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.: +1 514-954-8219 ext. 6717

Ref.: AN 4/1.1.57-17/44 19 April 2017

**Subject:** Proposals for the amendment of Annex 14, Volume I and PANS-Aerodromes (Doc 9981)

**Action required:** Comments to reach Montréal by 21 July 2017

Sir/Madam,

1. I have the honour to inform you that the Air Navigation Commission, at the seventh meeting of its 204th Session held on 7 March 2017, considered proposals developed by the second meeting of the Aerodrome Design and Operations Panel (ADOP/2) to amend Annex 14 — *Aerodromes*, Volume I — *Aerodrome Design and Operations* and the *Procedures for Air Navigation Services (PANS) — Aerodromes* (Doc 9981). The Commission authorized their transmission to Member States and appropriate international organizations for comments.

2. The background of the aforementioned proposals is explained in Attachment A. The proposals for amendment to Annex 14, Volume I and the consequential amendment to PANS-Aerodromes are contained in Attachments B and C, respectively. A rationale box providing more information has also been included for each proposal.

3. May I request that any comments you wish to make on the amendment proposals be dispatched to reach me not later than 21 July 2017. To facilitate the processing of replies with substantive comments, I invite you to submit an electronic version in Word format to 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 receipt of your reply, please let me know in advance of the due date.

4. For your information, the proposed amendment to Annex 14, Volume I and PANS-Aerodromes is envisaged for applicability on 8 November 2018. Any comments you may have thereon would be appreciated.

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5. 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 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 D which may be completed and returned together with your comments, if any, on the proposals in Attachments B and C. Should you have comments on the wording of the amendment proposals in one of the languages other than English, you are invited to provide these in Attachment E. This will facilitate coordination with ICAO Languages and Publications.

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

Fang Liu
Secretary General

**Enclosures:**

A — Background information
B — Proposed amendment to Annex 14, Volume I
C — Proposed amendment to PANS-Aerodromes
D — Response form
E — Response form for comments on wording

**ATTACHMENT A** to State letter AN 4/1.1.57-17/44

## BACKGROUND INFORMATION

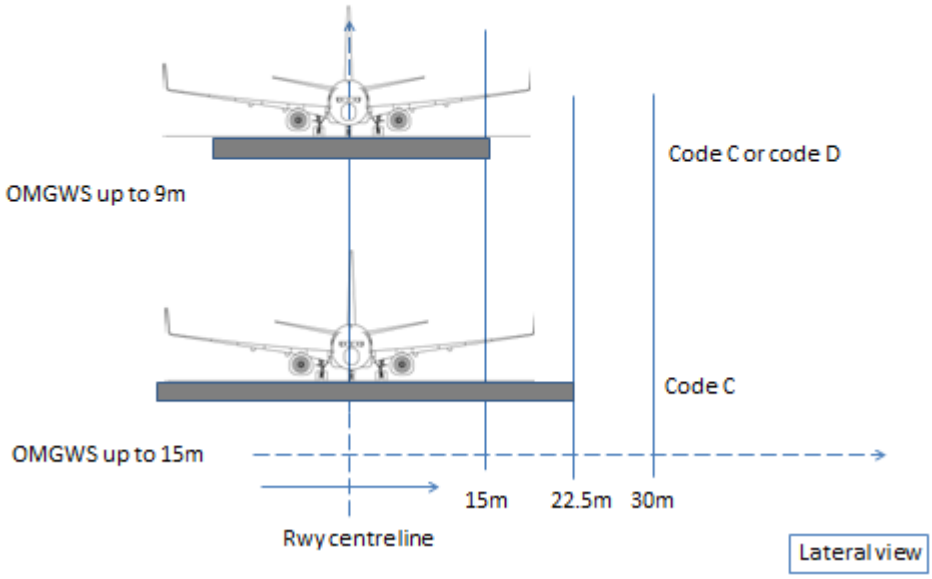
*As part of the* Annex 14 — *Aerodromes*, Volume I — *Aerodrome Design and Operations, Chapter 3 review, the aerodrome design specifications were extensively discussed within the Aerodrome Design and Operations Panel (ADOP). In general, the ADOP had considered that the existing specifications were derived before the advent of modern, new large aircraft and that they were overly conservative. In light of the foregoing, the second meeting of the ADOP (ADOP/2) concluded that based on various studies conducted in different States and international organizations, the work was comprehensive and its proposal well justified, and this was also agreed to by the Air Navigation Commission.*

*The following diagrams/figures provide clarification on selected amendment proposals for better understanding.*

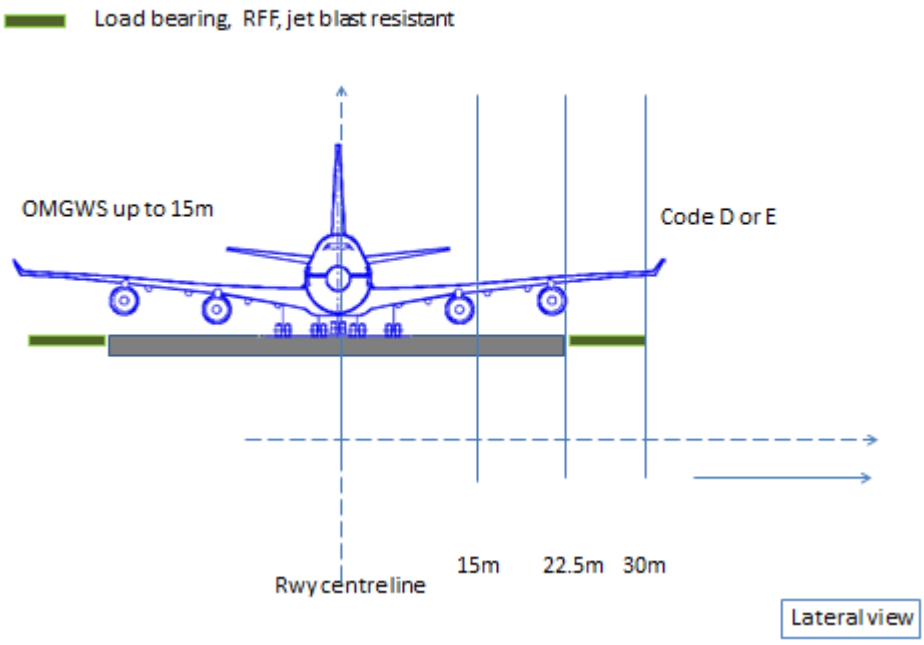
### 1. Runway widths and shoulders (Annex 14, Volume I, paragraph 3.1.10)

1.1 The following diagrams show the different runway and shoulders for OMGWS above 6m and up to 15m (covering nearly all commercial aeroplanes, Codes C, D, E and F)

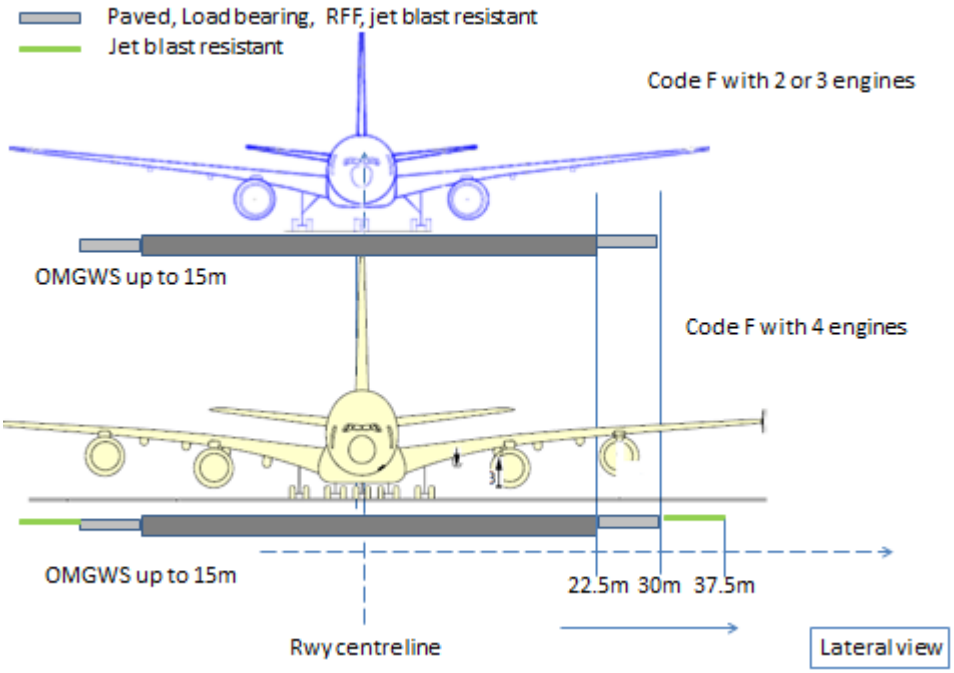
Rwy widths/shoulders (Code C and D)



