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

Ref.:   AN 13/2.5-15/45   11 June 2015

Subject: Proposals for the amendment of the PANS-ATM (Doc 4444) relating to performance-based longitudinal and lateral separation minima and automatic dependent surveillance — contract (ADS-C) climb and descend procedure (CDP)

Action required: Comments to reach Montréal by 11 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, considered proposals originated by the Separation and Airspace Safety Panel (SASP) to amend the *Procedures for Air Navigation Services — Air Traffic Management* (PANS-ATM, Doc 4444) relating to performance-based longitudinal and lateral separation minima and automatic dependent surveillance — contract (ADS-C) climb and descend procedure (CDP) for aircraft in the en-route phase of flight. The Commission authorized the transmission of the proposals to Contracting States and appropriate international organizations for comments.

2.   The aforementioned proposals to the PANS-ATM (Doc 4444) are contained in Attachment A to this letter. 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.   It is expected that this proposal for amendment will require a minimum amount of resources and will be cost effective given that the procedures would be implemented only when air traffic density necessitates a reduction in separation minima.

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.
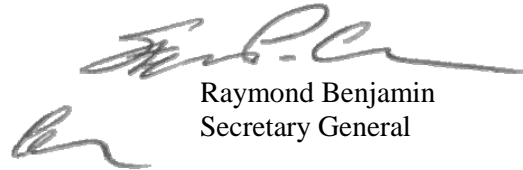
5.	May I request that any comments you wish to make on the amendment proposals be dispatched to reach me not later than 11 September 2015. The Air Navigation Commission has asked me to specifically indicate that comments received after the due date may not be considered by the Commission and the Council. 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 to the PANS-ATM (Doc 4444) is 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.

8.	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 B which may be completed and returned together with your comments, if any, on the proposals in Attachment A.

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

Raymond Benjamin
Secretary General

Enclosures:
    A — Proposed amendment to the PANS-ATM
    B — Response form

PROPOSED AMENDMENT TO THE PANS-ATM

NOTES ON THE PRESENTATION OF THE PROPOSED 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   new text to replace existing text
by the replacement text which is highlighted with grey
shading.

PROPOSED AMENDMENT TO

**PROCEDURES FOR
AIR NAVIGATION SERVICES**

AIR TRAFFIC MANAGEMENT

Editorial Note.— Initial Proposals 1, 2 and 3 are related to lateral separation minima.

INITIAL PROPOSAL 1

Chapter 5

SEPARATION METHODS AND MINIMA

. . .

5.4.1   Lateral separation

. . .

5.4.1.2   LATERAL SEPARATION CRITERIA AND MINIMA

. . .

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:

a)   for a minimum spacing between tracks of 93 km (50 NM) a navigational performance of RNAV 10 (RNP 10), RNP 4 or RNP 2 shall be prescribed;

b)   for a minimum spacing between tracks of ~~55.5~~42.6 km (~~30~~23 NM) a navigational performance of RNP 4 or RNP 2 shall be prescribed. The communication system shall satisfy required communication performance 240 (RCP 240) and the surveillance system shall satisfy required surveillance performance 180 (RSP 180). Conformance monitoring shall be ensured by establishing an ADS-C event contract with a lateral deviation change event with a maximum of 5 NM threshold and a waypoint change event;

c)   for a minimum spacing between tracks of 27.8 km (15 NM) a navigational performance of RNP 2 or a GNSS equipage shall be prescribed. Direct controller-pilot VHF voice communication shall be maintained while such separation is applied;

d)   for a minimum spacing between tracks of 13 km (7 NM), applied while one aircraft climbs/descends through the level of another aircraft, a navigational performance of RNP 2 or a GNSS equipage shall be prescribed. Direct controller-pilot VHF voice communication shall be maintained while such separation is applied; and

e) for a minimum spacing between tracks of 37 km (20 NM), applied while one aircraft climbs/descends through the level of another aircraft whilst using other types of communication than specified in d) above, a navigational performance of RNP 2 or a GNSS equipage shall be prescribed.

