



International Civil Aviation Organization

Sixth Meeting of CNS/MET Sub-Group of APANPIRG

Bangkok, Thailand, 15-19 July 2002

Agenda Item 3: ATN transition planning

TECHNICAL DOCUMENT ON ATN PERFORMANCE - PROPOSED RCPS

(Presented by Japan)

Summary

This paper provides information on ATN Performance with an example of the ATN performance requirements.

1. INTRODUCTION

1.1 ATN Technical Documents, including the presented document for the ATN performance, are being developed by Aeronautical Telecommunication Network (ATN) Transition Task Force of APANPIRG.

1.2 The first draft of the Technical Document on ATN Performance had been presented at the Fourth Meeting of ATN Transition Task Force, held in Mumbai, India, 8-12 April 2002. As requested by the ATN Transition Task Force Meeting, the document was presented for comments to the Twelfth Meeting of ATS/AIS/SAR Sub Group, held in Bangkok, Thailand, 24-28 June 2002.

2. DISCUSSION

2.1 At the ATS/AIS/SAR Sub Group Meeting, the document was presented. However, the meeting was not in a position to provide any comment at that time. In addition, the meeting had requested the Secretariat to circulate the paper formally to the States and compile their comments and present it to the CNS/ATM/IC SG/10 and ATN Transition Task Force/5 and to the ATS/AIS/SAR SG/13 in 2003.

2.2 As per the agreement reached at the ATS/AIS/SAR SG, the future activities for refinement of the document are expected as below:

- 1) To present the concept and to receive comments at CNS/MET/ SG/6 Meeting.
- 2) To circulate the document formally to the States and compile their comments by Secretariat, as requested by ATS/AIS/SAR SG/12 Meeting.
- 3) To review the compiled comments and to revise the document if necessary at Working Group B Meeting of ATNTTF of APANPIRG (August and/or November 2002)
- 4) To present the latest (revised) document with the compiled comments at CNS/ATM/IC SG/10 Meeting (2003) for comments.
- 5) To present the latest document with comments at ATNTTF/5 Meeting (2003).
- 6) To present/review the latest document with comments at ATS/AIS/SAR SG/13 Meeting (2003).
- 7) To present the final document revised according to comments and adopt the document at CNS/MET/ SG/7 Meeting (2003) and present it for consideration by APANPIRG/14.

3. Action by the meeting

3.1 The meeting is invited to note the above process.

Attachment

Operational Required Communication Performance (RCP) for ATS (for presentation only)

Operational Required Communication Performance (RCP) for ATS

Sixth Meeting of the APANPIRG CNS/MET Sub-Group
Bangkok, Thailand, 15-19 July 2002

Naoto SAKAUE (Tetsuo MIZOGUCHI)
(Japan)



Table of Contents

- ❑ Background of the presentation
 - Activities by the ICAO APANPIRG
 - Background of the Communication Performance Document
- ❑ Communication Performance Document Part I
 - Scope; Definition; Procedure for RCP Planning
 - Operational Communication Process Model
 - Operational Communication Timing Performance Parameters
 - Describing Operational Communication Performance (Timing-1/2)
- ❑ Communication Performance Document Part II
 - Communication Services Categorizations in DO-274
 - Communication Services RCP rating in DO-274
 - Assigning Parameter Values to Performance Rating in DO-274
 - RCP example
 - Summary of Performance Document
- ❑ Appendix: Introduction of the Technical Document



Background of the presentation

Activities by the ICAO APANPIRG (1/3)

- ❑ Regional ATN Planning Documents and Regional Technical Documents are being developed in Asia/Pacific Region, after the publication of ATN SARPs by ICAO ATNP

- ❑ Regional ATN Planning Documents have been adopted and circulated to the States and adjacent region in February 2002
 - **Regional ATN Transition Plan**
 - ✚ Regional ATN backbone configuration using ATN Routers, and implementation Plan
 - **Routing Architecture Plan**
 - ✚ Routing topology for inter-Domain and intra-Domain connections using ATN Routers
 - **ATN NSAP Addressing Plan**
 - ✚ Definition and assignment of Network Service Access Point Address
 - **ATN NSAP Address Registration Form**
 - ✚ Registration Form for Network Service Access Point Address registration
 - **AMHS Naming Plan**
 - ✚ Definition and assignment of AMHS naming (common worldwide)



Background of the presentation

Activities by the ICAO APANPIRG (2/3)

