



International Civil Aviation Organization

Middle East Regional Monitoring Agency Board

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Agenda Item 4: RVS M Monitoring and related Technical Issues

PERFORMANCE BASED COMMUNICATION AND SURVEILLANCE (PBCS)

(Presented by MIDRMA)

SUMMARY

The standards and procedures for an air traffic management (ATM) operation that is predicated on communication and surveillance capabilities, such as the application of a reduced separation minimum, should refer to the appropriate required communication performance (RCP)/required surveillance performance (RSP) specification. The RCP/RSP specification provide the operational performance criteria and associated allocations to the subsystems for the communication and surveillance capabilities supporting the ATM operation.

Action by the meeting is at paragraph 3.

1. INTRODUCTION

1.1 The Performance-Based Communication and Surveillance (PBCS) concept provides objective operational criteria to evaluate different and emerging communication and surveillance technologies, intended for evolving air traffic management (ATM) operations. Once these criteria have been established and accepted, implementation of a specific ATM operation including its technical and human performance may be evaluated against these operational criteria to assess their viability. The PBCS concept and guidelines are applicable to any air traffic services (ATS) system change that is predicated on communication and/or surveillance performance.

1.2 The PBCS concept is aligned with that of performance-based navigation (PBN). While the PBN concept applies required navigation performance (RNP) and area navigation (RNAV) specifications to the navigation element, the PBCS concept applies required communication performance (RCP) and required surveillance performance (RSP) specifications to communication and surveillance elements, respectively. Each RCP/RSP specification includes allocated criteria among the components of the communication and surveillance systems involved.

1.3 There are some differences between the PBCS concept and PBN concept:

- a) the PBCS concept applies RCP and RSP specifications, which allocate criteria to ATS provision, including communication services, aircraft capability, and the aircraft operator; whereas the PBN concept applies RNP/RNAV specifications, which allocate criteria only to the aircraft capability and the aircraft operator; and

- b) the PBCS concept includes post-implementation monitoring programmes, on a local and regional basis, with global exchange of information; whereas the PBN concept includes real time monitoring and alerting functionality in the aircraft capability

2. DISCUSSION

2.1 The PBCS concept provides a framework to apply RCP and RSP specifications to ensure acceptable levels of communication and surveillance capabilities and performance of an operational system. These specifications are applied using the following methods:

- a) prescription (in accordance with Annex 11, PANS-ATM, Regional Supplementary Procedures (Doc7030) and/or the Aeronautical Information Publication (AIP) (or equivalent publication)) of an RCP specification for a communication capability and/or an RSP specification for a surveillance capability, either of which is required for air traffic services (ATS) provision in a particular airspace;
- b) operational approval (in accordance with Annex 6) to file the flight plan RCP/RSP capabilities, including aircraft equipage where RCP and/or RSP specifications are prescribed for the communications and/or surveillance capabilities supporting the ATS provision; and
- c) local and regional monitoring programmes to assess actual communication and surveillance performance against RCP and RSP specifications, thereby determining corrective action, as applicable, for the appropriate entity.

2.2 The PBCS concept applies to communication and surveillance capability performance. It therefore affects the provision of air traffic services and the aircraft operator's use of the services, including associated aircraft equipage. The PBCS concept is also intended to characterize the communication and surveillance capability, as well as its performance, through RCP and RSP specifications and ensure that systems meet these specifications.

2.3 An RCP/RSP specification provides values for operational parameters that, when applied within a PBCS framework, ensures confidence that the operational communication and surveillance capabilities will be conducted in an acceptably safe manner. These operational parameters include RCP transaction time, RSP surveillance data delivery time, RCP/RSP continuity, RCP/RSP availability and RCP/RSP integrity. An RCP/RSP specification includes functional, safety and performance requirements that are associated with each of the operational parameters.

2.4 ICAO identifies an RCP/RSP specification, as appropriate, to develop Standards and procedures for new ATM operations. States apply an RCP/RSP specification in support of applicable ATM operations. As such, the application of an RCP/RSP specification also requires safety oversight of air traffic services, operational approval, aircraft system design approval and post-implementation monitoring.

2.5 States should prescribe an RCP and/or RSP specification based on the ATM operations that an ATS provider chooses to implement within that airspace. In cases where a safety-related change, including the implementation of a reduced separation minimum or a new procedure, is predicated on communication and surveillance performance, RCP and RSP specifications are prescribed. The approval of this change demonstrates that the criteria defined by the RCP and RSP specifications have been met.

2.6 When ATM operations within an airspace are predicated on communication and/or surveillance performance, the State prescribes RCP and RSP specifications for an airspace either locally or on the basis of a bilateral, multilateral or regional air navigation agreement, if applicable.

2.7 To perform certain ATM operations, States may require a combination of voice/data communication and surveillance capabilities applicable to the prescribed RCP and RSP specifications. Data communication and surveillance capabilities allow for the integration of operational capabilities in order to exchange information between an ATS unit's system and an aircraft system. Data communication and surveillance capabilities can also provide functional integration (e.g. loading CPDLC messages on the flight deck and ATS conformance monitoring using ADS-C reports) with the aircraft's system or an ATS unit's system.