Rwy widths/shoulders (Code D and E)



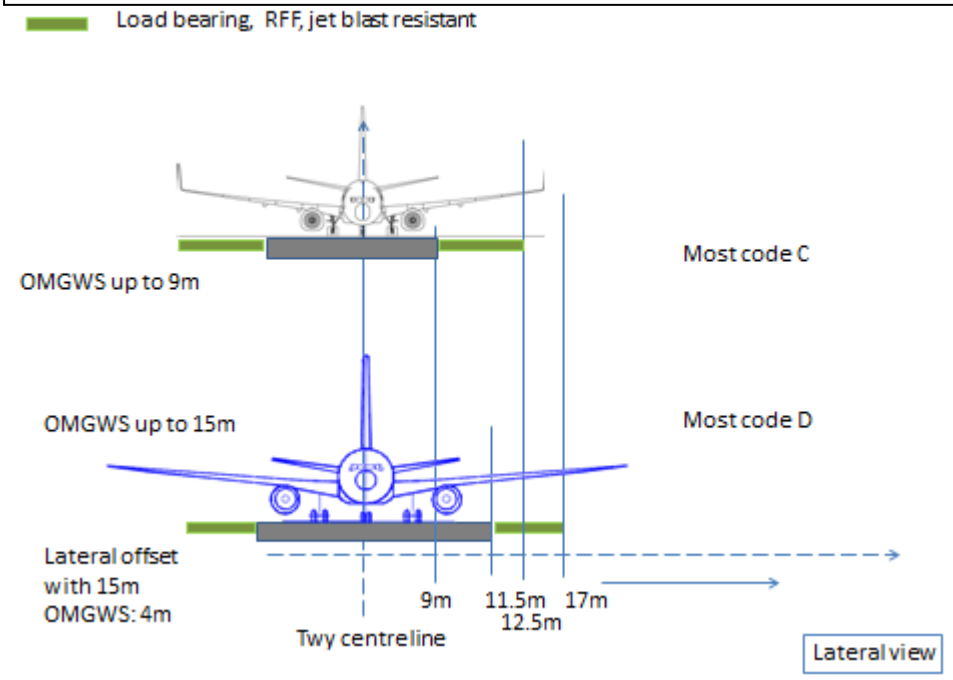

Rwy widths/shoulders (Code F)



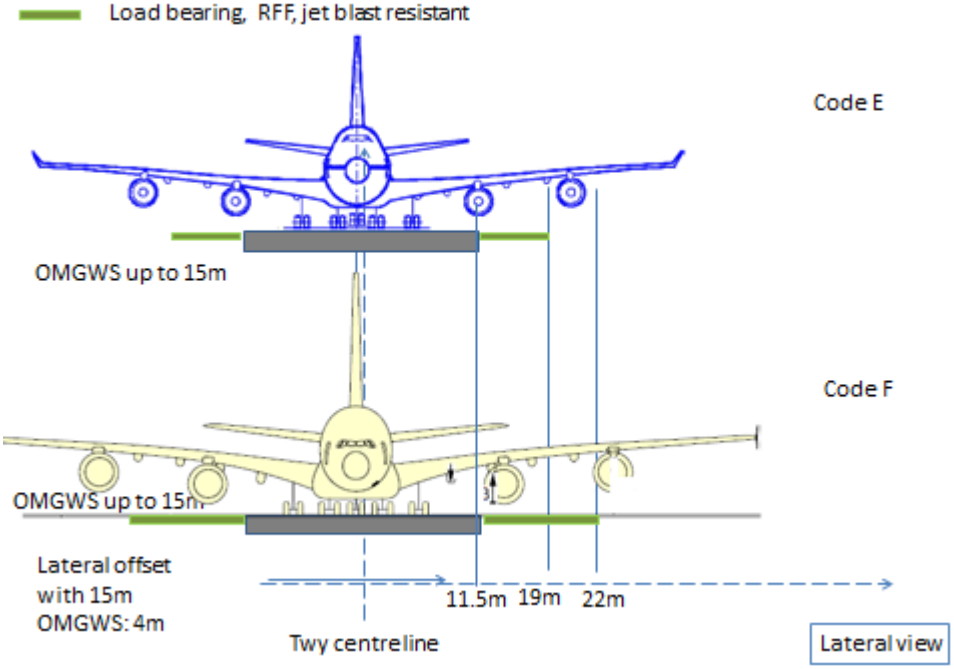

2. **Taxiway widths and shoulders (Annex 14, Volume I, paragraphs 3.9.3, 3.9.4 and 3.10.1)**

2.1 The following diagrams show the different taxiway and shoulders for OMGWS above 6m and up to 15m (covering nearly all commercial aeroplanes, Codes C, D, E and F).

Twy widths/shoulders (Code C and D)




Twy widths/shoulders (Code E and F)




3. **Widths of runway strips for precision and non-precisions runways (paragraphs 3.4.3 and 3.4.4)**

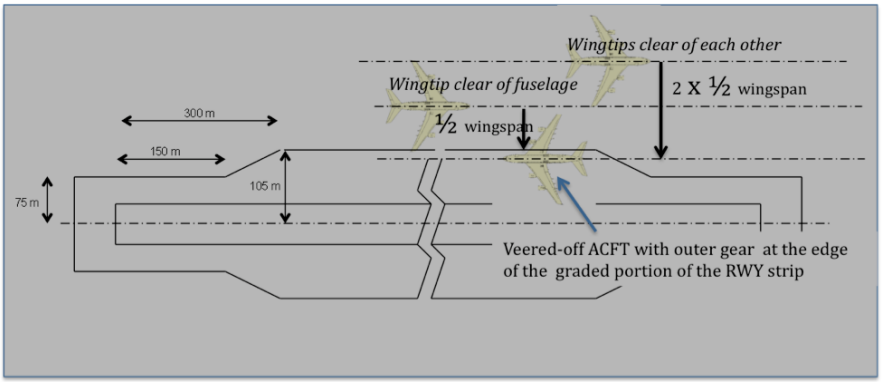
3.1 This is an extract of a paper (ADWG/7- DP/6) which discusses runway-taxiway separation and, by extension, explains the rationale for reduction of runway width.

3.2 For runways with precision approaches, the half-width of the graded portion of the strip is recommended to be between 75 and 105m, depending on the distance from the threshold. Using the higher value, this yields separations of (see figure below):

a) For "protection" against wing-tip to fuselage contact (catastrophic):
½ width of graded area + ½ wingspan= 105+40 = 145m

b) For "protection" against wing-tip to wingtip contact (major):
½ width of graded area – ½ gear span + ½ wingspan + ½ wingspan = 105 – 7 + 40 + 40 = 178m

(runway aircraft with its outer gear at the edge of graded area)




c) it shows that the worst case leads to a minimum runway-taxiway separation of 178m for code F, allowing for the extremely improbable deviation of an aircraft on the runway to the edge of the graded portion of the strip;

d) this minimum runway-taxiway separation is rounded up from 178 to 180m;

e) the 180 m includes the half wingspan of the aircraft on the taxiway (corresponding to 140m half strip + 40m half wingspan)

f) thus, full protection is achieved with a half strip width of 140 m.