- ❑ The following documents are planned to be developed as Regional Documents, which includes Technical Document on ATN Performance (Year described is the target date of completion)
 - **ICD** (Interface Control Document)
 - ↓ **AMHS**; 2002, **ATN Router**; 2003, **AIDC**; 2004
 - **Technical Documents**
 - ↓ **ATN Performance**, **System Management**, **Security**, **Directory Service**; 2003
 - **Routing Policy**
 - ↓ IDRP for ATN Router and MTA for AMHS; 2003
 - **Guidance Material**
 - ↓ For the use of the public internet for AFTN; 2003
 - ↓ For the use of IP as an ATN Subnetwork; 2005
 - **Implementation Plan**
 - ↓ **ATN Router**; Completed, **AMHS**; 2002, **AIDC**; 2003



Background of the presentation

Activities by the ICAO APANPIRG (3/3)

❑ Plan for the Review/Discussion on the ATN Performance Document (APANPIRG)

- ATS/AIS/SAR SG/12 Meeting (24-28 June 2002)
; No comments on the document but with requirements that:
 - ✚ To circulate the document formally to the States and to compile their comments by Secretariat
 - ✚ To present it to CNS/ATM/IC SG/10 and ATNTTF/5
 - ✚ To present it at the next ATS/AIS/SAR SG/13 (2003)
- CNS/MET SG/6 Meeting (15-17 July 2002)
- Formal Circulation of the document to the States and Compilation of their comments by Secretariat
- ATN Transition Task Force WG B (Aug. and/or Oct. 2002)
- CNS/ATM/IC SG/10 Meeting (2003)
- ATN Transition Task Force/5 Meeting (around March 2003)
- ATS/AIS/SAR SG/13 Meeting (2003)
- CNS/MET/ SG/7 Meeting (2003); Final document for the adoption



Background of the presentation

Background of the Communication Performance Document (1/2)

- ❑ Identification of requirements is crucial for planning, implementation and management of CNS (the requirements have a significant impact on the CNS materialization).
- ❑ For Communication portion, RCP (Required Communication Performance) has been discussed by OPLINKP (former ADSP). As an operational panel, OPLINKP proposed the concept of Operational RCP. (OPLINKP does not fix any parameter values for RCP, for instance, Operational RCP: delay time 30 seconds in TMA)
- ❑ Some groups (e.g. RTCA/EUROCAE SC) have been defining the procedure to define RCP, Operational and Technical RCP(see RTCA DO-264), and also discussing the RCP parameter values.



Background of the presentation

Background of the Communication Performance Document (2/2)

- ❑ The PIRG is responsible to provide 'operational and environment definition based on the data communication and regional implementation'.
- ❑ The ATN Transition Task Force within the CNS/MET SG has a task to develop a technical document on ATN (Data Communication) Performance, which includes the RCP. Currently the drafted materials consists of two parts; (1) Survey, Definition and Procedure, (2) Operational RCP values.
- ❑ The ATN Transition Task Force asks the ATS experts in Asia/Pacific to make comments on the materials.



Communication Performance Document Part I

Scope, Definition and Procedure for RCP Planning

□ Scope

- ATN and its components
- Nature of ATS communications(see Operational Communication Process Diagram)

