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PBCS MONITORING AND REPORTING GUIDANCE

NORTH ATLANTIC (NAT) REGION

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Record of Amendments

to NAT Doc 011 – PBCS MONITORING AND REPORTING GUIDANCE

Amendments to this document are approved by the North Atlantic Systems Planning Group (NAT SPG). The space below is provided to keep a record of such amendments.

The NAT SPG, at its 58th meeting, confirmed that approval of changes to this document was the responsibility of the North Atlantic Safety Oversight Group (NAT SOG) and North Atlantic Implementation Management Group (NAT IMG) (C 58/18 refers).

Date	**Amendments to the NAT PBCS MONITORING AND REPORTING GUIDANCE** containing the following changes:
August 2022	Amendments to Chapter 2 and 4 related to the removal of the guidance concerning inclusion of aircraft with insufficient data (less than 100 data points) from the monthly non-compliance reports. (C 58/18 refers)
July 2023	Amendments to Chapter 2 and 4 to offer greater clarity on who is responsible for taking further action on under-performing airframes. The flow diagram in Chapter 1 has also been deleted. (C 59/19 refers)

Chapter 1. – INTRODUCTION

1.1 Performance Based Communications and Surveillance (PBCS) monitoring programmes not only require available infrastructure to function, but also a set of interlinking policies and procedures to facilitate smooth operations between the participating organisations. Those organisations also need the competence and capability to participate in a successful monitoring program and to ensure that the data drives the appropriate actions. The transmission of data between the participating organisations and the response to the data provided are fundamental to a successful monitoring program, which should be built on coordination and cooperation between all parties. It is advisable to establish the process ahead of the implementation of performance-based operations reliant on surveillance or communications standards.

1.2 Regional monitoring systems require detailed procedures for the analysis and processing of the available data and this guidance is not intended to replace those regional processes. This guidance is proposed as a means by which a common set of parameters may be applied, either regionally or globally, to give all of those involved in the monitoring programmes a means to ensure a consistent and repeatable process for the transmission and response to PBCS under-performance data. It will also allow airspace users who fly in multiple Flight Information Regions (FIR) and regions to gain confidence that any identified under-performance or non-compliance will be managed consistently, transparently, and proportionately.

1.3 ICAO Doc. 9869 *Performance-based Communication and Surveillance Manual* offers the reader guidance on the establishment of a PBCS monitoring program, with detailed guidance in Appendix D for compilation and handling of the data to support monitoring. Significant revisions are being coordinated to provide clarification in Appendix D for Edition 3. This guidance document focuses on the reporting and filtering of under-performing airframes as well as guidance for State Oversight Authorities. For ease, the process described is divided into three phases and reliant on the positive participation of the aircraft operators in accordance with the PBCS Global Charter, version 8, 2018:

Phase 1 - ATSP: This phase covers initial monitoring and reporting by the Air Traffic Service Provider (ATSP) at a local level. The ATSP is responsible for the collection, analysis and, if possible, classification of under-performance data as well as the transmission of that data, in the agreed format, to the Regional Monitoring Agency (RMA).

Phase 2 - RMA: This phase captures the administration of the regional monitoring requirements and the mechanism to achieve global reporting. The RMA is responsible for the collection and collation of the data reported by ATSPs for transmission to, either, the States within their region of responsibility, or to other RMAs for transmission to States within their own regions of responsibility.

Phase 3 - State Oversight Authority: This phase covers the State Oversight Authority's role in the management of reports of under-performance. The State Oversight Authority is responsible for the oversight of all aircraft operators registered in their respective states and ensuring that the performance of their airframes meets the required standards.

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Chapter 2. – PHASE 1: LOCAL PBCS MONITORING AND REPORTING

2.1 Every ATSP responsible for the local monitoring program should develop and document a process to compile and analyse data measuring Actual Surveillance Performance (ASP), and Actual Communication Performance (ACP), and prepare reports with under-performing airframes monthly. ATSPs should consider using data sets that include the data from the current month and previous two months (a rolling three-month sample) with an aim to increase the number of data points for airframes that do not operate frequently. In addition, this data will be used in the construction of regional biannual PBCS performance reports that are made available at www.fans-cra.com.

2.2 The ATSP may choose to indicate where an airframe is causing them specific concerns and/or where intervention is being requested from the State Oversight Authority.

2.3 The monthly data sets should be filtered with consideration for the documented regional agreements, which should include filtering out data during periods where network outage or degradation is detected.

