International Civil Aviation Organization

AERODROMES PANEL (AP)

THIRD MEETING

Montréal, 7 – 11 April 2014

REPORT FOLDER

The material in this report has not been considered by the Air Navigation Commission. The views expressed therein should be taken as advice of a panel of experts to the Air Navigation Commission but not as representing the views of the Organization. After the Air Navigation Commission has reviewed this report, a supplement setting forth the action taken by the Air Navigation Commission thereon will be issued to this report.

REPORT OF THE THIRD MEETING OF THE AERODROMES PANEL (AP) (2014)

LETTER OF TRANSMITTAL

To: President, Air Navigation Commission

From: Chairman, Aerodromes Panel (AP) (2014)

I have the honour to submit the report of Aerodromes Panel which was held in Montréal from 7 to 11 April 2014.

Jean-Louis Pirat
Chairman

Montreal, 11 April 2014

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* Recommendations annotated “RSPP” relate to proposals for amendment of Standards, Recommended Practices and Procedures for Air Navigation Services or guidance material in an Annex.

AERODROMES PANEL (AP)

THIRD MEETING

Montréal, 7 to 11 April 2014

HISTORY OF THE MEETING

1. DURATION

1.1 The third meeting of the Aerodromes Panel (AP) in Montréal was opened by Mr. Farid Zizi, President of the Air Navigation Commission (ANC), at 1000 hours on 7 April 2014. The meeting ended on 11 April 2014.

2. ATTENDANCE

2.1 The meeting was attended by members and observers nominated by eighteen Contracting States and seven international organizations, as well as by advisers and others as shown in the list below:

Members	Advisers	Nominated by
GOOSEN, Jan	CURWOOD, Kim	Australia
CLARYSSE, Kris	GEUKENS, Dick	Belgium
DE CANOSSA MACEDO, Marcelo	BERNARDI, H. Eduardo	Brazil
HENEAULT, Guy		Canada
ZHAO, Hongyuan	NG, Che On SIU, Yet Yung	China
PIRAT, Jean-Louis	BERNADAC, Aude	France
SCHWARZ, Fabian	ZASS, Stephan MAYER, Thomas ZANTOUT, Ibrahim	Germany
PANDOLFI, Costantino		Italy
MATSUI, Atsushi	OKA, Jun YOKONO, Hideaki YAMAMOTO, Yutaka	Japan

CHO, Jae-ik	LIM, Gyeong tack KIM, Jeong Min KIM, Se Yeon NA, Ung Jin SONG, Sang Bae	Korea
JAGER, Sietse	MEERMAN, Dick	Netherlands
SEIJEAS, Jorn	NORHEIM, Armann	Norway
LOO, Chee Beng	WONG, Tseng Lee	Singapore
SANCHO DE SALAS, Pablo		Spain
OLSSON, Tomas	BURMAN, Roland	Sweden
BADHAM, Andrew		United Kingdom
DERMODY, John	BONANNI, Robert LEGARRETA, George	United States
GAMPER, David	KIM, John	ACI
LIEBLE, Sally A.		ASA
KESSLER, Gernot		EASA
NEKRASOV, Valery		IAC
RENNER, Jurgen	GROUT, Jean-Francois MEJSTRIKOVA, Monika SUIDAN, Joseph	IATA
BACHTEL, Brad	DUPONT, Willy-Pierre	ICCAIA
SALAZAR, Heriberto	PERKINS, Robert	IFALPA
SCHAAF, Paul		IFHA
Observers		
ARABACI, Gultekin		Turkey

3. OFFICERS AND SECRETARIAT

3.1 Mr. Jean-Louis PIRAT (France) was elected Chairman of the meeting.

3.2 The Secretary of the meeting was Mr. Yong Wang, Chief Aerodromes Section, who was assisted by Mr. Geoffroy Ville, seconded from France, Mr. Joseph Cheong, Technical Officer, Ms. Mary Margiottiello, Technical Clerk, Mr. Huseyin Akdogan, seconded from Turkey, all of the Aerodromes Section.

3.3 Mr. Holger Matthiesen, from ATM section, Mr. Miguel Marin, from OPS section, Mr. Mike Hohm, from IIM section, assisted in the discussions as needed.

3.4 The following members and observers of the Air Navigation Commission attended at least the opening sessions of the meeting, some attending various other sessions: Mr. Alexander Korsakov, Mr. Mike Comber and Mr. Paul Fleming,

4. AGENDA OF THE MEETING

4.1 The agenda for the meeting shown hereunder was approved by the Air Navigation Commission on 17 October 2013.

Agenda Item 1	Aerodrome design
Agenda Item 2	Visual aids for navigation
Agenda Item 3	Rescue and fire fighting
Agenda Item 4	Aerodrome operations and services
Agenda Item 5	Heliport design
Agenda Item 6	Strategic view of ICAO provisions for aerodromes
Agenda Item 7	Review of work programme
Agenda Item 8	Any other business

5. WORKING ARRANGEMENTS

5.1 The panel met as a single body, with ad hoc drafting groups as required. Discussions in the main meeting were conducted in Chinese, English, French, Russian and Spanish. Some working papers were presented in English only. The report was issued in Chinese, English, French, Russian and Spanish.

6. OPENING REMARKS BY THE PRESIDENT OF THE AIR NAVIGATION COMMISSION

6.1 Ladies and gentlemen, on behalf of the Air Navigation Commission, it is my pleasure to welcome you all to Montreal, to ICAO and to the Third Meeting of the Aerodromes Panel. I extend a special welcome to you all.

6.2 After 12th Air Navigation Conference, the Air Navigation Commission initiated the so called “Panel modernization”. With the aim to simplify the Panel structure, modernize working methods and seek for working efficiencies especially for cross disciplinary coordination, the Panel modernization is supported by mainly three initiatives: a new Panel structure, an update of the *Directives for Panel of ANC* (Doc 7984) and the set-up of improved cross disciplinary coordination mechanisms. The new Directives for panels were just approved by the Council during its 201st session. The Panel structure is agreed for the most part and Terms of Reference of Panels are redrafted using a common template. This should be achieved in any case in full respect of the work in course and the transition should not lead to any loss of work or expertise.

6.3 Beside Panel modernization, ANC also decided in its 195-3rd meeting to request from various panels a generic impact assessment for each deliverable as well as a corresponding task list. It is understood that such impact assessment cannot be absolute since appreciation of impact of a deliverable may change greatly from one part of the world to the other. Nevertheless, even a high level impact assessment combined with corresponding rationales and elaborated by the proper expertise will assist in the review of various deliverables. Then presented to States during consultation process, it will conduct them to react and express their own views on impact of SARPs. This all should help to have a more educated process and facilitate further implementation of proposed deliverables.

6.4 I also want to tell you that the ANC is presently reviewing the Air Navigation Work Program which comprises all work items identified for all disciplines of Air Navigation. A first version of the Air Navigation Work Programme was issued officially by the Secretariat at the end of February and is presently under review and prioritization by ANC. It will then be shared openly and transparently with all panels and will therefore become a very good tool for planning of the work, identifying coordination needs and achieve consistency in-between various groups delivery. The job card system of communication with panel for coherent tasking will be integrated in the Air Navigation Work Programme managing process and therefore remains actual and the proper tool for defining future work.

6.5 Concerning the Aerodrome Panel, all this evolution should lead to an increase of the Operational aspects of aerodromes with integration of the PANS-Aerodromes in the scope of the Panel and work on the corresponding ASBU modules of the GANP. For GASP, Runway Safety is also a priority to which the Panel should contribute. However this should not lead to a revolution but more a natural evolution from the present Aerodrome Panel to the Aerodrome Design and Operations Panel. A specific working group on Aerodrome Operations should be identified in order to liaise with other panels on subjects like CDM, Runway sequencing or Surface movements. The integration of the PANS-Aerodromes in the scope the panel will permit a complete consistency of the work developed towards Annex, PANS and guidance material.

6.6 I understand that since the second meeting of the Aerodromes Panel in October 2010, the members of the panel have met three times – once as AP Working Group of the Whole (in 2011) and twice as the AP Working Groups (2012 and 2013). I am happy to learn that a huge amount of work has been accomplished, is mature, and is being presented here for final deliberations by the panel prior to submitting the proposals to the Commission and States’ consultation. These proposals contain important and significant progress concerning, among others, provisions addressing aerodrome physical characteristics, including taxiway separation distances and RESA and arresting systems, runway surface condition assessment and reporting using a global reporting format, visual aids matters such as runway status lights, LEDs, obstacle lighting, heliport design and operations including emergency response.

6.7 One of the salient developments since 2010 is Amendment 11 to Annex 14, Volume I and Amendment 5 to Annex 14, Volume II which were adopted by the Council at the fifth meeting of its 198th Session on 27 February 2013. These amendments which became applicable in November 2013 are expected to enhance aerodrome safety and efficiency in a globally harmonized manner. The importance of your contribution in ensuring safe and efficient aircraft operations at aerodromes is once again highlighted.

