

# **EUROCONTROL SPECIFICATION on Data Link Services**

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<b>Abstract</b>			
<p>This document is the EUROCONTROL Specification, developed under the EUROCONTROL Regulatory and Advisory Framework (ERAF), for an initial set of air traffic services supported by air-ground data link. The objective is to define a Specification that could be associated with the interoperability implementing rule on Data Link Services developed in accordance with the interoperability Regulation in the framework of the Single European Sky.</p>			
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Augustin Gheorghe		+32 2 7295075	CND/CoE/CNS

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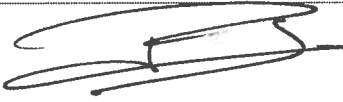




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## DOCUMENT APPROVAL

The following table identifies all management authorities who have successively approved the present issue of this document.

AUTHORITY		NAME AND SIGNATURE	DATE
CND/COE/CN/CO	Editor	 Mr Augustin GHEORGHE	10.02.2009
CND/COE/CN/CO Head of COM Unit		 Mr. Jacky POUZET	10.02.09
COM & AIM Project Manager		 Mr Martin ADNAMS	11.02.09
Deputy Director Network Development		 Mr Alex HENDRIKS	19.02.09
Deputy Director Single European Sky Implementation		 Mr Jean-Luc GARNIER	23/02/09
Director Cooperative Network Design		 Mr. Bo REDEBORN	24/02/09
Director General		<b>David McMILLAN</b> <b>Director General</b> Mr David MCMILLAN	02 MARS 2009

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## **EXECUTIVE SUMMARY**

This document is the EUROCONTROL Specification, developed under the EUROCONTROL Regulatory and Advisory Framework (ERAF), for an initial set of air traffic services supported by air-ground data link. The objective is to define a Specification that could be associated with the interoperability implementing rule on Data Link Services developed in accordance with the interoperability Regulation in the framework of the Single European Sky.

The current version of this EUROCONTROL Specification includes the data link services ACM, ACL, AMC and DLIC, operating over an ATN and VDL Mode 2 infrastructure.



## 1. INTRODUCTION

### 1.1 Purpose

1.1.1 This EUROCONTROL Specification on Data Link Services is developed to complement the Single European Sky (SES) interoperability implementing rule (hereafter called the DLS implementing rule) on the provision and use of data link services supported by air-ground communications [1]<sup>1</sup>.

1.1.2 The EUROCONTROL Regulatory and Advisory Framework (ERAF)<sup>2</sup> has set up the basis for the development of EUROCONTROL Specifications.

### 1.2 Scope

1.2.1 This EUROCONTROL Specification defines detailed requirements, explanatory materials and conformity assessment materials providing means of compliance (MOC) associated with the DLS implementing rule [1].

1.2.2 The scope of this document covers the implementation and the use of a number of data link services, derived from the ICAO standard Context Management (CM) and Controller Pilot Data Link Communication (CPDLC) applications.

1.2.3 In particular, separate independent “MOC elements” are specified for

- a) the data link services, including message element semantics,
- b) the end-to-end communications service and protocols,
- c) the associated procedures, and
- d) the air-ground subnetwork technology.

1.2.4 One or more of the “MOC element” specifications can be extended in the future to cover alternative means of compliance in these areas, without affecting the other “MOC elements.” For example, an alternative air-ground data link technology could be introduced without affecting the end-to-end communications service specification.

1.2.5 The EUROCONTROL Specification also provides the list of the documents and standards defining the requirements for the implementers in order to achieve compliance with the specification.

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<sup>1</sup> References given in square brackets in this document refer to the list of documents in Section 7.

<sup>2</sup> EUROCONTROL Regulatory and Advisory Framework:  
[http://www.eurocontrol.int/enprm/public/standard\\_page/enprm04002.html](http://www.eurocontrol.int/enprm/public/standard_page/enprm04002.html)

1.2.6 This EUROCONTROL Specification is intended to provide a definitive statement on the compliancy requirements for systems and procedures with respect to the referenced standards. As such, for each external standard, it identifies the baseline version of that standard and the changes to those standards that are required. Each identified change that is incorporated into this EUROCONTROL Specification includes the original reference.

1.2.7 The EUROCONTROL Specification applies to the following systems:

- a) Aircraft communication and display systems, including an ATN Router and an ATN End System;
- b) Air-Ground ATN Routers;
- c) Ground-Ground ATN Routers;
- d) Ground communication and display systems, including an ATN End System;
- e) Ground Data Recording equipment;
- f) VDL Mode 2 communications equipment.

1.2.8 The EUROCONTROL Specification includes requirements applicable to operational procedures in the following areas:

- ATM procedures for the operation of the identified data link services;
- Procedures for the management of names and addresses.

1.2.9 The following areas, though representing a requirement in the DLS implementing rule, are out of scope of this EUROCONTROL Specification:

- Human-machine interface details. Essential HMI requirements are specified, and those in EUROCAE Document ED-110B [9] are also included by reference. Details such as ergonomics and screen layout are not specified here.
- Security Policy. This is the subject of a separate Means of Compliance specification.
- Service level agreements. These are subject to individual agreement between air navigation service providers (ANSPs) and air-ground communication service providers (CSPs). It also includes Quality of Service monitoring and management.

## 1.3 Document Structure

1.3.1 The EUROCONTROL Specification document is composed of a 'Main Body', providing Introductory and Explanatory material and a number of normative

Annexes (“MOC elements”) providing detailed interoperability and compliance requirements.

1.3.2 This EUROCONTROL Specification comprises the following Chapters and Annexes:

- The present Chapter includes introductory material describing the purpose and scope of the EUROCONTROL Specification, its structure, and a description of the document conventions, abbreviations, definitions and the interoperability target.
- Chapter 2 introduces the data link services and options to be implemented, referring to the detailed requirements in Annex A.
- Chapter 3 introduces the end-to-end data link communications required to support the identified services, referring to the detailed requirements in Annex B.
- Chapter 4 introduces a number of additional areas affecting interoperability of the identified data link services. These include the associated procedures and flight planning aspects, ground recording functionality, and name and address registration, referring to the detailed requirements in Annex C.
- Chapter 5 introduces the air-ground data link technology. Currently, the only data link specified is based on VHF Digital Link Mode 2 (VDL-2) technology, with detailed requirements in Annex D.
- Chapter 6 describes the traceability between the means of compliance in this EUROCONTROL Specification and the regulatory provisions in the DLS implementing rule [1] referring to the detailed traceability tables in Appendix 1.
- Chapter 7 contains a list of reference documents.

1.3.3 Detailed interoperability and compliance requirements are specified in four normative Annexes (“MOC elements”), which form an integral part of this EUROCONTROL Specification.

- Annex A contains detailed requirements for the implementation of the identified data link services. It identifies the systems that are being deployed in order to provide those services, the system level requirements, and the external standards and documents applicable to each system. For each such standard, the baseline version is identified in Chapter 7, and any additional requirements are specified.
- Annex B contains detailed requirements for the implementation of the end-to-end communications formats and protocols to support the identified services.

- Annex C specifies associated procedures and flight planning requirements for the operation of the identified data link services largely by reference to existing ICAO PANS and regional supplementary procedures. It also defines provisions for ground recording of the data link messages, inter-centre coordination requirements and requirements for the registration and dissemination of names and addresses associated with the communication procedures.
- Annex D contains detailed requirements for the air-ground data link based on VHF Digital Link Mode 2 (VDL-2) technology.

1.3.4 Compliance requirements are provided where possible in the form of protocol and operational implementation compliance statement (PICS/OICS) tables giving a detailed statement of functional and protocol compliancy. These tables are generally contained in external standards referenced from this EUROCONTROL Specification.

## **1.4 Conventions**

1.4.1 Only the minimum subset of 'mandatory' requirements necessary for the correct and harmonised implementation of the EUROCONTROL Specification is specified. Mandatory items (requirements) within the EUROCONTROL Specification are clearly separated from non-mandatory items and are contained in the four normative Annexes.

1.4.2 Each requirement may be identified by reference to its unique paragraph number in this document.

1.4.3 Conventions for denoting requirements are as follows:

- 'Shall' - indicates a statement of specification, the compliance with which is mandatory to achieve the implementation of the EUROCONTROL Specification. It indicates a requirement which must be satisfied by all systems claiming conformity to the specification. Such requirements shall be testable and their implementation auditable.
- 'Should' - indicates a recommendation or best practice, which may or may not be satisfied by all systems claiming conformity to the EUROCONTROL Specification.
- 'May' – indicates an optional element.

## 1.5 Abbreviations and Definitions

### 1.5.1 Abbreviations

The following abbreviations are used throughout the Main Body and Annexes of this EUROCONTROL Specification:

A/N	Affirm or Negative
ACL	ATC Clearances service
ACM	ATC Communications Management service
ACSE	Association Control Service Element
ADM	Administration field (of NSAP address)
ADS	Automatic Dependent Surveillance
AEEC	Airlines Electronic Engineering Committee
AFI	Authority Format Identifier field (of NSAP address)
AMC	ATC Microphone Check service
ANSP	Air Navigation Service Provider
App	Application
ARS	Administrative Region Selector field (of NSAP address)
ASE	Application Service Element
ATC	Air Traffic Control
ATM	Air Traffic Management
ATN	Aeronautical Telecommunication Network
ATS	Air Traffic Services
ATSC	Air Traffic Services Communication
C	Conditional
CDA	Current Data Authority
CHG	Modification Message
CLNP	Connectionless Network Protocol
CLTP	Connectionless Transport Protocol
CM	Context Management
CND	Cooperative Network Design
CNS	Communications, Navigation, Surveillance
CoE	Centre of Expertise
COTR	Coordination and Transfer
CP	Presentation Connect PDU
CPA	Presentation Connect Accept PDU

CPDLC	Controller Pilot Data Link Communication
CPR	Presentation Connect Reject PDU
CSP	Communication Service Provider
CPR	Presentation Connect Reject PDU
DLIC	Data Link Initiation Capability service
DLS	Data Link Service(s)
DM	Downlink Message
EATMN	European Air Traffic Management Network
EC	European Commission
ED	EUROCAE Document
ERAF	EUROCONTROL Regulatory and Advisory Framework
ETIC	EUROCONTROL Inter Centre Test Tool
EUROCAE	European Organisation for Civil Aviation Equipment
FIS	Flight Information Service
HH	Hexadecimal digits
HMI	Human-Machine Interface
ICAO	International Civil Aviation Organisation
ICS	ATN Internet Communications Service
IDI	Initial Domain Identifier field (of NSAP address)
IDRP	Inter-Domain Routing Protocol
IEC	International Electrotechnical Commission
IETF	Internet Engineering Task Force
IFPS	Initial Flight Plan Processing System
IP	Internet Protocol
ISO	International Organisation for Standardisation
ITU-T	International Telecommunication Union - Standardization Sector
LACK	Logical Acknowledgement
LOC	Location field (of NSAP address)
LOF	Log On Forwarding (OLDI Message)
M	Mandatory
MOC	Means of Compliance
N	No Response
NAN	Next Authority Notified (OLDI Message)
NPDU	Network Protocol Data Unit
NSAP	Network Service Access Point

NSEL	Network Selector
O	Optional
OICS	Operational Implementation Conformance Statement
OLDI	On-Line Data Interchange
OPA	Operational Performance Assessment
OSA	Operational Safety Assessment
OSED	Operational Services and Environment Definition
OSI	Open Systems Interconnection
PANS	Procedures for Air Navigation Services
PDR	Proposed Defect Report (to ICAO Doc. 9705)
PER	Packed Encoding Rules (of Abstract Syntax Notation One)
PICS	Protocol Implementation Conformance Statement
PPDU	Presentation Protocol Data Unit
QoS	Quality of Service
R	ROGER
R/T	Radio Telecommunication.
R-ATSU	Receiving Air Traffic Services Unit
RCP	Required Communication Performance
RDF	Routing Domain Format field (of NSAP address)
RF	Radio Frequency
RPL	Repetitive Flight Plan
RTCA	Radio Technical Commission for Aeronautics, Inc.
SAC	Short Accept SPDU
SACC	Short Accept Continue SPDU
SARPs	ICAO Standards and Recommended Practices
SCN	Short Connect SPDU
SES	Single European Sky
SLA	Service Level Agreement
SNDCF	Sub-Network Dependent Convergence Function
SO	Safety Objective
SPDU	Session Protocol Data Unit
SPR	Safety and Performance Requirements
SQP	Signal Quality Parameter
SR	Safety Requirement
SRF	Short Refuse SPDU

SRFC	Short Refuse Continue SPDU
SYS	System Identifier field (of NSAP address)
T-ATSU	Transferring Air Traffic Services Unit
TC	Transport Connection
TP4	Transport Protocol Class 4
TPDU	Transport Protocol Data Unit
TSAP	Transport Service Access Point
TSEL	Transport Selector
ULCS	ATN Upper Layer Communications Service
UM	Uplink Message
VDL-2	Very High Frequency Digital Link Mode 2
VDR	VHF Data Radio
VER	Version field (of NSAP address)
VHF	Very High Frequency
W/U	WILCO or Unable
X.25	ITU-T Packet Switching standard
XID	Exchange Identifier
Y	Response Requested

### 1.5.2 Definitions

This section defines the terms specific to this EUROCONTROL Specification. Other definitions may be included by reference to other documents.

Interoperability Target	An interoperability target is a description of specific operational, functional and/or technical elements within the European ATM Network (EATMN) used to support the identification of regulatory and specification provisions. Used within a EUROCONTROL Specification, it provides a high level operational and services environment description that supports understanding of what is to be achieved.
MOC element	For the purposes of this EUROCONTROL Specification, a "MOC element" specifies a means of compliance with one or more elements of the interoperability target. A set of MOC elements can provide one or more means of complying with the overall requirements.
24-bit aircraft address	Unambiguous bit string assigned to an individual aircraft in accordance with ICAO Annex 10 Volume III, Part 1, Chapter 9 (Aircraft Addressing System) [4]



## 1.6 Interoperability Target

- 1.6.1 This section describes the Interoperability Target. This is explanatory material providing a high level operational and services environment description that supports understanding of what is to be achieved.
- 1.6.2 The interoperability target, excluding the air-ground subnetwork, is specified in the RTCA/EUROCAE Interoperability Requirements Standard for Aeronautical Telecommunication Network Baseline 1, Document ED-110B [9], Chapter 2. Within that chapter, ADS (§2.2.2) and FIS (§2.2.4) are excluded from the scope of this EUROCONTROL Specification. CPDLC (§2.2.3) refers only to “App Type 22”, incorporating the application message integrity check mechanism.
- 1.6.3 ED-110B in turn requires support of the ATN applications and supporting communication services defined in ICAO Doc 9705, second Edition [7] plus identified defect resolutions.
- 1.6.4 To ensure seamless operation, there are interoperability requirements at a number of distinct levels:
- a) Geographical  
For optimal efficiency, it is highly desirable that the Data Link Services are provided in a contiguous area and the RF coverage is as complete as practicable over the area in which the Data Link Services are operated. This aspect is covered by the airspace requirements in Article 1 (3) of the DLS implementing rule [1].
  - b) Procedural  
The selected data link services must be used in a consistent way (air and ground) to ensure a seamless service.
  - c) Human-machine interface (HMI)  
The HMI (air and ground) must offer the required input capabilities and display the required information. However, human factors / ergonomics are outside the scope of this EUROCONTROL Specification.
  - d) End-to-end  
Air and ground end systems must interwork at the technical level. The end system includes:
    - Data Link Application (e.g. CPDLC ASE);
    - ATN Upper Layers;
    - TP4 Transport Protocol.
  - e) Air-ground data link  
The communications subsystem on the aircraft must be capable of communicating with multiple communications subsystems on the ground. This includes:
    - VHF Data Link protocols (VDL-2);

- Airborne and air-ground ATN router protocols (CLNP, IDRP, Mobile SNDCEF);
- CSP service provision.

f) Ground-ground segment

A ground network with suitable performance characteristics must interconnect ATS units with CSPs. This includes:

- Ground-ground router protocols (CLNP, IP SNDCEF);
- CSP-CSP interconnection;
- CSP – ANSP communications service provision.

CSP-CSP and CSP-ANSP interconnections are outside the scope of this EUROCONTROL Specification.

- 1.6.5 To enable the interoperability target to be reached, this EUROCONTROL Specification specifies means of compliance largely by reference to external standards and documents maintained by ICAO, EUROCAE and the AEEC. In turn, these documents also reference many ISO/IEC standards and ITU-T Recommendations.
- 1.6.6 EUROCAE ED-110B [9] may be regarded as the primary reference for the interoperability requirements. ED-120 [10] is the main reference for the Safety and Performance requirements (SPR) for the identified data link services. However, the scope of these EUROCAE documents (and their RTCA equivalents) is wider than the scope of the DLS implementing rule.
- 1.6.7 The DLS implementing rule [1] identifies in Annex II the data link services to be supported, and their ED-120 safety and performance requirements. Such requirements are necessary, but not sufficient, to ensure interoperability. This EUROCONTROL Specification defines specific means of compliance that address the interoperability issues, including the optional elements of the identified data link services, and, in consequence, the parts of the EUROCAE SPR and Interoperability specifications that are also applicable. Other means of compliance, outside the scope of this EUROCONTROL Specification are also possible, provided they meet the requirements specified in the DLS implementing rule.
- 1.6.8 The referenced EUROCAE documents and the other external standards are under various degrees of change control. This EUROCONTROL Specification references such change control mechanisms as necessary (e.g. ICAO PDRs, EUROCAE Improvement Suggestion Forms) that are used by the bodies responsible for maintaining the referenced standards and documents. All relevant changes have been incorporated in this EUROCONTROL Specification.
- 1.6.9 For instance ED-110B [9] identifies a number of PDR changes to ICAO Doc. 9705 edition 2 [7]. Any additional PDRs that are required would be identified in this EUROCONTROL Specification.
- 1.6.10 The means of compliance in this EUROCONTROL Specification include:

- a) Interoperability requirements for each Data Link Service (DLIC, ACL, ACM, AMC), making reference also to the complete definition of safety requirements in ED-120 [10].
- b) Specification of end-to-end communications. This includes the ATN End Systems (dialogue service, upper layers, TP4, CLNP, IDRP, mobile SND CF) and Data Link Applications (CM, CPDLC), making reference to interoperability requirements in ED-110B [9]. It also includes Performance requirements (by reference to ED-120), message set support (mandatory and optional message elements), specification of how unsupported messages are handled, etc.
- c) Procedures for operation of the Data Link Services making reference to generally applicable requirements in ICAO PANS-ATM [5] and Regional Supplementary Procedures [6], and specifications for network operations. This includes organisational principles, Naming, Addressing and Registration.
- d) Specification of air-ground communications link, using VDL-2.
- e) Implementation Conformance Statement proformas (PICS/OICS) per stakeholder type (aircraft systems, CSPs, ANSPs).

Safety and performance requirements are covered in the identified SPR standard (ED-120 [10]), which is the product of the operational safety assessment (OSA) and the operational performance assessment (OPA), based on the operational services and environment definition (OSED). The OSA determines, validates, and allocates requirements to ensure that the CNS/ATM system, as described in the OSED, is acceptably safe. The OPA derives and/or validates required communication performance (RCP) type.

## **2. DATA LINK SERVICES**

### **2.1 General**

2.1.1 The Data Link Services required by the DLS implementing rule, and therefore within the scope of this EUROCONTROL Specification are:

- a) DLIC - Data Link Initiation Capability (log on and contact);
- b) ACM - ATC Communications Management;
- c) ACL - ATC Clearances;
- d) AMC - ATC Microphone Check.

2.1.2 For the CPDLC-based services, ACM, ACL and AMC, it is necessary to specify unambiguously exactly which CPDLC / PANS-ATM message elements must be supported by air and ground systems, as well as the level of support (e.g. originate, receive-and-process, receive-and-ignore).

2.1.3 Annex A specifies requirements for the implementation of the identified Data Link Services.

## **2.2 DLIC**

2.2.1 DLIC is a data link service that is derived from the Context Management application to provide the necessary information to make data link communications possible between an ATS Unit and aircraft.

2.2.2 The DLIC service makes it possible to:

- Unambiguously associate flight data from the aircraft with flight plan data stored by an ATS Unit.
- Exchange the supported application type and version information and deliver application address information.

2.2.3 Only the Logon and Contact functions of DLIC are within the scope of this EUROCONTROL Specification. (Operational support of the Update function is out of scope, although the associated primitives are handled to the extent necessary for interoperability):

- The Logon service allows the aircraft to initiate the data link service. The logon parameters provide aircraft identification and application addresses to ATS units for identification and flight plan association as well as for use in subsequent CPDLC exchanges.
- The Contact service allows the Ground System to request that an aircraft logon with another Ground System.

2.2.4 The DLIC service is air-initiated, as specified in ED-110B [9].

## **2.3 ACM**

2.3.1 The ACM service provides automated assistance to flight crew and controllers for conducting the transfer of ATC communications (voice and CPDLC), respecting the operational rule that there is only one ATC controlling authority at any given time.

2.3.2 The ACM service permits:

- the initial establishment of CPDLC service between an aircraft and an ATS Unit;
- the transparent transfer of data communications, concurrently with the transfer of voice communications for a flight from one ATS Unit (the Transferring ATS Unit, T-ATSU) to the next ATS Unit (the Receiving ATS Unit, R-ATSU), or the instruction to change voice channels within an ATS Unit or sector;

- the termination of CPDLC with an ATS Unit.

2.3.3 Two variants of the ACM service are described in ED-110B [9], identified as "Case A" and "Case B". The requirement in this EUROCONTROL Specification is to support Case A, in which Transfer instructions are passed without concatenation of the operational instruction UM135 CONFIRM ASSIGNED LEVEL.

*Note: ACM Case A corresponds to the agreed operating method in European continental airspace, employed by existing data link programmes. Other regions outside the scope of the DLS implementing rule might require support of Case B, in which Transfer instructions are passed with concatenation of operational instruction UM135 CONFIRM ASSIGNED LEVEL, requiring specific response DM38 ASSIGNED LEVEL. Therefore it is recommended (but not required) that avionics also support Case B, to foster global interoperability.*

2.3.4 No explicit mechanism is defined for the ground system to signal to the airborne system that it supports "Case A" procedures. This information is signalled implicitly by the fact that the Transfer instruction does not have a concatenated UM135 CONFIRM ASSIGNED LEVEL message element. Airborne systems, upon detecting the absence of the UM135 element in the Transfer instruction message, will consequently not include a DM38 ASSIGNED LEVEL element in the response message.

## 2.4 ACL

2.4.1 The ACL service allows flight crews and controllers to conduct operational exchanges. The ACL service permits:

- flight crew to make requests and reports to controllers;
- controllers to issue clearances, instructions and notifications to flight crew.

2.4.2 ACL is intended for use in non-time-critical situations and may be applied instead of or in combination with voice communications.

2.4.3 The ACL service will only be available after successful execution of the ACM service.

## 2.5 AMC

2.5.1 The AMC service allows a controller to send an instruction to all CPDLC equipped aircraft in a given sector, at the same time, in order to instruct flight crews to verify that their voice communication equipment is not blocking the sector's voice channel. This instruction will be issued only to those aircraft for which the controller currently has responsibility.

