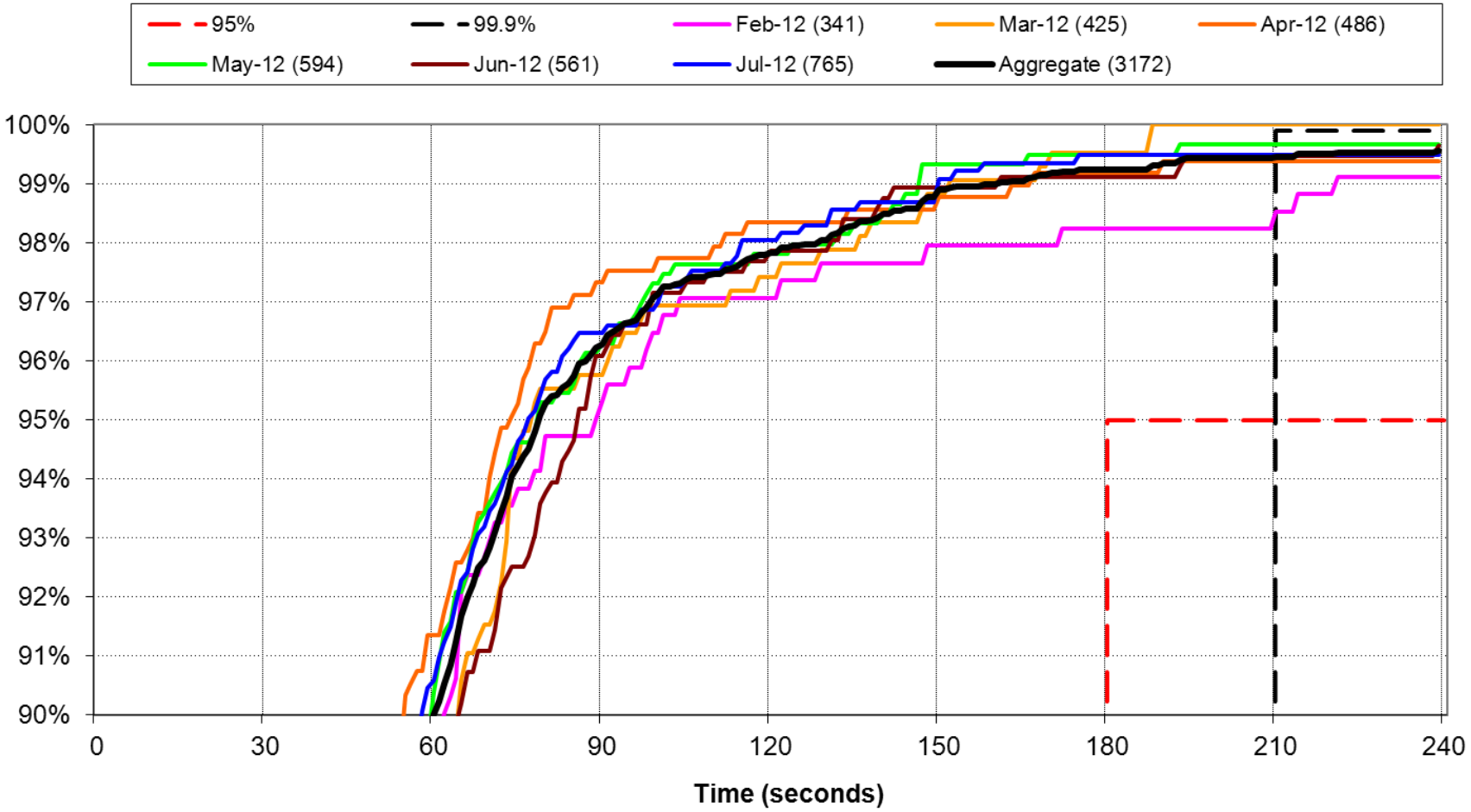


VHF Performance
New York FIR
February to July 2012

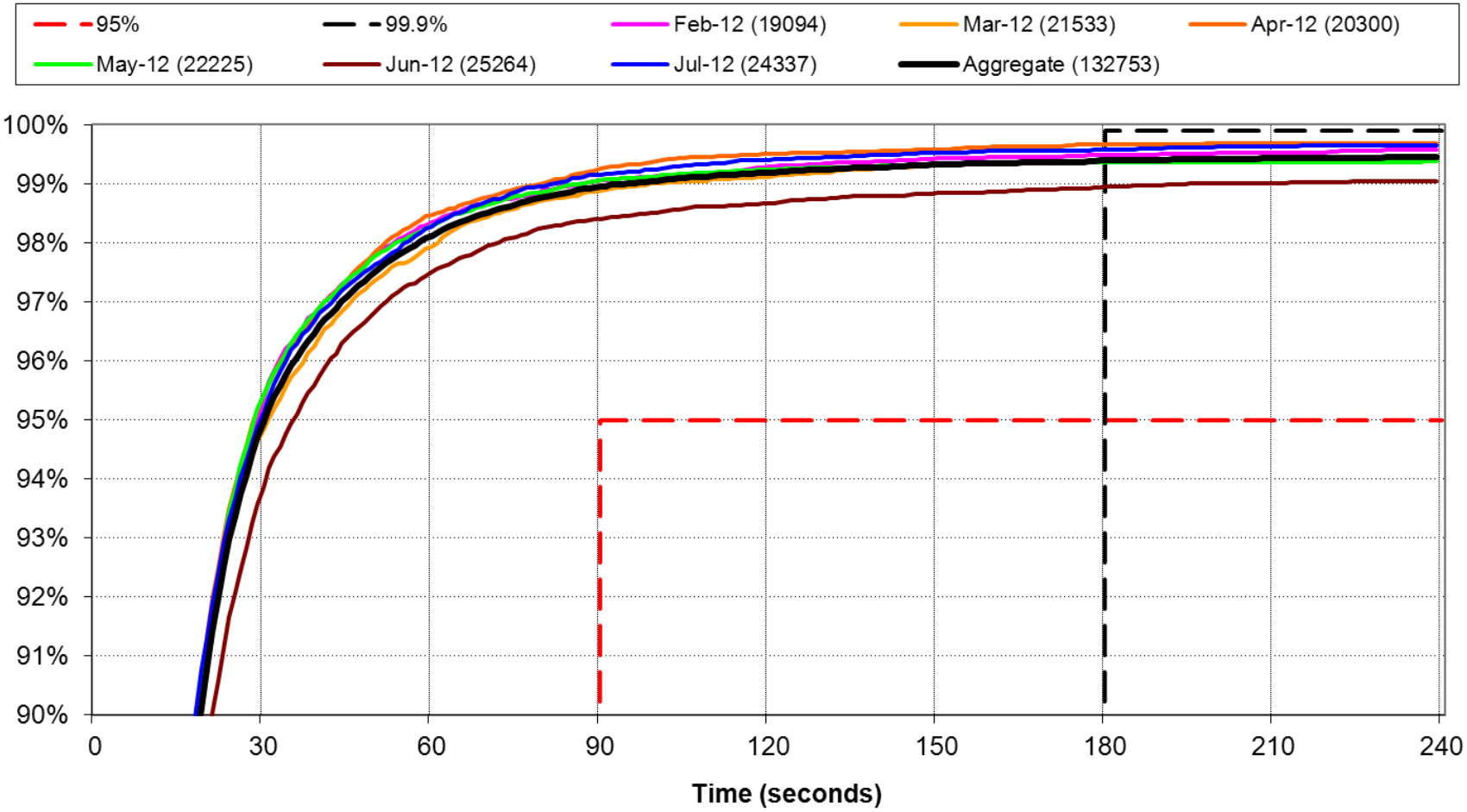
New York FIR - VHF RGS
CPDLC Actual Communication Technical Performance (ACTP)
(Reported DSP Outages Excluded)



New York FIR - VHF RGS
CPDLC Actual Communication Performance (ACP)
(Reported DSP Outages Excluded)



New York FIR - VHF RGS
ADS-C Downlink Latency
(Duplicate Messages and Messages During Reported DSP Outages Excluded)



Summary of Performance – February to July 2012 – New York FIR

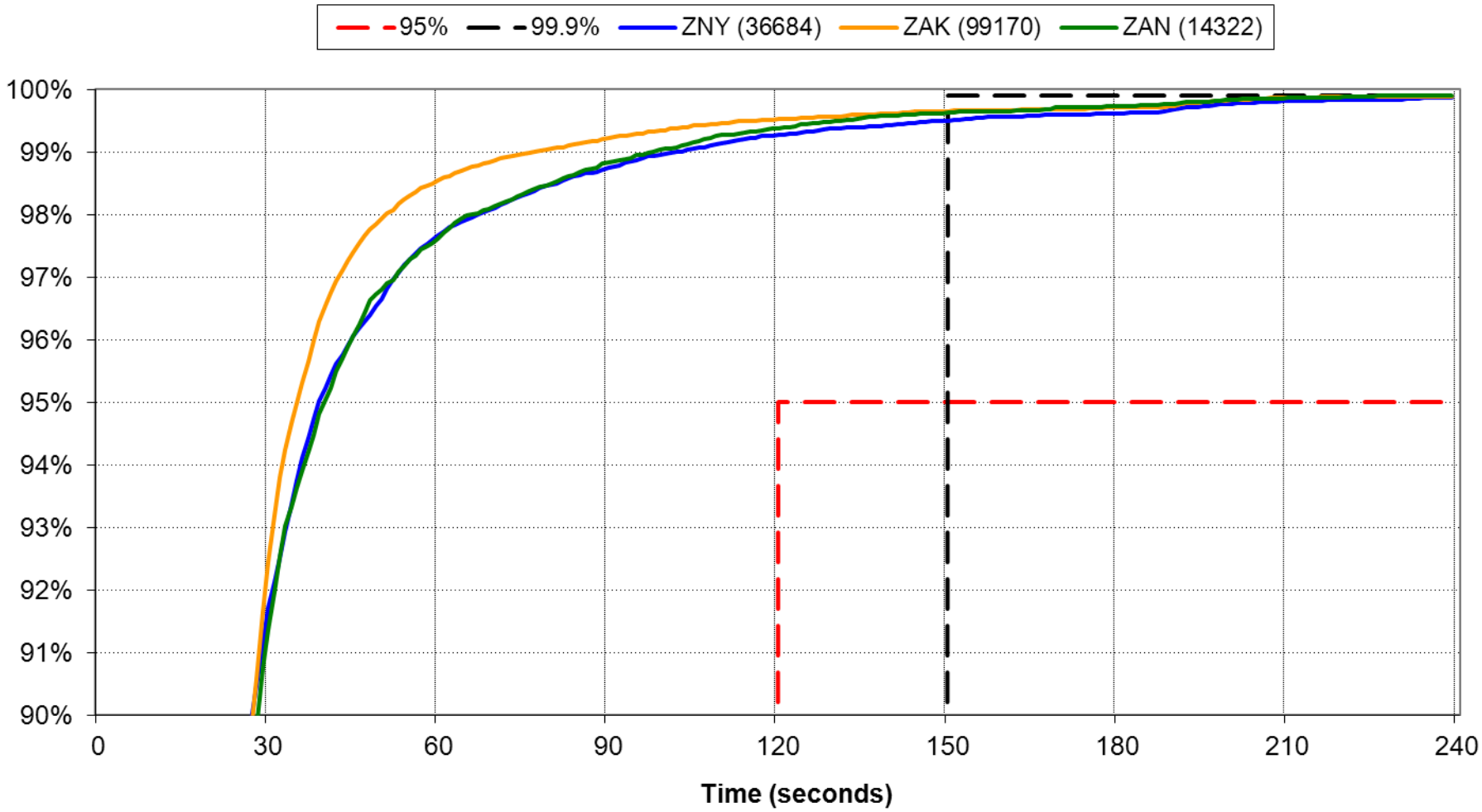
Media Type	ADS-C			CPDLC					
	Count of ADS-C Downlink Messages	ADS-C 95%	ADS-C 99.9%	Count of CPDLC Transactions	ACTP 95%	ACTP 99.9%	ACP 95%	ACP 99.9%	PORT 95%
SAT	477,290	**97.8%**	99.2%	32,996	**99.3%**	**99.5%**	**98.7%**	99.1%	**94.8%**
VHF	132,753	**98.9%**	99.4%	3,172	**100%**	**100%**	**99.2%**	99.4%	**94.7%**
HF*	1,894	93.5%	96.4%	--	--	--	--	--	--
Total	611,937	**98.0%**	99.2%	36,684	**99.3%**	**99.5%**	**98.6%**	99.0%	**94.7%**

* HF performance is assessed against RSP400/RCP400 criteria.