6.8 During the Commission's preliminary review of the PANS-Aerodromes, it was realised that there was a need to undertake a strategic review of ICAO provisions for aerodromes. A specific agenda item dedicated to this topic has been included for this meeting, and I will be interested to see the outcomes of the meeting deliberations and discussions on this.

6.9 The Commission has tasked the Aerodromes Panels with a number of subjects contained in the ANC Job Cards. I am happy to note that these are currently being worked on by the AP and its various working groups.

6.10 A debriefing session with the Commission will be scheduled at the end of the meeting on Friday this week. In that session, I would like the Chairman of this meeting to highlight the work that has been accomplished during the meeting, any major difficulties you may have identified to progress your work as well as proposed future work. You are all invited to participate in the debriefing.

6.11 You have a considerable amount of work to accomplish during the next four days. The Commission is confident that you will complete all your agenda items and achieve the goals established for this meeting. I am also very happy to what I heard at the last debriefing of the AP in December on your willingness of assessing the impact of various proposals.

6.12 I would like to welcome you another time in Montreal where Spring is slowly becoming a reality and wish you every success in your deliberations and I declare open the third meeting of the Aerodromes Panel.

GLOSSARY OF TERMS

A	
ACI	Airport Council International
ACN	Aircraft Classification Number
ARC	Aerodrome Reference Code
ADWG	Airport Design Working Group
AIP	Aeronautical Information Publication
ANC	Air Navigation Commission
AOSWG	Aerodrome Operations and Services Working Group
AP	Aerodromes Panel
APV	Approach procedure with vertical guidance
AP-WGs	Aerodromes Panel – Working Groups
ARIWS	Autonomous Runway Incursion Warning System
A-SMGCS	Advanced surface movement guidance and control systems
ATC	Air traffic control
C	
Cd	candela
CIE	International Commission on Illumination (Commission Internationale de l'Éclairage)
D	
DGAC	Direction Générale de l'Aviation Civile
E	
EASA	European Aviation Safety Agency
ECAC	European Civil Aviation Conference
EMAS	Engineered Material Arresting System
EUROCAE	European Organization for Civil Aviation Equipment
EUROCONTROL	European Organisation for the Safety of Air Navigation
F	
FAA	Federal Aviation Administration
FATO	Final approach and take-off area
FOD	Foreign Object Debris
FTF	Friction Task Force
G	
GRF	Global Reporting Format
H	
HDWG	Heliport Design Working Group
I	
IAOPA	International Council of Aircraft Owner and Pilot Associations
IATA	International Air Transport Association
ICCAIA	International Coordinating Council of Aerospace Industries Associations
IFALPA	International Federation of Air Line Pilots' Association

IFATCA	International Federation of Air Traffic Controllers' Association
IFHA	International Federation of Helicopter Association
IFR	Instrument flight rules
ILS	Instrument landing system
IMC	Instrument meteorological conditions
L	
LED	Light emitting diode
M	
MIT	Massachusetts Institute of Technology
MPa	megapascals
N	
NAPTF	US National Airport Pavement Test Facility
NOTAM	Notice to airmen
O	
OLS	Obstacle limitation surfaces
P	
PANS-ATM	Procedures for Air Navigation Services – Air Traffic Management
PANS-OPS	Procedures for Air Navigation Services – Aircraft Operations
R	
RESA	Runway End Safety Area
RET	Rapid Exit Taxiway
RFF	Rescue and fire fighting
RFFWG	Rescue and Fire Fighting Working Group
RI	Runway incursion
RVR	Runway visual range
RWSL	Runway Status Lights
RWYCC	Runway Condition Code
S	
SARPs	Standards and recommended Practices
Snowtam	Snow notice to airmen
T	
TOLRA	Take-off run available
TLOF	Touchdown and lift-off
V	
VAWG	Visual Aids Working Group
VFR	Visual flight rules
VMC	Visual meteorological conditions
W	
WG	Working group

AERODROMES PANEL (AP)

THIRD MEETING

Montréal, 7 to 11 April 2014

AGENDA ITEM 1

The attached constitutes the report on Agenda Item 1 and should be inserted at the appropriate place in the yellow folder.

Agenda Item 1: Aerodrome design

1.1 INTRODUCTION

1.1.1 In considering this agenda item, the meeting reviewed several working papers of the Aerodrome Design Working Group (ADWG) which contained amendment proposals on the subjects as detailed in the following paragraphs. The meeting also noted that the ADWG had held five meetings (ADWG/9 to ADWG/13) to progress its work.

1.2 ADOPTION OF NEW DEFINITION FOR ARRESTING SYSTEM

1.2.1 It was recalled that Amendment 11A to Annex 14 Volume I, which had become applicable on 14 November 2013, recognized the safety benefits of an arresting system installed beyond the end of a runway as one alternative for physically constrained airports. However, the Annex still lacked a formal definition of arresting system that would explicitly prescribe the function of such a system. This omission could hamper the determination by States as to the acceptability of a proposed arresting system.

1.2.2 The ADWG had reviewed various proposals on a definition of arresting system and had reached a consensus on the following proposed definition:

> ***Arresting System***. *A system beyond the end of a runway designed to predictably decelerate an aeroplane overrunning the runway to reduce the risk of damage to the aeroplane.*

1.2.3 It was noted that the above proposed definition had been endorsed by the Second Meeting of the AP Working Groups (2 to 6 December 2013).

1.2.4 The meeting agreed with the ADWG's proposal. In the meantime, questions were raised on how to address undershoots and whether a stopway should be taken into account in determining the location of an arresting system. In this connection, the meeting was advised that the ADWG was working on the development of guidance material on the preferable location of an arresting system in order to deal with aircraft undershooting a runway where an arresting system was provided and how to take account of a stopway. Regarding the location of arresting systems for runways with a stopway as compared to runways without a stopway, further dialogue revealed that, in consistency with Annex 14, Volume I paragraph 3.4.2 that specifies how to calculate the length of the strip, all measurement for the placement of an arresting system would commence from the end of the runway or, if a stopway is provided, from the end of the stopway. In other words, the presence of a stopway, which is used for the determination of the ASDA, would not place the arresting system closer to the paved end of the runway.

Post-meeting note by the Secretariat: as the Aerodromes Panel agreed that an arresting system is placed beyond the end of a runway, "or a stopway where provided"*, it is proposed to add this text to the definition in 1.2.2.*

1.2.5 The proposed amendment to Annex 14, Volume I on the definition of arresting system is contained in Appendix A to the report on this agenda item.

1.3 CLARIFICATION FOR CLEARANCE DISTANCES ON AIRCRAFT STANDS

1.3.1 Annex 14, Volume I paragraph 3.13.6 specifies the provision for minimum clearance distances for aircraft stands in terms of the aircraft using the stand and any adjacent building, aircraft on another adjacent stand, and other objects within or near the stand. However, the ADWG had considered that the existing phraseology found in paragraph 3.13.6, namely "*aircraft using the stand*", was not sufficiently explicit as to when an individual would measure the distances between the aircraft using the stand and nearby objects.

1.3.2 It was noted that when service was rendered to a parked aircraft, service vehicles, passenger bridges, luggage carts, lavatory equipment, etc., needed to be in very close proximity to the parked aircraft. Therefore, there was a need to clarify that this Recommended Practice of clearances within the aircraft stand should apply while the aircraft was in motion.

1.3.3 For more clarity the ADWG proposed replacing the existing word "*using*" in paragraph 3.13.6 with the more accurate words "*entering or exiting*".

1.3.4 The proposal of the ADWG was agreed to by the meeting, which is contained in Appendix B of the report to this agenda item.

1.4 PROPOSED AMENDMENT TO ANNEX 14, VOLUME I AND ANNEX 15 FOR PUBLISHING RESA AND ARRESTING SYSTEM IN AIP

1.4.1 The meeting was advised that during the review by the Air Navigation Commission (ANC) of AP/2 proposals, it had been recognized that the provision of RESA and/or arresting system was significantly important for safety and, therefore, should be published in States' AIPs. As a result, the following paragraph had been approved by the Council, as part of Amendment 11A, for inclusion in Attachment A of Annex 14, Volume I (green pages):

> 10.6 The information relating to the provision of a runway end safety area and the presence of an arresting system should be published in the AIP.

1.4.2 Since Attachment A of the Annex was considered guidance material, the Commission had tasked the AP to review Annex 15 for including the same requirement. This task was reflected in the job card AP002.

1.4.3 The ADWG, along with the Secretariat, had studied the issue and come to the conclusion that from regulatory and operational perspectives, it would be beneficial for safety to include RESA and arresting system in the aerodrome data and publish them in the AIP. Accordingly, a proposal was made to amend Annex 14, Volume I, Chapter 2 and Annex 15, Appendix 1 to that effect.

1.4.4 During the meeting discussion there was a suggestion that in addition to the location of an arresting system, it might be needed to include other information such as the type and dimension of the arresting system. It was concluded, however, that those pieces of information were not relevant to pilots and therefore, were not essential for inclusion in the AIP.

