

**NOTICE OF PROPOSED AMENDMENT (NPA) No 11/2005
DRAFT DECISION OF THE EXECUTIVE DIRECTOR,**

AMENDING

DECISION 2003/12/RM OF THE EXECUTIVE DIRECTOR

Of 5 November 2003 ON

**General acceptable means of compliance for airworthiness of products, parts and
appliances (« AMC-20 »)**

**Airworthiness and Operational Approval for
On-Board Equipment related to ATM Programmes**

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A. EXPLANATORY NOTE

I. General

1. The purpose of this Notice of Proposed Amendment (NPA) is to envisage amending Decision 2003/12/RM of the Executive Director of 5 November 2003 on general acceptable means of compliance for airworthiness of products, parts and appliances (« AMC-20 »). The scope of this rulemaking activity is outlined in ToR AMC-20/004 and is described in more detail below.
2. The Agency is directly involved in the rule-shaping process. It assists the Commission in its executive tasks by preparing draft regulations, and amendments thereof, for the implementation of the Basic Regulation¹ which are adopted as “Opinions” (Article 14.1). It also adopts Certification Specifications, including Airworthiness Codes and Acceptable Means of Compliance and Guidance Material to be used in the certification process (Article 14.2).
3. When developing rules, the Agency is bound to following a structured process as required by article 43.1 of the Basic Regulation. Such process has been adopted by the Agency’s Management Board and is referred to as “The Rulemaking Procedure”².
4. This rulemaking activity is included in the Agency’s rulemaking programme for 2005. It implements the rulemaking task AMC-20.004 Airworthiness and operational approval for on-board equipment related to Air Traffic Management (ATM) Programmes (e.g. European Air Traffic Management Programme EATMP).
5. The text of the proposed AMC 20-9 thru AMC 20-13 is a transposition of JAA NPAs which have followed and completed the JAA consultation process. These JAA NPAs were developed by the JAA CNS/ATM Steering Group. It was adapted to the EASA regulatory context by the Agency. It is now submitted for consultation of all interested parties in accordance with Article 5(3) of the EASA rulemaking procedure³.

¹ Regulation (EC) No 1592/2002. OJ L 240, 7.9.2002, p.1.

² Management Board decision concerning the procedure to be applied by the Agency for the issuing of opinions, certification specifications and guidance material (“rulemaking procedure”), EASA MB/7/03, 27.6.2003

³ Decision of the Management Board concerning the procedure to be applied by the Agency for the issuing of opinions, certification specifications and guidance material (“rulemaking procedure”), EASA MB/7/03, 27.6.2003.

II. Consultation

5. Because the content of this NPA was already agreed for adoption in the Joint Aviation Authorities (JAA) system and was the subject of a full worldwide consultation, the transitional arrangements of article 15 of the EASA rulemaking procedure apply. They allow for a shorter consultation period of six weeks in stead off the standard three months and also exempt from the requirement to produce a full Regulatory Impact Assessment.

Comments on this proposal may be forwarded (*preferably by e-mail*), using the attached comment form, to:

By e-mail: NPA@easa.eu.int

By Fax: +49(221) 89990 5508

By correspondence: Process Support Unit
Rulemaking Directorate
EASA
Ref: NPA-11-2005
Postfach 10 12 53
D-50452 Köln
Germany

Comments should be received by the Agency **before 16-01-2006**. If received after this deadline they might not be treated. Comments may not be considered if the form provided for this purpose is not used.

III. Comment response document

6. All comments received in time will be responded to and incorporated in a comment response document (CRD). This may contain a list of all persons and/or organisations that have provided comments. The CRD will be widely available on the Agency's website.

IV. Content of the draft decision

This Notice of Proposed Amendment is bundling a number of previously issued JAA NPAs. The relation between the various document numbering is given in the table bellow.

Editorial changes have been made to the original JAA NPA text to reflect the EASA format and if possible references to JAA documents have been replaced by EASA references. This also includes references to newly developed AMC and ETSO that are processed almost simultaneously with this NPA, and are available on the EASA Web-site.

EASA draft AMC 20 No	Subject	Adaptation of JAA NPA No:	JAA draft ACJ No:
AMC 20-9	Temporary Acceptable Means of Compliance on Approval of Departure Clearance via Data Com-munications over ACARS	JAA NPA 20-7	ACJ 20X8
AMC 20-10	Digital ATIS via Data Link over ACARS	JAA NPA 20-13	ACJ 20X12
AMC 20-11	Approval for use of Initial Services for Air-Ground Data Link in Continental Airspace	JAA NPA 20-11	ACJ 20X10
AMC 20-12	Recognition of FAA Order 8400.12a for RNP 10 Operations	JAA NPA 20-8	ACJ 20X9
AMC 20-13	Enhanced Surveillance with SSR Mode S	JAA NPA 20-12	ACJ 20X11

7. **AMC 20-9. Temporary Acceptable Means of Compliance on Approval of Departure Clearance via Data Communications over ACARS.**
(Adaptation of JAA NPA 20-7)

The JAA NPA 20-7 was published by the JAA on 1st August 2002 and provided the draft version of temporary guidance material on Departure Clearance via Data Link over ACARS. The draft Temporary Guidance Material ACJ 20X8, included in this JAA NPA, was developed by the CNS/ATM Steering Group.

The comments received on this NPA were reviewed by the CNS/ATM Steering Group and are provided in Appendix II of this NPA.

The AMC 20-9 presented in section B of this NPA therefore reflects the draft ACJ 20X8 from the JAA NPA 20-7 revised in accordance with the corresponding CRD in Appendix II.

8. **AMC 20-10. Digital ATIS via Data Link over ACARS.**
(Adaptation of JAA NPA 20-13)

The JAA NPA 20-13 was published by the JAA on 1st August 2003 and provided the draft version of guidance material on Digital ATIS via Data Link over ACARS. The draft Advisory Material ACJ 20X12, included in this JAA NPA, was developed by the CNS/ATM Steering Group.

The comments received on this NPA were reviewed by the CNS/ATM Steering Group and are provided in Appendix II of this NPA.

The AMC 20-10 presented in section B of this NPA therefore reflects the draft ACJ 20X12 from the JAA NPA 20-13 revised in accordance with the corresponding CRD in Appendix II.

9. AMC 20-11. Approval for use of Initial Services for Air-Ground Data Link in Continental Airspace. (Adaptation of JAA NPA 20-11)

The JAA NPA 20-11 was published by the JAA on 1st August 2003 and provided the draft version of guidance material on Approval for use of Initial Services for Air-Ground Data Link in Continental Airspace. The draft Advisory Material ACJ 20X10, included in this JAA NPA, was developed by the CNS/ATM Steering Group.

The comments received on this NPA were reviewed by the CNS/ATM Steering Group and are provided in Appendix II of this NPA.

The AMC 20-11 presented in section B of this NPA therefore reflects the draft ACJ 20X10 from the JAA NPA 20-11 revised in accordance with the corresponding CRD in Appendix II.

The content for paragraph 8 “Operational Considerations” is being developed by the CPDLC Ad Hoc working group by means of TGL 40 “Operational Considerations For The Use Of Initial Services For Air-Ground Data Link Communications In European Airspace”, and will be introduced at a later stage.

10. AMC 20-12. Recognition of FAA Order 8400.12a for RNP 10 Operations (Adaptation of JAA NPA 20-8)

The JAA NPA 20-8 was published by the JAA on 1st August 2002 and provided the draft version of temporary guidance material for Recognition of FAA Order 8400.12a for RNP 10 Operations. The draft Advisory Material ACJ 20X9, included in this JAA NPA, was developed by the CNS/ATM Steering Group.

The comments received on this NPA were reviewed by the CNS/ATM Steering Group and are provided in Appendix II of this NPA.

The AMC 20-12 presented in section B of this NPA therefore reflects the draft ACJ 20X9 from the JAA NPA 20-8 revised in accordance with the corresponding CRD in Appendix II.

11. AMC 20-13. Enhanced Surveillance with SSR Mode S (Adaptation of JAA NPA 20-12)

The JAA NPA 20-12 was published by the JAA on 1st August 2002 and provided the draft version of temporary guidance material for Recognition of FAA Order 8400.12a for RNP 10 Operations. The draft Advisory Material ACJ 20X11, included in this JAA NPA, was developed by the CNS/ATM Steering Group.

The comments received on this NPA were reviewed by the CNS/ATM Steering Group and are provided in Appendix II of this NPA.

The AMC 20-13 presented in section B of this NPA therefore reflects the draft ACJ 20X11 from the JAA NPA 20-12 revised in accordance with the corresponding CRD in Appendix II.

B. DRAFT DECISION

The following amendments should be included in Decision No.2003/12/RM of the Executive Director of the Agency of 5 November 2003

To add new AMC 20-9 thru AMC 20-13 to read as follows:

AMC 20-9 Temporary Acceptable Means of Compliance on Approval of Departure Clearance via Data Communications over ACARS

1 PREAMBLE

1.1 This AMC is issued in response to the EUROCONTROL Convergence and Implementation Plan that recommends an interim deployment of air-to-ground and ground-to-air data link applications based on the existing airline ACARS technology. One such application is Departure Clearance (DCL) data link now operational at various airports in Europe (as indicated in AIPs). Aircraft operators, on a voluntary basis, may take advantage of DCL over ACARS where it is available, subject to any arrangements that may be required by their responsible operations authority.

1.2 The use of ACARS for data link purposes is a transitional step to data link applications that will use VDL Mode 2 and the Aeronautical Telecommunications Network (ATN), compliant with ICAO SARPS, as proposed in the EUROCONTROL LINK2000+ programme¹.

1.3 Described in EUROCAE document ED-85 (hereafter “ED-85”), Data Link Application System document (DLASD) for the “Departure Clearance” Data Link Service, DCL over ACARS is a control tower application providing direct communication between the flight crew and the air traffic controller. ED-85 addresses three domains: airborne, ground ATC, and communication service providers. It deals also with associated flight crew and controller procedures. ED-85 takes account of EUROCAE document ED-78 which describes the global processes including approval planning, co-ordinated requirements determination, development and qualification of a system element, entry into service, and operations.

2 PURPOSE

2.1 This AMC is intended for operators seeking to use Departure Clearance via data link over ACARS as described in ED-85. It may assist also other stakeholders such as airspace planners, air traffic service providers, ATS system manufacturers, communication service providers, aircraft and equipment manufacturers, and ATS regulatory authorities to advise them of the airborne requirements and procedures, and the related assumptions.

2.2 This AMC provides a method for evaluating compliance of a data link system to the requirements of ED-85, and the means by which an aircraft operator can satisfy an authority that operational considerations have been addressed.

3 SCOPE

3.1 This AMC addresses DCL over ACARS using the ARINC 623 protocol as elaborated in EUROCAE document ED-85 and promoted by the EUROCONTROL Convergence and Implementation Plan as an interim data link application pending maturity of the LINK2000+ programme. The AMC is not directly applicable to Pre-Departure Clearance (PDC) as used in the USA and some other states. For PDC approval, guidance may be found in FAA document *Safety and Interoperability Requirements for Pre-*

¹ Information on LINK2000+ is available at web site www.eurocontrol.int/link2000

Departure Clearance, issued by AIR-100 on April 21, 1998. A comparison of PDC with DCL may be found in Appendix 1.

3.2 This AMC is not applicable to the phased implementation of data link services within the EUROCONTROL LINK2000+ programme, in particular, DCL over the Aeronautical Telecommunications Network. In this case, the Safety and Performance Requirements (EUROCAE ED-120) and the Interoperability Requirements (EUROCAE ED-110) are established using EUROCAE document ED-78A, *Guidelines for Approval of the Provision and use of Air Traffic Services supported by Data Communications*. Guidance for the implementation of DCL over ATN may be found in EASA document AMC 20-11.

3.3 The operational requirements for the DCL application are published in the EUROCONTROL document OPR/ET1/ST05/1000, Edition 2, October 15,1996, *Transition guidelines for initial air ground data communication services*. The EUROCONTROL document includes the re-issued clearance capability, however document ED-85 does not address this capability and it is not included in the scope of this AMC.

3.4 For the remainder of this document, the acronym DCL should be interpreted to mean DCL over ACARS using the ARINC 623 protocol unless stated otherwise.

4 REFERENCE DOCUMENTS

4.1 Related Requirements

CS/FAR 25.1301, 25.1307, 25.1309, 25.1322, 25.1431, 25.1581, or equivalent requirements of CS 23, 27 and 29 if applicable.

4.2 Related Standards and Guidance Material

ICAO	Doc 9694 AN/955	Manual of Air Traffic Services (ATS) Data Link Applications
	Doc 4444	Rules of the Air and Air Traffic Services
	Draft Proposal	PANS-Air Traffic Management
	Annex 11	Air Traffic Services
	Doc 8585	Designators for Aircraft Operating agencies, Aeronautical Authorities and Services.
EASA	AMC 25-11	Electronic Display Systems
EUROCONTROL	CIP: COM.ET2.S04; 2.1.5	Implement Air/Ground Communication Services- Interim step on non-ATN (ACARS) services.
	OPR/ET1/ST05/10 00	Transition guidelines for initial air ground data communication services
	ESARR 4	Risk assessment and mitigation in ATM
FAA	AC 25-11	Electronic Display Systems.

	AC 120-COM	Initial Air Carrier Operational Approval for use of Digital Communication Systems
	AC 20-140	Guidelines for design approval of aircraft data communications systems
	98-Air-PDC	Safety and Interoperability requirement for Pre-Departure-Clearance (PDC). (Air-100, April 21,1998)
EUROCAE	ED 78	Guidance material for the establishment of data link supported ATS Services
	ED-85	Data Link Application System document (DLASD) for the “ departure Clearance ” data link service
	ED-112	Minimum operational performance specification for Crash protected airborne recorder systems
RTCA	DO 224	Minimum Aviation System Performance Standards (MASPS) for Advanced VHF Digital Data Communications Including Compatibility with Digital Voice Techniques.
SAE	ARP 4791	Human Machine Interface on the flight deck

5 ASSUMPTIONS

Applicants should note that this AMC is based on the assumptions stated in Chapter 3 of ED-85 together with the following that concern the measures taken by the responsible airspace authorities to safeguard DCL operations.

5.1 ATS Provider

5.1.1 The data link service for DCL has been shown to satisfy applicable airspace safety regulations and the relevant ATS domain performance, safety and interoperability requirements of ED-85.

5.1.2 Procedures for the use of DCL take account of the performance limitations of ACARS and the airborne implementation capabilities meeting at least the provisions of this AMC.

Note: Some aircraft ACARS installations approved to earlier standards are classified as “Non Essential” without guarantees of performance or integrity. Consequently, procedures are necessary to compensate for any deficiency and to safeguard operations. ED-85 addresses this issue.

5.1.3 Appropriate procedures are established to minimise the possibility of failure to detect inconsistency in the case of a complex clearance.

5.1.4 Each ATS provider has published a list of communication service providers that may be used by aircraft operators for the DCL application. The list should take account of internetworking arrangements between service providers.

5.1.5 The procedures of the ATS provider state the actions that should be taken in the event of an inadequate communication service from the communications service provider (CSP).

5.2 Communications Service Provider

The communications service provider does not modify the operational information (content and format) exchanged between the ATS provider and the airborne equipment.

5.3 Aeronautical Information Service

Each State offering a DCL service by data link publishes in its AIP, or equivalent notification, availability of the service, relevant procedures, and confirmation of compliance with ED-85.

5.4 Message Integrity

The Cyclic Redundancy Check (CRC) is implemented as required by ED-85 and is providing integrity of the end-to-end data link transmission path. On this basis, Performance Technical Requirement PTR_3 of ED-85 need not be demonstrated.

6 AIRWORTHINESS CONSIDERATIONS

6.1 General

6.1.1 The installation will need to be shown compliant with the airborne domain requirements allocated as per ED-85 (§7.1) covering the Interoperability Operational Requirements, the Interoperability Technical Requirements, the Performance Technical Requirements, the Safety Operational & Technical Requirements.

6.1.2 If multiple ATS data link applications are available to the aircraft, the crew interface and related crew procedures will need to be based on a common and compatible philosophy.

6.2 Required Functions

An acceptable minimum airborne installation comprises the following functions:

- (a) A means of data communications appropriate to the area of operation, e.g. single ACARS (specifically the basic standard known by industry as plain old ACARS) or VDL mode 2, VHF or SATCOM;
- (b) A means to manage data communications and to control the data communications system;
- (c) A means to easily check and modify the parameters of the DCL request;
- (d) “Visual” alerting of an incoming message, visible to both pilots;
- (e) Means to display the text message, e.g. a single display readable by both crewmembers or a dedicated display for each pilot.
- (f) A means to accept the DCL delivered by the ATS.

6.3 Recommended Functions

- (a) “Audible” alerting of an incoming message;
- (b) A means to print the messages;
- (c) Recording of DCL messages and flight crew responses on an accident flight recorder.

7 ACCEPTABLE MEANS OF AIRWORTHINESS COMPLIANCE

7.1 Airworthiness

7.1.1 When demonstrating compliance with this AMC, the following specific points should be noted:

(a) Compliance with the airworthiness requirements for intended function and safety may be demonstrated by equipment qualification, safety analysis of the interface between the communications management system and data sources, structural analyses of new antenna installations, equipment cooling verification, and evidence of a suitable human to machine interface. The DCL function will need to be demonstrated by end-to-end ground testing that verifies system operation, either with an appropriate ATS unit, or by means of test equipment that has been shown to be representative of the actual ATS unit.

Note: This limited testing assumes that the communication systems (VHF or SATCOM) have been shown to satisfactorily perform their intended functions in the flight environment in accordance with applicable requirements.

(b) The safety analysis of the interface between the communications management system and its data sources should show that, under normal or fault conditions, no unwanted interaction which adversely affects essential systems can occur.

7.1.2 To minimise the certification effort for follow-on installations credit may be granted for applicable certification and test data obtained from equivalent aircraft installations.

7.2 Performance

The installation should be shown to meet the airborne domain performance requirements allocated by ED-85 (§7.1). Demonstration of Performance Technical Requirement PTR_A1 may be difficult for some airborne installations. The applicant may choose an alternative acceptable means of compliance for PTR_A1 consisting in an end-to-end demonstration of PTR_5 & PTR-6 of ED-85 (§5.2) with an appropriate ATS unit and communication service provider.

7.3 Aircraft Flight Manual

The Flight Manual should state the following limitation.

Note: This limited entry assumes that a detailed description of the installed system and related operating instructions are available in other operating or training manuals and that operating procedures take account of ED-85.

Limitation: The Departure Clearance (DCL) over ACARS application has been demonstrated with data link services declared compliant with EUROCAE document ED-85.

7.4 Existing installations

The applicant will need to submit a compliance statement that shows how the criteria of this AMC have been satisfied for existing installations. Compliance may be established by inspection of the installed system to confirm the availability of required features and functionality.

8 OPERATIONAL CONSIDERATIONS

8.1 Aircraft Identification

8.1.1 The Aircraft Identification transmitted by data link will need to conform to the ICAO format and correspond with the flight identity as entered in the applicable flight plan.

8.1.2 Aircraft identification includes both *Aircraft Type* and *Sub-type*. However, certain ACARS equipment can be pre-programmed only with *Aircraft Type* with the possibility of manual insertion of *Sub-type* via the system control panel. Absence of the *Sub-type* parameter either may lead to a rejected departure clearance request at some airports, or the issue of an inappropriate clearance where the aircraft performance capability is not taken into account. Where, to obtain the DCL service, *Sub-type* needs to enter manually, the entry should be verified.

8.2 Operational Safety Aspects

8.2.1 Failure Conditions are presented in ED-85 (§6) together with the resulting safety requirements and operational means of mitigation. Failure Condition FC3 (undetected erroneous SID) is discussed further in the following paragraphs.

8.2.2 When a SID construct is simple and unambiguous (e.g. only one SID for one runway magnetic orientation (QFU) and one destination) so allowing the flight crew and the ATS controller to independently detect any inconsistency in the DCL, then additional means of mitigation are not required.

8.2.3 For other, more complex cases where the SID construction prevents the flight crew and the controller from readily detecting any inconsistency, a specific flight crew to controller procedure will need to be implemented to verify the clearance. This may be stated in the AIP or other notification issued by the State where aircraft will operate and use DCL service.

Note (1):

In some countries (e.g. United Kingdom, AIC 125/1999, France AIC A19/00), following the investigation of level violations, voice confirmation of cleared altitude or flight level and SID identification is already required even for voice delivered departure clearance on the first contact with the approach control/departure radar. In such cases, no additional confirmation procedure is required.

Note (2):

The ATS may agree that voice confirmation is not required where the data link function is certificated with an integrity level corresponding to the Essential category of CS25.1309.

8.2.4 In all cases, flight crews will need to comply with any mitigating procedures published by the States where aircraft will operate and use DCL service.

