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منظمة الطيران
المدني الدولي

国际民用
航空组织

Tel.: +1 514-954-8219 ext. 6710

Ref.: SP 52/4-15/44 12 June 2015

Subject: Proposals for the amendment of Annexes 4, 6, Parts I, II and III, 10, Volumes II and III, 11, 15, PANS-ABC (Doc 8400) and PANS-ATM (Doc 4444) relating to DLIC, CPDLC, ADS-C, PBCS and SATVOICE arising from OPLINKP/2

Action required: Comments to reach Montréal by 14 September 2015

Sir/Madam,

1. I have the honour to inform you that the Air Navigation Commission, at the fifth meeting of its 199th Session held on 14 May 2015, reviewed amendment proposals, originated from the second meeting of the Operational Data Link Panel (OPLINKP/2), for Annexes 4, 6, Parts I, II and III; 10, Volumes II and III; 11, 15, PANS-ABC (Doc 8400) and PANS-ATM (Doc 4444) relating to data link initiation capability (DLIC), controller-pilot data link communications (CPDLC), automatic dependent surveillance — contract (ADS-C), performance-based communication and surveillance (PBCS) and satellite voice communications (SATVOICE). The Commission authorized the transmission of these proposals to Contracting States and appropriate international organizations for comments.

2. The background of the aforementioned proposals for the amendment is explained in Attachment A. The proposals for amendment of multiple Annexes and PANS are presented by subject in Attachments B, C, D and E. To facilitate your review of the proposed amendments, the rationales for the amendments have been provided in a text box immediately following each proposal.

3. To further assist your review, the English version of current draft guidance material on PBCS, developed by OPLINKP, is attached to this State letter at Attachment F. States are encouraged to refer to the draft guidance material when considering the proposals for amendment in relation to the PBCS, as it provides additional information that will assist in the evaluation. It should be noted that the guidance material will continue to be developed for some months and will need to be aligned to the final outcomes of this proposal. The final version of the PBCS guidance material will become the *Performance-Based Communication and Surveillance (PBCS) Manual* (Doc 9869) and will be published well ahead of the applicability date of PBCS provisions.

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4. In examining the proposed amendments, you should not feel obliged to comment on editorial aspects as such matters will be addressed by the Air Navigation Commission during its final review of the draft amendment.

5. May I request that any comments you wish to make on the amendment proposals be dispatched to reach me not later than 14 September 2015. The Air Navigation Commission has asked me to specifically indicate that comments received after the due date may not be considered by the Commission and the Council. In this connection, should you anticipate a delay in the receipt of your reply, please let me know in advance of the due date.

6. For your information, the proposed amendment Annexes 4, 6, Parts I, II and III; 10, Volumes II and III; 11, 15. PANS-ABC and PANS-ATM are envisaged for applicability on 10 November 2016. Any comments you may have thereon would be appreciated.

7. The subsequent work of the Air Navigation Commission and the Council would be greatly facilitated by specific statements on the acceptability or otherwise of the amendment proposals. Please note that for the review of your comments by the Air Navigation Commission and the Council, replies are normally classified as “agreement with or without comments”, “disagreement with or without comments” or “no indication of position”. If in your reply the expressions “no objections” or “no comments” are used, they will be taken to mean “agreement without comment” and “no indication of position”, respectively. In order to facilitate proper classification of your response, a form has been included in Attachment G which may be completed and returned together with your comments, if any, on the proposals in Attachments B, C, D and E.

Accept, Sir/Madam, the assurances of my highest consideration.

Raymond Benjamin
Secretary General

Enclosures:

A — Background information
B — Proposed amendment Annex 10, Volume II and PANS-ATM (Doc 4444) relating to DLIC and ADS-C
C — Proposed amendment to Annex 10, Volume II and PANS-ATM (Doc 4444) relating to CPDLC
D — Proposed amendment to Annex 6, Parts I, II and III, Annex 11, Annex 15, PANS-ATM (Doc 4444) and PANS-ABC (Doc 8400) relating to PBCS
E — Proposed amendment to Annex 4, Annex 15, Annex 10, Volumes II and III, PANS-ATM (Doc 4444) and PANS-ABC (Doc 8400) relating to SATVOICE
F — Draft Guidance Material on PBCS
G — Response form

ATTACHMENT A to State letter SP 52/4-15/44

BACKGROUND INFORMATION

1. DATA LINK INITIATION CAPABILITY (DLIC) AND AUTOMATIC DEPENDENT SURVEILLANCE — CONTRACT (ADS-C)

1.1 The Air Navigation Commission (AN-Min 194-8), conducted the final review on the OPLINKP proposal for amendments to Annex 10, Volume II and the PANS-ATM related to the 2010 High-Level Safety Conference (2010 HLSC), Recommendation 3/2 b)[1], and referred some comments from a State to the OPLINKP for further consideration as they were outside the scope of the initial proposal.

1.2 Based on the assessment of the State comments, the OPLINKP/2 considered it necessary to further clarify the requirements and procedures relating to the initiation of data link. Moreover, some additional areas of improvement were identified regarding the provisions related to ADS-C services. The proposed amendment to Annex 10, Volume II and the PANS-ATM, provided in Attachment B, includes the following key elements:

a) reorganizing the material to correctly link data link initiation with DLIC (not with CPDLC);

b) clarifying the procedure to facilitate logons to only apply to aircraft near or within the ATS unit in question;

c) improving the procedures for the handling of event contracts; and

d) updating the provisions related to ADS-C functionalities to align them in conformance with actual capabilities of fleet in operation.

2. CONTROLLER-PILOT DATA LINK COMMUNICATIONS (CPDLC)

2.1 Recognizing that the divergence of the technologies (FANS 1/A and ATN Baseline 1) had been a major constraint for globally harmonized implementation of ATS data link services, the OPLINKP, in close coordination with the industry standard making bodies (EUROCAE and RTCA), have been working on defining the next generation of ATS data link services, namely Baseline 2. The Panel also noted that some provisions in the PANS-ATM are not implementable as they are not supported by the existing data link technologies.

2.2 The objectives of the amendment are to describe operational requirements for the next generation of CPDLC, which would serve as global baseline to achieve the convergence of CPDLC operations in the future as well as to align ICAO provisions with the current implementation.

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[1] HLSC Recommendation 3/2 b) : ICAO should review Standards and Recommended Practices (SARPs) and guidance material for the purpose of improving surveillance, flight monitoring and communications of aircraft operating in oceanic/remote areas, including the provision of timely and adequate search and rescue services.

2.3 The proposed amendment to Annex 10, Volume II and the PANS-ATM, provided in Attachment C, clarifies the terms used in the CPDLC provisions and updates the CPDLC message set. Key elements of the proposed amendment include the following:

a) clarification of the CPDLC-related terms;

b) merging of urgency and alert attributes into a single alert attribute;

c) regrouping of the message elements into operational categories with a numbering scheme independent of any technology;

d) inclusion of new message elements designed to reflect current CPDLC operations (Block 0);

e) deletion or replacement of message elements that are potentially confusing or redundant, and identified as not operationally required;

f) revision of existing message elements and/or message intents/use to improve their intelligibility and to help reduce errors associated with those messages; and

g) addition of description of message parameters.

3. PERFORMANCE-BASED COMMUNICATION AND SURVEILLANCE FRAMEWORK

3.1 Air traffic is increasing and there is a need to optimize the use of available airspace. By taking advantage of available technologies, such as CPDLC, ADS-C and SATVOICE, separation minima are being reduced. Without appropriate means to quantify system performance, there are risks with current and evolving operations as the potential exists for misapplying performance-based separation minima to inappropriate aircraft pairs.

3.2 The PBCS framework assures that the required level of communication and surveillance performance is managed in accordance with globally accepted specifications of required communication performance (RCP) and required surveillance performance (RSP). This should also encourage implementation of new air traffic management (ATM) operations while mitigating safety risks.

3.3 In light of the above, OPLINKP/2 reaffirmed the need for the implementation of PBCS and agreed on the main components of its framework as follows:

a) prescription of RCP and RSP for air traffic services that are predicated on communication and surveillance performance;

b) approval of air operators for a communication and/or surveillance capability including aircraft equipage for operations where RCP and/or RSP specifications have been prescribed;

c) indication of an aircraft's communication and surveillance capability in the form of RCP/RSP specifications in the flight plan; and

d) monitoring programmes to assess actual communication and surveillance performance against RCP and RSP specifications and to determine corrective action, as applicable, for the appropriate entity.

3.4 In order to address all the requirements and procedures to implement the PBCS framework, it was considered necessary to amend Annex 6, Parts I, II and III, 11, 15, PANS-ATM and PANS-ABC, as provided in Attachment D.

3.5 It is noteworthy that the proposals for amendment were developed using the proposed provisions for performance-based navigation (PBN) approval process (State letter AN 11/1.1.30-15/9 refers) and the current reduced vertical separation minimum (RVSM) provisions, respectively for PBCS approval and monitoring programmes.

3.6 Regarding the provisions on PBCS approval, the OPLINKP worked closely with the Flight Operations Panel (FLTOPSP) in order to ensure that the same framework was applied to the provisions of PBC, PBN and PBS. The framework includes two types of approvals – a general approval and a specific approval. It addresses both Commercial Air Transport and General Aviation. While reviewing the approval process, the Panels considered that a specific approval for PBCS was not necessary because "complex and out of the ordinary" operations were not applied to PBCS at the moment. Currently, available RCP/RSP specifications are available for application in oceanic and remote airspace which may be compared to PBN where an RNP10 and RNP04 navigation specifications may be required in the same airspace. Furthermore, there are currently no RCP/RSP specifications developed for operations in the terminal area, which could be comparable to RNP authorization required (AR) in PBN.

4. SATELLITE VOICE COMMUNICATIONS (SATVOICE)

4.1 SATVOICE services complement existing high frequency (HF) voice services. Some States are already providing or are planning to provide SATVOICE services as their operational trials proved that it had been useful to use SATVOICE in situations such as poor HF propagation conditions and emergencies. Moreover, some operators are already seeking relief of HF radio equipment on the minimum equipment list (MEL) based on SATVOICE to reduce weight, save fuel, reduce greenhouse gas emissions and allow greater payload.

4.2 In order to realize expected benefits of SATVOICE and to ensure a proper transition from HF voice to SATVOICE, as envisioned in the *Global Air Navigation Plan* (Doc 9750), it is a prerequisite to ensure global harmonization of SATVOICE services, aircraft SATVOICE capability and use for air traffic service communication.

4.3 The key elements of the proposed amendments to Annexes 4, 10, Volumes II and III, 15, PANS-ATM and PANS-ABC, provided in Attachment E, include the following:

a) introduction of a new term SATVOICE;

b) addition of a reference to the *Satellite Voice Operations Manual (SVOM)* (Doc 10038);

c) inclusion of requirements to publish SATVOICE number in aeronautical charts and aeronautical information publications (AIP) to inform users of available SATVOICE services; and

d) addition of SATVOICE communication system characteristics essential for common infrastructure using different satellite companies, network service providers and aircraft equipment.

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ATTACHMENT B to State letter SP 52/4-15/44

**PROPOSED AMENDMENT TO PANS-ATM (DOC 4444)
CONCERNING DLIC AND ADS-C**

NOTES ON THE PRESENTATION OF THE AMENDMENT

The text of the amendment is arranged to show deleted text with a line through it and new text highlighted with grey shading, as shown below:

~~Text to be deleted is shown with a line through it.~~	Text to be deleted
New text to be inserted is highlighted with grey shading.	New text to be inserted
~~Text to be deleted is shown with a line through it~~ followed by the replacement text which is highlighted with grey shading.	New text to replace existing text

PROPOSED AMENDMENT TO

PROCEDURES FOR AIR NAVIGATION SERVICES

AIR TRAFFIC MANAGEMENT

Chapter 1

DEFINITIONS

INITIAL PROPOSAL 1

. . .

Logon address. A specified code used for data link logon to an ATS unit.

. . .

Origin:	**Rationale:**
OPLINKP/2 Modified by the Secretariat through correspondence	A term already defined in other Annexes is added as it is used in the proposed amendment.

INITIAL PROPOSAL 2

Chapter 4

GENERAL PROVISIONS FOR AIR TRAFFIC SERVICES

. . .

4.11 POSITION REPORTING

. . .

4.11.5 Contents of ADS-C reports

4.11.5.1 ADS-C reports shall be composed of data blocks selected from the following:

a) **Aircraft identification**

b) **Basic ADS-C**
latitude
longitude
altitude
time
figure of merit

Note.— The Basic ADS-C block is mandatory and is included in all ADS-C reports.

. . .

f) **Meteorological information**
wind speed
wind direction
wind quality flag (if available)
temperature
turbulence (if available)
humidity (if available)

Note.— The specifications for the elements in the meteorological information data block, including their ranges and resolutions, are shown in Appendix 4 to Annex 3.

. . .

~~h) **Extended projected profile (in response to an interrogation from the ground system)**~~
~~next waypoint~~
~~estimated altitude at next waypoint~~
~~estimated time at next waypoint~~
~~(next + 1) waypoint~~
~~estimated altitude at (next + 1) waypoint~~
~~estimated time at (next + 1) waypoint~~
~~(next + 2) waypoint~~
~~estimated altitude at (next + 2) waypoint~~
~~estimated time at (next + 2) waypoint~~
~~[repeated for up to (next + 128) waypoints]~~

~~*Note.— The specifications for the elements in the meteorological information data block, including their ranges and resolutions, are shown in Appendix 4 to Annex 3.*~~

. . .

Origin:	**Rationale:**
OPLINKP/2 Modified by the Secretariat through correspondence	The proposal is to add notes that provide additional information. The extended projected profile (EPP) is planned for future technology (Base line 2), but not supported today. The proposal is to align the provision for ADS-C reporting capabilities to be in conformance with actual capabilities of the fleet in operations.

INITIAL PROPOSAL 3

4.15 DATA LINK COMMUNICATIONS INITIATION PROCEDURES

4.15.1 General

Note 1.— Provisions concerning the data link initiation capability (DLIC) are contained in Annex 10, Volume II, Chapter 8.

Note 2.— Guidance material relating to the implementation of DLIC can be found in the Global Operational Data Link (GOLD) Manual *(Doc 10037).*

4.15.1.1 Before entering an airspace where data link applications are ~~required~~ used by the ATS unit, data link communications shall be initiated between the aircraft and the ATS unit in order to register the aircraft and, when necessary, allow the start of a data link application. This shall be initiated by the aircraft, either automatically or by the pilot, or by the ATS unit on address forwarding.

~~*Note.— Guidance material relating to the data link initiation capability (DLIC) can be found in the* Manual of Air Traffic Services Data Link Applications *(Doc 9694)*~~).

4.15.1.2 The ~~DLIC~~ logon address associated with an ATS unit shall be published in Aeronautical Information Publications in accordance with Annex 15.

Note.— A given FIR may have multiple ~~DLIC~~ logon addresses; and more than one FIR may share the same ~~DLIC~~ logon address.

4.15.2 Aircraft initiation

~~Whenever the pilot or the aircraft initiates data link communication procedures, an initiation message shall be sent. Except when the initiation message is corrupted, it shall not be rejected by the ATS unit.~~ On receipt of a valid data link initiation request from an aircraft approaching or within a data link service area, the ATS unit shall accept the request and, if able to correlate it with a flight plan, shall establish a connection with the aircraft.

. . .

4.15.4 Failure

4.15.4.1 In the case of a~~n~~ data link initiation failure, the data link system shall provide an indication of the failure to the appropriate ATS unit(s) and the flight crew.

Note.— When the aircraft's logon request results from address forwarding by an upstream ATS unit, then both ATS units will receive the indication.

4.15.4.2 The ATS unit shall establish procedures to resolve, as soon as practicable, data link initiation failures. Procedures should include, as a minimum, ~~the following~~, verifying that the aircraft is initiating a data link request with the appropriate ATS unit (i.e. the aircraft is approaching or within the ATS unit's control area), and if so:

a) when a flight plan is available, verify that the aircraft identification, aircraft registration, or aircraft address and other details contained in the data link initiation request correspond with details in the flight plan, and where differences are detected verify the correct information and make the necessary changes; or

b) when a flight plan is not available, create a flight plan with sufficient information in the flight data processing system, to achieve a successful data link initiation; then

c) arrange for the re-initiation of the data link.

4.15.4.3 The aircraft operator shall establish procedures to resolve, as soon as practicable, initiation failures. Procedures should include, as a minimum, that the pilot:

a) verify the correctness and consistency of the flight plan information available in the FMS or equipment from which the ~~CPDLC communication~~ data link is initiated, and where differences are detected make the necessary changes;

b) verify the correct address of the ATS unit; then

c) re-initiate data link.

. . .

Origin:	**Rationale:**
OPLINKP/2 Modified by the Secretariat through correspondence	The proposal is to add notes to reference relevant Annex provisions and to replace the reference to the *Manual of Air Traffic Services Data Link Applications* (Doc 9694) with a new manual that includes the guidance on the implementation of air-ground data link (DLIC, CPDLC and ADS-C). The proposal is also to clarify the procedure to facilitate logons to only apply to aircraft near or within the ATS unit in question. The current provisions could be interpreted to indicate that ATS units are required to accept data link initiation requests from aircraft irrespective of their location. This would have safety implications in cases where the aircraft is operating in other parts of the world, as this would preclude meeting the requirement to generate sufficient flight plan data to allow correlation.

INITIAL PROPOSAL 4

Chapter 13

AUTOMATIC DEPENDENT SURVEILLANCE — CONTRACT (ADS-C) SERVICES

13.1 GENERAL

Note.— Guidance material concerning the implementation of ADS-C is contained in the Global Operational Data Link (GOLD) Manual *(Doc 10037).*

. . .

13.2 ADS-C GROUND SYSTEM CAPABILITIES

13.2.1 ADS-C ground systems used in the provision of air traffic services shall have a very high level of reliability, availability and integrity. The possibility of system failures or significant system degradations that may cause complete or partial interruptions of service shall be very remote. Backup facilities shall be provided.

Note 1.— An ADS-C ground system will normally consist of a number of integrated elements, including communication interfaces, a data-processing system and one or more controller interfaces.

Note 2.— Information pertaining to use of ADS-C and to system reliability, availability and integrity is contained in the ~~Manual of Air Traffic Services Data Link Applications *(Doc 9694)*~~ Performance-based Communication and Surveillance (PBCS) Manual *(Doc 9869).*

. . .

13.4 USE OF ADS-C IN THE PROVISION OF AIR TRAFFIC CONTROL SERVICE

. . .

13.4.3 Provision of ADS-C services

13.4.3.1 GENERAL

The number of aircraft simultaneously provided with ADS-C services shall not exceed that which can safely be handled under the prevailing circumstances, taking into account:

a) the complexity of the traffic situation and associated workload within the sector or area of responsibility of the controller;

b) the level of automation of the ADS-C ground system;

c) the overall technical performance of the ADS-C systems and communications systems, including possible degradations that would require use of backup facilities;

d) the overall performance of the backup surveillance and communications systems; and

e) the effect of loss of controller-pilot communications.

~~*Note.— Further guidance on the factors to be considered can be found in the* Manual of Air Traffic Services Data Link Applications *(Doc 9694).*~~

. . .

Origin:	**Rationale:**
OPLINKP/2	The proposal is to add and update references to guidance material related to the implementation of ADS-C.

INITIAL PROPOSAL 5

. . .

13.4.3.4 GENERAL ADS-C PROCEDURES

. . .

13.4.3.4.3 *ADS-C AGREEMENTS*

. . .

13.4.3.4.3.2 In airspace where procedural separation is being applied, ADS-C agreements shall, as a minimum, contain the following ADS contracts:

a) a periodic contract at an interval appropriate to the airspace requirements;

b) an event contract, specifying the following:

~~b~~1) a waypoint change event ~~contract~~;

~~c~~2) a lateral deviation event ~~contract~~; and

~~d~~3) a level range deviation event ~~contract~~.

~~*Note 1.— Circumstances may dictate that periodic contract reporting rate might be increased on receipt of a lateral deviation or level range deviation event report.*~~

Note~~ 2.~~— A vertical rate change event specified at, for example, a negative vertical rate (i.e. a descent) exceeding 27 m/s (5 000 ft/min), may provide additional indication of an abnormal situation.

13.4.3.4.3.3 Upon receipt of an event report indicating a deviation from the cleared profile, the ATC unit shall establish a periodic contract at a reduced reporting interval, as deemed appropriate, requesting the ground vector data block in addition to ADS-C basic data block. The ATC unit shall advise the flight crew of the observed deviation and ascertain its intention using CPDLC or voice, as appropriate.

13.4.3.4.3.4 The reduced ADS-C periodic reporting interval shall be retained until it has been established that the aircraft is on a cleared profile, at which time the event contract shall be re-established and the normal periodic contract restored. Action should be taken by the ATC unit to notify proximate aircraft if appropriate.

13.4.3.4.3.~~3~~5 When the application of specified separation minima is dependent on the reporting interval of periodic position reports, the ATC unit shall not establish periodic contracts with a reporting interval greater than the required reporting interval.

13.4.3.4.3.~~4~~6 Where an expected position report is not received within a prescribed time parameter, action shall be taken, as appropriate, to ascertain the position of the aircraft.

Note 1.— This may be achieved by the use of an ADS demand contract, CPDLC or voice communications, or receipt of a subsequent periodic report.

Note 2.— Requirements concerning the provision of an alerting service are contained in Chapter 9.

~~13.4.3.4.3.5 An ADS-C aircraft observed to deviate significantly from its cleared flight profile shall be advised accordingly. Action shall be taken, as appropriate, to ascertain the position and intentions of the aircraft. Appropriate action shall also be taken if, in the opinion of the controller, such deviation is likely to affect the air traffic service being provided.~~

~~*Note.— This may be achieved by the use of an ADS demand contract, CPDLC or voice communications.*~~

. . .

Origin:	**Rationale:**
OPLINKP/2	The proposal with respect to paragraph 13.4.3.4.3.2 is to correct a minor error in the description of event contracts. It should refer to a single contract set to report multiple types of events, instead of referring to multiple event contracts. The proposal with respect to paragraphs 13.4.3.4.3.3 and 13.4.3.4.3.4 is to improve the procedures used following the detection of an aircraft deviation from clearance. The design of the current data link system is that events other than waypoint change events will cancel themselves after a single report, thus preventing the transmission of further information. Since re-establishing the event contract, while the aircraft remains out of conformance, will have the effect of generating an immediate response, each such initiation would effectively be equivalent to a demand contract request and might lead to a continuous back-and-forth exchange of request and response between controller and pilot. Therefore, a more appropriate response to the occurrence of conformance monitoring events would be the automatic reduction, to a suitable shorter reporting interval, of the periodic contract established with the aircraft.

	The contents of such reports would be limited to the information deemed most essential, namely the current position and altitude, ground speed, track angle and vertical speed. The reduced reporting interval would be retained until the aircraft's safety was assured and its position, altitude and route were consistent again with its cleared profile. At that time the periodic contract would be returned to the previous contract and the event contract would be re-established.

INITIAL PROPOSAL 6

. . .

13.4.3.4.5 *EMERGENCY ~~AND/OR URGENCY~~ REPORTS*

Note.— To indicate that it is in a state of emergency or ~~to transmit other urgent information~~ the state of emergency is terminated, an aircraft equipped with ADS-C might operate the emergency ~~and/or urgency~~ mode as follows:

a) emergency; and

~~*b) communication failure;*~~

~~*c) unlawful interference;*~~

~~*d) minimum fuel; and/or*~~

~~*e) medical.*~~

b) emergency cancelled.

13.4.3.4.5.1 When an ADS-C ~~emergency and/or urgency~~ report is received with an emergency status indication, the controller with responsibility for the flight must acknowledge receipt of the information by the most appropriate means of communication.

13.4.3.4.5.2 Both the aircraft and the ADS-C ground system shall be capable of supporting an emergency ~~and/or urgency~~ mode of ADS-C operation to assist ATC alerting procedures and to assist search and rescue operations. In the event of an aircraft in, or appearing to be in, any form of emergency, all possible assistance shall be provided by the controller.

Note.— The ADS-C airborne system will provide for a pilot-initiated emergency ~~and/or urgency~~ mode. It may also permit the aircraft to automatically establish the emergency ~~and/or urgency~~ mode.

13.4.3.4.5.3 The ADS-C ground system shall recognize the initiation, modification and termination of an emergency ~~and/or urgency~~ mode and alert the controller. The ADS-C ground system shall be able to modify the emergency ~~and/or urgency~~ reporting rate if necessary. The ADS-C ground system shall be able to suppress an emergency~~/urgency~~ indication.

. . .

Origin:	**Rationale:**
OPLINKP/2 Modified by the Secretariat through correspondence	The proposal is to clarify that ADS-C cannot be used for transmission of urgent data and to align the ADS-C functionality with the Emergency Mode management in conformance with actual capabilities of fleet in operations.

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PROPOSED AMENDMENT TO ANNEX 10, VOLUME II CONCERNING DLIC AND ADS-C

NOTES ON THE PRESENTATION OF THE AMENDMENT

The text of the amendment is arranged to show deleted text with a line through it and new text highlighted with grey shading, as shown below:

~~Text to be deleted is shown with a line through it.~~	Text to be deleted
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PROPOSED AMENDMENT TO

INTERNATIONAL STANDARDS
AND RECOMMENDED PRACTICES AND
PROCEDURES FOR AIR NAVIGATION SERVICES

AERONAUTICAL TELECOMMUNICATIONS

ANNEX 10
TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

VOLUME II — COMMUNICATION PROCEDURES
INCLUDING THOSE WITH PANS STATUS

INITIAL PROPOSAL 1

CHAPTER 1. DEFINITIONS

When the following terms are used in this publication, they have the meaning prescribed in this chapter:

. . .

Logon address. A specified code used for data link logon to an ATS unit.

. . .

Origin:	**Rationale:**
OPLINKP/2 Modified by the Secretariat through correspondence	A term already defined in other Annexes is added as it is used in the proposed amendment.

INITIAL PROPOSAL 2

CHAPTER 8. AERONAUTICAL MOBILE SERVICE – DATA LINK COMMUNICATIONS

8.1 GENERAL

. . .

Note 3. —Guidance material relating to CPDLC, ADS-C, and related data link initiation capability (DLIC), can be found in the Global Operational Data Link (GOLD) Manual *(Doc 10037).*

. . .

Insert new text as follows:

8.1.1 Data link initiation capability (DLIC)

8.1.1.1 General

8.1.1.1.1 **PANS**.— *Before entering an airspace where data link applications are used by the ATS unit, data link communications shall be initiated between the aircraft and the ATS unit in order to register the aircraft and, when necessary, allow the start of a data link application. This shall be initiated by the aircraft, either automatically or by the pilot, or by the ATS unit on address forwarding.*

Note.— Guidance material relating to the data link initiation capability (DLIC) can be found in the Global Operational Data Link (GOLD) Manual *(Doc 10037).*

8.1.1.1.2 **PANS**.— *The logon address associated with an ATS unit shall be published in Aeronautical Information Publications in accordance with Annex 15.*

Note.— A given FIR may have multiple logon addresses; and more than one FIR may share the same logon address.

8.1.1.2 Aircraft initiation

PANS.— *On receipt of a valid data link initiation request from an aircraft approaching or within a data link service area, the ATS unit shall accept the request and, if able to correlate it with a flight plan, shall establish a connection with the aircraft.*

8.1.1.3 ATS unit forwarding

PANS.— *The ground system initially contacted by the aircraft shall provide to the next ATS unit any relevant updated aircraft information in sufficient time to permit the establishment of data link communications.*

8.1.1.4 Failure

8.1.1.4.1 **PANS**.— *In the case of a data link initiation failure, the data link system shall provide an indication of the failure to the appropriate ATS unit(s) and the flight crew.*

Note.— When the aircraft's logon request results from address forwarding by an upstream ATS unit, then both ATS units will receive the indication.

8.1.1.4.2 **PANS**.— *The ATS unit shall establish procedures to resolve, as soon as practicable, data link initiation failures. Procedures shall include, as a minimum, verifying that the aircraft is initiating a data link request with the appropriate ATS unit (i.e. the aircraft is approaching or within the ATS unit's control area); and if so:*

a) when a flight plan is available, verify that the aircraft identification, aircraft registration, or aircraft address and other details contained in the data link initiation request correspond with *details in the flight plan, and where differences are detected verify the correct information and then make the necessary changes; or*

b) when a flight plan is not available, create a flight plan with sufficient information in the flight data processing system, to achieve a successful data link initiation; then

c) arrange for the re-initiation of the data link.

8.1.1.4.3 **PANS**.— *The aircraft operator shall establish procedures to resolve, as soon as practicable, data link initiation failures. Procedures shall include, as a minimum, that the pilot:*

a) verify the correctness and consistency of the flight plan information available in the FMS or equipment from which data link is initiated, and where differences are detected make the necessary changes; and

b) verify the correct address of the ATS unit; then

c) re-initiate data link.

End of new text.

Editorial Note.— Renumber subsequent paragraphs

Origin:	**Rationale:**
OPLINKP/2	There were no provisions in Annex 10, Volume II for DLIC, which is different from CPDLC connection and the data link initiation failure procedures had been misplaced under CPDLC procedures. A new Data Link Initiation Capability (DLIC) section is inserted using existing text in PANS-ATM (4.15.4.1 through 4.15.4.4 refer) with partial modifications and editorial corrections. Also, section 8.2.12.6 of Annex 10, Volume II was deleted then relocated under the new proposed section 8.1.1.4 with amendments related to DLIC.

INITIAL PROPOSAL 3

8.2 CPDLC PROCEDURES

. . .

8.2.12 Emergencies, hazards and equipment failure procedures

. . .

8.2.12.5 FAILURE OF CPDLC

Note 1.— Action to be taken in the event of a ~~CPDLC~~ data link initiation failure is covered in ~~8.2.12.6~~ 8.1.1.4.

Note ~~1~~ 2.— Action to be taken in the event of the failure of a single CPDLC message is covered in 8.2.12.~~8~~7.

. . .

~~8.2.12.6 INITIATION FAILURE OF CPDLC~~

Editorial Note.— Delete section 8.2.12.6 and *renumber* subsequent paragraphs

. . .

Origin:	**Rationale:**
OPLINKP/2	Consequential changes to delete material that is moved into the new proposed DLIC section (8.1.1.4 refers).

— — — — — — — —

ATTACHMENT C to State letter SP 52/4-15/44

PROPOSED AMENDMENT TO ANNEX 10, VOLUME II
CONCERNING CPDLC

NOTES ON THE PRESENTATION OF THE AMENDMENT

The text of the amendment is arranged to show deleted text with a line through it and new text highlighted with grey shading, as shown below:

~~Text to be deleted is shown with a line through it.~~	Text to be deleted
New text to be inserted is highlighted with grey shading.	New text to be inserted
~~Text to be deleted is shown with a line through it~~ followed by the replacement text which is highlighted with grey shading.	New text to replace existing text

PROPOSED AMENDMENT TO

**INTERNATIONAL STANDARDS
AND RECOMMENDED PRACTICES AND
PROCEDURES FOR AIR NAVIGATION SERVICES**

AERONAUTICAL TELECOMMUNICATIONS

**ANNEX 10
TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION**

**VOLUME II — COMMUNICATION PROCEDURES
INCLUDING THOSE WITH PANS STATUS**

INITIAL PROPOSAL 1

. . .

CHAPTER 1. DEFINITIONS

. . .

1.8 DATA LINK COMMUNICATIONS

. . .

CPDLC message. Information exchanged between an airborne system and its ground counterpart. A CPDLC message consists of a single message element or a combination of message elements conveyed in a single transmission by the initiator.

Note.— The abbreviated term 'message' is commonly used to refer to a CPDLC message.

CPDLC message set. A list of standard message elements and free text message elements.

. . .

~~***Downstream data authority***. A designated ground system, different from the current data authority, through which the pilot can contact an appropriate ATC unit for the purposes of receiving a downstream clearance.~~

. . .

Free text message element. A message ~~element~~ component that includes message element identifier and attributes used to convey information not conforming to any ~~standardized~~ standard message element ~~in the CPDLC message set~~.

. . .

~~***Pre-formatted free text message element.*** A free text message element that is stored within the aircraft system or ground system for selection.~~

~~***Standardized free text message element.*** A message element that uses a defined free text message format, using specific words in a specific order.~~

~~*Note.— Standardized free text message elements may be manually entered by the user or preformatted.*~~

Standard message element. A message component that includes message element identifier, display format, intended use and attributes.

Origin:	**Rationale:**
OPLINKP/2 Modified by the Secretariat through correspondence	Terms used in the CPDLC provisions are added and clarified. The terms no longer in use are deleted.

INITIAL PROPOSAL 2

CHAPTER 8. AERONAUTICAL MOBILE SERVICE — DATA LINK COMMUNICATIONS

. . .

8.2 CPDLC PROCEDURES

. . .

8.2.6 The pilot and the controller shall be provided with the capability to exchange messages which ~~do not conform to defined formats (i.e. free text messages)~~ include standard message elements, free text message elements or a combination of both.

. . .

8.2.9 Exchange of operational CPDLC messages

8.2.9.1 Controllers and pilots shall construct CPDLC messages using ~~the defined message set, a free text message~~ standard message elements, free text message elements or a combination of both.

8.2.9.1.1 **PANS.—** *When CPDLC is being used,~~-~~and the intent of the message is included in the CPDLC message set contained in the PANS-ATM, Appendix 5, the associated ~~message~~ standard message elements shall be used.*

. . .

Origin:	**Rationale:**
OPLINKP/2 Modified by the Secretariat through correspondence	The proposal is to clarify the provision referring to free text message elements and standard message elements, now defined in the introduction.

INITIAL PROPOSAL 3

8.2.9.3 CPDLC ground systems and airborne systems shall be capable of using the CPDLC message ~~urgency and~~ alert attributes ~~to alter presentations~~ in order to draw attention to higher priority messages.

Note.— Message attributes dictate certain message handling requirements for the CPDLC user receiving a message. Each CPDLC message has ~~three~~ two attributes: ~~urgency,~~ alert and response attributes. When a message contains multiple message elements, the highest precedence message element attribute type becomes the attribute type for the entire message.

~~8.2.9.3.1 The urgency attribute shall delineate the queuing requirements for received messages that are displayed to the end-user. Urgency types are presented in Table 8-1.~~

8.2.9.3.~~2~~1 The alert attribute shall delineate the type of alerting required upon message receipt. Alert types are presented in Table 8-~~2~~1.

8.2.9.3.~~3~~2 The response attribute shall delineate valid responses for a given message element. Response types are presented in Table 8-~~3~~2 for uplink messages and Table 8-~~4~~3 for downlink messages.

~~Table 8-1. Urgency Attribute (Uplink and Downlink)~~

~~*Type*~~	~~*Description*~~	~~*Precedence*~~
~~D~~	~~Distress~~	~~1~~
~~U~~	~~Urgent~~	~~2~~
~~N~~	~~Normal~~	~~3~~
~~L~~	~~Low~~	~~4~~

Table 8-~~2~~1. Alert Attribute (Uplink and Downlink)

. . .

Table 8-~~3~~2. Response Attribute (Uplink)

. . .

Table 8-~~4~~3. Response Attribute (Downlink)

Type	*Response required*	*Valid responses*	*Precedence*
Y	Yes	Any CPDLC uplink message, LOGICAL ACKNOWLEDGEMENT	1

		(only if required)	
N	No, unless logical acknowledgement required	LOGICAL ACKNOWLEDGEMENT (only if required), ~~SERVICE UNAVAILABLE~~ MESSAGE NOT SUPPORTED BY THIS ATC UNIT, ~~FLIGHT PLAN NOT HELD,~~ ERROR	2

8.2.9.3.3.1 **PANS.—** *When a multi-element message requires a response, ~~and the response is in the form of a single message element,~~ the response shall apply to all message elements.*

Note.— For example, a multi-element message containing CLIMB TO FL310 MAINTAIN MACH.84, *a* WILCO *response applies to, and indicates compliance with, both elements of the message.*

. . .

8.2.9.5 The appropriate ATS authority shall select those message elements contained in PANS-ATM, Appendix 5 that support operations in their airspace. Should an ATS authority choose to select a subset of the message elements, and a received message does not belong to this subset, the ATC unit shall respond by uplinking the message element ~~SERVICE UNAVAILABLE~~ MESSAGE NOT SUPPORTED BY THIS ATC UNIT.

. . .

Origin:	**Rationale:**
OPLINKP/2	The proposal is to merge the Alert and Urgency attributes into a single Alert attribute. The Urgency attribute requires a change to the order in which successive CPDLC messages are presented, which was considered problematic by CPDLC users (pilots and controllers) and human factor specialists. The level of alert required for each message element has been reassessed based on its intended use (see proposed amendment to PANS-ATM Appendix 5). SERVICE UNAVAILABLE is replaced with MESSAGE NOT SUPPORTED BY THIS ATC UNIT to make it consistent with the standard message element in the CPDLC message set in PANS-ATM, Appendix 5. FLIGHT PLAN NOT HELD is removed from Table 8-3 as it is now proposed for deletion from the CPDLC message set.

INITIAL PROPOSAL 4

~~8.2.9.5.2 When considered necessary by the appropriate ATS authority, additional standardized free text message elements shall be made available and used by controllers and pilots for those occasions where the CPDLC message set contained in the PANS-ATM does not provide for specific requirements. In such cases, a list of standardized free text message elements shall be established by the appropriate ATS authority, in consultation with operators and other ATS authorities that may be concerned.~~

8.2.9.5.3 Information concerning CPDLC message elements subset utilized ~~and, if applicable, any additional standardized free text message elements~~ shall be published in the ~~a~~Aeronautical ~~i~~Information ~~p~~Publications (AIPs).

~~8.2.9.5.4 **PANS.**— *Standardized free text message elements should be pre-formatted to facilitate their use.*~~

. . .

8.2.11 Free text messages~~s~~ elements

8.2.11.1 **PANS.—** *The use of free text message elements by controllers or pilots, ~~other than standardized free text message elements referred to in paragraph 8.2.9.5.2~~, should be avoided.*

Note.— Whilst it is recognized that non-routine and emergency situations may necessitate the use of free text, particularly when voice communication has failed, the avoidance of utilizing free text messages is intended to reduce the possibility of misinterpretation and ambiguity.

8.2.11.2 When the CPDLC message set contained in the PANS-ATM does not provide for specific circumstances, the appropriate ATS authority may determine it to be acceptable to use free text message elements. In such cases, the appropriate ATS authority shall define display format, intended use and attributes for each different use of free text message element, in consultation with operators and other ATS authorities that may be concerned and publish them with relevant procedures in the AIPs.

8.2.11.3 **PANS.—** *Free text message elements should be stored within the aircraft or ground system for selection to facilitate their use.*

. . .

Origin:	**Rationale:**
OPLINKP/2	The proposal is to relocate provisions (8.2.9.5.2 refers) for the use of free text message elements under 8.2.11 and to make editorial corrections.

INITIAL PROPOSAL 5

Editorial Note.— Delete section 8.2.14 from Chapter 8.

~~**8.2.14 Downstream clearance delivery service**~~

Origin:	**Rationale:**
OPLINKP/2 Modified by the	The proposal is to delete the provisions related to CPDLC Downstream Clearance (i.e. section 8.2.14) capability, not supported by existing technology (FANS 1/A or

Secretariat through correspondence	ATN B1) and not planned for B2 as of today, as it cannot be used operationally by CPDLC users.

— — — — — — — —

PROPOSED AMENDMENT TO PANS-ATM (DOC 4444)
CONCERNING CPDLC

NOTES ON THE PRESENTATION OF THE AMENDMENT

The text of the amendment is arranged to show deleted text with a line through it and new text highlighted with grey shading, as shown below:

~~Text to be deleted is shown with a line through it.~~	Text to be deleted
New text to be inserted is highlighted with grey shading.	New text to be inserted
~~Text to be deleted is shown with a line through it~~ followed by the replacement text which is highlighted with grey shading.	New text to replace existing text

PROPOSED AMENDMENT TO

PROCEDURES FOR
AIR NAVIGATION SERVICES

AIR TRAFFIC MANAGEMENT

INITIAL PROPOSAL 1

. . .

Chapter 1

DEFINITIONS

. . .

CPDLC message. Information exchanged between an airborne system and its ground counterpart. A CPDLC message consists of a single message element or a combination of message elements conveyed in a single transmission by the initiator.

Note.— The abbreviated term 'message' is commonly used to refer to a CPDLC message.

CPDLC message set. A list of standard message elements and free text message elements

. . .

~~***Downstream data authority.*** A designated ground system, different from the current data authority through which the pilot can contact an appropriate ATC unit for the purposes of receiving a downstream clearance.~~

. . .

Free text message element. A message ~~element~~ component that includes message element identifier and attributes used to convey information not conforming to any ~~standardized~~ standard message element ~~in the CPDLC message set~~.

. . .

~~***Preformatted free text message element.*** A free text message element that is stored within the aircraft system or ground system for selection.~~

. . .

~~***Standardized free text message element.*** A message element that uses a defined free text message format, using specific words in a specific order.~~

~~*Note.— Standardized free text message elements may be manually entered by the user or preformatted.*~~

Standard message element. A message component that includes message element identifier, display format, intended use and attributes.

. . .

Origin:	**Rationale:**
OPLINKP/2 Modified by the Secretariat through correspondence	Terms used in the CPDLC provisions are added and clarified. The terms no longer in use are deleted.

INITIAL PROPOSAL 2

Chapter 14

CONTROLLER-PILOT DATA LINK COMMUNICATIONS (CPDLC)

14.1 GENERAL

Note 1.— Provisions concerning CPDLC are contained in Annex 10, Volume II, Chapter 8.

Note 2.— Guidance material concerning the implementation of CPDLC is contained in the Global Operational Data Link (GOLD) Manual *(Doc 10037).*

14.1.1 ~~The~~ CPDLC ~~application~~ provides a means of communication between the controller and pilot, using ~~data link~~ the CPDLC message set for ATC communication.

Note 1.— See Appendix 5 for the CPDLC message set which lists the message elements and their respective message inten~~ts~~ded~~/~~ use.

Note 2.— Message element intent and text and associated procedures are, in general, consistent with Chapter 12 — Phraseologies. It is, however, recognized that the CPDLC message set and the associated procedures differ somewhat from the voice equivalent used because of the differences between the two media; one being direct-speech and the other an exchange of data, the latter of which can be displayed and/or printed.

. . .

~~14.1.2.1 The controller shall be provided with the capability to respond to messages, including emergencies, to issue clearances, instructions and advisories, and to request and provide information, as appropriate.~~

~~14.1.2.2 The pilot shall be provided with the capability to respond to messages, to request clearances and information, to report information, and to declare or cancel an emergency.~~

~~14.1.2.3~~14.1.3 The pilot and the controller shall be provided with the capability to exchange messages which ~~do not conform to defined formats (i.e. free text messages)~~ include standard message elements, free text message elements or combinations of both.

14.1.~~3~~4 Ground and airborne systems shall allow for messages to be appropriately displayed, printed when required and stored in a manner that permits timely and convenient retrieval should such action be necessary.

14.1.~~4~~5 Whenever textual presentation is required, the English language shall be displayed as a minimum.

~~14.1.5 Where applicable, the communication procedures for the provision of CPDLC shall be in accordance with Annex 10, Volume III, Part I, Chapter 3. Message element intent and text and associated procedures are, in general, consistent with Chapter 12 — Phraseologies. It is, however, recognized that the CPDLC message set and the associated procedures differ somewhat from the voice equivalent used because of the differences between the two media; one being direct speech and the other an exchange of data, the latter of which can be displayed and/or printed.~~

. . .

14.3 EXCHANGE OF OPERATIONAL CPDLC MESSAGES

14.3.1 The controller or pilot shall construct CPDLC messages using ~~the defined message set, a free text message~~ standard message elements, free text message elements or a combination of both.

. . .

14.3.1.2 When CPDLC is being used, and the intent of the message is included in the CPDLC message set contained in Appendix 5, the associated ~~message~~ standard message elements shall be used.

. . .

Origin:	**Rationale:**
OPLINKP/2 Modified by the Secretariat through correspondence	The proposal is to : a) add references to other provisions in Annex 10, Volume II and guidance material concerning CPDLC; and b) restructure and clarify the provisions using the terms newly introduced in the definition section.

INITIAL PROPOSAL 3

14.3.2 Message attributes dictate certain message handling requirements for the CPDLC user receiving a message. Each CPDLC message has ~~three~~ two attributes: ~~Urgency,~~ Alert and Response.

~~14.3.2.1 URGENCY~~

~~The urgency attribute delineates the queuing requirements for received messages that are displayed to the end-user. Urgency types are presented in Table 14-1.~~

14.3.2.~~2~~1 ALERT

The alert attribute delineates the type of alerting required upon message receipt. Alert types are presented in Table 14-~~2~~1.

14.3.2.~~3~~2 RESPONSE

14.3.2.~~3~~2.1 The response attribute delineates valid responses for a given message element. Response types are presented in Table 14-~~3~~2 for uplink messages and Table 14-~~4~~3 for downlink messages.

14.3.2.~~3~~2.2 When a multi-element message requires a response~~, and the response is in the form of a single message element~~, the response shall apply to all message elements.

. . .

~~Table 14-1. Urgency attribute (uplink and downlink)~~

~~*Type*~~	~~*Description*~~	~~*Precedence*~~
~~D~~	~~Distress~~	~~1~~
~~U~~	~~Urgent~~	~~2~~
~~N~~	~~Normal~~	~~3~~
~~L~~	~~Low~~	~~4~~

Table 14-~~2~~1. Alert attribute (uplink and downlink)

. . .

Table 14-~~3~~2. Response attribute (uplink)

. . .

Table 14-43. Response attribute (downlink)

Type	*Response required*	*Valid responses*	*Precedence*
Y	Yes	Any CPDLC uplink message, LOGICAL ACKNOWLEDGEMENT (only if required)	1
N	No, unless logical acknowledgement required	LOGICAL ACKNOWLEDGEMENT (only if required), ~~SERVICE UNAVAILABLE~~ MESSAGE NOT SUPPORTED BY THIS ATC UNIT~~,~~ ~~FLIGHT PLAN NOT HELD~~, ERROR	2

. . .

Origin:	**Rationale:**
OPLINKP/2	The proposal is to merge the Alert and Urgency attributes into a single Alert attribute. The Urgency attribute requires a change to the order in which successive CPDLC messages are presented, which was considered problematic by CPDLC users (pilots and controllers) and human factor specialists. The level of alert required for each message element has been reassessed based on its intended use (see proposed amendment to PANS-ATM Appendix 5). SERVICE UNAVAILABLE is replaced with MESSAGE NOT SUPPORTED BY THIS ATC UNIT to make it consistent with the standard message element in the CPDLC message set in PANS-ATM Appendix 5. FLIGHT PLAN NOT HELD is removed from Table 14-3 as it is now proposed for deletion from the CPDLC message set.

INITIAL PROPOSAL 4

14.3.3 Transfer of CPDLC

~~*Note.— Details on CPDLC transfer can be found in the* Manual of Air Traffic Services Data Link Applications *(Doc 9694)*~~

. . .

14.3.4 Free text messages~~ ~~ elements

14.3.4.1 The use of free text message elements by controllers or pilots~~, other than standardized free text message elements,~~ should be avoided. ~~Standardized free text message elements should be preformatted and made available to controllers and pilots to facilitate their use.~~

Note ~~1~~.— While it is recognized that non-routine and emergency situations may necessitate use of free text, particularly when voice communications have failed, the avoidance of utilizing free text messages is intended to reduce the possibility of misinterpretation and ambiguity.

~~*Note 2.— Provisions concerning the use of standardized free text message elements are contained in Annex 10, Volume II, Chapter 8.*~~

14.3.4.2 When determined acceptable by the appropriate ATS authority to use free text message elements, free text message elements should be stored within the aircraft system or ground system for selection to facilitate their use.

Origin:	**Rationale:**
OPLINKP/2 Modified by the Secretariat through correspondence	The proposal is to delete the reference to the *Manual of Air Traffic Services Data Link Applications* (Doc 9694) now that the reference to the *Global Operational Data Link (GOLD) Manual* (Doc 10037), new guidance material for CPDLC, is added in the general section. The proposal is also to update the provisions for free text message elements consistently with modifications proposed in Annex 10 with regard to the use of free text message elements. A general note has been added as an introduction to 14.1 to refer to Annex 10, Volume II for provisions concerning CPDLC. Note 2 becomes redundant and is therefore proposed for deletion.

INITIAL PROPOSAL 5

14.3.5 Emergencies, hazards and equipment failure procedures

. . .

14.3.5.3 When responding via CPDLC to ~~all other~~ emergency~~ or urgency~~ messages, uplink message ROGER MAYDAY shall be used.

14.3.5.4 When responding via CPDLC to urgency messages, uplink message ROGER PAN shall be used.

14.3.5.~~4~~5 When a CPDLC message requires a logical acknowledgement and/or an operational response, and such a response is not received, the pilot or controller, as appropriate shall be alerted.

. . .

Origin:	**Rationale:**
OPLINKP/2 Modified by the Secretariat through correspondence	The proposal is to make the provisions consistent with the proposed amendment to the CPDLC message set and operational procedures currently applied, which recommend the use of specific acknowledgement message elements in case of urgency or emergency downlinks.

INITIAL PROPOSAL 6

Appendix 5

CONTROLLER-PILOT DATA LINK COMMUNICATIONS (CPDLC) MESSAGE SET

Note 1.— The message identifier of the CPDLC message set in this Appendix is derived from the operational category of the CPDLC message element. A message element identifier of specific technologies, correlated to those defined in this document can be found in the Global Operational Data Link (GOLD) Manual *(Doc 10037).*

Note 2.— Parameters contained in message elements are defined in Table A-5-14-1 of this Appendix. When they are optional in a message element, parameters are denoted with an [O].

~~1. Uplink messages~~

~~2. Downlink messages~~

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1. Route message elements

Table A5-1-1. Route uplinks (RTEU)

Instructions to proceed via the specified route or named procedure, change the route, and notifications to expect route changes.

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~73~~ RTEU-1	Instruction to ~~be followed from departure until~~ proceed via the specified departure clearance ~~limit~~.	*(departure clearance)*	M	W/U
~~74~~ RTEU-2	Instruction to proceed directly ~~from its present position~~ to the specified position.	PROCEED DIRECT TO *(position)*	M	W/U
~~75~~	~~Instruction to proceed, when able, directly to the specified position.~~	~~WHEN ABLE PROCEED DIRECT TO *(position)*~~	~~M~~	~~W/U~~
~~76~~ RTEU-3	Instruction to proceed, at the specified time, directly to the specified position.	AT TIME *(time)* PROCEED DIRECT TO *(position)*	M	W/U
~~77~~ RTEU-4	Instruction to proceed, at the specified position, directly to the next specified position.	AT *(Position)* PROCEED DIRECT TO *(position)*	M	W/U
~~78~~ RTEU-5	Instruction to proceed~~,~~ upon reaching the specified level, directly to the specified position.	AT *(level single)* PROCEED DIRECT TO *(position)*	M	W/U
~~79~~ RTEU-6	Instruction to proceed to the specified position via the specified route.	CLEARED TO *(position)* VIA *(departure data[O]) (en-route data~~clearance~~)*	M	W/U
~~80~~ RTEU-7	Instruction to proceed via the specified route.	CLEARED *(departure data[O]) (en-route data~~clearance~~) (arrival approach data)*	M	W/U
~~81~~ RTEU-8	Instruction to proceed in accordance with the specified procedure.	CLEARED *(procedure name)*	M	W/U
~~83~~ RTEU-9	Instruction to proceed from the specified position via the specified route.	AT *(position)* CLEARED *(en-route data~~clearance~~) (arrival approach data)*	M	W/U
~~84~~ RTEU-10	Instruction to proceed from the specified position via the specified procedure.	AT *(position)* CLEARED *(procedure name)*	M	W/U
~~85~~	~~Notification that a clearance to fly on the specified route may be issued.~~	~~EXPECT *(route clearance)*~~	~~L~~	~~R~~

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~86~~	~~Notification that a clearance to fly on the specified route from the specified position may be issued.~~	~~AT *(position)* EXPECT *(route clearance)*~~	~~L~~	~~R~~
~~87~~	~~Notification that a clearance to fly directly to the specified position may be issued.~~	~~EXPECT DIRECT TO *(position)*~~	~~L~~	~~R~~
~~88~~	~~Notification that a clearance to fly directly from the first specified position to the next specified position may be issued.~~	~~AT *(position)* EXPECT DIRECT TO *(position)*~~	~~L~~	~~R~~
~~89~~	~~Notification that a clearance to fly directly to the specified position commencing at the specified time may be issued.~~	~~AT *(time)* EXPECT DIRECT TO *(position)*~~	~~L~~	~~R~~
~~90~~	~~Notification that a clearance to fly directly to the specified position commencing when the specified level is reached may be issued.~~	~~AT *(level)* EXPECT DIRECT TO *(position)*~~	~~L~~	~~R~~
~~91~~ RTEU-11	Instruction to enter a holding pattern ~~with the specified characteristics~~ at the specified position ~~and level~~ in accordance with the specified instructions. *Note.— RTEU-13 EXPECT FURTHER CLEARANCE AT [time] is appended to this message when an extended hold is anticipated (Chapter 6, 6.5.7 and 6.5.8 refer).*	AT *(position)* HOLD ~~AT *(position)* MAINTAIN *(level)*~~ INBOUND TRACK *(degrees) (direction)* TURNS *(leg type)* LEGS	M	W/U
~~92~~ RTEU-12	Instruction to enter a holding pattern ~~with the published characteristics~~ at the specified position ~~and level.~~in accordance with the published holding instructions. *Note.— RTEU-13 EXPECT FURTHER CLEARANCE AT [time] is appended to this message when an extended hold is anticipated (Chapter 6, 6.5.7 and 6.5.8 refer).*	AT *(position)* HOLD ~~AT *(position)*~~ AS PUBLISHED ~~MAINTAIN *(level)*~~	M	W/U
~~93~~ RTEU-13	Notification that an onwards clearance may be issued at the specified time.	EXPECT FURTHER CLEARANCE AT TIME *(time)*	~~L~~M	R

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~99~~ RTEU-14	Notification that a clearance may be issued for the aircraft to fly the specified procedure or clearance name.	EXPECT *(~~procedure name~~named instruction)*	~~L~~M	R
~~132~~	~~Instruction to report the present position.~~	~~REPORT POSITION~~	~~M~~	~~Y~~
~~137~~ RTEU-15	~~Instruction~~ Request to confirm the ~~currently~~ assigned route.	CONFIRM ASSIGNED ROUTE	~~L~~M	Y
~~138~~	~~Instruction to confirm the previously reported time over the last reported waypoint.~~	~~CONFIRM TIME OVER REPORTED WAYPOINT~~	~~L~~	~~Y~~
~~139~~	~~Instruction to confirm the identity of the previously reported waypoint.~~	~~CONFIRM REPORTED WAYPOINT~~	~~L~~	~~Y~~
~~140~~	~~Instruction to confirm the identity of the next waypoint.~~	~~CONFIRM NEXT WAYPOINT~~	~~L~~	~~Y~~
~~141~~	~~Instruction to confirm the previously reported estimated time at the next waypoint.~~	~~CONFIRM NEXT WAYPOINT ETA~~	~~L~~	~~Y~~
~~142~~	~~Instruction to confirm the identity of the next but one waypoint.~~	~~CONFIRM ENSUING WAYPOINT~~	~~L~~	~~Y~~
~~146~~	~~Instruction to report the present ground track.~~	~~REPORT GROUND TRACK~~	~~M~~	~~Y~~
~~147~~	~~Instruction to make a position report.~~	~~REQUEST POSITION REPORT~~	~~M~~	~~Y~~
~~181~~	~~Instruction to report the present distance to or from the specified position.~~	~~REPORT DISTANCE *(to/from) (position)*~~	~~M~~	~~Y~~
~~184~~	~~Instruction to report at the specified time the distance to or from the specified position.~~	~~AT *(time)* REPORT DISTANCE *(to/from) (position)*~~	~~L~~	~~Y~~
~~216~~	~~Instruction to file a flight plan.~~	~~REQUEST FLIGHT PLAN~~	~~M~~	~~Y~~
~~228~~ RTEU-16	~~Instruction~~ Request to provide ~~report~~ the estimated time of arrival at the specified position.	~~REPORT~~ ADVISE ETA *(position)*	~~L~~M	Y
~~229~~	~~Instruction to report the preferred alternate aerodrome for landing.~~	~~REPORT ALTERNATE AERODROME~~	~~L~~	~~Y~~

Table A5-1-2. Route downlinks (RTED)

Requests to modify the route of flight.

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~22~~ RTED-1	Request ~~to track from the present position~~ for a direct clearance to the specified position.	REQUEST DIRECT TO *(position)*	~~L~~M	Y
~~23~~ RTED-2	Request for the specified procedure or clearance name.	REQUEST *(~~procedure name)~~named instruction)*	~~L~~M	Y
~~24~~ RTED-3	Request for ~~a~~ the specified route ~~clearance~~.	REQUEST CLEARANCE *(departure data[O]) (en-route data~~clearance~~) (arrival approach data[O])*	~~L~~M	Y
~~25~~ RTED-4	Request for ~~a~~the specified clearance.	REQUEST *(clearance type)* CLEARANCE	~~L~~M	Y
~~33~~	~~Notification of the present position.~~	~~PRESENT POSITION *(position)*~~	~~L~~	~~N~~
~~36~~	~~Notification of the present ground track in degrees.~~	~~PRESENT GROUND TRACK *(degrees)*~~	~~L~~	~~N~~
~~42~~	~~The next waypoint is the specified position.~~	~~NEXT WAYPOINT *(position)*~~	~~L~~	~~N~~
~~43~~	~~The ETA at the next waypoint is as specified.~~	~~NEXT WAYPOINT ETA *(time)*~~	~~L~~	~~N~~
~~44~~	~~The next but one waypoint is the specified position.~~	~~ENSUING WAYPOINT *(position)*~~	~~L~~	~~N~~
~~45~~	~~Clarification of previously reported waypoint passage.~~	~~REPORTED WAYPOINT *(position)*~~	~~L~~	~~N~~
~~46~~	~~Clarification of time over previously reported waypoint.~~	~~REPORTED WAYPOINT *(time)*~~	~~L~~	~~N~~
~~48~~	~~Position report.~~	~~POSITION REPORT *(position report)*~~	~~M~~	~~N~~
~~70~~ RTED-5	Request ~~a clearance to adopt~~ for the specified heading.	REQUEST HEADING *(degrees)*	~~L~~M	Y
~~71~~ RTED-6	Request ~~a clearance to adopt~~ for the specified ground track.	REQUEST GROUND TRACK *(degrees)*	~~L~~M	Y
~~78~~	~~Notification that at the specified time the aircraft's position was as specified.~~	~~AT *(time) (distance) (to/from) (position)*~~	~~L~~	~~N~~

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~51~~ RTED-7	Request for the ~~earliest~~ time ~~at which a clearance to regain the planned route~~ or position that can be expected to rejoin the cleared route.	WHEN CAN WE EXPECT BACK ON ROUTE	~~L~~M	Y
~~40~~ RTED-8	~~Readback of~~ Confirmation that the assigned route is the specified route.	ASSIGNED ROUTE *(departure data[O])* *(en- route data~~clearance~~)* *(arrival approach data[O])*	M	N
~~104~~ RTED-9	Notification of estimated time of arrival at the specified position.	ETA *(position)* TIME *(time)*	~~L~~M	N
~~105~~	~~Notification of the alternate aerodrome for landing.~~	~~ALTERNATE AERODROME *(Airport)*~~	~~L~~	~~N~~

2. Lateral message elements

Table A5-2-1. Lateral uplinks (LATU)

Instructions to fly a parallel route or rejoin the originally cleared route, clearances to deviate from assigned route and notifications to expect offset change.

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~64~~ LATU-1	Instruction to fly a parallel track to the cleared route at a displacement of the specified distance in the specified direction.	OFFSET *(specified distance)* *(direction)* OF ROUTE	M	W/U
~~65~~ LATU-2	Instruction to fly a parallel track to the cleared route at a displacement of the specified distance in the specified direction and commencing at the specified position.	AT *(position)* OFFSET *(specified distance)* *(direction)* OF ROUTE	M	W/U
~~66~~ LATU-3	Instruction to fly a parallel track to the cleared route at a displacement of the specified distance in the specified direction and commencing at the specified time.	AT TIME *(time)* OFFSET *(specified distance)* *(direction)* OF ROUTE	M	W/U
~~67~~ LATU-4	Instruction ~~that~~to rejoin the cleared ~~flight~~ route ~~is to be rejoined~~.	~~PROCEED BACK ON~~ REJOIN ROUTE	M	W/U

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~68~~ LATU-5	Instruction ~~that~~to rejoin the cleared ~~flight~~ route ~~is to be rejoined at or~~ before passing the specified position.	REJOIN ROUTE ~~BY~~ BEFORE PASSING *(position)*	M	W/U
~~69~~ LATU-6	Instruction ~~that~~ to rejoin the cleared ~~flight~~ route ~~is to be rejoined at or~~ before the specified time.	REJOIN ROUTE ~~BY~~ BEFORE TIME *(time)*	M	W/U
~~70~~ LATU-7	Notification that a clearance may be issued to enable the aircraft to rejoin the cleared route ~~at or~~ before passing the specified position.	EXPECT BACK ON ROUTE ~~BY~~ BEFORE PASSING *(position)*	~~L~~M	R
~~71~~ LATU-8	Notification that a clearance may be issued to enable the aircraft to rejoin the cleared route ~~at or~~ before the specified time.	EXPECT BACK ON ROUTE ~~BY~~ BEFORE TIME *(time)*	~~L~~M	R
~~72~~ LATU-9	Instruction to resume own navigation following a period of tracking or heading clearances. May be used in conjunction with an instruction on how or where to rejoin the cleared route.	RESUME OWN NAVIGATION	M	W/U
~~82~~ LATU-10	~~Approval~~ Instruction allowing deviation ~~to deviate~~ up to the specified distance(s) from the cleared route in the specified direction(s).	CLEARED TO DEVIATE UP TO ~~*(specified distance)*~~ *(~~direction~~lateral deviation)* OF ROUTE	M	W/U
~~94~~ LATU-11	Instruction to turn left or right as specified on to the specified heading.	TURN *(direction)* HEADING *(degrees)*	M	W/U
~~95~~ LATU-12	Instruction to turn left or right as specified on to the specified track.	TURN *(direction)* GROUND TRACK *(degrees)*	M	W/U
~~215~~ LATU-13	Instruction to turn ~~a~~ the specified number of degrees left or right.	TURN *(direction)* *(number of degrees)* DEGREES	M	W/U
~~96~~ LATU-14	Instruction to continue to fly ~~on~~ the ~~cu~~present heading.	CONTINUE PRESENT HEADING	M	W/U
~~97~~ LATU-15	Instruction to fly ~~on~~ the specified heading ~~from~~ upon reaching the specified position.	AT *(position)* FLY HEADING *(degrees)*	M	W/U

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~190~~ LATU-16	Instruction to fly ~~on~~ the specified heading.	FLY HEADING *(degrees)*	M	W/U
~~243~~	~~Instruction to report when the aircraft is clear of adverse meteorological conditions, and a clearance to regain cleared flight route can be accepted.~~	~~REPORT CLEAR OF WEATHER~~	~~L~~	~~W/U~~
~~127~~ LATU-17	Instruction to report when the aircraft is back on the cleared route.	REPORT BACK ON ROUTE	~~L~~M	W/U
~~130~~ LATU-18	Instruction to report ~~when the aircraft has passed~~ upon passing the specified position.	REPORT PASSING *(position)*	~~L~~M	W/U
~~152~~	~~Instruction to report the earliest time or position when the specified offset track can be accepted.~~	~~WHEN CAN YOU ACCEPT *(specified distance) (direction)* OFFSET~~	~~L~~	~~Y~~
~~221~~	~~Instruction to stop turn at the specified heading prior to reaching the previously assigned heading.~~	~~STOP TURN HEADING *(degrees)*~~	~~M~~	~~W/U~~
~~98~~	~~Instruction to turn immediately left or right as specified on to the specified heading.~~	~~IMMEDIATELY TURN *(direction)* HEADING *(degrees)*~~	~~H~~	~~W/U~~
~~145~~	~~Instruction to report the present heading.~~	~~REPORT HEADING~~	~~M~~	~~Y~~

Table A5-2-2. Lateral downlinks (LATD)

Requests to offset or deviate from route.

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~15~~ LATD-1	Request ~~that~~ for a parallel track~~, offset~~ from the cleared ~~track by~~ route at a displacement of the specified distance in the specified direction~~, be approved~~.	REQUEST OFFSET *(specified distance) (direction)* OF ROUTE	~~L~~M	Y
~~16~~	~~Request that a parallel track, offset from the cleared track by the specified distance in the specified direction, be approved from the specified position.~~	~~AT *(position)* REQUEST OFFSET *(specified distance) (direction)* OF ROUTE~~	~~L~~	~~Y~~

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~17~~	~~Request that a parallel track, offset from the cleared track by the specified distance in the specified direction, be approved from the specified time.~~	~~AT *(time)* REQUEST OFFSET *(specified distance) (direction)* OF ROUTE~~	~~L~~	~~Y~~
~~26~~	~~Request for a weather deviation to the specified position via the specified route.~~	~~REQUEST WEATHER DEVIATION TO *(position)* VIA *(route clearance)*~~	~~M~~	~~Y~~
~~27~~ LATD-2	Request for a weather deviation up to the specified distance(s) off track in the specified direction(s).	REQUEST WEATHER DEVIATION UP TO ~~*(specified distance)*~~ *(~~direction~~lateral deviation)* OF ROUTE	M	Y
~~35~~	~~Notification of the present heading in degrees.~~	~~PRESENT HEADING *(degrees)*~~	~~L~~	~~N~~
~~114~~	~~Notification that the aircraft is clear of weather and is able to accept a clearance to regain cleared flight route.~~	~~CLEAR OF WEATHER~~	~~M~~	~~N~~
~~41~~ LATD-3	~~The aircraft has regained~~ Report indicating that the cleared route has been rejoined.	BACK ON ROUTE	M	N
~~59~~ LATD-4	~~Notification that the aircraft is~~ Report indicating diverting to the specified position via the specified route ~~due to an urgent need~~, which may be sent without any previous coordination done with ATC.	DIVERTING TO *(position)* VIA *(en-route data~~clearance~~) (arrival approach data[O])*	~~H~~M	Y
~~60~~ LATD-5	~~Notification~~ Report indicating that the aircraft is ~~deviating~~ offsetting to a parallel track at the specified distance in the specified direction ~~off~~ from the cleared route ~~and maintaining a parallel track due to an urgent need~~.	OFFSETTING *(specified distance) (direction)* OF ROUTE	~~H~~M	Y
~~80~~ LATD-6	~~Notification that the aircraft is~~ Report indicating deviating ~~up to the~~ specified distance ~~from the cleared route~~ or degrees in the specified direction ~~due to an urgent need~~ from the cleared route.	DEVIATING ~~UP TO~~ *(specified deviation ~~distance~~) (direction)* OF ROUTE	~~H~~M	Y
~~31~~ LATD-7	~~Notification of~~ Report indicating passing the specified position.	PASSING *(position)*	~~L~~M	N

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~85~~	~~We can accept a parallel track offset the specified distance in the specified direction at the specified time.~~	~~WE CAN ACCEPT *(specified distance) (direction)* AT *(time)*~~	~~L~~	~~N~~
~~86~~	~~We cannot accept a parallel track offset the specified distance in the specified direction.~~	~~WE CANNOT ACCEPT *(specified distance) (direction)*~~	~~L~~	~~N~~
~~117~~	~~We can accept a parallel track offset the specified distance in the specified direction at the specified position.~~	~~WE CAN ACCEPT *(specified distance) (direction)* AT *(position)*~~	~~L~~	~~N~~

3. Level message elements

Table A5-3-1. Level uplinks (LVLU)

Instructions to change the assigned level, responses to level request, modifications or restrictions to level clearances, and notifications to expect level clearance.

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~6~~	~~Notification that a level change instruction should be expected.~~	~~EXPECT *(level)*~~	~~L~~	~~R~~
~~7~~ LVLU-1	Notification that an instruction ~~should~~ may be expected for the aircraft to commence climb at the specified time.	EXPECT ~~CLIMB~~ HIGHER AT TIME *(time)*	~~L~~M	R
~~8~~ LVLU-2	Notification that an instruction ~~should~~ may be expected for the aircraft to commence climb at the specified position.	EXPECT ~~CLIMB~~ HIGHER AT *(position)*	~~L~~M	R
~~9~~ LVLU-3	Notification that an instruction ~~should~~ may be expected for the aircraft to commence descent at the specified time.	EXPECT ~~DESCENT~~ LOWER AT TIME *(time)*	~~L~~M	R
~~10~~ LVLU-4	Notification that an instruction ~~should~~ may be expected for the aircraft to commence descent at the specified position.	EXPECT ~~DESCENT~~ LOWER AT *(position)*	~~L~~M	R
~~11~~	~~Notification that an instruction should be expected for the aircraft to commence cruise climb at the specified time.~~	~~EXPECT CRUISE CLIMB AT *(time)*~~	~~L~~	~~R~~

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~12~~	~~Notification that an instruction should be expected for the aircraft to commence cruise climb at the specified position.~~	~~EXPECT CRUISE CLIMB AT *(position)*~~	~~L~~	~~R~~
~~13~~	~~(reserved)~~		~~L~~	~~R~~
~~14~~	~~(reserved)~~		~~L~~	~~R~~
~~15~~	~~(reserved)~~		~~L~~	~~R~~
~~16~~	~~(reserved)~~		~~L~~	~~R~~
~~17~~	~~(reserved)~~		~~L~~	~~R~~
~~18~~	~~(reserved)~~		~~L~~	~~R~~
~~19~~ LVLU-5	Instruction to maintain the specified level or vertical range.	MAINTAIN *(level)*	M	W/U
~~20~~ LVLU-6	Instruction that a climb to ~~a~~ the specified level or vertical range is to commence and once reached ~~the specified level~~ is to be maintained.	CLIMB TO *(level)*	M	W/U
~~21~~ LVLU-7	Instruction that at the specified time a climb to the specified level or vertical range is to commence and once reached ~~the specified level~~ is to be maintained.	AT TIME *(time)* CLIMB TO *(level)*	M	W/U
~~22~~ LVLU-8	Instruction that at the specified position a climb to the specified level or vertical range is to commence and once reached ~~the specified level~~ is to be maintained.	AT *(position)* CLIMB TO *(level)*	M	W/U
~~23~~ LVLU-9	Instruction that a descent to ~~a~~ the specified level or vertical range is to commence and once reached ~~the specified level~~ is to be maintained.	DESCEND TO *(level)*	M	W/U
~~24~~ LVLU-10	Instruction that at ~~a~~ the specified time a descent to ~~a~~ the specified level or vertical range is to commence and once reached ~~the specified level~~ is to be maintained.	AT TIME *(time)* DESCEND TO *(level)*	M	W/U
~~25~~ LVLU-11	Instruction that at the specified position a descent to the specified level or vertical range is to commence and once reached ~~the specified level~~ is to be maintained.	AT *(position)* DESCEND TO *(level)*	M	W/U

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~26~~ LVLU-12	Instruction that a climb is to ~~commence at a rate~~ be completed such that the specified level is reached ~~at or~~ before the specified time. ~~When this message element is not concatenated with another vertical clearance, the level specified is the assigned level which is to be maintained.~~	CLIMB TO REACH *(level single)* ~~BY~~ BEFORE TIME *(time)*	M	W/U
~~27~~ LVLU-13	Instruction that a climb is to ~~commence at a rate~~ be completed such that the specified level is reached ~~at or~~ before passing the specified position. ~~When this message element is not concatenated with another vertical clearance, the level specified is the assigned level which is to be maintained.~~	CLIMB TO REACH *(level single)* ~~BY~~ BEFORE PASSING *(position)*	M	W/U
~~28~~ LVLU-14	Instruction that a descent is to ~~commence at a rate~~ be completed such that the specified level is reached ~~at or~~ before the specified time. ~~When this message element is not concatenated with another vertical clearance, the level specified is the assigned level which is to be maintained.~~	DESCEND TO REACH *(level single)* ~~BY~~ BEFORE TIME *(time)*	M	W/U
~~29~~ LVLU-15	Instruction that a descent is to ~~commence at a rate~~ be completed such that the specified level is reached ~~at or~~ before passing the specified position. ~~When this message element is not concatenated with another vertical clearance, the level specified is the assigned level which is to be maintained.~~	DESCEND TO REACH *(level single)* ~~BY~~ BEFORE PASSING *(position)*	M	W/U
~~30~~	~~Instruction that a level within the defined vertical range specified is to be maintained.~~	~~MAINTAIN BLOCK *(level)* TO *(level)*~~	~~M~~	~~W/U~~
~~31~~	~~Instruction that a climb to a level within the vertical range defined is to commence.~~	~~CLIMB TO AND MAINTAIN BLOCK *(level)* TO *(level)*~~	~~M~~	~~W/U~~
~~32~~	~~Instruction that a descent to a level within the vertical range defined is to commence.~~	~~DESCEND TO AND MAINTAIN BLOCK *(level)* TO *(level)*~~	~~M~~	~~W/U~~
~~33~~	~~(reserved)~~		~~L~~	~~Y~~

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~34~~	~~Instruction that a cruise climb to the specified level is to commence and continue and, once reached, the specified level is to be maintained.~~	~~CRUISE CLIMB TO *(level)*~~	~~M~~	~~W/U~~
~~35~~	~~Instruction to be used in conjunction with an associated level instruction indicating that a cruise climb can commence once above the specified level.~~	~~WHEN ABOVE *(level)* COMMENCE CRUISE CLIMB~~	~~M~~	~~W/U~~
~~36~~	~~Instruction that the climb to the specified level should be made at the aircraft's best rate.~~	~~EXPEDITE CLIMB TO *(level)*~~	~~M~~	~~W/U~~
~~37~~	~~Instruction that the descent to the specified level should be made at the aircraft's best rate.~~	~~EXPEDITE DESCENT TO *(level)*~~	~~M~~	~~W/U~~
~~38~~	~~Urgent instruction to immediately climb to the specified level and, once reached, the specified level is to be maintained.~~	~~IMMEDIATELY CLIMB TO *(level)*~~	~~H~~	~~W/U~~
~~39~~	~~Urgent instruction to immediately descend to the specified level and, once reached, the specified level is to be maintained.~~	~~IMMEDIATELY DESCEND TO *(level)*~~	~~H~~	~~W/U~~
~~40~~	~~(reserved)~~		~~L~~	~~Y~~
~~41~~	~~(reserved)~~		~~L~~	~~Y~~
~~192~~	~~Instruction that a change of level is to continue, but at a rate such that the specified level is reached at or before the specified time.~~	~~REACH *(Level)* BY *(Time)*~~	~~M~~	~~W/U~~
~~209~~	~~Instruction that a change of level is to continue, but at a rate such that the specified level is reached at or before the specified position.~~	~~REACH *(Level)* BY *(Position)*~~	~~M~~	~~W/U~~
~~219~~	~~Instruction to stop the climb at the specified level and, once reached, this level is to be maintained. The specified level will be below the previously assigned level.~~	~~STOP CLIMB AT *(Level)*~~	~~M~~	~~W/U~~
~~220~~	~~Instruction to stop the descent at the specified level and, once reached, this level is to be maintained. The specified level will be above the previously assigned level.~~ .	~~STOP DESCENT AT *(Level)*~~	~~M~~	~~W/U~~
~~171~~ LVLU-16	Instruction to climb at ~~not less than~~ the specified rate or greater.	CLIMB AT *(vertical rate)* ~~MINIMUM~~OR GREATER	M	W/U

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~172~~ LVLU-17	Instruction to climb at ~~not above~~ the specified rate or less.	CLIMB AT *(vertical rate)* ~~MAXIMUM~~OR LESS	M	W/U
~~173~~ LVLU-18	Instruction to descend at ~~not less than~~ the specified rate or greater.	DESCEND AT *(vertical rate)* ~~MINIMUM~~OR GREATER	M	W/U
~~174~~ LVLU-19	Instruction to descend at ~~not above~~ the specified rate or less.	DESCEND AT *(vertical rate)* ~~MAXIMUM~~OR LESS	M	W/U
LVLU-20	Notification that a clearance may be issued for the aircraft to commence a climb to the specified level at the specified number of minutes after departure.	EXPECT *(level single)* *(number of minutes)* AFTER DEPARTURE	M	R
~~128~~ LVLU-21	Instruction to report ~~when the aircraft has vacated~~ upon leaving the specified level ~~that has either been maintained or passed through on climb or descent~~.	REPORT LEAVING *(level single)*	~~L~~M	W/U
~~129~~ LVLU-22	Instruction to report when the aircraft is maintaining ~~level flight at~~ the specified level.	REPORT MAINTAINING *(level single)*	~~L~~M	W/U
~~133~~	~~Instruction to report the present level.~~	~~REPORT PRESENT LEVEL~~	~~M~~	~~Y~~
~~180~~ LVLU-23	Instruction to report ~~when the aircraft is within~~ upon reaching the specified vertical range.	REPORT REACHING BLOCK *(level single)* TO *(level single)*	~~L~~M	W/U
~~135~~ LVLU-24	~~Instruction~~ Request to confirm the ~~currently~~ assigned level.	CONFIRM ASSIGNED LEVEL	~~L~~M	Y
~~231~~ LVLU-25	~~Instruction~~ Request to ~~indicate~~ provide the ~~pilot's~~ preferred level.	~~STATE~~ ADVISE PREFERRED LEVEL	~~L~~M	Y
~~232~~ LVLU-26	~~Instruction~~ Request to ~~indicate~~ provide the ~~pilot's~~ preferred time and/or position to commence descent to the aerodrome of intended arrival.	~~STATE~~ADVISE TOP OF DESCENT	L	Y
~~200~~	~~Instruction used in conjunction with a level clearance to report maintaining the level assigned~~	~~REPORT MAINTAINING~~	~~L~~	~~W/U~~
~~148~~ LVLU-27	Request for the earliest time or position ~~at which~~ when the specified level can be accepted.	WHEN CAN YOU ACCEPT *(level single)*	~~L~~M	Y
~~149~~ LVLU-28	~~Instruction~~ Request to ~~report~~ indicate whether or not the specified level can be accepted at the specified position.	CAN YOU ACCEPT *(level single)* AT *(position)*	~~L~~M	A/N

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~150~~ LVLU-29	~~Instruction~~ Request to ~~report~~ indicate whether or not the specified level can be accepted at the specified time.	CAN YOU ACCEPT *(level single)* AT TIME *(time)*	~~L~~M	A/N
~~175~~	~~(reserved)~~		~~L~~	~~W/U~~
~~185~~	~~(reserved)~~		~~M~~	~~W/U~~
~~186~~	~~(reserved)~~		~~M~~	~~W/U~~
~~236~~	~~Instruction to leave controlled airspace.~~	~~LEAVE CONTROLLED AIRSPACE~~	~~M~~	~~W/U~~
~~217~~	~~Instruction to report that the aircraft has landed.~~	~~REPORT ARRIVAL~~	~~M~~	~~Y~~

Table A5-3-2. Level downlinks (LVLD)

Requests to change the assigned altitude and inquiries when level change can be expected.