Note 1.— Guidance material for the implementation of the navigation capability supporting 93 km (50 NM), ~~55.5~~42.6 km (~~30~~23 NM), 37 km (20 NM), 27.8 km (15 NM) and 13 km (7 NM) lateral separation minima is contained in the Performance-based Navigation (PBN) Manual *(Doc 9613). Guidance material for the implementation of the 93 km (50 NM), 42.6 km (23 NM), 37 km (20 NM), 27.8 km (15 NM) and 13 km (7 NM) lateral separation minima is contained in* ~~and~~ *Circular ~~334~~341,* Guidelines for the Implementation of Lateral Separation Minima.

Note 2.— Guidance material for the implementation of communication and surveillance capability supporting 93 km (50 NM) and ~~55.5~~ 42.6 km (~~30~~23 NM) lateral separation minima is contained in the ~~Manual on Required~~ Performance-based Communication and Surveillance (PBCS) Manual ~~Performance (RCP)~~ *(Doc 9869) and the* Global Operational Data Link (GOLD) Manual *(Doc 10037). ~~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).~~

~~*Note 3.— Existing implementations of the 55.5 km (30 NM) lateral separation minimum require a communication capability of direct controller-pilot voice communications or CPDLC and a surveillance capability by an ADS-C system in which a periodic contract and waypoint change and lateral deviation event contracts are applied.*~~

Note ~~4~~3.— See Appendix 2, ITEM 10: EQUIPMENT AND CAPABILITIES, in relation to the GNSS prescribed in c), d) and e) above.

Origin	Rationale
SASP	Collision risk calculations have shown that lateral separation between any combination of RNP 4 and RNP 2 aircraft can safely be reduced from 55.5 km (30 NM) to 42.6 km (23 NM). Apart from being an overall global improvement in airspace management, this also satisfies the North Atlantic (NAT) operational requirement to separate aircraft laterally by 25 NM (aircraft operating on half degree tracks within the NAT track structure).
	Opportunity is also taken to align the separation minima with the RCP and RSP concepts as developed by the OPLINK panel and published in the Performance-based Communication and Surveillance (PBCS) Manual (Doc 9869).

INITIAL PROPOSAL 2

5.4.1.2.1.7 *Lateral separation of aircraft on intersecting tracks or ATS routes.* Lateral separation between aircraft operating on intersecting tracks or ATS routes shall be established in accordance with the following.

a) an aircraft converging with the track of another aircraft is laterally separated until it reaches a

lateral separation point that is located a specified distance measured perpendicularly from the track of the other aircraft (see Figure 5-6); and

b) an aircraft diverging from the track of another aircraft is laterally separated after passing a lateral separation point that is located a specified distance measured perpendicularly from the track of the other aircraft (see Figure 5-6).

This type of separation may be used for tracks that intersect at any angles using the values for lateral separation points specified below:

Navigation	*Separation*
RNAV 10 (RNP 10)	93 km (50 NM)
RNP 4	~~55.5~~42.6 km (~~30~~23 NM)
RNP 2	27.8 km (15 NM)

5.4.1.2.1.8   When applying the 27.8 km (15 NM) separation minima specified in the table above, a GNSS, as indicated in the flight plan by the letter G meets the specified navigation performance.

Note.— Guidance material for the implementation of the navigation capability supporting 93 km (50 NM), ~~55.5~~42.6 km (~~30~~23 NM), and 27.8 km (15 NM) lateral separation minima is contained in the Performance-based Navigation (PBN) Manual *(Doc 9613). Supporting information for the implementation of the 93 km (50 NM), 42.6 km (23 NM) and 27.8 km (15 NM) lateral separation minima is contained in ~~and~~ Circular ~~334~~341*, Guidelines for the Implementation of Lateral Separation Minima.

