



International  
Civil Aviation  
Organization

Organisation  
de l'aviation civile  
internationale

Organización  
de Aviación Civil  
Internacional

Международная  
организация  
гражданской  
авиации

منظمة الطيران  
المدني الدولي

国际民用  
航空组织

Tel.: +1 514-9 54-8219 ext. 6710

Ref.: AN 13/2.5-21/51

9 July 2021

**Subject:** Proposed amendment to PANS-ATM relating to time-based separation (TBS) minima for wake turbulence arising from the direct submission method

**Action required:** Comments to reach Montréal by 10 January 2022

Sir/Madam,

1. I have the honour to inform you that the Air Navigation Commission, at the tenth meeting of its 217th Session held on 22 June 2021, considered proposals developed from the direct submission method to amend the *Procedures for Air Navigation Services — Air Traffic Management* (PANS-ATM, Doc 4444) relating to time-based separation (TBS) minima for wake turbulence. The Commission authorized their transmission to Member States and appropriate international organizations for comments.
2. The background information pertaining to the aforementioned proposal is presented in Attachment A. The proposals for amendment to the PANS-ATM are contained in Attachment B.
3. To facilitate your review of the proposed amendments, rationales have been provided in a text box immediately following each proposal throughout Attachment B. In examining the proposed amendment, you should not feel obliged to comment on editorial aspects, as such matters will be addressed by the ANC during its final review of the draft amendment.
4. May I request that any comments you wish to make on the amendment proposals be dispatched to reach me not later than 10 January 2022. To facilitate the processing of replies with substantive comments, I invite you to submit an electronic version in Microsoft Word format to [icaohq@icao.int](mailto:icaohq@icao.int). 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 transmission of your reply, please let me know in advance of the due date.
5. The proposed amendments to the PANS-ATM are envisaged for applicability on 28 November 2024. Any comments you may have thereon would be appreciated.

6. 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.

7. 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 C, which may be completed and returned together with your comments, if any, on the technical content of the proposals in Attachment B.

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

Fang Liu  
Secretary General

**Enclosures:**

- A — Background information
- B — Proposed amendment to PANS-ATM
- C — Response form

## BACKGROUND INFORMATION

1.1 Recommendation 5.5/3 — *Standard-making processes* of the Thirteenth Air Navigation Conference (AN-Conf/13, Montreal, 9 to 19 October 2018) called on ICAO to review and enhance its Standard-making processes in order to meet the requirements of the rapid pace of technological developments. Subsequently, the Air Navigation Commission (214-10) reviewed a proposal from the Secretariat regarding alternative methods to the ICAO Standards-making process for the development of ICAO provisions. One of the proposed alternatives was the direct submission method; with the leveraging of existing ICAO processes and the resources of external entities, operationally validated and regulated solutions with potential global application may be submitted for consideration in the ICAO Standards-making process.

1.2 In coordination with the European Organisation for the Safety of Air Navigation (EUROCONTROL) as project partner, the Secretariat identified the time-based separation (TBS) minima for wake turbulence as a suitable pilot project candidate to support the development of the direct submission method.

1.3 The amendment to the *Procedures for Air Navigation Services — Air Traffic Management* (PANS-ATM, Doc 4444) stems from existing work by EUROCONTROL, which had been operationally validated and regulated. Additionally, the proposed amendment was reviewed by the appropriate expert group of the ANC.

### *Time-based separation (TBS) minima for wake turbulence*

1.4 Where the indicated airspeed (IAS) of an aircraft remains constant, the time taken to fly a specific distance increases as aircraft ground speed decreases due to headwind conditions. As such, in the application of distance-based wake turbulence separation minima between aircraft on final approach, headwind conditions result in longer time intervals between successive arrivals, resulting in reduced landing rates and operational uncertainty.