8.2.5 The assumptions of Section 5 need to be satisfied as a condition for operational use.

8.3 Operations Manual and Training

8.3.1 The Operations Manual will need to be amended to define operating procedures for use of the DCL.

8.3.2 Flight crew training should address:

- (a) The different data link services available using the same airborne equipment (e.g. differences between DCL and PDC applications as described in Annex 1);
- (b) ATS procedures for DCL; and
- (c) The required format for the flight identification input.

8.3.3 Subject to any arrangements that may be required by the responsible operations authority in respect of amendments to the Operations Manual, and the approval of training programmes, the aircraft operator may implement operations using DCL over ACARS.

8.4 Incident reporting

Significant incidents associated with a departure clearance transmitted by data link that affects or could affect the safe operation of the aircraft will need to be reported in accordance with applicable operational rules, and to the authority responsible for the airport where the DCL service was provided.

AVAILABILITY OF DOCUMENTS

EUROCAE documents may be purchased from EUROCAE, 17 rue Hamelin, 75783 Paris Cedex 16, France, (Fax: 33 1 45 05 72 30). Web site: www.eurocae.org.

JAA documents are available from the JAA publisher Information Handling Services (IHS). Information on prices, where and how to order is available on both the JAA web site www.jaa.nl and the IHS web site www.avdataworks.com.

EUROCONTROL documents may be requested from EUROCONTROL, Documentation Centre, GS4, Rue de la Fusee, 96, B-1130 Brussels, Belgium; (Fax: 32 2 729 9109 or web site www.eurocontrol.int).

ICAO documents may be purchased from Document Sales Unit, International Civil Aviation Organisation, 999 University Street, Montreal, Quebec, Canada H3C 5H7, (Fax: 1 514 954 6769, e-mail: sales_unit@icao.org) or through national agencies.

FAA documents may be obtained from Department of Transportation, Subsequent Distribution Office SVC-121.23, Ardmore East Business Centre, 3341 Q 75th Avenue, Landover, MD 20785, USA. Web site www.faa.gov/aviation.htm

RTCA documents may be obtained from RTCA Inc, 1828 L Street, NW., Suite 805, Washington, DC 20036, USA., (Tel: 1 202 833 9339; Fax 1 202 833 9434). Web site: www.rtca.org.

SAE documents may be obtained from SAE World Headquarters, 400 Commonwealth Drive, Warrendale, PA 15096-0001, USA. Telephone 1-877-606-7323 (U.S. and Canada only) or 724/776-4970 (elsewhere). Web site www.sae.org.

Appendix 1 PDC versus DCL: A Comparison

The US Pre-Departure Clearance.

In the United States, the concept of Pre-departure Clearance is used where PDC messages are delivered via the airlines own ACARS network and operational host computer. The airline host, or the flight crew, initiates the process for the generation of the PDC by submitting the flight plan information to the air traffic service, which in turn forwards the flight strip information to the appropriate airport control tower. Approximately 30 minutes before the aircraft is scheduled to depart, the approved PDC is transmitted from the tower via ground-ground data link to the airline host computer. The airline host responds with an acknowledgement that ultimately feeds back to the tower PDC workstation. Depending upon the airline capabilities, the PDC may then be transmitted directly to the aircraft flight deck via the ACARS data link. If the aircraft is not equipped with ACARS, the approved PDC is sent to an airport gate printer for delivery by hand in printed format to the aircraft. For a clearance requested from the aircraft, the flight crew will initiate a PDC request via the ACARS data link network to the airline host computer. The host will then respond via the ACARS network with the approved PDC.

Thus, the airline is responsible for ensuring that the clearance is delivered to the flight crew. Without PDC, Instrument Flight Rule (IFR) clearances for departing aircraft are provided by the clearance-delivery controller via a tower voice channel.

The PDC is pre-formatted in an ARINC 620 free text message. The ARINC 623 standard also may be used but it is not required. All failures are classified Minor by the fact that flight crew has to follow a procedure to verify the information with the initial flight plan and, by voice communication, with departure control.

Guidance on the use of PDC may be found in FAA document *Safety and Interoperability Requirements for Pre-Departure Clearance*, issued by AIR-100 on April 21, 1998.

The European Departure Clearance.

In Europe, departure clearance over ACARS is a direct ATC to pilot data link communication based on the EUROCAE ED-85 and ARINC 623 standards. The clearance delivered by data link is fully considered as an ATC departure clearance and it is not the responsibility of the airline to ensure delivery via its own facilities. ARINC 623 provides enhanced integrity of end-to-end communication, compared to ARINC 620 as used in the USA. However, flight crew verification procedures may still be required due to departure clearance options such as alternative SIDs, or to satisfy AIP requirements for local safety reasons.

Current operational implementation in Europe does not include a re-issued clearance capability, which is under study by some ATS providers.

Appendix 2 Common Terms

Reference should be made to EUROCAE document ED-85 for definition of terms.

Abbreviations

ACARS	Aircraft Communication, Addressing and Reporting System
AIP	Aeronautical Information Publication
ARINC	Aeronautical Radio Inc.
ATS	Air Traffic Services
CPDLC	Controller-Pilot Data Link Communication
DCL	Departure Clearance
ESARR	EUROCONTROL Safety Regulatory Requirement
EUROCAE	European Organisation for Civil Aircraft Equipment
PDC	Pre-departure Clearance (as used in USA)
PTR	Performance Technical Requirement
RTCA	RTCA Inc.
SAE	Society of Automotive Engineers
SARPS	ICAO Standards and Recommended Practices
SID	Standard Instrument Departure
VDL	VHF Digital Link

AMC 20-10 Digital ATIS via Data Link over ACARS

1 PREAMBLE

1.1 This AMC is issued in response to the EUROCONTROL Convergence and Implementation Plan that recommends an interim deployment of air-to-ground and ground-to-air data link applications based on the existing airline ACARS technology. One such application is Digital ATIS (D-ATIS) now planned to be operational at various airports in Europe. Aircraft operators, on a voluntary basis, may take advantage of D-ATIS where it is available, provided the service is verified in accordance with operational procedures acceptable to the responsible operations authority.

1.2 The use of ACARS for data link purposes is a transitional step to data link applications that will use VHF Digital Link (VDL) Mode 2 and the Aeronautical Telecommunications Network (ATN), compliant with ICAO SARPS, as proposed in the EUROCONTROL LINK2000+ programme¹.

1.3 Described in EUROCAE document ED-89A, *Data Link Application System document (DLASD) for the "ATIS" Data Link Service*, D-ATIS is a control tower application providing direct communication of ATIS information to the flight crew and, optionally automatic updating of this information. The ED-89A document addresses three domains: airborne, ground ATC, and communication service providers. It deals also with associated flight crew and air traffic service provider procedures. ED-89A incorporates the protocols and message formats formerly published in ARINC Specification 623, and takes account of EUROCAE document ED-78 which describes the global processes including approval planning, co-ordinated requirements determination, development and qualification of a system element, entry into service, and operations.

2. PURPOSE

2.1 This AMC is intended for operators intending to use Digital ATIS over ACARS as described in document EUROCAE ED-89A. It may assist also other stakeholders such as airspace planners, air traffic service providers (ATSP), ATS system manufacturers, communication service providers (CSP), aircraft and equipment manufacturers, and ATS regulatory authorities to advise them of the airborne requirements and procedures, and the related assumptions.

2.2 This AMC provides a method for evaluating compliance of a data link system to the requirements of ED-89A, and the means by which an aircraft operator can satisfy an authority that operational considerations have been addressed.

3 SCOPE

3.1 This AMC addresses D-ATIS over ACARS using the ARINC 623 protocol as elaborated in EUROCAE document ED-89A and promoted by the EUROCONTROL *Convergence and Implementation Plan* as an interim data link application pending maturity of the LINK 2000+ programme.

3.2 Other implementation of D-ATIS service may exist in the world. They are not necessarily identical to the service defined within this AMC and EUROCAE document ED-

¹ Information on LINK2000+ is available at web site www.eurocontrol.int/link2000

89A. For example, application message formats may differ. Similarly, the ATSP may send ATIS information to an ACARS communication service provider who then distributes it to subscriber operators. This should not be considered as an air traffic service offered directly by an ATSP. In the USA, guidance on ATIS data link approval for use in the US airspace, may be found in FAA document 98-AIR D-ATIS: *Safety and Interoperability Requirements for ATIS*.

3.3 This AMC is not applicable to the phased implementation of data link services within the EUROCONTROL LINK2000+ programme, in particular, D-ATIS over the Aeronautical Telecommunications Network via VHF Digital Link (VDL) Mode 2. In this case, the Safety and Performance Requirements (EUROCAE ED-120) and the Interoperability Requirements (EUROCAE ED-110) have been established using EUROCAE document ED-78A, *Guidelines for Approval of the Provision and use of Air Traffic Services supported by Data Communications*. Guidance for the implementation of data link over ATN may be found in EASA document AMC 20-11.

3.4 The operational requirements for the D-ATIS application are published in EUROCONTROL document OPR/ET1/ST05/1000, *Transition guidelines for initial air ground data communication services*.

3.5 For the remainder of this document, the acronym D-ATIS should be interpreted to mean *D-ATIS over ACARS* using the ARINC 623 protocol in accordance with ED-89A unless stated otherwise.

4 REFERENCE DOCUMENTS

4.1 Related Requirements

CS/FAR 25.1301, 25.1307, 25.1309, 25.1322, 25.1431, 25.1581, or equivalent requirements of CS 23, 27 and 29, if applicable.

4.2 Related Standards and Guidance Material

ICAO	Doc 9694 AN/955	Manual of Air Traffic Services (ATS) Data Link Applications
	Doc 4444	Rules of the Air and Air Traffic Services
	Annex 11	Air Traffic Services
	Doc 8585	Designators for Aircraft Operating agencies, Aeronautical Authorities and Services.
EASA	AMC 25-11	Electronic Display Systems
EUROCONTROL	CIP: COM. ET2.SO4; 2.1.5	Implement Air/Ground Communication Services- Interim step on non-ATN (ACARS) services.
	OPR/ET1/ST05/1000	Transition guidelines for initial air ground data communication services
	ESARR 4	Risk assessment and mitigation in ATM
FAA	AC 25-11	Electronic Display Systems.
	AC 120-70	Initial Air Carrier Operational Approval for use of Digital Communication Systems
	AC 20-140	Guidelines for design approval of aircraft data communications systems
	98-Air-D-ATIS	Safety and Interoperability requirement for D-ATIS (Air-100, April 21,1998)
EUROCAE	ED 78	Guidance material for the establishment of data link supported ATS Services
	ED-89A	Data Link Application System document (DLASD) for the "ATIS" data link service
	ED-92A	Minimum Operational Performance specification for an airborne VDL Mode 2 Transceiver
	ED-112	Minimum operational performance specification for Crash protected airborne recorder systems Note: Includes criteria for recording of data link messages.
RTCA	DO-224	Minimum Aviation System Performance Standards (MASPS) for Advanced VHF Digital Data Communications Including Compatibility with Digital Voice Techniques.
SAE	ARP 4791	Human Machine Interface on the flight deck

5 ASSUMPTIONS

Applicants should note that this AMC is based on the assumptions stated in Chapter 3 of document ED-89A together with the following that concern the measures taken by the responsible airspace authorities to safeguard operations affected by the transmission of D-ATIS.

5.1 ATS Provider

5.1.1 The data link service for ATIS has been shown to satisfy applicable airspace safety regulations and the relevant ATS domain performance, safety and interoperability requirements of ED-89A.

5.1.2 The ATS Provider ensures that information provided through D-ATIS service is fully consistent with the voice information broadcast over VHF.

5.1.3 Appropriate procedures are established to minimise the possibility of failure to detect any inconsistency in ATIS information for approach, landing and take off.

5.1.4 Each ATS provider has published a list of communication service providers that may be used by aircraft operators for the D-ATIS application. The list should take account of internetworking arrangements between service providers.

5.1.5 The procedures of the ATS provider state the actions that should be taken in the event of an inadequate communication service from the communications service provider.

5.2 Communications Service Provider

The communications service provider does not modify the operational information (content and format) exchanged between the ATS provider and the airborne equipment.

5.3 Aeronautical Information Service

5.3.1 The availability of the D-ATIS service, a statement of compliance with ED-89A, and additional relevant procedures are published in the AIP or other notification issued by the States where D-ATIS is offered.

5.4 Message Integrity

The Cyclic Redundancy Check (CRC) is implemented as required by ED-89A and is providing integrity of the end-to-end data link transmission path. On this basis, Performance Technical Objective PTO_3 of ED-89A need not be demonstrated by end systems. The PTO_3 requirement is applicable only to the Communication Service Provider and limits the amount of corrupted messages that would be detected and rejected by end-systems.

Note: The CRC is described in ARINC Specification 622 Chapter 5.

6 AIRWORTHINESS CONSIDERATIONS

6.1 General

6.1.1 The installation will need to meet the airborne domain requirements allocated as per ED-89A (§7.1) covering the Interoperability Operational Requirements, the Interoperability Technical Requirements, the Performance Technical Requirements, and the Safety Operational & Technical Requirements.

6.1.2 If multiple ATS data link applications are available to the aircraft, the crew interface and related crew procedures will need to be based on a common and compatible philosophy.

6.2 Required Functions

An acceptable minimum airborne installation comprises the following functions:

- (a) A means of data communication appropriate to the area of operation, e.g. single ACARS (specifically the basic standard known by industry as *plain old ACARS*) and VHF or SATCOM. VDL Mode 2 equipment can be used provided that radio transceiver is compliant with ED-92A.
- (g) A means to manage data communications and to control the data communications system.
- (c) A means to easily check and modify the D-ATIS request parameters.
- (d) A means of attracting the attention of the flight crew to an incoming message.
Notes: (1) Activation of a printer may suffice to meet this need.
(2) The means used will need to be such as to avoid confusion with other, non-data link, flight deck alerting devices.
(3) The need for temporary suppression of the attention-getter during critical flight phases should be considered.
- (e) Means to display the text message, e.g. a single display readable by both pilots or a dedicated display for each pilot. For the interim deployment of D-ATIS over ACARS, a printer may serve as the primary display for messages subject to compliance with paragraph 7.3 of this AMC.

6.3 Recommended Functions

- (d) A means to print the message.
- (e) Recording of D-ATIS messages and flight crew requests on an accident flight recorder.

Note: The recording of data link messages for the purposes of accident investigation is under consideration by the regulatory authorities. Until consultation is completed and a decision is reached to publish new regulations, the recording of messages for the interim deployment of D-ATIS using the ACARS network remains optional.

7 ACCEPTABLE MEANS OF AIRWORTHINESS COMPLIANCE

7.2 Airworthiness

7.1.1 When demonstrating compliance with this AMC, the following should be noted:

- (a) Compliance with the airworthiness requirements for intended function and safety may be demonstrated by equipment qualification, safety analyses of the interfaces between components of the airborne communications equipment, structural analyses of new antenna installations, equipment cooling verification, and evidence of a suitable human to machine interface. The D-ATIS function will need to be demonstrated by end-to-end ground testing that verifies system operation, either with an appropriate ATS unit, or by means of test equipment that has been shown to be representative of an actual ATS unit.

Note:

This limited testing assumes that the communication systems (VHF or SATCOM) have been shown to satisfactorily perform their intended functions in the flight environment in accordance with applicable requirements.

(b) The safety analysis of the interface between the ACARS and other systems should show that, under normal or fault conditions, no unwanted interaction that adversely affects essential systems can occur.

(c) Where a printer is used as the primary display of the ATIS message, its readability should be shown to be adequate for this purpose, and that it does not present an unacceptable risk of an erroneous display.

Note:

This does not preclude the use of a printer classified as non-essential provided it has demonstrated a satisfactory in-service record that supports compliance with paragraph 7.3 of this AMC.

7.1.2 To minimise the certification effort for follow-on installations, the applicant may claim credit, from the responsible authority, for applicable certification and test data obtained from equivalent aircraft installations.

7.2 Performance

The installation will need to be shown compliant with the airborne domain performance requirements allocated by ED-89A (§7.1). Demonstration of Performance Technical Requirement PTR_A1 may be difficult for some airborne installations. The applicant may choose an alternative acceptable means of compliance for PTR_A1 consisting in an end-to-end demonstration of PTR_5 & PTR_6 of ED-89A (§5.2) with an appropriate ATS unit and communication service provider.

7.3 Safety Objectives

7.3.1 Failure Conditions are presented in ED-89A (§6) together with the resulting safety objectives and operational means of mitigation. Failure Condition FC3 (Non-detected corrupted ATIS presented to an aircrew) requires that the occurrence of such a hazard at the aircraft level be demonstrated improbable.

7.3.2 ED-89A takes into account the possibility of using ACARS approved to earlier standards and classified as “non-essential” without guarantees of performance or integrity. Consequently, additional procedures are necessary to compensate for any deficiency and to safeguard operations. (See §8 of this AMC)

7.4 Aircraft Flight Manual

The Aircraft Flight Manual (AFM) or the Pilot’s Operating Handbook (POH), whichever is applicable, should identify the *D-ATIS over ACARS* application as having been demonstrated with data link services declared compliant with EUROCAE document ED-89A.

7.5 Existing installations

The applicant will need to submit a compliance statement that shows how the criteria of this AMC have been satisfied for existing installations. Compliance may be established by inspection of the installed system to confirm the availability of required features and functionality.

8 OPERATIONAL CONSIDERATIONS

8.1 Operational Safety Aspects

8.1.1 Failure Conditions are presented in ED-89A (§6) together with the resulting safety requirements and operational means of mitigation. Failure Condition FC3 (Non-detected corrupted ATIS presented to an aircrew) is discussed further in the following paragraphs.

8.1.2 Applying existing ICAO operational procedures can independently verify the majority of ATIS parameters. Certain information may need to be verified by additional operational procedures. Examples include runway surface conditions, air and dew point temperatures, and other essential operational information.

8.1.3 If the aircraft system is classified and certified as “non-essential”, additional flight crew verification procedures will need to be defined to compensate for this deficiency.

8.1.4 When the airborne system is certified as “essential”, then integrity and performance can be considered as acceptable without a voice ATIS cross check unless otherwise required by the AIP.

8.1.5 It is important that crew are aware that they remain responsible for checking that received ATIS information corresponds to their request in terms of airfield name, date, type of ATIS (D or A) and type of contract. In case of inconsistency, reversion to voice ATIS is required.

Note: ED-89A (§6) SOR-A1 (check of name of airfield), SOR-A2 (ATIS letter acknowledgement at first contact) and SOR-A3 (check of global consistency of information) require checks irrespective of the level of classification of the data link system

8.1.6 Flight crews will need to comply with any additional mitigating procedures published by the States where aircraft will operate and use a D-ATIS service.

8.1.7 The assumptions of Section 5 of this AMC need to be satisfied as a condition for operational use.

8.2 Operations Manual and Training

8.2.1 The Operations Manual should be amended to reflect the Flight Manual statement of paragraph 7.4, and the *Operational Considerations* discussed in paragraph 8 of this AMC. Similarly, flight crew training should be reviewed to address:

- (a) The different data link services available using the same airborne equipment (e.g. differences between ATIS provided through D-ATIS service that are declared to conform to ED-89A requirements, and ATIS received through other means such as ACARS AOC).
- (b) The procedures for safe use of D-ATIS over ACARS.

8.2.2 Subject to acceptance by the responsible authority of amendments to the Operations Manual, and related training programs, the aircraft operator may implement operations using D-ATIS over ACARS without the need for further formal operational approval.

8.4 Incident reporting

Significant incidents associated with a D-ATIS transmitted by data link that affects or could affect the safe operation of the aircraft will need to be reported in accordance with applicable operational rules. The incident should be reported also to the ATS authority responsible for the airport where the D-ATIS service is provided.

AVAILABILITY OF DOCUMENTS

EUROCAE documents may be purchased from EUROCAE, 17 rue Hamelin, 75783 Paris Cedex 16, France, (Fax: 33 1 45 05 72 30). Web site: www.eurocae.org

JAA documents are available from the JAA publisher Information Handling Services (IHS). Information on prices, where and how to order is available on both the JAA web site: www.jaa.nl and the IHS web site: www.avdataworks.com. JAA documents transposed to publications of the European Aviation Safety Agency (EASA) are available on the EASA web site www.easa.eu.int

EUROCONTROL documents may be requested from EUROCONTROL, Documentation Centre, GS4, Rue de la Fusee, 96, B-1130 Brussels, Belgium; (Fax: 32 2 729 9109). Web site: www.eurocontrol.int

ICAO documents may be purchased from Document Sales Unit, International Civil Aviation Organisation, 999 University Street, Montreal, Quebec, Canada H3C 5H7, (Fax: 1 514 954 6769, e-mail: sales_unit@icao.org) or through national agencies.