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~6~~ LVLD-1	Request to fly at the specified level or vertical range.	REQUEST *(level)*	~~L~~M	Y
~~7~~	~~Request to fly at a level within the specified vertical range.~~	~~REQUEST BLOCK *(level)* TO *(level)*~~	~~L~~	~~Y~~
~~8~~	~~Request to cruise climb to the specified level.~~	~~REQUEST CRUISE CLIMB TO *(level)*~~	~~L~~	~~Y~~
~~9~~ LVLD-2	Request ~~to~~ for a climb to the specified level or vertical range.	REQUEST CLIMB TO *(level)*	~~L~~M	Y
~~10~~ LVLD-3	Request ~~to descend~~ for a descent to the specified level or vertical range.	REQUEST DESCENT TO *(level)*	~~L~~M	Y
~~11~~ LVLD-4	Request ~~that at the specified position~~ for a climb/descent to the specified level ~~be approved~~ or vertical range to commence at the specified position.	AT *(position)* REQUEST ~~CLIMB TO~~ *(level)*	~~L~~M	Y
~~12~~	~~Request that at the specified position a descent to the specified level be approved.~~	~~AT *(position)* REQUEST DESCENT TO *(level)*~~	~~L~~	~~Y~~

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~13~~ LVLD-5	Request ~~that at the specified time~~ for a climb/descent to the specified level ~~be approved~~ or vertical range to commence at the specified time.	AT TIME *(time)* REQUEST ~~CLIMB TO~~ *(level)*	~~L~~M	Y
~~14~~	~~Request that at the specified time a descent to the specified level be approved.~~	~~AT *(time)* REQUEST DESCENT TO *(level)*~~	~~L~~	~~Y~~
~~52~~ LVLD-6	Request for the earliest time ~~at which~~ or position that a ~~clearance to descend~~ descent can be expected.	WHEN CAN WE EXPECT LOWER LEVEL	~~L~~M	Y
~~53~~ LVLD-7	Request for the earliest time ~~at which~~ or position that a ~~clearance to~~ climb can be expected.	WHEN CAN WE EXPECT HIGHER LEVEL	~~L~~M	Y
~~54~~	~~Request for the earliest time at which a clearance to cruise climb to the specified level can be expected.~~	~~WHEN CAN WE EXPECT CRUISE CLIMB TO *(level)*~~	~~L~~	~~Y~~
~~28~~ LVLD-8	~~Notification of~~ Report indicating leaving the specified level.	LEAVING *(level single)*	~~L~~M	N
~~37~~ LVLD-9	~~Notification~~ Report indicating that the ~~aircraft is maintaining the~~ specified level is being maintained.	MAINTAINING *(level single)*	~~L~~M	N
~~69~~	~~Request that a descent be approved on a see-and-avoid basis.~~	~~REQUEST VMC DESCENT~~	~~L~~	~~Y~~
~~76~~ LVLD-10	~~Notification that the aircraft has reached a level within~~ Report indicating reaching the specified vertical range.	REACHING BLOCK *(level single)* TO *(level single)*	~~L~~M	N
~~32~~	~~Notification of the present level.~~	~~PRESENT LEVEL *(level)*~~	~~L~~	~~N~~
~~38~~ LVLD-11	~~Readback of~~ Confirmation that the assigned level or vertical range is the specified level or vertical range.	ASSIGNED LEVEL *(level)*	M	N
~~72~~	~~(reserved)~~		~~L~~	~~N~~
~~77~~	~~Readback of the assigned vertical range.~~	~~ASSIGNED BLOCK *(level)* TO *(level)*~~	~~M~~	~~N~~
~~106~~ LVLD-12	~~Notification of~~ Report indicating that the aircraft's preferred level is the specified level.	PREFERRED LEVEL *(level single)*	~~L~~M	N

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~29~~ LVLD-13	~~Notification of~~ Report indicating climbing to the specified level.	CLIMBING TO *(level single)*	~~L~~M	N
~~30~~ LVLD-14	~~Notification of~~ Report indicating descending to the specified level.	DESCENDING TO *(level single)*	~~L~~M	N
~~81~~ LVLD-15	~~We can accept~~ Indication that the specified level can be accepted at the specified time.	WE CAN ACCEPT *(level single)* AT TIME *(time)*	~~L~~M	N
~~115~~ LVLD-16	~~We can accept~~ Indication that the specified level can be accepted at the specified position.	WE CAN ACCEPT *(level single)* AT *(position)*	~~L~~M	N
~~82~~ LVLD-17	~~We cannot accept~~ Indication that the specified level cannot be accepted.	WE CANNOT ACCEPT *(level single)*	~~L~~M	N
~~87~~	~~Request for the earliest time at which a clearance to climb to the specified level can be expected.~~	~~WHEN CAN WE EXPECT CLIMB TO *(level)*~~	~~L~~	~~Y~~
~~88~~	~~Request for the earliest time at which a clearance to descend to the specified level can be expected.~~	~~WHEN CAN WE EXPECT DESCENT TO *(level)*~~	~~L~~	~~Y~~
~~109~~	~~Notification of the preferred time to commence descent for approach.~~	~~TOP OF DESCENT *(time)*~~	~~L~~	~~N~~
~~110~~	~~Notification of the preferred position to commence descent for approach.~~	~~TOP OF DESCENT *(position)*~~	~~L~~	~~N~~
~~111~~ LVLD-18	Notification of the preferred time and position to commence descent for approach.	TOP OF DESCENT ~~*(time)*~~ *(position)* TIME *(time)*	~~L~~M	N

4. Crossing constraint message elements

Table A5-4-1. Crossing constraint uplinks (CSTU)

Instructions to cross a specified position at a specified altitude, time, and/or speed, instruction to cancel a crossing constraint.

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~42~~	~~(reserved)~~		~~L~~	~~R~~
~~43~~	~~(reserved)~~		~~L~~	~~R~~
~~44~~	~~(reserved)~~		~~L~~	~~R~~

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~45~~	~~(reserved)~~		~~L~~	~~R~~
~~46~~ CSTU-1	I Instruction that the specified position is to be crossed at the specified level~~. This may require~~ or within the ~~aircraft to modify its climb or descent profile~~ specified vertical range.	CROSS *(position)* AT *(level)*	M	W/U
~~47~~ CSTU-2	Instruction that the specified position is to be crossed at or above the specified level.	CROSS *(position)* AT OR ABOVE *(level single)*	M	W/U
~~48~~ CSTU-3	Instruction that the specified position is to be crossed at or below the specified level.	CROSS *(position)* AT OR BELOW *(level single)*	M	W/U
~~49~~	~~Instruction that the specified position is to be crossed at the specified level and that level is to be maintained when reached.~~	~~CROSS *(position)* AT AND MAINTAIN *(level)*~~	~~M~~	~~W/U~~
~~50~~	~~Instruction that the specified position is to be crossed at a level between the specified levels.~~	~~CROSS *(position)* BETWEEN *(level)* AND *(level)*~~	~~M~~	~~W/U~~
~~51~~ CSTU-4	Instruction that the specified position is to be crossed at the specified time.	CROSS *(position)* AT TIME *(time)*	M	W/U
~~52~~ CSTU-5	Instruction that the specified position is to be crossed ~~at or~~ before the specified time.	CROSS *(position)* ~~AT OR~~ BEFORE TIME *(time)*	M	W/U
~~53~~ CSTU-6	Instruction that the specified position is to be crossed ~~at or~~ after the specified time.	CROSS *(position)* ~~AT OR~~ AFTER TIME *(time)*	M	W/U
~~54~~ CSTU-7	Instruction that the specified position is to be crossed ~~at a time~~ between the specified times.	CROSS *(position)* BETWEEN TIME *(time)* AND TIME *(time)*	M	W/U
~~55~~ CSTU-8	Instruction that the specified position is to be crossed at the specified speed~~ and the specified speed is to be maintained until further advised~~.	CROSS *(position)* AT *(speed)*	M	W/U
~~56~~ CSTU-9	Instruction that the specified position is to be crossed at ~~a speed equal to~~ or less than the specified speed ~~and the specified speed or less is to be maintained until further advised~~.	CROSS *(position)* AT *(speed)* OR LESS ~~THAN *(speed)*~~	M	W/U

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~57~~ CSTU-10	Instruction that the specified position is to be crossed at ~~a speed equal to~~ or greater than the specified speed ~~and the specified speed or greater is to be maintained until further advised~~.	CROSS *(position)* AT *(speed)* OR GREATER ~~THAN~~ ~~*(speed)*~~	M	W/U
~~58~~ CSTU-11	Instruction that the specified position is to be crossed at the specified time and at the level or within the vertical range as specified ~~level~~.	CROSS *(position)* AT TIME *(time)* AT *(level)*	M	W/U
~~59~~ CSTU-12	Instruction that the specified position is to be crossed ~~at or~~ before the specified time and at the level or within the vertical range as specified ~~level~~.	CROSS *(position)* ~~AT OR~~ BEFORE TIME*(time)* AT *(level)*	M	W/U
~~60~~ CSTU-13	Instruction that the specified position is to be crossed ~~at or~~ after the specified time and at the level or within the vertical range as specified ~~level~~.	CROSS *(position)* ~~AT OR~~ AFTER TIME*(time)* AT *(level)*	M	W/U
~~61~~ CSTU-14	Instruction that the specified position is to be crossed at the level or within the vertical range, as specified ~~level~~, and at the specified speed~~, and the level and speed are to be maintained~~.	CROSS *(position)* AT ~~AND MAINTAIN~~ *(level)* AT *(speed)*	M	W/U
~~62~~	~~Instruction that at the specified time the specified position is to be crossed at the specified level and the level is to be maintained.~~	~~AT *(time)* CROSS *(position)* AT AND MAINTAIN *(level)*~~	~~M~~	~~W/U~~
~~63~~ CSTU-15	Instruction that ~~at the specified time~~ the specified position is to be crossed at the specified time at the level or within the vertical range, as specified, and at the specified speed~~, and the level and speed are to be maintained~~.	~~AT *(time)*~~ CROSS *(position)* AT TIME *(time)* AT ~~AND MAINTAIN~~ *(level)* AT *(speed)*	M	W/U

5. Speed message elements

Table A5-5-1. Speed uplinks (SPDU)

Instructions to change or maintain speed, notifications to expect speed change.

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~100~~ SPDU-1	Notification that a speed instruction may be issued to ~~be effective~~ take effect at the specified time.	EXPECT SPEED CHANGE AT TIME *(time)* ~~EXPECT *(speed)*~~	~~L~~M	R
~~101~~ SPDU-2	Notification that a speed instruction may be issued to ~~be effective~~ take effect at the specified position.	~~AT *(position)*~~ EXPECT ~~*(speed)*~~ SPEED CHANGE AT *(position)*	~~L~~M	R
~~102~~ SPDU-3	Notification that a speed instruction may be issued to ~~be effective~~ take effect at the specified level.	EXPECT SPEED CHANGE AT *(level single)* ~~EXPECT *(speed)*~~	~~L~~M	R
~~103~~	~~Notification that a speed range instruction may be issued to be effective at the specified time.~~	~~AT *(time)* EXPECT *(speed)* TO *(speed)*~~	~~L~~	~~R~~
~~104~~	~~Notification that a speed range instruction may be issued to be effective at the specified position.~~	~~AT *(position)* EXPECT *(speed)* TO *(speed)*~~	~~L~~	~~R~~
~~105~~	~~Notification that a speed range instruction may be issued to be effective at the specified level.~~	~~AT *(level)* EXPECT *(speed)* TO *(speed)*~~	~~L~~	~~R~~
~~106~~ SPDU-4	Instruction ~~that~~ to maintain the specified speed ~~is to be maintained~~.	MAINTAIN *(speed)*	M	W/U
~~188~~	~~Instruction that after passing the specified position the specified speed is to be maintained.~~	~~AFTER PASSING *(Position)* MAINTAIN *(Speed)*~~	~~M~~	~~W/U~~
~~107~~ SPDU-5	Instruction ~~that~~ to maintain the present speed ~~is to be maintained~~.	MAINTAIN PRESENT SPEED	M	W/U
~~108~~ SPDU-6	Instruction ~~that~~ to maintain the specified speed or ~~a~~ greater ~~speed is to be maintained~~.	MAINTAIN *(speed)* OR GREATER	M	W/U
~~109~~ SPDU-7	Instruction ~~that~~ to maintain the specified speed or ~~a lesser speed is to be maintained~~ less.	MAINTAIN *(speed)* OR LESS	M	W/U
~~110~~ SPDU-8	Instruction ~~that a speed within~~ to maintain the specified speed range ~~is to be maintained~~.	MAINTAIN *(speed)* TO *(speed)*	M	W/U

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~111~~ SPDU-9	Instruction that the present speed is to be increased to the specified speed and maintained until further advised.	INCREASE SPEED TO *(speed)*	M	W/U
~~112~~ SPDU-10	Instruction that the present speed is to be increased to the specified speed or greater, and maintained at or above the specified speed until further advised.	INCREASE SPEED TO *(speed)* OR GREATER	M	W/U
~~113~~ SPDU-11	Instruction that the present speed is to be reduced to the specified speed and maintained until further advised.	REDUCE SPEED TO *(speed)*	M	W/U
~~114~~ SPDU-12	Instruction that the present speed is to be reduced to the specified speed, or less, and maintained at or below the specified speed until further advised.	REDUCE SPEED TO *(speed)* OR LESS	M	W/U
~~115~~	~~Instruction that the specified speed is not to be exceeded.~~	~~DO NOT EXCEED *(speed)*~~	~~M~~	~~W/U~~
~~116~~ SPDU-13	Instruction ~~that the aircraft's~~ to resume a normal speed ~~be resumed~~. The aircraft no longer needs to comply with a previously issued speed restriction~~(s) are cancelled~~.	RESUME NORMAL SPEED	M	W/U
~~189~~	~~Instruction that the present speed is to be changed to the specified speed.~~	~~ADJUST SPEED TO *(Speed)*~~	~~M~~	~~W/U~~
~~222~~ SPDU-14	~~Notification~~Indication that the ~~aircraft may keep its~~ preferred speed may be flown without restriction.	NO SPEED RESTRICTION	~~L~~M	R
~~223~~	~~Instruction to reduce present speed to the minimum safe approach speed.~~	~~REDUCE TO MINIMUM APPROACH SPEED~~	~~M~~	~~W/U~~
~~134~~ SPDU-15	~~Instruction~~ Request to report the ~~requested~~ speed defined by the specified speed type(s).	REPORT *(speed types)* ~~*(speed type) (speed type)*~~ SPEED	M	Y
~~136~~ SPDU-16	~~Instruction~~ Request to confirm the ~~currently~~ assigned speed.	CONFIRM ASSIGNED SPEED	~~L~~M	Y
~~151~~ SPDU-17	~~Instruction to report~~ Request for the earliest time or position when the specified speed can be accepted.	WHEN CAN YOU ACCEPT *(speed)*	~~L~~M	Y

Table A5-5-2. Speed downlinks (SPDD)

Requests related to speed and inquiries when speed change can be expected.

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~18~~ SPDD-1	Request ~~to fly at~~ for the specified speed.	REQUEST *(speed)*	~~L~~M	Y
~~19~~	~~Request to fly within the specified speed range.~~	~~REQUEST *(speed)* TO *(speed)*~~	~~L~~	~~Y~~
~~49~~ SPDD-2	Request for the earliest time ~~at which a clearance to~~ or position that the specified speed can be expected.	WHEN CAN WE EXPECT *(speed)*	~~L~~M	Y
~~50~~	~~Request for the earliest time at which a clearance to a speed within the specified range can be expected.~~	~~WHEN CAN WE EXPECT *(speed)* TO *(speed)*~~	~~L~~	~~Y~~
~~113~~ SPDD-3	~~Notification of the requested speed~~ Report indicating the speed defined by the specified speed types is the specified speed.	*(speed types)* ~~*(speed type) (speed type)*~~ SPEED *(speed)*	~~L~~M	N
~~34~~	~~Notification of the present speed.~~	~~PRESENT SPEED *(speed)*~~	~~L~~	~~N~~
~~39~~ SPDD-4	~~Readback of~~ Confirmation that the assigned speed is the specified speed.	ASSIGNED SPEED *(speed)*	M	N
~~83~~ SPDD-5	~~We can accept~~ Indication that the specified speed can be accepted at the specified time.	WE CAN ACCEPT *(speed)* AT TIME *(time)*	~~L~~M	N
~~116~~	~~We can accept the specified speed at the specified position.~~	~~WE CAN ACCEPT *(Speed)* AT *(Position)*~~	~~L~~	~~N~~
~~84~~ SPDD-6	~~We cannot accept~~ Indication that the specified speed cannot be accepted.	WE CANNOT ACCEPT *(speed)*	~~L~~M	N

6. Air Traffic Advisory message elements

Table A5-6-1. Air traffic advisory uplinks (ADVU)

Advisories related to the use CPDLC, ADS-C and surveillance services.

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~153~~	~~ATS advisory that the altimeter setting should be the specified setting.~~	~~ALTIMETER *(altimeter)*~~	~~L~~	~~R~~
~~213~~ ADVU-1	~~ATS~~ Advisory ~~that~~ providing the ~~specified~~ altimeter setting for ~~relates to~~ the specified facility.	*(facility Designation)* ALTIMETER *(altimeter setting)*	~~L~~M	R
~~154~~ ADVU-2	~~ATS~~ Advisory that ~~the radar~~ ATS surveillance service is terminated.	~~RADAR~~ SURVEILLANCE SERVICE TERMINATED	~~L~~M	R
~~191~~	~~ATS Advisory that the aircraft is entering airspace in which no air traffic services are provided and all existing air traffic services are terminated.~~	~~ALL ATS TERMINATED~~	~~M~~	~~R~~
~~155~~ ADVU-3	~~ATS~~ Advisory that ~~radar contact~~ ATS surveillance service has been established ~~at the~~. A position may be specified ~~position~~.	~~RADAR CONTACT *(position)*~~IDENTIFIED *(position[O])*	M	R
~~210~~	~~ATS advisory that the aircraft has been identified on radar and/or ADS-B at the specified position.~~	~~IDENTIFIED *(position)*~~	~~M~~	~~R~~
~~156~~ ADVU-4	~~ATS~~ Advisory that ~~radar~~ ATS surveillance contact has been lost.	~~RADAR CONTACT~~ IDENTIFICATION LOST	M	R
~~193~~	~~Notification that radar and/or ADS-B identification has been lost.~~	~~IDENTIFICATION LOST~~	~~M~~	~~R~~
~~158~~ ADVU-5	~~ATS~~ Advisory that the ~~ATIS information identified by the specified code is the~~ current ATIS ~~information~~ code is as specified.	ATIS *(~~atis~~ATIS code)*	~~L~~M	R
~~182~~	~~Instruction to report the identification code of the last ATIS received.~~	~~CONFIRM ATIS CODE~~	~~L~~	~~Y~~
~~212~~	~~ATS advisory that the specified ATIS information at the specified airport is current.~~	~~*(facility designation)* ATIS *(atis code)* CURRENT~~	~~L~~	~~R~~

Message element identifier	*Message ~~element intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~214~~	~~ATS Advisory that indicates the RVR value for the specified runway.~~	~~RVR RUNWAY *(Runway) (Rvr)*~~	~~M~~	~~R~~
~~224~~	~~ATS Advisory that no delay is expected.~~	~~NO DELAY EXPECTED~~	~~L~~	~~R~~
~~225~~	~~ATS advisory that the expected delay has not been determined.~~	~~DELAY NOT DETERMINED~~	~~L~~	~~R~~
~~226~~	~~ATS advisory that the aircraft may expect to be cleared to commence its approach procedure at the specified time.~~	~~EXPECTED APPROACH TIME *(Time)*~~	~~L~~	~~R~~
~~237~~ ADVU-6	~~Indicates that the~~ Advisory to request ~~cannot be responded to by the current unit and that it should be requested from~~ again with the next ATC unit.	REQUEST AGAIN WITH NEXT ATC UNIT	~~L~~M	N
ADVU-7	Advisory of traffic significant to the flight.	TRAFFIC IS *(traffic description)*	M	R
ADVU-8	Instruction to report that the specified traffic has been visually sighted and passed. The instruction may indicate the estimated time of passing.	REPORT SIGHTING AND PASSING OPPOSITE DIRECTION *(aircraft type[O]) (traffic location) (ETP time[O])*	M	W/U
~~123~~ ADVU-9	Instruction ~~that~~ to select the specified ~~code (~~SSR code~~) is to be selected.~~.	SQUAWK *(discrete beacon code)*	M	W/U
~~124~~ ADVU-10	Instruction ~~that the~~ to disable SSR transponder responses ~~are to be disabled~~.	STOP SQUAWK	M	W/U
~~239~~	~~Instruction that the ADS-B transmissions are to be terminated.~~	~~STOP ADS-B TRANSMISSION~~	~~M~~	~~W/U~~
~~125~~ ADVU-11	Instruction ~~that the~~ to include level information in SSR transponder responses ~~should include level information~~.	SQUAWK MODE ~~CHARLIE~~ C	M	W/U
~~126~~ ADVU-12	Instruction ~~that the~~ to stop including level information in SSR transponder responses ~~should no longer include level information~~.	STOP SQUAWK MODE ~~CHARLIE~~ C	M	W/U
~~144~~ ADVU-13	~~Instruction~~ Request to ~~report~~ confirm the selected ~~(SSR)~~ code.	CONFIRM SQUAWK CODE	~~L~~M	Y

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~179~~ ADVU-14	Instruction that the "ident" function on the SSR transponder is to be actuated.	SQUAWK IDENT	M	W/U
ADVU-15	Instruction to activate the ADS-C capability.	ACTIVATE ADS-C	M	W/U
ADVU-16	Instruction to transmit voice position reports, as specified, due to ADS-C being out of service.	ADS-C OUT OF SERVICE REVERT TO VOICE POSITION REPORTS	M	W/U
ADVU-17	Instruction to intermediary aircraft to relay the specified message to the specified aircraft on the specified frequency, when provided.	RELAY TO *(aircraft identification) (unit name) (relay text) (frequency[O])*	M	W/U
ADVU-18	Request to check the aircraft route due to ADS-C indicating a route deviation.	ADS-C INDICATES ROUTE DEVIATION. VERIFY AND ADVISE	M	W/U
~~240~~	~~Instruction that the ADS-B transmissions should include level information.~~	~~TRANSMIT ADS-B ALTITUDE~~	~~M~~	~~W/U~~
~~241~~	~~Instruction that the ADS-B transmissions should no longer include level information.~~	~~STOP ADS-B ALTITUDE TRANSMISSION~~	~~M~~	~~W/U~~
~~242~~	~~Instruction that the "ident" function of the ADS-B emitter is to be activated.~~	~~TRANSMIT ADS-B IDENT~~	~~M~~	~~W/U~~
~~244~~	~~ATS advisory that the radar and/or ADS-B service is terminated.~~	~~IDENTIFICATION TERMINATED~~	~~L~~	~~R~~

Table A5-6-2. Air traffic advisory downlinks (ADVD)

Reports related to the application of relay procedure

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~47~~ ADVD-1	Report indicating that the aircraft is squawking the specified ~~(~~SSR~~)~~ code~~ has been selected~~.	SQUAWKING *(discrete beacon code)*	~~L~~M	N
~~79~~	~~The code of the latest ATIS received is as specified.~~	~~ATIS *(atis code)*~~	~~L~~	~~N~~
~~102~~	~~Used to report that an aircraft has landed.~~	~~LANDING REPORT~~	~~N~~	~~N~~

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
ADVD-2	Report indicating that whether or not traffic has been visually sighted and if so, if it has been passed. May provide a description of the aircraft.	TRAFFIC *(aircraft type[O]) (traffic location) (traffic visibility)*	M	N

7. Voice communications message elements

Table A5-7-1. Voice communications uplinks (COMU)

Instructions to monitor or contact air traffic control on voice frequencies and instruction to check stuck microphone.

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~117~~ COMU-1	Instruction ~~that the ATS unit~~ to establish voice contact with the specified ATS unit ~~name is to be contacted~~ on the specified frequency.	CONTACT *(unit name) (frequency)*	M	W/U
~~118~~ COMU-2	Instruction that at the specified position ~~the ATS unit~~, to establish voice contact with the specified ATS unit ~~name is to be contacted~~ on the specified frequency.	AT *(position)* CONTACT *(unit name) (frequency)*	M	W/U
~~119~~ COMU-3	Instruction that at the specified time ~~the ATS unit~~ to establish voice contact with the specified ATS unit ~~name is to be contacted~~ on the specified frequency.	AT TIME *(time)* CONTACT *(unit name) (frequency)*	M	W/U
~~238~~ COMU-4	~~Notification that~~ Advisory of the secondary frequency ~~is as specified~~.	SECONDARY FREQUENCY *(frequency)*	~~L~~M	R
~~120~~ COMU-5	Instruction ~~that the ATS unit with~~ to monitor the specified ATS unit ~~name is to be monitored~~ on the specified frequency. The flight crew is not required to establish voice contact on the frequency.	MONITOR *(unit name) (frequency)*	M	W/U

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~121~~ COMU-6	Instruction that at the specified position ~~the ATS unit with~~ to monitor the specified ATS ~~unit name is to be monitored~~ on the specified frequency. The flight crew is not required to establish voice contact on the frequency.	AT *(position)* MONITOR *(unit name) (frequency)*	M	W/U
~~122~~ COMU-7	Instruction that at the specified time ~~the ATS unit with~~, to monitor the specified ATS unit ~~name is to be monitored~~ on the specified frequency. The flight crew is not required to establish voice contact on the frequency.	AT TIME *(time)* MONITOR *(unit name) (frequency)*	M	W/U
~~157~~ COMU-8	~~Notification that~~ Instruction to check the microphone button due to detection of a continuous transmission ~~is detected on the specified~~. A frequency. ~~Check the microphone button~~ may be specified.	CHECK STUCK MICROPHONE *(frequency)*	~~M~~H	N
COMU-9	Advisory of the name of the current ATC unit.	CURRENT ATC UNIT *(unit name)*	M	N

Table A5-7-2. Voice communications downlinks (COMD)

Requests regarding voice contact or frequency change.

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~20~~	~~Request for voice contact.~~	~~REQUEST VOICE CONTACT~~	~~L~~	~~Y~~
~~21~~ COMD-1	Request for voice contact on the specified-frequency.	REQUEST VOICE CONTACT *(frequency)*	~~L~~M	Y
COMD-2	Notification from the intermediary aircraft of the specified response from the specified aircraft.	RELAY FROM *(aircraft identification) (relayed text response)*	M	N
~~89~~	~~The specified ATS unit is being monitored on the specified frequency.~~	~~MONITORING *(unit name) (frequency)*~~	~~M~~	~~N~~

8. Spacing message elements

Table A5-8-1. Spacing uplinks (SPCU)

Clearances to conduct spacing manoeuvre during en-route or arrival operations and notifications to expect spacing clearance.

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~*~~ SPCU-1	ATS acknowledgement for the pilot use of the in-trail procedure when the ITP aircraft is behind the reference aircraft. This message element is always concatenated with a vertical clearance.	ITP BEHIND *(aircraft identification ~~of reference aircraft~~)*	~~L~~M	~~L~~M
~~*~~ SPCU-2	ATS acknowledgement for the pilot use of the in-trail procedure when the ITP aircraft is ahead of the reference aircraft. This message element is always concatenated with a vertical clearance.	ITP AHEAD OF *(aircraft identification ~~of reference aircraft~~)*	~~L~~M	~~L~~M
~~*~~ SPCU-3	ATS acknowledgement for the pilot use of the in-trail procedure when the ITP aircraft is behind both reference aircraft. This message element is always concatenated with a vertical clearance.	ITP BEHIND *(aircraft identification ~~of reference aircraft~~)* AND BEHIND *(aircraft identification ~~of reference aircraft~~)*	~~L~~M	~~L~~M
~~*~~ SPCU-4	ATS acknowledgement for the pilot use of the in-trail procedure when the ITP aircraft is ahead of both reference aircraft. This message element is always concatenated with a vertical clearance.	ITP AHEAD OF *(aircraft identification ~~of reference aircraft~~)* AND AHEAD OF *(aircraft identification ~~of reference aircraft~~)*	~~L~~M	~~L~~M
~~*~~ SPCU-5	ATS acknowledgement for the pilot use of the in-trail procedure when the ITP aircraft is behind one reference aircraft and ahead of one reference aircraft. This message element is always concatenated with a vertical clearance.	ITP BEHIND *(aircraft identification ~~of reference aircraft~~)* AND AHEAD OF *(aircraft identification ~~of reference aircraft~~)*	~~L~~M	~~L~~M
~~* Use UM169 when sending these messages as free text.~~				

Table A5-8-2. Spacing downlinks (SPCD)

Responses and reports to conduct spacing manoeuvre during en-route or arrival operations.

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~*~~ SPCD-1	Advisory indicating that the pilot has the ITP equipment, and provides the specified distance to the reference aircraft, including aircraft identification. This message element is always concatenated with a vertical request.	ITP *(specified distance)* BEHIND *(aircraft identification ~~of reference aircraft~~)*	~~L~~M	N
~~*~~ SPCD-2	Advisory indicating that the pilot has the ITP equipment, and provides the specified distance from the reference aircraft, including aircraft identification. This message element is always concatenated with a vertical request.	ITP *(specified distance)* AHEAD OF *(aircraft identification ~~of reference aircraft~~)*	~~L~~M	N
~~*~~ SPCD-3	Advisory indicating that the pilot has the ITP equipment, and provides the specified distance to both reference aircraft, including aircraft identification. This message element is always concatenated with a vertical request.	ITP *(specified distance)* BEHIND *(aircraft identification ~~of reference aircraft~~)* AND *(specified distance)* BEHIND *(aircraft identification ~~of reference aircraft~~)*	~~L~~M	N
~~*~~ SPCD-4	Advisory indicating that the pilot has the ITP equipment, and provides the specified distance from both reference aircraft, including aircraft identification. This message element is always concatenated with a vertical request.	ITP *(specified distance)* AHEAD OF *(aircraft identification ~~of reference aircraft~~)* AND *(specified distance)* AHEAD OF *(aircraft identification ~~of reference aircraft~~)*	~~L~~M	N
~~*~~ SPCD-5	Advisory indicating that the pilot has the ITP equipment, and provides the specified distance to one reference aircraft and the specified distance from another reference aircraft, including aircraft identification. This message element is always concatenated with a vertical request.	ITP *(specified distance)* BEHIND *(aircraft identification ~~of reference aircraft~~)* AND *(specified distance)* AHEAD OF *(aircraft identification ~~of reference aircraft~~)*	~~L~~M	N

9. Emergency/urgency message elements

Table A5-9-1. Emergency/urgency uplinks (EMGU)

Instructions or annotations associated to instructions providing a high level of alert in the cockpit.

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~131~~ EMGU-1	~~Instruction~~ Request to ~~report~~ provide the ~~amount of~~ fuel remaining (time) and the number of persons on board.	REPORT ~~REMAINING FUEL~~ ENDURANCE AND PERSONS ON BOARD	~~M~~H	Y
~~230~~ EMGU-2	Instruction to immediately comply with the associated instruction ~~is to be complied with immediately~~ to avoid an imminent situation.	IMMEDIATELY	H	N
~~235~~ EMGU-3	~~Not~~Indi~~fi~~cation of receipt of an unlawful interference message.	ROGER 7500	H	N
EMGU-4	Request to confirm an ADS-C indicated emergency.	CONFIRM ADS-C EMERGENCY	H	A/N
~~199~~		~~*(FreeText)*~~	~~H~~	~~N~~
EMGU-5	Indication that the emergency message is received.	ROGER MAYDAY	H	N
EMGU-6	Indication that the urgency message is received.	ROGER PAN	H	N

Table A5-9-2. Emergency/urgency downlinks (EMGD)

Reports providing a high level of alert to the air traffic control.

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~55~~ EMGD-1	~~Urgency prefix.~~Indication of an urgent situation.	PAN PAN PAN	H	Y
~~56~~ EMGD-2	~~Distress prefix.~~Indication of an emergency situation.	MAYDAY MAYDAY MAYDAY	H	Y
~~112~~	~~Indicates specifically that the aircraft is being subjected to unlawful interference.~~	~~SQUAWKING 7500~~	~~H~~	~~N~~
~~57~~ EMGD-3	~~Notification of~~ Report indicating fuel remaining (time) and number of persons on board.	*(remaining fuel)* ~~OF FUEL REMAINING~~ ENDURANCE AND *(persons on board)* PERSONS ON BOARD	H	Y

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~58~~ EMGD-4	~~Notification~~Indication that the ~~pilot wishes to cancel or~~ emergency ~~condition~~ situation is cancelled.	CANCEL EMERGENCY	~~M~~H	Y
~~61~~	~~Notification that the aircraft is descending to the specified level due to an urgent need.~~	~~DESCENDING TO *(level)*~~	~~H~~	~~Y~~

10. Standard response message elements

Table A5-10-1. Standard response uplinks (RSPU)

Standard air traffic control responses to pilot inquiries and requests.

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~0~~ RSPU-1	Indicat~~es~~ion that ~~ATC~~ the message cannot ~~comply~~ be complied with~~ the request~~.	UNABLE	M	N
~~1~~ RSPU-2	Indicat~~es~~ion that ~~ATC has received~~ the message ~~and~~ will ~~respond~~ be responded to shortly.	STANDBY	~~L~~M	N
~~2~~ RSPU-3	~~Indicates that ATC has received the request but it has been deferred until later~~ Indication that a long term delay in response can be expected.	REQUEST DEFERRED	~~L~~M	N
~~3~~ RSPU-4	Indicat~~es~~ion that ~~ATC has received and~~ the message is received~~understood the message~~.	ROGER	~~L~~M	N
4 RSPU-5	~~Yes~~ Indication that ATC is responding positively to the message.	AFFIRM	~~L~~M	N
~~5~~ RSPU-6	~~No~~ Indication that ATC is responding negatively to the message.	NEGATIVE	~~LM~~	N
~~211~~ RSPU-7	Indicat~~es~~ion that ~~ATC has received~~ the request ~~and~~ has ~~passed it~~ been forwarded to the next control ~~authority~~ unit.	REQUEST FORWARDED	~~L~~M	N

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~218~~	~~Indicates to the pilot that the request has already been received on the ground.~~	~~REQUEST ALREADY RECEIVED~~	~~N~~	~~N~~
~~143~~ RSPU-8	~~The request~~Request to confirm the referenced request since the initial request was not understood. ~~It~~ The request should be clarified and resubmitted.	CONFIRM REQUEST	~~L~~M	~~Y~~N

Table A5-10-2. Standard response downlinks (RSPD)

Standard responses to air traffic control instructions and inquiries.

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~0~~ RSPD-1	Indication that the instruction is understood and will be complied with.	WILCO	M	N
~~1~~ RSPD-2	Indication that the instruction cannot be complied with.	UNABLE	M	N
~~2~~ RSPD-3	~~Wait for a reply~~ Indication that the message will be responded to shortly.	STANDBY	M	N
~~3~~ RSPD-4	Indication that the message is received~~ and understood~~.	ROGER	M	N
~~4~~ RSPD-5	~~Yes.~~ Indication of a positive response to a message.	AFFIRM	M	N
~~5~~ RSPD-6	~~No.~~ Indication of a negative response to a message.	NEGATIVE	M	N

11. Supplemental message elements

Table A5-11-1. Supplemental uplinks (SUPU)

Annotations to air traffic control instructions and standard responses.

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~164~~ SUPU-1	Indication that the associated instruction ~~may~~ is to be ~~complied with at any future time~~ executed when the flight crew is ready.	WHEN READY	~~N~~M	N
~~165~~	~~Used to link two messages, indicating the proper order of execution of clearances/instructions.~~	~~THEN~~	~~N~~	~~N~~
~~166~~ SUPU-2	Indication that the associated ~~instruction~~ message is issued due to ~~traffic considerations~~ the specified reason.	DUE TO *(due to reason uplink~~traffic type~~)* ~~TRAFFIC~~	~~N~~M	N
~~167~~	~~The associated instruction is issued due to airspace restrictions.~~	~~DUE TO AIRSPACE RESTRICTION~~	~~N~~	~~N~~
~~168~~	~~The indicated communication should be ignored.~~	~~DISREGARD~~	~~M~~	~~R~~
~~176~~	~~Instruction that the pilot is responsible for maintaining separation from other traffic and is also responsible for maintaining visual meteorological conditions.~~	~~MAINTAIN OWN SEPARATION AND VMC~~	~~M~~	~~W/U~~
~~177~~ SUPU-3	Used in conjunction with a clearance/instruction to indicate that the pilot may execute when prepared to do so.	AT PILOTS DISCRETION	~~L~~M	N
SUPU-4	Instruction to execute the associated instruction at the aircraft's best performance rate.	EXPEDITE	M	N
SUPU-5	Indication that the associated instruction is either a revision to a previously issued instruction or is different from the requested clearance.	REVISED *(revision reason[O])*	H	N

Table A5-11-2. Supplemental downlinks (SUPD)

Annotations to requests and standard responses.

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~65~~ SUPD-1	~~Used to explain reasons~~ Indication of the reason for ~~pilot's~~ the associated message.	DUE TO WEATHER	~~L~~N	N
~~75~~ SUPD-2	Used in conjunction with another message to indicate that the pilot wishes to execute request when the pilot is prepared to do so.	AT PILOTS DISCRETION	~~L~~M	N
~~66~~ SUPD-3	~~Used to explain~~ Indication of the reasons for ~~pilot's~~ the associated message.	DUE TO AIRCRAFT PERFORMANCE	~~L~~M	N
~~74~~	~~States a desire by the pilot to provide his/her own separation and remain in VMC.~~	~~REQUEST TO MAINTAIN OWN SEPARATION AND VMC~~	~~L~~	~~Y~~
~~101~~	~~Allows the pilot to indicate a desire for termination of CPDLC service with the current data authority.~~	~~REQUEST END OF SERVICE~~	~~L~~	~~Y~~
~~103~~	~~Allows the pilot to indicate that he/she has cancelled IFR flight plan.~~	~~CANCELLING IFR~~	~~L~~	~~Y~~

12. Free text message elements

Used when none of the standard message elements in the CPDLC message set in this Appendix are appropriate for a specific intended use.

Table A5-12-1. Free text uplinks (TXTU)

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~169~~ TXTU-1		*(free text)*	~~L~~M	R
~~183~~ TXTU-2		*(free text)*	M	N
~~187~~ TXTU-3		*(free text)*	N	N

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~196~~ TXTU-4		*(free text)*	M	W/U
~~205~~ TXTU-5		*(free text)*	M	A/N
~~178~~	~~(reserved)~~		~~L~~	~~Y~~
~~170~~		~~*(free text)*~~	~~H~~	~~R~~
~~194~~		~~*(free text)*~~	~~L~~	~~Y~~
~~195~~		~~*(free text)*~~	~~L~~	~~R~~
~~197~~		~~*(free text)*~~	~~M~~	~~W/U~~
~~198~~		~~*(free text)*~~	~~H~~	~~W/U~~
~~201~~	~~Not used.~~		~~L~~	~~N~~
~~202~~	~~Not used.~~		~~L~~	~~N~~
~~203~~		~~*(free text)*~~	~~M~~	~~R~~
~~204~~		~~*(free text)*~~	~~M~~	~~Y~~
~~206~~		~~*(free text)*~~	~~N~~	~~Y~~
~~207~~		~~*(free text)*~~	~~L~~	~~Y~~
~~208~~		~~*(free text)*~~	~~L~~	~~N~~

Table A5-12-2. Free text downlinks (TXTD)

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~91~~ TXTD-1		*(free text)*	~~L~~M	Y
~~97~~		~~*(freeText)*~~	~~L~~	~~N~~
~~98~~ TXTD-2		*(freeText)*	~~N~~M	N
~~67~~		~~*(free text)*~~	~~L~~	~~N~~
~~68~~		~~*(free text)*~~	~~H~~	~~Y~~
~~90~~		~~*(free text)*~~	~~M~~	~~N~~
~~92~~		~~*(free text)*~~	~~L~~	~~Y~~
~~93~~		~~*(free text)*~~	~~H~~	~~N~~

Message element identifier	*Message ~~element intent/use~~ element intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~94~~		~~*(free text)*~~	~~H~~	~~N~~
~~95~~		~~*(free text)*~~	~~M~~	~~N~~
~~96~~		~~*(free text)*~~	~~L~~	~~N~~

13. System management message elements

Table A5-13-1. System management uplinks (SYSU)

Messages dedicated to the management of the CPDLC communications (usually sent by the ground system).

Message element identifier	*Message ~~element intent/use~~ element intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~159~~ SYSU-1	~~A~~ System-generated ~~message notifying that the ground system has detected~~ notification of an error.	ERROR *(error information)*	~~M~~N	N
~~160~~ SYSU-2	~~Notification to the avionics that the specified data authority is the next data authority. If no data authority is specified, this indicates that any previously specified next data authority is no longer valid.~~ System-generated notification of the next data authority or the cancellation thereof.	NEXT DATA AUTHORITY *(facility designation[O])*	~~N~~M	N
~~161~~	~~Notification to the avionics that the data link connection with the current data authority is being terminated.~~	~~END SERVICE~~	~~N~~	~~N~~
~~162~~ SYSU-3	System-generated ~~N~~notification that ~~the ground system does not support this~~ received message is not supported.	MESSAGE NOT SUPPORTED BY THIS ATS~~S~~C UNIT	~~L~~M	N
~~163~~	~~Notification to the pilot of an ATSU identifier.~~	~~*(facility designation)*~~	~~N~~	~~N~~

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~227~~ SYSU-4	~~Confirmation to the aircraft system~~ System-generated notification that the ~~ground system has~~ received ~~the~~ message ~~to which the logical acknowledgement refers and found it~~ is acceptable for display ~~to the responsible person~~.	LOGICAL ACKNOWLEDGEMENT	~~M~~N	N
~~233~~ SYSU-5	~~Notification to~~ A system-generated message indicating that ~~messages sent requiring a~~ requests for logical ~~acknowledgement will~~ acknowledgements are not ~~be accepted by this ground system~~ permitted.	USE OF-LOGICAL ACKNOWLEDGEMENT PROHIBITED	M	N
~~234~~	~~Notification that the ground system does not have a flight plan for that aircraft.~~	~~FLIGHT PLAN NOT HELD~~	~~L~~	~~N~~
SYSU-6	Advisory providing the maximum one-way uplink message transmission delay.	LATENCY TIME VALUE *(latency value)*	N	N
SYSU-7	Indication that the received message has a latency greater than the requirement.	MESSAGE RECEIVED TOO LATE, RESEND MESSAGE OR CONTACT BY VOICE	M	N

Table A5-13-2. System management downlinks (SYSD)

Messages dedicated to the management of the CPDLC communications (usually sent by aircraft system).

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~62~~ SYSD-1	~~A~~ System-generated ~~message that the avionics has detected~~ notification of an error.	ERROR *(error information)*	~~L~~N	N
~~100~~ SYSD-2	~~Confirmation to the ground system~~ System-generated notification that the ~~aircraft system has~~ received ~~the~~ message ~~to which the logical acknowledgement refers and found it~~ is acceptable for display ~~to the responsible person~~.	LOGICAL ACKNOWLEDGEMENT	~~M~~N	N

Message element identifier	*Message element ~~intent/use~~intended use*	*~~Message element~~Format for message element display*	*ALRT*	*RESP*
~~63~~ SYSD-3	~~A~~ System-generated ~~denial to~~ rejection of any CPDLC message sent from a ground facility that is not the current data authority.	NOT CURRENT DATA AUTHORITY	~~L~~M	N
~~99~~ SYSD-4	~~A~~ System-generated ~~message to inform a~~ notification that the ground facility ~~that it~~ is now the current data authority.	CURRENT DATA AUTHORITY	~~L~~M	N
~~107~~ SYSD-5	~~A~~ System-generated ~~message sent to a ground system~~ notification that ~~tries to connect to an aircraft when a current data authority has not designated~~ the ground system is not designated as the ~~NDA~~ next data authority (NDA), indicating the identity of the Current Data Authority. Identity of the Next Data Authority, if any, is also reported.	NOT AUTHORIZED NEXT DATA AUTHORITY *(facility designation) (facility designation[O])*	~~L~~M	N
SYSD-6	Indication that the received message has a latency greater than the requirement.	MESSAGE RECEIVED TOO LATE, RESEND MESSAGE OR CONTACT BY VOICE	M	N
SYSD-7	System-generated notification that the aircraft is in the inhibited state.	AIRCRAFT CPDLC INHIBITED	M	N
~~64~~	~~Notification to the ground system that the specified ATSU is the current data authority.~~	~~*(facility designation)*~~	~~L~~	~~N~~
~~73~~	~~A system-generated message indicating the software version number.~~	~~*(version number)*~~	~~L~~	~~N~~

Origin:	**Rationale:**
OPLINKP/2 and ANC	<u>Regrouping of message elements</u> Message elements are grouped into operational categories to facilitate the identification of the set of message elements appropriate to any particular ATM function. These operational categories are also used to introduce a technology-independent numbering scheme, which is further explained below. <u>Changes to the numbering scheme</u> There are several underlying technologies to support CPDLC message exchanges, i.e. FANS 1/A, ATN B1 and later B2. The technical identifiers for an operational

message element contained in PANS-ATM may vary among the supporting interoperability standards of the industry. In order to avoid this constraint, the proposed numbering scheme in PANS ATM is made independent of the underlying data link technology to provide the technology-independent and operational definition of the CPDLC message set.

Note.— Detailed linkage with each of the supporting technologies (i.e. FANS 1/A, ATN B1 and later B2 message sets) is provided in the Global Operational Data Link (GOLD) Manual *(Doc 10037) Appendix A.*

<u>Changes to CPDLC message elements</u>

Changes to CPDLC message elements are proposed to support world-wide operations in airspaces where ATS surveillance services are provided as well as in airspaces where procedural separation is being applied. Lessons learned from extensive experience in current operations have been considered in terms of safety, flexibility and efficiency for the proposed changes. Proposed changes consist of a global rationalization of the CPDLC message set, intended to provide simplification while focusing on added value capabilities. The proposed changes can be categorized into the following enhancements:

- modification to existing message elements to improve their intelligibility to minimize errors associated with those messages;
- deletion or replacement of message elements that are potentially confusing, redundant or identified as not operationally required; and
- inclusion of new message elements designed to reflect current CPDLC operations.

The summary of major modifications is provided below:

- use of action verbs in an EXPECT message is excluded to avoid misinterpretation by the flight crew;

- constraint for manoeuvre completion, used to be expressed with “BY”, is reworded based on in-service experience and human factor assessments. It is now proposed to use “BEFORE TIME” or “BEFORE PASSING”;

- distinction has been introduced between message elements for vertical manoeuvres to specify those where a single altitude has to be used and those where either a single altitude or a vertical range can be used; and

- the terms “IMMEDIATELY” and “EXPEDITE” are now proposed as separated message elements, which can be concatenated, as needed, with any other instruction. Consequently, pre-formatted message elements that included those prefixes are now proposed for deletion (useless duplication).

The resulting CPDLC message set allows unambiguous reference to CPDLC message elements from PANS-ATM whenever required, while providing an operations-oriented description of the CPDLC message set.

	Some CPDLC message elements are proposed for deletion as an effort to eliminate the duplication with ADS-C capabilities, thus reducing implementation cost and unnecessary complications. Duplication can be eliminated for the following reasons: - vast majority of existing CPDLC implementations also support ADS-C capability; - failure of the ADS-C and CPDLC capabilities will be simultaneous on the aircraft; and - operational procedures should be in place to avoid unexpected flight crew disabling of the ADS-C application on the airplane. It is recognized that this proposal will require States to implement ADS-C with the required availability. It is however, the opinion of OPLINK that it would be much more effective (technically and more importantly, operationally, as there is no need to include the flight crew to get these aircraft information) to use ADS-C from the ground than to rely on controller/flight crew exchanges.

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14. Message elements parameters

Table A5-14-1. Parameters

Provides descriptions for the variables used in the parameters specified in the message elements.

Variable	*Description*
aircraft identification	Provides the aircraft identification identical to, or the code equivalent of, the aircraft call sign.
aircraft type	Specifies the aircraft type when known.
altimeter setting	Specifies an altimeter in inches of mercury or hectopascals.
arrival approach data	Specifies at least one of the following: destination airport, arrival runway, arrival procedure, or approach procedure.
ATIS code	Specifies the current ATIS code.
ATS route designator	Specifies the 2-7 character name of the route.
along track waypoint	Specifies point in the route specified as relative distance for another waypoint on the route. May include speed and level constraints at this point.
clearance limit	Specifies the farthest cleared point as a *position*.
clearance name	Specifies a 2-14 character name of a clearance, usually specifying the name of an unpublished procedure or route.
clearance type	Specifies the type of clearance as: approach, departure, further, startup, pushback, taxi, or oceanic.
degrees	Specifies direction in terms of degrees as either degrees from magnetic north or degrees from true north.

Variable	*Description*

departure clearance	Specifies the required departure clearance information as one or more of the following:
	• departure airport;
	• departure runway;
	• cleared to position;
	• departure route data specified as either;
	  o the route is as filed; or
	  o a SID and optionally that the rest of the route after the SID is as filed (i.e. then as filed).
	• departure level, and any constraint on the level (duration or until position);
	• expected level and any constraint on the level (duration or until position);
	• departure speed and any constraint on the speed (duration or until position);
	• departure heading in degrees;
	• indication when no delay is expected;
	• target start-up approval time;
	• arrival and/or approach procedures including any special instructions;
	• *discrete beacon code*;
	• *ATIS code*; and/or
	• departure frequency.

departure data	Specifies the departure data as at least one of the following: departure airport, departure runway, or departure procedure.
direction	Specifies direction as: • left, right, or either side; • north, south, east, or west; or • northeast, northwest, southeast, or southwest.
discrete beacon code	Specifies the beacon code as 4 octal digits.
due to reason uplink	Specifies the reason for the associated message as: opposite direction traffic, same direction traffic, converging traffic, crossing traffic, or diverging traffic, airspace restriction, invalid oceanic entry point, no flight plan held, oceanic clearance request received too late.
error information	Specifies reason for error as: unrecognized message reference number, insufficient resources, checksum failure, or undefined.
ETP time	Specifies the estimated time (hours and minutes) of passing opposite direction traffic.
facility designation	Specifies the ICAO location indicator for a facility.
facility function	Specifies the function of the facility as: centre, approach, tower, final, ground control, clearance delivery, departure, control, radio, apron, information, ramp, flight watch, AOC/company, de-icing, or flight service.
free text	Provides additional information in a non-structured format.
frequency	Specifies the frequency as an HF, VHF, or UHF frequency, or as a SATVOICE number.
hold at waypoint	Specifies a holding instruction providing the position of the holding as: *position*, and additionally any or all of the following: holding speed low, waypoint level constraint, holding speed high, a left or right holding, degrees, time a further clearance is expected, and *leg type*.
latency value	Provides the CPDLC message latency value in seconds.
lateral deviation	Specifies the lateral deviation as the permitted distance left, right, or either side from the cleared route in nautical miles or kilometres.

Variable	*Description*
latitude longitude	Specifies the latitude and longitude in degrees, minutes, tenths of minutes and direction (north, south, east or west).
leg type	Specifies a holding leg as distance (tenths of nautical miles or tenths of kilometres) or time (tenths of minutes).
level	Specifies a level as a single or block level in feet, metres, or flight levels.
level single	Specifies a single level in feet, metres, or flight levels.
named instruction	Specifies a named instruction as either a *clearance name* or a *procedure name*.
number of degrees	Provides the number of degrees.
number of minutes	Provides the number of minutes (time).
persons on board	Provides the number of persons on board or indicates that the number is unknown.
place bearing distance	Specifies a *place bearing* and a distance in nautical miles or kilometres.
place bearing	Specifies a *published identifier* and *degrees*.
position	Specifies a position as a: • *published identifier*; • *latitude longitude*; *or* • *place bearing distance*.
procedure name	Specifies a procedure name by specifying a procedure type (departure, arrival, or approach) and identifier (1-20 characters), and when applicable: • the runway; • any required procedure transition; and/or • any required additional information about the procedure.
published identifier	Specifies the published identifier name (1-5 characters) and associated latitude and longitude (degrees, minutes, seconds).
relay text	Specifies the information to be relayed to the specified aircraft as *free text*.
relayed text response	Specifies information relayed from the specified aircraft as *free text*.
remaining fuel	Specifies remaining fuel as time in seconds.
revision reason	Specifies the reason(s) for the clearance revision as any or all of the following: a level change, a speed change, a route change at a specified position, a route change at multiple waypoints, an entry point change, a clearance limit change, a named instruction change, and/or a ground location change.
en-route data	Specifies the cleared route of flight for up to 128 waypoints with positional information (*route information*), including for each waypoint as required, level constraint, speed constraint, required time of arrival, holding instruction and fly-by or flyover information (*route information additional*). A *clearance limit* may be included. A locally defined *named instruction* may also be included.
route information additional	Specifies any or all of the following: • 1 to 8 *along track waypoint*; • 1 to 8 *hold at waypoint*; • 1 to 32 *waypoint speed level*; *and* • 1 to 32 *required time arrival*.
route information	Specifies route information as one of: • *published identifier*; • *latitude longitude*; • *place bearing distance*; or • *ATS route designator*.

Variable	*Description*
required time arrival	For the specified position, provides the required time of arrival (hours, minutes (seconds (optional)), optionally any tolerance around the required time of arrival, and indicates the required time of arrival as at, before, or after the specified time.
runway	Specifies a runway by direction and configuration (left, right, centre, or none).
specified deviation	Specifies the deviation from the route as a *specified distance* or *number of degrees*.
specified distance	Specifies distance in nautical miles or kilometres.
speed	Specifies speed in English or metric units as indicated, true, ground, or Mach speed.
speed types	Specifies the speed as a minimum or maximum and 1 to 2 speed type(s), where the speed type indicates speed as: indicated, true, ground, Mach, approach, cruise, or present.
time	Specifies time in hours and minutes.
traffic description	Specifies a description of traffic significant to a flight by providing any or all of the following information: the *aircraft flight identification*, the *aircraft type*, the current flight level of the aircraft, the location relative to the given aircraft as the distance (if known) above or below, and indicates when known that the traffic is, opposite direction, same direction, converging, crossing, or diverging from the given aircraft.
traffic location	Specifies the location for opposite direction traffic indicating if the traffic is above or below the given aircraft, and when known, provides the vertical distance in feet or metres.
traffic visibility	Indicates the traffic visibility as: “sighted and passed”, “sighted”, or “not sighted”.
unit name	Specifies the unit name by providing any or all of the following: facility name, *facility designation*, or *facility function* as appropriate.
vertical rate	Specifies the vertical rate as feet/minute or metres/minute.
waypoint speed level	Specifies the speed and level constraints on the specified position.

Origin:	**Rationale:**
OPLINKP/2 and ANC	Currently, only a few parameters are explained as a note accompanied to some Tables. The proposal is to add the operational description of all parameters used in the CPDLC Message Set, which complements the list of message elements. The description of the CPDLC message elements parameters is necessary to understand how each CPDLC message element supports its operational intent.

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ATTACHMENT D to State letter SP 52/4-15/44

PROPOSED AMENDMENT TO ANNEX 6, PARTS I, II AND III CONCERNING PERFORMANCE-BASED COMMUNICATION AND SURVEILLANCE

NOTES ON THE PRESENTATION OF THE AMENDMENT

The text of the amendment is arranged to show deleted text with a line through it and new text highlighted with grey shading, as shown below:

~~Text to be deleted is shown with a line through it.~~	Text to be deleted
New text to be inserted is highlighted with grey shading.	New text to be inserted
~~Text to be deleted is shown with a line through it~~ followed by the replacement text which is highlighted with grey shading.	New text to replace existing text

PROPOSED AMENDMENT TO

INTERNATIONAL STANDARDS
AND RECOMMENDED PRACTICES

OPERATION OF AIRCRAFT

ANNEX 6
TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

PART I
INTERNATIONAL COMMERCIAL AIR TRANSPORT —
AEROPLANES

INITIAL PROPOSAL 1

ABBREVIATIONS AND SYMBOLS
(used in this Annex)

Abbreviations

. . .

PBC Performance-based communication
PBN Performance-based navigation
PBS Performance-based surveillance

RCP Required communication performance
RNAV Area navigation
RNP Required navigation performance
RSP Required surveillance performance

. . .

Origin:	Rationale:
OPLINKP/2	Performance-based communication and surveillance (PBCS) concept is introduced requiring new abbreviations and codes.

INITIAL PROPOSAL 2

PUBLICATIONS
(referred to in this Annex)

. . .

Manuals

. . .

~~*Manual on Required Communications Performance (RCP)*~~ *Performance-based Communication and Surveillance (PBCS) Manual* (Doc 9869)
Performance-based Navigation (PBN) Manual (Doc 9613)

. . .

Origin:	**Rationale:**
OPLINKP/2	The *Manual on Required Communications Performance (RCP)* (Doc 9869) is being updated and renamed as the *Performance-based Communication and Surveillance (PBCS) Manual* (Doc 9869) to support the PBCS concept and provide guidance on its implementation. Therefore, the title of Doc 9869 needs to be changed.

INITIAL PROPOSAL 3

CHAPTER 1

DEFINITIONS

When the following terms are used in the Standards and Recommended Practices for operation of aircraft in international commercial air transport, they have the following meanings:

. . .

Air traffic service (ATS). A generic term meaning variously, flight information service, alerting service, air traffic advisory service, air traffic control service (area control service, approach control service or aerodrome control service).

. . .

Performance-based communication (PBC). Communication based on performance specifications applied to the provision of air traffic services.

Note.— An RCP specification includes communication performance requirements that are allocated to system components in terms of the communication to be provided and associated transaction time, continuity, availability, integrity, safety and functionality needed for the proposed operation in the context of a particular airspace concept.

. . .

Performance-based surveillance (PBS). Surveillance based on performance specifications applied to the provision of air traffic services.

Note.— An RSP specification includes surveillance performance requirements that are allocated to system components in terms of the surveillance to be provided and associated data delivery time, continuity, availability, integrity, accuracy of the surveillance data, safety and functionality needed for the proposed operation in the context of a particular airspace concept.

. . .

Required communication performance (RCP) specification. ~~A statement of the performance requirements for operational communication in support of specific ATM functions.~~ A set of requirements for air traffic service provision and associated ground equipment, aircraft capability, and operations needed to support performance-based communication.

~~***Required communication performance type (RCP type)***. A label (e.g. RCP 240) that represents the values assigned to RCP parameters for communication transaction time, continuity, availability and integrity.~~

Required surveillance performance (RSP) specification. A set of requirements for air traffic service provision and associated ground equipment, aircraft capability, and operations needed to support performance-based surveillance.

. . .

Origin:	**Rationale:**
OPLINKP/2 Modified by the Secretariat through correspondence	The new terms used in the *Performance-based Communication and Surveillance* (PBCS) provisions are introduced and the existing terms are updated. The terms for performance-based communication (PBC) and performance-based surveillance (PBS) are aligned with those used for performance-based navigation (PBN), to facilitate advances in ATM operations within a complete and common performance-based framework for communication, navigation and surveillance (CNS). The term required communication performance (RCP), previously defined as “a

	statement of the performance requirements for operational communication in support of specific ATM functions", has been revised to align the concept of PBC with the concept of performance-based navigation (PBN). The terms RCP and required surveillance performance (RSP) are now used in the context of a specification that is applicable to the prescription of airspace requirements, qualification of ATS provision, aircraft capability, and operational use, including post-implementation monitoring. The terms also indicate differences with required navigation performance/area navigation (RNP/RNAV). While RNP/RNAV specifications apply to aircraft operating on a route of flight, required communication performance and required surveillance performance (RCP/RSP) specifications apply to air traffic service provision, aircraft capability and operations.

INITIAL PROPOSAL 4

CHAPTER 7

AEROPLANE COMMUNICATION, ~~AND~~ NAVIGATION AND SURVEILLANCE EQUIPMENT

7.1 Communication equipment

. . .

7.1.3 For ~~flights in defined portions of airspace or on routes~~ operations where communication equipment is required to meet an RCP ~~type~~ specification for *performance-based communication* (PBC) ~~has been prescribed~~, an aeroplane shall, in addition to the requirements specified in 7.1.1:

a) be provided with communication equipment which will enable it to operate in accordance with the prescribed RCP ~~typ(s)~~ specification(s); ~~and~~

b) ~~be authorized by the State of the Operator for operations in such airspace~~ have information relevant to the aeroplane RCP specification capabilities listed in the flight manual or other aeroplane documentation approved by the State of Design or State of Registry; and

c) have information relevant to the aeroplane RCP specification capabilities included in the MEL.

Note.— ~~Information on RCP and associated procedures, and guidance concerning the approval process, are contained in the Manual on Required Communications Performance (RCP) (Doc 9869). This document also contains references to other documents produced by States and international bodies concerning communication systems and RCP~~. Information on the performance-based communication and

surveillance (PBCS) concept and guidance material on its implementation are contained in the Performance-based Communication and Surveillance (PBCS) Manual *(Doc 9869)*.

7.1.4 The State of the Operator shall, for operations where an RCP specification for PBC has been prescribed, ensure that the operator has established and documented:

a) normal and abnormal procedures, including contingency procedures;

b) flight crew qualification and proficiency requirements, in accordance with appropriate RCP specifications;

c) a training programme for relevant personnel consistent with the intended operations; and

d) appropriate maintenance procedures to ensure continued airworthiness, in accordance with appropriate RCP specifications.

7.1.5 The State of the Operator shall ensure that, in respect of those aeroplanes mentioned in 7.1.3, adequate provisions exist for:

a) receiving the reports of observed communication performance issued by the monitoring programmes established in accordance with Annex 11, Chapter 3, 3.3.5.2; and

b) taking immediate corrective action for individual aircraft, aircraft types or operators, identified in such reports as not complying with the RCP specification.

7.2 Navigation equipment

. . .

7.3 Surveillance equipment

7.3.1 An aeroplane shall be provided with surveillance equipment which will enable it to operate in accordance with the requirements of air traffic services.

7.3.2 For operations where surveillance equipment is required to meet an RSP specification for performance-based surveillance (PBS), an aeroplane shall, in addition to the requirements specified in 7.3.1:

a) be provided with surveillance equipment which will enable it to operate in accordance with the prescribed RSP specification(s);

b) have information relevant to the aeroplane RSP specification capabilities listed in the flight manual or other aeroplane documentation approved by the State of Design or State of Registry; and

c) have information relevant to the aeroplane RSP specification capabilities included in the MEL.

Note 1.— Information on surveillance equipment is contained in the Aeronautical Surveillance Manual *(Doc 9924).*

Note 2.— Information on RSP specifications for performance-based surveillance is contained in the Performance-based Communication and Surveillance (PBCS) Manual *(Doc 9869).*

7.3.3 The State of the Operator shall, for operations where an RSP specification for PBS has been prescribed, ensure that the operator has established and documented:

a) normal and abnormal procedures, including contingency procedures;

b) flight crew qualification and proficiency requirements, in accordance with appropriate RSP specifications;

c) a training programme for relevant personnel consistent with the intended operations; and

d) appropriate maintenance procedures to ensure continued airworthiness, in accordance with appropriate RSP specifications.

7.3.4 The State of the Operator shall ensure that, in respect of those aeroplanes mentioned in 7.3.2, adequate provisions exist for:

a) receiving the reports of observed surveillance performance issued by such monitoring programmes in accordance with Annex 11, Chapter 3, 3.3.5.2; and

b) taking immediate corrective action for individual aircraft, aircraft types or operators, identified in such reports as not complying with the RSP specification.

<table>
<tr><td>Origin:

OPLINKP/2
FLTOPSP/1</td><td>Rationale:

This proposal is to revise the existing provision from RCP to PBC and to add a provision for surveillance equipment and PBS. More specifically, it is to add a provision for operations where RCP and RSP specifications are prescribed to ensure that:

a) the aircraft communication and surveillance system meets the RCP and RSP specification(s) respectively. This provision was adapted from the proposed amendment to the existing provision for PBN developed by the Flight Operations Panel (FLTOPSP);

b) the operator participates in monitoring programmes established by the air navigation service providers (ANSPs), as per Annex 11 — Air Traffic Services, Chapter 3, 3.3.5.2, which will allow system performance against RCP/RSP specifications to be monitored. This provision was adapted from the existing provision for reduced vertical separation minimum (RVSM), which also requires continued performance monitoring in accordance with Annex 11, Chapter 3.

The PBCS concept provides objective operational criteria to evaluate different and emerging communication and surveillance technologies that are intended for</td></tr>
</table>

	evolving ATM operations. It also provides a global framework for management and continuous improvement of communication and surveillance system performance. This proposal meets the need to optimize the use of available airspace while ensuring the safety of the operation. It supports application of performance-based separation minima, an increase in user-preferred routes and decreased flight times, thus reducing aircraft operators' fuel burn and greenhouse gas emissions. Some States have already implemented part of the PBCS framework and recognize the need for adoption of this ICAO material.

INITIAL PROPOSAL 5

7.4~~3~~ Installation

The equipment installation shall be such that the failure of any single unit required for ~~either~~ communication~~s~~, ~~or~~ navigation or surveillance purposes or any combination thereof ~~both~~ will not result in the failure of another unit required for communication~~s~~, ~~or~~ navigation or surveillance purposes.

7.54 Electronic navigation data management

Editorial Note.— Renumber subsequent paragraphs accordingly.

. . .

Origin:	**Rationale:**
OPLINKP/2 FLTOPSP/1	The proposal is to include surveillance in the provision. Technologies, such as automatic dependent surveillance – contract (ADS-C) and automatic dependent surveillance – broadcast (ADS-B), are based on aircraft systems and equipment whose performance characteristics are critical to support certain ATM operations. Aircraft systems and equipment support communication, navigation and surveillance capabilities.

— — — — — — — —

PROPOSED AMENDMENT TO

INTERNATIONAL STANDARDS
AND RECOMMENDED PRACTICES

OPERATION OF AIRCRAFT

ANNEX 6
TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

PART II
INTERNATIONAL GENERAL AVIATION — AEROPLANES

INITIAL PROPOSAL 1

ABBREVIATIONS AND SYMBOLS

(used in this Annex)

Abbreviations

. . .

PBC Performance-based communication
PBN Performance-based navigation
PBS Performance-based surveillance

RCP Required communication performance
RNAV Area navigation
RNP Required navigation performance
RSP Required surveillance performance

. . .

Origin:	**Rationale:**
OPLINKP/2	Performance-based communication and surveillance (PBCS) concept is introduced requiring new abbreviations and codes.

INITIAL PROPOSAL 2

PUBLICATIONS
(referred to in this Annex)

. . .

Manuals

. . .

~~*Manual on Required Communications Performance (RCP)*~~ *Performance-based Communication and Surveillance (PBCS) Manual* (Doc 9869)
Performance-based Navigation (PBN) Manual (Doc 9613)

. . .

Origin:	**Rationale:**
OPLINKP/2	The *Manual on Required Communications Performance (RCP)* (Doc 9869) is being updated and renamed as the *Performance-based Communication and Surveillance (PBCS) Manual* (Doc 9869) to support the PBCS concept and provide guidance on its implementation. Therefore, the title of Doc 9869 needs to be changed.

INITIAL PROPOSAL 3

CHAPTER 1.1

DEFINITIONS

When the following terms are used in the Standards and Recommended Practices for the operation of aeroplanes in international general aviation, they have the following meanings:

. . .

Air traffic service (ATS). A generic term meaning variously, flight information service, alerting service, air traffic advisory service, air traffic control service (area control service, approach control service or aerodrome control service).

. . .

Performance-based communication (PBC). Communication based on performance specifications applied to the provision of air traffic services.

Note.— An RCP specification includes communication performance requirements that are allocated to system components in terms of the communication to be provided and associated transaction time, continuity, availability, integrity, safety and functionality needed for the proposed operation in the context of a particular airspace concept.

. . .

Performance-based surveillance (PBS). Surveillance based on performance specifications applied to the provision of air traffic services.

Note.— An RSP specification includes surveillance performance requirements that are allocated to system components in terms of the surveillance to be provided and associated data delivery time, continuity, availability, integrity, accuracy of the surveillance data, safety and functionality needed for the proposed operation in the context of a particular airspace concept.

. . .

Required communication performance (RCP) specification. ~~A statement of the performance requirements for operational communication in support of specific ATM functions.~~ A set of requirements for air traffic service provision and associated ground equipment, aircraft capability, and operations needed to support performance-based communication.

~~***Required communication performance type (RCP type).*** A label (e.g. RCP 240) that represents the values assigned to RCP parameters for communication transaction time, continuity, availability and integrity.~~

Required surveillance performance (RSP) specification. A set of requirements for air traffic service provision and associated ground equipment, aircraft capability, and operations needed to support performance-based surveillance.

. . .

Origin:	**Rationale:**
OPLINKP/2 Modified by the Secretariat through correspondence	The new terms that are used in the PBCS provisions are introduced and the existing terms are updated. The terms for performance-based communication (PBC) and performance-based surveillance (PBS) are aligned with those used for performance-based navigation (PBN), to facilitate advances in ATM operations within a complete and common performance-based framework for communication, navigation and surveillance (CNS). The term RCP, previously defined as “a statement of performance requirements for operational communication in support of specific ATM functions”, has been revised to align the concept of PBC with the concept of PBN. The terms RCP and RSP are now used in the context of a specification that is

	applicable to the prescription of airspace requirements, qualification of ATS provision, aircraft capability, and operational use, including post-implementation monitoring. The terms also indicate differences with required navigation performance/area navigation (RNP/RNAV). While RNP/RNAV specifications apply to aircraft operating on a route of flight, required communication performance and required surveillance performance (RCP/RSP) specifications apply to air traffic service provision, aircraft capability and operations.

INITIAL PROPOSAL 4

SECTION 2
GENERAL AVIATION OPERATIONS

. . .

CHAPTER 2.5 AEROPLANE COMMUNICATION, ~~AND~~ NAVIGATION AND SURVEILLANCE EQUIPMENT

2.5.1 Communication equipment

. . .

2.5.1.6 For ~~flight~~ operations ~~in defined portions of airspace or on routes~~ where communication equipment is required to meet an RCP specification for *performance-based communication* (PBC) ~~type has been prescribed~~, an aeroplane shall, in addition to the requirements specified in 2.5.1.1 to 2.5.1.5:

a) be provided with communication equipment which will enable it to operate in accordance with the prescribed RCP specification(s) ~~type(s)~~; ~~and~~

b) ~~be authorized by the State of Registry for such operations.~~ have information relevant to the aeroplane RCP specification capabilities listed in the flight manual or other aeroplane documentation approved by the State of Design or State of Registry; and

c) where the aeroplane is operated in accordance with a MEL, have information relevant to the aeroplane RCP specification capabilities included in the MEL.

Note.— ~~Information on RCP and associated procedures, and guidance concerning the approval process, are contained in the Manual on Required Communications Performance (RCP) (Doc 9869). This document also contains references to other documents produced by States and international bodies concerning communication systems and RCP~~. Information on the performance-based communication and

surveillance (PBCS) concept and guidance material on its implementation are contained in the Performance-based Communication and Surveillance (PBCS) Manual *(Doc 9869).*

2.5.1.7 The State of Registry shall establish criteria for operations where an RCP specification for PBC has been prescribed.

2.5.1.8 In establishing criteria for operations where an RCP specification for PBC has been prescribed, the State of Registry shall require that the operator/owner establish:

a) normal and abnormal procedures, including contingency procedures;

b) flight crew qualification and proficiency requirements, in accordance with the appropriate RCP specifications;

c) a training programme for relevant personnel consistent with the intended operations; and

d) appropriate maintenance procedures to ensure continued airworthiness, in accordance with appropriate RCP specifications.

2.5.1.9 The State of Registry shall ensure that, in respect of those aeroplanes mentioned in 2.5.1.6, adequate provisions exist for:

a) receiving the reports of observed communication performance issued by the monitoring programmes established in accordance with Annex 11, Chapter 3, 3.3.5.2; and

b) taking immediate corrective action for individual aircraft, aircraft types or operators, identified in such reports as not complying with the RCP specification.

. . .

2.5.3 Surveillance equipment

2.5.3.1 An aeroplane shall be provided with surveillance equipment which will enable it to operate in accordance with the requirements of air traffic services.

2.5.3.2 For operations where surveillance equipment is required to meet an RSP specification for performance-based surveillance (PBS), an aeroplane shall, in addition to the requirements specified in 2.5.3.1:

a) be provided with surveillance equipment which will enable it to operate in accordance with the prescribed RSP specification(s);

b) have information relevant to the aeroplane RSP specification capabilities listed in the flight manual or other aeroplane documentation approved by the State of Design or State of Registry; and

c) where the aeroplane is operated in accordance with a MEL, have information relevant to the aeroplane RSP specification capabilities included in the MEL.

Note 1.— Information on surveillance equipment is contained in the Aeronautical Surveillance Manual *(Doc 9924).*

Note 2.— Information on RSP specifications for performance-based surveillance is contained in the Performance-based Communication and Surveillance (PBCS) Manual *(Doc 9869).*

2.5.3.3 The State of the Registry shall establish criteria for operations where an RSP specification for PBS has been prescribed.

2.5.3.4 In establishing criteria for operations where an RSP specification for PBS has been prescribed, the State of Registry shall require that the operator/owner establish:

a) normal and abnormal procedures, including contingency procedures;

b) flight crew qualification and proficiency requirements, in accordance with appropriate RSP specifications;

c) a training programme for relevant personnel consistent with the intended operations; and

d) appropriate maintenance procedures to ensure continued airworthiness, in accordance with appropriate RSP specifications.

2.5.3.5 The State of Registry shall ensure that, in respect of those aeroplanes mentioned in 2.5.3.2, adequate provisions exist for:

a) receiving the reports of observed surveillance performance issued by such monitoring programmes in accordance with Annex 11, Chapter 3, 3.3.5.2; and

b) taking immediate corrective action for individual aircraft, aircraft types or operators, identified in such reports as not complying with the RSP specification.

. . .

Origin:	***Rationale:***
OPLINKP/2 FLTOPSP/1	This proposal is to revise the existing provision from RCP to PBC and to add a provision for surveillance equipment and PBS. More specifically, it is to add a provision for operations where RCP and RSP specifications are prescribed to ensure that: a) the aircraft communication and surveillance system meets the RCP and RSP specification(s) respectively. This provision was adapted from the proposed amendment to the existing provision for PBN developed by the Flight Operations Panel (FLTOPSP); b) the operator participates in monitoring programmes established by the air navigation service providers (ANSPs), as per Annex 11 — *Air Traffic Services*, Chapter 3, 3.3.5.2, which will allow system performance against RCP/RSP specifications to be monitored. This provision was adapted from the existing provision for reduced vertical separation minimum (RVSM), which also requires continued performance monitoring in accordance with Annex 11, Chapter 3. The PBCS concept provides objective operational criteria to evaluate different and

	emerging communication and surveillance technologies that are intended for evolving ATM operations. It also provides a global framework for management and continuous improvement of communication and surveillance system performance. This proposal meets the need to optimize the use of available airspace while ensuring the safety of the operation. It supports application of performance-based separation minima, an increase in user-preferred routes and decreased flight times, thus reducing aircraft operators' fuel burn, and greenhouse gas emissions. Some States have already implemented part of the PBCS framework and recognize the need for adoption of this ICAO material.

INITIAL PROPOSAL 5

SECTION 3

LARGE AND TURBOJET AEROPLANES

. . .

CHAPTER 3.7 AEROPLANE COMMUNICATION, ~~AND~~ NAVIGATION AND SURVEILLANCE EQUIPMENT

. . .

3.7.2 Installation

The equipment installation shall be such that the failure of any single unit required for ~~either~~ communications, ~~or~~ navigation or surveillance purposes or any combination thereof ~~both~~ will not result in the failure of another unit required for communications, ~~or~~ navigation or surveillance purposes.

. . .

Origin:	**Rationale:**
OPLINKP/2 FLTOPSP/1	The proposal is to include surveillance in the provision. Technologies, such as automatic dependent surveillance – contract (ADS-C) and automatic dependent surveillance – broadcast (ADS-B), are based on aircraft systems and equipment whose performance characteristics are critical to support certain ATM operations. Aircraft systems and equipment support communication, navigation and surveillance capabilities.

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PROPOSED AMENDMENT TO

INTERNATIONAL STANDARDS
AND RECOMMENDED PRACTICES

OPERATION OF AIRCRAFT

ANNEX 6
TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

PART III
INTERNATIONAL OPERATIONS — HELICOPTERS

INITIAL PROPOSAL 1

ABBREVIATIONS AND SYMBOLS

(used in this Annex)

Abbreviations

. . .

PBC Performance-based communication
PBN Performance-based navigation
PBS Performance-based surveillance

. . .

RCP Required communication performance
RNAV Area navigation
RNP Required navigation performance
RSP Required surveillance performance

. . .

Origin:	**Rationale:**
OPLINKP/2	Performance-based communication and surveillance (PBCS) concept is introduced requiring new abbreviations and codes.

INITIAL PROPOSAL 2

PUBLICATIONS
(referred to in this Annex)

. . .

Manuals

. . .

~~*Manual on Required Communications Performance (RCP)*~~ *Performance-based Communication and Surveillance (PBCS) Manual* (Doc 9869)
Performance-based Navigation (PBN) Manual (Doc 9613)

. . .

Origin:	Rationale:
OPLINKP/2	The *Manual on Required Communications Performance (RCP)* (Doc 9869) is being updated and renamed as the *Performance-based Communication and Surveillance (PBCS) Manual* (Doc 9869) to support the PBCS concept and provide guidance on its implementation. Therefore, the title of Doc 9869 needs to be changed.

INITIAL PROPOSAL 3

SECTION I. GENERAL

CHAPTER 1. DEFINITIONS

When the following terms are used in the Standards and Recommended Practices for international operations with helicopters, they have the following meanings:

. . .

Air traffic service (ATS). A generic term meaning variously, flight information service, alerting service, air traffic advisory service, air traffic control service (area control service, approach control service or aerodrome control service).

. . .

Performance-based communication (PBC). Communication based on performance specifications applied to the provision of air traffic services.

Note.— An RCP specification includes communication performance requirements that are allocated to system components in terms of the communication to be provided and associated transaction time, continuity, availability, integrity, safety and functionality needed for the proposed operation in the context of a particular airspace concept.

. . .

Performance-based surveillance (PBS). Surveillance based on performance specifications applied to the provision of air traffic services.

Note.— An RSP specification includes surveillance performance requirements that are allocated to system components in terms of the surveillance to be provided and associated data delivery time, continuity, availability, integrity, accuracy of the surveillance data, safety and functionality needed for the proposed operation in the context of a particular airspace concept.

. . .

Required communication performance (RCP) specification.~~— A statement of the performance requirements for operational communication in support of specific ATM functions.~~ A set of requirements for air traffic service provision and associated ground equipment, aircraft capability, and operations needed to support performance-based communication.

~~***Required communication performance type (RCP type)***. A label (e.g. RCP 240) that represents the values assigned to RCP parameters for communication transaction time, continuity, availability and integrity.~~

Required surveillance performance (RSP) specification. A set of requirements for air traffic service provision and associated ground equipment, aircraft capability, and operations needed to support performance-based surveillance.

. . .

Origin:	**Rationale:**
OPLINKP/2 Modified by the Secretariat through correspondence	The new terms that are used in the PBCS provisions are introduced and the existing terms are updated. The terms for performance-based communication (PBC) and performance-based surveillance (PBS) are aligned with those used for performance-based navigation (PBN), to facilitate advances in ATM operations within a complete and common performance-based framework for communication, navigation and surveillance (CNS). The term RCP, previously defined as “a statement of performance requirements for operational communication in support of specific ATM functions”, has been revised to align the concept of PBC with the concept of PBN.

	The terms RCP and RSP are now used in the context of a specification that is applicable to the prescription of airspace requirements, qualification of ATS provision, aircraft capability, and operational use, including post-implementation monitoring. The terms also indicate differences with required navigation performance/area navigation (RNP/RNAV). While RNP/RNAV specifications apply to aircraft operating on a route of flight, required communication performance and required surveillance performance (RCP/RSP) specifications apply to air traffic service provision, aircraft capability and operations.

INITIAL PROPOSAL 4

SECTION II. INTERNATIONAL COMMERCIAL AIR TRANSPORT

. . .

CHAPTER 5

HELICOPTER COMMUNICATION, ~~AND~~ NAVIGATION AND SURVEILLANCE EQUIPMENT

5.1 Communication equipment

. . .

5.1.3 For operations ~~flights in defined portions of airspace or on routes~~ where communication equipment is required to meet an RCP ~~type~~ specification for *performance-based communication* (PBC) ~~has been prescribed~~, a helicopter shall, in addition to the requirements specified in 5.1.1:

a) be provided with communication equipment which will enable it to operate in accordance with the prescribed RCP ~~type(s)~~ specification(s); ~~and~~

b) ~~be authorized by the State of the Operator for operations in such airspace.~~have information relevant to the helicopter RCP specification capabilities is listed in the flight manual or other helicopter documentation approved by the State of Design or State of Registry; and

c) have information relevant to the helicopter RCP specification capabilities included in the MEL.

Note.— ~~Information on RCP and associated procedures, and guidance concerning the approval process, are contained in the Manual on Required Communications Performance (RCP) (Doc 9869). This document also contains references to other documents produced by States and international bodies concerning communication systems and RCP~~. Information on the performance-based communication and

surveillance (PBCS) concept and guidance material on its implementation are contained in the Performance-based Communication and Surveillance (PBCS) Manual *(Doc 9869).*

5.1.4 The State of the Operator shall, for operations where a RCP specification for PBC has been prescribed, ensure that the operator has established and documented:

a) normal and abnormal procedures, including contingency procedures;

b) flight crew qualification and proficiency requirements, in accordance with appropriate RCP specifications;

c) a training programme for relevant personnel consistent with the intended operations; and

d) appropriate maintenance procedures to ensure continued airworthiness, in accordance with appropriate RCP specifications.

5.1.5 The State of the Operator shall ensure that, in respect of those helicopters mentioned in 5.1.3, adequate provisions exist for:

a) receiving the reports of observed communication performance issued by such monitoring programmes in accordance with Annex 11, Chapter 3, 3.3.5.2; and

b) taking immediate corrective action for individual helicopters, helicopter types or operators, identified in such reports as not complying with the RCP specification.

. . .

5.3 Surveillance equipment

5.3.1 A helicopter shall be provided with surveillance equipment which will enable it to operate in accordance with the requirements of air traffic services.

5.3.2 For operations where surveillance equipment is required to meet an RSP specification for performance-based surveillance (PBS), a helicopter shall, in addition to the requirements specified in 5.3.1:

a) be provided with surveillance equipment which will enable it to operate in accordance with the prescribed RSP specification(s);

b) have information relevant to the helicopter RSP specification capabilities listed in the flight manual or other helicopter documentation approved by the State of Design or State of Registry; and

c) have information relevant to the helicopter RSP specification capabilities included in the MEL.

Note 1.— Information on surveillance equipment is contained in the Aeronautical Surveillance Manual *(Doc 9924).*

Note 2.— Information on RSP specifications for performance-based surveillance is contained in the Performance-based Communication and Surveillance (PBCS) Manual *(Doc 9869).*

5.3.3 The State of the Operator shall, for operations where an RSP specification for PBS has been prescribed, ensure that the operator has established and documented:

a) normal and abnormal procedures, including contingency procedures;

b) flight crew qualification and proficiency requirements, in accordance with appropriate RSP specifications;

c) a training programme for relevant personnel consistent with the intended operations; and

d) appropriate maintenance procedures to ensure continued airworthiness, in accordance with appropriate RSP specifications.