□ Definition

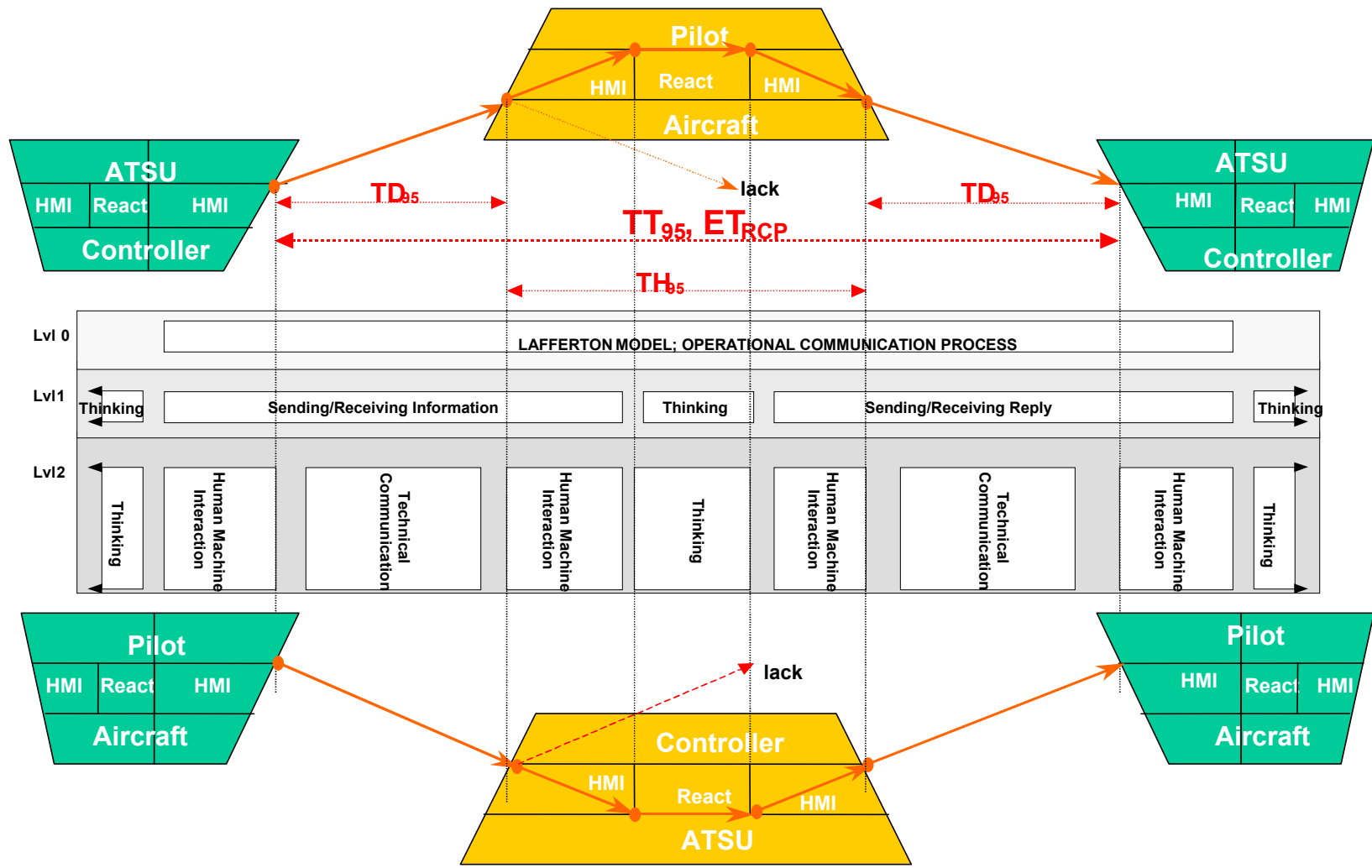
- Parameters for Performance Definitions
- Operational RCP and Technical RCP

□ Procedure for RCP Planning

- Deriving RCP
- Stating RCP
- see RTCA DO-264 'Guidelines for approval of the provision and use of Air Traffic Services supported by Data Communications' Dec., 2000



Operational Communication Process Model (C-P-C/ P-C-P)