- 2.5.2 The AMC service is available to controllers only after execution of the ACM service.

### **3. END-TO-END COMMUNICATIONS**

#### **3.1 General**

- 3.1.1 This section and the associated Annex (Annex B – Specification of End-to-End Communications) contain explanatory material and requirements for end-to-end data link communications.
- 3.1.2 The emphasis is on end-to-end communication based on the ATN upper layer and internet communications services (ULCS and ICS).

#### **3.2 ATN Communications Services**

- 3.2.1 The ATN upper layer communications service (ULCS) provides the CM and CPDLC applications with a Dialogue Service used to establish, maintain and terminate connections between air and ground end systems.
- 3.2.2 The ULCS also incorporates a minimal profile of the OSI Session and Presentation layers and some elements of the application layer, including the Association Control Service Element (ACSE).
- 3.2.3 The ATN internet communications service (ICS) provides end to end communications to fixed and mobile end systems over various different types of subnetwork. It provides the Class 4 transport service (TP4) used by the ULCS. It specifies the use of connectionless network protocol (CLNP) for packet forwarding and inter-domain routing protocol (IDRP) for updating the routing information used by intermediate systems.

#### **3.3 ATN Applications**

- 3.3.1 The CPDLC application entity allows ground and air systems to establish, maintain and terminate a relationship for the exchange of operational CPDLC messages, which are composed of uplink and downlink message elements.
- 3.3.2 The “Protected Mode” of CPDLC is invoked, in which all CPDLC message exchanges use the default end-to-end application message integrity check mechanism to verify the message integrity and ensure that the recipient and sender are as expected.

*Note: Only the “protected mode” CPDLC application (previously known as “PM-CPDLC”) including the application message integrity check (application type 22) is required. The previously defined CPDLC without this feature (application type 2) is excluded.*

3.3.3 The CM application is a system application used to establish communication between air and ground end systems and to exchange addressing and flight plan information enabling unambiguous association of flights with flight plans in the ground systems.

### **3.4 System Requirements**

3.4.1 Compliant aircraft are installed with an ATN Airborne End System and implement the CM and CPDLC air-user and pilot interface. A VHF Data Radio (VDR) is also required in order to support VDL Mode 2.

3.4.2 No compliance conditions apply to the avionics architecture adopted.

3.4.3 Compliant ground systems include an ATN Ground End System and implement the CM and CPDLC ground-user and controller interface.

3.4.4 Air and ground end systems are interconnected by means of a network of VDL Mode 2 ground stations and associated data communications infrastructure.

3.4.5 The detailed compliancy requirements for the implementation of end to end communications are set out in Annex B of this EUROCONTROL Specification.

## **4. ASSOCIATED PROCEDURES**

### **4.1 General**

4.1.1 This chapter introduces a number of additional areas that affect interoperability and that are necessary to provide support for seamless operation of the identified data link services. These include:

- the associated operational procedures;
- flight planning aspects;
- coordination between adjacent ATS units;
- ground recording functionality;
- name and address registration and dissemination.

### **4.2 Operational Procedures**

4.2.1 Annex C lists the minimum requirements for the ATS procedures associated with the provision of the specified Data Link Services.

4.2.2 Note that the existence of a CPDLC connection between the ATS unit and the aircraft does not exempt the pilot and ATC from applying the relevant ICAO provisions in the event of radio communication failure.

4.2.3 ICAO Annex 2 – Rules of the Air [16], requires that a pilot establishes two way communication and maintains a continuous watch of the air-ground voice communication channel, including the situation where CPDLC is established. When the pilot cannot comply with the requirement above, the provisions stipulated for the event of radio communication failure apply.

### **4.3 Flight Planning Aspects**

4.3.1 Annex C specifies requirements for the information to be included in initial flight plans to support the data link communications mechanisms. This includes the need to incorporate the 24-bit aircraft address into the flight plan for flights intending to use ATN based CPDLC.

### **4.4 Inter-Centre Coordination**

4.4.1 Annex C specifies requirements for the information to be exchanged between ATC centres to support the seamless provision of data link services.

4.4.2 This includes identification of the OLDI messages concerned, as well as interoperability and performance requirements for the data exchanges.

4.4.3 Ground-ground forwarding of the aircraft Logon information is the default mechanism used between data link equipped ground systems to exchange aircraft data link parameters. The DLIC Contact service is the fall-back (see A.2.5.10 in Annex A).

### **4.5 Ground Recording of Data Link Messages**

4.5.1 Annex C elaborates on the information required to be recorded by ground systems, in accordance with ICAO recording requirements. These are minimum requirements for recording the data link exchanges for audit and incident investigation purposes.

4.5.2 Neither the DLS implementing rule nor this EUROCONTROL Specification imposes any requirements on the airborne recording of data link communications.

### **4.6 Naming and Addressing**

4.6.1 Annex C also specifies requirements for specifying, maintaining and disseminating unambiguous name and address information required for safe and efficient operation of the data link communications system.



4.6.2 The ATN NSAP address of air traffic service providers' ground systems is illustrated in Figure 1, with fields including either fixed values or variable values (expressed in Hexadecimal format, HH):

**Figure 1: ATN Ground System NSAP Address format for air traffic service providers**

AFI	IDI	VER	ADM	RDF	ARS	LOC	SYS	NSEL
47	0027	81	HHHHHH	00	HHHHHH	HHHH	HHHHHHHHHHHH	HH

4.6.3 The CM ATN Application Address is composed of two elements:

- a) the ATN NSAP Address element, as above;
- b) the CM ATN TSAP Selector element (CM TSEL) which locates the Transport Service User for the CM application within the ATN System.

*Note: In ATN, as the Session and Presentation address selectors are not used, the ATN TSAP Selector directly locates the ATN Application within the ATN System.*

## 5. AIR-GROUND DATA LINK

5.1 Annex D specifies minimum requirements for the implementation of the air-ground data link and supporting infrastructure.

5.2 The data link technology is VHF Digital Link Mode 2.

## 6. TRACEABILITY TO REGULATORY PROVISIONS

6.1 EUROCONTROL Specifications providing means of compliance to SES regulatory material are required to demonstrate how they meet regulatory requirements and are required to include (notably through appropriate tables) elements showing clear traceability between specifications and the relevant provisions within the regulatory material to which they provide MOCs.

6.2 This EUROCONTROL Specification provides means of compliance to SES regulatory material and therefore includes an implementation conformance statement template which allows the users of the specification to record their level of compliance with the specification.

6.3 The template:

- a) allows the user to indicate conformity or non-conformity with the requirements ('shall' items) of the EUROCONTROL Specification
- b) allows the user to describe any reasons or mitigations in the case of declaration of non-conformity.

- 6.4 The implementation conformance statement template also allows users to describe their degree of conformity with recommended items ('should' statements).
- 6.5 The Annexes to this EUROCONTROL Specification provide separate tables for the various elements of the specification, facilitating possible additional future MOCs for any/all of the separate functional areas.
- 6.6 Appendix 1 provides specific traceability tables between the Articles and Annexes of the DLS implementing rule [1] and the provisions of this EUROCONTROL Specification.

## **7. LIST OF REFERENCES**

### **7.1 Description of References**

- 7.1.1 This EUROCONTROL Specification incorporates by reference a number of specifications and standards maintained by ICAO, EUROCAE and the AEEC. In turn, these documents also reference many ISO, ITU-T and IETF standards. A list of the current versions of these standards is provided for information in Appendix 2.
- 7.1.2 Primary references are those referred to in the requirements of this EUROCONTROL Specification, and which therefore constitute an integral part of this EUROCONTROL Specification.
- 7.1.3 Associated references are those standards and other documents which are referenced from recommendations or explanatory material and are therefore not essential for implementation.

### **7.2 Primary References**

- [1] Commission Regulation (EC) No. 29/2009, of 16 January 2009, laying down requirements on data link services for the single European sky OJ L 13/3 (17.1.2009),
- [2] ICAO Convention on International Civil Aviation, Annex 10 — Aeronautical Telecommunications, Volume II — Communication Procedures including those with PANS status, Sixth edition – October 2001, incorporating Amendment 83 (20/07/2008)
- [3] [VDL SARPs] ICAO Convention on International Civil Aviation, Annex 10 — Aeronautical Telecommunications, Volume III, – Communication Systems, Part I – Digital Data Communication Systems, Second Edition – July 2007, incorporating Amendment 83 (20/07/2008). ISBN 92-9194-245-6, Chapter 6 – VHF Air-ground Digital Link (VDL)
- [4] ICAO Annex 10 to the Convention on International Civil Aviation, Annex 10 — Aeronautical Telecommunications, Volume III, – Communication Systems, Part I – Digital Data Communication Systems, Second Edition – July 2007,

- incorporating Amendment 83 (20/07/2008). ISBN 92-9194-245-6, Chapter 9 – Aircraft Addressing System
- [5] [PANS-ATM] ICAO Doc. 4444-ATM/501 – Procedures for Air Navigation Services - Air Traffic Management, Fifteenth Edition — 2007, incorporating Amendments 1 – 5. ISBN 978-92-92310-11-0
- [6] Amendment to ICAO Doc 7030/5 Regional Supplementary Procedures European Region, (Serial No. EUR/NAT-S 08/1 – EUR), (approved 14 Nov 2008)
- [7] ICAO Doc. 9705-AN/956 – Manual of Technical Provisions for the Aeronautical Telecommunications Network (ATN) Second Edition, December 1999, including identified PDRs.
- [8] ICAO Doc. 9776/AN970 – Manual on VHF Digital Link (VDL) Mode 2, first edition, 2001
- [9] EUROCAE Document ED-110B / RTCA DO-280B - Interoperability Requirements Standard for Aeronautical Telecommunication Network Baseline 1 (ATN B1 INTEROP STANDARD), December 2007
- [10] EUROCAE Document ED-120 / RTCA DO-290 - Safety and Performance Requirements Standard for Air Traffic Data Link Services In Continental Airspace (SPR IC), May 2004, including Change 1 (April 2007) and Change 2 (October 2007)
- [11] EUROCAE Document ED-111, Functional Specifications for CNS/ATM Ground Recording, July 2002 including Amendment 1 (30/07/2003)
- [12] EUROCONTROL Specification For On-Line Data Interchange (OLDI), EUROCONTROL-SPEC-0106, Edition 4.1, 16 January 2008 [Recognised as SES Community specification, OJ C 149, 14.6.2008, p.22]
- [13] ARINC Specification 631-5, VHF Digital Link (VDL) Mode 2 Implementation Provisions (Published 3 December 2008)
- [14] ICAO EUR Doc 011, EUR Frequency Management Manual for Aeronautical Mobile and Aeronautical Radio Navigation Services, ICAO European and North Atlantic Office, Edition 2008

### **7.3 Associated References**

- [15] ICAO Convention on International Civil Aviation, Annex 1 — Personnel Licensing, 10th edition, incorporating Amendments 1–167, July 2006. ISBN 92-9194-750-4
- [16] ICAO Convention on International Civil Aviation, Annex 2 — Rules of the Air, 10th edition, incorporating Amendments 1–38, July 2005. ISBN 92-9194-561-7
- [17] [ATN SARPs] ICAO Convention on International Civil Aviation, Annex 10 — Aeronautical Telecommunications, Volume III, – Communication Systems, Part I – Digital Data Communication Systems, First Edition – July 1995, incorporating Amendment 81 (23/11/2006). ISBN 92-9194-245-6, Chapter 3 – Aeronautical Telecommunication Network (ATN)

- [18] ICAO Draft Doc. 9880-AN/466 Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI standards and protocols, Part I – Air-Ground Applications, 1st edition (draft v1.1), November 2006
- [19] ISO/IEC 8208:2000 Information technology -- Data communications -- X.25 Packet Layer Protocol for Data Terminal Equipment, Edition 4 (2000-11-16)
- [20] Commission Regulation (EC) No 1032/2006 of 6 July 2006 laying down requirements for automatic systems for the exchange of flight data for the purpose of notification, coordination and transfer of flights between air traffic control units, OJ L 186/27 (7.7.2006)
- [21] ARINC Characteristic 750-4, VHF Data Radio (2004)
- [22] Commission Regulation (EC) No 30/2009 of 16 January 2009 amending Regulation (EC) No 1032/2006 as far as the requirements for automatic systems for the exchange of flight data supporting data link services are concerned, OJ L 13/20 (17.1.2009)

## ANNEX A : SPECIFICATION OF DATA LINK SERVICES

### A.1 CONFIGURATION CONTROL

#### A.1.1 MOC ELEMENT IDENTIFICATION

MOC_Title	MOC_Version	MOC_Edition
MOC_DLS1_DLS	1	1

#### A.1.2 MOC ELEMENT CHANGE RECORD

The following table records the complete history of the successive editions of MOC specifications.

Version Number	Edition Number	Edition Date	Reason for Change	Sections Affected
1	1	17/12/2008	Initial specification	All

#### A.1.3 MOC ELEMENT TRACEABILITY TOWARDS REGULATORY PROVISIONS

The following table records the traceability history of regulatory provisions associated with this MOC element.

Version Number	Edition Number	Implementing rule references	References of regulatory provisions	Validation date
1	1	DLS IR [1]	Annex II: sections 1 to 4	17/12/2008

#### A.1.4 MOC ELEMENT TRACEABILITY TOWARDS INTERNATIONAL STANDARDS

The following table records the traceability of international standards associated with this MOC element.

International standards identification	References to text parts used to derive MOC specifications	Standards text incorporated by reference into the MOC element
ED-110B [9]		INTEROP: Chapters 4.1 - 4.5 inclusive.
ED-120 [10]	Service Descriptions: 4.1.1, 5.1.1, 5.2.1, 5.3.1.	Safety Requirements: 4.2.2, 5.1.2.3, 5.2.2.3, 5.3.2.3 Performance Requirements: 4.3.2, 5.1.3.2, 5.2.3.2, 5.4.3.2

## A.2 REQUIREMENTS AND EXPLANATORY MATERIALS

### A.2.1 General Requirements

*Note 1: This Annex specifies the MOC element for the specified data link services: ACL, ACM, AMC and DLIC as identified in Annex II of the DLS implementing rule [1].*

*Note 2: This MOC element is completely specified by the provisions in this Annex.*

*Note 3: This normative Annex is an integral part of this EUROCONTROL Specification.*

*Note 4: The set of uplink and downlink message elements specified in this Annex is derived from the "Baseline 1" specification for continental airspace in EUROCAE Documents ED-110B[9] [9] and ED-120 [10][10]. This is a subset of the message elements defined in ICAO Doc 4444 (PANS-ATM) [5][5]. Message elements outside of this subset are outside the scope of this EUROCONTROL Specification; the corresponding communications will continue to be performed by voice R/T communication, which remains the primary means of communication in all cases.*

#### Avionics

- A.2.1.1 In airborne systems, a means shall be provided to appropriately display data link messages and to elicit crew input (HMI).
- A.2.1.2 All operational uplink message (UM) elements that are implemented by the aircraft system in support of the ACL, ACM and AMC services shall be displayed to the pilot in accordance with ED-110B [9].
- A.2.1.3 Uplink CPDLC messages not supported by the aircraft implementation shall result in an appropriate error response, as defined in ED-110B, being sent to the ground system.
- A.2.1.4 Aircraft systems shall be able to generate and send all downlink message (DM) elements that are implemented in support of the ACL, ACM and AMC services.

*Note 1: Mandatory and Optional downlink message elements are specified by reference to Table A-2 and Table A-4.*

*Note 2: Response messages to uplinks that are not supported do not have to be available for sending, nor do "unsolicited" downlink messages.*

#### Ground Systems

- A.2.1.5 In Ground Systems, a means shall be provided to display data link messages and to elicit controller input (HMI).
- A.2.1.6 All CPDLC downlink message (DM) elements that are implemented in support of the ACL, ACM and AMC services shall be displayed to the controller in accordance with ED-110B.
- A.2.1.7 Downlink CPDLC messages not supported by the implementation shall result in an appropriate error response, as defined in ED-110B, being sent to the airborne system.

- A.2.1.8 Ground Systems shall be able to generate and send all uplink message (UM) elements that are implemented in support of the ACL, ACM and AMC services.

*Note: Mandatory and Optional uplink message elements are specified by reference to Table A-1, Table A-3 and Table A-5.*

*Encoding of latitude and longitude*

- A.2.1.9 When latitude and longitude are included in CPDLC message elements, the sending Ground System shall use the (degrees, minutes, seconds) format.

*Note: This requirement is intended to optimise the avionics systems processing efficiency.*

Common Interoperability Requirements

*Precedence*

- A.2.1.10 In the event of a conflict between the interoperability requirements expressed in ED-110B [9] and the requirements in this EUROCONTROL Specification, the latter shall take precedence.

*Use of Logical Acknowledgement*

- A.2.1.11 The Logical Acknowledgement (LACK) messages (downlink message element DM100 and uplink message element UM227) shall be used in ACL and ACM message exchanges.

*Note: The implementation of uplink message UM233 USE OF LOGICAL ACKNOWLEDGEMENT PROHIBITED is therefore not required by ground systems. This requirement does not remove the need for airborne systems to comply with the provisions associated with a "USE OF LOGICAL ACKNOWLEDGEMENT PROHIBITED" response, as other airspace regions may not use LACK.*

Common Performance Requirements

- A.2.1.12 Implementations of Systems and Services shall be compliant with the associated Performance Requirements specified by EUROCAE ED-120 [10].

Common Safety Requirements

- A.2.1.13 Implementations of Systems and Services shall be compliant with the associated Safety Requirements specified by EUROCAE ED-120 [10].

## A.2.2 Specification of Data Link Service ACM

	Defined in	Interop	Safety	Performance
ACM	ED-120 §5.1.1.1 to 5.1.1.1.7, 5.1.1.2	ED-110B §4.2, 4.3	ED-120 §5.1.2 (OSA)	ED-120 §5.1.3 (OPA)

### Specific Interoperability Requirements

A.2.2.1 Implementations of the ACM service shall comply with the air-ground interoperability requirements specified in ED-110B [9] chapter 4.2 and 4.3, except where indicated otherwise in this EUROCONTROL Specification.

*Note: Interoperability aspects of ground-ground coordination using LOF and NAN messages in support of the ACM service are covered by the OLDI Specification [12] (see Annex C.2.3).*

A.2.2.2 The ACM service shall be implemented in compliance with “Case A” as specified in ED-110B [9], paragraph 4.3.4.

A.2.2.3 When issuing a data link transfer instruction, compliant ground systems shall therefore send the requisite message element (UM117 CONTACT or UM120 MONITOR) in a CPDLC-End Request without concatenating a UM135 CONFIRM ASSIGNED LEVEL message element.

A.2.2.4 When responding positively to a data link transfer instruction in the applicable airspace, compliant air systems shall send a WILCO response without concatenating a DM38 ASSIGNED LEVEL message element.

A.2.2.5 **Recommendation:** Air systems should be capable of handling ED-110B “Case B”, i.e. of processing a concatenated UM135 message element and responding with a concatenated DM38 message element.

*Note: Avionics may need to be capable of working according to Case “A” or Case “B”, depending on the geographical area of operation. The above Recommendation relaxes the ED-110B requirement that an aircraft must be able to interact correctly with both Case A and Case B, since Case B is out of scope of this EUROCONTROL Specification.*

A.2.2.6 When UM117 CONTACT is received, the pilot will select the instructed voice frequency and will contact the named unit by voice; no DM89 MONITORING message shall be sent in these circumstances.

*Note: The above requirement differs from ED-110B [9] which requires (in Table 4-3, item 6a) aircraft to send a message containing DM89 (MONITORING [unitname] [frequency]) irrespective of whether the transfer instruction received is UM117 (CONTACT) or UM120 (MONITOR).*

### Uplink Message Elements

A.2.2.7 Ground end systems shall allow the sending of the CPDLC message elements identified by “M” (Mandatory) in the “Ground” column of Table A-1, with valid parameters where applicable.

A.2.2.8 **Recommendation:** Ground end systems should additionally allow transmission of the message elements identified by “O” (Optional) in the “Ground” column of Table A-1.

A.2.2.9 Air end systems shall have the capability to receive and process the message elements identified by “M” in the “Air” column of Table A-1.



**Table A-1: ACM Uplink Message Element Support Requirements**

Element ID	Message Element Content	Ground	Air
UM 117	CONTACT [unitname] [frequency]	M	M
UM 159	ERROR [errorInformation]	M	M
UM 160	NEXT DATA AUTHORITY [facility]	M	M
UM 183	[free text] – see below	M	M
UM 227	LOGICAL ACKNOWLEDGEMENT	M	M
UM 120	MONITOR [unitname] [frequency]	O	M

A.2.2.10 The “free text” content of UM183 when used to indicate the Unit Name in the ACM service shall be formatted as specified in ED-110B [9], paragraph 3.3.7.6.2.3.

*Note: The UM183 text format in the above case is “CURRENT ATC UNIT <facility designation>, <facility name>, <facility function>”*

Downlink Message Elements

A.2.2.11 Air end systems shall allow the sending of the message elements identified by “M” (Mandatory) in the “Air” column of Table A-2, with valid parameters where applicable.

A.2.2.12 Ground end systems shall have the capability to receive and process the message elements identified by “M” (Mandatory) in the “Ground” column of Table A-2.

A.2.2.13 **Recommendation:** Ground end systems should have the capability to receive and process the message elements identified by “O” (Optional) in the “Ground” column of Table A-2.

**Table A-2: ACM Downlink Message Element Support Requirements**

Element ID	Message Element Content	Ground	Air
DM0	WILCO	M	M
DM1	UNABLE	M	M
DM2	STANDBY	M	M
DM62	ERROR [errorInformation]	M	M
DM63	NOT CURRENT DATA AUTHORITY	M	M
DM98	[freetext] (for additional error information)	M	M
DM99	CURRENT DATA AUTHORITY	M	M
DM100	LOGICAL ACKNOWLEDGEMENT	M	M
DM107	NOT AUTHORIZED NEXT DATA AUTHORITY	M	M
DM89	MONITORING [unitname] [frequency]	O	M

Specific Performance Requirements

A.2.2.14 ACM implementations shall satisfy the performance requirements specified in ED-120 [10] chapter 5.1.3.2.

Specific Safety Requirements

A.2.2.15 ACM implementations shall satisfy the safety requirements specified in ED-120 [10] chapter 5.1.2.3, excluding requirements relating to downstream clearance.

**A.2.3 Specification of Data Link Service ACL**

	Defined in	Interop	Safety	Performance
ACL	ED-120 §5.2.1.1.1 to 5.2.1.1.4, 5.2.1.2	ED-110B §4.2, 4.4	ED-120 §5.2.2 (OSA)	ED-120 §5.2.3 (OPA)

Specific Interoperability Requirements

A.2.3.1 Implementations of the ACL service shall comply with the air-ground interoperability requirements specified in ED-110B [9] chapter 4.2 and 4.4, except where indicated otherwise in this EUROCONTROL Specification.