3.3 The same logic applies to lower codes on Instrument runways.

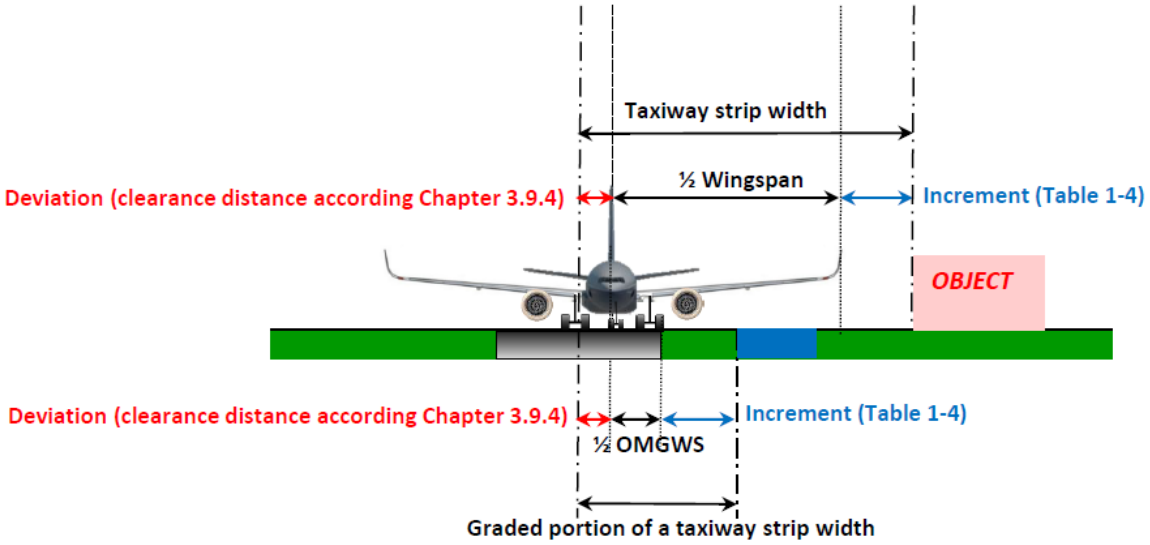
## 4. Width of the graded portion of the taxiway strip (paragraph 3.11.4)

4.1 The objective of the graded portion of a taxiway strip is to reduce the risk of damage to an aeroplane accidentally running off the taxiway, and should therefore be expressed in terms of OMGWS, while the taxiway to object values (Table 3-1) are expressed in terms of wingspan.

4.2 The current graded portion of the taxiway strip includes a by far larger safety buffer than the taxiway to object separation distance required for ensuring wingtip clearance. In practice, this means that an aircraft could travel on an area prepared to occasionally withstand its weight and hit an object far before leaving the graded portion of a taxiway strip. It is proposed to harmonize the values with table 3-1 according to the formula:

½ OMGWS + deviation + increment

4.3 The proposed values are consistent with the revised taxiway separations distances in Table 3-1 as per Amendment 13, Annex 14, Volume I. The proposed amendment simplifies the application of airport planning standards as well as allowing a more efficient use of aerodrome land surface by applying the same safety level for a wingtip collision as for getting beyond the graded portion of a taxiway strip in case of an excursion.




Graded portion of a taxiway strip in relation to taxiway to object distance according to Table 3-1 .

— — — — — — — —

**ATTACHMENT B** to State letter AN 4/1.1.57-17/44

# PROPOSED AMENDMENT TO INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

## AERODROMES

## ANNEX 14

## TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

## VOLUME I
## (AERODROME DESIGN AND OPERATIONS)

## 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 |

**INTERNATIONAL STANDARDS**
**AND RECOMMENDED PRACTICES**

**AERODROMES**

**ANNEX 14**

**TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION**

**VOLUME I**
**(AERODROME DESIGN AND OPERATIONS)**

**INITIAL PROPOSAL 1**

## ABBREVIATIONS AND SYMBOLS

*Abbreviations*

ACN Aircraft classification number

**…**

OLS Obstacle limitation surface
OMGWS Outer main gear wheel span
PAPI Precision approach path indicator

**...**

## CHAPTER 1. GENERAL

…

### 1.1 Definitions

**...**

***Obstacle free zone (OFZ).*** The airspace above the inner approach surface, inner transitional surfaces, and balked landing surface and that portion of the strip bounded by these surfaces, which is not penetrated by any fixed obstacle other than a low-mass and frangibly mounted one required for air navigation purposes.

***Outer main gear wheel span (OMGWS).*** The distance between the outside edges of the main gear wheels.

***Orthometric height.*** Height of a point related to the geoid, generally presented as an MSL elevation.

| **Origin:** | **Rationale:** |
|---|---|
| ARCTF/3 | The term OMGWS is an important input parameter when determining runway and taxiway widths. With the proposed removal of column (5) in Table 1-1, as well as its general restructuring, the existing subscript (a) in Table 1-1 is now proposed to be relocated in both the **ABBREVIATIONS AND SYMBOLS** and **Definitions** sections. |

**INITIAL PROPOSAL 2**

**…**

### 1.6 Reference code

*Introductory Note.— The intent of the reference code is to provide a simple method for interrelating the numerous specifications concerning the characteristics of aerodromes so as to provide a series of aerodrome facilities that are suitable for the aeroplanes that are intended to operate at the aerodrome. The code is not intended to be used for determining runway length or pavement strength requirements. The code is composed of two elements which are related to the aeroplane performance characteristics and dimensions. Element 1 is a number based on the aeroplane reference field length and element 2 is a letter based on the aeroplane wingspan ~~and outer main gear wheel span. A particular specification is related to the more appropriate of the two elements of the code or to an appropriate combination of the two code elements~~. The code letter or number within an element selected for design purposes is related to the critical aeroplane characteristics for which the facility is provided. When applying Annex 14, Volume I, the aeroplanes which the aerodrome is intended to serve are first identified and then by the two elements of the code.*

1.6.1 An aerodrome reference code — code number and letter — which is selected for aerodrome planning purposes shall be determined in accordance with the characteristics of the aeroplane for which an aerodrome facility is intended.

1.6.2 The aerodrome reference code numbers and letters shall have the meanings assigned to them in Table 1-1.

1.6.3 The code number for element 1 shall be determined from Table 1-1, column 1, selecting the code number corresponding to the highest value of the aeroplane reference field lengths of the aeroplanes for which the runway is intended.

*Note 1.— The determination of the aeroplane reference field length is solely for the selection of a code number and is not intended to influence the actual runway length provided.*

*Note 2.— Guidance on determining the runway length is given in the* Aerodrome Design Manual, *(Doc 9157), Part 1 —* Runways.

| **Origin:** | **Rationale:** |
|---|---|
| ARCTF/3 | There is confusion between the use of the aeroplane reference field length as a parameter in Annex 14 and actual aerodrome runway length, which are different. Doc 9157, Part 1 contains guidance on factors affecting runway length, including aeroplane performance parameters. |

1.6.4 The code letter for element 2 shall be determined from Table 1-1, ~~column 3~~, by selecting the code letter which corresponds to the greatest wingspan~~, or the greatest outer main gear wheel span, whichever gives the more demanding code letter~~ of the aeroplanes for which the facility is intended.

*Note.— Guidance ~~to assist the appropriate authority~~ ~~in~~ on determining the aerodrome reference code is given in the* Aerodrome Design Manual *(Doc 9157), Parts 1 and 2.*

| **Origin:** | **Rationale:** |
|---|---|
| ADWG/15 IP/1, ARCTF/3, ADWG/16 | The aerodrome reference code (ARC) is intended to provide a simple method for interrelating the numerous specifications concerning characteristics of aerodromes, so as to provide a series of suitable aerodrome facilities for the aeroplanes intended to operate at the aerodrome. The operational and physical characteristics of the aeroplane determine the code letter or number, which is used to determine the specification of each airfield design element.<br><br>In the process of reviewing the ARC and related Standards and Recommended Practices (SARPs), the Aerodrome Reference Code Task Force (ARCTF) identified the need to de-correlate the two code letter components i.e. wingspan and OMGWS. The ARCTF observed that wingspan is relevant for aerodrome characteristics related to separation distances (e.g. obstacles, strips), while OMGWS impacts ground-based manoeuvring characteristics (e.g. runway and taxiway widths). Thus, the two components should be used separately, since using the most demanding component may cause overdesign, either for separations or runway/taxiway width for some aeroplane types.<br><br>The following examples are aeroplanes that cannot be properly codified with the current Table 1-1, as their wingspan and OMGWS belong to different code letters: Dash 8-400, TU-134, B-757, AN-124.<br><br>As the OMGWS is the relevant parameter for determining runway width, taxiway width and graded portion of taxiway strips, it should be referenced directly in the relevant provisions to avoid the complexity of a third code element, especially as OMGWS is relevant for few Annex 14 SARPS. |

**Table 1-1. Aerodrome reference code**
*(see 1.6.2 to 1.6.4)*

| Code element 1 | | Code element 2 | | |
|---|---|---|---|---|
| Code number (1) | Aeroplane reference field length (2) | Code letter (3) | Wingspan (4) | Outer main gear wheel span[a] (5) |
| 1 | Less than 800 m | A | Up to but not including 15 m | Up to but not including 4.5 m |
| 2 | 800 m up to but not including 1 200 m | B | 15 m up to but not including 24 m | 4.5 m up to but not including 6 m |
| 3 | 1 200 m up to but not including 1 800 m | C | 24 m up to but not including 36 m | 6 m up to but not including 9 m |
| 4 | 1 800 m and over | D | 36 m up to but not including 52 m | 9 m up to but not including 14 m |
| | | E | 52 m up to but not including 65 m | 9 m up to but not including 14 m |
| | | F | 65 m up to but not including 80 m | 14 m up to but not including 16 m |

a. Distance between the outside edges of the main gear wheels.