1.4.5 The meeting agreed to the proposed amendment, which is contained in Appendix C and D to the report on this agenda item.

1.5 WHEEL-TO-EDGE CLEARANCE FOR STRAIGHT PORTIONS OF CODE C TAXIWAYS

1.5.1 In reviewing Chapter 3 of Annex 14, Volume I, the ADWG had realized that taxiway systems were significant financial expenditures for all airports. Annex 14, Volume I paragraphs 3.9.4 and 3.9.5 provided the aviation industry with SARPs for determining the width of taxiway systems according to aerodrome reference code letters.

1.5.2 General dimensional designs of taxiway systems were based primarily on two aircraft parameters, namely, the outer main gear wheel span and the length of the wheelbase (nose gear to main gear). For Code C taxiways paragraphs 3.9.4 and 3.9.5 of the Annex specified two numeric taxiway widths based on the aircraft wheelbase lengths. However, these different numeric taxiway widths did not differentiate whether they applied to curved or straight portions of taxiways.

1.5.3 The ADWG had concluded that in designing taxiway width for straight portions of a taxiway, the aircraft parameter of outer main gear wheel span should be considered and not that of wheel base length. For curved portions, both parameters should be considered. Accordingly, the current design criteria for Code C needed to be revised to differentiate between straight portions and curved portions of a taxiway. Adoption of the proposal would eliminate costly over construction of straight taxiways for all Code C aircraft.

1.5.4 The meeting agreed to the amendment proposal with editorial modifications. The proposed amendment is contained in Appendix E to the report on this agenda item.

1.6 REDUCED TAXIWAY AND TAXILANE SEPARATION DISTANCES – TABLE 3-1, ANNEX 14, VOLUME I

1.6.1 As part of the Annex 14, Volume I, Chapter 3 review, taxiway centre line separations had been extensively discussed within the ADWG over the past 3 years. In general, the ADWG had considered that the existing figures were derived before the advent of modern, new large aircraft and many aerodrome systems in use today, and that they were overly conservative.

1.6.2 The ADWG had adopted a risk-based approach, which was based on utilising existing ICAO separation principles, analysis of actual movements of aircraft derived from infield taxiway centre line deviation studies, a scientific approach based on assessment of a wing tip collision risk and a statistical approach of lateral centre line deviations from straight taxiway centre lines. A unique element of the proposed centre line separation distances is an aim for a more coherent, uniform set of design specifications across all code letters.

1.6.3 The first methodology examined by the ADWG was based on taxiway centreline deviation studies. Extensive taxiway centre line deviation studies had been performed at LHR, AMS, ANC, JFK, SYD, CDG, FRA and SFO, between the years 1987 and 2006, which had involved over 400,000 movements measured by aircraft across the code letters C-E. Similar studies had also been conducted by the U.S. FAA for codes C and D aircraft from 2009 to 2012. The ADWG had assessed those studies in detail and concluded that for a given risk level of 1e10-6, the estimated centre line separation distances could be reduced by 10-15%.

1.6.4 The second methodology examined by the ADWG was the methodology adopted by the European Aerodrome Operations Planning Group (AOPG), formalized as ICAO Document 7754 to support entry into service of the B747-400. Based on this document the ADWG had concluded that if one were to take the AOPG minimum taxiway centre line separation distances of 8 metres for code

letters A-C, and 11 metres for code letters D-F, along with taxilane to taxilane centre line separations of 4.5 metres (for code letters A-C) and 7.5 metres (for code letters D-F), then a coherent, uniform, and easily indexed set of design of centre line separations could be supported, all of which was lower than a risk level of 1e10-6.

1.6.5 The third methodology examined by ADWG was based on risk assessment. Using a risk-based assessment methodology, the ADWG had sought to review and validate the taxiway centre line deviation measurements from the studies worldwide, and concluded that the lower centre line separations proposed by the ADWG could achieve a target level of safety (TLS) between 1e10-7 and 1e10-8, which is equivalent to or better than the ICAO global risk factor.

1.6.6 The meeting considered that based on various studies conducted in different States and using a risk-based approach, the ADWG's work was comprehensive and its proposal well justified. In connection with a question as to whether operational restrictions were imposed in Europe in implementing reduced taxiway separation distances as in Document 7754, the meeting was advised that no restrictions were imposed. The meeting agreed that the definition of taxiway should be reviewed in order to define, inter alia, a taxilane which may not be an aircraft stand taxilane.

1.6.7 The meeting agreed to the proposed amendments, as contained in Appendix F to the report on this agenda item.

1.7 TAXIWAY DESIGN GUIDANCE FOR THE PREVENTION OF RUNWAY INCURSION

1.7.1 The ADWG, in reviewing Chapter 3 of Annex 14, Volume I, had developed some guidance material on good taxiway design practices to help prevent runway incursions for inclusion in Attachment A of the Annex (green pages). The proposal also included new Notes in Chapter 3 of the Annex to reinforce the importance of runway incursion prevention from a taxiway design perspective.

1.7.2 With some editorial modifications and by adding a paragraph on the need to address human factors issues (e.g., in using a perimeter taxiway), the meeting agreed to the amendment proposal. The proposed amendment is contained in Appendix G to the report on this agenda item.

1.8 RECOMMENDATION

In light of the above discussions, the following recommendations were developed:

RSPP **Recommendation 1/1 – Amendment to Annex 14, Volume I: Aerodrome design**

That Annex 14, Volume I, be amended as shown in Appendices A to C and E to G to the report on this agenda item.

RSPP **Recommendation 1/2 – Amendment to Annex 15**

That Annex 15 be amended as shown in Appendix D to the report on this agenda item.

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APPENDIX A

PROPOSED AMENDENT 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 PROPOSED AMENDMENT TO ANNEX 14, VOLUME I

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

CHAPTER 1. GENERAL

1.1 DEFINITIONS

. . .

Apron management service. *A service provided to regulate the activities and the movement of aircraft and vehicles on an apron.*

Arresting System*. A system beyond the end of a runway, or a stopway where provided, designed to predictably decelerate an aeroplane overrunning the runway to reduce the risk of damage to the aeroplane.*

Balked landing*. A landing manoeuvre that is unexpectedly discontinued at any point below the obstacle clearance altitude/height (OCA/H).*

. . .

Origin

AP Work Programme ADWG item (c) (3)

ADWG/9 through ADWG/13

Rationale

The above amendment aims to formally define the *functional aspects* for any arresting system referred to by paragraph 3.5.3 of Annex 14, Volume I. This paragraph, revised in 2013 by Amendment 11A to the Annex, offers States with the ability to use proven arresting systems when deemed *acceptable by the States*.

The proposed definition reflects the fundamentals of an arresting system, including its location (it cannot be on the runway or stopway), predictability (its performance needs to be predictable) and its main purpose (to decelerate an overrunning aircraft to reduce the risk of damage). The proposal also takes into account the wording in the definition of RESA, which serves to reduce the risk of damage to both overrunning and undershooting aircraft.

The proposed definition would help States determine the acceptability of any proposed arresting system under paragraph 3.5.3 of the Annex.

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APPENDIX B

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 PROPOSED AMENDMENT TO ANNEX 14, VOLUME I

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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

CHAPTER 3. PHYSICAL CHARACTERISTICS

3.13 Aprons

. . .

Clearance distances on aircraft stands

3.13.6 **Recommendation**.— *An aircraft stand should provide the following minimum clearances between an aircraft ~~using~~ entering or exiting the stand and any adjacent building, aircraft on another stand and other objects:*

Code letter	*Clearance*
A	*3 m*
B	*3 m*
C	*4.5 m*
D	*7.5 m*
E	*7.5 m*
F	*7.5 m*

When special circumstances so warrant, these clearances may be reduced at a nose-in aircraft stand, where the code letter is D, E or F:

a) between the terminal, including any fixed passenger bridge, and the nose of an aircraft; and

b) over any portion of the stand provided with azimuth guidance by a visual docking guidance system.

Note.— On aprons, consideration also has to be given to the provision of service roads and to manoeuvring and storage area for ground equipment (see the Aerodrome Design Manual (Doc 9157), Part 2, for guidance on storage of ground equipment).

. . .

Origin

AP Work Programme ADWG task (a) Aerodrome Design Specifications: Review of Chapter 3, Annex14, Volume I

ADWG Special Task Force Meeting – London, England: Taxiway centerline separations and clearances

ADWG/11 through ADWG/13

Rationale

A problem arises with the accidental misapplications of the object clearance dimensions for aircraft parking stands under paragraph 3.13.6 of Annex 14, Volume I.

The existing phraseology, *"an aircraft using the stand"* within paragraph 3.13.6 is not sufficiently explicit to indicate when the object clearances are measured. Basically, should the measurements between an aircraft and nearby objects be taken while the aircraft is stationary or moving in the parking stand?

The proposed change resolves this costly misapplication with new phraseology that clearly indicates that aircraft are in motion, not stationary.

Adoption of the proposals offers costs savings and improved operational efficiencies to the aviation industry.