FAA documents may be obtained from Department of Transportation, Subsequent Distribution Office SVC-121.23, Ardmore East Business Centre, 3341 Q 75th Avenue, Landover, MD 20785, USA.

RTCA documents may be obtained from RTCA Inc, 1828 L Street, NW. Suite 805, Washington, DC 20036, USA., (Tel: 1 202 833 9339; Fax 1 202 833 9434). Web site: www.rtca.org

SAE documents may be obtained from SAE World Headquarters, 400 Commonwealth Drive, Warrendale, PA 15096-0001, USA. Telephone 1-877-606-7323 (U.S. and Canada only) or 724/776-4970 (elsewhere). Web site: www.sae.org

Appendix 1

Common Terms

Reference should be made to EUROCAE document ED-89A for definition of terms.

Abbreviations

ACARS	Aircraft Communication, Addressing and Reporting System
AIP	Aeronautical Information Publication
ATIS	Automatic Terminal Information Service
ATSP	Air Traffic Service Provider
D-ATIS	Digital ATIS
ARINC	Aeronautical Radio Inc.
ATS	Air Traffic services
CPDLC	Controller-Pilot Data Link Communication
ESARR	EUROCONTROL Safety Regulatory Requirement
EUROCAE	European Organisation for Civil Aircraft Equipment
NAS	National Airspace System (USA)
PTR	Performance Technical Requirement
PTO	Performance Technical Objective
RTCA	RTCA Inc.
SAE	Society of Automotive Engineers
SARPS	ICAO Standards and Recommended Practices
VDL	VHF Digital Link

AMC 20-11 Acceptable Means of Compliance for the Approval of use of Initial Services for Air-Ground Data Link in Continental Airspace

1 PREAMBLE

Controller Pilot Data Link Communications, CPDLC is identified in the ATM Strategy for the years 2000+ as an enabler for operational improvement. They reduce controller workload and increase sector capacity. Simulations show that the sector capacity is increased by 11% if 75% of all controlled flights have CPDLC data link capability. The deployment strategy of CPDLC data link services is a three-step plan:

- Pioneer support for at least the first 150 aircraft.
- Incentives mechanisms for aircraft with CPDLC capability to foster the aircraft equipage with data link capability.
- Single European Sky interoperability implementing rules on data link services.

Airlines committed to the implementation of initial data link services during the pioneer phase have requested appropriate advisory materials to support the certification airworthiness process and the operational approval process. This document is the advisory material to support certification airworthiness and the operational approval of initial data link services in continental airspace. Upon endorsement of the SES implementing rule on data link services by the SES Committee, an update of this advisory material will be necessary.

2 PURPOSE

This AMC is for aircraft operators seeking early approval to use initial data link services in continental airspace. It contains:

- a set of assumptions relating to the implementation of data link services by air navigation service providers, communications service providers, aeronautical information service providers;
- an initial basis relating to the implementation of data link services in the flight deck to guide the airworthiness certification process;
- an initial basis relating to the operational use of data link services by aircraft operators to guide the operational approval process is being developed by JAA in parallel.

3 SCOPE

3.1 This AMC is applicable to services for with the following capabilities:

- a) Data Link Initiation Capability (DLIC) enables initial contact between the aircraft and an ATC unit that supports data communications, to unambiguously identify the aircraft, and to ensure compatibility of aircraft equipage with ATC. It is a prerequisite to any other operational data link services.
- b) ATC Communication Management (ACM) provides the necessary information to the aircraft to enable transfer of frequencies for both voice and data communications, either within the same sector, between two sectors or between two ATC centres.
- c) ATC Clearances (ACL) enables uplink of a set of clearance and information messages and downlink of pilot responses and requests.
- d) ATC Microphone Check (AMC) enables the controller to send a message to data link equipped aircraft (of appropriate interoperability) to request a stuck microphone check.

- e) Departure Clearance (DCL) enables the request and the delivery of departure information and clearance.
 - f) Downstream Clearance (DSC) enables the request and the delivery of clearance with a downstream ATC centre (i.e. oceanic clearance).
 - g) D-ATIS enables the request and the delivery of ATIS via data link.
- 3.2 Air navigation service providers can implement initial data link services on a step by step basis to meet local operational constraints. It is possible that only a subset of these services will be operated by a given air traffic service unit. The available services will be published in the AIP/NOTAM

Note : Early implementations of DCL, D-ATIS and OCL over ACARS are not the subject of this AMC. Reference should be made to other applicable JAA or EASA documents based on ED85A, ED89A and ED106A¹.

4 REFERENCE DOCUMENTS

4.1 Related Requirements

CS/FAR 25.1301, 25.1307, 25.1309, 25.1322, 25.1431, 25.1581, or equivalent requirements of CS 23, 27 and 29, if applicable.

4.2 Related Standards and Guidance Material

ICAO	Annex 2	Rules of the Air.
	Annex 6	Operation of Aircraft, Part I - International Commercial Air Transport – Aeroplanes.
	Annex 10	Aeronautical Telecommunications - Volume II (Communications Procedures including those with PANS status).
	Annex 11	Air Traffic Services.
	Annex 15	Aeronautical Information Services.
	Doc 4444	Procedures for Air Navigation Services - Air Traffic Management (PANS-ATM)
	Doc 8585	Designators for Aircraft Operating agencies, Aeronautical Authorities and Services.
	Doc 9694	Manual of Air Traffic Services (ATS) Data Link Applications.
EASA	AMC 25-11	Electronic Display Systems.
EUROCONTROL	ECIP: ATC06	Implement the first set of non- time critical ATC air ground data link services based on the voluntary carriage of data link by aircraft.
	AGC-ORD-01	EATCHIP/ODIAC Operational Requirements for Air ground cooperative air traffic services Edition1.0. 2 April 2001.
FAA	ESARR 4	Risk assessment and mitigation in ATM.
	AC 25-11	Electronic Display Systems.
	AC 120-70	Initial Air Carrier Operational Approval for use of Digital Communication Systems.

¹ It is expected that an interoperability document for DCL, D-ATIS and OCL over ACARS consistent with ED-120 will be delivered by EUROCAE in addition to guidance material facilitating traceability of safety and performance requirement between ED-85A, ED-89A, ED-106A and ED-120.

	AC 20-140	Guidelines for design approval of aircraft data communications systems.
EUROCAE	ED-78A	Guidelines for Approval of the Provision and Use of Air Traffic Services supported by Data communications.
	ED-92A	Minimum Operational Performance Specification for an Airborne VDL System.
	ED-112	Minimum operational performance specification for Crash protected airborne recorder systems
	ED-110A	Interoperability Requirements Standard for ATN Baseline 1 (INTEROP ATN B1).
	ED-120	Safety and Performance Requirements Standard for Initial Data Link Services In Continental Airspace (SPR IC).
RTCA	DO-224A	Signal-in-Space Minimum Aviation System Performance Standards (MASPS) for Advanced VHF Digital Data Communications Including Compatibility with Digital Voice Techniques.
	DO-250	Guiding Principles for Air Traffic Services Provided via Data Communications Utilizing the ATN, Builds 1 and 1A.
	DO-264	Guidelines for Approval of the Provision and Use of Air Traffic Services Supported by Data Communications. (Equivalent to ED-78A)
	DO-280A	Interoperability Requirements Standard for ATN B1 (Equivalent to ED-110A)
SAE	ARP 4791	Human Machine Interface on the flight deck.

5 ASSUMPTIONS

Applicants should note that this AMC is based on the following assumptions.

5.1 Air Navigation Service Provider (ANSP)

5.1.1 Air navigation service providers implement all services or a subset compliant with relevant requirements of:

- the Safety and Performance Requirements of EUROCAE standard SPR ED-120,
- and the interoperability requirements of EUROCAE standard INTEROP ED-110A².

Deviations from these standards are assessed by ANSPs. Deviations that potentially impact the airborne domain should be assessed in coordination with relevant stakeholders as per ED-78A.

5.1.2 ANSP procedures specify the actions to be taken in case of failure of data link communication.

5.2 Communications Service Provider (CSP)

5.2.1 The CSP is committed to provide communication services to ANSPs and aircraft operators with the expected Quality of Service as defined in a specific Service Level

² EUROCONTROL is studying the feasibility of accommodating FANS equipped aircraft in continental airspace for which existing interoperability standards (e.g. ED-100A/DO-258A) or expanded standard may prove acceptable.

Agreement. The Service Level Agreement is bilaterally agreed between the CSP and an ANSP. The terms of reference of the Service Level Agreement are consistent with the performance requirements of the SPR ED-120 document.

- 5.2.2 The CSP does not modify intentionally the operational information (content and format) of messages exchanged between the ANSP and the aircraft

5.3 Aeronautical Information Service (AIS)

- 5.3.1 Each State publishes in its AIP/NOTAM, or equivalent notification, information related to the data link service provisions, service schedule, relevant procedures, and confirmation of compliance with EUROCAE standard SPR, ED-120 and INTEROP ED-110A².
- 5.3.2 The publication will comprise a list of communication service providers that may be used by aircraft operators for the Link 2000+ services, taking into account internetworking arrangements between service providers.

6 AIRWORTHINESS CONSIDERATIONS

6.1 General

- 6.1.1 Qualification criteria requiring coordination is provided in ED-78A.
- 6.1.2 The installation should be shown to meet the safety and performance requirements allocated to the aircraft as provided in SPR ED-120, and the applicable interoperability requirements² INTEROP ED-110A³.
- 6.1.3 The VDL mode 2 system should be compliant with ED-92A.
- 6.1.4 The airborne ATN router should be compliant with an ATN MOPS acceptable to the certification authority. In the absence of a published generic MOPS, the applicant may propose alternative minimum performance criteria for which interoperability and testability can be demonstrated.
- 6.1.5 Recording of ATS messages for accident investigation will need to be implemented when required by the applicable operational rules or by national regulation.

6.2 Human-machine interface on the flight deck

- 6.2.1 Compatibility. The human-machine interface should be compatible with the crew interface and flight deck design of the particular aircraft in which the data communications system and applications are installed.
- 6.2.1.1 If multiple ATS data link applications are available to the aircraft, the crew interface and related crew procedures should be based on a common and compatible philosophy.
- 6.2.2 Flight deck annunciation. The data communications system should have the following annunciation capability, which should be integrated into the flight deck so as to be compatible with the overall alerting scheme of the aircraft.
- 6.2.2.1 Unless otherwise substantiated by means acceptable to the certification authority, an audible and visual indication should be given for each uplink ATS message intended to be displayed to the flight crew, including those messages not be displayed immediately because of lack of crew acknowledgement to an earlier ATS message. Visual alerts alone may be used for non-ATS messages
- 6.2.2.2 The status of the data communications system should be available to the flight crew, e.g., loss of the data communications connection with communications management unit or its equivalent.
- 6.2.2.3 If message storage and/or printing capability is provided, the system should indicate when storage and/or printing is not possible.

³ It is not intended that aircraft which have received airworthiness approval in compliance with interoperability requirement ED-110 should be reinvestigated.

- 6.2.2.4 Annunciation of the receipt of a message during critical flight phases (e.g., takeoff and landing) should be suppressed until after the critical flight phase. The criteria that define critical flight phases should be consistent with the particular flight deck philosophy and the particular data link services supported.
- 6.2.3 Flight deck controls. Control capability for the data communications system and applications should meet the following criteria:
- 6.2.3.1 Means should be provided for the flight crew to activate or deactivate each of the data communication applications (CPDLC, D-FIS, or ADS).
- 6.2.3.2 Means should be provided to the aircrew to know in real time the identity of the ATS provider(s) connecting with the aircraft, and the applications involved with each connection.
- 6.2.3.3 Means should be provided for the flight crew to acknowledge receipt of ATS messages.
- 6.2.3.4 Means should be provided for the flight crew to list, select, and retrieve the most recent (e.g. ten) ATS messages received and sent by the flight crew during the flight segment. The status of each message, the time it was received or sent, should be accessible.
- 6.2.3.5 Means should be provided for the flight crew to clear uplinked messages from the display. However this capability should be protected against inadvertent clearing.
- 6.2.3.6 Means should be provided for the flight crew to create, store, retrieve, edit, delete, and send messages.
- 6.2.3.7 If a direct interface exists between the data communications application and other computer functions, (e.g. flight planning and navigation), a means should be provided for the flight crew to activate the computer function to use the data contained in the message. The means provided should be separate from that used to acknowledge receipt of a message.
- 6.2.4 Flight deck displays. Display capability of the data communications system and applications should meet the following criteria:
- 6.2.4.1 All messages should be displayed, without being truncated, in a format that the flight crew can comprehend without the need for translation from English into another language.
- 6.2.4.2 The flight crew should be able to read displayed messages without leaving their seats.
- 6.2.4.3 Except for the ATIS, messages from the ATS should be displayed without the need for flight crew action, and remain displayed until acknowledged, unless the flight crew selects another message or, in the case of a multi-function display, another display format or function. In these cases a reminder should indicate that pending messages are waiting for a response.
- 6.2.4.4 ATS messages should be displayed so that messages are distinguishable from each other. The status of each message (i.e. source, time sent, open/closed) should be displayed together with the message.
- 6.2.4.5 When the data communications application is sharing a display with other aircraft functions, the aircraft system should ensure appropriate priority for the information to be displayed.
- 6.2.4.6 If a message intended for visual display is greater than the available display area and only part of the message is displayed, a visual indication shall be provided to the pilot to indicate the presence of the message remainder.
- 6.2.5 Flight deck Printer. A flight deck printer may be used as a means of storing data communications messages received or sent during the current flight. It should satisfy integrity and interface design criteria appropriate for this purpose

7 ACCEPTABLE MEANS OF AIRWORTHINESS COMPLIANCE

7.1 Airworthiness

7.1.1 When showing compliance with this AMC, the following points should be noted:

- a) The applicant will need to submit, to the Agency, a certification plan and a compliance statement that shows how the criteria of this AMC have been satisfied, together with evidence resulting from the activities described in the following paragraphs.
- b) Compliance with the certification specifications (e.g. CS 25) for intended function and safety may be demonstrated by equipment qualification, safety analysis of the interface between the communications management system and other systems, structural analyses of new antenna installations, equipment cooling verification, and evidence of a human to machine interface, suitable for ATC initial continental data link services, and taking account of the criteria of paragraph 6.
- c) The aircraft data communications system and applications should be demonstrated by end-to-end ground testing that verifies system operation interoperability and performance, either with an appropriate ATS unit, or by means of test equipment that has been shown to be representative of the actual ATS unit. The testing should verify system operation, interoperability, and performance.

Notes: 1 EUROCAE ED-78A gives guidance on test equipment for this purpose.

- 2 This limited testing assumes that the communication systems have been shown to satisfactorily perform their intended functions in the flight environment in accordance with applicable requirements.

- d) When showing compliance with CS 25.1309, consideration should be given to the possibility of unacceptable interaction between the communications management system and other essential systems.

7.1.2 To minimise the certification effort for follow-on installations, the applicant may claim credit, from the responsible authority, for applicable certification and test data obtained from equivalent aircraft installations.

7.2 Performance

Where compliance with a performance requirement cannot readily be demonstrated by a test, then the performance may be verified by an alternative method such as analysis.

7.3 Aircraft Flight Manual

7.3.1 The Normal Procedures section of the Flight Manual shall provide a statement as follows: *“The aircraft ATC data link system has been demonstrated to comply with the applicable safety and performance requirements of EUROCAE ED-120, the interoperability requirements of ED-110A and with AMC 20-11. This AFM entry does not, by itself, constitute an operational approval where such an approval is required.”*

7.3.2 The following information, as applicable to the specific services approved for the aircraft, will need to be included in either the Flight Manual or other operational documents.

“The aircraft ATC data link system is intended for the following data link services:

- a) Data Link Initiation Capability (DLIC) enabling initial contact between the aircraft and an ATC unit that supports data communications, to unambiguously identify the

- aircraft, and to ensure compatibility of aircraft equipage with ATC. It is a prerequisite to any other operational data link services.
- b) ATC Communication Management (ACM) providing the necessary information to the aircraft to enable transfer of frequencies for both voice and data communications, either within the same sector, between two sectors or between two ATC centres.
 - c) ATC Clearances (ACL) enabling uplink of a set of clearance and information messages and downlink of pilot responses and requests.
 - d) ATC Microphone Check (AMC) enabling the controller to send a message to data link equipped aircraft (of appropriate interoperability) to request a stuck microphone check.
 - e) Departure Clearance (DCL) enabling the request and the delivery of departure information and clearance.
 - f) Downstream Clearance (DSC) enabling the request and the delivery of clearance with a downstream ATC centre (i.e. oceanic clearance).
 - g) D-ATIS “enabling the request and the delivery of ATIS via data link.”

7.4 Existing installations

- 7.4.1 The applicant will need to submit, to the responsible authority, a compliance statement, which shows how the criteria of this AMC have been satisfied for existing installations. Compliance may be supported by design review and inspection of the installed system to confirm the availability of required features, functionality and acceptable human-machine interface.
- 7.4.2 Where this design review finds items of non-compliance, the applicant may offer mitigation that demonstrates an equivalent level of safety and performance. Items presented by the applicant which impact safety, performance and interoperability requirements allocation will need to be coordinated in accordance with ED-78A.

8 OPERATIONAL CONSIDERATIONS

Reserved.

9 AVAILABILITY OF DOCUMENTS

EUROCAE documents may be purchased from EUROCAE, 17 rue Hamelin, 75783 Paris Cedex 16, France, (Fax: 33 1 45 05 72 30). Web site: www.eurocae.org.

JAA documents are available from the JAA publisher Information Handling Services (IHS). Information on prices, where and how to order is available on both the JAA web site www.jaa.nl and the IHS web site www.avdataworks.com.

EUROCONTROL documents may be requested from EUROCONTROL, Documentation Centre, GS4, Rue de la Fusee, 96, B-1130 Brussels, Belgium; (Fax: 32 2 729 9109 or web site www.eurocontrol.int).

ICAO documents may be purchased from Document Sales Unit, International Civil Aviation Organisation, 999 University Street, Montreal, Quebec, Canada H3C 5H7, (Fax: 1 514 954 6769, e-mail: sales_unit@icao.org) or through national agencies.

FAA documents may be obtained from Department of Transportation, Subsequent Distribution Office SVC-121.23, Ardmore East Business Centre, 3341 Q 75th Avenue, Landover, MD 20785, USA.

RTCA documents may be purchased from RTCA, Incorporated, 1828 L Street, Northwest, Suite 820, Washington, D.C. 20036-4001 U.S.A. Web site: www.rtca.org.

SAE documents may be obtained from SAE World Headquarters, 400 Commonwealth Drive, Warrendale, PA 15096-0001, USA. Telephone 1-877-606-7323 (U.S. and Canada only) or 724/776-4970 (elsewhere). Web site www.sae.org.

Appendix 1

Common Terms

Reference should be made to EUROCAE document ED-110A and ED-120 for definitions of terms.

Abbreviations

AAC	Aeronautical Administrative Communications
ACARS	Aircraft Communications Addressing and Reporting System
ACC	Area Control Centre
ACL	ATC Clearances
ACM	ATC Communication Management
ADS	Automatic Dependent Surveillance
AIP	Aeronautical Information Publication
AMC	ATC Microphone Check (service)
AMJ	Advisory Material Joint
ANS	Air Navigation Service
ARINC	Aeronautical Radio Incorporated (USA)
ATC	Air Traffic Control
ATIS	Automatic Terminal Information Service
ATM	Air Traffic Management
ATN	Aeronautical Telecommunication Network
ATS	Air Traffic Services
ATSU	Air Traffic Service Unit
CAA	Civil Aviation Authority
CFR	Code of Federal Regulations
CM	Configuration (Context) Management
CMU	Communications Management Unit
CNS	Communication, Navigation and Surveillance
CNS/ATM	Communication, Navigation and Surveillance / Air Traffic Management
CPDLC	Controller Pilot Data Link Communications
CS	Certification Specifications
CSP	Communication Service Provider
D-ATIS	Data Link ATIS
DCL	Departure Clearance
DFIS	Data Link Flight Information Service (ICAO)
DLIC	Data Link Initiation Capability
DSC	Downstream Clearance
EATCHIP	European Air Traffic Control Harmonisation and Integration Programme (see EATMP)
EATMP	European Air Traffic Management Programme
ECIP	European Convergence and Implementation Plan
EFIS	Electronic Flight Instrument System
ESARR	Eurocontrol Safety Regulatory Requirements
EUROCAE	EUROpean Organisation for Civil Aviation Equipment
EUROCONTROL	European Organisation for the Safety of Air Navigation
FAA	Federal Aviation Administration
FANS	Future Air Navigation Systems (ICAO)
FMS	Flight Management System
ICAO	International Civil Aviation Organisation

INTEROP	Interoperability
JAA	Joint Aviation Authorities
JAR-OPS	Joint Aviation Requirements- Operations
MASPS	Minimum Aircraft System Performance Specification or Minimum Aviation System Performance Standards
MCDU	Multi-purpose Control and Display Unit
MOPS	Minimum Operational Performance Specification or Minimum Operational Performance Standards
NOTAM	Notice to Airmen
OSD	Operational Services and Environment Definition
REF	Reference
RTCA	RTCA Inc
SAE	Society of Automotive Engineers
SARPs	Standards and Recommended Practices (ICAO)
SATCOM	Satellite Communications
SC	Standing Committee
SLA	Service Level Agreement
SPR	Safety and Performance Requirements
VDL	VHF Digital Link
VDR	VHF Digital/Data Radio
VHF	Very High Frequency
WG	Working Group

AMC 20-12 Recognition Of FAA Order 8400.12a For RNP-10 Operations.