Uplink Message Elements

A.2.3.2 Ground end systems shall allow the sending of the message elements identified by “M” (Mandatory) in the “Ground” column of Table A-3, with valid parameters where applicable.

A.2.3.3 Air end systems shall have the capability to receive and process the message elements identified by “M” in the “Air” column of Table A-3.

A.2.3.4 **Recommendation:** Ground end systems should additionally allow the sending of the message elements identified by “O” (Optional) in the “Ground” column of Table A-3, with valid parameters where applicable.

*Note: The “Response” column of Table A-3 indicates the type of response expected in a subsequent downlink message; it is referenced in sections A.2.3.13 and A.2.3.14 below. In order of precedence, “W/U” indicates WILCO or UNABLE, “A/N” indicates AFFIRM or NEGATIVE; “R” indicates ROGER; “Y” indicates that a response is requested; “N” indicates No Response (unless LACK required). A complete list of valid responses is given in ICAO Doc 9705 [7].*

**Table A-3: ACL Uplink Message Element Support Requirements**

Element ID	Message Element Content	Response	Ground	Air
UM0	UNABLE	N	M	M
UM1	STANDBY	N	M	M
UM19	MAINTAIN [level]	W/U	M	M
UM20	CLIMB TO [level]	W/U	M	M
UM23	DESCEND TO [level]	W/U	M	M
UM74	PROCEED DIRECT TO [position]	W/U	M	M
UM159	ERROR [errorInformation]	N	M	M
UM162	SERVICE UNAVAILABLE	N	M	M
UM183	[freetext] (for additional error information)	N	M	M
UM190	FLY HEADING [degrees]	W/U	M	M
UM227	LOGICAL ACKNOWLEDGMENT	N	M	M
UM3	ROGER	N	O	M

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Element ID	Message Element Content	Response	Ground	Air
UM4	AFFIRM	N	O	M
UM5	NEGATIVE	N	O	M
UM26	CLIMB TO REACH [level] BY [time]	W/U	O	M
UM27	CLIMB TO REACH [level] BY [position]	W/U	O	M
UM28	DESCEND TO REACH [level] BY [time]	W/U	O	M
UM29	DESCEND TO REACH [level] BY [position]	W/U	O	M
UM46	CROSS [position] AT [level]	W/U	O	M
UM47	CROSS [position] AT OR ABOVE [level]	W/U	O	M
UM48	CROSS [position] AT OR BELOW [level]	W/U	O	M
UM51	CROSS [position] AT [time]	W/U	O	M
UM52	CROSS [position] AT OR BEFORE [time]	W/U	O	M
UM53	CROSS [position] AT OR AFTER [time]	W/U	O	M
UM54	CROSS [position] BETWEEN [time] AND [time]	W/U	O	M
UM55	CROSS [position] AT [speed]	W/U	O	M
UM61	CROSS [position] AT AND MAINTAIN [level] AT [speed]	W/U	O	M
UM64	OFFSET [specifiedDistance] [direction] OF ROUTE	W/U	O	M
UM72	RESUME OWN NAVIGATION	W/U	O	M
UM79	CLEARED TO [pos] VIA [route clearance]	W/U	O	M
UM80	CLEARED [route clearance]	W/U	O	M
UM82	CLEARED TO DEVIATE UP TO [specifiedDistance] [direction] OF ROUTE	W/U	O	M
UM92	HOLD AT [position] AS PUBLISHED MAINTAIN [level]	W/U	O	M
UM94	TURN [direction] HEADING [degrees]	W/U	O	M
UM96	CONTINUE PRESENT HEADING	W/U	O	M
UM106	MAINTAIN [speed]	W/U	O	M
UM107	MAINTAIN PRESENT SPEED	W/U	O	M
UM108	MAINTAIN [speed] OR GREATER	W/U	O	M
UM109	MAINTAIN [speed] OR LESS	W/U	O	M
UM116	RESUME NORMAL SPEED	W/U	O	M
UM123	SQUAWK [code]	W/U	O	M
UM133	REPORT PRESENT LEVEL	Y	O	M
UM148	WHEN CAN YOU ACCEPT [level]	Y	O	M
UM165	THEN	N	O	M
UM171	CLIMB AT [verticalRate] MINIMUM	W/U	O	M
UM172	CLIMB AT [verticalRate] MAXIMUM	W/U	O	M
UM173	DESCEND AT [verticalRate] MINIMUM	W/U	O	M
UM174	DESCEND AT [verticalRate] MAXIMUM	W/U	O	M
UM179	SQUAWK IDENT	W/U	O	M
UM196	[freetext]	W/U	O	M
UM203	[freetext]	R	O	M
UM205	[freetext]	A/N	O	M
UM211	REQUEST FORWARDED	N	O	M
UM213	[facilitydesignation] ALTIMETER [altimeter]	R	O	M
UM215	TURN [direction] [degrees]	W/U	O	M
UM222	NO SPEED RESTRICTION	R	O	M
UM231	STATE PREFERRED LEVEL	Y	O	M
UM232	STATE-TOP-OF-DESCENT	Y	O	M
UM237	REQUEST AGAIN WITH NEXT UNIT	N	O	M

**Downlink Message Elements**

- A.2.3.5 Air end systems shall allow the sending of the message elements identified by “M” (Mandatory) in the “Air” column of Table A-4, with valid parameters where applicable.
- A.2.3.6 Ground end systems shall have the capability to receive and process the message elements identified by “M” (Mandatory) in the “Ground” column of Table A-4.
- A.2.3.7 **Recommendation:** Air end systems should additionally allow the sending of the message elements specified as “O” (Optional) in the “Air” column of Table A-4.
- A.2.3.8 **Recommendation:** Ground end systems should additionally have the capability to receive and process the message elements specified as “O” (Optional) in the “Ground” column of Table A-4.

*Note 1: Ground systems may reject message elements DM27 REQUEST WEATHER DEVIATION UP TO [specifiedDistance] [direction] OF ROUTE and DM18 REQUEST [speed] and return an error response.*

*Note 2: Support of the message elements specified as “C” (Conditional)” in the “Ground” column of Table A-4 is dependent upon the conditions stated in the paragraphs following the table.*

**Table A-4: ACL Downlink Message Element Support Requirements**

Element ID	Message Element Content	Ground	Air
DM0	WILCO	M	M
DM1	UNABLE	M	M
DM2	STANDBY	M	M
DM6	REQUEST [level]	M	M
DM22	REQUEST DIRECT TO [position]	M	M
DM62	ERROR [errorInformation]	M	M
DM65	DUE TO WEATHER	M	M
DM66	DUE TO AIRCRAFT PERFORMANCE	M	M
DM98	[freetext] (for additional information)	M	M
DM100	LOGICAL ACKNOWLEDGMENT	M	M
DM9	REQUEST CLIMB TO [level]	M	O
DM10	REQUEST DESCENT TO [level]	M	O
DM18	REQUEST [speed]	O	M
DM27	REQUEST WEATHER DEVIATION UP TO [specifiedDistance] [direction] OF ROUTE	O	O
DM3	ROGER	C	M
DM4	AFFIRM	C	M
DM5	NEGATIVE	C	M
DM32	PRESENT LEVEL [level]	C	M
DM81	WE CAN ACCEPT [level] AT [time]	C	M
DM82	WE CANNOT ACCEPT [level]	C	M
DM106	PREFERRED LEVEL [level]	C	M
DM109	TOP OF DESCENT [time]	C	M

- A.2.3.9 Ground systems that implement the sending of UM133 REPORT PRESENT LEVEL shall have the capability to receive and process the message element DM32 PRESENT LEVEL [level].
- A.2.3.10 Ground systems that implement the sending of UM148 WHEN CAN YOU ACCEPT [level] shall have the capability to receive and process the message

- elements DM81 WE CAN ACCEPT [level] AT [time] and DM82 WE CANNOT ACCEPT [level].
- A.2.3.11 Ground systems that implement the sending of UM231 STATE PREFERRED LEVEL shall have the capability to receive and process the message element DM106 PREFERRED LEVEL [level].
- A.2.3.12 Ground systems that implement the sending of UM232 STATE-TOP-OF-DESCENT shall have the capability to receive and process the message element DM109 TOP OF DESCENT [time].
- A.2.3.13 If uplink messages with response type “A/N” or “Y” as indicated in the “Response” column of Table A-3 are used then both DM4 AFFIRM and DM5 NEGATIVE shall be supported.
- A.2.3.14 If uplink messages with response type “R” as indicated in the “Response” column of Table A-3 are used then DM3 ROGER shall be supported.

#### Implementation Issues

- A.2.3.15 **Recommendation:** Implementations should ignore the Alert attribute on received CPDLC messages.
- Note: ED-110B [9], paragraph 3.3.7.1.1 recognises that non-use of Alert attribute is a deviation from Doc 9705 [7], with no interoperability consequences.*
- A.2.3.16 **Recommendation:** Implementations should ignore the Urgency attribute on received CPDLC messages.
- Note: ED-110B [9], paragraph 3.3.7.1.2 recognises that ignoring Urgency attribute is a deviation from Doc 9705 [7], with no interoperability consequences.*

#### Specific Performance Requirements

- A.2.3.17 ACL implementations shall satisfy the performance requirements specified in ED-120 [10], chapter 5.2.3.2.

#### Specific Safety Requirements

- A.2.3.18 ACL implementations shall satisfy the safety requirements specified in ED-120 [10], chapter 5.2.2.3.
- A.2.3.19 ACL Safety Requirement SR-ACL-22 as defined in ED-120 [10] Table 5-29 shall apply only to Safety Objective SO-ACM-4, and not to SO-ACL-15.
- Note: Experience of the mitigation of hazards resulting from out of sequence execution of clearances (H-ACL-15) has shown that SR-ACL-22 (“Messages shall be transmitted/received in the order that they are sent”) does not apply to Safety Objective SO-ACL-15 (“The likelihood of undetected out of sequence messages used for separation shall be no greater than remote”). As result, SR-ACL-22 only applies to SO-ACM-4, hazard class 4. There is hence no need to place reliance on the communications service for the delivery of messages in the same order in which they were dispatched. SO-ACL-15 (responding to H-ACL-15) is to ensure that the controller’s intent as to the order of execution of dependent clearances is preserved during the execution*

*of the clearances by the pilot. As clearances/messages could be responded to in a different order than the one in which they were received, when there is a need to issue a clearance that is dependent on the successful outcome of a clearance that had been issued earlier, the controller is required to wait until the execution of that earlier clearance has been completed before the new clearance is issued.*

#### **A.2.4 Specification of Data Link Service AMC**

	Defined in	Interop	Safety	Performance
AMC	ED-120 §5.3.1.1.1, 5.3.1.1.2, 5.3.1.2	ED-110B §4.2, 4.5	ED-120 §5.3.2 (OSA)	ED-120 §5.3.3 (OPA)

##### Specific Interoperability Requirements

A.2.4.1 Implementations of the AMC service shall comply with the interoperability requirements specified in ED-110B [9] chapter 4.2 and 4.5, except where indicated otherwise in this EUROCONTROL Specification.

##### Uplink Message Set

A.2.4.2 Ground end systems shall allow the sending of at least one of the message elements identified by “O” (Optional) in the “Ground” column of Table A-5, with valid parameters where applicable.

A.2.4.3 Air end systems shall have the capability to receive and process the message elements identified by “M” in the “Air” column of Table A-5.

A.2.4.4 AMC message elements shall only be issued to those aircraft that are in the sector where the voice channel is blocked.

**Table A-5: AMC Uplink Message Element Support Requirements**

Element ID	Message Element Content	Ground	Air
UM157	CHECK STUCK MICROPHONE [frequency]	O	M
UM183	[free text] – see below	O	M

A.2.4.5 The “free text” content of UM183 when used in the AMC service shall be as specified in ED-110B [9], paragraph 4.5.3.2.

*Note: The UM183 text format in the above case is “CHECK STUCK MICROPHONE” with no frequency parameter.*

##### Specific Performance Requirements

A.2.4.6 AMC implementations shall satisfy the performance requirements specified in ED-120 [10] chapter 5.3.3.2.

##### Specific Safety Requirements

A.2.4.7 AMC implementations shall satisfy the safety requirements specified in ED-120 [10] chapter 5.3.2.3, except that for Ground Systems the safety requirements SR-AMC-9, SR-AMC-10, SR-AMC-11 and SR-AMC-12 are not applicable.

*Note: The exceptions for Ground Systems arise because there are no downlink messages in the AMC service, which could be used in response to the AMC uplink message.*

### **A.2.5 Specification of Data Link Service DLIC**

	Defined in	Interop	Safety	Performance
DLIC	ED-120 §4.1	ED-110B §4.1	ED-120 §4.2 (OSA)	ED-120 §4.3 (OPA)

#### Specific Interoperability Requirements

- A.2.5.1 Implementations of the DLIC service shall comply with the interoperability requirements specified in ED-110B [9] chapter 4.1, except where indicated otherwise in this EUROCONTROL Specification.
- A.2.5.2 Ground Systems shall have the capability to respond correctly to the DLIC “Logon” service and to initiate the DLIC “Contact” service.
- A.2.5.3 Aircraft systems shall have the capability to initiate the DLIC “Logon” service and to respond correctly to the DLIC “Contact” service.
- A.2.5.4 Prior to entering the airspace of a data link equipped ATS Unit, and when the aircraft has no CPDLC Current Data Authority, the aircraft system shall use the DLIC “Logon” service in order to identify itself and initiate the use of data link services.
- Note 1: The manner in which the parameters for contacting ground stations are entered into the avionics is left to local implementation choice.*
- Note 2: Compliance with ICAO Doc 9705 requires an aircraft to support the “maintain dialogue” option of the Logon service, when requested by the CM ground user.*
- A.2.5.5 Ground Systems shall store and process the 24-bit aircraft address independently of the other aircraft identifiers that are used for flight plan association (namely Aircraft ID, Departure and Destination Aerodromes).
- A.2.5.6 Ground systems shall perform the flight plan association before issuing a DLIC response.
- A.2.5.7 Ground Systems shall verify that the 24-bit aircraft address received from the aircraft in the DLIC Logon request matches the address extracted from the corresponding flight plan before issuing a positive DLIC response.
- A.2.5.8 **Recommendation:** Aircrew should have the possibility to disable the future use of CPDLC during any phase of flight; if this occurs, the air system is said to be in the “CPDLC inhibited” state. Aircrew action is then required to re-enable CPDLC (e.g. manual initiation of a DLIC Logon).
- A.2.5.9 When the air system is in the “CPDLC inhibited” state, any DLIC Contact Request shall be processed but the air system remains in the “CPDLC inhibited” state.
- A.2.5.10 In case of failure of the inter-centre ground-ground forwarding mechanism, or when this is temporarily not available, ATS Units shall use the DLIC “Contact” service to request the airborne system to establish communications with the next ATC centre.

*Note: It is an objective to enable an aircraft to log on only once while traversing the applicable airspace. Once an aircraft has logged on, the parameters for data link will be passed between adjacent data link equipped centres using the inter-centre coordination ground-ground forwarding mechanism. Subsequent centres along the route will establish CPDLC services to the aircraft at the appropriate time, without further use of DLIC.*

**Specific Performance Requirements**

A.2.5.11 DLIC implementations shall satisfy the performance requirements specified in ED-120 [10] chapter 4.3.2.

**Specific Safety Requirements**

A.2.5.12 DLIC implementations shall satisfy the safety requirements specified in ED-120 [10] chapter 4.2.2.

**A.3 CONFORMITY ASSESSMENT MATERIALS**

This section includes the implementation conformance statement for the Data Link Services specified in Annex A.

**A.3.1 Supported Message Element Compliance Statement**

A.3.1.1 Applicants claiming conformance to the services and message sets for ground implementation shall complete the conformance statement below.

**Uplink message elements- Ground User**

Operational Elements	Requirement	Implementation
UM0 UNABLE	M	
UM1 STANDBY	M	
UM3 ROGER	O	
UM4 AFFIRM	O	
UM5 NEGATIVE	O	
UM19 MAINTAIN [level]	M	
UM20 CLIMB TO [level]	M	
UM23 DESCEND TO [level]	M	
UM26 CLIMB TO REACH [level] BY [time]	O	
UM27 CLIMB TO REACH [level] BY [position]	O	
UM28 DESCEND TO REACH [level] BY [time]	O	
UM29 DESCEND TO REACH [level] BY [position]	O	
UM46 CROSS [position] AT [level]	O	
UM47 CROSS [position] AT OR ABOVE [level]	O	
UM48 CROSS [position] AT OR BELOW [level]	O	
UM51 CROSS [position] AT [time]	O	
UM52 CROSS [position] AT OR BEFORE [time]	O	
UM53 CROSS [position] AT OR AFTER [time]	O	
UM54 CROSS [position] BETWEEN [time] AND [time]	O	
UM55 CROSS [position] AT [speed]	O	
UM61 CROSS [position] AT AND MAINTAIN [level] AT [speed]	O	
UM64 OFFSET [specifiedDistance] [direction] OF ROUTE	O	



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Operational Elements	Requirement	Implementation
UM72 RESUME OWN NAVIGATION	O	
UM74 PROCEED DIRECT TO [position]	M	
UM79 CLEARED TO [position] VIA [routeClearance]	O	
UM80 CLEARED [route clearance]	O	
UM82 CLEARED TO DEVIATE UP TO [specifiedDistance] [direction] OF ROUTE	O	
UM92 HOLD AT [position] AS PUBLISHED MAINTAIN [level]	O	
UM94 TURN [direction] HEADING [degrees]	O	
UM96 CONTINUE PRESENT HEADING	O	
UM106 MAINTAIN [speed]	O	
UM107 MAINTAIN PRESENT SPEED	O	
UM108 MAINTAIN [speed] OR GREATER	O	
UM109 MAINTAIN [speed] OR LESS	O	
UM116 RESUME NORMAL SPEED	O	
UM117 CONTACT [unitname] [frequency]	M	
UM120 MONITOR [unitname] [frequency]	O	
UM123 SQUAWK [code]	O	
UM133 REPORT PRESENT LEVEL	O	
UM148 WHEN CAN YOU ACCEPT [level]	O	
UM157 CHECK STUCK MICROPHONE [frequency]	O	
UM159 ERROR [errorInformation]	M	
UM160 NEXT DATA AUTHORITY [facility]	M	
UM162 SERVICE UNAVAILABLE	M	
UM165 THEN	O	
UM171 CLIMB AT [verticalRate] MINIMUM	O	
UM172 CLIMB AT [verticalRate] MAXIMUM	O	
UM173 DESCEND AT [verticalRate] MINIMUM	O	
UM174 DESCEND AT [verticalRate] MAXIMUM	O	
UM179 SQUAWK IDENT	O	
UM183 [freetext]	M	
UM190 FLY HEADING [degrees]	M	
UM196 [freetext]	O	
UM203 [freetext]	O	
UM205 [freetext]	O	
UM211 REQUEST FORWARDED	O	
UM213 [facilitydesignation] ALTIMETER [altimeter]	O	
UM215 TURN [direction] [degrees]	O	
UM222 NO SPEED RESTRICTION	O	
UM227 LOGICAL ACKNOWLEDGMENT	M	
UM231 STATE PREFERRED LEVEL	O	
UM232 STATE-TOP-OF-DESCENT	O	
UM237 REQUEST AGAIN WITH NEXT UNIT	O	

Downlink message elements- Ground User

Operational Elements	Requirement	Implementation
DM0 WILCO	M	

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Operational Elements	Requirement	Implementation
DM1 UNABLE	M	
DM2 STANDBY	M	
DM3 ROGER	C	
DM4 AFFIRM	C	
DM5 NEGATIVE	C	
DM6 REQUEST [level]	M	
DM9 REQUEST CLIMB TO [level]	M	
DM10 REQUEST DECENT TO [level]	M	
DM18 REQUEST [speed]	O	
DM22 REQUEST DIRECT TO [position]	M	
DM27 REQUEST WEATHER DEVIATION UP TO [specifiedDistance] [direction] OF ROUTE	O	
DM32 PRESENT LEVEL [level]	C	
DM62 ERROR [errorInformation]	M	
DM63 NOT CURRENT DATA AUTHORITY	M	
DM65 DUE TO WEATHER	M	
DM66 DUE TO AIRCRAFT PERFORMANCE	M	
DM81 WE CAN ACCEPT [level] AT [time]	C	
DM82 WE CANNOT ACCEPT [level]	C	
DM89 MONITORING [unitname] [frequency]	O	
DM98 [freetext]	M	
DM99 CURRENT DATA AUTHORITY	M	
DM100 LOGICAL ACKNOWLEDGMENT	M	
DM106 PREFERRED LEVEL [level]	C	
DM107 NOT AUTHORIZED NEXT DATA AUTHORITY	M	
DM109 TOP OF DESCENT [time]	C	

A.3.1.2 Applicants claiming conformance to services and message sets for airborne implementation shall complete the conformance statement below.

