



International Civil Aviation Organization

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1. INTRODUCTION

1.1 The following information on data link performance criteria was provided by the Administrator of the FIT-Asia CRA website, also a member of the ICAO OPLINK Panel.

2. DISCUSSION

2.1 Information on the 99.9% expiry time and where it comes from is included in the attachment to this Flimsy. The information is extracted from the **draft** PBCS manual developed by OPLINKP.

2.2 The relevance of the 99.9% level was established by its determination by an operational safety assessment conducted in accordance with RTCA DO 264/ED 78A. If aircraft performance does not meet the level it implies that, if a reduced separation is in place, the controller workload can be expected to increase to resolve the communication response or position report that has not been received.

2.3 It has been observed that if the performance level drops below the 95% level then controller complaints are usually received about fleet datalink performance.

2.4 The impact of a drop below 99.9% is on controller workload. It has been observed that if the performance level drops below the 95% level then controller complaints are usually received about fleet datalink performance.

2.5 If the fleet does not usually have many applications of 30/30 separation or there are not many times when separation requiring RCP240/RSP180 is applied, then monitored performance may be allowed to fall below 99.9 without significant safety impact. If every aircraft in the airspace was being separated by RNP4-based 30/30 separations then falling below 99.9% performance may not be acceptable due to workload issues.

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RCP transaction time and allocations

There may be multiple operational communication transactions that support an ATM operation. These transactions are assessed to determine the most stringent. The value for the RCP transaction time is based on the time needed to complete the most stringent transaction for controller intervention.

The assessment would take into consideration the time needed to safely execute the contingency procedure and can include simulations, demonstrations, operational trials and analysis of empirical data applicable to the RCP communication transaction times for the ATM operation.

For separation assurance, the RCP transaction time can be determined by collision risk modeling. Collision risk modeling considers the RCP transaction times in the communications and controller intervention buffer supporting separation assurance. [Figure 3-1](#) illustrates the operational communication transaction in the context of communications and controller intervention buffer.

In practice, the RCP transaction time is specified for a nominal continuity (TT) and for an operational continuity (ET). The time associated with the operational continuity is called expiration time (ET), as this is associated with the time the controller takes action upon receiving an alert provided by the expiration of the ground timer. These times are associated directly with the RCP continuity requirements for the controller's communication and intervention capability.

a) The TT value is used in statistical analysis during post-implementation monitoring and is not monitored in real time. The TT value is known as the nominal time (i.e. the time at which 95% of the communication transactions in a data sample are completed). Other statistical values, such as mean and average time values, may be considered in local assessments. If the system does not meet the TT value, appropriate action should be taken to identify and rectify the source(s) of performance deterioration to improve performance to an acceptable level before providing the ATM operation predicated on RCP;

b) The ET value is monitored in real time for each transaction by the ATC system. When a response to an ATC instruction has not been received within the ET value, the ATC system provides an indication to the controller for appropriate action. The ET value is associated with a continuity requirement of 0.999 (99.9%), which was determined by an operational safety assessment, in accordance with DO 264/ED 78A. In this case, the operational safety assessment concluded that under worst case conditions, a frequent occurrence of this indication to the controller (i.e. that a WILCO response has not been received by the ET value) could result in a significant increase in controller workload. This is considered to be a "Class 4" hazard. The corresponding safety objective is that the occurrence of a WILCO response exceeding the ET value is no greater than 10^{-3} (or 99.9% of WILCO responses are received within the ET value); and

c) The time values at 95% and at the operational continuity criterion (e.g. 99.9%) apply to the communication transaction, operational performance (RCMP), PORT, and RCTP. It should be noted that only the 'RCMP time value at the operational RCP continuity criterion' portion has an expiration timer.

For example, [Appendix B](#) contains the RCP 240 specification, including the allocated RCP transaction time values. Compliance with the times specified for the controller to compose the message and to access the response after receipt of indication is shown by analysis, simulations, safety and human factors assessments. Compliance with the requirements for the remainder of the transaction, referred to as RCMP, is shown by contracts and/or service agreements for communication services and post-implementation monitoring

of CPDLC transactions requiring a WILCO response. Allocated requirements associated with ACTP and PORT aid in determining initial compliance and further assessment when ACP does not meet the requirements for RCMP.

Note.— Further information on RCP 240 and compliance means is contained in [Chapter 5](#) and [Appendix B](#) of this Manual.

