RCP / RSP

Frequently Asked Questions

Presented to: ICAO PBCS Workshops

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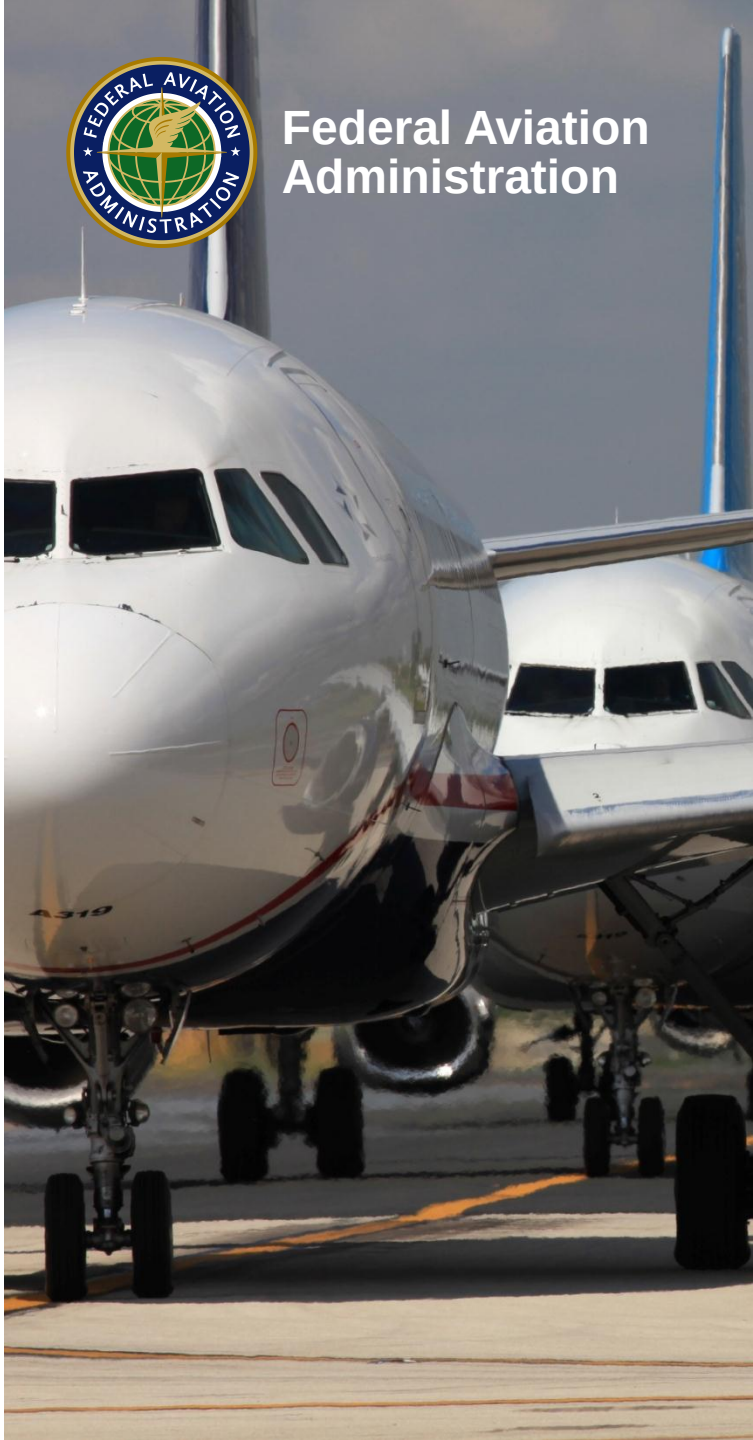


What is the difference between availability and continuity?

“Availability of service”

- Calculated based on 24/7 operation over a 12 month period of operation
  - 24/7 = 168 hours per week x 52 weeks per year = 8736 hours or 524,160 minutes in a 12-month period
  - 99.9% (for safety) available service allows 0.001 “down time” or 524 minutes of a 24/7 operation
  - 99.99% (for efficiency) available service allows 0.01 “down time” or 52.4 minutes/year of a 24/7 operation
- Outages greater than 10 min for RCP240 and 20 min for RCP400 included
- Outages less than these values are included against continuity requirement
- Down time due to planned service is not included

What is the difference between availability and continuity?

Continuity

- Time to complete a CPDLC transaction or deliver an ADS-C report
- Defines the percentage of transactions or reports delivered within a specified time
- For any transaction not completed within the specified time, the controller or system should take some action
- Value is 99.9% in current RCP/RSP specifications and the time value associated should be used to provide indication to system or controller when it is exceeded
- A continuity value of 95% is also specified. This value is used in statistical measurement and no indications are provided to the system or controller.

Availability vs Continuity

- RCP 240 includes a time value (TRN) for actual communication performance (ACP).
- The TRN applies to a sample of CPDLC “intervention-like” transactions measured from when a controller presses “send” to when the controller receives indication of the response.
- TRN for ACP is 210 seconds. The continuity associated with 210 seconds is 99.9%, meaning that 99.9% of transactions should be completed within 210 seconds.
- For any transaction that is not completed within 210 seconds, an indication would be provided to the system/controller for subsequent action
- Same idea applies to ADS-C report delivery times except the measuring points are different.
- The time from when the aircraft is at the compulsory reporting point position to when the ATSU receives the report is 180 seconds (3 minutes). Any report not received within 3 minutes is overdue and action is taken.
  - The continuity is 99.9%, meaning 1 out of every thousand ADS-C reports can be overdue.
  - 99% means that 1 out of every 100 reports can be overdue.

What is the tactical application of availability? How will it affect day-to-day operations?

