

Interpreting RCP/RSP and Monitoring Results

Data Link Performance Monitoring Seminar
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Interpreting RCP/RSP and Monitoring Results

Assessing availability?

- **When the separation minimum is predicated on communication and surveillance performance, and procedural mitigations are in place to transition to a different separation minimum, availability can be locally assessed to determine if the separation remains effective even with high outage rate.**
 - ***e.g. 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 versus workload associated with frequent transitions to another form of separation after an outage occurs.**
 - ***e.g. For reduced separations in a fully populated multiple track system, the availability may become more significant factor in applying the separation.***
 - ***e.g. Other factors that can contribute to providing acceptable mitigations may include issuing conflict free routes for the entire route.***



Interpreting RCP/RSP and Monitoring Results

What do we mean by local assessment of performance?

Refer to Oceanic SPR (RTCA DO-306, paragraph 5.2.5):

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.***



Interpreting RCP/RSP and Monitoring Results

Why do we have 99.9% availability for safety and 99.99% for efficiency ?

- **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.**



Interpreting RCP/RSP and Monitoring Results

What is the “240” in RCP240?

- **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.**



Interpreting RCP/RSP and Monitoring Results

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 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 a system indication to the controller who can then assess the situation.**
- **As long as the system acts appropriately on CPDLC transactions and the ADS-C reports that exceed the time values, and it provides an indication to the controller for action, the 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 is what is stopping RCP/RSP implementation.**



Interpreting RCP/RSP and Monitoring Results

How does RCP/RSP affect day-to-day operations?

- **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 or an ADS-C position report is overdue.**
- **As more CPDLC transactions or position reports exceed the time value specified at 99.9%, then the workload for the controller will increase.**
- **This increased workload can be assessed locally to determine if controllers can (or are willing to) handle the increase.**



Interpreting RCP/RSP and Monitoring Results

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.**



Interpreting RCP/RSP and Monitoring Results

Are there any aspects of RCP which could or should affect 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.**



Interpreting RCP/RSP and Monitoring Results

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

- **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.**



Interpreting RCP/RSP and Monitoring Results

What changes are expected to the FANS1/A 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.**



Interpreting RCP/RSP and Monitoring Results

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

- **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.**



Interpreting RCP/RSP and Monitoring Results

Identifying poor performers?

- **The reasons behind degraded performance are many and varied.**
- **Considerable analysis may be required before the reasons behind poor performing fleets are identified and it is difficult to provide guidance for all situations.**
- **On a number of occasions poor performance has been attributed to a specific aircraft in a fleet.**
 - **Usually these poor-performing aircraft can be identified by the visual inspection of monthly data ordered in terms of transit time,**
 - **or more accurately by graphing the monthly data for a fleet by aircraft registration.**
- **Techniques such as graphing the positions of all delayed messages on a geographical display have identified areas for further investigation.**



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Assessing Results?

- **Typically post implementation monitoring is carried out on a monthly basis and observed performance assessed to detect any performance degradation.**

99.9% Criteria

- **When using data link to provide reduced separations the RCP240 ET and RSP180 OT are the times after which if a CPDLC intervention transaction is not completed or an ADS-C position report is not received then the controller is obliged to revert to alternative separation procedure as defined in the separation specification.**
- **If monthly monitoring shows that a specific fleet is not meeting the criteria then a local safety assessment by the ANSP should be carried out to assess if the reduced separation standard can continue to be applied.**
- **Some ANSP have set monitoring guidelines as to when to trigger a safety assessment and further investigation.**



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Assessing Results?

95% Criteria

- **The 95% criteria define the nominal time acceptable for normal CPDLC and ADS-C operations.**
- **If monthly monitoring shows that measured performance is consistently below the 95% criteria then consideration may be given to the withdrawal of data link services to the fleet.**
- **Experience has shown that observed fleet performance below the specified RCP240/RSP180 95% criteria will usually be accompanied by controller complaints of unacceptable performance by that fleet.**



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Assessing Results?