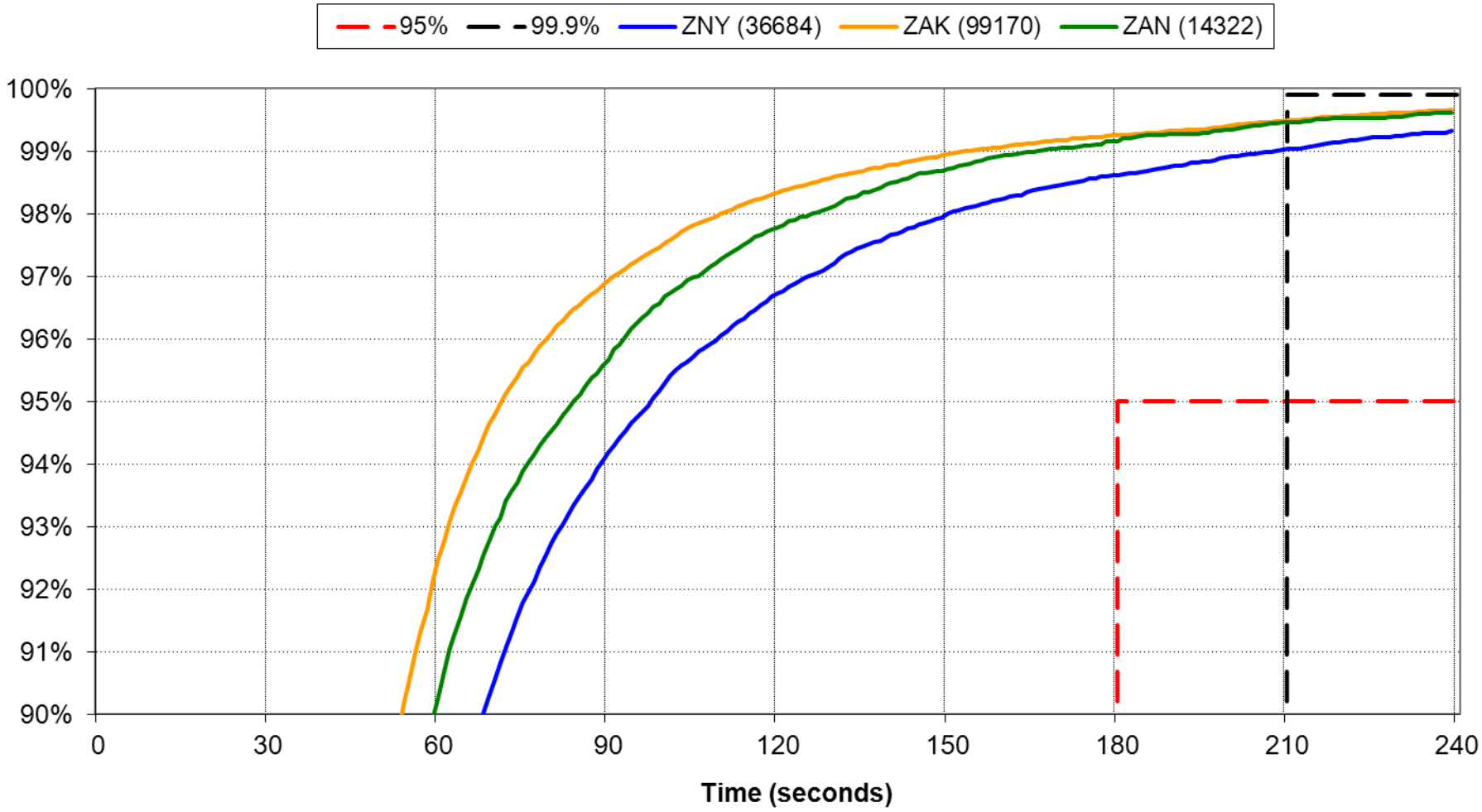
** 1.4% of RCP transactions occur over mixed media

Aggregate Performance Comparison by FIR February to July 2012

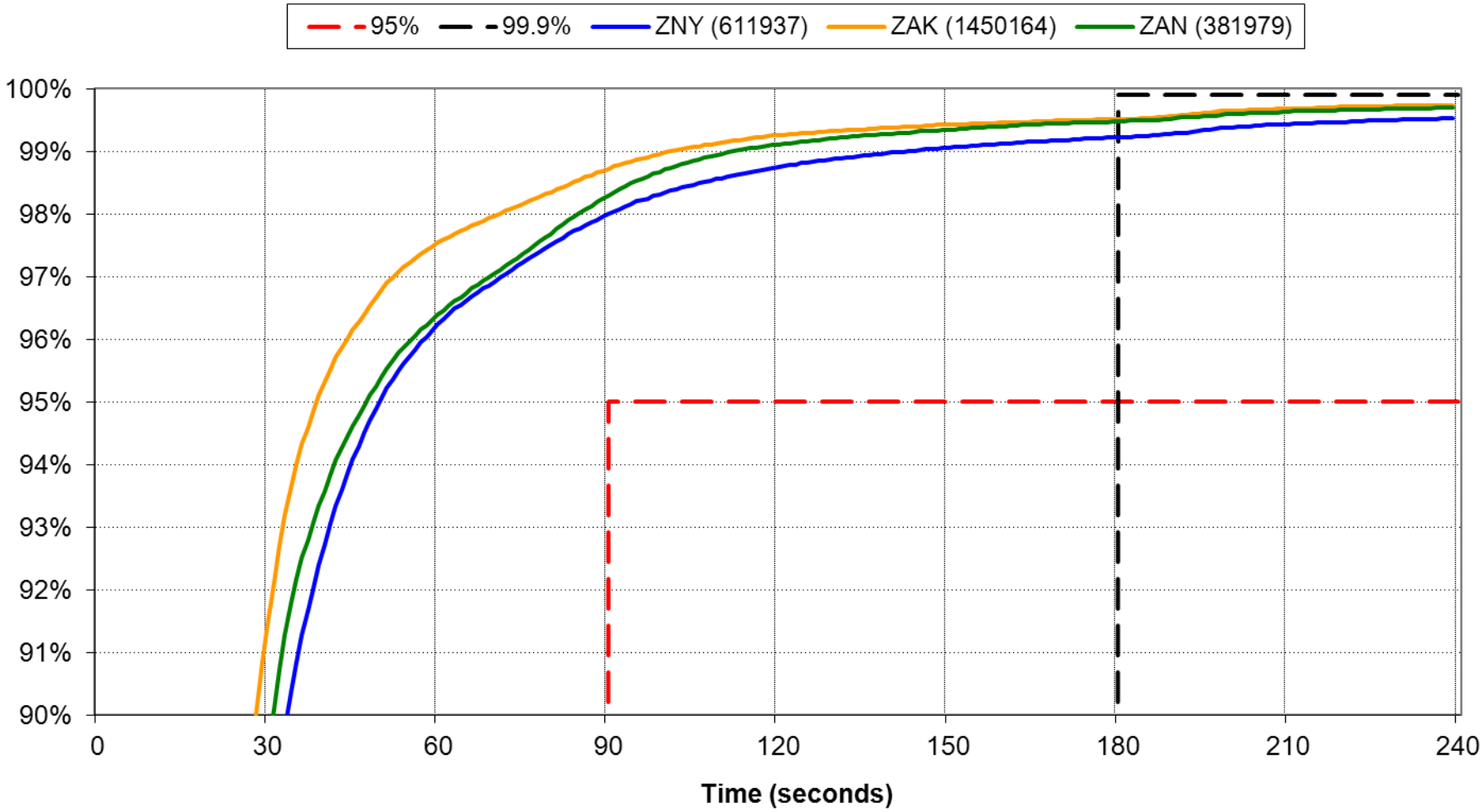
Aggregate Performance By FIR - February to July 2012
CPDLC Actual Communication Technical Performance (ACTP)
(Reported DSP Outages Excluded)



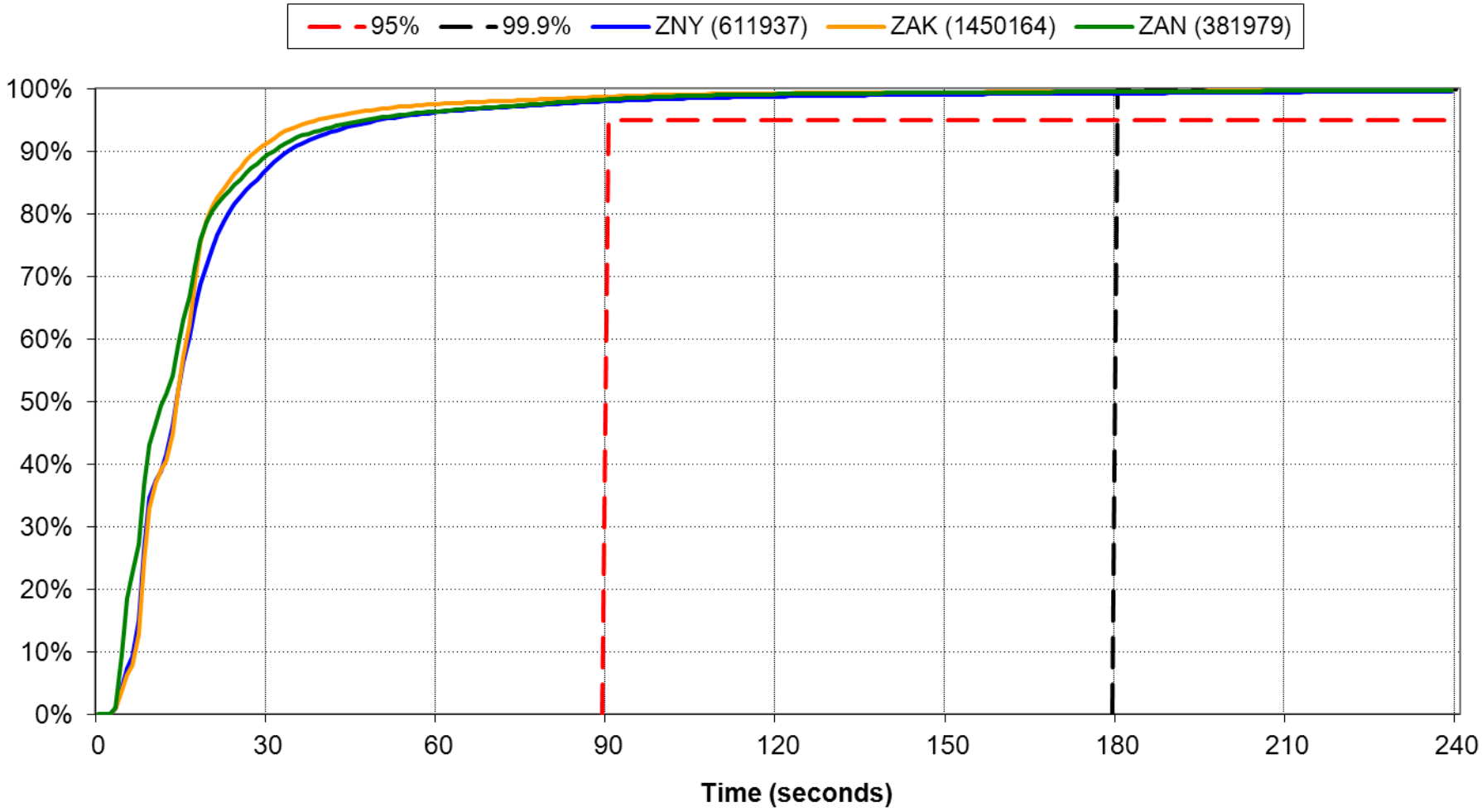
Aggregate Performance By FIR - February to July 2012
CPDLC Actual Communication Performance (ACP)
(Reported DSP Outages Excluded)