Operational Communication (Timing) Performance Parameters

□ TT_{95}

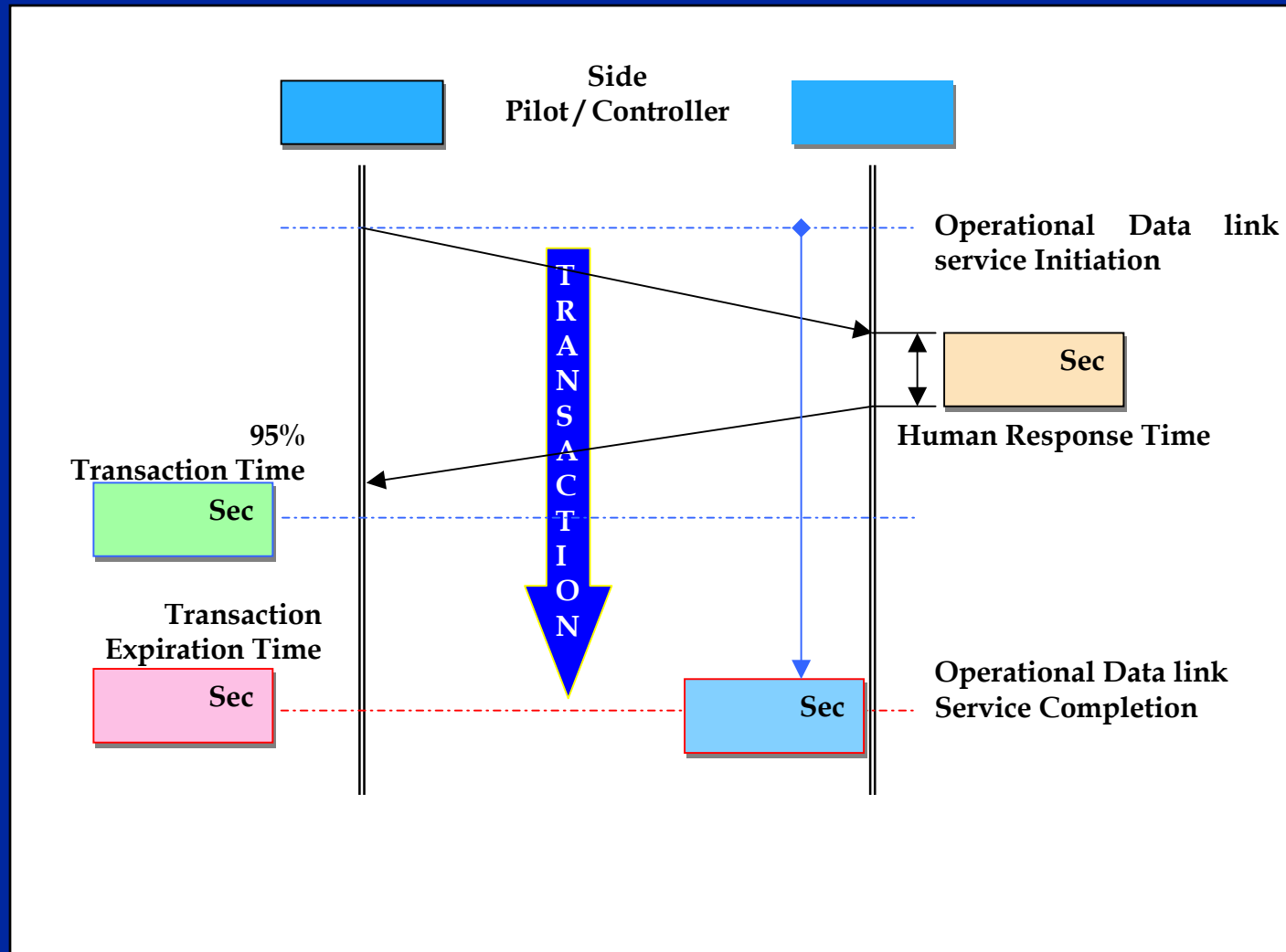
- 95% transaction time
- The time for which 95% of the transactions are completed