- This is where availability gets tricky since a single long outage can adversely affect for a long period of time. Consequently, availability must be assessed on local conditions

- When the separation minimum is predicated on communication and surveillance performance, and procedural mitigations are in place to transition to a different separation minimum (not predicated on communication performance), the availability can be locally assessed to determine if applying the reduced separation remains effective even with high outage rate.
  - A reduced longitudinal separation may still be applied to targets of opportunity owing to relatively low exposure of the applied reduced separation and the ability to transition to another form of separation if an outage occurs.

- A high outage rate becomes an issue of benefit and workload associated with frequent transitions to another form of separation after the outage occurs.
  - For reduced lateral separations is a fully populated multiple track system, the availability may become more significant factor in applying the reduced separation.
  - Other factors that can contribute to providing acceptable mitigations may include issuing conflict free routes for the entire route.

- Transitions to another form of separation after the outage occurs. However, for reduced lateral separations in a fully populated multiple parallel track system, the availability may become a more significant factor in applying the reduced separation. Other factors that can contribute to providing acceptable mitigations may include issuing conflict free routes for the entire route.

What is the tactical application of availability? How will it affect day-to-day operations?

RTCA DO-306, paragraph 5.2.5 gives additional explanation:

Note 1: The values for availability and continuity provide a basis for further operational safety assessment taking into account other factors and operational judgment. These values may be adjusted on the basis of a regional air navigation agreement considering the potential conditions of the airspace when the loss of data link capability occurs, including, but not limited to:

- *Air traffic density;*
- *Proportion of aircraft using the data link service;*
- *Separation minima being applied;*
- *Number of aircraft holding a weather deviation clearance in a localized area;*
- *Capability and performance of detecting and indicating the loss of the data link services;*
- *Capability and performance of route conformance monitoring, e.g., the amount of time after the loss in which the airspace can be considered to be conflict-free; and*
- *Capability and performance of the alternative means of communication, including associated procedures for applying an alternative form of separation.*

How does 240 seconds come in to play in RCP 240?

- 240 seconds at 99.9% includes the time (at the beginning of the CPDLC transaction) for the controller to compose the message and the time (at the end of the CPDLC transaction) for the controller to understand the response after receipt of the indication that it has been received.

- This time (30 seconds) provides a basis for human-machine interaction (HMI) design for the controller's workstation and the HMI design is verified by analysis, simulation, etc. The HMI design for the controller is not measured in operations via post-implementation monitoring.

- RCP 240 includes a TRN value for ACP, which is measured from when the controller sends a clearance to when the controller receives indication of WILCO. The TRN values are:
  - 210 seconds at 99.9%, meaning 99.9% of sampled CPDLC transactions should be completed within 210 seconds.
  - 180 seconds at 95%, meaning 95% of sampled CPDLC transactions should be completed within 180 seconds.

Given the requirement for 99.9% availability for safety and 99.99% for efficiency, can separation reductions be implemented if 99.9% is met but tracks not established or loaded at the reduced separation unless 99.99% is met?

It can be looked at that way, but…

- The 99.99% efficiency requirement is specifically a value for consideration in local assessment (i.e. within a specific center).
- The 99.9% availability requirement, which was determined from a safety assessment, should determine whether or not reduced separations to targets of opportunity or on tracks that require RCP 240 are applied.
- Note the difference between 99.9% (524 minutes of total down time over a one-year period) versus 99.99% (52.4 minutes down time over a one–year period).
- These events are counted on a per center basis if the outage exceeds 10 minutes and if it affects multiple aircraft.

It has been suggested that even though there is a 99.9% continuity requirement, States may not do anything until it drops below 99%. What does this mean?

The continuity requirement can be related to controller workload. Actual continuity can be assessed from that perspective.

- The lower the actual continuity, the more often a CPDLC transaction will not be completed within the time specified (210 seconds) and the more often an ADS-C report will be overdue (3 minutes).
  - In these cases, some action would be needed, such as the system indicating to the controller in the queue and then controller would need to assess the situation.
- As long as the system acts appropriately on CPDLC transactions and the ADS-C reports that exceed the time values, or it provides the indication to the controller for action, this continuity value of 99.9% can be assessed based on controller workload.
- There are limits to how bad it can be. There's been a lot of debate, but local assessment may determine that 99% is acceptable for the intended operations if the 99.9% criteria are what is stopping RCP/RSP implementation.
- Additional guidance on compliance/noncompliance needs to be defined, consensus reached and then added to the ICAO Global Operational Data Link Document (GOLD).

What data is collected for monitoring?

For specific details, see GOLD, Appendix D. Basically:

- Outage information (for availability) applied to both RCP and RSP

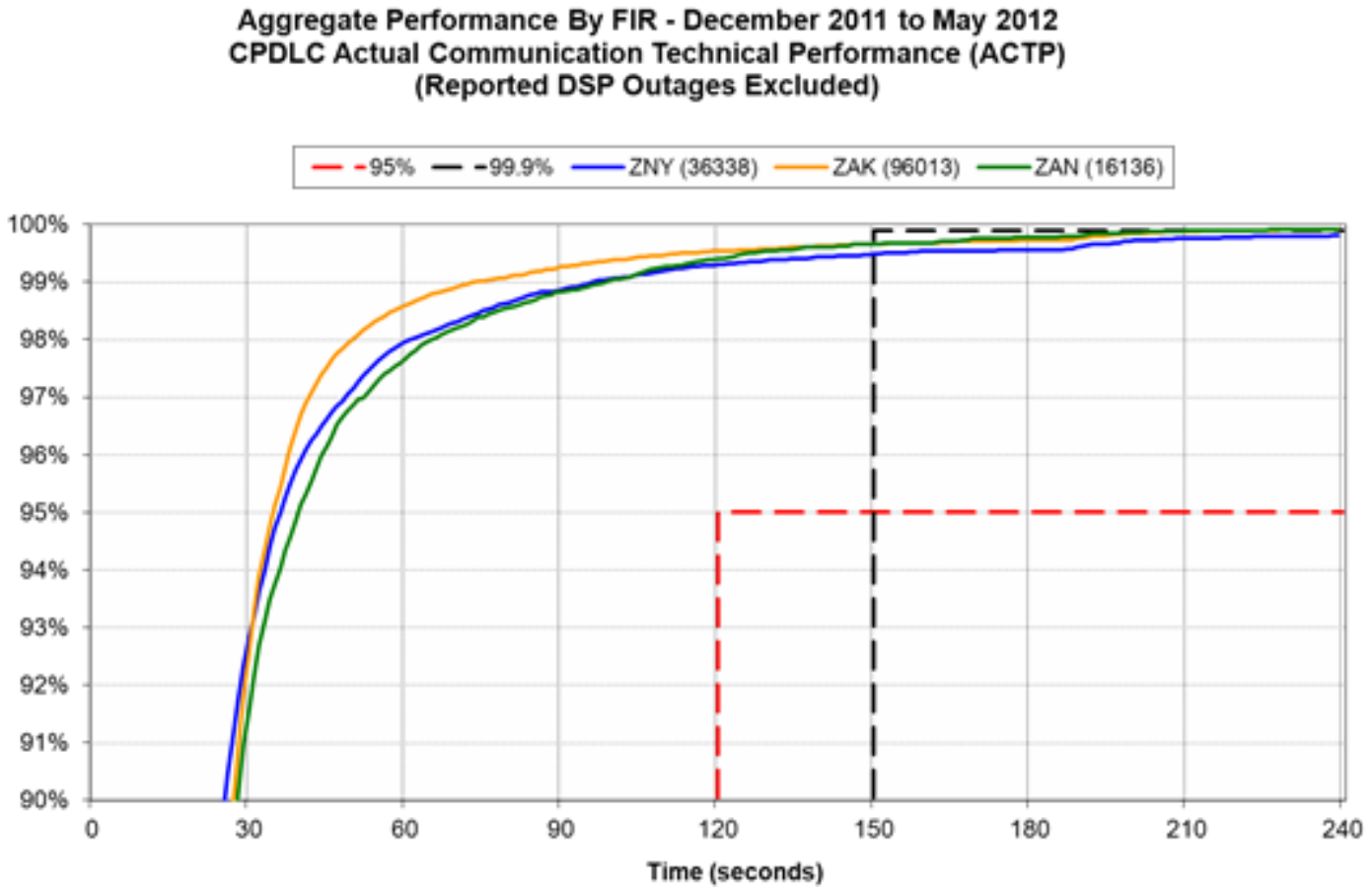
- RCP – Latency of CPDLC transactions
  - Actual communication performance (ACP) associated with TRN - from when the controller sends a clearance to when the controller received indication of WILCO (except for route re-clearance transactions involving UM79, UM80 and UM83)
  - Actual communication technical performance (ACTP) associated with Required Communication Technical Performance (RCTP) – from when the controller sends a clearance to when the flight crew received indication of the instruction and from when the flight crew sends the WILCO to when the controller received indication of the WILCO. This technical performance is estimated from the ACP of each CPDLC transaction in the sample and basically removes the pilot operational response time from the ACP measurement.
  - Pilot operational response time (PORT) – from when the flight crew receives indication of the instruction to when the flight crew sends the WILCO response.

- RSP – ADS-C report delivery time (at position to ATS receipt of the report)

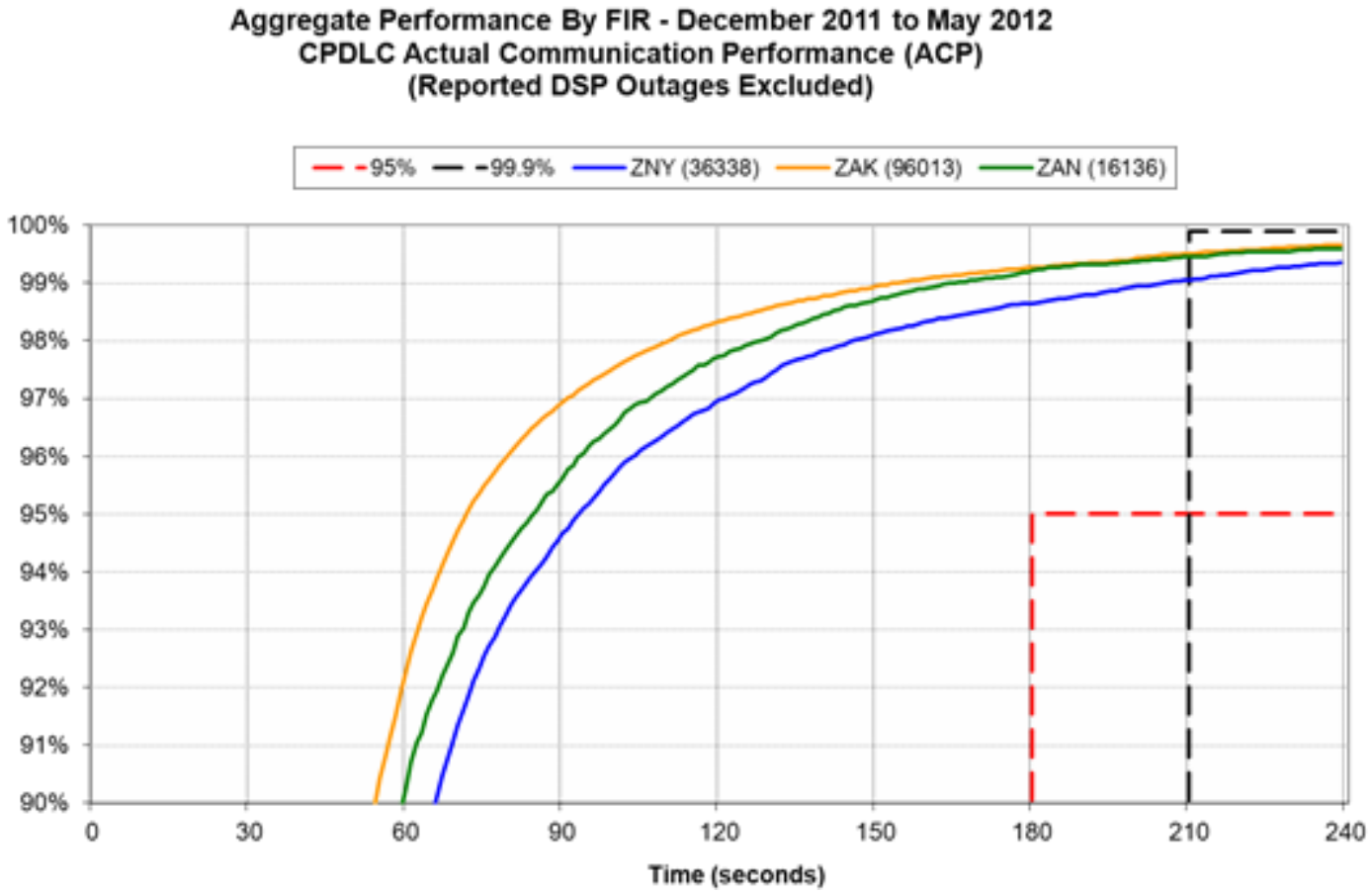
What data is collected for monitoring?