5.3.4 The State of the Operator shall ensure that, in respect of those helicopters mentioned in 5.3.2, adequate provisions exist for:

a) receiving the reports of observed surveillance performance issued by such monitoring programmes in accordance with Annex 11, Chapter 3, 3.3.5.2; and

b) taking immediate corrective action for individual helicopter, helicopter types or operators, identified in such reports as not complying with the RSP specification.

Origin:	***Rationale:***
OPLINKP/2 FLTOPSP/1	This proposal is to revise the existing provision from RCP to PBC and to add a provision for surveillance equipment and PBS. More specifically, it is to add a provision for operations where RCP and RSP specifications are prescribed to ensure that: a) the aircraft communication and surveillance system meets the RCP and RSP specification(s) respectively. This provision was adapted from the proposed amendment to the existing provision for PBN developed by Flight Operations Panel (FLTOPSP); b) the operator participates in monitoring programmes established by the air navigation service providers (ANSPs), as per Annex 11 — *Air Traffic Services*, Chapter 3, 3.3.5.2, which will allow system performance against RCP/RSP specifications to be monitored. This provision was adapted from the existing provision for reduced vertical separation minimum (RVSM), which also requires continued performance monitoring in accordance with Annex 11, Chapter 3. The PBCS concept provides objective operational criteria to evaluate different and emerging communication and surveillance technologies that are intended for evolving ATM operations. It also provides a global framework for management and continuous improvement of communication and surveillance system performance. This proposal meets the need to optimize the use of available airspace while ensuring the safety of the operation. It supports application of performance-based

	separation minima, an increase in user-preferred routes and decreased flight times, thus reducing aircraft operators' fuel burn and greenhouse gas emissions. Some States have already implemented part of the PBCS framework and recognize the need for adoption of this ICAO material.

INITIAL PROPOSAL 5

5.4~~3~~ Installation

The equipment installation shall be such that the failure of any single unit required for ~~either~~ communication~~s~~, ~~or~~ navigation or surveillance purposes or any combination thereof ~~both~~ will not result in the failure of another unit required for communication~~s~~, ~~or~~ navigation or surveillance purposes.

. . .

Origin:	**Rationale:**
OPLINKP/2 FLTOPSP/1	The proposal is to include surveillance in the provision. Technologies, such as automatic dependent surveillance – contract (ADS-C) and automatic dependent surveillance – broadcast (ADS-B), are based on aircraft systems and equipment whose performance characteristics are critical to support certain ATM operations. Aircraft systems and equipment support communication, navigation and surveillance capabilities.

INITIAL PROPOSAL 6

SECTION III. INTERNATIONAL GENERAL AVIATION

. . .

CHAPTER 5

HELICOPTER COMMUNICATION, ~~AND~~
NAVIGATION AND SURVEILLANCE EQUIPMENT

5.1 Communication equipment

. . .

5.1.6 For operations ~~flights in defined portions of airspace or on routes~~ where communication equipment is required to meet an RCP ~~type~~ specification for *performance-based communication* (PBC) ~~has been prescribed~~, a helicopter shall, in addition to the requirements specified in 5.1.1 to 5.1.5:

a) be provided with communication equipment which will enable it to operate in accordance with the prescribed RCP ~~type(s)~~ specification(s); ~~and~~

b) ~~be authorized by the State of Registry for operations in such airspace.~~ have information relevant to the helicopter RCP specification capabilities listed in the flight manual or other helicopter documentation, approved by the State of Design or State of Registry; and

c) where the helicopter is operated in accordance with a MEL, have information relevant to the helicopter RCP specification capabilities included in the MEL.

Note.— ~~Information on RCP and associated procedures, and guidance concerning the approval process, are contained in the Manual on Required Communications Performance (RCP) (Doc 9869). This document also contains references to other documents produced by States and international bodies concerning communication systems and RCP~~. Information on the performance-based communication and surveillance (PBCS) concept and guidance material on its implementation are contained in the Performance-based Communication and Surveillance (PBCS) Manual *(Doc 9869).*

5.1.7 The State of the Registry shall establish criteria for operations where an RCP specification for PBC has been prescribed.

5.1.8 In establishing criteria for operations where an RCP specification for PBC has been prescribed, the State of Registry shall require that the operator/owner establish:

a) normal and abnormal procedures, including contingency procedures;

b) flight crew qualification and proficiency requirements, in accordance with appropriate RCP specifications;

c) a training programme for relevant personnel consistent with the intended operations; and

d) appropriate maintenance procedures to ensure continued airworthiness, in accordance with appropriate RCP specifications.

5.1.9 The State of Registry shall ensure that, in respect of those helicopters mentioned in 5.1.6, adequate provisions exist for:

a) receiving the reports of observed communication performance issued by such monitoring programmes in accordance with Annex 11, Chapter 3, 3.3.5.2; and

b) taking immediate corrective action for individual helicopters, helicopter types or operators, identified in such reports as not complying with the RCP specification.

. . .

5.3 Surveillance equipment

5.3.1 A helicopter shall be provided with surveillance equipment which will enable it to operate in accordance with the requirements of air traffic services.

5.3.2 For operations where surveillance equipment is required to meet an RSP specification for performance-based surveillance (PBS), a helicopter shall, in addition to the requirements specified in 5.3.1:

a) be provided with surveillance equipment which will enable it to operate in accordance with the prescribed RSP specification(s);

b) have information relevant to the helicopter RSP specification capabilities listed in the flight manual or other helicopter documentation approved by the State of Design or State of Registry; and

c) where the helicopter is operated in accordance with a MEL, have information relevant to the helicopter RSP specification capabilities included in the MEL.

Note 1.— Information on surveillance equipment is contained in the Aeronautical Surveillance Manual *(Doc 9924).*

Note 2.— Information on RSP specifications for performance-based surveillance is contained in the Performance-based Communication and Surveillance (PBCS) Manual *(Doc 9869).*

5.3.3 The State of the Registry shall establish criteria for operations where an RSP specification for PBS has been prescribed.

5.3.4 In establishing criteria for operations where an RSP specification for PBS has been prescribed, the State of Registry shall require that the operator/owner establish:

a) normal and abnormal procedures, including contingency procedures;

b) flight crew qualification and proficiency requirements, in accordance with appropriate RSP specifications;

c) a training programme for relevant personnel consistent with the intended operations; and

d) appropriate maintenance procedures to ensure continued airworthiness, in accordance with appropriate RSP specifications.

5.3.5 The State of Registry shall ensure that, in respect of those helicopters mentioned in 5.3.2, adequate provisions exist for:

a) receiving the reports of observed surveillance performance issued by such monitoring programmes in accordance with Annex 11, Chapter 3, 3.3.5.2; and

b) taking immediate corrective action for individual helicopter, helicopter types or operators, identified in such reports as not complying with the RSP specification.

Origin:	***Rationale:***
OPLINKP/2 FLTOPSP/1	This proposal is to revise the existing provision from RCP to PBC and to add a provision for surveillance equipment and PBS. More specifically, it is to add a provision for operations where RCP and RSP specifications are prescribed to

	ensure that: a) the aircraft communication and surveillance system meets the RCP and RSP specification(s) respectively. This provision was adapted from the proposed amendment to the existing provision for PBN developed by the Flight Operations Panel (FLTOPSP); b) the operator participates in monitoring programmes established by the air navigation service providers (ANSPs), as per Annex 11 — *Air Traffic Services*, Chapter 3, 3.3.5.2, which will allow system performance against RCP/RSP specifications to be monitored. This provision was adapted from the existing provision for reduced vertical separation minimum (RVSM), which also requires continued performance monitoring in accordance with Annex 11, Chapter 3. The PBCS concept provides objective operational criteria to evaluate different and emerging communication and surveillance technologies that are intended for evolving ATM operations. It also provides a global framework for management and continuous improvement of communication and surveillance system performance. This proposal meets the need to optimize the use of available airspace while ensuring the safety of the operation. It supports application of performance-based separation minima, an increase in user-preferred routes and decreased flight times, thus reducing aircraft operators' fuel burn and greenhouse gas emissions. Some States have already implemented part of the PBCS framework and recognize the need for adoption of this ICAO material.

— — — — — — — —

PROPOSED AMENDMENT TO ANNEX 11
CONCERNING PERFORMANCE-BASED COMMUNICATION
AND SURVEILLANCE

NOTES ON THE PRESENTATION OF THE AMENDMENT

The text of the amendment is arranged to show deleted text with a line through it and new text highlighted with grey shading, as shown below:

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PROPOSED AMENDMENT TO

INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

AIR TRAFFIC SERVICES

ANNEX 11 TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

INITIAL PROPOSAL 1

CHAPTER 1. DEFINITIONS

. . .

When the following terms are used in the Standards and Recommended Practices for Air Traffic Services, they have the following meanings:

. . .

Performance-based communication (PBC). Communication based on performance specifications applied to the provision of air traffic services.

Note.— An RCP specification includes communication performance requirements that are allocated to system components in terms of the communication to be provided and associated transaction time, continuity, availability, integrity, safety and functionality needed for the proposed operation in the context of a particular airspace concept.

. . .

Performance-based surveillance (PBS). Surveillance based on performance specifications applied to the provision of air traffic services.

Note.— An RSP specification includes surveillance performance requirements that are allocated to system components in terms of the surveillance to be provided and associated data delivery time, continuity, availability, integrity, accuracy of the surveillance data, safety and functionality needed for the proposed operation in the context of a particular airspace concept.

. . .

~~***RCP type***. A label (e.g. RCP 240) that represents the values assigned to RCP parameters for communication transaction time, continuity, availability and integrity.~~

Required communication performance (RCP) specification.~~— A statement of the performance requirements for operational communication in support of specific ATM functions.~~ A set of requirements for air traffic service provision and associated ground equipment, aircraft capability, and operations needed to support performance-based communication.

Required surveillance performance (RSP) specification. A set of requirements for air traffic service provision and associated ground equipment, aircraft capability, and operations needed to support performance-based surveillance.

. . .

Origin:	**Rationale:**
OPLINKP/2 Modified by the Secretariat through correspondence	The new terms that are used in the PBCS provisions are introduced and the existing terms are updated. The terms for performance-based communication (PBC) and performance-based surveillance (PBS) are aligned with those used for performance-based navigation (PBN), to facilitate advances in ATM operations within a complete and common performance-based framework for communication, navigation and surveillance (CNS). The term RCP, previously defined as “a statement of performance requirements for operational communication in support of specific ATM functions”, has been revised to align the concept of PBC with the concept of PBN. The terms RCP and RSP are now used in the context of a specification that is applicable to the prescription of airspace requirements, qualification of ATS provision, aircraft capability, and operational use, including post-implementation monitoring. The terms also indicate differences with required navigation performance/area navigation (RNP/RNAV). While RNP/RNAV specifications apply to aircraft operating on a route of flight, required communication performance and required surveillance performance (RCP/RSP) specifications apply to air traffic service provision, aircraft capability and operations.

INITIAL PROPOSAL 2

CHAPTER 2. GENERAL

. . .

2.8 ~~Required communication performance (RCP)~~ Performance-based communication (PBC) operations

2.8.~~1~~ In applying performance-based communication (PBC), RCP ~~types~~ specifications shall be prescribed by States. When applicable, the RCP ~~type(s)~~ specification(s) shall be prescribed on the basis of regional air navigation agreements.

Note.— In prescribing an RCP specification, limitations may apply as a result of communication infrastructure constraints or specific communication functionality requirements.

2.8.2 The prescribed RCP ~~type~~ specification shall be appropriate to the air traffic services provided.

Note.— ~~Applicable RCP types and associated procedures will be published in the Manual on Required Communication Performance (RCP) (Doc 9869) (in preparation)~~. Information on the performance-based communication and surveillance (PBCS) *concept and guidance material on its implementation are contained in the* Performance-based Communication and Surveillance (PBCS) Manual *(Doc 9869).*

2.9 Performance-based surveillance (PBS) operations

2.9.1 In applying performance-based surveillance (PBS), RSP specifications shall be prescribed by States. When applicable, the RSP specification(s) shall be prescribed on the basis of regional air navigation agreements.

Note.— In prescribing an RSP specification, limitations may apply as a result of surveillance infrastructure constraints or specific surveillance functionality requirements.

2.9.2 The prescribed RSP specification shall be appropriate to the air traffic services provided.

2.9.3 Where an RSP specification has been prescribed by States for performance-based surveillance, ATS units shall be provided with equipment capable of performance consistent with the prescribed RSP specification(s).

Note.— Information on the PBCS concept and guidance material on its implementation are contained in the Performance-based Communication and Surveillance (PBCS) Manual *(Doc 9869).*

2.~~9~~10 Establishment and designation of the units providing air traffic services

Editorial Note.— Renumber subsequent paragraphs accordingly.

. . .

Origin:	**Rationale:**
OPLINKP/2 Modified by the Secretariat through correspondence	This proposal is to revise the existing RCP provision to PBC and to add a provision for surveillance equipment and PBS. The PBC and PBS provisions are adapted from the existing PBN provisions. The PBCS concept provides objective operational criteria to evaluate different and emerging communication and surveillance technologies that are intended for evolving ATM operations. It also provides a global framework for management and continuous improvement of communication and surveillance system performance.

	This proposal meets the need to optimize the use of available airspace while ensuring the safety of the operation. It supports application of performance-based separation minima, an increase in user-preferred routes and decreased flight times, thus reducing aircraft operators' fuel burn and greenhouse gas emissions. Some States have already implemented part of the PBCS framework and recognize the need for adoption of this ICAO material.

INITIAL PROPOSAL 3

CHAPTER 3. AIR TRAFFIC CONTROL SERVICE

. . .

3.3 Operation of air traffic control service

. . .

3.3.5.1 For all airspace where a reduced vertical separation minimum of 300 m (1 000 ft) is applied between FL 290 and FL 410 inclusive, a programme shall be instituted, on a regional basis, for monitoring the height-keeping performance of aircraft operating at these levels, in order to ensure that the continued application of this vertical separation minimum meets the safety objectives. The scope of regional monitoring programme shall be adequate to conduct analyses of aircraft group performance and evaluate the stability of altimetry system error.

Note.— Guidance material relating to vertical separation and monitoring of height-keeping performance is contained in the Manual on a 300 m (1 000 ft) Vertical Separation Minimum Between FL 290 and FL 410 Inclusive *(Doc 9574).*

3.3.5.2 Where RCP/RSP specifications are applied, programmes shall be instituted for monitoring the performance of the infrastructure and the participating aircraft against the appropriate RCP and/or RSP specifications, to ensure that operations in the applicable airspace continue to meet safety objectives. The scope of monitoring programmes shall be adequate to evaluate communication or surveillance performance.

Note.— Guidance material relating to RCP and RSP specifications and monitoring of communication and surveillance performance is contained in the Performance-based Communication and Surveillance (PBCS) Manual *(Doc 9869).*

3.3.5.3~~2~~ ***Recommendation —*** *Arrangements ~~shall~~should be put in place, through interregional agreement, for the sharing between regions of data and/or information from monitoring programmes.*

~~*Note.— Guidance material relating to vertical separation and monitoring of height-keeping performance is contained in the Manual on Implementation of a 300 m (1 000 ft) Vertical Separation Minimum Between FL 290 and FL 410 Inclusive (Doc 9574).*~~

. . .

Origin:	**Rationale:**
OPLINKP/2 and ANC	The proposal is to include a provision to establish a PBCS monitoring programme when RCP and RSP specifications are prescribed. The provision related to the RVSM monitoring data exchange is relocated so that it applies to both RVSM and PBCS, and is amended to: a) add “information”; and b) change the provision into a recommendation, which will give more flexibility in terms of the appropriate mechanism that allows the exchange of data and/or information.

INITIAL PROPOSAL 4

CHAPTER 6 AIR TRAFFIC SERVICES REQUIREMENTS FOR COMMUNICATIONS

6.1 Aeronautical mobile service (air-ground communications)

6.1.1 General

. . .

6.1.1.2 Where an RCP specification has ~~types have~~ been prescribed by States for performance-based communication ~~ATM functions~~, ATS units shall, in addition to the requirements specified in 6.1.1.1, be provided with communication equipment which will enable them to provide ATS in accordance with the prescribed RCP specification(s) ~~type(s)~~.

Note.— ~~*Information on RCP and associated procedures, and guidance concerning implementation the approval process will be contained in the Manual on Required Communication Performance (RCP) (Doc 9869) (in preparation). This document also contains a list of references to other documents produced by States and international bodies concerning communication systems and RCP.*~~ *Information on the performance-based communication and surveillance (PBCS) concept and guidance material on its implementation are contained in the* Performance-based Communication and Surveillance (PBCS) Manual *(Doc 9869).*

. . .

6.2 Aeronautical fixed service (ground-ground communications)

6.2.1 General

. . .

~~6.2.1.2 Where RCP types have been prescribed by States for ATM functions, ATS units shall, in addition to the requirements specified in 6.2.1.1, be provided with communication equipment which will enable them to provide ATS in accordance with the prescribed RCP type(s).~~

~~*Note.— Information on RCP and associated procedures, and guidance concerning implementation the approval process, will be contained in the Manual on Required Communication Performance (RCP) (Doc 9869) (in preparation). This document also contains references to other documents produced by States and international bodies concerning communication systems and RCP.*~~

Origin:	**Rationale:**
OPLINKP/2	The proposal is to update terminology and the reference to the manual for air-ground communications. The “RCP type” provision is deleted from ground-ground communications as there are neither RCP specifications defined nor guidance material supporting ground-ground communications.

— — — — — — — —

PROPOSED AMENDMENT TO ANNEX 15
CONCERNING PERFORMANCE-BASED COMMUNICATION
AND SURVEILLANCE

NOTES ON THE PRESENTATION OF THE AMENDMENT

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PROPOSED AMENDMENT TO

**INTERNATIONAL STANDARDS
AND RECOMMENDED PRACTICES**

AERONAUTICAL INFORMATION SERVICES

**ANNEX 15
TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION**

INITIAL PROPOSAL 1

CHAPTER 1. GENERAL

Note 1.— The object of the aeronautical information service (AIS) is to ensure the flow of aeronautical data and aeronautical information necessary for global air traffic management (ATM) system safety, regularity, economy and efficiency in an environmentally sustainable manner. The role and importance of aeronautical data and aeronautical information changed significantly with the implementation of area navigation (RNAV), performance-based navigation (PBN), airborne computer-based navigation systems, performance-based communication (PBC), performance-based surveillance (PBS), including ~~and~~ data link systems. Corrupt, erroneous, late, or missing aeronautical data and aeronautical information can potentially affect the safety of air navigation.

. . .

1.1 Definitions

When the following terms are used in the Standards and Recommended Practices for aeronautical information services, they have the following meanings:

. . .

Performance-based communication (PBC). Communication based on performance specifications applied to the provision of air traffic services.

Note.— An RCP specification includes communication performance requirements that are allocated to system components in terms of the communication to be provided and associated transaction time, continuity, availability, integrity, safety and functionality needed for the proposed operation in the context of a particular airspace concept.

. . .

Performance-based surveillance (PBS). Surveillance based on performance specifications applied to the provision of air traffic services.

Note.— An RSP specification includes surveillance performance requirements that are allocated to system components in terms of the surveillance to be provided and associated data delivery time, continuity, availability, integrity, accuracy of the surveillance data, safety and functionality needed for the proposed operation in the context of a particular airspace concept.

. . .

Required communication performance (RCP) specification. A set of requirements for air traffic service provision and associated ground equipment, aircraft capability, and operations needed to support performance-based communication.

Required surveillance performance (RSP) specification. A set of requirements for air traffic service provision and associated ground equipment, aircraft capability, and operations needed to support performance-based surveillance.

. . .

Origin:	**Rationale:**
OPLINKP/2	The new terms are introduced to support RCP/RSP provisions introduced in the proposed amendment.

INITIAL PROPOSAL 2

APPENDIX 1. CONTENTS OF THE AERONAUTICAL INFORMATION PUBLICATION (AIP)

(see Chapter 4)

. . .

PART 2 — EN-ROUTE (ENR)

. . .

ENR 3. ATS ROUTES

. . .

ENR 3.1 Lower ATS routes

Detailed description of lower ATS routes, including:

1) route designator, designation of the *required communication performance* (RCP) specification(s), navigation specification(s) and/or *required surveillance performance* (RSP) specification(s) applicable to a specified segment(s), names, coded designators or name-codes

and the geographical coordinates in degrees, minutes and seconds of all significant points defining the route including "compulsory" or "on-request" reporting points;

. . .

7) remarks, including an indication of the controlling unit, its operating channel and, if applicable, its logon address, and any navigation, RCP and RSP specification(s) limitations.

. . .

ENR 3.2 Upper ATS routes

Detailed description of upper ATS routes, including:

1) route designator, designation of the *required communication performance* (RCP) specification(s), navigation specification(s) and/or *required surveillance performance* (RSP) specification(s) applicable to a specified segment(s), names, coded designators or name-codes and the geographical coordinates in degrees, minutes and seconds of all significant points defining the route including "compulsory" or "on-request" reporting points;

. . .

7) remarks, including an indication of the controlling unit, its operating channel and, if applicable, its logon address, and any navigation, RCP and RSP specification(s) limitations.

. . .

ENR 3.3 Area navigation routes

Detailed description of PBN (RNAV and RNP) routes, including:

1) route designator, designation of the *required communication performance* (RCP) specification(s), navigation specification(s) and/or *required surveillance performance* (RSP) specification(s) applicable to a specified segment(s), names, coded designators or name-codes and the geographical coordinates in degrees, minutes and seconds of all significant points defining the route including "compulsory" or "on-request" reporting points;

. . .

7) remarks, including an indication of the controlling unit, its operating channel and, if applicable, its logon address, and any navigation, RCP and RSP specification(s) limitations.

ENR 3.4 Helicopter routes

Detailed description of helicopter routes, including:

1) route designator, designation of the *required communication performance* (RCP) specification(s), navigation specification(s) and/or *required surveillance performance* (RSP) specification(s) applicable to a specified segment(s), names, coded designators or name-codes and the geographical coordinates in degrees, minutes and seconds of all significant points defining the route including "compulsory" or "on-request" reporting points;

. . .

6) remarks, including an indication of the controlling unit, ~~and~~ its operating channel~~,~~ and, if applicable, its logon address, and any navigation, RCP and RSP specification(s) limitations.

Origin:	**Rationale:**
OPLINKP	This is a consequential amendment to support provisions for PBCS in Annex 11 regarding prescription of RCP/RSP specifications.

— — — — — — — —

**PROPOSED AMENDMENT TO PANS-ATM (DOC 4444)
CONCERNING PERFORMANCE-BASED COMMUNICATION
AND SURVEILLANCE**

NOTES ON THE PRESENTATION OF THE AMENDMENT

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PROPOSED AMENDMENT TO

PROCEDURES FOR
AIR NAVIGATION SERVICES

AIR TRAFFIC MANAGEMENT

INITIAL PROPOSAL 1

Chapter 1

DEFINITIONS

. . .

Performance-based communication (PBC). Communication based on performance specifications applied to the provision of air traffic services.

Note.— An RCP specification includes communication performance requirements that are allocated to system components in terms of the communication to be provided and associated transaction time, continuity, availability, integrity, safety and functionality needed for the proposed operation in the context of a particular airspace concept.

Performance-based navigation (PBN). Area navigation based on performance requirements for aircraft operating along an ATS route, on an instrument approach procedure or in a designated airspace.

Note.— Performance requirements are expressed in navigation specifications (RNAV specification, RNP specification) in terms of accuracy, integrity, continuity, availability and functionality needed for the proposed operation in the context of a particular airspace concept.

. . .

Performance-based surveillance (PBS). Surveillance based on performance specifications applied to the provision of air traffic services.

Note.— An RSP specification includes surveillance performance requirements that are allocated to system components in terms of the surveillance to be provided and associated data delivery time, continuity, availability, integrity, accuracy of the surveillance data, safety and functionality needed for the proposed operation in the context of a particular airspace concept.

. . .

~~***RCP type***. A label (e.g. RCP 240) that represents the values assigned to RCP parameters for communication transaction time, continuity, availability and integrity.~~

. . .

Required communication performance (RCP) specification. ~~A statement of the performance requirements for operational communication in support of specific ATM functions.~~ A set of requirements for air traffic service provision and associated ground equipment, aircraft capability, and operations needed to support performance-based communication.

Required surveillance performance (RSP) specification. A set of requirements for air traffic service provision and associated ground equipment, aircraft capability, and operations needed to support performance-based surveillance.

. . .

Origin:	**Rationale:**
OPLINKP/2 and ANC	The new terms that are used in the PBCS provisions are introduced and the existing terms are updated. The terms for performance-based communication (PBC) and performance-based surveillance (PBS) are aligned with those used for performance-based navigation (PBN), to facilitate advances in ATM operations within a complete and common performance-based framework for communication, navigation and surveillance (CNS). The term RCP, previously defined as "a statement of performance requirements for operational communication in support of specific ATM functions", has been revised to align the concept of PBC with the concept of PBN. The terms RCP and RSP are now used in the context of a specification that is applicable to the prescription of airspace requirements, qualification of ATS provision, aircraft capability, and operational use, including post-implementation monitoring. The terms also indicate differences with required navigation performance/area navigation (RNP/RNAV). While RNP/RNAV specifications apply to aircraft operating on a route of flight, required communication performance and required surveillance performance (RCP/RSP) specifications apply to air traffic service provision, aircraft capability and operations.

INITIAL PROPOSAL 2

Chapter 4

GENERAL PROVISIONS FOR AIR TRAFFIC SERVICES

. . .

4.4 FLIGHT PLAN

4.4.1 Flight plan form

. . .

4.4.1.4 An operator shall, prior to departure:

a) ensure that, where the flight is intended to operate on a route or in an area where ~~an RNP type~~ a navigation specification is prescribed, ~~the aircraft~~ it has an appropriate RNP approval, and that all conditions applying to that approval will be satisfied;

b) ensure that, where operation in reduced vertical separation minimum (RVSM) airspace is planned, ~~the aircraft~~it has the required RVSM approval; ~~and~~

c) ensure that, where the flight is intended to operate where an RCP ~~type~~ specification is prescribed, ~~the aircraft has~~ it has an appropriate RCP approval, and that all conditions applying to that approval will be satisfied; and~~.~~

d) ensure that, where the flight is intended to operate where an RSP specification is prescribed, it has an appropriate RSP approval, and that all conditions applying to that approval will be satisfied.

. . .

Origin:	**Rationale:**
OPLINKP/2 and ANC	The proposal updated existing RCP provision with PBC concept and included RSP specifications consistent with the PBS provision. The procedures will ensure efficient, safe and flexible application of ATM operations predicated on communication and surveillance performance, and based on communication and surveillance capabilities.

INITIAL PROPOSAL 3

Chapter 5

SEPARATION METHODS AND MINIMA

. . .

5.4 HORIZONTAL SEPARATION

. . .

5.4.1 Lateral separation

. . .

5.4.1.2 LATERAL SEPARATION CRITERIA AND MINIMA

5.4.1.2.1 Means by which lateral separation may be applied include the following:

. . .

5.4.1.2.1.6 *Lateral separation of aircraft on parallel or non-intersecting tracks or ATS routes.* Within designated airspace or on designated routes, lateral separation between aircraft operating on parallel or non-intersecting tracks or ATS routes shall be established in accordance with the following:

. . .

Note 2.— Guidance material for implementation of communication and surveillance *capability supporting 93 km (50 NM) and 55.5 km (30 NM) lateral separation is contained in the* Performance-based Communication and Surveillance (PBCS) Manual ~~*Manual* on Required Communication Performance (RCP)~~ *(Doc 9869).* ~~Information regarding RCP allocations for these capabilities is contained in RTCA DO-306/EUROCAE ED-122 Safety and Performance Standard for Air Traffic Data Link Services in Oceanic and Remote Airspace (Oceanic SPR Standard)~~.

. . .

Origin:	*Rationale:*
OPLINKP/2	The proposal is to update the reference from *Manual on Required Communication Performance (RCP)* (Doc 9869), which is being updated and renamed as *Performance-based Communication and Surveillance (PBCS) Manual* (Doc 9869) to support the PBCS concept and provide guidance on its implementation.

INITIAL PROPOSAL 4

Appendix 2

FLIGHT PLAN

. . .

2. Instructions for the completion of the flight plan form

. . .

2.2 Instructions for insertion of ATS data

. . .

ITEM 10: EQUIPMENT AND CAPABILITIES

. . .

Radiocommunication, navigation and approach aid equipment and capabilities

INSERT one or more of the following letters to indicate the serviceable COM/NAV/approach aid equipment and capabilities available:

- A GBAS landing system
- B LPV (APV with SBAS)
- C LORAN C
- D DME
- E1 FMC WPR ACARS
- E2 D-FIS ACARS
- E3 PDC ACARS
- F ADF
- G GNSS If any portion of the flight is planned to be conducted under IFR, it refers to GNSS receivers that comply with the requirements of Annex 10, Volume I *(See Note 2)*
- H HF RTF
- I Inertial Navigation
- J1 CPDLC ATN VDL Mode 2 *(See Note 3)*
- J2 CPDLC FANS 1/A HFDL
- J3 CPDLC FANS 1/A VDL Mode A
- J4 CPDLC FANS 1/A VDL Mode 2
- J5 CPDLC FANS 1/A SATCOM (INMARSAT)

- J6 CPDLC FANS 1/A SATCOM (MTSAT)
- J7 CPDLC FANS 1/A SATCOM (Iridium)
- K MLS
- L ILS
- M1 ATC RTF SATCOM (INMARSAT)
- M2 ATC RTF (MTSAT)
- M3 ATC RTF (Iridium)
- O VOR
- P1~~–P9~~ ~~Reserved for RCP~~ CPDLC RCP 400 (See Note 7)
- P2 CPDLC RCP 240 (See Note 7)
- P3 SATVOICE RCP 400 (See Note 7)
- P4–P9 Reserved for RCP
- R PBN approved *(See Note 4)*
- T TACAN
- U UHF RTF
- V VHF RTF
- W RVSM approved
- X MNPS approved
- Y VHF with 8.33 kHz channel spacing capability
- Z Other equipment carried or other capabilities *(See Note 5)*

Any alphanumeric characters not indicated above are reserved.

. . .

Note 5.— If the letter Z is used, specify in Item 18 the other equipment carried or other capabilities, preceded by COM/, NAV/, ~~and/or~~ DAT/ and/or SUR/, as appropriate.

. . .

Note 7.— Guidance material on the application of performance-based communication, which prescribes RCP to an air traffic service in a specific area, is contained in the Performance-based Communication and Surveillance (PBCS) Manual *(Doc 9869).*

Surveillance equipment and capabilities

INSERT N if no surveillance equipment for the route to be flown is carried, or the equipment is unserviceable,
OR

INSERT one or more of the following descriptors, to a maximum of 20 characters, to describe the serviceable surveillance equipment and/or capabilities on board:

. . .

ADS-C

D1 ADS-C with FANS 1/A capabilities
G1 ADS-C with ATN capabilities

Alphanumeric characters not indicated above are reserved.

Example: ADE3RV/HB2U2V2G1

Note 1.— The RSP specification(s), if applicable, will be listed in Item 18 following the indicator SUR/. Guidance material on the application of performance-based surveillance, which prescribes RSP to an air traffic service in a specific area, is contained in the Performance-based Communication and Surveillance (PBCS) Manual *(Doc 9869).*

Note 2.— Additional surveillance equipment or capabilities ~~application should~~ will be listed in Item 18 following the indicator SUR/, as required by the appropriate ATS authority.

. . .

ITEM 18: OTHER INFORMATION

. . .

COM/ Indicate communication~~s~~ equipment and ~~applications or~~ capabilities not specified in Item 10 a).

DAT/ Indicate data communication equipment and ~~applications or~~ capabilities not specified in 10 a).

SUR/ Indicate ~~Include~~ surveillance equipment and capabilities not specified in Item 10 b). Indicate the appropriate RSP specification(s) here.

. . .

Origin:	Rationale:
OPLINKP/2	The proposed amendment defines three of the descriptors (P1 through P9) that are reserved for RCP specifications, in Item 10 a) of the flight plan. No descriptors were reserved for RSP specifications, so these specifications are conveyed in Item 18 of the flight plan following the SUR/ indicator to indicate the appropriate performance-based surveillance level. Based on communication and surveillance capabilities filed in the flight plan, flight data processing systems (FDPSs) will be able to automatically determine the appropriate level of air traffic services (e.g. application of a separation minimum) to apply to eligible aircraft. Since P1 through P9 in Item 10 of the flight plan are defined and currently reserved for RCP, this amendment should not result in the flight data processing system (FDPS) rejecting the flight plan.

— — — — — — — —

**PROPOSED AMENDMENT TO PANS-ABC (DOC 8400)
CONCERNING PERFORMANCE-BASED COMMUNICATION
AND SURVEILLANCE**

NOTES ON THE PRESENTATION OF THE AMENDMENT

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PROPOSED AMENDMENT TO

PROCEDURES FOR
AIR NAVIGATION SERVICES

ICAO ABBREVIATIONS AND CODES

INITIAL PROPOSAL 1

. . .

ABBREVIATIONS

DECODE

. . .

PBC	Performance-based communication
PBN	Performance-based navigation
PBS	Performance-based surveillance

. . .

RSP‡	Required surveillance performance
RSP	Responder beacon

. . .

ABBREVIATIONS

ENCODE

. . .

Performance-based communication	PBC
Performance-based navigation	PBN
Performance-based surveillance	PBS

. . .

Required surveillance performance	RSP‡
Requirements	RQMNTS

ABBREVIATIONS AND TERMS TO BE TRANSMITTED USING THE INDIVIDUAL LETTERS IN NON-PHONETIC FORM WHEN USED IN RADIOTELEPHONY

DECODE

. . .

RCP	Required communication performance
RNP	Required navigation performance
RPI	Radar position indicator
RSP	Required surveillance performance

. . .

ABBREVIATIONS AND TERMS TO BE TRANSMITTED USING THE INDIVIDUAL LETTERS IN NON-PHONETIC FORM WHEN USED IN RADIOTELEPHONY

ENCODE

. . .

Required communication performance	RCP
Required navigation performance	RNP
Required surveillance performance	RSP

. . .

Origin:	**Rationale:**
OPLINKP/2	Performance-based communication and surveillance (PBCS) concept is introduced in Annex 6, Parts I, II and III, Annex 11, Annex 15 and PANS-ATM, requiring new abbreviations, codes and terms in the PANS-ABC.

— — — — — — — —

ATTACHMENT E to State letter SP 52/4-15/44

PROPOSED AMENDMENT TO ANNEX 4
CONCERNING SATVOICE

NOTES ON THE PRESENTATION OF THE AMENDMENT

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PROPOSED AMENDMENT TO

INTERNATIONAL STANDARDS
AND RECOMMENDED PRACTICES

AERONAUTICAL CHARTS

ANNEX 4
TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

INITIAL PROPOSAL 1

CHAPTER 7. ENROUTE CHART — ICAO

. . .

7.9 Aeronautical data

. . .

7.9.3 Air traffic services system

7.9.3.1 Where appropriate, the components of the established air traffic services system shall be shown.

7.9.3.1.1 The components shall include the following:

. . .

k) communication facilities listed with their channels and, if applicable, logon address and satellite voice (SATVOICE) number;

. . .

CHAPTER 8. AREA CHART — ICAO

. . .

8.9 Aeronautical data

. . .

8.9.4 Air traffic services system

8.9.4.1 The components of the established relevant air traffic services system shall be shown.

8.9.4.1.1 The components shall include the following:

. . .

o) communication facilities listed with their channels and, if applicable, logon address and SATVOICE number~~.~~; and

. . .

CHAPTER 9. STANDARD DEPARTURE CHART — INSTRUMENT (SID) — ICAO

. . .

9.9 Aeronautical data

. . .

9.9.4 Air traffic services system

9.9.4.1 The components of the established relevant air traffic services system shall be shown.

9.9.4.1.1 The components shall comprise the following:

. . .

j) radio communication procedures, including:

  1) call sign(s) of ATS unit(s);

  2) frequency and, if applicable, SATVOICE number;

  3) transponder setting, where appropriate;

. . .

CHAPTER 10. STANDARD ARRIVAL CHART — INSTRUMENT (STAR) — ICAO

. . .

10.9 Aeronautical data

. . .

10.9.4 Air traffic services system

10.9.4.1 The components of the established relevant air traffic services system shall be shown.

10.9.4.1.1 The components shall comprise the following:

. . .

i) radio communication procedures, including:

1) call sign(s) of ATS unit(s);

2) frequency and, if applicable, SATVOICE number;

3) transponder setting, where appropriate;

. . .

CHAPTER 13. AERODROME/HELIPORT CHART — ICAO

. . .

13.6 Aerodrome/heliport data

13.6.1 This chart shall show:

. . .

o) relevant communication facilities listed with their channels and, if applicable, logon address and SATVOICE number;

. . .

Origin:	Rationale:
OPLINKP	The proposal is to include a provision on the aeronautical charts for satellite voice (SATVOICE) number(s) so they are easily accessible to the flight crew, and supports a provision for SATVOICE in Annex 10, Volumes II and III (see pages E-11 and E-13).

— — — — — — — —

PROPOSED AMENDMENT TO ANNEX 15
CONCERNING SATVOICE

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PROPOSED AMENDMENT TO

INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

AERONAUTICAL INFORMATION SERVICES

ANNEX 15 TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

INITIAL PROPOSAL 1

CHAPTER 1. GENERAL

Note 1.— The object of the aeronautical information service (AIS) is to ensure the flow of aeronautical data and aeronautical information necessary for global air traffic management (ATM) system safety, regularity, economy and efficiency in an environmentally sustainable manner. The role and importance of aeronautical data and aeronautical information changed significantly with the implementation of area navigation (RNAV), performance-based navigation (PBN), airborne computer-based navigation systems,~~ and~~ data link systems and satellite voice communications. Corrupt, erroneous, late, or missing aeronautical data and aeronautical information can potentially affect the safety of air navigation.

. . .

APPENDIX 1. CONTENTS OF THE AERONAUTICAL INFORMATION PUBLICATION (AIP)

(see Chapter 4)

. . .

PART 2 — EN-ROUTE (ENR)

. . .

ENR 3. ATS ROUTES

. . .

ENR 3.1 Lower ATS routes

Detailed description of lower ATS routes, including:

. . .

7) remarks, including an indication of the controlling unit, its operating channel and, if applicable, its logon address, SATVOICE number, and any navigation specification(s) limitations.

. . .

ENR 3.2 Upper ATS routes

Detailed description of upper ATS routes, including:

. . .

7) remarks, including an indication of the controlling unit, its operating channel and, if applicable, its logon address, SATVOICE number, and any navigation specification(s) limitations.

. . .

ENR 3.3 Area navigation routes

Detailed description of PBN ~~area navigation~~ (RNAV and RNP) routes, including:

. . .

7) remarks, including an indication of the controlling unit, its operating channel and, if applicable, its logon address, SATVOICE number, and any navigation specification(s) limitations.

. . .

ENR 3.4 Helicopter routes

Detailed description of helicopter routes, including:

. . .

6) remarks, including an indication of the controlling unit, ~~and~~ its operating frequency~~,~~ and, if applicable, its logon address, SATVOICE number, and any navigation specification(s) limitations.

. . .

PART 3 — AERODROMES (AD)

. . .

AD 2. AERODROMES

. . .

**** AD 2.18 Air traffic services communication facilities

Detailed description of air traffic services communication facilities established at the aerodrome, including:

1) service designation;

2) call sign;

3) channel(s);

4) SATVOICE number(s), if available;

5~~4~~) logon address, as appropriate;

6~~5~~) hours of operation; and

7~~6~~) remarks.

Origin:	**Rationale:**
OPLINKP	The proposal includes a provision in the aeronautical information publication for satellite voice (SATVOICE) number(s) so they are easily accessible to the flight operations personnel.

— — — — — — — —

PROPOSED AMENDMENT TO ANNEX 10, VOLUMES II AND III CONCERNING SATVOICE

NOTES ON THE PRESENTATION OF THE AMENDMENT

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PROPOSED AMENDMENT TO

**INTERNATIONAL STANDARDS
AND RECOMMENDED PRACTICES AND
PROCEDURES FOR AIR NAVIGATION SERVICES**

AERONAUTICAL TELECOMMUNICATIONS

**ANNEX 10
TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION**

**VOLUME II — COMMUNICATION PROCEDURES
INCLUDING THOSE WITH PANS STATUS**

INITIAL PROPOSAL 1

CHAPTER 5. AERONAUTICAL MOBILE SERVICE — VOICE COMMUNICATIONS

5.1 General

Note 1.— For the purposes of these provisions, the communication procedures applicable to the aeronautical mobile service, as appropriate, also apply to the aeronautical mobile satellite service.

Note 2.— Guidance material for the implementation of the aeronautical mobile satellite service is contained in the Manual on the Aeronautical Mobile Satellite (Route) Service (Doc 9925). *Additional guidance for SATVOICE communication systems is contained in the* Satellite Voice Operations Manual *(Doc 10038) and the* Performance-based Communication and Surveillance (PBCS) Manual (Doc 9869*).*

5.2 Radiotelephony procedures

. . .

5.2.1.5 *Transmitting technique*

. . .

5.2.1.5.8 The following words and phrases shall be used in radiotelephony communications as appropriate and shall have the meaning ascribed hereunder:

. . .

Phrase	*Meaning*
. . .	
OVER	"My transmission is ended, and I expect a response from you."
	Note.— Not normally used in VHF or SATVOICE communications.
OUT	"This exchange of transmissions is ended and no response is expected."
	Note.— Not normally used in VHF or SATVOICE communications.
. . .	

Origin:	**Rationale:**
OPLINKP	The proposal is to add reference to the *Manual on the Aeronautical Mobile Satellite (Route) Service* (Doc 9925) and, specifically for SATVOICE, to the *Satellite Voice Operations Manual* (Doc 10038) and the *Performance-based Communication and Surveillance (PBCS) Manual* (Doc 9869) to support the proposed amendment. The proposal is also to indicate that the phrases OVER and OUT are not normally used in SATVOICE communication, similar to VHF, which is the current practice with SATVOICE. .

— — — — — — — —

PROPOSED AMENDMENT TO

INTERNATIONAL STANDARDS
AND RECOMMENDED PRACTICES

AERONAUTICAL TELECOMMUNICATIONS

ANNEX 10
TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

VOLUME III —
COMMUNICATION SYSTEMS

PART I — DIGITAL DATA COMMUNICATION SYSTEMS
PART II — VOICE COMMUNICATION SYSTEMS)

INITIAL PROPOSAL 1

PART II — VOICE COMMUNICATION SYSTEMS

. . .

CHAPTER 2. AERONAUTICAL MOBILE SERVICE

. . .

Insert new text as follows:

2.5 Satellite voice (SATVOICE) communication system characteristics

Note.— Guidance material for the implementation of the aeronautical mobile satellite service is contained in the Manual on the Aeronautical Mobile Satellite (Route) Service *(Doc 9925). Additional guidance for SATVOICE communication systems is contained in the* Satellite Voice Operations Manual *(Doc 10038), and the* Performance-based Communication and Surveillance (PBCS) Manual *(Doc 9869).*

2.5.1 For ground-to-air calls, the SATVOICE communication system shall be capable of contacting the aircraft and enabling the ground party/system to provide, as a minimum, the following:

a) secure calling;

b) priority level as defined in **Table 2-1**; and

c) aircraft SATVOICE number, which is the aircraft address expressed as an 8-digit octal number.

2.5.2 For ground-to-air calls, the SATVOICE communication system shall be capable of locating the aircraft in the appropriate airspace regardless of the satellite and ground earth station (GES) to which the aircraft is logged on.

2.5.3 For air-to-ground calls, the SATVOICE communication system shall be capable of:

a) contacting the aeronautical station via an assigned SATVOICE number, which is a unique 6-digit number or public switched telephone network (PSTN) number; and

b) allowing the flight crew and/or aircraft system to specify the priority level for the call as defined in **Table 2-1**.

Table 2-1. Priority levels for SATVOICE calls (air-to-ground/ground-to-air)

Priority level	Application category
1 / EMG / Q15 Emergency (highest) Safety of flight	Distress and urgency. For use by flight crew, when appropriate.
2 / HGH / Q12 Operational high (second highest) Safety of flight	Flight safety. Typically assigned to calls between aircraft and ANSPs.
3 / LOW / Q10 Operational low (third highest) Safety of flight	Regularity of flight, meteorological, administrative. Typically assigned to calls between aircraft operators and their aircraft.
4 / PUB / Q9 Non-operational (lowest) Non safety	Public correspondence.

End of new text.

Origin:	**Rationale:**
OPLINKP/2 Modified by the Secretariat through correspondence	The proposal is to add a new section to address satellite voice (SATVOICE) communication system characteristics essential for common infrastructure using different satellite companies, network service providers and aircraft equipment. Current systems have been implemented using different satellites, communication networks and aircraft equipment that did not follow a common approach and has resulted in added complexities and additional costs. The provision will stop further divergence in implementations.

— — — — — — — —

**PROPOSED AMENDMENT TO PANS-ATM (DOC 4444)
CONCERNING SATVOICE**

NOTES ON THE PRESENTATION OF THE AMENDMENT

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PROPOSED AMENDMENT TO

PROCEDURES FOR AIR NAVIGATION SERVICES

AIR TRAFFIC MANAGEMENT

INITIAL PROPOSAL 1

Appendix 2

FLIGHT PLAN

. . .

2. Instructions for the completion of the flight plan form

. . .

2.2 Instructions for insertion of ATS data

. . .

ITEM 10: EQUIPMENT AND CAPABILITIES

. . .

Radiocommunication, navigation and approach aid equipment and capabilities

. . .

INSERT one or more of the following letters to indicate the serviceable COM/NAV/approach aid equipment and capabilities available:

A	GBAS landing system
B	LPV (APV with SBAS)
C	LORAN C
D	DME
E1	FMC WPR ACARS
E2	D-FIS ACARS
E3	PDC ACARS
F	ADF
G	GNSS If any portion of the flight is planned to be conducted under IFR, it refers to GNSS receivers that comply with the requirements of Annex 10, Volume I *(See Note 2)*
H	HF RTF
I	Inertial Navigation
J1	CPDLC ATN VDL Mode 2 *(See Note 3)*
J2	CPDLC FANS 1/A HFDL
J3	CPDLC FANS 1/A VDL Mode A
J4	CPDLC FANS 1/A VDL Mode 2
J5	CPDLC FANS 1/A SATCOM (INMARSAT)
J6	CPDLC FANS 1/A SATCOM (MTSAT)
J7	CPDLC FANS 1/A SATCOM (Iridium)
K	MLS
L	ILS
M1	ATC SATVOICE ~~RTF SATCOM~~ (INMARSAT)
M2	ATC SATVOICE ~~RTF~~ (MTSAT)
M3	ATC SATVOICE ~~RTF~~ (Iridium)
O	VOR
P1–P9	Reserved for RCP
R	PBN approved *(See Note 4)*
T	TACAN
U	UHF RTF
V	VHF RTF
W	RVSM approved
X	MNPS approved
Y	VHF with 8.33 kHz channel spacing capability
Z	Other equipment carried or other capabilities *(See Note 5)*

. . .

Appendix 3

AIR TRAFFIC SERVICES MESSAGES

. . .

1. Message contents, formats and data conventions

. . .

1.8 Accuracy in the preparation of ATS messages

. . .

Field Type 10 – Equipment and capabilities

. . .

SINGLE HYPHEN

(a) *Radiocommunication, navigation and approach aid equipment and capabilities*

1 LETTER as follows:

N no COM/NAV/approach aid equipment for the route to be flown is carried, or the equipment is unserviceable

OR S Standard COM/NAV/approach aid equipment for the route to be flown is carried and serviceable (*see Note 1*)

AND/OR ONE OR MORE OF THE FOLLOWING LETTERS to indicate the serviceable COM/NAV/approach aid equipment and capabilities

A	GBAS landing system
B	LPV (APV with SBAS)
C	LORAN C
D	DME
E1	FMC WPR ACARS
E2	D-FIS ACARS
E3	PDC ACARS
F	ADF
G	GNSS. If any portion of the flight is planned to be conducted under IFR it refers to GNSS receivers that comply with the requirements of Annex 10, Volume I *(See Note 2)*
H	HF RTF
I	Inertial navigation
J1	CPDLC ATN VDL Mode 2 *(see Note 3)*
J2	CPDLC FANS 1/A HFDL
J3	CPDLC FANS 1/A VDL Mode A
J4	CPDLC FANS 1/A VDL Mode 2
J5	CPDLC FANS 1/A SATCOM (INMARSAT)
J6	CPDLC FANS 1/A SATCOM (MTSAT)
J7	CPDLC FANS 1/A SATCOM (Iridium)
K	MLS
L	ILS
M1	ATC SATVOICE ~~RTF SATCOM~~ (INMARSAT)
M2	ATC SATVOICE ~~RTF~~ (MTSAT)
M3	ATC SATVOICE ~~RTF~~ (Iridium)
O	VOR
P1-P9	Reserved for RCP
R	PBN approved *(see Note 4)*
T	TACAN
U	UHF RTF
V	VHF RTF
W	RVSM approved
X	MNPS approved
Y	VHF with 8.33 kHz channel spacing capability
Z	Other equipment carried or other capabilities *(see Note 5)*

. . .

. . .

Origin:	Rationale:
OPLINKP/2	The proposal is to replace RTF SATCOM and RTF to SATVOICE in Appendix 2 and Appendix 3. This proposed amendment aligns with the proposed amendment to PANS-ABC (see page E-21), which has clarified that SATCOM is to be used when referring generally to voice and data satellite communication or only data communication. The new term SATVOICE is introduced for use in phraseology, as necessary, in mixed voice and data communication environments. When communicating to the flight crew a particular means of communication to use, SATVOICE is more efficient than RTF SATCOM or SATCOM VOICE.

— — — — — — — —

PROPOSED AMENDMENT TO PANS-ABC (DOC 8400)
CONCERNING SATVOICE

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PROPOSED AMENDMENT TO

PROCEDURES FOR AIR NAVIGATION SERVICES

ICAO ABBREVIATIONS AND CODES

INITIAL PROPOSAL 1

ABBREVIATIONS

DECODE

. . .

SATCOM†	Satellite communication (used only when referring generally to both voice and data satellite communication or only data satellite communication)
SATVOICE†	Satellite voice communication

. . .

ABBREVIATIONS

ENCODE

. . .

Satellite communication (used only when referring generally to both voice and data satellite communication or only data satellite communication)	SATCOM†
Satellite voice communication	SATVOICE†

. . .

ABBREVIATIONS AND TERMS TO BE TRANSMITTED AS SPOKEN WORDS WHEN USED IN RADIOTELEPHONY

DECODE

. . .

SATCOM	Satellite communication (used only when referring generally to both voice and data satellite communication or only data satellite communication)

SATVOICE Satellite voice communication

. . .

ABBREVIATIONS AND TERMS TO BE TRANSMITTED AS SPOKEN WORDS WHEN USED IN RADIOTELEPHONY

ENCODE

. . .

Satellite communication (used only when referring generally to both voice and data satellite communication or only data satellite communication)	SATCOM
Satellite voice communication	SATVOICE

. . .

Origin:	**Rationale:**
OPLINKP/2	The term SATCOM was clarified so that it would be used only when referring generally to both voice and data satellite communication or only data satellite communication. The new term SATVOICE is introduced to use in phraseology, as necessary, in mixed voice (HF, VHF, UHF, SATVOICE) and data (CPDLC) communication environments. ATC can communicate to the flight crew a particular means of communication to use; SATVOICE is more efficient than RTF SATCOM or SATCOM VOICE.

— — — — — — — —

ATTACHMENT F to State letter SP 52/4-15/44

DRAFT GUIDANCE MATERIAL ON PBCS

Doc 9869

PERFORMANCE-BASED COMMUNICATION AND SURVEILLANCE (PBCS) MANUAL

CAVEAT:

This document represents a work in progress and its content will need to be aligned to the final outcomes of the proposed amendments in relation to PBCS. It is only to provide additional information that will assist in the evaluation of these proposals contained in the associated State letter.

Second Edition (advance unedited) — xxxx

International Civil Aviation Organization

AMENDMENTS

Amendments are announced in the supplements to the Catalogue of ICAO Publications; the catalogue and its supplements are available on the ICAO website at www.icao.int. The space below is provided to keep a record of such amendments.

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FOREWORD

1. Historical background

1.1 In 1983, the Council of the International Civil Aviation Organization (ICAO) established the Special Committee on Future Air Navigation Systems (FANS) which was tasked with studying, identifying and assessing new technologies, including the use of satellites, and making recommendations for the future development of air navigation for civil aviation. The FANS Committee determined that it would be necessary to develop new systems that would overcome the limitations of conventional systems and allow air traffic management (ATM) to develop on a global scale.

1.2 In September 1991, 450 representatives from eighty-five ICAO Contracting States and thirteen international organizations gathered at ICAO Headquarters in Montréal, Canada, for the Tenth Air Navigation Conference to consider and endorse the concept for a future air navigation system as developed by the FANS Committee that would meet the needs of the civil aviation community well into the next century. The FANS concept, which came to be known as the communications, navigation, surveillance/air traffic management (CNS/ATM) systems concept, involves a complex and interrelated set of technologies, dependent largely on satellites.

1.3 The endorsement of the CNS/ATM systems concept reached at the Tenth Air Navigation Conference signalled the beginning of a new era for international civil aviation and paved the way for the many activities related to the planning and implementation of new systems around the world.

1.4 The fourth meeting of the Aeronautical Mobile Communications Panel (AMCP/4) (Montréal, April 1996) recognized the absence of objective criteria to evaluate communication performance requirements. The objective criteria needed were a set of values for parameters which would be based on the operational requirements for communication systems in the various phases of flight. The meeting agreed that there was an urgent need to assess the existing technical options of communication systems against such a set of parameter values. The term RCP type was used to denote a set of values for these parameters.

1.5 When reviewing the report of AMCP/4 in 1997, the Air Navigation Commission (ANC) tasked the Automatic Dependent Surveillance Panel (renamed in 2000 as the Operational Data Link Panel — OPLINKP) to develop the operational concept of required communication performance (RCP).

1.6 In 2001, the OPLINKP completed its document entitled *Concept of Required Communication Performance*, and the ANC solicited comments thereon from ICAO Contracting States. The comments received indicated broad support for the RCP concept. In light of the comments received, in 2002 the ANC amended the OPLINKP work programme to develop a Manual on *Required Communications Performance (RCP)* and, as necessary, Standards and Recommended Practices (SARPs) and procedures relating to the use of RCP in the provision of air traffic services.

1.7 In 2003, the Eleventh Air Navigation Conference endorsed recommendations to:

a) continue the development of SARPs, procedures and guidance material on RCP; and

b) investigate areas for further work including determining the relationship of the RCP concept to separation studies and interoperability, standardizing RCP types and allocations, ensuring the adequacy of air traffic service (ATS) functions and procedures for new CNS/ATM environments, as well as establishing requirements for safety performance monitoring.

1.8 The first meeting of the OPLINKP (OPLINKP/1, Montréal, September 2005) agreed on the proposed amendments to include a provision for RCP in Annex 6, Annex 11, and Procedures for Air Navigation Services (PANS), and the First Edition of the *Manual on Required Communication Performance (RCP)*.

1.9 In 2007, the ICAO North Atlantic (NAT) and Asia-Pacific (APAC) Regions began collaborating on a global issue concerning the increased use and dependency of commercial communication services in the provision of air traffic services. The companies providing these services had decided to shut down certain components of the system for economic reasons that conflicted with the needs for aviation safety. The NAT and APAC Regions recognized that the issue should be examined at the global level, but as a matter of urgency, it also needed to be addressed at the regional level because communication was an integral part of regional implementation plans. Both regions held special meetings to address the issue.

1.10 By 2008, the NAT Systems Planning Group (SPG) concluded to develop an RCP Implementation Plan that would propose to mandate RCP in the NAT Region by 2015. The NAT and APAC Regions also agreed to develop common guidance material, which later became widely known by two separate documents, the *Global Operational Data Link Document (GOLD),* the second edition was published in April 2013, and the *Satellite Voice Guidance Material (SVGM)*, the first edition was published in July 2012.

1.11 In 2008 the ANC approved a work programme to reconvene the OPLINKP. The work programme included the need to update the *Manual on RCP* (Doc 9869) to take into account significant advances by ICAO Contracting States and regions, in the areas of qualification and monitoring, commercial service contracts/agreements and operational approvals, and to avoid regional or State-specific criteria being imposed on aircraft operators and aircraft/avionics manufacturers.

1.12 In 2010, OPLINKP reconvened where it agreed to progress an amendment to Doc 9869 that would rename it the *Performance-Based Communication and Surveillance (PBCS) Manual,* expand its scope and incorporate parts of the GOLD and SVGM, and other material that had been developed by the regions since 2007.

1.13 An RCP type, which had been used in the first edition to denote a set of values for specific parameters, is not used in the second edition. An RCP type provided a means for the AMCP to assess different technologies. However, a means was needed to specify and allocate operational, functional, safety and performance criteria and ensure actual CNS/ATM system performance. The operational criteria and associated allocations are now included in globally accepted RCP specifications. In addition, the second edition of the PBCS Manual includes required surveillance performance (RSP) specifications to provide the operational, functional, safety and performance criteria for surveillance capability. The RCP/RSP specifications are described within the performance-based communication and surveillance (PBCS) framework, which provides the means to prescribe the appropriate RCP/RSP specifications and initially qualify different sub-systems, and manage operational (end-to-end) system performance in continued operations.

1.14 The second meeting of the OPLINKP (OPLINKP/2, Montréal, October 2014) agreed on the proposed amendments to include a provision for PBCS in Annex 6, Annex 11, and PANS, and the second edition of the *Performance-Based Communication and Surveillance (PBCS) Manual*.

2. Scope and purpose

2.1 The PBCS Manual provides guidance and information concerning PBCS operations and is intended to facilitate uniform application of Standards and Recommended Practices contained in Annex 6 — *Aircraft Operations*, Annex 10 — *Aeronautical Telecommunications* and Annex 11 — *Air Traffic Services*, the provisions in the *Procedures for Air Navigation Services — Air Traffic Management* (PANS-ATM, Doc 4444) and, when necessary, the *Regional Supplementary Procedures* (Doc 7030).

2.2 This guidance material is intended to improve safety and maximize operational benefits by promoting the PBCS concept and its general application to emerging technologies for communication and surveillance supporting ATM operations. The PBCS concept provides a framework for managing communication and surveillance performance in accordance with globally accepted required communication performance (RCP) and required surveillance performance (RSP) specifications. The RCP/RSP specifications included are intended initially for automatic dependent surveillance — contract (ADS-C), controller-pilot data link communications (CPDLC) and satellite voice (SATVOICE) communications supporting ATM operations in airspace where procedural separations are being applied. However, the PBCS concept allows for new RCP/RSP specifications for other purposes. For example, the manual could be updated to include a new RSP specification that is intended for automatic dependent surveillance – broadcast (ADS-B) supporting an ATM operation.

2.3 The PBCS Manual, which was formerly the *Manual on Required Communication Performance (RCP)*, was restructured as follows:

a) Chapter 1 was renamed from “Introduction” to “Terms and Definitions.” This chapter provides terms, definitions and acronyms;

b) Chapter 2 was renamed from “Overview of RCP” to “Performance-based communication and surveillance (PBCS) concept.” This chapter provides information on the PBCS concept, including differences with performance-based navigation (PBN), the relationship of the PBCS concept to State safety oversight, the PBCS framework, which addresses ATS provision, flight operations, aircraft systems and monitoring programmes, RCP and RSP specifications supporting ATM operations, and developing, applying and complying with an RCP/RSP specification;

c) Chapter 3 was renamed from “Determining an RCP Type” to “Developing an RCP/RSP specification.” This chapter provides guidance on developing an RCP/RSP specification, which includes operational criteria in terms of RCP/RSP times, RCP/RSP continuity, RCP/RSP availability, RCP/RSP integrity and associated functional and safety requirements; and allocations to different components of the system;

d) Chapter 4 was renamed from “Prescribing an RCP Type” to “Applying an RCP/RSP specification.” This chapter provides guidance on applying an RCP/RSP specification, which includes the prescription of the communication and surveillance capability supporting specific ATM operations in specific airspace, associated operational approvals, and post-implementation monitoring;

e) Chapter 5 was renamed from “Complying with an RCP type” to “Complying with an RCP/RSP specification.” This chapter provides guidance on complying with an RCP/RSP specification, which includes initial compliance determination and State approvals for aircraft systems, air navigation service provider (ANSP) systems and aircraft operators, flight plan requirements and continued operational compliance – PBCS monitoring programmes;

f) Appendix A was renamed from “Glossary of terms” to “PBCS Implementation Plan – Checklist.” The terms were moved to Chapter 1. Appendix A now includes guidance—or a checklist—that lists tasks and other aspects for consideration in the development of a local or Regional PBCS implementation plan;

g) Appendix B was renamed from “Checklist for RCP application” to “RCP specifications.” The checklist was replaced by a new checklist that is contained in Appendix A. Appendix B now contains a “merged” version of the RCP specifications taken from GOLD and SVGM, Appendix B in each document. These specifications are considered a requirement when they are prescribed or guidance if applied only to PBCS monitoring programmes;

h) Appendix C was renamed from “Example of determining an RCP type” to “RSP specifications.” The example was deleted. Appendix C now contains a “merged” version of the RSP specifications taken from GOLD and SVGM, Appendix C in each document. These specifications are considered a requirement when they are prescribed or guidance if applied only to PBCS monitoring programmes;

i) A new Appendix D, “Post-implementation monitoring and corrective action (CPDLC and ADS-*C*),” was added. Appendix D contains the guidance on post-implementation monitoring at ANSP, regional and inter-regional levels, taken from GOLD, Appendix D. The material was simplified and is structured differently from what was provided in GOLD;

j) A new Appendix E, “Post-implementation monitoring and corrective action (SATVOICE),” was added. Appendix E contains the guidance on post-implementation monitoring at ANSP, regional and inter-regional levels, taken from SVGM, Appendix D.

2.4 The following personnel and organizations should be familiar with relevant aspects of its contents: regulators, airspace planners, aircraft operators, flight operations officers/flight dispatchers, ANSPs, aeronautical stations, communication service providers (CSPs), satellite service providers (SSPs) and radio operators, training organizations, regional/local monitoring entities, automation specialists at centres and radio facilities, and aircraft manufacturers and equipment suppliers.

2.5 The guidance supports the following activities:

a) States’ roles and responsibilities in relation to the following:

   1) safety oversight of air navigation services;

   2) operational approval, (e.g. flight crew training and qualification); and

   3) design approval of aircraft data link systems.

b) development of agreements and/or contractual arrangements between ANSPs and aircraft operators and their respective CSPs;

c) development of operational procedures; and

d) operational monitoring, analysis, and exchange of operational data among appropriate entities, such as regional monitoring entities, States, ANSPs, and CSPs.

3. References

ICAO documents

Annex 1 — *Personnel Licensing*

Annex 4 — *Aeronautical Charts*

Annex 6 — *Operation of Aircraft*

- *Part I* — International Commercial Air Transport — Aeroplanes
- *Part II* — International General Aviation — Aeroplanes
- *Part III* — International Operations — Helicopters

Annex 10 — *Aeronautical Telecommunications*

- *Volume II* — Communication Procedures including those with PANS status
- *Volume III* — Communication Systems

Annex 11 — *Air Traffic Services*

Annex 15 — *Aeronautical Information Services*

Annex 19 — *Safety Management*

Procedures for Air Navigation Services — Air Traffic Management (PANS-ATM, Doc 4444)

Procedures for Air Navigation Services — ICAO Abbreviations and Codes (PANS-ABC, Doc 8400)

Regional Supplementary Procedures (Regional SUPPs, Doc 7030)

Designators for Aircraft Operating Agencies, Aeronautical Authorities and Services (Doc 8585)

Aircraft Type Designators (ICAO Doc 8643)

Manual on Airspace Planning Methodology for the Determination of Separation Minima (Doc 9689)

Performance-based Navigation Manual (PBN) (Doc 9613)

Manual on a 300 m (1 000 ft) Vertical Separation Minimum Between FL 290 and FL 410 Inclusive (Doc 9574)

Operating Procedures and Practices for Regional Monitoring Agencies in Relation to the Use of a 300 m (1 000 ft) Vertical Separation Minimum Between FL 290 and FL 410 Inclusive (Doc 9937)

Manual on Monitoring the Application of Performance-Based Horizontal Separation Minima (Doc [PBHSM])

European Organisation for Civil Aviation Equipment (EUROCAE) and RTCA, Inc. documents

Safety and Performance Standard for Air Traffic Data Link Services in Oceanic and Remote Airspace (Oceanic SPR Standard, RTCA DO-306/EUROCAE ED-122)

Safety and Performance Standard for Air Traffic Data Link Services in Continental Airspace (Continental SPR Standard, RTCA DO-290/EUROCAE ED-120, Change 1 and Change 2)

Interoperability Requirements for ATS Applications Using ARINC 622 Data Communications (FANS 1/A INTEROP Standard, RTCA DO-258A/EUROCAE ED-100A)

Interoperability Requirements Standard for Aeronautical Telecommunication Network Baseline 1 (ATN B1 INTEROP Standard, RTCA DO-280B/EUROCAE ED-110B)

Future Air Navigation System 1/A — Aeronautical Telecommunication Network Interoperability Standard (FANS 1/A — ATN B1 INTEROP Standard, RTCA DO 305A/EUROCAE ED 154A)

Safety, Performance and Interoperability Requirements Document for In Trail Procedure in Oceanic Airspace (RTCA DO 312/EUROCAE ED 159) and Supplement

4. Future developments

4.1 In order to keep this manual relevant and accurate, suggestions for improving it in terms of format, content or presentation are welcome. Any such recommendation or suggestion will be examined and, if found suitable, will be included in regular updates to the manual. Regular revision will ensure that the manual remains both pertinent and accurate. Comments on this manual should be addressed to:

The Secretary General

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Montréal, Quebec, Canada H3C 5H7

1. Definitions

1.1 Terms and definitions

When the following terms are used in this document they have the following meanings.

Note.— Where the term has "(ICAO)" annotated, the term has already been defined as such in Annexes and Procedures for Air Navigation Services (PANS).

Term

Access number. The number used by the ATS unit, aeronautical station or aeronautical operational control (AOC) to access the network switch to contact an aircraft via SATVOICE.

Active flight plan. (See flight plan).

Actual communication performance (ACP). The portion of communication transaction time that is monitored against the *required communication monitored performance* (RCMP) values provided by the RCP specification.

Actual surveillance performance (ASP). The portion of surveillance data delivery time that is monitored against the *required surveillance monitored performance* (RSMP) values provided by the RSP specification.

Aeronautical Information Publication (AIP). A publication issued by or with the authority of a State and containing aeronautical information of a lasting character essential to air navigation. (ICAO)

Aeronautical mobile-satellite (route) service (AMS(R)S). An aeronautical mobile-satellite service reserved for communications relating to safety and regularity of flights, primarily along national or international civil air routes. (ICAO)

Note.— AMS(R)S includes both voice and data. In this document, the use of AMS(R)S for voice communications is referred to as SATVOICE to reflect the operational use of the term in standard phraseology and messages.

Aeronautical mobile service (AMS). A mobile service between aeronautical stations and aircraft stations, or between aircraft stations, in which survival craft stations may participate; emergency position-indicating radio beacon stations may also participate in this service on designated distress and emergency frequencies. (ICAO, RR S1.32)

Aeronautical operational control (AOC). Communication required for the exercise of authority over the initiation, continuation, diversion or termination of flight for safety, regularity and efficiency reasons. (ICAO)

Aeronautical station. A land station in the aeronautical mobile service. In certain instances, an aeronautical station may be located, for example, on board ship or on a platform at sea. (ICAO, RR S1.81)

Term

Aeronautical telecommunication network (ATN). A global internetwork architecture that allows ground, air-ground and avionic data subnetworks to exchange digital data for the safety of air navigation and for the regular, efficient and economic operation of air traffic services. (ICAO)

Air navigation services provider (ANSP). The organization(s) that operate(s) on behalf of a State to manage air traffic and airspace safely, economically and efficiently through the provision of facilities and seamless services in collaboration with all parties and involving airborne and ground-based functions.

Air traffic control (ATC) clearance. Authorization for an aircraft to proceed under conditions specified by an air traffic control unit.

Note 1.— For convenience, the term "air traffic control clearance" is frequently abbreviated to "clearance" when used in appropriate contexts.

Note 2.— The abbreviated term "clearance" may be prefixed by the words "taxi", "take-off", "departure", "en-route", "approach" or "landing" to indicate the particular portion of flight to which the air traffic control clearance relates. (ICAO)

Air traffic control (ATC) service. A service provided for the purpose of:

a) preventing collisions:

   1) between aircraft, and

   2) on the manoeuvring area between aircraft and obstructions; and

b) expediting and maintaining an orderly flow of air traffic. (ICAO)

Air traffic management (ATM). The dynamic, integrated management of air traffic and airspace including air traffic services, airspace management and air traffic flow management — safely, economically and efficiently — through the provision of facilities and seamless services in collaboration with all parties and involving airborne and ground-based functions. (ICAO)

Air traffic service (ATS). A generic term meaning variously, flight information service, alerting service, air traffic advisory service, air traffic control service (area control service, approach control service or aerodrome control service). (ICAO)

Air traffic services unit (ATS unit). A generic term meaning variously, air traffic control unit, flight information centre or air traffic services reporting office. (ICAO)

Aircraft. Any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface. (ICAO)

Aircraft address. A unique combination of 24 bits available for assignment to an aircraft for the purpose of air-ground communications, navigation and surveillance. (ICAO)

Term

Aircraft identification. A group of letters, figures or a combination thereof which is either identical to, or the coded equivalent of, the aircraft call sign to be used in air-ground communications, and which is used to identify the aircraft in ground-ground air traffic services communications. (ICAO)

Note 1.— The aircraft identification does not exceed 7 characters and is either the aircraft registration or the ICAO designator for the aircraft operating agency followed by the flight identification.

Note 2.— ICAO designators for aircraft operating agencies are contained in ICAO Doc 8585.

Aircraft registration. A group of letters, figures or a combination thereof which is assigned by the State of Registry to identify the aircraft.

Note.— Also referred to as registration marking.

Appropriate authority.

a) Regarding flight over the high seas: The relevant authority of the State of Registry.

b) Regarding flight other than over the high seas: The relevant authority of the State having sovereignty over the territory being overflown. (ICAO)

Area navigation (RNAV) specification. See navigation specification. (ICAO)

ATC waypoint. A waypoint contained in Item 15 of the ICAO flight plan, or as amended by ATC.

Note.— A waypoint inserted by the flight crew for purposes of conducting flight operations such as points of no return are not ATC waypoints.

ATM operation. An individual operational component of air traffic management.

Note.— Examples of ATM operations include the application of separation between aircraft, the re-routing of aircraft, and the provision of flight information.

ATS surveillance service. A term used to indicate a service provided directly by means of an ATS surveillance system. (ICAO)

ATS surveillance system. A generic term meaning variously, ADS-B, PSR, SSR or any comparable ground-based system that enables the identification of aircraft.

Note.— A comparable ground-based system is one that has been demonstrated, by comparative assessment or other methodology, to have a level of safety and performance equal to or better than monopulse SSR.(ICAO)

Automatic dependent surveillance — broadcast (ADS-B). A means by which aircraft, aerodrome vehicles and other objects can automatically transmit and/or receive data such as identification, position and additional data, as appropriate, in a broadcast mode via a data link. (ICAO)

Term

Automatic dependent surveillance — contract (ADS-C). A means by which the terms of an ADS-C agreement will be exchanged between the ground system and the aircraft, via a data link, specifying under what conditions ADS-C reports would be initiated, and what data would be contained in the reports. (ICAO)

Note.— The abbreviated term "ADS contract" is commonly used to refer to ADS event contract, ADS demand contract, ADS periodic contract or an emergency mode.

Call sign. The designator used to identify aeronautical stations, including ATS units, and aircraft in radiotelephony communications.

Note.— See Annex 10, Volume II, paragraph 5.2.1.7 for Standards on defining call signs. For aircraft, the call sign is equivalent to the aircraft identification.

Caller line identification (CLI). A display of the identification of a caller to the recipient prior to answering the call.

Note.— For the purposes of ATS communications, caller line identification to the flight crew is a display of facility name or the facility designator for the aeronautical station or ATS unit. For the ground user it is a display of the aircraft identification.

Communication service provider (CSP). Any public or private entity providing communication services for general air traffic.

Communication services. Aeronautical fixed and mobile services to enable ground-ground and/or air-ground communications for safety and regularity of flight.

Compulsory reporting point. An ATC waypoint for which a position report is required by the aircraft.

Control area (CTA). A controlled airspace extending upwards from a specified limit above the earth. (ICAO).

Controller. A person authorized by the appropriate authority to provide air traffic control services.

Controller-pilot data link communications (CPDLC). A means of communication between controller and pilot, using data link for ATC communications. (ICAO)

CPDLC message element. A component of a message. A standard message element is defined for specific uses (e.g. vertical clearance, route modification). A "free text message element" provides additional capability.

Note.— The abbreviated term 'message element' is commonly used to refer to a CPDLC message element.

CPDLC message. Information exchanged between an airborne application and its ground counterpart. A CPDLC message consists of a single message element or a combination of message elements conveyed in a single transmission by the initiator.

Note.— The abbreviated term 'message' is commonly used to refer to a CPDLC message.

Term

Current flight plan. (See flight plan).

Data link initiation capability (DLIC). A data link application that provides the ability to exchange addresses, names and version numbers necessary to initiate data link applications. (ICAO)

Diagnostic rhyme test (DRT). A test and scoring system for speech intelligibility using trained listeners to distinguish a standard set of word-pairs with initial consonants that sound somewhat similar. (ANSI/ASA S3.2-2009)

Note.— Speech intelligibility is a vital factor in aeronautical safety communications. The DRT is specifically designed to test intelligibility of speech using trained listeners to distinguish a standard set of word-pairs with initial consonants that sound somewhat similar (e.g. goat/coat). They are then played the same word pairs processed through the condition (e.g. codec) under test and the success rate is scored. Intelligibility is largely dependent on consonant recognition; vowel recognition is less important. The target users for aeronautical communications are, as for the DRT listening panels, trained listeners (pilots, air traffic controllers) who use standard phrases.

Downlink message (DM). A CPDLC message sent from an aircraft.

Figure of merit (FOM). An indication of the aircraft navigation system's ability to maintain position accuracy.

Filed flight plan. (See flight plan).

Flight crew member. A person authorized by the appropriate authority charged with duties essential to the operations of an aircraft on the flight deck during a flight duty period.

Flight identification. A group of numbers, which is usually associated with an ICAO designator for an aircraft operating agency, to identify the aircraft in Item 7 of the flight plan.

Flight information region (FIR). An airspace of defined dimensions within which flight information service and alerting service are provided. (ICAO)

Flight manual. A manual, associated with the certificate of airworthiness, containing limitations within which the aircraft is to be considered airworthy, and instructions and information necessary to the flight crew members for the safe operation of the aircraft. (ICAO)

Term

Flight plan. Specified information provided to air traffic services units, relative to an intended flight or portion of a flight of an aircraft. (ICAO)

A flight plan can take several forms, such as:

Current flight plan (CPL). The flight plan, including changes, if any, brought about by subsequent clearances. (ICAO)

Note 1.— When the word "message" is used as a suffix to this term, it denotes the content and format of the current flight plan data sent from one unit to another.

Filed flight plan (FPL). The flight plan as filed with an ATS unit by the pilot or a designated representative, without any subsequent changes. (ICAO)

Note 2.— When the word "message" is used as a suffix to this term, it denotes the content and format of the filed flight plan data as transmitted.

Operational flight plan. The operator's plan for the safe conduct of the flight based on considerations of aeroplane performance, other operating limitations and relevant expected conditions on the route to be followed and at the aerodromes concerned. (ICAO)

Active flight plan. The operational flight plan which is controlling the aircraft's progress in terms of route, speed and altitude.

Free text message element. A message element used to convey information not conforming to any standardized message element in the CPDLC message set.

Grade of service. The probability of a call being blocked or delayed for more than a specified interval, with reference to the busy hour when the traffic intensity is the greatest.

Ground user. A term to refer to either the controller or the radio operator.

Lateral deviation event (LDE). A type of event that triggers an ADS-C report when the absolute value of the lateral distance between the aircraft`s actual position and the aircraft`s expected position on the active flight plan becomes greater than the lateral deviation threshold.

Level range deviation event (LRDE). A type of event that triggers an ADS-C report when the aircraft`s level is higher than the level ceiling or the aircraft`s level is lower than the level floor.

Note.— Sometimes referred to as altitude range change event or altitude range event.

Long-range communication system (LRCS). A system that uses satellite relay, data link, high frequency, or another approved communication system which extends beyond line of sight.

Master minimum equipment list (MMEL). A list established for a particular aircraft type by the organization responsible for the type design with the approval of the State of Design containing items, one or more of which is permitted to be unserviceable at the commencement of a flight. The MMEL may be associated with special operating conditions, limitations or procedures. (ICAO)

Term

Maximum accumulated unplanned outage time. A value that defines the acceptable accumulated duration of unplanned outages that exceed the unplanned outage duration limit in a specified time period.

Note.— Unplanned outages that are less than the unplanned outage duration limit are considered against the criterion for continuity.

Maximum number of unplanned outages. A value that defines the acceptable number of unplanned outages that exceed the unplanned outage duration limit in a specified time period.

Note.— Unplanned outages that are less than the unplanned outage duration limit are considered against the criterion for continuity.

Message element identifier. The ASN.1 tag of the ATCUplinkMsgElementId or the ATCDownlinkMsgElementId. (ICAO)

Minimum equipment list (MEL). A list which provides for the operation of aircraft, subject to specified conditions, with particular equipment inoperative, prepared by an operator in conformity with, or more restrictive than, the MMEL established for the aircraft type. (ICAO)

Navigation specification. A set of aircraft and flight crew requirements needed to support performance-based navigation operations within a defined airspace. There are two kinds of navigation specifications:

Required navigation performance (RNP) specification. A navigation specification based on area navigation that includes the requirement for performance monitoring and alerting, designated by the prefix RNP (e.g. RNP 4, RNP APCH).

Area navigation (RNAV) specification. A navigation specification based on area navigation that does not include the requirement for performance monitoring and alerting, designated by the prefix RNAV (e.g. RNAV 5, RNAV 1).

Note 1.— The Performance-based Navigation (PBN) Manual (Doc 9613), Volume II, contains detailed guidance on navigation specifications.

Note 2.— The term RNP, previously defined as "a statement of the navigation performance necessary for operation within a defined airspace", has been removed from this Annex as the concept of RNP has been overtaken by the concept of PBN. The term RNP is now solely used in the context of navigation specifications that require performance monitoring and alerting (e.g. RNP 4 refers to the aircraft and operating requirements, including a 4 NM lateral performance with on-board performance monitoring and alerting that are detailed in Doc 9613).

NOTAM. A notice distributed by means of telecommunication containing information concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to personnel concerned with flight operations. (ICAO)

Operational communication transaction. The process a human uses to initiate the transmission of an instruction, clearance, flight information, and/or request, and is completed when that human is confident that the transaction is complete.

Term

Operational flight plan. (See flight plan).

Performance-based communication (PBC). Communication based on performance specifications applied to the provision of air traffic services.

Note.— An RCP specification includes communication performance requirements that are allocated to system components in terms of communication transaction time, continuity, availability, integrity, safety and functionality needed for the proposed operation in the context of a particular airspace concept.

Performance-based navigation (PBN). Area navigation based on performance requirements for aircraft operating along an ATS route, on an instrument approach procedure or in a designated airspace.

Note.— Performance requirements are expressed in navigation specifications (RNAV specification, RNP specification) in terms of accuracy, integrity, continuity, availability and functionality needed for the proposed operation in the context of a particular airspace concept. (ICAO)

Performance-based surveillance (PBS). Surveillance based on performance applied to the provision of air traffic services.

Note.— An RSP specification includes surveillance performance requirements that are allocated to system components in terms of surveillance data delivery time, continuity, availability, integrity, accuracy of the surveillance data, safety and functionality needed for the proposed operation in the context of a particular airspace concept.

Personal identification number (PIN). A secret numeric password shared between a user and a system that can be used to authenticate the user to the system.

Note.— For the purposes of ATS communications, all PIN numbers are issued for the same purpose, as there is no PIN that grants higher priority or access than another. The priority of the call is determined by the dialling string and ground initiated calling service used. Calling line identification (caller ID) is just a substitute for the radio operator not having to dial the PIN number for ground initiated calls. When CLI is implemented for the customer, then all calls made from the access numbers provided to the GES provider will not be prompted for a PIN when the call is placed to the aircraft. If the switch does not recognize the pre-defined CLI list provided to the GES, then the caller will be prompted for the PIN code.

Pre-emption. The immediate and automatic seizure of resources allocated to a lower-priority call. A higher priority call will interrupt communication resources being used by a lower-priority communication to establish a connection without any indication or delay.

Note.— If the intervening call is the same or lower, the current call will not be pre-empted and the intervening caller will get an indication that the line is not available. The effects of pre-emption can be minimized by multiple channels and conference calling, but not completely eliminated.

Preformatted free text message element. A free text message element that is stored within the aircraft system or ground system for selection.

Term

Priority level. An indication of call precedence for ground to air or air to ground calls. Priority level may be used to establish pre-emption.