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APPENDIX C

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 PROPOSED AMENDMENT TO ANNEX 14, VOLUME I

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CHAPTER 2. AERODROME DATA

. . .

2.5 Aerodrome dimensions and related information

2.5.1 The following data shall be measured or described, as appropriate, for each facility provided on an aerodrome:

a) runway — true bearing to one-hundredth of a degree, designation number, length, width, displaced threshold location to the nearest metre or foot, slope, surface type, type of runway and, for a precision approach runway category I, the existence of an obstacle free zone when provided;

b) strip
runway end safety area } length, width to the nearest metre or
stopway } foot, surface type; and

arresting system (if any) —location (which runway end);

c) taxiway — designation, width, surface type;

d) apron — surface type, aircraft stands;

. . .

Origin:

ADWG/12

Rationale:

Amendment 11A to Annex 14, Volume I has included new SARPs on the provision of an arresting system in relation to the dimension of RESA. Accordingly, there is a need to include arresting system in the aerodrome data, from both regulatory and operational perspectives.
Suggestion was made that in addition to the location of an arresting system, it might be needed to include other information such as the type and dimension of the arresting system. It was concluded, however, that those pieces of information were not relevant to pilots and therefore, were not essential for inclusion in the AIP.

— — — — — — — —

APPENDIX D

PROPOSED AMENDMENT TO

INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

AERONAUTICAL INFORMATION SERVICES

ANNEX 15

TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

NOTES ON THE PRESENTATION OF THE PROPOSED AMENDMENT TO ANNEX 15

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

. . .

****** AD 2.12 Runway physical characteristics**

Detailed description of runway physical characteristics, for each runway, including:

. . .

8) dimensions of stopway (if any) to the nearest metre or foot;

9) dimensions of clearway (if any) to the nearest metre or foot;

10) dimensions of strips;

11) dimensions of runway end safety areas;

12) location (which runway end) of arresting system (if any);

1~~1~~3) the existence of an obstacle-free zone; and

1~~2~~4) remarks.

Origin:

ADWG/12

Rationale:

Amendment 11A to Annex 14, Volume I has included new SARPs on the provision of an arresting system in relation to the dimension of RESA. From both regulatory and operational perspectives, it would be beneficial to safety to publish information on RESA and arresting system in the AIP.
Suggestion was made that in addition to the location of an arresting system, it might be needed to include other information such as the type and dimension of the arresting system. It was concluded, however, that those pieces of information were not relevant to pilots and therefore, were not essential for inclusion in the AIP.

— — — — — — — —

APPENDIX E

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 PROPOSED AMENDMENT TO ANNEX 14, VOLUME I

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CHAPTER 3. PHYSICAL CHARACTERISTICS

. . .

~~3.9.3 **Recommendation.** — *The design of a taxiway should 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 should 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 taxiway is intended to be used by aeroplanes with a wheel base less than 18 m;*~~ ~~*4.5 m 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*~~

~~*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.*~~

3.9.4~~3~~ ~~As of 20 November 2008, the~~ 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 ~~if the taxiway is intended to be used by aeroplanes with a wheel base less than 18 m~~ on straight portions;

	3 m on curved portions if the taxiway is intended to be used by aeroplanes with a wheel base less than 18 m; 4.5 m ~~if the taxiway is intended to be used by aeroplanes with a wheel base equal to or greater than 18 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

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.

Width of taxiways

3.9.~~5~~ 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 ~~if the taxiway is intended to be used by aeroplanes with a wheel base less than 18 m;~~* *~~18 m if the taxiway is intended to be used by aeroplanes with a wheel base equal to or greater than 18 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;* *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*

Editorial Note.— Renumber subsequent paragraphs accordingly.

Origin:

AP Work Programme ADWG task (a) Aerodrome Design Specifications: Review of Chapter 3, Annex14, Volume I.

ADWG/10 through ADWG/13

Rationale:

Earlier discussions on taxiway design criteria for the width of taxiways identified that for Code C paragraphs 3.9.4 and 3.9.5 of Annex 14, Volume I, applied the aircraft parameter of "wheelbase length" to prescribe two numeric taxi widths. However, these values did not differentiate if they applied to the design of curved taxiways or straight taxiways. In designing taxiway width for straight portions of a taxiway, the aircraft parameter of outer main gear wheel span should be considered and not that of wheel base length. Accordingly, the current design criteria for Code C need to be revised to differentiate between straight portions and curved portions of a taxiway.

Adoption of the proposal would eliminate costly over construction of straight taxiways for all Code C aircraft.

The proposed deletion of the existing paragraph 3.9.3 is because it would be replaced with the existing paragraph 3.9.4.

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APPENDIX F

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 PROPOSED AMENDMENT TO ANNEX 14, VOLUME I

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Table 3-1 Taxiway minimum separation distances

Code letter	Distance between taxiway centre line and runway centre line (metres): Instrument runways Code number 1	2	3	4	Non-instrument runways Code number 1	2	3	4	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)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	**(12)**	(13) ~~(12)~~
A	82.5	82.5	–	–	37.5	47.5	–	–	**23** ~~(23.75)~~	**15.5** ~~(16.25)~~	**19.5**	12
B	87	87	–	–	42	52	–	–	**32** ~~(33.5)~~	**20** ~~(21.5)~~	**28.5**	16.5
C	–	–	168	–	–	–	93	–	44	26	**40.5**	**22.5** ~~(24.5)~~
D	–	–	176	176	–	–	101	101	**63** ~~(66.5)~~	**37** ~~(40.5)~~	**59.5**	**33.5** ~~(36)~~
E	–	–	–	182.5	–	–	–	107.5	**76** ~~(80)~~	**43.5** ~~(47.5)~~	**72.5**	**40** ~~(42.5)~~
F	–	–	–	190	–	–	–	115	**91** ~~(97.5)~~	**51** ~~(57.5)~~	**87.5**	**47.5** ~~(50.5)~~

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

ANC task for Aerodrome Panel work item on aerodrome design specifications: "*Review the basis and the adoption of a risk-based approach for the development of aerodrome design SARPs on physical characteristics, based on the aerodrome reference code and the consequential development of revised SARPs as deemed necessary*".

ADWG/10 - 13

Previous ADWG/1 - 9

Rationale

The existing taxi centre line separation distances in Annex 14, Volume I, Table 3-1 were derived before the advent of modern, new large aircraft and many aerodrome systems in use today. The original design groups were correctly to be cautious in establishing the present values, but scientific assessments, together with practical risk-based studies have shown that there is room for the values to be reduced without having a negative impact on the safety or regularity of taxiing operations. Flight crew can be confident that they will have the sufficient centre line separations to manoeuvre their aircraft without limitation.

The proposed revisions to Table 3-1 retain the ICAO taxi centre line separation methodology.

Additionally, this will enable aerodromes to develop their facilities within their existing footprints and reduce the overall costs for doing future upgrades.

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APPENDIX G

PROPOSED AMENDMENT TO

INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

AERODROMES

ANNEX 14

TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

VOLUME I (AERODROME DESIGN AND OPERATIONS)

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. . .

3.9 taxiway

Note 1.— Unless otherwise indicated the requirements in this section are applicable to all types of taxiways.

Note 2. — See Attachment A, Section 21 for specific taxiway design guidance which may assist in the prevention of runway incursions when developing a new taxiway or improving existing ones with a known runway incursion safety risk.

General

3.9.1 **Recommendation.**— *Taxiways should be provided to permit the safe and expeditious surface movement of aircraft.*

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

. . .

Attachment A. Guidance Material Supplementary to Annex 14, Volume I

20.2 ACNs for several aircraft types

. . .

21. Taxiway design guidance for minimizing the potential for runway incursions

21.1 Good aerodrome design practices can reduce the potential for runway incursions while maintaining operating efficiency and capacity. The following taxiway design guidance may be considered to be part of a runway incursion prevention programme as a means of better ensuring that runway incursion aspects are addressed during the development of new runway and taxiway design proposals. Within this focused guidance, the prime considerations are to limit the number of unnecessary aircraft or vehicles entering or crossing a runway, provide pilots with enhanced unobstructed views of the entire runway, and correct taxiways designated as hot spots as far as possible.

21.2 The centre line of an entrance taxiway should be perpendicular to the runway centre line, where possible. This design principle provides pilots with an unobstructed view of the entire runway, in both directions, to confirm that the runway and approach is clear of conflicting traffic before proceeding towards the runway. Where the taxiway angle is such that a clear unobstructed view, in both directions, is not possible, consideration should be given to providing a perpendicular portion of the taxiway immediately adjacent to the runway to allow for a full visual scan by the pilots prior to entering or crossing a runway.

21.3 For taxiways intersecting with runways, avoid taxiway wider than recommended in Annex 14. This design principle offers improved recognition of the location of the runway holding position and the accompanying sign, marking, and lighting visual cues.

21.4 Existing taxiways with excess width can be rectified by painting taxi side stripe markings to the recommended width. As far as practicable, it is preferable to redesign such locations properly rather than to reconfigure or repaint such locations.

