CNS/SG/3-WP/37
30/03/2010

International Civil Aviation Organization

Third Meeting of the APIRG Communications, Navigation and Surveillance Sub-Group (CNS/SG/3)
[Nairobi, Kenya 26 – 30 April 2010**]**

Agenda Item 5: Aeronautical Mobile Service (AMS)

Air-Ground Communications Requirements - Required Communication Performance (RCP) and Air Traffic Management (ATM)

(Presented by IATA)

SUMMARY

Communication capabilities on the ground and in the air are not absolute elements or exclusive in themselves. Their capabilities and hence performance are determined by how these direct inter-dependencies are harnessed within the bounds of a functional and all-encompassing ATM system, to deliver efficient and safe flight.

RCP being a performance specification serves as one possible safety net in order to ensure that the various infrastructural and technological components blend the Aircraft systems and the Ground systems to deliver an effective service.

The meeting is invited to endorse the RCP methodology as the key to seamless and efficient movement of flight in all flight phases. That the Performance (and not the availability alone) of ground and airborne capability can combine to form an end-to-end ATM system is the key to flight safety and efficiency.

References:
- ICAO RCP Manual (Doc 9869)
- ICAO PBN Manual (Doc 9613)
- ICAO SP AFI RAN 2008 Report
- APIRG/16 Report

1. INTRODUCTION

1.1 "ATM is the aggregation of the airborne functions and ground-based functions (Air Traffic Services – ATS, Airspace Management – ASM, and Air Traffic Flow Management- ATFM) that are required to ensure the safe and efficient movement of aircraft during all phases of operations". Communications has played a key role in generating a paradigm shift from the traditional tasks of

Air Traffic Controllers exercising their direct Control over a flight till the next 'hand-off'. Automation, Information Technology (IT), human machine interfaces (HMI) and decision support tools have been the key enablers in migrating from the traditional Control Role to one of Air Traffic Management.

1.2 In transitioning from Control to Management, the challenges of working with the Voice media were recognized very early. Conscious of the ever-increasing demands on the ATM system to constantly improve airspace capacity as traffic grew and without reducing its safety or efficiency, data services were being introduced rapidly. Indeed data services in some airspace volumes such as Continental radar airspace were deployed effectively in order to resolve the saturation levels that voice media was facing. For example, normal times for Departure Clearance using voice from the time a clearance is requested, issued, read-back, acknowledged and confirmed (5 transactions) could be safely reduced from an average of say 3 minutes to say, 10 seconds.

1.3 The lack of direct communication and surveillance in Remote and Oceanic airspace quickly led to the take-up of data link applications to support separation assurance and conformance monitoring. Indeed, both direct communications tightly integrated into human-machine interfaces and automated position reporting were now possible for the first time ever.

1.4 A clear need to transition away from an earlier generation of single-dependent technological solutions was now migrating to a high-performance integrated system. The performance assurance connecting the ground and aircraft systems also provided the justification to safely reduce separation standards.

1.5 Datalink was not only the catalyst in bringing relief to a saturated voice system but also dramatically improving the role of a controller from active control to one of automating routine tasks. Data exchange also enabled the continuity and seamlessness of flight as inter-center or inter-sector flow of flight information was improved by ATS Inter-facility Data Communication (AIDC).

2. DISCUSSION

Communications

2.1 This variable mix of communication, navigation and surveillance capabilities in the air while it always tries to meet the varying requirements of a tightly federated ground-system architecture as a flight overflies each one of them in turn did not come without its complexities. With the clear absence of a performance element within each technological component, the onus of using a combination of data and voice in order to assure safe separation and intervention at all times squarely fell on the pilot and controller involved, and without any assurances from the performance of the system itself as a whole.

2.2 The intervention capability available to the controller was never assured and the pilot was trained to follow established contingency procedures at first recognition of a COM failure. Clearly, the uncertainty elements in such a situation are not conducive to either effective sharing of information or a functional end-to-end Traffic Management system. Communication capabilities on the ground and in the air are no longer autonomous elements or exclusive in themselves. Their capabilities and hence performance are determined by how these direct inter-dependencies are harnessed within the bounds of a functional and all-encompassing ATM system, to deliver efficient and safe flight.

