

ELEVENTH AIR NAVIGATION CONFERENCE

Montreal, 22 September to 3 October 2003

Agenda Item 3: Air traffic management (ATM) performance targets for safety, efficiency and regularity and the role of required total system performance (RTSP) in this respect

3.1 Performance targets for ATM

:

REQUIRED COMMUNICATION PERFORMANCE (RCP)

(Presented by the United States)

SUMMARY

The transition to a performance-based airspace system is a critical aspect of evolving to a safe and efficient communications, navigation, and surveillance/air traffic management (CNS/ATM) environment. The operational communication component and its associated performance as established by required communication performance (RCP) are essential to creating a global seamless air traffic management system that uses a mixture of voice and data communication capabilities and technologies.

Action by the conference is in paragraph 5.

1. INTRODUCTION

1.1 The transition to a performance-based airspace system is a critical aspect of evolving to a safe and efficient global communications, navigation, and surveillance/air traffic management (CNS/ATM) environment. As CNS/ATM technologies evolve, it will be necessary to ensure acceptable operational performance, taking into account the changing technologies and a changing environment. The operational concept of required communication performance (RCP), developed by the Operational Data Link Panel (OPLINKP), provides a basis to develop the means to ensure acceptable operational performance in environments with these characteristics. The communication component and its associated performance as established by RCP are essential to creating a global seamless air traffic management system that is evolving using a mixture of data and voice communication technologies.

1.2 In the area of communications, there are already implementations that use CNS/ATM technologies. From the experience gained from these implementations, there has been significant evidence of differing requirements among Contracting States and regions to address issues with communication performance. This has resulted in additional burden on aircraft manufacturers, modifiers, operators, and communication and air traffic service providers. In light of the urgent need for global harmonization of communication performance measures, it is recommended that Contracting States give high priority to progress the work, within ICAO, enabling RCP implementation.

2. DISCUSSION

2.1 Work on RCP is currently in progress within ICAO and industry groups. At ICAO, OPLINKP is developing Standards and Recommended Practices (SARPs) and a Manual on RCP, based on its operational concept of RCP document. The operational concept defines RCP as a statement of the performance requirements for operational communication in support of specific air traffic service (ATS) functions. It defines ATS function as an individual operational component of air traffic services. Examples of ATS functions include the application of separation minima between aircraft, re-routing of aircraft and provision of flight information.

2.2 Outside of ICAO, industry groups (RTCA SC-189 and EUROCAE WG-53) are working cooperatively to develop guidelines and requirements, consistent with the RCP concept, to support the approvals for the implementation of communication capabilities used for the provision and use of air traffic services. The work of SC-189/WG-53 includes the development of guidance material on the allocation of requirements related to RCP types. This guidance material is contained in RTCA DO-264/EUROCAE ED-78A, guidelines for approval of the provision and use of air traffic services supported by data communications. Further work to update this material is in progress. In addition, SC-189/WG-53 is developing requirements that include values for operational performance parameters, consistent with the parameters for RCP types, together with allocations for aircraft equipage, service provision, and procedures.

3. KEY CHARACTERISTICS OF THE RCP CONCEPT

3.1 A number of key characteristics of the RCP concept are reinforced in the following paragraphs. These characteristics are consistent with the guiding principles of the ATM operational concept document developed by the Air Traffic Management Operational Concept Panel (ATMCP):

3.1.1 *Performance based.* The RCP concept characterizes the performance required for communication capabilities that support ATS functions without reference to any specific technology and is open to new technology. This approach is essential to CNS/ATM implementation.

3.1.2 *Human-centered.* The RCP concept assesses human and technical aspects of the dialogues that are necessary among humans to fulfill an operational need for information to complete a task by the human initiating the dialogue.

3.1.3 *Operationally significant.* The RCP concept depends on operational assessments of defined ATS functions, taking into account human interactions, procedures, and environmental characteristics. These assessments provide “operationally significant” benchmarks that can be used to ensure confidence that the

operational communications supporting the ATS functions will be conducted in an acceptable and safe manner.

3.1.4 *Technology independent.* The RCP concept permits greater flexibility in the choice of technologies selected for the intended use and facilitates standardization between airspace planners, procedure designers, aircraft and avionics manufacturers, air traffic control/management, operators and pilots. It facilitates implementation of new technologies, reduces dependence on a specific technology and provides a basis for new safety related applications of communication capabilities. RCP can exploit current technologies and evolve as industry develops new technologies in response to user needs and requirements.