2.8 The application of a given separation minimum within a volume of airspace may require that a single RCP and/or single RSP be specified. However, the State can prescribe multiple RCP and RSP specifications within a given airspace. For example, the State may prescribe one RCP specification, applicable to the normal means of communication appropriate for the controller's intervention capability to apply the separation minimum, and prescribe another RCP specification to a new communication technology that supports an alternative means of communication when the normal means of communication fails.

2.9 The State can prescribe different RCP and RSP specifications for different airspace depending on ATM operations. For example, an RCP specification applicable in terminal area airspace may differ from the RCP specification for en-route or oceanic airspace. In cases where ATM operations are not predicated on communication or surveillance performance, it can be beneficial for the State to apply RCP and RSP specifications, if only to provide a basis for post-implementation monitoring programmes (i.e. the specifications are not prescribed).

2.10 When the State prescribes an RCP/RSP specification for communication or surveillance capability, the ANSP and the aircraft operator should show that the provision of air traffic services and use of the service comply with the specifications to achieve and maintain the required communication and surveillance performance. Compliance with an RCP/RSP specification may be achieved in various ways: the State provides policies and guidance on acceptable means through which the ANSP and the aircraft operator show compliance with RCP and RSP specifications, both initially and in continued operations, to support approvals.

2.11 For continued operations, the ANSP establishes a local monitoring programme to collect and analyze operational data, ensuring that the infrastructure and the aircraft operators within its airspace continue to meet the appropriate RCP and RSP specifications. A regional monitoring programme may also be established to analyze performance at the regional level. Aircraft operators, CSPs, SSPs and other stakeholders participate in the ANSP monitoring programmes in accordance with operational approvals or service agreements.

2.12 The scope of local and regional monitoring programmes includes analyses on an operator basis, taking into account individual aircraft, aircraft types/systems and various infrastructure and technological dependencies (e.g. subnetwork types, subnetwork routing policies, frequencies), all of which are factors in evaluating communication or surveillance performance. When a monitoring programme detects non-compliance, it is reported to the appropriate parties for corrective action.

2.13 **Required Communication Performance (RCP):**

2.13.1 An RCP specification is identified by a designator (e.g. RCP 240) to simplify the RCP designator naming convention and to make the RCP transaction time readily apparent to airspace planners, aircraft manufacturers and operators. The designator represents the maximum communication transaction time after which the initiator should revert to an alternative procedure (or

RCP expiration time). Currently, the number of specifications is limited to two (RCP 240 and RCP 400) in airspace where procedural separation is applied. Other RCP specifications may be added, pending the introduction of new ATM operations or the use of new communication technologies. RCP 240 may be applied to maintain the performance for normal means of communication, which supports controller intervention capability in procedurally controlled airspace, where the separation minimum applied is predicated on communication performance.

2.13.2 RCP 400 may be applied to maintain the performance for emerging technology (e.g. satellite voice) used to provide normal means of communication supporting controller intervention capability in procedurally controlled airspace, where the separation minimum applied is based on position reporting at compulsory reporting points. RCP 400 may also be applied to maintain the performance required for emerging technologies used to provide alternative means of communication that may be required in combination with the normal means of communication, to which RCP 240 is applied.

2.14 **Required Surveillance Performance (RSP):**

2.14.1 An RSP specification is identified by a designator (e.g. RSP 180) in order to simplify the designator naming convention and to make the required surveillance data delivery time readily apparent to airspace planners, aircraft manufacturers and operators. The designator represents the value for the surveillance data delivery time when the surveillance data delivery is considered overdue. The operational surveillance data transit parameters apply to the actual performance of the surveillance data delivery from when the aircraft is at the position, to when the ATS unit/controller receives the surveillance data (e.g. ADS-C report delivery). The actual performance is associated with the surveillance data delivery from the time associated with the aircraft's position provided with the data, to the time when the ATS unit receives the data (referred to as actual (operational) surveillance performance (ASP)).

2.14.2 Currently, the number of specifications is limited to two (RSP 180 and RSP 400) in airspace where procedural separation applies. Other RSP specifications may be added, pending the introduction of new ATM operations or the use of new surveillance technologies.

2.14.3 RSP 180 may be applied to maintain the performance for normal means of surveillance, which supports controller intervention capability in procedurally controlled airspace, where separation minimum applied is predicated on surveillance performance. RSP 400 may be applied to maintain the performance for emerging technology (e.g. satellite voice) used to provide normal means of surveillance supporting controller intervention capability in procedurally controlled airspace, where the separation minimum being applied is based on position reporting at compulsory reporting points. RSP 400 might also be applied to maintain the performance required for emerging technologies used to provide alternative means of surveillance that may be required in combination with the normal means of surveillance, to which RSP 180 is applied.

3. **ACTION BY THE MEETING**

3.1 The meeting is invited to:

- a) note and discuss the contents of this working paper; and
- b) agree how to proceed with the implementation of PBCS, as required.