1. PURPOSE

This AMC calls attention to the FAA Order 8400.12A "Required Navigation Performance 10 (RNP-10) Operational Approval", issued 9th February 1998. FAA Order 8400.12A addresses RNP-10 requirements, the operational approval process, application principles, continuing airworthiness and operational requirements. This AMC explains how the technical content and the operational principles of the Order may be applied as a means, but not the only means, to obtain EASA approval for RNP-10 operations.

2. REFERENCE DOCUMENTS

2.1 Related Requirements

CS/FAR 25.1301, 25.1307, 25.1309, 25.1316, 25.1321, 25.1322, 25.1329, 25.1431, 25.1335 25.1581.

CS/FAR 23.1301, 23.1309, 23.1311, 23.1321, 23.1322, 23.1329, 23.1335, 23.1431, 23.1581.

2.2 Related Guidance Material

2.2.1 ICAO

ICAO Doc 7030/4	Regional Supplementary Procedures
ICAO Doc 9613-AN/937	Manual on Required Navigational Performance

2.2.2 EASA/JAA

EASA AMC 25-11	Electronic Display Systems.
EASA AMC 20-5	Airworthiness Approval and Operational Criteria for the use of the Navstar Global Positioning System (GPS).
JAA Leaflet No 9	Recognition of EUROCAE Document ED-76 (RTCA DO-200A): Standards for Processing Aeronautical Data.

2.2.3 FAA

Order 8400.12A	Required Navigation Performance 10 (RNP-10) Operational Approval, issued February 1998. Order 8110.60 GPS as Primary Means of Navigation for Oceanic/Remote Operations.
AC 25-4	Inertial Navigation Systems (INS).
AC 25-11	Electronic Display Systems.
AC 25-15	Approval of Flight Management Systems in Transport Category Airplanes.
AC 20-130A	Airworthiness Approval of Navigation or Flight Management Systems Integrating Multiple Navigation Sensors.

AC 20-138	Airworthiness Approval of NAVSTAR Global Positioning System (GPS) for use as a VFR and IFR Supplemental Navigation System.
14 CFR Part 121 Appendix G	Doppler Radar and Inertial Navigation System (INS): Request for Evaluation; Equipment and Equipment Installation; Training Program; Equipment Accuracy and Reliability; Evaluation Program.

2.2.4 Technical Standard Orders

ETSO-2C115() / TSO-C115()	Airborne Area Navigation Equipment Using Multi-sensor Inputs.
ETSO-C129a / TSO-C129a	Airborne Supplemental Navigation Equipment Using the Global Positioning System (GPS)
ETSO-C145a/ TSO-C145a	Airborne Navigation Sensors Using the Global Positioning System (GPS) Augmented by the Wide Area Augmentation System (WAAS).
ETSO-C146a/ TSO-C146a	Stand-Alone Airborne Navigation Equipment Using the Global Positioning System (GPS) Augmented by the Wide Area Augmentation System (WAAS).

2.2.5 EUROCAE / RTCA and ARINC

ED-75A / DO-236A	Minimum Aviation System Performance Standards: Required Navigation Performance for Area Navigation.
ED-76 / DO-200A	Standards for Processing Aeronautical Data.
ED-77 / DO-201A	Standards for Aeronautical Information.
DO-229B	Minimum Operational Performance Standards for Global Positioning System/Wide Area Augmentation System Airborne equipment.
ARINC 424	Navigation System Data Base.

3. BACKGROUND

3.1 Airspace in various oceanic and remote regions of the world is being restructured progressively to provide capacity and operating benefits for the aircraft traffic. This restructuring involves reduced route spacing (e.g. 50NM in place of 100NM) that, in turn, demands improved aircraft navigational performance. Airspace for this purpose is designated as RNP-10 airspace.

3.2 The RNP-10 implementation is for the oceanic and remote phases of flight where ground based navigation aids do not exist except possibly at isolated locations. Hence aircraft navigation will need to be based on a long range navigation capability of acceptable performance using inertial navigation and/or global positioning systems.

3.3 Aircraft may qualify for RNP-10 airspace operational approval on the basis of compliance with an appropriate RNP build standard. The navigation performance of aircraft

already in service also may qualify and this AMC provides a means of determining their eligibility.

3.4 It is not intended that RNP-10 operational approvals already granted by national authorities in compliance with FAA Order 8400.12A should be re-investigated.

4. CERTIFICATION CRITERIA

4.1 Airworthiness Approval

FAA Order 8400.12A discusses required system performance (paragraphs 10 and 15), certification actions (paragraph 16), continued airworthiness considerations (paragraph 14), and provides guidance (paragraph 12) for demonstrating eligibility for RNP-10 approval. Key aspects of the FAA Order are summarised in the following paragraphs of this AMC. These should be applied in conjunction with the technical content of the Order for the purposes of obtaining RNP-10 approval under EASA regulations.

4.2 Required Equipment and Performance

4.2.1 Aircraft operating in RNP-10 airspace shall have a 95% cross-track error of less than 10 NM. This includes positioning error, flight technical error (FTE), path definition error and display error. The aircraft shall have also a 95% along-track positioning error of less than 10 NM.

4.2.2 Loss of all long range navigation information should be Improbable (Remote), and displaying misleading navigational or positional information simultaneously on both pilot's displays should be Improbable (Remote). This requirement can be satisfied by the carriage of at least dual independent, long range navigation systems compliant with the criteria of this AMC and the FAA Order. See also EASA AMC 25-11.

4.3 Eligibility for RNP-10 Operations

In respect of system navigational performance, the Order defines three aircraft groups, which may be eligible for RNP-10 operations:

- Aircraft eligibility through RNP certification (Eligibility Group 1).
- Aircraft eligibility through prior navigation system certification (Eligibility Group 2).
- Aircraft eligibility through Data Collection (Eligibility Group 3).

In all cases, where navigation relies on inertial systems, a usage limit of 6.2 hours is set from the time the inertial system is placed into the navigation mode. The FAA Order explains, in paragraph 12d, the options available to extend the time limits for use of inertial systems.

RNP containment integrity/continuity, as defined in EUROCAE ED-75() (or RTCA DO-236() "MASPS for RNP Area Navigation"), are not required functions for RNP-10 operations.

4.3.1 Aircraft eligibility through RNP certification (Eligibility Group 1).

Group 1 aircraft are those that have obtained formal certification and approval of RNP capable systems integrated in the aircraft.

If RNP compliance is stated in the Aircraft Flight Manual (AFM), the operational approval of Group 1 aircraft will be based upon the performance defined in that statement.

Note: RNP value in AFM is typically not limited to RNP-10. The AFM will state RNP levels that have been demonstrated. An airworthiness approval specifically addressing only RNP-10 performance may be requested and granted.

4.3.2 Aircraft eligibility through prior navigation system certification (Eligibility Group 2).

Group 2 represents aircraft that can equate their level of performance, certified against earlier standards, to the RNP-10 criteria. Group 2 aircraft are sub-divided into three parts:

(a) Aircraft equipped with Inertial Systems

These aircraft are considered to meet all of the RNP-10 requirements for up to 6.2 hours of flight time if the inertial systems have been shown to meet the intent of CFR Part 121, Appendix G¹, or equivalent criteria. This time starts when the system is placed in the navigation mode and no en-route facility for radio updating is available. Operators may seek approval to extend this time limit by demonstrating inertial system accuracy, better than the assumed 2 NM per hour radial error, by means of an additional data collection.

If systems are updated en-route (radio navigation updating), the 6.2 hour limit can be extended taking account of the accuracy of the update. See paragraph 4.5 of this AMC.

(b) Aircraft where GPS provides the only means of long range navigation.

For aircraft in this group where GPS provides the only means of long range navigation (i.e. inertial systems are not carried) when out of range of conventional ground stations (VOR/DME), the aircraft flight manual should indicate that the GPS installation is approved as a primary means of navigation for oceanic and remote operations in accordance with FAA Notice 8110.60². These aircraft are considered to meet the RNP-10 requirements without time limitations. At least dual GPS equipment, compliant with ETSO-C129(), are required, together with an approved availability prediction program for fault detection and exclusion (FDE) for use prior to dispatch. For RNP-10 operations, the maximum allowable period of time for which the FDE capability is predicted to be unavailable is 34 minutes.

(c) Multisensor Systems Integrating GPS with Inertial Data.

Multisensor systems integrating GPS with RAIM, FDE or an equivalent integrity method that are approved in accordance with FAA AC 20-130A are considered to meet RNP-10 requirements without time limitations. In this case, the inertial system will need to meet the intent of CFR Part 121, Appendix G, or equivalent criteria.

4.3.3 Aircraft eligibility through Data Collection (Eligibility Group 3).

Group 3 represents older out-of-production aircraft that contain widely varying navigation capability.

A data collection program, acceptable to the Agency, may be used by the applicant to demonstrate that the aircraft and navigation systems provide the flight crew with acceptable

¹ See Annex 2

² Notice 8110.60 is recognised by JAA TGL No. 3 revision 1.

navigational situational awareness relative to the intended RNP-10 route. The Order describes the essential aspects of a data collection programme.

The Agency will accept as evidence, inertial system performance data obtained and analysed during previous programmes for RNP-10 approval including data that validates extended flight time.

4.4 Operational Approval and Procedures.

The operational principles given in the FAA Order may be used as the basis for JAA RNP-10 operational approval. To obtain approval, the applicant should address at least the following:

4.4.1 Eligibility for RNP-10.

Evidence should be made available confirming that the aircraft has an approved RNP-10 navigation capability.

4.4.2 Aircraft Equipment and Minimum Equipment List.

The applicant should provide a configuration list of equipment to be used for RNP-10 operations. The MEL(MMEL) should be reviewed to ensure its compatibility with RNP-10 operations. Specific attention should be directed to the need for three inertial navigation units for dispatch if RNP-10 approval is based on a triple-mix solution.

4.4.3 Operational Procedures and Training.

4.4.3.1 Applicant should demonstrate to the responsible authority that the training items related to RNP-10 operations are incorporated into flight crew training. Training for other personnel should be included where appropriate (e.g., dispatchers and maintenance personnel).

4.4.3.2 Operating manuals and checklists should be revised to include information and guidance appropriate to RNP-10 operations. The manuals should include operating instructions for the navigation equipment, and RNP-10 operational procedures (see Appendix 4 of the Order).

4.4.3.3 Operating procedures will need to take account of the RNP-10 time limit declared for the inertial system, if applicable, considering also the effect of weather conditions that could affect flight duration in RNP-10 airspace. Where an extension to the time limit is permitted, the flight crew will need to ensure en-route radio facilities are serviceable before departure, and to apply radio updates in accordance with any Flight Manual limits.

4.4.3.4 Manuals and checklists will need to be submitted to the responsible authority for review as part of the approval process.

4.5 Position Updating

Subject to approval, operators may extend their RNP-10 inertial navigation time by position updating as discussed in paragraph 12e and Appendix 7 of the Order. For position updating approval, aircraft operators will need to calculate, using statistically based typical winds for each planned route, points at which updates can be made, and the points at which further updates will not be possible.

4.5.1 Automatic radio position update.

Automatic radio position updating is acceptable for operations in RNP-10 airspace as discussed in paragraph 12f of the Order.

4.5.2 Manual radio position update.

Subject to an approved procedure, manual radio updating is permitted as discussed in the paragraph 12g and Appendix 7, of the Order.

4.6 Incident reporting.

Significant incidents associated with the operation of the aircraft that affect or could affect the safety of RNP-10 operations (i.e. navigation error) will need to be reported in accordance with applicable operational rules.

5. AVAILABILITY OF DOCUMENTS

JAA documents are available from the JAA publisher Information Handling Services (IHS). Information on prices, where and how to order is available on the JAA website and at www.avdataworks.com).

EUROCAE documents may be purchased from EUROCAE, 17 rue Hamelin, 75783 Paris Cedex 16, France, (Fax : 33 1 45 05 72 30). Web site: www.eurocae.org

FAA documents may be obtained from Department of Transportation, Subsequent Distribution Office SVC-121.23, Ardmore East Business Centre, 3341 Q 75th Avenue, Landover, MD 20785, USA. Web site www.faa.gov/aviation.htm

RTCA documents may be obtained from RTCA Inc, 1828 L Street, NW., Suite 805, Washington, DC 20036, USA., (Tel: 1 202 833 9339; Fax 1 202 833 9434). Web site www.rtca.org

ICAO documents may be purchased from Document Sales Unit, International Civil Aviation Organisation, 999 University Street, Montreal, Quebec, Canada H3C 5H7, (Fax: 1 514 954 6769, e-mail: sales_unit@icao.org) or through national agencies.

AMC 20-13 Certification of Mode S Transponder Systems for Enhanced Surveillance

1 PREAMBLE

Operating regulations require that an operator shall not operate an aircraft unless it is equipped with;

- (1) a pressure altitude reporting SSR transponder; and
- (2) any other SSR transponder capability required for the route being flown.

In accordance with the European Air Traffic Management Plan, the implementation of Enhanced Surveillance requires aircraft to have the capability to down-link aircraft derived data via a Mode S transponder.

2 PURPOSE

2.1 This AMC has been prepared to provide guidance for the installation, certification and maintenance of Mode S SSR transponder systems for Enhanced Surveillance. It provides a method by which equipment installers and aircraft operators can satisfy an authority that the transponder capability required by airspace regulations has been addressed. This AMC is not mandatory and does not constitute a regulation. In lieu of following this method without deviation, an alternative method may followed provided it is found by the responsible authority to be in compliance with applicable airworthiness certification specifications, operational and airspace requirements This document does not change, create, authorise, or permit deviations from, regulatory requirements.

2.2 Where required, the units of measurement used in this document are in accordance with the International System of Units (SI) specified in Annex 5 to the Convention on International Civil Aviation. Non-SI units are shown in parentheses following the base units. Where two sets of units are quoted, it should not be assumed that the pairs of values are equal and interchangeable. It may be inferred, however, that an equivalent level of safety is achieved when either set of units is used exclusively.

3 SCOPE

This AMC addresses only the Mode S transponder for Enhanced Surveillance purposes used in conjunction with interrogating ground stations. It does not deal with Mode S elementary surveillance, or automatic dependent surveillance (ADS-B or ADS-C), or the use of the transponder as a data link component of the Aeronautical Telecommunication Network (ATN), or security aspects relating to unlawful interference with aircraft operation.

4 REFERENCE MATERIAL

4.1 JAA/EASA

- (a) EASA ETSO-2C112b, *Minimum Operational Performance Specification for SSR Mode S Transponders*. (adopts EUROCAE ED-73B,).
- (b) JAA JTSO-C112A, EASA ETSO-2C112a, *Minimum Operational Performance Specification for SSR Mode S Transponders*. (Adopts EUROCAE ED-73A).
- (c) EASA AMC 20-18 Certification of Mode S Transponder Systems for Elementary Surveillance
- (d) JAR-OPS 1: Amendment 6: 1.845 and 1.866 and associated AMCs.
- (e) JAR-OPS 3: Amendment 2: 3.845, 3.860, 3.865, and associated AMCs.
- (f) JAR-OPS 1/3: MEL Policy Document.
- (g) EASA *Certification Specifications* CS-23, CS-25, CS-27, and CS-29, as applicable.

4.2 FAA

- (a) FAR 121.345, Radio equipment.
- (b) TSO-C112, 1986, (Based on RTCA DO-181). This standard of transponder does not provide the full functionality required for the European Region. However, the RTCA document has been updated to DO-181C that defines an acceptable standard. It is expected that the FAA TSO will be updated to reflect this standard.
- (c) FAR 25, 25, 27 and FAR 29 as applicable.

4.3 EUROCONTROL

- (a) Document SUR.ET2.ST02.1000-CNP-01-00, Edition 2, Nov 1996 *The Concept of Operations - Mode S in Europe*.
- (b) Document (Mode S/OHA/001) Edition 1.0, October 2001, *Operational Hazard Assessment of Elementary & Enhanced Surveillance*.
- (c) Document Mode S/SAF/002, Edition 1.0, dated October 2003, *Preliminary System Safety Analysis for the Controller Access Parameter Service delivered by Mode S Enhanced Surveillance*.
- (d) Document SUR/Mode S/ES 3SP MP, Edition 1.0, 30 August 2002, *Mode S Three States Project Master Plan*.
- (e) Document SUR-EHS/02-001, Edition 2.0, July 2003, *Common Framework for the Regulation of Mode S Enhanced Surveillance*.

4.4 ICAO

- (a) Annex 10, Amd. 77, *Aeronautical Communications (Digital Data Communication Systems)*, Volume III, July 2002.
- (b) Annex 10, Amd. 77, *Aeronautical Communications (Surveillance Radar and Collision Avoidance Systems)*, Volume IV, July 2002.
- (c) *Manual of the Secondary Surveillance Radar System*, Doc 9684, Third Edition 2004.
- (d) *EUR Regional Supplementary Procedures*, ICAO Doc 7030/4, as amended.

4.5 EUROCAE

- (a) *Minimum Operational Performance Specification for SSR Mode S Transponders*, ED-73B, January 2003.
- (b) *Minimum Operational Performance Specification for SSR Mode S Transponders*, ED-73A, February 1999.
- (c) *Minimum Operational Performance Specification for Aircraft Data Link Processors*, ED-82A, November 1999.
- (d) *Minimum Operational Performance Specification for Mode S Specific Service Applications*, ED-101, September 2000.
- (e) *Minimum Operational Performance Specification for Light Aviation SSR Transponder*, ED-115, August 2002

4.6 RTCA

- (a) *Minimum Operational Performance Specification for Air Traffic Control Radar Beacon System/ Mode Select (ATCRBS/Mode S) Airborne Equipment*, RTCA DO-181C, June 2001.
- (b) *Minimum Operational Performance Specification for the Mode S Airborne Data Link Processor*, RTCA DO-218B, June 2001

5 ASSUMPTIONS

5.1 Applicants should note that this AMC takes account of EUROCONTROL document, Mode S/OHA/001, Operational Hazard Assessment of Elementary and Enhanced Surveillance (reference 4.3.b), and is based on the following assumptions concerning the proposed use of aircraft derived data by the air traffic services:

- (a) The data is intended for display to the air traffic controller (referred to as controller accessed parameters (CAPs)) and that means are implemented, where appropriate, by the air traffic services to verify the validity of received data (e.g. as currently performed by means of the ICAO required controller-pilot verification procedure for the altitude report).
- (b) A safety review is performed to identify the measures needed to confirm an acceptable level of integrity for aircraft derived data, prior to such data being used by the ATC systems (referred to as system accessed parameters (SAPS)) such as safety nets.
- (c) Loss of any parameter is readily detectable by the air traffic controller and/or the ATC system (as applicable).
- (d) The Air Traffic Service Provider supplements the Preliminary System Safety Analysis (reference 4.3(c)) with such additional studies and mitigation as may be necessary to comply with EUROCONTROL Safety and Regulatory Requirements (ESARR) for the introduction of Mode S Enhanced Surveillance.

5.2 On this basis, for the purposes of system certification, Failure Conditions involving lost or erroneous aircraft derived data can be classified as shown in Annex 1, table 2 of this AMC.

5.3 This AMC is applicable to Enhanced Surveillance only. It is not intended to cover the certification considerations for extended squitter. It is however recognised that extended squitter data will be used for future applications. If the extended squitter function of the transponder is enabled on the aircraft, the installer should ensure that the transponder is fully compliant with the requirements of ED 73B, ED 82A (where applicable) and ICAO Annex 10 amendment 77 with regard to extended squitter. The Flight Manual Supplement should state whether or not extended squitter is enabled. No certification credit can be assumed by the enabling of extended squitter on the aircraft unless a full certification exercise is completed in accordance with relevant guidelines. Note: Certification guidelines covering ADS-B, using extended squitter, will be produced at a later date.

5.4 Enhanced Surveillance is not applicable to helicopters. They are only required to install Elementary Surveillance. This does not preclude a helicopter from voluntary installation of Enhanced Surveillance.

