

Doc 9869
AN/462



Manual on Required Communication Performance (RCP)

**Approved by the Secretary General
and published under his authority**

First Edition — 2008

International Civil Aviation Organization

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Published in separate Arabic, Chinese, English, French, Russian and Spanish editions by the
INTERNATIONAL CIVIL AVIATION ORGANIZATION
999 University Street, Montréal, Quebec, Canada H3C 5H7

For ordering information and for a complete listing of sales agents
and booksellers, please go to the ICAO website at www.icao.int

First edition 2008

ICAO Doc 9869, *Manual on Required Communication Performance (RCP)*

Order Number: Doc9869

ISBN 978-92-9231-127-8

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AMENDMENTS

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RECORD OF AMENDMENTS AND CORRIGENDA

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Chapter 1

INTRODUCTION

1.1 BACKGROUND

1.1.1 In 1983, the Council of the International Civil Aviation Organization (ICAO) established the Special Committee on Future Air Navigation Systems (FANS) which was tasked with studying, identifying and assessing new technologies, including the use of satellites, and making recommendations for the future development of air navigation for civil aviation. The FANS Committee determined that it would be necessary to develop new systems that would overcome the limitations of conventional systems and allow Air Traffic Management (ATM) to develop on a global scale.

1.1.2 In September 1991, 450 representatives from 85 States and 13 international organizations gathered at ICAO Headquarters in Montréal, Canada, for the Tenth Air Navigation Conference to consider and endorse the concept for a future air navigation system as developed by the FANS Committee that would meet the needs of the civil aviation community well into the next century. The FANS concept, which came to be known as the communications, navigation, surveillance/air traffic management (CNS/ATM) systems concept, involves a complex and interrelated set of technologies, dependent largely on satellites.

1.1.3 The endorsement of the CNS/ATM systems concept reached at the Tenth Air Navigation Conference signalled the beginning of a new era for international civil aviation and paved the way for the many activities related to the planning and implementation of new systems around the world.

1.1.4 The fourth meeting of the Aeronautical Mobile Communications Panel (AMCP/4) (Montréal, April 1996) recognized the absence of objective criteria to evaluate communication performance requirements. The objective criteria needed were a set of values for parameters which would be based on the operational requirements for communication systems in the various phases of flight. The meeting agreed that there was an urgent need to assess the existing technical options of communication systems against such a set of parameter values. The term RCP type is used to denote a set of values for these parameters.

1.1.5 When reviewing the report of AMCP/4 in 1997, the Air Navigation Commission tasked the Automatic Dependent Surveillance Panel (renamed in 2000 as the Operational Data Link Panel — OPLINKP) to develop the operational concept of Required Communication Performance (RCP).

1.1.6 In 2001, the OPLINKP completed its document entitled *Concept of Required Communication Performance*, and the Air Navigation Commission (ANC) solicited comments thereon from ICAO Contracting States. The comments received indicated broad support for the RCP concept. In light of the comments received, in 2002 the ANC amended the OPLINKP work programme to develop a Manual on Required Communications Performance (RCP) and, as necessary, Standards and Recommended Practices (SARPS) and procedures relating to the use of RCP in the provision of air traffic services.

1.1.7 In 2003, the Eleventh Air Navigation Conference endorsed recommendations to:

- a) continue the development of SARPs, procedures and guidance material on RCP; and
- b) investigate areas for further work including determining the relationship of the RCP concept to separation studies and interoperability, standardizing RCP types and allocations, ensuring the

adequacy of air traffic service (ATS) functions and procedures for new CNS/ATM environments, as well as establishing requirements for safety performance monitoring.

1.2 PURPOSE OF MANUAL

The purpose of this guidance material is to explain the concept of RCP, identify RCP requirements applicable to the provision and use of air traffic services, and provide a basis for the application of RCP in a specified airspace.

1.3 EXPLANATION OF TERMS

The development and explanation of RCP rely on the understanding of terms which are included in Appendix A.

Chapter 2

OVERVIEW OF RCP

2.1 GENERAL

2.1.1 The continuing growth of aviation places increasing demands on airspace capacity and emphasizes the need for the optimum utilization of the available airspace. These factors, allied with the requirement for operational efficiency within acceptable levels of safety, have resulted in the need for a performance-based airspace system.

2.1.2 The transition to a performance-based airspace system is a critical aspect of the evolution to a safe and efficient global air traffic management (ATM) environment. As ATM evolves, it will be necessary to ensure acceptable operational performance, taking into account changing technologies.

2.1.3 ATM is the aggregation of the airborne functions and ground-based functions (air traffic services, airspace management and air traffic flow management) required to ensure the safe and efficient movement of aircraft during all phases of operations.