Origin	Rationale
SASP	To align the separation value with the 42.6 km (23 NM) separation specified for parallel or non-intersecting tracks or ATS routes.
	This type of separation does not have requirements of RCP and/or RSP considering that the communication requirements depend on how the intersecting track separation is applied for converging and diverging traffic and surveillance performance was not factored into the intersecting track separation.

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INITIAL PROPOSAL 3

Chapter 16

MISCELLANEOUS PROCEDURES

. . .

16.5   STRATEGIC LATERAL OFFSET PROCEDURES (SLOP)

. . .

16.5.2   Strategic lateral offsets shall be authorized only in en-route airspace as follows:

a)   where the lateral separation minima or spacing between route centre lines is ~~55.5~~42.6 km (~~30~~23 NM) or more, offsets to the right of the centre line relative to the direction of flight in tenths of a nautical mile up to a maximum of 3.7 km (2 NM); and

b)   where the lateral separation minima or spacing between route centre lines is 11.1 km (6 NM) or more and less than ~~55.5~~42.6 km (~~30~~23 NM), offsets to the right of the centre line relative to the direction of flight in tenths of a nautical mile up to a maximum of 0.9 km (0.5 NM).

. . .

Origin	Rationale
SASP	The SLOP rules are changed to align them with the new 42.6 km (23 NM) lateral separation minimum.

Editorial Note.— Initial proposal 4 is related to longitudinal separation minima based on distance using ADS-C CDP.

INITIAL PROPOSAL 4

Chapter 5

SEPARATION METHODS AND MINIMA

. . .

Insert new text as follows:

5.4.2.8   LONGITUDINAL SEPARATION MINIMA BASED ON DISTANCE
USING ADS-C CLIMB AND DESCEND PROCEDURE (CDP)

5.4.2.8.1   When aircraft on the same track is cleared to climb or descend through the level of another aircraft, the clearance should be issued provided the following requirements are met:

a)   the longitudinal distance between the aircraft is determined by the ground automation system from near simultaneous demand ADS-C reports which contain position accuracy of 0.25 NM or better (Figure of Merit 6 or higher);

Note.— Refer to 5.4.2.9.5 for distance calculations.

b)   the longitudinal distance between the aircraft, as determined in a) above, is not less than:

1) 27.8 km (15 NM) when the preceding aircraft is at the same speed or faster than the

following aircraft; or

2) 46.3 km (25 NM) when the following aircraft is not more than either 18.5 km/h (10 kt) or Mach 0.02 faster than the preceding aircraft;

c) the altitude difference between aircraft is not greater than 600 m (2000 ft);

d) the clearance is issued with a restriction that ensures vertical separation is re-established within 15 minutes from the first demand report request; and

e) direct controller-pilot voice communications or CPDLC is maintained.

5.4.2.8.2 The application of the ADS-C climb and descend procedure (CDP) should be supported by an ongoing monitoring process.

Note.— Supporting information on ongoing monitoring is provided in Circular 342, *Automatic Dependent Surveillance — Contract (ADS-C) Climb and Descend Procedure (CDP).*

End of new text.

Origin	Rationale
SASP	The SASP developed the ADS-C CDP in response to the demand by airspace users to facilitate the assignment of optimal altitudes, and the collision risk analysis proved it safe.
	The ADS-C CDP utilizes on board and air traffic control (ATC) capabilities to allow more flights to achieve their preferred vertical profiles, and thereby increases both capacity and efficiency.
	The ADS-C CDP is designed to improve air traffic services to appropriately equipped aircraft by allowing an altitude change when other separation minima do not allow for a climb or descent through the altitude of a blocking aircraft.

Editorial Note.— Initial proposals 5, 6 and 7 are related to performance-based longitudinal separation minima.

INITIAL PROPOSAL 5

Chapter 5

SEPARATION METHODS AND MINIMA

5.1   INTRODUCTION

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Note 3.— Attention is drawn to the use of strategic lateral offset procedures (SLOP) described in Chapter 16, 16.5.