2.3 RCP being a performance specification serves as one possible safety net in airspace planning in order to ensure that the various infrastructural, operational and technological components blend the Aircraft systems and the Ground systems to deliver a safe, reliable and repeatable service.

RCP as a type is not inherently prescriptive. Where both voice and datalink applications are required (such as remote and oceanic) in order to support enhanced surveillance and communication services, an ANSP's might choose to prescribe an RCP type and/or surveillance Performance specifications. Under the broad provisions of the ICAO RCP Manual (Doc. 9869), it remains within the remit of the ANSP working closely with other ATM users to indicate the best combination of technologies to support the RCP type adopted. Procedures are required in order to cope with failures on the ground and air.

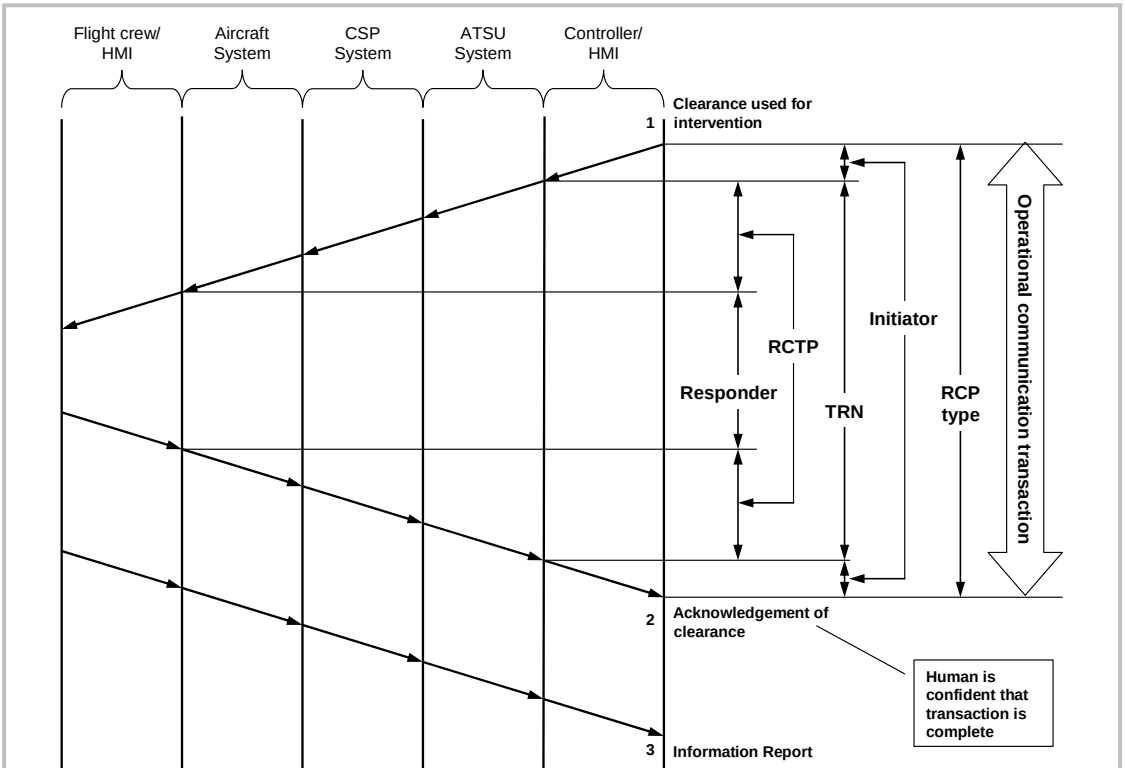
2.4 The guidelines used for this purpose are RTCA DO-290/EUROCAE ED-120, Change 1 and Change 2 (Continental SPR), that provides operational, safety and performance criteria for data link services that are applicable in airspace where radar services are provided. This is also referred to as continental airspace.