Procedural control. Term used to indicate that information derived from an ATS surveillance system is not required for the provision of air traffic control service. (ICAO)

Procedural separation. The separation used when providing procedural control. (ICAO)

Public switched telephone network (PSTN). A network of the world's public circuit-switched telephone networks. It consists of telephone lines, fibre optic cables, microwave transmission links, cellular networks, communications satellites, and undersea telephone cables, all inter-connected by switching centres, thus allowing any telephone in the world to communicate with any other.

Qualification. The process through which a State, approval authority and applicant ensure that a specific implementation complies with applicable requirements with a specified level of confidence.

Radio operator. A person authorized by the appropriate authority to relay a radiotelephony communication between the ATS unit and the flight crew.

RCP allocation. A portion of an RCP parameter value assigned to a specific component of the communication system.

Note.— The different components of the system may include, for example, the ATS unit, the CSP/SSP, the aircraft system and the flight crew. An RCP allocation may also be a portion of an RCP parameter value that is used for monitoring (e.g. RCMP).

RCP answer/call performance. An RCP allocation that specifies the maximum time for when the flight crew receives an indication of an incoming call to when the parties on the call have completed the communication.

RCP availability (A). An RCP parameter that specifies the required probability that an operational communication transaction can be initiated.

RCP availability - aircraft (A_{AIR}). An RCP allocation that specifies the required probability that the aircraft system is serviceable for the relevant communication capability.

RCP availability – CSP/SSP ($A_{CSP/SSP}$). An RCP allocation that specifies the required probability that the CSP/SSP systems are available to provide the required level of communication service, given the ATS unit’s system is available.

RCP availability - service ($A_{SERVICE}$). An RCP allocation that specifies the required probability that the ATS unit’s system and the CSP/SSP systems are available to provide the required level of communication service.

Term

RCP continuity (C). An RCP parameter that specifies the minimum proportion of relevant operational communication transactions to be completed within the specified time, given that the service was available at the start of the transaction, where:

a) the minimum proportion is either 95 per cent that is used for statistical monitoring, or a proportion (e.g. 99.9 per cent) that is associated with the time after which the initiator is required to revert to an alternative procedure; and

b) the specified time represents the RCP transaction time or any allocation provided by the RCP specification.

Note.— For any given allocation of the RCP transaction time, the RCP continuity remains constant and is referred to as "C for [allocation]", (e.g. C for RCMP, C for RCTP).

RCP initiator performance. An RCP allocation that specifies the maximum time for the controller to issue an ATC instruction and receive a response.

RCP integrity (I). An RCP parameter that specifies the required probability that an operational communication transaction is completed with no undetected errors.

Note.— Whilst RCP integrity is defined in terms of the "goodness" of the communication capability, it is specified in terms of the likelihood of occurrence of malfunction on a per flight hour basis (e.g. 10^{-5}), consistent with RNAV/RNP specifications.

RCP parameter. A performance characteristic that provides the basis for developing an RCP specification. The RCP parameters include RCP transaction time, RCP continuity, RCP availability and RCP integrity.

RCP pilot operational response time (PORT). An RCP allocation that specifies the maximum time for the flight crew to recognize and respond to an ATC instruction.

RCP queue/connect performance. An RCP allocation that specifies the maximum time allocated to the radio operator/aeronautical station system to organize and place the call either via a manual or automated dialling sequence.

RCP transaction time. An RCP parameter that specifies the maximum time for the completion of a proportion of operational communication transactions after which the initiator should revert to an alternative procedure. Two values are specified:

a) RCP nominal time (TT). The maximum nominal time within which 95 per cent of operational communication transactions is required to be completed; and

b) RCP expiration time (ET). The maximum time for the completion of the operational communication transaction after which the initiator is required to revert to an alternative procedure.

$RCTP_{AIR}$. An RCP allocation that specifies the maximum portion of RCTP for the aircraft system.

Term

RCTP$_{AS}$. An RCP allocation that specifies the maximum portion of RCTP for an aeronautical station's system for ground-ground communications with an ATS unit.

Note.— RCTP$_{AS}$ includes two concurrent processes:

a) *the aircraft and aeronautical station technically disconnect the call; which is assumed. Operationally, the call is disconnected when the flight crew and radio operator complete the call; and*

b) *the aeronautical station sends the response to the ATS unit via the ground-ground network; the performance is denoted by RCTP$_{AS}$.*

RCTP$_{ATSU}$. An RCP allocation that specifies the maximum portion of RCTP for the ATS unit's system.

RCTP$_{CSP/SSP}$. An RCP allocation that specifies the maximum portion of RCTP for the network, including CSP and SSP.

RCTP$_{G/A}$. An RCP allocation that specifies the maximum portion of RCTP for the ground system, network and aircraft system to set up a ground-to-air call as determined from when the last digit of the dialling sequence is finished to when the aircraft indicates an incoming call to the flight crew.

Required communication monitored performance (RCMP). An RCP allocation that specifies the maximum time against which ACP is assessed.

Required communication performance (RCP) specification. A set of requirements for air traffic service provision, aircraft capability, and operations needed to support performance-based communication.

Note.— The term RCP, currently defined as "a statement of performance requirements for operational communication in support of specific ATM functions", has been revised to align the concept of PBC with the concept of PBN. The term RCP is now used in the context of a specification that is applicable to the prescription of airspace requirements, qualification of ATS provision, aircraft capability, and operational use, including post-implementation monitoring (e.g. RCP 240 refers to the criteria for various components of the operational system to ensure an acceptable intervention capability for the controller is maintained).

Required communication technical performance (RCTP). An RCP allocation that specifies the maximum technical time for relevant parts of the ATS unit's system, aeronautical station's system, the network systems and the aircraft system, for which there is no human contribution to the communication transaction performance.

Required navigation performance (RNP) specification. See navigation specification. (ICAO)

Required surveillance monitored performance (RSMP). An RSP allocation that specifies the maximum time against which ASP is assessed.

Term

Required surveillance performance (RSP) specification. A set of requirements for air traffic service provision, aircraft capability, and operations needed to support performance-based surveillance.

Note.— The term RSP is used in the context of a specification that is applicable to the prescription of airspace requirements, qualification of ATS provision, aircraft capability, and operational use, including post-implementation monitoring (e.g. RSP 180 refers to the criteria for various components of the operational system to ensure an acceptable surveillance capability for the controller is maintained).

Required surveillance technical performance (RSTP). An RSP allocation that specifies the maximum technical time for relevant parts of the ATS unit's system, aeronautical station's system, the network systems and the aircraft system, for which there is no human contribution to the surveillance data delivery performance.

RSP allocation. A portion of an RSP parameter value assigned to a specific component of the surveillance system.

Note.— The different components of the system may include, for example, the ATS unit, the CSP/SSP, the aircraft system and the flight crew. An RSP allocation may also be a portion of an RCP parameter value that is used for monitoring (e.g. RSMP).

RSP answer performance. An RSP allocation that specifies the maximum time for when the ground user receives an indication of an incoming call to when the ground user accepts the call.

RSP availability (A). An RSP parameter that specifies the required probability that surveillance data can be provided.

RSP availability – aircraft (A_{AIR}). An RSP allocation that specifies the required probability that the aircraft system is serviceable for the relevant surveillance service.

RSP availability – CSP/SSP ($A_{CSP/SSP}$). An RSP allocation that specifies the required probability that the CSP/SSP systems are available to provide the required level of communication supporting surveillance services, given the ATS unit's system is available.

RSP availability – service ($A_{SERVICE}$). An RSP allocation that specifies the required probability that the ATS unit's system and the CSP/SSP systems are available to provide the required level of surveillance service.

RSP call performance. An RSP allocation that specifies the maximum time for when the ground user accepts an incoming air-to-ground call to when the parties on the call have completed the communication.

Term

RSP continuity (C). An RSP parameter that specifies the minimum proportion of relevant surveillance data to be delivered within the specified time, given that the service was available at the start of delivery, where:

a) the minimum proportion is either 95 per cent that is used for statistical monitoring, or a proportion (e.g. 99.9 per cent) that is associated with the time after which the surveillance data is considered overdue; and

b) the specified time represents the RSP data delivery time or any allocation provided by the RSP specification.

Note.— For any given allocation of the RSP data delivery time, the RSP continuity remains constant and is referred to as "C for [allocation]", (e.g. for RSTP, C for $RSTP_{CSP}$*).*

RSP data delivery time. An RSP parameter that specifies the maximum time for a proportion of surveillance data deliveries from the time at which the aircraft reported its position to when the ATS unit receives the report. Two values are specified:

a) RSP nominal delivery time (DT). The maximum nominal time within which 95 per cent of surveillance data deliveries are required to be successfully delivered; and

b) RSP overdue delivery time (OT). The maximum time for the successful delivery of surveillance data after which time the initiator is required to revert to an alternative procedure.

RSP initiator performance. An RSP allocation that specifies the maximum time for the flight crew to prepare a position report, from the time the aircraft was over its compulsory reporting point to when the call is initiated.

RSP integrity (I). An RSP parameter that specifies the required probability that the surveillance data is delivered with no undetected error.

Note 1.— Surveillance integrity includes such factors as the accuracy of time, correlating the time at aircraft position, reporting interval, data latency, extrapolation and/or estimation of the data.

Note 2.— Whilst surveillance integrity is defined in terms of the "goodness" of the surveillance capability, it is specified in terms of the likelihood of occurrence of malfunction on a per flight hour basis (e.g. 10^{-5}*), consistent with RCP and RNAV/RNP specifications.*

RSP parameter. A performance characteristic that provides the basis for developing an RSP specification. The RSP parameters include RSP data delivery time, RSP continuity, RSP availability and RSP integrity.

$\mathbf{RSTP_{A/G}}$. An RSP allocation that specifies the maximum portion of RSTP for the ground system, network and aircraft system to set up an air-to-ground call as determined from when the last digit of the dialling sequence is finished to when the ground system indicates an incoming call to the receiving party.

$\mathbf{RSTP_{AIR}}$. An RSP allocation that specifies the maximum portion of RSTP for the aircraft system.

Term

RSTP$_{AS}$. An RSP allocation that specifies the maximum portion of RSTP for the aeronautical station's system for ground-ground communications with an ATS unit.

Note.— RSTP$_{AS}$ includes two concurrent processes:

a) the aircraft and aeronautical station technically disconnect the call; which is assumed. Operationally, the call is disconnected when the flight crew and radio operator complete the call; and

b) the aeronautical station sends the surveillance data to the ATS unit via the ground-ground network; the performance is denoted by RSTP$_{AS}$.

RSTP$_{ATSU}$. An RSP allocation that specifies the maximum portion of RSTP for the ATS unit's system.

RSTP$_{CSP/SSP}$. An RSP allocation that specifies the maximum portion of RSTP for the CSP/SSP.

Satellite service provider (SSP). An entity or group of entities that provide, via satellite, aeronautical fixed services and/or aeronautical mobile services at least from the signal in space to/from aircraft, to the attachment point of the ground earth station (GES) to the ground communication services network.

SATVOICE number. The number used to contact an aircraft or ground facility via SATVOICE.

Note.— The SATVOICE number takes different forms:

a) after the access number has been dialled, the aircraft SATVOICE number is the ICAO aircraft address represented by an 8-digit octal code;

b) the ATS unit or aeronautical station SATVOICE number is a 6-digit short code or a PSTN direct dial number, which are published on aeronautical charts and in aeronautical information publications (AIPs or equivalent publications); and

c) AOC SATVOICE number is a PSTN direct dial number.

Standard message element. Any message element defined by ICAO Doc 4444 that does not contain the [free text] parameter.

Standardized free text message element. A message element that uses a defined free text message format, using specific words in a specific order.

Note.— Standardized free text message elements may be manually entered by the user or may be preformatted.

State of Design. The State having jurisdiction over the organization responsible for the type design. (ICAO)

State of Manufacture. The State having jurisdiction over the organization responsible for the final assembly of the aircraft. (ICAO)

Term

State of Registry. The State on whose register the aircraft is entered. (ICAO)

Note.— In the case of the registration of aircraft of an international operating agency on other than a national basis, the States constituting the agency are jointly and severally bound to assume the obligations which, under the Chicago Convention, attach to a State of Registry. See, in this regard, the Council Resolution of 14 December 1967 on Nationality and Registration of Aircraft Operated by International Operating Agencies which can be found in Policy and Guidance Material on the Economic Regulation of International Air Transport *(Doc 9587).*

State of the Operator. The State in which the operator's principal place of business is located or, if there is no such place of business, the operator's permanent residence. (ICAO)

Surveillance data. Data pertaining to the identification of aircraft and/or obstructions for route conformance monitoring and safe and efficient conduct of flight.

Surveillance data delivery. The process for obtaining surveillance data.

Unplanned outage. An outage for which no advance notification was provided to the appropriate parties.

Unplanned outage duration limit. A value applied to a given airspace that defines the maximum time for the duration of an unplanned outage at which time there is an operational impact.

Unplanned outage notification delay. The time from when the unplanned outage begins to when the ATS unit receives notification of the unplanned outage.

Unplanned outage time. The time from when an unplanned outage begins to when the ATS unit receives notification that the service has been restored.

Uplink message (UM). A CPDLC message sent from a ground system.

Vertical rate change event (VRE). A type of event that triggers an ADS-C report when the aircraft`s rate of climb or descent is greater than the vertical rate threshold.

Waypoint change event (WCE). A type of event that triggers an ADS-C report when there is a change in the next waypoint or the next plus 1 waypoint on the active flight plan.

1.2 Acronyms

When the following acronyms are used in this document they have the following meanings. Where the term has "(ICAO)" annotated, the acronym has already been defined as such in Annexes and/or PANS.

Acronym	Description
ACARS	Aircraft communications addressing and reporting system
ACL	ATS clearance (data link service)
ACM	ATS communications management (data link service)
ACP	Actual communication performance
ACTP	Actual communication technical performance
ADS	Automatic dependent surveillance (retained for reference with non-updated documents. This term would normally be used to refer to ADS-C)
ADS-B	Automatic dependent surveillance – broadcast (ICAO)
ADS-C	Automatic dependent surveillance – contract (ICAO)
AFN	ATS facilities notification
AGL	Above ground level (ICAO)
AIC	Aeronautical information circular (ICAO)
AIP	Aeronautical Information Publication (ICAO)
AMC	ATS microphone check (data link service)
AMS	Aeronautical mobile service (ICAO)
AMS(R)S	Aeronautical mobile satellite (route) service (ICAO)
ANSP	Air navigation service provider
AOC	Aeronautical operational control (ICAO)
ASP	Actual surveillance performance
ATC	Air traffic control (ICAO)
ATM	Air traffic management (ICAO)
ATN	Aeronautical telecommunication network (ICAO)

Acronym	Description
ATN B1	Aeronautical telecommunication network baseline 1 (RTCA DO-280B/EUROCAE ED-110B) *Note.— ATN B1 generally means that the data link system on an aircraft, the ATS unit's system, and communication service provision comply with the standard as adapted by Eurocontrol Specification on Data Link Services (EUROCONTROL-SPEC-0116). ATN B1 consists of the following data link applications:* *a) context management (CM) for data link initiation capability (DLIC); and* *b) limited CPDLC for ATS communications management (ACM), ATS clearance (ACL), and ATC microphone check (AMC).*
ATS	Air traffic service (ICAO)
ATSU	ATS unit
C	Continuity
CLI	Caller line identification
CM	Context management (data link application)
CNS	Communications, navigation and surveillance (ICAO)
CNS/ATM	Communications, navigation and surveillance/air traffic management (ICAO)
COM	Communications (ICAO)
CPDLC	Controller-pilot data link communications (ICAO)
CPL	Current flight plan
CRC	Cyclic redundancy check
CSP	Communication service provider
CTA	Control area
DCPC	Direct controller-pilot communications
DLIC	Data link initiation capability (ICAO)
DM	Downlink message
DRT	Diagnostic rhyme test
DT	RSP data delivery time (associated with nominal continuity – 95 per cent)

Acronym	Description
ET	RCP expiration time (associated with operational continuity)
FANS	Future air navigation system
FANS 1/A	Future air navigation system – initial (RTCA DO-258A/EUROCAE ED-100A, or previous standards that defined the FANS 1/A capability) *Note.— FANS 1/A generally means that the data link system on an aircraft, the ATS unit's system, and communication service provision comply with the standard. In certain cases, specific reference is made to a particular type of FANS 1/A aircraft as follows:* *a) FANS 1/A+ means that the aircraft completely complies with Revision A of the standard, which includes message latency monitor; and* *b) FANS 1/A ADS-C means that the aircraft complies with AFN and ADS-C applications, but does not include the CPDLC application.*
FIR	Flight information region (ICAO)
FMS	Flight management system
FOM	Figure of merit
FPL	Filed flight plan
GEO	Geosynchronous earth orbit
GES	Ground earth station
GOLD	Global Operational Data Link (Manual)
HF	High frequency (3-30 MHz) (ICAO)
ICAO	International Civil Aviation Organization (ICAO)
LDE	Lateral deviation event
LRCS	Long-range communication system
LRDE	Level range deviation event
MAS	Message assurance
MEL	Minimum equipment list (ICAO)
MMEL	Master minimum equipment list (ICAO)
ORT	Operational requirements table

Acronym	Description
OT	RSP data overdue time (associated with operational continuity)
PANS-ATM	Procedures for Air Navigation Services — Air Traffic Management (ICAO Doc 4444). (ICAO)
PBC	Performance-based communication
PBCS	Performance-based communication and surveillance
PBN	Performance-based navigation
PBS	Performance-based surveillance
PIN	Personal identification number
PORT	Pilot operational response time
POS	Position report message
PSTN	Public switched telephone network
RCMP	Required communication monitored performance
RCP	Required communication performance
RCP A	RCP availability
RCP $\mathbf{A}_{AIR}$	RCP availability – aircraft
RCP $\mathbf{A}_{CSP/SSP}$	RCP availability – CSP/SSP
RCP $\mathbf{A}_{SERVICE}$	RCP availability – service
RCP C	RCP continuity
RCP I	RCP integrity
RCTP	Required communication technical performance
RGS	Radio ground station
RNAV	Area navigation
RNP	Required navigation performance
RSMP	Required surveillance monitored performance

Acronym	Description
RSP	Required surveillance performance
RSP A	RSP availability
RSP A_{AIR}	RSP availability – aircraft
RSP $A_{CSP/SSP}$	RSP availability – CSP/SSP
RSP $A_{SERVICE}$	RSP availability – service
RSP C	RSP continuity
RSP I	RSP integrity
RSTP	Required surveillance technical performance
RTF	Radiotelephone (ICAO)
SARPs	Standards and Recommended Practices (ICAO)
SATCOM	Satellite communication (used only when referring generally to both voice and data satellite communication) (ICAO)
SATVOICE	Satellite voice
SSP	Satellite service provider
TT	RCP transaction time (associated with nominal continuity – 95 per cent)
UM	Uplink message
VDL	VHF data link Mode 0/A or Mode 2
VDL M2	VHF data link Mode 2 subnetwork
VHF	Very high frequency (30-300 MHz) (ICAO)
VRE	Vertical rate change event
WCE	Waypoint change event

Chapter 2. PERFORMANCE-BASED COMMUNICATION AND SURVEILLANCE (PBCS) CONCEPT

2.1 General

2.1.1 The PBCS concept provides objective operational criteria to evaluate different and emerging communication and surveillance technologies that are intended for evolving ATM operations. Once these criteria have been set and accepted, a specific implementation of an ATM operation including its technical and human performance may have its viability assessed against these operational criteria. The PBCS concept and the guidelines provided in this manual are applicable to any ATS system change that is predicated on communication and/or surveillance performance.

2.1.2 The PBCS concept is aligned with the concept of performance based navigation (PBN). While the PBN concept applies required navigation performance (RNP) and area navigation (RNAV) specifications to the navigation element, the PBCS concept applies required communication performance (RCP) and required surveillance performance (RSP) specifications to communication and surveillance elements, respectively. Each RCP/RSP specification includes allocated criteria among the components of the communication and surveillance systems involved.

2.1.3 Where beneficial, RCP, RNP/RNAV and RSP specifications are applied to communication, navigation and surveillance elements to ensure the operational system and its components perform in accordance with the specifications. Figure 2-1 provides an overview of the performance-based CNS/ATM model, which characterizes the relationship of the performance-based specifications among CNS elements supporting an ATM operation.

Note 1.— While RCP and RSP specifications may be applied where beneficial, the PBCS concept is intended primarily for emerging technologies, not existing or traditional ones, such as HF voice communication or radar. This edition has considered CPDLC, ADS-C and SATVOICE technologies, and may be revised to apply to other technologies, such as ADS-B, as experience is gained.

Note 2.— Similar to the PBN concept, security is beyond the scope of the PBCS concept. However, in some cases, the RCP and RSP specifications may include criteria to support mitigations from security threats. For example, the RCP and RSP specifications that may be applied to SATVOICE contain provisions for SSPs to oversee CSPs in administering accounts to authorized subscribers with PIN and priority level calling. Aircraft SATVOICE systems only route calls to the flight deck from authorized subscribers or alert the flight crew of the appropriate call priority for ATS communication.

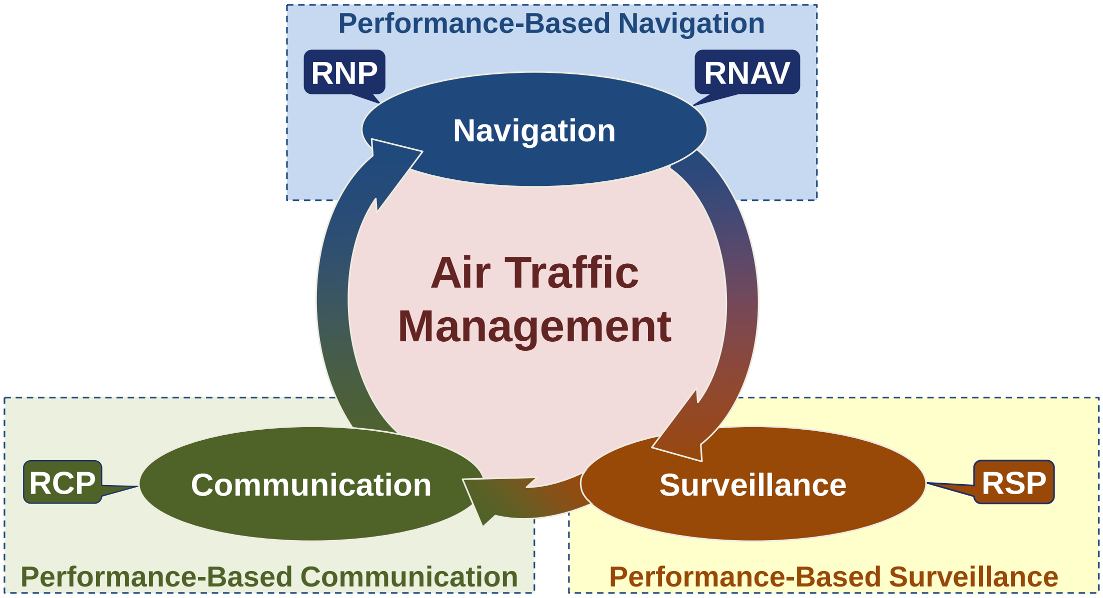


Figure 2-1. Performance-based CNS/ATM model

2.1.4 There are some differences between the PBCS concept and PBN concept:

a) the PBCS concept applies RCP and RSP specifications, which allocate criteria to ATS provision, including communication services, aircraft capability, and the aircraft operator; the PBN concept applies RNP/RNAV specifications, which allocate criteria only to the aircraft capability and the aircraft operator; and

b) the PBCS concept includes post-implementation monitoring programmes, on a local and regional basis, with global exchange of information; the PBN concept includes real-time monitoring and alerting functionality in the aircraft capability.

Note.— PBCS includes real-time alerts (e.g. when a communication transaction expires or a position report is overdue) that are conceptually different than the PBN alerts (e.g. RNP UNABLE).

2.2 Relationship of the PBCS concept to State safety oversight

2.2.1 In accordance with Annex 19, the State provides safety oversight of training organizations, aircraft operators and associated maintenance organizations, organizations responsible for the type design or manufacture of aircraft, ANSPs and certified aerodrome operators, in accordance with ICAO standards, to ensure safe, regular and efficient conduct of operations. The PBCS concept applies RCP and RSP specifications to support State safety oversight in accordance with the following:

a) Annex 1 contains standards for training and qualification of personnel associated with licensing a flight crew member, aircraft maintenance personnel, flight operations officer/flight dispatcher, air traffic controller or aeronautical station operator;

b) Annex 6 contains standards for safety oversight of aircraft operators, including airworthiness of aircraft systems and equipment in accordance with Annex 8.

c) Annex 8 contains standards for safety oversight in the type design and manufacture of aircraft; and

d) Annex 11 contains standards for safety management, including monitoring programmes, for the provision and operation of air traffic services.

2.2.2 State safety oversight includes the "supervision" of contracted services in accordance with Annex 10, Volume II, Chapter 2. When communication and surveillance services are negotiated, as depicted in Figure 2-2, the ANSP and aircraft operator establish proper mechanisms, such as administrative and legal arrangements, to oversee the contracted CSP and SSP, as appropriate.

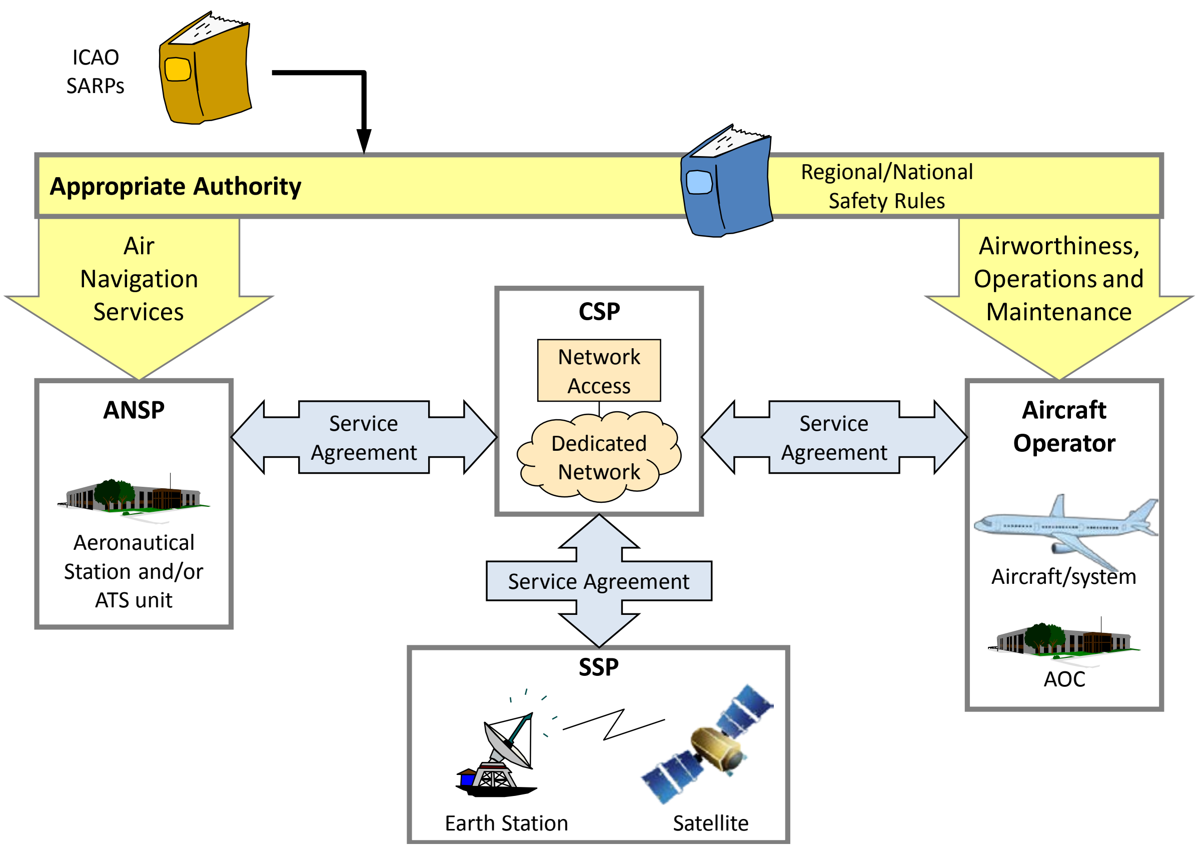


Figure 2-2. Example of contracted communication and surveillance services

2.2.3 Annex 19 requires States to establish a State safety programme for the management of safety in the State, to achieve an acceptable level of safety performance in civil aviation. The relationship of the PBCS concept to each of the components of a State safety programme is highlighted as follows:

a) ***State safety policy and objectives*** – The PBCS concept provides means to establish a safety policy with objectives to ensure responsible parties manage, commit, and account for achieving acceptable level of performance for communication and surveillance systems;

b) ***State safety risk management*** – The PBCS concept provides a basis for initial and ongoing compliance determination, including hazard identification, risk assessment, and mitigation, through the application of RCP/RSP specifications to communication and surveillance systems;

c) ***State safety assurance*** – The PBCS concept supports safety oversight by providing allocated functional, safety and performance requirements, which are contained in RCP/RSP specifications, and a means of compliance framework for approval of the different communication and surveillance system components, and identify substandard performance for appropriate action. These components include, for example, the aircraft operator, aircraft type/system, ANSP, CSP/SSP, and others, as appropriate; and

d) ***State safety promotion*** – The PBCS concept is global in nature, to support State activities to effectively and efficiently promote the safety of communication and surveillance capabilities by applying RCP/RSP specifications, and exchanging information on a regional and global basis, such as through workshops and monitoring programmes.

2.3 The PBCS framework

2.3.1 The PBCS concept provides a framework to apply RCP and RSP specifications to ensure the acceptable communication and surveillance capabilities and performance of an operational system. The PBCS concept applies RCP and RSP specifications in any one or more of the following ways:

a) air traffic services (ATS) provision and prescription (in accordance with ICAO Annex 11, PANS, *Regional Supplementary Procedures* (Doc 7030) and/or the AIP (or equivalent publication)) of an RCP specification for a communication capability and/or an RSP specification for a surveillance capability, either of which is required for the ATS in a particular airspace;

b) operator approval (under air operator certificate, special authorization or equivalent, in accordance with ICAO Annex 6) of a communication and/or surveillance capability including aircraft equipage where RCP and/or RSP specifications have been prescribed for the communications and/or surveillance capabilities supporting the ATS provision; and

c) local and regional monitoring programmes to assess actual communication and surveillance performance against RCP and RSP specifications and to determine corrective action, as applicable, for the appropriate entity.

Note.— Consistent with ICAO Doc 4444, Appendix 2, Item 10, a communication or surveillance capability "comprises the following elements: a) presence of relevant serviceable equipment on board the aircraft; b) equipment and capabilities commensurate with flight crew qualifications; and c) where applicable, authorization from the appropriate authority."

2.3.2 There is a need to ensure consistent definition and use of communication and surveillance capabilities to apply the PBCS concept on a global basis to achieve the benefits that are advantageous to States, ANSPs and users.

2.3.3 The PBCS concept applies to the performance of the communication and surveillance capabilities and, therefore, affects the provision of air traffic service and the aircraft operator's use of the services, including associated aircraft equipage. The PBCS concept is intended to characterize the communication and surveillance capability and its performance through RCP and RSP specifications and ensure that systems meet these specifications.

2.4 RCP and RSP specifications supporting ATM operations

2.4.1 To perform ATM operations within a performance-based airspace, the standards specify functional, safety and performance criteria for the applicable communication (C), navigation (N) and/or surveillance (S) elements. RCP and RSP specifications, in conjunction with RNP/RNAV specifications provide these criteria and are intended to facilitate the development of standards for ATM operations. This approach is essential to the evolution of operational concepts that use emerging technologies.

2.4.2 The *Manual on Airspace Planning Methodology for the Determination of Separation Minima* (Doc 9689), outlines considerations for assessing the risk of collision when determining separation minima within a target level of safety. When assessing the communication, navigation and surveillance criteria for a particular ATM operation, the risk of collision is affected by many factors, such as navigation performance, route configuration, traffic density, surveillance, communication and air traffic control. Trade-offs in required performance among the communication, navigation and surveillance elements are evaluated taking into account practical and technological constraints to achieve the target level of safety.

2.4.3 Doc 9689 characterizes the relationship of communication and surveillance elements with the navigation element through the use of a communication and controller intervention buffer, referred to as tau (τ). Table 2-1 shows the relationship of the parameters of tau (τ) with RCP/RSP specifications, considering three different scenarios: normal communication and surveillance, non-normal communication (i.e. first communication transaction was not completed by a specified time) and non-normal surveillance (i.e. surveillance data was not delivered by a specified time and is now considered overdue).

Note.— Table 2-1 was derived from RTCA DO-306/EUROCAE ED-122, paragraph 5.2.3.2, Table 5-5.

Table 2-1. Relationship of tau (τ) with RCP/RSP specifications

Communication and controller intervention buffer, τ, parameter (Doc 9689, Appendix 5)	**Normal communication and surveillance**	**Non-normal communication**	**Non-normal surveillance**
Not considered part of τ. The time for the system to deliver the surveillance data to the ATS unit.	Consideration for RSP specification	Consideration for RSP specification	Consideration for RSP specification
The time for the controller to recognize the potential conflict and to devise an alternative means of separation (assumed to be achieved by a change of level in procedurally controlled airspace).	Not considered in RSP or RCP specification	Not considered in RCP specification	No time allocated for RSP specification. (Overdue position report)

Communication and controller intervention buffer, τ, parameter (Doc 9689, Appendix 5)	**Normal communication and surveillance**	**Non-normal communication**	**Non-normal surveillance**
The time taken to communicate the instructions to the pilot via normal means of communication. In the case of an overdue position report, the time taken to obtain the report via normal means of surveillance.	Consideration for RCP specification	Consideration for RCP specification	Consideration for RSP specification (Time after which the controller initiates first attempt to obtain overdue position report.)
The time taken to communicate the instructions to the pilot via alternative means of communication. In the case first attempt to obtain overdue position report fails, the time taken for a second attempt via alternative means of surveillance.	Not applicable	Consideration for RCP specification.	Consideration for RSP specification Time after which the controller initiates second attempt to obtain overdue position report. If no response received, the controller would have initiated communication with other aircraft.)
The time for the pilot to react and initiate an appropriate manoeuvre and the time for the aircraft to achieve a change of trajectory sufficient to ensure that a collision will be averted.	Not applicable	Not applicable	Not applicable
Not considered part of τ. Communication time for the PORT and WILCO response to the ATC instruction, which may be concurrent with manoeuvring the aircraft.	Consideration for RCP specification	Consideration for RCP specification	Not applicable

2.4.4 An RCP/RSP specification provides values for operational parameters that, when applied within a PBCS framework, ensures confidence that the operational communication and surveillance capabilities will be conducted in an acceptably safe manner. These operational parameters include RCP transaction time, RSP surveillance data delivery time, RCP/RSP continuity, RCP/RSP availability and RCP/RSP integrity. An RCP/RSP specification includes functional, safety and performance requirements that are associated with each of the operational parameters.

2.4.5 In addition, an RCP/RSP specification includes allocated criteria to system components based on technological dependencies. These allocations are used to:

a) assess viability of different technologies to meeting operational requirements;

b) approve the provision of air traffic services supported by communication and/or surveillance systems;

c) determine when to initiate contingency procedures;

d) design, implement and qualify communication and/or surveillance services;

e) design, implement, qualify and approve aircraft type designs;

f) approve aircraft operators for PBCS operations; and

g) operationally monitor, detect and resolve non-compliant performance.

2.4.6 An RCP and RSP specification is globally harmonized and applied for the same or similar ATM operations to reduce training requirements and errors resulting from confusion in operations across airspace boundaries. Global harmonization also facilitates the application of an RCP/RSP specification to components of the system that are global in nature, such as aeronautical mobile satellite services and ground-ground networks.

2.4.7 An RCP/RSP specification provides the basis to manage the performance of communication and surveillance capabilities. This is achieved by:

a) developing an RCP/RSP specification for one or more communication and surveillance capabilities on a global basis; then

b) applying an RCP/RSP specification related to one or more communication and surveillance system(s) within that airspace; and

c) complying with a prescribed RCP/RSP specification through initial approvals of the different system components and on-going local and regional monitoring programmes, which include operational assessments of the actual performance of communication and surveillance systems and corrective action.

2.5 Developing an RCP/RSP specification

2.5.1 ICAO, in coordination with industry (e.g. EUROCAE/RTCA), develops a new RCP/RSP specification or revises an existing RCP/RSP specification to provide a set of operational requirements for communication and surveillance capabilities that are adequate for a standard supporting a new ATM operation. ICAO may also revise an existing RCP/RSP specification to provide a new set of allocations to the communication or surveillance system components as new technologies emerge. These system components include the air traffic service provision, including contracted communication and surveillance services, the aircraft operator and the aircraft systems. Figure 2-3 provides an overview of developing an RCP/RSP specification.

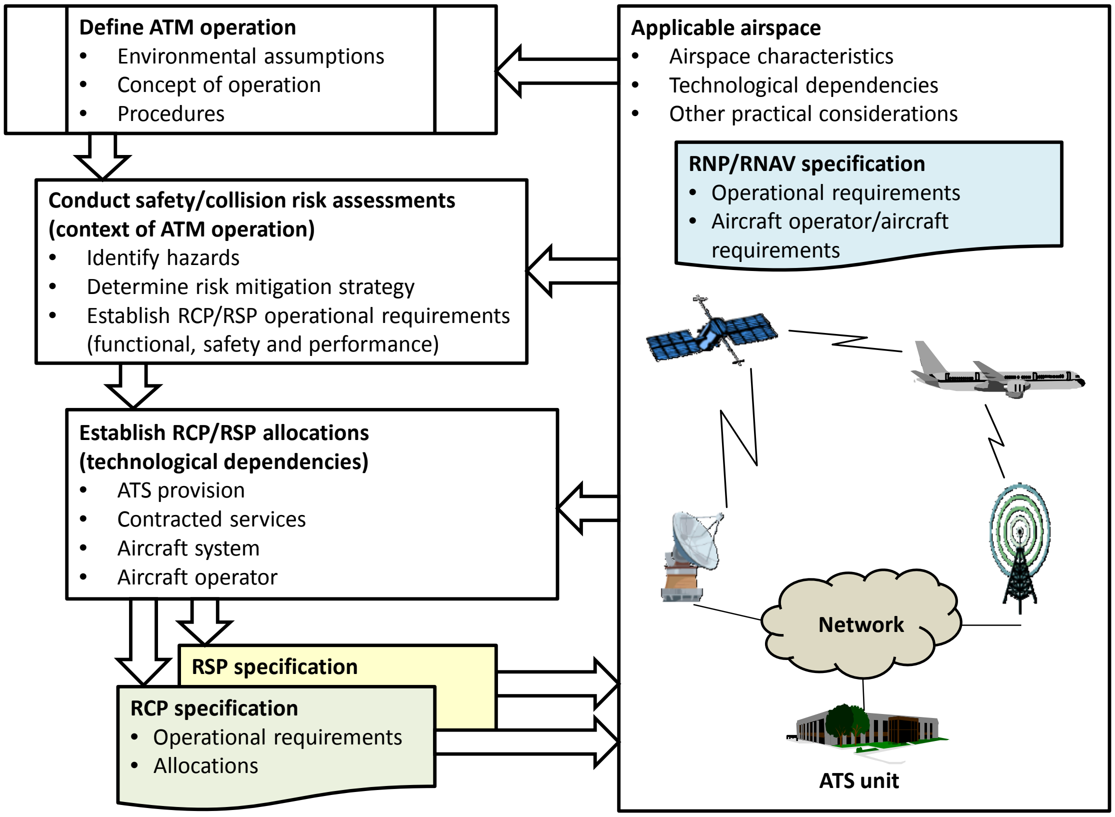


Figure 2-3. Overview of developing RCP and RSP specifications

2.5.2 The operational requirements provided by an RCP/RSP specification are based on an assessment of operational communication transactions and operational surveillance data delivery for a specific ATM operation, taking into account human interactions, procedures and environmental characteristics. These operational requirements concern the functions, performance and safety of a complete system comprising interoperable system components.

2.5.3 The operational requirements of an RCP/RSP specification are not based on technological dependencies, although the underlying assumption is the compliance of communication and surveillance capabilities to prescribed interoperability standards, including those applicable to communication medium types that support the capabilities.

2.5.4 The allocations to the system components, which are also provided in an RCP/RSP specification, take into account technological dependencies. However, it is not intended to promote an unrestricted number of alternative communication technologies for one ATM operation. An RCP/RSP specification is intended to be flexible, to the greatest extent practicable, taking into account aircraft equipage and operator requirements, interoperability, cost and other practical considerations.

Note.— Chapter 3 provides guidance for developing an RCP/RSP specification, including existing specifications, criteria for new specifications, operational assessment in the development of new specifications and application in standards for one or more ATM operations.

2.6 Applying an RCP/RSP specification

2.6.1 ICAO, in coordination with industry (e.g. EUROCAE/RTCA), identifies RCP/RSP specifications, as appropriate, to develop standards and procedures for new ATM operations. States apply RCP/RSP specifications in support of applicable ATM operations. Application of RCP/RSP specifications also requires safety oversight of air traffic services, operational approval, aircraft system design approval and post-implementation monitoring. Figure 2-4 provides an overview of applying an RCP/RSP specification.

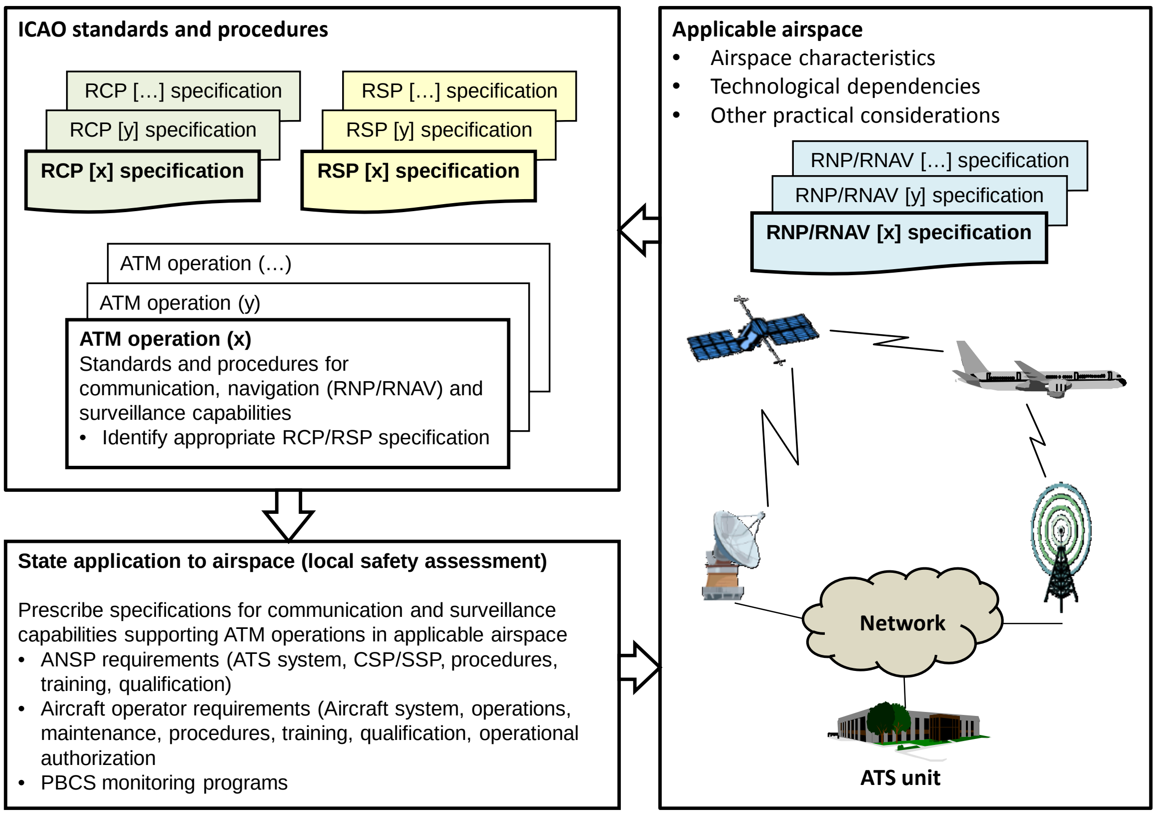


Figure 2-4. Overview of applying an RCP/RSP specification

2.6.2 Several factors affect a States' decision as to when it prescribes an RCP and/or RSP specification. These factors are based on the ATM operations that an air traffic services (ATS) provider chooses to implement within that airspace. In cases where a safety-related change, including the implementation of a reduced separation minimum or a new procedure, is predicated on communication and surveillance performance, RCP and RSP specifications are prescribed. The approval of this change includes showing that the criteria defined by the RCP and RSP specifications have been met.

2.6.3 When the ATM operations within that airspace are predicated on communication and/or surveillance performance, the State prescribes RCP/RSP specifications for an airspace, either locally or on the basis of a bilateral, multilateral or regional air navigation agreement, if applicable.

2.6.4 To perform certain ATM operations, States can require a mixture of voice and data communication and surveillance capabilities applicable to the prescribed RCP and RSP specifications. Data communication and surveillance capabilities allow for the integration of operational capabilities to exchange information between an ATS unit's system and an aircraft system. Data communication and surveillance capabilities can provide for functional integration (e.g. loading CPDLC messages on the flight deck and ATS conformance monitoring using ADS-C reports) with the aircraft's system or an ATS unit's system.

2.6.5 RCP/RSP specifications can be applied to communication and surveillance capabilities in an airspace or to support an ATM operation, including:

a) a defined airspace, such as in the North Atlantic or Pacific Regions, for safety or to support application of a 5-minute or 55.5 km (30 NM) longitudinal separation minimum;

b) a fixed ATS route, such as between Sydney, Australia, and Auckland, New Zealand;

c) random track operations, such as between Hawaii and Japan; or

d) a volume of airspace, such as a block altitude on a specified route.

2.6.6 When a State prescribes an RCP/RSP specification, the RCP/RSP specification indicates the requirements for initial qualification and approval of the procedures, aircraft equipage and airspace infrastructure, requirements for operational approval, flight plan filing requirements and post-implementation monitoring programmes.

2.6.7 The application of a given separation minimum within a volume of airspace may require that a single RCP and/or single RSP be specified. However, the State can prescribe multiple RCP/RSP specifications within a given airspace. An example would be for the State to prescribe one RCP specification, applicable to the normal means of communication appropriate for the controller's intervention capability to apply the separation minimum, and prescribe another RCP specification to a new communication technology that supports an alternative means of communication when the normal means of communication fails.

2.6.8 The State can prescribe different RCP/RSP specifications for different airspace depending on the ATM operations. For example, an RCP specification applicable in terminal area airspace can be different from the RCP specification for en-route or oceanic airspace.

2.6.9 In cases where the ATM operation is not predicated on communication or surveillance performance, it can be beneficial for the State to apply RCP/RSP specifications only to provide a basis for post-implementation monitoring programmes (i.e. the specifications are not prescribed).

Note.— Chapter 4 provides guidelines for applying RCP/RSP specifications to communication and surveillance capabilities.

2.7 Complying with an RCP/RSP specification

2.7.1 When the State prescribes an RCP/RSP specification for communication or surveillance capability, the ANSP and the aircraft operator shows that the provision of air traffic service and use of the service comply with the specifications to achieve and maintain the required communication and surveillance performance. Figure 2-5 provides an overview of complying with an RCP/RSP specification.

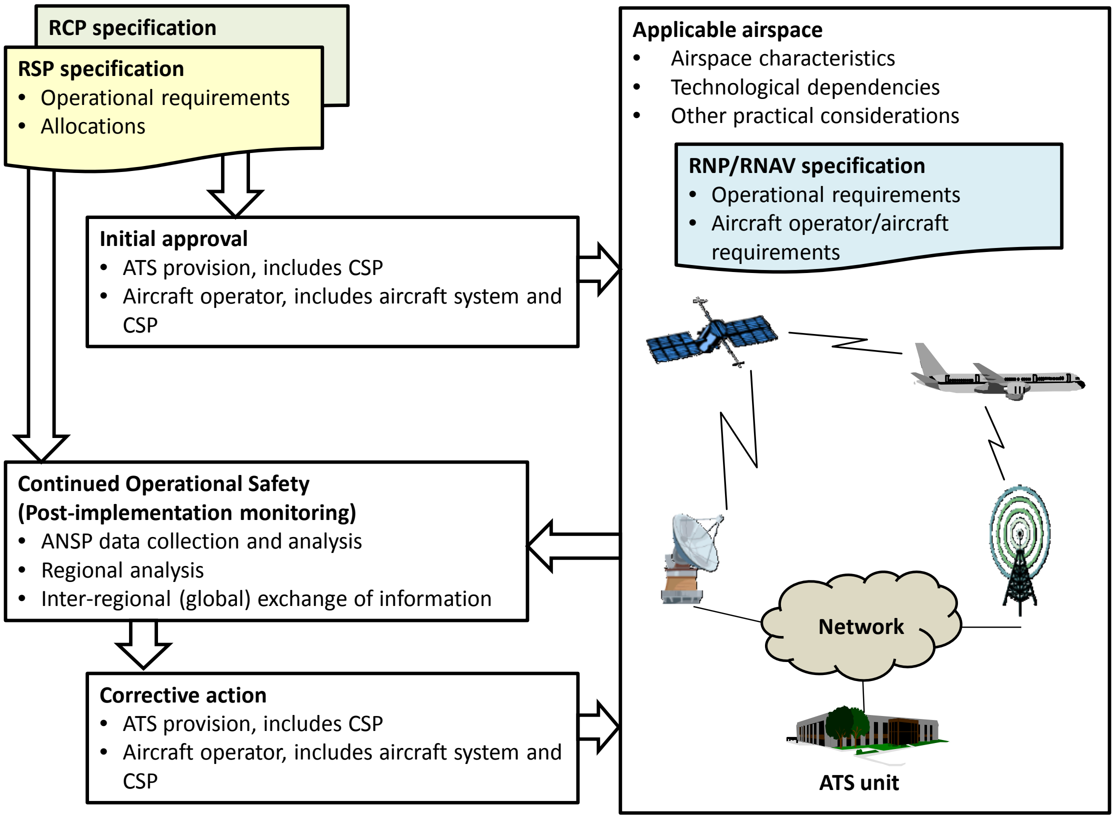


Figure 2-5. Overview of complying with RCP/RSP specifications

2.7.2 Compliance with an RCP/RSP specification can be achieved in many different ways, and the State provides policies and guidance on acceptable means through which the ANSP and the aircraft operator show compliance with RCP/RSP specifications, initially and in continued operations, to support approvals.

2.7.3 The initial compliance, for the air traffic service provision, the aircraft system and aircraft operator use occur at different times; the processes for these approvals are different and the parties involved are different. Compliance with RCP/RSP specifications is determined as part of these approval processes. Generally:

a) the ANSP initially shows compliance in accordance with applicable national regulations from the State and ICAO standards. The ANSP shows that the necessary procedures training, systems and related contracted services comply with the RCP/RSP specifications appropriate for the specified ATM operations and airspace; and

b) the aircraft operator initially shows compliance in accordance with national regulations from the State of the Operator or State of Registry. The operator shows that the necessary procedures and training, aircraft system, maintenance and related contracted services comply with the RCP/RSP specifications appropriate for specified aircraft types/systems in its fleet. For the aircraft system, the operator usually shows compliance by presenting a certificate of approval obtained by the aircraft or equipment manufacturer from the State of Design or through bilateral or multilateral airworthiness agreements.

Note.— The State of the Operator would be applicable to commercial air transport operations (Annex 6, Part I and Part III, Section II). The State of Registry would be applicable to general aviation operations (Annex 6, Part II and Part III, Section III).

2.7.4 For continued operations, the ANSP establishes a local monitoring programme to collect and analyse operational data to ensure the infrastructure and the aircraft operators within its airspace continue to meet the appropriate RCP/RSP specifications. In addition, ANSPs may establish a regional monitoring programme to analyse performance at the regional level. Aircraft operators, CSPs, satellite service providers and other stakeholders participate in the ANSP monitoring programmes in accordance with operational approvals or service agreements.

2.7.5 The scope of local and regional monitoring programmes includes analyses on an operator basis taking into account individual aircraft, aircraft types/systems and various infrastructure and technological dependencies (e.g. sub-network types, sub-network routing policies, frequencies), all of which are factors in evaluating communication or surveillance performance.

2.7.6 When a monitoring programme detects a non-compliance, it is reported to the appropriate parties for corrective action.

Note.— Chapter 5 provides guidelines for complying with RCP/RSP specifications and reporting non-compliance to the appropriate parties.

Chapter 3. DEVELOPING AN RCP/RSP SPECIFICATION

3.1 Assessment of an RCP/RSP specification

3.1.1 Figure 3-1 provides a synopsis for assessing the need for an RCP/RSP specification in a particular airspace. The potential need for an RCP/RSP specification is two-fold:

a) the operational introduction of one or more new ATM operations may prescribe an RCP/RSP specification (e.g. the introduction of reduced lateral and longitudinal separation minima or trajectory based operations); and

b) the introduction of a new communication media technology may require the evaluation against an existing RCP/RSP specification (e.g. the use of SwiftBroadband services over SATCOM).

3.1.2 For some of the ATM operations, both CPDLC and ADS-C applications are used as enablers for the ATM operation. Also in most cases, both CPDLC and ADS-C applications use the same new technology. In such cases, both the RCP and RSP specification would need to be assessed.

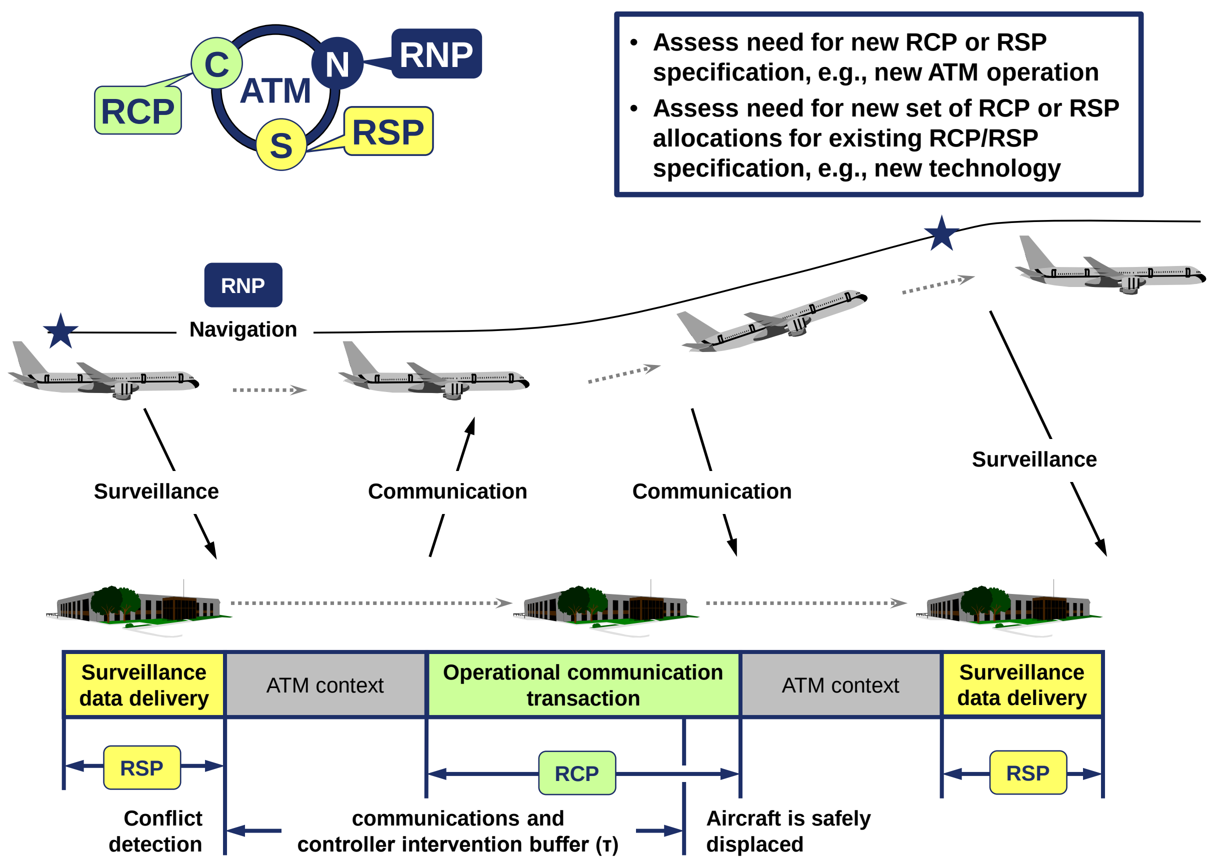


Figure 3-1. Operational context of communication and surveillance capability and performance

3.1.3 An assessment of operational communication and surveillance services includes:

a) airspace characteristics, such as separation minima, spacing criteria and capacity limits;

b) ATM operations, such as a dynamic arrival procedure, crossing flight paths, or in-trail climb/descent procedure; and

c) operational system performance, such as navigation, surveillance, flight management, flight data processing, and decision support tools for the controller and the flight crew.

3.1.4 It is important to note that the RCP/RSP specification needs to be determined in the context of the relevant airspace characteristics, operational capabilities and system performance. Trade-offs can be, and are, made to take advantage of existing fleet equipage and air navigation service provision. For example, when implementing a 50 NM longitudinal separation minimum, if the operator is eligible for RNP 4 operations, the interval for ADS-C periodic position reports is 32 minutes. If an operator/aircraft were only eligible for RNP 10 operations, the separation minima can still be implemented, but the interval for ADS-C periodic position reports is 27 minutes, which increases the number of position reports and associated costs, but the operator would not have to incur costs to upgrade to RNP 4 operations. The service provision would need to allow for variations in these performance trade-offs.

3.1.5 Given the airspace characteristics and other capabilities and performances, the RCP/RSP specification is used to characterize the communication and surveillance capabilities and performances that need to exist for the controller/system to detect an out-of-conformance, intervene and resolve a conflict. It is not intended to imply that all communication and surveillance need to meet the RCP/RSP specification. However, in addition to the RCP/RSP specifications applicable to the intervention capability, other RCP or RSP specifications may be appropriate for specific operations that require different performance characteristics. This dependency may be related to, for example:

a) functional differences in the means of communication or surveillance, such as between voice, which provides an interactive capability, and data, which provides an air-ground automation integration capability;

b) an increase in communications due to an increase in airspace capacity. For example, when increasing airspace capacity, the controller depends on a CPDLC and ADS-C to maintain an acceptable workload and suitable performance of the VHF voice communication to intervene in time-critical situations; and

c) a contingency procedure in the event the normal communication system fails. For example, when implementing a separation minimum predicated on communication and surveillance performance, the contingency procedure requires an alternative means of communication that enables the controller to establish communications with an aircraft after the normal means fails to obtain position information and intervene, as necessary.

3.1.6 In cases where an RCP/RSP specification is applied to a normal means of communication, it may be necessary to apply a different RCP/RSP specification, such as when employing an emerging technology, to the alternative means of communication or surveillance to ensure that it performs as expected and to convey its performance characteristics to the controller and flight crew for proper use.

3.2 RCP specifications

3.2.1 General

3.2.1.1 The operational requirements of an RCP specification apply to the controller's communication and intervention capability and define parameter values for operational (end-to-end) RCP transaction times, RCP continuity, RCP availability and RCP integrity as well as their allocated values (e.g. RCMP, RCTP and, when applicable, human performance). An underlying assumption to applying RCP is that the supporting system components are compatible and interoperable, in accordance with interoperability Standards.

3.2.1.2 An RCP specification is identified by a designator (e.g. RCP 240) to simplify the RCP designator naming convention and to make the RCP transaction time readily apparent to airspace planners, aircraft manufacturers and operators. The designator represents the value for the maximum communication transaction time after which the initiator should revert to an alternative procedure (or RCP expiration time).

3.2.1.3 Figure 3-2 shows an RCP specification model for which the same operational (end-to-end) performance applies but with two different sets of RCP allocations (CPDLC and SATVOICE). Different communication technologies may lead to different allocated values, but yield the same end-to-end values. The performance of the technical systems is known as the required communication technical performance (RCTP).

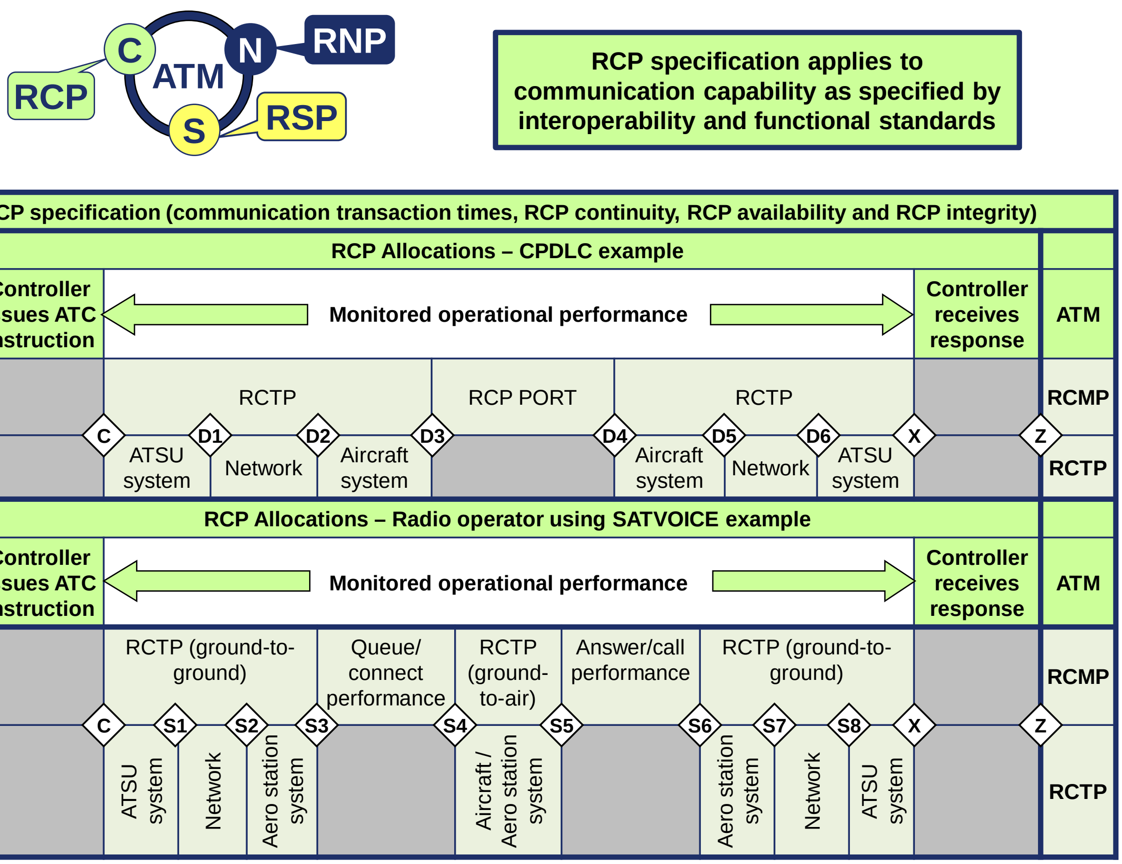


Figure 3-2. RCP specification model

3.2.1.4 As is illustrated in Figure 3-2, using CPDLC, the communication transactions are allocated to the following components:

a) controller (initiator) – composition of the instruction and recognition of the response;

b) required communication monitored performance (RCMP), which is further allocated to:

   1) pilot operational response time (PORT); and

   2) required communication technical performance (RCTP).

3.2.1.5 Using CPDLC, the operational (end-to-end) communication transaction performance parameters apply to the actual performance associated with:

a) the controller's human-machine interaction (HMI) design and procedures; and

b) the communication transaction from when the controller sends the instruction to the aircraft to when the controller receives an indication of the WILCO response (RCMP). RCMP is a pseudo end-to-end transaction time parameter against which the ACP is measured during post-implementation monitoring. The allocations allow for further assessment of actual communication technical performance (ACTP) and pilot operational response time (PORT). As there are routine messages that do not pertain directly to the controller intervention capability, a subset of communication transaction types, as defined in the Appendix D for CPDLC and Appendix E for SATVOICE, is used to assess the critical system data transit delay.

3.2.1.6 An operational communication transaction is the process a human uses to send an instruction, a clearance, flight information, and/or a request, and is completed when that human is confident that the transaction is complete.

3.2.1.7 The contribution of the human can be significant to RCP. Communication is the transfer of information between sender and receiver.

3.2.1.8 Additionally, data communication capabilities that meet the prescribed RCP specification can provide the capability to communicate clearances and instructions without the need for a voice read-back.

3.2.1.9 The RCP specification should include the necessary operational, functional, safety and performance criteria, for example:

a) a specific message set or phraseology, transaction types and intended use;

b) the interactive capability of voice communication;

c) the air-ground integration capability of data communication;

d) times to indicate non-compliant performance and procedures when such indications occur;

e) positive assurance of the flight crew's receipt of an instruction, clearance or request or the controller's receipt of a request/flight information; and

f) party-line and/or broadcast capability, multiple recipients of the same instruction, clearance or information (e.g. such as transmitting and receiving on guard frequencies).

3.2.1.10 The set of requirements for an RCP specification are based on the following parameters:

a) RCP transaction time. The maximum time for the completion of the operational communication transaction after which the initiator should revert to an alternative procedure;

b) RCP continuity. The minimum proportion of operational communication transactions to be completed within the specified RCP transaction time, given that the service was available at the start of the transaction;

c) RCP availability. The required probability that an operational communication transaction can be initiated; and

d) RCP integrity. The required probability that an operational communication transaction is completed with no undetected errors.

Note.— Whilst RCP integrity is defined in terms of the "goodness" of the communications capability, it is specified in terms of likelihood of occurrence of malfunction on a per flight hour basis (e.g. 10^{-5}), consistent with RNAV/RNP specifications.

3.2.1.11 Table 3-1 lists RCP specifications, which are provided in Appendix B. Currently, the number of specifications is limited to two (RCP 240 and RCP 400) in airspace where procedural separation is being applied. Other RCP specifications may be added, pending the introduction of new ATM operations or the use of new communication technologies.

Table 3-1. RCP specifications

RCP specification	RCP transaction time (sec)	RCP continuity (probability)	RCP availability (probability)	RCP integrity (acceptable rate/flight hour)
RCP 240	240	0.999	0.999 0.9999 (efficiency) *(See Note 3)*	10^{-5}
RCP 400	400	0.999	0.999	10^{-5}

Note 1.— The results of safety assessment and further information on RCP 240 and RCP 400 are contained in RTCA DO-306/EUROCAE ED-122. Additional RCP specifications will be validated by a safety assessment, data collection and/or other means prior to inclusion.

Note 2.— When a unit of measure other than the "per flight hour" is used to specify RCP specification values for integrity, the conversion process will need to be validated. For example, when data are analysed on a "per transaction" basis, or on a "per sector" basis, the average number of transactions per flight hour or the average number of flight hours per sector hour, respectively, will need to be validated for the specific implementation.

Note 3.— The values for availability are based on a safety assessment, taking into account assumptions about the environment, such as the mitigating procedures for failed communication and contingencies. For RCP 240, an additional more stringent value has been assigned, based on the operational effect of frequent losses of the service on providing an efficient and orderly flow of air traffic. Two values are used to determine corrective action when the service availability degrades below the *assigned value. The corrective action may vary depending on whether the criterion is for safety or for efficiency.*

3.2.1.12 RCP 240 may be applied to maintain the performance for normal means of communication supporting controller intervention capability in procedurally controlled airspace where separation minimum being applied is predicated on communication performance.

3.2.1.13 RCP 400 may be applied to maintain the performance for emerging technology (e.g. satellite voice) used to provide normal means of communication supporting controller intervention capability in procedurally controlled airspace where the separation minimum being applied is based on position reporting at compulsory reporting points. RCP 400 might also be applied to maintain the performance required for emerging technology used to provide alternative means of communication that may be required in combination with the normal means of communication, to which RCP 240 is applied.

Note.— RCP specifications were derived from intervention capabilities used in collision risk modelling (Doc 9689), aircraft performance characteristics, conflict detection and resolution capability, PANS-ATM (ICAO Doc 4444), RTCA/EUROCAE Standards, and other factors.

3.2.2 RCP transaction time and allocations

3.2.2.1 There may be multiple operational communication transactions that support an ATM operation. These transactions are assessed to determine the most stringent. The value for the RCP transaction time is based on the time needed to complete the most stringent transaction for controller intervention.

3.2.2.2 The assessment would take into consideration the time needed to safely execute the contingency procedure and can include simulations, demonstrations, operational trials and analysis of empirical data applicable to the RCP communication transaction times for the ATM operation.

3.2.2.3 For separation assurance, the RCP transaction time can be determined by collision risk modelling. Collision risk modelling considers the RCP transaction times in the communications and controller intervention buffer supporting separation assurance. Figure 3-1 illustrates the operational communication transaction in the context of communications and controller intervention buffer.

3.2.2.4 In practice, the RCP transaction time is specified for a nominal continuity (TT) and for an operational continuity (ET). The time associated with the operational continuity is called expiration time (ET), as this is associated with the time the controller takes action upon receiving an alert provided by the expiration of the ground timer. These times are associated directly with the RCP continuity requirements for the controller’s communication and intervention capability:

a) the TT value is used in statistical analysis during post-implementation monitoring and is not monitored in real-time. The TT value is known as the nominal time (i.e. the time at which 95 per cent of the communication transactions in a data sample are completed). Other statistical values, such as mean and average time values, may be considered in local assessments. If the system does not meet the TT value, appropriate action should be taken to identify and rectify the source(s) of performance deterioration to improve performance to an acceptable level before providing the ATM operation predicated on RCP;

b) the ET value is monitored in real-time for each transaction by the ATC system. When a response to an ATC instruction has not been received within the ET value, the ATC system provides an indication to the controller for appropriate action. The ET value is associated with a continuity requirement of 0.999 (99.9 per cent), which was determined by an operational safety assessment, in accordance with DO 264/ED 78A. In this case, the operational safety assessment concluded that under worst case conditions, a frequent occurrence of this indication to the controller (i.e. that a WILCO response has not been received by the ET value) could result in a significant increase in controller workload. This is considered to be a “Class 4” hazard. The corresponding safety objective is that the occurrence of a WILCO response exceeding the ET value is no greater than 10-3 (or 99.9 per cent of WILCO responses are received within the ET value); and

c) the time values at 95 per cent and at the operational continuity criterion (e.g. 99.9 per cent) apply to the communication transaction, operational performance (RCMP), PORT, and RCTP. It should be noted that only the ‘RCMP time value at the operational RCP continuity criterion’ portion has an expiration timer.

3.2.2.5 For example, Appendix B contains the RCP 240 specification, including the allocated RCP transaction time values. Compliance with the times specified for the controller to compose the message and to access the response after receipt of indication is shown by analysis, simulations, safety and human factors assessments. Compliance with the requirements for the remainder of the transaction, referred to as RCMP, is shown by contracts and/or service agreements for communication services and post-implementation monitoring of CPDLC transactions requiring a WILCO response. Allocated requirements associated with ACTP and PORT aid in determining initial compliance and further assessment when ACP does not meet the requirements for RCMP.

Note.— Further information on RCP 240 and compliance means is contained in Chapter 5 and Appendix B of this manual.

3.2.3 RCP continuity and allocations

3.2.3.1 The value for the RCP continuity parameter is associated with the actual communication performance of the expiration value of RCP and is selected based on the results of an operational hazard and performance assessment.

3.2.3.2 The operational hazard assessment should include a severity-of-effects analysis of detected errors within the communication transactions. Detected errors include, but are not limited to:

a) detecting that the transaction has exceeded the RCP transaction time (ET);

b) detecting that one or more messages within the transaction are corrupted, misdirected, directed out-of sequence or lost, and cannot be corrected to complete the transaction within the RCP transaction time; and

c) detecting loss of the communication service or aircraft capability to use the service whilst transactions are pending completion.

3.2.3.3 An acceptable operational RCP continuity value should be determined based on an analysis of the severity and the likelihood of occurrence of communication transactions with detected errors. As stated in paragraph 3.2.2.4, the operational safety assessment for RCP 240 classified the effects of identified hazards on ATS services, such as controller workload as “minor,” which equates to a likelihood of occurrence of a malfunction of no greater than 10-3, or a 0.999 success rate (99.9 per cent).

3.2.3.4 From a performance perspective, RCP continuity is associated with the required level of usability. This puts a maximum on the number of interrupted transactions after which it becomes annoying or less productive from a usability viewpoint to use CPDLC.

3.2.3.5 A nominal RCP continuity value (TT) is specified to assess the performance at 95 per cent. Other statistical values, such as mean and average time values, may be considered in local assessments.

3.2.3.6 The values for RCP continuity remain the same (95 per cent and 99.9 per cent) for all allocations (e.g. operational performance (RCMP), PORT, and RCTP).

3.2.4 RCP availability and allocations

3.2.4.1 The RCP availability (RCP A) is a system requirement, associated with the communication service, which is at the disposal of the flight crew and controller. RCP A is the required probability that the communication system is in service, measured over a period of time.

3.2.4.2 RCP A is defined as the ratio between the time the system is actually available for service (actual service time) and the time the system is planned for service (actual service time + unplanned outage time), (i.e. RCP A = actual service time/ (actual service time + unplanned outage time)).

3.2.4.3 In a given airspace, RCP A is specified in terms of the RCP availability for the communication service (RCP $A_{SERVICE}$), which comprises the RCP availability for the ATS unit (RCP A_{ATSU}) and the RCP availability for the CSP/SSP (RCP $A_{CSP/SSP}$), and the RCP availability for the aircraft system (RCP A_{AIR}). Therefore:

a) RCP $A_{SERVICE}$ = RCP A_{ATSU} x RCP $A_{CSP/SSP}$; and

b) RCP A = RCP $A_{SERVICE}$ x RCP A_{AIR}.

3.2.4.4 In order for the communication service to be available, the ATS unit's system, any CSP/SSP's service and any aircraft system that the communication service depends on must be available.

3.2.4.5 The value for RCP A is selected based on the results of an operational hazard and performance assessment. The operational hazard assessment should include a severity-of-effects analysis of the detected loss of the communication service. Detected loss includes, but is not limited to:

a) detecting loss of communications for multiple aircraft; and

b) detecting loss of communications for a single aircraft.

3.2.4.6 An acceptable probability should be determined for the likelihood of occurrence of an inability to initiate a transaction based on the severity-of-effects analysis.

3.2.4.7 From performance (efficiency) perspective, RCP availability is affected by aircraft operator and ANSP expectations, and the confidence that the communications service is available.

Note.— If a service outage is declared in the midst of a transaction which causes a continuity failure, the failure is only counted against availability and is excluded from the continuity measurement. This is because it is anticipated that most service outage durations will be more than the expiration time.

3.2.4.8 The value for RCP A is based on the acceptable rate of detected inability to initiate a transaction.

3.2.4.9 RCP availability for the aircraft (RCP A_{AIR}) is the required probability that the aircraft system is serviceable for the relevant communication capability. It is the ratio between the time the aircraft system is actually in operation (actual time of operation) and the time the aircraft system is planned for being in operation (actual time of operation/ (actual time of operation + unplanned outage time).

3.2.4.9.1 The aircraft system that provides the communication functionality comprises various components (including the radio that is accessing the different communication subnetworks). Since no system is perfect, the aircraft system has a failure rate, expressed on a per flight hour basis (e.g. 7E-4/flight hour). The reciprocal of failure rate is actual time of operation (1/failure rate = actual time of operation) and represents the average number of flight hours between two failures as shown in Figure 3-3.

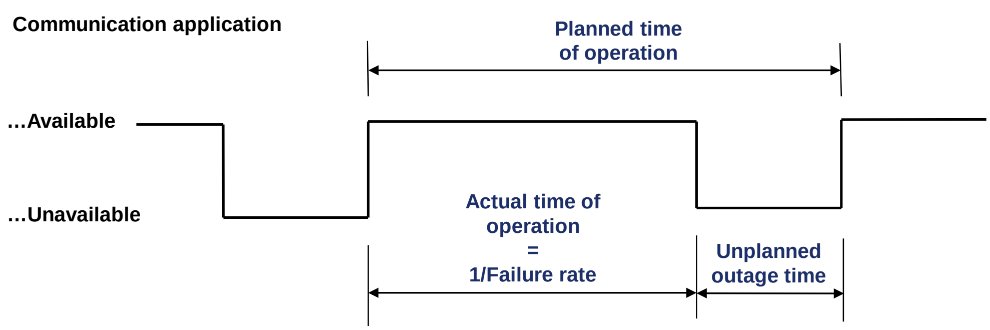


Figure 3-3. RCP availability – aircraft (RCP A_{AIR})

3.2.4.9.2 The communication system failure duration (unplanned outage time) for the aircraft corresponds to the duration of a flight, which is to be taken into account in the availability computation. From this, RCP A_{AIR} can be derived (i.e. actual time of operation/ (actual time of operation + unplanned outage time)).

3.2.4.9.3 When the communication service is dependent on an aircraft system, the RCP A_{AIR} for that system typically determines the number of similar components (redundancy) that will need to be installed on the aircraft. The number of similar components needed in any given architecture for the aircraft system will depend on the component availability.

3.2.4.9.10 RCP availability for the air traffic service (RCP $A_{SERVICE}$) is the probability that the system is in service within a planned service area for planned hours of operation, and is measured over a period of time. It is the ratio between the time the ATS unit and CSP/SSP systems are actually in service (actual service time) and the time the ATS unit and CSP/SSP systems are planned for being in service (actual service time + unplanned outage time).

3.2.4.10.1 RCP $A_{SERVICE}$ is evaluated only over the ATS unit and CSP/SSP.

3.2.4.10.2 If the CSP/SSP or ATS unit is not available for communications service provision then the ATS unit will have to cease ATM operations that are predicated on the service and apply an alternative procedure.

3.2.4.10.3 A service outage counts against RCP $A_{SERVICE}$ regardless of whether any aircraft are located in the service area. The RCP $A_{SERVICE}$ requirements (RCP $A_{CSP/SSP}$ and RCP A_{ATSU}) are specified in terms of unplanned outage duration limit, maximum number of unplanned outages (exceeding the duration limit) per year, the maximum accumulated unplanned outage time in minutes/year and the unplanned outage notification delay.

3.2.4.11 Figure 3-4 provides an overview of relationships among the parameters specified for RCP/RSP service availability.

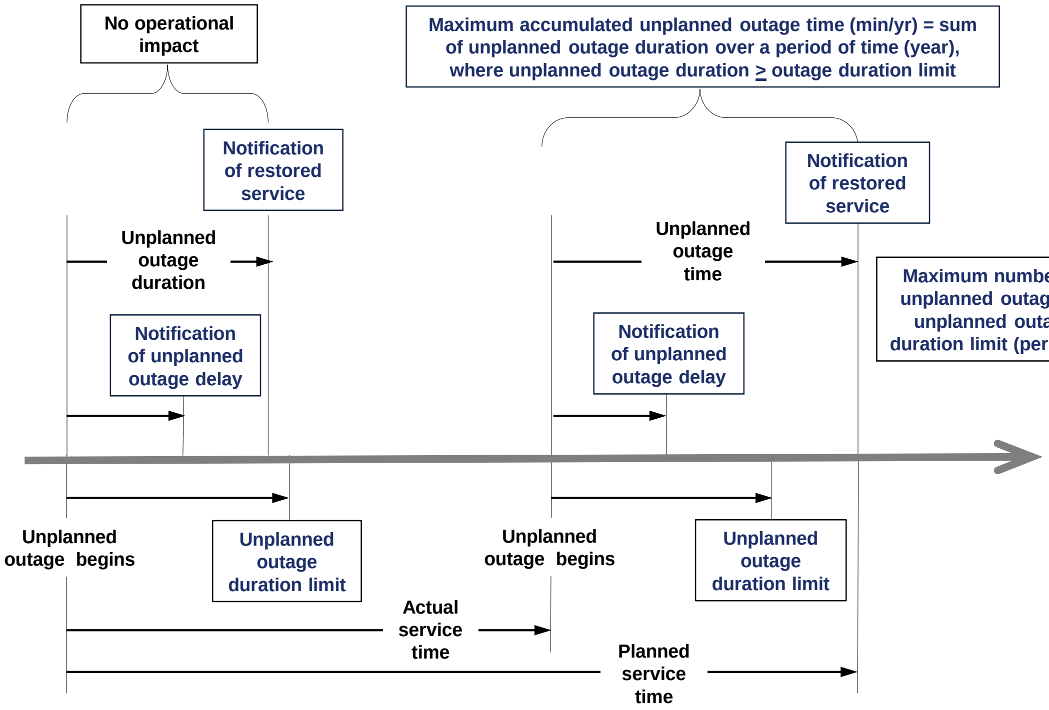


Figure 3-4. Overview of relationship of RCP/RSP service availability parameters

3.2.4.12 As an example, Appendix B contains the RCP 240 specification, including the values for RCP availability and allocations. The RCP availability requirement of 99.99 per cent for efficiency is specifically a value for consideration in local assessment (i.e. within a specific centre). The RCP availability requirement of 99.9 per cent was determined based on an operational safety assessment (per DO-264/ED-78A) that classified the effect of loss of service as “minor” provided procedural mitigations are in place to transition to a different separation minimum (those not predicated on RCP 240 performance). The RCP availability requirements for safety should determine whether or not reduced separations that require RCP 240 are applied.