*Editorial Note.— Replace existing Table 1-1 with text below.*

| Code element 1 | |
|---|---|
| Code number | Aeroplane reference field length |
| 1 | less than 800 m |
| 2 | 800 m up to but not including 1 200 m |
| 3 | 1 200 m up to but not including 1 800 m |
| 4 | 1 800 m and over |

| Code element 2 | |
|---|---|
| Code letter | Wingspan |
| A | Up to but not including 15 m |
| B | 15 m up to but not including 24 m |
| C | 24 m up to but not including 36 m |
| D | 36 m up to but not including 52 m |
| E | 52 m up to but not including 65 m |
| F | 65 m up to but not including 80 m |

*Note.— Guidance on planning for aeroplanes with wingspans greater than 80 m is given in the* Aerodrome Design Manual *(Doc 9157), Parts 1 and 2.*

| **Origin:** | **Rationale:** |
|---|---|
| ADWG/15 IP/1, ARCTF/3, ADWG/16 | It is proposed to change the format of the table since the current format implies a direct relationship between code elements 1 and 2. The proposed format will remove any assumed alignment or relationship between the two code elements of the ARC. The revised Table 1-1 is simpler and avoids confusion between the two unrelated code elements, i.e. ARFL and wingspan. For code element 2 (code letter), the OMGWS component is proposed to be deleted from the ARC as explained in the rational box to 1.6.4 above. |

**INITIAL PROPOSAL 3**

…

## CHAPTER 3. PHYSICAL CHARACTERISTICS

**…**

3.1.9 Runways with stopways or clearways

**…**

**Width of runways**

3.1.10 **Recommendation.—** *The width of a runway should be not less than the appropriate dimension specified in the following tabulation:*

~~Code Letter~~

| ~~Code number~~ | ~~A~~ | ~~B~~ | ~~C~~ | ~~D~~ | ~~E~~ | ~~F~~ |
|---|---|---|---|---|---|---|
| ~~*1*[a]~~ | ~~*18 m*~~ | ~~*18 m*~~ | ~~*23 m*~~ | ~~-~~ | ~~--~~ | |
| ~~*2*[a]~~ | ~~*23 m*~~ | ~~*23 m*~~ | ~~*30 m*~~ | ~~-~~ | ~~--~~ | |
| ~~*3*~~ | ~~*30 m*~~ | ~~*30 m*~~ | ~~*30 m*~~ | ~~*45 m*~~ | ~~--~~ | |
| ~~*4*~~ | ~~-~~ | ~~-~~ | ~~*45 m*~~ | ~~*45 m*~~ | ~~*45 m*~~ | ~~*60 m*~~ |

[a] ~~*The width of a precision approach runway should be not less than 30 m where the code number is 1 or 2.*~~

Outer Main Gear Wheel Span (OMGWS)

| Code number | Up to but not including 4.5 m | 4.5 m up to but not including 6 m | 6 m up to but not including 9 m | 9 m up to but not including 15 m |
|---|---|---|---|---|
| *1*[a] | *18 m* | *18 m* | *23 m* | – |
| *2*[a] | *23 m* | *23 m* | *30 m* | – |
| *3* | *30 m* | *30 m* | *30 m* | *45 m* |
| *4* | – | – | *45 m* | *45 m* |

*a. The width of a precision approach runway should be not less than 30 m where the code number is 1 or 2.*

*Note 1.— The combinations of code numbers and ~~letters~~* OMGWS *for which widths are specified have been developed for typical aeroplane characteristics.*

*Note 2.— Factors affecting runway width are given in the* Aerodrome Design Manual, *(Doc 9157), Part 1.*

| **Origin:** | **Rationale:** |
|---|---|
| Circular 305<br>ARCTF/3<br>ADWG/16 | ICAO provisions concerning runway widths first appeared in Annex 14 (1st Edition) in 1951, at the beginning of the jet era. The widths, as specified then, could be interpreted as a percentage of the runway length.<br><br>The Aerodromes, Air Routes and Ground Aids (AGA) Divisional meeting (1981) approved the concept which relates runway width to the maximum OMGWS and a clearance on either side which depends on the probability of aeroplane deviation from the centre line. The runway width determination had been based on the formula (ARCP/2 – WP/8):<br>OMGWS + 10σ + 2 x, with σ representing the standard deviation (from aeroplanes lateral deviation distribution) and x representing an offset from the centerline for the aircraft group. |

| | |
|---|---|
| | With the introduction of the ARC (1982), the runway width had been related to code elements 1 and 2. The ARCP proposed changes based on the only runway deviation study available (FAA RD74 -36 report in 1975). The output of the study at that time confirmed the adequacy of a 45 m runway for a 14 m OMGWS and that either 30 m or 45 m runways can be used by 9 m OMGWS aeroplanes (as for current provision in Chapter 3.1.10).<br><br>When introducing code F in 1999, the extrapolation of the standard deviation (3.6 m compared with 2.6 m to 2.8 m for codes C, D and E from the 1975 FAA study) led to a 60 m requirement for code F while keeping 45 m for smaller codes. At that time, no commercial code F aircraft was in service. The assumptions made were extrapolative rather than based on actual data and aircraft knowledge and have subsequently proved to be an overdesign.<br><br>During the ARCTF work, more recent studies (specific discussion papers for ARCTF) including revisiting the 1975 FAA study and consideration of recent back-to-back runway lateral deviation studies (FAA on the A380, Airbus on A340, 747-8 and A380) have been reviewed. The introduction of the A380 in 2007 and the 747-8 in 2011 (with more than one million movements on airports worldwide) have proven that these aeroplanes deviate less than smaller aeroplanes: an equivalent standard deviation of 1.8 m to 2.0 m was observed by the FAA, less than the values found in the 1975 study.<br><br>The work accomplished within the A380 Airport Compatibility Group (AACG) and Boeing 747-8 Airport Compatibility Group (BACG) in the 2000's has demonstrated that the current Annex 14, Volume I code F runway width values of 60 m are too conservative and can be reduced to 45 m. Current code F aeroplanes, with OMGWS from 9 m to 14.3 m, are either certificated (A380) or approved (AN124, 747-8) by the State of Design for operations on 45 m wide runways. New technological features allowing for better guidance and control of these aeroplanes in all normal and abnormal operations permit code F aeroplanes to maintain a more precise alignment along the centre line of a runway.<br><br>A survey of ICAO Accident/Incident Data Reporting (ADREP) data concerning veer-offs, over a 19-year period (1970 to 1989), indicates that very few excursions happened between 22.5 m and 30 m from the runway centreline. Other veer-off data (NLR, Bureau d'Enquêtes et d'Analyses (BEA), Australian Transport Safety Bureau (ATSB), FAA) and supporting studies (joint International Coordinating Council of Aerospace Industries Associations (ICCAIA) veer-off database from the period 1980 to 2011 for ADWG discussions) indicated no significant benefit in accommodating veer-offs, as between 60 m wide and 45 m wide runways. The data covered all known accidents or incidents irrespective of runway type (instrument or non-instrument runway) and reveals the following:<br><br>- most veer-offs happened during landings; some incidents during take-offs were associated with asymmetric power situations, an issue which is addressed for modern aircrafts;<br><br>- modern aircraft tend to have less veer-offs per movement than previous generations. As an example, for the wide bodies: 747 -100/200/300, |

| | |
|---|---|
| | DC10 and MD11 represent 75 per cent of veer-off cases while representing 20 per cent of delivered wide bodies and the number of these aeroplanes is decreasing. Very rare veer-off cases are documented for 744, 777, A330, A340s; and<br><br>- most studied veer-offs have been contained by runway shoulders.<br><br>Furthermore, the trends for future aircraft designs obtained from various sources, including the aircraft manufacturers and the ICCAIA, have indicated that OMGWS is not expected to exceed 15 m for future code F aeroplanes.<br><br>As a conclusion, all aeroplanes with OMGWS between 9 m and up to but not including 15 m are capable of using the same minimum runway width, 45 m, with appropriate runway shoulders (see proposals in Section 3.2 Runway shoulders), including increased shoulder width if specific conditions (such as heavy snow and elevated edge lights, crosswind, etc.) have to be met. |