1.5 TBS minima for wake turbulence were developed to mitigate the loss of runway throughput in headwind conditions by delivering time intervals between arrivals that are consistent with distance-based separation in low wind conditions. TBS has demonstrated to be a suitable alternative to distance-based separation minima, where the headwind component is a determining factor.

1.6 The proposal contained in Appendix B proposes adding a new sub-section 8.7.3.7 — *Time-based wake turbulence separation minima on final approach* to PANS-ATM, Chapter 8, allowing for the establishment of location specific time-based wake turbulence separation minima.

-----



**PROPOSED AMENDMENT TO  
PROCEDURES FOR AIR NAVIGATION SERVICES —  
AIR TRAFFIC MANAGEMENT  
(PANS-ATM, DOC 4444)**

**NOTES ON THE EDITORIAL 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:

1. ~~Text to be deleted is shown with a line through it.~~ text to be deleted
2. **New text to be inserted is highlighted with grey shading.** new text to be inserted
3. ~~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 (PANS-ATM, DOC 4444)***

**Chapter 5**

**SEPARATION METHODS AND MINIMA**

...

**5.8 TIME-BASED WAKE TURBULENCE  
LONGITUDINAL SEPARATION MINIMA**

*Note.— Distance-based and time-based wake turbulence separation minima based on ATS surveillance systems are set forth in Chapter 8, 8.7.3.*

<b>Origin:</b>	<i>Rationale</i>
Direct Submission EUROCONTROL	The note under paragraph 5.8 is amended to clarify the difference between the existing time-based wake turbulence separation minima and the proposed TBS provisions in Chapter 8.

...

**Chapter 8**

**ATS SURVEILLANCE SERVICES**

...

**8.7 USE OF ATS SURVEILLANCE SYSTEMS IN THE  
AIR TRAFFIC CONTROL SERVICE**

...

**8.7.3 Separation minima based on ATS surveillance systems**

...

---

*Insert new text as follows:*

---

**8.7.3.7 Time-based wake turbulence separation minima on final approach**

*Note 1.— Time-based wake turbulence separation minima may be used as an alternative to the distance-based separation minima specified in either 8.7.3.4 or 8.7.3.5, as a means of mitigating the impact*

of headwind conditions that can unnecessarily increase the time intervals between successive landing aircraft, resulting in reduced arrival rates.

*Note 2.— Guidance on the implementation of time-based separation minima and supporting automation can be found in the European Organisation for the Safety of Air Navigation (EUROCONTROL) Guidelines on Time-based Separation (TBS) (EUROCONTROL – GUID-187)(latest version).*

8.7.3.7.1 When authorized by the appropriate ATS authority, the distance-based separation minima prescribed in 8.7.3.4 and 8.7.3.5 may be converted to, and applied as, time-based minima between aircraft on final approach in accordance with the following:

- a) the aircraft are being provided with an ATS surveillance service in the approach phase and both aircraft are using the same runway, or parallel runways separated by less than 760 m (2 500 ft);
- b) the reference time-based separation minima shall be based on location and runway-specific analysis of elapsed final approach flight time of different aircraft types or wake turbulence categories or groups to fly the applicable distance-based separation minima in low wind conditions. The analysis shall, as a minimum:
  - 1) consider the variability of aircraft speed profile and the effect of local meteorological conditions; and
  - 2) be subject to periodic review to ensure continued validity;

*Note.— Low wind conditions of 9 km/h (5 kt) or less provide a conservative reference with regard to wake decay.*

<b>Origin:</b>	<i>Rationale</i>
Direct Submission EUROCONTROL	<p>As the reference measured flight times are unique to each runway for a specific location, it is necessary to mandate that TBS minima are determined by location and runway-specific analysis. This will determine the time it takes for various aircraft types, wake turbulence categories or groups to fly the various wake turbulence separation distances, specified in 8.7.3.4 and 8.7.3.5, in low wind conditions at that location. Additionally, due to the changing nature of aviation, it is necessary to stipulate that the analysis be subject to periodic review to ensure it remains representative of the local traffic mix or if related procedures change.</p> <p>The low wind parameter contained in the note (less than 5 kt) has been previously applied in the development of reduced wake turbulence separation minima in 8.7.3.4 and 8.7.3.5, and provides clarification of that phrase, as used on 8.7.3.7.1.b)</p>