3.2.4.12.1 For RCP 240, RCP availability is ensured initially in contract/service agreements with the CSP/SSP and approval of aircraft CPDLC equipment. Post-implementation monitoring evaluates service availability from unplanned outage events on a per centre basis if the outage exceeds 10 minutes and if it affects multiple aircraft. The service availability requirements are allocated exclusively to the CSP/SSP, and assume that failed CPDLC components within the ANSP would not significantly contribute to loss of the CPDLC service.

3.2.4.13 When the operational system does not meet the RCP availability requirements, the ANSP may consider local factors such as whether the reduced separation minimum is being applied between pairs of suitably-equipped aircraft or on tracks, to determine the appropriate mitigation and/or action. See also RTCA DO-306/EUROCAE ED-122 for examples of other factors.

Note.— Guidance on compliance means and RCP specifications are contained in Chapter 5 and Appendix B, respectively.

3.2.5 RCP integrity and allocations

3.2.5.1 The value for the RCP integrity parameter is selected based on the results of an operational hazard assessment. The operational hazard assessment should include a severity-of-effects analysis of communication transactions with undetected errors. Undetected errors include, but are not limited to:

a) undetected corruption of one or more messages within the transaction;

b) undetected misdirection of one or more messages within the transaction;

c) undetected delivery of messages in an order that was not intended;

d) undetected delivery of a message after the RCP transaction time; and

e) undetected loss of service or interruption in a communication transaction.

Note.— Undetected loss of service is associated with integrity because it is "undetected." In some operational scenarios, it is conceivable that a network could have failed with no indication provided to the users of the system.

3.2.5.2 An acceptable probability should be determined for the likelihood of occurrence of communication transactions with undetected errors based on the severity-of-effects analysis.

3.2.5.3 The value for the RCP integrity parameter is the acceptable probability of communication transactions with undetected errors.

3.2.5.4 The RCP integrity requirements are specified in terms of likelihood of malfunction (i.e. failure instead of quality of service) on a per flight hour basis. For RCP 240, the likelihood of system malfunction shall be less frequent than 10^{-5} per flight hour. The RCP integrity requirements were determined based on an operational safety assessment (per DO 264/ED 78A) that classified the effects of undetected message corruption, misdelivery and other misleading anomalous system behaviour as "major." These requirements are allocated to system components in terms of safety and performance requirements.

3.2.5.5 RCP integrity is demonstrated by procedures, design assurance, design features and system architecture characterized by interoperability standards (e.g. RTCA DO-258A/EUROCAE ED-100A for FANS 1/A) and safety and performance requirements (SPR) standards (e.g. RTCA DO-306/RTCA ED-122 for oceanic/remote airspace).

3.2.5.6 Some examples include:

a) RTCA DO-258A/EUROCAE ED-100A employs a cyclic redundancy check (CRC) algorithm that is implemented in the CPDLC and ADS-C application (RTCA DO-178C/EUROCAE ED-12C level C software) to eliminate the potential risk of undetected corruption of message content and message address caused by communication services as required by the SPR standard;

b) specification of a safety requirement, requiring the ATS unit to correlate flight plan information with the information provided in the logon request from the aircraft to ensure that the CPDLC connection with the aircraft is legitimate; and

c) specification of a safety requirement, requiring the flight crew/aircraft system to provide correct aircraft identification in the logon request.

3.2.5.7 There may be situations in operations where problems affecting system integrity are discovered post-implementation. These problems should be reported to the appropriate PBCS monitoring entity and/or authorities to determine appropriate action. Particularly if such problems are systematic, additional actions may be indicated to remove the source of the problem. A good way for determining whether there is a systematic problem is to observe an accumulation of similar reports over time.

3.3 Selecting the RCP specifications

3.3.1 Once all the safety and operational requirements have been determined, the RCP specification which meets these requirements is selected from Table 3-1.

3.3.2 Separate analyses of different ATM operations may result in the need to apply a number of different RCP specifications.

Note.— Guidance on prescribing an RCP specification in these situations is contained in Chapter 4.

3.4 RSP specifications

3.4.1 General

3.4.1.1 The operational requirements of an RSP specification apply to the surveillance services and define parameter values for surveillance data transit times, RSP continuity, RSP availability and RSP integrity as well as allocated values (e.g. RSMP, RSTP and, when applicable, human performance). An underlying assumption to applying RSP is that the supporting system components are compatible and interoperable, in accordance with interoperability Standards.

3.4.1.2 An RSP specification is identified by a designator (e.g. RSP 180) in order to simplify the designator naming convention and to make the required surveillance data delivery time readily apparent to airspace planners, aircraft manufacturers and operators. The designator represents the value for the surveillance data delivery time when the surveillance data delivery is considered overdue.

3.4.1.3 Figure 3-5 shows an RSP specification model for which the same operational (end-to-end) performance applies but with two different sets of allocations (ADS-C and SATVOICE). Different technologies may lead to different allocated values, but yield the same end-to-end values. The performance of the technical systems is known as the required surveillance technical performance (RSTP). It should be noted that in the case of ADS-C usage, the position report is generated without flight crew action, while SATVOICE usage via a radio operator requires flight crew action.

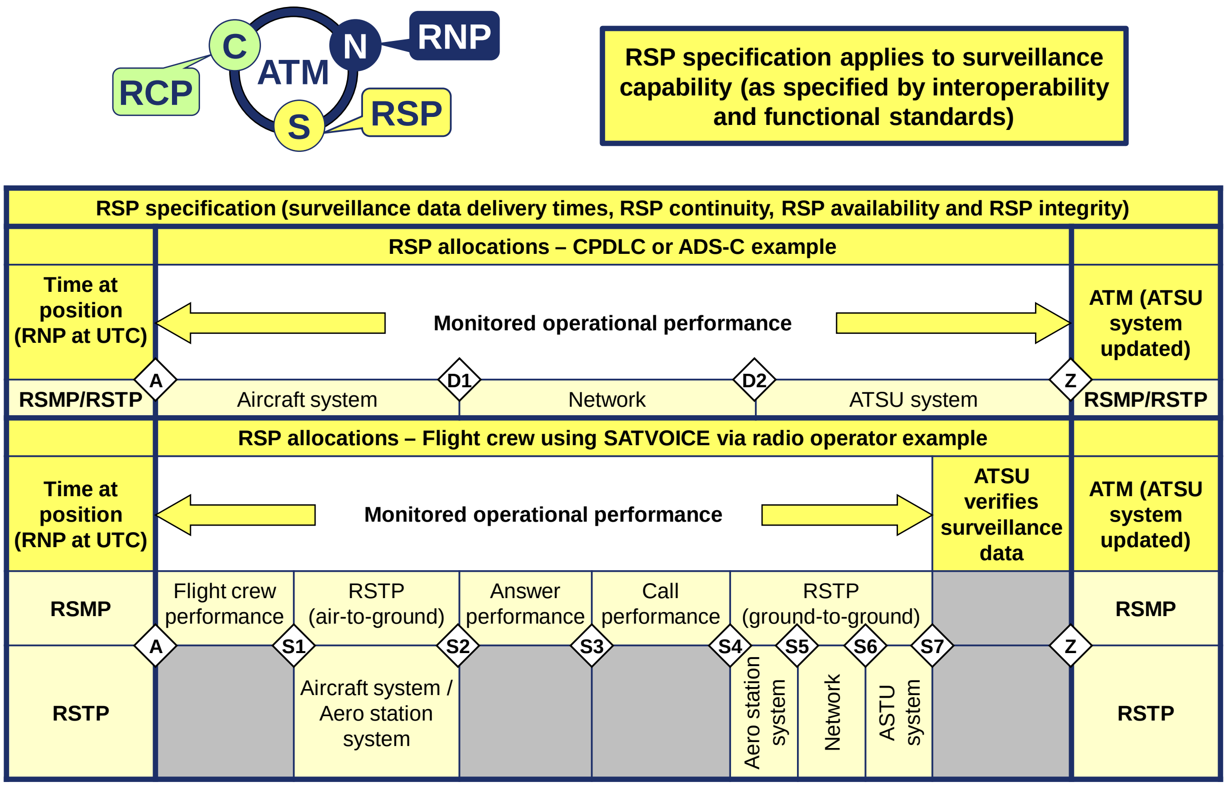


Figure 3-5. RSP specification model

3.4.1.4 The operational surveillance data transit parameters apply to the actual performance of the surveillance data delivery from when the aircraft is at the position to when the ATS unit/controller receives the surveillance data (e.g. ADS-C report delivery).

3.4.1.5 The actual performance is associated with the surveillance data delivery from the time associated with the aircraft's position provided with the data to the time when the ATS unit receives the data, referred to as actual (operational) surveillance performance (ASP). Post-implementation monitoring continues to assess ASP.

3.4.1.6 As is illustrated in Figure 3-5, surveillance data delivery is allocated to the following components:

a) SATVOICE: flight crew (Initiator) – position report preparation and call establishment;

b) operational performance (Monitored) – RSTP.

Note.— In the case of ADS-C usage, surveillance data delivery is a system based transaction, for which RSTP coincides with RSP.

3.4.1.7 The RSP specification should include the necessary operational, functional, safety and performance criteria, for example:

a) type of reports and intended use;

b) the interactive capability of voice communication;

c) the air-ground integration capability of data communication;

d) times to indicate non-compliant performance and procedures when such indications occur; and

e) positive assurance of the controller's receipt of a report.

3.4.1.8 The set of requirements for an RSP specification are based on the following parameters:

a) RSP surveillance data transit time. The maximum time for the reception of the surveillance data after which the controller should revert to an alternative procedure;

b) RSP continuity. The minimum proportion of surveillance data delivery to be completed within the specified RSP surveillance data delivery time, given that the service was available at the start of the delivery;

c) RSP availability. The required probability that surveillance data can be provided; and

d) RSP integrity. The required probability that surveillance data delivery is completed with no undetected errors.

Note.— Whilst RSP integrity is defined in terms of the "goodness" of the surveillance capability, it is specified in terms of likelihood of occurrence of malfunction on a per flight hour basis (e.g. 10^{-5}), consistent with RNAV/RNP specifications.

3.4.1.9 Table 3-2 lists RSP specifications, which are provided in Appendix C. Currently, the number of specifications is limited to two (RSP 180 and RSP 400) in airspace where procedural separation is being applied. Other RSP specifications may be added, pending the introduction of new ATM operations or the use of new surveillance technologies.

Table 3-2. RSP specifications

RSP specification	**RSP delivery time (sec)**	**RSP continuity (probability)**	**RSP availability (probability)**	**RSP integrity (acceptable rate/flight hour)**
RSP 180	180	0.999	0.999 0.9999 (efficiency) *(See Note 3)*	FOM = Navigation specification Time at position accuracy = +/- 1 sec Data integrity (malfunction) = 10^{-5}
RSP 400	400	0.999	0.999	FOM = Navigation specification Time at position accuracy = +/- 30 sec Data integrity (malfunction) = 10^{-5}

Note 1.— The results of safety assessment and further information on RSP 180 and RSP 400 are contained in RTCA DO-306/EUROCAE ED-122. Additional RSP specifications will be validated by a safety assessment, data collection and/or other means prior to inclusion.

Note 2.— When a unit of measure other than the "per flight hour" is used to specify RSP specification values for integrity, the conversion process will need to be validated. For example, when data are analysed on a "per transaction" basis, or on a "per sector" basis, the average number of transactions per flight hour or the average number of flight hours per sector hour, respectively, will need to be validated for the specific implementation.

Note 3.— The values for availability are based on a safety assessment, taking into account assumptions about the environment, such as the mitigating procedures for failed data communication and contingencies. For RSP 180, an additional more stringent value has been assigned, based on the operational effect of frequent losses of the service on providing an efficient and orderly flow of air traffic. Two values are used to determine corrective action when the service availability degrades below the assigned value. The corrective action may vary depending on whether the criterion is for safety or for efficiency.

3.4.1.10 RSP 180 may be applied to maintain the performance for normal means of surveillance supporting controller intervention capability in procedurally controlled airspace where separation minimum being applied is predicated on surveillance performance.

3.4.1.11 RSP 400 may be applied to maintain the performance for emerging technology (e.g. satellite voice) used to provide normal means of surveillance supporting controller intervention capability in procedurally controlled airspace where the separation minimum being applied is based on position reporting at compulsory reporting points. RSP 400 might also be applied to maintain the performance required for emerging technology used to provide alternative means of surveillance that may be required in combination with the normal means of surveillance, to which RSP 180 is applied.

Note.— RSP specifications were derived from intervention capabilities used in collision risk modelling (Doc 9689), aircraft performance characteristics, conflict detection and resolution capability, PANS-ATM *(ICAO Doc 4444), RTCA/EUROCAE Standards, and other factors.*

3.4.2 RSP data delivery time and allocations

3.4.2.1 The value for the RSP data delivery time is based on the time when the surveillance data delivery is considered overdue.

3.4.2.2 The assessment would take into consideration the time needed to safely execute the contingency procedure and can include analysis of empirical data applicable to the RSP data delivery times for the ATM operation.

3.4.2.3 For separation assurance, the RSP data delivery can be determined by collision risk modelling. Collision risk modelling considers the RSP delivery times in the surveillance data delivery and controller intervention buffer supporting separation assurance. Figure 3-1 illustrates the surveillance data delivery in the context of surveillance capabilities and controller intervention buffer.

3.4.2.4 In practice, the RSP data delivery time is specified for a nominal continuity (DT) and for an operational continuity (OT). The time associated with the operational continuity (OT) is called overdue time, as this is associated with the time the controller takes action upon receiving an alert provided by the expiration of the ground timer. These times are associated directly with the RSP continuity requirements for the controller's surveillance capability.

a) The DT value is used in statistical analysis during post-implementation monitoring and is not monitored in real-time. The DT value is known as the nominal delivery time (i.e. the time at which 95 per cent of the surveillance reports in a data sample are delivered). Other statistical values, such as mean and average time values, may be considered in local assessments. If the system does not meet the DT value, appropriate action should be taken to identify and rectify the source(s) of performance deterioration to improve performance to an acceptable level before providing the ATM operation predicated on RSP.

b) The OT value is monitored in real-time for each surveillance report by the ATC system. When the surveillance report is not received within the OT value (i.e. the report is overdue), the ATC system provides an indication to the controller for appropriate action. The OT value is associated with a continuity requirement of 0.999 (99.9 per cent), which was determined by an operational safety assessment, in accordance with DO-264/ED-78A. In this case, the operational safety assessment concluded that under worst case conditions, a frequent occurrence of this indication to the controller (i.e. that a surveillance report is overdue) could result in a significant increase in controller workload. This is considered to be a "Class 4" hazard. The corresponding safety objective is that the occurrence of an overdue surveillance report is no greater than 10^{-3} (or 99.9 per cent of surveillance reports are received within the OT value); and

c) The time values at 95 per cent and at the operational continuity criterion (e.g. 99.9 per cent) apply to the RSP data delivery and RSTP. It should be noted that only the RSP time value at the operational RSP continuity criterion (which coincides with the RSTP) has an expiration timer (OT).

3.4.2.5 For example, Appendix C contains the RSP 180 specification, including the allocated RSP surveillance data delivery time values. Compliance with the times for the RSP data delivery is shown by analysis, contracts and/or service agreements for surveillance services and post-implementation monitoring of actual surveillance data deliveries (ASP). Allocated requirements associated with ASP aid in determining initial compliance and further assessment when ASP does not meet the requirements for RSP.

Note.— Guidance on compliance means and the RSP 180 specification is contained in Chapter 5 and Appendix C, respectively.

3.4.3 RSP continuity and allocations

3.4.3.1 The value for the RSP continuity parameter is associated with the actual surveillance performance of the overdue value of RSP and is selected based on the results of an operational hazard and performance assessment.

3.4.3.2 The operational hazard assessment should include a severity-of-effects analysis of detected errors within the surveillance data deliveries. Detected errors include, but are not limited to:

a) detecting that the surveillance data delivery has exceeded the RSP data delivery time (OT);

b) detecting that the surveillance data delivery is corrupted, misdirected, directed out-of sequence or lost, and cannot be corrected to data delivery within the RSP data delivery time; and

c) detecting loss of the surveillance service or aircraft capability to use the service whilst data deliveries are pending.

3.4.3.3 An acceptable operational RSP continuity value should be determined based on an analysis of the severity and the likelihood of occurrence of surveillance data deliveries with detected errors. As stated in paragraph 3.4.2.4, the operational safety assessment for RSP 180 classified the effects of identified hazards on ATS services, such as controller workload as “minor,” which equates to a likelihood of occurrence of a malfunction of no greater than 10^{-3}, or a 0.999 success rate (99.9 per cent).

3.4.3.4 From performance perspective, RSP continuity is associated with the required level of usability. This puts a maximum on the number of interrupted data deliveries transactions after which it becomes annoying or less productive from usability viewpoint to use ADS-C.

3.4.3.5 A nominal RSP continuity value (DT) is specified to assess the performance at 95 per cent. Other statistical values, such as mean and average time values, may be considered in local assessments.

3.4.3.6 The values for RSP continuity remain the same (95 per cent and 99.9 per cent) for all RSP allocations.

3.4.4 RSP availability and allocations

3.4.4.1 The RSP availability (RSP A) is a system requirement, associated with the surveillance service, which is at the disposal of the aircraft system and controller. RSP A is the required probability that the surveillance system is in service, measured over a period of time.

3.4.4.2 RSP availability is defined as the ratio between the time the system is actually available for service (actual service time) and the time the system is planned for service (actual service time + unplanned outage time), (i.e. RSP A = actual service time/ (actual service time + unplanned outage time)).

3.4.4.3 In a given airspace, RSP A is specified in terms of the RSP availability for the surveillance service (RSP $A_{SERVICE}$), which comprises the RSP availability for the ATS unit (RSP A_{ATSU}) and the RSP availability for the CSP/SSP (RSP $A_{CSP/SSP}$), and the RSP availability for the aircraft system (RCP A_{AIR}). Therefore:

a) RSP $A_{SERVICE}$ = RSP A_{ATSU} x RSP $A_{CSP/SSP}$; and

b) RSP A = RSP $A_{SERVICE}$ x RSP A_{AIR}.

3.4.4.4 In order for the surveillance service to be available, the ATS unit’s system, any CSP/SSP’s service and any aircraft system that the surveillance service depends on must be available.

3.4.4.5 The value for RSP A is selected based on the results of an operational hazard and performance assessment. The operational hazard assessment should include a severity-of-effects analysis of the detected loss of the surveillance service. Detected loss includes, but is not limited to:

a) detecting loss of surveillance information for multiple aircraft; and

b) detecting loss of surveillance information for a single aircraft.

3.4.4.6 An acceptable probability should be determined for the likelihood of occurrence of an inability to initiate surveillance data delivery based on the severity-of-effects analysis.

3.4.4.7 From performance (efficiency) perspective, RSP availability is affected by aircraft operator and ANSP expectations and the confidence that the communications service is available.

Note.— If a service outage is declared in the midst of surveillance data delivery which causes a continuity failure, the failure is only counted against availability and is excluded from the continuity measurement. This is because it is anticipated that most service outage durations will be more than the overdue time.

3.4.4.8 The value for RSP A is based on the acceptable rate of detected inability to initiate the delivery of the surveillance data.

3.4.4.9 RSP availability for the aircraft (A_{AIR}) is the required probability that the aircraft system is serviceable for the relevant surveillance capability. It is the ratio between the time the aircraft system is actually in operation (actual time of operation) and the time the aircraft system is planned for being in operation (actual time of operation/ (actual time of operation + unplanned outage time).

3.4.4.9.1 The aircraft system that provides the surveillance functionality comprises various components (including the radio that is accessing the different communication subnetworks). Since no system is perfect, the aircraft system has a failure rate, expressed on a per flight hour basis (e.g. 7 x 10^{-4}/flight hour). The reciprocal of failure rate is actual time of operation (1/failure rate = actual time of operation) and represents the average number of flight hours between two failures as shown in Figure 3-6.

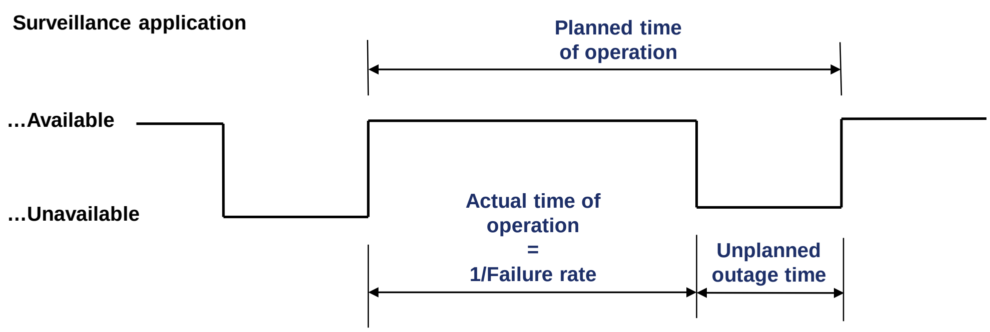


Figure 3-6. RSP availability – aircraft (RSP A_{AIR})

3.4.4.9.2 The surveillance system failure duration (unplanned outage time) for the aircraft corresponds to the duration of a flight, which is to be taken into account in the availability computation. From this, RSP A_{AIR} can be derived (i.e. actual time of operation/(actual time of operation + unplanned outage time)).

3.4.4.9.3 When the surveillance service is dependent on an aircraft system, the RSP A_{AIR} for that system typically determine the number of similar components (redundancy) that will need to be installed on the aircraft. The number of similar components needed in any given architecture for the aircraft system will depend on the component availability.

3.4.4.10 RSP availability for the air traffic service ($A_{SERVICE}$) is the probability that the system is in service within a planned service area for planned hours of operation, and is measured over a period of time. It is the ratio between the time the ATS unit and CSP/SSP systems are actually in service (actual service time) and the time the ATS unit's and CSP/SSP systems are planned for being in service (actual service time + unplanned outage time).

3.4.4.10.1 $A_{SERVICE}$ is evaluated only over the ATS unit and CSP/SSP.

3.4.4.10.2 If the CSP/SSP or ATS unit is not available for surveillance service provision then the ATS unit will have to cease ATM operations that are predicated on the service and apply an alternative procedure.

3.4.4.10.3 A service outage counts against RSP $A_{SERVICE}$ regardless of whether any aircraft are located in the service area. The RSP $A_{SERVICE}$ requirements (RSP $A_{CSP/SSP}$ and RSP A_{ATSU}) are specified in terms of unplanned outage duration limit, maximum number of unplanned outages (exceeding the duration limit) per year, the maximum accumulated unplanned outage time in minutes/year and the unplanned outage notification delay.

3.4.4.11 Figure 3-4 provides an overview of relationships among the parameters specified for RSP service availability, which are the same as those used for RCP service availability.

3.4.4.12 As an example, Appendix C contains the RSP 180 specification, including the values for RSP availability and allocations. The RSP availability requirement of 99.99 per cent for efficiency is specifically a value for consideration in local assessment (i.e. within a specific centre). The RSP availability requirement of 99.9 per cent was determined based on an operational safety assessment (per DO-264/ED-78A) that classified the effect of loss of service as “minor” provided procedural mitigations are in place to transition to a different separation minimum (those not predicated on RSP 180 performance). The RSP availability requirements for safety should determine whether or not reduced separations that require RSP 180 are applied.

3.4.4.12.1 For RSP 180, RSP availability is ensured initially in contract/service agreements with the CSP/SSP and approval of aircraft ADS-C equipment. Post-implementation monitoring evaluates service availability from unplanned outage events on a per centre basis if the outage exceeds 10 minutes and if it affects multiple aircraft. The service availability requirements are allocated exclusively to the CSP/SSP, and assume that failed ADS-C components within the ANSP would not significantly contribute to loss of ADS-C.

3.4.4.13 When the operational system does not meet the RSP availability requirements, the ANSP may consider local factors such as whether the reduced separation minimum is being applied between pairs of suitably-equipped aircraft or on tracks, to determine the appropriate mitigation and/or action. See also RTCA DO-306/EUROCAE ED-122 for examples of other factors.

Note.— Guidance on compliance means and RSP specifications are contained in Chapter 5 and Appendix C, respectively

3.4.5 RSP integrity and allocations

3.4.5.1 The value for the RSP integrity parameter is selected based on the results of an operational hazard assessment. The operational hazard assessment should include a severity-of-effects analysis of communication transactions with undetected errors. Undetected errors include, but are not limited to:

a) undetected corruption of the delivered surveillance data;

b) undetected misdirection of delivered surveillance data;

c) undetected delivery of ADS-C reports in an order that was not intended;

d) undetected delivery of an ADS-C report after the RSP data delivery time; and

e) undetected loss of service or interruption in surveillance data delivery.

Note.— Undetected loss of service is associated with integrity because it is "undetected." In some operational scenarios, it is conceivable that a network could have failed with no indication provided to the users of the system.

3.4.5.2 An acceptable probability should be determined for the likelihood of occurrence of surveillance data deliveries with undetected errors based on the severity-of-effects analysis.

3.4.5.3 The value for the RSP integrity parameter is the acceptable probability of surveillance data deliveries with undetected errors.

3.4.5.4 Additionally, the RSP integrity requirements include criteria for accuracy of navigation data and time at the position provided in the surveillance data. The information provided in the surveillance data has the following accuracy requirements:

a) The accuracy of the navigation position data is specified as a navigation figure of merit (FOM). The navigation FOM is specified based on the performance based navigation specification (or other navigation requirement). For example, if RNP 10 is prescribed, then for ADS-C surveillance service, the FOM level would need to be 3 or higher, or if RNP 4 is prescribed, then for ADS-C, navigation FOM would need to be 4 or higher. In all cases, when the navigation capability no longer meets the criteria specified for the operation, the flight crew is responsible for reporting the non-compliance to ATC in accordance with ICAO procedures.

b) The accuracy of the time at position is specified to within 1 second of the time (UTC) the aircraft was actually at the position.

3.4.5.5 The RSP integrity requirements are specified in terms of likelihood of malfunction (i.e. failure instead of quality of service) on a per flight hour basis. As an example, for RSP 180 and RSP 400, the likelihood of system malfunction shall be less frequent than 10^{-5} per flight hour. The RSP integrity requirements were determined based on an operational safety assessment (per DO-264/ED-78A) that classified the effects of undetected message corruption, misdelivery and other misleading anomalous system behaviour as "major." These requirements are allocated to system components in terms of safety and performance requirements.

3.4.5.6 RSP integrity is demonstrated by procedures, design assurance, design features and system architecture characterized by interoperability standards (e.g. RTCA DO-258A/EUROCAE ED-100A for FANS 1/A) and safety and performance requirements (SPR) standards (e.g. RTCA DO-306/EUROCAE ED-122 for oceanic/remote airspace).

3.4.5.7 Some examples include:

a) RTCA DO-258A/EUROCAE ED-100A employs a cyclic redundancy check (CRC) algorithm that is implemented in the CPDLC and ADS-C application (RTCA DO-178C/EUROCAE ED-12C level C software) to eliminate the potential risk of undetected corruption of message content and message address caused by communication services as required by the SPR standard;

b) specification of a safety requirement, requiring the ATS unit to correlate flight plan information with the information provided in the logon request from the aircraft to ensure that the ADS-C contract establishment with the aircraft is legitimate; and

c) specification of a safety requirement, requiring the flight crew to ensure the aircraft is correctly identified and that instructions are properly executed.

3.4.5.8 There may be situations in operations where problems affecting system integrity are discovered post-implementation. These problems should be reported to the appropriate PBCS monitoring entity and/or authorities to determine appropriate action. Particularly if such problems are systematic, additional actions may be indicated to remove the source of the problem. A good way for determining whether there is a systematic problem is to observe an accumulation of similar reports over time.

3.5 Selecting the RSP specifications

3.5.1 Once all the safety and operational requirements have been determined, the RSP specification which meets these requirements is selected from Table 3-2.

3.5.2 Separate analyses of different ATM operations may result in the need to apply a number of different RSP specifications.

Note.— Guidance on prescribing an RSP specification in these situations is contained in Chapter 4.

Chapter 4. APPLYING AN RCP/RSP SPECIFICATION

4.1 General

4.1.1 The standards and procedures for an ATM operation that is predicated on communication and surveillance capabilities, such as the application of a reduced separation minimum, should refer to the appropriate RCP/RSP specification. The RCP/RSP specifications provide the operational performance criteria and associated allocations to the ATM subsystems for the communication and surveillance capabilities supporting the ATM operation.

Note.— Refer to Appendix B for RCP specifications and Appendix C for RSP specifications.

4.1.2 This chapter provides guidance for a State to apply an RCP/RSP specification to communication and/or surveillance capabilities supporting an ATM operation in applicable airspace. An RCP/RSP specification provides a globally standardized means to prescribe in the AIP (or equivalent publication) the initial and continued compliance criteria for communication and surveillance capabilities in the applicable airspace, to support:

a) approval of ANSP to provide the new ATM operations, including flight plan provision and notification of service;

b) operational approval of the aircraft operator, including aircraft system approval; and

c) PBCS monitoring programmes.

4.1.3 When the ANSP can show that there is no safety impact, the RCP/RSP specification provides a globally standardized means to specify continuing compliance criteria for PBCS monitoring programmes to ensure that communication and surveillance systems are operating efficiently and as expected.

4.1.4 To ensure a globally standardized means of measuring the actual communication performance (ACP) and actual surveillance performance (ASP), a general PBCS monitoring programme can be adapted without applying any specific acceptance criteria. This can be used to evaluate actual performance of a communication or surveillance capability that is not associated with an existing RCP/RSP specification.

4.1.5 Applying an RCP/RSP specification and PBCS monitoring programmes provide a globally standardized means to ensure the communication system within a particular airspace meets applicable performance requirements initially and in continued operations.

Note.— Guidance for determining initial and continued compliance with an RCP/RSP specification is provided in Chapter 5.

4.2 Prescribing an RCP/RSP specification

4.2.1 The State should prescribe the appropriate RCP/RSP specification for the communication and surveillance capability supporting the ATM operation in the AIP (or equivalent publication) for the applicable airspace, concurrent with operational implementation of:

a) a new ATM operation that is predicated on communication and surveillance performance, or

b) any significant safety-related change to the communication and surveillance capabilities.

Note.— When an ATM operation is being trialled, the State may refer to the appropriate RCP/RSP specification to measure and assess actual system performance in preparation for operational implementation.

4.2.2 If the appropriate RCP/RSP specification does not exist for the relevant ATM operation or safety-related change intended to be implemented, the State should coordinate with ICAO to develop and publish the appropriate RCP/RSP specification.

Note.— Guidance for developing an RCP/RSP specification is provided in Chapter 3.

4.2.3 When prescribing the RCP/RSP specification in the AIP (or equivalent publication), the State should specify the following:

a) applicable airspace or specific routes;

b) specific ATM operations (e.g. 5-minute longitudinal separation minimum); and

c) associated designator that defines the interoperability standards for the communication and surveillance capabilities (e.g. FANS 1/A CPDLC and ADS-C; Iridium, Inmarsat or MTSAT SATVOICE).

Note.— Refer to Doc [GOLD] for designators that define the interoperability standards for CPDLC and ADS-C. Refer to Doc [SVOM] for designators that define the interoperability standards for SATVOICE. For example, FANS 1/A is an interoperability designator for CPDLC and ADS-C; or Iridium, Inmarsat or MTSAT are interoperability designators for SATVOICE.

4.2.4 Figure 4-1 provides an example of information included in the AIP (or equivalent publication) when prescribing an RCP/RSP specification.

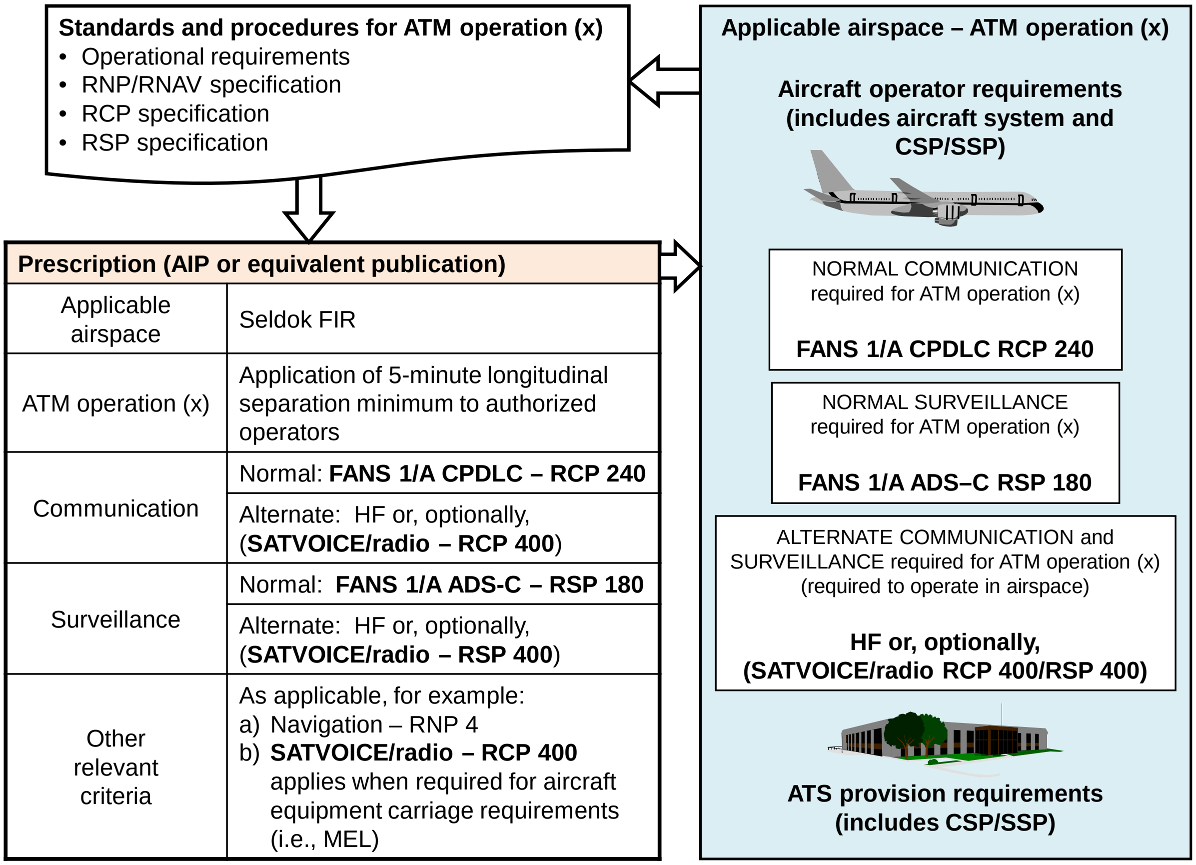


Figure 4-1. Example of prescribing an RCP/RSP specification

4.2.5 The State should prescribe an RCP/RSP specification in the AIP (or equivalent publication) on the basis of a bilateral, multilateral or regional air navigation agreement, as appropriate, when the:

a) ATM operation affects neighbouring airspace, such as when applying a separation minimum predicated on communication and surveillance capability at the boundary; or

b) communication and surveillance infrastructure is common within the region.

4.2.6 The air navigation agreement should address:

a) flight plan provision for aircraft operators to file PBCS capabilities;

b) means of compliance with the appropriate RCP/RSP specification, including requirements for ATS provision, aircraft system and aircraft operator approvals for PBCS operations;

c) application of the RCP/RSP specification to communication and surveillance capabilities for the ATM operation; and

d) PBCS monitoring programmes.

4.3 Applying an RCP/RSP specification to PBCS monitoring programmes

4.3.1 When the State does not prescribe an RCP/RSP specification, the ANSP should apply the appropriate RCP/RSP specification to identify the continuing compliance criteria for PBCS monitoring programmes when employing new technology for communication and surveillance capabilities.

4.3.2 The ANSP should establish policies and procedures for taking appropriate action when the PBCS monitoring programme indicates that the communication capability and surveillance capabilities do not meet RCP/RSP specification.

4.4 Adapting PBCS monitoring programme (absent an RCP/RSP specification)

4.4.1 When monitoring the performance of existing communication and surveillance capabilities, the ANSP should adapt the PBCS monitoring programme guidelines in Chapter 5, to ensure globally standardized measurements of ACP and ASP.

Note.— Refer to Figure 3-2 ACP measuring points (C and X), and Figure 3-5 for ASP measuring points (C and X). Refer to Figure 3-4 for the measuring parameters used to assess the actual service availability.

4.4.2 If other measuring points or parameters are used, the ANSP should specify how the measuring points and parameters used will affect the actual measurements against the standardized measuring points and parameters.

Note.— For example, the ANSP may adapt the PBCS monitoring programme to measure the ACP of ATC clearance transactions and ASP of position reports on HF voice via a radio operator. The aeronautical station may measure communication performance from the "time value" included with the ATC clearance message received from the ATS unit to the "time value" included in the response message the aeronautical station sends back to the ATS unit. The ACP may be estimated taking into account a relatively small and statistically stable value for the time from when the aeronautical station sent the response message to when the ATS unit received the response message.

Chapter 5. COMPLYING WITH AN RCP/RSP SPECIFICATION

5.1 General

5.1.1 The guidance in this chapter is intended to be used by a State to set its policies and objectives for PBCS supporting safety oversight of training organizations, aircraft operators and associated maintenance organizations, organizations responsible for the type design or manufacture of aircraft, and the ANSP. It is also intended for the appropriate organizations to show:

a) initial compliance for:

   1) training programmes, which may be under the oversight of the ANSP and aircraft operator, as appropriate (Annex 1);

   2) operators of international commercial air transport, including operations and maintenance (Annex 6, Parts I and III, Section II)

   3) design or manufacture of aircraft, systems and equipment (Annex 8); and

   4) ANSP service provision (Annex 11); and

   5) “supervision” of CSP/SSP services, which are under the oversight of the ANSP and aircraft operator (Annex 10, Volume II).

b) continued compliance, at the operational level, through PBCS monitoring programmes (Annex 6 and Annex 11), including:

   1) local PBCS monitoring programme;

   2) regional PBCS monitoring programme; and

   3) global exchange of monitoring information.

5.1.2 Initial compliance supports subsystem approval by providing a level of confidence that the subsystem will perform in accordance with the allocations provided by the RCP/RSP specification and it will not compromise the overall performance of the operational system. Since the initial subsystem approval process is not exhaustive, the PBCS monitoring programmes provide a higher level of confidence that the operational system will continue to meet the RCP/RSP specification.

Note 1.— RCP specifications are contained in contained in Appendix B. RSP specifications are contained in Appendix C.

Note 2.— Guidelines on PBCS monitoring programmes are contained in section 5.5, Appendix D for CPDLC and ADS-C, and Appendix E for SATVOICE.

5.1.3 This guidance is applicable when a State prescribes an RCP/RSP specification for a communication and/or surveillance capability required to support an ATM operation, such as the application of a reduced separation minimum.

5.1.4 This guidance is also applicable when monitoring performance of any communication and surveillance capabilities in the absence of a prescribed RCP/RSP specification. This will provide a globally standardized means of monitoring the communication and surveillance capabilities.

5.1.5 It is assumed that the ATS system, CSP/SSP system and aircraft system comply with appropriate interoperability standards prior to assessing compliance with an RCP/RSP specification.

Note.— Refer to Doc [GOLD] for appropriate interoperability standards associated with CPDLC and ADS-C systems. Refer to Doc [SVOM] for appropriate interoperability standards associated with SATVOICE systems.

5.2 Guidance for States

5.2.1 General policies and objectives

5.2.1.1 The State should provide policies and guidance material for appropriate organizations with regard to showing that systems, procedures and supporting programmes, initially comply with the RCP/RSP allocations and that the operational system continues to comply with the prescribed RCP/RSP specification.

5.2.1.2 The State should ensure that the ANSP establishes local and regional PBCS monitoring programmes, and means for appropriate entities, some not necessarily under the jurisdiction of the State, to participate in the programmes in accordance with paragraph 5.3.1.8. Other entities may include the ATS units, aeronautical stations, CSPs/SSPs, aircraft manufacturers and equipment suppliers and aircraft operators.

Note 1.— PBCS monitoring programmes may support search and rescue (SAR) and accident/incident investigations. However, they are not intended to replace the ATS incident reporting standards and guidelines, as specified in ICAO Doc 4444, Appendix 4; ICAO Air Traffic Services Planning Manual *(Doc 9426), Part I, Section 2, Chapter 8; or applicable State regulations, affecting the parties directly involved in a potential ATS incident.*

Note 2.— PBCS monitoring programmes are not intended to replace the standards to retain records of communications and surveillance data for accident/incident investigation purposes in accordance with Annex 11, paragraph 6.1.1.3, and Annex 10, Volume II, paragraph 3.5.

5.2.2 State safety oversight of an ANSP

5.2.2.1 When an RCP/RSP specification is prescribed, the State should ensure that the ANSP establishes means to assess the actual performance of communication and surveillance services in a particular airspace prior to operational implementation of associated ATM operations. In addition to ensuring that the ANSP adheres to the guidelines of section 5.3.1, the ANSP should determine that the actual performance within the applicable airspace complies with the RCP/RSP specification.

5.2.2.2 The State should ensure that the ANSP performs ATM operations that are predicated on RCP/RSP specifications in the applicable airspace only to aircraft operators that file the appropriate PBCS capability in the flight plan in accordance with section 5.4.

5.2.2.3 To determine compliance in the applicable airspace, the State should obtain a sufficient sample from the applicable airspace of the actual communication performance (ACP) of relevant communication transactions and actual surveillance performance (ASP) of surveillance data delivery measured against RCP/RSP time values, and apply the following criteria:

a) time values associated with nominal continuity criterion (95 per cent):

    1) ACP should meet RCP transaction time (TT) value at the nominal continuity criterion; and

2) ASP should meet RSP delivery time (DT) value at the nominal continuity criterion.

b) time values associated with operational continuity criterion (See Note 1):

1) ACP should meet RCP expiration time (ET) value at the operational continuity criterion; and

2) ASP should meet the RSP overdue time (OT) value at the operational continuity criterion; or

3) if ACP or ASP does not meet the operational continuity criteria, the State may determine that the performance is acceptable from an ANSP's local safety assessment taking into account the significance of the impact on operations within the relevant ATS unit(s).

Note 1.— While RCP 240, RCP 400, RSP 180 and RSP 400 specify operational continuity criteria of 99.9 per cent, early implementations of PBCS for CPDLC and ADS-C have indicated that an operational continuity of 99 per cent is acceptable. However, as ATM operations become more dependent on communication and surveillance performance, the operational continuity may need to be more stringent.

Note 2.— The time values for operational continuity provide values for when the ATS unit takes appropriate action when alerted by the ATS system that the relevant communication transaction was not completed or surveillance data was not delivered. The actual operational continuity determines how often the ATS unit is alerted when an operational response to an ATC instruction has not yet been received, or when a surveillance data report is considered overdue. The local safety assessment would determine the impact the frequency of these alerts has on operations within the ATS unit.

c) Service availability

1) actual availability measurements should meet the RCP/RSP availability criteria for safety; or

2) if actual availability measurements do not meet the RCP/RSP availability criteria for safety, the State may determine performance is acceptable taking into account the ANSP's assessment of the impact on operations within the relevant ATS unit(s).

Note 3.— If the operational continuity or service availability criteria are not met, a local safety assessment to determine appropriate mitigation and/or action may take into account local factors. Local factors include, for example, whether a reduced separation minimum predicated on an RCP/RSP specification is being applied between pairs of suitably-equipped aircraft or within an organized track system, frequency of application of the ATM operation, route structure, traffic density, loading conditions of the communication and surveillance capability, alternative means of communication and surveillance capability available, and contingency procedures.

5.2.2.4 The State should ensure that the ANSP establishes a means to notify the operator and the State of the Operator or State of Registry when the actual performance of the operator's fleet, taking into account different aircraft types/systems, does not comply with an RCP/RSP specification (refer to paragraph 5.5.3.11).

5.2.2.5 The State should ensure that the ANSP establishes a means to assess the risk of any non-compliance with the RCP/RSP specification and take appropriate action to correct the related deficiency and provide notification, as appropriate.

5.2.2.6 If the non-compliance cannot be satisfactorily corrected, the ANSP may continue to provide the communication and surveillance services, but cease any ATM operation predicated on the

RCP/RSP specification in the relevant airspace or as appropriate (e.g. cease ATM operation involving a particular aircraft operator or an aircraft type/system within an operator's fleet).

5.2.3 State safety oversight of an aircraft operator

5.2.3.1 When an RCP/RSP specification is prescribed, the State of the Operator or State of Registry should ensure that the aircraft operator establishes means to assess the actual performance of its fleet. In addition to ensuring that the aircraft operator adheres to the guidelines of section 5.3.4, the State of the Operator or State of Registry should determine that the actual performance of specified aircraft types/systems in the aircraft operator's fleet complies with the RCP/RSP specification.

5.2.3.2 To determine compliance, the State of the Operator or State of Registry should obtain a sufficient sample from the different aircraft types/systems in the aircraft operator's fleet of the ACP of relevant communication transactions and ASP of surveillance data delivery measured against RCP/RSP time values, and apply the following criteria:

a) time values associated with nominal continuity criterion (95 per cent):

   1) ACP should meet RCP transaction time (TT) value associated with the nominal continuity criterion; and

   2) ASP should meet RSP delivery time (DT) value associated with the nominal continuity criterion.

b) time values associated with operational continuity criterion *(See Note)*:

   1) ACP should meet RCP expiration time (ET) value associated with the operational continuity criterion; and

   2) ASP should meet the RSP overdue time (OT) value associated with the operational continuity criterion; or

   3) if ACP or ASP does not meet the operational continuity criteria, the State of the Operator or State of Registry may determine that the performance is acceptable, based on a local safety assessment by the ANSPs in control of the airspace in which the aircraft operator operates (see paragraph 5.2.2.2).

Note.— While RCP 240, RCP 400, RSP 180 and RSP 400 specify operational continuity criteria of 99.9 per cent, early implementations of PBCS for CPDLC and ADS-C have indicated that an operational continuity of 99 per cent is acceptable. However, as ATM operations become more dependent on communication and surveillance performance, the operational continuity may need to be more stringent.

5.2.3.3 If the relevant PBCS monitoring programme provides notification that a particular aircraft operator does not comply with the RCP/RSP specification, the State of the Operator or State of Registry should provide the aircraft operator with information on the non-compliance and corrective action with a predetermined timeframe based on severity of the deficiency and magnitude of the solution.

Note.— The relevant PBCS monitoring programme would provide such notification, in accordance with paragraph 5.5.3.11, after the non-compliance and recommended action has been confirmed with the aircraft operator, which participated in the investigation.

5.2.3.4 If the non-compliance cannot be corrected within the timeframe specified, the State of the Operator or State of Registry may allow the aircraft operator to continue to use the communication and surveillance capabilities, but should restrict the aircraft operator from filing RCP/RSP capability and participating in ATM operations predicated on the RCP/RSP specification.

5.2.3.5 The State of the Operator or State of Registry should establish a means to verify that aircraft operators that file PBCS capabilities in the flight plan are authorized, as appropriate.

Note.— Aircraft operator approval status is maintained by regional monitoring programmes for reduced vertical separation minimum (RVSM) and performance-based horizontal separation minima. Guidelines for these monitoring programmes can be found in Doc 9574, Doc 9937 and Doc [PBHSM]).

5.3 Initial compliance determination and related approvals

5.3.1 ANSP service provision

5.3.1.1 The ANSP service provision includes:

a) ATS system, comprising CSP/SSP services, procedures, personnel training and qualification and service provision approval;

b) establishment of local and regional PBCS monitoring programmes; and

c) notification of ATM operations, related aircraft operator requirements, including compliance with appropriate RCP/RSP specifications.

5.3.1.2 The ANSP should ensure a validation process that confirms the system and procedures meets capability and performance requirements to support PBCS operations. This process should include:

a) a system safety assessment, including a functional hazard analysis, demonstrating that the service provision meets the safety objectives. This assessment should include:

   1) identifying failure conditions;

   2) assigning levels of criticality;

   3) determining probabilities for occurrence; and

   4) identifying mitigating measures;

b) a design evaluation, demonstrating that the ATS system complies with the RCP/RSP specification by providing the necessary functionality, performance, human-machine interface, including controls, displays and alerts;

c) configuration management, demonstrating that the operational system, including network and/or frequency management, priority selection criteria of sub-networks, and changes to the system, continues to meet the RCP/RSP specification;

d) integration testing and operational trials of sufficient duration confirming interoperability and performance is acceptable for the ATM operation predicated on the RCP/RSP specification; and

e) confirmation that the ATS operation manuals are compatible with those of adjacent providers, where applicable.

5.3.1.3 The ANSP should establish procedures to ensure notification and mitigation of identified failure conditions, including failure conditions within its aeronautical stations, ATS units, CSPs/SSPs, taking into account local factors and other mitigating circumstances, such as:

a) the ATS unit should be capable of applying specific ATM operations predicated on a prescribed RCP/RSP specification only to aircraft operators that are eligible to participate in the operation;

Note.— In cases where an aircraft operator does not meet a more stringent prescribed RCP/RSP specification (e.g. RCP 240/RSP 180) for its communication and surveillance capabilities to support a specific ATM operation, the ANSP may find it useful to continue to allow the aircraft operator to use those capabilities in the applicable airspace for other ATM operations that are not dependent on the more stringent RCP/RSP specification, consistent with paragraph 5.2.3.4.

b) the ATS unit should be capable of taking appropriate action when alerted that:

1) a relevant communication transaction was not completed by the expiration time value specified by the RCP specification;

2) the surveillance data was not delivered by the overdue delivery time value specified by the RSP specification;

3) an ATS services required for the ATM operation has failed for a significant portion of the flights in the applicable airspace (i.e. unexpected service outage).

5.3.1.4 The ANSP should establish procedures to restore operations after a failure condition has been rectified.

5.3.1.5 The ANSP should ensure that contracted services, such as with CSPs/SSPs and aeronautical stations, are bound by contractual arrangements stipulating the RCP/RSP allocations, including any monitoring or recording requirements, and the guidelines of section 5.3.2.

5.3.1.6 The ANSP should ensure that its air traffic controllers and aeronautical station operators receive appropriate training in accordance with ICAO Annex 1.

5.3.1.7 The ANSP should establish the following, subject to a bilateral, multilateral or regional air navigation agreement, if applicable:

a) a local PBCS monitoring programme to ensure that the communication and surveillance capabilities in the airspace applicable to its ATS units continue to meet the RCP/RSP specification, and to coordinate monitored-data, analysis and corrective action; and

b) in cooperation with the other ANSPs within the region, a regional PBCS monitoring programme to assess regional performance and exchange the results of PBCS monitoring programmes regionally and globally.

Note.— Guidelines for PBCS monitoring programmes are provided in section 5.5.

5.3.1.8 The ANSP should notify aircraft operators in the AIP (or equivalent publication) of PBCS operations and include, as a minimum, the following:

a) requirements for aircraft system and capability, and participating in PBCS monitoring programmes, in accordance with section 5.3.3; and

b) flight plan filing requirements in accordance with section 5.4.

5.3.2 CSP/SSP services

5.3.2.1 The CSP/SSP should provide services that meet the RCP/RSP allocations provided in the specifications. These allocations are used to establish contractual arrangements, which support safety oversight and approval of ANSP service provision and approval of aircraft operator use of the services.

5.3.2.2 The CSP/SSP should ensure that services it provides adhere to the contractual arrangements, which include:

a) RCP/RSP allocations, as contained in appropriate RCP/RSP specifications;

b) notification to ATS units, aircraft operators and others, as appropriate, of any failure condition that may impact PBCS operations.

5.3.2.3 When a CSP/SSP holds a contract with an aircraft operator but not with ATS units for airspace in which the aircraft operator operates, that CSP/SSP should also notify the appropriate ATS units of any failure condition that may impact that aircraft operator's PBCS operations in the ATS units' airspace.

5.3.2.4 The CSP/SSP should record and retain communication and surveillance data and provide data to ANSP and regional PBCS monitoring programmes upon request, when authorized by appropriate parties, in accordance with the contractual arrangements with the ANSP or aircraft operator.

5.3.3 Aircraft system

Note 1.— The aircraft system is approved by the State of Design and/or State of Manufacture, which typically issues design, production and airworthiness certificates to an aircraft manufacturer or equipment supplier in accordance with national regulations. However, national regulations often allow an aircraft operator to obtain the necessary certificates for equipment approval. In such cases, the guidelines in this section (5.3.3) would apply to the aircraft operator.

Note 2.— The PBCS requirements for the design of the aircraft system concern its functionality, interoperability and performance in accordance with national airworthiness standards. There are no additional PBCS requirements concerning the production and airworthiness certificates other than those provided by national regulations. Certificates issued for design, production and airworthiness approval of the aircraft system do not constitute operational approval to use the system.

5.3.3.1 The aircraft manufacturer or supplier should demonstrate that aircraft system meets the RCP/RSP allocations.

Note.— For a FANS 1/A CPDLC and ADS-C aircraft system, RTCA DO-306/EUROCAE ED-122 is equivalent to RCP 240, RCP 400, RSP 180 and RSP 400 specifications. For an ATN B1 or FANS 1/A CPDLC aircraft system, RTCA DO-290/EUROCAE ED-120 provides performance criteria for the EUR Region.

5.3.3.2 The aircraft manufacturer or equipment supplier should demonstrate that the aircraft meets the RCP/RSP integrity criteria and associated safety requirements. RCP/RSP integrity is typically shown by analysis, design, system architecture, and evaluations of HMI, taking into account flight crew training and qualification programmes instituted by the aircraft operator.

5.3.3.3 The aircraft manufacturer or supplier should demonstrate that the aircraft system meets the RCP/RSP availability criteria. RCP/RSP availability is typically shown by evaluation of equipment failure and the number of similar components (redundancy) installed on the aircraft.

Note.— For voice communication, the number of radios and types of radios required may be specified by operating rules and airspace requirements (i.e. the AIP or equivalent publication).

5.3.3.4 The aircraft manufacturer or supplier should demonstrate that the aircraft system, when operating with a representative ATS provision (i.e. simulation or real ground system), is capable of meeting the operational RCP/RSP time and continuity criteria.

Note.— It would be impractical to exhaustively demonstrate compliance at the aircraft system level.

5.3.3.5 The aircraft manufacturer or supplier should demonstrate that the aircraft system provides the flight crew with alerts in case of aircraft system or connectivity failures that would cause the aircraft to no longer be capable of meeting the RCP/RSP specification.

Note.— Examples of alerts include failure of a particular communication means, definitive connectivity loss, or failure of the communication or surveillance functions. There is no consolidated RCP/RSP capability directly displayed to the flight crew. Appropriate procedures and flight crew training associated with the alerts ensure continued compliance with PBCS operations.

5.3.3.6 The aircraft manufacturer or equipment supplier should identify any specific items related to PBCS capability in the master minimum equipment list (MMEL).

5.3.3.7 The aircraft manufacturer or equipment supplier should identify the demonstrated PBCS capability of the aircraft, any associated operating limitations, information and procedures, in the flight manual.

5.3.4 Aircraft operator eligibility

5.3.4.1 The aircraft operator should obtain an operational approval from the State of the Operator or State of Registry to be eligible for PBCS operations. The operational approval should address flight crew training and qualification, MEL, maintenance, user modifiable software and CSP/SSP service agreements.

5.3.4.2 The aircraft operator should ensure that procedures are established and the flight crews and other personnel (e.g. aircraft maintenance, flight operations officer/flight dispatcher) are trained and qualified for PBCS operations. The flight crew procedures and training should include normal operations and those associated with alerts provided by the aircraft system to indicate failures when the aircraft is no longer capable of meeting the RCP/RSP specification prescribed for the associated ATM operations.

5.3.4.3 The aircraft operator should ensure that contracted services, such as with CSPs/SSPs, are bound by contractual arrangements stipulating the RCP/RSP allocations, including any monitoring or recording requirements, and the guidelines of section 5.3.2.

5.3.4.4 The aircraft operator should ensure that contractual arrangements include a provision for the CSP/SSP to notify the ATS units appropriate for the route system of the aircraft operator of failure conditions impacting PBCS operations.

Note.— This provision ensures appropriate ATS units are notified in cases when the ANSP does not have a contractual arrangement with a particular CSP/SSP, and services are provided through internetworking among CSPs/SSPs.

5.3.4.5 The aircraft operator should ensure that the aircraft system has been approved for the intended use in accordance with appropriate RCP/RSP specifications and guidelines provided in section 5.3.3.

5.3.4.6 The aircraft operator should ensure that aircraft system is properly maintained, including configuring user modifiable software, such as software used to manage communication media and routing policies, to meet appropriate RCP/RSP specifications.

5.3.4.7 The aircraft operator should participate in ANSP and regional PBCS monitoring programmes, which are applicable to the aircraft operator's route system, and should provide the following information to regional PBCS monitoring entities specified in AIPs (or equivalent publications):

a) operator name;

b) operator contact details; and

c) other coordination information.

5.3.4.8 The aircraft operator should advise the appropriate PBCS monitoring entities of any changes to the information listed in paragraph 5.3.4.7.

5.3.4.9 The aircraft operator should establish procedures to report problems, identified by the flight crew or other personnel, to the regional PBCS monitoring entities identified in AIPs (or equivalent publications) associated with the route of flight on which the problem occurred.

5.3.4.10 The aircraft operator should ensure procedures are established to disclose operational data, including data from its CSPs/SSPs, in a timely manner, to the appropriate PBCS monitoring entity, when requested for the purposes of investigating a reported problem.

5.4 Flight plan requirements

5.4.1 When filing RCP/RSP capabilities, the aircraft operator should ensure that the planned use of associated communication and surveillance capabilities for the flight will be in accordance with regulations, policies and procedures in control areas for the flight, as published by the applicable States in AIPs (or equivalent publications).

Note.— RCP/RSP capabilities are inserted only when the descriptors J2 through J7 for CPDLC, M1 through M3 for SATVOICE, and/or D1 for ADS-C, are also inserted. While RCP/RSP capability denotes performance, the descriptors J2 through J7, M1 through M3 and D1 in item 10 denote the interoperability for the aircraft equipment. Guidance on filing J2 through J7 and D1 descriptors is contained in Doc [GOLD]. Guidance on filing M1 through M3 descriptors is contained in Doc [SVOM].

5.4.2 The aircraft operator should ensure that the proper information to denote PBCS capabilities are included in the ICAO flight plan.

Note 1.— Refer to ICAO Doc 4444, Appendix 2, for flight plan requirements.

Note 2.— The inclusion of PBCS capability in the filed flight plan indicates that the relevant aircraft equipment comprising the aircraft system is approved and serviceable, and that the operator is eligible (e.g. flight crew training and qualification) to use the equipment for PBCS operations. If these conditions are not met then PBCS capability should not be included in the flight plan. Refer to paragraph 5.3.4 for guidance on operator eligibility for PBCS operations.

5.4.3 In Item 10 of the flight plan, the aircraft operator should insert one of the descriptors, as appropriate, listed in Table 5-1, to identify an aircraft's RCP capability:

Table 5-1. Descriptors for RCP capability in flight plan – Item 10

Item 10a – Radio communication, navigation and approach aid equipment and capabilities	Descriptor
CPDLC RCP 400	P1
CPDLC RCP 240	P2
SATVOICE RCP 400	P3
(reserved)	P4
(reserved)	P5
(reserved)	P6
(reserved)	P7
(reserved)	P8
(reserved)	P9

5.4.4 In Item 18 of the flight plan, the aircraft operator should file the RSP capability by inserting the indicator SUR/ followed by the appropriate RSP specification (e.g. RSP 400 or RSP 180).

Note.— The ATS unit uses the flight plan information to determine when to apply particular ATM operations that are dependent on the capability and to configure the system (e.g. set timer threshold values) for efficient operation when required communication and/or surveillance performance varies.

5.5 Continued operational compliance – PBCS monitoring programmes

Note.— This section provides general guidelines for ANSP and regional PBCS monitoring programmes. Guidelines specifically for monitoring CPDLC and ADS-C are provided in Appendix D, and guidelines specifically for monitoring SATVOICE are provided in Appendix E.

5.5.1 Administering PBCS monitoring programmes

5.5.1.1 While the RCP/RSP specification provides allocations to subsystems to support initial approval processes, the ANSPs within a region should establish local and regional PBCS monitoring programmes to monitor actual performance against the operational (end-to-end) criteria provided in the RCP/RSP specification, and take any necessary action to resolve unacceptable performance.

Note.— Guidance for a local (ANSP) PBCS monitoring programme is provided in section 5.5.2. Guidance for a regional PBCS monitoring programme is provided in section 5.5.3.

5.5.1.2 The ANSPs within a region should identify the entity and focal point(s) for administering the regional PBCS monitoring programme to manage a regional problem reporting system and provide regional-level analysis and reporting of ANSP-monitored performance.

5.5.1.3 The ANSPs should administer the PBCS monitoring programmes taking into account other monitoring programmes, particularly those established on the basis of a bilateral, multilateral or regional air navigation agreement, such as for monitoring RVSM, performance-based horizontal separation minima, and safety of ATM operations.

Note.— Guidance on monitoring programmes for RVSM is provided in Doc 9574 and Doc 9937. Guidance on monitoring programmes for horizontal separation minima is provided in Doc [PBHSM].

5.5.1.4 The ANSPs within a region should establish the policies and procedures for administering the regional PBCS monitoring programme, including:

a) formats and intervals of ANSP-monitored data provided to the regional PBCS monitoring programme;

b) extent to which the PBCS monitoring programme will manage problem reports, maintain data, and support analysis of ANSP-monitored data; and

c) formats and intervals of reports the PBCS monitoring programme will provide to the ANSPs and other participants.

5.5.1.5 When administering the PBCS monitoring programmes, the ANSPs within a region should consider the following:

a) ANSP and regional PBCS monitoring programmes include collecting data, monitoring and analysing data, investigating problem reports, and coordinating corrective actions. The regional PBCS monitoring programmes also include globally exchanging the results of monitoring programmes.

b) The guidance in this document related to reporting, tracking and resolving problems only considered the problem reporting system established for the regional PBCS monitoring programme. ANSPs, aircraft operators and other participants may adapt this guidance to establish means to report, track and resolve internal problems in accordance with local policies and procedures and to report problems to the regional PBCS monitoring programme.

c) The guidance in this document provides monitoring of communication and surveillance capability against certain actual operational and technical performance criteria. ANSPs, aircraft operators and other participants may collect other data and monitor other characteristics, where beneficial or to support other regional monitoring programmes (paragraph 5.5.1.3), such as the frequency of use of specific message types, proportion of flights using CPDLC, ADS-C and SATVOICE services, and the aircraft operators and proportion of flights that file RCP/RSP capabilities in the flight plan.

d) PBCS monitoring programmes should use similar monitoring and analysis methods; however, the sample of data monitored and used in the analysis will vary. Additionally, the ANSP PBCS monitoring programme may be more comprehensive than the regional PBCS monitoring programme.

Note.— For example, the ANSP PBCS monitoring programme may use a data sample that is filtered from the data collected from the ANSP's operational system to include only certain communication transactions or surveillance data through a particular routing path, from a particular aircraft operator, aircraft type or individual aircraft. The regional PBCS monitoring programme may only provide an aggregate result from similar summary information provided by each of the ANSPs within the region.

e) PBCS monitoring programmes should monitor actual performance against the operational and technical criteria for RCP transaction time, RSP surveillance data delivery time, RCP/RSP continuity and RCP/RSP availability. RCP/RSP integrity, which is shown during initial subsystem approval processes, is not monitored, although routine analysis of operational data and problem reports could reveal undetected errors and their effects as a consequence of a problem requiring corrective action.

f) PBCS monitoring programmes do not need to routinely measure the performance of a particular subsystem against its RCP/RSP allocations. However, these measurements can facilitate the identification and resolution of problems, on a case-by-case basis, when actual performance has degraded below the operational (end-to-end) criteria specified in the RCP/RSP specification.

g) PBCS monitoring programmes should apply the guidelines in paragraph 5.2.2.2 for determining successful operation (i.e. compliance with an RCP/RSP specification) within the applicable airspace and in paragraph 5.2.3.2 for a specific aircraft operator. Additionally, PBCS monitoring programmes should investigate further any performance degradation measured from a sample of data within a specified time interval (e.g. 0.5 per cent per month) when compared with the measured performance of samples of similar data from previous time intervals.

5.5.2 ANSP PBCS monitoring programme

5.5.2.1 After an ATM operation predicated on the RCP/RSP specification becomes operational, the ANSP should ensure that the communication and surveillance systems continue to operate successfully as a whole to ensure efficient and safe operations.

5.5.2.2 The ANSP should establish means to collect and maintain operational performance data in the standardized data formats defined in Appendix D for CPDLC and ADS-C and Appendix E for SATVOICE.

*Note.— While the ANSP develops the data collection mechanisms, monitoring tools, and internal reporting requirements that best suit their particular environment, the data formats provide a consistent means to aggregate performance monitoring on a regional and global basis. This aggregation of performance data is in accordance with the guidelines provided in ICAO Doc 9883 (*Manual on Global Performance of the Air Navigation System*).*

5.5.2.3 To determine continued operational compliance, the ANSP should monitor communication and surveillance capabilities in the applicable airspace to detect and correct performance degradations due to potential instabilities or variations in overall system performance, or changes to any of the various subsystems.

5.5.2.4 The ANSP should be the entity to perform local analysis because it possesses the necessary operational expertise, local area knowledge and control, when identifying problems and taking corrective action.

5.5.2.5 The ANSP should determine the extent to which these capabilities are monitored (i.e. what to monitor and the interval for producing the monitoring results). As a minimum, the ANSP should monitor ACP for relevant communication transactions and ASP for surveillance data delivery collectively for the airspace concerned, as well as on the basis of other factors affecting the stability of communication or surveillance performance, such as:

a) various infrastructure and technological dependencies (e.g. sub-network types, sub-network routing policies, frequencies); and

b) different aircraft operators, different aircraft types/systems or individual aircraft.

5.5.2.6 The ANSP should perform analysis of ACP and ASP at an interval suitable to verify system performance, and enable continuous performance improvement by detecting where specific infrastructure, aircraft operator fleet, aircraft type, or individual aircraft is not meeting the RCP/RSP specification.

Note.— Typically, an ANSP will conduct its analysis on data taken at monthly intervals. However, the specific interval will depend on local factors, such as volume of data accumulated and confidence level in the stability of performance over time.

5.5.2.7 The ANSP should performance analysis of service availability at an interval suitable to verify an acceptable number and duration of unplanned service outages affecting a significant portion of flights in the applicable airspace.

5.5.2.8 The ANSP should report to the regional PBCS monitoring programme any problems that may have a regional or global impact, or affect aircraft operators in its airspace, including any non-compliance with an RCP/RSP specification.

5.5.3 Regional PBCS monitoring programme

5.5.3.1 The regional PBCS monitoring programme should provide flexible services and centralized support to accommodate specific local, regional and global needs. Figure 5-1 provides an overview of the regional PBCS monitoring programme.

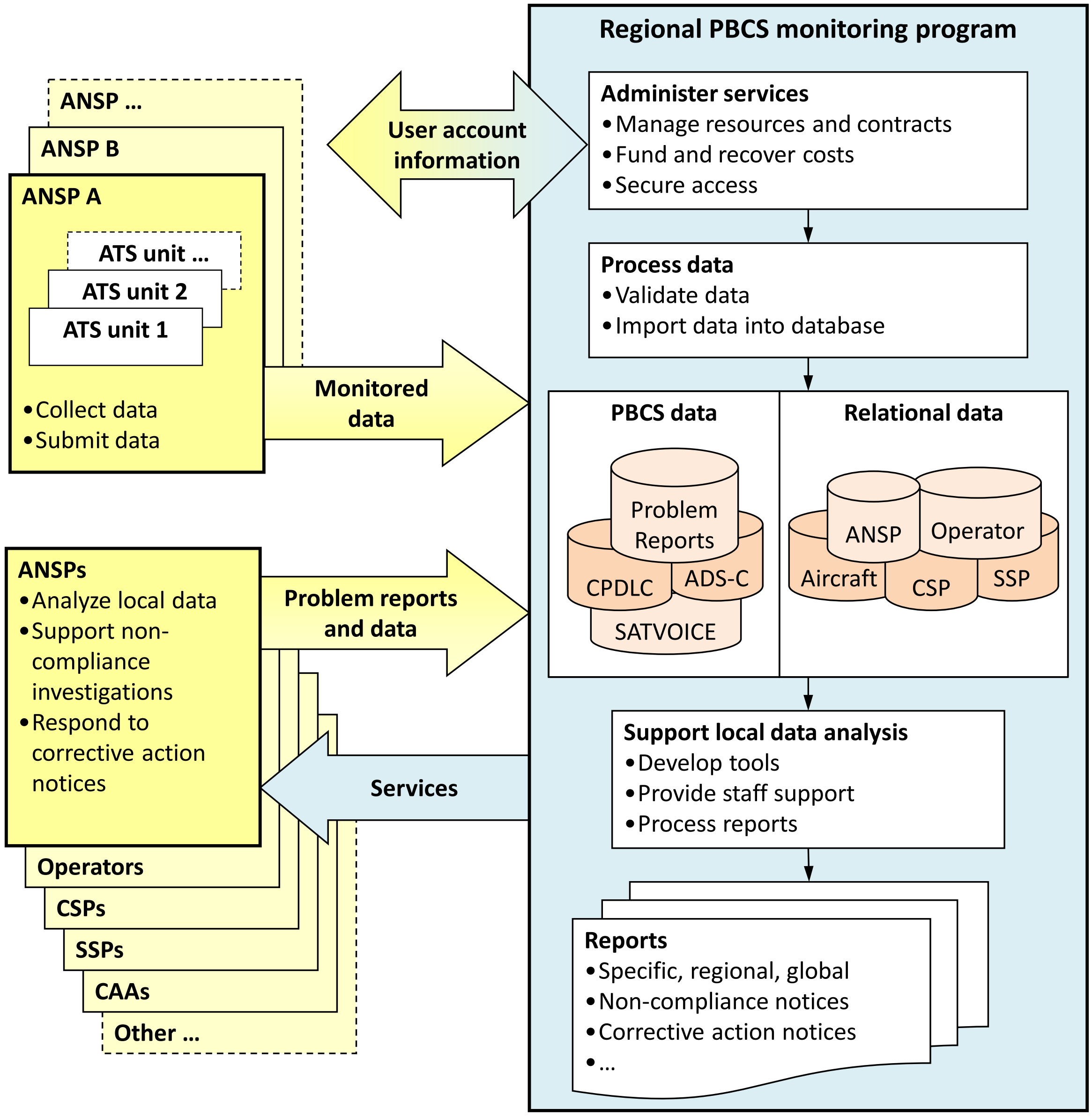


Figure 5-1. Regional PBCS monitoring programme overview

5.5.3.2 The regional PBCS monitoring programme should manage resources and any contracts, fund and recover costs and secure access to the services and information.

5.5.3.3 The regional PBCS monitoring programme should establish a process that authorizes users, such as ANSPs, aircraft operators, CSPs, SSPs, aircraft manufacturers, equipment suppliers and other participants to submit or access information. This process may include issuing a user ID and password associated with a unique security profile to a user requesting an account. This would ensure that each user is authorized to submit or access information, such as:

a) submitting problem reports and other ANSP-monitored information (e.g. summary reports or PBCS CSV data files, as necessary);

b) submitting other data supporting the problem investigation and analysis;

c) accessing relational databases that provide information specific to an operator, aircraft type, ANSP, CSP, SSP or message type; and

d) accessing standardized reports, such as status reports for management, civil aviation authorities (CAAs) or regional groups on an as-needed basis.

5.5.3.4 The regional PBCS monitoring programme should validate submitted data before importing it into a secure centralized database and desensitize reports consistent with non-disclosure and security policies established for defining the security profile of authorized users.

5.5.3.5 The regional PBCS monitoring programme should maintain relational data, such as related to the ANSP, CSP/SSP, aircraft type and aircraft operator.

5.5.3.6 The regional PBCS monitoring programme should provide a forum for users to develop and share tools to facilitate the conduct of specific analysis on selected data or to automatically query a database and send non-compliance and corrective action notices to appropriate parties.

5.5.3.7 The regional PBCS monitoring programme should provide staff support to assist ANSPs and other participants to investigate problems and conduct local and regional analyses.

5.5.3.8 The regional PBCS monitoring programme should manage problems reports, including

a) provide a means to receive, track and manage problem reports (e.g. web-based service);

b) request data from relevant sources;

c) coordinate the problem investigation and assign appropriate entities to assist in the analysis;

d) provide a diagnosis of the problem and recommend resolutions; and

e) inform the originator of the problem report of status and closure of the problem.

5.5.3.9 The regional PBCS monitoring programme should support participating ANSPs in the analysis and reporting of operational data, including ACP, ASP and availability data, at the regional level, including:

a) coordinate, as requested by the participating ANSPs, the analysis of degraded performance and availability issues that are common within the region or globally; and

b) produce regional PBCS monitoring reports in accordance with established procedures for receiving ANSP-monitored information and report formats provided by the participating ANSPs;

Note.— When the regional PBCS monitoring programme is established, the participating ANSPs determine the extent to which the regional PBCS monitoring programme receives monitoring information and supports any regional analysis of monitored information.

5.5.3.10 The regional PBCS monitoring programme should coordinate, as necessary, with other regional monitoring programmes, such as those established for monitoring RVSM (Doc 9574 and Doc 9937) and performance-based horizontal separation minima (Doc [PBHSM]), and safety of ATM operations.

5.5.3.11 The regional PBCS monitoring programme should notify appropriate parties when the operational system does not meet the RCP/RSP specification, including:

a) the relevant ANSP when the non-compliance concerns a subsystem of the infrastructure, including the CSP/SSP, under its control; and

b) the relevant operator and the State of the Operator or State of Registry when the non-compliance concerns the operator, or any aircraft type or individual aircraft within its fleet.

Note.— Typically, means to notify the State of the Operator or State of Registry will be conducted via the regional PBCS monitoring programme to which the relevant State is assigned. If the relevant State is not assigned to a regional PBCS monitoring programme, then the regional PBCS monitoring programme that originated the non-compliance action would contact the State directly.

5.5.3.12 The regional PBCS monitoring programme should coordinate the global exchange of monitoring information in accordance with the guidelines provided in section 5.5.4.

5.5.4 Global exchange of monitoring information

5.5.4.1 The RCP/RSP specifications provide global criteria for communication and surveillance capabilities supporting ATM operations. In many cases, the RCP/RSP specifications are applicable to global systems that are commercially owned and operated and provide services for aviation, maritime, land-mobile and military purposes. For example, application of a 30 NM longitudinal separation minimum depends on acceptable levels of performance from satellite systems and global networks.

5.5.4.2 These systems and global networks that support ATM operations are complex and require oversight of system components to ensure that the operational system performs in accordance with RCP/RSP specifications. In addition, when one region experiences a problem and resolves it, exchanging this information globally will be more efficient than if another region has to conduct its own investigation to determine the cause and resolution of a similar problem.

5.5.4.3 Local and regional PBCS monitoring conducted in accordance with the guidelines set forth in this manual will allow the sharing of analytical tools and ensure consistent results for comparative analysis.

5.5.4.4 The regional PBCS monitoring programme in one region should exchange the following information with the regional PBCS monitoring programme in other regions:

a) lessons learned from PBCS implementation and operations;

b) analytical tools that can be shared for conducting analysis of ACP and ASP;

c) a list of aircraft operators that are filing RCP/RSP designators in their flight plan; and

d) a list of known problems, including those with particular networks, components of a network, aircraft types/systems, or aircraft operators, and associated resolutions.

Note.— Any of the information maintained by a regional PBCS monitoring programme, as described in section 5.5.3, may be of interest to other regional or local PBCS monitoring programmes. A local PBCS monitoring programme acting on its own within a region may also exchange information with other local and regional PBCS monitoring programmes.

APPENDIX A. PBCS Implementation Plan – Checklist

This appendix provides a checklist in Table A-1 that should be used as a guide for planning the implementation of PBCS operations. The checklist is organized as follows:

- Group A tasks – State/region preparation;
- Group B tasks – ANSP general project development and management;
- Group C tasks – ANSP implementation activities – ATS service provision;
- Group D tasks – Aircraft operator, aircraft type/system (airworthiness) eligibility; and
- Group E tasks – All stakeholders – post-implementation monitoring.

Table A-1. Checklist for PBCS implementation plan

Task ID	Task Descriptor	Task Detail	Reference(s)
Group A tasks – State/region preparation			
A-1	AIP – Prescription of an RCP/RSP specification	Prescribe the appropriate RCP/RSP specification in the AIP (or equivalent publication). If applicable, common AIP language may be based on a bilateral, multilateral or regional air navigation agreement.	Chapter 4
A-2	ANSP – PBCS policies, objectives supporting safety oversight	Identify means to apply RCP/RSP specifications and compliance criteria for initial approval and continued compliance, including: a) ATS provision requirements, and requirements for ATS unit's system and CSP/SSP service agreements, if applicable; b) flight plan requirements; and c) monitoring, alerting and reporting requirements.	Chapter 5 Section 5.2.1 Section 5.2.2

Task ID	Task Descriptor	Task Detail	Reference(s)
A-3	Operator and aircraft system – PBCS policies, objectives supporting safety oversight	Identify means to determine aircraft operator eligibility requirements for PBCS operations, including requirements for operations, maintenance, aircraft system and CSP/SSP service agreements, if applicable: a) establish State airworthiness requirements; b) establish operational policy/procedures requirements for operational approval; c) prepare State inspectors to perform tasks for operational approval; d) develop plan to issue operational approval to national operators. Train pilots and, if applicable, dispatchers on PBCS operations; and e) develop and distribute operations manuals, pilot bulletins or other appropriate documents containing PBCS policy and/or procedures. *Note.— State of the Operator identifies means for commercial air transport operations. State of Registry identifies means for general aviation operations. State of Design identifies means for design approval of the aircraft system.*	Chapter 5 Section 5.2.1 Section 5.2.3
A-4	*Regional Supplementary Procedures* (Doc 7030) for PBCS operations, if applicable	On behalf of a region, a State may develop a proposed amendment to the *Regional Supplementary Procedures* (Doc 7030), if applicable.	Chapter 4 Chapter 5
Group B tasks – ANSP general project development and management			
B-1	PBCS Implementation Plan	Establish PBCS implementation team and prepare a plan outlining the tasks for PBCS implementation. Include interdependencies between tasks, when each task is to be completed, lead point of contact and any coordination required.	State/region specific, this appendix serves as a guide.
B-2	Target dates for PBCS and relevant ATM operations	Identify key target dates for implementing PBCS supporting specified ATM operation(s) and the tasks identified in the plan.	State/region specific.

Task ID	Task Descriptor	Task Detail	Reference(s)
B-3	RCP/RSP specifications	Identify and confirm applicable RCP/RSP specifications that will be used for operational implementation of communication and surveillance capabilities supporting specified ATM operation(s). Existing RCP/RSP specifications may be appropriate for a new ATM operation predicated on RCP/RSP specifications (e.g. application of performance-based separation minimum), or when implementing an emerging technology to provide a communication or surveillance capability (e.g. SATVOICE) supporting an existing ATM operation. If a new RCP or RSP specification is needed, establish a task to coordinate with ICAO on the development of the appropriate RCP/RSP specifications for update to Doc 9869.	Chapter 3 Appendix B Appendix C
B-4	PBCS awareness	Establish means to raise awareness on PBCS implementation in a particular region or airspace through workshops and distribution of information. Establish a planning team to work with ICAO and subject matter experts to develop relevant material.	This manual Doc [GOLD] Doc [SVOM]
Group C tasks – ANSP implementation activities – ATS service provision			
C-1	Operational concepts and procedures for PBCS operations	Develop operational concepts for implementation of any ATM operation predicated on an RCP/RSP specification. Consider the following: a) applicable ATM operation(s); b) relevant interoperability requirements for communication and surveillance capabilities; c) provision for PBCS operations and appropriate RCP/RSP specifications; d) operating procedures for PBCS operations; e) operator/flight/flight crew and/or ATS unit/controller contingency procedures when system degrades below that required by RCP/RSP specifications; and f) procedures for resuming specified ATM operation(s) after system is restored to an acceptable level of performance.	This manual Doc [GOLD] Doc [SVOM]
C-2	ATC automation changes to use flight plan RCP/RSP indicators	Implement changes to recognize and use flight plan RCP/RSP indicators to apply ATM operation(s) predicated on the RCP/RSP specifications only to eligible operators/aircraft, and/or adapt other system parameters, if applicable (e.g. set timer threshold values), based on different performance levels). This task should be complete prior to operational implementation of ATM operation(s) predicated on RCP/RSP specifications.	Chapter 5 Section 5.4

Task ID	Task Descriptor	Task Detail	Reference(s)
C-3	ATC automation changes for PBCS monitoring	Implement post-implementation monitoring capability in ATC automation. This task should be completed to obtain a sufficient sample to confirm ACP and ASP comply with RCP/RSP specifications prior to implementation of specified ATM operation(s).	Chapter 5 Section 5.5 Appendix D Appendix E
C-4	Confirm initial ANSP compliance with RCP/RSP specifications	Prior to operational implementation, confirm CPDLC and ADS-C comply with RCP/RSP specifications: a) measure actual performance against RCP/RSP specifications for compliance to support initial approval of ATS provision, including CSP/SSP service agreement, if applicable; b) identify any aspect of service performance that is not compliant with the RCP/RSP specifications; and c) take appropriate action to mitigate.	Chapter 5 Section 5.2.2 Section 5.3.1 Section 5.3.2 Appendix D Appendix E
Group D tasks – Aircraft operator, Aircraft type/system (airworthiness) eligibility			
D-1	Confirm initial operator and/or aircraft type/system compliance with RCP/RSP specifications	Prior to operational approval, confirm CPDLC and ADS-C aircraft equipment and operator capabilities comply with RCP/RSP specifications: a) measure actual performance against RCP/RSP specifications for compliance to support initial approval of operator, including aircraft system approval and CSP/SSP service agreement, if applicable; b) identify any aspect of aircraft type/system and/or capability performance that is not compliant with the RCP/RSP specifications; and c) take appropriate action to mitigate.	Chapter 5 Section 5.2.3 Section 5.3.2 Section 5.3.3 Section 5.3.4 Appendix D Appendix E
Group E tasks – All stakeholders – post-implementation monitoring			
E-1	PBCS monitoring – post-implementation	On-going post-implementation data collection, monitoring, problem reporting and tracking, analysis and corrective action. When performance falls below specified levels, or problems are reported, operational judgment may be a consideration in determining appropriate actions.	Chapter 5 Section 5.5 Appendix D Appendix E Doc 9937 Doc [PBHSM]

APPENDIX B. RCP specifications

B.1 General

B.1.1 The RCP specifications are derived mainly from a safety assessment. However, in cases where it has been determined to be beneficial, the RCP specification may include criteria to support operational efficiency and orderly flow of air traffic. In these cases, the RCP specification indicates the distinction between safety and efficiency.