□ ET_{RCP}

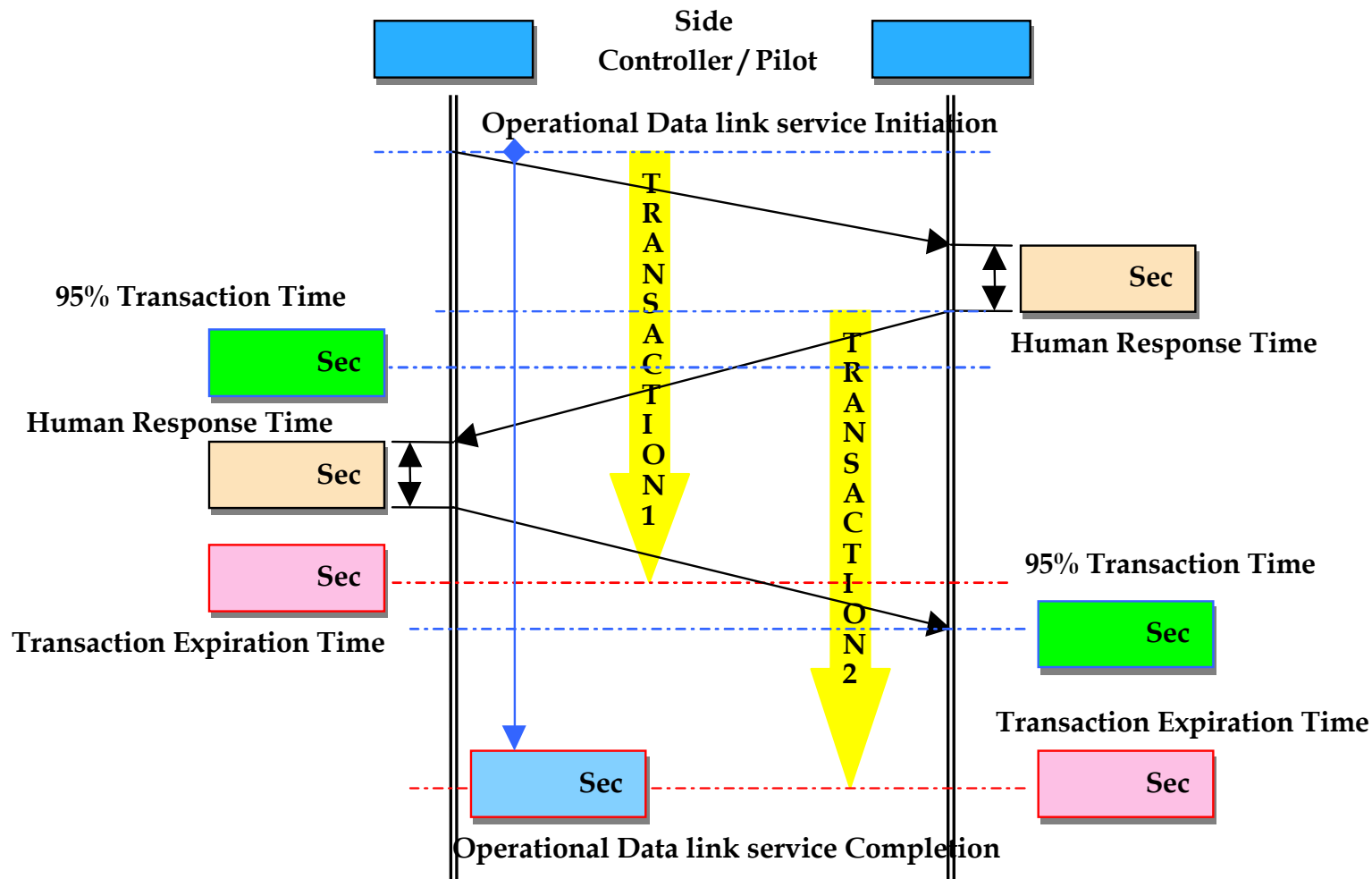
- Transaction expiration time
- The maximum time to complete a transaction



Describing Operational Communication Performance (Timing-1)



Describing Operational Communication Performance (Timing-2)



Communication Performance Document Part II

Two Documents on RCP parameter values;

- (1) RTCA DO-274 'Next generation Air/Ground communication (NEXCOM) Principles of Operation' Oct., 12, 2001

RCP is rated in the 5-level(Immediate, Very Short, Intermediate, Long, Very Long)

- (2) EUROCAE/RTCA WG-53/SC189/SG6 Operational Performance Assessment CNS/ATM Operational Performance Assessment of ATM system using data link communications', Jan., 2001

RCP is given by specifying numbers.

What is shown in the materials;

- A) Each Communication Scenario in both documents is presented using the template diagram.
- B) RCP parameter values are assigned to the 5 levels.



Communication Services Categorization in DO-274

- ❑ 1. Communications Management Services
 - Transfer of Communications; Failure Recovery; Stuck Microphone; Ground Radio Failure; Aircraft Radio Failure; Controller Override
- ❑ 2. Planning Communications Service
 - File flight plan; Initial clearance delivery; Initial clearance delivery after a short delay
- ❑ 3. Strategic Communications Service
 - Pilot requests direct to a fix; Pilot requests change of altitude due to continuous light turbulence; Pilot requests a routing change to avoid weather that is <150 NM> ahead on his current cleared route
- ❑ 4. Tactical Communications Service
 - Pilot request for tactical maneuver denied by ATC; Request for clearance with immediate approval; Request for clearance approved after slight delay; ATC delivers taxi clearance
- ❑ 5. Emergency Communications Service
 - Pilot advising ATC of a TCAS resolution advisory; Aircraft experiences engine failure after takeoff while under departure control; Emergency descent



Communication Services RCP rating in DO-274

- ❑ 1. Communications Management Services
 - TT_{95} 2 (Very Short)
 - ET_{RCP} 2 (Very Short)
- ❑ 2. Planning Communications Service
 - TT_{95} 5 (Very Long)
 - ET_{RCP} 5 (Very Long)
- ❑ 3 Strategic Communications Service
 - TT_{95} 3 (Intermediate)
 - ET_{RCP} 3 (Intermediate)
- ❑ 4. Tactical Communications Service
 - TT_{95} 2 (Very Short)
 - ET_{RCP} 2 (Very Short)
- ❑ 5. Emergency Communications Service
 - TT_{95} 1 (Immediate)
 - ET_{RCP} 1 (Immediate)