- c) calculation of the minimum distance (displayed to the controller) required between aircraft pairs shall be performed by an ATC automation system, and shall be based on the following:
  - 1) the established final approach sequence;
  - 2) the reference time-based separation minima for the aircraft pair concerned;
  - 3) applicable final approach wind condition data and any predicted variability; and
  - 4) the expected elapsed time of the succeeding aircraft type, wake turbulence category or group,

based on the applicable final approach wind condition data, including appropriate additional margins as necessary to allow for predicted variability;

*Note 1.— Accurate approach sequence information is necessary for the determination of the appropriate time-based minima to be applied.*

*Note 2.— Final approach wind condition data may comprise of actual and system generated wind profiles, and can be applied both predictively or in real-time to assist in determination of expected elapsed times.*

<b>Origin:</b>	<i>Rationale</i>
Direct Submission EUROCONTROL	<p>The minimum separation distance (which is subsequently displayed to the controller) required to meet the applicable time-based minima can only be calculated from a combination of the reference time-based minima (determined by the analysis as per 8.7.3.7.1 b) and the aircraft concerned, and conditions at the time this information is stipulated in c).</p> <p>While the wind on final approach is continuously fed into the system, the actual displayed visual indicator is based on “expected” time to fly a required distance as modified by a system-generated wind profile, which can be predictive or real-time. Consequently, the wording used “applicable final approach wind condition data” captures this combination succinctly.</p> <p>Note: Safety margins (buffers) are added to the system for the calculation of the visual indicators to address variability of flying time and wind condition. This ensures the minima is unlikely to become eroded in event of a wind strength change.</p>

d) controllers shall be in possession of the following:

- 1) information on the approach sequence for the runway(s)-in-use, and the capability to modify the approach sequence, in the ATC automation system, if necessary;
- 2) visual indication on the situation display of the minimum distance between aircraft to maintain the equivalent time-based minima;
- 3) safety-related alerts and warnings, as required by the appropriate ATS authority to enable the controller to assess, in a timely manner, potential or actual infringements of separation minima and, if necessary, take appropriate actions; and

e) information on the application of time-based separation minima at specified aerodromes shall be published in the AIP.

---

End of new text.

---



<p><b>Origin:</b></p> <p>Direct Submission EUROCONTROL</p>	<p><i>Rationale</i></p> <p>As the TBS system calculates and depicts the equivalent distance based on an established approach sequence, any change to the approach sequence will need to be entered into the system, either manually or automatically, in order to ensure the correct minima is determined and displayed.</p> <p>The minimum distance between aircraft to maintain the equivalent time-based minima for specific aircraft pairs vary depending on the wind conditions. Therefore, the calculated minimum separation distance required to meet the established time minima behind a preceding aircraft must be displayed to the controller by way of a visual indicator in order to ensure correct application of TBS.</p> <p>While minimum controller information requirements are specified in d), it is acknowledged that other safety alerts, such as unexpected speed variations indications or out of sequence aircraft alerts, may provide benefit. The decision as to whether or not these are provided to the controller will be based on the local implementation safety case.</p>
--	--

-----



**ATTACHMENT C** to State letter AN 13/2.5-21/51

**RESPONSE FORM TO BE COMPLETED AND RETURNED TO ICAO TOGETHER  
WITH ANY COMMENTS YOU MAY HAVE ON THE PROPOSED AMENDMENT**

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.**

	<i>Agreement without comments</i>	<i>Agreement with comments*</i>	<i>Disagreement without comments</i>	<i>Disagreement with comments</i>	<i>No position</i>
Amendment to PANS-ATM (Doc 4444) (Attachment B 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 —