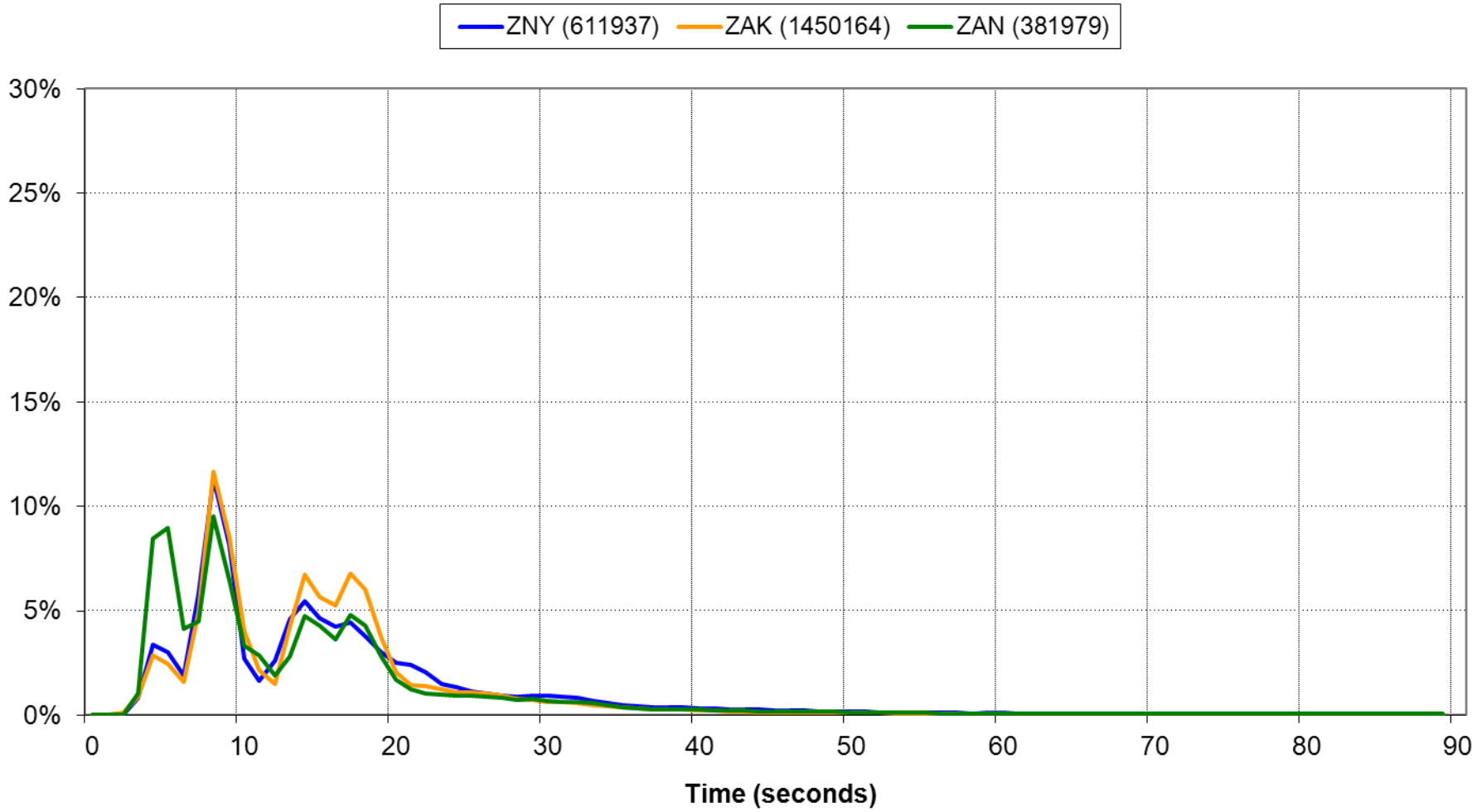
Aggregate Performance By FIR - February to July 2012
ADS-C Downlink Latency
(Duplicate Messages and Messages During Reported DSP Outages Excluded)



Aggregate Performance By FIR - February to July 2012
ADS-C Downlink Latency
(Duplicate Messages and Messages During Reported DSP Outages Excluded)



Aggregate Performance By FIR - February to July 2012
ADS-C Downlink Latency - Relative Frequency Distribution
(Reported DSP Outages Excluded)



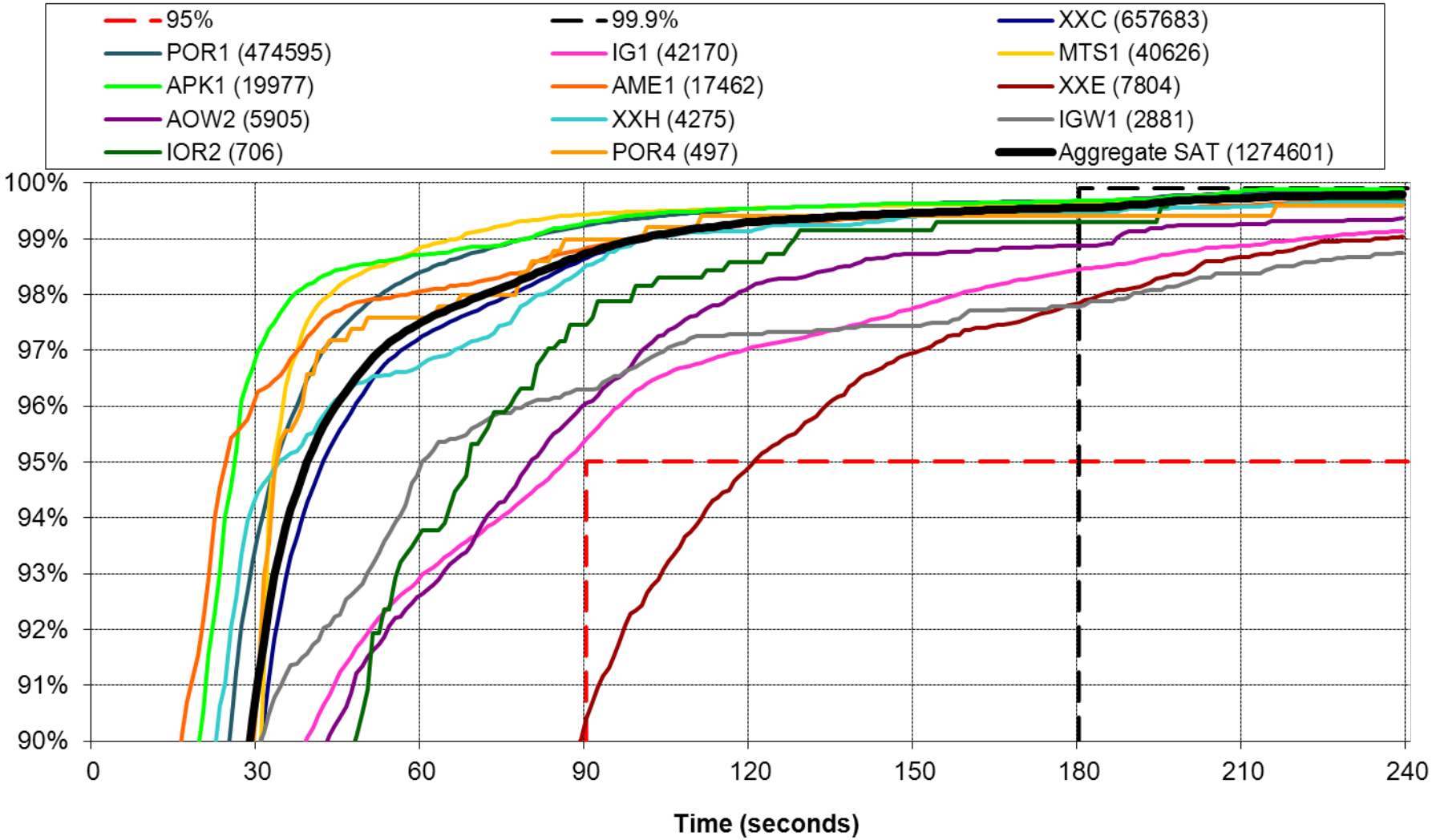
ADS-C Performance by Station ID

- **Analysis period: February to July 2012**
  - Note: 21 days missing from May 2012 and 27 days missing from July 2012 in Anchorage data
- **RSP180 criteria**
- **Station identifiers (IDs) designate "path" taken by data link messages between aircraft and ATC**
- **"Paths" vary between the four constellations of satellites as well as between the two data link service providers**

Station/Gateway Identifiers

Satellite	GES Location(s)	SITA	ARINC
Inmarsat I-3	Aussaguel, France:	AOW2 AOE2	--
	Eik, Norway:	AOW3 AOE3 IOR5	XXE
	Perth, Australia:	POR1 IOR2	--
	Santa Paula, California, US:	POR4	XXC
Inmarsat I-4	Fucino, Italy	EUA1	XXF
	Paumalu, HI, US	APK1 AME1	XXH
MTSAT	Kobe and Hitachiota, Japan	MTS1	--
Iridium	Phoenix, Arizona, US	IGW1	IG1

Oakland FIR - Performance By Station Identifier - Febraury to July 2012
ADS-C Downlink Latency
(Duplicate Messages and Messages During Reported DSP Outages Excluded)



Performance By Operator

- Analysis period: February to July 2012
- Analysis separate by FIR
- All media types combined
- RCP240 and RSP180 criteria
- Operators contributing top 90% of ADS-C downlink messages
- Operators ordered in summary tables by descending count of ADS-C downlink messages
- Operators not meeting 95% criteria highlighted in red
- Operators meeting 99.9% criteria highlighted in green