Uplink message elements- Airborne User

Operational Elements	Requirement	Implementation
UM0 UNABLE	M	
UM1 STANDBY	M	
UM3 ROGER	M	
UM4 AFFIRM	M	
UM5 NEGATIVE	M	
UM19 MAINTAIN [level]	M	
UM20 CLIMB TO [level]	M	
UM23 DESCEND TO [level]	M	
UM26 CLIMB TO REACH [level] BY [time]	M	
UM27 CLIMB TO REACH [level] BY [position]	M	
UM28 DESCEND TO REACH [level] BY [time]	M	
UM29 DESCEND TO REACH [level] BY [position]	M	
UM46 CROSS [position] AT [level]	M	
UM47 CROSS [position] AT OR ABOVE [level]	M	

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Operational Elements	Requirement	Implementation
UM48 CROSS [position] AT OR BELOW [level]	M	
UM51 CROSS [position] AT [time]	M	
UM52 CROSS [position] AT OR BEFORE [time]	M	
UM53 CROSS [position] AT OR AFTER [time]	M	
UM54 CROSS [position] BETWEEN [time] AND [time]	M	
UM55 CROSS [position] AT [speed]	M	
UM61 CROSS [position] AT AND MAINTAIN [level] AT [speed]	M	
UM64 OFFSET [specifiedDistance] [direction] OF ROUTE	M	
UM72 RESUME OWN NAVIGATION	M	
UM74 PROCEED DIRECT TO [position]	M	
UM79 CLEARED TO [position] VIA [routeClearance]	M	
UM80 CLEARED [route clearance]	M	
UM82 CLEARED TO DEVIATE UP TO [specifiedDistance] [direction] OF ROUTE	M	
UM92 HOLD AT [position] AS PUBLISHED MAINTAIN [level]	M	
UM94 TURN [direction] HEADING [degrees]	M	
UM96 CONTINUE PRESENT HEADING	M	
UM106 MAINTAIN [speed]	M	
UM107 MAINTAIN PRESENT SPEED	M	
UM108 MAINTAIN [speed] OR GREATER	M	
UM109 MAINTAIN [speed] OR LESS	M	
UM116 RESUME NORMAL SPEED	M	
UM117 CONTACT [unitname] [frequency]	M	
UM120 MONITOR [unitname] [frequency]	M	
UM123 SQUAWK [code]	M	
UM133 REPORT PRESENT LEVEL	M	
UM148 WHEN CAN YOU ACCEPT [level]	M	
UM157 CHECK STUCK MICROPHONE [frequency]	M	
UM159 ERROR [errorInformation]	M	
UM160 NEXT DATA AUTHORITY [facility]	M	
UM162 SERVICE UNAVAILABLE	M	
UM165 THEN	M	
UM171 CLIMB AT [verticalRate] MINIMUM	M	
UM172 CLIMB AT [verticalRate] MAXIMUM	M	
UM173 DESCEND AT [verticalRate] MINIMUM	M	
UM174 DESCEND AT [verticalRate] MAXIMUM	M	
UM179 SQUAWK IDENT	M	
UM183 [freetext]	M	
UM190 FLY HEADING [degrees]	M	
UM196 [freetext]	M	
UM203 [freetext]	M	
UM205 [freetext]	M	
UM211 REQUEST FORWARDED	M	
UM213 [facilitydesignation] ALTIMETER [altimeter]	M	
UM215 TURN [direction] [degrees]	M	
UM222 NO SPEED RESTRICTION	M	
UM227 LOGICAL ACKNOWLEDGMENT	M	

EUROCONTROL SPECIFICATION  
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Operational Elements	Requirement	Implementation
UM231 STATE PREFERRED LEVEL	M	
UM232 STATE-TOP-OF-DESCENT	M	
UM237 REQUEST AGAIN WITH NEXT UNIT	M	

Downlink message elements- Airborne User

Operational Elements	Requirement	Implementation
DM0 WILCO	M	
DM1 UNABLE	M	
DM2 STANDBY	M	
DM3 ROGER	M	
DM4 AFFIRM	M	
DM5 NEGATIVE	M	
DM6 REQUEST [level]	M	
DM9 REQUEST CLIMB TO [level]	O	
DM10 REQUEST DECENT TO [level]	O	
DM18 REQUEST [speed]	M	
DM22 REQUEST DIRECT TO [position]	M	
DM27 REQUEST WEATHER DEVIATION UP TO [specifiedDistance] [direction] OF ROUTE	O	
DM32 PRESENT LEVEL [level]	M	
DM62 ERROR [errorInformation]	M	
DM63 NOT CURRENT DATA AUTHORITY	M	
DM65 DUE TO WEATHER	M	
DM66 DUE TO AIRCRAFT PERFORMANCE	M	
DM81 WE CAN ACCEPT [level] AT [time]	M	
DM82 WE CANNOT ACCEPT [level]	M	
DM89 MONITORING [unitname] [frequency]	M	
DM98 [freetext]	M	
DM99 CURRENT DATA AUTHORITY	M	
DM100 LOGICAL ACKNOWLEDGMENT	M	
DM106 PREFERRED LEVEL [level]	M	
DM107 NOT AUTHORIZED NEXT DATA AUTHORITY	M	
DM109 TOP OF DESCENT [time]	M	

## ANNEX B : SPECIFICATION OF END-TO-END COMMUNICATIONS

### B.1 CONFIGURATION CONTROL

#### B.1.1 MOC ELEMENT IDENTIFICATION

MOC_Name	MOC_Version	MOC_Edition
MOC_DLS1_DLA	1	1

#### B.1.2 MOC ELEMENT CHANGE RECORD

The following table records the complete history of the successive editions of MOC specifications.

Version Number	Edition Number	Edition Date	Reason for Change	Sections Affected
1	1	17/12/2008	Initial specification	All

#### B.1.3 MOC ELEMENT TRACEABILITY TOWARDS REGULATORY PROVISIONS

The following table records the traceability history of regulatory provisions associated with this MOC element.

Version Number	Edition Number	Implementing rule references	References of regulatory provisions	Validation date
1	1	DLS IR [1]	Annex IV, Parts A and B	17/12/2008

#### B.1.4 MOC ELEMENT TRACEABILITY TOWARDS INTERNATIONAL STANDARDS

The following table records the traceability of international standards associated with this MOC element.

International standards identification	References to text parts used to derive MOC specifications	Standards text incorporated by reference into the MOC element
ED-110B [9]		INTEROP: chapters 3.1, 3.3, excluding 3.3.5.7, 3.3.5.8.
ICAO Doc 9705 [7]	Sub-Volume II, Chapter 2.1 (CM) Sub-Volume IV (ULCS) Sub-Volume V (ICS) PDR M6050001 (CPDLC)	
ICAO Doc 9880 [18]	Part 1, Chapters 3, 6	

## B.2 REQUIREMENTS AND EXPLANATORY MATERIALS

### B.2.1 General Requirements

*Note 1: This Annex specifies a MOC element for end-to-end data communications supporting the specified Data Link Services.*

*Note 2: This MOC element is completely specified by the provisions in this Annex.*

*Note 3: This normative Annex is an integral part of this EUROCONTROL Specification*

#### Common Interoperability Requirements

B.2.1.1 CSPs and ANSPs shall operate Ground-Ground ATN Routers, as defined by ICAO Doc 9705 [7], in order to support interoperations with each other.

*Note: ATN Air-Ground and Ground-Ground Routers will have local interfaces to ground networks, such as X.25 and Ethernet. These interfaces are outside of the scope of this EUROCONTROL Specification.*

B.2.1.2 ATN Routers and Systems incorporating an ATN End System shall comply with the requirements of ED-110B [9] chapters 2 and 3 that are applicable to ATN communications services (ICS and ULCS), CM Application and CPDLC Applications, and amended as described in this Annex.

B.2.1.3 **Recommendation:** In addition to the Doc 9705 [7] updates specified in ED-110B [9], chapter 2.4, implementations should additionally incorporate all defect resolutions listed in Table B-1.

**Table B-1: Modifications to ICAO Doc 9705 - General**

PDR ref	PDR Description (Ed 2)	Applies To	Notes
99070001	ICAO 9705 Edition 2 - Editorial Errors	All Systems	
M1050001	Correction of CLNP Priority	All Systems	Documents restriction of CLNP priorities on VHF data links.
M0060001	ICAO 9705 Edition 2 - Editorial Errors	All Systems	

### B.2.2 Specification of Data Link Application CPDLC

	Defined in	Interop	Safety	Performance
<b>CPDLC (App Type 22)</b>	ED-110B §2.2.3 ICAO Doc. 9880, Part I [18], Chapter 3	ED-110B §3.3		

#### Specific Interoperability Requirements

B.2.2.1 Implementations of the CPDLC air and ground application entities shall comply with the interoperability requirements applicable to the CPDLC-start, CPDLC-message, CPDLC-end, CPDLC-user-abort and CPDLC-provider-abort services specified in ED-110B [9] chapter 3.3, except where indicated otherwise in this EUROCONTROL Specification.

*Note 1: The DSC-start, DSC-end and Forward services are out of scope of this EUROCONTROL Specification.*

*Note 2: Only the “protected mode” CPDLC application (previously known as “PM-CPDLC”) including the application message integrity check (application type 22) is required. The previously defined CPDLC without this feature (application type 2) is excluded.*

B.2.2.2 Ground systems shall be able to receive all downlink CPDLC message elements specified in ICAO Doc 9705 [7] and handle unsupported message element types as indicated in ED-110B [9] paragraph 3.3.7.6.

B.2.2.3 Aircraft systems shall be able to receive all uplink CPDLC message elements specified in ICAO Doc 9705 [7] and handle unsupported message element types as indicated in ED-110B [9] paragraph 3.3.7.6.

*Note: The “handling” of unsupported message elements referred to above consists of receiving the message element type and responding with an appropriate error message, without causing a local system error. Such unsupported messages are not presented to the controller / pilot.*

B.2.2.4 Both ground and airborne systems shall support and use the CPDLC application message integrity check mechanism, with the default checksum algorithm as specified in ED-110B [9] paragraphs 3.3.5.1 and 3.3.6.

B.2.2.5 Ground systems shall ensure that the 24-bit aircraft address included in the CPDLC integrity check computation is the value extracted from the corresponding flight plan, rather than the value received from the aircraft via DLIC or from an adjacent ATS Unit via inter-centre coordination message.

B.2.2.6 Where ED-110B [9] refers to CPDLC as specified in ICAO Doc. 9705 [7] (Sub-Volume II, chapter 2.3, modified by the specified defect resolutions), the provisions of ICAO Doc. 9880, Part I [18], Chapter 3 may be taken as equivalent.

*Note: The CPDLC provisions originally published in Doc 9705 are entirely replaced by the resolution of defect report ref. M6050001. The CPDLC chapter of Doc 9880 is technically aligned with this PDR resolution. A detailed mapping between these CPDLC provisions and Doc 9880 is available for traceability purposes.*

### **B.2.3 Specification of Data Link Application CM**

	Defined in	Interop	Safety	Performance
<b>CM</b>	ED-110B §2.2.1	ED-110B §3.1		

#### Specific Interoperability Requirements

B.2.3.1 Implementations of the CM air and ground application entities shall comply with the interoperability requirements applicable to the CM-logon, CM-contact, CM-update, CM-end, CM-user-abort and CM-provider-abort services specified in ED-110B [9] chapter 3.1, except where indicated otherwise in this EUROCONTROL Specification.

B.2.3.2 The CM-update service shall not be invoked by ground systems for aircraft in the applicable airspace.

*Note 1: Minimal ground system support requirements for handling received CM-update primitives are given in ED-110B Note after paragraph 3.1.3.3.1.1.1.*

*Note 2: The CM-forward service is outside the scope of this EUROCONTROL Specification.*

#### **B.2.4 ATN Upper Layer Communications Service Requirements**

	Defined in	Interop	Safety	Performance
<b>ULCS</b>	Doc 9705 [7] Sub-Volume IV			

#### Specific Interoperability Requirements

B.2.4.1 ULCS implementations shall conform to the requirements of ED-110B [9] (which refers to ICAO Doc. 9705 [7], Sub-Volume IV), except where indicated otherwise in this EUROCONTROL Specification.

B.2.4.2 Where Doc 9705 paragraph 4.4.3.2 specifies the base standard for the ATN session protocol, the phrase “together with all approved amendments and defect report resolutions” shall be taken to mean “including Technical Corrigendum 1 (2002)”.

B.2.4.3 Implementations of the ATN session protocol shall be capable of supporting the session protocol data units (SPDUs) listed in Table B-2, any other SPDUs being out of scope of this EUROCONTROL Specification:

**Table B-2: SPDU Support Requirements**

Value (Hex)	Abbreviation	Full SPDU Name
E8	SCN	Short Connect
F0	SAC	Short Accept
D8	SACC	Short Accept Continue
E0 – E3	SRF	Short Refuse E0: TC retained, transient refusal E1: TC retained, persistent refusal E2: TC released, transient refusal E3: TC released, persistent refusal
A0	SRFC	Short Refuse Continue

B.2.4.4 **Recommendation:** It is recommended that the value “E3” should be used for encoding the SRF SPDU.

B.2.4.5 Where Doc 9705 [7] paragraph 4.5.1.2 specifies the base standard for the ATN presentation protocol, the phrase “together with all approved amendments and defect report resolutions” shall be ignored.



B.2.4.6 Implementations of the ATN presentation protocol shall be capable of supporting the presentation protocol data units (PPDUs) listed in Table B-3, any other PPDUs being out of scope of this EUROCONTROL Specification:

**Table B-3: PDU Support Requirements**

Value (Hex)	Abbreviation	Full PDU Name
02	SHORT-CP	Short Presentation Connect, unaligned PER
02	SHORT-CPA	Short Presentation Connect Accept, unaligned PER
x2	SHORT-CPR	Short Presentation Connect Reject, where x = reason code: 02: presentation-user 12: reason not specified (transient) 22: temporary congestion (transient) 32: local limit exceeded (transient) 42: called presentation address unknown (permanent) 52: protocol version not supported (permanent) 62: default context not supported (permanent) 72: user data not readable (permanent)

B.2.4.7 **Recommendation:** It is recommended that the value “02” should be used for encoding the SHORT-CPR PDU.

B.2.4.8 **Recommendation:** In addition to the Doc 9705 updates specified in ED-110B [9], chapter 2.4, ULCS implementations should additionally incorporate all defect resolutions listed in Table B-4.

**Table B-4: Modifications to ICAO Doc 9705 - ULCS**

PDR ref	PDR Description (Ed 2)	Applies To	Notes
M0040002	Potential Misdelivery of CLNP Packets (32 bit checksum)	All End Systems	Support is Mandatory in ED-110B [9] section 2.4. However, 32-bit checksum is not required

### **B.2.5 ATN Internet Communications Service Requirements**

	Defined in	Interop	Safety	Performance
<b>ICS</b>	Doc 9705 [7] Sub-Volume V			

#### Specific Interoperability Requirements

B.2.5.1 ICS implementations shall conform to the requirements of ED-110B [9] (which refers to ICAO Doc. 9705 [7], Sub-Volume V), except where indicated otherwise in this EUROCONTROL Specification.

B.2.5.2 ATN end systems shall implement the TP4 protocol as specified in Doc 9705 [7], section 5.5.2.

*Note: The connectionless transport protocol (CLTP) is outside the scope of this EUROCONTROL Specification.*

B.2.5.3 Airborne systems shall implement an ATN Router Class 6 (airborne router supporting IDRP based routing), as defined in Doc 9705 [7], section 5.2.4.1.

**B.2.5.4** ATN Air-Ground Routers supporting ATN communication services shall implement requirements for an ATN Router Class 5, as defined in ICAO Doc 9705 [7], section 5.2.4.1.

*Note 1: Air-Ground Routers are not required to support the procedures for the optional non-use of IDRP.*

*Note 2: Support for subnetwork dependent convergence functions (SNDCFs) other than the Mobile SNDCF is out of scope of this EUROCONTROL Specification.*

**B.2.5.5** **Recommendation:** In addition to the Doc 9705 updates specified in ED-110B [9] chapter 2.4, ICS implementations should incorporate all defect resolutions listed in Table B-5.

**Table B-5: Modifications to ICAO Doc 9705 - ICS**

<b>PDR ref</b>	<b>PDR Description (Ed 2)</b>	<b>Applies To</b>	<b>Notes</b>
99090001	ICS: Over-specification of ARS Address	All Systems	Needed for ARINC network compatibility.
99100003	ICS: LREF Compression and CLNP ECHO NPDUs	Air and Air-Ground Router	Used for compression of NSAP addresses
99100004	ICS: ISO/IEC 8208 Non-Standard Default Packet Size Facility	All ATN Routers	Relaxation of requirement. No interoperability implications.
99100005	ICS: Reservation of Unassigned/Undefined Values	All Systems	Only impact of this PDR could be on implementations that used private values.
M0040001	ICS: Incorrect/Duplicated ATSC Class Security Tag	All ATN Routers	Clarifies an error condition
M0040002	Potential Misdelivery of CLNP Packets (32 bit checksum)	All End Systems	Support is Mandatory in ED-110B [9] section 2.4. However, 32-bit checksum is not required
M4050001	ICS: Typos and inconsistencies in the Doc. 9705 Sub-Volume V	All Systems	
M5020001	ICS: Inclusion of ATN IP SNDCF	Air-Ground and Ground-Ground Routers	When IP networks are used for the ATN ground-ground segment.

**Specific Performance Requirements**

**B.2.5.6** **Recommendation:** The TP4 parameter settings listed in Table B-6 should be implemented by all aircraft and ground ATN End Systems.

**Table B-6: Recommended TP4 parameter settings**

Scope	Parameter	Definition	Recommended Value (Air and Ground end systems)
<b>Inactivity</b>	Inactivity time (I)	A bound for the time after which a transport entity will, if it does not receive a TPDU, initiate the release procedure to terminate the transport connection.	360 sec
<b>Retransmission</b>	Retransmission time (T1)	A bound for the maximum time the transport entity will wait for acknowledgement before re-transmitting a TPDU.  The retransmission time is adaptive.	Initial value 30 sec
	Maximum retransmissions (N)	Maximum number of TPDU retransmissions.	7
<b>Window</b>	Window time (W)	A bound for the maximum time a transport entity will wait before re-transmitting up-to-date window information.	120 sec
<b>Flow Control</b>	Local acknowledgement delay (AI)	A bound for the maximum time which can elapse between the receipt of a TPDU by the local transport entity from the network layer and the transmission of the corresponding acknowledgement.	1 sec

**B.2.5.7 Recommendation:** The IDRP parameter settings listed in Table B-7 should be implemented by all ATN Routers

**Table B-7: Recommended IDRP parameter settings**

Entity	Timer	Recommended Value
IDRP (Airborne Router)	IDRP Hold time	900 sec
IDRP (Air-Ground Router)	IDRP Hold time	900 sec
IDRP (Ground-Ground Router)	IDRP Hold time	90 sec

### **B.3 CONFORMITY ASSESSMENT MATERIALS**

- B.3.1 This section specifies the Implementation Conformance Statement for the ATN communication services specified in Annex B.
- B.3.2 The PICS/OICS for CM and CPDLC as contained in ED-110B [9], Annex B shall be completed for all implementations.
- B.3.3 There are no additional constraints placed on the requirements for the Transport Protocol PICS other than those specified in ICAO Doc 9705 [7].
- B.3.4 Unless specified to the contrary in section B.2 above, implementations shall comply with the relevant Profile Requirements Lists for the ATN ULCS and ICS in Doc 9705 [7], Sub-Volumes IV and V.

## ANNEX C : SPECIFICATION OF ASSOCIATED PROCEDURES AND RELATED REQUIREMENTS

### C.1 CONFIGURATION CONTROL

#### C.1.1 MOC ELEMENT IDENTIFICATION

MOC_Name	MOC_Version	MOC_Edition
MOC_DLS1_OTH	1	1

#### C.1.2 MOC ELEMENT CHANGE RECORD

The following table records the complete history of the successive editions of MOC specifications.

Version Number	Edition Number	Edition Date	Reason for Change	Sections Affected
1	1	17/12/2008	Initial specification	All

#### C.1.3 MOC ELEMENT TRACEABILITY TOWARDS REGULATORY PROVISIONS

The following table records the traceability history of regulatory provisions associated with this MOC element.

Version Number	Edition Number	Implementing rule references	References of regulatory provisions	Validation date
1	1	DLS IR [1]	Article 4, Article 5(5), Article 7(3), Article 13(1-2)	17/12/2008

#### C.1.4 MOC ITEM TRACEABILITY TOWARDS INTERNATIONAL STANDARDS

The following table records the traceability of international standards associated with this MOC element.

International standards identification	References to text parts used to derive MOC specifications	Standards text incorporated by reference into the MOC element
ICAO Annex 10, Volume II [2]		Chapter 8
ICAO Annex 10, Volume III [4]		Part 1, Chapter 9
ICAO Doc 4444 [5]		Chapter 14, Appendix 2, section 2.2
ED-111 [11]		Whole document
Amendment to ICAO Doc 7030 [6]		2.1.14 (CPDLC)
OLDI Community specification [12]		Chapter 15

## C.2 REQUIREMENTS AND EXPLANATORY MATERIALS

### C.2.1 General Requirements

*Note 1: This Annex specifies a MOC element for operational procedures and flight planning requirements to support the identified data link services.*

*Note 2: This MOC element is completely specified by the provisions in this Annex.*

*Note 3: This normative Annex is an integral part of this EUROCONTROL Specification.*

### C.2.2 Operational Procedures

C.2.2.1 Operation of the identified Data Link Services shall comply with the requirements of Chapter 14 (Controller-Pilot Data Link Communications – CPDLC) of ICAO Doc. 4444 PANS-ATM [5] and with the requirements of Chapter 8 (Aeronautical Mobile Service – Data Link Communications) of ICAO Annex 10, Volume II [2]. This covers provisions for:

- The establishment of CPDLC;
- The exchange of operational CPDLC messages;
- The transfer of CPDLC;
- The temporary discontinuation of the use of CPDLC;
- Failure and shutdown of CPDLC.

C.2.2.2 Whenever sending a clearance or an instruction via CPDLC, the conditions pertaining to that clearance or instruction (e.g. vertical speed control) shall be included in the same CPDLC message.

C.2.2.3 **Recommendation:** The design of the HMI should limit the options for responding to a message to the operationally relevant possibilities.

C.2.2.4 Where CPDLC-related voice communications are required, the controller and pilot shall use the appropriate phraseologies as detailed in PANS-ATM [5], paragraph 14.3, whenever possible.

C.2.2.5 **Recommendation:** The list of phrases available in PANS-ATM [5], paragraph 14.3 is not intended to be exhaustive, and when circumstances differ, pilots and ATS personnel will be expected to use plain language, which should be as clear and concise as possible, to the level specified in the ICAO language proficiency requirements contained in Annex 1 — Personnel Licensing [15], in order to avoid possible confusion by those persons using a language other than one of their national languages.

C.2.2.6 When there is a need to issue a clearance that is dependent on the successful outcome of a previously issued clearance, the controller shall wait until the execution of that earlier clearance has been completed before the new clearance is issued.

### **C.2.3 Inter-Centre Coordination**

- C.2.3.1 **Recommendation:** Although the current data authority (CDA) represents the ground system through which a CPDLC dialogue between a pilot and a controller, currently responsible for the flight, is permitted to take place, appropriate consideration should be given to cases where flights are transiting from a non-CPDLC equipped ATC unit to a CPDLC equipped ATC unit and for which establishment of CPDLC will occur before the flight is transferred.
- C.2.3.2 **Recommendation:** The time and/or position where the transfer of data link is initiated should be subject to agreement between the ATC units concerned, consistent with PANS-ATM requirements (Doc. 4444 [5], paragraph 14.2.1) to publish related information in Aeronautical Information Circulars or Publications.
- C.2.3.3 All operational details with respect to the transfer of communications using CPDLC shall be reflected accordingly in Letters of Agreement established between the ATC units concerned.
- C.2.3.4 The interconnection of national and regional networks for the exchange of the “Logon Forward Message (LOF)” and the “Next Authority Notified Message (NAN)” shall be implemented in compliance with Chapter 15 of the EUROCONTROL Specification for On-Line Data Interchange (OLDI) [12].

*Note 1: This does not imply any obligation to implement OLDI between an ANSP’s own systems.*

*Note 2: Ground-ground forwarding of the aircraft Logon information is the default mechanism used between data link equipped ground systems to exchange aircraft data link parameters. The DLIC Contact service is the fall-back (see A.2.5.10 in Annex A).*

- C.2.3.5 The performance requirements specified in the OLDI Specification [12] shall be taken as the baseline for inter-centre communication performance.
- C.2.3.6 When performing the flight plan association process, Ground Systems shall verify that the 24-bit aircraft address extracted from the flight plan matches the address received from the adjacent centre via the ground-ground forwarding function (LOF message).

### **C.2.4 Flight Planning Requirements**

- C.2.4.1 Operators of data link equipped aircraft shall insert in Item 10 (Equipment) of the ICAO flight plan form the letter “J” to indicate “Data Link” in accordance with Appendix 2, section 2.2 of ICAO Doc. 4444 PANS-ATM [5].
- C.2.4.2 Operators of data link equipped aircraft shall insert in Item 18 (Other Information) of the ICAO flight plan form the indicator “DAT/” to indicate “Significant data related to data link capability”, followed by, as a minimum, the

letter “V” to indicate VHF data link, in accordance with Appendix 2, section 2.2 of ICAO Doc. 4444 PANS-ATM [5].