2.4 The ATSP will first prepare a list of all airframes observed with ASP and/or ACP performance below the 95% benchmarks for RSP180 and RCP240, respectively. The ATSP will also review the airframes with performance observed below the 99.9% benchmarks, but depending on resources available, the priority is to review the cases below the 95% benchmarks for the monthly under-performance reporting.

2.5 The airframes that have not filed the identifiers corresponding to the appropriate RCP and RSP specifications (for example, P2 in item 10 for RCP240and SUR/RSP180 in item 18 for RSP180) should be removed and handled separately from the under-performance process.

2.6 There are known statistical challenges with the size of data sets, hence it is recommended to concentrate on observed under-performance based on 100 or more data points for either ASP or ACP.

a) Where data sets available are below 100 data points, e.g. airframes that do not operate frequently, these airframes should be observed over a longer period to accurately identify performance issues (e.g. biannual PBCS performance reports that are made available at www.fans-cra.com).

b) Another known challenge that exists for most airframes is the size of data sets used to assess ACP when using a monthly reporting process. During a typical flight, most airframes will not have a large number of CPDLC (Controller–pilot data link communications) transactions with ATC. Except in the case of problems related to the regular occurrence of abnormally long Pilot Operational Response Times (PORT), it is expected that the CPDLC engineered system will not underperform without a corresponding underperformance in the ADS-C (Automatic dependent surveillance – contract) engineered systems.

2.7 When reporting under-performance, an agreed standard template should be used. The template should include:

a) Important identification details, such as where the under-performance was observed, the airframe type and registration number and presumed State of Operator.

b) The number of data points used to measure the ASP and ACP and the corresponding performance value at the 95% benchmarks for the appropriate Required Surveillance Performance (RSP) and Required Communication Performance (RCP), respectively.

c) Where possible, an “issue code” that provides details of the root cause and recommendation for corrective action (see 2.11 for details).

2.8 For ASP, filter out all airframes with fewer than 100 data points. Achieving a similar number of data points for ACP is problematic. It is expected that communications will not underperform without a corresponding underperformance in surveillance. Conclusions cannot, typically, be drawn from airframes offering a small set of data related to communications performance but operating within tolerance for ASP.

2.9 For the remaining data filter out all airframes that are achieving 95% in ASP or ACP for example, **95% RCP240 Benchmark**: percentage of CPDLC transactions that have ACP less than 180 seconds or **95% RSP180 Benchmark**: percentage of ADS-C messages that have ASP less than 90 seconds.

2.10 Following the filtering process, the remaining data is made up from airframes that are identified and reportable as under-performing to the agency responsible for the collation or analysis of the regional data. The list of under-performing airframes requires, if possible, classification to identify the root cause and necessary, subsequent action.

2.11 The most observed causes for poor performance are detailed in NAT OPS Bulletin 2019_003 as revised: *Data Link Performance Improvement Options*. The "issue codes" provided in the under-performance reports map to the following common causes:

a) **Delayed reports around VHF/SAT transitions** - This note is used when ADS-C or CPDLC messages are observed with delays when there is mixed media usage in the sequence of messages before, at or after the delayed messages (ex.: VHF-VHF-SAT-VHF-SAT).

b) **Delayed reports via HF media** - This note is used when delayed ADS-C or CPDLC reports are observed to be delivered via HF data link (HFDL), or near reports delivered via HFDL. Check whether this appears to be a SATCOM failure with one flight, or a period during the flight, or more continuous, intermittent use of HFDL. Potential issue with airframe media priority settings.

c) **Delayed reports due to Inmarsat avionics, Inmarsat satellite to satellite transition or satellite network problems** - This note is used when ADS-C or CPDLC messages are observed with delays and it is noticed that there is a switch sequence between different or same Inmarsat satellite paths (Ex.: XXF/XXH/XXF/XXH). One known area where this occurs in the NAT is at 30W longitude. If multiple airframes are observed with this same issue around the same time, there may be a network-related issue and the ATSP may want to file a report to the FANS-CRA/DLMA.

d) **Delayed reports due to Iridium avionics (airframe) or satellite network problems** - This note is used when ADS-C or CPDLC messages are observed with delays via Iridium satellite paths (IG1, IGW1). If multiple airframes are observed with this same issue around the same time, there may be a network-related issue and the ATSP may elect to file a report to the FANS-CRA/DLMA.

e) **Reported on only VHF and/or HF** - This note is used when delayed ADS-C reports or CPDLC messages are observed via VHF and/or HF only (no SATCOM). This might indicate that the SATCOM unit is defective or became unavailable during flight. Check if this issue is observed during one flight or part of one flight only, or whether it is an ongoing problem. If the problem is not observed on subsequent flights, the issue may have been addressed.