Observed Performance by Operator
Oakland FIR – February to July 2012

Oper Code	ADS-C				CPDLC						
	Count of ADS-C	% of Total ADS-C	ADS-C 95%	ADS-C 99.9%	Count of CPDLC	% of Total CPDLC	ACTP 95%	ACTP 99.9%	ACP 95%	ACP 99.9%	PORT 95%
A	241,265	16.6%	98.3%	99.5%	13,425	13.5%	99.3%	99.5%	98.9%	99.3%	95.6%
D	123,297	8.5%	98.6%	99.6%	6,236	6.3%	99.4%	99.5%	99.4%	99.7%	98.0%
NNN	108,928	7.5%	97.4%	99.2%	5,997	6.0%	99.0%	99.4%	97.8%	98.3%	93.7%
L	101,727	7.0%	98.8%	99.6%	7,380	7.4%	99.6%	99.7%	98.8%	99.2%	95.3%
B	100,855	7.0%	99.2%	99.6%	6,648	6.7%	99.5%	99.6%	99.4%	99.6%	98.2%
Q	84,543	5.8%	98.7%	99.7%	5,725	5.8%	99.5%	99.7%	99.6%	99.8%	98.3%
G	78,713	5.4%	99.7%	**99.9%**	10,453	10.5%	99.9%	**99.9%**	99.8%	**99.9%**	99.2%
E	57,864	4.0%	99.3%	99.6%	3,966	4.0%	99.8%	**99.9%**	99.7%	99.7%	98.8%
J	45,756	3.2%	99.7%	**99.9%**	4,904	4.9%	99.9%	**99.9%**	99.8%	99.8%	99.3%
O	45,319	3.1%	99.2%	99.7%	2,562	2.6%	99.8%	**99.9%**	99.7%	**99.9%**	99.0%

Observed Performance by Operator (Continued)
Oakland FIR – February to July 2012

Oper Code	ADS-C				CPDLC						
	Count of ADS-C	% of Total ADS-C	ADS-C 95%	ADS-C 99.9%	Count of CPDLC	% of Total CPDLC	ACTP 95%	ACTP 99.9%	ACP 95%	ACP 99.9%	PORT 95%
F	38,568	2.7%	99.4%	99.8%	4,117	4.2%	99.7%	99.8%	99.5%	99.7%	98.8%
N	36,700	2.5%	99.5%	99.6%	2,119	2.1%	99.2%	99.2%	99.3%	99.8%	98.3%
H	36,361	2.5%	99.5%	99.8%	3,724	3.8%	99.9%	**99.9%**	99.9%	**100.0%**	99.3%
S	34,719	2.4%	98.5%	99.3%	1,962	2.0%	99.4%	99.5%	99.5%	99.6%	98.6%
R	34,546	2.4%	98.9%	99.7%	2,214	2.2%	99.6%	99.6%	99.5%	99.7%	97.6%
T	32,168	2.2%	99.3%	99.7%	2,573	2.6%	99.4%	99.5%	99.1%	99.3%	97.6%
K	30,492	2.1%	98.5%	99.1%	2,549	2.6%	99.0%	99.3%	99.5%	99.7%	98.4%
Y	29,892	2.1%	97.0%	98.3%	753	0.8%	98.3%	98.8%	97.7%	98.0%	96.4%
P	18,687	1.3%	98.8%	99.6%	1,546	1.6%	99.6%	**99.9%**	99.9%	**100.0%**	98.3%
V	18,580	1.3%	99.7%	99.7%	1,241	1.3%	99.9%	**99.9%**	99.8%	**99.9%**	99.4%

Summary of Observed Performance by Operator
Oakland FIR – February to July 2012

- **There are 20 operators contributing 90% of the ADS-C downlink messages**
- **All 20 operators meet the 95% criteria for RSP180 ADS-C and RCP240 ACTP and ACP**
- **19 of the 20 operators meet the 95% criteria for PORT within 60 seconds**
- **2 of the operators meet the 99.9% criteria for RSP180 ADS-C**
- **7 of the operators meet the 99.9% criteria for RCP240 ACTP**
- **5 of the operators meet the 99.9% criteria for RCP240 ACP**

Performance Issue with Operator S - B77L in Anchorage FIR

Observed Performance and Investigation Materials

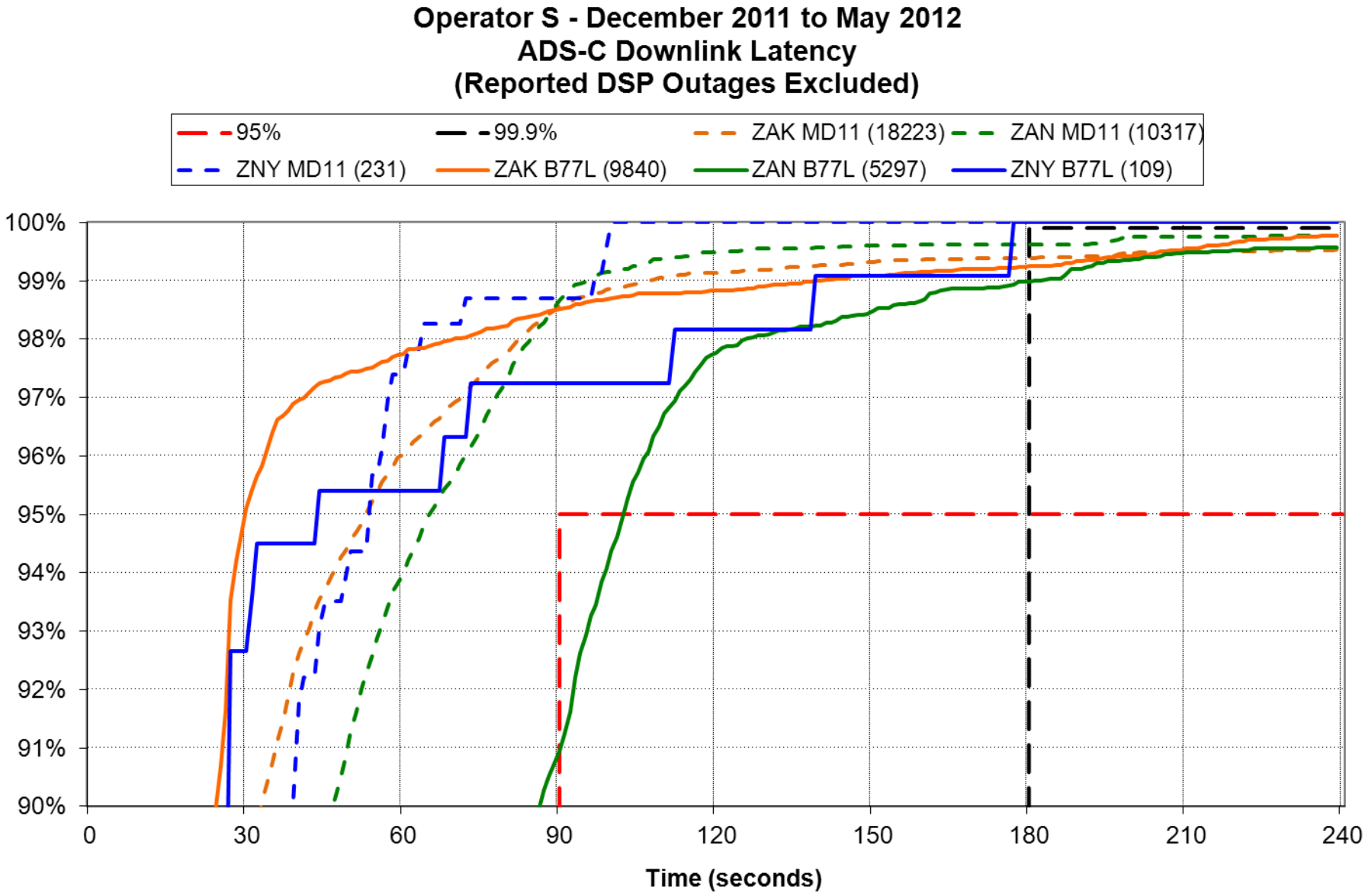
Background

- **In order to assess performance over the Inmarsat I-4 satellites, graphical analysis of ADS-C performance was prepared**
  - Analysis by station ID and FIR revealed one station ID associated with I4 was not meeting 95% criteria in Anchorage FIR
  - Further analysis by operator for station IDs corresponding to I4 satellites in Anchorage FIR revealed one operator was not meeting 95% performance criteria

Operator S - Performance by Aircraft Type and FIR

- **Aggregate ADS-C performance for Operator S over SAT media**
  - December 2011 to May 2012
  - Oakland (ZAK), Anchorage (ZAN) and New York (ZNY)
  - Includes I3 and I4 combined
    - MD11 (dashed lines) mainly uses I3 (POR1)
    - B77L (solid lines) mainly uses I4 (AME1 and APK1)

- **Purpose – to highlight performance issue with B77L in Anchorage FIR (solid green line)**


Operator S - December 2011 to May 2012
ADS-C Downlink Latency
(Reported DSP Outages Excluded)
95%
99.9%
ZAK MD11 (18223)
ZAN MD11 (10317)
ZNY MD11 (231)
ZAK B77L (9840)
ZAN B77L (5297)
ZNY B77L (109)
100%
99%
98%
97%
96%
95%
94%
93%
92%
91%
90%
0
30
60
90
120
150
180
210
240
Time (seconds)