- C.2.4.3 Operators of CPDLC equipped aircraft shall insert in Item 18 (Other Information) of the ICAO flight plan form the indicator “CODE”, followed by the 24-bit aircraft address (expressed in the form of an alphanumerical code of six hexadecimal characters) in accordance with the provisions of ICAO Doc. 7030 [6], section 2.1.14.
- C.2.4.4 Operators of aircraft having operational CPDLC capability shall insert in Item 18 (Other Information) of the ICAO flight plan form the indicator “COM/” to indicate “Significant data related to communication equipment”, followed by the character string “CPDLC”.
- C.2.4.5 For a flight operating based on a repetitive flight plan (RPL), for which it is intended to use data link services a modification message (CHG) shall be submitted to indicate that the flight is capable of, and authorised for CPDLC, in accordance with the provisions in this section.
- C.2.4.6 When there is a change to the CPDLC capability status, or a change of aircraft for a flight planned to operate in the applicable airspace area specified in the DLS implementing rule [1], a modification message (CHG) shall be sent with the appropriate indications in the relevant items of the ICAO flight plan form, including any change to the 24-bit aircraft address.
- C.2.4.7 A modification message resulting from a change to the CPDLC capability status for the day of operation shall be sent not earlier than 20 hours before the estimated off-block time.

## **C.2.5 Ground Recording Requirements**

- C.2.5.1 Data link messages exchanged between an ATS Unit and aircraft, and between different ATS Units, shall be recorded according to the functional specifications for ground recording as published in EUROCAE Document ED-111 [11].

## **C.2.6 Naming and Addressing Requirements**

- C.2.6.1 **Recommendation:** A central repository for ATN name and address information, together with suitable maintenance procedures, should be established.
- C.2.6.2 **Recommendation:** A registration authority function should be used to ensure uniqueness of assigned names and addresses.
- C.2.6.3 ATN application entity titles and ATN addresses including LOC, SYS and NSEL values shall be assigned in accordance with the data link services supported.

- C.2.6.4 Ground ATC entities shall be identified by an ICAO Facility Designator and the corresponding CM TSEL value.
- C.2.6.5 Ground system addresses required for the DLIC Logon function shall be included in national aeronautical information publications.
- C.2.6.6 Aircraft systems shall be configured with the correct 24-bit aircraft address in accordance with ICAO Annex 10 Volume III, Part 1, Chapter 9 (Aircraft Addressing System) [4] before entering the applicable airspace as defined in the DLS implementing rule [1].

*Note: After maintenance, or on first commissioning an aircraft or its communications equipment, the aircraft operator must ensure that the correct 24-bit aircraft address is applied to the relevant aircraft system(s).*

### C.3 CONFORMITY ASSESSMENT MATERIALS

*Note 1: This section specifies the conformity assessment material available for the operational procedures and flight planning requirements specified in Annex C.*

*Note 2: Conformity of flight plan information will be assured by a future release of the IFPS system.*

- C.3.1 Ground test tools qualified in accordance with this EUROCONTROL Specification may be used in support of the assessment of interoperability of systems.
- C.3.2 The EUROCONTROL ETIC Test Tool may be used in support of the conformity assessment of inter-centre message protocols.
- C.3.3 Applicants claiming conformance to this EUROCONTROL Specification shall complete the conformance statement below.

#### Publication of related information

Ref.	Requirement	Conformance	Implementation
C.2.3.3	All operational details with respect to the transfer of communications using CPDLC shall be reflected accordingly in Letters of Agreement established between the ATC units concerned.	M	
C.2.6.5	Ground system addresses required for the DLIC Logon function shall be included in national aeronautical information publications.	M	
C.2.6.1	A central repository for ATN name and address information, together with suitable maintenance procedures, should be established.	O	
C.2.6.2	A registration authority function should be established to ensure uniqueness of assigned names and addresses.	O	
C.2.3.2	The time and/or position where the transfer of data link is initiated should be subject to agreement between the ATC units concerned, consistent with PANS-ATM requirements (Doc. 4444 paragraph 14.2.1) to publish related information in Aeronautical Information Circulars or Publications.	O	

#### Operational Procedures

Ref.	Requirement	Conformance	Implementation
C.2.2.1	Operation of the identified Data Link Services shall comply with the requirements of Chapter 14 (CPDLC) of ICAO Doc. 4444 PANS-ATM and with the requirements of Chapter 8 (Aeronautical Mobile Service – Data Link Communications) of ICAO Annex 10, Volume II.	M	
C.2.2.2	Whenever sending a clearance or an instruction via CPDLC, the conditions pertaining to that clearance or instruction (e.g. vertical speed control) shall be included in the same CPDLC message.	M	



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Ref.	Requirement	Conformance	Implementation
C.2.2.4	Where CPDLC-related voice communications are required, the controller and pilot shall use the appropriate phraseologies as detailed in PANS-ATM, paragraph 14.3, whenever possible.	M	
C.2.2.5	When circumstances differ, pilots and ATS personnel should use plain language, which should be as clear and concise as possible, to the level specified in the ICAO language proficiency requirements contained in Annex 1 — Personnel Licensing	O	
C.2.2.6	When there is a need to issue a clearance that is dependent on the successful outcome of a previously issued clearance, the controller shall wait until the execution of that earlier clearance has been completed before the new clearance is issued.	M	
C.2.3.1	Appropriate consideration should be given to cases where flights are transiting from a non-CPDLC equipped ATC unit to a CPDLC equipped ATC unit and for which establishment of CPDLC will occur before the flight is transferred.	O	
C.2.4.1	Operators of data link equipped aircraft shall insert in Item 10 of the ICAO flight plan form the letter "J" in accordance with Appendix 2, section 2.2 of ICAO Doc. 4444 PANS-ATM.	M	
C.2.4.2	Operators of data link equipped aircraft shall insert in Item 18 of the ICAO flight plan form the indicator "DAT/", followed by, as a minimum, the letter "V" to indicate VHF data link, in accordance with Appendix 2, section 2.2 of ICAO Doc. 4444 PANS-ATM.	M	
C.2.4.3	Operators of CPDLC equipped aircraft shall insert in Item 18 of the ICAO flight plan form the indicator "CODE/", followed by the 24-bit aircraft address (expressed in the form of an alphanumerical code of six hexadecimal characters) in accordance with the provisions of ICAO Doc. 7030, section 2.1.14	M	
C.2.4.4	Operators of aircraft having operational CPDLC capability shall insert in Item 18 of the ICAO flight plan form the indicator "COM/", followed by the character string "CPDLC".	M	
C.2.4.5	For a flight operating based on a repetitive flight plan (RPL), during which the pilot intends to use CPDLC, a modification message (CHG) shall be submitted to indicate that the flight is capable of, and authorised for CPDLC, in accordance with the specified provisions	M	
C.2.4.6	When there is a change to the CPDLC capability status or a change of aircraft for a flight planned to operate in the applicable airspace area, a modification message (CHG) shall be sent with the appropriate indications in the relevant items of the ICAO flight plan form, including any change to the 24-bit aircraft address.	M	
C.2.4.7	A modification message resulting from a change to the CPDLC capability status for the day of operation shall be sent not earlier than 20 hours before the estimated off-block time.	M	

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**Ground System Requirements**

Ref.	Requirement	Conformance	Implementation
	Compliance with high level safety requirements of the COTR implementing rule [20], amended by [22]	M	
C.2.3.4	Implementation of the "Logon Forward Message (LOF)" and the "Next Authority Notified Message (NAN)" processes between ATC units in accordance with the EUROCONTROL Specification for On-Line Data Interchange (OLDI).	M	
C.2.5.1	Data link messages exchanged between an ATS Unit and aircraft, and between different ATS Units, shall be recorded in compliance with EUROCAE Document ED 111.	M	
C.2.2.3	The design of the HMI should limit the options for responding to a message to the operationally relevant possibilities.	O	
C.2.4.1	Processing of Item 10 of the ICAO flight plan form containing the letter "J" in accordance with Appendix 2, section 2.2 of ICAO Doc. 4444 PANS-ATM.	M	
C.2.4.2	Processing of Item 18 of the ICAO flight plan form containing the indicator "DAT/", followed by, as a minimum, the letter "V" to indicate VHF data link, in accordance with Appendix 2, section 2.2 of ICAO Doc. 4444 PANS-ATM.	M	
C.2.4.3	Processing of Item 18 of the ICAO flight plan form containing the indicator "CODE/" followed by the 24-bit aircraft address expressed in the form of an alphanumeric code of six hexadecimal characters, in accordance with ICAO Doc 7030, section 2.1.14.	M	
C.2.4.4	Processing of Item 18 of the ICAO flight plan form containing the indicator "COM/" followed by the character string "CPDLC".	M	
C.2.4.5	Processing of a modification message (CHG) submitted to indicate that the flight is capable of, and authorised for CPDLC	M	
C.2.6.4	Ground ATC entities shall be identified by an ICAO Facility Designator and the corresponding CM TSEL value.	M	
C.2.6.3	ATN application entity titles and ATN addresses including LOC, SYS and NSEL values shall be assigned in accordance with the data link services supported.	M	

**Aircraft System Requirements**

Ref.	Requirement	Conformance	Implementation
C.2.6.6	Are there provisions in place to ensure that aircraft systems are configured with the correct 24-bit aircraft address in accordance with ICAO Annex 10 Volume III, Part 1, Chapter 9 before entering the applicable airspace?	M	
	Are there provisions in place to ensure that, after maintenance or on first commissioning an aircraft or its communications equipment, the correct 24-bit aircraft address is applied to the relevant aircraft system(s)?	M	
C.2.2.3	The design of the HMI should limit the options for responding to a message to the operationally relevant possibilities.	O	
C.2.6.3	ATN application entity titles and ATN addresses including LOC, SYS and NSEL values shall be assigned in accordance with the data link services supported.	M	

## ANNEX D : SPECIFICATION OF AIR-GROUND DATA LINK

### D.1 CONFIGURATION CONTROL

#### D.1.1 MOC ELEMENT IDENTIFICATION

MOC_Name	MOC_Version	MOC_Edition
MOC_DLS1_AGC	1	1

#### D.1.2 MOC ELEMENT CHANGE RECORD

The following table records the complete history of the successive editions of MOC specifications.

Version Number	Edition Number	Edition Date	Reason for Change	Sections Affected
1	1	17/12/2008	Initial specification	All

#### D.1.3 MOC ELEMENT TRACEABILITY TOWARDS REGULATORY PROVISIONS

The following table records the traceability history of regulatory provisions associated with this MOC element.

Version Number	Edition Number	Implementing rule references	References of regulatory provisions	Validation date
1	1	DLS IR [1]	Article 7 (1) Annex IV Part B	17/12/2008

#### D.1.4 MOC ELEMENT TRACEABILITY TOWARDS INTERNATIONAL STANDARDS

The following table records the traceability of international standards associated with this MOC element.

International standards identification	References to text parts used to derive MOC specifications	Standards text incorporated by reference into the MOC element
VDL SARPs, ICAO Annex 10 [3]	Provisions applicable to VDL Mode 2	
ARINC 631 [13]		Whole specification
ICAO Doc 9776/AN970 [8]	Whole specification	
ICAO EUR Doc 011 [14]		VDL-2 frequency assignment

## D.2 REQUIREMENTS AND EXPLANATORY MATERIALS

### D.2.1 General Requirements

	Defined in	Interop	Safety	Performance
VDL-2	ICAO Annex 10 Volume III, Part I, Chapter 6 [3]	ARINC 631 [13]		ED-120 [10]: 4.3.2, 5.1.3.2, 5.2.3.2, 5.4.3.2

*Note 1: This Annex specifies a MOC element for the VDL-2 air-ground data link service supporting the specified data link services and end-to-end communication services.*

*Note 2: This MOC element is completely specified by the provisions in this Annex.*

*Note 3: This normative Annex is an integral part of this EUROCONTROL Specification.*

D.2.1.1 Where ARINC 631 [13] identifies a specific deviation from ICAO VDL SARPs [3] and/or ICAO Manual on VDL Mode 2 [8], the provisions of the former shall take precedence.

*Note: ARINC 631 also references ARINC 750 [21] for definition of Signal Quality Parameter (SQP) levels. Measurements of SQP levels may be passed over the air-ground link as parameters in the XID exchanges.*

D.2.1.2 All functionality identified as “M” (Mandatory) in ARINC 631 [13] Attachment 2 (Data Link Layer PICS) and Attachment 3 (Subnetwork Layer PICS) shall be supported.

#### Common Interoperability Requirements

D.2.1.3 The VDL Mode 2 service shall be implemented in accordance with ARINC Specification 631 [13], except where indicated otherwise in this Annex.

D.2.1.4 VDL Mode 2 shall be available, including appropriate transmitter/receiver equipment, and used for the air-ground exchange of CPDLC and CM Messages.

D.2.1.5 Frequency assignments for VDL-2 operation shall be in accordance with ICAO European agreements [14].

D.2.1.6 VDL-2 avionics shall support the VDL Mode 2 Autotune function as specified in ARINC 631 [13], which allows operation on several VDL Mode 2 channels.

**D.3 CONFORMITY ASSESSMENT MATERIALS**

D.3.1 This section specifies an Implementation Conformance Statement for the VDL-2 air-ground data link.

D.3.2 PICS for VDL-2 implementations are contained in ARINC 631 [13] Attachment 2 (Data Link Layer PICS) and Attachment 3 (Subnetwork Layer PICS), and shall be completed for all implementations.

# EUROCONTROL Specification on Data Link Services

## Appendix 1

### Traceability Matrix between DLS IR and EUROCONTROL Specification

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## APPENDIX 1. TRACEABILITY BETWEEN DLS IR AND DLS EUROCONTROL SPECIFICATION

### A1.1 INTRODUCTION

This Appendix provides traceability from the Articles and Annexes of the DLS implementing rule to the detailed technical provisions of the EUROCONTROL Specification on Data Link Services.

### A1.2 ARTICLES IN THE DRAFT IR

Each numbered Article of the Data Link Services implementing rule is reproduced in the first two columns of the table below, followed by a cross-reference to the corresponding paragraph in the EUROCONTROL Specification on Data Link Services, together with explanatory notes.

#### Article 1. Subject matter and scope

IR Ref.	IR Text	EUROCONTROL Specification ref.	Notes
1.	This Regulation lays down requirements for the coordinated introduction of data link services based on air-ground point-to-point data communications as defined in Article 2 (5).	All Annexes	The Regulation is necessary, but not sufficient, to ensure interoperability between systems implementing data link services. The EUROCONTROL Specification provides detailed specifications to ensure technical interoperability.
2.	This Regulation shall apply to:		
(a)	flight data processing systems, their constituents and associated procedures, and human-machine interface systems, their constituents and associated procedures serving air traffic control units providing services to general air traffic;	Annex A, Annex B, Annex C	Requirements applicable to ground systems at various levels are distributed throughout the Annexes of the EUROCONTROL Specification.
(b)	airborne human-machine interface constituents and associated procedures	A.2.1, A.2.5.5, C.2.2, C.2.6.6	
(c)	air-ground communication systems, their constituents and associated procedures.	Annex A, Annex B, Annex C, Annex D	Requirements applicable to air-ground communication systems at various levels are distributed throughout the Annexes of the EUROCONTROL Specification.
3.	This Regulation shall apply to all flights operating as general air traffic in accordance with instrument flight rules within the airspace above FL285 defined in Annex I, Part A. In addition, it shall apply from 5 February 2015 to all flights operating as general air traffic in accordance with instrument flight rules within the airspace above FL285 defined in Annex I, Part B.	1.6.4(a)	Airspace and deployment timescales are outside the scope of the EUROCONTROL Specification. Contiguous coverage is highly desirable for seamless operation.
4.	This Regulation shall apply to air traffic service providers (hereinafter ATS providers) providing services to general air traffic within the airspace referred to in paragraph 3 and in accordance with the relevant dates of application.	N/A	Airspace and deployment timescales are outside the scope of the EUROCONTROL Specification

## Article 2. Definitions

IR Ref.	IR Text	EUROCONTROL Specification ref.	Notes
	For the purpose of this Regulation the definitions in Article 2 of Regulation (EC) No 549/2004 shall apply.	1.5.2	Reference is made to the SES framework Regulation, which defines terms such as: ATC service, air navigation service providers, air traffic services, communication services, interoperability, procedure, etc.
	The following definitions shall also apply:		The EUROCONTROL Specification is consistent with these definitions.
1.	'data link service' means a set of related air traffic management transactions, supported by air-ground data link communications, which have a clearly defined operational goal and begin and end on an operational event;	2, Annex A	The specific data link services defined in IR Annex II (DLIC, ACM, ACL and AMC) are described in more detail in section 2 of the EUROCONTROL Specification.
2.	'operator' means a person, organisation or enterprise engaged in or offering to engage, in an aircraft operation;	N/A	
3.	'air traffic services unit' (hereinafter ATS unit) means a unit, civil or military, responsible for providing air traffic services;	N/A	
4.	'service level agreement' means that part of a service contract between organisations in which a certain level of service is agreed, in particular in relation to the quality and performance of the data communications service;	N/A	SLAs are out of scope of the EUROCONTROL specification.
5.	'air-ground point-to-point data communication' means a two-way communication between an aircraft and a ground communication entity relying upon a set of distributed functions to achieve:		
(a)	the transmission and reception of uplink and downlink bit frames over a mobile data link between ground and aircraft communication systems;	N/A	
(b)	the transmission and reception of data units between ground and aircraft systems hosting the air-ground applications with: - the relay of data units throughout ground communication paths and mobile data links; - the cooperative mechanisms of both ends for the transport of data units.	N/A	
6.	'State aircraft' means any aircraft used for military, customs and police;	N/A	
7.	'transport type State aircraft' means fixed wing State aircraft that are designed for the purpose of transporting persons and/or cargo;	N/A	
8.	'air-ground application' means a set of cooperative air-ground functions in support of air traffic services;	3, B.2.2, B.2.3	The specific air-ground applications referenced in IR Articles 5 - 9 and Annex IV (CM and CPDLC) are described in more detail in section 3 of the EUROCONTROL Specification.



9.	'end-to-end communication' means the transfer of information between peer air-ground applications;	N/A	
10.	'air-ground communication' means a two-way communication between aircraft and ground communication systems;	N/A	
11.	'security policy' means a set of objectives, rules of behaviour for users and administrators, and requirements for system configuration and management that collectively are designed to safeguard systems and communication resources concerned with the provision of data link services against acts of unlawful interference;	N/A	Out of scope of the EUROCONTROL specification
12.	'addressing information' means information pertaining to the system or network address of an entity participating in air-ground data link communication and enabling the location of the entity to be unambiguously determined;	4.6, C.2.6	
13.	'integrated initial flight plan processing system' (hereinafter IFPS) means a system within the European Air Traffic Management Network through which a centralised flight planning processing and distribution service, dealing with the reception, validation and distribution of flight plans, is provided within the airspace covered by this Regulation;	N/A	
14.	'inoperative' in relation to an airborne constituent means that the constituent does not accomplish its intended purpose or is not consistently functioning within its operating limits or tolerances.	N/A	

### Article 3. Data link services

IR Ref.	IR Text	EUROCONTROL Specification ref.	Notes
1.	ATS providers shall ensure that ATS units providing air traffic services within the airspace referred to in Article 1(3) have the capability to provide and operate the data link services defined in Annex II.	Annex A	Annex A specifies interoperability requirements for the referenced data link services. Airspace and deployment timescales are outside the scope of the EUROCONTROL Specification
2.	Without prejudice to paragraph 4 of this Article, operators shall ensure that aircraft operating flights referred to in Article 1(3) with an individual certificate of airworthiness first issued on or after 1 January 2011 have the capability to operate the data link services defined in Annex II.	Annex A	
3.	Without prejudice to paragraph 4 of this Article, operators shall ensure that aircraft operating flights referred to in Article 1(3) with an individual certificate of airworthiness first issued before 1 January 2011 have the capability to operate the data link services defined in Annex II as from 5 February 2015.	Annex A	

IR Ref.	IR Text	EUROCONTROL Specification ref.	Notes
4.	Paragraphs 2 and 3 shall not apply to the following:  (a) aircraft with an individual certificate of airworthiness first issued before 1 January 2014 and fitted with data link equipment certified against the requirements of one of the Eurocae documents specified in point 10 of Annex III;	N/A	FANS-1/A applications are outside the scope of the EUROCONTROL Specification
(b)	aircraft which have an individual certificate of airworthiness first issued before 1 January 1998 and which will cease operation in the airspace referred to in Article 1(3) by 31 December 2017;	N/A	The EUROCONTROL Specification is not relevant for aircraft which are exempted from the IR provisions.
(c)	State aircraft;	N/A	
(d)	aircraft flying in the airspace referred to in Article 1(3) for testing, delivery or for maintenance purpose or with data link constituents temporarily inoperative under conditions specified in the applicable minimum equipment list required by point 1 of Annex III and Regulation (EC) No 216/2008 and its implementing rules.	N/A	
5.	Member States which decide to equip new transport type State aircraft entering into service from 1 January 2014 with data link capability relying upon standards which are not specific to military operational requirements, shall ensure that those aircraft have the capability to operate the data link services defined in Annex II.	Annex A	

#### Article 4. Associated procedures

IR Ref.	IR Text	EUROCONTROL Specification ref.	Notes
	ATS providers providing air traffic services and operators using air traffic services supported by the data link services defined in Annex II shall apply common standardised procedures consistent with relevant provisions of the International Civil Aviation Organisation (hereinafter ICAO) for:		The EUROCONTROL Specification is based on relevant parts of ICAO Doc 4444 (PANS-ATM) and Annex 10 Volume II.
1.	the establishment of controller – pilot data link communications (hereinafter CPDLC);	C.2.2	
2.	the exchange of operational CPDLC messages;	C.2.2	
3.	the transfer of CPDLC;	A.2.2, C.2.2	
4.	the temporary discontinuation of the use of CPDLC pilot requests;	A.2.5.8, C.2.2	
5.	failure and shutdown of CPDLC;	C.2.2	
6.	the filing of flight plans regarding information pertaining to data link capability.	C.2.4	

### Article 5. Obligations of ATS providers for data link communications

IR Ref.	IR Text	EUROCONTROL Specification ref.	Notes
1.	ATS providers shall ensure that the ground systems referred to in Article 1(2) and their constituents support the air-ground applications defined in the ICAO standards specified in points 2 and 3 of Annex III.	1.2.7 (systems), B.2.2 (CPDLC) and B.2.3 (CM)	The specific air-ground applications referenced in IR Article 5 via their Annex 10 references (i.e. CM and CPDLC) are described in more detail in section 3 of the EUROCONTROL Specification.
2.	ATS providers shall ensure that the ground systems referred to in Article 1(2)(c) and their constituents apply end-to-end communications in compliance with the requirements of Part A of Annex IV for data exchanges of the air-ground applications defined in the ICAO standards specified in points 2 and 3 of Annex III.	1.2.7 (systems), Annex B	ATN applications (CPDLC, CM) and communication services (ULCS, ICS) fulfil the requirements of IR Annex IV Part A. The end-to-end protection mechanism is provided by the "protected mode" of CPDLC (EUROCONTROL Spec B.2.2.4) and, to a lesser extent, by the ICS Transport Layer checksum.
3.	ATS providers that rely upon other organisations for the provision of communication services for data exchanges with aircraft which are necessary for air-ground applications defined in the ICAO standards specified in points 2 and 3 of Annex III shall ensure that those services are provided in accordance with the terms and conditions of a service level agreement, including in particular:		The content of SLAs is not included within the scope of the EUROCONTROL Specification.
(a)	the description of communication services in accordance with the requirements of the data link services defined in Annex II;	N/A	Safety and performance requirements in IR Annex II are echoed in A.2.1.12-13, A.2.2.14-15, A.2.3.18-20, A.2.4.5-6 and A.2.5.8-9 of the EUROCONTROL Spec.
(b)	the description of the security policy put in place to secure data exchanges of the air-ground applications defined in the ICAO standards specified in points 2 and 3 of Annex III;	N/A	Security policy is outside the scope of the EUROCONTROL Specification.
(c)	the relevant materials to be supplied for the monitoring of the quality of service and performances of communication services.	N/A	
4.	ATS providers shall make appropriate arrangements to ensure that data exchanges can be established with all aircraft flying in the airspace under their responsibility and having data link capability in accordance with the requirements of this Regulation, with due regard to possible coverage limitations inherent in the communication technology used.	1.6.4(e)-(f), B.2.1.1	Such arrangements may include contracting a communications service provider for air-ground coverage and ground-ground connectivity.