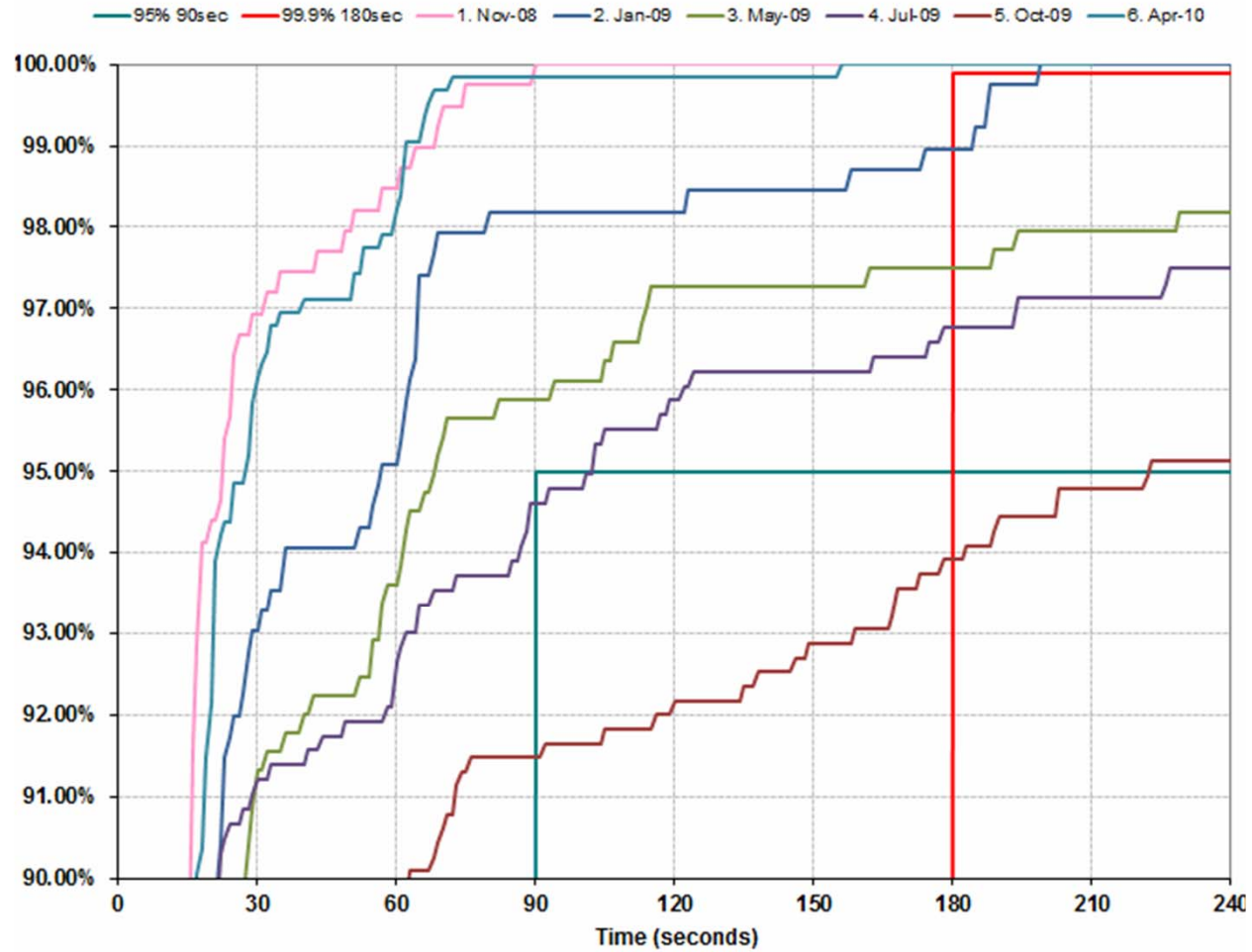
Setting Guidelines

- **complete withdrawal of data link may not be required even if performance is observed to fall below the RCP240/RSP180 criteria.**
- **While safety services such as reduced separation standards requiring RCP240/RSP180 would be withdrawn the observed performance may still meet RCP/RSP400 criteria and the local safety assessment may also conclude that maintaining the data link connection is viable.**
- **Some ANSP have set monitoring guidelines. These include:**
 - **If the performance observed for a fleet by monthly monitoring at the 99.9% level is better than 99.75% then the fleet is considered to meet 99.9%.**
 - **Performance consistently falling below 99.0% will be subject to CRA problem reports and investigation.**
 - **Any monthly performance degradation (0.5%) by a fleet below observed historical performance will be subject to investigation.**