21.5 Multi-taxiway entrances to a runway should be parallel to each other and should be distinctly separated by an earthen area. This design principle allows each runway holding location an earthen area for the proper placement of accompanying sign, marking, and lighting visual cues at each runway holding position. Moreover, the design principle eliminates needless costs for building unusable pavement and the costs for painting taxiway edge markings to indicate such unusable pavement. In general, excess paved areas at runway holding positions reduce the effectiveness of sign, marking, and lighting visual cues.

21.6 Build taxiways that cross a runway as a single straight taxiway on both sides of the taxiway. In other words, avoid dividing the taxiway into two after crossing the runway. This design principle avoids constructing “Y-shaped” taxiways known to present opportunities for runway incursions.

21.7 If possible, avoid building taxiways that enter at the mid-runway location. This design principle helps to reduce the collision risks at the most hazardous locations (high energy location) because normally departing aircraft have too much energy to stop, but not enough speed to take-off before colliding with another errant aircraft.

21.8 Provide clear separation of pavement between a rapid exit taxiway and other non-rapid taxiways entering or crossing a runway. This design principle avoids two taxiways from overlapping each other to create an excessive paved area that would confuse pilots entering a runway.

21.9 Avoid the placement of different pavement materials (asphalt and portland cement concrete) at or near the vicinity of the runway holding position, as far as practicable. This design principle avoids creating visual confusion as to the actual location of the runway holding position.

21.10 Perimeter taxiways. Many aerodromes have more than one runway, notably paired parallel runways (two runways on one side of the terminal), which creates a difficult problem in that either on arrival or departure an aircraft is required to cross a runway. Under such a configuration, the safety objective here is to avoid or at least keep to a minimum the number of runway crossings. This safety objective may be achieved by constructing a "perimeter taxiway". A perimeter taxiway, a taxi route that goes around the end of a runway, enabling arrival aircraft (when landings are on outer runway of a pair) to get to the terminal or departure aircraft (when departures are on outer runway of a pair) to get to the runway without either crossing a runway, or conflicting with a departing or approaching aircraft.

21.11 A perimeter taxiway would be designed according to the following criteria:

a) Sufficient space is required between the landing threshold and the taxiway centre line where it crosses under the approach path, to enable the critical taxing aircraft to pass under the approach without violating any approach surface.

b) The jet blast impact of aircraft taking off should be considered with aircraft manufacturers; the extent of take-off thrust should be evaluated when determining the location of a perimeter taxiway.

c) The requirement for runway end safety area, as well as possible interference with the Instrument Landing System should also be taken into account: the perimeter taxiway should be located behind the localiser antenna, not between the localiser antenna and the runway, due to the potential for severe Instrument Landing System disturbance, noting that this is harder to achieve as the distance between the localiser and the runway increases. Likewise, perimeter roads should be provided where possible.

d) Human factors issues should also be taken into account. For example, screens or other measures should be put in place to assist pilots to distinguish between aircraft that are crossing the runway and those that are safely on a perimeter taxiway.

Origin
AP Work Programme ADWG item (c) (3)
ADWG/9 through ADWG/13

Rationale

Runway incursion is a leading safety issue for aviation worldwide. Adoption of the proposed guidance would help minimize this safety risk.

This would be accomplished by providing uniquely, focused taxiway design guidance known to reduce the risk of runway incursions. For example, the centre line of taxiways entering the runway should be perpendicular to the runway centreline, where possible.

Moreover, the guidance offers cost savings for aerodrome operators and State aviation regulatory agencies in the sense that new taxiway construction should not become a designated HOT SPOT. Such designation generally triggers reconstruction of the problematic taxiway.

It is proposed to insert this material in Annex 14 Volume I instead of a guidance material (ADM) to give more visibility.

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AERODROMES PANEL (AP)

THIRD MEETING

Montréal, 7 to 11 April 2014

AGENDA ITEM 2

The attached constitutes the report on Agenda Item 2 and should be inserted at the appropriate place in the yellow folder.

Agenda Item 2: Visual aids for navigation

2.1 INTRODUCTION

2.1.1 The meeting reviewed several papers from the Visual Aids Working Group (VAWG) on topics which it had been requested to study. It was noted that the VAWG had held four meetings (VAWG/08 to VAWG/11) to progress its work.

2.2 FLASHING CHARACTERISTICS AND COLOUR SPECIFICATION FOR LED LIGHTING

2.2.1 This proposal for ICAO Annex 14 – *Aerodromes*, Volume I – *Aerodrome Design and Operations* allows for use of light-emitting diodes (LEDs). It gives a definition of flashing lights that does not refer to one particular technology and provides colour standards for aeronautical ground lights which utilize solid state sources. The figure A1-1 of Annex 14, Volume I was published for filament-type lights and is based on CIE 2.2 (1975).

2.2.2 The growing availability of LED lighting for aviation offers the opportunity to adopt more precise chromaticity standards for these lights, allowing a more accurate representation of each colour without diffusion through a filter required by legacy lighting. The superimposition of the two figures at the end of the proposal helped the understanding of the differences.

2.2.3 The two figures A1-1a and A1-1b were updated for better clarity and a "*variable white*" paragraph was added to maintain compatibility with the paragraphs of Annex 14 Volume I that refers to it. It was decided that the flickering effect would be addressed in future work.

2.2.4 An information paper raised the concern of the intensities of LED lights and compatibility with Enhanced Vision Systems (EVS) or Night Imaging Vision Systems (NVIS). This issue, not related to the adoption of colours standard, was taken into account by adding a note in Chapter 5.3 *Lights*. It was noted that the intensity issues were covered in the proposal. One member asked that the technical requirements of these systems relating to aerodrome facilities be established before conducting further work. The AP and OPSP will work in coordination on the EVS and NVIS issues.

2.2.5 With minor modifications, the proposal was agreed.

2.2.6 The proposed amendment is shown in Appendix A to the report on this agenda item.

2.3 MAINTENANCE OF ANNEX 14 VOLUME I ON VISUAL AIDS

2.3.1 To simplify and clarify the Annex 14 Volume I, three amendment proposals were presented: modification of figure 5-30 and paragraph 5.4.2.18 to simplify and clarify mandatory instruction signs provisions, clarification of the layout and the dimensions for the runway vacated sign

and the NO ENTRY sign, and reformatting of table 6-5 for a better reading. These modifications did not introduce new standards but clarified existing ones that could be misinterpreted.

2.3.2 These three proposals were presented in three different papers for AP-WGs/2 and were agreed with minor changes. They were grouped in one proposal for AP/3, which was agreed with no modifications.

2.3.3 The proposed amendment is shown in Appendix B to the report on this agenda item.

2.4 MARKING AND LIGHTING OF TETHERED OBJECTS

2.4.1 Because of innovations for alternate energy sources to address climate change, tethered objects could become a reality. The proposal introduced SARPs for the marking and lighting of such objects in chapter 6 *Visual Aids for Denoting Obstacles* of Annex 14, Volume I.

2.4.2 The meeting supported the effort on this topic but raised questions on some technical issues and applicability as stated. The meeting was in favour of disconnecting this specific topic from other existing requirements, while the VAWG tried to maintain consistency. For example, respecting the visibility of 1.6 km was questioned even though it came from requirements on other obstacles. The lighting of the tether seemed also difficult to require. The application to leisure activity (kites) was also mentioned. The rapporteur reminded that the requirement made the difference between an object and an obstacle. Some members proposed to keep high level requirements in the Annex and move the rest of the material in guidance. The rapporteur reminded that it would be difficult to justify the differences with other obstacles. The secretariat did not support the cutting in two.

2.4.3 The chair considered that this safety issue needed to be addressed in all its aspects, and not be restricted to the visual aids, and should be part of future Air Navigation work program. He understood the VAWG spent three years to come up with the current proposal, trying to maintain consistency with other requirements but the variety of issues raised in the discussion showed that the proposal was not mature enough for global application. The group reverted the proposal to the VAWG to define more clearly what would be considered an obstacle and to use other techniques for this specific case.

2.5 AUTONOMOUS RUNWAY INCURSION WARNING SYSTEM (ARIWS)

2.5.1 The proposal introduced the concept of Autonomous Runway Incursion Warning System (ARIWS) in which Runway Status Lights (RWSL) could take place. The Runway Status Lights had already been proposed for inclusion by AP/2 but the Air Navigation Commission decided to postpone the adoption of the proposed SARPs pending the production by the Aerodromes Panel of a document including procedures for the implementation of the system.

2.5.2 The proposal dealt with the following issues:

- the procedures for all aerodromes and types of systems need to be the same;
- the proposed amendment need to be system independent;

- for mature systems, provisions need to be set up to ensure harmonization and consistency of visual aids;
- the provisions shall in no way be interpreted as an obligation or a recommendation to install such a system; and
- the installation of such a system at an aerodrome shall only be decided after an assessment of the runway incursion risk at this specific aerodrome has concluded it is appropriate or necessary.