Note 4.— Procedures applicable to data link initiation capability (DLIC) are contained in Chapter 4. Procedures applicable to automatic dependent surveillance - contract (ADS-C) are contained in Chapter 13. Procedures applicable to controller-pilot data link communications (CPDLC) are contained in Chapter 14.

. . .

Origin	Rationale
SASP	Since some separation minima in Chapter 5 are now reliant on data link, there is a requirement to refer to Chapters 4, 13 and 14 for DLIC, ADS-C and CPDLC. The SASP agreed that it is better to include one reference at the beginning of Chapter 5 instead of making multiple references in various parts of Chapter 5.

INITIAL PROPOSAL 6

Editorial Note.— Section 5.4.2.6.4 Longitudinal distance-based separation minima in an RNP RNAV environment using ADS-C, is proposed to be deleted and replaced by Section 5.4.2.9 below. *Move Figures 5-26, 5-27A, 5-27B and 5-28 to Section 5.4.2.5 with their associated paragraphs.*

Insert new text as follows:

5.4.2.9   PERFORMANCE-BASED LONGITUDINAL SEPARATION MINIMA

Note.— Guidance material for implementation and application of the separation minima in this section is contained in the Performance-based Communication and Surveillance (PBCS) Manual *(Doc 9869), the* Global Operational Data Link (GOLD) Manual *(Doc 10037), the* Satellite Voice Operations Manual *(SVOM) (Doc 10038) and the* Guidelines for the Implementation of Performance-based Longitudinal Separation Minima *(Circular 343).*

5.4.2.9.1   Within designated airspace, or on designated routes, separation minima in accordance with the provisions of this section may be used.

5.4.2.9.2   For aircraft cruising, climbing or descending on:

a)   the same track; or

b)   crossing tracks provided that the relative angle between the tracks is less than 90 degrees, the following separation minima may be used:

Separation minima	RNP	RCP	RSP	Maximum ADS-C periodic reporting interval
93 km (50 NM)	10	240	180	27 minutes
	4	240	180	32 minutes
55.5 km (30 NM)	2 or 4	240	180	12 minutes
5 minutes	2 or 4 or 10	240	180	14 minutes

Note.— Detailed information on the analysis used to determine these separation minima and monitoring procedures is contained in the Guidelines for the Implementation of Performance-based Longitudinal Separation Minima *(Circular 343).*

5.4.2.9.3   Opposite-direction aircraft on reciprocal tracks may be cleared to climb or descend to or through the levels occupied by another aircraft provided that ADS-C reports show that the aircraft have passed each other by the applicable separation minimum in 5.4.2.9.2.

5.4.2.9.4   The five-minute separation shall be calculated to a resolution of one second without rounding.

5.4.2.9.5   Separation shall be applied so that the distance or time between the calculated positions of the aircraft is never less than the prescribed minimum. This distance or time shall be obtained by one of the following methods:

a)   when the aircraft are on the same identical track, the distance or time may be measured between the calculated positions of the aircraft or may be calculated by measuring the distances or times to a common point on the track (see Figures 5-29 and 5-30);

Note.— Same identical tracks are a special case of same track defined in 5.4.2.1.5 a) where the angular difference is zero degrees or reciprocal tracks defined in 5.4.2.1.5 b) where the angular difference is 180 degrees.

b)   when the aircraft are on same or reciprocal non-parallel tracks other than in a) above, or on crossing tracks, the distance or time shall be calculated by measuring the distances or times to the common point of intersection of the tracks or projected track (see Figures 5-31 to 5-33); and

c)   when the aircraft are on parallel tracks whose protection areas overlap, the distance or time shall be measured along the track of one of the aircraft as in a) above using its calculated position and the point abeam the calculated position of the other aircraft (see Figure 5-34).