4. AREAS REQUIRING FURTHER WORK ON RCP

4.1 The following paragraphs summarize areas that need further work to progress the application of the RCP concept. These areas have been identified through the experience gained from the implementation of data link services for ATM within European, Asia-Pacific, North Atlantic, and North American Regions.

4.1.1 *Relationship of the RCP concept to separation studies.* The ICAO Separation and Airspace Safety Panel (SASP) conducts separation studies, based on ICAO Doc 9689, the *Manual on Airspace Planning Methodology for the Determination of Separation Minima*. For communication performance, the separation studies employ the concept of a communication and controller intervention buffer. The buffer is to allow for the possibility that, when the next distance check is obtained, it may become apparent to the controller that separation will be lost, requiring the controller to establish some alternative form of separation. The separation studies make assumptions about the functional and performance characteristics of the communication capabilities associated with the buffer. Further work is needed to develop means to specify performance requirements appropriate for the assumptions made by the separation studies, particularly for controller intervention and pilot initiated weather deviations, within the framework provided by the RCP concept.

4.1.2 *Relationship of the RCP concept to interoperability.* The RCP concept is characterized as performance based. However, the proliferation of emerging technologies has resulted in different technological solutions being used to provide similar ATS functions. This has resulted in making the planning and implementation of a CNS/ATM environment more complex and contributes significantly to the cost and complexity of aircraft equipage, flight crew qualification programs, and development of procedures for operators who operate in parts of the world that use different technologies. Further work is needed to address the implications resulting from use of different technologies to perform similar ATS functions and provide guidance to understand better the relationship of the RCP concept to interoperability.

4.1.3 *Standardization of RCP types and allocations.* The RCP concept document suggests minimizing the number of RCP types that are implemented. The RCP concept document noted that it is beyond its scope to specify RCP types or allocations for RCP types. However, there are no limits on the number of RCP types and there are no limits on the different allocations that could support one RCP type. Further work is needed to determine if the RCP Manual can provide a practical number of RCP types and associated allocations that can satisfy global application of the RCP concept.

4.1.4 *Allocation of RCP type.* The allocations for one or more RCP type should consider allocations to the air traffic service provision, the operator's communication service provider (CSP), if applicable, and the aircraft equipage. The operator's CSP, aircraft equipage, and flight deck procedures contribute to a significant portion of operational communication performance. The RCP types allocated to the operator and the aircraft need to be globally harmonized so States can determine if operators and the aircraft equipage qualify for use of the air traffic service provisions. Otherwise, an operator and the aircraft equipage may qualify for an RCP type applied to an ATS function in one region of the world but may not qualify for the same RCP type applied to the same ATS function in another region. For example, an operator may be approved with controller-pilot data link communications (CPDLC) that uses multiple sub-networks, such as satellite and high frequency (HF) data link. If the satellite sub-network is unavailable, then the operation requiring a particular RCP type may not be sufficient when using the HF data link. In another example, an operator may meet an RCP type when accessing an air traffic data link service using a third party or contracted communication service provider (CSP), which is the same CSP contracted by a particular air traffic service provider. However, when an air traffic service provider contracts communication services through a different CSP, the operator may not meet the same RCP type.

4.1.5 *Air traffic procedures-ATS functions.* The RCP concept is applied to ATS functions that are defined to characterize the communication component, human interactions, and procedures. Further work is needed to assess the adequacy of international air traffic procedures and phraseology in e.g. ICAO Doc 4444, the *Procedures for Air Navigation Services — Air Traffic Management* for new CNS/ATM environments. Inadequate definition and harmonization of ATS functions, associated procedures, and phraseology can lead to flight crew or controller confusion and misinterpretation, affecting human performance.

4.1.6 *Safety performance monitoring.* ICAO Annex 11, paragraph 2.26.5 requires that “any significant safety-related change to the ATC system, including the implementation of a reduced separation minimum or a new procedure, shall only be effected after a safety assessment has demonstrated that an acceptable level of safety will be met and users have been consulted. When appropriate, the responsible authority shall ensure that adequate provision is made for post-implementation monitoring to verify that the defined level of safety continues to be met.” The RCP concept should be considered as a means to meet this requirement for monitoring the actual performance of safety related communications, particularly for those parts of the communication system whose performance cannot be reliably predicted.

5. ACTION BY THE CONFERENCE

5.1 The conference is invited to agree on the following recommendation:

**Recommendation 3/ — Required communication performance
(RCP)**

That ICAO:

- a) continue efforts in the development of SARPs, procedures and guidance material on RCP; and
- b) investigate areas for further work as identified in this working paper.

— END —