Observations of Operator S Performance

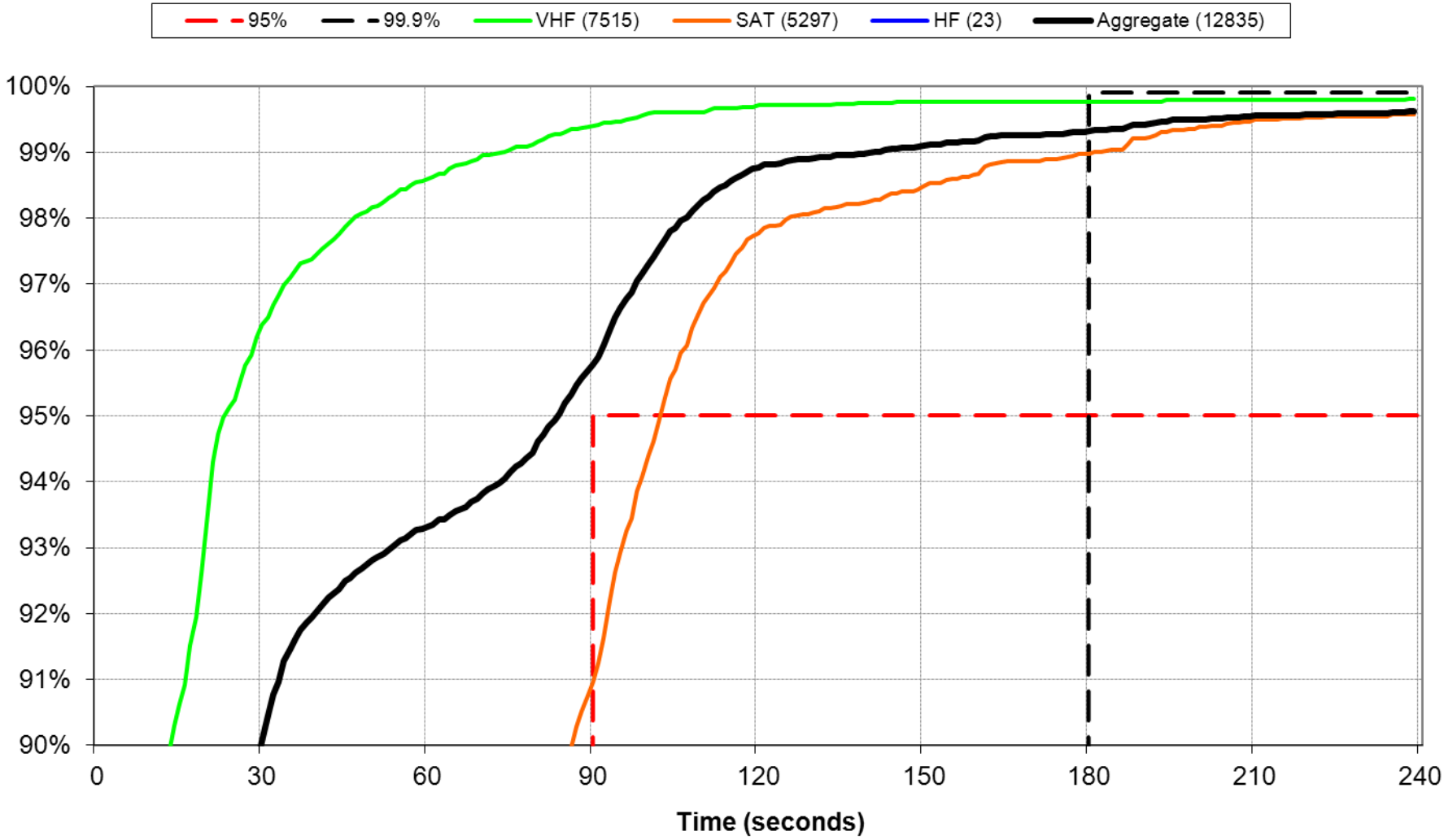
- **MD11 meets 95% criteria for RSP180 ADS-C performance in ZAK, ZAN and ZNY**
- **B77L meets the 95% criteria for RSP180 ADS-C performance in ZAK and ZNY <u>but not ZAN</u>**
- **The same fleet of B77L is used by Operator S in all 3 FIR**
  - Similar delay distribution observed in ZAK and ZNY but different in ZAN, with much lower peak around 9 seconds and small peaks observed past 90 seconds

- **Next step - further analysis for B77L fleet of Operator S in Anchorage FIR – by media type**

Operator S - B77L
Performance by Media Type - Anchorage FIR

- **ADS-C performance by media type (SAT, VHF, HF)**
  - December 2011 to May 2012
  - SAT includes I3 and I4 combined

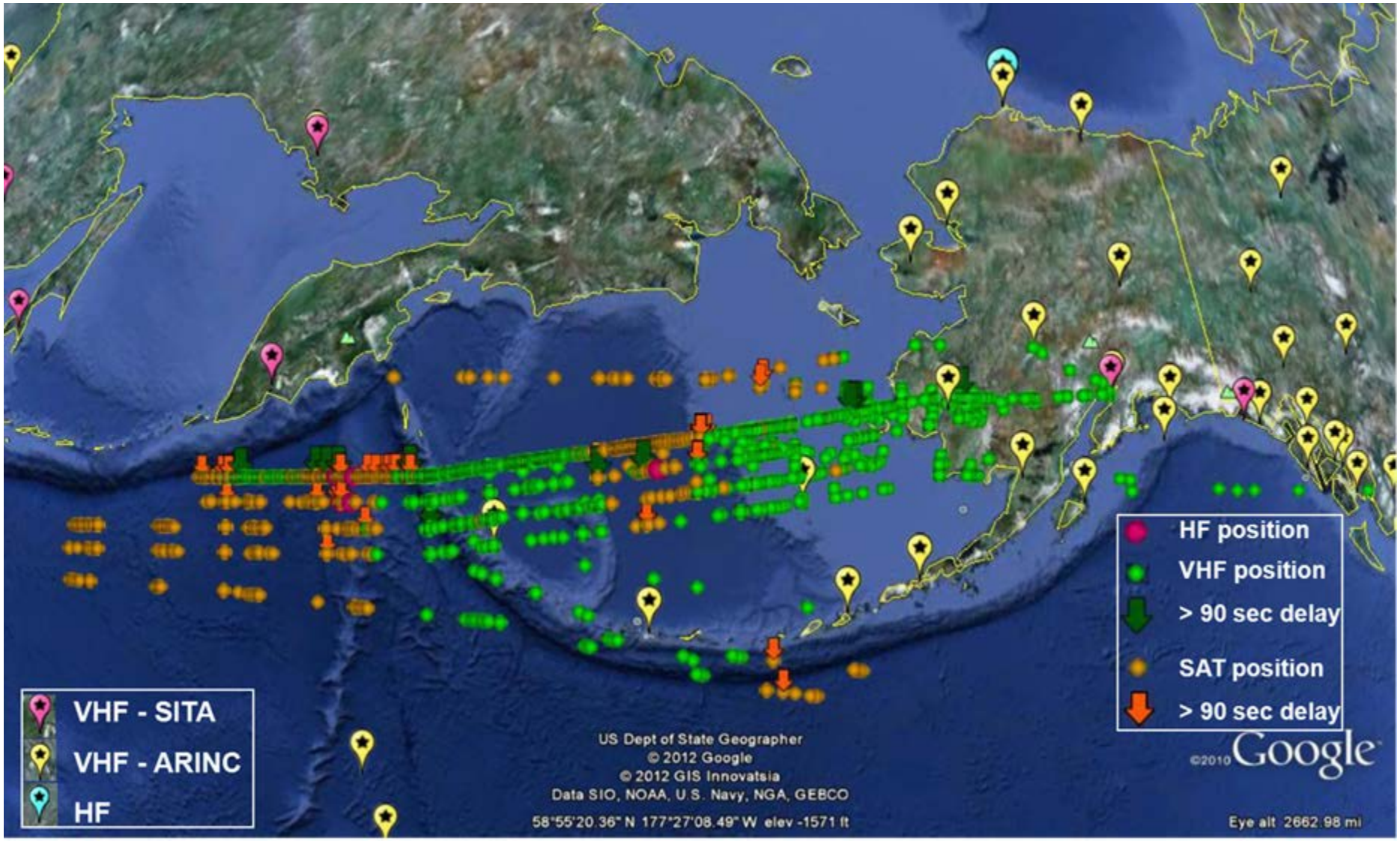
Operator S B77L - Anchorage FIR - By Media Type - December 2011 to May 2012
ADS-C Downlink Latency
(Duplicate Messages and Messages During Reported DSP Outages Excluded)



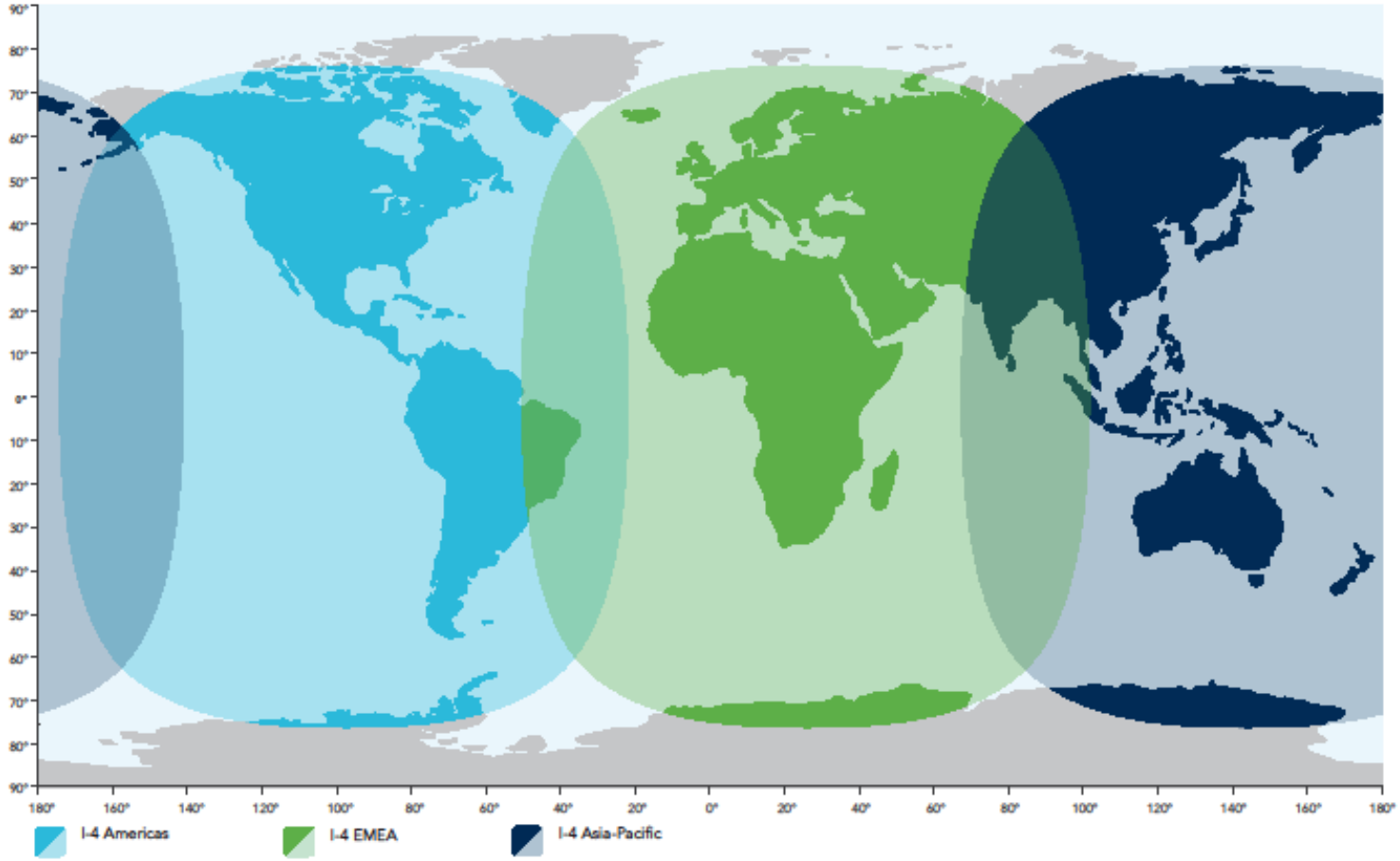
Plot of ADS-C Positions by Media Type for April 2012

- **ADS-C positions**
  - SAT – orange
  - VHF – green
  - HF – pink
- **ADS-C positions with delays ≥ 90 seconds**
  - SAT – orange arrow
  - VHF – green arrow
  - Note: all HF positions had delays ≥ 90 seconds
- **VHF station locations**
  - Sita VHF – pink place-marker
  - ARINC VHF – yellow place-marker
- **HF station locations – blue place-marker**

Operator S - B77L – ADS-C positions – April 2012



I-4 satellite coverage post repositioning



This map depicts Inmarsat's expectations of coverage post repositioning of its I-4 satellites. This map does not represent a guarantee of service. The availability of service at the edge of coverage areas fluctuates depending on various conditions.