Note.— In all cases presented in Figures 5-29 to 5-34, "d" and "t" are calculated by subtracting the distance or time of the closer aircraft from the common point from the distance or time of the more distant aircraft from the common point, except in Figure 5-33 where the two distances or times are added and the order of the aircraft is not important in the calculation.

5.4.2.9.6   The communication system provided to enable the application of the separation minima in 5.4.2.9.2 shall allow a controller, within 4 minutes, to intervene and resolve a potential conflict by contacting an aircraft using the normal means of communication. An alternative means shall be available to allow the controller to intervene and resolve the conflict within a total time of 10.5 minutes, should the normal means of communication fail.

5.4.2.9.7   When an ADS-C periodic or waypoint change event report is not received within 3 minutes of the time it should have been sent, the report is considered overdue and the controller shall take action to obtain the report as quickly as possible, normally by ADS-C or CPDLC. If a report is not received within 6 minutes of the time the original report should have been sent, and there is a possibility of loss of separation with other aircraft, the controller shall take action to resolve any potential conflict(s) as soon as possible. The communication means provided shall be such that the conflict is resolved within a further 7.5 minutes.

5.4.2.9.8   When information is received indicating ground or aircraft equipment failure or deterioration below the communication, navigation and surveillance performance requirements, ATC shall then, as required, apply alternative separation minima.
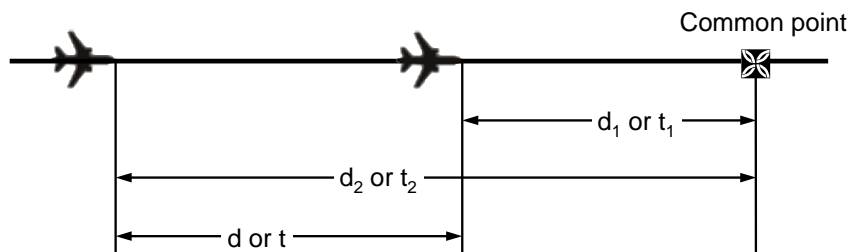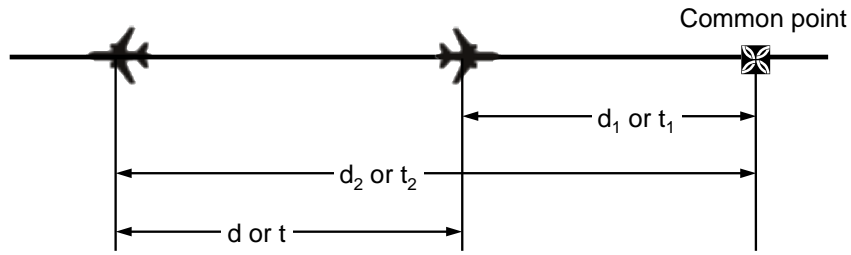

**Figure 5-29. Calculation of longitudinal distance/time between aircraft —
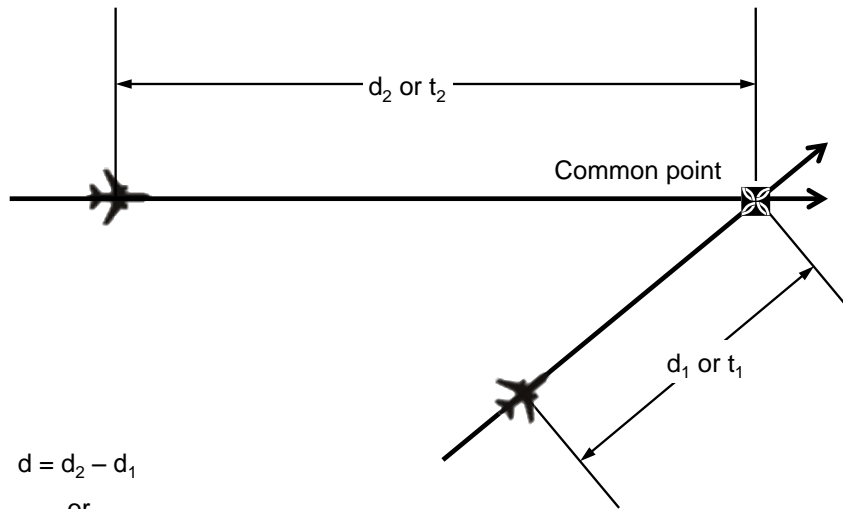identical track, same direction (see 5.4.2.9.5 a))**