2.5 RTCA DO-306/EUROCAE ED-122 (Oceanic SPR) provides operational, safety and performance criteria for data link services that are applicable in oceanic and remote airspace for normal ATC communication and surveillance.

2.6 That the elements on ground and in the air will then be seen and measured to perform; to meet or exceed these performance perquisites (Actual Communication Performance- ACP) will deliver the level of safety and efficiency that is ultimately the goal of any ATM system.

2.7 RCP in reality provides a critical feature in measuring and benchmarking a system as whole rather than individual technological components that may perform well individually but not be compatible with each other. It is now possible using RCP to monitor and ensure that the minima levels as used in the airspace communications are being safely met. For example an RCP240 will assure safe communication latency in a 30NM separation minima environment. Likewise, RCP400 would deliver 50 NM or more in minima.

C for $RCTP_{CSP}$	The proportion of intervention messages and responses that can be delivered within the specified $RCTP_{CSP}$ for Intervention.
C for $RCTP_{AIR}$	The proportion of intervention messages and responses that can be delivered within the specified $RCTP_{AIR}$ for Intervention.



Global Operational Data Link Document (GOLD)

2.8 An ICAO-sponsored Ad-hoc Working Group is developing the Global Operational Data Link Document (GOLD). **Appendix** to this paper provides a description of GOLD's contents. The purpose of the GOLD is to facilitate global harmonization of existing data link operations and resolve regional and/or State differences impacting seamless operations. It also will include required communication performance (RCP) and surveillance specifications, based on RTCA DO-306/EUROCAE ED-122, and guidelines on post-implementation monitoring and corrective action to address a number of issues with satellite data communication services.

2.9 The GOLD will effectively replace the Guidance Material for ATS Data Link Services in North Atlantic Airspace (NAT Data Link GM) and the FANS-1/A Operations Manual (FOM) for the Asia-Pacific, South American and African-Indian Ocean Regions[1]. The GOLD also includes provisions for the aeronautical telecommunication network (ATN) implementation in the European Region.

[1] The FANS 1/A Operational Manual (FOM) was adopted for application in the AFI Region under APIRG Conclusion 16/33. The management of the FOM for the AFI Region was assigned to South Africa.

Extract from Draft Global Operational Datalink Document (GOLD)

Availability	
Term	**Description**
Service availability (A_{CSP})	The required probability that the communication service is available to all users in a specific airspace when desired.
Unplanned outage duration limit (minutes)	Time after the unplanned outage begins at which there is an operational impact. Measured from when an unplanned outage begins to when the ATSU receives notification that the service has been restored.
Maximum number of unplanned outages	Measured separately for each relevant operational airspace or Flight Information Region (FIR) over any 12-month period.

2.10 As the very first phase, all ATM functions should be benchmarked to a given level of RCP. Once done, a given level of RCP that co-relates with the ATM function can then be applied. For example, RCP 10 may be applied to controller intervention capability supporting separation assurance in a 5 NM separation standard environment. The same criteria are also used in forward planning where reductions in separations are being considered.

Air Traffic Management (ATM)

2.11 At an Application level, it is also necessary to ensure that a surveillance capability exists (e.g. ADS-C) along with a defined Navigational Performance (e.g. RNP4) and a communication performance value (e.g. RCP240) to deliver a safe horizontal separation minima of 30 NM/30 NM. A surveillance performance specification of a pre-determined value (e.g. 180 seconds with ADS-C) for example would be required in order to support an RCP240 COM specification to eventually deliver a safe 30NM horizontal spacing.

2.12 For these reasons, IATA considers that RCP for Communications and supported by its equivalent Surveillance and Navigation value, should form the baseline for any planning strategy. Further, RCP is a crucial element in assuring a seamless and harmonized passage of flight across multiple FIRs.

.

CONCLUSION

2.13 Essentially, RCP is technology-agnostic. Once a level of RCP has been determined for a service volume, this type may be used as an agreed measure in order to assure ANSP service provision needs. The reverse is however not acceptable. If an ANSP would like to implement RNP4- 30/30, it would not be plausible to conduct a feasibility study to know if RCP 240 or a lower value might support 25 NM lateral separation and/or 5 minutes longitudinal separation.