Assigning Parameter Values to Performance Rating in DO-274

□ TT_{95}

- 1 (Immediate) 3 seconds
- 2 (Very Short) 10 seconds
- 3 (Intermediate) 30 seconds
- 4 (Long) 60 seconds
- 5 (Very Long) 120 seconds

□ ET_{RCP}

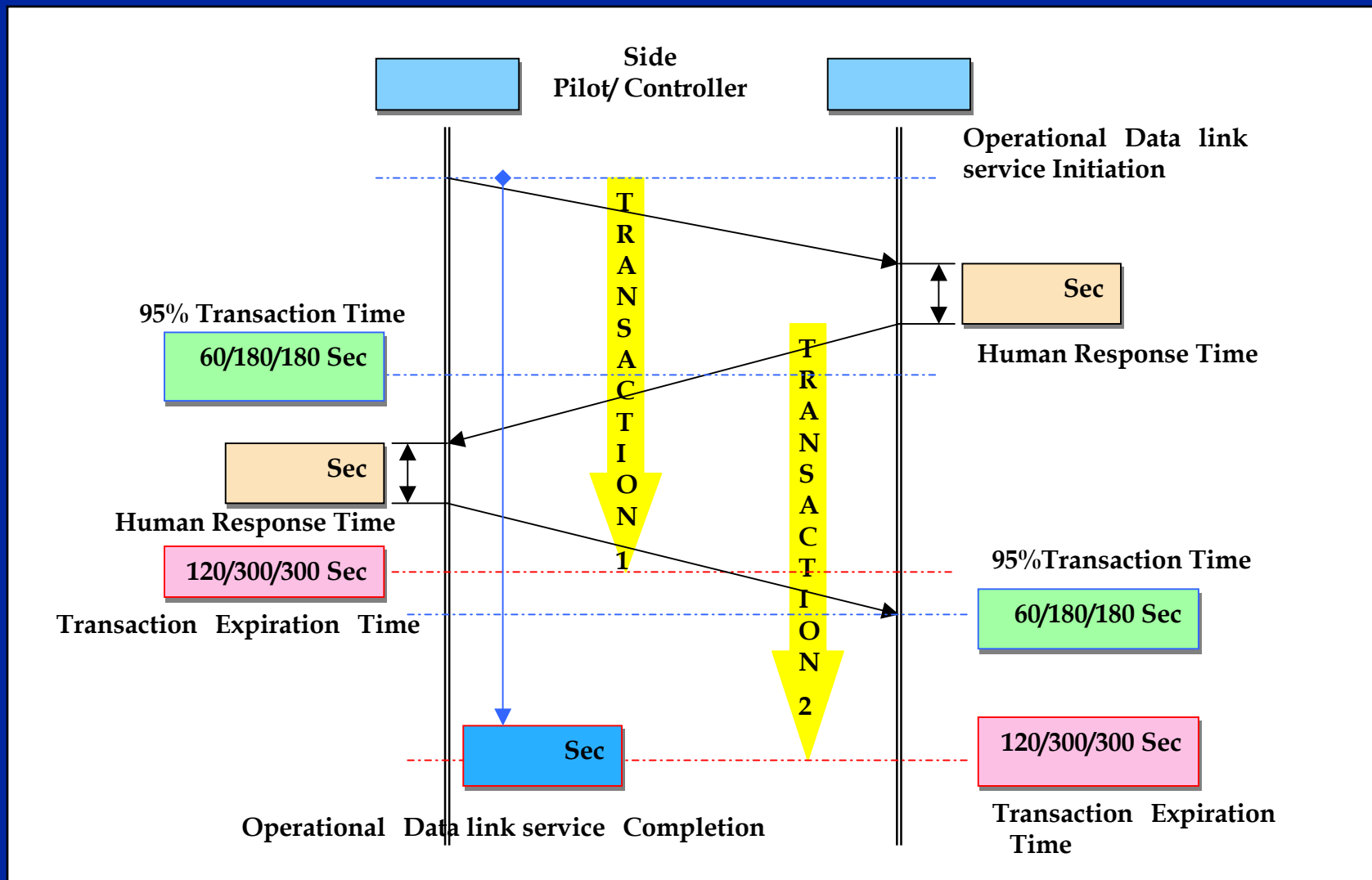
- 1 (Immediate) 5 seconds
- 2 (Very Short) 20 seconds
- 3 (Intermediate) 60 seconds
- 4 (Long) 120 seconds
- 5 (Very Long) 240 seconds