inmarsat.com

inmarsat

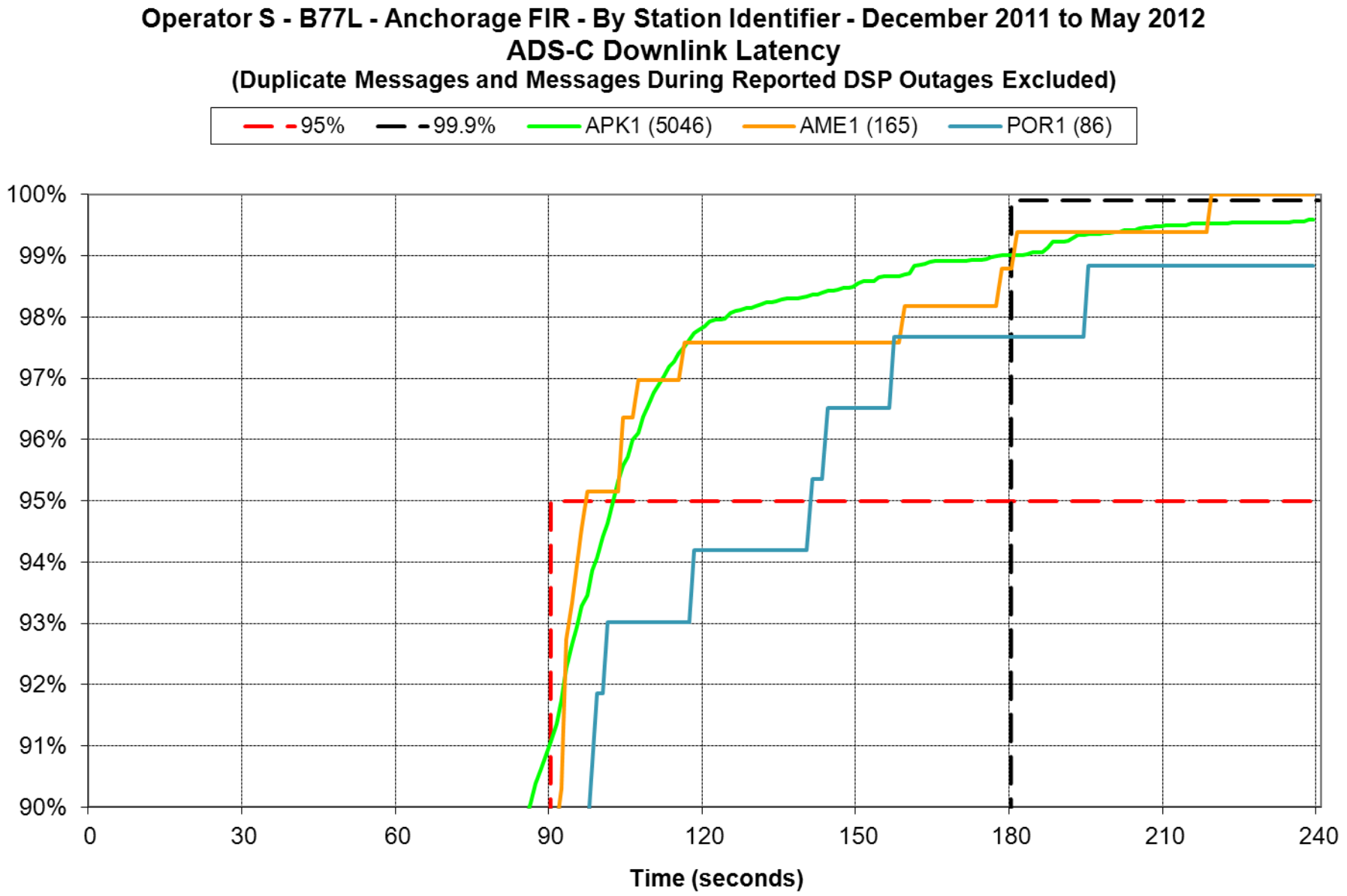
Observations

- **Not much data for HF analysis (23 messages over 6 months)**
  - All HF positions had delays ≥ 90 seconds
- **95% criteria for RSP180 ADS-C performance is met for VHF but not for SAT**
- **99.9% criteria for RSP180 ADS-C performance is nearly met for VHF**
- **Large delays appear to be clustered around SAT/VHF transition areas**

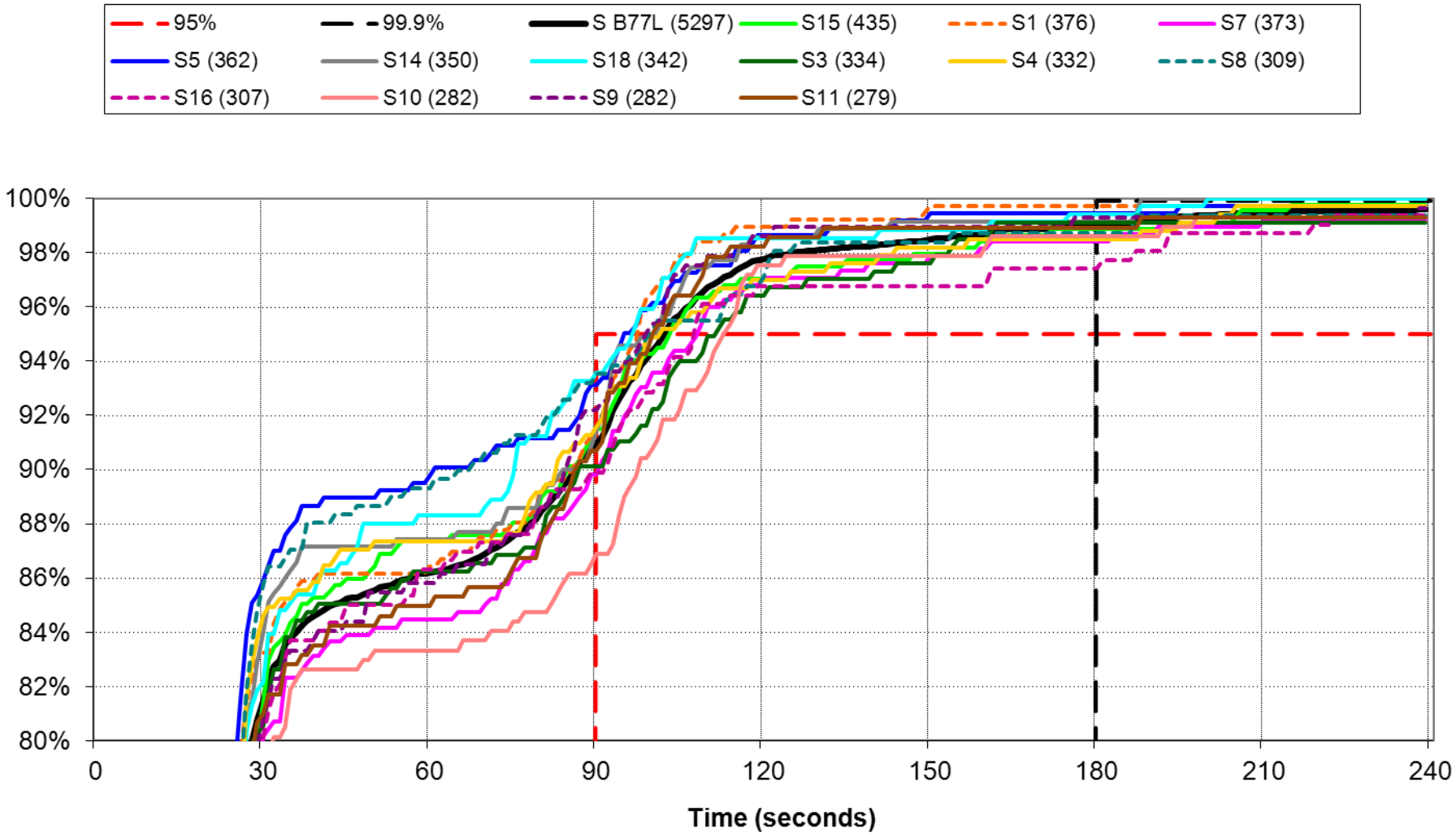
- **Next step: further analysis for Anchorage FIR – SAT media**

Operator S - B77L
Performance by Station ID and Airframe - Anchorage FIR

- **Operator S B77L - ADS-C performance by station ID – SAT media**
- **Operator S B77L - ADS-C performance by airframe – SAT media**


Operator S - B77L - Anchorage FIR - By Station Identifier - December 2011 to May 2012
ADS-C Downlink Latency
(Duplicate Messages and Messages During Reported DSP Outages Excluded)
95%
99.9%
APK1 (5046)
AME1 (165)
POR1 (86)
100%
99%
98%
97%
96%
95%
94%
93%
92%
91%
90%
0
30
60
90
120
150
180
210
240
Time (seconds)

Operator S - B77L - SAT Media - Anchorage FIR - December 2011 to May 2012
ADS-C Downlink Latency
(Reported DSP Outages Excluded)



Observations

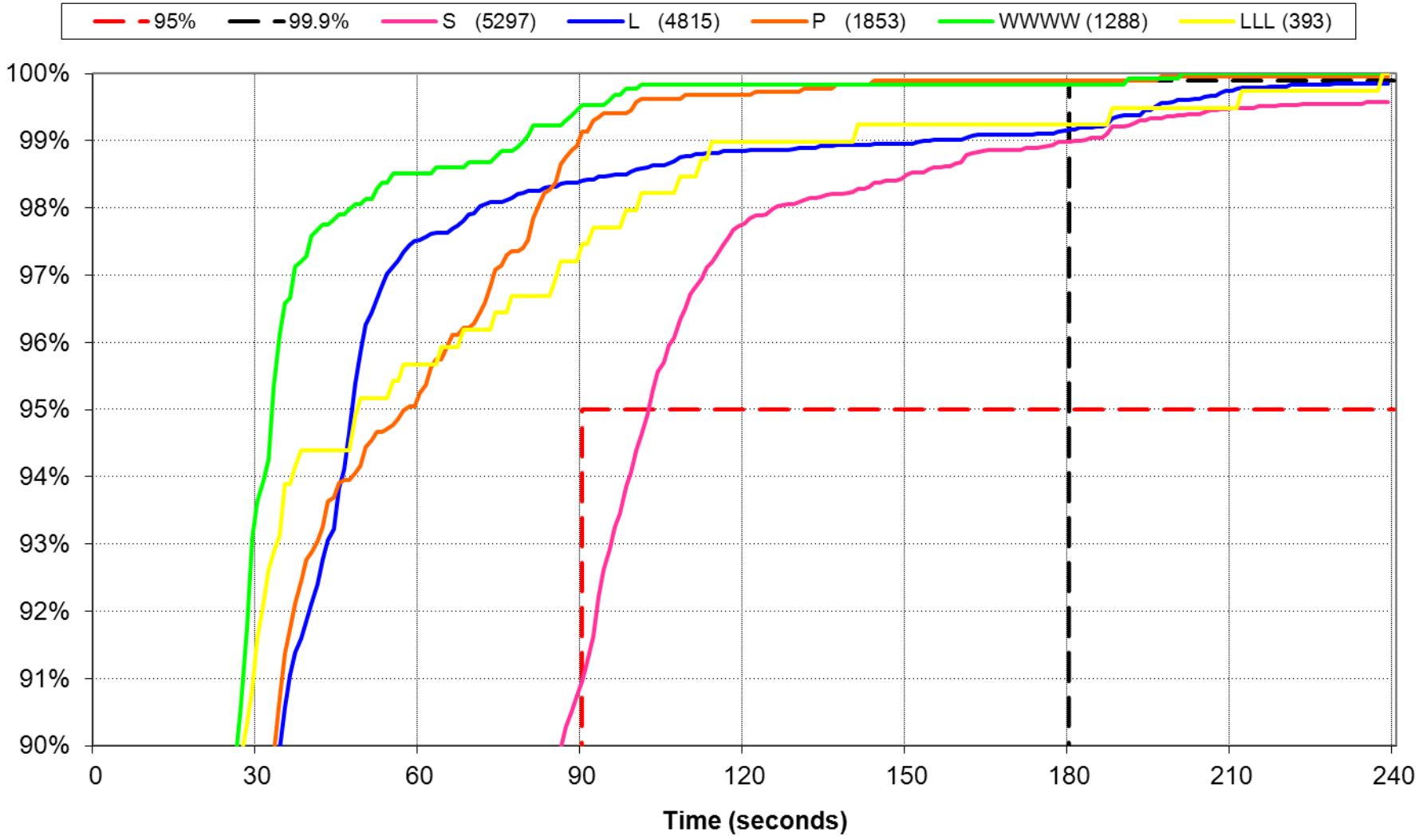
- **Majority of Operator S B77L SAT messages go through APK1 in ZAN**
  - Different delay distributions observed over APK1 and AME1
- **Similar SAT performance observed by airframe in ZAN**
  - 1 airframe drops below aggregate