RCP continuity and allocations

The value for the RCP continuity parameter is associated with the actual communication performance of the expiration value of RCP and is selected based on the results of an operational hazard and performance assessment.

The operational hazard assessment should include a severity-of-effects analysis of detected errors within the communication transactions. Detected errors include, but are not limited to:

- a) Detecting that the transaction has exceeded the RCP transaction time (ET);
- b) Detecting that one or more messages within the transaction are corrupted, misdirected, directed out-of sequence or lost, and cannot be corrected to complete the transaction within the RCP transaction time; and
- c) Detecting loss of the communication service or aircraft capability to use the service whilst transactions are pending completion.

An acceptable operational RCP continuity value should be determined based on an analysis of the severity and the likelihood of occurrence of communication transactions with detected errors. As stated in [paragraph 3.2.2.4](#), the operational safety assessment for RCP 240 classified the effects of identified hazards on ATS services, such as controller workload as “minor,” which equates to a likelihood of occurrence of a malfunction of no greater than 10^{-3} , or a 0.999 success rate (99.9%).

From a performance perspective, RCP continuity is associated with the required level of usability. This puts a maximum on the number of interrupted transactions after which it becomes annoying or less productive from a usability viewpoint to use CPDLC.

A nominal RCP continuity value (TT) is specified to assess the performance at 95%. Other statistical values, such as mean and average time values, may be considered in local assessments.

The values for RCP continuity remain the same (95% and 99.9%) for all allocations (e.g. operational performance (RCMP), PORT, and RCTP).

RSP data delivery time and allocations

The value for the RSP data delivery time is based on the time when the surveillance data delivery is considered overdue.

The assessment would take into consideration the time needed to safely execute the contingency procedure and can include analysis of empirical data applicable to the RSP data delivery times for the ATM operation.

For separation assurance, the RSP data delivery can be determined by collision risk modeling. Collision risk modeling considers the RSP delivery times in the surveillance data delivery and controller intervention buffer supporting separation assurance. [Figure 3-1](#)

illustrates the surveillance data delivery in the context of surveillance capabilities and controller intervention buffer.

In practice, the RSP data delivery time is specified for a nominal continuity (DT) and for an operational continuity (OT). The time associated with the operational continuity (OT) is called overdue time, as this is associated with the time the controller takes action upon receiving an alert provided by the expiration of the ground timer. These times are associated directly with the RSP continuity requirements for the controller's surveillance capability.

a) The DT value is used in statistical analysis during post-implementation monitoring and is not monitored in real time. The DT value is known as the nominal delivery time (i.e. the time at which 95% of the surveillance reports in a data sample are delivered). Other statistical values, such as mean and average time values, may be considered in local assessments. If the system does not meet the DT value, appropriate action should be taken to identify and rectify the source(s) of performance deterioration to improve performance to an acceptable level before providing the ATM operation predicated on RSP.

b) The OT value is monitored in real time for each surveillance report by the ATC system. When the surveillance report is not received within the OT value (i.e. the report is overdue), the ATC system provides an indication to the controller for appropriate action. The OT value is associated with a continuity requirement of 0.999 (99.9%), which was determined by an operational safety assessment, in accordance with DO-264/ED-78A. In this case, the operational safety assessment concluded that under worst case conditions, a frequent occurrence of this indication to the controller (i.e. that a surveillance report is overdue) could result in a significant increase in controller workload. This is considered to be a "Class 4" hazard. The corresponding safety objective is that the occurrence of an overdue surveillance report is no greater than 10^{-3} (or 99.9% of surveillance reports are received within the OT value); and

c) The time values at 95% and at the operational continuity criterion (e.g. 99.9%) apply to the RSP data delivery and RSTP. It should be noted that only the RSP time value at the operational RSP continuity criterion (which coincides with the RSTP) has an expiration timer (OT).

For example, [Appendix C](#) contains the RSP 180 specification, including the allocated RSP surveillance data delivery time values. Compliance with the times for the RSP data delivery is shown by analysis, contracts and/or service agreements for surveillance services and post-implementation monitoring of actual surveillance data deliveries (ASP). Allocated requirements associated with ASP aid in determining initial compliance and further assessment when ASP does not meet the requirements for RSP.

Note.— Guidance on compliance means and the RSP 180 specification is contained in [Chapter 5](#) and [Appendix C](#), respectively