$$d = d_2 - d_1$$

or

$$t = t_2 - t_1$$

**Figure 5-30. Calculation of longitudinal distance/time between aircraft —
identical track, opposite direction (see 5.4.2.9.5 a))**

$$d = d_2 - d_1$$

or

$$t = t_2 - t_1$$

**Figure 5-31. Calculation of longitudinal distance/time between aircraft —
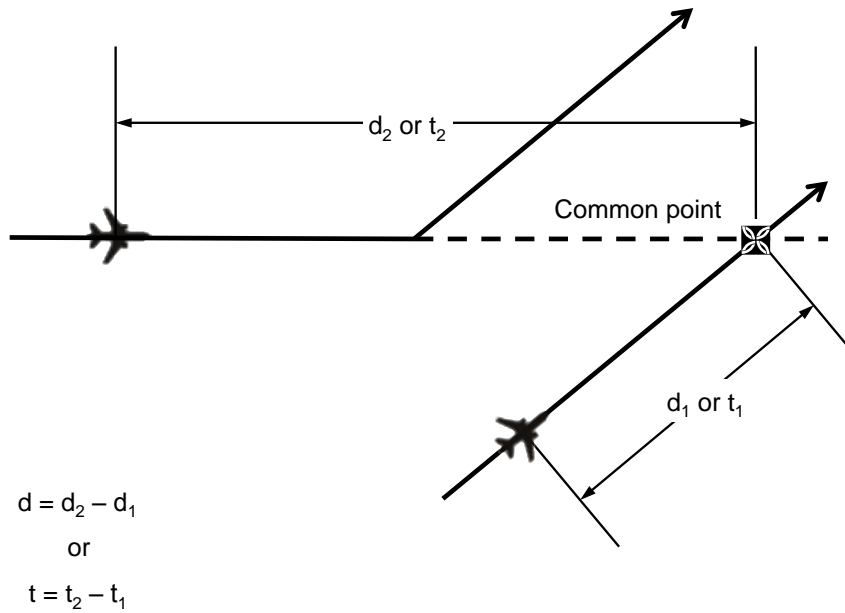same track, but not identical and crossing tracks (see 5.4.2.9.5 b))**

d_2 or t_2

Common point

d_1 or t_1

$d = d_2 - d_1$

or

$t = t_2 - t_1$

**Figure 5-32. Calculation of longitudinal distance/time between aircraft —
same track projected, but not identical (see 5.4.2.9.5 b))**