f) **Poor ACP due to high PORT** - This note is used when it's found that the delayed CPDLC transactions are caused by long Pilot Operational Response Time (PORT).

g) **Airframe data link connection problems detected** - This note is used when it can be identified that delays happened during periods when disconnections and reconnections have been performed. Check whether this appears to be a problem with one flight or a period during

one flight, or whether it is an ongoing problem. If the problem is not observed on later flights, the issue may have been addressed.

h) **Delays related to a specific VHF station** - This note is used when the delayed ADS-C reports and CPDLC messages are observed via a specific VHF ground station. If multiple airframes are observed with the same issue, around the same time, there may be a network issue and the ATSP should file a report to the FANS-CRA/DLMA as a VHF station issue.

i) **FMS time before ATC uplink time** - Clock setting not synchronized with GPS - This note is used when it's found that the FMS response time is earlier than the ATC uplink time. According to airframe manufacturers this happens when the aircraft clock is set manually and is not being synchronized with a GPS source.

2.12 Each month the standard PBCS ATSP under-performance Report form should be completed for each airframe determined to be under-performing, ordered by operator and submitted to the agency responsible for gathering and collating the regional data.

2.13 In addition to the reporting described above, the ATSP responsible for the local monitoring program may choose to take additional courses of action as described below, to follow up on under-performance.

a) Where an under-performance report can be attributed to a known issue and is not causing operational impact, the ATSP may choose to continue to monitor the airframe.

b) Where the ATSP has established a point of contact from the airframe operator either through their own list of contacts or through a regional contact list, the ATSP may contact the operator directly to report and explore the identified problem.

c) Exceptionally, the ATSP may choose to report the problem to the Data Link Monitoring Agency (DLMA). In these circumstances, it is likely that larger volumes of data may be required to support the investigation to identify the cause.

d) Following extended periods of unexplained under-performance, or where an operator chooses not to engage, the ATSP may choose to escalate and highlight the under-performance directly with their own state, or the state of the operator.

2.14 Whichever action the ATSP determines, that airframe should still be included within the report submitted to the agency responsible for regional monitoring.

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Chapter 3. – PHASE 2: REGIONAL MONITORING AGENCIES (RMA) AND REPORTING

3.1 The agency assigned the task of facilitating the transmission of the under-performance reports shall routinely be the RMA responsible for the ICAO region where the under-performance has been observed. The RMA will have established a nominated email address that can be used for this purpose.

3.2 It is not a requirement for the RMA to also administer the regional monitoring program, however, Planning and Implementation Regional Groups (PIRG) may choose to enlist the help of sub-groups within their organisational structure to carry out the monitoring function at a regional level and include the task in their respective work programs.

3.3 The RMA should establish agreements with ATSPs within the ICAO region they have responsibly for in order to detail the practical aspects of data collation and transmission including timescales

3.4 RMAs responsible for the receipt and collation of the supplied performance data will ensure that either the State of Operator or State of Registry, as applicable, is assigned to each reported airframe.

3.5 Agreed processes should be in place between RMAs to facilitate the development of best practices and allow for onward transmission of the under-performance data to other RMA or State Oversight Authorities as applicable.

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Chapter 4. – PHASE 3: ACTIONS AND GUIDANCE FOR STATE OVERSIGHT AUTHORITIES

4.1 State oversight authorities should designate a point of contact for any required follow up action, make those contact details available to RMAs and create an email inbox for the purposes of receiving and processing the PBCS under-performance data received from the RMA.

4.2 The State Oversight Authorities should maintain a list of contacts from the operators registered in their respective states. The contacts should have specific responsibility for PBCS operations.

4.3 The State Oversight Authority should establish a method for collating information on airframes that operate and underperform in multiple FIRs and regions to enable them to have a more complete picture of each aircraft operator's overall PBCS performance.

4.4 On receiving an under-performance report, the State Authority should ensure that the operator is approved to file PBCS identifiers for the subject airframe. If no approval has been granted, then the state should require that the operator does not file PBCS identifiers in their flight plan.

4.5 Having established that the operator identified within a non-performance report is approved to file PBCS identifiers, the oversight authority has a variety of proportionate actions available to them depending on the scenario and in line with the principals of risk-based oversight.