2.5.3 The proposal was a modified version of the paper presented in AP-WGs/2 with further editorial modifications discussed during the meeting to remain ICAO compliant. Technical issues on the lights were addressed in a Flimsy.

2.5.4 With the above modifications, the proposal was agreed.

2.5.5 Coordination with ATMOPS panel and OPS panel was planned and participation of controllers and pilots using this system was requested during these panels to assess the need for modification in PANS-ATM and PANS-OPS.

2.5.6 The proposed amendment is shown in Appendix D to the report on this agenda item.

2.6 MARKING AND LIGHTING OF WINDTURBINES OVER 150 M IN HEIGHT

2.6.1 The existing standards for wind turbines had been developed at a time when the overall height (nacelle plus vertical blade) of wind turbines were less that 150 m. The advent of wind turbines of more than 150 m necessitated that these be addressed in revised standards. The height was considered as the overall height measured to the top of a vertical blade. This proposal ended the specification at 315 m (1 033 ft) overall height.

2.6.2 The word "*backup*" was considered ambiguous and replaced by "*alternate*". Members from several States, with support of a Flimsy, explained that they were already using steady lights instead of flashing lights, considered as visual pollution, with no safety concern. They also mentioned that for wind turbines near sea, flashing lights could be an issue as they could conflict with maritime signals. They proposed a modification to be added to the proposal to allow for this possibility. The rapporteur reminded that the flashing lights were consistent with existing requirements on obstacles of that height but accepted the modification. With these modifications, the proposal was agreed.

2.6.3 The proposed amendment is shown in Appendix E to the report on this agenda item.

2.7 LOCATION CRITERIA FOR PAPI OPS

2.7.1 The article 5.3.5.45 of Annex 14 Volume I indicates means to remedy situations for which an object extends above the Precision Approach Path Indicator (PAPI) obstacle protection surface (OPS), which is attached to the threshold. It was noted that the remedy was flawed. The proposal suggested revising the location criteria of the OPS such that it is fixed to the position of the PAPI rather than to the threshold.

2.7.2 The proposal was agreed.

2.7.3 The proposed amendment is shown in Appendix F to the report on this agenda item.

2.8 MANDATORY INSTRUCTION AND INFORMATION MARKINGS

2.8.1 The ICAO Annex 14, Appendix 3, introduces specification for pavement sign characters but does not provide criteria for the spacing of the characters. For elevated signs, the spacings are given in Table A4-1(c) for particular character codes. The proposal provided an explicit method of computing the spacing between pavement sign markings based on the one used for elevated signs.

2.8.2 The proposal did not introduce new requirements but provided explicit guidance in a short paragraph. The proposal was agreed with no modifications.

2.8.3 The proposed amendment is shown in Appendix G to the report on this agenda item.

2.9 PROPOSAL ON MANDATORY INSTRUCTION SIGN

2.9.1 This paper dealt with a special mandatory instruction sign in the form of “B2” and a new proposal was made to solve those problems related with “B2”.

2.9.2 The meeting considered that the proposal needed to be matured by the VAWG first and, therefore, referred it to the group.

2.9.3 Two other issues were addressed in this proposal. The wording of *taxiway intersection marking* versus *intermediate holding position marking* in paragraph 5.4.3.15 was recognized as an issue but needed to be further assessed by the VAWG. The modification of Figure A2-2 to write the red intensities in the red sector of the graph, was considered by the secretariat and accepted but without any change in the numbers. The replacement of Figure A2-2 was agreed by the meeting.

2.9.4 The proposed amendment is shown in Appendix C to the report on this agenda item.

2.10 EXIT-ONLY TAXIWAY AND VISUAL AIDS

2.10.1 This paper discussed the exit-only taxiway and all the visual aids related to it and provided amendment proposals in the appendix. It suggested to introduce NO-ENTRY markings at the end of an exit-only taxiway. The flimsy related to the paper simplified the proposal and only proposed to add a new paragraph 5.2.16.4A. The original proposal contained several other changes.

2.10.2 Several members endorsed the paper to be further reviewed in the VAWG.

2.11 TAXIWAY NAMING CONVENTION PROPOSAL

2.11.1 The paper put forward a new taxiway naming convention proposal.

2.11.2 Similar work had been started by the ADWG and transferred to the VAWG for coordination. This proposal was welcomed and the meeting agreed that it be sent to the VAWG as part of the on-going work.

2.12 RECOMMENDATION

In the light of the above discussion, the following recommendation was developed:

RSPP **Recommendation 2/1 – Amendment to Annex 14, Volume I: Visual aids for navigation**

That Annex 14 Volume I be amended as shown in the Appendices A through G to the report of this agenda item.

APPENDIX A

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 PROPOSED AMENDMENT TO ANNEX 14, VOLUME I

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Introduction
The future trend for airports lights will be using new technologies. Incandescent lights will be replaced by light-emitting diode (LED) based lights. Existing specifications need to be reviewed and possibly new provisions need to be developed to enable their use in aviation.

This task is part of the AP work programme.

The proposal involves two changes: deletion of a reference to specific technology for flashing lights and introduction of a full chromaticity chart.

Impact
The impact due to technology evolution is important. An introduction of a standard for LEDs will allow for the safe replacement of existing technology. Incandescent lights are still authorized so the cost impact is minimal.

Follow-up
No roll-out activities seem necessary.
Possible impact on *Aerodrome Design Manual* (Doc 9157), part 4.
Recommendations on replacement of lights by full segments will be addressed in that manual.

1.1 Definitions

. . .

~~***Capacitor discharge light.*** A lamp in which high intensity flashes of extremely short duration are produced by the discharge of electricity at high voltage through a gas enclosed in a tube.~~

5.3.4 Approach lighting systems

. . .

Precision approach category I lighting system

. . .

Characteristics

. . .

5.3.4.17 **Recommendation —** *If the centre line consists of barrettes as described in 5.3.4.14 b) or 5.3.4.15 b), each barrette should be supplemented by a ~~capacitor discharge~~ flashing light, except where such lighting is considered unnecessary taking into account the characteristics of the system and the nature of the meteorological conditions.*

5.3.4.18 Each ~~capacitor discharge~~ flashing light as described in 5.3.4.17 shall be flashed twice a second in sequence, beginning with the outermost light and progressing toward the threshold to the innermost light of the system. The design of the electrical circuit shall be such that these lights can be operated independently of the other lights of the approach lighting system.

. . .

Precision approach category II and III lighting system
Characteristics

. . .

5.3.4.34 **Recommendation —** *If the centre line beyond 300 m from the threshold consists of barrettes as described in 5.3.4.31 a) or 5.3.4.32 a), each barrette beyond 300 m should be supplemented by a ~~capacitor discharge~~ flashing light, except where such lighting is considered unnecessary taking into account the characteristics of the system and the nature of the meteorological conditions.*

5.3.4.35 Each ~~capacitor discharge~~ flashing light shall be flashed twice a second in sequence, beginning with the outermost light and progressing toward the threshold to the innermost light of the system. The design of the electrical circuit shall be such that these lights can be operated independently of the other lights of the approach lighting system.

. . .

Origin:

VAWG/9-DP/01, VAWG/11-DP/18, APWGs/2-DP/01, AP/3-WP/04

Rationale:

The LED compared to incandescent lamps is nearly free from any delay in the change of intensity. Therefore, dynamic flashing lights based on Xenon tubes can be replaced by high intensity LEDs producing an equally conspicuous light signal.

The text in paragraphs 5.3.4.17, 5.3.4.18, 5.3.4.34 and 5.3.4.35 explicitly states gas discharging tubes as the technology to be used for flashing approach strobe lights and should be changed to a description of the required light characteristics.

The term *flashing light* gives information about the characteristics and allows a clear differentiation from the steady types.

It is proposed to remove the definition of capacitor discharge light and replace the term by flashing light in all paragraphs.

. . .

5.3 Lights

5.3.1 General

. . .

Enhanced Vision Systems and Aeronautical ground lighting

Note. Solid state light sources without additional enhancements (e.g., infrared emitters) may not be compatible with Enhanced Vision Systems (EVS) or Night Vision Goggles (NVG) and may reduce or prevent their detection by these systems. However, independent of the technology – solid state or incandescent – colour coding of the lighting may be missing when using EVS or NVG.

Origin:

AP/3

Rationale:

The proposed note is provided to point out that solid state light sources, i.e., LED, may not have sufficient if any IR (heat) emission so as to be seen with use of EVS or NVGs. The note also points out that regardless of the lighting technology, the colour coding, which is a characteristic of aeronautical ground lighting, may be lost.

APPENDIX 1. COLOURS FOR AERONAUTICAL GROUND LIGHTS, MARKINGS, SIGNS AND PANELS

1. General

Introductory Note.— The following specifications define the chromaticity limits of colours to be used for aeronautical ground lights, markings, signs and panels. The specifications are in accord with the 1983 specifications of the International Commission on Illumination (CIE), except for the colour orange in Figure A1-2 for ordinary colours for markings and externally illuminated signs and panels.