**INITIAL PROPOSAL 4**

**…**

### 3.2 Runway shoulders

***General***

*Note.— Guidance on characteristics and treatment of runway shoulders is given in Attachment A, Section 9, and in the* Aerodrome Design Manual *(Doc 9157), Part 1.*

3.2.1 **Recommendation.—** *Runway shoulders should be provided for a runway where the code letter is D ~~or~~, E ~~and the runway width is less than 60 m~~ or F.*

~~3.2.2 **Recommendation.—** *Runway shoulders should be provided for a runway where the code letter is F.*~~

| **Origin:** | **Rationale:** |
|---|---|
| ARCTF/3 | The inclusion of code letter F in para 3.2.1 and the deletion of 3.2.2 is intended to harmonize the recommendations for application of runway shoulders. |

***Width of runway shoulders***

3.2.~~3~~2 **Recommendation.—** *The runway shoulders should extend symmetrically on each side of the runway so that the overall width of the runway and its shoulders is not less than:*

*— 60 m where the code letter is D or E for aeroplanes with OMGWS from 9 m up to but not*

*including 15 m; ~~and~~*

— *60 m where the code letter is F for two- or three-engined aeroplanes with OMGWS from 9 m up to but not including 15 m; and*

— *75 m where the code letter is F for four (or more)-engined aeroplanes with OMGWS from 9 m up to but not including 15 m.*

| **Origin:** | **Rationale:** |
|---|---|
| ARCTF/3 | For runway shoulders, the required widths are related to the wingspan, and especially the position of the outer engines, as prescribed in paragraph 3.2.2.<br><br>In the case of code F aeroplanes, the provisions distinguish between aeroplanes with 2 or 3 engines, which have no need for 75 m runway shoulders due to engine position, and those with 4 engines which require 75 m shoulders to protect a) the outer engines from foreign object debris (FOD) ingestion and b) the shoulders, lights and signs from jet blast.<br><br>The proposals in paragraph 3.2.2 were based on a study of critical jet engine exhaust velocity contours in relation to engine lateral position and height. |

***Slopes on runway shoulders***

3.2.~~4~~3 **Recommendation.—** *The surface of the shoulder that abuts the runway should be flush with the surface of the runway and its transverse slope should not exceed 2.5 per cent.*

***Strength of runway shoulders***

3.2.~~5~~4 **Recommendation.—** *~~A~~The portion of a runway shoulder between the runway edge and a distance of 30 m from the runway centreline should be prepared or constructed so as to be capable, in the event of an aeroplane running off the runway, of supporting the aeroplane without inducing structural damage to the aeroplane and of supporting ground vehicles which may operate on the shoulder.*

*Note.— Guidance on strength of runway shoulders is given in the* Aerodrome Design Manual *(Doc 9157), Part 1.*

***Surface of runway shoulders***

3.2.5 **Recommendation.—** *A runway shoulder should be prepared or constructed so as to resist erosion and the ingestion of the surface material by aeroplane engines.*

3.2.6 **Recommendation.—** *Runway shoulders for code letter F aeroplanes should be paved to a minimum overall width of runway and shoulder of not less than 60 m.*

*Note.— Guidance on surface of runway shoulders is given in the* Aerodrome Design Manual, *(Doc 9157), Part 1.*

| **Origin:** | **Rationale:** |
|---|---|
| ARCTF/3<br>ADWG/16 | A new section entitled *Surface of runway shoulders* is proposed to be established to be consistent with *Surface of runways* in Section 3.1, Runways.<br><br>The proposals for shoulder strength and surface above are a consensus solution, discussed extensively within ARCTF and ADWG. The intent is to replace the current code F runway width recommendation of 60 m by a combination of a 45 m wide full strength runway and 7.5 m paved shoulders on each side to cope with potential excursions (a much cheaper option for the same level of safety, which has been proven in use at many airports).<br><br>The overall 60 m paved width (runway plus shoulder) minimizes damage to aeroplanes veering-off and allows emergency vehicles to access the aeroplane, as per (new) 3.2.4 above. Additional (not necessarily paved) shoulders of 7.5 m each side outside the 60 m for jet blast erosion are only needed for aeroplanes having 4 engines (see 3.2.2 rationale) . |

**INITIAL PROPOSAL 5**

### 3.3 Runway turn pads

**….**

3.3.5 **Recommendation.—** *The nose wheel steering angle to be used in the design of the runway turn pad should not exceed 45 degrees.*

3.3.6 The design of a runway turn pad shall be such that, when the cockpit of the aeroplane for which the turn pad is intended remains over the turn pad marking, the clearance distance between any wheel of the aeroplane landing gear and the edge of the turn pad shall be not less than that given by the following tabulation:

| ~~*Code letter*~~ | ~~*Clearance*~~ |
|---|---|
| ~~A~~ | ~~1.5 m~~ |
| ~~B~~ | ~~2.25 m~~ |
| ~~C~~ | ~~3 m if the turn pad is intended to be used by aeroplanes with a wheel base less than 18 m;~~<br>~~4.5 m if the turn pad is intended to be used by aeroplanes with a wheel base equal to or greater than 18 m.~~ |
| ~~D~~ | ~~4.5 m~~ |
| ~~E~~ | ~~4.5 m~~ |
| ~~F~~ | ~~4.5 m~~ |

| | OMGWS | | | |
|---|---|---|---|---|
| | Up to but not including 4.5 m | 4.5 m up to but not including 6 m | 6 m up to but not including 9 m | 9 m to but not not including 15 m |
| Clearance | 1.50 m | 2.25 m | 3 m[a] or 4 m[b] | 4 m |

[a] if the turn pad is intended to be used by aeroplanes with a wheel base less than 18 m
[b] if the turn pad is intended to be used by aeroplanes with a wheel base equal to or greater than 18 m

*Note.— Wheel base means the distance from the nose gear to the geometric centre of the main gear.*

~~3.3.7 **Recommendation.** — *Where severe weather conditions and resultant lowering of surface friction characteristics prevail, a larger wheel-to-edge clearance of 6 m should be provided where the code letter is E or F.*~~

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*Editorial Note.—* Renumber subsequent paragraphs

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| **Origin:** | **Rationale:** |
|---|---|
| ARCTF/3 | Operational experience on the use of turn pads indicates that the provision in paragraph 3.3.7 was overly conservative and is now proposed to be deleted. Evidence has shown that most veer-offs or excursions from the runway turn pads occur due to inadequate/impaired visual aids, rather than due to weather related effects that may decrease surface friction.<br><br>Existing guidance in Doc 9157, Part 1 will be updated to provide better guidance on turn pad design.<br><br>The design of runway turn pads is independent of the wingspan component of the current code element 2 (code letter) and is therefore no longer related to the (new) code letter which does not include the OMGWS component. There are no changes to existing edge clearance values except for aeroplanes with OMGWS 6 m up to but not including 15 m. Refer to rationale box, paragraph 3.9.3. for justifications. |

**INITIAL PROPOSAL 6**

**…**

### 3.4 Runway strips

**…**

***Width of runway strips***

3.4.3 A strip including a precision approach runway shall, wherever practicable, extend laterally to a distance of at least:

— ~~150 m~~140 m where the code number is 3 or 4; and

— ~~75 m~~70 m where the code number is 1 or 2;

on each side of the centre line of the runway and its extended centre line throughout the length of the strip.