6 SYSTEM DESCRIPTION

An overview of transponder characteristics is given in JAA TGL No. 13, as revised, Section 6.

7 AIRWORTHINESS CERTIFICATION OBJECTIVES

7.1 For the purposes of certification of an installed transponder system for Enhanced Surveillance, the demonstration of intended function (CS-25.1301) will need to be show that, except as permitted by the Coordinated Exemptions Policy, aircraft derived data can be transmitted to meet the objectives of the Common Framework (reference 4.3(e)).

Note: The Coordinated Exemptions Policy is determined by the responsible airspace authorities and managed by EUROCONTROL in accordance with the Guidance Material of Reference 4.3(e). Further advice may be obtained by contacting the Mode S Exemptions Coordination Cell at www.eurocontrol.int/mode_s or modes.reg@eurocontrol.int.

7.2 The minimum required characteristics of aircraft derived data are shown in Table 1 of Annex 1 to this AMC. Similarly, the criticality classifications of the data that need to be met are shown in Table 2. These classifications take account of the assumptions of Section 5, and correspond with the definitions of EASA Certification Specification CS-25.1309 and associated AMC.

8 FUNCTIONAL CRITERIA

8.1 The Enhanced Surveillance functionality will need to ensure, through Ground Initiated Comm-B (GICB) protocols as defined in ICAO Annex 10 (Amendment 77), Volume III, Part 1, Appendix to Chapter 5, the extraction and transmission of information contained in the following standardised transponder registers (designated by BDS x, y and which may be composed of up to 4 different aircraft data):

BDS Register	Contents of BDS Register
a) BDS 6,0	Heading and Speed report
b) BDS 5,0	Track and Turn report
c) BDS 4,0	Selected vertical intention

8.2 As a minimum, unless a specific exemption has been granted, the data transmitted for Mode S Enhanced Surveillance will need to be:

a) BDS 6,0 (Heading and Speed Report)	Magnetic heading Indicated airspeed Mach no. Vertical rate (Barometric rate of climb/descend or baro-inertial)
b) BDS 5,0 (Track and Turn Report)	Roll angle Track angle rate (or True Airspeed – see Note 2) True track angle Ground speed
c) BDS 4,0 (Selected Vertical Intention)	Selected altitude

- Notes:
- For aircraft that require ACAS II, the Resolution Advisory Report will need to be transmitted also by the transponder (ICAO Annex 10, Volume IV) in BDS 3.0.
 - See Table 1 of Annex 1 for further details relating to the data requirements.

8.3 The transponder capability report, as defined in ICAO Annex 10, Volume IV, 3.1.2.6.10.2 and Volume III, Part 1, Appendix to Chapter 5, 2.5.4, will need to be updated to reflect the Enhanced Surveillance capability as implemented and supported in the aircraft. The affected BDS to be appropriately filled are: BDS 1,0; BDS 1,7; BDS 1,8 to 1,C; and BDS 1,D to 1,F. For implementations not supporting MSP services, the correct servicing of register 1,D to 1,F corresponds to at least transmitting 0 in response to extraction of these registers. In such case the setting of the bits corresponding to BDS 1,D to 1,F in BDS 1,8 may be accepted either as being 1 or 0.

9 ACCEPTABLE MEANS OF AIRWORTHINESS COMPLIANCE

9.1 The criteria for Mode S Elementary Surveillance will need to be satisfied prior to, or concurrently with, the certification tasks for Enhanced Surveillance.

9.2 The Mode S Transponder will need to be approved in accordance with EASA European Technical Standard Order ETSO-2C112b, or an equivalent standard that is consistent with applicable ICAO SARPS and which is acceptable to the responsible certification authority. The transponder manufacturer should state in their Declaration of Design and Performance (DDP) whether or not they are fully compliant with the requirements of ED-73B, ED-82A and ICAO Annex 10 amendment 77.

Note: Transponders approved to ETSO-2C112a or ETSO-2C112a may be acceptable if they are fully compliant with ED-73B, ED-82A and ICAO Annex 10 amendment 77. Compliance should be stated in the transponder DDP.

9.3 For the processing of data parameters, information may be found in EUROCAE Minimum Operational Performance Specification for Aircraft Data Link Processors, ED-82A, November 1999. This specification is applicable to the processing within a Mark 4 transponder, or, to the processing within an Aircraft Data Link Processor or equivalent when this function is performed separately from the transponder.

9.4 When demonstrating compliance with this AMC, the following specific points should be noted:

- (a) The applicant will need to submit, to the responsible authority, a compliance statement that shows how the criteria of this AMC have been satisfied, together with evidence resulting from the activities described in the following paragraphs.
- (b) Compliance with the airworthiness certification specifications for intended function and safety may be demonstrated by equipment qualification, safety analysis of the interface between the transponder and data sources, equipment cooling verification, and ground tests. To support the approval application, design data will need to be submitted showing that the objectives and criteria of Sections 7 and 8 of this AMC have been satisfied.
- (c) The safety analysis of the interface between the transponder and its data sources should show no unwanted interaction under normal or fault conditions.

9.5 On the assumption that the transponder installation has been shown to meet the existing criteria for Modes A, and C, Elementary Surveillance, and ACAS II, then the additional functionality introduced for Enhanced Surveillance may be demonstrated by ground testing, using ramp test equipment where appropriate, that verifies:

- correct system operation;
- that the aircraft derived data in the transmitted response, including the 24-bit aircraft address; and
- correct functioning of system fault detectors.

9.6 To minimise the certification effort for transponder follow-on installations, the applicant may claim from the responsible authority, credit for applicable certification and flight test data obtained from equivalent aircraft installations.

9.7 Particular attention should be given to the interface between dual (or more than 2 transponders) and dual or multiple sensors. In this context, ‘sensors’ refers to FMS, IRS, AHS, ADS, GPS, or Data Concentrator (or other) systems used to provide data to the transponder for Altitude Reporting, Elementary Surveillance, Enhanced Surveillance, or Extended Squitter (e.g., Automatic Dependent Surveillance-Broadcast (ADS-B) or other Mode-S Specific Services (MSSS) functions.

For the captain’s side transponder:

The captain’s side (e.g., on-side) sensor should be connected to the captain’s side (e.g., on-side) input of the captain’s side transponder.

The co-pilot’s side (e.g., cross-side) sensor should be connected to the co-pilot’s side (e.g., cross-side) input of the captain’s side transponder.

For the co-pilots side transponder:

The co-pilot’s side (e.g., on-side) sensor should be connected to the co-pilot’s side (e.g., on-side) input of the co-pilot’s side transponder.

The captain’s side (e.g., cross-side) sensor should be connected to the captain’s side (e.g., cross-side) input of the co-pilot’s side transponder.

Transponder Selection:

Appropriate means should be provided for the flight crew to select the active transponder at any given time. At all times, the active transponder should be selected such that it operates as either the captain’s side or the co-pilot’s side transponder. This is an important consideration when more than 2 transponders are available to the crew.

Sensor Selection:

The crew should be aware, at all times, which sensors (captain’s or co-pilots side) are providing information to the active transponder. Where necessary, appropriate means should be provided to command the selected active transponder to use the crew selected sensor that is being used to control or report parameters that are relevant to the aircraft flight profile.

Note 1: In a ‘standard’ installation, where crew sensor selection for the active transponder is **not** provided, the captain’s side transponder may utilise the captain’s side sensors and the co-pilot’s side transponder may utilise the co-pilot’s side sensors.

Note 2: In an installation where crew sensor selection for the active transponder is provided, the crew should be aware of the selected sensor (captain's or co-pilot's sensor) at all times.

Note 3: It is important to note that data parameters from different sensors, of the same type, should not be mixed. For example, you should not be reporting altitude information from ADC #1 in your Mode-C and Mode-S replies and then report TAS, Mach, Baro Vert. Rate, from ADC #2. Why? Because if a Static port became partially blocked, data output from ADC #1 and #2 will not correlate. This could cause problems with the ATC ground processing of the data.

9.8 Where only single sensors are available (i.e. single FMS) it is permissible to connect the single sensor to both transponders. It should be noted that this may result in reduced operational availability of the transponder function should the single sensor fail.

9.9 Table 3, Annex 1, offers guidance on the classification (minor or major change) of Elementary and Enhanced Surveillance modifications.

9.10 An aircraft is considered to be 'EHS capable' if the full list of 8 Downlink Aircraft Parameters, as detailed in Table 1, Annex 1, can be transmitted to the ATC ground system.

Note: Table 1 lists 9 parameters, however Indicated Airspeed and Mach No. may be considered as a single DAP and either parameter may be supplied. If an aircraft can provide both, it should do so.

10 FLIGHT MANUAL

10.1 The Aircraft Flight Manual (AFM) or the Pilot's Operating Handbook (POH), whichever is applicable, should provide at least the following information.

- A statement of compliance that the transponder system(s) comply with the criteria of ICAO Doc 7030/4 Regional Supplementary Procedures for operations where Enhanced Surveillance is required.

10.2 The Limitations Section should identify those parameters that, at the time of certification, the transponder are unable to transmit due to the installation configuration, as permitted by the Coordinated Exemptions Policy.

Note: Annex 2 provides a template for an AFM Supplement.

10.3 The Flight Manual Supplement should state whether or not extended squitter is enabled. See paragraph 5.3 of this AMC for further information.

10.4 In the absence of, or as an alternative to, information in the AFM, appropriate information may be given in the Operations Manual.

11 MINIMUM EQUIPMENT LIST

The MEL will need to be revised to indicate the mandatory carriage of a serviceable system to meet applicable operational requirements for flight in designated airspace. Despatch with partial unserviceability of the system, or non-availability of some required aircraft derived data, may be permitted in accordance with the Coordinated Exemptions Policy (see Section 7).

12 GROUND TESTING

12.1 All the BDS registers containing data as defined in Table 1, Annex 1, should be tested to ensure correct data is received and transmitted by the Mode S transponder.

12.2 The rate parameters are particularly difficult to measure statically. To ensure that the rate parameters are correctly received and transmitted by the transponder it is acceptable to test that the correct BDS register is transmitted (by the transponder) and that the parameter value is valid and set to zero.

Where a parameter is not available, and therefore not provided to the transponder, it is acceptable to test that the correct BDS register is transmitted and that the parameter is declared invalid in the reply to the appropriate interrogation. This will prove that the BDS register is received by the Mode S ground test set and declared invalid.

12.3 Other parameters listed in Table 1 Annex 1, which are derived from an Inertial Reference System, may also be difficult to measure statically, i.e. Ground Speed. A similar method as described in paragraph 12.2 may be used.

12.4 A test should be performed to ensure that the transponder:

- i. does not respond to an 'All Call' interrogation when on ground, and
- ii. does respond when interrogated with its Mode S aircraft address when on ground, and
- iii. does provide DF-11 Acquisition Squitter transmissions in the air (on ground acquisition squitter is replaced by extended squitter DF-17, when enabled).

These tests are required to ensure that the WOW switch is correctly interfaced with the transponder.

Note: These tests are not required if they were conducted as part of the Mode S Elementary Surveillance ground testing.

12.5 The Mode S transponder system(s) should be tested to ensure it has no effect on other aircraft systems. Similarly, testing should ensure that the aircraft systems have no effect on the Mode S transponder system(s).

13 FLIGHT TESTING

No specific flight testing is required assuming a full ground test of all the parameters listed in Table 1, Annex 1, is performed. Installation of Mode S antenna's not previously approved, may require a flight test to ensure adequate performance of the antenna's in the new position.

The Agency should be contacted to define the level of flight testing required for adequate performance.

14 MAINTENANCE

- 14.1 Maintenance testing of altitude reporting transponders should be suitably screened to minimise the risk of nuisance traffic or collision resolution advisories in operating aircraft. When performing transponder testing which involves the use of the altitude changes, it is advisable to ensure the transponder is in 'standby' or 'off' whilst the air data system is set to the required altitude. The transponder should only be operated during the testing phase to minimise the risk of interference with other aircraft. Following completion of the testing, the transponder should be returned to 'standby' or 'off'. The air data system may then be returned to atmospheric pressure. Note: Before performing any transponder testing involving altitude changes the local Air Traffic Controller should be contacted and a 'safe test altitude(s)' agreed.
- 14.2 Maintenance tests should include a periodic verification check of aircraft derived data including the ICAO 24 bit aircraft address using suitable ramp test equipment. The check of the aircraft address should be made also in the event of a change of state of registration of the aircraft.
- 14.3 Where possible, maintenance tests should check the correct functioning of system fault detectors.
- 14.4 Maintenance tests for encoding altitude sensors with Gillham's code output should be based on the transition points defined in EUROCAE ED-26, Table 13. (Included as Annex 3 to this guidance material).

15 AVAILABILITY OF DOCUMENTS

JAA documents are available from the JAA publisher Information Handling Services (IHS). Information on prices, where and how to order is available on the JAA website and at www.avdataworks.com. JAA documents transposed to publications of the European Aviation Safety Agency (EASA) are available on the EASA web site www.easa.eu.int

EUROCAE documents may be purchased from EUROCAE, 17 rue Hamelin, 75783 Paris Cedex 16, France, (Fax : 33 1 45 05 72 30). Web site: www.eurocae.org

FAA documents may be obtained from Department of Transportation, Subsequent Distribution Office SVC-121.23, Ardmore East Business Centre, 3341 Q 75th Avenue, Landover, MD 20785, USA. Web site www.faa.gov/aviation.htm

RTCA documents may be obtained from RTCA Inc, 1828 L Street, NW., Suite 805, Washington, DC 20036, USA., (Tel: 1 202 833 9339; Fax 1 202 833 9434), Web site www.rtca.org

ICAO documents may be purchased from Document Sales Unit, International Civil Aviation Organisation, 999 University Street, Montreal, Quebec, Canada H3C 5H7, (Fax: 1 514 954 6769, e-mail: sales_unit@icao.org or through national agencies.

Table 1: Minimum Required Characteristics of Aircraft Derived Data for Enhanced Surveillance**Annex 1**

Item	Parameter	Range	Minimum Resolution	Accuracy Limits	Remarks
5	Magnetic Heading	-180, +180 degrees	90/512	As installed sensor	BDS Register 6,0
6	Indicated Airspeed)	As installed sensor	1 kt	As installed sensor	BDS Register 6,0
7	Mach No.)	As installed sensor	2.048/512	As installed sensor	BDS Register 6,0
8	Vertical Rate	-4994, +4984m/minute (-16384, +16352 ft/minute)	8192/256	As installed sensor	BDS Register 6,0
9	Roll Angle	-90, +90 degrees	45/256	As installed sensor	BDS Register 5,0
10	Track Angle Rate (Note 8)	-16, +16 degrees/second	8/256	As installed sensor	BDS Register 5,0
11	True Track Angle	-180, +180 degrees	90/512	As installed sensor	BDS Register 5,0
12	Ground Speed	As installed sensor	2 kt	As installed sensor	BDS Register 5,0
13	Selected Altitude	As installed sensor	5m (16ft)	See notes 5 & 6	BDS Register 4,0

- Notes:**
- 1 See JAA TGL 13 for details of parameters 1 through 4.
 - 2 The minimum parameter characteristics shown above are applicable to the data source and need to be maintained through any intermediate data processing systems until delivered to the transponder.
 - 3 The required characteristics of the transponder BDS registers are defined in Amd 77 to ICAO 10, Vol III, Part 1, Chapter 5, Appendix 1, 'Tables for Section 2'.
 - 4 Where reference is made to "As installed sensor", this should be interpreted to mean either the primary system used to fly the aircraft, or an approved system of equivalent performance and capability.
 - 5 The value of Selected Altitude, transmitted by the transponder, will need to correspond within +/-8m (+/- 25ft) to the value displayed to the flight crew or the associated output to the flight control/guidance system.
 - 6 The Selected Altitude data to be provided by BDS 4,0 is the "MCP/FCU SELECTED ALTITUDE" (bits 2-13), together with bit 1 (STATUS), and bits 48 to 51, set as described in the register definition. In addition, where readily available, Barometric Pressure Setting in bits 28 to 40 of BDS 4,0 should be provided as defined in Annex 10, Table 2-64 BDS 4,0. The transponder subtracts 800 mb from the Barometric Pressure Setting prior to loading into the register.
 - 7 The transponder capability report, as defined in ICAO Annex 10, Vol IV, 3.1.2.6.10.2 and Vol III, Part 1, Appendix to Chapter 5, 2.5.4, will need to reflect the enhanced surveillance capability, as implemented and supported in the aircraft. The affected BDS to be appropriately filled are:- BDS 1,0; BDS 1,7; BDS 1,8 to 1,C; and BDS 1,D to 1,F.
 - 8 If the Track Angle Rate parameter, as defined in the ARINC 429 data bus specification, Label 335, cannot be readily provided because the aircraft configuration is based on the GAMA 429 specification then 'True Airspeed' (TAS) should be substituted. If the aircraft is supplying TAS then ARINC Label 335 should not be transmitted.
 - 9 Indicated Airspeed and Mach No. are considered as a single DAP. If an aircraft can provide both, it should do so.

Table 2: Failure Condition Categories of Aircraft Derived Data for Enhanced Surveillance

1. The Failure Condition categories listed here assume that aircraft derived data are used only as air traffic controller accessed parameters (CAP) and are subject to a correspondence check by means of radio communication with the pilot, or verification by the end user by other equivalent means. It is assumed also, that loss of any parameter is readily detectable by the air traffic controller and ATC system (if applicable). Aircraft derived data used as system accessed parameters (SAPs) for air traffic safety nets involving automated processing may require higher levels of integrity yet to be established. In anticipation of increasing reliance by the air traffic services on automatic processing of data for safety nets, the aircraft system should be designed such as to provide, so far as is practicable, data of high accuracy, high availability and high integrity.
2. Use of aircraft derived data for other purposes such as Automatic Dependent Surveillance- Broadcast, is expected to require data meeting more demanding availability and integrity criteria. Designers of Mode S systems are strongly recommended to take account of such expectations.
3. The Failure Condition categories listed here take account of advice from EUROCONTROL based on safety analyses to support Enhanced Surveillance. (See reference documents 4.3 (b) and (c)).

Parameter	Loss of Parameter	Undetected Erroneous Parameter
Magnetic Heading	Minor	Minor
Indicated Airspeed	Minor	Minor
Mach No.	Minor	Minor
Vertical Rate	Minor	Minor
Roll Angle	Minor	Minor
Track Angle Rate (or True Airspeed)	Minor	Minor
True Track Angle	Minor	Minor
Groundspeed	Minor	Minor
Selected Altitude (including Barometric Pressure Setting)	Minor	Minor

TABLE 3 Examples of Modification Classification for Mode S Elementary & Enhanced Surveillance Aircraft Installations

Mass of Aircraft	Is Cruising TAS > 250 kts?	Elementary & Enhanced Surveillance?	Pressurised Yes/No	Example No.	Proposed Classification (Major /Minor Change)	Reason/Justification for Classification
Less than 5700 Kgs	No	Elementary Surveillance only required	No	1	Minor	Assuming a simple replacement of existing Mode A/C transponder and no antenna change.
				2	Major	STC required to install Mode S transponder on aircraft where no transponder was previously fitted. Consideration should be given to antenna location and flight test may be required to ensure adequate antenna performance
				3	Major	If Mode S transponder <i>is elementary and enhanced capable</i> and ‘enhanced’ parameters are loaded into transponder (due to connection to an ADC – transponder will also strip off ARINC 429 labels required for enhanced surveillance) then a Flight Manual Supplement or Pilot’s Operating Handbook Supplement should be raised to record which ‘enhanced’ parameters are downloaded – See NPA 20-12b.
			Yes	4	Major	If Mode S transponder <i>is elementary and enhanced capable</i> and ‘enhanced’ parameters are loaded into transponder (due to connection to an ADC – transponder will also strip off ARINC 429 labels required for enhanced surveillance) then a Flight Manual Supplement or Pilot’s Operating Handbook Supplement should be raised to record which ‘enhanced’ parameters are downloaded – See NPA 20-12b.
				5	Minor	Assuming a simple replacement of existing Mode A/C transponder and no antenna location change the modification may be classed as minor.
More than 5700 kgs	Yes	Elementary & Enhanced Surveillance Required (antenna diversity also required)	Either pressurised or un-pressurised	6	Major	Major change because of Flight Manual Supplement and potential technical complexity
	No			7	Major	Major change because of Flight Manual Supplement and potential technical complexity
	Yes			8	Major	Major change because of Flight Manual Supplement and potential technical complexity

Template for Aircraft Flight Manual (AFM) Supplement

(Aircraft Type) Flight Manual [or POH as appropriate] Reference (XXXX)

(Company Name)

FLIGHT MANUAL SUPPLEMENT (1) ISSUE (1)

Registration Mark: _____ Serial Number: _____

SSR MODE S ENHANCED SURVEILLANCE

Modification Number (XXXX)

ADDITIONAL LIMITATIONS AND INFORMATION*The limitations and information contained herein either supplement or, in the case of conflict, override those in the flight manual.*LIMITATIONS

1 The installed Mode S system satisfies the data requirements of ICAO Doc 7030/4, Regional Supplementary Procedures for SSR Mode S Enhanced Surveillance in designated European airspace. The capability to transmit data parameters is shown in column 2: [mark as applicable]:

Parameter	Available/Not Available
Magnetic Heading	
Indicated Airspeed	
Mach No	
Vertical Rate	
Roll Angle	
Track Angle Rate / True Airspeed *	
True Track Angle	
Groundspeed	
Selected Altitude	
Barometric Pressure Setting	

2. Extended squitter is **ENABLED/DISABLED***

Note: No airworthiness or operational approval can be assumed for extended squitter functionality unless a full certification exercise is completed in accordance with relevant guidelines.