It is not possible to establish specifications for colours such that there is no possibility of confusion. For reasonably certain recognition, it is important that the eye illumination be well above the threshold of perception, that the colour not be greatly modified by selective atmospheric attenuations and that the observer's colour vision be adequate. There is also a risk of confusion of colour at an extremely high level of eye illumination such as may be obtained from a high-intensity source at very close range. Experience indicates that satisfactory recognition can be achieved if due attention is given to these factors.

*The chromaticities are expressed in terms of the standard observer and coordinate system adopted by the International Commission on Illumination (CIE) at its Eighth Session at Cambridge, England, in 1931.**

The chromaticities for solid state lighting [e.g. LED] are based upon the boundaries given in the standard S004 of 2001 of the International Commission on Illumination (CIE), except for the blue boundary of white.

2. Colours for aeronautical ground lights

2.1 Chromaticities for lights having filament-type light sources

2.1.1 The chromaticities of aeronautical ground lights with filament-type light sources shall be within the following boundaries:

CIE Equations (see Figure A1-1a):

a) Red

Purple boundary	y = 0.980 – x
Yellow boundary	y = 0.335, except for visual approach slope indicator systems;
Yellow boundary	y = 0.320, for visual approach slope indicator systems.

Note:- See 5.3.5.14 and 5.3.5.30.

b) Yellow

Red boundary	y = 0.382
White boundary	y = 0.790 – 0.667x
Green boundary	y = x – 0.120

c) Green (refer also 2.1.2 and 2.1.3)
Yellow boundary x = 0.360 – 0.080y
White boundary x = 0.650y
Blue boundary y = 0.390 – 0.171x

d) Blue
Green boundary y = 0.805x + 0.065
White boundary y = 0.400 – x
Purple boundary x = 0.600y + 0.133

e) White
~~1) Incandescent~~
Yellow boundary x = 0.500
Blue boundary x = 0.285
Green boundary y = 0.440 and y = 0.150 + 0.640x
Purple boundary y = 0.050 + 0.750x and y = 0.382
~~2) LED~~
~~Yellow boundary x = 0.440~~
~~Blue boundary x = 0.320~~
~~Green boundary y = 0.150 + 0.643x~~
~~Purple boundary y = 0.050 +0.757x~~ [moved to 2.3.1 e]

f) Variable white
Yellow boundary x = 0.255 + 0.750y and ~~x = 1.185 – 1.500y~~ y = 0.790 - 0.667x
Blue boundary x = 0.285
Green boundary y = 0.440 and y = 0.150 + 0.640x
Purple boundary y = 0.050 + 0.750x and y = 0.382

Note.— Guidance on chromaticity changes resulting from the effect of temperature on filtering elements is given in the Aerodrome Design Manual, Part 4 — *Visual Aids* (Doc 9157).

2.1.2 **Recommendation.—** *Where dimming is not required, or where observers with defective colour vision must be able to determine the colour of the light, green signals should be within the following boundaries:*

Yellow boundary y = 0.726 – 0.726x
White boundary x = 0.650y
Blue boundary y = 0.390 – 0.171x

Note: Where the colour signal is to be seen from long range, it has been practice to use colours within the boundaries of 2.1.2.

2.1.3 **Recommendation.—** *Where increased certainty of recognition, from white, is more important than maximum visual range, green signals should be within the following boundaries:*

Yellow boundary y = 0.726 – 0.726x
White boundary x = 0.625y – 0.041

Blue boundary $y = 0.390 – 0.171x$

2.2 Discrimination between lights having filament type sources

2.2.1 **Recommendation.—** *If there is a requirement to discriminate yellow and white from each other, they should be displayed in close proximity of time or space as, for example, by being flashed successively from the same beacon.*

2.2.2 **Recommendation.—** *If there is a requirement to discriminate yellow from green and/or white, as for example on exit taxiway centre line lights, the y coordinates of the yellow light should not exceed a value of 0.40.*

Note.— The limits of white have been based on the assumption that they will be used in situations in which the characteristics (colour temperature) of the light source will be substantially constant.

2.2.3 **Recommendation.—** *The colour variable white is intended to be used only for lights that are to be varied in intensity, e.g. to avoid dazzling. If this colour is to be discriminated from yellow, the lights should be so designed and operated that:*

a) the x coordinate of the yellow is at least 0.050 greater than the x coordinate of the white; and

b) the disposition of the lights will be such that the yellow lights are displayed simultaneously and in close proximity to the white lights.

~~2.2.4 The colour of aeronautical ground lights shall be verified as being within the boundaries specified in Figure A1-1 by measurement at five points within the area limited by the innermost isocandela curve (isocandela diagrams in Appendix 2 refer), with operation at rated current or voltage. In the case of elliptical or circular isocandela curves, the colour measurements shall be taken at the centre and at the horizontal and vertical limits. In the case of rectangular isocandela curves, the colour measurements shall be taken at the centre and the limits of the diagonals (corners). In addition, the colour of the light shall be checked at the outermost isocandela curve to ensure that there is no colour shift that might cause signal confusion to the pilot~~. [new version in 2.4.1]

~~*Note 1. For the outermost isocandela curve, a measurement of colour coordinates should be made and recorded for review and judgement of acceptability by the appropriate authority.*~~ [moved to 2.4.1]

~~*Note 2. Certain light units may have application so that they may be viewed and used by pilots from directions beyond that of the outermost isocandela curve (e.g. stop bar lights at significantly wide runway holding positions). In such instances, the appropriate authority should assess the actual application and if necessary require a check of colour shift at angular ranges beyond the outermost curve.*~~ [moved to 2.4.1]

~~2.2.5 In the case of visual approach slope indicators and other light units having a colour transition sector, the colour shall be measured at points in accordance with 2.2.4, except that the colour areas shall be treated separately and no point shall be within 0.5 degrees of the transition sector.~~ [moved to 2.4.2]

2.3 Chromaticities for lights having a solid state light source

2.3.1 The chromaticities of aeronautical ground lights with solid state light sources, e.g., LEDs, shall be within the following boundaries:

CIE Equations (see Figure A1-1b):

a) Red

Purple boundary	y = 0.980 – x
Yellow boundary	y = 0.335, except for visual approach slope indicator systems;
Yellow boundary	y = 0.320, for visual approach slope indicator systems.

Note:- See 5.3.5.14 and 5.3.5.30.

b) Yellow

Red boundary	y = 0.387
White boundary	y = 0.980 – x
Green boundary	y = 0.727x + 0.054

c) Green (also refer 2.3.2 and 2.3.3)

Yellow boundary	x = 0.310
White boundary	x = 0.625y - 0.041
Blue boundary	y = 0.400

d) Blue

Green boundary	y = 1.141x - 0.037
White boundary	x = 0.400 – y
Purple boundary	x = 0.134 + 0.590y

e) White

Yellow boundary	x = 0.440
Blue boundary	x = 0.320
Green boundary	y = 0.150 + 0.643x
Purple boundary	y = 0.050 + 0.757x

f) Variable white

The boundaries of variable white for solid state light source are those of *e) White* above.

2.3.2 **Recommendation.—** *Where observers with defective colour vision must be able to determine the colour of the light, green signals should be within the following boundaries:*

Yellow boundary	*y = 0.726 – 0.726x*
White boundary	*x = 0.625y - 0.041*
Blue boundary	*y = 0.400*

2.3.3 **Recommendation.—** *In order to avoid a large variation of shades of green, if colours within the boundaries below are selected, colours within the boundaries of 2.3.2 should not be used.*

Yellow boundary	$x = 0.310$
White boundary	$x = 0.625y - 0.041$
Blue boundary	$y = 0.726 – 0.726x$

2.4 Colour measurement for filament-type and solid state-type light sources

2.4.1 The colour of aeronautical ground lights shall be verified as being within the boundaries specified in Figure A1-1a or A1-1b as appropriate, by measurement at five points within the area limited by the innermost isocandela curve (isocandela diagrams in Appendix 2 refer), with operation at rated current or voltage. In the case of elliptical or circular isocandela curves, the colour measurements shall be taken at the centre and at the horizontal and vertical limits. In the case of rectangular isocandela curves, the colour measurements shall be taken at the centre and the limits of the diagonals (corners). In addition, the colour of the light shall be checked at the outermost isocandela curve to ensure that there is no colour shift that might cause signal confusion to the pilot.

Note 1.— For the outermost isocandela curve, a measurement of colour coordinates should be made and recorded for review and judgement of acceptability by the appropriate authority.

Note 2.— Certain light units may have application so that they may be viewed and used by pilots from directions beyond that of the outermost isocandela curve (e.g. stop bar lights at significantly wide runway-holding positions). In such instances, the appropriate authority should assess the actual application and if necessary require a check of colour shift at angular ranges beyond the outermost curve.

2.4.2 In the case of visual approach slope indicator systems and other light units having a colour transition sector, the colour shall be measured at points in accordance with 2.4.1, except that the colour areas shall be treated separately and no point shall be within 0.5 degrees of the transition sector.