3.4.4 **Recommendation.—** *A strip including a non-precision approach runway should extend laterally to a distance of at least:*

— *~~150 m~~140 m where the code number is 3 or 4; and*

— *~~75 m~~ 70 m where the code number is 1 or 2;*

*on each side of the centre line of the runway and its extended centre line throughout the length of the strip.*

| **Origin:** | **Rationale:** |
|---|---|
| ADWG/7-DP/6<br>ADWG/16<br>ARCTF<br>Circular 305<br>AACG<br>BACG | Current Annex 14, Volume I runway strip values were derived during the 1950's and can be interpreted to be proportional to runway length. Relationships with aeroplane characteristics were added in 1981, without changing strip width values. Current runway strip width is not designed based on modern aeroplane performance or safety objectives according to historical evidences.<br><br>The work accomplished within the AACG and BACG in the 2000's and discussed during the ARCTF and ADWG demonstrated that current Annex 14, Volume I values are conservative and could be reduced. The distribution of locations of aeroplanes after runway lateral excursions is similar to a Gaussian pattern, with a sharp reduction of veer-off events within a distance of 100 m from the runway centreline, and a much smaller decrease between 100 m and 150 m from the runway centreline. Only a few extreme cases can be found exceeding 150 m from the runway centreline.<br><br>The ARCTF considered that based on modern aeroplane performance and |

| | |
|---|---|
| | improvements in aeroplane avionics and flight controls, it could safely propose a slightly reduced value of 140 m from 150 m, where the code number is 3 or 4, coming from several sources:<br><br>- an Airports Council International (ACI) (ADWG/7-DP/6) paper explains the proposed 140 m strip width for instrument runway by considering ground collision risk between an aeroplane deviating to the edge of the runway strip and an aeroplane on a parallel taxiway. Other risks, notably the risk of airborne collision based on the obstacle free zone (OFZ), were also considered and found to be lower;<br>- an aeronautical study for Sydney airport accepted by the Civil Aviation Safety Authority (CASA) demonstrating that code F aeroplanes can operate safely on airport with a strip width of 142.5 m;<br>- FAA runway strip width value as per the AC 150/5300-13A Change 1;<br>- Transport Canada runway strip width values as per TP312, 5th Edition;<br>- ADREP data analysis indicates that there are no reported instances of veer-offs between 140 m to 150 m; and<br>- a new CAA Italy veer-offs data tool which shows results in line with ADREP data analysis.<br><br>The proposed reduction from 75 m to 70 m where the code number is 1 or 2, is in line with the existing relationship between the code numbers and is justified applying the logic presented in ADWG/7-DP/6 to codes 1 and 2.<br><br>The Obstacle Limitation Surface Task Force (OLSTF) has agreed that this proposed reduction concerning the width of runway strip could be made independently of the ongoing research by the OLSTF regarding Chapter 4 of Annex 14, Volume I. This endorsement by OLSTF is in line with the latter's proposal to remove the linkage between runway strip widths and the future OLS for instrument runways. |

**INITIAL PROPOSAL 7**

**…**

### 3.9 Taxiways

**…**

3.9.3 The design of a taxiway shall be such that, when the cockpit of the aeroplane for which the taxiway is intended remains over the taxiway centre line markings, the clearance distance between the outer main wheel of the aeroplane and the edge of the taxiway shall be not less than that given by the following tabulation:

| ~~*Code letter*~~ | ~~*Clearance*~~ |
|---|---|
| ~~A~~ | ~~1.5 m~~ |
| ~~B~~ | ~~2.25 m~~ |
| ~~C~~ | ~~3 m on straight portions;~~<br>~~3 m on curved portions if the taxiway is intended to be used by aeroplanes with a wheel base less than 18 m;~~<br>~~4.5 m on curved portions if the taxiway is intended to be used by aeroplanes with a wheel base equal to or greater than 18 m.~~ |
| ~~D~~ | ~~4.5 m~~ |
| ~~E~~ | ~~4.5 m~~ |
| ~~F~~ | ~~4.5 m~~ |

| | OMGWS | | | |
|---|---|---|---|---|
| | Up to but not including 4.5 m | 4.5 m up to but not including 6 m | 6 m up to but not including 9 m | 9 m up to but not including 15 m |
| Clearance | 1.50 m | 2.25 m | 3 m[a] or 4 m[b] | 4 m |

[a] On curved portions if the taxiway is intended to be used by aeroplanes with a wheel base of less than 18 m

[b] On curved portions if the taxiway is intended to be used by aeroplanes with a wheel base equal to or greater than 18 m

*Note ~~1~~.— Wheel base means the distance from the nose gear to the geometric centre of the main gear.*

~~*Note 2.— Where the code letter is F and the traffic density is high, a wheel-to-edge clearance greater than 4.5 m may be provided to permit higher taxiing speeds.*~~

~~*Note 3.— This provision applies to taxiways first put into service on or after 20 November 2008.*~~

| **Origin:** | **Rationale:** |
|---|---|
| ADWG/12–DP/10; State letter AN 4/1.1.54-14/97 Appendix D; ADWG/14-DP/2; ARCTF/3–DP/19; ADWG/16 | The ARCTF observed that wingspan is relevant for aerodrome characteristics related to separation distances (e.g. obstacles, strips), while OMGWS impacts ground-based manoeuvring characteristics (e.g. runway and taxiway widths). Thus, the two components should be de-correlated, as using the most demanding component may cause overdesign for separations or taxiway width depending on the most critical aircraft. Proposed changes to Table 1-1 (see above) keeps wingspan for code letters and applies OMGWS in relevant SARPS, among which the taxiway width.<br><br>ICAO provisions concerning taxiway widths first appeared in Annex 14 (1st Edition) in 1951. The widths specified at that time were generally seen to be half of the runway width. With the introduction of the ARC in 1981, taxiway widths were related to new code letters based on OMGWS. The second |

| | |
|---|---|
| | Aerodrome Reference Code Panel (ARCP/2, 1980) further confirmed that taxiway widths should be designed, by adding "wheel to pavement edge" clearances to OMGWS. We can infer from these findings and current data that a 20 per cent edge margin on each side was deemed necessary, thus, taxiway width was designed using OMGWS as 60 per cent of taxiway width. At that time, no taxiway deviation study was available.<br><br>Of the many taxiway lateral deviation studies, most of them referenced in ADWG/14- DP/2, (more than 600,000 movements on many world airports) have been performed since the late 70s and were used for the revision of taxiway separations (Table 3-1) contained in the recent Amendment 13A to Annex 14, Volume I.<br><br>During the ARCTF work, the results of the same taxiway deviation studies were reviewed, but this time, to check the adequacy of taxiway edge margin.<br><br>As an example, in order to review the provisions concerning taxiway edge clearances, the French Civil Aviation Technical Centre (STAC) performed a study of lateral deviation on straight taxiways. The data used for this study were collected from 2002 to 2005 on two code E taxiways. It was observed that, for every OMGWS studied (either grouped or detailed), 95 per cent of all observed deviations were within 2 m from taxiway axis, even for aircraft which could deviate far more without reaching the edge of the paved surface. This indicates that most aircraft deviations stay within 2 m of the taxiway centreline on straight sections. Moreover, the edge of the main landing gear stayed within 9 m from the taxiway centerline for all registered data, indicating that aircrafts only used the central 18 m wide section of code E studied straight taxiways. Current 4.5 m taxiway edge margins are conservative and can be reduced. This conclusion was confirmed by a review of the studies listed in ADWG/14-DP/2.<br><br>Current design margins range from 2.25 m to 4.5 m, but modern aeroplanes deviate far less. For code E aeroplanes, no recent recorded data on straight taxiways exhibit deviations higher than 2.5 m was found during a study review.<br><br>Data specific to codes A, B and C aeroplanes on relevant straight taxiways are scarce, however, the observed behaviour of these aircrafts on wider taxiways and the overall scarcity and reduced severity of straight taxiway excursions (106 from 1980 to 2011 worldwide for all codes, only 2 injuries registered) indicate that current margins are safe.<br><br>Studies confirmed that for an OMGWS of 6 m up to but not including 15 m, the margins can be safely reduced from 4.5 m to 4.0 m.<br><br>For an OMGWS up to but not including 6 m, current margins remain unchanged. |