IR Ref.	IR Text	EUROCONTROL Specification ref.	Notes
5.	ATS providers shall implement in their flight data processing systems the log on forward and next authority notification processes between ATC units in accordance with Commission Regulation (EC) No 1032/2006 <sup>(1)</sup> as far as the requirements for automatic systems for the exchange of flight data supporting data link services are concerned.	C.2.3.4	Regulation 1032/2006 is the Coordination and Transfer (COTR) Regulation "laying down requirements for automatic systems for the exchange of flight data for the purpose of notification, coordination and transfer of flights between air traffic control units." LOF and NAN are not in the current Regulation.  The DLS EUROCONTROL Specification refers to the OLDI Specification V4.1 (which is recognised as a Community specification providing means of compliance to Regulation 1032/2006) for use of the LOF and NAN messages.
6.	ATS providers shall monitor the quality of service of communication services and verify their conformance with the level of performance required for the operational environment under their responsibility.	N/A	Performance requirements in ED-120 are referenced in the EUROCONTROL Specification sections A.2.1.12, A.2.2.14, A.2.3.17, A.2.4.6, A.2.5.11. However, the QoS management and QoS monitoring that are needed to ensure that performance requirements are met are outside the scope of the EUROCONTROL Specification.

### Article 6. Obligations of operators for data link communications

IR Ref.	IR Text	EUROCONTROL Specification ref.	Notes
1.	Operators shall ensure that airborne systems referred to in Article 1(2)(c) and their constituents installed on-board aircraft referred to in Article 3(2) and (3) support the air-ground applications defined in the ICAO standards specified in points 2 and 3 of Annex III.	1.2.7 (systems), B.2.2 (CPDLC) and B.2.3 (CM)	The specific air-ground applications referenced in IR Article 6 (CM and CPDLC) are described in more detail in section 3 of the EUROCONTROL Specification.
2.	Operators shall ensure that airborne systems referred to in Article 1(2)(c) and their constituents installed on-board aircraft referred to in Article 3(2) and (3) apply end-to-end communications in compliance with requirements of Part A of Annex IV for data exchanges of the air-ground applications defined in the ICAO standards specified in points 2 and 3 of Annex III.	1.2.7 (systems), Annex B	ATN applications (CPDLC, CM) and communication services (ULCS, ICS) fulfil the requirements of IR Annex IV Part A. The end-to-end protection mechanism is provided by the "protected mode" of CPDLC (EUROCONTROL Spec B.2.2.4) and, to a lesser extent, by the ICS Transport Layer checksum.
3.	Operators shall ensure that airborne systems referred to in Article 1(2)(c) and their constituents installed on-board aircraft referred to in Article 3(2) and (3) apply air-ground communications in compliance with requirements of Part B or Part C of Annex IV for data exchanges of the air-ground applications defined in the ICAO standards specified in points 2 and 3 of Annex III.	1.2.7 (systems), Annexes A to D (for IR Annex IV Part B)  N/A (IR Annex IV Part C)	IR Annex IV Part B specifies requirements for air-ground communications based on ATN and VDL-2 and Part C specifies requirements for air-ground communications based on other communication protocols.  The EUROCONTROL Specification is aimed at providing a means of compliance for systems applying Part B.

IR Ref.	IR Text	EUROCONTROL Specification ref.	Notes
4.	Operators referred to in paragraph 3 shall make appropriate arrangements to ensure that data exchanges can be established between their aircraft having data link capability and all ATS units which may control the flights they operate in the airspace referred to in Article 1(3), with due regard to possible coverage limitations inherent in the communication technology used.	1.6.4(e), A.2.1.1-4.	This implies that Operators must equip their aircraft and contract with an air-ground communication service provider.

### Article 7. General obligations of Member States for data link communications

IR Ref.	IR Text	EUROCONTROL Specification ref.	Notes
1.	Member States which have designated ATS providers in the airspace referred to in Article 1(3) shall ensure that air-ground communications services applying requirements of Part B of Annex IV are available to operators for aircraft flying within that airspace under their responsibility for data exchanges of the air-ground applications defined in the ICAO standards specified in points 2 and 3 of Annex III, with due regard to possible coverage limitations inherent in the communication technology used	Annexes A to D	IR Annex IV Part B specifies requirements for air-ground communications based on ATN and VDL-2. The specified air-ground applications are CM and CPDLC. Safety and performance requirements flow down from the specific data link services.
2.	Member States shall ensure that air navigation service providers and other entities providing communication services implement an appropriate security policy for data exchanges of the data link services defined in Annex II, notably by applying common security rules to protect distributed physical resources supporting those data exchanges.	N/A	Security policy is outside the scope of the EUROCONTROL Specification.
3.	Member States shall ensure that harmonised procedures apply for the management of addressing information in order to unambiguously identify air and ground communications systems supporting data exchanges of the air-ground applications defined in the ICAO standards specified in points 2 and 3 of Annex III.	C.2.6	

### Article 8. Data link communication for transport type State aircraft

IR Ref.	IR Text	EUROCONTROL Specification ref.	Notes
1.	Member States shall ensure that airborne systems referred to in Article 1(2)(c) and their constituents installed on-board transport type State aircraft referred to in Article 3(5) support the air-ground applications defined in the ICAO standards specified in points 2 and 3 of Annex III.	1.2.7 (systems), B.2.2 (CPDLC) and B.2.3 (CM)	The specific air-ground applications referenced in IR Article 8 via their Annex 10 references (i.e. CM and CPDLC) are described in more detail in section 3 of the EUROCONTROL Specification.

IR Ref.	IR Text	EUROCONTROL Specification ref.	Notes
2.	Member States shall ensure that airborne systems referred to in Article 1(2)(c) and their constituents installed on-board transport type State aircraft referred to in Article 3(5) apply end-to-end communications in compliance with requirements of Part A of Annex IV for data exchanges of the air-ground applications defined in the ICAO standards specified in points 2 and 3 of Annex III.	1.2.7 (systems), Annex B	ATN applications (CPDLC, CM) and communication services (ULCS, ICS) fulfil the requirements of IR Annex IV Part A. The end-to-end protection mechanism is provided by the "protected mode" of CPDLC (EUROCONTROL Spec B.2.2.4) and, to a lesser extent, by the ICS Transport Layer checksum.
3.	Member States shall ensure that airborne systems referred to in Article 1(2)(c) and their constituents installed on-board transport type State aircraft referred to in Article 3(5) apply air-ground communications in compliance with requirements specified in Part B or Part C of Annex IV for data exchanges of the air-ground applications defined in the ICAO standards specified in points 2 and 3 of Annex III.	1.2.7 (systems), Annexes A to D (for IR Annex IV Part B) N/A (IR Annex IV Part C)	IR Annex IV Part B specifies requirements for air-ground communications based on ATN and VDL-2 and Part C specifies requirements for air-ground communications based on other communication protocols.  The EUROCONTROL Specification is aimed at providing a means of compliance for systems applying Part B.

### Article 9. Obligations of air navigation services providers and other entities for data link communications

IR Ref.	IR Text	EUROCONTROL Specification ref.	Notes
	Air navigation service providers and other entities providing communication services for data exchanges of the air-ground applications defined in the ICAO standards specified in points (2) and (3) of Annex III shall ensure that the ground systems referred to in Article 1(2)(c) apply air-ground communications in compliance with requirements of Part B or Part C of Annex IV.	Annexes A to D (Annex IV Part B) N/A (Annex IV Part C)	IR Annex IV Part B specifies requirements for air-ground communications based on ATN and VDL-2 and Part C specifies requirements for air-ground communications based on other communication protocols.  The EUROCONTROL Specification is aimed at providing a means of compliance for systems applying Part B.

### Article 10. Safety requirements

IR Ref.	IR Text	EUROCONTROL Specification ref.	Notes
	Member States shall take the necessary measures to ensure that any changes to the existing systems referred to in Article 1(2) or the introduction of new systems are preceded by a safety assessment, including hazard identification, risk assessment and mitigation, conducted by the parties concerned.	N/A	Safety requirements for data link services in ED-120 are referenced in the EUROCONTROL Specification sections A.2.2.15, A.2.3.18, A.2.4.7, A.2.5.12.

### Article 11. Conformity or suitability for use of constituents

IR Ref.	IR Text	EUROCONTROL Specification ref.	Notes
1.	Before issuing an EC declaration of conformity or suitability for use referred to in Article 5 of Regulation (EC) No 552/2004, manufacturers of constituents of the systems referred to in Article 1(2) of this Regulation, or their authorised representatives established in the Community, shall assess the conformity or suitability for use of those constituents in accordance with the requirements set out in Annex V.	A.3, B.3, C.3, D.3	The EUROCONTROL Specification provides references to conformity assessment materials, but does not define specific test cases or testing procedures.
2.	However, certification airworthiness processes complying with Regulation (EC) No 216/2008, when applied to airborne constituents referred to in Article 1(2)(b) and (c) of this Regulation, shall be considered acceptable procedures for the conformity assessment of those constituents if they include the demonstration of compliance with the interoperability, performance and safety requirements of this Regulation.	N/A	Reference is made to EC Regulation No 216/2008 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency. The EUROCONTROL Specification provides references to conformity assessment materials and specifies detailed interoperability, performance and safety requirements.

### Article 12. Verification of systems

IR Ref.	IR Text	EUROCONTROL Specification ref.	Notes
1.	Air navigation service providers who demonstrate or have demonstrated that they fulfil the conditions set out in Annex VI shall conduct a verification of the systems referred to in Article 1(2)(a) and (c) in compliance with the requirements set out in Part A of Annex VII.	N/A	Refer to Annex VII Part A below.
2.	Air navigation service providers which cannot demonstrate that they fulfil the conditions set out in Annex VI shall subcontract to a notified body a verification of the systems referred to in Article 1(2)(a) and (c). That verification shall be conducted in accordance with the requirements set out in Part B of Annex VII.	N/A	Refer to Annex VII Part B below.

### Article 13. Additional requirements

IR Ref.	IR Text	EUROCONTROL Specification ref.	Notes
1.	ATS providers shall ensure that air-ground data exchanges of the air-ground applications defined in the ICAO standards specified in points 2 and 3 of Annex III, are recorded in accordance with the ICAO standards specified in points 6, 7 and 8 of Annex III, insofar as they relate to the ground-based recording function of data link communications.	C.2.5	Reference to Eurocae ED-111 provides the ground recording requirements.

IR Ref.	IR Text	EUROCONTROL Specification ref.	Notes
2.	The Eurocae document specified in point 9 of Annex III shall be considered sufficient means of compliance with regard to the requirements for recording of air-ground data exchanges referred to in paragraph 1 identified in the ICAO standards specified in points 6, 7 and 8 of Annex III.	C.2.5	Reference to Eurocae ED-111 provides the ground recording requirements.
3.	ATS providers shall:		
(a)	develop and maintain operations manuals containing the necessary instructions and information to enable all personnel concerned to apply this Regulation;	N/A	
(b)	ensure that the manuals referred to in point (a) are accessible and kept up to date and that their update and distribution are subject to appropriate quality and documentation configuration management;	N/A	
(c)	ensure that the working methods and operating procedures comply with this Regulation.	C.2.2	
4.	Member States shall take the necessary measures to ensure that the centralised flight planning processing and distribution service:		
(a)	develops and maintains operations manuals containing the necessary instructions and information to enable all personnel concerned to apply this Regulation;	N/A	
(b)	ensures that the manuals referred to in point (a) are accessible and kept up to date and that their update and distribution are subject to appropriate quality and documentation configuration management;	N/A	
(c)	ensures that the working methods and operating procedures comply with this Regulation.	C.2.4	
5.	Air navigation service providers shall ensure that all personnel concerned are made duly aware of the relevant provisions in this Regulation and that they are adequately trained for their job functions.	N/A	
6.	Operators shall take the necessary measures to ensure that the personnel operating data link equipment are made duly aware of this Regulation and that they are adequately trained for their job functions, and that instructions about how to use data link equipment are available in the cockpit where feasible.	N/A	
7.	Member States shall take the necessary measures to ensure that the personnel involved in flight planning who operate the IFPS are made duly aware of the requirements laid down in this Regulation and that they are adequately trained for their job functions.	N/A	
8.	Member States shall ensure that relevant information on the use of data link services is published in the national aeronautical information publications.	C.2.3.2, C.2.6.5	



### Article 14. Exemptions

IR Ref.	IR Text	EUROCONTROL Specification ref.	Notes
1.	When particular circumstances, based on the criteria defined in paragraph 3, prevent aircraft of specific types from complying with the requirements of this Regulation, the Member States concerned shall communicate to the Commission by 31 December 2012 at the latest, detailed information justifying the need for granting exemptions to these aircraft types.	N/A	The EUROCONTROL Specification is not relevant for aircraft which are exempted from the IR provisions.
2.	The Commission shall examine the requests for exemption referred to in paragraph 1 and, following consultation with the parties concerned, shall adopt a decision in accordance with the procedure referred to in Article 5(3) of Regulation (EC) No 549/2004.		
3.	The criteria referred to in paragraph 1 shall be the following:		
(a)	aircraft types reaching the end of their production life and being produced in limited numbers; and		
(b)	aircraft types for which re-engineering costs required would be disproportionate due to old design.		

### Article 15. Entry into force and application

IR Ref.	IR Text	EUROCONTROL Specification ref.	Notes
	This Regulation shall enter into force on the 20th day following its publication in the <i>Official Journal of the European Union</i> .	N/A	Airspace and deployment timescales are outside the scope of the EUROCONTROL Specification.
	This Regulation shall apply from 7 February 2013		
	This Regulation shall be binding in its entirety and directly applicable in all Member States.		

### A1.3 ANNEXES IN THE DRAFT IR

#### ANNEX I. Airspace referred to in Article 1(3)

IR Ref.	IR Text	EUROCONTROL Specification ref.	Notes
	<b>Part A</b>	N/A	The definition of airspace areas is outside the scope of the EUROCONTROL Specification, which applies to all conformant ATS unit and airborne systems according to the schedule given in the IR.
	The airspace referred to in Article 1(3)(a) shall include the airspace above FL 285 within the following Flight Information Regions (FIR) and Upper Flight Information Regions (UIR):		
	Amsterdam FIR, Wien FIR, Barcelona UIR, Brindisi UIR, Brussels UIR, Canarias UIR, France UIR, Hannover UIR, Lisboa UIR, London UIR, Madrid UIR, Milano UIR, Rhein UIR, Roma UIR, Scottish UIR, Shannon UIR.		
	<b>Part B</b>		
	The airspace referred to in Article 1(3)(b) shall include the airspace above FL 285 defined in Part A and in addition, the following Flight Information Regions and Upper Flight Information Regions:		
	Bratislava FIR, Bucuresti FIR, Budapest FIR, Kobenhavn FIR, Ljubljana FIR, Nicosia FIR, Praha FIR, Sofia FIR, Warszawa FIR, Finland UIR south of 61°30', Hellas UIR, Malta UIR, Riga UIR, Sweden UIR south of 61°30', Tallinn UIR, Vilnius UIR,		

#### ANNEX II. Definition of data link services referred to in Articles 3, 4, 5 and 7 and Annex IV

IR Ref.	IR Text	EUROCONTROL Specification ref.	Notes
<b>1.</b>	<b>Definition of Data Link Communications Initiation Capability (DLIC)</b>	<b>A.2.5</b>	
	The DLIC service shall enable the exchange of the necessary information for the establishment of data link communications between ground and aircraft data link systems.	A.2.5	This is core DLIC functionality supported by the ATN CM application.
	The DLIC service shall be available to support:		
-	the unambiguous association of flight data from the aircraft with flight plan data used by an ATS unit;	A.2.5	DLIC logon data includes the following information used for flight plan association: airframe identification, callsign, ADEP, ADES and optionally the EOBT.
-	the exchange of the supported air-ground application type and version information;	A.2.5	DLIC logon data includes this information

IR Ref.	IR Text	EUROCONTROL Specification ref.	Notes
-	and the delivery of the addressing information of the entity hosting the application.	A.2.5	DLIC logon data includes this information
	The exchanges between airborne and ground data link systems for the execution of DLIC service shall comply with:		
-	operating methods, time sequence diagrams and messages for the DLIC initiation and DLIC contact functions specified in Section 4.1 of the Eurocae document identified in point 11 of Annex III,	A.2.5.1 to A.2.5.10	The reference is to ED-120. The DLIC Update function is out of scope. The EUROCONTROL Spec additionally refers to INTEROP requirements in ED-110B.
-	safety requirements specified in Section 4.2.2 of the Eurocae document identified in point 11 of Annex III,	A.2.5.12	The reference is to ED-120
-	performance requirements specified in Section 4.3.2 of the Eurocae document identified in point 11 of Annex III.	A.2.5.11	The reference is to ED-120
<b>2.</b>	<b>Definition of ATC Communications Management service (ACM)</b>	<b>A.2.2</b>	
	The ACM service shall provide automated assistance to flight crews and air traffic controllers for conducting the transfer of ATC communications (voice and data) comprising:	A.2.2	This is core ACM functionality supported by the ATN CPDLC application.
-	the initial establishment of CPDLC with an ATS unit;	A.2.2	
-	the transfer of CPDLC and voice for a flight from one ATS unit to the next ATS unit, or to instruct a change of voice channel within an ATS unit or sector;	A.2.2, C.2.3	
-	the normal termination of CPDLC with an ATS unit.	A.2.2	
	The exchanges between airborne and ground data link systems for the execution of ACM service shall comply with:		
-	operating methods and time sequence diagrams specified in Sections 5.1.1.1.1 to 5.1.1.1.7 and 5.1.1.2 of the Eurocae document identified in point 11 of Annex III,	A.2.2.1 to A.2.2.13	The reference is to ED-120, excluding ACM message definitions. The EUROCONTROL Spec defines the message element support requirements and additionally refers to INTEROP requirements in ED-110B.
-	safety requirements specified in Section 5.1.2.3 of the Eurocae document identified in point 11 of Annex III, excluding requirements relating to downstream clearance,	A.2.2.15	The reference is to ED-120
-	performance requirements for the en route phase specified in Section 5.1.3.2 of the Eurocae document identified in point 11 of Annex III.	A.2.2.14	The reference is to ED-120
<b>3.</b>	<b>Definition of ATC Clearances and Information service (ACL)</b>	<b>A.2.3</b>	
	The ACL service shall provide flight crews and controllers with the ability to conduct operational exchanges comprising:	A.2.3	This is core ACL functionality supported by the ATN CPDLC application.

IR Ref.	IR Text	EUROCONTROL Specification ref.	Notes
-	requests and reports from flight crews to air traffic controllers;	A.2.3	
-	clearances, instructions and notifications issued by air traffic controllers to flight crews.	A.2.3	
	The exchanges between airborne and ground data link systems for the execution of ACL service shall comply with:		
-	operating methods and time sequence diagrams specified in Sections 5.2.1.1.1 to 5.2.1.1.4 and 5.2.1.2 of the Eurocae document identified in point 11 of Annex III,	A.2.3.1 to A.2.3.16	The reference is to ED-120, excluding ACL message definitions.
-	a common subset of the message elements specified in Section 5.2.1.1.5 of the Eurocae document identified in point 11 of Annex III as appropriate to the en route operational environment,	A.2.3.1 to A.2.3.16	The EUROCONTROL Spec defines the message element support requirements and additionally refers to INTEROP requirements in ED-110B.
-	safety requirements specified in Section 5.2.2.3 of the Eurocae document identified in point 11 of Annex III,	A.2.3.18-19	The reference is to ED-120
-	performance requirements for the en route phase specified in Section 5.2.3.2 of the Eurocae document identified in point 11 of Annex III.	A.2.3.17	The reference is to ED-120
<b>4.</b>	<b>Definition of ATC Microphone Check service (AMC)</b>	<b>A.2.4</b>	
	The AMC service shall provide air traffic controllers with the capability to send an instruction to several data link equipped aircraft, at the same time, in order to instruct flight crews to verify that their voice communication equipment is not blocking a given voice channel.	A.2.4	This is core AMC functionality supported by the ATN CPDLC application.
	This instruction shall only be issued to those aircraft tuned to the frequency that is blocked.	A.2.4.4	
	The exchanges between airborne and ground data link systems for the execution of AMC service shall comply with:		
-	operating methods and time sequence diagrams specified in Sections 5.3.1.1.1, 5.3.1.1.2 and 5.3.1.2 of the Eurocae document identified in point 11 of Annex III,	A.2.4.1 to A.2.4.3	The reference is to ED-120, excluding AMC message definitions. The EUROCONTROL Spec defines the message element support requirements and additionally refers to INTEROP requirements in ED-110B.
-	safety requirements specified in Section 5.3.2.3 of the Eurocae document identified in point 11 of Annex III,	A.2.4.7	The reference is to ED-120
-	performance requirements specified in Section 5.3.3.2 of the Eurocae document identified in point 11 of Annex III.	A.2.4.6	The reference is to ED-120

**ANNEX III. ICAO provisions referred to in Articles 3, 5, 6, 7, 8, 9 and 13 and Annex IV / Eurocae documents referred to in Articles 3 and 13 and Annex II**

IR Ref.	IR Text	EUROCONTROL Specification ref.	Notes
1.	Subpart B, OPS 1 030, of Annex III to Regulation (EEC) No 3922/91.	N/A	This refers to the aircraft operations manual and minimum equipment list (MEL) requirements.
2.	Chapter 3 – Aeronautical Telecommunication Network, section 3.5.1.1 “Context Management” (CM) application items a) and b) of ICAO Annex 10 – Aeronautical Telecommunications – Volume III, Part I (Digital Data Communication Systems) (First edition July 1995 incorporating Amendment 81 (23.11.2006)).	7.3 [17]	Annex 10 specifies high level requirements for CM and refers to detailed technical specifications in Doc 9705, which is the main CM reference in the EUROCONTROL Spec.
3.	Chapter 3 – Aeronautical Telecommunication Network, section 3.5.2.2 “Controller-Pilot Data Link Communications” (CPDLC) application items a) and b) of ICAO Annex 10 – Aeronautical Telecommunications – Volume III, Part I (Digital Data Communication Systems) (First edition July 1995 incorporating Amendment 81 (23.11.2006)).	7.3 [17]	Annex 10 specifies high level requirements for CPDLC and refers to detailed technical specifications in Doc 9705, which is the main CPDLC reference in the EUROCONTROL Spec.
4.	Chapter 3 – Aeronautical Telecommunication Network, sections 3.3, 3.4 and 3.6 of ICAO Annex 10 – Aeronautical Telecommunications – Volume III, Part I (Digital Data Communication Systems) (First edition July 1995 incorporating Amendment 81 (23.11.2006)).	7.3 [17]	Annex 10 specifies high level requirements for the ATN and refers to detailed technical specifications in Doc 9705, which is the main ATN reference in the EUROCONTROL Spec.
5.	Chapter 6 – VHF air–ground digital link (VDL) of ICAO Annex 10 – Aeronautical Telecommunications – Volume III, Part I (Digital Data Communication Systems) (First edition July 1995 incorporating Amendment 81 (23.11.2006)).	7.2 [3]	
6.	Chapter 3 – General procedures for the international aeronautical telecommunication service, section 3.5.1.5 of ICAO Annex 10 – Aeronautical Telecommunications – Volume II, (Communication Procedures) (Sixth edition October 2001 incorporating Amendment 81 (23.11.2006)).	7.2 [2]	Requirements for ground recording are by reference to EUROCAE ED-111, which includes this Annex 10 reference.
7.	Chapter 2 – General, – sections 2.25.3 of ICAO Annex 11 – Air Traffic Services (13th edition July 2001 incorporating Amendment 45 (16.7.2007))	N/A	Requirements for ground recording are by reference to EUROCAE ED-111, which includes this Annex 11 reference.
8.	Chapter 6 – Air traffic services requirements for communications, – sections 6.1.1.2, of ICAO Annex 11 – Air Traffic Services (Thirteenth edition - July 2001 incorporating Amendment 45 (16.7.2007))	N/A	Requirements for ground recording are by reference to EUROCAE ED-111, which includes this Annex 11 reference.
9.	Eurocae ED-111, Functional specifications for CNS/ATM ground recording, July 2002 including Amendment 1 (30.7.2003).	7.2 [11]	
10.	Eurocae ED-100 (September 2000) and ED-100A (April 2005), Interoperability requirements for ATS applications using ARINC 622 Data Communications.	N/A	FANS-1/A applications are outside the scope of this EUROCONTROL Specification.