d_2 or t_2

d_1 or t_1

Common point
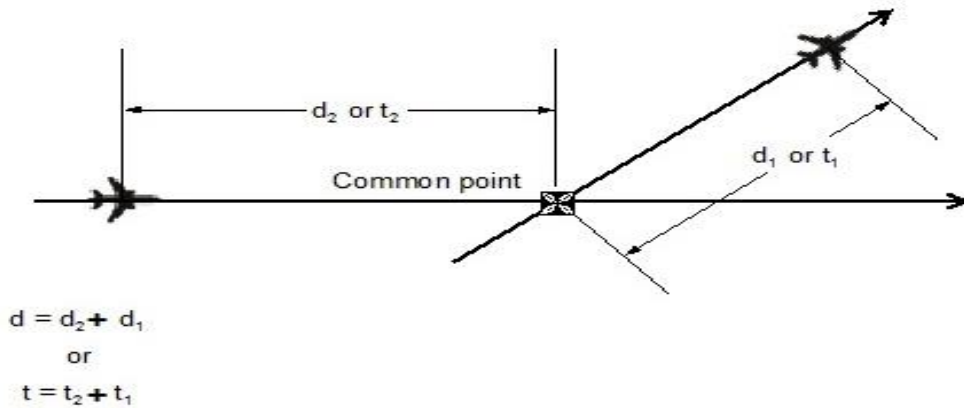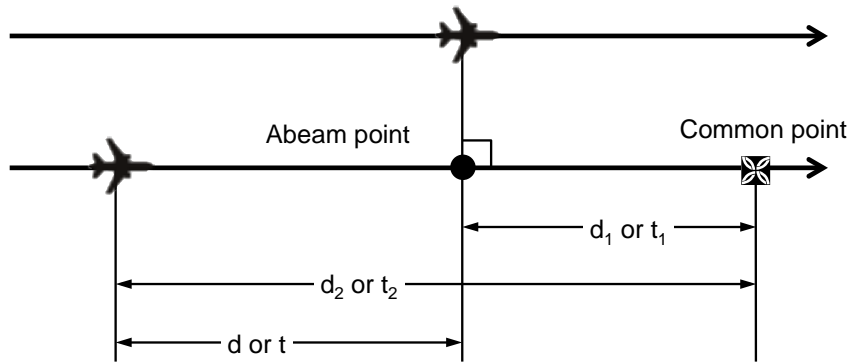
$d = d_2 + d_1$

or

$t = t_2 + t_1$

**Figure 5-33. Calculation of longitudinal distance/time between aircraft —
opposite sides of the common point (see 5.4.2.9.5 b))**

$$d = d_2 - d_1$$
$$\text{or}$$
$$t = t_2 - t_1$$

**Figure 5-34. Calculation of longitudinal distance/time between aircraft –
parallel tracks (see 5.4.2.9.5 c))**

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End of new text.

_____

Origin	Rationale
SASP	Besides navigation, in a performance-based environment it is necessary to address the communication and surveillance requirements also in terms of the required performance in the application of the separation minima. It was considered that minor restructuring within Chapter 5, Section 5.4.2.6.4 to allow the 93 km (50 NM), 55.5 km (30 NM) and five-minute longitudinal separation minima to remain together in a table format would be the better long-term scheme for interested parties to access. Therefore, Section 5.4.2.6.4 was significantly reviewed and replaced by the proposed new Section 5.4.2.9.
	The recommendation for the change from 14 to 12 minutes for the maximum ADS-C periodic reporting interval is due to the fact that the initial modelling developed in 1998 did not account for the Observed Navigational Performance (ONP) of aircraft with GNSS equipage. The earlier work assumed a navigation accuracy equivalent to RNP 4 whereas it is now realised that the ONP of modern GNSS equipped aircraft is typically in the order of 0.5 NM and as such results in higher risk in the longitudinal sense and specifically in the case of same identical track. Other parameters used in the safety assessment were also revised, however considering the conservative nature of the earlier safety assessment, 14 minutes is still safe and can be used. However for new implementations of the minima and where it is possible for an ANSP to adjust the reporting interval, the 12 minute maximum ADS-C periodic reporting interval should be used.

INITIAL PROPOSAL 7

Chapter 13

AUTOMATIC DEPENDENT SURVEILLANCE —
CONTRACT (ADS-C) SERVICES

. . .

13.5.3 Application of horizontal separation using ADS-C position information

. . .

13.5.3.1   ADS-C-based longitudinal distance separation minima are detailed at 5.4.2.9 ~~6.4~~ of Chapter 5.

. . .

Origin	Rationale
SASP	Consequential amendment resulting from the introduction of the proposed new Section 5.4.2.9 replacing Section 5.4.2.6.4.

— — — — — — — —

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

*"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 —