2.14 For these purposes, the performance benchmark considered is the assurance provided in order to ensure controller Intervention capability. IATA fully endorses the RCP methodology as the key to seamless and efficient movement of flight in all flight phases. That the Performance (and not the availability alone) of ground and airborne capability can combine to form a end-to-end ATM system is the key to flight safety and efficiency

2.15 Airline flight-deck avionics are equipping to a baseline of currently known ATS requirements and continue to retrofit where required in order to meet ground imposed mandates. Performance Specifications in the air and on the ground are therefore the key levers in delivering safety and efficiency. A move away for the availability or ‘’popularity’’ of a given technology is crucial in determining ANSP and aircraft requirements towards an all-encompassing and functional ATM system.

3. **Action by the meeting**

3.1 The meeting is invited to agree with the following conclusions:

That:

a) all AFI States should adopt RCP as a planning guideline when developing Regional and State Air Navigation Plans;

b) all AFI States should consider using RCP guidelines for planning towards the safe reduction in Separation standards based on RNAV10 (RNP10) and RNP4 PBN navigation specifications

c) APIRG should prescribe performance specifications in specific airspace; and

d) upon release of the Global Operational Data Link Document (GOLD) by the Ad-Hoc GOLD Working Group[2], the FANS-1/A Operations Manual (FOM) should be withdrawn and replaced by the GOLD as AFI regional guidance material for use by States and airspace users as the basis for operating ADS-C and CPDLC, in conjunction with the provisions contained in ICAO Annex 10, Volume II and PANS–ATM (Doc 4444).

— END —

[2] The release of GOLD was expected in First Quarter 2010.

Appendix

GOLD Contents

Type of material	Reference	Description	Intended uses, remarks
Introductory material	Foreword	Purpose, scope, etc.	For all users of the document. Descriptive.
	Chapter 1	Definitions	For all users of the document. Descriptive.
	Chapter 2	Overview of data link operations	For ATSPs and operators to develop training material for personnel, as appropriate, on the fundamentals of data link operations. Descriptive.
Guidelines	Chapter 3	Administrative provisions related to data link operations	For ATSPs and airspace planners to plan for and implement data link services, including ATC automation, and interfacility agreements. For ATSPs and operators to negotiate contractual arrangements with CSPs. For operators to plan for and use the data link system.
	Chapter 4	Controller and radio operator procedures	For ATSPs and CSPs to develop procedures and training material for controllers and other personnel at ATSUs and radio facilities.
	Chapter 5	Flight crew procedures	For operators to develop procedures and training material for the flight crew and dispatchers
	Chapter 6	Advanced data link operations	For ATSPs and operators to develop procedures and training material for personnel, as appropriate, related to advanced data link operations, such as dynamic airborne reroute procedures (DARP) and tailored arrival (TA).
	Chapter 7	State aircraft data link operations	For ATSPs and State (military) operators to develop procedures and training material for personnel, as appropriate, related to conducting military operations, such as military assumes responsibility for the separation of aircraft (MARSA) and air-to-air refueling (AAR).
Appendices (Supporting and Additional Guidelines)	Appendix A	CPDLC message elements and standardized free text messages	For all users. Based on Doc 4444, and includes FANS 1/A and ATN B1 messages.
	Appendix B	RCP specifications	For technical operations specialists, applies to CPDLC, particularly in reduced separation environments.
	Appendix C	Surveillance performance specifications	For technical operations specialists, applies to ADS-C and FMC WPR, particularly in reduced separation environments.
	Appendix D	Post-implementation monitoring and corrective action	For post-implementation monitoring of the performance of the data link system, analysis, investigations, and corrective action at the the State/ATSP, regional, and global levels.
	Appendix E	Regional/State-specific information	Includes differences in data link operations at the State/ATSP and regional levels.
	Appendix F	Operator/aircraft specific information	Includes differences in aircraft data link system capability and performance.