The following 7 slides show results of GOLD (RCP/RSP) performance analysis for New York, Anchorage and Oakland FIRs for the period December 2011 to May 2012.

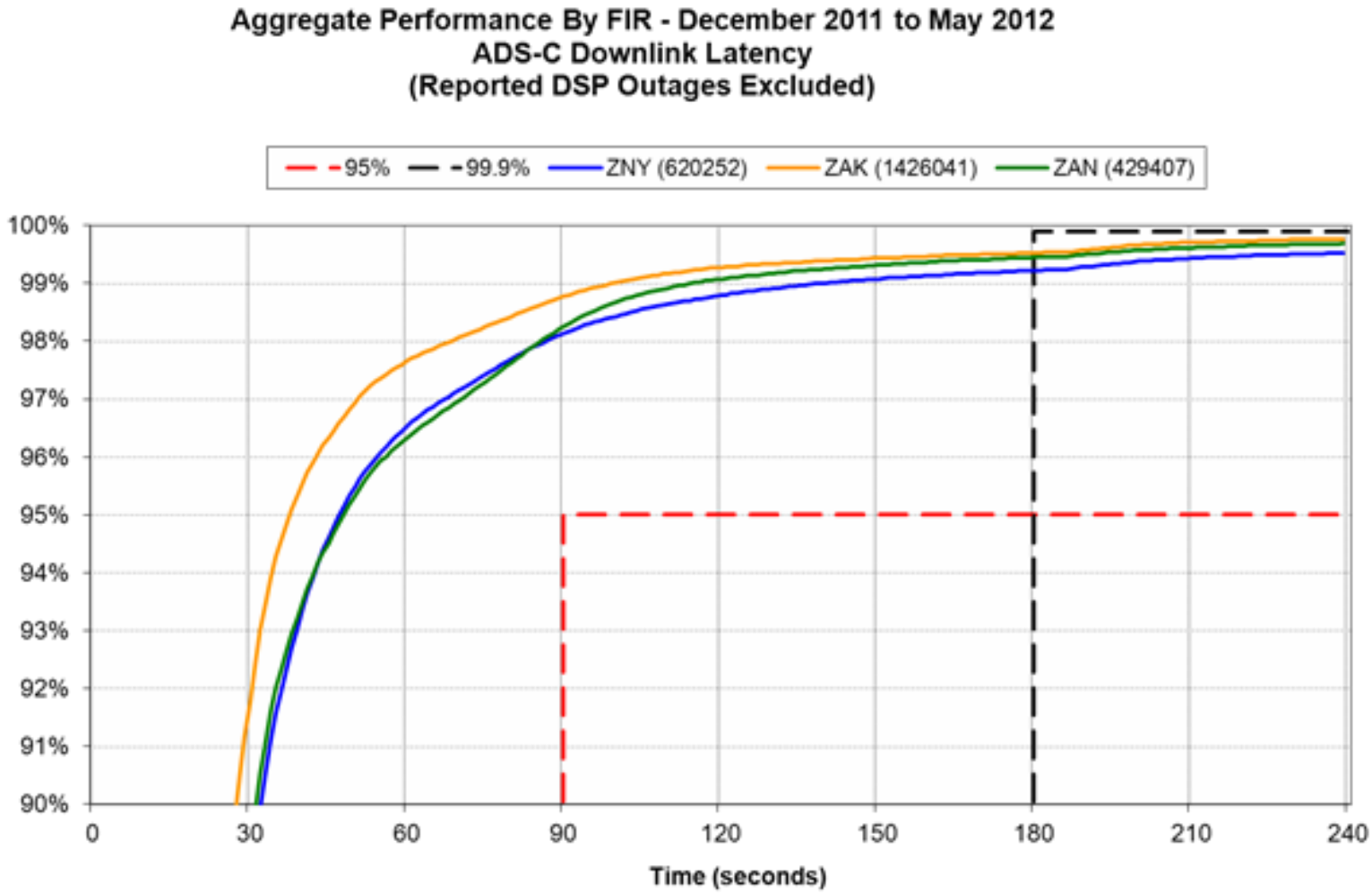
RCP CPDLC FAA – Actual Communication Technical Performance (ACTP)