To be inserted in the flight manual and record sheet amended accordingly.

Page 1 of (X)

Authority Approval:

Date:

[*delete as applicable]

Extract from EUROCAE Document ED-26: Table 13: Altitude Encoding Transition Points

Nominal Transition Altitude (feet)	Transition Pulse	Enabled Information Pulses.										
		D ₂	D ₄	A ₁	A ₂	A ₄	B ₁	B ₂	B ₄	C ₁	C ₂	C ₄
-950	C ₁										1	
										1	1	
-850	C ₂									1	1	
										1		
-750	B ₄									1		
									1	1		
-450	C ₄									1		1
										1		1
-250	B ₂									1		1
									1	1		1
750	B ₁									1		1
								1	1			1
2750	A ₄											1
							1	1				1
6750	A ₂											1
						1	1					1
14750	A ₁											1
					1	1						1
30750	D ₄											1
				1	1							1
62750	D ₂											1
		1	1									1

Original Justification for JAA NPA 20-7

1 Discussion and Operational Aspects

1.1 General

1.1.1 EUROCONTROL recommends provision of Departure Clearance (DCL) as an interim data link application based on EUROCAE document ED-85. DCL is a data link application providing direct communication between the flight crew and the air traffic controller. The ED-85 document addresses three domains: airborne, ground ATS, and communication service providers. It deals also with associated flight crew and controller procedures. ED-85 takes account of EUROCAE document ED-78 that describes the global approval processes including planning, co-ordinated requirements determination, development and qualification of a system element, entry into service, and operations.

1.1.2 EUROCONTROL Safety Regulatory Requirements (ESARR) have been issued setting airspace safety objectives as one element of a regulatory framework. To satisfy these regulations, any significant change in air traffic management will need to be assessed by the responsible airspace authority from a safety perspective, and safety requirements relevant to the change should be derived. Within this regulatory framework, data link applications can be assessed to facilitate aircraft airworthiness approval, operational use, and to ensure continued interoperability, performance and safety. The regulatory framework will ensure consistency of requirements across national boundaries, and assist the demonstration of compliance for the aircraft, the intermediate communication networks and the air traffic service domains.

1.1.3 Departure Clearance by data link is recommended by EUROCONTROL because of its potential safety and efficiency benefits. At some busy airports, congestion on the departure clearance voice channel often results in blocked or garbled communications, heavy workload for pilots and controllers, and in some cases departure delays. The expected benefits of the DCL are:

- Flexible timing of flight crew request and ATC clearance delivery;
- Reduced potential for communication errors between flight crew and controller;
- Reduced flight crew work load;
- Reduced controller work load;
- Automatic update of flight plan in the air traffic system;
- Automatic preparation of clearance and information elements;
- Reduced voice channel traffic;
- Reduced ground delay.

Initial trials have shown very good acceptance by both pilots and air traffic controllers.

1.1.4 Current operational implementation in Europe does not include a re-issued clearance capability but this is under study by some ATS providers.

1.2 Current Practice in the USA.

1.2.1 In the United States, the concept of Pre-departure Clearance is used where PDC messages are delivered via the airlines own network and operational host computer. Depending upon the airline capabilities, the PDC may then be transmitted from the host computer directly to the aircraft flight deck via the ACARS data link. If the aircraft is not equipped with ACARS, the approved PDC is sent to an airport gate printer for delivery by hand in printed format to the aircraft.

1.2.2 Further details with a comparison between DCL and PDC may be found in Appendix 1 of the attached proposed guidance leaflet.

1.3 Supporting technologies

1.3.1 The ACARS network supports current implementations using low speed VHF or SATCOM subnetworks. The ACARS network was originally designed for airline business communications (Aeronautical Administrative Communication- AAC), but advantage of this capability has been taken for limited ATS communications (ARINC 623 and FANS 1/A) where satisfactory performance can be shown.

1.3.2 New applications, such as those proposed in the EUROCONTROL Link 2000+ programme and in the FAA CPDLC build 1/1A, will use the ATN and VHF digital link (VDL) Mode 2 sub-networks. Operating a mix of different communication capabilities in the same airspace is being considered in the deployment of these new systems.

2 Identified Rule-making Activities

2.1 The attached guidance leaflet is proposed as a basis for granting airworthiness approval and for operational use of the DCL service as defined in ED-85. The leaflet contains Acceptable Means of Compliance relative to the requirements of ED-85. It does not address re-issued clearance capability.

2.2 ICAO has amended Annex 6 to require, from 2005 for new aircraft, and from 2007 for all aircraft, the recording of data link messages for the purposes of accident investigation. This issue is being progressed by EUROCAE WG 50 and is the subject of a separate Steering Group paper and AMC that is still in development.

3 Applicable Dates and Schedules

Departure Clearance using the ACARS network is optional thus no mandatory implementation dates are applicable.

4 Rationale

The DCL application is now fully operational as an interim standard in various European ATS centres. It is expected to become operational soon at several airports. Airlines are upgrading their ACARS avionics to be compliant with ARINC 623 and ED-85 for DCL. It is necessary therefore to provide a means to approve them. The implementation of DCL needs to be standardised across the industry to comply with end-to-end safety and interoperability requirements.

Original Justification for JAA NPA 20-13

1. Discussion and Operational Aspects

1.1. General

1.1.1. EUROCONTROL recommends provision of Digital ATIS (D-ATIS) as an interim data link application based on EUROCAE document ED-89. D-ATIS is a data link application providing direct communication of ATIS information from the air traffic service provider to the flight crew. The ED-89 document addresses three domains: airborne, ground ATS, and communication service providers. It deals also with associated flight crew and air traffic service provider procedures. ED-89 takes account of EUROCAE document ED-78 that describes the global approval processes including planning, co-ordinated requirements determination, development and qualification of a system element, entry into service, and operations.

1.1.2. EUROCONTROL has issued EUROCONTROL Safety Regulatory Requirements (ESARR) setting airspace safety objectives as one element of a regulatory framework. To satisfy these requirements, any significant change in air traffic management will need to be assessed by the responsible airspace authority from a safety perspective, and safety requirements relevant to the change should be derived. Within this regulatory framework, data link applications can be evaluated to facilitate aircraft airworthiness approval, implementation, and to ensure continued interoperability, performance and safety. The regulatory framework will ensure consistency of requirements across national boundaries, and assist the demonstration of compliance for the aircraft, the intermediate communication networks, and the air traffic service domains.

1.1.3. The aim of D-ATIS service is to provide information that is fully consistent with the information contained in Voice ATIS broadcast over VHF.

1.1.4. The D-ATIS service offered directly by an air traffic service provider (ATSP) should not be confused with other available implementations where aircraft receive ATIS information from their companies through the ACARS terminal, or directly through communication service providers. These other implementations do not satisfy the obligation of broadcasting the latest ATIS information communicated by an ATSP.

1.2. Operational Benefits

1.2.1. D-ATIS is recommended by EUROCONTROL because of its potential safety and efficiency benefits. An ATIS message contains part of the required information for a flight crew to take off or land at busy airports where it might be impractical for the controller to provide each aircraft individually with airport parameters. When this information is transmitted in digital format the following additional benefits can be expected for the flight crew:

- Flexible timing of the flight crew request for information (allowing a request outside voice VHF coverage area with better flight crew anticipation and decision-making for arrivals);
- Reduced potential for listening errors by the flight crew;
- Relief for the crew from needing to listen to ATIS broadcasts;
- The availability of printed information leading to a reduced flight crew work load;

- Availability of an alternative means of communication to the voice ATIS.

1.2.2. Optionally, at the discretion of the ATSP, automatic update of D-ATIS information can be provided to the flight crew on request. There is no obligation for the flight crew to use this feature, or for the airborne system to offer this function. However this function offers the following additional benefits:

- Awareness in real time of ATIS information update ensuring safer operations;
- A potential reduction in the risk arriving with out of date, wrong, or missing ATIS information.

1.3. Supporting technologies

3.3.1 The ACARS network supports current implementations using low speed VHF or SATCOM sub-networks. The ACARS network was originally designed for airline business communications (Aeronautical Administrative Communication- AAC), but advantage of this capability has been taken for limited ATS communications (ARINC 623 and FANS 1/A) where satisfactory performance can be shown. VDL Mode 2 can also be used with ACARS Over AVLC (AOA) protocols.

1.3.2. New applications, such as those proposed in the EUROCONTROL Link 2000+ programme and in the FAA CPDLC build 1/1A, will use the ATN and VHF digital link (VDL) Mode 2 sub-networks. Operating a mix of different communication capabilities in the same airspace is being considered in the deployment of these new systems.

2. Identified Rule-making Activities

2.1.. The attached AMC is proposed as a basis for granting airworthiness approval and for operational use of the D-ATIS service as defined in ED-89. The AMC contains Acceptable Means of Compliance relative to the requirements of ED-89.

2.2. ICAO has amended Annex 6 to require, from 2005 for new aircraft, and from 2007 for all aircraft, the recording of data link messages for the purposes of accident investigation. This issue is being progressed by EUROCAE WG 50 and the JAA Flight Recorder Working Group.

2.3 EUROCAE is reviewing the published ED 85, 89 and ED106, (i.e. those that deal with data link services over ACARS) to improve their consistency. However, this work should not be seen as an obstacle to publication of the Advisory material proposed by this paper.

3. Rationale

To gain experience in the deployment of data link applications, the EUROCONTROL *Convergence and Implementation Plan* recommends an interim deployment of air-to-ground and ground-to-air data link communication based on the existing ACARS network. The D-ATIS application is now fully operational as an interim standard in some European ATS centres and will be offered at an increasing number of locations. Airlines are upgrading their ACARS avionics to be compliant with ARINC 623 and ED-89 for D-ATIS. It is necessary therefore to provide a basis to approve them. The implementation of D-ATIS needs to be standardised across the industry to comply with end-to-end safety and interoperability requirements.

Original Justification for JAA NPA 20-11

1. Discussion and Operational Aspects

1.1. General

1.1.1. The objective of the Link 2000+ programme is to plan and coordinate the implementation of operational air-ground data link services via the ATN over VDL Mode 2 in the time period up to 2007.

1.1.2. Data link applications can provide Controller Pilot Data Link Communications (CPDLC), a Data Link Automatic Terminal Information Service (D-ATIS), and Automatic Dependent Surveillance (ADS).

1.1.3. Link 2000+ has a phased implementation of services with the following capabilities:

a) Data Link Initiation Capability (DLIC) enables initial contact between the aircraft and an ATC unit that supports data communications, to unambiguously identify the aircraft, and to ensure compatibility of aircraft equipage with ATC. It is a prerequisite to any other operational data link services.

b) ATC Communication Management (ACM) provides the necessary information to the aircraft to enable transfer of frequencies for both voice and data communications, either within the same sector, between two sectors or between two ATC centres.

c) ATC Clearances (ACL) enables uplink of a set of clearance and information messages and downlink of pilot responses and requests.

d) ATC Microphone Check (AMC) enables the controller to send a message to data link equipped aircraft (of appropriate interoperability) to request a stuck microphone check.

e) Departure Clearance (DCL) enables the request and the delivery of departure information and clearance.

f) Downstream Clearance (DSC) enables the request and the delivery of clearance with a downstream ATC centre (i.e. oceanic clearance).

g) D-ATIS enables the request and the delivery of ATIS via data link.

1.1.4. Due to specific needs, the specific environment, and step-by-step implementation by the service providers, it is possible that only a subset of these services will be available at an air traffic ground location. The availability of services will be published in the state's AIP/NOTAMs.

1.1.5. Later, beyond 2007, consideration may be given to implementation of Flight Plan Consistency (FLIPCY) that could verify consistency between the flight plan within the aircraft FMS and the flight plan within the ATC system. In case of inconsistency, action can be taken by ATC, either by voice or data link communication. FLIPCY will require advanced capabilities within the aircraft FMS.

1.2. FAA Programme

1.2.1 In the United States, the FAA has launched a phased programme for CPDLC:

a) CPDLC Build I includes a limited set of services (ACM, Initial Contact, Altimeter setting and pre-defined controller messages).

b) CPDLC Build IA is adding a limited set of messages of an ACL service.

c) CPDLC Build II is not yet fully defined.

1.2.2. The FAA initial implementation is based on interoperability standard ED-110/DO-280.

1.3. Supporting Technologies

1.3.1. The EUROCONTROL Link 2000+ programme and the FAA CPDLC Build I/IA will use the ATN and the VDL Mode 2 sub-network.

- 1.3.2. ICAO has issued SARPs for ATN (Annex 10, Volume III, Part I, Chapter 3 and Doc 9705).
- 1.3.3. ICAO has issued the SARPs (ICAO Annex 10, Volume III, Part I, chapter 6) for the physical means and the access protocols of the VDL Mode 2 sub-network.

1.4. Standards

1.4.1. ATN Applications and Data Link Services

1.4.1.1. Guidance material and the technical provisions for the ATN can be found in ICAO Doc 9694 and ICAO Doc 9705. Doc 9705 provides technical requirements for the ATN applications, the communication services, and at the system level. Doc 9694 provides operational guidelines for the data link applications and communication services, together with some data link service definitions (i.e., departure clearance, transfer of data authority, and downstream clearance).

1.4.1.2. EUROCAE WG-53 and RTCA SC-189 are developing a safety and performance requirements (SPR) document ED-120 that includes the Operational Services and Environment Definition (OSED), the Operational Hazards Assessment (OHA), the Allocation of Safety Objectives and Requirements (ASOR), and the Operational Performance Assessment (OPA). EUROCAE expects to publish the SPR document during 2003 permitting its use as a standard for early approvals of aircraft data link systems for initial continental ATS data link services.

1.4.1.3. The SPR and INTEROP standards, based on ICAO material, are intended to provide the co-ordinated and agreed basis for satisfying the regulatory requirements for the different approval types and to ensure global interoperability. These standards, in particular, are intended for aircraft type design (airworthiness) approval, operational approval, and approval of the air traffic service provisions by a state within its airspace.

1.4.1.4. SPR standards provide the safety and performance requirements for each of the data link services in the context of the intended operational environment.

1.4.1.5. INTEROP standards provide the interoperability requirements for the technologies that are will be used to provide the data link services.

1.5. Air Traffic Service Provision

1.5.1. ICAO Annex 11 requires that, as of 27th November 2003, states assess the safety of new or modified ATM systems. For European ATS providers, compliance with the requirements of ESARR4 will be necessary. EUROCONTROL has evaluated and confirmed that EUROCAE document ED-78A, *Guidelines for Approval of the Provision and Use of Air Traffic Services Supported by Data Communications*, is a partial means of compliance with ESARR4, and the findings and further advice have been published in documents SRC EAM4/AMC and SRC DOC 20.

1.5.2. The methodology for ATS data link services approval, as defined by ED78A, is applicable to the Link 2000+ programme.

1.5.3. States will announce in their AIP and/or NOTAM, compliance with the SPR and with INTEROP. The AIP/NOTAM may prescribe additional conditions to be met by aircraft intending to use the data link services whilst operating in specified airspace.

1.6. Aircraft System

1.6.1. ED-78A, recognises that Minimum Operational Performance Standards (MOPS) and Minimum Aviation System Performance Standards (MASPS) can provide performance requirements tailored to the characteristics of a specific technology. For aircraft data link equipment, available standards can be used to assess the feasibility of a specific technology to meet the minimum operational, safety, and performance requirements defined in an SPR.

1.6.2. The implementation of ATN applications and data link services is aircraft type specific, and is distributed over multiple units (e.g. FMS, CMU, EFIS, Dedicated display, MCDU). Testing is an essential consideration for system certification. A test philosophy is provided in ED-78A and applies to routers, applications, and services.

1.7 Human factors on the Flight Deck

1.7.1. Consideration will need to be given to the integration on the flight deck of data link capability with attention to crew workload, ergonomics, and the human interface, taking into account the existing flight deck philosophy for the aircraft type design, and the continental operating environment.

1.7.2. The potential for conflicting voice and data messages will need to be assessed and appropriately mitigated. Risk mitigation strategies may rely on new phraseology and procedures that will need to be recognised internationally through ICAO.

1.8 Aircraft Certification

1.8.1. Aircraft systems will need to satisfy the requirements allocated to them in the SPR and INTEROP.

1.8.2. The goal is to be able to demonstrate with an acceptable level of confidence for certification, compliance using a representative ATSP infrastructure, so avoiding the need to perform tests against all ATSP implementations known at the time of certification. To support this goal, configuration management and monitoring, per ED-78A, can ensure continued operational safety, performance, and interoperability after initial demonstrations with the aircraft have been made.

2 Standards and Guidance Material Developments

2.1. The EUROCAE/RTCA groups are revising the interoperability requirements (INTEROP) to extend document ED-110 to include the full set of data link services (described in paragraph 1.1.3), and to achieve consistency with ED-120.

2.2. EUROCAE WG-47 is completing MOPS for the VDL System, ED-92A.

2.3. ICAO has amended Annex 6 to require, from 2005 for new aircraft, and from 2007 for all aircraft, the recording of data link messages for the purposes of accident investigation. This issue is being progressed by EUROCAE WG 50 and is the subject of a separate Steering Group paper pp004.

2.4. The attached NPA proposal for AMC is proposed as a basis for granting airworthiness approval and for operational use of the initial continental services as defined in the safety and performance requirements (SPR) in ED-120. It contains Acceptable Means of Compliance relative to the requirements of these documents.

2.5. The EUROCONTROL Safety Regulation Commission has not yet provided a point of view on the acceptability of the safety argument (based on the Safety and Performance Requirements of EUROCAE ED-120) for LINK 2000+. Advice will then be given to national authorities to assist their formal approval and oversight processes of data link implementation in their airspace.

3 Applicable Dates and Schedules

3.1. The detailed schedule for LINK 2000+ programme can be found in the LINK 2000+ Programme Master Plan. The principle milestones are:

- Initial Implementation at airports: 2003
- Initial Implementation in area control centres: 2005
- All services available in the LINK 2000+ geographical area: 2007

3.2. The US CPDLC Build 1 and build 1A programmes are planned for implementation between 2002 and 2006.

Original Justification for JAA NPA 20-8

1 Discussion and Operational Aspects.

1.1 General

FAA Order 8400.12A discusses airworthiness and continued airworthiness considerations and provides guidance for obtaining RNP-10 operational approval. Relevant parts of the Order are suitable as a basis for approvals to be granted by JAA. The Order defines three aircraft groups, which may be eligible for RNP-10 operations:

- Aircraft eligibility through RNP certification (Eligibility Group 1).
- Aircraft eligibility through prior navigation system certification (Eligibility Group 2).
- Aircraft eligibility through Data Collection (Eligibility Group 3).

Further elaboration of these groupings is given in the attached proposed guidance leaflet.

1.2 Position Updating

Subject to approval, FAA practice permits manual radio updating of position (see Order 8400.12A paragraph 12g. and Appendix 7). The acceptability of manual radio updating needs to be confirmed by the JAA Operations Sectorial Team.

1.3 Operational Approval.

The attached draft guidance leaflet includes a proposed operational approval process and operational procedures taking account of the technical content and principles presented in the FAA Order.

2 Identified Rule-making Activities

FAA order 8400.12A was published on February 9, 1998. FAA indicated (in July 2001) that the Order is unlikely to be revised or introduced as an Advisory Circular for at least 2 years.

2 Applicable Dates and Schedules

RNP-10 procedures are already in place in the South Pacific and will be developed in other oceanic areas in the near future. RNP-10 approvals have been granted for aircraft flying in these areas (i.e. FANS 1 and FANS A equipped aircraft).

4 Steering Group Recommendations and Addressees

The Steering Group recommends that the Regulation Director requests appropriate JAA teams to review existing regulatory and guidance material taking into account the information in this paper. The Steering Group has identified the following aspects, which should be addressed:

- (a) Review and, where necessary, update JAR OPS to ensure equipment carriage, operation, maintenance and training requirements for RNP-10 operations are adequately addressed.
- (b) Confirm that the operational aspects of the FAA Order, in particular, Appendix 4, are appropriate for JAA approvals.
- (c) Consider the acceptability of manual radio updating of position.
- (d) Adopt and publish the attached Temporary Guidance Leaflet with consideration for future incorporation into permanent advisory material for the airworthiness certification aspects of RNP.