2.1.4 ATM is achieved through the collaborative integration of humans, information, technology, facilities and services, and is supported by communication, navigation and surveillance capabilities that are dependent on each other. For instance, the communication and surveillance capabilities and performance required to meet a given operational capability, which in this document is referred to as an ATM function, will depend on the capabilities and performance of the available navigation and other air traffic management functions, including those on the aircraft. Therefore, to determine the capability and performance requirements of the ATM system, it will be necessary to consider the system in its overall context, taking into account all its interdependencies.

2.1.5 To meet the demands on airspace capacity and operational efficiency, the operational communication capability is playing an increasingly essential role in air traffic management using a mixture of data and voice communication. For example, data link can provide for the integration of air traffic management functional capabilities on the aircraft and at the ATS units, and for more direct controller-pilot communications enabling user-preferred and dynamic re-routing and intervention capabilities in reduced separation environments where alternative communications are more cumbersome.

2.1.6 The RCP concept provides a means to ensure the acceptable performance of communications within a complete ATM system.

2.2 THE RCP CONCEPT

2.2.1 The RCP concept characterizes the performance required of communication capabilities that support ATM functions without reference to any specific technology and is open to new technology. This approach is essential to the evolution of operational concepts that use emerging technologies. An ATM function is an individual operational component of air traffic services. Examples of ATM functions include the application of separation between aircraft, the re-routing of aircraft, and the provision of flight information.

2.2.2 The RCP concept assesses operational communication transactions in the context of an ATM function, taking into account human interactions, procedures and environmental characteristics.

2.2.2.1 The contribution of the human can be significant to RCP. Communication is the accurate transfer between sender and receiver of information which can be readily understood by both.

2.2.2.2 An operational communication transaction is the process a human uses to send an instruction, a clearance, flight information, and/or a request, and is completed when that human is confident that the transaction is complete.

2.2.3 The RCP concept is based upon "operationally significant" benchmarks which when attained assure confidence that the operational communications supporting the ATM functions will be conducted in an acceptably safe manner.

2.2.4 The basis for the development of the RCP concept was the need for objective operational criteria, in the form of an RCP type, to evaluate a variety of communication technologies. Once these criteria have been set and accepted, a specific implementation of an ATM function including its technical and human performance may have its viability assessed against acceptable operational criteria.

2.2.4.1 An RCP type is a label (e.g. RCP 240) that defines a performance standard for operational communication transactions. Each RCP type denotes values for communication transaction time, continuity, availability and integrity applicable to the most stringent operational communication transaction supporting an ATM function.

2.2.4.2 The RCP concept is not based on technology; however, it is not intended to promote an unrestricted number of alternative communication technologies for one ATM function. Whilst RCP types will be prescribed on the basis of regional consultation within the ATM community, so too will be the aircraft equipage requirements for communications. Interoperability and cost considerations will be major items to contend with during such consultations.

2.2.5 Several factors may affect States' decisions as to when an RCP type will be prescribed. These factors are based on the ATM functions that an air traffic services (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 performance, an RCP type should be prescribed. The approval of this change should include showing that the requirements and assumptions defined by the RCP type have been met.

2.2.6 It is anticipated that most aircraft, operating in airspace for which RCP has been prescribed by States or on the basis of a regional air navigation agreement, will carry a mixture of voice and data communication equipment. The carriage of voice and data communication equipment may even be required in some regions or States to perform certain ATM functions. In order to receive approval to operate in such environments, the combined communications equipment should be required to provide at least the capabilities and features (or their equivalents) applicable to the appropriate RCP type.

2.2.7 Data communication capabilities allow for the integration of air traffic management functional capabilities to exchange information between air traffic management facilities and aircraft. For some ATM functions, to comply with its performance requirements, it may be necessary to introduce data communication capabilities that allow for automatically loading flight and navigation information data into the aircraft's flight management system or an ATS provider's flight data processor.

2.2.8 Additionally, data communication capabilities that meet the prescribed RCP type can provide the capability to communicate clearances and instructions without the need for a voice read-back.

2.2.9 The application of data communication capabilities in various parts of the world has already been shown to provide a number of advantages over voice communication. Among these advantages are:

- a) reduced separations;

- b) routine in-flight re-routes;
- c) direct controller-pilot communications;
- d) reduced frequency congestion and a capping of the need for additional spectrum; and
- e) automatic exchange of flight information between aircraft and the ATS unit.

2.2.10 There is a need to ensure consistent definition and use of communication capabilities to apply the RCP concept on a global basis to achieve the benefits that are advantageous to States, ATS providers and users.

2.2.11 The RCP concept applies to the performance of the communication capabilities required for an ATM function and therefore affects the provision of air traffic service and the operator's use, including aircraft equipage. The RCP concept is intended to characterize the communication capability and its performance through a statement of the communication performance (RCP type) to be achieved in order to perform the ATM function.