RCP CPDLC FAA – Actual Communication "Operational" Performance (ACP)



RSP – ADS-C FAA – Position Report Delivery Performance



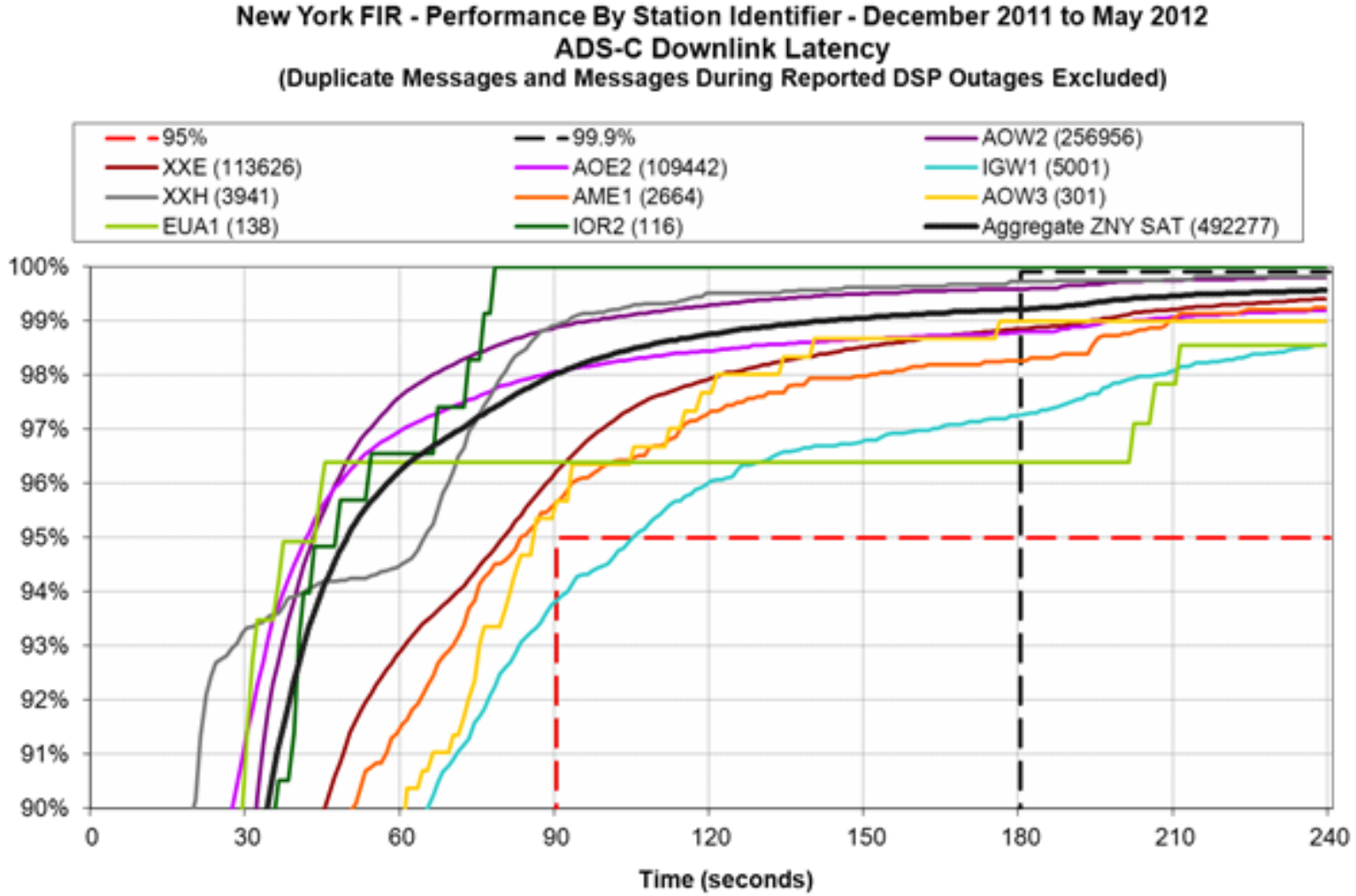
RCP/RSP Actual Performance – New York FIR – December 2011 to May 2012 (by Communication Media Type and Total)

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	492,277 (79.4%)	98.0%	99.2%	33,367 (91.8%)	99.3%	99.5%	98.7%	99.1%	94.9%
VHF	125,861 (20.3%)	99.1%	99.5%	2,564 (7.1%)	99.9%	99.9%	99.3%	99.4%	95.1%
HF*	2,114 (0.3%)	92.4%	95.3%	5 (<0.1%)	--	--	--	--	--
Total	620,252	98.1%	99.2%	36,338**	99.3%	99.5%	98.6%	99.0%	94.8%

* HF performance is assessed against RSP 400/RCP 400 criteria.