5 Rationale

The implementation of RNP as part of the worldwide ICAO effort to advance the Future Air Navigation Plan is progressing. AMC is needed for operators who are subject to JAA regulations.

Original Justification for JAA NPA 20-12

1 Discussion and Operational Aspects

1.1 Background

JAA CNS/ATM Position Paper pp010-15 and JAA TGL No. 13, Revision 1 address Mode S Elementary Surveillance functionality.

1.2 European Policy and Programme

The programme for Mode S implementation, including a phased action plan, is defined in the *EATCHIP strategy for the Initial Implementation of Mode S Enhanced Surveillance (IIMSES)*.

The *Three States Mode S Enhanced Surveillance Project Master Plan* (SUR/Mode S/ES 3SP MP) has been published by EUROCONTROL defining the intentions of France, Germany and the United Kingdom.

1.3 Concept of Operations

The EUROCONTROL document, *Concept of Operations- Mode S in Europe*, specifies the operational use of SSR following the introduction of Mode S. This document defines all current and future users of SSR operating at 1030/1090Mhz. General requirements and specific military requirements are covered. The document gives the operational policy and procedures, defines transitional aspects, and proposes a co-ordinated exemptions arrangement.

1.4 Airborne System and Equipment

To support Mode S Enhanced Surveillance, at least an ICAO Level 2 Mode S transponder, compliant with Annex 10, (currently at Amendment 77) is needed to allow the extraction of the required parameters from the aircraft by ground interrogation.

For the immediate future, a single Mode S Transponder installation will meet the minimum requirements for Enhanced Surveillance. Future air traffic management dependency on the transponder may lead to more demanding system availability and integrity requirements with a consequential impact on system redundancy and monitoring.

1.5 Aircraft Derived Data

A detailed technical definition of all the parameters is given in Amendment 77 to ICAO 10, Vol III, Part 1, Appendix to Chapter 5, Tables for Section 2. The parameters to be transmitted are as follows:

- (a) Elementary Surveillance (see JAA TGL No. 13)
- Automatic reporting of Flight ID;
 - Transponder Capability Report;
 - Altitude reporting;

- Flight Status.
- (b) Enhanced Surveillance
- Magnetic Heading;
 - Indicated Airspeed
 - Mach No.
 - Vertical Rate (barometric rate or, preferably, baro-inertial);
 - Roll Angle;
 - Track Angle Rate;
 - True Track Angle;
 - Groundspeed
 - Selected Altitude

EUROCAE document ED-101 is the Minimum Operational Performance Specification (MOPS) for Mode S Specific Services Applications and includes the Dataflash function. Dataflash relies on an aircraft system announcing a change of value of a parameter that is likely to change only infrequently (such as aircraft intention information), and therefore does not rely on regular interrogations to check the status of the parameter thus reducing unnecessary transmissions from the aircraft. Dataflash is not required to satisfy the current Enhanced Surveillance proposal.

1.6 Exemptions

JAR-OPS 1.866 [Amdt. 3, 01.12.01]- *Transponder Equipment*, requires that an operator shall not operate an aeroplane unless it is equipped with;

- (1) a pressure altitude reporting SSR transponder; and
- (2) any other SSR transponder capability required for the route being flown.

Recognising that some aircraft types may be difficult to modify to meet the proposed Mode S requirements, EUROCONTROL is coordinating an exemption policy that would define the minimum airspace entry requirements

1.7 Certification and Maintenance Issues

The minimum standard for the Mode S transponder will need to be that represented by JAA TSO 2C112A (EUROCAE Minimum Operational Performance Specification document ED-73A).

Note: ED-73A is now at version ED-73B to take full account of Amd 77 to ICAO Annex 10, and the JTSA is being updated accordingly.

For the processing of data parameters, information may be found in EUROCAE Minimum Operational Performance Specification for Aircraft Data Link Processors, ED-82, March 1997. This specification is applicable to the processing within a Mark 4 transponder, or, to the processing within an Aircraft Data Link Processor or its equivalent when this function is performed separately from the transponder.

Enhanced Surveillance implementation involves the extraction of airborne parameters and will require approved modifications to the aircraft. New test equipment is being developed, and new test procedures will be required.

2 Identified Rule-making Activities

JAA Advisory material is proposed dealing with Certification Considerations for Secondary Surveillance Radar Mode S Transponder Systems for Enhanced Surveillance.

The Ministers in all ECAC member States agreed in early 1998, a proposal to amend ICAO EUR Regional Supplementary Procedures (Doc 7030/4) dealing with SSR Mode S transponder carriage requirements. An ICAO State Letter was issued 13 March 1998 and State responses have been processed. An update to ICAO Document 7030/4 is awaited.

NPA-OPS-27 to JAR-OPS 3 introduces revised equipment carriage requirements for helicopters.

3 Applicable Dates and Schedules

Enhanced Surveillance is proposed by the EATMP, subject to consultation and agreement, for implementation after 2005. The Three States Master Plan defines March 2005 as the initial implementation date for Mode S Enhanced Surveillance in France, Germany and UK.

4 Steering Group Recommendations and Addressees

The Steering Group recommends that the Regulation Director advises relevant JAA Sectorial Teams to review existing regulatory and AMC and, where necessary, taking account of the information in this paper, to develop appropriate material to provide for the installation, certification and maintenance of SSR Mode S equipment in aircraft of JAA States.

For this purpose, the following aspects should be addressed:

- (a) To progress NPA-OPS-27 to JAR-OPS 3 which addresses the equipment carriage requirements for helicopters.
- (b) To consider how partial compliance with the required capability for transmission of aircraft derived parameters and how exemptions from the equipment carriage requirements should be managed taking account of any harmonised exemption arrangements.
- (c) To consider the MMEL requirements with respect to unserviceability of parts of the system and the potential non-transmission of specific parameters by the Mode S transponder.
- (d) To consider the publication of advisory material giving certification and maintenance guidance for installation approval of systems for Mode S Enhanced Surveillance. A proposal is attached to this paper for this purpose.

- (e) The need to advise member authorities to take action, where required, to establish national legislation and procedures for the carriage and use of Mode S transponders for Enhanced Surveillance in aircraft not subject to JAR-OPS 1 or 3.
- (f) To emphasise to JAA member authorities the importance of adopting a common and harmonised set of Mode S aircraft derived parameters in accordance with the EUROCONTROL proposals.

5 Rationale

The carriage and operation of SSR Enhanced Mode S airborne equipment is proposed, subject to consultation and agreement, for implementation from March 2005.

II Original JAA NPA Comment Response Document

Original JAA NPA 20-7 Comment Response Document

Departure Clearance via Data Link over ACARS

Item	Affected Paragraphs	Commenter	Comment	Response/Status
1	ACJ 20X8 paragraph 8.1	SAS, Sweden	<p>Several types of installed ACARS do not have the possibility to hard code/pin code aircraft sub-type. Extend the text as shown underlined.</p> <p>8.1 Aircraft Identification – The Aircraft Identification transmitted by data link must conform to the ICAO format and must correspond with the flight identity as entered in the applicable flight plan. Aircraft sub-type identification is optional.</p>	<p>Aircraft sub-type is a parameter included in the definition of the Departure Clearance request. Its non-transmission may cause either the request to be rejected by some ATC centres, or the issue of an inappropriate clearance that assumes a certain performance capability of the aircraft. Although some ACARS do not have the possibility to hard code/pin code aircraft sub-type, manual intervention by the pilot to modify the request is possible. The text of 8.1 has been modified to clarify this point and to take account of the risks associated with manual intervention.</p>
2		CAA, Denmark		No comment
3		Austro-control		Proposal acceptable
4		Luftfarts-verket		Proposal acceptable

Item	Affected Paragraphs	Commenter	Comment	Response/Status
5	NPA 20-7 paragraph 1.2	Transport Canada	<p>After review of the JAA NPA 20-7, I would like to make one comment concerning paragraph 1.2 under “Statement of Issue”. The current text says “In the longer term, for continental and domestic airspace..”. I propose that at the start of this paragraph that there would be some mention that CPDLC will be phased implemented on a voluntary basis in the NAT region starting in the Fall of 2002. My proposed text would be to add: “Starting in the Fall of 2002, the Gander and Shanwick Oceanic Control Areas (OCA’s) not necessarily in concurrence will start a phased implementation of CPDLC. In the longer term...”. The reason for this proposed text is that air operators should be aware that CPDLC is now a short-term option and subject to approval by responsible authorities, air operators will have phased implementations possibilities to use CPDLC of a voluntary basis in the NAT region.</p>	<p>This comment is outside the scope of Departure Clearance and not addressed to the proposed guidance material itself. To include the proposed text risks confusion between two different data link services. The point can be considered in guidance material for oceanic clearance.</p>
6	ACJ 20X8 paragraph 2	DGAC, France	<p>The status of the leaflet leaves the question unclear of whether a preliminary approval is necessary for using the ACARS for transmission of clearances. The paragraph 2 titled “Purpose” by using the words “this leaflet is intended for operators seeking approval...” seems to imply existence of an approval, but it is not in the rule itself.</p>	<p>Accepted. Paragraph 2.1 and 2.2 has been clarified to explain the intent more clearly.</p>

Item	Affected Paragraphs	Commenter	Comment	Response/Status
7	ACJ 20X8	FAA	This document makes use of ED-78 to develop ED-85. ED-78 identifies safety, performance and interoperability requirements, but these requirements are directly derived from a specific technology implementation (ACARS). The FAA has asked JAA to harmonize their approach of DCL (PDC), D-ATIS and other initial/oceanic data link airworthiness means of compliance.	The comment is an accurate statement. As explained in the document, the guidance material is issued in response to the EUROCONTROL Convergence and Implementation Plan that recommends an interim deployment of data link applications based on the existing airline ACARS technology. Also, the paper explains the differences between DCL and the US Pre Departure Clearance (PDC). The basis and scope of the paper are considered appropriate for an interim deployment.

Item	Affected Paragraphs	Commenter	Comment	Response/Status
8	ACJ 20X8	FAA	<p>RTCA SC189/EUROCAE WG53 has been working on development of ED-120 for Safety and Performance Requirements for Initial Continental (SPR IC) data link communications. This SPR is performed at the data link service level and is intended to be technology independent.</p> <p>JAA is currently soliciting comments against NPA 20-11, Approval for use of Initial Services for Air-Ground Data Link in Continental Airspace. This draft NPA would make reference to ED-120 and specifically makes reference to DCL. NPA 20-11 notes that ED-120 will be published in 2003. FAA has been informed that NPA 20-11 is scheduled for near term publication.</p> <p>The safety and performance requirements contained in ED-85 and draft ED-120 are not similar and may in fact be incompatible. Issuance of NPA 20-11 and NPA 20-7 may provide conflicting guidance.</p> <p>Recommendation: JAA should assess the relevant need for near term publication of NPA 20-7 in light of near term publication of NPA 20-11. If JAA decides for go forth with NPA 20-7, JAA must assess the impact of publication of NPA 20-11 and the compatibility of safety and performance requirements therein.</p>	<p>The point is accepted. EASA also notes that similar comments have been received against NPA 20-11. Consequently, NPA-7 has been amended to provide greater clarity on its applicability. NPA 20-11 will be similarly clarified.</p> <p>In conclusion, recognising that evolving technology can benefit from the availability of different levels of guidance, EASA proposes to continue with its plan to publish guidance material as shown in the two NPAs but with improved clarity of their inter-relationship.</p>

Item	Affected Paragraphs	Commenter	Comment	Response/Status
9	ACJ 20X8 Paragraph 7.3	FAA	<p>For the Flight Manual, it states, "Limitation: The Departure Clearance (DCL) application has been demonstrated only with data link services declared compliant with EUROCAE document ED-85."</p> <p>This "limitation" does not read as a typical AFM limitation entry (i.e., does not implicitly impose an operational restriction in use or capability). This entry is a statement of the basis for approval for DCL over ACARS.</p> <p>Recommendation: This entry should reside in Section 3 of the A/RFM, Normal Operating Procedures. This recommendation is consistent with other harmonization efforts of FAA Advisory Circular AC 20-140.</p>	<p>In Europe, the intention is that air navigation service providers will identify in Aeronautical Information Publications, that their DCL service is compliant with ED-85. This is already being done in some states. To ensure interoperability, it is necessary to identify in the aircraft documents that the onboard system is also ED-85 compliant. This does not preclude the onboard system being declared compliant with other standards such as those published by FAA for PDC. (See paragraphs 1.1, 1.3, 3.1, 5.1.2, and 5.3 of AMC 20-12). Thus the AFM statement is intended to provide a basis for operational use of compatible DCL services in Europe.</p> <p>Following further discussion, the preference for making the statement in the Limitations Section of a EASA AFM has been confirmed. This does not preclude other solutions.</p>
10	ACJ 20X8 Paragraph 2.2	RST	<p>It is not possible to say that the means of compliance must meet the objectives of this guidance material, it must meet the objectives of a rule. Perhaps it could be "..... must be the same objectives, satisfy applicable airspace"</p>	<p>Paragraph 2.2 has been revised to correct this point with new text derived from equivalent text used in FAA Advisory Circulars.</p>

Original JAA NPA 20-13 Comment Response Document

Digital ATIS via Data Link over ACARS

Item	Affected Paragraph	Source	Comment	Response/Status
1	-	CAA UK	No comments	Noted
2	-	LFV Sweden	In favour of proposed amendment	Noted
3	-	Dassault Aviation	No comments	Noted
4	-	DGAC France	No comments	Noted
5	Section 1.3	FAA USA	<p>This document makes use of ED-78 to develop ED-89. ED-78 identifies safety, performance and interoperability requirements, but these requirements are directly derived from a specific technology implementation (ACARS). The FAA has asked JAA to harmonise their approach of DCL (PDC), D-ATIS and other initial/oceanic data link airworthiness means of compliance.</p> <p>RTCA SC189/EUROCAE WG53 has been working on development of ED-120 for Safety and Performance Requirements for Initial Continental (SPR IC) data link communications. This SPR is performed at the data link service level and is intended to be technology independent. JAA is currently soliciting comments against NPA 20-11. Approval for use of Initial Services for Air Ground Data Link in Continental Airspace. This draft NPA would make reference to ED-120 and specifically makes reference to D-ATIS. NPA 20-11 notes that ED-120 will be published in 2003. FAA has been informed that NPA 20-11 is scheduled for near term publication.</p>	<p>The comment is an accurate statement. As explained in the document, the guidance material is issued in response to the EUROCONTROL Convergence and Implementation Plan that recommends an interim deployment of data link applications based on the existing airline ACARS technology. The basis and scope of the paper are considered appropriate for an interim deployment.</p> <p>EASA also notes that similar comments have been received against NPA 20-11. Consequently, NPA-13 has been amended to provide greater clarity on its applicability. NPA 20-11 will be similarly clarified.</p>

Item	Affected Paragraph	Source	Comment	Response/Status
			<p>The data communications services provided by ED-89 and ED-120 are virtually identical in content and operational context. The safety and performance requirements contained in ED-89 and draft ED-120 are not similar and may in fact be incompatible. Issuance of NPA 20-13 and NPA 20-11 may provide conflicting guidance.</p> <p>Suggestion – JAA should assess the relevant need for near term publication of NPA 20-13 in light of near term publication of NPA 20-11. If JAA decides to go forth with NPA 20-13, JAA must assess the impact of publication of NPA 20-11 and the compatibility of safety and performance requirements therein.</p>	<p>In conclusion, recognising that evolving technology can benefit from the availability of different levels of guidance, EASA proposes to continue with its plan to publish guidance material as shown in the two NPAs but with improved clarity of purpose and scope that define of their inter-relationship.</p> <p>As a further development, the guidance material will reference the revised EUROCAE document ED-89A that now integrates the protocols and message formats of ARINC 623. The revised document ED-89A remains compatible with the earlier ED-89 and adds no new requirements.</p>

Original JAA NPA 20-11 Comment-Response Document

Advisory Material for the Approval for use of Initial Services for Air-Ground Data Link in Continental Airspace

Item	Affected Paragraphs	Source	Comment	Response/Status
1		AECMA France	Request postponement of the NPA until JAA has validated the safety and performance requirements of ED-120 with priority to the requirements allocated to the airborne systems. Emphasis should be put on the quantification aspects of safety requirements, for which implementation does not seem mature yet.	The comment is accepted. Postponement proposal is agreed. Adoption by EASA will be coordinated with Eurocontrol SRC after assessment of compliance with ESARR4. The same point will also apply to interoperability : ED110A should also be referred in the document and ED100A in the relevant note. Note 1 of paragraph 4.2 will be deleted ED120 and ED110A have been approved by EUROCAE and RTCA since this comment has been raised.
2	-	CAA UK	No comment on document and find it acceptable.	Noted
3		LFV Sweden	In favour of proposed amendment	Noted
4	-	Dassault Aviation	No comments	Noted
5	-	DGAC France	No comments	Noted

Item	Affected Paragraphs	Source	Comment	Response/Status
6	Background Section 1.2	FAA USA	<p>Reference: "...EUROCONTROL is studying the feasibility of accommodating FANS equipped aircraft in continental airspace for which <u>earlier interoperability standards exist and may prove acceptable.</u>" This is only true for ARINC 622 FANS-1/A for oceanic and remote area operations. A separate and distinct interoperability standard would be necessary to any introduction of a ground based gateway that would allow accommodation of FANS-1/A domestic operations to be compatible with ATN CPDLC.</p> <p>Suggestion – Make reference to the potential need for creation of a new or expanded interoperability standard related to any introduction of ground gateway for FANS accommodation in ATN CPDLC airspace.</p>	<p>A ground gateway does not need a new air ground interoperability standard. A new interoperability standard could be necessary in case of an evolution of FANS/1/A to converge with ATN.</p> <p>It is not intended to update the CNS/ATM Steering Group position paper</p>
7	Background Section 1.3	FAA USA	<p>Reference: FAA CPDLC Build 1A. FAA CPDLC Building 1A currently does not formally exist in any definition and all funding has been deferred until re-base lining has been approved.</p> <p>Suggestion – Remove reference to FAA CPDLC Build 1A throughout the document.</p>	<p>Noted</p> <p>It is not intended to update the CNS/ATM Steering Group position paper</p>
8	Background Section 3.2.1(b)	FAA USA	<p>CPDLC Build 1A is not funded nor fully defined.</p> <p>Suggestion – Change this section to read, "CPDLC Build 1A is not yet fully defined".</p>	<p>Noted</p> <p>It is not intended to update the CNS/ATM Steering Group position paper</p>

Item	Affected Paragraphs	Source	Comment	Response/Status
9	Background Section 3.2.2	FAA USA	<p>Reference: FAA implementation is based upon ED-110/DO-280 implementation. This is not the case for the only currently funded FAA activity CPDLC Build 1 Miami. At Aircraft Certification Service request, a study was done to determine the delta between FAA CPDLC Build 1 interoperability requirements and those published in ED-110/DO-280. This study indicated a great margin in interoperability differences were present. The margin was sufficient enough to warrant identification of a separate set of interoperability requirements be identified and referenced in a draft CPDLC Build 1 Issue Paper.</p> <p>Suggestions – Either delete this paragraph or revise to indicate that FAA Build 1 interoperability will be identified in a forthcoming Issue Paper.</p>	<p>This is an issue for the objective of convergence between FAA and Eurocontrol programmes.</p> <p>It is not intended to update the CNS/ATM Steering Group position paper</p>
10	Background Section 5.2	FAA USA	<p>Reference US CPDLC Build 1A. Build 1A is not funded and thus official timelines for implementation are not defined.</p> <p>Suggestion – Remove reference to CPDLC Build 1A and any timelines for implementation.</p>	<p>Noted</p> <p>It is not intended to update the CNS/ATM Steering Group position paper</p>
11	ACJ 20X10 Section 1.4 Preamble	FAA USA	<p>Reference CPDLC Build 1A. Build 1A is not funded and thus not fully defined.</p> <p>Suggestion – Change this section to indicate that Build 1A is not funded, however, it is anticipated that efforts to ensure interoperability between FAA CPDLC and Link 2000+ are underway.</p>	<p>Noted</p>