2.2.12 The RCP concept seeks to manage the performance of communications supporting evolving ATM concepts and emerging technologies. This is achieved by:

- determining an RCP type for the communication capabilities supporting an ATM function; then
- prescribing the RCP type(s) related to the communications system(s) supporting the ATM functions within that airspace; and
- complying with the prescribed RCP type(s) through analysis, operational assessments and performance monitoring of the communication systems.

2.3 DETERMINING AN RCP TYPE

2.3.1 To enable ATM functions within a performance-based airspace, it will be necessary to characterize the performance required for the applicable communication (C), navigation (N) and/or surveillance (S) elements. RCP will be used in conjunction with RNP and other performance-based measures. Chapter 3 provides guidance for determining an RCP type for an ATM function.

2.3.2 For a particular ATM function, an increase or decrease in the required performance for any single element (i.e. C or N or S) may allow a trade-off in required performance of some or all of the other elements, provided the target level of safety is maintained.

2.3.3 It is important that the States globally harmonize RCP type for the same or similar ATM functions to reduce training requirements and errors resulting from confusion in operations across airspace boundaries.

2.3.4 The *Manual on Airspace Planning Methodology for the Determination of Separation Minima* (Doc 9689), outlines considerations for assessing the risk of collision when determining separation minima within an acceptable target level of safety. The risk of collision is a function of navigation performance, route configuration, traffic density, surveillance, communication and air traffic control. Determination of separation minima allows for trade-offs among these considerations to ensure that the target level of safety is achieved. An RCP type can be used to specify the performance requirements for the communication capability to implement separation minima.

2.4 PRESCRIBING AN RCP TYPE

2.4.1 After an RCP type has been determined, it may be prescribed for an airspace based on the ATM functions that an airspace planner or authority chooses to implement within that airspace. Potential airspace to which RCP may be applied includes:

- a) a defined airspace, such as North Atlantic minimum navigation performance specifications (MNPS) airspace;
- b) a fixed ATS route, such as between Sydney, Australia, and Auckland, New Zealand;
- c) random track operations, such as between Hawaii and Japan;
- d) a volume of airspace, such as a block altitude on a specified route.

2.4.2 When an RCP type is prescribed based on the intended ATM function provided in a given airspace, the RCP type(s) will indicate the requirements for qualification and approval of the procedures, aircraft equipage and airspace infrastructure.

2.4.3 Ideally, airspace should have a single RCP type; but multiple RCP types may be prescribed within a given airspace. An example would be to prescribe one RCP type appropriate for the controller's ability to intervene in a conflict situation given the separation minima and another RCP type to perform a specific procedure, such as an in-trail climb or dynamic re-route, within that airspace.

2.4.4 Different RCP types may be prescribed for different airspace depending on the ATM functions. As an example, an RCP type in terminal area airspace may be different from the RCP type for en-route or oceanic airspace. Chapter 4 provides guidance for prescribing an RCP type for an airspace.

2.5 COMPLYING WITH AN RCP TYPE

State requirements

2.5.1 Since RCP is a statement of operational communication performance, there is an obligation on the part of the State to provide the necessary equipment, procedures and training to achieve and maintain the required communication performance.

2.5.2 The State should ensure that changes to services that rely on communication performance within a given airspace maintain safe separation.

2.5.3 The State should ensure that aircraft operators intending to operate in airspace where an RCP type is prescribed are qualified and approved for RCP operations.

2.5.4 It should be noted that compliance with an RCP type can be achieved in many different ways, and the State may provide guidance on acceptable means through which the ATS provider and the aircraft operator can show how RCP is achieved.

Aircraft operator requirements

2.5.5 The concept of RCP is based on the expected communication performance of all relevant communication capabilities used within an airspace. This in turn places demands on manufacturers of aircraft and aircraft operators to

achieve the communication performance required for a specific RCP type. The RCP concept may also require different aircraft functional capabilities for different RCP types. As an example, one RCP type may be related to functional requirements for automatic loading of flight data into the aircraft's flight management system, whereas another RCP type may only relate to ATC communications.

2.5.6 Since RCP is a statement of operational communication performance, there is an obligation on the part of the operator to provide the necessary procedures and training within its operations and ensure that aircraft equipment and related communication services comply with the required communication performance.

Monitoring communication performance

2.5.7 Monitoring provides objective operational data to determine that the ATM system continues to meet the RCP type. Monitoring includes data collection on a routine basis and as problems or abnormalities arise.

2.5.8 Monitoring is performed by organizations in control of or responsible for a part of the ATM system in operation, and a data collection point resides within that part. Chapter 5 provides guidance for complying with an RCP type.

2.6 RCP APPLICATION

A checklist to aid in determining, prescribing and complying with an RCP type can be found at Appendix B.