** 1.1% of RCP transactions occur over mixed media

RSP – ADS-C New York FIR – Position Report Delivery Performance (by Ground Station Identifier)



Observed Performance by Operator – New York FIR – December 2011 to May 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%
AA	73,119	11.8%	99.2%	99.7%	6,844	18.8%	99.8%	99.8%	99.4%	99.6%	96.6%
BB	61,475	9.9%	99.3%	99.5%	3,482	9.6%	99.1%	99.2%	99.0%	99.4%	96.0%
L	58,749	9.5%	97.3%	99.3%	3,480	9.6%	99.0%	99.5%	97.8%	98.2%	92.4%
FF	42,282	6.8%	95.3%	97.3%	2,775	7.6%	98.4%	98.6%	98.1%	98.8%	95.9%
DD	36,981	6.0%	96.8%	99.2%	2,562	7.1%	99.1%	99.7%	97.4%	98.1%	89.9%
A	33,929	5.5%	96.2%	98.4%	1,190	3.3%	98.2%	98.4%	97.8%	98.6%	96.3%
HH	30,069	4.8%	99.2%	99.4%	1,285	3.5%	99.9%	99.9%	99.1%	99.4%	96.0%
GG	29,745	4.8%	99.0%	99.8%	1,725	4.7%	99.4%	99.5%	99.4%	99.4%	95.4%
R	28,856	4.7%	97.3%	99.7%	1,031	2.8%	99.4%	99.8%	99.0%	99.4%	96.7%
JJ	23,548	3.8%	99.7%	99.9%	558	1.5%	99.6%	99.6%	99.3%	99.3%	93.9%
EE	23,234	3.7%	98.4%	98.7%	1,509	4.2%	99.4%	99.5%	98.8%	99.1%	94.1%
KKKK	20,174	3.3%	99.9%	99.9%	2,028	5.6%	99.9%	99.9%	99.1%	99.3%	95.0%
CC	15,908	2.6%	97.4%	98.9%	1,144	3.1%	99.3%	99.4%	99.0%	99.3%	97.0%
LL	13,872	2.2%	98.8%	99.3%	1,412	3.9%	99.8%	99.8%	99.4%	99.8%	98.2%
MM	13,569	2.2%	99.4%	99.8%	584	1.6%	99.7%	99.7%	97.8%	98.5%	90.2%
SS	11,125	1.8%	98.0%	99.6%	303	0.8%	98.4%	99.0%	97.4%	97.7%	92.1%
TT	9,805	1.6%	99.9%	100.0%	552	1.5%	100.0%	100.0%	99.3%	99.8%	95.3%
PP	9,423	1.5%	98.7%	99.8%	442	1.2%	99.6%	99.6%	99.3%	99.8%	96.2%
ZZZZ	8,997	1.5%	95.4%	96.7%	331	0.9%	97.6%	97.6%	94.6%	95.8%	86.4%
II	8,359	1.3%	99.5%	99.9%	523	1.4%	100.0%	100.0%	99.8%	100.0%	97.5%
WW	5,419	0.9%	97.3%	99.1%	175	0.5%	99.4%	100.0%	99.4%	100.0%	97.7%

Summary of Reported Outages/Degradations October 2011 to June 19, 2012

Start Date	Start Time (UTC)	Duration (hh:mm:ss)	Service Impacted	Satellite Region Impacted	Notification Source	Notes
18-Oct-11	18:10	02:35:00	ARINC Iridium	Global	ARINC	ARINC Iridium Service operating in an impaired state
22-Oct-11	8:58	13:52:00	All POR	POR	ARINC, Sita	Inmarsat POR outage
1-Nov-11	2:00	00:39:00	Iridium	Global	ARINC, Sita	
1-Nov-11	1:18	00:17:00	Iridium	Global	ARINC, Sita	
2-Nov-11	2:01:00	02:35:00	Iridium	Global	ARINC, Sita	Voicemail, SMS and all Paging services are now available. No reason given for outage.
17-Jan-12	21:45	00:30:00	Iridium	Global	ARINC, Sita	Unexpected Service Interruption - SATELLITE AIRCOM-Iridium Datalink ACARS Service (Post-Incident Report) Short Burst Data Service may have been affected during the above timeframe. Voice service was not affected. Location: GLOBAL
18-Mar-12	12:15	00:40:00	Iridium	Global	ARINC, Sita	Iridium was experiencing delays with SBD DMT message delivery
2-Apr-12	5:45	00:58:00	Sita	AOE, AOW	Sita	Unexpected service interruption at Aussaguel GES
30-Apr-12	6:00	10:00:00	Iridium	Global	ARINC, Sita	Due to an internal network anomaly at the Tempe Gateway, SBD customers will have intermittent use of all SBD services during this period. SBD messages are queuing for delivery. Message delivery is delayed 30+ minutes.
1-May-12	10:15	04:52:00	Iridium	Global	ARINC, Sita	SBD DMO customers may have experienced delays in message delivery of up to 30 minutes.
9-May-12	23:48	5:07:00	Iridium	Global	ARINC, Sita	Due to severe thunderstorms in the vicinity of the Tempe Gateway
6-Jun-12	13:57	0:22:00	Sita	AOE, AOW, IOR, POR	Sita	Network Issue

What does it mean to meet RCP?

This question is currently a source of great debate. The NAT CNSG is coordinating with the GOLD Ad Hoc Working Group on an answer.

- It can be envisioned that RCP is a fundamental component of SMS that provides the means for each state to ensure that communication and surveillance performance meets the criteria specified by the relevant separation standards for the separation minima being applied.
- In addition to finding compliance as part of initial approval, post-implementation monitoring must show that the requirements of CPDLC transaction time, availability, integrity and continuity for TRN continue to be met in order to "meet" RCP.
  - TRN allocations facilitate component qualification (e.g., aircraft, air operator, and air traffic service provision, including communication services). However, the TRN values provide the operational criteria when all the components are working together for a specific operator or an aircraft type, or in a specific regional or state implementation.
    - Availability – Were the services met at 99.9%? Integrity – Malfunction = 10-5 per flight hour?
    - Transaction time / Continuity – Was ACP transaction time met at 95%? Was ACP transaction time met at 99.9%?