***Width of taxiways***

3.9.4 **Recommendation.—** *A straight portion of a taxiway should have a width of not less than that given by the following tabulation:*

| ~~Code letter~~ | ~~Taxiway width~~ |
|---|---|
| ~~*A*~~ | ~~*7.5 m*~~ |
| ~~*B*~~ | ~~*10.5 m*~~ |
| ~~*C*~~ | ~~*15 m*~~ |
| ~~*D*~~ | ~~*18 m if the taxiway is intended to be used by aeroplanes with an outer main gear wheel span of less than 9 m;*~~<br>~~*23 m if the taxiway is intended to be used by aeroplanes with an outer main gear wheel span equal to or greater than 9 m.*~~ |
| ~~*E*~~ | ~~*23 m*~~ |
| ~~*F*~~ | ~~*25 m*~~ |

| | OMGWS | | | |
|---|---|---|---|---|
| | Up to but not including 4.5 m | 4.5 m up to but not including 6 m | 6 m up to but not including 9 m | 9 m up to but not including 15 m |
| Taxiway width | 7.5 m | 10.5 m | 15 m | 23 m |

*Note.— Guidance on width of taxiways is given in the* Aerodrome Design Manual *(Doc 9157), Part 2.*

| **Origin:** | **Rationale:** |
|---|---|
| ADWG/12-DP/10; State letter AN4/1.1.54-14/97 Appendix D; ARCTF/3 -DP/19; ADWG/16 | The minimum width of a straight portion of a taxiway is derived by applying the values given in 3.9.3 above, to the maximum OMGWS in each group, i.e. the OMGWS plus twice the clearance distance between the outer main wheel of the aeroplane and the edge of the taxiway. |

**INITIAL PROPOSAL 8**

…

## Table 3-1. Taxiway minimum separation distances

| Code letter | Distance between taxiway centre line and runway centre line (metres) | | | | | | | | Taxiway centre line to taxiway centre line (metres) | Taxiway, other than aircraft stand taxilane, centre line to object (metres) | Aircraft stand taxilane centre line to aircraft stand taxilane centre line (metres) | Aircraft stand taxilane centre line to object (metres) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Instrument runways Code number | | | | Non-instrument runways Code number | | | | | | | |
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | | | | |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) |
| A | ~~82.5~~ 77.5 | ~~82.5~~ 77.5 | – | – | 37.5 | 47.5 | – | – | 23 | 15.5 | 19.5 | 12 |
| B | ~~87~~ 82 | ~~87~~ 82 | 152 | – | 42 | 52 | 87 | – | 32 | 20 | 28.5 | 16.5 |
| C | 88 | 88 | ~~168~~ 158 | 158 | 48 | 58 | 93 | 93 | 44 | 26 | 40.5 | 22.5 |
| D | – | – | ~~176~~ 166 | ~~176~~ 166 | – | – | 101 | 101 | 63 | 37 | 59.5 | 33.5 |
| E | – | – | 172.5 | ~~182.5~~ 172.5 | – | – | 107.5 | 107.5 | 76 | 43.5 | 72.5 | 40 |
| F | – | – | 180 | ~~190~~ 180 | – | – | 115 | 115 | 91 | 51 | 87.5 | 47.5 |

*Note 1.— The separation distances shown in columns (2) to (9) represent ordinary combinations of runways and taxiways. The basis for development of these distances is given in the* Aerodrome Design Manual *(Doc 9157), Part 2.*

*Note 2.— The distances in columns (2) to (9) do not guarantee sufficient clearance behind a holding aeroplane to permit the passing of another aeroplane on a parallel taxiway. See the* Aerodrome Design Manual *(Doc 9157), Part 2.*

…

| **Origin:** | **Rationale:** |
|---|---|
| ARCTF/3<br>ADWG/16 | Runway to taxiway separation is determined by half of the width of the runway strip plus half the wingspan for the code letter; new values are a consequence of revised runway strip widths.<br><br>Two additional figures were introduced to cover cases (existing aeroplanes) which were not previously addressed. |

**INITIAL PROPOSAL 9**

**…**

### 3.10 Taxiway shoulders

*Note.— Guidance on characteristics of taxiway shoulders and on shoulder treatment is given in the* Aerodrome Design Manual *(Doc 9157), Part 2.*

3.10.1 **Recommendation.—** *Straight portions of a taxiway where the code letter is C, D, E or F should be provided with shoulders which extend symmetrically on each side of the taxiway so that the overall width of the taxiway and its shoulders on straight portions is not less than:*

— ~~*60 m*~~ *44 m where the code letter is F; and*

— ~~*44 m*~~ *38 m where the code letter is E; and*

— ~~*38 m*~~ *34 m where the code letter is D; and*

— *25 m where the code letter is C.*

*On taxiway curves and on junctions or intersections where increased pavement is provided, the shoulder width should be not less than that on the adjacent straight portions of the taxiway.*

**…**

| **Origin:** | **Rationale:** |
|---|---|
| ARCTF/3-DP/17, DP/18<br>ADWG16 | Widths of taxiway shoulders, protecting aeroplanes against jet blast erosion and FOD ingestion, are currently based on the location of outer engines, for 4-engined aeroplanes. The ARCTF considers that they should be related to inner engines, which are closer to the ground. An analysis of the outer engines of 4-engined aeroplanes reveals that their height is such that jet blast that touches the ground at engine idle or breakaway power has an acceptable velocity. Outer engine can thus extend beyond the taxiway shoulder edge without causing jet blast issues.<br><br>The proposed formula is: distance of the nacelle of the furthest inboard engine (including nacelle width) plus lateral taxiway edge margin defined in paragraph 3.9.3.<br><br>The criterion of rescue and firefighting (RFF) vehicle access has also been considered, therefore no change is proposed where the code letter is C. |

**INITIAL PROPOSAL 10**

### 3.11 Taxiway strips

**…**

***Grading of taxiway strips***

3.11.4 **Recommendation.—** *The centre portion of a taxiway strip should provide a graded area to a distance from the centre line of the taxiway of ~~at least:~~ not less than that given by the following tabulation:*

- ~~*11 m where the code letter is A;*~~
- ~~*12.5 m where the code letter is B or C;*~~
- ~~*19 m where the code letter is D;*~~
- ~~*22 m where the code letter is E; and*~~
- ~~*30 m where the code letter is F.*~~
- *10.25 m where the OMGWS is up to but not including 4.5 m*
- *11 m where the OMGWS is 4.5m up to but not including 6 m*
- *12.50 m where the OMGWS is 6 m up to but not including 9 m*
- *18.50 m where the OMGWS is 9 m up to but not including 15 m*

*Note.— Guidance on width of the graded portion of a taxiway is given in the* Aerodrome Design Manual *(Doc 9157), Part 2.*

…

| **Origin:** | **Rationale:** |
|---|---|
| ARCTF/3<br>ADWG/16 | Annex 14, Volume I currently defines the width of the graded portion of a taxiway strip as identical to the taxiway shoulder width for code letters C to F. For code letters A and B, specific values are used as there is no taxiway shoulder requirement.<br><br>As per the rationale for paragraph 3.10.1 above, the taxiway shoulder should be related to the position of the inner engine which is a function of the associated wingspan. However, the aim of the graded portion of the taxiway strip is to protect the wheels and the fuselage of an aircraft during a veer-off from the |

| | |
|---|---|
| | taxiway and must therefore be linked to OMGWS.<br><br>Current values include a considerably larger safety buffer than the taxiway to object separation distance (Table 3-1) required for ensuring wingtip clearance. In practice, this means that an aircraft could travel on an area prepared to occasionally withstand its weight and the wingtip could hit an object before leaving the graded portion of a taxiway strip.<br><br>For the purpose of simplifying airport planning and design, the ADWG proposes to harmonize the values of the graded portion of taxiway strips with Table 3-1.<br><br>Therefore, the ARCTF and the ADWG propose to use the OMGWS as the input parameter for the width of the graded portion of taxiway strip, and to bring the values in line with revised taxiway separation distances (Annex 14, Volume I, Amendment 13) within Table 3-1, by using the same formula (Table 1-4, Doc 9157, Part 2) replacing half wingspan by half OMGWS.<br><br>The graded portion of the taxiway strip should be half of the OMGWS, plus a buffer (8 m for codes A, B and C, 11 m for codes D, E and F, as per the new Table 3-1 in Amendment 13). |