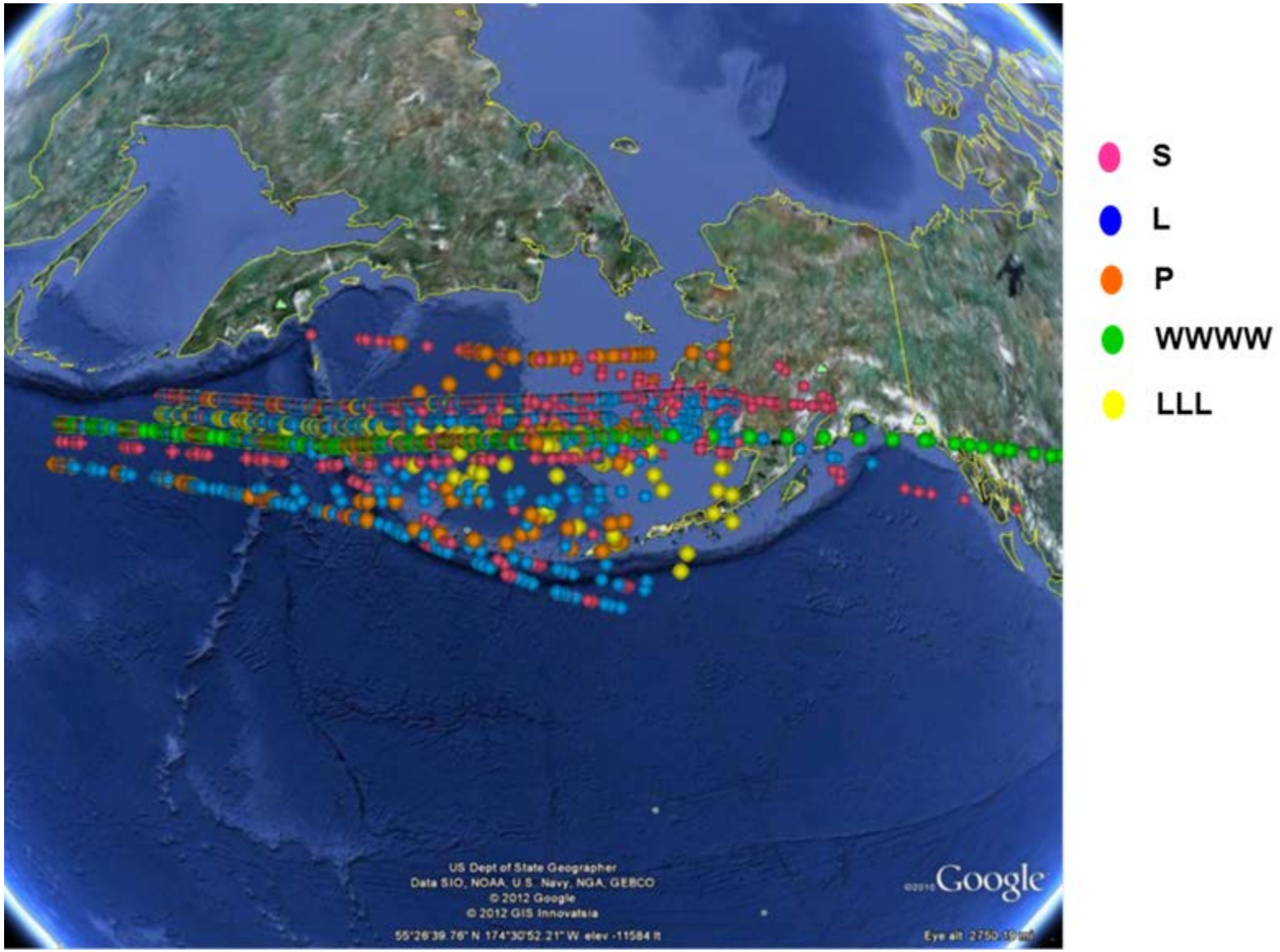
- **Next step: investigation of performance for all B77L fleets in Anchorage FIR**

B77L – ADS-C Performance by Operator
Anchorage FIR

- **ADS-C performance by operator for all B77L fleets observed in ZAN from December 2011 to May 2012**
- **Plot of ADS-C position reports by operator for April 2012**

Anchorage Oceanic FIR - B77L SAT Performance - December 2011 to May 2012
ADS-C Downlink Latency
(Duplicate Messages and Messages During Reported DSP Outages Excluded)

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US Dept of State Geographer
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
© 2012 Google
© 2012 GIS Innovatsia
55°26'39.76" N 174°30'52.21" W elev -11584 ft
Google

Observations

- **Different performance observed for various B77L fleets in ZAN**
  - S (I4 – Sita) – does not meet 95% criteria for RSP180 ADS-C
  - L (I3 – Sita) – meets 95% criteria for RSP180 ADS-C
  - P (I3 – ARINC) – meets 95% criteria for RSP180 ADS-C
  - WWWW (I3 – ARINC) – meets 95% criteria for RSP180 ADS-C
  - LLL (I3/I4 – ARINC) – meets 95% criteria for RSP180 ADS-C

GOLD Performance Analysis Tool (G-PAT) : A tool for post-implementation monitoring

Federal Aviation Administration

ICAO Seminar/Workshop on the Implementation of Ground-ground and Air-ground Data Links in the SAM Region

Lima, Peru

10 - 12 September 2012

Overview

- **The United States has developed software to aid ANSPs in the task of post-implementation monitoring**

- **This software – the GOLD performance analysis tool (G-PAT) – helps the user perform graphical analysis to assess the performance of the data link system in their respective airspace in relation to the RCP/RSP specifications for TIME / CONTINUITY**

- **The G-PAT is written in java script and has a graphical user interface (GUI) which can be run on a MS Windows-based personal computer**

Purpose

- **The G-PAT is used to create charts to measure:**
  - CPDLC performance against the required communication performance (RCP) 240 or RCP 400 criteria
    - actual communication performance (ACP)
    - actual communication technical performance (ACTP)
    - pilot operational response time (PORT)
  - ADS-C downlink latency performance against the required surveillance performance (RSP) 180 or RSP 400 criteria

How it works

- **The user inputs CPDLC or ADS-C performance data in the format described in Appendix D of the GOLD**
- **The user then selects:**
  - the desired analysis filters, e.g. media type or operator
  - the performance measure being analyzed, e.g. ACTP
  - the performance criteria based on the data type and the media type
    - CPDLC – RCP 240 for satellite, VHF media or RCP 400 for HF media
    - ADS-C – RSP 180 for satellite, VHF media or RSP 400 for HF media
- **The tool then creates the cumulative distribution for the selected performance measure and generates the reports and charts selected by the user**

Current Status

- The G-PAT is currently being tested by select users
- Version 2 is expected to be available for select users by October 2012
- Once testing is complete, it is intended to make G-PAT available for all interested ANSPs

Demonstration

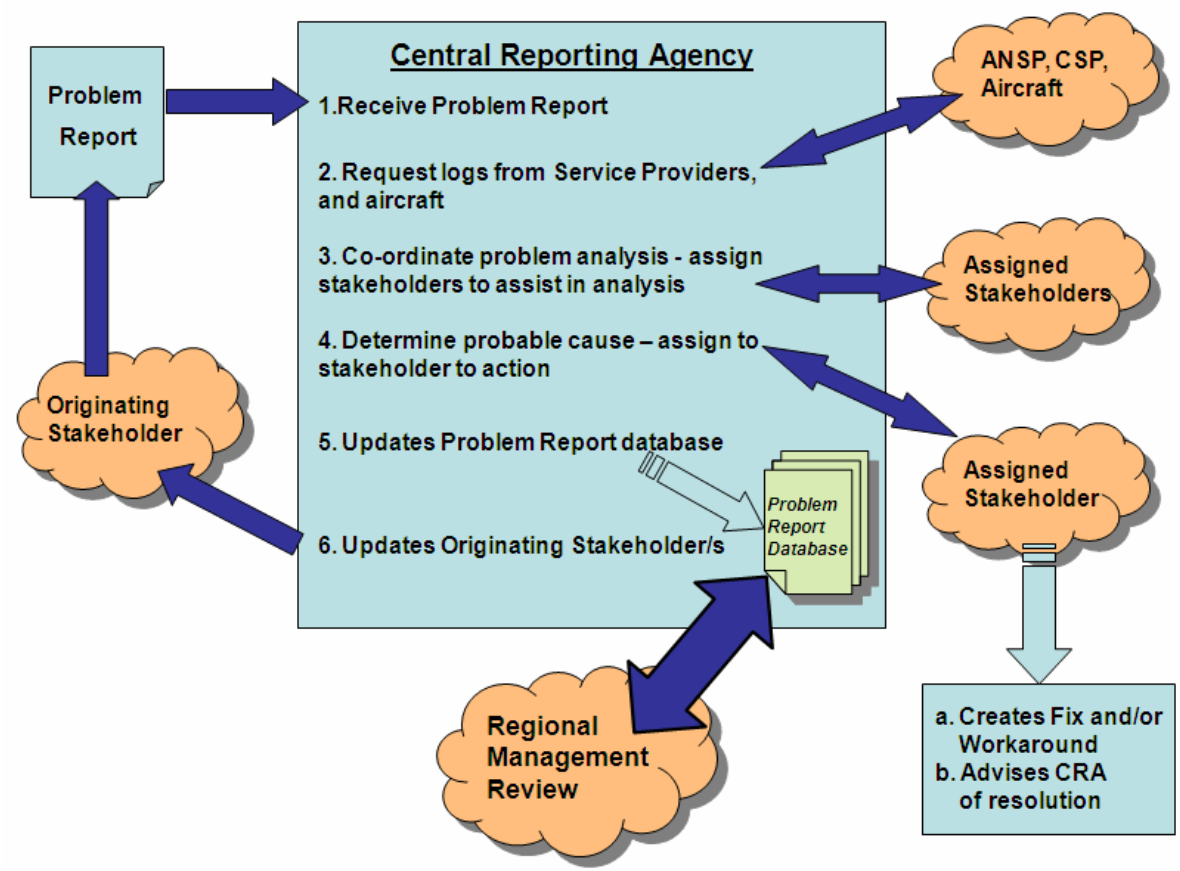
Problem Reporting – ISPACG CRA Website

(ICAO Seminar/workshop on the implementation of Ground Ground and Ground Air data link in the SAM Region)