□ Other Assumptions

- RCP values in En-route are proposed as three times larger as in TMA, and some larger values for Surface.
- 5 min (300 sec) is the upper limit of any elapsed time



RCP example; Initial Clearance Delivery (TMA/En-route/Surface)



RCP example; Summary (1/2)

- ❑ 1. Communications Management Services; Detailed description in the scenario is omitted, since some of the communications are in voice
 - Transfer of Communications; Failure Recovery; Stuck Microphone; Ground Radio Failure; Aircraft Radio Failure; Controller Override
- ❑ 2. Planning Communications Service
 - File flight plan $TT_{95}=120$ 、 $ET_{RCP}=240$
 - Initial clearance delivery
(Terminal Area/ En-route/ Surface) $TT_{95}=60/180/180$ 、 $ET_{RCP}=120/300/300$
 - Initial clearance delivery after a short delay $TT_{95}=120$ 、 $ET_{RCP}=240$
- ❑ 3 Strategic Communications Service
 - Pilot requests direct to a fix $TT_{95}=30$ 、 $ET_{RCP}=60$
 - Pilot requests change of altitude due to continuous light turbulence $TT_{95}=30$ 、 $ET_{RCP}=60$
 - Pilot requests a routing change to avoid weather that is <150 NM> ahead on his current cleared route ; No scenario



RCP example; Summary (2/2)

❑ 4. Tactical Communications Service

- Pilot request for tactical maneuver denied by ATC
- Request for clearance with immediate approval
- Request for clearance approved after slight delay
- ATC delivers taxi clearance

$TT_{95} = 10, ET_{RCP} = 20$

$TT_{95} = 10, ET_{RCP} = 20$

$TT_{95} = 10, ET_{RCP} = 20$

$TT_{95} = 10, ET_{RCP} = 20$

❑ 5. Emergency Communications Service

- Pilot advising ATC of a TCAS resolution advisory
- Aircraft experiences engine failure after takeoff while under departure control
- Emergency descent

$TT_{95} = 3, ET_{RCP} = 5$

$TT_{95} = 3, ET_{RCP} = 5$

$TT_{95} = 3, ET_{RCP} = 5$



Summary of Performance Document

- ❑ 'Planning Communication' and 'Strategic Communication' are the potential uses of data communications
- ❑ 'Tactical Communication' can be adapted by a specific airspace in the region
- ❑ 'Communications Management' need further studies, because of the operational aspect in the integrated voice/data communications.
- ❑ 'Emergency Communication' may not possibly be used in the data communication context in near future.



Appendix: Introduction of the Technical Document (1/6)

Asia/Pacific Region Technical Document on ATN Performance

- ❑ **Table of Contents;** Page 2
- ❑ **Related References;** Page 3

- ❑ **Part I: Survey, Definition and Procedures;** Page 4-14
- ❑ **1. Introduction;** Page 4
- ❑ **2. Performance Definitions;** Page 4-9
- ❑ **2.1 Scope of ATN performance;** Page 4-7
 - REFERENCE to Figure for ES-ES Communication on the ATN, Figure for ATN scope and components from monitoring view point of ATN performance, Process Model for Pilot-Controller Communication at each level, including Human factor
- ❑ **2.2 Parameters of ATN performance;** Page 8-9
 - REFERENCE to a definition of ATN Performance Parameters (Availability, Reliability, Continuity, End-End transfer Delay, Integrity, Throughput, Connection Establishment Delay)
 - REFERENCE to a definition of RCP Parameters (95% transaction time, Transaction expiration time, etc.)