B.1.2 The RCP specifications provide a means of compliance, in general. Additional guidance related to service provision, aircraft approval and operational approval can be found Chapter 5. Guidance and requirements on post-implementation monitoring can be found at Appendix D for CPDLC and ADS-C and Appendix E for SATVOICE.

B.1.3 The RCP specifications include allocations for CPDLC and SATVOICE via a radio operator. The /D designator is used to indicate the RCP allocations associated with CPDLC. The /V_{RO} designator is used in this specification to indicate the RCP allocations associated with controller intervention via a radio operator and /V_{ATC} designator is reserved for RCP allocations associated with controller intervention via DCPC. See Figure 3-2 for RCP allocations for CPDLC and SATVOICE via a radio operator.

B.1.4 RCP allocations are provided for SATVOICE when it is intended to be used to provide an intervention and/or surveillance capability in support of an ATS service that is subject to a specified RCP. The RCP allocations for SATVOICE communications are based on the operational performance criteria, for intervention capability. As it is difficult to compare the actual performance of different technologies, the RCP 400 operational performance criteria provides a common basis for assessing SATVOICE, CPDLC or any new technology that may emerge.

B.2 RCP 240 specification

<table>
<tr><th colspan="4">RCP Specification</th></tr>
<tr><th colspan="2">RCP specification</th><th colspan="2">RCP 240</th></tr>
<tr><th colspan="4">Airspace specific considerations</th></tr>
<tr><td>Interoperability</td><td colspan="3">Specify interoperability criteria (e.g. FANS 1/A)</td></tr>
<tr><td>ATM operation</td><td colspan="3">Specify ATM operation(s) (e.g. applicable separation standard)</td></tr>
<tr><td>Application</td><td colspan="3">Specify controller-pilot ATC communication intervention capability (e.g. CPDLC application per ICAO Doc 4444, and RTCA DO-306/EUROCAE ED-122, Annex A)</td></tr>
<tr><th colspan="4">RCP parameter values</th></tr>
<tr><th>Transaction time (sec)</th><th>Continuity (C)</th><th>Availability (A)</th><th>Integrity (I)</th></tr>
<tr><td>ET = 240</td><td>C(ET) = 0.999</td><td rowspan="2">0.999
0.9999 (efficiency)</td><td rowspan="2">Malfunction = 10^{-5} per flight hour</td></tr>
<tr><td>TT = 210</td><td>C(TT) = 0.95</td></tr>
<tr><th colspan="4">RCP monitoring and alerting criteria</th></tr>
<tr><th>Ref</th><th colspan="3">Criteria</th></tr>
<tr><td>MA-1</td><td colspan="3">The system shall be capable of detecting failures and configuration changes that would cause the communication service to no longer meet the RCP specification for the intended function.</td></tr>
<tr><td>MA-2</td><td colspan="3">When the communication service can no longer meet the RCP specification for the intended function, the flight crew and/or the controller shall take appropriate action.</td></tr>
<tr><th colspan="4">Notes</th></tr>
<tr><td colspan="4">Note 1.— Rationale for the criteria provided in this specification can be found in ICAO Annex 11, ICAO Doc 4444, ICAO Doc 9689, and RTCA DO-306/EUROCAE ED-122.
Note 2.— The values for transaction times are to be applied to transactions that are representative of communication capability for the controller to intervene with a specific operator, aircraft type, and aircraft identification.
Note 3.— If changes are made to the system capacity limits, as specified by the airspace requirements, and the changes cause the system to perform below the RCP specification, this would be considered a change in system configuration.
Note 4.— RTCA DO-306/EUROCAE ED-122 specifies an availability value based on safety assessment of the operational effects of the loss of the service. The availability value herein is more stringent, based on an additional need to maintain orderly and efficient operations.</td></tr>
</table>

B.2.1 RCP 240/D allocations

B.2.1.1 General

B.2.1.1.1 The RCP 240/D allocations are applicable to the controller intervention capability via CPDLC. Figure B-1 provides the RCP 240/D allocations associated with transaction time and continuity. The time it takes for the controller to issue the instruction and receive the response is shown by analysis.

Actual communication performance (ACP) is monitored from C to X. The remaining allocations support initial compliance and problem investigation when ACP does not meet the specified criteria.

<table>
<tr><th colspan="11">RCP 240 specification (communication transaction times and RCP continuity)</th></tr>
<tr><td>RCP</td><td colspan="9">240</td><td>RCP</td></tr>
<tr><td>95%</td><td colspan="9">210</td><td>95%</td></tr>
<tr><td></td><td colspan="9">RCP 240/D allocations – CPDLC example</td><td></td></tr>
<tr><td>ATM</td><td>Controller issues ATC instruction</td><td colspan="7">Monitored operational performance</td><td>Controller receives response</td><td>ATM</td></tr>
<tr><td>99.9%</td><td>$P_{C/ATSU}$ (30)</td><td colspan="7">210</td><td>$P_{C/ATSU}$ (30)</td><td>ET</td></tr>
<tr><td>95%</td><td>$P_{C/ATSU}$ (30)</td><td colspan="7">180</td><td>$P_{C/ATSU}$ (30)</td><td>TT</td></tr>
<tr><td>RCMP</td><td></td><td colspan="3">RCTP</td><td>RCP PORT</td><td colspan="3">RCTP</td><td></td><td>RCMP</td></tr>
<tr><td>99.9%</td><td></td><td colspan="3">P_{RCTP}(150)</td><td>60</td><td colspan="3">P_{RCTP}(150)</td><td></td><td>99.9%</td></tr>
<tr><td>95%</td><td></td><td colspan="3">P_{RCTP}(120)</td><td>60</td><td colspan="3">P_{RCTP}(120)</td><td></td><td>95%</td></tr>
<tr><td></td><td>A</td><td>C</td><td>D1</td><td>D2</td><td>D3</td><td>D4</td><td>D5</td><td>D6</td><td>X</td><td>Z</td></tr>
<tr><td>RCTP</td><td></td><td>ATSU system</td><td>Network</td><td>Aircraft system</td><td></td><td>Aircraft system</td><td>Network</td><td>ATSU system</td><td></td><td>RCTP</td></tr>
<tr><td>99.9%</td><td></td><td>P_{ATSU}(15)</td><td>P_{NET}(120)</td><td>P_{AIR}(15)</td><td></td><td>P_{AIR}(15)</td><td>P_{NET}(120)</td><td>P_{ATSU}(15)</td><td></td><td>99.9%</td></tr>
<tr><td>95%</td><td></td><td>P_{ATSU}(10)</td><td>P_{NET}(100)</td><td>P_{AIR}(10)</td><td></td><td>P_{AIR}(10)</td><td>P_{NET}(100)</td><td>P_{ATSU}(10)</td><td></td><td>95%</td></tr>
<tr><td colspan="11"><u>Note</u>.— $P_{[SUBSCRIPT]}$([value]) means part of the specified [value], and that the combination of all the allocations in the row, denoted by, $P_{[SUBSCRIPT]}$, equals the [value] specified.</td></tr>
</table>

Figure B-1. RCP 240/D allocations – communication transaction times and continuity

B.2.1.1.1 The RCP 240/D allocations are shared by the ANSP, the CSP/SSP, the aircraft system and the aircraft operator. The descriptions and assignments for these allocations, as shown in Figure B-1, are provided in Table B-1.

Table B-1. RCP 240/D allocation descriptions and assignments

RCP 240/D Allocations	Description	ANSP	CSP/SSP	Aircraft	Operator
Controller (RCP initiator performance)	The maximum time allocated to the controller to issue an ATC instruction and receive the response.	X			
RCMP	The maximum time against which ACP is assessed.	X	X	X	X
RCP PORT	The maximum time allocated to the flight crew to recognize and respond to an ATC instruction.			X	X
RCTP	The maximum technical time allocated to relevant parts of the ATS unit's system, aeronautical station's system, the network systems and the aircraft system, for which there is no human contribution to the communication transaction performance.	X	X	X	X
ATSU system ($RCTP_{ATSU}$)	The maximum portion of RCTP allocated to the ATS unit's system.	X			
Network ($RCTP_{CSP/SSP}$)	The maximum portion of RCTP allocated to the network, including CSP and SSP.	X	X		X
Aircraft system ($RCTP_{AIR}$)	The maximum portion of RCTP allocated to the aircraft system.			X	

B.2.1.2 Air navigation service provider (ANSP)

RCP transaction time and continuity criteria			
Specification: RCP 240/D	**Application: CPDLC**		**Component: ANSP**
Transaction time parameter	**ET (sec) C = 99.9%**	**TT (sec) C = 95%**	**Compliance means**
Transaction time value (A to Z)	240	210	Analysis, monitored.
RCP time allocations			
Initiator (controller/ATSU system) (A to C) + (X to Z)	30	30	Analysis, simulations, safety and human factors assessments
RCMP (C to X)	210	180	Monitored.
RCMP time allocations			
RCTP (C to D3) + (D4 to X)	150	120	Monitored.
RCTP time allocations			

RCP transaction time and continuity criteria			
Specification: RCP 240/D	**Application: CPDLC**		**Component: ANSP**
Transaction time parameter	**ET (sec) C = 99.9%**	**TT (sec) C = 95%**	**Compliance means**
$RCTP_{ATSU}$ (C to D1) + (D6 to X)	15	10	Pre-implementation demonstration.
$RCTP_{CSP/SSP}$ (D1 to D2) + (D5 to 6)	120	100	CSP/SSP contract/service agreement. See also paragraph B.2.1.3.

RCP availability criteria			
Specification: RCP 240/D	**Application: CPDLC**		**Component: ANSP**
Availability parameter	**Efficiency**	**Safety**	**Compliance means**
Availability – service ($A_{SERVICE}$)	0.9999	0.999	Contract/service agreement terms. *Note 1.— For guidelines to aid in the development of the contract/service agreement with the CSP/SSP, see paragraph B.2.1.3, RCP 240/D allocations to CSP/SSP for RCP availability criteria.* *Note 2.— The availability criteria are allocated entirely to $A_{CSP/SSP}$ and assume that the ATS unit's system is always available.*

RCP integrity criteria		
Specification: RCP 240/D	**Application: CPDLC**	**Component: ANSP**
Integrity parameter	**Integrity value**	**Compliance means**
Integrity (I)	Malfunction = 10^{-5} per flight hour	Analysis, safety requirements, development assurance level commensurate with integrity level, (compliance shown prior to operational implementation). See also RCP related safety requirement SR-26 for the ANSP. CSP/SSP contract/service agreement. See also RCP integrity criteria for CSP/SSP, paragraph B.2.1.3.

RCP monitoring and alerting criteria		
Specification: RCP 240/D	**Application: CPDLC**	**Component: ANSP**
Ref:	**Criteria**	**Compliance means**
MA-1a	The ground system shall be capable of detecting ground system failures and configuration changes that would cause the communication service to no longer meet the requirements for the intended function. *Note.— If changes are made to the system capacity limits, as specified by the airspace requirements, and the changes cause the system to perform below the RCP specification, this would be considered a change in system configuration.*	System design, implementation. CSP/SSP contract/service agreement. See also paragraph B.2.1.3, RCP availability criteria.
MA-1b	When the communication service no longer meets the requirements for the intended function, the ground system shall provide indication to the controller.	System design, implementation. CSP/SSP contract/service agreement. See also paragraph B.2.1.3, RCP availability criteria.
MA-2	When the controller receives an indication that the communication service no longer meets the requirements for the intended function (e.g. reduced longitudinal separation), the controller shall take action to resolve the situation (e.g. apply an alternative form of separation).	System design, procedures, implementation

RCP related safety requirements		
Specification: RCP 240/D	**Application: CPDLC**	**Component: ANSP**
Ref	**Related RCP parameter**	**Safety requirement**
SR-1a (ANSP)	A	The ATS unit shall display the indication provided by the aircraft system when a data link service request initiated by the ground system or the controller is rejected at the application layer.
SR-1b (ANSP)	A	The ATS unit shall provide to the aircraft system an indication when it rejects a data link service request initiated by the flight crew at the application layer.
SR-2 (ANSP)	A, C	The ATS unit shall indicate to the controller a detected loss of data link service.
SR-3 (ANSP)	A	Data link service shall be established in sufficient time to be available for operational use.
SR-4 (ANSP)	A, C	ATS unit shall be notified of planned outage of data link service sufficiently ahead of time.
SR-5 (ANSP)	A, C	The ATS unit shall indicate to the controller when a message cannot be successfully transmitted.

RCP related safety requirements		
Specification: RCP 240/D	**Application: CPDLC**	**Component: ANSP**
Ref	**Related RCP parameter**	**Safety requirement**
SR-6 (ANSP)	C, I	The ATS unit end system shall provide unambiguous and unique identification of the origin and destination with each message it transmits.
SR-7 (ANSP)	C, I	The ATS unit shall indicate in each response to which messages it refers.
SR-8 (ANSP)	I	The ATS unit shall send the route clearance information with the route clearance via data link.
SR-9 (ANSP)	C, I	The ATS unit end system shall time stamp to within one second UTC each message when it is released for onward transmission.
SR-11 (ANSP)	C, I	Any processing performed by ATS unit (data entry/encoding/transmitting/ decoding/displaying) shall not affect the intent of the message.
SR-12 (ANSP)	C, I	The ATS unit end system shall reject messages not addressed to itself.
SR-13 (ANSP)	C, I	The ATS unit shall transmit messages to the designated aircraft system.
SR-14 (ANSP)	A, C, I	The ATS unit system shall indicate to the controller when a required response for a message sent by the ATS unit is not received within the required time (ET_{RCMP}).
SR-15 (ANSP)	C, I	When the ATS unit receives a message whose time stamp exceeds ET_{RCMP}, the ATS unit shall provide appropriate indication.
SR-16 (ANSP)	C, I	The ATS unit shall prevent the release of clearance without controller action.
SR-17 (ANSP)	C, I	The ATS unit shall prohibit operational processing by controller of corrupted messages.
SR-18 (ANSP)	C, I	The ATS unit shall be able to determine the message initiator.
SR-19 (ANSP)	C, I	The ATS unit shall prohibit to the controller operational processing of messages not addressed to the ATS unit.
SR-20 (ANSP)	C, I	ATS unit shall only establish and maintain data link services when the aircraft identifiers in data link initiation correlates with the ATS unit's corresponding aircraft identifiers in the current flight plan.
SR-21 (ANSP)	C, I	The aircraft identifiers used for data link initiation correlation by the ATS unit shall be unique and unambiguous (e.g. the aircraft identification and either the registration marking or the aircraft address).
SR-23 (ANSP)	C, I	An ATS unit system shall not permit data link services when there are non-compatible version numbers.

RCP related safety requirements		
Specification: RCP 240/D	**Application: CPDLC**	**Component: ANSP**
Ref	**Related RCP parameter**	**Safety requirement**
SR-24 (ANSP)	C, I	The ATS unit shall respond to messages in their entirety.
SR-25 (ANSP)	I	The ATS unit end system shall be capable of detecting errors that would result in misdelivery introduced by the communication service.
SR-26 (ANSP)	I	The ATS unit end system shall be capable of detecting errors that would result in corruption introduced by the communication service.

B.2.1.3 Communication/satellite service provider (CSP/SSP)

Note.— The RCP allocations for the CSP/SSP are intended to aid the ANSP and the aircraft operator in the development of contracts and service agreements.

RCP transaction time and continuity criteria			
Specification: RCP 240/D	**Application: CPDLC**		**Component: CSP/SSP**
Transaction time parameter	**ET (sec) C = 99.9%**	**TT (sec) C = 95%**	**Compliance means**
RCTP time allocations			
$RCTP_{CSP/SSP}$ (D1 to D2) + (D5 to D6)	120	100	Contract/service agreement terms. Pre-implementation demonstration.

RCP availability criteria			
Specification: RCP 240/D	**Application: CPDLC**		**Component: CSP/SSP**
Availability parameter	**Efficiency**	**Safety**	**Compliance means**
Availability – CSP/SSP ($A_{CSP/SSP}$)	0.9999	0.999	Contract/service agreement terms
Unplanned outage duration limit (minutes)	10	10	Contract/service agreement terms
Maximum number of unplanned outages	4	48	Contract/service agreement terms
Maximum accumulated unplanned outage time (minutes/year)	52	520	Contract/service agreement terms
Unplanned outage notification delay (minutes)	5	5	Contract/service agreement terms
Note.— RTCA DO-306/EUROCAE ED-122 specifies a requirement to indicate loss of the service. Unplanned outage notification delay is an additional time value associated with the requirement to indicate the loss to the ANSP per the RCP related safety requirement SR-4 for the ANSP.			

RCP integrity criteria		
Specification: RCP 240/D	**Application: CPDLC**	**Component: CSP/SSP**
Integrity parameter	**Integrity value**	**Compliance means**
Integrity (I)	Not specified	Contract/service agreement terms. Per RCP related safety requirements SR-26 for the ANSP and SR-26 for the aircraft system, the end system is required include provisions, consistent with the overall RCP integrity criteria, to mitigate the effects of errors introduced by the network. These provisions require the network to pass protected information (or data) to the end system without manipulating the protected information (or data) it passes. *Note.— In formulating contract terms with the CSP/SSP, the ANSP and/or operator may specify an integrity value and other related criteria, as appropriate, for the network, including subnetworks, that will ensure acceptable data integrity, consistent with the assumptions used to define the end system provisions (e.g. CRC or Fletcher's checksum).*

B.2.1.4 Aircraft system

RCP transaction time and continuity criteria			
Specification: RCP 240/D	**Application: CPDLC**		**Component: Aircraft system**
Transaction time parameter	**ET (sec) C = 99.9%**	**TT (sec) C = 95%**	**Compliance means**
RCMP time allocations			
Responder (PORT) (D3 to D4)	60	60	Human-machine interface capability, pre-implementation demonstration
RCTP time allocations			
$RCTP_{AIR}$ (D2 to D3) + (D4 to D5)	15	10	Pre-implementation demonstration

RCP availability criteria			
Specification: RCP 240/D	**Application: CPDLC**		**Component: Aircraft system**
Availability parameter	**Efficiency**	**Safety**	**Compliance means**
Availability – aircraft (A_{AIR})	N/A	0.999	Analysis, architecture, design, pre-implementation demonstration

RCP integrity criteria		
Specification: RCP 240/D	**Application: CPDLC**	**Component: Aircraft system**
Integrity parameter	**Integrity value**	**Compliance means**
Integrity (I)	Malfunction = 10^{-5} per flight hour	Analysis, safety requirements, development assurance level (e.g. Level C software) commensurate with integrity level, pre-implementation demonstration. See also RCP related safety requirement SR-26 for the aircraft system.

RCP monitoring and alerting criteria		
Specification: RCP 240/D	**Application: CPDLC**	**Component: Aircraft system**
Ref:	**Criteria**	**Compliance means**
MA-1a	The aircraft system shall be capable of detecting aircraft system failures or loss of air/ground communication that would cause the aircraft communication capability to no longer meet the requirements for the intended function.	System design, implementation
MA-1b	When the aircraft communication capability no longer meets the requirements for the intended function, the aircraft system shall provide indication to the flight crew.	System design, implementation

RCP related safety requirements		
Specification: RCP 240/D	**Application: CPDLC**	**Component: Aircraft system**
Ref	**Related RCP parameter**	**Safety requirement**
SR-1a (Air)	A	The aircraft system shall provide to the ATS unit an indication when it rejects a data link service request initiated by the ground system or the controller at the application layer.
SR-1b (Air)	A	The aircraft system shall display the indication provided by the ATS unit when a data link service request initiated by the flight crew is rejected at the application layer.
SR-2 (Air)	A, C	The aircraft system shall indicate to the flight crew a detected loss of data link service.

RCP related safety requirements		
Specification: RCP 240/D	**Application: CPDLC**	**Component: Aircraft system**
Ref	**Related RCP parameter**	**Safety requirement**
SR-5 (Air)	A, C	The aircraft system shall indicate to the flight crew when a message cannot be successfully transmitted.
SR-6 (Air)	C, I	The aircraft end system shall provide unambiguous and unique identification of the origin and destination with each message it transmits.
SR-7 (Air)	C, I	The aircraft system shall indicate in each response to which messages it refers.
SR-8 (Air)	I	The aircraft shall execute the route clearance per the route clearance received from the ATS unit via data link.
SR-9 (Air)	C, I	The aircraft end system shall time stamp to within one second UTC each message when it is released for onward transmission.
SR-10 (Air)	C, I	The aircraft end system shall include in each ADS-C report the time at position to within one second of the UTC time the aircraft was actually at the position provided in the report.
SR-11 (Air)	C, I	Any processing performed by aircraft system (data entry/encoding/ transmitting/decoding/displaying) shall not affect the intent of the message
SR-12 (Air)	C, I	The aircraft end system shall reject messages not addressed to itself.
SR-13 (Air)	C, I	The aircraft system shall transmit messages to the designated ATS unit.
SR-15 (Air)	C, I	When the aircraft system receives a message whose time stamp exceeds ET_{RCMP}, the aircraft system shall provide appropriate indication.
SR-16 (Air)	C, I	The aircraft end system shall prevent the release of responses to clearances without flight crew action.
SR-17 (Air)	C, I	The aircraft system shall prohibit operational processing by flight crew of corrupted messages.
SR-18 (Air)	C, I	The aircraft system shall be able to determine the message initiator.
SR-19 (Air)	C, I	The aircraft system shall prohibit to the flight crew operational processing of messages not addressed to the aircraft.
SR-21 (Air)	C, I	The aircraft identifiers sent by the aircraft system and used for data link initiation correlation shall be unique and unambiguous (e.g. the aircraft identification and either the registration marking or the aircraft address).
SR-24 (Air)	C, I	The aircraft system shall respond to messages in their entirety or allow the flight crew to do it.

RCP related safety requirements		
Specification: RCP 240/D	**Application: CPDLC**	**Component: Aircraft system**
Ref	**Related RCP parameter**	**Safety requirement**
SR-25 (Air)	I	The aircraft end system shall be capable of detecting errors that would result in misdelivery introduced by the communication service.
SR-26 (Air)	I	The aircraft end system shall be capable of detecting errors that would result in corruption introduced by the communication service.
SR-27 (Air)	C, I	The aircraft and/or flight crew shall ensure the correct transfer into or out of the aircraft's FMS of route data received/sent via data link that will be used to define the active flight plan.

B.2.1.5 Aircraft operator

RCP transaction time and continuity criteria			
Specification: RCP 240/D	**Application: CPDLC**		**Component: Aircraft operator**
Transaction time parameter	**ET (sec) C = 99.9%**	**TT (sec) C = 95%**	**Compliance means**
RCMP time allocations			
Responder (PORT) (D3 to D4)	60	60	Procedures, flight crew training and qualification in accordance with safety requirements.
RCTP time allocations			
$RCTP_{AIR}$ (D2 to D3) + (D4 to D5)	15	10	Aircraft type design approval, maintenance, properly configured user-modifiable software (e.g. owner requirements table).
$RCTP_{CSP/SSP}$ (D1 to D2) + (D5 to D6)	120	100	CSP/SSP contract/service agreement. See also paragraph B.2.1.3. Pre-implementation demonstration.

RCP availability criteria			
Specification: RCP 240/D	**Application: CPDLC**		**Component: Aircraft operator**
Availability parameter	**Efficiency**	**Safety**	**Compliance means**
Availability – aircraft (A_{AIR})	N/A	0.999	Aircraft type design approval, maintenance, properly configured user-modifiable software (e.g. owner requirements table or airline policy file).
Availability – CSP/SSP ($A_{CSP/SSP}$)	0.9999	0.999	Contract/service agreement terms. *Note.— For guidelines to aid in the development of the contract/service agreement with the CSP/SSP, see paragraph B.2.1.3, RCP 240/D allocations to CSP/SSP for RCP availability criteria.*

RCP integrity criteria		
Specification: RCP 240/D	**Application: CPDLC**	**Component: Aircraft operator**
Integrity parameter	**Integrity value**	**Compliance means**
Integrity (I)	Malfunction = 10^{-5} per flight hour	Aircraft type design approval, establish procedures, training, and qualification to meet safety requirements. CSP/SSP contract/service agreement. See also RCP integrity criteria for CSP/SSP, paragraph B.2.1.3.

RCP monitoring and alerting criteria		
Specification: RCP 240/D	**Application: CPDLC**	**Component: Aircraft operator**
Ref:	**Criteria**	**Compliance means**
MA-2	When the flight crew determines that the aircraft communication capability no longer meets the requirements for the intended function, the flight crew shall advise the ATS unit concerned.	Procedures, flight crew training and qualification

RCP related safety requirements		
Specification: RCP 240/D	**Application: CPDLC**	**Component: Aircraft operator**
Ref	**Related RCP parameter**	**Safety requirement**
SR-22 (Operator)	C, I	The flight crew shall perform the initiation data link procedure again with any change of the flight identifier.
SR-24 (Operator)	C, I	The flight crew shall respond to a message in its entirety when not responded by the aircraft system.

RCP related safety requirements		
Specification: RCP 240/D	**Application: CPDLC**	**Component: Aircraft operator**
Ref	**Related RCP parameter**	**Safety requirement**
SR-27 (Operator)	C, I	The aircraft and/or flight crew shall ensure the correct transfer into or out of the aircraft's FMS of route data received/sent via data link that will be used to define the active flight plan.

B.3 RCP 400 specification

RCP Specification			
RCP specification		**RCP 400**	
Airspace specific considerations			
Interoperability	Specify interoperability criteria (e.g. FANS 1/A, SATVOICE Iridium, Inmarsat, and/or MTSAT communications)		
ATM operation	Specify ATM operation(s) (e.g. applicable separation standard), if necessary.		
Application	Specify controller-pilot ATC communication intervention capability (e.g. CPDLC, SATVOICE communications)		
RCP parameter values			
Transaction time (sec)	**Continuity (C)**	**Availability (A)**	**Integrity (I)**
ET = 400	C(ET) = 0.999	0.999	Malfunction = 10^{-5} per flight hour
TT = 350	C(TT) = 0.95		
RCP monitoring and alerting criteria			
Ref:	**Criteria**		
CMA-1	The system shall be capable of detecting failures and configuration changes that would cause the communication service to no longer meet the RCP specification for the intended function.		
CMA-2	When the communication service can no longer meet the RCP specification for the intended function, the flight crew and/or the controller shall take appropriate action.		
Notes			
Note 1.— Rationale for the criteria provided in this specification can be found in ICAO Annex 11, ICAO Doc 4444, ICAO Doc 9689, and RTCA DO-306/EUROCAE ED-122.			
Note 2.— The values for transaction times are to be applied to transactions that are representative of communication capability for the controller to intervene with a specific operator, aircraft type, and aircraft identification.			
Note 3.— If changes are made to the system capacity limits, as specified by the airspace requirements, and the changes cause the system to perform below the RCP specification, this would be considered a change in system configuration.			

B.3.1 RCP 400/D allocations

B.3.1.1 General

B.3.1.1.1 The RCP 400/D allocations are applicable to the controller intervention capability via CPDLC. Figure B-2 provides the RCP 400/D allocations associated with transaction time and continuity. The time it takes for the controller to issue the instruction and receive the response is shown by analysis. Actual communication performance (ACP) is monitored from C to X. The remaining allocations support initial compliance and problem investigation when ACP does not meet the specified criteria.

RCP 400 specification (communication transaction times and RCP continuity)										
RCP	400									RCP
95%	350									95%
	RCP 400/D allocations – CPDLC example									
ATM	Controller issues ATC instruction	Monitored operational performance							Controller receives response	ATM
99.9%	$P_{C/ATSU}$ (30)	370							$P_{C/ATSU}$ (30)	ET
95%	$P_{C/ATSU}$ (30)	320							$P_{C/ATSU}$ (30)	TT
RCMP		RCTP			RCP PORT	RCTP				RCMP
99.9%		P_{RCTP}(310)			60	P_{RCTP}(310)				99.9%
95%		P_{RCTP}(260)			60	P_{RCTP}(260)				95%
	A	C	D1	D2	D3	D4	D5	D6	X	Z
RCTP		ATSU system	Network	Aircraft system		Aircraft system	Network	ATSU system		RCTP
99.9%		P_{ATSU}(15)	P_{NET}(280)	P_{AIR}(15)		P_{AIR}(15)	P_{NET}(280)	P_{ATSU}(15)		99.9%
95%		P_{ATSU} (10)	P_{NET} (240)	P_{AIR} (10)		P_{AIR} (10)	P_{NET} (240)	P_{ATSU}(10)		95%

Note.— $P_{[SUBSCRIPT]}$([value]) means part of the specified [value], and that the combination of all the allocations in the row, denoted by, $P_{[SUBSCRIPT]}$, equals the [value] specified.

Figure B-2. RCP 400/D allocations – communication transaction times and continuity

B.3.1.1.2 The RCP 400/D allocations are shared by the ANSP, the CSP/SSP, the aircraft system and the aircraft operator. The descriptions and assignments for these allocations, as shown in Figure B-2, are the same as the descriptions and assignments for the RCP 240/D allocations provided in Table B-1.

B.3.1.2 Air navigation service provider (ANSP)

RCP transaction time and continuity criteria			
Specification: RCP 400/D	**Application: CPDLC**		**Component: ANSP**
Transaction time parameter	**ET (sec) C = 99.9%**	**TT (sec) C = 95%**	**Compliance means**
Transaction time value (A to Z)	400	350	Analysis, monitored.
RCP time allocations			
Initiator (controller/ATSU system) (A to C) + (X to Z)	30	30	Analysis, simulations, safety and human factors assessments.
RCMP (C to X)	370	320	Monitored.
RCMP time allocations			
RCTP (C to D3) + (D4 to X)	310	260	Monitored.
RCTP time allocations			
$RCTP_{ATSU}$ (C to D1) + (D6 to X)	15	10	Pre-implementation demonstration.
$RCTP_{CSP/SSP}$ (D1 to D2) + (D5 to D6)	280	240	CSP/SSP contract/service agreement. See also paragraph B.3.1.3.

RCP availability criteria			
Specification: RCP 400/D	**Application: CPDLC**		**Component: ANSP**
Availability parameter	**Efficiency**	**Safety**	**Compliance means**
Availability – service ($A_{SERVICE}$)	N/A	0.999	Contract/service agreement terms. *Note 1.— For guidelines to aid in the development of the contract/service agreement with the CSP/SSP, see paragraph B.3.1.3, RCP 400/D allocations to CSP/SSP for RCP availability criteria.* *Note 2. — The availability criteria are allocated entirely to $A_{CSP/SSP}$ and assume that the ATS unit's system is always available.*

RCP integrity criteria		
Specification: RCP 400/D	**Application: CPDLC**	**Component: ANSP**
Integrity parameter	**Integrity value**	**Compliance means**
Integrity (I)	*Note.— RCP integrity criteria related to RCP 400/D are the same as those related to RCP 240/D. See paragraph B.2.1.2.*	

RCP monitoring and alerting criteria		
Specification: RCP 400/D	**Application: CPDLC**	**Component: ANSP**
Ref:	**Criteria**	**Compliance means**
All	*Note.— RCP monitoring and alerting criteria related to RCP 400/D are the same as those related to RCP 240/D. See paragraph B.2.1.2.*	

RCP related safety requirements		
Specification: RCP 400/D	**Application: CPDLC**	**Component: ANSP**
Ref	**Related RCP parameter**	**Safety requirement**
All	A, C, I	*Note.— Safety requirements related to RCP 400/D are the same as those related to RCP 240/D. See paragraph B.2.1.2.*

B.3.1.3 Communication/satellite service provider (CSP/SSP)

Note.— The RCP allocations for the CSP/SSP are intended to aid the ANSP and the aircraft operator in the development of contracts and service agreements.

RCP transaction time and continuity criteria			
Specification: RCP 400/D	**Application: CPDLC**		**Component: CSP/SSP**
Transaction time parameter	**ET (sec) C = 99.9%**	**TT (sec) C = 95%**	**Compliance means**
RCTP time allocations			
$RCTP_{CSP/SSP}$ (D1 to D2) + (D5 to D6)	280	240	Contract/service agreement terms

RCP availability criteria				
Specification: RCP 400/D	**Application: CPDLC**		**Component: CSP/SSP**	
Availability parameter	**Efficiency**	**Safety**	**Compliance means**	
Availability – CSP/SSP ($A_{CSP/SSP}$)	N/A	0.999	Contract/service agreement terms	
Unplanned outage duration limit (minutes)	N/A	20	Contract/service agreement terms	
Maximum number of unplanned outages	N/A	24	Contract/service agreement terms	
Maximum accumulated unplanned outage time (minutes/year)	N/A	520	Contract/service agreement terms	
Unplanned outage notification delay (minutes)	N/A	10	Contract/service agreement terms	

RCP integrity criteria		
Specification: RCP 400/D	**Application: CPDLC**	**Component: CSP/SSP**
Integrity parameter	**Integrity value**	**Compliance means**
Integrity (I)	*Note.— RCP integrity criteria related to RCP 400/D are the same as those related to RCP 240/D. See paragraph B.2.1.3.*	

B.3.1.4 Aircraft system

RCP transaction time and continuity criteria			
Specification: RCP 400/D	**Application: CPDLC**		**Component: Aircraft system**
Transaction time parameter	**ET (sec) C = 99.9%**	**TT (sec) C = 95%**	**Compliance means**
RCMP time allocations			
Responder (PORT) (D3 to D4)	60	60	Human-machine interface capability, pre-implementation demonstration
RCTP time allocations			
$RCTP_{AIR}$ (D2 to D3) + (D4 to D5)	15	10	Pre-implementation demonstration

RCP availability criteria			
Specification: RCP 400/D	**Application: CPDLC**		**Component: Aircraft system**
Availability parameter	**Efficiency**	**Safety**	**Compliance means**
Availability – aircraft (A_{AIR})	N/A	0.999	Analysis, architecture, design, pre-implementation demonstration

RCP integrity criteria		
Specification: RCP 400/D	**Application: CPDLC**	**Component: Aircraft system**
Integrity parameter	**Integrity value**	**Compliance means**
Integrity (I)	*Note.— RCP integrity criteria related to RCP 400/D are the same as those related to RCP 240/D. See paragraph B.2.1.4.*	

RCP monitoring and alerting criteria		
Specification: RCP 400/D	**Application: CPDLC**	**Component: Aircraft system**
Ref:	**Criteria**	**Compliance means**
All	*Note.— RCP monitoring and alerting criteria related to RCP allocations 400/D are the same as those related to RCP 240/D. See paragraph B.2.1.4.*	

RCP related safety requirements		
Specification: RCP 400/D	**Application: CPDLC**	**Component: Aircraft system**
Ref	**Related RCP parameter**	**Safety requirement**
All	A, C, I	*Note.— Safety requirements related to RCP 400/D are the same as those related to RCP 240/D. See paragraph B.2.1.4.*

B.3.1.5 Aircraft operator

RCP transaction time and continuity criteria			
Specification: RCP 400/D	**Application: CPDLC**		**Component: Aircraft operator**
Transaction time parameter	**ET (sec) C = 99.9%**	**TT (sec) C = 95%**	**Compliance means**
RCMP time allocations			
Responder (PORT) (D3 to D4)	60	60	Procedural capability, flight crew training and qualification in accordance with safety requirements.
RCTP time allocations			
$RCTP_{AIR}$ (D2 to D3) + (D4 to D5)	15	10	Aircraft type design approval, maintenance, properly configured user-modifiable software (e.g. owner requirements table).
$RCTP_{CSP/SSP}$ (D1 to D2) + (D5 to D6)	280	240	CSP/SSP contract/service agreement. See also paragraph B.3.1.3.

RCP availability criteria			
Specification: RCP 400/D	**Application: CPDLC**		**Component: Aircraft operator**
Availability parameter	**Efficiency**	**Safety**	**Compliance means**
Availability – aircraft (A_{AIR})	N/A	0.999	Aircraft type design approval, maintenance, properly configured user-modifiable software (e.g. owner requirements table)
Availability – CSP/SSP ($A_{CSP/SSP}$)	N/A	0.999	Contract/service agreement terms. *Note.— For guidelines to aid in the development of the contract/service agreement with the CSP/SSP, see paragraph B.3.1.3, RCP 400/D allocations to CSP/SSP for RCP availability criteria.*

RCP integrity criteria			
Specification: RCP 400/D		**Application: CPDLC**	**Component: Aircraft operator**
Integrity parameter	**Integrity value**		**Compliance means**
Integrity (I)	*Note.— RCP integrity criteria related to RCP 400/D are the same as those related to RCP 240/D. See paragraph B.2.1.5.*		

RCP monitoring and alerting criteria			
Specification: RCP 400/D		**Application: CPDLC**	**Component: Aircraft operator**
Ref:	**Criteria**		**Compliance means**
All	*Note.— RCP monitoring and alerting criteria related to RCP 400/D are the same as those related to RCP 240/D. See paragraph B.2.1.5.*		

RCP related safety requirements			
Specification: RCP 400/D		**Application: CPDLC**	**Component: Aircraft operator**
Ref	**Related RCP Parameter**	**Safety requirement**	
All	C, I	*Note.— Safety requirements related to RCP 400/D are the same as those related to RCP 240/D. See paragraph B.2.1.5.*	

B.3.2 RCP 400/V_{RO} allocations

B.3.2.1 General

B.3.2.1.1 The RCP 400/V_{RO} allocations are applicable to the controller intervention capability via a radio operator using SATVOICE. Figure B-3 provides the RCP 400/V_{RO} allocations associated with transaction time and continuity. The time it takes for the controller to issue the instruction and receive the response is shown by analysis. Actual communication performance (ACP) is monitored from C to X. The remaining allocations support initial compliance and problem investigation when ACP does not meet the specified criteria.

RCP 400 specification (communication transaction times and RCP continuity)												
RCP	**400**											**RCP**
95%	350											95%
	RCP 400/V_{RO} allocations – Radio operator using SATVOICE example											
ATM	**Controller issues ATC instruction**	**Monitored operational performance**									**Controller receives response**	**ATM**
99.9%	$P_{C/ATSU}$(30)	370									$P_{C/ATSU}$ (30)	ET
95%	$P_{C/ATSU}$ (30)	320									$P_{C/ATSU}$ (30)	TT
RCMP		RCTP (ground-to-ground)			Queue/ connect performance	RCTP (ground-to-air)	Answer/call performance	RCTP (ground-to-ground)				**RCMP**
99.9%		P_{RCTP}(18)			147	30	175	P_{RCTP} (18)				ET
95%		P_{RCTP} (10)			132	25	163	P_{RCTP} (10)				TT
	A	C	S1	S2	S3	S4	S5	S6	S7	S8	X	Z
RCTP		ATSU system	Network	Aero station system		Aircraft / Aero station system		Aero station system	Network	ATSU system		**RCTP**
99.9%		P_{ATSU} (4)	P_{NET} (10)	P_{AS} (4)		30		P_{AS} (4)	P_{NET} (10)	P_{ATSU} (4)		ET
95%		P_{ATSU} (2)	P_{NET} (6)	P_{AS} (2)		25		P_{AS} (2)	P_{NET} (6)	P_{ATSU} (2)		TT

Note.— $P_{[SUBSCRIPT]}$([value]) means part of the specified [value], and that the combination of all the allocations in the row, denoted by, $P_{[SUBSCRIPT]}$, equals the [value] specified.

Figure B-3. RCP 400/V_{RO} allocations – communication transaction times and continuity

B.3.2.1.2 The RCP 400/V_{RO} allocations are shared by the ANSP, the CSP/SSP, the aircraft system and the aircraft operator. The descriptions and assignments for these allocations, as shown in Figure B-3, are provided in Table B-2.

Table B-2. RCP 400/V_{RO} allocation descriptions and assignments

RCP 400/V_{RO} Allocations	Description	ANSP	CSP/SSP	Aircraft	Operator
Controller (initiator performance)	The maximum time allocated to the controller to issue an ATC instruction and receive the response.	X			
RCMP	The maximum time against which ACP is assessed.	X	X	X	X
Queue/connect performance	The maximum time allocated to the radio operator/aeronautical station system to organize and place the call either via a manual or automated dialling sequence.	X	X		
Answer/call performance (ground-to-air)	The maximum time allocated to when the flight crew receives an indication of an incoming call to when the parties on the call have completed the communication. *Note.— The call is complete when the radio operator sends the flight crew response to the ATS unit.*	X	X	X	X
RCTP	The maximum technical time allocated to relevant parts of the ATS unit's system, aeronautical station's system, the network systems and the aircraft system, for which there is no human contribution to the communication transaction performance.	X	X	X	X
RCTP (ground-to-air) ($RCTP_{G/A}$)	The maximum portion of RCTP allocated to the ground system, network and aircraft system to set up a ground-to-air call as determined from when the last digit of the dialling sequence is finished to when the aircraft indicates an incoming call to the flight crew.		X	X	
RCTP (ground-to-ground)	The maximum portion of RCTP allocated to the ground-to-ground network.	X	X		
ATSU system ($RCTP_{ATSU}$)	The maximum portion of RCTP allocated to the ATS unit's system.	X			
Network ($RCTP_{CSP/SSP}$)	The maximum portion of RCTP allocated to the CSP/SSP.	X	X		X
Aero station system ($RCTP_{AS}$)	The maximum portion of RCTP allocated to the aeronautical station's system for ground-ground communications with an ATS unit. *Note.— $RCTP_{AS}$ includes two concurrent processes:* *a) the aircraft and aeronautical station technically disconnect the call; which is assumed. Operationally, the call is disconnected when the flight crew and radio operator complete the call; and* *b) the aeronautical station sends the response to the ATS unit via the ground-ground network; the performance is denoted by $RCTP_{AS}$.*	X	X		

B.3.2.1.3 Measurements for assessing ACP/continuity include calls that are disconnected or dropped for any reason, such as aircraft manoeuvres or switching satellites, or busy conditions. They would also include loss of service while on the call if the service outage is less than the maximum unplanned outage duration limit. If the outage is greater than the maximum unplanned outage duration limit, these calls would be excluded from ACP/continuity measurements, because they would be considered as part of SATVOICE service availability.

B.3.2.1.4 SATVOICE service availability includes failures prohibiting the call to be initiated or congestion (much like the analogy of a terrestrial mobile phone network). Measurements for assessing SATVOICE service availability would not include any calls associated with the measurements for ACP/continuity.

B.3.2.1.5 SATVOICE integrity includes an assessment, such as a diagnostic rhyme test (DRT), of the intelligibility of the voice transaction and the extent to which the parties could potentially misunderstand the communication.

B.3.2.1.6 Table B-3 provides safety requirements related to the RCP parameters for the RCP 400/V_{RO} specification. The allocations for these requirements to ANSP, CSP/SSP, aircraft SATVOICE system and the aircraft operator are provided in the relevant sections of the specification.

Table B-3. Safety requirements related to RCP 400/V_{RO} parameters

Reference	Related RCP parameter	RCP safety requirements
SR-1	A, C	The controller shall be capable of contacting the aircraft.
SR-2	A, C	The flight crew shall be capable of contacting the radio operator and/or controller.
SR-3	I	The ANSP and aircraft operator shall ensure adequate means to mitigate against voice communication errors leading to incorrect execution of clearances.
SR-4	A, C, I	The SATVOICE system shall be capable of detecting loss of service, equipment failures and/or logon failures and provide indication to the controller/radio operator or flight crew of system status.
SR-5	C, ET	The ATS unit system shall provide an indication to the controller when the transaction time for response of clearance issued via radio operator exceeds the specified time (ET_{RCMP}).
SR-6	All	The ANSP and aircraft operator shall ensure means are in place to monitor for compliance to RCP specification and provide alert(s) for appropriate action.

B.3.2.2 Air navigation service provider (ANSP)

Note 1.— The ANSP includes the specification criteria allocated to the aeronautical station.

Note 2.— Automation may employ autodial capability, data bases and other features to meet performance specifications.

RCP transaction time and continuity criteria			
Specification: RCP 400/V_{RO}	**Application: SATVOICE/RO**		**Component: ANSP**
Transaction time parameter	**ET (sec) C = 99.9%**	**TT (sec) C = 95%**	**Compliance means**
Transaction time value (A to Z)	400	350	Analysis, monitored.
RCP time allocations			
Initiator (controller/ATSU system) (A to C) + (N to Z)	30	20	Analysis, simulations, safety and human factors assessments.
RCMP (C to X)	370	330	Monitored.
RCMP time allocations			
Queue/connect performance (S3 to S4)	147	132	Initially, by analysis, simulations, safety human factors assessments.
Answer/call performance (S5 to S6)	175	163	Initially, by analysis, simulations, safety human factors assessments.
RCTP time allocations			
$RCTP_{ATSU}$ (C to S1) + (S8 to X)	4	2	Pre-implementation demonstration.
RCTP (ground-to-ground) (C to S3) + (S6 to X)	18	10	Estimated, CSP/SSP contract/service agreement. See paragraph B.3.2.3.
$RCTP_{G/A}$ (S4 to S5)	30	25	Estimated, CSP/SSP contract/service agreement. See paragraph B.3.2.3.

RCP availability criteria			
Specification: RCP 400/V_{RO}	**Application: SATVOICE/RO**		**Component: ANSP**
Availability parameter	**Efficiency**	**Safety**	**Compliance means**
Availability –service ($A_{SERVICE}$)	N/A	0.999	Contract/service agreement terms *Note 1.— For guidelines to aid in the development of the contract/service agreement with the CSP/SSP, see paragraph B.3.2.3, RCP 400/V_{RO} allocations to CSP/SSP for RCP availability criteria.* *Note 2. — The availability criteria are allocated entirely to $A_{CSP/SSP}$ and assume that the ATS unit's system is always available.*

RCP integrity criteria		
Specification: RCP 400/V_{RO}	**Application: SATVOICE/RO**	**Component: ANSP**
Integrity parameter	**Integrity value**	**Compliance means**
Integrity (I)	Malfunction = 10^{-5} per flight hour	Analysis, safety requirements, development assurance level commensurate with integrity level, (compliance shown prior to operational implementation). See related safety requirements SR-3 and SR-4 for the ANSP. CSP/SSP contract/service agreement. See RCP integrity criteria for CSP/SSP, paragraph B.3.2.3.

RCP monitoring and alerting criteria		
Specification: RCP 400/V_{RO}	**Application: SATVOICE/RO**	**Component: ANSP**
Ref	**Criteria**	**Compliance means**
CMA-1 CMA-2	*Note.— RCP monitoring and alerting criteria are specified by safety requirements allocated to the ANSP for SR-6.*	Review.

RCP related safety requirements		
Specification: RCP 400/V_{RO}	**Application: SATVOICE/RO**	**Component: ANSP**
Ref	**Related RCP parameter**	**Safety requirement**
SR-1	A, C	a) The ANSP shall use the aircraft address to contact the aircraft. b) The ANSP shall use 2/HGH/Q12 priority to contact the aircraft. c) The ANSP shall ensure that access number(s) support the commercial SATVOICE services (e.g. Inmarsat, MTSAT, Iridium) it provides in its airspace.
SR-2	A, C	a) The ANSP shall provide PSTN phone numbers to SSP for short code assignment. b) The ANSP shall publish its SATVOICE number(s) (e.g. short code(s)) for its ATS units and aeronautical stations in aeronautical publications/charts.
SR-3	I	a) The ANSP shall establish procedures that use RTF conventions and provide training for the controller. b) The ANSP shall ensure the SATVOICE system at its aeronautical stations and ATS units provide a DRT score of at least 85 when measured in accordance with ANSI/ASA S3.2-2009 in a jet transport aircraft noise environment. c) The ANSP shall ensure that its CSP/SSP maintains acceptable voice call quality for contracted SATVOICE services.
SR-4	A, C, I	a) The ANSP shall indicate to the radio operator/controller of detected SATVOICE equipment failure. b) ANSP shall notify operators of service outages, degradation and restoration by NOTAM (or equivalent publication).
SR-5	C, ET	a) The ATS unit system shall indicate to the controller when a required response for a message sent by the ATS unit is not received within the required time (ET_{RCMP}).

RCP related safety requirements		
Specification: RCP 400/V_{RO}	**Application: SATVOICE/RO**	**Component: ANSP**
Ref	**Related RCP parameter**	**Safety requirement**
SR-6	All	a) The ANSP shall be capable of detecting failures and configuration changes that would cause the communication service to no longer meet the RCP specification for the intended uses. b) The ANSP shall ensure that when the communication service can no longer meet the RCP specification for the intended uses, the controller shall take appropriate action. *Note.— Compliance with the RCP specification is determined by initial approvals of system components, compliance with safety requirements, and means for the flight crew and controller to report problems and for ANSPs to conduct post-implementation monitoring, analysis and corrective actions.*

B.3.2.3 Communication/satellite service provider (CSP/SSP)

RCP transaction time and continuity criteria				
Specification: RCP 400/V_{RO}	**Application: SATVOICE/RO**		**Component: CSP/SSP**	
Transaction time parameter	**ET (sec) C = 99.9%**	**IT (sec) C = 99%**	**TT (sec) C = 95%**	**Compliance means**
RCTP time allocations	44	[Not defined]	33	Contract/service agreement terms.
$RCTP_{CSP/SSP}$ (S1 to S2) + (S7 to S8)	10	[Not defined]	6	Contract/service agreement terms.
$RCTP_{AS}$ (S2 to S3) + (S6 to S7)	4	[Not defined]	2	Contract/service agreement terms.
$RCTP_{G/A}$ (S4 to S5)	[Not defined]	30	25	Contract/service agreement terms. *Note.— Criteria are shared between aircraft system, ground system and air-ground network*

RCP availability criteria			
Specification: RCP 400/V_{RO}	**Application: SATVOICE/RO**		**Component: CSP/SSP**
Availability parameter	**Efficiency**	**Safety**	**Compliance means**
Availability – CSP/SSP ($A_{CSP/SSP}$)	N/A	0.999	Contract/service agreement terms.
Unplanned outage duration limit (minutes)	N/A	20	Contract/service agreement terms.
Maximum number of unplanned outages	N/A	24	Contract/service agreement terms.
Maximum accumulated unplanned outage time (minutes/year)	N/A	520	Contract/service agreement terms.
Unplanned outage notification delay (minutes)	N/A	10	Contract/service agreement terms.
Grade of service	N/A	1%	Contract/service agreement terms. *Note.— This value is the same as that defined in Annex 10, Volume III.*

RCP integrity criteria		
Specification: RCP 400/V_{RO}	**Application: SATVOICE/RO**	**Component: CSP/SSP**
Integrity parameter	**Integrity value**	**Compliance means**
Integrity (I)	[not defined]	Pre-implementation demonstration and contract/service agreement terms. *Note.— RCP integrity criteria are specified by safety requirements allocated to the CSP/SSP for SR-3 and SR-4.*

RCP related safety requirements		
Specification: RCP 400/V_{RO}	**Application: SATVOICE/RO**	**Component: CSP/SSP**
Ref	**Related RCP parameter**	**Safety requirement**
SR-1	A, C	a) The CSP/SSP shall ensure that the aircraft SATVOICE number is the aircraft address represented in octal code.
SR-2	A, C	a) The CSP/SSP shall assign a unique short code for each PSTN phone number. b) The CSP/SSP shall provide a means to distribute a SATVOICE number (e.g. short code, direct dial) directory to operators, ANSP and other stakeholders that subscribe to receive the directory.
SR-3	I	a) The CSP/SSP shall ensure the SATVOICE network provides a DRT score of at least 85 when measured in accordance with ANSI/ASA S3.2-2009 in a jet transport aircraft noise environment.

RCP related safety requirements		
Specification: RCP 400/V_{RO}	**Application: SATVOICE/RO**	**Component: CSP/SSP**

Ref	Related RCP parameter	Safety requirement
SR-4	A, C, I	a) The SSP shall notify its CSPs of outages, degradation and restoration. b) The CSP shall notify its subscribers (e.g. ANSPs, operators) of outages, degradation and restoration.
SR-5	C, ET	[Not applicable]
SR-6	All	a) The CSP/SSP shall provide notification to its ANSP and aircraft operator subscribers of any service impairment that would cause the SATVOICE service to no longer comply with the RCP specification.

B.3.2.4 Aircraft system

RCP transaction time and continuity criteria		
Specification: RCP 400/V_{RO}	**Application: SATVOICE/RO**	**Component: Aircraft system**

Transaction time parameter	ET (sec) C = 99.9%	IT (sec) C = 99%	TT (sec) C = 95%	Compliance means
RCMP time allocations				
Answer/call performance (S5 to S7)	175	[Not defined]	163	Human-machine interface capability, pre-implementation demonstration
RCTP time allocations				
$RCTP_{G/A}$ (S4 to S5)	[Not defined]	30	25	Pre-implementation demonstration *Note.— Criteria are shared between aircraft system, ground system and air-ground network*

RCP availability criteria		
Specification: RCP 400/V_{RO}	**Application: SATVOICE/RO**	**Component: Aircraft system**

Availability parameter	Efficiency	Safety	Compliance means
Availability – aircraft (A_{AIR})	N/A	0.999	Analysis, architecture, design, pre-implementation demonstration

RCP integrity criteria		
Specification: RCP 400/V_{RO}	**Application: SATVOICE/RO**	**Component: Aircraft system**
Integrity parameter	**Integrity value**	**Compliance means**
Integrity (I)	Malfunction = 10^{-3} per flight hour	Design approval of aircraft system. Analysis, safety requirements, development assurance level (e.g. Level D software), commensurate with integrity level, pre-implementation demonstration. *Note.— RCP integrity criteria are specified by safety requirements allocated to the aircraft system for SR-3 and SR-4.*

RCP monitoring and alerting criteria		
Specification: RCP 400/V_{RO}	**Application: SATVOICE/RO**	**Component: Aircraft system**
Ref	**Criteria**	**Compliance means**
CMA-1 CMA-2	*Note.— RCP monitoring and alerting criteria are specified by safety requirements allocated to the aircraft system for SR-6.*	

RCP related safety requirements		
Specification: RCP 400/V_{RO}	**Application: SATVOICE/RO**	**Component: Aircraft system**
Ref	**Related RCP parameter**	**Safety requirement**
SR-1	A, C	a) The aircraft SATVOICE system shall be properly maintained to receive calls with 2/HGH/Q12 priority level and using the aircraft address represented in octal code.
SR-2	A, C	a) The aircraft SATVOICE system shall be operable prior to entering airspace where SATVOICE is used to meet LRCS requirements.
SR-3	I	a) The aircraft SATVOICE system shall provide a DRT score of at least 85 when measured in accordance with ANSI/ASA S3.2-2009 in a jet transport aircraft noise environment.
SR-4	A, C, I	a) The aircraft SATVOICE system shall detect logon failure and equipment failure and provide the appropriate indication to the flight crew.
SR-5	C, ET	[Not applicable]
SR-6	All	a) The aircraft SATVOICE system shall provide indication(s) for the flight crew to determine when the aircraft SATVOICE system or logon failures would cause the system to no longer comply with the RCP specification.

B.3.2.5 Aircraft operator

RCP transaction time and continuity criteria				
Specification: RCP 400/V_{RO}	**Application: SATVOICE/RO**		**Component: Aircraft operator**	
Transaction time parameter	**ET (sec) C = 99.9%**	**IT (sec) C = 99%**	**TT (sec) C = 95%**	**Compliance means**
RCMP time allocations				
Answer/call performance (S5 to S6)	175	[Not defined]	163	Procedural capability, flight crew training and qualification in accordance with safety requirements.
RCTP time allocations				
$RCTP_{G/A}$ (S4 to S5)	[Not defined]	30	25	CSP/SSP contract/service agreement, aircraft type design approval and maintenance.

RCP availability criteria			
Specification: RCP 400/V_{RO}	**Application: SATVOICE/RO**		**Component: Aircraft operator**
Availability parameter	**Efficiency**	**Safety**	**Compliance means**
Availability – aircraft (A_{AIR})	N/A	0.999	Aircraft type design approval, maintenance and properly configured user-modifiable software (e.g. ORT).
Availability – CSP/SSP ($A_{CSP/SSP}$)	N/A	0.999	Contract/service agreement terms. *Note.— For guidelines to aid in the development of the contract/service agreement with the CSP/SSP, see paragraph B.3.2.3, RCP 400/D allocations to CSP/SSP for RCP availability criteria.*

RCP integrity criteria		
Specification: RCP 400/V_{RO}	**Application: SATVOICE/RO**	**Component: Aircraft operator**
Integrity parameter	**Integrity value**	**Compliance means**
Integrity (I)	Malfunction = 10^{-5} per flight hour	Review of procedures, training programmes, and qualification to meet safety requirements. Design approval of aircraft SATVOICE system. CSP/SSP contract/service agreement. *Note.— RCP integrity criteria are specified by safety requirements allocated to the aircraft operator for SR-3 and SR-4. See also RSP integrity criteria for the aircraft system, paragraph C.3.2.4, and the CSP/SSP, paragraph C.3.2.3.*

RCP monitoring and alerting criteria		
Specification: RCP 400/V_{RO}	**Application: SATVOICE/RO**	**Component: Aircraft operator**
Ref	**Criteria**	**Compliance means**
CMA-1 CMA-2	*Note.— RCP monitoring and alerting criteria are specified by safety requirements allocated to the aircraft system for SR-6.*	

RCP related safety requirements		
Specification: RCP 400/V_{RO}	**Application: SATVOICE/RO**	**Component: Aircraft operator**
Ref	**Related RCP parameter**	**Safety requirement**
SR-1	A, C	a) The aircraft operator shall file appropriate SATVOICE capability, the aircraft address and aircraft registration in the flight plan. b) The operator shall ensure that the phone number for the aircraft is activated by the CSP/SSP prior to return to service.
SR-2	A, C	a) The aircraft operator shall ensure that flight crew has means to contact the appropriate ATS unit or aeronautical station for route of flight, where SATVOICE services are available. b) The aircraft operator shall ensure the flight crew uses 2/HGH/Q12 priority.
SR-3	I	a) The aircraft operator shall establish procedures that use RTF conventions and provide training for the flight crew. b) The aircraft operator shall ensure that its CSP/SSP maintains acceptable voice call quality for contracted SATVOICE services.
SR-4	A, C, I	a) The aircraft operator shall notify flight crew of service outages, degradation, or restoration.
SR-5	C, ET	[Not applicable]

RCP related safety requirements		
Specification: RCP 400/V_{RO}	Application: SATVOICE/RO	Component: Aircraft operator

Ref	Related RCP parameter	Safety requirement
SR-6	All	a) The aircraft operator shall ensure that when the aircraft SATVOICE system fails such that it can no longer meet the RCP specification for the intended uses, the flight crew shall take appropriate action.

B.3.3 RCP 400/V_{ATC} allocations

(reserved)

APPENDIX C RSP specifications

C.1 General

C.1.1 The RSP specifications are derived mainly from a safety assessment. However, in cases where it has been determined to be beneficial, the RSP specification may include criteria to support operational efficiency and orderly flow of air traffic. In these cases, the RSP specification indicates the distinction between safety and efficiency.

C.1.2 The RSP specifications provide a means of compliance, in general. Additional guidance related to service provision, aircraft approval and operational approval can be found in Chapter 5. Guidance and requirements on post-implementation monitoring can be found at Appendix D for CPDLC and ADS-C and Appendix E for SATVOICE.

C.1.3 The RSP specifications include allocations for CPDLC and SATVOICE via a radio operator. The /D designator is used to indicate the RSP allocations associated with ADS-C. The $/V_{RO}$ designator is used to indicate the RSP allocations associated with voice position reporting via a radio operator and $/V_{ATC}$ designator is reserved for RSP allocations associated with position reporting direct to the controller.

C.1.4 RCP allocations are provided for SATVOICE when it is intended to be used to provide an intervention and/or surveillance capability in support of an ATS service that is subject to a specified RSP. The RSP allocations for SATVOICE communications are based on the operational performance criteria for surveillance capability. As it is difficult to compare the actual performance of different technologies, the RSP 400 operational performance specification provides a common basis for assessing SATVOICE, ADS-C or any new technology that may emerge.

C.2 RSP 180 specification

<table>
<tr><th colspan="7">RSP specification</th></tr>
<tr><th colspan="3">RSP specification</th><th colspan="4">RSP 180</th></tr>
<tr><th colspan="7">Airspace specific considerations</th></tr>
<tr><td>Interoperability</td><td colspan="6">Specify interoperability criteria (e.g. FANS 1/A)</td></tr>
<tr><td>ATM operation</td><td colspan="6">Specify ATM operation(s) (e.g. applicable separation standard)</td></tr>
<tr><td>Application</td><td colspan="6">Specify the required surveillance capability. For ADS-C, specify the types of contracts required to support the ATM operation (e.g. ADS-C periodic interval, waypoint change event, lateral deviation event).</td></tr>
<tr><th colspan="7">RSP parameter values</th></tr>
<tr><td>Transit time (sec)</td><td>Continuity I</td><td></td><td>Availability (A)</td><td colspan="3">Integrity (I)</td></tr>
<tr><td>OT = 180</td><td>C(OT) = 0.999</td><td rowspan="3"></td><td rowspan="3">0.999
0.9999 (efficiency)
See Note 3.</td><td colspan="2">Navigation FOM</td><td>See Note 4.</td></tr>
<tr><td rowspan="2">DT = 90</td><td rowspan="2">C(DT) = 0.95</td><td colspan="2">Time at position accuracy</td><td>+/- 1 sec (UTC)</td></tr>
<tr><td colspan="2">Data integrity</td><td>Malfunction = 10^{-5} per flight hour</td></tr>
<tr><th colspan="7">RSP monitoring and alerting criteria</th></tr>
<tr><th>Ref</th><th colspan="6">Criteria</th></tr>
<tr><td>MA-1</td><td colspan="6">The system shall be capable of detecting failures and configuration changes that would cause ADS-C to no longer meet the surveillance parameter values for the intended function.</td></tr>
<tr><td>MA-2</td><td colspan="6">When ADS-C can no longer meet the surveillance parameter values for the intended function, the flight crew and/or the controller shall take appropriate action.</td></tr>
<tr><th colspan="7">Notes</th></tr>
<tr><td colspan="7">Note 1.— Rationale for the criteria provided in this specification can be found in ICAO Annex 11, ICAO Doc 4444, ICAO Doc 9689, and RTCA DO-306/EUROCAE ED-122.
Note 2.— If changes are made to the system capacity limits, as specified by the airspace requirements, and the changes cause the system to perform below the surveillance parameter values, this would be considered a change in system configuration.
Note 3.— RTCA DO-306/EUROCAE ED-122 specifies an availability value based on safety assessment of the operational effects of the loss of the service. The availability value herein is more stringent, based on an additional need to maintain orderly and efficient operations.
Note 4.— The navigation figure of merit (FOM) is specified based on the navigation criteria associated with this specification. For example, if RNP 4 is prescribed, then for ADS-C surveillance service, the FOM level would need to be 4 or higher. In all cases, when the navigation capability no longer meets the criteria specified for the operation, the flight crew is responsible for reporting the non-compliance to ATC in accordance with ICAO procedures.</td></tr>
</table>

C.2.1 RSP 180/D allocations

C.2.1.1 General

C.2.1.1.1 The RSP 180/D allocations are applicable to the delivery of surveillance data via ADS-C. Figure C-1 provides the RSP 180/D allocations associated with surveillance data delivery time and continuity. Actual surveillance performance (ASP) is monitored from A to Z. The remaining allocations support initial compliance and problem investigation when ASP does not meet the specified criteria.

RSP 180 specification (surveillance data delivery times and RSP continuity)				
RSP	**180**			**RSP**
95%	90			95%
	RSP 180/D allocations – CPDLC or ADS-C example			
Time +/- 1 second at position (RNP at UTC)	**Monitored operational performance**			**ATM (ATSU system updated)**
99.9%	180			OT
95%	90			DT
	A	D1	D2	Z
RSMP/RSTP	Aircraft system	Network	ATSU system	**RSMP/RSTP**
99.9%	5	170	5	99.9%
95%	3	84	3	95%

Figure C-1. RSP 180/D allocations – data delivery times and continuity

C.2.1.1.2 The RSP 180/D allocations are shared by the ANSP, the CSP/SSP, the aircraft system and the aircraft operator. The descriptions and assignments for these allocations, as shown in Figure C-1, are provided in Table C-1.

Table C- 1. RSP 180/D allocation descriptions and assignments

RSP 180/D Allocations	Description	ANSP	CSP/SSP	Aircraft	Operator
RSMP	The maximum time against which ASP is assessed.	X	X	X	X
RSTP	The maximum technical time allocated to relevant parts of the ATS unit's system, aeronautical station's system, the network systems and the aircraft system, for which there is no human contribution to the surveillance data delivery performance.				
ATSU system ($RSTP_{ATSU}$)	The maximum portion of RSTP allocated to the ATS unit's system.	X			
Network ($RSTP_{CSP/SSP}$)	The maximum portion of RSTP allocated to the CSP/SSP.	X	X		X
Aircraft system ($RSTP_{AIR}$)	The maximum portion of RSTP allocated to the aircraft system.			X	

C.2.1.2 Air navigation service provider (ANSP)

RSP data delivery time and continuity criteria			
Specification: RSP 180/D	**Application: ADS-C**		**Component: ANSP**
Data delivery time parameter	**OT (sec) C = 99.9%**	**DT (sec) C = 95%**	**Compliance means**
RSMP time allocation	180	90	Monitored.
RSTP time allocations			
$RSTP_{ATSU}$ (D2 to Z)	5	3	Pre-implementation demonstration
$RSTP_{CSP/SSP}$ (D1 to D2)	170	84	CSP/SSP contract/service agreement. See also paragraph C.2.1.3.

RSP availability criteria			
Specification: RSP 180/D	**Application: ADS-C**		**Component: ANSP**
Availability parameter	**Efficiency**	**Safety**	**Compliance means**
Availability – service ($A_{SERVICE}$)	0.9999	0.999	Contract/service agreement terms. *Note 1.— For guidelines to aid in the development of the contract/service agreement with the CSP/SSP, see paragraph C.2.1.3, RSP 180/D allocations to CSP/SSP for surveillance availability criteria.* *Note 2.— The availability criteria are allocated entirely to $A_{CSP/SSP}$ and assume that the ATS unit's system is always available.*

RSP integrity criteria		
Specification: RSP 180/D	**Application: ADS-C**	**Component: ANSP**
Integrity parameter	**Integrity value**	**Compliance means**
Integrity (I)	Malfunction = 10^{-5} per flight hour	Analysis, safety requirements, development assurance level commensurate with integrity level, (compliance shown prior to operational implementation). See also related safety requirement SR-26 for the ANSP. CSP/SSP contract/service agreement. See also surveillance integrity criteria for CSP/SSP, paragraph C.2.1.3.

RSP monitoring and alerting criteria		
Specification: RSP 180/D	**Application: ADS-C**	**Component: ANSP**
Ref:	**Criteria**	**Compliance means**
MA-1a	The ground system shall be capable of detecting ground system failures and configuration changes that would cause ADS-C to no longer meet the requirements for the intended function. *Note.— If changes are made to the system capacity limits, as specified by the airspace requirements, and the changes cause the system to perform below the RSP specification, this would be considered a change in system configuration.*	System design, implementation. CSP/SSP contract/service agreement. See also paragraph C.2.1.3, surveillance availability criteria.
MA-1b	When ADS-C no longer meets the requirements for the intended function, the ground system shall provide indication to the controller.	System design, implementation. CSP/SSP contract/service agreement. See also paragraph C.2.1.3, surveillance availability criteria.

RSP monitoring and alerting criteria		
Specification: RSP 180/D	**Application: ADS-C**	**Component: ANSP**
Ref:	**Criteria**	**Compliance means**
MA-2	When the controller receives an indication that ADS-C no longer meets the requirements for the intended function (e.g. reduced longitudinal separation), the controller shall take action to resolve the situation, (e.g. apply an alternative form of separation).	System design, procedures, implementation

RSP related safety requirements		
Specification: RSP 180/D	**Application: ADS-C**	**Component: ANSP**
Ref	**Related Surveillance Parameter**	**Safety requirement**
All	A, C, I	*Note.— Safety requirements related to RSP 180/D are the same as those related to RCP 240/D, unless otherwise modified in this table. See Appendix B, paragraph B.2.1.2.*

C.2.1.3 Communication/satellite service provider (CSP/SSP)

Note.— The RSP allocations for the CSP/SSP are intended to aid the ANSP and the aircraft operator in the development of contracts and service agreements.

RSP data delivery time and continuity criteria			
Specification: RSP 180/D	**Application: ADS-C**		**Component: CSP/SSP**
Data delivery time parameter	**OT (sec) C = 99.9%**	**DT (sec) C = 95%**	**Compliance means**
RSTP time allocations			
$RSTP_{CSP/SSP}$ (D1 to D2)	170	84	Contract/service agreement terms. Pre-implementation demonstration.

RSP availability criteria			
Specification: RSP 180/D	**Application: ADS-C**		**Component: CSP/SSP**
Availability parameter	**Efficiency**	**Safety**	**Compliance means**
Availability – CSP/SSP ($A_{CSP/SSP}$)	0.9999	0.999	Contract/service agreement terms
Unplanned outage duration limit (minutes)	10	10	Contract/service agreement terms
Maximum number of unplanned outages	4	48	Contract/service agreement terms
Maximum accumulated unplanned outage time (minutes/year)	52	520	Contract/service agreement terms
Unplanned outage notification delay (minutes)	5	5	Contract/service agreement terms
Note.— The RSP availability criteria for RSP 180/D are the same as those provided for RCP 240/D. See Appendix B, paragraph B.2.1.3.			

RSP integrity criteria		
Specification: RSP 180/D	**Application: ADS-C**	**Component: CSP/SSP**
Integrity parameter	**Integrity value**	**Compliance means**
Integrity (I)	Not specified	Contract/service agreement terms. Per surveillance related safety requirements SR-26 for the ANSP and SR-26 for the aircraft system, the end system is required include provisions, consistent with the overall data integrity criteria, to mitigate the effects of errors introduced by the network. These provisions require the network to pass protected information (or data) to the end system without manipulating the protected information (or data) it passes. *Note.— In formulating contract terms with the CSP/SSP, the ANSP and/or operator may specify an integrity value and other related criteria, as appropriate, for the network, including subnetworks, that will ensure acceptable data integrity, consistent with the assumptions used to define the end system provisions (e.g. CRC or Fletcher's checksum).*

C.2.1.4 Aircraft system

RSP data delivery time and continuity criteria			
Specification: RSP 180/D	**Application: ADS-C**		**Component: Aircraft system**
Data delivery time parameter	**OT (sec) C = 99.9%**	**DT (sec) C = 95%**	**Compliance means**
RSTP time allocations			
$RSTP_{AIR}$ (A to D1)	5	3	Pre-implementation demonstration

RSP availability criteria			
Specification: RSP 180/D	**Application: ADS-C**		**Component: Aircraft system**
Availability parameter	**Efficiency**	**Safety**	**Compliance means**
Availability – aircraft (A_{AIR})	N/A	0.999	Analysis, architecture, design, pre-implementation demonstration
Note.— The surveillance availability criteria for RSP 180/D are the same as those provided for RCP 240/D. See Appendix B, paragraph B.2.1.4.			

RSP integrity criteria		
Specification: RSP 180/D	**Application: ADS-C**	**Component: Aircraft system**
Integrity parameter	**Integrity value**	**Compliance means**
Integrity (I)	Malfunction = 10^{-5} per flight hour	Analysis, safety requirements, development assurance level (e.g. Level C software) commensurate with integrity level, pre-implementation demonstration. See also related safety requirement SR-26 for the aircraft system.

RSP monitoring and alerting criteria		
Specification: RSP 180/D	**Application: ADS-C**	**Component: Aircraft system**
Ref:	**Criteria**	**Compliance means**
MA-1a	The aircraft system shall be capable of detecting aircraft system failures or loss of air/ground communication that would cause the aircraft surveillance capability to no longer meet the requirements for the intended function.	System design, implementation
MA-1b	When the aircraft surveillance capability no longer meets the requirements for the intended function, the aircraft system shall provide indication to the flight crew.	System design, implementation

RSP related safety requirements		
Specification: RSP 180/D	**Application: ADS-C**	**Component: Aircraft system**
Ref	**Related surveillance parameter**	**Safety requirement**
All	A, C, I	*Note.— Safety requirements related to RSP 180/D are the same as those related to RCP 240/D, unless otherwise modified in this table. See Appendix B, paragraph B.2.1.4.*

C.2.1.5 Aircraft operator

RSP data delivery time and continuity criteria			
Specification: RSP 180/D	**Application: ADS-C**		**Component: Aircraft operator**
Data delivery time parameter	**OT (sec) C = 99.9%**	**DT (sec) C = 95%**	**Compliance means**
RSTP time allocations			
$RSTP_{AIR}$ (A to D1)	5	3	Aircraft type design approval, maintenance, properly configured user-modifiable software (e.g. owner requirements table)
$RSTP_{CSP/SSP}$ (D1 to D2)	170	84	CSP/SSP contract/service agreement. See also paragraph C.2.1.3. Pre-implementation demonstration.

RSP availability criteria			
Specification: RSP 180/D	**Application: ADS-C**		**Component: Aircraft operator**
Availability parameter	**Efficiency**	**Safety**	**Compliance means**
Availability – aircraft (A_{AIR})	N/A	0.999	Aircraft type design approval, maintenance, properly configured user-modifiable software (e.g. owner requirements table or airline policy file).

RSP availability criteria			
Specification: RSP 180/D	**Application: ADS-C**		**Component: Aircraft operator**
Availability parameter	**Efficiency**	**Safety**	**Compliance means**
Availability –CSP/SSP ($A_{CSP/SSP}$)	0.9999	0.999	Contract/service agreement terms. *Note.— For guidelines to aid in the development of the contract/service agreement with the CSP/SSP, see paragraph C.2.1.3, RSP 180/D allocations to CSP/SSP for surveillance availability criteria.*

RSP integrity criteria			
Specification: RSP 180/D	**Application: ADS-C**		**Component: Aircraft operator**
Integrity parameter	**Integrity value**	**Compliance means**	
Integrity (I)	Malfunction = 10^{-5}	Aircraft type design approval, establish procedures, training, and qualification to meet safety requirements. CSP/SSP contract/service agreement. See also surveillance integrity criteria for CSP/SSP, paragraph C.2.1.3.	

RSP monitoring and alerting criteria			
Specification: RSP 180/D		**Application: ADS-C**	**Component: Aircraft operator**
Ref:	**Criteria**		**Compliance means**
MA-2	When the flight crew determines that the aircraft surveillance capability no longer meets the requirements for the intended function, the flight crew shall advise the ATS unit concerned.		Procedures, flight crew training and qualification.

RSP related safety requirements		
Specification: RSP 180/D	**Application: ADS-C**	**Component: Aircraft operator**
Ref	**Related surveillance parameter**	**Safety requirement**
All	C, I	*Note.— Safety requirements related to RSP 180/D are the same as those related to RCP 240/D. See Appendix B, paragraph B.2.1.5.*

C.3 RSP 400 specification

<table>
<tr><th colspan="6">RSP specification</th></tr>
<tr><th colspan="3">RSP specification</th><th colspan="3">RSP 400</th></tr>
<tr><th colspan="6">Airspace specific considerations</th></tr>
<tr><td>Interoperability</td><td colspan="5">Specify interoperability criteria (e.g. FANS 1/A or SATVOICE Iridium, Inmarsat, and/or MTSAT communications)</td></tr>
<tr><td>ATM operation</td><td colspan="5">Specify ATM operation(s) (e.g. use or required for applicable separation standard)</td></tr>
<tr><td>Application</td><td colspan="5">Specify the required surveillance capability. For position reporting, specify the ATM operation (e.g. ADS-C periodic interval, waypoint change event, lateral deviation event or SATVOICE via a radio operator).</td></tr>
<tr><th colspan="6">Surveillance parameter values</th></tr>
<tr><td>Data delivery time (sec)</td><td>Continuity I</td><td rowspan="4"></td><td>Availability (A)</td><td colspan="2">Integrity (I)</td></tr>
<tr><td>OT = 400</td><td>C(OT) = 0.999</td><td rowspan="3">0.999</td><td>Navigation FOM</td><td>See Note 3.</td></tr>
<tr><td rowspan="2">DT = 300</td><td rowspan="2">C(DT) = 0.95</td><td>Time at position accuracy</td><td>+/- 30 sec (UTC)</td></tr>
<tr><td>Data integrity</td><td>Malfunction = 10^{-5} per flight hour</td></tr>
<tr><th colspan="6">Surveillance monitoring and alerting criteria</th></tr>
<tr><td>Ref</td><td colspan="5">Criteria</td></tr>
<tr><td>SMA-1</td><td colspan="5">The system shall be capable of detecting failures and configuration changes that would cause the ADS-C or SATVOICE service to no longer meet the RSP parameter values for the intended function.</td></tr>
<tr><td>SMA-2</td><td colspan="5">When the ADS-C or SATVOICE service can no longer meet the RSP parameter values for the intended function, the flight crew and/or the controller shall take appropriate action.</td></tr>
<tr><th colspan="6">Notes</th></tr>
<tr><td colspan="6">Note 1.— Rationale for the criteria provided in this specification can be found in ICAO Annex 11, ICAO Doc 4444, ICAO Doc 9689, and RTCA DO-306/EUROCAE ED-122.
Note 2.— If changes are made to the system capacity limits, as specified by the airspace requirements, and the changes cause the system to perform below the surveillance parameter values, this would be considered a change in system configuration.
Note 3.— The navigation figure of merit (FOM) is specified based on the navigation criteria associated with this spec. For example, if RNP 10 is prescribed, then for ADS-C surveillance service, the FOM level would need to be 3 or higher. In all cases, when the navigation capability no longer meets the criteria specified for the operation, the flight crew is responsible for reporting the non-compliance to ATC in accordance with ICAO procedures.</td></tr>
</table>

C.3.1 RSP 400/D allocations

C.3.1.1 General

C.3.1.1.1 The RSP 400/D allocations are applicable to the delivery of surveillance data via ADS-C. Figure C-2 provides the RSP 400/D allocations associated with surveillance data delivery time and continuity. Actual surveillance performance (ASP) is monitored from A to Z. The remaining allocations support initial compliance and problem investigation when ASP does not meet the specified criteria.

RSP 400 specification (surveillance data delivery times and RSP continuity)				
RSP	**400**			**RSP**
95%	300			95%
	RSP 400/D allocations – CPDLC or ADS-C example			
Time +/- 1 second at position (RNP at UTC)	**Monitored operational performance**			**ATM (ATSU system updated)**
99.9%	400			OT
95%	300			DT
	A	D1	D2	Z
RSMP/RSTP	Aircraft system	Network	ATSU system	**RSMP/RSTP**
99.9%	30	340	30	99.9%
95%	15	270	15	95%

Figure C-2. RSP 400/D allocations – data delivery times and continuity

C.3.1.1.2 The RSP 400/D allocations are shared by the ANSP, the CSP/SSP, the aircraft system and the aircraft operator. The descriptions and assignments for these allocations, as shown in Figure C-2, are the same as the descriptions and assignments for the RSP 180/D allocations provided in Table C-1.

C.3.1.2 Air navigation service provider (ANSP)

RSP data delivery time and continuity criteria			
Specification: RSP 400/D	**Application: ADS-C**		**Component: ANSP**
Data delivery time parameter	**OT (sec) C = 99.9%**	**DT (sec) C = 95%**	**Compliance means**
RSMP time allocation	400	300	Monitored.
RSMP/RSTP time allocations			
$RSTP_{ATSU}$ (D2 to Z)	30	15	Pre-implementation demonstration
$RSTP_{CSP/SSP}$ (D1 to D2)	340	270	CSP/SSP contract/service agreement. See also paragraph C.3.1.3.