IR Ref.	IR Text	EUROCONTROL Specification ref.	Notes
11.	Eurocae ED -120 Safety and Performance Requirements Standard for Air Traffic Data Link Services in Continental Airspace, published in May 2004, including Change 1, published in April 2007, and Change 2, published in October 2007.	7.2 [10]	

## ANNEX IV. Requirements referred to in Article 5, 6, 7, 8 and 9

### Part A: Requirements for end-to-end communications

IR Ref.	IR Text	EUROCONTROL Specification ref.	Notes
1.	End-to-end data communications shall ensure seamless provision and use of communication services in the airspace referred to in Article 1(3).	Annex B	The <u>schedule</u> for deployment to ensure seamless geographical coverage is outside the scope of the EUROCONTROL Specification.
2.	End-to-end data communications shall support the exchange of messages in support of the data link services defined in Annex II, in accordance with a common standardised messages set.	Annex B	The standardised message elements are specified in Annex A, Tables A-1 to A-5.
3.	End-to-end data communications shall support a common standardised end-to-end protection mechanism to ensure the integrity of messages received consistent with safety requirements of the data link services defined in Annex II.	B.2.2.4	The referenced protection mechanism is the CPDLC Application Message Integrity Check, which was developed to satisfy the ED-120 safety requirements.

### Part B: Requirements for air-ground communications based on ATN and VDL Mode 2

IR Ref.	IR Text	EUROCONTROL Specification ref.	Notes
1.	Air-ground communications shall be designed to support end-to-end communications and to ensure seamless provision and use of communications services to air-ground applications defined in the ICAO standards specified in points 2 and 3 of Annex III in the airspace referred to in Article 1(3).	Annex B, Annex D	The EUROCONTROL Specification covers interoperability of the referenced CM and CPDLC air-ground applications, mainly by reference to EUROCAE ED-110B and ICAO Doc 9705.
2.	Air-ground communications shall comply with safety and performance requirements of the data link services defined in Annex II.	A.2.1.12-13	
3.	Air-ground communications shall be based on a common addressing scheme.	C.2.6	

IR Ref.	IR Text	EUROCONTROL Specification ref.	Notes
4.	The transmission and reception of data units between ground and aircraft systems hosting the air-ground applications defined in the ICAO standards specified in points 2 and 3 of Annex III shall be based on communication protocols which comply with the ICAO standards defining the Aeronautical Telecommunication Network referenced in point 4 of Annex III.	B.2.1.2 (ATN CM, CPDLC and communication services) B.2.4 (ATN ULCS) B.2.5 (ATN ICS)	Annex III points (2) and (3) refer to CM and CPDLC, respectively. Annex III point 4 refers to general ATN/OSI high level and communications service requirements.
5.	The ground and aircraft communication system characteristics and the transmission and reception of bit frames between ground and aircraft communication systems shall comply with the ICAO standards defining the very high frequency digital link, VDL Mode 2, referenced in point 5 of Annex III.	D.2.1.1	Annex III point 5 refers to the VDL-2 SARPs in Annex 10, reference [3] in the EUROCONTROL Spec. ARINC 631-5 [13] takes precedence.

**Part C: Requirements for air-ground communications based on other communication protocols**

IR Ref.	IR Text	EUROCONTROL Specification ref.	Notes
1.	Air-ground communications shall be designed to support end-to-end communications and to ensure seamless provision and use of communications services to air-ground applications defined in the ICAO standards specified in points 2 and 3 of Annex III in the airspace referred to in Article 1(3).	N/A	The EUROCONTROL Specification provides compliance with IR Annex IV PART B – Air-ground communications based on ATN and VDL 2.  (In so doing, it incidentally also provides conformity with IR ANNEX IV PART C)
2.	Air-ground communications shall comply with safety and performance requirements of the data link services defined in Annex II.		
3.	Air-ground communications shall be based on a common addressing scheme.		
4.	The transmission and reception of bit frames between ground and aircraft communication systems shall be based on communication protocols fulfilling conditions set out in Part D.		

**Part D: Conditions referred to in Part C**

IR Ref.	IR Text	EUROCONTROL Specification ref.	Notes
1.	Communication protocols must support end-to-end communications.	N/A	The EUROCONTROL Specification provides compliance with IR Annex IV, PART B– Air-ground communications based on ATN and VDL-2.
2.	Communication protocols must be subject to a safety case to demonstrate compliance with safety and performance requirements of the data link services defined in Annex II.		

IR Ref.	IR Text	EUROCONTROL Specification ref.	Notes
3.	Communication protocols must support bidirectional point-to-point communications using those parts of the radio frequency spectrum identified by ICAO as suitable for air-ground data communications in support of air traffic services.		(In so doing, it incidentally also provides conformity with IR ANNEX IV PART D)
4.	Communication protocols must include a mechanism to manage mobile connectivity between ground and airborne stations in a transparent way.		
5.	Communication protocols must be specified and validated with respect to airworthiness regulations and operational approval regulations applicable to aircraft communication equipment.		
6.	Communication systems supporting these protocols must not create harmful effects on airborne and ground installations supporting VDL 2.		

## ANNEX V

### Requirements for the assessment referred to in Article 11 of the conformity or suitability for use of constituents

IR Ref.	IR Text	EUROCONTROL Specification ref.	Notes
1.	The verification activities shall demonstrate the conformity or suitability for use of constituents implementing the data link services, end-to-end communications and air-ground communications with the applicable requirements of this Regulation whilst those constituents are in operation in the test environment.	A.3, B.3, C.3, D.3	The EUROCONTROL Specification provides references to conformity assessment materials, but does not define specific test cases or testing procedures.
2.	The manufacturer shall manage the conformity assessment activities and shall in particular:		
-	determine the appropriate test environment,		
-	verify that the test plan describes the constituents in the test environment,		
-	verify that the test plan provides full coverage of applicable requirements,		
-	ensure the consistency and quality of the technical documentation and the test plan,		
-	plan the test organisation, staff, installation and configuration of test platform,		
-	perform the inspections and tests as specified in the test plan,		
-	write the report presenting the results of inspections and tests.		



IR Ref.	IR Text	EUROCONTROL Specification ref.	Notes
3.	The manufacturer shall ensure that the constituents implementing data link services, end-to-end communications and air-ground communications, integrated in the test environment meet the applicable requirements of this Regulation.		
4.	Upon satisfying completion of verification of conformity or suitability for use, the manufacturer shall under its responsibility draw up the EC declaration of conformity or suitability for use, specifying the applicable requirements of this Regulation met by the constituent and its associated conditions of use in accordance with point 3 of Annex III to Regulation (EC) No 552/2004.		

### ANNEX VI. Conditions referred to in Article 12

IR Ref.	IR Text	EUROCONTROL Specification ref.	Notes
1.	The air navigation service provider must have in place reporting methods within the organisation which ensure and demonstrate impartiality and independence of judgement in relation to the verification activities.	N/A	The EUROCONTROL Specification does not address personnel and reporting requirements with respect to verification activities.
2.	The air navigation service provider must ensure that the personnel involved in verification processes, carry out the checks with the greatest possible professional integrity and the greatest possible technical competence and are free of any pressure and incentive, in particular of a financial type, which could affect their judgment or the results of their checks, in particular from persons or groups of persons affected by the results of the checks.		
3.	The air navigation service provider must ensure that the personnel involved in verification processes, have access to the equipment that enables them to properly perform the required checks.		
4.	The air navigation service provider must ensure that the personnel involved in verification processes, have sound technical and vocational training, satisfactory knowledge of the requirements of the verifications they have to carry out, adequate experience of such operations, and the ability required to draw up the declarations, records and reports to demonstrate that the verifications have been carried out.		
5.	The air navigation service provider must ensure that the personnel involved in verification processes, are able to perform their checks with impartiality. Their remuneration shall not depend on the number of checks carried out, or on the results of such checks		

## ANNEX VII

### Part A: Requirements for the verification of systems referred to in Article 12(1)

IR Ref.	IR Text	EUROCONTROL Specification ref.	Notes
1.	The verification of systems identified in Article 1(2) shall demonstrate the conformity of these systems with the applicable requirements of this Regulation in an assessment environment that reflects the operational context of these systems.	A.3, B.3, C.3, D.3	<p>The EUROCONTROL Specification provides references to conformity assessment materials, but does not define specific test cases or testing procedures.</p> <p>C.3.2. refers to the ETIC test tool for inter-centre message protocols.</p>
2.	The verification of systems identified in Article 1(2) shall be conducted in accordance with appropriate and recognised testing practices.		
3.	Test tools used for the verification of systems identified in Article 1(2) shall have appropriate functionalities.	C.3.2	
4.	The verification of systems identified in Article 1(2) shall produce the elements of the technical file required by point 3 of Annex IV to Regulation (EC) No 552/2004 including the following elements:		
-	description of the implementation,		
-	the report of inspections and tests achieved before putting the system into service.		
5.	The air navigation service provider shall manage the verification activities and shall in particular:		
-	determine the appropriate operational and technical assessment environment reflecting the operational environment,		
-	verify that the test plan describes the integration of systems identified in Article 1(2) in an operational and technical assessment environment,		
-	verify that the test plan provides full coverage of the interoperability and performance requirements of this Regulation,		
-	ensure the consistency and quality of the technical documentation and the test plan,		
-	plan the test organisation, staff, installation and configuration of the test platform,		
-	perform the inspections and tests as specified in the test plan,		
-	write the report presenting the results of inspections and tests.		

IR Ref.	IR Text	EUROCONTROL Specification ref.	Notes
6.	The air navigation service provider shall ensure that the systems identified in Article 1(2) operated in an operational assessment environment meet the applicable requirements of this Regulation.		
7.	Upon satisfying completion of verification of compliance, air navigation service providers shall draw up the EC declaration of verification of system and submit it to the national supervisory authority together with the technical file as required by Article 6 of Regulation (EC) No 552/2004.		

Part B: Requirements for the verification of systems referred to in Article 12(2)

IR Ref.	IR Text	EUROCONTROL Specification ref.	Notes
1.	The verification of systems identified in Article 1(2) shall demonstrate the conformity of these systems with the applicable requirements of this Regulation in an assessment environment that reflects the operational context of these systems.	A.3, B.3, C.3, D.3	The EUROCONTROL Specification provides references to conformity assessment materials, but does not define specific test cases or testing procedures.  C.3.2. refers to the ETIC test tool for inter-centre message protocols.
2.	The verification of systems identified in Article 1(2) shall be conducted in accordance with appropriate and recognised testing practices.		
3.	Test tools used for the verification of systems identified in Article 1(2) shall have appropriate functionalities.	C.3.2	
4.	The verification of systems identified in Article 1(2) shall produce the elements of the technical file required by point 3 of Annex IV to Regulation (EC) No 552/2004, including the following elements:		
-	description of the implementation,		
-	the report of inspections and tests achieved before putting the system into service.		
5.	The air navigation service provider shall determine the appropriate operational and technical assessment environment reflecting the operational environment and shall have verification activities performed by a notified body.		
6.	The notified body shall manage the verification activities and shall in particular:		
-	verify that the test plan describes the integration of systems identified in Article 1(2) in an operational and technical assessment environment,		
-	verify that the test plan provides full coverage of the requirements of this Regulation,		

IR Ref.	IR Text	EUROCONTROL Specification ref.	Notes
-	ensure the consistency and quality of the technical documentation and the test plan,		
-	plan the test organisation, staff, installation and configuration of the test platform,		
-	perform the inspections and tests as specified in the test plan,		
-	write the report presenting the results of inspections and tests.		
7.	The notified body shall ensure that the systems identified in Article 1(2) operated in an operational assessment environment meet the applicable requirements of this Regulation.		
8.	Upon satisfying completion of verification tasks, the notified body shall draw up a certificate of conformity in relation to the tasks it carried out.		
9.	Then, the air navigation service provider shall draw up the EC declaration of verification of system and submit it to the national supervisory authority together with the technical file as required by Article 6 of Regulation (EC) No 552/2004.		

**EUROCONTROL Specification on Data Link Services**

**Appendix 2**

**Current Editions of Referenced ISO/IEC Standards and IETF RFCs**

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## APPENDIX 2. CURRENT EDITIONS OF REFERENCED ISO/IEC STANDARDS

### A2.1 INTRODUCTION

This informational Appendix provides references to the current editions of international standards that are invoked in the baseline ICAO technical provisions for the ATN (Doc 9705 edition 2).

ICAO Doc 9705 provides in Sub-Volume I, section 1.1.2, a list of referenced standards. This list refers to specific editions of the standards, identified by their year of publication. Other parts of Doc 9705 generally make non-specific references to these standards (i.e. without edition number or year of publication), but as stated in Sub-Volume I, they are in fact referring to the specific editions and/or versions listed therein.

A note in Doc 9705, section 1.1.2 states:

*"Note 1.— The cited references were used in the preparation of Doc 9705. In the course of the normal progression of ISO and ITU-T standards, new editions are released. New editions to the referenced documents can be safely used in place of the referenced documents with the understanding that new functions introduced in those editions might not be supported by other implementations. Additionally, Amendments to ISO standards are incorporated into the following editions of the base standard and therefore information can be found there."*

In support of implementers the table in this Appendix shows the latest editions of the standards used/referenced in the relevant parts of Doc. 9705. The intention is not to mandate their use but to indicate the current standards editions (as at June 2008). As noted above, these latest editions may be used in place of the referenced editions, provided backwards compatibility is maintained where any new functionality is introduced in later editions.

In case of doubt, the specific edition referred to in Doc 9705 remains the master reference.

As some of these editions are now unobtainable, the later edition may be used by implementers, with the above provisos.

### A2.2 LIST OF REFERENCED STANDARDS

In the following table, the first column lists all cross-references found in Doc 9705/SV4 Ed 2 (ULCS), Doc 9705/SV5 Ed 2 (ICS) and PDR M6050001 / Doc 9880 (CPDLC part). In general, these are not qualified by a particular year or edition number, but refer to the list of external standards in Doc 9705/SV1. References in *italics* appear only in Notes.

The second column lists the reference as given in Doc9705/SV1 Ed 2. Highlighted references are either standards that have been withdrawn by ISO (normally replaced by a later edition), and/or references with an incorrect year of publication.

The third column gives the current edition and title, as well as a list of withdrawn editions of each standard, taken from the ISO online catalogue at [www.iso.ch](http://www.iso.ch). It also lists the relevant Amendments and Technical Corrigenda to the base standard.

Standards used by CPDLC and Supporting Layers.

Ref in Doc 9705	Doc 9705 SV1 Reference	ISO Status
ISO 3166	<b>ISO/IEC 3166:1993.</b> Codes for the representation of names and countries.	<p><u>ISO 3166:1993</u> Codes for the representation of names of countries (1993 Edition 4 Withdrawn 1997-09-24)</p> <p><u>ISO 3166-1:2006</u> Codes for the representation of names of countries and their subdivisions -- Part 1: Country codes Edition 2 (2006-11-20) (1997 Edition 1 Withdrawn 2006-11-20)</p> <p><u>ISO 3166-1:2006/Cor 1:2007</u> Edition 1 (2007-07-11)</p> <p><u>ISO 3166-2:2007</u> Codes for the representation of names of countries and their subdivisions -- Part 2: Country subdivision code Edition 2 (2007-12-13) (1998 Edition 1 Withdrawn 2007-12-13)</p> <p><u>ISO 3166-3:1999</u> Codes for the representation of names of countries and their subdivisions -- Part 3: Code for formerly used names of countries Edition 1 (1999-03-11)</p>
ISO 6523	<b>ISO/IEC 6523:1994.</b> Data interchange — Structures for the identification of organizations (Registration of International Code Designators).	<p><u>ISO 6523:1984</u> Data interchange -- Structures for the identification of organizations (1984 Edition 1 Withdrawn 1998-12-20)</p> <p><u>ISO 6523:1984/Amd 1:1994</u> Edition 1 (Withdrawn 1998-12-20)</p> <p><u>ISO/IEC 6523-1:1998</u> Information technology -- Structure for the identification of organizations and organization parts -- Part 1: Identification of organization identification schemes Edition 1 (1998-12-20)</p> <p><u>ISO/IEC 6523-2:1998</u> Information technology -- Structure for the identification of organizations and organization parts -- Part 2: Registration of organization identification schemes Edition 1 (1998-12-20)</p>

Ref in Doc 9705	Doc 9705 SV1 Reference	ISO Status
ISO 7498 parts 1-4	<p><i>ISO/IEC 7498-1:1994</i>. Information technology — Open Systems Interconnection — Basic Reference Model. Reference: ITU-T Rec. X.200 (1994)</p> <p><i>ISO/IEC 7498-2:1989</i>. Information processing systems — Open Systems Interconnection — Basic Reference Model — Part 2: Security Architecture.</p> <p><i>ISO/IEC 7498-3:1989</i>. Information processing systems — Open Systems Interconnection — Basic Reference Model — Part 3: Naming and Addressing. Reference: ITU-T Rec. X.650 (1992).</p> <p><i>ISO/IEC 7498-4:1989</i>. Information processing systems — Open Systems Interconnection — Basic Reference Model — Part 4: Management framework.</p>	<p><i>ISO/IEC 7498-1:1994</i>. Information technology -- Open Systems Interconnection -- Basic Reference Model: The Basic Model Edition 2 (1994-11-17)</p> <p><i>ISO 7498-2:1989</i>. Information processing systems -- Open Systems Interconnection -- Basic Reference Model -- Part 2: Security Architecture Edition 1 (1989-02-02)</p> <p><i>ISO/IEC 7498-3:1997</i>. Information technology -- Open Systems Interconnection -- Basic Reference Model: Naming and addressing Edition 2 (1997-04-03) (1989 Edition 1 Withdrawn 1997-04-03)</p> <p><i>ISO/IEC 7498-4:1989</i>. Information processing systems -- Open Systems Interconnection -- Basic Reference Model -- Part 4: Management framework Edition 1 (1989-11-16)</p>
ISO/IEC 10589	<p><i>ISO/IEC 10589:1992</i>. Information technology — Telecommunications and information exchange between systems — Intermediate system to intermediate system intra-domain-routing routine information exchange protocol for use in conjunction with the protocol for providing the connectionless-mode Network Service ( ISO/IEC 8473).</p>	<p><i>ISO/IEC 10589:2002</i>. Information technology -- Telecommunications and information exchange between systems -- Intermediate System to Intermediate System intra-domain routing information exchange protocol for use in conjunction with the protocol for providing the connectionless-mode network service (ISO 8473) Edition 2 (2002-11-15) (1992 Edition 1 Withdrawn 2002-11-15)</p>
ISO/IEC 10747	<p><i>ISO/IEC 10747:1994</i>. Information technology — Telecommunications and information exchange between systems — Protocol for exchange of inter-domain routing information among intermediate systems to support forwarding of ISO/IEC 8473 PDUs.</p>	<p><i>ISO/IEC 10747:1994</i>. Information technology -- Telecommunications and information exchange between systems -- Protocol for exchange of inter-domain routing information among intermediate systems to support forwarding of ISO 8473 PDUs Edition 1 (1994-10-06)</p> <p><i>ISO/IEC 10747:1994/Amd 1:1996</i>. Implementation conformance statement proformas Edition 1 (1996-07-11)</p> <p><i>ISO/IEC 10747:1994/Cor 1:1996</i>. Edition 1 (1996-12-19)</p>
ISO/IEC 11577	<p><i>Not in reference list</i></p>	<p><i>ISO/IEC 11577:1995</i>. Information technology -- Open Systems Interconnection -- Network layer security protocol Edition 1 (1995-05-11)</p>
ISO/IEC 8072	<p><i>ISO/IEC 8072:1994</i>. Information technology — Open Systems Interconnection — Transport service definition (second edition). Reference: ITU-T Rec. X.214 (1993).</p>	<p><i>ISO/IEC 8072:1996</i>. Information technology -- Open systems interconnection -- Transport service definition Edition 3 (1996-07-18) (1986 Edition 1 Withdrawn 1994-07-21) (1994 Edition 2 Withdrawn 1996-07-18)</p>