Appendix: Introduction of the Technical Document (2/6)

Asia/Pacific Region Technical Document on ATN Performance

- ❑ **3. Stating Performance Requirement;** Page 10-14
- ❑ **3.1 How the ATN Performance Requirements can be derived;** Page 10-12
 - EXPLANATION on Decision Flow on the RCP for ICAO ATN Panel and PIRGs
 - REFERENCE to a definition of transit delay as Technical RCP (Airborne + Communication Domain + Ground Domain)
- ❑ **3.2 How the ATN Performance Requirements can be stated;** Page 13-14
 - REFERENCE to a ATN Performance Statement Template by RTCA SC-189/EUROCAE WG-53 SG3
- ❑ **3.3 Summary;** Page 13-14
 - If a ICAO PIRG plans to provide data link application for some areas and service in the region, the environment and the operational services have to be identified; and Performance Requirements have to be developed
 - After the development of Performance Requirement, it has to be broken down to a Technical RCP where the performance of each component within a system can be planned, implemented , monitored and improved.
 - Wider coordination beyond the PIRGs is important in there process.



Appendix: Introduction of the Technical Document (3/6)

Asia/Pacific Region Technical Document on ATN Performance

❑ 4. Management of Performance; Page 14

- EXPLANATION generally for each phase of Planning, Implementation and Monitoring
- REFERENCE to management objectives

❑ Appendix: Communication Performance Parameter Definitions by RTCA SG-3; Page 15-18

- REFERENCE to the definition of Communication Performance Parameters Definition by RTCA SC-189/EUROCAE WG-53 SG3, such as each Transaction Time, Availability, Message Integrity, Other Parameters



Appendix: Introduction of the Technical Document (4/6)

Asia/Pacific Region Technical Document on ATN Performance

- ❑ **Part II: ATN Performance Requirements Determination; Page 19-50**
- ❑ **1. Introduction; Page 19**
- ❑ **2. Communication Scenarios and Corresponding Operational Timing Performance; Page 19-47**
- ❑ **2.1 Communication Services; RTCA/ EUROCAE SG position paper; Page 19-26**
 - REFERENCE to Parameter Values of 95% Transaction Time (TT_{95}) and Transaction Expiration Time (ET_{RCP}) provided in the RTCA document, for each service (DLIC, ACL, ACM, DCL, DSC, D-ATIS), using **Performance Statement Template**
 - Summary of Values for Operational Performance Requirement (RCP)
- ❑ **2.2 Communication Services; DO-274; Page 27-47**
- ❑ **2.2.1 Communication Service Description in DO-274; Page 27-28**
 - REFERENCE to the description in DO-274 for the **Five Services of Communication Management, Planning, Strategic, Tactical and Emergency Communication**



Appendix: Introduction of the Technical Document (5/6)

Asia/Pacific Region Technical Document on ATN Performance

- ❑ **2.2.2 Rating of Operational Timing Performance in DO-274; Page 28-30**
 - REFERENCE to the assignment of Five Service Levels to each Communication Performance Parameter, and the assignment of Five Service Levels to 95% Transaction Time (TT_{95}) and Transaction Expiration Time (ET_{RCP}), etc. for each Service in Chapter 2.2.1
- ❑ **2.2.3 Proposed RCP parameter values of attributes in DO-274; Page 31**
 - PROPOSAL of Values of the Five Service Level, which are assigned to 95% Transaction Time and Transaction Expiration Time in Chapter 2.2.2
 - Service Levels: 1 – 5 are corresponds to 3 - 120 seconds for 95% Transaction Time (TT_{95}) and 5 – 240 seconds for Transaction Expiration Time (ET_{RCP})
- ❑ **2.2.4 Detail Communication Scenarios based on DO-274; Page 32-47**
 - DESCRIBING of proposed RCP Values (2.2.3) of 95% Transaction Time (TT_{95}) and Transaction Expiration Time (ET_{RCP}) according to the assigned Five Service Levels (2.2.2) for each of Five Services (2.2.1) (Communication Management, Planning, Strategic, Tactical and Emergency Communication) using Performance Statement Template



Appendix: Introduction of the Technical Document (6/6)

Asia/Pacific Region Technical Document on ATN Performance

□ 3. Technical Performance Requirements; Page 48-49

- REFERENCE to the description of Technical RCP Values in EUROCAE/RTCA WG-53/SC-189/SG6 Operational Performance Assessment (Assignment of value to each Transit Delay on Airborne, CSP and Ground for each service; ACL, ACM, DCL, DSC and D-ATIS)

□ 4. Summary; Page 50

- 'Planning Communication' and 'Strategic Communication' are the potential uses of data communications
- 'Tactical Communication' can be adapted by a specific airspace in the region
- 'Communications Management' need further studies, because of the operational aspect in the integrated voice/data communications.
- 'Emergency Communication' may not possibly be used in the data communication context in near future



**Your comments are extremely
appreciated.**

Thank you.