RSP availability criteria			
Specification: RSP 400/D	**Application: ADS-C**		**Component: ANSP**
Availability parameter	**Efficiency**	**Safety**	**Compliance means**
Availability – service ($A_{SERVICE}$)	N/A	0.999	Contract/service agreement terms. *Note 1.— For guidelines to aid in the development of the contract/service agreement with the CSP/SSP, see paragraph C.3.1.3, RSP 180/D allocations to CSP/SSP for surveillance availability criteria.* *Note 2. — The availability criteria are allocated entirely to $A_{CSP/SSP}$ and assume that the ATS unit's system is always available.*

Note.— The RSP integrity criteria, monitoring and alerting criteria, and related safety requirements for RSP 400/D are the same as the criteria provided for RSP 180/D. See paragraph C.2.1.2.

C.3.1.3 Communication/satellite service provider (CSP/SSP)

Note.— The RSP allocations for the CSP/SSP are intended to aid the ANSP and the aircraft operator in the development of contracts and service agreements.

RSP data delivery time and continuity criteria			
Specification: RSP 400/D	**Application: ADS-C**		**Component: CSP/SSP**
Data delivery time Parameter	**OT (sec) C = 99.9%**	**DT (sec) C = 95%**	**Compliance means**
RSTP time allocations			
$RSTP_{CSP/SSP}$ (D1 to D2)	340	270	Contract/service agreement terms. Pre-implementation demonstration.

RSP availability criteria			
Specification: RSP 400/D	**Application: ADS-C**		**Component: CSP/SSP**
Availability parameter	**Efficiency**	**Safety**	**Compliance means**
Availability – CSP/SSP ($A_{CSP/SSP}$)	N/A	0.999	Contract/service agreement terms
Unplanned outage duration limit (minutes)	N/A	20	Contract/service agreement terms
Maximum number of unplanned outages	N/A	24	Contract/service agreement terms
Maximum accumulated unplanned outage time (minutes/year)	N/A	520	Contract/service agreement terms

RSP availability criteria			
Specification: RSP 400/D	**Application: ADS-C**		**Component: CSP/SSP**
Availability parameter	**Efficiency**	**Safety**	**Compliance means**
Unplanned outage notification delay (minutes)	N/A	10	Contract/service agreement terms
Note.— The RSP availability criteria for RSP 400/D are the same as those provided for RCP 400/D. See Appendix B, paragraph B.3.1.3.			

RSP integrity criteria		
Specification: RSP 400/D	**Application: ADS-C**	**Component: CSP/SSP**
Integrity parameter	**Integrity value**	**Compliance means**
Integrity (I)	*Note.— RSP integrity criteria related to RSP 400/D are the same as those related to RSP 180/D. See paragraph C.2.1.4.*	

C.3.1.4 Aircraft system

RSP data delivery time and continuity criteria			
Specification: RSP 400/D	**Application: ADS-C**		**Component: Aircraft system**
Data delivery time parameter	**OT (sec) C = 99.9%**	**DT (sec) C = 95%**	**Compliance means**
RSTP time allocations			
$RSTP_{AIR}$ (A to D1)	30	15	Pre-implementation demonstration

Note.— The RSP availability, integrity and monitoring and alerting criteria, and related safety requirements for RSP 400/D are the same as the criteria and related safety requirements provided for RSP 180/D. See paragraph C.2.1.4.

C.3.1.5 Aircraft operator

RSP data delivery time and continuity criteria			
Specification: RSP 400/D	**Application: ADS-C**		**Component: Aircraft operator**
Data delivery time parameter	**OT (sec) C = 99.9%**	**DT (sec) C = 95%**	**Compliance means**
RSTP time allocations			
$RSTP_{AIR}$ (A to D1)	30	15	Aircraft type design approval, maintenance, properly configured user-modifiable software (e.g. owner requirements table)
$RSTP_{CSP/SSP}$ (D1 to D2)	340	270	CSP/SSP contract/service agreement. See also paragraph C.3.1.3. Pre-implementation demonstration.

Note.— The RSP availability, integrity and monitoring and alerting criteria, and related safety requirements for RSP 400/D are the same as the criteria and related safety requirements provided for RSP 180/D. See paragraph C.2.1.5.

C.3.2 RSP 400/V_{RO} allocations

C.3.2.1 General

C.3.2.1.1 The RSP 400/VRO allocations are applicable to the delivery of surveillance data via a radio operator using SATVOICE. Figure C-3 provides the RSP 400/D allocations associated with surveillance data delivery time and continuity. The time it takes for the surveillance data upon receipt is shown by analysis. Actual surveillance performance (ASP) is monitored from A to S7. The remaining allocations support initial compliance and problem investigation when ASP does not meet the specified criteria.

RSP 400 specification (surveillance data delivery times and RSP continuity)									
RSP	**400**								**RSP**
95%	300								95%
	RSP 400/V$_{RO}$ allocations – Flight crew using SATVOICE via radio operator example								
Time */- 30 seconds at position (RNP at UTC)	**Monitored operational performance**							**ATSU verifies surveillance data**	**ATM (ATSU system updated)**
99.9%	385							15	OT
95%	290							10	DT
RSMP	Flight crew performance	RSTP (air-to-ground)	Answer performance	Call performance	RSTP (ground-to-ground)				**RSMP**
99.9%	195	15	46	120	9				99.9%
95%	165	10	25	85	5				95%
	A	S1	S2	S3	S4	S5	S6	S7	Z
RSTP		Aircraft system / Aero station system			Aero station system	Network	ASTU system		**RSTP**
99.9%		15			2	5	2		99.9%
95%		10			1	3	1		95%

Figure C-3. RSP 400/V$_{RO}$ allocations – data delivery times and continuity

C.3.2.1.2 The RSP 400/V$_{RO}$ allocations are shared by the ANSP, the CSP/SSP, the aircraft system and the aircraft operator. The descriptions and assignments for these allocations, as shown in Figure C-3, are provided in Table C-2.

Table C- 2. RSP 400/V$_{RO}$ allocation descriptions and assignments

RSP 400/V$_{RO}$ Allocations	Description	ANSP	CSP/SSP	Aircraft	Operator
RSMP	The maximum time against which ASP is assessed.	X	X	X	X
Flight crew (initiator performance)	The maximum time allocated to the flight crew to prepare a position report, from the time the aircraft was over its compulsory reporting point to when the call is initiated.			X	X
Answer performance	The maximum time allocated to when the ground user receives an indication of an incoming call to when the ground user accepts the call.	X	X		

RSP 400/V_{RO} Allocations	**Description**	**ANSP**	**CSP/SSP**	**Aircraft**	**Operator**
Call performance (air-to-ground)	The maximum time allocated to when the ground user accepts an incoming call to when the parties on the call have completed the communication. *Note.— The call is complete when the radio operator sends the surveillance data to the ATS unit.*	X	X	X	X
RSTP	The maximum technical time allocated to relevant parts of the ATS unit's system, aeronautical station's system, the network systems and the aircraft system, for which there is no human contribution to the surveillance data delivery performance.	X	X	X	X
RSTP (air-to-ground) ($RSTP_{A/G}$)	The maximum portion of RSTP time allocated to the ground system, network and aircraft system to set up an air-to-ground call as determined from when the last digit of the dialling sequence is finished to when the ground system indicates an incoming call to the receiving party.		X	X	
RSTP (ground-to-ground)	The maximum portion of RSTP allocated to the ATS unit's system, ground-to-ground network, and aeronautical station's system for ground-ground communications.	X	X		
ATSU system ($RSTP_{ATSU}$)	The maximum portion of RSTP time allocated to the ATS unit's system.	X			
Network ($RSTP_{CSP/SSP}$)	The maximum portion of RSTP time allocated to the CSP/SSP.	X	X		X
Aero station system ($RSTP_{AS}$)	The maximum portion of RSTP allocated to the aeronautical station's system for ground-ground communications with an ATS unit. *Note.— $RSTP_{AS}$ includes two concurrent processes:* *a) the aircraft and aeronautical station technically disconnect the call; which is assumed. Operationally, the call is disconnected when the flight crew and radio operator complete the call; and* *b) the aeronautical station sends the surveillance data to the ATS unit via the ground-ground network; the performance is denoted by $RCTP_{AS}$.*	X	X		

C.3.2.1.3 Measurements for assessing ACP/continuity include calls that are disconnected or dropped for any reason, such as aircraft manoeuvres or switching satellites, or busy conditions. They would also include loss of service while on the call if the service outage is less than the maximum unplanned outage duration limit. If the outage is greater than the maximum unplanned outage duration limit, these calls would be excluded from ACP/continuity measurements, because they would be considered as part of SATVOICE service availability.

C.3.2.1.4 SATVOICE service availability includes failures prohibiting the call to be initiated or congestion (much like the analogy of a terrestrial mobile phone network). Measurements for assessing SATVOICE service availability would not include any calls associated with the measurements for ACP/continuity.

C.3.2.1.5 SATVOICE integrity includes an assessment, such as a diagnostic rhyme test (DRT), of the intelligibility of the voice transaction and the extent to which the parties could potentially misunderstand the communication.

Reference	RSP safety requirements
All	Safety requirements for RSP 400/V_{RO} are the same as the safety requirements for RCP 400/V_{RO} (See Appendix B, paragraph B.3.2.1.5).

C.3.2.2 Air navigation service provider (ANSP)

RSP data delivery time and continuity criteria			
Specification: RSP 400/V_{RO}	**Application: SATVOICE/RO**		**Component: ANSP**
Data delivery time parameter	**OT (sec) C = 99.9%**	**DT (sec) C = 95%**	**Compliance means**
Recipient performance (verify data) (S7 to Z)	15	10	Initially, by analysis, simulations, safety human factors assessments.
RSMP time allocation	385	290	Monitored.
Answer performance (H to I)	46	25	Initially, by analysis, simulations, safety human factors assessments.
Call performance (I to J)	120	85	Initially, by analysis, simulations, safety human factors assessments.
RSTP time allocations			
$RSTP_{ATSU}$ (S6 to S7)	2	1	Pre-implementation demonstration
$RSTP_{A/G}$ (S1 to S2)	15	10	Estimated, CSP/SSP contract/service agreement. See paragraph C.3.2.3.
RSTP (ground-to-ground) (S4 to S7)	9	5	Estimated, CSP/SSP contract/service agreement. See paragraph C.3.2.3.

RSP availability criteria			
Specification: RSP 400/V_{RO}	**Application: SATVOICE/RO**		**Component: ANSP**
Availability parameter	**Efficiency**	**Safety**	**Compliance means**
Availability – service ($A_{SERVICE}$)	N/A	0.999	Contract/service agreement terms. *Note 1.— For guidelines to aid in the development of the contract/service agreement with the CSP/SSP, see paragraph C.3.2.3, RSP 400/V_{RO} allocations to CSP/SSP for RSP availability criteria.* *Note 2.— The availability criteria are allocated entirely to $A_{CSP/SSP}$ and assume that the ATS unit's system is always available.*

RSP integrity criteria		
Specification: RSP 400/V_{RO}	**Application: SATVOICE/RO**	**Component: ANSP**
Integrity parameter	**Integrity value**	**Compliance means**
Integrity (I)	Malfunction = 10^{-5} per flight hour	Analysis, safety requirements, development assurance level commensurate with integrity level, (compliance shown prior to operational implementation). See related safety requirement SR-3 and SR-4 for the ANSP. CSP/SSP contract/service agreement. See RSP integrity criteria for CSP/SSP, paragraph C.3.2.3.

RSP monitoring and alerting criteria		
Specification: RSP 400/V_{RO}	**Application: SATVOICE/RO**	**Component: ANSP**
Ref:	**Criteria**	**Compliance means**
SMA-1 SMA-2	*Note.— RSP monitoring and alerting criteria are specified by safety requirements allocated to the ANSP for SR-6.*	Review.

RSP related safety requirements		
Specification: RSP 400/V_{RO}	**Application: SATVOICE/RO**	**Component: ANSP**
Ref	**Related RSP parameter**	**Safety requirement**
All	A, C, I, ET	*Note.— Safety requirements related to RSP 400/V_{RO} are the same as those related to RCP 400/V_{RO}. See Appendix B, paragraph B.3.2.2.*

C.3.2.3 Communication/satellite service provider (CSP/SSP)

RSP data delivery time and continuity criteria				
Specification: RSP 400/V_{RO}	**Application: SATVOICE/RO**			**Component: CSP/SSP**
Data delivery time parameter	**OT (sec) C = 99.9%**	**IT (sec) C = 99%)**	**DT (sec) C = 95%**	**Compliance means**
RSTP time allocations				
$RSTP_{A/G}$ (S1 to S2)	[Not defined]	15	10	Pre-implementation demonstration.
$RSTP_{AS}$ (S4 to S5)	2	[not defined]	1	Pre-implementation demonstration.
$RSTP_{CSP/SSP}$ (S5 to S6)	5	[not defined]	3	Contract/service agreement terms. Pre-implementation demonstration.

RSP availability criteria			
Specification: RSP 400/V_{RO}	**Application: SATVOICE/RO**		**Component: CSP/SSP**
Availability parameter	**Efficiency**	**Safety**	**Compliance means**
Availability – CSP/SSP ($A_{CSP/SSP}$)	N/A	0.999	Contract/service agreement terms.
Unplanned outage duration limit (minutes)	N/A	20	Contract/service agreement terms.
Maximum number of unplanned outages	N/A	24	Contract/service agreement terms.
Maximum accumulated unplanned outage time (minutes/year)	N/A	520	Contract/service agreement terms.
Unplanned outage notification delay (minutes)	N/A	10	Contract/service agreement terms.
Grade of service	N/A	1%	Contract/service agreement terms. *Note.— This value is the same as that defined Annex 10, Volume III.*
Note.— The RSP 400/V_{RO} availability are the same as for RCP 400/V_{RO}. See Appendix B, paragraph B.3.2.3.			

RSP integrity criteria		
Specification: RSP 400/V_{RO}	**Application: SATVOICE/RO**	**Component: CSP/SSP**
Integrity parameter	**Integrity value**	**Compliance means**
Integrity (I)	[not defined]	Pre-implementation demonstration and contract/service agreement terms. *Note.— RSP integrity criteria are specified by safety requirements allocated to the CSP/SSP for SR-3 and SR-4.*

RSP related safety requirements		
Specification: RSP 400/V_{RO}	**Application: SATVOICE/RO**	**Component: CSP/SSP**
Ref	**Related RSP parameter**	**Safety requirement**
All	A, C, I	*Note.— Safety requirements related to RSP 400/V_{RO} are the same as those related to RCP 400/V_{RO}. See Appendix B, paragraph B.3.2.3.*

C.3.2.4 Aircraft system

RSP data delivery time and continuity criteria				
Specification: RSP 400/V_{RO}	**Application: SATVOICE/RO**			**Component: Aircraft system**
Data delivery time parameter	**OT (sec) C = 99.9%**	**IT (sec) C = 99%**	**DT (sec) C = 95%**	**Compliance means**
RSMP time allocations				
Call performance (S3 to S4)	120	[not defined]	85	Human-machine interface capability, pre-implementation demonstration
RSTP time allocations				
$RSTP_{A/G}$ (S1 to S2)	[not defined]	15	10	Pre-implementation demonstration

RSP availability criteria			
Specification: RSP 400/V_{RO}	**Application: SATVOICE/RO**		**Component: Aircraft system**
Availability parameter	**Efficiency**	**Safety**	**Compliance means**
Availability – aircraft (A_{AIR})	N/A	0.999	Analysis, architecture, design, pre-implementation demonstration
Note.— The RSP availability criteria for RSP 400/V_{RO} are the same as the criteria for RCP 400/V_{RO}. See Appendix B, paragraph B.3.2.4.			

RSP integrity criteria		
Specification: RSP 400/V_{RO}	**Application: SATVOICE/RO**	**Component: Aircraft system**
Integrity parameter	**Integrity value**	**Compliance means**
Integrity (I)	Malfunction = 10^{-3} per flight hour	Design approval of aircraft system. Analysis, safety requirements, development assurance level (e.g. Level D software), commensurate with integrity level, pre-implementation demonstration. *Note.— RCP integrity criteria are specified by safety requirements allocated to the aircraft system for SR-3 and SR-4.*

RSP monitoring and alerting criteria		
Specification: RSP 400/V_{RO}	**Application: SATVOICE/RO**	**Component: Aircraft system**
Ref:	**Criteria**	**Compliance means**
SMA-1 SMA-2	*Note.— RSP monitoring and alerting criteria are specified by safety requirements allocated to the ANSP for SR-6.*	Review.

RSP related safety requirements		
Specification: RSP 400/V_{RO}	**Application: SATVOICE/RO**	**Component: Aircraft system**
Ref	**Related RSP parameter**	**Safety requirement**
All	A, C, I	*Note.— Safety requirements related to RSP 400/V_{RO} are the same as those related to RCP 400/V_{RO}. See Appendix B, paragraph B.3.2.4.*

C.3.2.5 Aircraft operator

RSP data delivery time and continuity criteria			
Specification: RSP 400/V_{RO}	**Application: SATVOICE/RO**		**Component: Aircraft operator**
Data delivery time parameter	**OT (sec) C = 99.9%**	**DT (sec) C = 95%**	**Compliance means**
Initiator performance (A to G)	195	165	Procedural capability, flight crew training and qualification in accordance with safety requirements.
Call performance (I to J)	120	85	Contract/service agreement terms. Pre-implementation demonstration.

RSP data delivery time and continuity criteria			
Specification: RSP 400/V_{RO}	**Application: SATVOICE/RO**		**Component: Aircraft operator**
Data delivery time parameter	**OT (sec) C = 99.9%**	**DT (sec) C = 95%**	**Compliance means**
$RSTP_{A/G}$ (G to H)	15	10	Pre-implementation demonstration.

RSP availability criteria			
Specification: RSP 400/V_{RO}	**Application: SATVOICE/RO**		**Component: Aircraft operator**
Availability parameter	**Efficiency**	**Safety**	**Compliance means**
Availability – aircraft (A_{AIR})	N/A	0.999	Aircraft type design approval, maintenance and properly configured user-modifiable software (e.g. ORT).
Availability – CSP/SSP ($A_{CSP/SSP}$)	N/A	0.999	Contract/service agreement terms. *Note.— For guidelines to aid in the development of the contract/service agreement with the CSP/SSP, see paragraph C.3.2.3, RSP 400/V_{RO} allocations to CSP/SSP for RSP availability criteria.*

RSP integrity criteria		
Specification: RSP 400/V_{RO}	**Application: SATVOICE/RO**	**Component Aircraft operator**
Integrity parameter	**Integrity value**	**Compliance means**
Integrity (I)	Malfunction = 10^{-5} per flight hour	Review of procedures, training programmes, and qualification to meet safety requirements. Design approval of aircraft SATVOICE system. CSP/SSP contract/service agreement. *Note.— RSP integrity criteria are specified by safety requirements allocated to the aircraft operator for SR-3 and SR-4. See also RSP integrity criteria for the aircraft system, paragraph C.3.2.4, and the CSP/SSP, paragraph C.3.2.3.*

RSP monitoring and alerting criteria		
Specification: RSP 400/V_{RO}	**Application: SATVOICE/RO**	**Component: Aircraft operator**
Ref:	**Criteria**	**Compliance means**
SMA-1 SMA-2	*Note.— RSP monitoring and alerting criteria are specified by safety requirements allocated to the ANSP for SR-6.*	Review.

RSP related safety requirements		
Specification: RSP 400/V_{RO}	**Application: SATVOICE/RO**	**Component: Aircraft operator**
Ref	**Related RSP Parameter**	**Safety requirement**
All	A, C, I	*Note.— Safety requirements related to RSP 400/V_{RO} are the same as those related to RCP 400/V_{RO}. See Appendix B, paragraph B.3.2.5.*

C.3.3 RSP 400/V_{ATC} allocations

(reserved)

APPENDIX D. Post-implementation monitoring and corrective action (CPDLC and ADS-C)

D.1 General

D.1.1 This appendix provides guidance additional to that provided in Chapter 5, for local and regional PBCS monitoring programmes. It contains the post-implementation guidance material relevant to CPDLC and ADS-C for which the RCP/RSP specifications provided in Appendix B and Appendix C are applicable, including:

a) ANSP data collection – This section defines a common data reporting format, providing guidance on how to obtain the necessary data points.

b) ANSP monitoring and analysis – This section contains guidance on data analysis, including recommended filtering for completeness of monitoring.

c) Regional performance monitoring and analysis – This section provides guidance on monitoring at a regional level.

d) Problem reporting and resolution – This section provides guidance on the process for problem identification and resolution.

D.2 ANSP data collection

D.2.1 ANSP data collection for CPDLC transaction time/continuity

D.2.1.1 General

D.2.1.1.1 This section provides guidance on data collection and performance measurement for the CPDLC application. The CPDLC analysis is based on measurement of actual communication performance (ACP) against required communication monitored performance (RCMP), actual communications technical performance (ACTP) against required communication technical performance (RCTP), and pilot operational response time (PORT) against RCP PORT.

D.2.1.1.2 While each ANSP may store the data in a database format, for the purpose of sharing CPDLC transaction data (e.g. with the regional monitoring entity for regional analysis), the data should be sent as a comma delimited text file. The format for each record will contain, at minimum the 20 data points specified below in Table D-1.

D.2.1.1.3 In addition to monitoring data communications performance as described below, it is suggested that the ANSP conduct regular analysis of the message use statistics for the current CPDLC message set for the purpose of future development of CPDLC applications.

D.2.1.1.4 The CPDLC data set is comprised of controller-initiated transactions, specifically the subset of CPDLC uplinks that receive a single DM 0 WILCO response are used. The transactions in which an uplink receives DM 1 UNABLE, DM 2 STANDBY, DM 3 ROGER, DM 4 AFFIRM, DM 5 NEGATIVE responses are not considered. A DM 0 WILCO response following a DM 2 STANDBY is also not measured.

D.2.1.2 Recording data points for each CPDLC transaction

D.2.1.2.1 The data points shown in Table D-1 are recommended as the minimum set that the ANSP should extract from CPDLC system recordings to provide sufficient information for RCP analysis and problem investigation. Possibilities for additional data points may be extracted for more detailed analysis are listed below Table D-1.

D.2.1.2.2 Most of the data points can be extracted from either the ACARS or ATN B1 header or the CPDLC application message, or calculated based on the other data points. However, the aircraft type and operator will need to be matched to each record from a separate database using the aircraft registration as the common point.

D.2.1.2.3 The methods for calculating the ACTP, ACP and PORT are described in section D.2.1.3.

Table D-1. CPDLC data collection points

Ref	Label	Description and/or remarks
1	ANSP	The four letter ICAO designator of the facility (e.g. NZZO).
2	Aircraft registration (FANS 1/A)	The aircraft registration in ICAO Doc 4444 Format (no hyphens, extraneous characters, etc.) (e.g. N104UA). *Note.— Extracted from ACARS header or application message.*
2	Aircraft address (ATNB1)	The 24 bit address in ICAO Doc 4444 Format (alphanumerical character, in six hexadecimals) *Note.— Extracted from CM application message.*
3	Aircraft type designator	The ICAO aircraft type designator (e.g. B744). *Note.— Extracted from the ANSP's database using aircraft registration as key. Aircraft type designators are contained in Doc 8643.*
4	Operator designator	The ICAO designator for the aircraft operating agency (e.g. UAL). *Note.— Extracted from the ANSP's database using aircraft registration as key.*
5	Date	In YYYYMMDD format (e.g. 20081114). *Note.— Extracted from the ANSP's system data recording time stamp.*
6	MAS RGS	Designator of the RGS that MAS downlink was received from. *Note.— This is a 3 or 4 letter designator extracted from the second field of the ACARS header DT line (e.g. DT DDL **POR1** 121212 M01A).*
7	OPS RGS	Designator of the RGS that the operational response was received from. *Note.— This is a 3 or 4 letter designator extracted from second field of the ACARS header DT line (e.g. DT DDL **AKL1** 121212 M01A).*
8	Uplink time	The timestamp on the uplink CPDLC message sent by the ANSP in HH:MM:SS format (e.g. 03:43:25). *Note.— Extracted from the ANSP system data recording time stamp.*
9	MAS/LACK receipt time	The ANSP timestamp on receipt of the MAS/LACK in HH:MM:SS format (e.g. 03:43:35). *Note.— Extracted from the ANSP system data recording time stamp.*

Ref	Label	Description and/or remarks
10	MAS/LACK round trip time	In seconds (#9-#8) (e.g. 10).
11	Aircraft FMS time stamp	In the operational response messages in HH:MM:SS (e.g. 03:44:15). *Note.— For FANS 1/A, extracted from the ATCmessageHeader timestamp in the decoded operational response message. See RTCA DO-258AEUROCAE ED-100A section 4.6.3.3.*
12	ANSP timestamp on the receipt of the operational response	In HH:MM:SS (e.g. 03:44:45). *Note.— Extracted from the ANSP system data recording time stamp.*
13	Operational message round trip time	From sending uplink (#8) to receipt of operational response (#12) in seconds (e.g. 80).
14	Downlink response transit time	In seconds (#12-#11) (e.g. 30).
15	Uplink message elements	All uplink message element identifier preceded by U encapsulated between quotation marks with a space between each element (e.g. “U118 U80”) *Note.— Extracted from the decoded operational uplink that initiated the transaction.*
16	Downlink message elements	All downlink message elements encapsulated between quotation marks with a space between each element if required (e.g. “D0”) *Note.— Extracted from the decoded operational downlink.*
17	ACTP	Actual communication technical performance in seconds (e.g. 35). *Note.— Truncated to whole seconds.*
18	ACP	Actual communications performance in seconds measured as the difference between time uplink sent (#8) to operational response received (#12) (e.g. 80).
19	PORT	Pilot Operational Response Time = ACP (#18) – ACTP (#17) (e.g. 45). *Note.— Implementers should allow for negative values where the operational response is received before the MAS as per above. When graphing PORT negative values should be counted as 0.*

D.2.1.2.4 In comma delimited text file format, these data points would appear as follows:

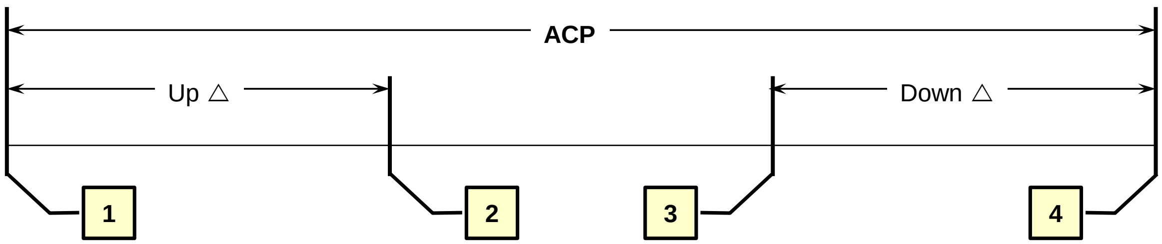
NZZO,N104UA,B744,UAL,20081114,POR1,AKL1,03:43:25,03:43:35,10,03:44:15,03:44:45,80,30,”U118 U80”,”D0”,35,80,45

D.2.1.3 Calculating ACP, ACTP and PORT

D.2.1.3.1 The ACP is calculated by the difference between the times that the uplink message is originated at the ANSP to the time that the corresponding response downlink is received at the ANSP.

D.2.1.3.2 The ACTP is estimated by calculating the difference between the downlink's aircraft time stamp and the received time and adding it to half the round trip time, determined by the difference between the uplink time when the message is sent from the ANSP and the receipt of the MAS response for the uplink at the ANSP ((uplink transmission time – MAS receipt)/2 + downlink time).

D.2.1.3.3 The PORT is estimated by the difference between ACP and ACTP. Figure D-1 illustrates how these measurements are calculated.



1	Uplink Sent	Date/time ATSU sent CPDLC clearance to the aircraft
2	MAS Received	Date/time ATSU receives the MAS for the CPDLC clearance
3	WILCO Sent	Date/time aircraft sends WILCO response for the CPDLC clearance
4	WILCO Received	Date/time ATSU receives WILCO response for the CPDLC clearance

The measurements (in seconds) are calculated as follows:

$$\text{ACP} = (\text{WILCO Received}) - (\text{Uplink Sent}) \quad \rightarrow \textbf{RCMP}$$

$$\text{ACTP} \cong \left(\left(\frac{\text{Up } \Delta}{2} \right) + (\text{Down } \Delta) \right) \quad \rightarrow \textbf{RCTP}$$

$$\text{PORT} \cong \text{ACP} - \text{ACTP} \quad \rightarrow \textbf{RCP PORT}$$

Figure D-1. CPDLC transaction calculations

D.2.1.3.4 The values for ACTP and PORT are only approximations. The assumption that the uplink transit times are half of the MAS/LACK response round trip time is flawed in a small percentage of cases because we know it is possible for the MAS to be received at the ANSP after the operational response is received; or for the timestamp on the operational response to be earlier than the MAS receipt time. This happens if the CSP does not hear the network ACK from the aircraft (which is sent on uplink receipt) and resends the uplink later. The CSP receives the network ACK from the aircraft (which is sent on uplink receipt) and resends the uplink later. The CSP receives the network ACK to this second uplink and sends the MAS to the ANSP. In the meantime, the aircraft has already responded with the operational response. The ANSP will see this issue reflected in their data with crew response times with negative or extremely small values.

D.2.1.3.5 Therefore, **all transactions with zero or negative crew response times should be filtered from data prior to analysis**. The time sequence diagram below in Figure D-2 illustrates the issue. Additional errors may arise if there are delays between the ANSP and the CSP on the uplink path. These delays will result in excessive calculated PORT and skewed ACP.

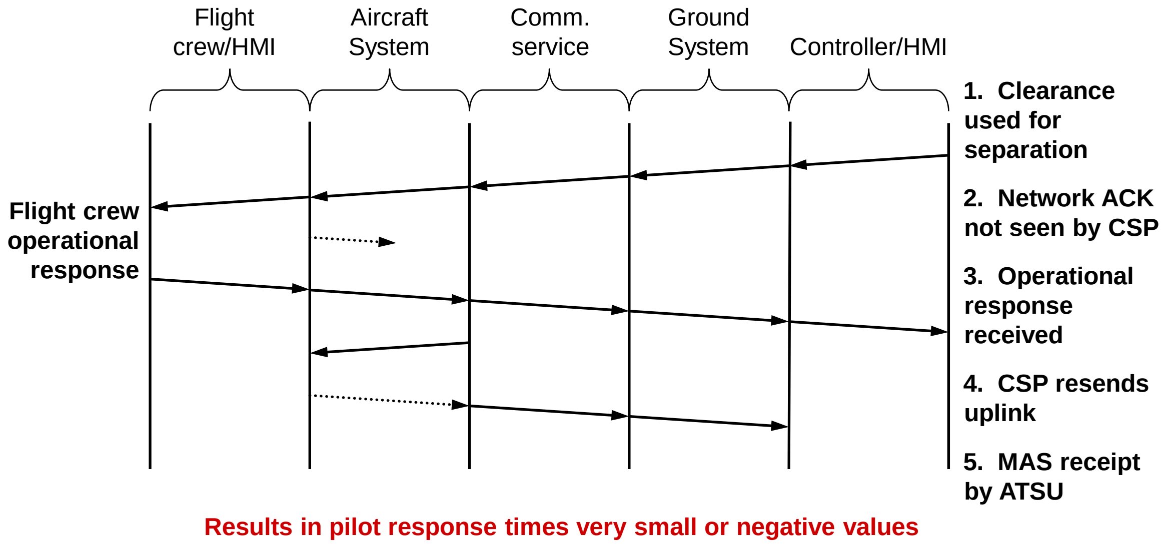


Figure D-2. Issue with estimating uplink transit time as half MAS roundtrip

D.2.1.3.6 The ANSP may find the following additional data points useful for further CPDLC performance analysis, investigate reported problems and support other analysis, such as from monitoring the application of performance-based horizontal separation minima:

a) the aircraft call sign extracted from either the Flight Plan (e.g. ANZ123) or the logon request message for the flight (e.g. NZ123) or the FI line in the ACARS header (e.g. NZ0123);

b) direction of flight calculated by the flight data processor and displayed as a three figure group representing degrees true (e.g. 275); and

c) the estimated position in latitude and longitude of the aircraft when a CPDLC downlink is sent. Calculated by the flight data processor. For consistency the following formats are recommended: for latitude use "+" for North and "-" for South followed by a decimal number of degrees (e.g. -33.456732). For longitude use "+" for East and "-" for West followed by a decimal number of degrees (e.g. +173.276554).

d) the communication type (COMTYP) identifying the media used for delivering CPDLC uplink and downlink messages. This is determined based on the MAS RGS field (#6) and OPS RGS field (#7). Table D-2 lists the nine possible entries for COMTYP: SAT, VHF, HF, SV, SH, VS, VH, HS, HV.

e) the regional monitoring entity should consider promulgating a list of RGS designators that are applicable to their region.

Table D-2. Determination of COMTYP indicators

MAS RGS Communication Type	OPS RGS Communication Type	COMTYP
SAT (e.g. MAS RGS = POR1)	SAT (e.g. OPS RGS = POR1)	SAT
VHF (e.g. MAS RGS = ADK)	VHF (e.g. OPS RGS = ADK)	VHF
HF (e.g. MAS RGS = H02)	HF (e.g. OPS RGS = H02)	HF
SAT (e.g. MAS RGS = POR1)	VHF (e.g. OPS RGS = ADK)	SV
SAT (e.g. MAS RGS = POR1)	HF (e.g. OPS RGS = H02)	SH
VHF (e.g. MAS RGS = ADK)	SAT (e.g. OPS RGS = POR1)	VS
VHF (e.g. MAS RGS = ADK)	HF (e.g. OPS RGS = H02)	VH
HF (e.g. MAS RGS = H02)	VHF (e.g. OPS RGS = ADK)	HV
HF (e.g. MAS RGS = H02)	SAT (e.g. OPS RGS = POR1)	HS

D.2.2 ANSP data collection for ADS-C report delivery time/continuity

D.2.2.1 General

D.2.2.1.1 This section provides guidance on data collection and performance measurement for the ADS-C application. The analysis of actual surveillance performance (ASP) is based on the measurement of the difference between the time extracted from the decoded ADS-C basic group timestamp (i.e. time at position) and the time the ADS-C report is received at the ANSP.

D.2.2.1.2 While each ANSP may store the data in a database format, for the purpose of sharing ADS-C transaction data (e.g. with the regional monitoring entity for regional analysis), the data should be sent as a comma delimited text file. The format for each record will contain, at minimum the 12 data points specified below in Table D-1.

D.2.2.2 Recording the data points for each ADS-C report

D.2.2.2.1 The data points shown in Table D-3 are recommended as the minimum set that the ANSP should extract from ADS-C system recordings to provide sufficient information for ASP analysis and problem investigation. Possibilities for additional data points that may be extracted for more detailed analysis are listed below Table D-3. Most of the data points can be extracted from either the ACARS header or the ADS-C application message. However, the aircraft type and operator will need to be matched to each record from a separate database using the aircraft registration as the common point.

Table D-3. ADS-C data collection points

Ref	Label	Description and/or remarks
1	ANSP	The four letter ICAO designator for the facility (e.g. NZZO).
2	Aircraft Registration	The aircraft registration in ICAO Doc 4444 Format (no hyphens, extraneous characters, etc.) (e.g. N104UA). *Note.— Extracted from ACARS header or application message.*
3	Aircraft Type Designator	The ICAO aircraft type designator (e.g. B744). *Note.— Extracted from the ANSP's database using aircraft registration as key. Aircraft type designators are contained in Doc 8643.*
4	Operator Designator	The ICAO designator for the aircraft operating agency (e.g. UAL). *Note.— Extracted from the ANSP's database using aircraft registration as key.*
5	Date	In YYYYMMDD format (e.g. 20081114). *Note.— Extracted from the ANSP's system data recording time stamp.*
6	RGS	Designator of the RGS that the ADS-C downlink was received from. *Note.— This is a 3 or 4 letter designator extracted from the second field of the ACARS header DT line (e.g. DT DDL* ***POR1*** *121212 M01A).*
7	Report Type	The type of ADS-C report extracted from the ADS-C basic group report tag where tag value 7=PER, 9=EMG, 10=LDE, 18=VRE, 19=LRDE, 20=WCE. As some aircraft concatenate more than one report in the same downlink extract the ADS-C report tag from each ADS-C basic group and identify them in the REP_TYPE column by using the first letter of the report type as an identifier (e.g. for a concatenated report containing two ADS-C basic groups for a periodic report and a waypoint event report the field will contain PW). Where a downlink does not contain an ADS-C basic group, the REP_TYPE field will be left blank.
8	Latitude	The current latitude decoded from the ADS-C basic group. The format is "+" for North and "-" for South followed by a decimal number of degrees (e.g. -33.456732).
9	Longitude	The current longitude decoded from the ADS-C basic group. The format is "+" for East and "-" for West followed by a decimal number of degrees (e.g. +173.276554).
10	Aircraft Time	The time the aircraft was at the position (latitude and longitude) in the ADS-C report to within the accuracy specified by the RSP specification in HH:MM:SS (e.g. 03:44:15). *Note.— Decoded from the ADS-C basic group timestamp extracted as seconds since the most recent hour. See RTCA DO-258A/EUROCAE ED-100A, section 4.5.1.4.*
11	Received Time	The ANSP timestamp on the receipt of the ADS-C message in HH:MM:SS (e.g. 03:44:45). *Note.— Extracted from the ANSP's system data recording time stamp.*

Ref	Label	Description and/or remarks
12	Transit Time	The transit time of the ADS-C downlink in seconds calculated as the difference between #10 Aircraft Time and #11 Received Time (e.g. 30).

D.2.2.2.1 In a comma delimited text file format, these data would appear as follows:

NZZO,N104UA,B744,UAL,20081114,POR1,PER,-33.456732,+173.276554,03:44:15,03:44:45,30

D.2.2.2.2 The ANSP may find the following additional data useful for performance analysis, investigate reported problems and support other analysis, such as from monitoring the application of performance-based horizontal separation minima:

a) The aircraft call sign extracted from either the Flight Plan (e.g. ANZ123), the AFN logon for the flight (e.g. NZ123) or the FI line in the ACARS header (e.g. NZ0123).

b) Direction of flight calculated by the ANSP flight data processor and displayed as a three figure group representing degrees true (e.g. 275).

c) The current altitude (e.g. 35 000) decoded from the ADS-C basic group. The altitude combined with the latitude, longitude, and time provide the aircraft position at the time the report was generated. Aircraft movement data is needed in airspace safety assessments and/or airspace safety monitoring analyses. Inclusion of altitude in the data sample would allow it to be used for both ADS-C performance monitoring and airspace safety monitoring analyses.

d) ADS-C predicted position latitude and longitude and time when available. (*Note.— time decoded from the ADS-C predicted group where timestamp is extracted as seconds since the most recent hour*. *(See RTCA DO-258A section 4.5.1.4)*). For consistency the following formats are recommended: For latitude use “+” for North or “-” for South followed by a decimal number of degrees (e.g. -33.456732). For longitude use “+” for East or “-” for West followed by a decimal number of degrees (e.g. +173.276554).

e) The communications type (COMTYP) identifying the media used for delivering the ADS-C report. This is determined based on the RGS field (#6). Satellite (SAT), Very High Frequency (VHF), High Frequency (HF). Refer to Table D-2.

D.2.2.3 Calculating ADS-C report delivery time

D.2.2.3.1 The ADS-C report delivery time is calculated by the difference between the times when the ADS-C report indicated the aircraft was at the reported position to when the ATS unit received the report.

D.2.3 ANSP data collection for CPDLC and ADS-C availability

D.2.3.1 The ANSP should collect data on CSP notified system outages as well as detected outages that are not observed by or notified by the CSP as these data are used to calculate the actual availability of CPDLC and ADS-C.

D.2.3.2 For each outage the following information should be collected:

a) Time of CSP outage notification: In YYYYMMDDHHMM format or "Not Notified" if no CSP notification received.

b) CSP Name: Name of CSP providing outage notification if applicable.

c) Type of outage: Report media affected SATCOM, VHF, HF, ALL.

d) Outage start time: In YYYYMMDDHHMM format.

e) Outage end time: In YYYYMMDDHHMM format.

f) Duration of Outage: In minutes.

D.2.3.3 As per Appendix B only outages greater than 10 minutes are reported. An example form is shown in Table D-4.

D.2.3.4 The data sets should also be examined to identify the cases of outages not detected or notified by the CSP. For example, when delays are observed from multiple aircraft and the messages are received by the ANSP at similar times, this may indicate a system outage. An example of an outage that was not notified by any CSP is illustrated in Table D-4, with large ADS-C downlink delays observed from 3 aircraft during the period from 1120 and 1213.

Table D-4. ADS-C outages not notified

Aircraft registration	Aircraft time	ANSP system time	Downlink time (Seconds)
ZKSUI	11:55:38	12:12:52	1034
ZKSUI	11:44:42	12:12:19	1657
ZKSUI	11:23:21	12:08:32	2711
ZKSUJ	11:41:54	12:12:01	1807
ZKSUJ	11:26:18	12:09:42	2604
ZKSUJ	11:20:34	12:07:39	2825
ZKOKG	11:53:52	12:12:51	1139

D.3 ANSP performance monitoring and analysis

D.3.1 Monitoring time/continuity of CPDLC transactions and ADS-C report deliveries

D.3.1.1 General

D.3.1.1.1 The collected CPDLC and ADS-C data are used to monitor the time/continuity of CPDLC transactions and ADS-C report delivery. In addition to monitoring the aggregate system performance, monitoring should also be conducted for important subsets of the data, including all observed media types, message type(s), operators, aircraft types and airframes.

D.3.1.2.2 The first step of the analysis is filtering the collected data. The following sections provide suggested filtering that will allow for an effective measurement of the RCP and RSP time/continuity parameters.

D.3.1.2 Filtering CPDLC data

D.3.1.2.1 The CPDLC data sent to a regional monitoring entity should at minimum contain all transactions that contain a WILCO response. The regional monitoring entity will filter transactions as agreed by their regional forum.

D.3.1.2.2 For the purposes of monitoring at the local level, it is recommended that the CPDLC transactions initiated by the following message types should be filtered from the CPDLC data set when measuring RCP:

a) non-intervention route messages (UM 79, UM 80, UM 81, UM 82, UM 83, UM 84, UM 91, and UM 92);

b) contact instructions (UM 117 – UM 123); and

c) RESUME NORMAL SPEED (UM 116).

D.3.1.2.3 The rationale behind only assessing data within a subset of CPDLC transactions is that the critical communications requirement is provided by intervention messages when applying reduced separation standards. Incorporating other message types such as free text queries, information requests not requiring a DM 0 WILCO response, messages with DM 1 UNABLE responses, or DM 2 STANDBY responses followed by DM 0 WILCO, or other CPDLC uplink messages specified above will skew the observed data because of the longer response times from the flight deck.

D.3.1.2.3.1 The removal of all contact instructions (UM 117 –UM 123) will drastically reduce the monthly data set for some smaller ANSPs and make it difficult to assess ACTP for individual fleets or aircraft on a monthly basis. For this reason some ANSPs may retain these (UM 117 – UM 123) transactions when assessing ACTP. The ANSP should decide on a data set that provides the best performance assessment capability.

D.3.1.3 Filtering ADS-C data

D.3.1.3.1 If an ADS-C report is sent and the acknowledgement (ACK) from the GES is not received within a defined period of time, the aircraft system will resend the report. In these cases, the ATS unit may receive the same ADS-C report two or three times. This typically occurs, when the aircraft system is transitioning between VHF and SATCOM media types, but there are other conditions that result in an ATS unit receiving multiple ADS-C reports. Experience indicates approximately 1.5 per cent of the total ADS-C reports are duplicates.

D.3.1.3.2 Duplicate ADS-C reports should be removed from the data set prior to analysis. In the case of duplicate reports, only the ADS-C report with the earliest receipt time should be kept in the data set. Table D-5 illustrates an example of multiple ADS-C reports received at different times for the same position from the same aircraft.

Table D-5. Example of multiple ADS-C reports for same position from same aircraft

LAT_LON	Aircraft time	ANSP system time	Downlink time (Seconds)
350225S1694139E	22:29:45	22:31:04	79
350225S1694139E	22:29:45	22:34:56	311
350225S1694139E	22:29:45	22:40:05	620

D.3.1.3.3 In addition, all ADS-C report delivery times that are zero or less than zero should be filtered out. These times represent cases where the ADS-C basic group timestamp extracted as seconds since the most recent hour was incorrectly decoded into the HH:MM:SS format by the ATS unit's system.

D.3.1.4 Filtering CPDLC and ADS-C data during service outage periods

D.3.1.4.1 In addition to being used to measure availability, the outage data should be used for filtering the ADS-C and CPDLC data sets. All ADS-C reports and CPDLC transactions occurring during outage periods reported by the CSP should be removed from the data set prior to analysis. All ADS-C reports and CPDLC transactions occurring during an unreported outage detected by the ANSP should also be removed.

D.3.1.5 Cumulative distributions of CPDLC and ADS-C data

D.3.1.5.1 Filtering data will limit the size of the sample that will be used in the cumulative distributions of CPDLC and ADS-C data. When providing cumulative distributions of CPDLC and ADS-C data, a sufficient sample size should be determined taking into account a number of factors, such as:

a) type of data that will be considered in the sample (e.g. CPDLC transactions that are representative of an intervention to manoeuvre the aircraft in the event of a conflict, or ADS-C reports);

b) cost, time and difficulty in collecting the data (e.g. for an entire airspace, an aircraft operator's fleet, an aircraft type/system, or a new media type);

c) existing knowledge about the underlying technologies and implementation (e.g. data have already been collected and analysed from a similar implementation using similar technologies);

d) variability of the data collected (e.g. how predictable is it that the performance will fall within a specified range?);

e) the specific criterion that the data sample will be measures against (e.g. if the criterion is specified at 95 per cent, then, statistically, the data sample would need to be at least 1 000 data points); and

f) level of confidence desired in the estimated result (e.g. operational judgment will play a role).

D.3.1.5.3 Once a sufficient sample of filtered data has been collected, the next step is to calculate a cumulative distribution for each of the performance parameters to be measured: ACP, ACTP, PORT, for the CPDLC applications and ASP for the ADS-C application. In order to enable the direct mapping of the performance data to the specifications, the cumulative distribution is plotted with a resolution and range appropriate for the RCP/RSP specification. For example, the cumulative distribution of ACP data plotted at 1-second intervals with a range of 300 seconds would be appropriate for the RCP 240 specification.

D.3.1.5.3 Regarding assessment of the performance by media type, only those CPDLC transactions where both the RGS for the MAS and the RGS of the operational response are from the same media type should be measured. Any mixed media transaction such as where the MAS is received via a VHF RGS and the operational response is via a SATCOM RGS would be excluded from a SATCOM analysis. They would be measured under a VHF/SAT mixed-media category and would also be included in the aggregate measurement. Since there is only one message involved in an ADS-C downlink report, this issue does not impact the ASP analysis.

D.3.1.5.4 It is recommended that the ANSP begins with graphical analysis of the data as this method is useful for clearly depicting the performance and facilitating the identification of performance problems. The cumulative performance should be shown in comparison to the relevant parameter values for the transaction times and corresponding continuity requirements. For example, when measuring the cumulative ACP for an RCP 240 operation, the following parameters values should be included to determine whether or not the operation is meeting the RCP 240 safety and efficiency requirements: 240 seconds at 99.9 per cent and 210 seconds at 95.0 per cent.

D.3.1.5.5 Figure D-3 provides a typical graph, constructed using a spreadsheet application, illustrating ACTP over SATCOM in the NZZO FIR between 2009 and 2013. The performance is measured against the RCP 240 specifications defined for ACTP, 95 per cent within 120 seconds and 99.9 per cent within 150 seconds.

D.3.1.5.6 Similar graphs are used to assess ACP, PORT and ASP.

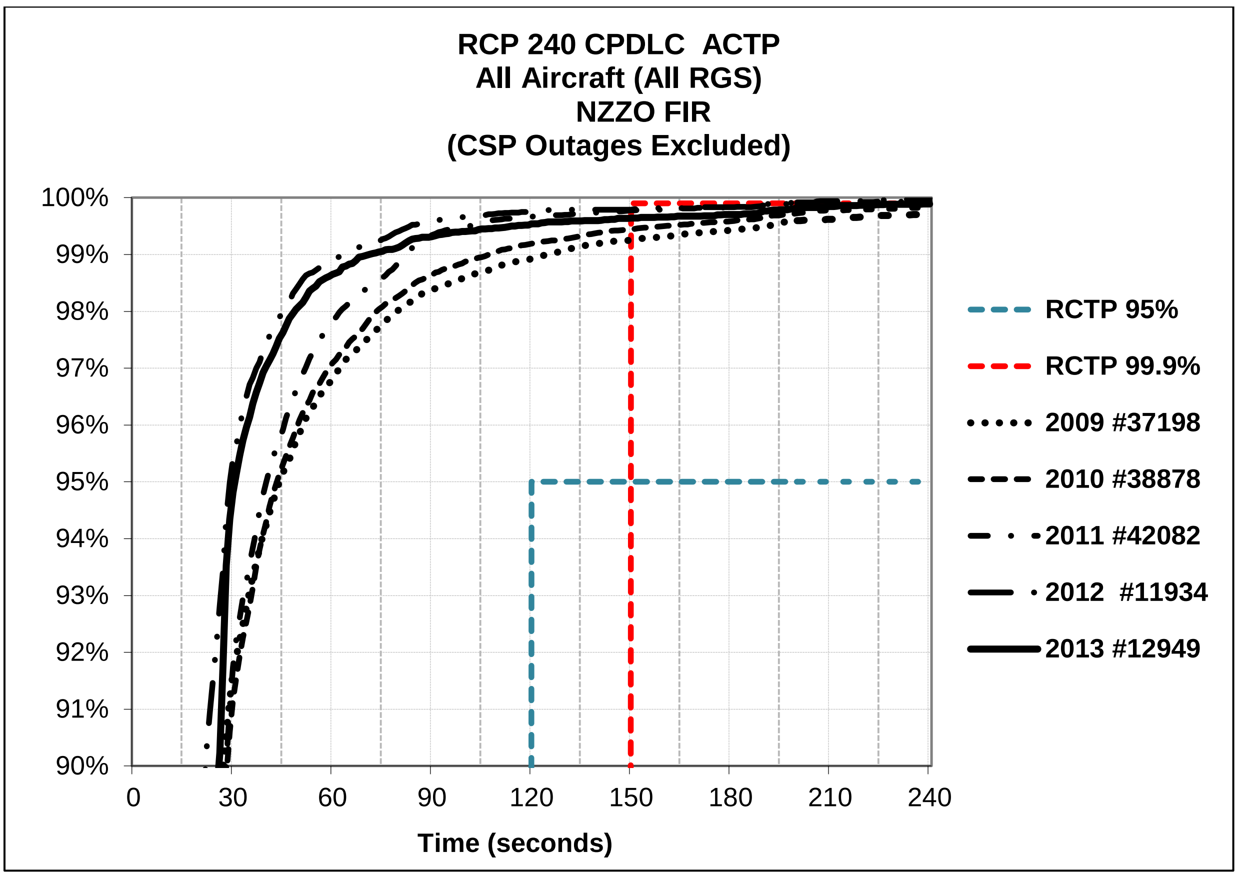


Figure D-3. CPDLC ACTP performance - graphical by year

D.3.1.5.7 Figure D-4 illustrates an alternative graphical method of analysis, in which the value of the cumulative distribution of the ACP corresponding to the time value specified for the 99.9 per cent continuity requirement, 210 seconds, is charted for ALL RGS performance from 2009 to 2014.

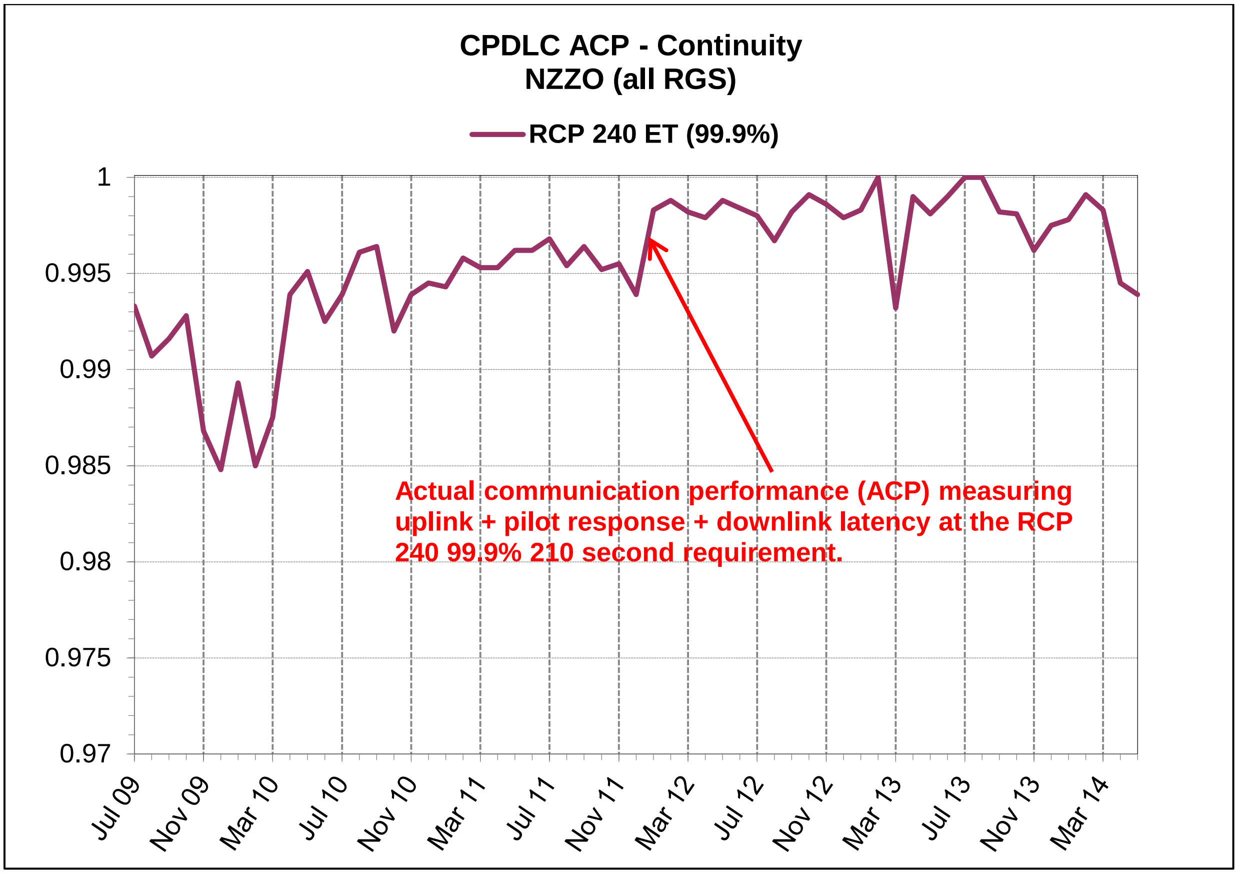


Figure D-4. CPDLC ACTP performance – graphical by month

D.3.1.5.8 It is also helpful to view and report the results in tabular format, especially when there is an impractical amount of series associated with a particular subset to be clearly displayed on a chart (e.g. the operator subsets). Table D-6 illustrates a tabular performance report for ASP, ACP, ACTP, and PORT by operator.

Table D-6. ASP, ACTP, ACP and PORT by operator – tabular format

Oper	ADS-C				CPDLC						
Code	Count of ADS-C	% of Total ADS-C	ASP 95%	ASP 99.9%	Count of CPDLC	% of Total CPDLC	ACTP 95%	ACTP 99.9%	ACP 95%	ACP 99.9%	PORT 95%
R	141 591	12.3%	98.2%	99.4%	2 712	7.0%	99.3%	99.4%	98.5%	98.8%	95.9%
AA	113 648	9.9%	99.2%	99.8%	5 309	13.7%	99.9%	99.9%	99.5%	99.6%	97.9%
L	85 874	7.5%	98.0%	99.3%	2 490	6.4%	99.4%	99.6%	98.6%	98.8%	95.0%
BB	62 638	5.5%	99.2%	99.5%	3 096	8.0%	99.5%	99.6%	99.3%	99.7%	97.4%
II	58 775	5.1%	99.5%	99.8%	1 875	4.8%	100.0%	100.0%	99.2%	99.5%	96.6%
A	54 411	4.7%	96.0%	98.5%	1 133	2.9%	98.3%	98.9%	97.6%	98.2%	95.3%
FF	51 564	4.5%	97.5%	99.4%	2 711	7.0%	99.6%	99.7%	99.2%	99.5%	97.2%
GG	42 737	3.7%	99.2%	99.7%	1 185	3.1%	99.7%	99.8%	99.2%	99.4%	95.5%

Oper	ADS-C				CPDLC						
Code	**Count of ADS-C**	**% of Total ADS-C**	**ASP 95%**	**ASP 99.9%**	**Count of CPDLC**	**% of Total CPDLC**	**ACTP 95%**	**ACTP 99.9%**	**ACP 95%**	**ACP 99.9%**	**PORT 95%**
HH	42 369	3.7%	99.4%	99.7%	1 393	3.6%	99.7%	99.9%	99.2%	99.5%	93.2%
DD	40 236	3.5%	96.5%	99.1%	2 051	5.3%	99.6%	100.0%	98.6%	99.1%	94.0%
SS	31 387	2.7%	98.2%	99.6%	524	1.3%	99.1%	99.6%	98.3%	99.1%	92.6%
BH	30 213	2.6%	94.3%	97.4%	939	2.4%	98.1%	98.8%	96.5%	97.8%	92.3%
EE	28 790	2.5%	99.2%	99.6%	1 856	4.8%	99.7%	99.7%	99.0%	99.4%	94.9%
CC	24 260	2.1%	98.5%	99.2%	856	2.2%	99.7%	99.8%	99.3%	99.5%	96.9%
TT	23 432	2.0%	99.7%	99.9%	777	2.0%	99.7%	99.7%	99.4%	99.6%	96.7%
JJ	23 352	2.0%	98.9%	99.8%	338	0.9%	99.7%	99.7%	98.2%	98.5%	94.1%
KKKK	21 066	1.8%	99.7%	99.8%	1 657	4.3%	100.0%	100.0%	100.0%	100.0%	98.1%
MM	20 228	1.8%	99.5%	99.8%	553	1.4%	99.8%	99.8%	98.9%	99.1%	95.8%
AQ	18 239	1.6%	96.8%	98.5%	733	1.9%	98.8%	99.5%	98.1%	99.2%	93.7%
PP	15 648	1.4%	99.1%	99.9%	429	1.1%	100.0%	100.0%	100.0%	100.0%	96.7%
MMMM	15 027	1.3%	96.2%	98.2%	336	0.9%	99.1%	99.1%	95.8%	97.6%	86.6%
ZZ	14 595	1.3%	99.2%	99.7%	599	1.5%	99.8%	99.8%	99.3%	99.8%	98.2%
Meets criteria →				Under criteria but above 99.0% →					Under criteria →		

D.3.1.5.9 Figure D-5 illustrates a comparative analysis of the ACTP over SATCOM for different fleets operating in NZZO FIR during 2012. Significant variations in observed performance, especially for the same aircraft type should be flagged for further analysis. It may also be useful to compare the performance of underperforming fleets with that observed for the same fleet in other CTAs.

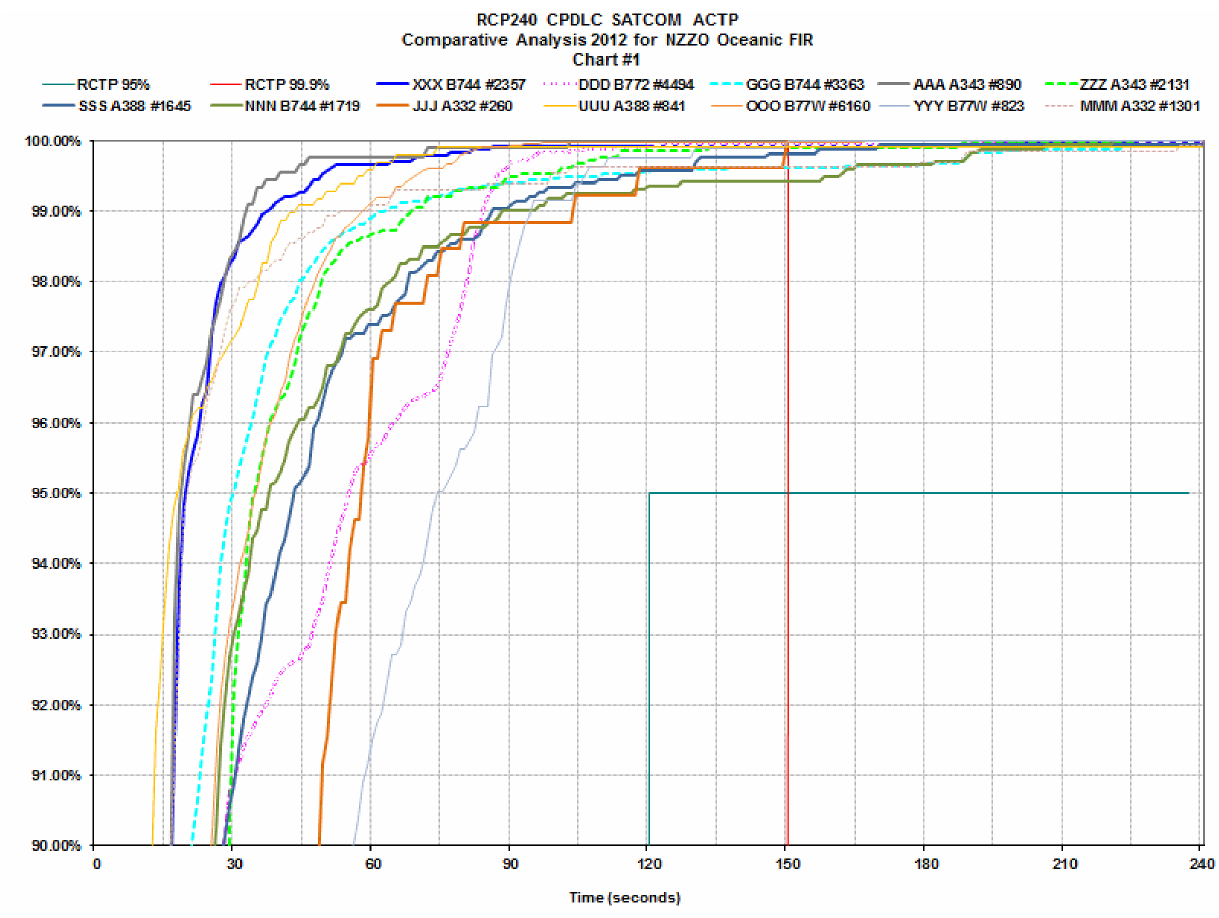


Figure D-5. CPDLC ACTP comparative operator/aircraft type performance

D.3.1.5.10 Figure D-6 illustrates the performance before and after an issue was identified with the B772 fleet of operator DDD in 2009. The regional CRA determined the poor performance of this fleet to be related to an aircraft issue that affected all B777 aircraft, which was eventually resolved by a software upgrade. It should be noted that software upgrades for aircraft may take some time to be implemented by all airlines.

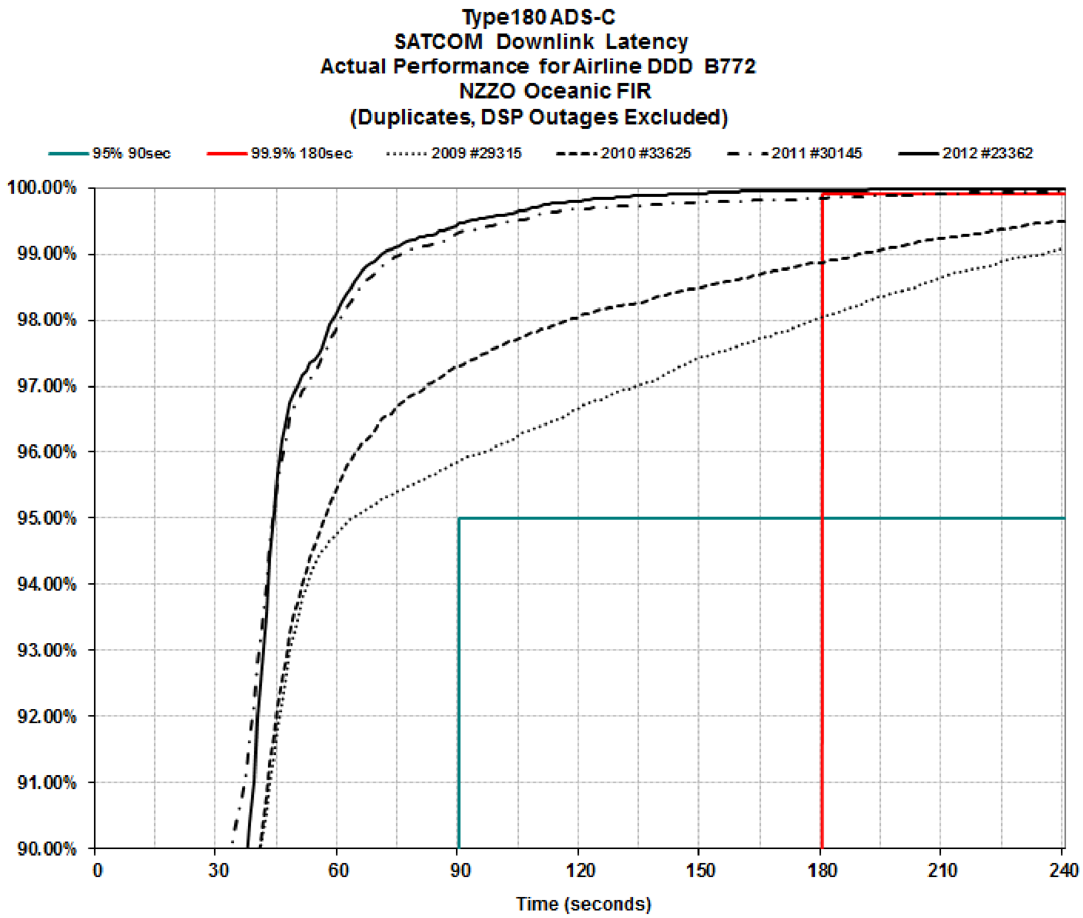


Figure D-6. SATCOM ADS-C Operator DDD B777 2009-2012

D.3.1.5.11 Identifying poor performers

D.3.1.5.11.1 There are many potential causes of degraded performance. Considerable analysis may be required to identify the reasons behind poor performing fleets so it is not possible to provide guidance for all situations. Some analysis techniques that have been found to be useful are provided in the following paragraphs.

D.3.1.5.11.2 On a number of occasions poor performance has been attributed to a specific aircraft in a fleet. Usually these poor-performing aircraft can be identified by the visual inspection of monthly data ordered in terms of transit time, or more accurately by graphing the monthly data for a fleet by aircraft registration.

D.3.1.5.11.3 Techniques such as graphing the positions of all delayed messages on a geographical display have identified areas for further investigation.

D.3.1.5.11.4 There are low speed (600 bps and 1 200 bps) and high speed (10 500 bps) data rates defined for the P, R, and T SATCOM channels. Some aircraft are capable of low speed SATCOM only. Other aircraft are capable of both high speed and low speed. However, not all aircraft that are capable of high speed operation have enabled the use of high speed SATCOM and, instead operate in low speed only. It is recommended an operator using low speed SATCOM channels change to the high speed channels where possible. Low or high speed channel use is selectable by an individual operator in the aircraft operational requirements table (ORT).

D.3.1.5.11.5 Significant performance benefits accrue with the use of the high speed channels as illustrated in Figure D-7.

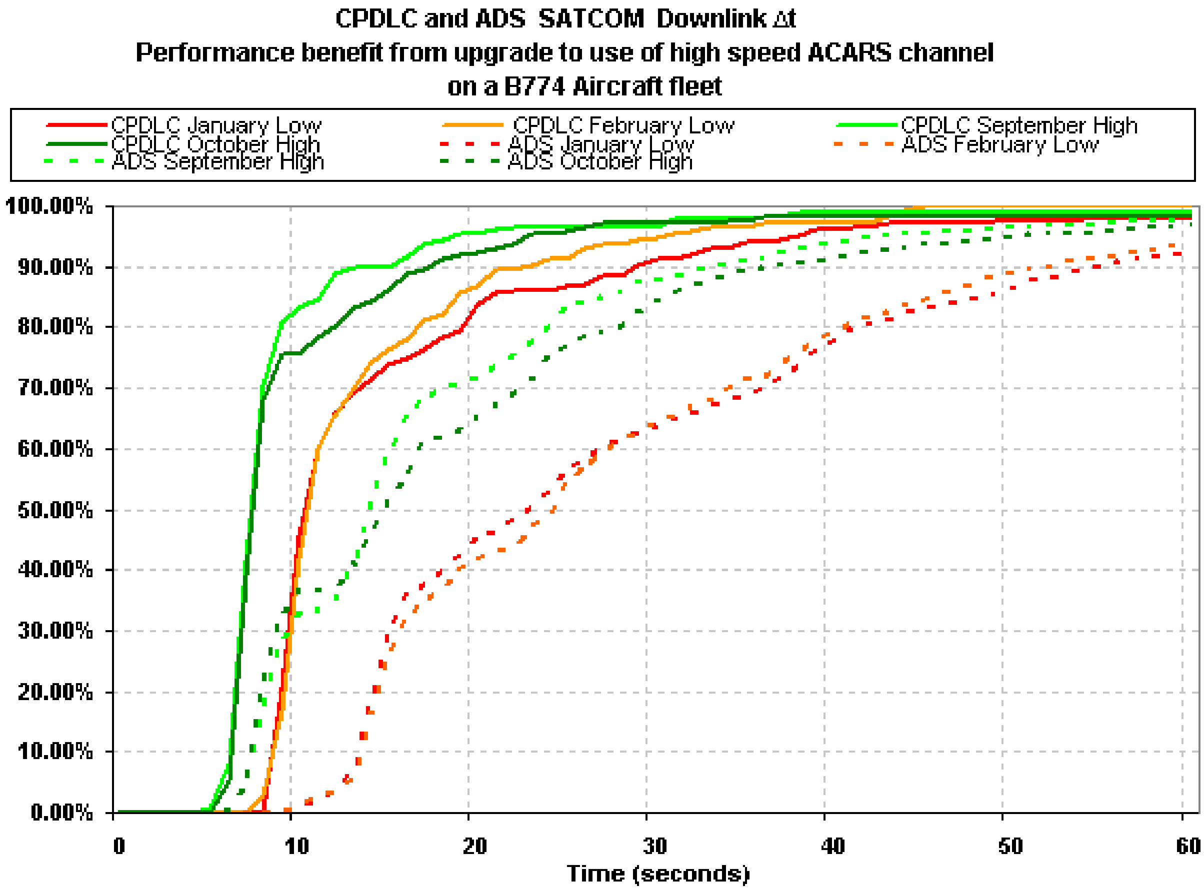


Figure D-7. Effect of ACARS channel speed on ADS-C surveillance data transit time

D.3.1.5.11.6 The ANSP can assess ACARS channel speed use by evaluating the monthly downlink times for ADS-C reports via SATCOM. For users of high speed channels, the ANSP will consistently see a small percentage of reports in the 6-8 second time bands. Low speed channels users usually have very few reports less than 10 seconds.

D.3.1.5.11.7 The ANSP should identify those operators using the low speed channels and stakeholders should work with those operators to achieve an upgrade to the high speed channels.

D.3.2 Monitoring availability of CPDLC and ADS-C

D.3.2.1 Using the data collected on outages reported by the CSP as well as unreported outages identified by the ANSP, described in section D.2.3, graphical analysis can be used to track availability as illustrated in Figure D-8 and Figure D-9.

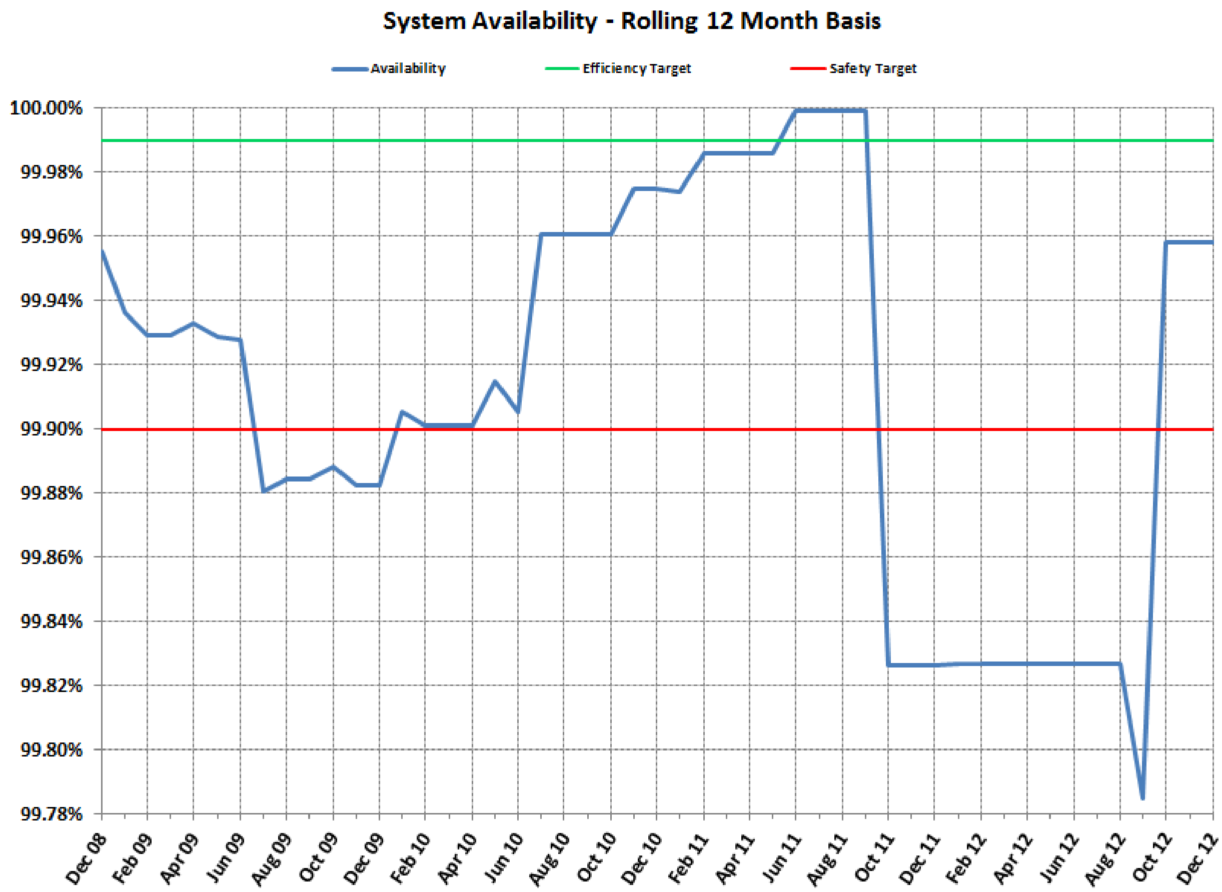


Figure D-8. Example system availability graph

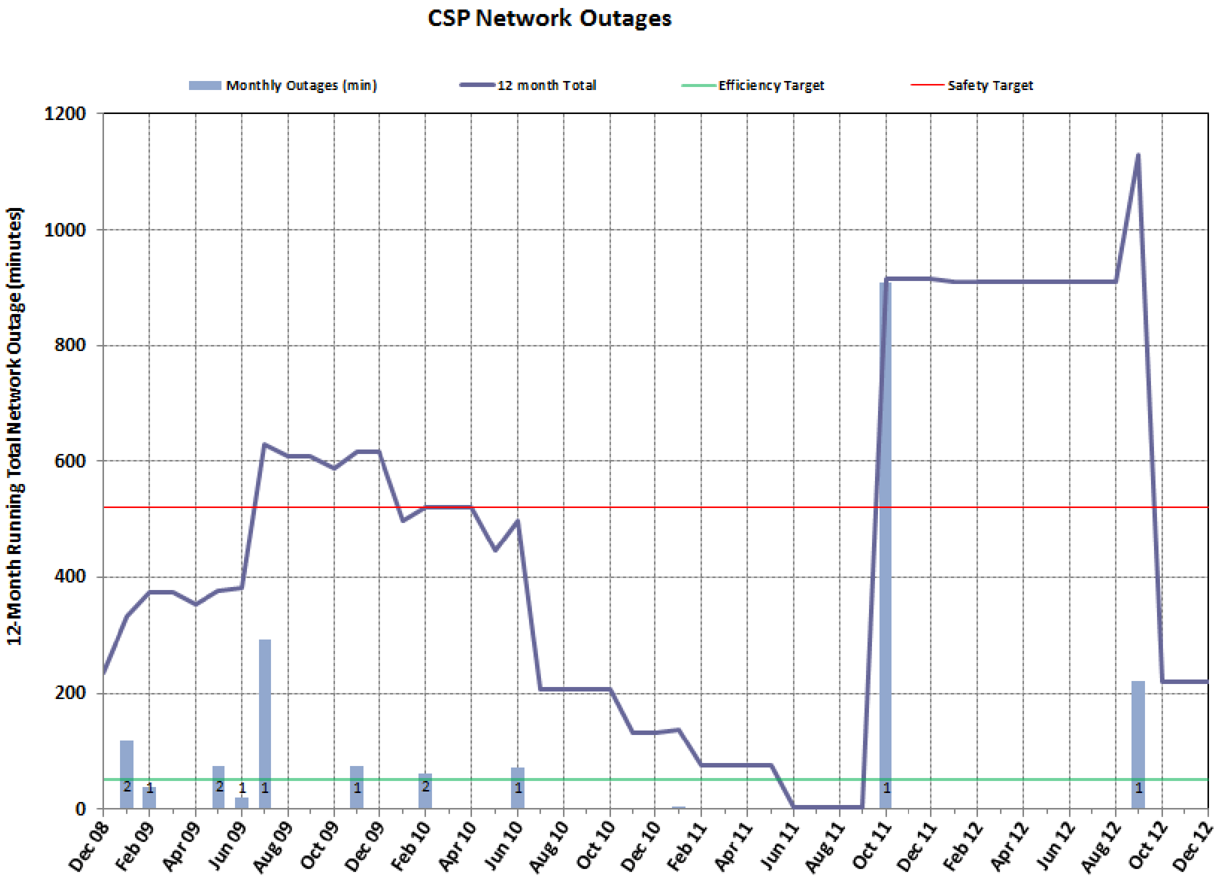


Figure D-9. Example network outage graph

D.3.3 ANSP monitoring reports for regional and global use

D.3.3.1 Each ANSP within a region should compile monitoring reports at the interval agreed by the regional forum. A tabular format can be used to report on the observed system performance in terms of the availability and time/continuity parameters specified in the applicable RCP and RSP specifications. Examples of local PBCS monitoring reports are provided as follows:

a) Table D-7 – service availability;

b) Table D-8 – RCP; and

c) Table D-9 – RSP.

D.3.3.2 Table D-10 provides an example of a PBCS monitoring report for an operator with different aircraft types/systems in its fleet.

Table D-7. Example service availability local PBCS monitoring report

PBCS Monitoring Report – Service Availability				
ANSP/CTA →	ANSP1/CTA1	**Period →**	1 Jan to 30 Jun 2014 (6 months)	
Specification →	RCP 240/RSP 180	**Application →**	CPDLC/ADS-C	
CSP notification	**CSP name**	**Outage type**	**Start time**	**Duration (minutes)**
200907150005	CSP1	SATCOM	200907150001	19
Not notified	N/A	SATCOM	200907212233	22
200907281515	CSP2	VHF	200907281510	15
. . .				

Table D-8. Example RCP local PBCS monitoring report

PBCS Monitoring Report – RCP							
ANSP/CTA →		ANSP1/CTA1	**Period →**		1 Jan to 30 Jun 2014 (6 months)		
Specification →		RCP 240	**Application →**		CPDLC		
Colour Key		**Transaction Counts (WILCO Received)**	**95% RCP 240 benchmark**		**99.9% RCP 240 benchmark**		
Meets criteria →			**ACP**	**ACTP**	**ACP**	**ACTP**	**PORT**
Under criteria but above 99.0% →			**<=180 sec**	**<=120 sec**	**<=210 sec**	**<=150 sec**	**<=60 sec**
Under criteria →			**End-to-End**	**Network**	**End-to-end**	**Network**	**Pilot Response**
Media Type (100 messages or more)							
SATCOM		35 123	98.90%	99.53%	99.28%	99.67%	
VHF		3 422	99.15%	99.80%	99.27%	99.85%	
HF		13					
SATCOM+HF		-					
SAT+VHF		-					
VHF+SAT		-					
HF+VHF		-					
. . .							
All		38 837	98.86%	99.52%	99.23%	99.67%	
Remote Ground Station (RGS) / Ground Earth Station (GES) (100 messages or more)							
GES1	VHF	14 476	99.03%	99.68%	99.32%	99.76%	
GES2	VHF	5 893	99.42%	99.69%	99.69%	99.76%	

PBCS Monitoring Report – RCP								
ANSP/CTA →		ANSP1/CTA1	**Period →**		1 Jan to 30 Jun 2014 (6 months)			
Specification →		RCP 240	**Application →**		CPDLC			
Colour Key		**Transaction Counts (WILCO Received)**	**95% RCP 240 benchmark**		**99.9% RCP 240 benchmark**			
Meets criteria →			**ACP**	**ACTP**	**ACP**	**ACTP**	**PORT**	
Under criteria but above 99.0% →			**<=180 sec**	**<=120 sec**	**<=210 sec**	**<=150 sec**	**<=60 sec**	
Under criteria →			**End-to-End**	**Network**	**End-to-end**	**Network**	**Pilot Response**	
GES3	VHF	4 494	98.49%	99.29%	98.82%	99.49%		
GES4	VHF	4 328	99.26%	99.70%	99.54%	99.77%		
GES5	VHF	1 455	95.60%	97.73%	97.32%	98.63%		
. . .								
Uplink Message Type (UM) (100 messages or more)								
U20 U129		13 516	99.29%	99.64%	99.59%	99.74%	97.57%	
U26 U129		12 894	99.12%	99.54%	99.37%	99.64%	96.49%	
U106		2 301	99.48%	99.70%	99.70%	99.74%	98.44%	
U74		1 001	97.60%	99.30%	98.50%	99.60%	92.01%	
. . .								
Aircraft Type (100 messages or more)								
ACT1		5 960	99.41%	99.80%	99.58%	99.87%	96.49%	
ACT2		5 357	99.12%	99.72%	99.48%	99.79%	95.13%	
ACT3		4 590	99.39%	99.65%	99.63%	99.69%	97.82%	
ACT4		4 422	97.33%	98.91%	98.10%	99.30%	92.74%	
ACT5		4 390	98.54%	99.45%	98.95%	99.70%	93.69%	
. . .								
Operator (100 messages or more)								
OP1		5 309	99.47%	99.85%	99.62%	99.91%	97.87%	
OP2		3 096	99.29%	99.52%	99.71%	99.61%	97.35%	
OP3		2 712	98.45%	99.34%	98.78%	99.41%	95.87%	
OP4		2 711	99.15%	99.63%	99.45%	99.67%	97.23%	
OP5		2 051	98.63%	99.61%	99.12%	99.95%	93.95%	
. . .								