Item	Affected Paragraphs	Source	Comment	Response/Status
12	ACJ 20X10 Section 3.2 Scope	FAA USA	<p>Reference DCL, D-ATIS and OCL over ACARS are not subject to this advisory material. ED-120 will address DCL, D-ATIS and OCL safety and performance requirements independent of technological implementation. Thus, clarification should be provided to explain how ED-85, ED-89, and ED-106 would exist and not be conflict with ED-110/ED-120.</p> <p>Suggestion – Clarification should be provided on how the regulatory adoption of ED-120 will reside with other JAA material making reference to ED-85, ED-89 and ED-106. Additionally, any future plans that JAA may have regarding harmonisation of safety and performance requirements identified in the above document should also be addressed.</p>	<p>Clarification will be added : Applicable JAA document based on ED85A, ED89A and ED106A.</p> <p>Note to be added to provide additional clarification</p>
13	ACJ 20X10 Section 5.1 (entirety) Assumptions	FAA USA	<p>Reference “Deviations from, or supplements to, established standards are assessed by the ATSP”. NPA 20-11 makes reference to ED-78A as the methodology for coordinated requirements process. Therefore, any assessment of implementation of data link services that would entertain deviation or supplement to existing safety, performance and interoperability standards must include all stakeholders...not just ATSP.</p> <p>Suggestion – Revise this section to clarify how acceptability of requirements coordination is accomplished by ATSP, Operational Approval Authority, and Type Design Approval Authority.</p>	<p>Noted. A sentence will be added : Deviation that potentially impact t the airborne domain should be assessed in coordination with relevant actors as per ED78A</p>

Item	Affected Paragraphs	Source	Comment	Response/Status
14	ACJ 20X10 Section 5.1.2 Assumption	FAA USA	<p>Requirements for operation in states airspace are published in Aeronautical Information Publications (AIPs) per ICAO.</p> <p>Suggestion – Change sentence to “Each State publishes in appropriate Aeronautical Information Publications (AIPs) a list of communications service providers...”Note that this section appears to convey the exact same information as Section 5.3.</p>	To be merged with 5.3 without losing information.
15	ACJ 20X10 Section 6.1 General	FAA USA	<p>This section does not cover means of coordinating qualification criteria amongst approval mechanisms.</p> <p>Suggestion – Add sentence stating, “Qualification criteria requiring coordination is provided in ED-78A.”</p>	Noted Suggested sentence added to section 6.1
16	ACJ 20X10 Section 6.2.2.1 HMI on the Flight Deck	FAA USA	<p>Reference – “Visual alerts along may be used for non-ATS messages”. HMI for AOC, AAC and APC messaging is out side the scope of NPA 20-11.</p> <p>Suggestion – Delete this sentence.</p>	The sentence is considered as useful for clarification and will be kept even if it is true that HMI for AOC, AAC and APC are out of scope
16	ACJ 20X10 Section 6.2.2.4	FAA USA	<p>Reference – Third sentence, “For each type of service supported...”. This sentence appears to be inconsistent with the logic of this section. This section speaks of “annunciations being suppressed”. This sentence implies “definition of when messages can be received” and flight phases when “messages are suppressed”.</p> <p>Suggestion – Clarify the third sentence to better define when annunciation (audible and visual) should be suppressed.</p>	Last sentence of 6.2.2.4 to be deleted

Item	Affected Paragraphs	Source	Comment	Response/Status
17	ACJ 20X10 Section 6.2.4.1 Flight Deck Displays	FAA USA	Reference “...(and particularly free text parts of messages)...”. Suggestion – Clarify definition of messages with free-text components.	Bracket deleted
18	ACJ 20X10 Section 6.2.4.4	FAA USA	Reference second sentence. “The status of each message...”. Use of the term status should be defined. Suggestions – Change the second sentence to read as follows, “The status of each message (i.e. source, time sent, open/closed) should be displayed together with the message.”	Noted Text changed accordingly
19	ACJ 20X10 Section 7.3.1 Aircraft Flight Manual	FAA USA	Reference Section 5, which allow deviations or supplements to existing standards such as ED-110/ED-120. Section 3 of the A/RFM boilerplate should allow for identification of SPR and Interop requirements that perhaps are different from ED-110/ED-120. Suggestion – Change the flight manual boilerplate to state, “The aircraft ATC data link system has been demonstrated to comply with the applicable safety and performance requirements identified in [insert document reference, (eg. ED-120)]; and interoperability requirements identified in [insert document reference, (eg. ED-110)].”	Noted Addition of compliance with current AMC

Item	Affected Paragraphs	Source	Comment	Response/Status
20	ACJ 20X10 Section 7.3.2	FAA USA	<p>Reference subparagraphs (e) DCL, (f) DSC, and (g) D-ATIS. Reference of these services and their SPR/Interop requirements may prove confusing or perhaps be in conflict with these same services over ACARS (see NPA 20-11 background section 3.2 indicating these services are out of scope).</p> <p>Suggestion – Clarify the relationship of safety, performance and interoperability requirements defined by NPA 20-11 (ie ED-120/ED-110) versus those in other JAA guidance material (ie. ED-85, ED-89 and ED-106).</p>	<p>It is agreed during meeting #28 not to modify AFM to address this issue.</p> <p>Paragraph 7.3 already mentions : “as applicable to the specific services approved for this aircraft”</p>
21	ACJ 20X10 Section 7.4.1 Existing Installations	FAA USA	<p>Reference use of the terms “man-machine interface”.</p> <p>Suggest changing to “human-machine interaction (HMI)”.</p>	<p>Noted Text not changed to keep consistency with Section 6.2</p>
22	ACJ 20X10 Section 7.4.2	FAA USA	<p>Reference guidance for applicant offering alternative forms of hazard mitigation or performance. Changes to safety and performance allocations should be coordinated amongst all stakeholders to ensure that safety and performance objectives continue to be met.</p> <p>Suggest addition of the following sentence, “Items presented by the applicant which impact safety, performance and interoperability requirements allocation will need to be coordinated in accordance with ED-78A.</p>	<p>Noted Text changed accordingly</p>

Item	Affected Paragraphs	Source	Comment	Response/Status
23	ACJ 20X10 Section 8.2.2 Operational Safety Aspects	FAA USA	<p>Reference needs to satisfy Section 5. Assumptions, prior to operational use. Should not Section 6, Airworthiness considerations also be satisfied prior to operational use?</p> <p>Suggestion – Revise this section to read as follows, “The assumptions of Section 5 and 6 need to be satisfied prior to operational use.”</p>	<p>Section 6 are not assumptions. It will be mentioned that “the installation should be certified according to airworthiness considerations in section 6 prior to operational approval” in paragraph 8.1.</p>
24	ACJ 20X10 Section 5	THALES Avionics	<p>The ED-120 Hazard Classification is highly dependant upon environmental conditions that are given in section 3 of ED-120. For example Table 3-1 says that it is assumed that there is a Radar service and table 3-2 identifies more precisely C—ENV-2 “Surveillance enables the controller to detect incorrect aircraft movement”.</p> <p>The current section 5 of ACJ 20X10 “Assumptions” says that the ATSP implements all services or a subset compliant with the relevant requirements of ... ED-120”.</p> <p>I think it is necessary to assume also that the ATSP has carefully checked that ED-120 assumptions are satisfied. I presume that the verification that in every condition “surveillance enables the controller to detect incorrect aircraft movement” is not obvious.</p>	<p>Comment accepted,</p> <p>Paragraph 5.1.1 is modified accordingly :</p> <p>“ATSP implements all services or a subset compliant with environmental conditions and relevant requirements of the safety and performance requirements (SPR)”</p>

Item	Affected Paragraphs	Source	Comment	Response/Status
25	ED-120 § 5.2.2.1	THALES Avionics	<p>The Hazard Classification 5 of some malfunctions for example in ACL § 5.2.2.1 (H-ACL-1 “Loss of ability to provide message”, H-ACL-2 “Detected early delivery of a message”, H-ACL-8 “Detected misdirection of a message”....) is surprising.</p> <p>The above comment 1 requires the validation by JAA of the safety requirements of ED-120.</p> <p>Has this activity been performed?</p>	<p>The first part of this comment applies to ED120. The classification of hazard has been tackled by the Eurocae WG53 and RTCA Sc189. Nevertheless it is clear that this document and ED110A have not yet been used for a full approval process and that these document are subject to revision based on the experience gained with implementation.</p> <p>A note will be added accordingly in 3.1</p>
26	ACJ 20X10 section 3	Euro-control	<p>The note says:</p> <p>"Due to specific needs, the specific environment, and step-by-step implementation by the service providers, it is possible that only a subset of these services will be available at an air traffic ground location. The available services will be published in the AIP/NOTAM. "</p> <p>Whilst this is of course true - the same is true on the aircraft , it should also be made clear that subsets are allowed on the aircraft as agreed with ANSPs and Implementation programmes.</p>	<p>Comment accepted and added in the note : Implementation of a subset of these services on the aircraft is also allowed in accordance with implementation programmes.</p>

Original JAA NPA 20-8 Comment-Response Document

Guidance Material for RNP-10 Operations AMJ 20X9

Item	Affected Paragraph	Commenter	Comment	Response/Status
1	-	CAA, Netherlands		No comment
2	-	CAA, Denmark		No comment
3	General	CAA, UK	It would seem this is a validation of an FAA order as a means to comply with RNP-10. The Order cross-refers to various other FAA documents and AC's, has the CNSA/ATM Steering Group reviewed and validated these documents?	The FAA material was reviewed and account was taken of previous use of the material in JAA certifications.
4	General	CAA, UK	The FAA Order and Continued Airworthiness (Maintenance) (page 12 para 14). The FAA are giving credit for an existing level of maintenance – has the CNSA/ATM Steering Group verified that this same level exists in Europe?	The general maintenance policy of FAA is considered to be equivalent to that applied in Europe under JAA regulations.
5	-	CAA, Sweden		No comment
6	NPA 20-8 3.2 and 6	Aerospace Industries of America	While the statement appears reasonable, the implications could be very significant. This introduces the possibility of operator procedures that differ from one RNP 10 to another, creating the increased risk of human error. Consistency with the current RNP 10 criteria is strongly urged.	No objections to manual radio have been received therefore the FAA criteria has been adopted thus giving consistency.
7	NPA 20-8 5	Aerospace Industries of America	We suggest that the example in parentheses at the end of the paragraph be revised to include “non-FANS equipped” type of aircraft.	The text in parentheses has been deleted. However, this change does affect the actual guidance material.

Item	Affected Paragraph	Commenter	Comment	Response/Status
8	AMJ 20X9 3.4	Aerospace Industries of America	This statement implies that there is no intention to reinvestigate the existing RNP 10 approvals. However, by taking exceptions or creating different operating procedures, the approvals are actually be “reinvestigated.” This creates the potential for operational confusion and error. If any changes are considered, we recommend an FAA/JAA harmonised standard before proceeding to publish this material.	The objective of this TGM is to provide guidance material technically and operationally consistent with the FAA Order. The TGM explains how the FAA material can be used within a EASA regulatory framework. Exceptions or differences are not anticipated.

RNP-10 Operations

Item	Affected Paragraphs	Commenter	Comment	Response/Status
9	AMJ 20X9 4.2.1	Aerospace Industries of America	This text changes the whole mean of RNP 10 from that contained in FAA Order 8400.12A. By stating that this is lateral track keeping accuracy and along track positioning accuracy, the lateral requirements appears to be flight technical only, instead of positioning error, path definition error, display error, and flight technical error. We request this paragraph be revised to make it consistent with Order 8400.12A.	Accepted. The summary of paragraph 4.2.1 has been revised to reflect more precisely the FAA Order. The existing paragraph 4.1 points to the relevant sections of the Order.
10	AMJ 20X9 4.3.2(a) and (c)	Aerospace Industries of America	The information contained in proposed paragraph 4.3.2(a) and (c) appears to set different Appendix G criteria from that contained in FAA Order 8400.12A. We suggest that the paragraph(s) be revised to be consistent with the FAA Order.	The text has been revised to be more consistent with the FAA Order and to avoid differing interpretations.

Item	Affected Paragraphs	Commenter	Comment	Response/Status
11	AMJ 20X9 4.4.1	Aerospace Industries of America	FAA Order 8400.12A does not require an Airplane Flight Manual (AFM) change in all cases. As written (and from experience), the proposed text will lead authorities and operator to believe a costly and untimely AFM change will be required from manufacturers. Manufacturers would prefer to avoid the book-keeping exercise this would create. We request that the text of the paragraph be revised to more clearly indicate that an AFM entry is <u>not</u> always required.	The final sentence of 4.4. 1 that refers to the AFM has been deleted
12	AMJ 20X9 4.5	DGAC, France	Cancel “4.4.3.5” reference in the first sentence of this paragraph	Editorial correction made. Also to 4.5.1 and 4.5.2.
13	AMJ 20X9 Annexes	DGAC, France	Annexes to AMJ 20X9 should be clarified. AMJ 20X9 makes reference to FAA Order 8400.12A as Annex 1 and FAR 121 App G as Annex 2. These two annexes should be referenced as Annexes to AMJ 20X9 and not Annexes to NPA 20-8. Furthermore, what is the status of the FAA “RNP 10 Operational approval outline” document which is included presently in annex 2? There is no specific link with this material in AMJ 20X9 <u>may be this document could be added to FAA order in annex 1.</u> FAA ORDER 8400 12A becomes Annex 1 to AMJ 20X9 FAR 121 App G becomes Annex 2 to AMJ 20X9	Annex 1 and Annex 2 have now been referenced to AMJ 20X9 by the insertion of section 6 in the guidance material. The FAA “RNP 10 Operational approval outline” document has been detached and will be available as separate guidance to authorities.

Original JAA NPA 20-12 Comment-Response Document

Enhanced Surveillance with SSR Mode S

Item	Affected Paragraph	Source	Comment	Response/Status
1	ACJ 20X11 General comment	CAA Denmark	<p>The exemption regulations should be clarified.</p> <p>As regards aeroplanes with analogue avionics, a reference is made to EUROCONTROL for exemption policy. According to the Guidance Material on the Common Framework for the Regulation of Mode S Enhanced Surveillance prepared by the EUROCONTROL Regulatory Unit it is not quite clear what is going to happen with these aeroplanes after the year 2007.</p>	<p>The airspace regulators and not EASA set the exemption policy; hence the comment is outside the scope of this advisory material. However, Section 7 has been amended to refer to the exemptions policy together with details of the EUROCONTROL Common Framework document, and the Exemptions Coordination Cell from which advice on this issue can be obtained. Similarly, Section 8 has been revised to make it consistent with the Common Framework document to more clearly state the parameter requirements.</p>
2	ACJ 20X11	CAA UK	No comments and find it acceptable	Noted.

Item	Affected Paragraph	Source	Comment	Response/Status
3	ACJ 20X11 Table 1 and Table 2	IFALPA	<p>Propose to delete ‘selected altitude’</p> <p>IFALPA recognises the possible safety advantages of the downlink of aircraft parameters, but before IFALPA can accept down-linking of flight control (MCP) data (i.e. selected altitude), several technical, legal and operational consequences need to be addressed.</p> <p>Technical: Altitude Selected in the MCP window does not always represent the pilot / aircraft’s intentions with modern FMS-type aircraft. This especially applies in case of delayed descents or step descents.</p> <p>Legal: What are the legal consequences of human errors made by ATC or pilots? Punitive actions?</p> <p>Operational: Are new RT communication protocols required? How are down-linked parameters processed by ATC? (Manually/automatically?).</p> <p>In Summary: IFALPA believes that system development should be based on accepted operational requirements. These operational requirements should only be formulated after the benefits of the information to the ground systems have been demonstrated, and the operational, human factors and legal issues have been resolved.</p>	<p>The aircraft derived data requirements are set by the airspace regulators and not EASA; hence the comment is outside the scope of this EASA advisory material. However, clarification has been sought via EUROCONTROL from the airspace Regulators’ Group about the intended use of this parameter.</p> <p>The explanation given is that the availability of Selected Altitude is expected to mitigate the problem of level busts but not to solve it. Air Navigation Service Providers have operationally tested and demonstrated the improvements gained from the use of the parameter, which has been recognised as providing a safety benefit for Europe. The use of the parameter is to be introduced to complement existing cockpit procedures that had not adequately prevented level busts. In this way, Selected Altitude would be a safety enhancement device in the form of alerting tool, and in no way used for separation purposes. In the view of the airspace regulators, this addresses the question of responsibility.</p> <p>Except as indicated in the response to Comment 5, no change to the advisory material is proposed with respect to this parameter.</p>

Item	Affected Paragraph	Source	Comment	Response/Status
4	ACJ 20X11	GAMTA	Accept	Noted
5	ACJ 20X11	National Air Traffic Services UK	<p>NATS requests amendment of the text to provide clear recognition of ‘Selected Vertical Intention’ including both MCP/FCU selected altitude and BPS items, rather than just ‘Selected Altitude’, as the mandated item. Also, within Table 1, note 6 it should include reference to the provision of BPS in bits 28 to 40 of BDS 4,0</p> <p>Without the provision of BPS from aircraft, NATS will be constrained in our ability to detect BPS related miss-settings/selections and alleviate the occurrence of level busts. Although we understand some operators expect that BPS provision in BDS 4,0 should result from standard equipment fit, this level of BPS provision is not yet clear. Thus, we would recommend amendment of NPA 20-12 as identified above. However, should inclusion of BPS within the mandated aspects not be considered as feasible or necessary at this stage, we would recommend that the value of its provision should be strongly recognised and supported by the JAA, and that likely levels of voluntary BPS provision should be clearly established.</p>	<p>Section 8 and Table 1 have been amended to make them consistent with the Common Framework document and to clarify the minimum and desired content of BDS 4.0. Thus Selected Vertical Intention is now addressed, with provision for Barometric Pressure Setting, where readily available, as defined in ICAO Annex 10.</p>

Item	Affected Paragraph	Source	Comment	Response/Status
6	ACJ 20X11 para 4.1(a)	Dassault Aviation	<p>(a) JTSO 2C112a, Minimum Operational Performance Specification for SSR Mode S Transponders. (Adopts EUROCAE ED-73A).</p> <p>The Note after should be deleted: As the Note refers to a JTSO at a not yet existing version, nobody of the commentators can be sure of what is inside this not yet existing regulation; suppose to know what will be in JTO2C112b, is supposing that the NPA TSO-10 is already adopted without any changes.</p>	<p>Document ED-73B is consistent with ICAO Annex 10 Amdt 77 that being the applicable standard for Enhanced Surveillance, hence the advisory material will need to reference the later equipment standard as proposed in JAA NPA TSO-10. The JAA Equipment Steering Committee has considered comments received during the NPA consultation process and is now in the process of submitting, without change, the agreed proposal to Central JAA. The TSO has been prepared as an ETSO ready for final adoption by EASA. Since NPA 20-12 will also need to be adopted and published by EASA, the advisory material has been amended assuming that ETSO 2C112B will be published at the same time.</p>
7	ACJ 20X11 para 9.2	Dassault Aviation	<p>The Mode S Transponder will need to be approved in accordance with JAA Technical Standard Order JTSO-2C112a, or an equivalent standard that is consistent with applicable ICAO SARPS and which is acceptable to the responsible certification authority.</p> <p>The Note should be deleted: As the Note refers to a JTSO at a not yet existing version, nobody of the commentators can be sure of what is inside this not yet existing regulation; suppose to know what will be in JT02C112b, is supposing that the NPA TSO-10 is already adopted without any changes.</p>	<p>See response to comment No. 6</p>
8	ACJ 20X11	DGAC, France	<p>No comment</p>	<p>Noted</p>

Item	Affected Paragraph	Source	Comment	Response/Status
9	ACJ 20X11	LFV Sweden	In favour of proposed amendment	Noted.
10	NPA 20-12 para 6(b) ACJ 20X11 Para 8.1	Rockwell Collins	<p>1. The Steering Group recommendations, Paragraph 6(b), should acknowledge the potential for widespread exemption requests for the Track Angle Rate parameter in particular. If required for ATM purposes, EUROCONTROL may need to identify specific alternatives to synthesize Track Angle Rate from other downlink parameters such as TAS + Roll Angle or Delta True Track Angle.</p> <p>2. A note should be added to the Functional Criteria, Paragraph 8.1 of proposed ACJ 20X11, cautioning applicants and regulators that transponders installed in a GAMA 429 system configuration and receiving GAMA 429 label 335 (Holding Pattern Azimuth) data will transmit misleading information in BDS register 5,0.</p> <p>Reason(s) for proposed text/comment:</p> <p>1. For the Business, Regional Airline and General Aviation aircraft community, Track Angle Rate will not be available to the Transponder in the majority of cases and there will be no information transmitted in BDS Register 5,0.</p> <p>2. If the Transponder is installed in a GAMA 429 system configuration and receives GAMA 429 label 335 (Holding Pattern Azimuth) data, misleading information would be transmitted in BDS register 5,0.</p>	<p>The comment is understood and accepted.</p> <p>European airspace regulators have agreed that Track Angle Rate would not be required in aircraft where the GAMA 429 data bus configuration is implemented. Track Angle Rate will not be removed from the list of required parameters but, when not available, an exemption for this parameter can be agreed.</p> <p>Note 8 has been added to Table 1 to address this situation.</p>