**INITIAL PROPOSAL 11**

## CHAPTER 4. OBSTACLE RESTRICTION AND REMOVAL

**….**

**Table 4-1. Dimensions and slopes of obstacle limitation surfaces — Approach runways**

# APPROACH RUNWAYS

| | RUNWAY CLASSIFICATION | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Precision approach category | | |
| | Non-instrument Code number | | | | Non-precision approach Code number | | | I Code number | | II or III Code number |
| Surface and dimensions[a] | 1 | 2 | 3 | 4 | 1,2 | 3 | 4 | 1,2 | 3,4 | 3,4 |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
| CONICAL | | | | | | | | | | |
| Slope | 5% | 5% | 5% | 5% | 5% | 5% | 5% | 5% | 5% | 5% |
| Height | 35 m | 55 m | 75 m | 100 m | 60 m | 75 m | 100 m | 60 m | 100 m | 100 m |
| INNER HORIZONTAL | | | | | | | | | | |
| Height | 45 m | 45 m | 45 m | 45 m | 45 m | 45 m | 45 m | 45 m | 45 m | 45 m |
| Radius | 2 000 m | 2 500 m | 4 000 m | 4 000 m | 3 500 m | 4 000 m | 4 000 m | 3 500 m | 4 000 m | 4 000 m |
| INNER APPROACH | | | | | | | | | | |
| Width | — | — | — | — | — | — | — | 90 m | 120 m[e] | 120 m[e] |
| Distance from threshold | — | — | — | — | — | — | — | 60 m | 60 m | 60 m |
| Length | — | — | — | — | — | — | — | 900 m | 900 m | 900 m |
| Slope | | | | | | | | 2.5% | 2% | 2% |
| APPROACH | | | | | | | | | | |
| Length of inner edge | 60 m | 80 m | 150 m | 150 m | ~~150 m~~ 140 m | ~~300 m~~ 280 m | ~~300 m~~ 280 m | ~~150 m~~ 140 m | ~~300 m~~ 280 m | ~~300 m~~ 280 m |
| Distance from threshold | 30 m | 60 m | 60 m | 60 m | 60 m | 60 m | 60 m | 60 m | 60 m | 60 m |
| Divergence (each side) | 10% | 10% | 10% | 10% | 15% | 15% | 15% | 15% | 15% | 15% |
| First section | | | | | | | | | | |
| Length | 1 600 m | 2 500 m | 3 000 m | 3 000 m | 2 500 m | 3 000 m | 3 000 m | 3 000 m | 3 000 m | 3 000 m |
| Slope | 5% | 4% | 3.33% | 2.5% | 3.33% | 2% | 2% | 2.5% | 2% | 2% |
| Second section | | | | | | | | | | |
| Length | — | — | — | — | — | 3 600 m[b] | 3 600 m[b] | 12 000 m | 3 600 m[b] | 3 600 m[b] |
| Slope | — | — | — | — | — | 2.5% | 2.5% | 3% | 2.5% | 2.5% |
| Horizontal section | | | | | | | | | | |
| Length | — | — | — | — | — | 8 400 m[b] | 8 400 m[b] | — | 8 400 m[b] | 8 400 m[b] |
| Total length | — | — | — | — | — | 15 000 m | 15 000 m | 15 000 m | 15 000 m | 15 000 m |
| TRANSITIONAL | | | | | | | | | | |
| Slope | 20% | 20% | 14.3% | 14.3% | 20% | 14.3% | 14.3% | 14.3% | 14.3% | 14.3% |
| INNER TRANSITIONAL | | | | | | | | | | |
| Slope | — | — | — | — | — | — | — | 40% | 33.3% | 33.3% |
| BALKED LANDING SURFACE | | | | | | | | | | |
| Length of inner edge | — | — | — | — | — | — | — | 90 m | 120 m[e] | 120 m[e] |
| Distance from threshold | — | — | — | — | — | — | — | c | 1 800 md | 1 800 md |
| Divergence (each side) | — | — | — | — | — | — | — | 10% | 10% | 10% |
| Slope | — | — | — | — | — | — | — | 4% | 3.33% | 3.33% |

a. All dimensions are measured horizontally unless specified otherwise.
b. Variable length (see 4.2.9 or 4.2.17).
c. Distance to the end of strip
d. Or end of runway whichever is less.
e. Where the code letter is F (Column (3) of Table 1-1), the width is increased to ~~155~~ 140 m. For information on code letter F aeroplanes equipped with digital avionics that provide steering commands to maintain an established track during the go-around manoeuvre, see Circular 301 — *New Larger Aeroplanes — Infringement of the Obstacle Free Zone: Operational Measures and Aeronautical Study*.

. . .

| **Origin:** | **Rationale:** |
|---|---|
| ARCTF/3<br>ADWG/16 | The new values of the length of the inner edge of an approach surface are a consequence of revised runway strip widths: Section 3.4.3 in case of a precision approach runway and non-precision approach runway, as well as Section 3.4.5 for a non-instrument runway where the code letter is 3.<br><br>With respect to footnote (e), the change from 155 m to 140 m is a consequence of the proposed change in runway width for code F from 60 m to 45 m as per the formulae agreed at OCP/11:<br><br>RWY width – OMGWS + wingspan + total buffer = 45 m – 15 m + 80 m + 30 m = 140 m |

— — — — — — — —

**ATTACHMENT C TO** State letter **AN** 4/1.1.57-17/44

**PROPOSED AMENDMENT TO**

**PANS-AERODROMES (Doc 9981)**

**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 by the replacement text which is highlighted with grey shading. | new text to replace existing text |

**INITIAL PROPOSAL 1**

…

## CHAPTER 4

## AERODROME COMPATIBILITY

…

### Appendix to Chapter 4

### PHYSICAL CHARACTERTICS OF AERODROMES

…

### 8. TAXIWAY SHOULDERS

*Introduction*

…

8.2 The taxiway shoulder dimensions are based on current information regarding the width of the ~~outer~~ inner engine exhaust plume for breakaway thrust. Furthermore, the surface of taxiway shoulders is prepared so as to resist erosion and ingestion of the surface material by aeroplane engines.

*Note.— Guidance material is contained in Doc 9157, Part 2.*

…

| **Origin:** | **Rationale:** |
|---|---|
| ARCTF/3-DP/17, 18<br>ADWG/16 | The widths of taxiway shoulders, protecting aeroplanes against jet blast erosion and foreign object damage (FOD) ingestion, are currently based on the location of outer engines, for 4-engined aeroplanes. The Aerodrome Reference Code Task Force (ARCTF) considers that they should be related to inner engines, which are closer to the ground. An analysis of the outer engines of 4-engined aeroplanes reveals that their height is such that the jet blast at engine idle or breakaway power touching the ground, has an acceptable velocity, thus the outer engine can extend beyond the shoulder edge, due to the outer engine height. |

— — — — — — — —

**ATTACHMENT D** to State letter AN 4/1.1.57-17/44

**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 14 — *Aerodromes*, Volume I — *Aerodrome Design and Operations* (Attachment B refers) | | | | | |
| Amendment to Doc 9981, *Procedures for Air Navigation Services (PANS) - Aerodromes* (Attachment C 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: _____

— — — — — — — —

**ATTACHMENT E** to State letter AN 4/1.1.57-17/44

**RESPONSE FORM FOR COMMENTS ON THE WORDING OF THE AMENDMENT PROPOSALS IN ONE OF THE LANGUAGES OTHER THAN ENGLISH**

(State) _____

1. Do you have comments on the wording of the amendment proposals in one of the languages other than English?

Yes ☐ No ☐

2. If yes, please indicate your comments in the space provided below *(provide additional sheets if required)*:

| | *Reference/ Paragraph No.* | *Comments* |
|---|---|---|
| Amendment to Annex 14 — *Aerodromes*, Volume I — *Aerodrome Design and Operations* (Attachment B refers) | | |
| Amendment to Doc 9981, *Procedures for Air Navigation Services (PANS) - Aerodromes* (Attachment C refers) | | |

— END —