Table D-9. Example RSP local PBCS monitoring report

PBCS Monitoring Report – RSP				
ANSP/CTA →	ANSP1/CTA1	**Period →**	1 Jan to 30 Jun 2014 (6 months)	
Specification →	RSP 180	**Application →**	ADS-C	
Colour Key		**Report Counts**	**95% RSP 180 benchmark**	**99.9% RSP 180 benchmark**
Meets criteria →			**ASP**	**ASP**
Under criteria but above 99.0% →			**<=90 sec**	**<=180 sec**
Under criteria →			**End-to-End**	**End-to-end**
Media Type (100 messages or more)				
SATCOM		893 064	97.98%	99.27%
VHF		251 619	98.98%	99.54%
HF		4 013	92.30%	94.49%
. . .				
All		1 148 696	98.09%	99.28%
Remote Ground Station (RGS) / Ground Earth Station (GES) (100 messages or more)				
GES1	VHF	355 121	98.57%	99.51%
GES2	VHF	167 491	97.54%	99.31%
GES3	VHF	106 908	99.05%	99.62%
GES4	VHF	101 662	98.64%	99.38%
GES5	VHF	38 006	91.96%	96.33%
. . .				
Operator (100 messages or more)				
OP1		141 591	98.17%	99.35%
OP2		113 648	99.17%	99.78%
OP3		85 874	98.01%	99.31%
OP4		62 638	99.23%	99.46%
OP5		30 213	94.31%	97.44%
. . .				

Table D-10. Example aircraft operator PBCS monitoring report

Aircraft Operator PBCS Monitoring Report – By Fleet							
Operator →	ZYX		**Period →**	1 Jan to 30 Jun 2014 (6 months)			
ANSP →	ANSP1		**CTA →**	CTA1			
RCP							
Specification →	RCP 240		**Application →**	CPDLC			
Colour Key		**Transaction Counts (WILCO Received)**	**95% RCP 240 benchmark**		**99.9% RCP 240 benchmark**		**RCP PORT**
Meets criteria →			**ACP**	**ACTP**	**ACP**	**ACTP**	**PORT**
Under criteria but above 99.0% →			**<=180 sec**	**<=120 sec**	**<=210 sec**	**<=150 sec**	**<=60 sec**
Under criteria →			**End-to-End**	**Network**	**End-to-End**	**Network**	**Pilot response**
Aircraft type (ACT)/Equipment type (EQ)							
ACT1	EQ1	777	99.4%	99.7%	99.6%	99.7%	96.7%
ACT1	EQ2	172	99.4%	99.4%	100%	100%	97.7%
ACT2	EQ1	336	95.8%	99.1%	97.6%	99.1%	86.6%
ACT2	EQ2	317	99.4%	99.7%	99.7%	100%	95.9%
ACT3	EQ1	142	99.3%	100%	100.0%	100%	97.9%
Aggregate		*1 744*	*98.7%*	*99.6%*	*99.3%*	*99.7%*	*94.8%*

RSP				
Specification →	RSP 180		**Application →**	ADS-C
		Report Counts	**95% RSP 180 benchmark**	**99.9% RSP 180 benchmark**
			ASP % <=90 sec	**ASP % <=180 sec**
Aircraft type (ACT)/Equipment type (EQ)				
ACT1	EQ1	23 432	99.7%	99.9%
ACT1	EQ2	8 709	97.6%	99.3%
ACT2	EQ1	15 027	96.2%	98.2%
ACT2	EQ2	14 534	98.1%	99.4%
ACT3	EQ1	7 408	98.5%	99.7%
Aggregate		*69 110*	*98.2%*	*99.3%*

D.3.3.3 When compiling data for analysis at the regional level the data from the individual ANSPs may be shared in the format of the raw .csv files as described in paragraph D.2.1.2.4 for CPDLC data and paragraph D.2.2.2.1 for ADS-C data. In this case, the regional PBCS monitoring programme would aggregate the data and perform the analysis as described in section D.3.1 and section D.3.2.

D.3.3.4 The regional PBCS monitoring programme may elect to receive data containing the cumulative distributions calculated by the ANSP. In this case, the regional PBCS monitoring programme would specify the time period of interest, the subset(s) of interest, the required filtering and the required format to ensure consistency between the data sets.

D.3.3.5 Figure D-10 illustrates a suggested format for sharing the data with the regional PBCS monitoring programme and includes part of an ANSP report of actual performance for ACTP, ACP, and PORT against the RCP 240 specification. The total number of transactions and the cumulative percentage at 1-second increments are shown. This type of format would enable regional aggregation of agreed performance information as well as assist in the aggregation at the global level. A similar format can be used for ASP against the RSP 180 specification.

PBCS Monitoring Report – RCP Cum %			
ANSP/CTA →	ANSP1/CTA1	**Period →**	Jan – Jun 2014
Specification →	RCP 240	**Application →**	CPDLC
Number of CPDLC transactions in sample →			12,354
Time increment (seconds)	**RCMP = 180 @ 95% 210 @ 99.9%**	**RCTP = 120 @ 95% 150 @ 99.9%**	**RCP PORT = 60 @ 95%**
	Cum % ACP	**Cum % ACTP**	**Cum % PORT**
1	0.0000	0.0000	0.0000
2	0.0000	0.0001	0.0000
…			
59	0.9213	0.9877	0.9779
60	0.9256	0.9881	0.9789
…			
119	0.9843	0.9950	0.9950
120	0.9845	0.9951	0.9950
…			
149	0.9896	0.9962	0.9964
150	0.9897	0.9963	0.9964
…			
179	0.9921	0.9967	0.9972
180	0.9921	0.9967	0.9972
…			
209	0.9947	0.9988	0.9978
210	0.9947	0.9989	0.9978
…			
239	0.9968	0.9989	0.9983
240	0.9968	0.9989	0.9983

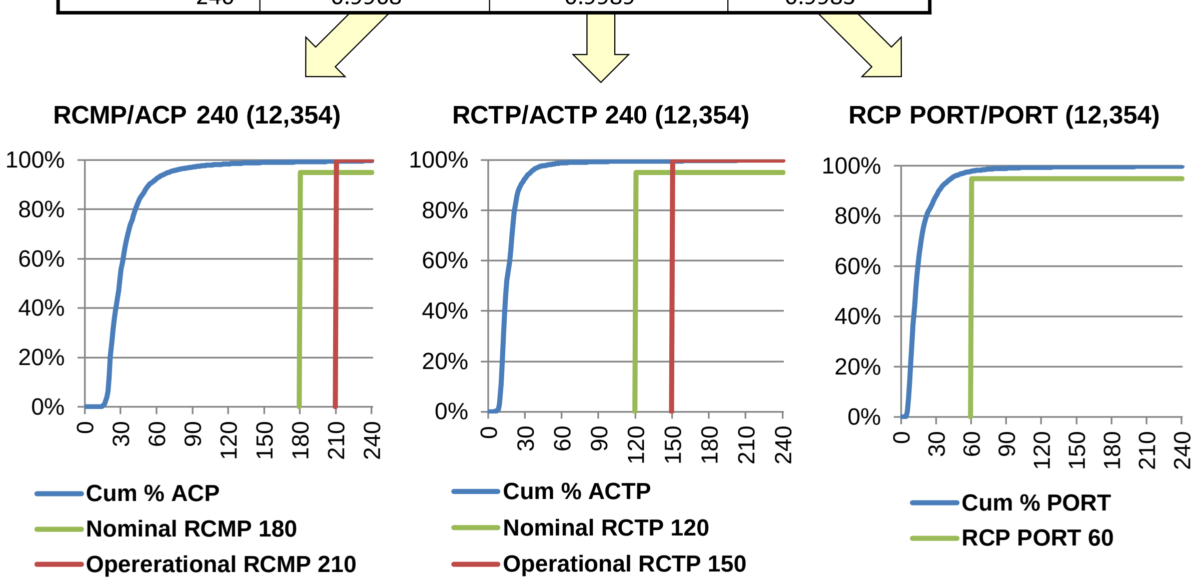


Figure D-10. Example of an ANSP report that will enable graphical analysis

D.3.3.6 Consistent data provided by each of the ANSPs within a region can be aggregated to create a regional PBCS monitoring report in graphical or tabular form. An example RCP/RSP regional PBCS monitoring report is provided in Table D-11.

Table D-11. Example RCP/RSP regional PBCS monitoring report

Regional PBCS Monitoring Report						
Region →	LAT Region		**Period →**	1 Jan to 30 Jun 2014 (6 months)		
RCP						
Specification →	RCP 240		**Application →**	CPDLC		
Colour Key		**Transaction Counts (WILCO Received)**	**95% RCP 240 benchmark**		**99.9% RCP 240 benchmark**	
Meets criteria →			**ACP**	**ACTP**	**ACP**	**ACTP**
Under criteria but above 99.0% →			**<=180 sec**	**<=120 sec**	**<=210 sec**	**<=150 sec**
Under criteria →			**End-to-End**	**Network**	**End-to-end**	**Network**
ANSP/Control area (CTA)						
LAT Region		201 723	98.6%	99.0%	99.4%	99.6%
ANSP1/CTA1		27 608	98.5%	98.9%	99.3%	99.6%
ANSP2/CTA2		22 736	98.9%	99.3%	99.5%	99.6%
. . .						

RSP				
Specification →	RSP 180		**Application →**	ADS-C
Colour Key (Same as for RCP)		**Report Counts**	**95% RSP 180 benchmark**	**99.9% RSP 180 benchmark**
			ASP % <=90 sec	**ASP % <=180 sec**
Control area				
LAT Region		5 043 218	98.4%	99.4%
ANSP1/CTA1		484 610	97.7%	98.9%
ANSP2/CTA2		628 998	98.6%	99.3%
. . .				

D.3.4 Case study

D.3.4.1 In early 2009, a slight performance degradation was detected for both CPDLC and ADS-C through an analysis of the December 2008 performance data from NZZO, as measured against the

RCP 240/RSP 180 specifications. Further performance deterioration was observed mid February 2009 when the January 2009 data was assessed.

D.3.4.2 During this period further local analysis was initiated and by March 2009 a CRA problem report had been raised and a full investigation was underway by the CRA and the CSP's. Further deterioration in performance was noted in the following months through to October 2009.

D.3.4.3 ADS-C performance for the fleet as measured against the RSP 180 performance standard is illustrated in Figure D-11 and CPDLC performance as measured against the RCP 240 specification is illustrated in Figure D-12.

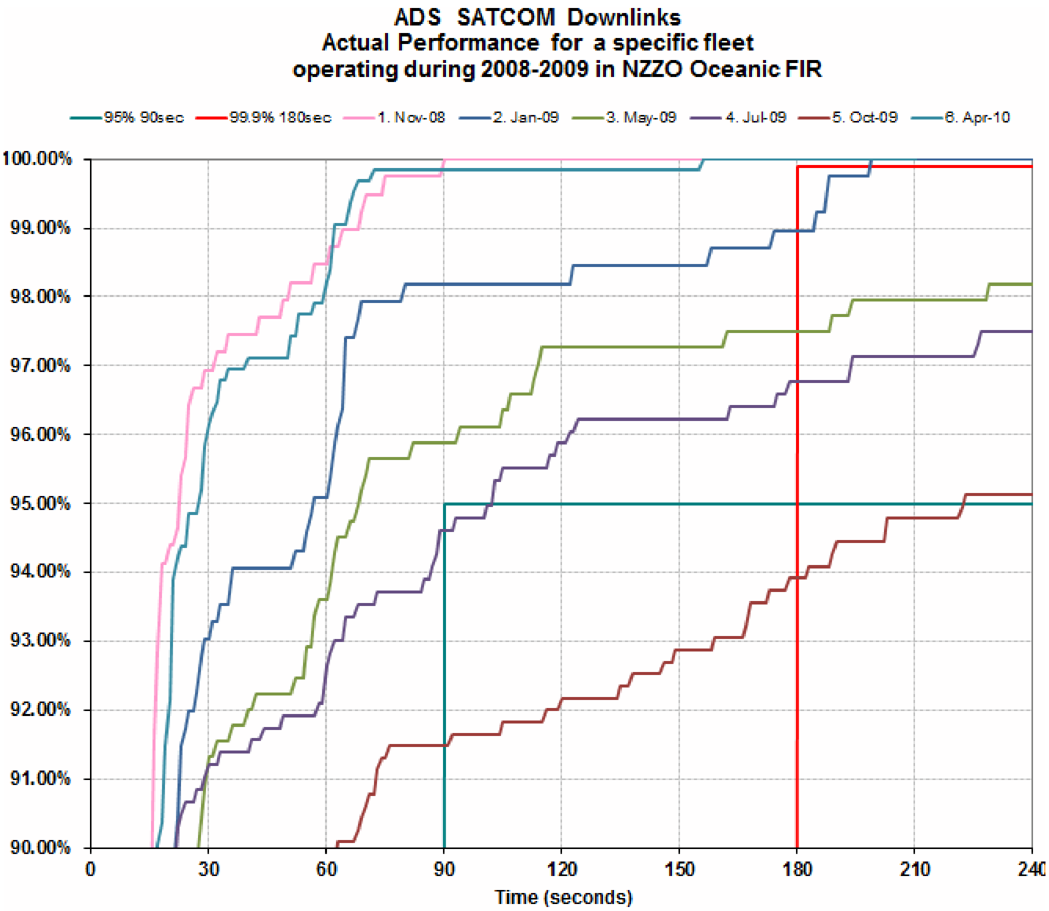


Figure D-11. Example of ADS-C ASP deterioration

D.3.4.4 A safety assessment in early 2009 concluded that reduced separation standards dependent on RCP/RSP specifications would be withdrawn although CPDLC and ADS-C would continue to be used.

D.3.4.5 The cause of the problem was identified in mid-2009 as a system level GES issue. This was caused by the implementation of new cabin services on the aircraft that were gradually installed on the fleet from late 2008 until the middle of 2009. This explained the continuing performance degradation through this period.

D.3.4.6 A software fix was released in early 2010 with observed performance levels for the fleet returning to normal immediately and meeting the RSP 180/RCP 240 standard.

D.3.4.7 Reduced separation standards were restored to the fleet in April 2009 after monitoring had demonstrated that performance standard compliance had been achieved.

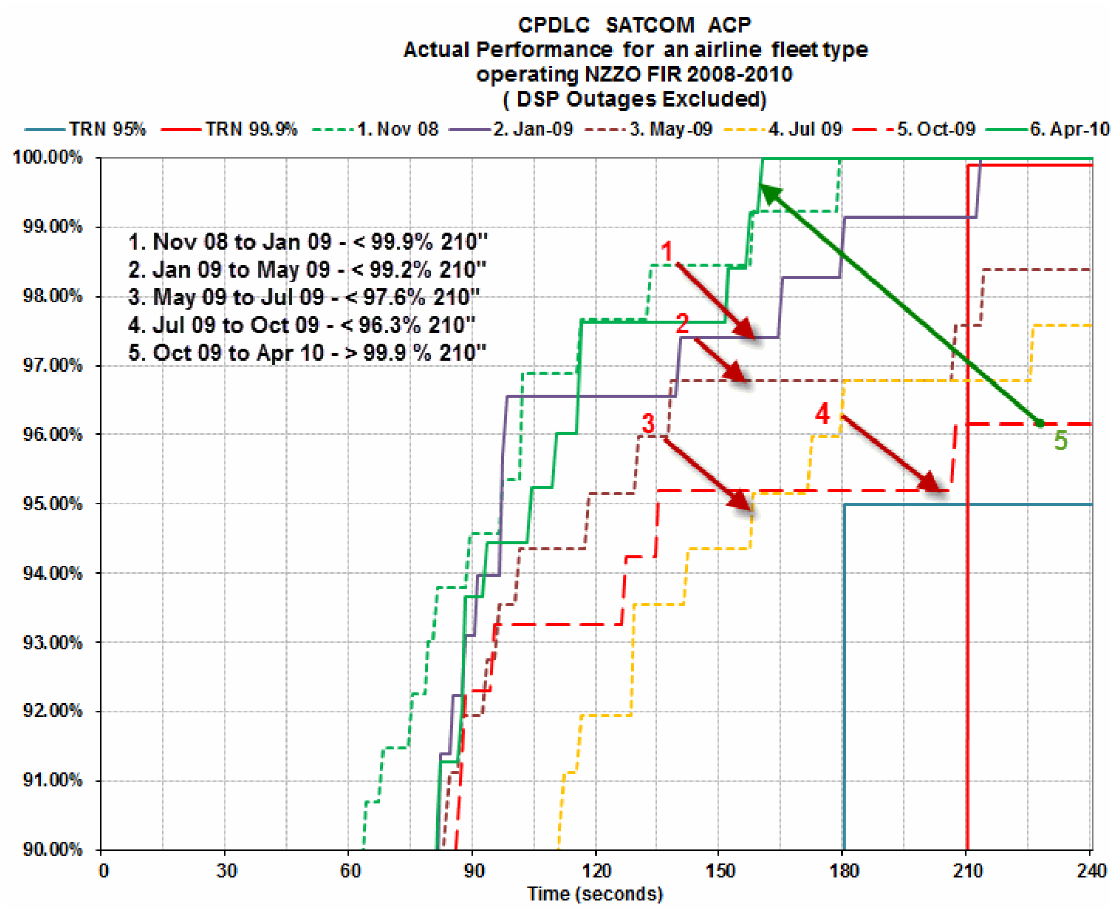


Figure D-12. Example of CPDLC ACP deterioration

D.4 Regional performance monitoring and analysis

D.4.1 General

D.4.1.1 This section provides guidance on periodic reporting by each ANSP of observed system performance in its respective airspace that will enable regional performance metrics to be developed for the availability, CPDLC transaction time and ADS-C surveillance data transit time requirements specified in Appendix B and Appendix C.

D.4.1.2 These regional performance metrics should be made available to all interested stakeholders. The use of regional websites to enhance the distribution of these metrics should be considered. An example of such a website can be viewed at http://www.ispacg-cra.com/.

D.4.1.3 It is recommended that regions implement monthly performance reporting to obtain system performance metrics. These reports will provide data on observed availability, CPDLC transaction time and ADS-C surveillance data transit time as described herein.

D.4.2 Reporting on CPDLC actual communications performance

D.4.2.1 The ANSP should report observed ACP and ACTP for RCP 240 and RCP 400 for different media paths using all transactions involving a WILCO response as described in paragraph D.3. The media paths to report are:

a) From all aircraft via all remote ground station (RGS) types.

b) From all aircraft where both uplink and downlink are via SATCOM RGS.

c) From all aircraft where both uplink and downlink are via VHF RGS.

d) From all aircraft where both uplink and downlink are via HF RGS.

e) From all aircraft where either uplink and downlink are via HF or SATCOM RGS.

D.4.2.2 A tabular reporting format can be used to capture the observed performance at the 95 per cent and 99.9 per cent RCP 240/400 times.

D.4.2.3 As PORT is independent of media path, this is only reported for all RGS types. An example form is shown in Table D-10.

D.4.3 Reporting on RSP data transit time

D.4.3.1 The ANSP should report observed RSP data transit time for RSP 180 and RSP 400 and DO290/ED120 based performance specifications for different media paths as described in paragraph D.3. The media paths to report are:

a) From all aircraft via all Remote Ground Station (RGS) types.

b) From all aircraft where both uplink and downlink are via SATCOM RGS.

c) From all aircraft where both uplink and downlink are via VHF RGS.

d) From all aircraft where both uplink and downlink are via HF RGS.

e) From all aircraft where either uplink and downlink are via HF or SATCOM RGS.

D.5 Regional problem reporting and resolution

D.5.1 General

D.5.1.1 The working principles in this guidance material result from the combined experience from CPDLC and ADS-C implementation, worldwide. Many regions have established regional monitoring programmes to manage the problem reporting and resolution process.

D.5.1.2 While problem reporting programmes exist at the local level, the guidance in this section considers only problem reporting and resolution at the regional level.

D.5.1.3 All stakeholders should be actively involved in the problem reporting and resolution process. It is essential that all aircraft operators in a region have the opportunity to become involved in the process and CRA's should be pro-active in getting all aircraft operators and other stakeholders to register and participate in the process.

D.5.1.4 The problem identification and resolution process, as it applies to an individual problem, consists of a data collection phase, followed by problem analysis and coordination with affected parties to secure a resolution, and recommendation of interim procedures to mitigate the problem in some instances. This is shown in the Figure D-13.

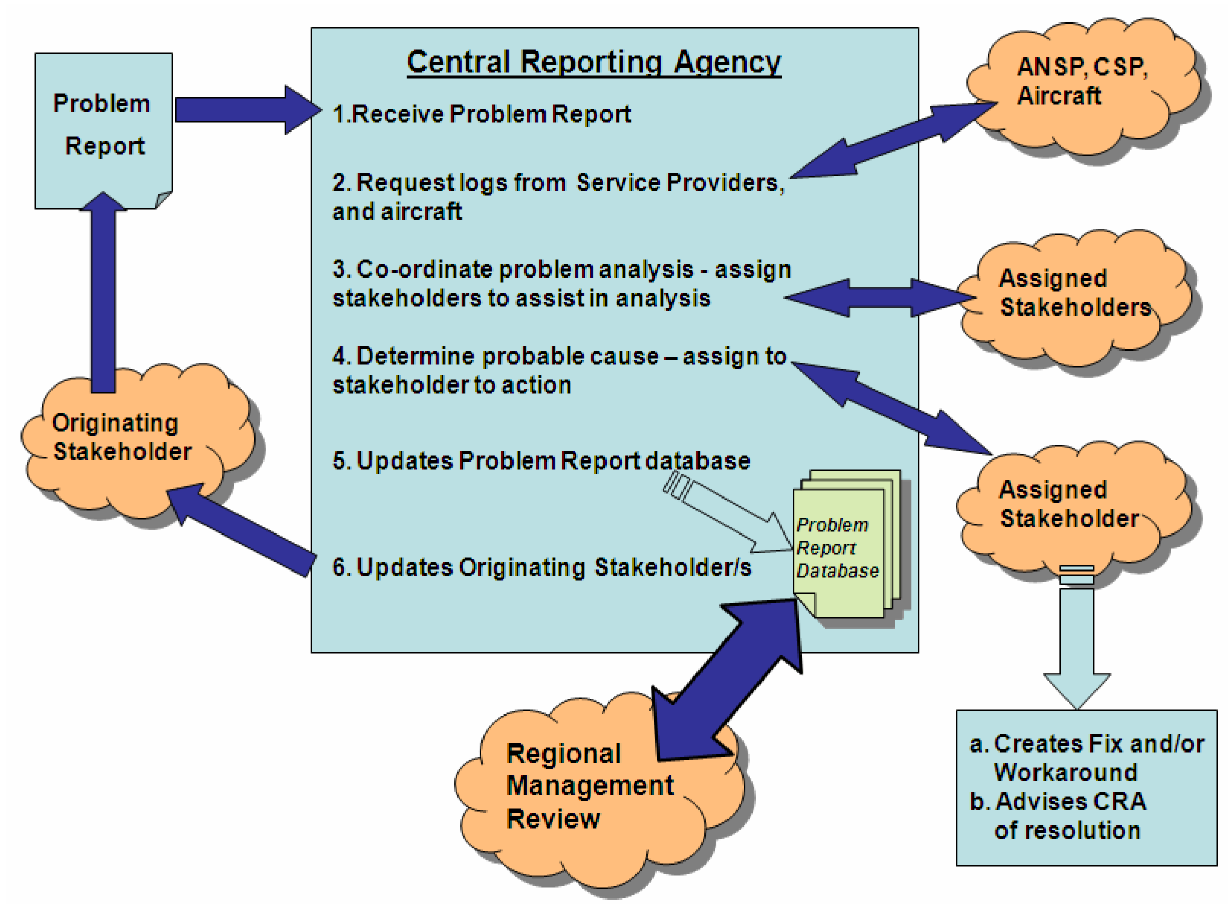


Figure D-13. Problem reporting and resolution process

D.5.2 Problem report form

D.5.2.1.1 The problem identification task begins with receipt of a problem report from a stakeholder, usually an operator, an ANSP or CSP/SSP but may include an aircraft or avionics manufacturer. Standard reporting forms should be developed and regions should investigate the use of a website to receive and store problem reports.

D.5.2.1.2 An example of an online problem reporting form is shown in Figure D-14. The fields used in the form are as follows:

a) Originator's Reference Number: Originators problem report reference (e.g. ANZ_2009-23);

b) Title: A short title which conveys the main issue of the reported problem (e.g. CPDLC transfer failure);

c) Date UTC: Date in YYYYMMDD format (e.g. 20090705);

d) Time UTC: Time in HHMM (e.g. 2345);

e) Aircraft registration: ICAO flight plan aircraft registration (e.g. ZKADR);

f) Aircraft identification: ICAO flight plan call sign if applicable (e.g. NZA456);

g) Flight Sector: If applicable the departure and destination airfield of the flight (e.g. NZAA-RJBB);

h) Organization: Name of the originators organization (e.g. Airways NZ);

i) Active Centre: Controlling Centre at time of occurrence if applicable (e.g. NZZO);

j) Next Centre: Next controlling centre at time of occurrence if applicable (e.g. NFFF);

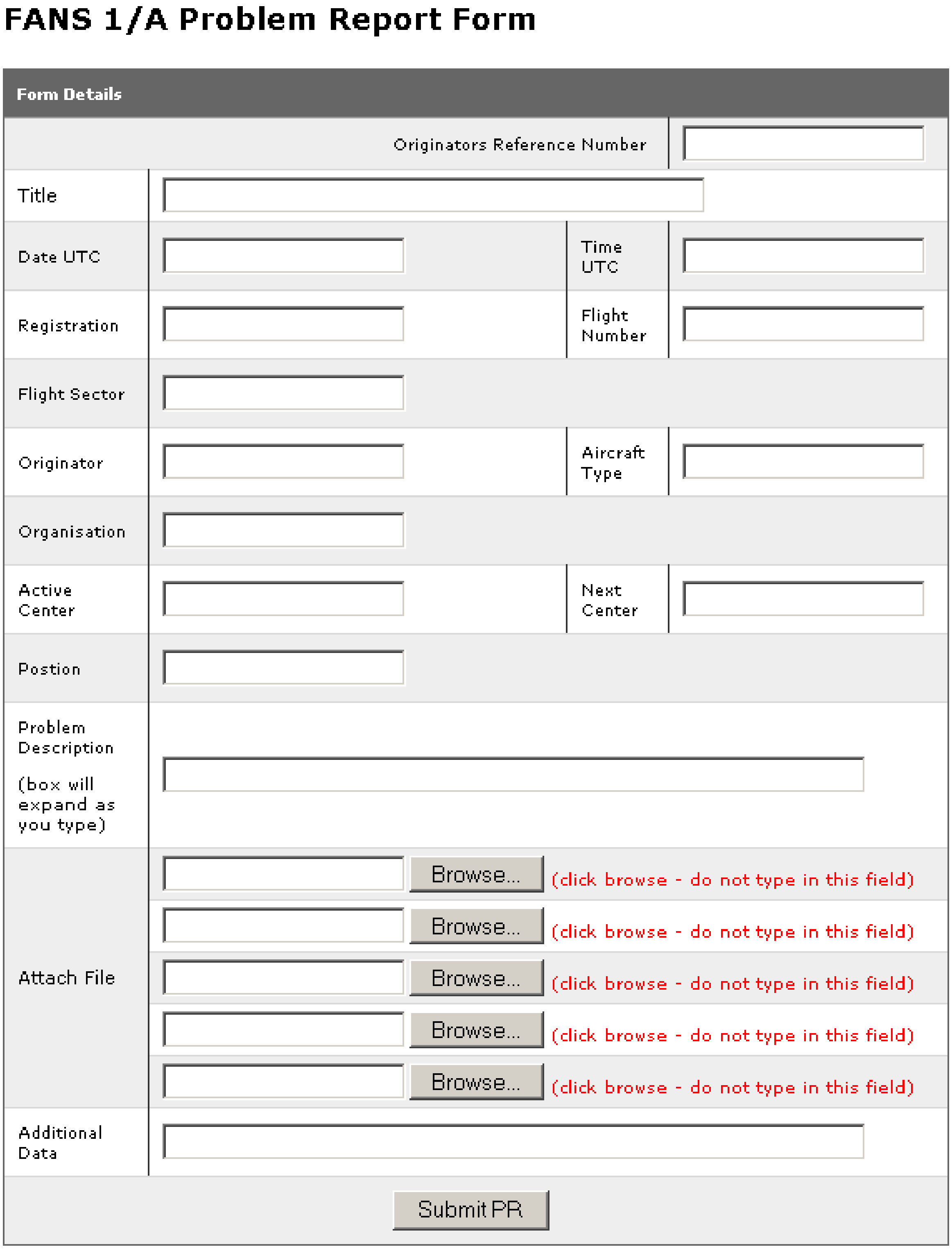
k) Position: Position of occurrence (e.g. 3022S16345E);

l) Problem Description: Detailed description of problem;

m) Attach File: Area of web page where originator and assigned stakeholders can attach data files or other detailed information such as geographic overlays; and

n) Additional Data: Area set aside for feedback from stakeholders assigned by the regional/local monitoring entity. This will includes the results of the investigation and the agreed action plan.

Note.— A number of regional PBCS monitoring programmes have established websites to manage the problem reporting process. Website addresses for CPDLC and ADS-C and the regional PBCS monitoring programmes to which they are applicable are listed in Doc [GOLD], Appendix E.



FANS 1/A Problem Report Form

Form Details			
		Originators Reference Number	
Title			
Date UTC		Time UTC	
Registration		Flight Number	
Flight Sector			
Originator		Aircraft Type	
Organisation			
Active Center		Next Center	
Postion			
Problem Description (box will expand as you type)			
Attach File	Browse... (click browse - do not type in this field)		
	Browse... (click browse - do not type in this field)		
	Browse... (click browse - do not type in this field)		
	Browse... (click browse - do not type in this field)		
	Browse... (click browse - do not type in this field)		
Additional Data			
	Submit PR		

Figure D-14. Example on-line problem reporting form

D.5.3 Problem assessment

D.5.3.1 Data collection

D.5.3.1.1 The data collection phase consists of obtaining message logs from the appropriate parties (which will depend on which ANSPs and CSP/SSPs were being used and operator service contracts). Today, this usually means obtaining logs for the appropriate period of time from the CSP/SSPs involved. Usually, a log for a few hours before and after the event that was reported will suffice, but once the analysis has begun, it is sometimes necessary to request additional data, (perhaps for several days prior to the event if the problem appears to be an on-going one).

D.5.3.1.2 Additionally, some aircraft-specific recordings may be available that may assist in the data analysis task. These are not always requested initially as doing so would be an unacceptable imposition on the operators, but may occur when the nature of the problem has been clarified enough to indicate the line of investigation that needs to be pursued. These additional records include:

a) Aircraft maintenance system logs.

b) Built-In Test Equipment data dumps for some aircraft systems.

c) SATCOM activity logs.

d) Logs and printouts from the flight crew and recordings/logs from the ANSPs involved in the problem may also be necessary. It is important that the entity collecting data for the analysis task requests all this data in a timely manner, as much of it is subject to limited retention.

D.5.3.2 Data analysis

D.5.3.2.1 Once the data has been collected, the analysis can begin. For this, it is necessary to be able to decode all the messages involved, and a tool that can decode every ATS message type used in the region is essential. These messages include:

a) AFN (ARINC 622), ADS-C and CPDLC (RTCA DO-258/EUROCAE ED-100) in a region operating FANS-1/A.

b) Context Management, ADS-C and CPDLC applications (ICAO Doc 9705 and RTCA DO-280B/ED-110B) in a region using ATN B1.

c) ARINC 623 messages used in the region.

D.5.3.2.2 The analysis of the decoded messages requires a thorough understanding of the complete message traffic, including:

a) Media management messages.

b) Relationship of ground-ground and air-ground traffic.

c) Message envelope schemes used by the particular CPDLC and ADS-C technology (e.g. ACARS or ATN).

D.5.3.2.3 The analyst must also have a good understanding of how the aircraft systems operate and interact to provide CPDLC and ADS-C, as many of the reported problems are aircraft system problems.

D.5.3.2.4 This information will enable the analyst to determine a probable cause by working back from the area where the problem was noticed to where it began. In some cases, this may entail manual decoding of parts of messages based on the appropriate standard to identify particular encoding errors. It may also require lab testing using the airborne equipment (and sometimes the ground networks) to reliably assign the problem to a particular cause.

D.5.3.2.5 Once the problem has been identified, then the task of coordination with affected parties begins. The stakeholder who is assigned responsibility for fixing the problem must be contacted and a corrective action plan agreed. The stakeholder who initiated the problem report shall be provided with regular updates on the progress and resolution of the problem.

D.5.3.2.6 This information (the problem description, the results of the analysis and the plan for corrective action) is then entered into a database covering CPDLC and ADS-C problems, both in a complete form to allow continued analysis and monitoring of the corrective action and in a de-identified form for the information of other stakeholders. These de-identified summaries are reported at the appropriate regional management forum and made available to other PBCS monitoring entities on request.

D.5.4 Mitigating procedures – problem resolution

D.5.4.1 The regional monitoring entity's responsibility does not end with determining the cause of the problem and identifying a fix. As part of that activity, and because a considerable period may elapse while software updates are applied to all aircraft in a fleet, procedural methods to mitigate the problem may have to be developed while the solution is being coordinated. The regional monitoring entity should identify the need for such procedures and develop recommendations for implementation by the ANSPs, CSP/SSPs and operators involved.

D.6 Supplemental guidance for EUR Region

D.6.1 General

D.6.1.1 This section provides supplemental information to support post-implementation monitoring and analysis in the EUR Region.

D.6.1.2 EC Regulation 29/2009 (the DLS IR) stipulates:

> "The quality of service of air-ground data link communications should be regularly monitored by ATS Providers".

D.6.1.3 It also states:

> "ATS providers shall monitor the quality of service of communication services and verify their conformance with the level of performance required".

D.6.1.4 RTCA DO 290/EUROCAE ED 120 – Continental SPR standard, comprises the performance requirements for:

a) data link initiation capability (DLIC) logon and contact; and

b) CPDLC – ATS communication management (ACM) and ATS clearance delivery (ACL).

Note.— The intention is to define a new RCP specification for ACM and ACL-controller initiated messages based on DO 290/ED 120.

D.6.1.5 In addition to CPDLC data collection, monitoring and analysis described in section D.2.1, section D.2.3 and section D.3, the ANSP should collect data and conduct analysis for the following:

a) DLIC-contact transactions; and

b) all CPDLC ground-initiated and air-initiated transactions.

Note.— The ANSP measures all implemented controller–initiated messages, including all received responses.

D.6.1.6 The ANSP should analyse air-initiated transactions separately from and ground initiated transactions.

D.6.1.7 The ANSP should analyse FANS 1/A DLIC and CPDLC transactions separately from ATN B1 DLIC and CPDLC transactions.

D.6.1.8 Instead of the method provided in paragraph D.2.1.3.2, the ANSP should calculate ACTP by taking the difference between the MAS/LACK reception time and CPDLC uplink message transmission time. The uplink messages are associated with their corresponding MAS/LACKs through the use of the CPDLC message reference number (See Figure D-15).

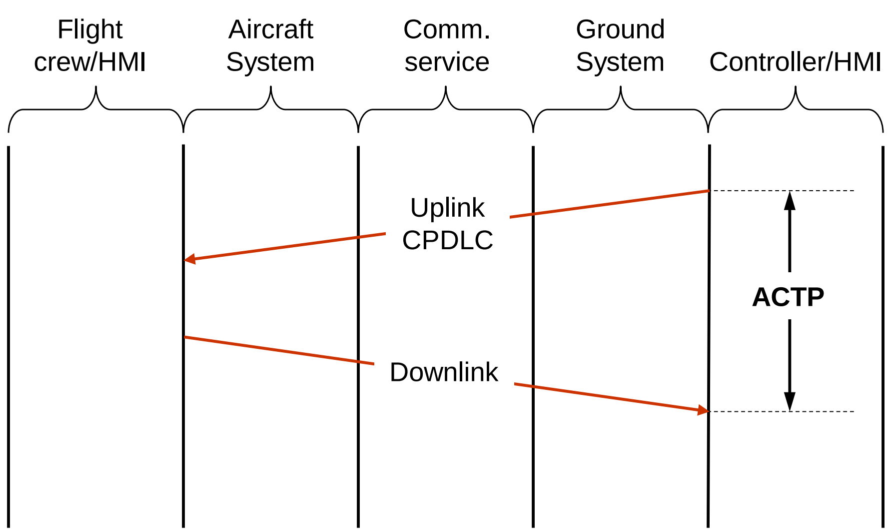


Figure D-15. EUR Region – ACTP measurement

D.6.2 CPDLC flight crew-initiated transactions

D.6.2.1 The ANSP should measure the transit and response times to a subset of CPDLC flight-crew initiated downlink messages that receive a single UNABLE or clearance response.

D.6.2.2 The ACP is calculated by the difference between the time in the header of the LACK message acknowledging the response and the time in the CPDLC header of the downlink message request. Figure D-16 illustrates the measurements.

Note.— The time provided in the header of the LACK message, sent from the aircraft, can be considered as giving a fairly accurate indication of when the associated uplink response has been processed and is available to the flight crew.

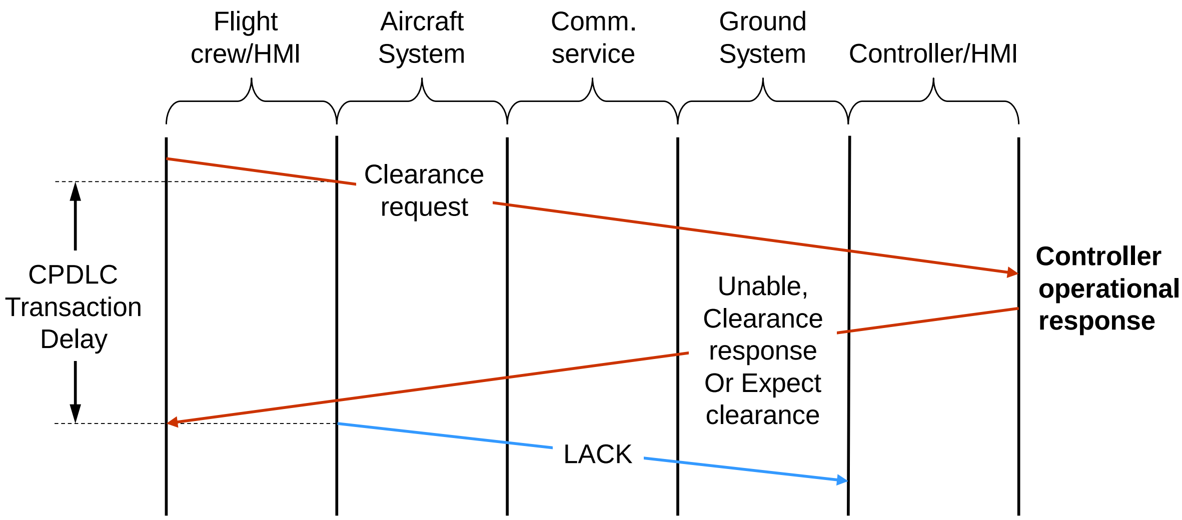


Figure D-16. Flight crew-initiated ACP time

D.6.3 DLIC contact transactions

D.6.3.1 The ANSP should measure the DLIC-contact transaction time.

D.6.3.2 The ACP is calculated by the difference between the contact response reception time and the contact request transmission time as is illustrated in Figure D-17.

Note.— It is not possible to accurately measure DLIC-logon transactions. Moreover, a logon is normally initiated well in advance of establishing a CPDLC connection with the first ATS unit.

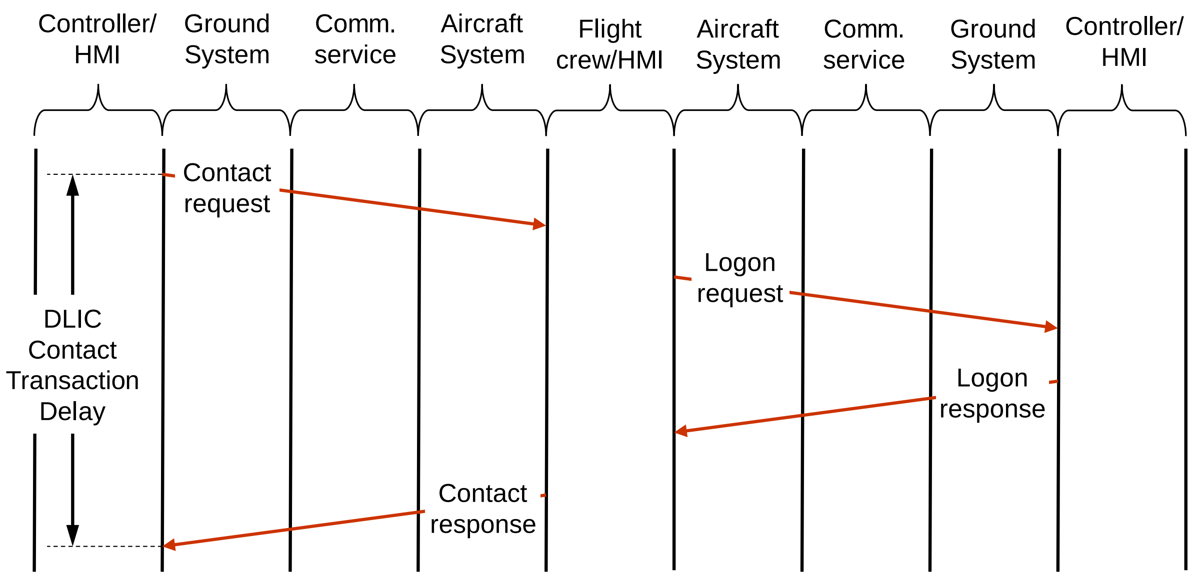


Figure D-17. DLIC Contact transaction

D.6.4 Data collection and reporting

D.6.4.1 For ATN B1 and FANS 1/A service provision in EUR Region, the following additional data should be provided:

a) ***DLIC Initiation Logon Counts***. The number of unsuccessful logon attempts, the number of successful logon attempts followed by the establishment of a CPDLC connection, and the number of successful logon attempts that are not followed by the establishment of a CPDLC connection.

b) ***Continuity for DLIC-Contact and CPDLC ground-initiated and air-initiated transactions***. As the performance requirements are different for ground-initiated transactions and air-initiated transactions, the actual probability for Continuity is calculated separately for ground-initiated and air-initiated transactions

c) ***Availability (Use)***. The number of Provider Aborts experienced by the ANSP and manually reported availability problems affecting a single aircraft.

Note.— Measuring actual probability of A(USE) according to formal definition is problematic. An acceptable indication is by counting the number of provider aborts (the air-ground connectivity is lost after 6 minutes).

d) ***Availability of service ($A_{SERVICE}$)***. Defined as Actual hours of CPDLC Operations / Planned Hours of CPDLC Operations, where:

1) ***Actual hours*** of CPDLC Operations = Planned Hours of CPDLC Operations - Accumulated declared unplanned service outages.

2) ***Planned Hours of CPDLC Operations*** = 24x7 operations over a certain period – planned service outages.

3) ***Accumulated declared unplanned service outages*** = sum of all partial failures (affecting multiple aircraft) or total failure (affecting all aircraft) over a certain period.

4) ***Unplanned service outages*** affecting more than one aircraft are due to problems, originated from, for example, FDP, CSP, VDL GS and router.

e) Deployment indicators using:

1) ***Fleet Equipage.*** The percentage of the aircraft fleet equipped to use CPDLC.

2) ***Fleet Usage***. The percentage of the aircraft fleet equipped to use CPDLC that are actually using CPDLC operationally.

f) System health indicators, using:

1) ***User Aborts***. The number of user aborts.

2) ***Error messages.*** *The number of different types of error message.*

3) ***Message Usage.*** *The number of different ACL and ACM messages sent.*

4) ***Transport level (TP4) retries (ATN B1)***. The number of uplink retries per ground end-system identifying which aircraft were involved, along with the ratio of the number of uplink TP4 retransmissions to the number of successfully transmitted Data TPDUs per ground end- system. Monitoring the rate of TP4 retries for each system on the ground and identifying which aircraft are involved will allow the identification of problems occurring within the network/ground system or with a particular aircraft.

Note.— A TP4 retry could occur as the result of:

a) temporary delays;

b) unavailability of a component of the network;

c) a dysfunctional VDL handoff; or

d) a problem in an end- system (ATS unit or aircraft system).

5) ***Failed transport connection attempts (ATN B1)***. The number of failed transport connection attempts measured per ground end-system identifying which aircraft were involved. Monitoring the number of failed attempts to establish a transport level connection will give an indication of problems with the slightly longer term availability of one of the end-systems or the underlying network.

6) ***TP4 Round Trip Delay (ATN B1)***. The time taken from the transmission of a Data TPDU to its acknowledgement.

g) Inconsistency in flight plan and log on association. The number of inconsistencies found in flight plan - logon association criteria (i.e. aircraft registration/aircraft address, CPDLC equipment and capability in Item 10a).

The ANSP may find that the following additional data may be useful for performance analysis:

h) Air-ground VDLM2 data. CSP sends VDLM2 data to the CRO, which may be supplemented with VDLM2 data from ANSPs for VDLM2 frequency capacity planning and problem investigation.

D.6.4.2 The ANSP should record the observed ACP and ACTP for CPDLC-flight crew-initiated log files for different media paths using all transactions requiring a response. In addition, it should record the observed ACP and ACTP for DLIC-contact/CPDLC log files and ATN B1 transport level log files, deployment and system health log files in the standardized XML-format. All ANSPs send the log files to the Central Reporting Organization (CRO) for importing into Pan-European Repository of Information Supporting the Management of EATM (PRISME). PRISME is an integrated ATM data warehouse for creation of various performance monitoring reports (e.g. EUR network, an ANSP, an aircraft operator, particular avionics configuration).

D.6.4.3 The EUR network performance monitoring reports are published on the CRO website. The reports at the other levels (per ANSP, per aircraft operator and per avionics configuration) would normally be restricted to just EUROCONTROL and the relevant stakeholder.

D.6.5 Problem reporting

D.6.5.1 JIRA (http://www.eurocontrol.int/link2000/wiki/index.php/) provides a secured web-based problem reporting and tracking application, which is managed by the LINK2000+/Central Reporting Office of EUROCONTROL.

D.6.5.2 ANSPs, aircraft operators and other participants should report problems to the regional PBCS monitoring programme, regardless whether they can be resolved locally or regionally to promote knowledge sharing among the participants and globally.

APPENDIX E. Post-implementation monitoring and corrective action (SATVOICE)

E.1 General

E.1.1 This appendix provides guidance additional to that provided in Chapter 5, for local and regional PBCS monitoring programmes. It contains guidance material relevant to monitoring SATVOICE services for which the RCP/RSP specifications provided in Appendix B and Appendix C are applicable, including:

a) ANSP data collection and analysis – This section defines a common data reporting format, providing guidance on how to obtain the required data points.

b) ANSP monitoring and analysis – This section contains guidance on data analysis, including recommended filtering for completeness of monitoring,

c) Regional performance monitoring and analysis – This section provides guidance on monitoring at a regional level.

d) Problem reporting and resolution – This section provides guidance on the process for problem identification and resolution.

E.2 ANSP data collection

E.2.1 ANSP data collection for SATVOICE transaction time/continuity

E.2.1.1 General

E.2.1.1.1 This section provides guidance on data collection and performance measurement for the communication application. SATVOICE communication performance analysis is based on the calculation of actual communication performance (ACP) used to monitor RCP time allocations for communication transaction (RCMP). The analysis uses the measurement of transit and response times related to clearances sent via SATVOICE—containing “ATCC”—that receive a single read back response. The rationale behind this is that the critical communications requirement is based on intervention messages.

E.2.1.2 Recording the data points for each clearance transaction

E.2.1.2.1 The data points shown in Table E-1 are recommended as the minimum set that the ANSP should extract from system recordings to provide sufficient information for RCP analysis and problem investigation. An ANSP may extract additional data points for their own analysis requirements, some possibilities of which are listed below Table E-1.

E.2.1.2.2 Most of the data points can be extracted from either the ACARS header or the ACARS application message. However, the aircraft type and operator will need to be matched to each record from a separate database using the aircraft registration as the common point.

E.2.1.2.3 The methods for calculating the ACP are described in section E.2.1.3.

Table E-1. Clearance transaction collection points

Ref	Label	Description and/or remarks
1	ANSP facility	The four letter ICAO designator of the ATS unit (e.g. NZZO).
2	Aircraft call sign	*Note.— Extracted from ACARS header or application message (e.g. UAL12).*
3	Operator designator	The ICAO designator for the aircraft operating agency (e.g. UAL). *Note.— Extracted from aircraft call sign.*
4	Aircraft type designator	The ICAO aircraft type designator (e.g. B744). *Note.— Extracted from the ANSP's database using aircraft registration as key. This may not be possible if registration number is not available. Aircraft type designators are contained in Doc 8643.*
5	Date	In YYYYMMDD format (e.g. 20081114). *Note.— Extracted from the ANSP's system data recording time stamp.*
6	Clearance media	Designator of the media type through which the clearance was sent (e.g. SAT Iridium, Inmarsat or MTSAT, or HF). *Note.— This is extracted from the ACARS header or application message.*
7	Clearance send time	The timestamp on the clearance message sent by the ANSP in HH:MM:SS format (e.g. 13:43:25). *Note.— Extracted from the ANSP's system data recording time stamp.*
8	ANSP timestamp on the receipt of the read back response	In HH:MM:SS (e.g. 13:44:45). *Note.— Extracted from the ANSP's system data recording time stamp.*
9	ACP	Actual communications performance in seconds measured as the difference between time the clearance is sent (#7) and time the operational read back response is received (#8) (e.g. 80).

E.2.1.2.4 In comma delimited text file format, these data points would appear as follows:

NZZO,UAL12,UAL,B744,20081114,SAT,13:43:25,13:44:45,80

E.2.1.3 Calculating ACP

E.2.1.3.1 The ACP is calculated by taking the difference between the time that the clearance message is originated at the ANSP and the time that the corresponding response read-back is received at the ANSP.

E.2.1.3.2 The ANSP may find that the following additional data may be useful for performance analysis:

a) the aircraft registration in ICAO Doc 4444 format (e.g. with no hyphens, extraneous characters, such as N104UA); and

b) the aircraft address in ICAO Doc 4444 format represented in hexadecimal code (e.g. C0173E).

E.2.2 ANSP data collection for SATVOICE position report delivery time/continuity

E.2.2.1 General

E.2.2.1.1 This section provides guidance on data collection and performance measurement for the surveillance application. The analysis of actual surveillance performance (ASP) is based on the measurement of the difference between the time-over-position extracted from the decoded ACARS message and the time the message is received at the ANSP. Because the accuracy of the time-over-position within the ACARS position report message is only to the minute (e.g. 15:11) while the accuracy of the timestamp of receipt at the ANSP is to the second (e.g. 15:11:11) the accuracy of the measurement of the surveillance performance will be limited to the minute.

E.2.2.1.2 The methods for calculating the ASP are described in section E.2.2.3.

E.2.2.2 Recording the data points for each position report

E.2.2.2.1 The data points listed in Table E-2 are recommended as the minimum set that the ANSP should extract from system recordings to provide sufficient information for ASP analysis and problem investigation. An ANSP may extract additional data points for their own analysis requirements, some possibilities of which are listed below Table E-2. Most of the data points can be extracted from either the ACARS header or the ADS-C application message. However, the aircraft type and operator will need to be matched to each record from a separate database using the aircraft registration as the common point.

Table E-2. Position report collection points

Ref	Label	Description and/or remarks
1	ANSP facility	The four letter ICAO designator for the ATS unit of the reporting ANSP (e.g. NZZO).
2	Aircraft call sign	*Note.— Extracted from ACARS header or application message (e.g. UAL12).*
3	Operator designator	The ICAO designator for the aircraft operating agency (e.g. UAL). *Note.— Extracted from aircraft call sign.*
4	Aircraft type designator	The ICAO aircraft type designator (e.g. B744). *Note.— Extracted from the ANSP's database using aircraft registration as key. May not be possible if registration number is not available. Aircraft type designators are contained in Doc 8643.*
5	Date	In YYYYMMDD format (e.g. 20081114). *Note.— Extracted from the ANSP's system data recording time stamp.*
6	Position report media	Designator of the media type through which the position report was sent (e.g. SAT Iridium, Inmarsat or MTSAT, or HF). *Note.— This is extracted from the ACARS header or application message.*
7	Report Type	The type of position report extracted from the ACARS header (e.g. POS or AEP).

Ref	Label	Description and/or remarks
8	Latitude	The reported latitude decoded from the ACARS position report message. The format is “+” for North or “-“ for South followed by a decimal number of degrees (e.g. -33.456732).
9	Longitude	The reported longitude decoded from the ACARS position report message. The format is “+” for East or “-“ for West followed by a decimal number of degrees (e.g. +173.276554).
10	Position Time	The time contained within the ACARS position report message that was sent from the aircraft in HH:MM (e.g. 03:44).
11	ANSP Receipt Time	The ANSP timestamp on the receipt of the ACARS position report message in HH:MM:SS (e.g. 03:44:45). *Note.— Extracted from the ANSP’s system data recording time stamp.*
12	ASP	The transit time of the position report calculated as the difference between position time (#10) and ANSP Receipt Time (#11).

E.2.2.2.2 In a comma delimited text file format, these data would appear as follows:

NZZO,UAL12,UAL,B744,20081114,SAT,POS,-33.456732,+173.276554,03:44,03:44:45,45

E.2.2.2.3 The ANSP may find that the following additional data may be useful for performance analysis:

a) the aircraft registration in ICAO Doc 4444 format (e.g. no hyphens, extraneous characters, such as N104UA); and

b) the aircraft address in ICAO Doc 4444 format represented in hexadecimal code (e.g. C0173E).

E.2.2.3 Calculating position report delivery time

E.2.2.3.1 The position report delivery time is calculated by the difference between the times when the position report indicated the aircraft was at the reported position to when the ATS unit received the report.

E.2.3 ANSP data collection for SATVOICE service availability

E.2.3.1 The ANSP should collect data on CSP notified system outages as well as detected outages that are not observed by or notified by the CSP as these data are used to calculate the actual availability of the SATVOICE service provision.

E.2.3.2 For each outage the following information should be collected:

a) Time of CSP outage notification: In YYYYMMDDHHMM format or “Not Notified” if no CSP notification received.

b) CSP Name: Name of CSP providing outage notification if applicable.

c) Outage start time: In YYYYMMDDHHMM format.

d) Outage end time: In YYYYMMDDHHMM format.

e) Duration of outage: In minutes.

E.2.3.3 Only outages greater than the unplanned outage duration limit are reported.

E.3 ANSP performance monitoring and analysis

E.3.1 Monitoring time/continuity of SATVOICE communications

E.3.1.1 General

E.3.1.1.1 The collected SATVOICE data are used to monitor the time/continuity of clearance transactions and position report delivery. In addition to monitoring the aggregate system performance, monitoring should also be conducted for important subsets of the data, including all observed media types, message type(s), operators, aircraft types and airframes.

E.3.1.1.2 The first step of the analysis is filtering the collected data. The following sections provide suggested filtering that will allow for an effective measurement of the RCP and RSP time/continuity parameters.

E.3.1.2 Filtering SATVOICE data

E.3.1.2.1 The performance specifications are intended to provide criteria for "operational" performance, so to not necessarily filter out failed attempts. However, in some cases filtering may be appropriate. It is important that consistent data filtering is employed to ensure that all ANSPs measure against the same baseline.

E.3.1.2.2 Raw data obtained from the ANSP recordings will include delayed transactions, which are affected by conditions affecting availability, such as system outages and congestion. These transactions should not be used when assessing clearance transaction time or position report delivery time, as they will be considered when assessing the service availability. This data should be filtered from the raw data before any performance assessment is made.

E.3.1.2.3 When SATVOICE is used after failed attempts on HF, the observed performance may indicate excessive delays in the SATVOICE performance. The analysis should include these data to reflect actual operational performance from the controller perspective and then determine whether procedures could potentially mitigate the effects of these delays (e.g. the radio operator may consider using the SATVOICE directly when it can be determined to provide a more reliable communication than HF).

E.3.1.2.4 Monitoring controller intervention (i.e. clearances) via radio operator using SATVOICE involves an assessment of the cumulative distribution of ACP. The purpose of the cumulative distribution is to depict measured performance of only data that is representative of an intervention capability against the RCP 400 requirements at the 95 per cent and 99.9 per cent levels.

E.3.1.2.5 Monitoring position report delivery via radio operator using SATVOICE involves an assessment of the cumulative distribution of ASP. The purpose of the cumulative distribution is to depict measured performance of only surveillance data against the RSP 400 requirements at the 95 per cent and 99.9 per cent levels.

E.3.1.3 Cumulative distributions of SATVOICE data

E.3.1.3.1 Filtering data will limit the size of the sample that will be used in the cumulative distributions of CPDLC and ADS-C data. When providing cumulative distributions of CPDLC and ADS-C data, a sufficient sample size should be determined taking into account a number of factors, such as:

a) type of data that will be considered in the sample (e.g. CPDLC transactions that are representative of an intervention to manoeuvre the aircraft in the event of a conflict, or ADS-C reports);

b) cost, time and difficulty in collecting the data (e.g. for an entire airspace, an aircraft operator's fleet, an aircraft type/system, or a new media type);

c) existing knowledge about the underlying technologies and implementation (e.g. data have already been collected and analysed from a similar implementation using similar technologies);

d) variability of the data collected (e.g. how predictable is it that the performance will fall within a specified range?);

e) the specific criterion that the data sample will be measures against (e.g. if the criterion is specified at 95 per cent, then , statistically, the data sample would need to be at least 1 000 data points); and

f) level of confidence desired in the estimated result (e.g. operational judgment will play a role).

E.3.1.3.2 Once a sufficient sample of filtered data has been collected, the next step is to calculate a cumulative distribution for each of the performance parameters to be measured: ACP for intervention capability and ASP for position reports.

E.3.1.3.3 Monitoring may be completed at several levels for both the communication and surveillance performance. The following structure is recommended:

a) monitoring performance by communication media - an analysis of:

   1) voice data from all aircraft.

   2) voice data from all aircraft via SAT (Iridium, Inmarsat and MTSAT).

   3) voice data from all aircraft via HF, as appropriate.

b) monitoring performance by airline fleet – an analysis of:

   1) observed performance of each type of aircraft operated by an operator for:

      i) all voice data;

      ii) vice data via SAT (Iridium, Inmarsat and MTSAT);

      iii) vice data via HF, as appropriate; and

   2) comparative analysis of the observed performance for an aircraft type used by different operators.

E.3.1.3.4 It is recommended that the ANSP begins with a graphical analysis of the collected performance data. Depicting the analysis results in graphical form has proven a useful technique for evaluating various aspects of performance and identifying problems.

E.3.1.3.5 Figure E-1 provides a typical graph, constructed using a spreadsheet application illustrating ACP of clearance transactions via a radio operator using SATVOICE. The observed performance of the 7 404 SATVOICE voice transactions in October 2011 is shown against the RCP 400 performance measures.

E.3.1.3.6 Figure E-2 illustrates an ACP chart showing the SATVOICE performance over a twelve-month period. The tight spread of the data shows relatively stable performance in this example.

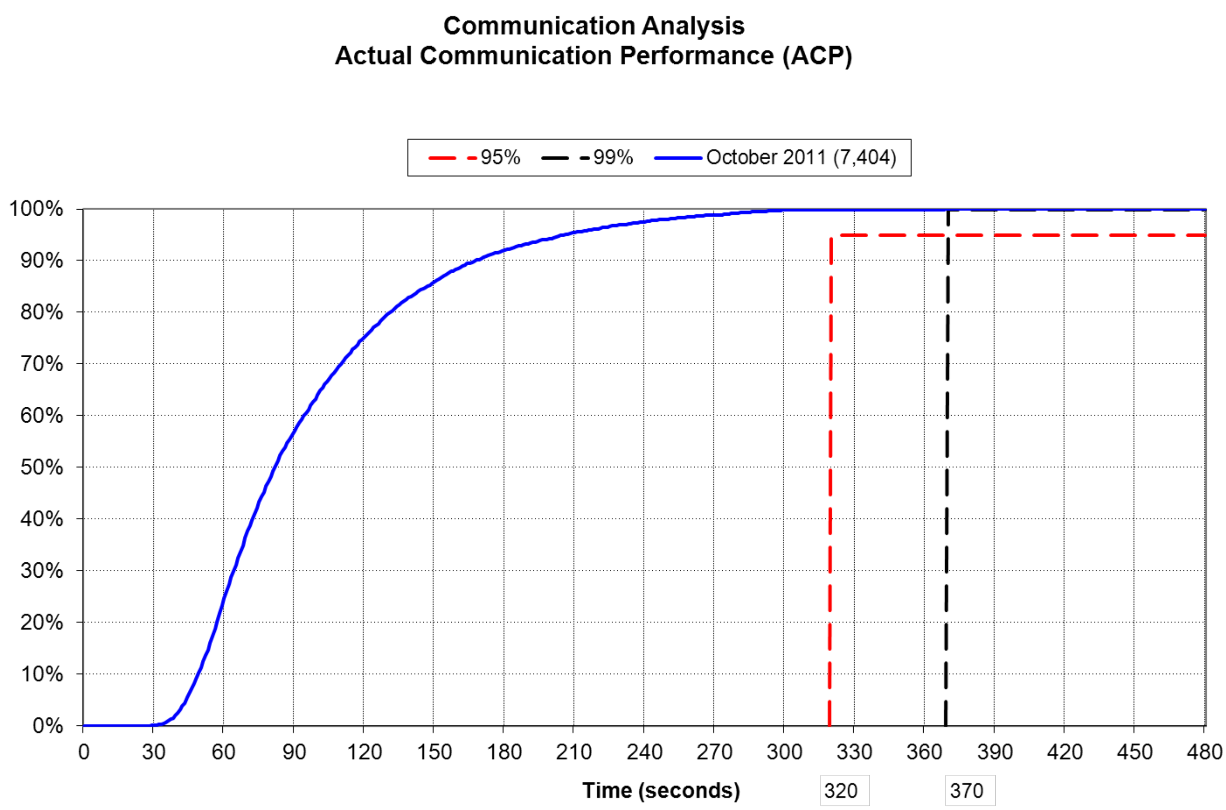


Figure E-1. SATVOICE communication performance – ACP

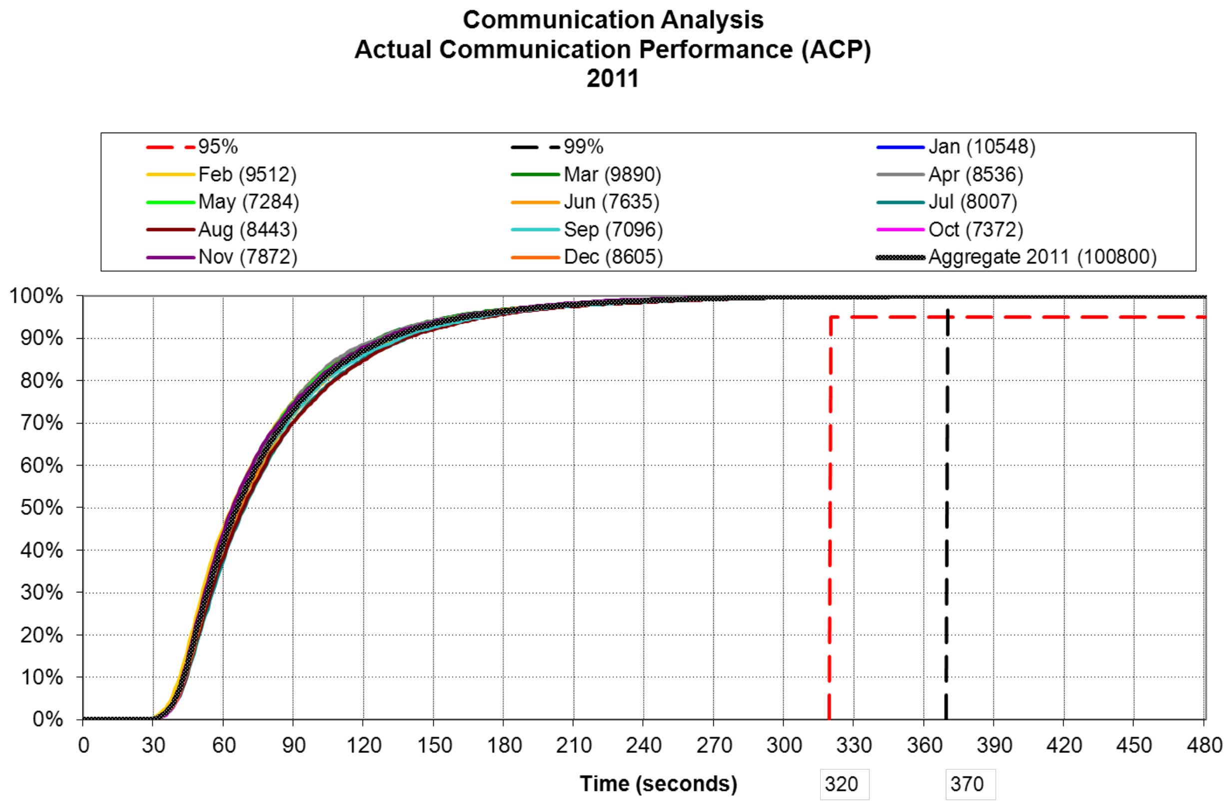


Figure E-2. SATVOICE communication performance – ACP – 12 months

E.3.1.3.7 Figure E-3 illustrates a typical graph, constructed using a spreadsheet application, illustrating ASP of position report delivery times via a radio operator using SATVOICE. The observed performance of the 10 217 voice position reports is shown against the RSP 400 performance criteria. The cumulative distribution is plotted using 1 minute increments.

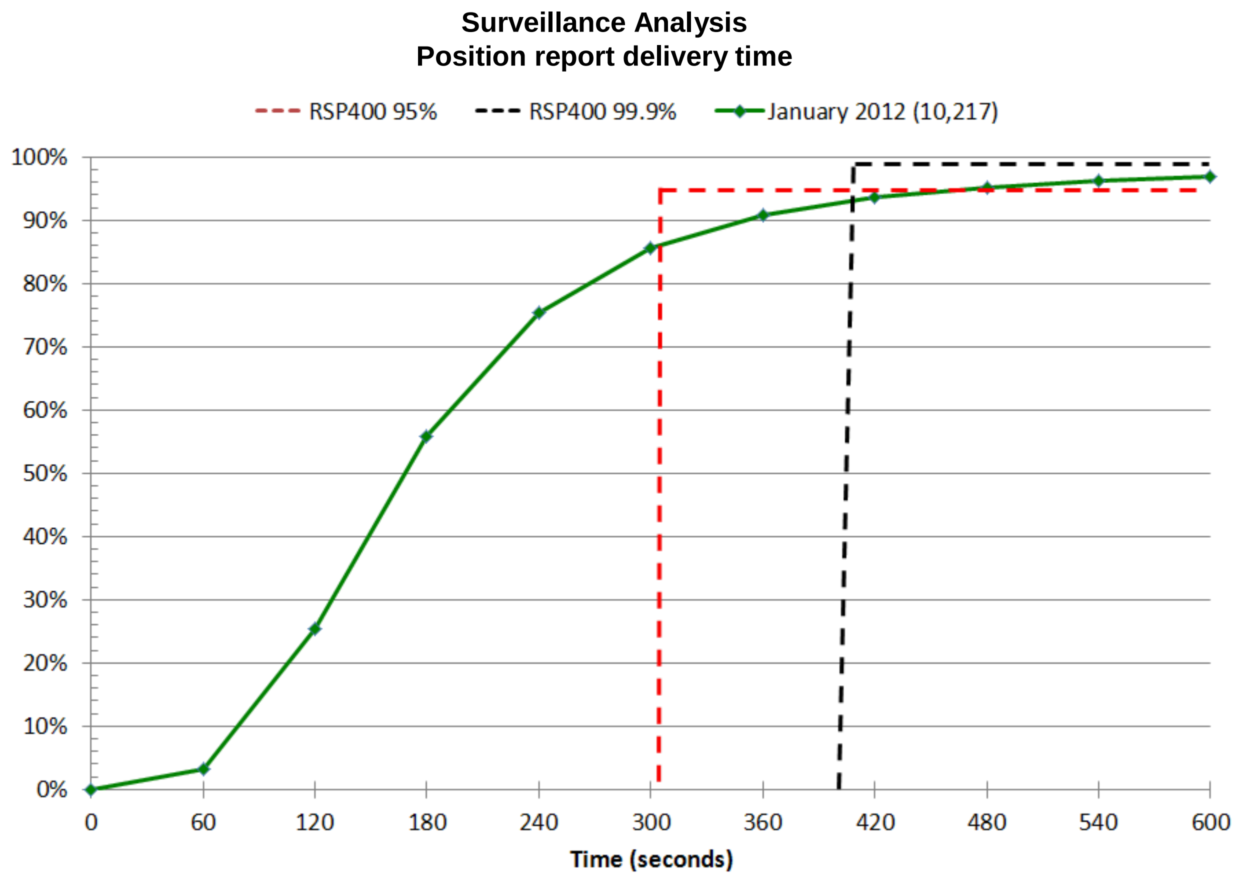


Figure E-3. Position report delivery time

E.3.1.3.8 Identifying poor performers

E.3.1.3.9 There are many potential causes of degraded performance. Considerable analysis may be required to identify the reasons behind poor performing fleets so it is not possible to provide guidance for all situations. Some analysis techniques that have been found to be useful are provided in the following paragraphs.

E.3.1.3.10 On a number of occasions poor performance has been attributed to a specific aircraft in a fleet. Usually these poor-performing aircraft can be identified by the visual inspection of monthly data ordered in terms of transit time, or more accurately by graphing the monthly data for a fleet by aircraft registration.

E.3.1.3.11 Techniques such as graphing the positions of all delayed messages on a geographical display have identified areas for further investigation.

E.3.2 Monitoring availability of CPDLC and ADS-C

E.3.2.1 Using the data collected on outages reported by the CSP as well as unreported outages identified by the ANSP, described in section E.2.3, graphical analysis can be used to track availability. Graphical analysis method are similar to those used for CPDLC and ADS-C provided in Appendix D.

E.4 Regional performance monitoring and analysis

E.4.1 General

E.4.1.1 This section provides guidance on periodic reporting by each ANSP of observed system performance in its respective airspace that will enable regional performance metrics to be developed for the availability, transaction time for interventions via SATVOICE and position report delivery time requirements specified in Appendix B and Appendix C.

E.4.1.2 These regional performance metrics should be made available to all interested stakeholders. The use of regional websites to enhance the distribution of these metrics for SATVOICE should be considered. For example, a website used for CPDLC and ADS-C monitoring programmes can be viewed at http://www.ispacg-cra.com.

E.4.2 Periodic reporting

E.4.2.1 It is recommended that regions implement monthly performance reporting to obtain system performance metrics. These reports will provide data on observed availability, transaction time for interventions via SATVOICE and position report delivery time.

a) The ANSP should report on CSP/SSP notified system outages and on detected outages that have not been notified. For each outage the following information should be reported:

   1) Time of CSP/SSP outage notification as described in section E.3.2: In YYYYMMDDHHMM format or “Not Notified” if no CSP/SSP notification received.

   2) CSP/SSP Name: Name of CSP and SSP providing outage notification if applicable.

   3) Type of outage: Report media affected SATCOM, VHF, HF, ALL.

   4) Outage start time: In YYYYMMDDHHMM format.

   5) Outage end time: In YYYYMMDDHHMM format.

   6) Duration of outage: In minutes.

b) The ANSP should report observed ACP for controller intervention via the radio operator using SATVOICE as described in section E.3.1.

c) The ANSP should report observed position report delivery time as described in section E.3.1.

E.4.2.2 A tabular reporting format can be used to capture the observed performance at the 95 per cent and 99.9 per cent RSP 180 and RSP 400 times.

E.4.2.3 In addition to the tabular performance reporting, regions should consider presenting performance data using graphical means, such as depicted in Figure E-1 and Figure E-2. Performance graphs illustrating regional communications and surveillance performance for SATVOICE can be readily obtained by aggregating spreadsheet data from individual ANSP. The relevant data can be included in an ANSP monthly report to enable regional aggregation of agreed performance information to allow it to be presented in graphical form. Regions could present all or some of the data reported in tabular and graphical form, if desired. This method of reporting would also assist global aggregation.

E.5 Problem reporting and resolution

E.5.1 General

E.5.1.1 Typically, aircraft operators and ANSPs that experience SATVOICE problems should contact their CSP that provides the SATVOICE service for investigation. However, a region may have a regional monitoring programme to manage the problem reporting and resolution process for components that support air traffic management that can assist in resolving SATVOICE problems.

E.5.1.2 The problem identification and resolution process, as it applies to an individual problem consists of a data collection phase, followed by problem analysis and coordination with affected parties to secure a resolution, and recommendation of interim procedures to mitigate the problem in some instances.

E.5.2 Problem report form

E.5.2.1 The problem identification task begins with receipt of a report from a stakeholder, usually an operator or an ANSP. Standard reporting forms should be developed and regions should investigate the use of a website to receive and store problem reports. The fields used in the form are as follows:

a) Originator’s Reference Number: Originators problem report reference (e.g. ANZ_2009-23);

b) Title: A short title which conveys the main issue of the reported problem (e.g. SATVOICE connection);

c) Date UTC: Date in YYYYMMDD format (e.g. 20090705);

d) Time UTC: Time in HHMM (e.g. 2345);

e) Aircraft Registration: ICAO flight plan aircraft registration (e.g. ZKADR);

f) Aircraft Identification: ICAO flight plan call sign if applicable (e.g. NZA456);

g) Flight Sector: If applicable the departure and destination airfield of the flight (e.g. NZAA-RJBB);

h) Organization: Name of the originators organization (e.g. Airways NZ);

i) Active Centre: Controlling Centre at time of occurrence if applicable (e.g. NZZO);

j) Next Centre: Next controlling centre at time of occurrence if applicable (e.g. NFFF);

k) Position: Position of occurrence (e.g. 3022S16345E);

l) Problem Description: Detailed description of problem;

m) Attach File: Originator and assigned stakeholders can attach data files or other detailed information such as geographic overlays; and

n) Additional Data: Area set aside for feedback from stakeholders assigned by the regional/local monitoring entity. This will includes the results of the investigation and the agreed action plan.

Note.— PBCS monitoring entities may develop websites to manage the problem reporting process.

E.5.3 Problem assessment

E.5.3.1 Data collection

E.5.3.1.1 The data collection phase consists of obtaining operational data logs from the appropriate parties (which will depend on which ANSPs and CSPs/SSPs were being used and operator service contracts). This usually means obtaining operational data logs for the appropriate period of time from the ANSPs, CSPs and SSPs involved. Usually, a log for a few hours before and after the event that was reported will suffice, but once the analysis has begun, it is sometimes necessary to request additional data, (perhaps for several days prior to the event if the problem appears to be an on-going one).

E.5.3.1.2 Additionally, some aircraft-specific recordings may be available that may assist in the data analysis task. These are not always requested initially as doing so would be an unacceptable imposition on the operators, but may occur when the nature of the problem has been clarified enough to indicate the line of investigation that needs to be pursued. These additional records include:

a) aircraft maintenance system logs;

b) built-in test equipment data dumps for some aircraft systems;

c) SATCOM activity logs; and

d) logs and printouts from the flight crew and recordings/logs from the ANSP(s) involved in the problem may also be necessary. It is important that the entity collecting data for the analysis task requests all this data in a timely manner, as much of it is subject to limited retention.

E.5.3.2 Data analysis

E.5.3.2.1 Once the data has been collected, the analysis can begin. It may be necessary to use support tools to analyse operational data. The analysis requires a thorough understanding of the SATVOICE system and the situation in which it was used.

E.5.3.2.2 The analyst must also have a good understanding of how the aircraft systems operate and interact to provide the ATM operations, as many of the reported problems are aircraft system problems.

E.5.3.2.3 This information will enable the analyst to determine a probable cause by working back from the area where the problem was noticed to where it began. In some cases, it may require lab testing using the airborne equipment (and sometimes the ground networks) to reliably determine the cause of the problem.

E.5.3.2.4 Once the problem has been identified, then the task of coordination with affected parties begins. The stakeholder who is assigned responsibility for fixing the problem must be contacted and a corrective action plan agreed. The stakeholder who initiated the problem report shall be provided with regular updates on the progress and resolution of the problem.

E.5.3.2.5 This information (the problem description, the results of the analysis and the plan for corrective action) is then entered into a database covering SATVOICE problems, both in a complete form to allow continued analysis and monitoring of the corrective action and in a de-identified form for the information of other stakeholders. These de-identified summaries are reported at the appropriate regional management forum and made available to other PBCS monitoring entities on request.

E.5.4 Mitigating procedures – problem resolution

E.5.4.1 Because a considerable period may elapse while software updates are applied to all aircraft in a fleet, a regional monitoring entity in coordination with the relevant ANSPs may have to develop procedural methods to mitigate the problem until the solution is implemented. A regional monitoring entity may serve to identify the need for such procedures and develop recommendations for implementation by the ANSPs, CSPs/SSPs and operators involved.

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ATTACHMENT G to State letter AN SP 52/4-15/44

RESPONSE FORM TO BE COMPLETED AND RETURNED TO ICAO TOGETHER WITH ANY COMMENTS YOU MAY HAVE ON THE PROPOSED AMENDMENTS

To: The Secretary General
International Civil Aviation Organization
999 Robert-Bourassa Boulevard
Montréal, Quebec
Canada, H3C 5H7

(State) ____

Please make a checkmark (√) against one option for each amendment. If you choose options "agreement with comments" or "disagreement with comments", **please provide your comments on separate sheets**.

	Agreement without comments	*Agreement with comments**	*Disagreement without comments*	*Disagreement with comments*	*No position*
Amendment to Annex 10 — *Aeronautical Telecommunications*, Volume II — *Communication Procedures including those with PANS status* and to PANS-ATM (Doc 4444), *Procedures for Air Navigation Services — Air Traffic Management* **(Attachment B related to DLIC and ADS-C)**					
Amendment to Annex 10 — *Aeronautical Telecommunications*, Volume II — *Communication Procedures including those with PANS status* and to PANS-ATM (Doc 4444), *Procedures for Air Navigation Services — Air Traffic Management* **(Attachment C related to CPDLC)**					
Amendment to Annex 6 — *Operation of Aircraft*, Part I — *International Commercial Air Transport — Aeroplanes*, Part II — *International General Aviation — Aeroplanes* and Part III — *International Operations — Helicopters*, Annex 11 — *Air Traffic Services* Annex 15 — *Aeronautical Information Services*, the *Procedures for Air Navigation Services — Air Traffic Management*, (PANS-ATM, Doc 4444) and the *Procedures for Air Navigation Services — ICAO Abbreviations and Codes*, (PANS-ABC, Doc 8400) **(Attachment D related to PBCS)**					

Amendment Annex 4 — *Aeronautical Charts*, Annex 15 — *Aeronautical Information Services*, Annex 10 — *Aeronautical Telecommunications*, Volume II — *Communication Procedures including those with PANS status* and Volume III — *Communication Systems*, the *Procedures for Air Navigation Services — Air Traffic Management*, (PANS-ATM, Doc 4444) and the *Procedures for Air Navigation Services — ICAO Abbreviations and Codes*, (PANS-ABC, Doc 8400) **(Attachment E related to PBCS)**					

*"Agreement with comments" indicates that your State or organization agrees with the intent and overall thrust of the amendment proposal; the comments themselves may include, as necessary, your reservations concerning certain parts of the proposal and/or offer an alternative proposal in this regard.

Signature____ Date____________________________________

— END —