What does it mean to meet RCP?

- For continuity, when an RCP is prescribed for a given ATS operation, such as a reduced separation minimum, the bottom line is whether an operator meets the TRN time values at 95% and 99.9%. It has been suggested that, generally speaking, if an operator meets the TRN time values at 95% and 99.9% (even if a specific allocation does not meet it's requirement) then that operator meets TRN time values at 95% and 99.9%. If an operator does not meet the TRN time values at 95% or 99.9%, then the monitored data can be analyzed to see why and provide an area for targeted corrective action.

  - Depending on local factors, it may be necessary to remove that operator from being eligible for the operations that are predicated on RCP. The TRN time value for the ACP at 99.9% is used by the ATC automation system to provide an indication to the controller of non-delivery per safety requirement (SR)-14 of the RCP specification. Depending on a local assessment of controller workload due to the actions necessary when an indication a WILCO response is not received in the required time and other factors may determine that the actual ACP specified at 99.9% may be acceptable.

What do we do if we see an RCP is not being met, for example, by a particular operator, or a sample of CPDLC transactions transmitted via a specific routing path (satellite, ground station, CSP, etc)?

- Problem report should be submitted to the NAT DLMA for investigation. If conclusion requires actions, then action would be assigned to correct the problem within a reasonable time period.
- This is one of the reasons for States to require an authorization. The problem is not what is not being met, but rather assurances have not been put in place to know which operators/CSPs are meeting specification, which ones are not meeting specification and which parts of the specification they may not be meeting. It has been proposed that GOLD be updated to include the following criteria:

  a) States grant operators approval for RCP 240 and RSP 180 as they do RNP 4

  b) Operator demonstrates 6 months of acceptable RCP/RSP performance for their fleet

     i) For RCP, CPDLC ACP (95%) and for RSP, ADS-C DT (95%) meets criteria;

     ii) For RCP, CPDLC ACP (99.9%) affects how often controller does not receive operational response; and

     iii) For RSP, ADS-C OT (99.9%) affects how often reports are overdue.

<u>Rule of thumb on 99.9% criteria – operational judgment</u>. 99% or better - no action necessary. Otherwise, contact DLMA/CRA and operator and/or CSP to determine action.

What do we do if we see an RCP is not being met, for example, by a particular operator, or a sample of CPDLC transactions transmitted via a specific routing path (satellite, ground station, CSP, etc)?

c) Corrective action notice – If actual performance measurement indicates non-compliance, the State of the Operator provides operator notice of action to correct within a predetermined timeframe based on severity of the deficiency and magnitude of the solution.

d) RCP [X] and or RSP [Y] authorization removed if non-compliance remains after the date indicated in the corrective action notice.

– can still use CPDLC and ADS-C but no reduced separation applied.

How does RCP affect day to day operations?

- One of the issues will be just getting all participants properly equipped.
- If the airspace aggregate or a particular operator/CSP fall below 95% criteria, that is pretty bad performance and the controllers will probably notice it.
- The time value associated with the 99.9% criteria is used to set parameters in the ATC automation, which provides an indication to controller if WILCO is not received within a certain amount of time.
- As more CPDLC transactions exceed the time value specified at 99.9%, then the workload for the controller would increase.
- This increased workload can be assessed locally to determine if controllers can (or are willing to) handle the increase.

Are there any aspects of RCP which could or should affect tactical operational decision making?

- Much of RCP is technical and controllers won't immediately know whether an operator is meeting 99% or 99.9%. What they will notice is how performance of a particular operator degrades as actual performance deviates below 95%.

- Controllers may need to know what to do, for example, when flight crews advise them of SATCOM failure but still have an operating CPDLC and ADS-C on HFDL.

- The controller may receive indications of an excessive amount of overdue reports or late responses to clearances leaving the controller or system to compensate for degraded performance. The above is specific to the controller, but some aspects require automation to support tactical operational decision making.

- Unless a fleet, aircraft type or a specific aircraft is consistently below 95%, which would be evidenced by overdue reports and overdue clearance responses, or crew notifies of a failure, the controller is not going to know. Decision as to whether to apply reduced separations rests with logic the system uses to judge eligibility to apply the separation and the controller's assessment of current communications/surveillance capability.

- At the tactical level, the controller needs to understand that the separations being applied are predicated on RCP/RSP and the ATC system should provide indication that an aircraft has delivered numerous overdue reports and/or responses to clearances, so the controller knows to take appropriate action, such as transitioning to an alternative form of separation. Reporting this will allow a review of the performance of the specific aircraft fleet from an RCP/RSP perspective and action can then be taken as needed.

- It should be noted, one of the advantages of the RCP concept is that it allows the controller to continue to use CPDLC and ADS-C without applying a reduced separation to an aircraft pair in lieu of HF voice even though it does not meet RCP 240/RSP 180.

It was pointed out that RTCA DO-306/EUROCAE ED-122, Safety and Performance Standard for Air Traffic Data Link Services in Oceanic and Remote Airspace (Oceanic SPR Standard) specified Required Communications Performance (RCP) 240 for the application of 30 NM lateral and longitudinal separation minima. In light of the fact that RCP 240 was not being met in the ICAO NAT Region, a clarification was required as to the interpretation of the ED-122 requirements in this regard.

It still has to be determined whether or not RCP 240 is being met in the ICAO NAT Region based on GOLD post-implementation monitoring. At its 40th meeting, the NAT IMG tasked the NAT CNSG to conduct and assessment of compliance with RCP 240:

•NAT IMG Decision 40/17– Assessment of compliance with RCP 240

•That the NAT Communications, Navigation and Surveillance Group (NAT CNSG):

a) provide a clear indication of whether or not Required Communications Performance (RCP) 240 is being met in each NAT Oceanic Control Area currently being assessed;

b) identify, if RCP 240 is not being met, what aspects of an operator's performance are not compliant with the RCP 240 specification; and

c) determine the potential effects of those shortcomings on the implementation of reduced separation minima.