4.5.1 When an under-performance report is received on an airframe for the first time in recent reporting periods, the State Authority may choose to monitor (i.e., wait for subsequent reports to be received), and take no specific action. Even when 100 or more data points are available, unless the magnitude of underperformance is substantial, more than one monitoring period is essential to ensure the statistical results have detected a true performance issue. (Some ATSPs may already include a process for monitoring to confirm underperformance issues, and where available, further supporting information may be included in their reports.) An example of why monitoring would be the appropriate course of action is when an airframe has a SATCOM problem during one flight but is performing well on multiple other flights in a monitoring period. While the performance of that one flight with an issue could impact the performance calculated for the period, it would not indicate a problem requiring corrective action, unless the same problem was observed in subsequent monitoring periods.

4.5.2 It is possible that issues like the one described in the example above may persist for multiple monitoring periods due to the nature of the rolling 3-month data sample. Therefore, when a 2nd and possibly 3rd report of underperformance is received it may be practical to ask the aircraft operator to request the most recent data available from the reporting ATSPs to check if this is the case or if a true problem is persisting before deeming an airframe to be non-compliant. If no further under-performance reports are received after the first 1-3 reports, then no further action may be necessary by the State Authority and the active monitoring of that airframe can cease.

4.5.3 If under-performance reports continue to be received from one or more ATSPs on the airframe, the State Authority may contact the aircraft operator requesting that they start an investigation into the PBCS performance of the aircraft. Initially the State Oversight Authority may check for performance results of the aircraft in previous monitoring periods and request recent performance data from all relevant ATSPs.

4.5.4 If the problem continues to persist, the State Authority may choose to engage the operator and the DLMA to identify the underlying cause. If the problem only appears in one ATSP airspace, the problem may be related to a localized situation in that airspace (e.g. media transition issues). If the problem appears in multiple ATSP airspaces, there may be a technical failure on the aircraft.

4.6 For persisting problems, the State Oversight Authority should follow the following guidance in close coordination with the aircraft operator and the DLMA:

4.6.1 If the root cause of the persistent under-performance has not been identified in a reasonable time period following notification to the operator, the state should **notify** the operator not to file PBCS identifiers in their flight plan until identification of the root cause and completion of a satisfactory corrective action as determined by the state Oversight Authority. The State of the Operator or the State of Registry may allow the aircraft operator to continue to use CPDLC and ADS-C.

4.6.2 For airframes where the root cause of persistent under-performance has been identified and suitable recommendations made, the State Oversight Authority should continue to monitor the airframe until it is observed that corrective action has been taken by the operator, and the performance is meeting the requirements as determined by the State Oversight Authority. The State Oversight Authority should notify the operator that PBCS identifiers cannot be filed for the airframe in their flight plan until the problem is fixed, however, the State of the Operator or the State of Registry may allow the aircraft operator to continue to use CPDLC and ADS-C.

4.6.3 If the corrective actions do not improve the performance to the required level following 12 months of substandard performance, the State Oversight Authorities may choose to revoke the approval for that airframe, and the operator will need to seek reapproval for that airframe to be able to file PBCS identifiers in their flight plan again.

4.7 Oversight Authorities recognise the benefits of working in partnership with industry to identify and rectify PBCS compliance issues. This facilitates a cooperative working arrangement between the operator and the State Oversight Authority. Enforcement should be an action of last resort.

4.8 In addition, states should make use of regional PBCS monitoring reports readily available on www.fans-cra.com. While the monthly under-performance reporting focuses on airframes that have filed P2/RSP180 and have been observed with at least 100 or more data points for either ASP or ACP, the reports on the FANS-CRA website contain results for all aircraft observed to be using data link regardless of filing status and number of messages. This allows for every aircraft using data link to be monitored in every airspace where they are operating and can help to provide the State Oversight Authorities with a more holistic view of each aircraft's performance.

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Chapter 5. – CONCLUSION

5.1 Regional monitoring systems will devise detailed procedures for the analysis and processing of the available data and this guidance is not intended to replace or embellish those regional processes. This guidance is proposed as a means by which a common set of parameters may be applied either regionally or globally, to give all of those involved in the monitoring programmes a means to ensure a consistent and repeatable process for the transmission and response to PBCS under-performance data. It will also allow airspace users who fly in multiple FIRs and regions to gain confidence that any identified under-performance will be managed consistently, transparently, and proportionately.

5.2 The success of a monitoring program, whether it be local, regional or global, relies on confidence that those contributing to it are applying a similar set of rules and triggers for action. This guidance has sought to document or formalise good practices in existence today, which make best use of experiences and positive relationships with all stakeholders. Actions by all of those involved in the process should be proportionate.

— END —