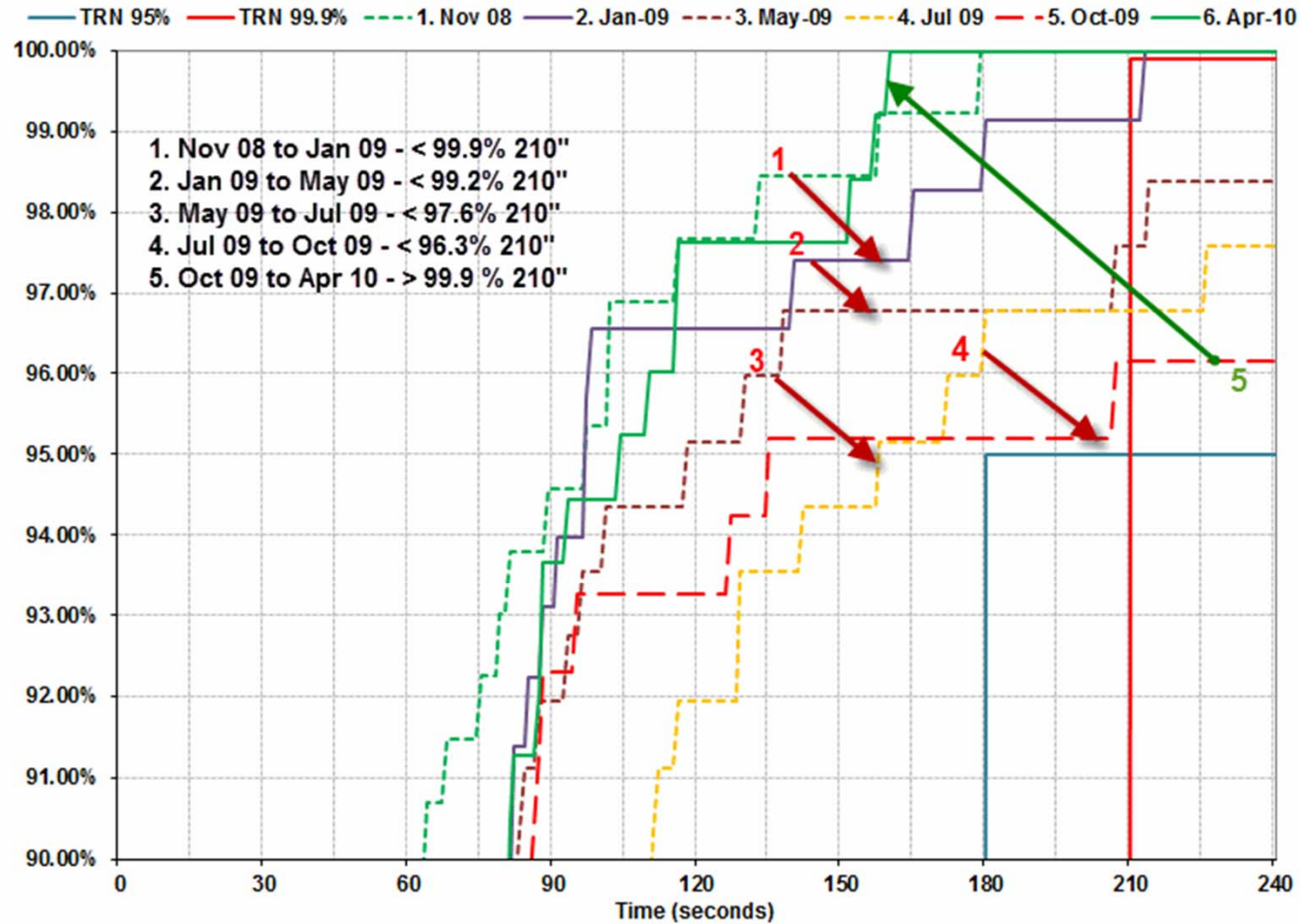
Case Study

ADS SATCOM Downlinks
Actual Performance for a specific fleet
operating during 2008-2009 in NZZO Oceanic FIR



Case Study

CPDLC SATCOM ACP
Actual Performance for an airline fleet type
operating NZZO FIR 2008-2010
(DSP Outages Excluded)





Thank you

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