Lima, Peru 10 -12 September 2012

AIRWAYS NEW ZEALAND

Asia/Pac ICAO Guidance for CRA Function



Web based problem reporting

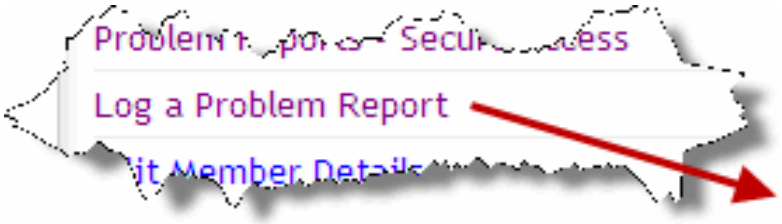
- In 2009 the Informal South Pacific Coordinating Group (ISPACG) FIT recommended the establishment of a website that would provide stakeholders with a readily accessible means of filing FANS1/A problem reports and provide the CRA with the means to provide feedback.
- The Asia/Pacific regional guidance material has a recommendation that when reporting FANS1/A problems the problem description, the results of the analysis and the plan for corrective action are entered into a database, both in a complete form to allow continued analysis and monitoring of the corrective action and in a de-identified form for the information of other stakeholders.
- ISPACG agreed that a web based system would provide such a facility.

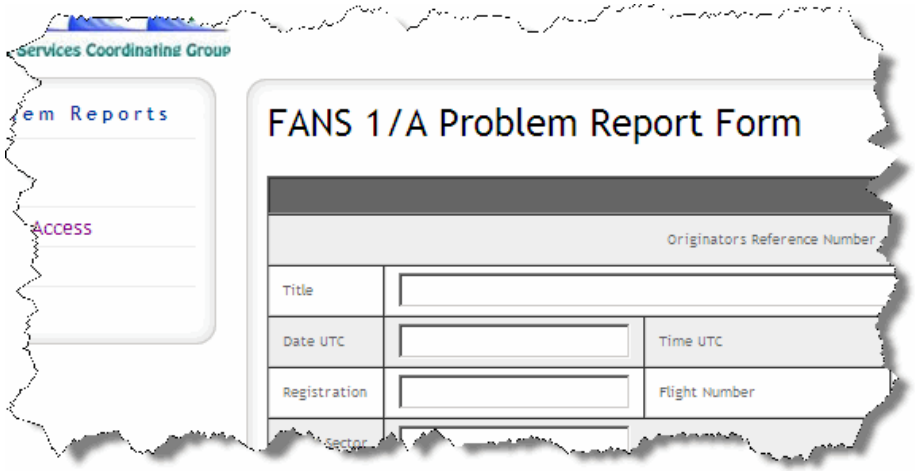
ISPACG CRA website

- The CRA web site at http://www.ispacg-cra.com/ commenced operations in late 2009 with the ISPACG stakeholders.
- Stakeholders of the North Atlantic Data Link Monitoring Agency (NAT DLMA) joined the website in 2010 for problem reporting.
- Initial meeting of FIT ASIA recommended to stakeholders to use the website at their inaugural meeting in August 2012.

Website Overview – logging a report

Log in to the secure area then select *Log a Problem Report*

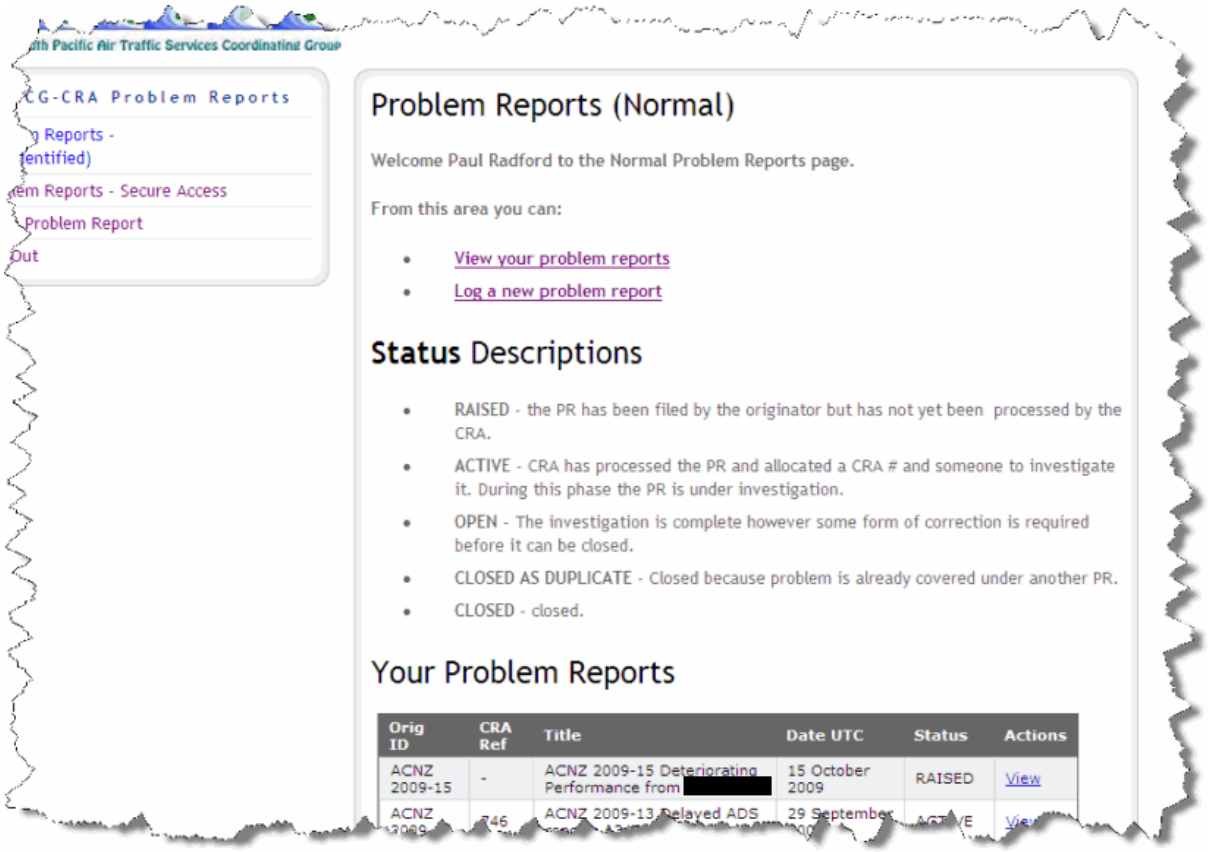




Refer GOLD D.2.2 for content

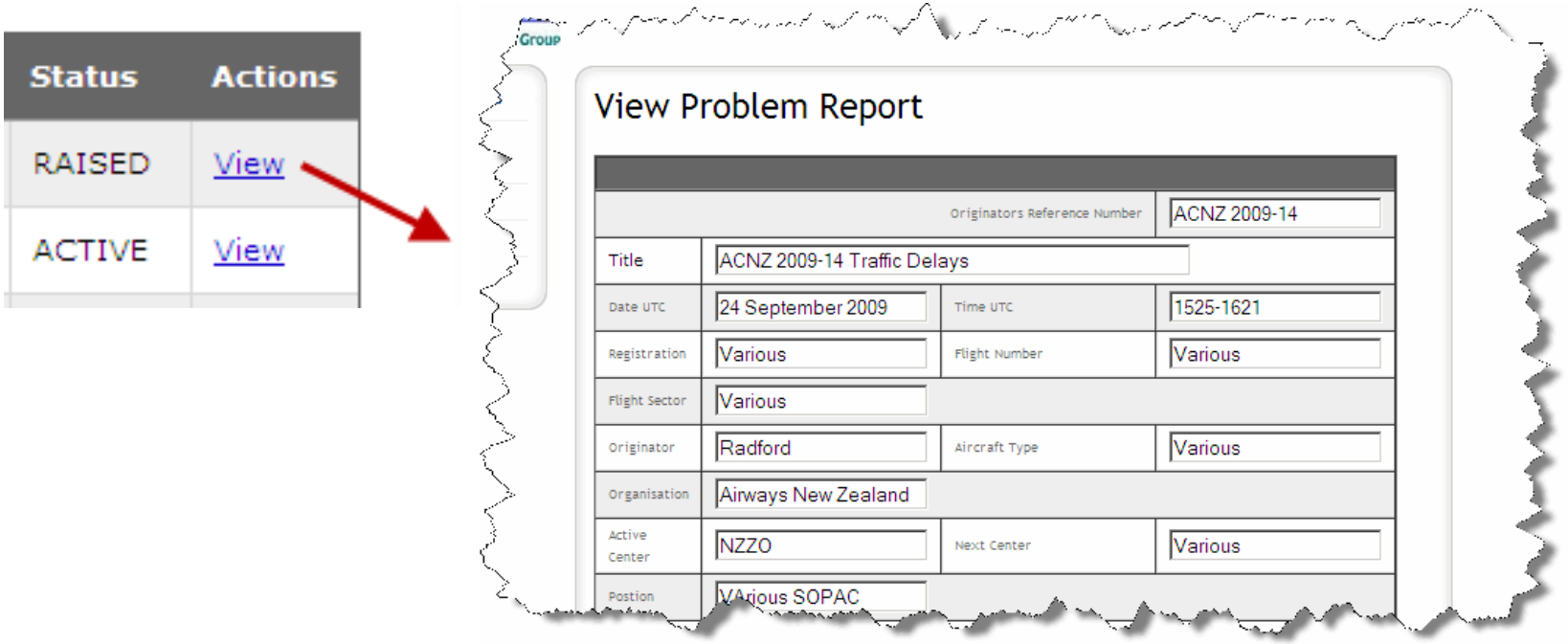
Website Overview – viewing your reports

Log in to the secure area and select View your problem reports.



Website Overview – viewing your reports

- The listing contains the originators ID, CRA reference, Short Title, Date, Status, and an Actions column with **View** as an option. Selecting View opens the complete problem report record.



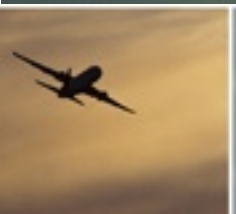
Issues in work

- ISPACG have found that it is difficult to get all aircraft operators to participate in problem reporting particularly the flight deck.
- Some operators have facilitated problem reporting by making it possible for flight crew to communicate the problem directly to the AOC via ACARS. The AOC then communicate the problem to a nominated person to file on the website.
- ISPACG are also investigating the possibility of making CRA database registration a compulsory requirement for all aircraft operators.

Thank you

Paul Radford
Oceanic Systems Manager

paul.radford@airways.co.nz



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