Ref in Doc 9705	Doc 9705 SV1 Reference	ISO Status
ISO/IEC 8073	<p><b>ISO/IEC 8073:1992.</b> Information technology — Telecommunications and information exchange between systems — Open Systems Interconnection — Protocol for providing the connection-mode transport service.</p> <p><b>ISO/IEC 8073/PDAM5:1992.</b> Information technology — Telecommunications and information exchange between systems — Open Systems Interconnection — Protocol for providing the connection-mode transport service — Amendment 5: Provision of Non-blocking Expedited Service.</p>	<p><b>ISO/IEC 8073:1997</b> Information technology -- Open Systems Interconnection -- Protocol for providing the connection-mode transport service Edition 4 (1997-09-04) (1986 Edition 1 Withdrawn 1988-12-15) (1988 Edition 2 Withdrawn 1992-12-17) (1992 Edition 3 Withdrawn 1997-09-04)</p> <p><b>ISO/IEC 8073:1997/Amd 1:1998</b> Relaxation of class conformance requirements and expedited data service feature negotiation Edition 1 (1998-09-17)</p>
ISO/IEC 8208	<p><b>ISO/IEC 8208:1995.</b> Information technology — Data communications — X.25 Packet Layer Protocol for Data Terminal Equipment (Revision of ISO/IEC 8208:1990).</p>	<p><b>ISO/IEC 8208:2000</b> Information technology -- Data communications -- X.25 Packet Layer Protocol for Data Terminal Equipment Edition 4 (2000-11-16) (1987 Edition 1 Withdrawn 1990-03-21) (1990 Edition 2 Withdrawn 1995-07-27) (1995 Edition 3 Withdrawn 2000-11-16)</p>
ISO/IEC 8327-1 Clause 6 <i>ISO/IEC 8327-1 clauses 7.16 and 7.17</i>	<p><b>ISO/IEC 8327-1:1994.</b> Information Technology — Open Systems Interconnection — Basic Connection Oriented Session Protocol: Part 1 — Protocol Specification (second edition). Reference: ITU-T Rec. X.225 (1994).</p>	<p>(No 1994 edition)</p> <p><b>ISO/IEC 8327-1:1996</b> Information technology -- Open Systems Interconnection -- Connection-oriented Session protocol: Protocol specification Edition 2 (1996-10-10) (1987 Edition 1 Withdrawn 1996-10-10)</p> <p><b>ISO/IEC 8327-1:1996/Cor 1:2002</b> Edition 1 (2002-05-30)</p>
ISO/IEC 8327-1: 1996 / Amd. 1: 1997 ISO/IEC 8327-1: 1:1996/Amd. 1:1997 as specified, together with all approved amendments and defect report resolutions.	<p><b>ISO/IEC 8327-1:1995/Amd. 1:1997.</b> Information Technology — Open Systems Interconnection — Basic Connection Oriented Session Protocol: Part 1 — Protocol Specification — Amendment 1: efficiency enhancements.</p>	<p>(No 1997 amendment)</p> <p><b>ISO/IEC 8327-1:1996/Amd 1:1998</b> Efficiency enhancements Edition 1 (1998-10-01)</p>
<i>ISO/IEC 8327-2</i>	<p><b>ISO/IEC 8327-2:1994.</b> Information technology — Open Systems Interconnection — Basic connection oriented session protocol specification — Part 2: Protocol Implementation Conformance Statement (PICS) Proforma.</p>	<p>(No 1994 edition)</p> <p><b>ISO/IEC 8327-2:1996</b> Information technology -- Open Systems Interconnection -- Connection-oriented Session protocol: Protocol Implementation Conformance Statement (PICS) proforma</p>

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		Edition 1 (1996-10-10)
ISO/IEC 8348	<b>ISO/IEC 8348:1993</b> . Information technology — Open Systems Interconnection — Network Service Definition.	<u>ISO/IEC 8348:2002</u> . Information technology -- Open Systems Interconnection -- Network service definition Edition 3 (2002-11-08) (1993 Edition 1 Withdrawn 1996-09-26) (1996 Edition 2 Withdrawn 2002-11-08)
ISO/IEC 8473	(No reference)	(Generic reference to multi-part standard ISO/IEC 8473-x) <u>ISO 8473:1988</u> . Information processing systems -- Data communications -- Protocol for providing the connectionless-mode network service (1988 Edition 1 Withdrawn 1994-07-14)
ISO/IEC 8473-1	<b>ISO/IEC 8473-1:1994</b> . Information technology — Protocol for providing the connectionless-mode network service: Protocol specification.	<u>ISO/IEC 8473-1:1998</u> . Information technology -- Protocol for providing the connectionless-mode network service: Protocol specification Edition 2 (1998-10-22) (1994 Edition 1 Withdrawn 1998-10-22)
ISO/IEC 8473-2	<b>ISO/IEC 8473-2:1994</b> . Information technology — Protocol for providing the connectionless-mode network service — Part 2: Provision of the underlying service by an ISO/IEC 8802 subnetwork.	(No 1994 edition) <u>ISO/IEC 8473-2:1996</u> . Information technology -- Protocol for providing the connectionless-mode network service -- Part 2: Provision of the underlying service by an ISO/IEC 8802 subnetwork Edition 1 (1996-03-14)
ISO/IEC 8473-3	<b>ISO/IEC 8473-3:1995</b> . Information technology — Protocol for providing the connectionless-mode network service — Part 3: Provision of the underlying service by an X.25 subnetwork.	<u>ISO/IEC 8473-3:1995</u> . Information technology -- Protocol for providing the connectionless-mode network service: Provision of the underlying service by an X.25 subnetwork Edition 1 (1995-03-02)
ISO/IEC 8473-4	<b>ISO/IEC 8473-4:1995</b> . Information technology — Protocol for providing the connectionless-mode network service — Part 4: Provision of the underlying service by a subnetwork that provides the OSI data link service	<u>ISO/IEC 8473-4:1995</u> . Information technology -- Protocol for providing the connectionless-mode network service: Provision of the underlying service by a subnetwork that provides the OSI data link service Edition 1 (1995-03-02)
ISO/IEC 8602	<b>ISO/IEC 8602:1995</b> . Information technology — Protocol for providing the OSI connectionless-mode transport service.	<u>ISO/IEC 8602:1995</u> . Information technology -- Protocol for providing the OSI connectionless-mode transport service Edition 2 (1995-03-30) (1987 Edition 1 Withdrawn 1995-03-30) <u>ISO/IEC 8602:1995/Amd 1:1996</u> . Addition of connectionless-mode multicast capability Edition 1 (1996-12-26)

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ISO/IEC 8649	<p>ISO/IEC 8649:1994. Information processing systems — Open Systems Interconnection — Service definition for the Association Control Service Element (second edition). Reference: ITU-T Rec. X.217 (1992).</p> <p>ISO/IEC 8649/PDAM 1:1995. Information technology — Open Systems Interconnection — Service definition for the Association Control Service Element — Amendment 1: Fast associate mechanism.</p>	<p>(No 1994 edition, no 1995 amendment)</p> <p>ISO/IEC 8649:1996 Information technology -- Open Systems Interconnection -- Service definition for the Association Control Service Element Edition 2 (1996-10-10) (1988 Edition 1 Withdrawn 1996-10-10)</p> <p>ISO/IEC 8649:1996/Amd 1:1997 Support of authentication mechanisms for the connectionless mode Edition 1 (1997-12-24)</p> <p>ISO/IEC 8649:1996/Amd 2:1998 Fast-associate mechanism Edition 1 (1998-09-10)</p>
ISO/IEC 8650-1 ISO/IEC 8650-1:1995 <i>second edition</i>	ISO/IEC 8650-1:1996. Information processing systems — Open Systems Interconnection — Protocol specification for the Association Control Service Element (second edition). Reference: ITU-T Rec. X.227 (1994).	ISO/IEC 8650-1:1996 Information technology -- Open Systems Interconnection -- Connection-oriented protocol for the Association Control Service Element: Protocol specification Edition 2 (1996-10-24) (1988 Edition 1 Withdrawn 1996-10-23)
ISO/IEC 8650-1:1996/Amd. 1:1997 ISO/IEC 8650-1, including the extensibility notation as specified as Amendment 1	ISO/IEC 8650-1/DAM 1:1995. Information processing systems — Open Systems Interconnection — Protocol specification for the Association Control Service Element — Amendment 1: Incorporation of extensibility markers.	(No 1995 amendment) ISO/IEC 8650-1:1996/Amd 1:1997 Incorporation of extensibility markers Edition 1 (1997-12-25)
ISO/IEC 8650-2	ISO/IEC 8650-2:1995. Information technology — Open Systems Interconnection — Protocol specification for the Association Control Service Element — Part 2: Protocol Implementation Conformance Statement (PICS) proforma.	ISO/IEC 8650-2:1997 Information technology -- Open Systems Interconnection -- Protocol specification for the Association Control Service Element: Protocol Implementation Conformance Statement (PICS) proforma Edition 2 (1997-07-03) (1995 Edition 1 Withdrawn 1997-07-03)
ISO 8802	(No reference)	(Generic reference to multi-part standard ISO/IEC 8802-x) ISO/IEC TR 8802-1:2001 Information technology -- Telecommunications and information exchange between systems -- Local and metropolitan area networks -- Specific requirements -- Part 1: Overview of Local Area Network Standards Edition 3 (2001-10-04)

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ISO/IEC 8802	<p><i>ISO/IEC 8802-2:1990</i>. Telecommunications and information exchange between systems — Local and metropolitan area networks — Specific requirements — Part 2: Logical Link Control</p> <p><i>ISO/IEC 8802-3:1989</i>. Telecommunications and information exchange between systems — Local and metropolitan area networks — Specific requirements — Part 3: Carrier Sense Multiple Access with Collision Detection — Access Method and Physical Layer Specifications.</p>	<p>(No 1990 edition)  <u>ISO/IEC 8802-2:1998</u> Information technology -- Telecommunications and information exchange between systems -- Local and metropolitan area networks -- Specific requirements -- Part 2: Logical link control            Edition 3 (1998-06-11)            (1981 Edition 1 Withdrawn 1994-12-22)            (1994 Edition 2 Withdrawn 1998-06-11)  <u>ISO/IEC 8802-2:1998/Cor 1:2000</u> Edition 1 (2000-10-19)  <u>ISO/IEC 8802-3:2000</u> Information technology -- Telecommunications and information exchange between systems -- Local and metropolitan area networks -- Specific requirements -- Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications Edition 6 (2000-12-21)            (1989 Edition 1 Withdrawn 1990-12-11)            (1990 Edition 2 Withdrawn 1992-03-20)            (1992 Edition 3 Withdrawn 1993-09-02)            (1993 Edition 4 Withdrawn 1996-11-28)            (1996 Edition 5 Withdrawn 2000-12-21)</p>
ISO/IEC 8823-1	<p><i>ISO/IEC 8823-1:1994</i>. Information technology — Open Systems Interconnection — Basic connection-oriented presentation protocol — Part 1: Protocol specification (second edition). Reference: ITU-T Rec. X.226 (1994).</p>	<p><u>ISO/IEC 8823-1:1994</u> Information technology -- Open Systems Interconnection -- Connection-oriented presentation protocol: Protocol specification            Edition 2 (1994-12-15)</p>
ISO/IEC 8823-1:1994/Amd. 1:1997	<p><i>ISO/IEC 8823-1:1994/Amd. 1:1997</i>. Information technology — Open Systems Interconnection — Basic connection-oriented presentation protocol — Part 1: Protocol specification — Amendment 1: Efficiency enhancements.</p>	<p><u>ISO/IEC 8823-1:1994/Amd 1:1998</u> Efficiency enhancements            Edition 1 (1998-09-17)</p>
ISO/IEC 8823-2	<p><i>ISO/IEC 8823-2:1995</i>. Information technology — Open Systems Interconnection — Basic connection-oriented presentation protocol — Part 2: Protocol Implementation Conformance Statement (PICS) proforma.</p>	<p><u>ISO/IEC 8823-2:1997</u> Information technology -- Open Systems Interconnection -- Connection-oriented presentation protocol: Protocol Implementation Conformance Statement (PICS) proforma            Edition 2 (1997-07-03)            (1995 Edition 1 Withdrawn 1997-07-03)</p>

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ISO/IEC 8824	<p><i>ISO/IEC 8824-1:1994</i>. Information Technology — OSI Abstract Syntax Notation One (ASN.1). — Specification of basic notation. Reference: ITU-T Rec. X.682 (1994).</p> <p><i>ISO/IEC 8824-1/Amd.1:1995</i>. Information Technology — Open Systems Interconnection — Abstract Syntax Notation One (ASN.1) — Specification of Basic Notation — Amendment 1: Rules for Extensibility.</p> <p><i>ISO/IEC 8824-2:1995</i>. Information technology Open Systems Interconnection Abstract Syntax Notation One (ASN.1) Part 2: Information object specification.</p> <p><i>ISO/IEC 8824-3:1995</i>. Information technology Open Systems Interconnection Abstract Syntax Notation One (ASN. 1) Part 3: Constraint specification.</p> <p><i>ISO/IEC 8824-4:1995</i>. Information technology Open Systems Interconnection Abstract Syntax Notation One (ASN. 1) Part 4: Parameterization of ASN.1 Specifications.</p>	<p><u>ISO/IEC 8824:1990</u> Information technology -- Open Systems Interconnection -- Specification of Abstract Syntax Notation One (ASN.1) (1990 Edition 1 Withdrawn 2003-06-30)</p>
ISO/IEC 8824-1	<p><b><u>ISO/IEC 8824-1:1994</u></b>. Information Technology — OSI Abstract Syntax Notation One (ASN.1). — Specification of basic notation. Reference: ITU-T Rec. X.682 (1994).</p>	<p>(No 1994 edition)</p> <p><u>ISO/IEC 8824-1:2002</u> Information technology -- Abstract Syntax Notation One (ASN.1): Specification of basic notation Edition 3 (2002-12-15) (1995 Edition 1 Withdrawn 1999-12-09) (1998 Edition 2 Withdrawn 2003-12-11)</p> <p><u>ISO/IEC 8824-1:1995/Amd 1:1996</u> Rules of extensibility Edition 1 (Withdrawn 1999-12-09)</p> <p><u>ISO/IEC 8824-1:1995/Cor 1:1996</u> Edition 1 (Withdrawn 1999-12-09)</p> <p><u>ISO/IEC 8824-1:1998/Cor 1:1999</u> Edition 2 (Withdrawn 2003-12-11)</p> <p><u>ISO/IEC 8824-1:1998/Amd 1:2000</u> Relative object identifiers Edition 2 (Withdrawn 2003-12-11)</p> <p><u>ISO/IEC 8824-1:1998/Amd 2:2000</u> ASN.1 Semantic Model Edition 1 (Withdrawn 2003-12-11)</p> <p><u>ISO/IEC 8824-1:1998/Cor 2:2002</u> Edition 1 (Withdrawn 2003-12-11)</p> <p><u>ISO/IEC 8824-1:1998/Cor 3:2002</u> Edition 1 (Withdrawn 2003-12-11)</p> <p><u>ISO/IEC 8824-1:1998/Cor 4:2002</u> Edition 1 (Withdrawn 2003-12-11)</p> <p><u>ISO/IEC 8824-1:2002/Amd 1:2004</u> Support for EXTENDED-XER Edition 1 (2004-09-27)</p>

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		<p><u>ISO/IEC 8824-1:2002/Amd 2:2005</u> Alignment with changes made to ITU-T Rec. X.660   <u>ISO/IEC 9834-1</u> for identifiers in object identifier value notation Edition 1 (2005-07-11)</p> <p><u>ISO/IEC 8824-1:2002/Cor 1:2006</u> Edition 1 (2006-02-15)</p> <p><u>ISO/IEC 8824-1:2002/Amd 3:2006</u> Time type support Edition 1 (2006-12-07)</p>
ISO/IEC 8825-1	<p><b>ISO/IEC 8825-1:1995</b>. Information technology — ASN.1 encoding rules — Part 1: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER) Reference: ITU-T Rec. X.691 (1993).</p>	<p><u>ISO/IEC 8825-1:2002</u> Information technology -- ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER) Edition 3 (2002-12-15) (1995 Edition 1 Withdrawn 1999-12-09) (1998 Edition 2 Withdrawn 2003-12-12)</p> <p><u>ISO/IEC 8825-1:1995/Cor 1:1996</u> Edition 1 (Withdrawn 1999-12-09)</p> <p><u>ISO/IEC 8825-1:1998/Cor 1:1999</u> Edition 2 (Withdrawn 2003-12-12)</p> <p><u>ISO/IEC 8825-1:1998/Amd 1:2000</u> Relative object identifiers Edition 1 (Withdrawn 2003-12-12)</p> <p><u>ISO/IEC 8825-1:1998/Cor 2:2002</u> Edition 1 (Withdrawn 2003-12-12)</p> <p><u>ISO/IEC 8825-1:2002/Amd 1:2004</u> Support for EXTENDED-XER Edition 1 (2004-10-12)</p> <p><u>ISO/IEC 8825-1:2002/Amd 2:2007</u> Time type support Edition 1 (2007-10-22)</p> <p><u>ISO/IEC 8825-1:2002/Cor 1:2007</u> Edition 1 (2007-11-21)</p>
ISO/IEC 8825-2	<p><b>ISO/IEC 8825-2:1996</b>. Information technology — Open Systems Interconnection — Encoding Rules for Abstract Syntax Notation One (ASN.1) — Part 2: Packed encoding rules. Reference: ITU-T Rec. X.691 (1995).</p>	<p><u>ISO/IEC 8825-2:2002</u> Information technology -- ASN.1 encoding rules: Specification of Packed Encoding Rules (PER) Edition 3 (2002-12-15) (1996 Edition 1 Withdrawn 1999-12-09) (1998 Edition 2 Withdrawn 2003-12-11)</p> <p><u>ISO/IEC 8825-2:2002/Amd 3:2008</u> PER encoding instructions Edition 1 (2008-03-25)</p> <p><u>ISO/IEC 8825-2:2002/Amd 2:2007</u> Time type support Edition 1 (2007-04-04)</p> <p><u>ISO/IEC 8825-2:2002/Cor 1:2006</u> Edition 1 (2006-03-29)</p> <p><u>ISO/IEC 8825-2:2002/Amd 1:2004</u> Support for EXTENDED-XER Edition 1 (2004-10-27)</p> <p><u>ISO/IEC 8825-2:1998/Cor 3:2002</u> Edition 1 (Withdrawn 2003-12-11)</p> <p><u>ISO/IEC 8825-2:1998/Cor 1:1999</u> Edition 1 (Withdrawn 2003-12-11)</p> <p><u>ISO/IEC 8825-2:1998/Cor 2:2002</u> Edition 1 (Withdrawn 2003-12-11)</p> <p><u>ISO/IEC 8825-2:1998/Amd 1:2000</u> Relative object identifiers Edition 1</p>

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		(Withdrawn 2003-12-11)
ISO/IEC 9542	<p><i>ISO/IEC 9542:1988</i>. Information processing systems — Telecommunications and information exchange between systems — End system to Intermediate system routing exchange protocol for use in conjunction with the Protocol for providing the connectionless-mode network service (ISO/IEC 8473).</p> <p><i>ISO/IEC 9542/DAM1:1988</i>. Information processing systems — Telecommunications and information exchange between systems — End system to Intermediate system routing exchange protocol for use in conjunction with the Protocol for providing the connectionless-mode network service (ISO/IEC 8473) — Amendment 1: Dynamic Discovery of OSI NSAP Addresses by End Systems.</p>	<p><u>ISO 9542:1988</u>. Information processing systems -- Telecommunications and information exchange between systems -- End system to Intermediate system routing exchange protocol for use in conjunction with the Protocol for providing the connectionless-mode network service (ISO 8473) Edition 1 (1988-08-11)</p> <p>(No 1998 amendment, no amendment with this title)</p> <p><u>ISO 9542:1988/Amd 1:1999</u>. Addition of group composition information Edition 1 (1999-09-02)</p> <p><u>ISO/IEC 8825-2:2002/Cor 2:2006</u> Edition 1 (2006-06-19)</p>
ISO/IEC 9545	<i>ISO/IEC 9545:1994</i> . Information technology — Open Systems Interconnection — Application Layer structure (second edition).	<p><u>ISO/IEC 9545:1994</u> Information technology -- Open Systems Interconnection -- Application Layer structure Edition 2 (1994-07-28)</p> <p>(1989 Edition 1 Withdrawn 1994-07-28)</p>
ISO/IEC 9834-1	<i>ISO/IEC 9834-1:1993</i> . Information technology — Open Systems Interconnection — Procedures for the operation of OSI Registration Authorities — Part 1: General procedures.	<p><u>ISO/IEC 9834-1:2005</u> Information technology -- Open Systems Interconnection -- Procedures for the operation of OSI Registration Authorities: General procedures and top arcs of the ASN.1 Object Identifier tree Edition 2 (2005-07-29)</p> <p>(1993 Edition 1 Withdrawn 2005-07-29)</p> <p><u>ISO/IEC 9834-1:1993/Amd 1:1997</u> Incorporation of object identifiers components Edition 1 (Withdrawn 2005-07-29)</p> <p><u>ISO/IEC 9834-1:1993/Amd 2:1998</u> Incorporation of the root arcs of the object identifier tree Edition 1 (Withdrawn 2005-07-29)</p>
ISO/IEC TR 9575	<i>ISO/IEC TR 9575:1995</i> . Information technology — Telecommunications and information exchange between systems — OSI Routing Framework.	<p><u>ISO/IEC TR 9575:1995</u> Information technology -- Telecommunications and information exchange between systems -- OSI Routing Framework Edition 2 (1995-10-12)</p> <p>(1990 Edition 1 Withdrawn 1995-10-12)</p>
ISO TR 9577	<i>ISO/IEC TR 9577:1993</i> . Information technology — Telecommunications and information exchange between systems — Protocol identification in the network layer.	<p><u>ISO/IEC TR 9577:1999</u> Information technology -- Protocol identification in the network layer Edition 4 (1999-12-16)</p> <p>(1990 Edition 1 Withdrawn 1993-09-30)</p> <p>(1993 Edition 2 Withdrawn 1996-12-26)</p> <p>(1996 Edition 3 Withdrawn 1999-12-16)</p>
ISO TR 10029	<i>Not in reference list</i>	<p><u>ISO/IEC TR 10029:1989</u> Information technology -- Telecommunications and information exchange between systems -- Operation of an X.25 interworking unit Edition 1 (1989-03-09)</p>

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<i>RFC 1186</i>	<i>Not in reference list</i>	<i>RFC 1186 MD4 Message Digest Algorithm. R.L. Rivest. (Obsoleted by RFC1320) (Status: INFORMATIONAL) October 1990</i>
RFC 1320	<i>IETF RFC 1320. The MD4 Message — Digest Algorithm, R. Rivest, April 1992.</i>	RFC 1320 The MD4 Message-Digest Algorithm. R. Rivest. (Obsoletes RFC1186) (Status: INFORMATIONAL) April 1992
RFC 1951	<i>Not in reference list</i>	RFC 1951 DEFLATE Compressed Data Format Specification version 1.3. P. Deutsch. (Status: INFORMATIONAL) May 1996