- Concerning CPDLC and ADS-C times at 99.9%, the FAA conducted an assessment and concluded that, given current percentage of aircraft using CPDLC/ADS-C in New York FIR and slight increase in controller workload, the current actual performance is acceptable. However, since we have monitoring data, States can investigate why the 99.9% requirements were not met and concentrate their corrective actions in those areas to improve performance as more aircraft are equipped and begin using CPDLC and ADS-C and applications of reduced separations increases. The FAA also expects improved performance from upgrades to the communication infrastructure with Iridium Next and Inmarsat I-4 satellites and networks.

- In accordance with ICAO Doc 4444, the internationally agreed data-link-based separation minima values available for application in oceanic and remote airspace are 50NM longitudinal, 30NM longitudinal and 30NM lateral. Specifics for 30NM lateral separation are provided in paragraph 5.4.1.2.1.6, “Lateral separation of aircraft on parallel or non-intersecting tracks or ATS routes,” with references to pertinent ICAO documents cited therein. Paragraph 5.4.2.6.4, “Longitudinal Distance- Based Separation Minima in an RNP RNAV Environment Using ADS-C” provides the corresponding details for the 50 NM and 30NM longitudinal separation minima, again with references to other relevant ICAO documents.

- ICAO developed guidelines for oceanic separation standards of 50NM longitudinal, 30NM longitudinal and 30NM lateral provided a set of requirements are met or exceeded. These requirements include that aircraft be authorized for RNP-10 or RNP-4, direct pilot-controller communication or CPDLC and ADS-C position reports.

- For CPDLC,
  - ICAO Doc 4444, paragraph 5.4.2.6.4.3.2. The communication system provided to enable the application of the separation minima in 5.4.2.6.4.3 shall allow a controller, within 4 minutes, to intervene and resolve a potential conflict by contacting an aircraft using the normal means of communication. An alternative means shall be available to allow the controller to intervene and resolve the conflict within a total time of 10½ minutes, should the normal means of communication fail.

- For ADS-C (or CPDLC Pos Report, which is not normally used, except to confirm CDA):
  - ICAO Doc 4444, paragraph 5.4.2.6.4.3.3. When an ADS-C periodic or waypoint change event report is not received within 3 minutes of the time it should have been sent, the report is considered overdue and the controller shall take action to obtain the report as quickly as possible, normally by ADS-C or CPDLC. If a report is not received within 6 minutes of the time the original report should have been sent, and there is a possibility of loss of separation with other aircraft, the controller shall take action to resolve any potential conflict(s) as soon as possible. The communication means provided shall be such that the conflict is resolved within a further 7½ minutes.
- The analysis supporting the RCP 240 and RSP 180 specifications was based on the communication and surveillance performance requirements provided in the aforementioned paragraphs of Doc 4444. The analysis is provided in RTCA DO-306/ED-122 (See paragraph 5.2.3).
- **So, while RCP 240 is not specifically called out in the separation standard for 30 Longitudinal, as defined in Doc 4444, if the implementation meets the communication and surveillance performance requirements of the standard in Doc 4444, then you would meet the RCP 240 specification. We know some operators are not meeting specs. The execution of the RCP-RSP implementation plan will provide the confidence that operational implementations meet the PANS/ATM communication and surveillance performance requirements for the application of 30 NM longitudinal minimum. The RCP 240 and RSP 180 specifications, when prescribed in Doc 7030 and State AIPs, and applied in SMS practice, will provide the assurance and confidence that the operational implementation is meeting the requirements of the 30 NM longitudinal separation standard as defined in Doc 4444.**

What are some benefits of prescribing RCP/RSP for an ATS operation in specified airspace?

- Once RCP/RSP is prescribed for an ATS operation in specified airspace (FIR, region, etc), there will be controls over operators, aircraft equipage and CSPs (via service contracts/agreements) to find problems and fix them to increase the total airspace aggregate to within specifications.

- Having these controls will ensure safe application of reduced separations in accordance with the standards and effectively increase safety and efficiency of air traffic.

- Implementation of the RCP/RSP framework, as endorsed by the *NAT Performance Based Communication and Surveillance Implementation Plan*, will improve these controls.

What changes are expected to the system?

- Inmarsat is acquiring new equipment for the ground earth stations (GESs) serving Inmarsat's third generation (I-3) satellites and redistributing the service coverage areas for the existing four GESs to only two GESs, one located in Perth, Australia and one located in Burum, Netherlands. This change is underway and expected to be fully implemented by the end of 2nd quarter 2013. (Refer to NAT SPG/48 IP/15)

- Examples of other changes occurring by 2015 include new infrastructure and communication services (e.g. Iridium Next and I-4 Classic Aero Services and SwiftBroadband), which will support CPDLC and ADS-C. Changes are continually being implemented and operators are making choices with their aircraft equipment and adapting it – for their specific business – in ways that can significantly affect operational performance.

- RCP/RSP approvals will ensure that new operators, new aircraft equipment and new infrastructure (e.g. network, satellites and ATC systems) supporting CPDLC and ADS-C initially meet their allocations of the RCP/RSP specifications.

- Post-implementation monitoring will measure operational CPDLC and ADS-C performance against RCP/RSP specifications, and detect degraded performance owing to failures or changes in aircraft equipment, infrastructure, and/or procedures for flight crew and controller for compliance action.

Comments?