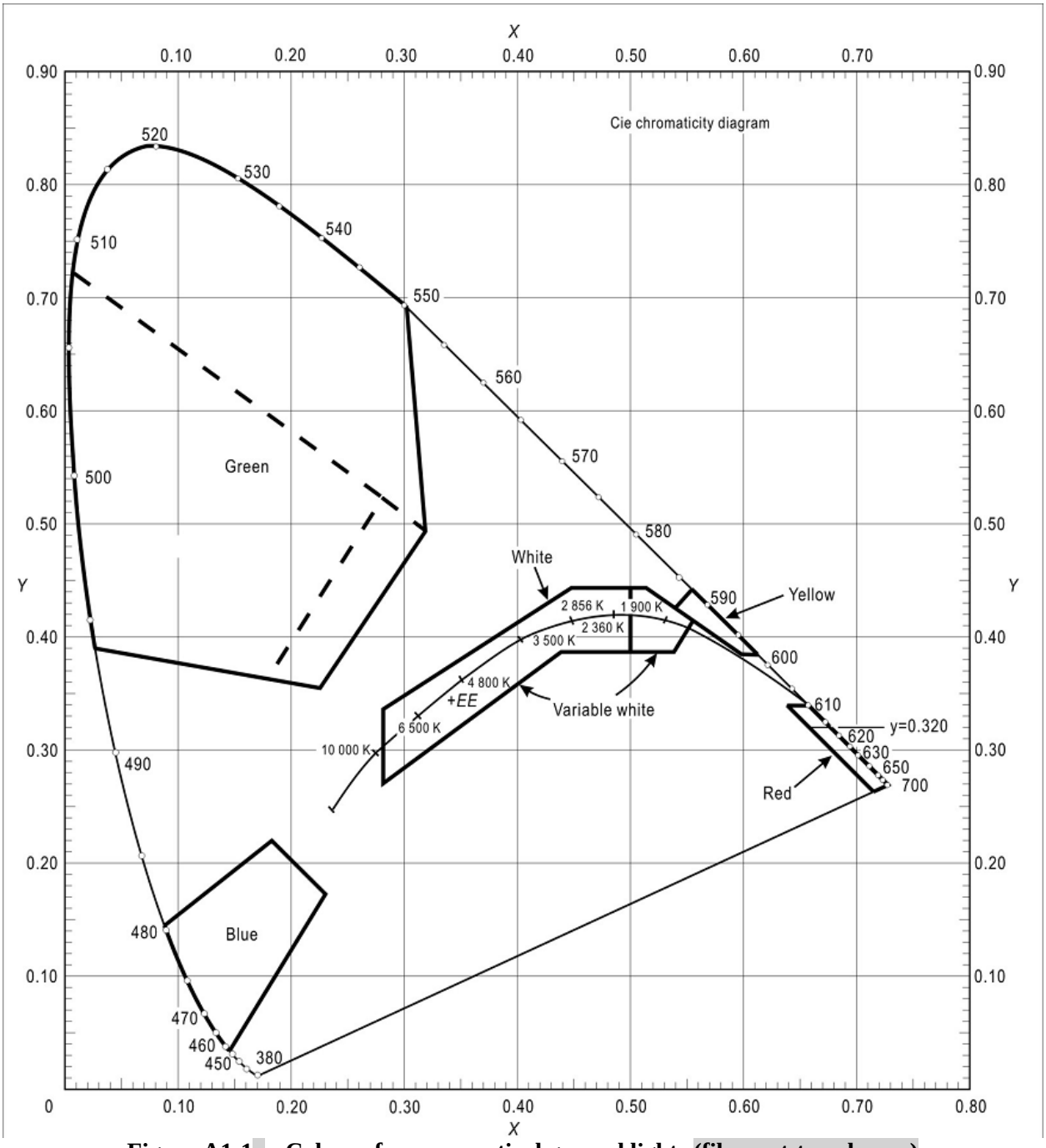


Figure A1-1a: Colours for aeronautical ground lights (filament-type lamps)

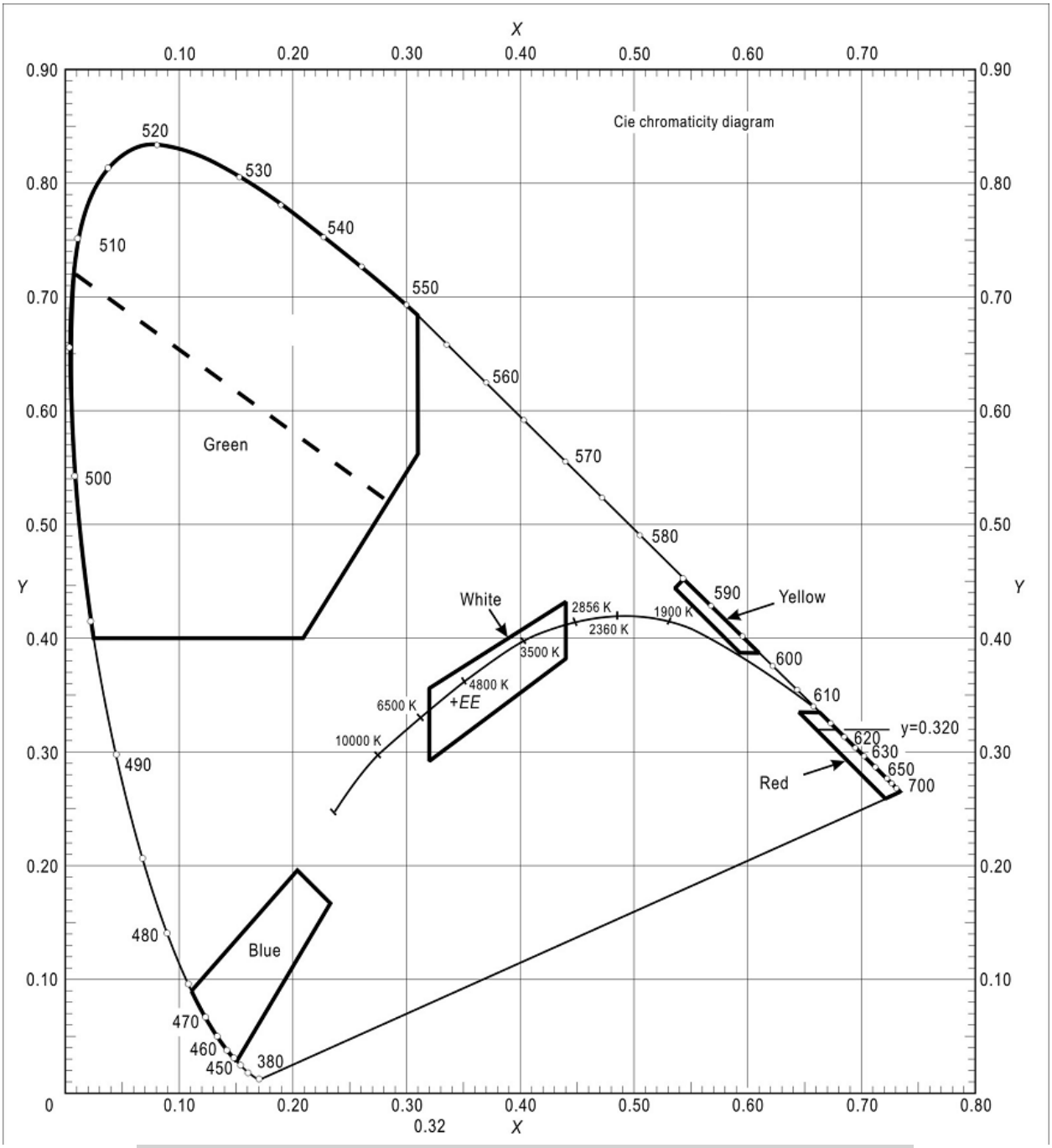


Figure A1-1b. Colours for aeronautical ground lights (solid state lighting)

Origin:

VAWG/8-DP/08, VAWG/9-DP/04, VAWG/10-DP/01, VAWG/11-DP/06, APWGs/2-DP/03, AP/3-WP/04

Rationale:

The intention is to have the LED colours in a new Figure A1-1(b). The current figure becomes A1-1(a) for incandescent lighting.

The LED colours are that of CIE S004 (2001), except for white, as explained below. This standard has been chosen for LEDs for reason that they are less sensitive to brightness setting change which, in the case of filament lighting, causes a colour shift. To explain the difference with incandescent lighting, the following figure shows a superimposition of the new specification of LED colours onto the current Annex 14 Figure A1-1.

The differences in the text are the following.

1. Gen. The section "1. General" applies to all colours including that of painted surfaces. The sentence "*except for the colour orange in Figure A1-2 for ordinary colours for markings and externally illuminated signs and panels*" is added for reason that the aviation orange paint colour is special to ICAO. The last paragraph points out the exception of the blue boundary of white.
2.1.1 (a) Notation is made for the yellow boundary x=0.320 for PAPI
2.1.1 (f) The yellow boundary equation is changed to y=0.790-0.667x for reason that this is the equation for the white boundary of yellow in 2.1.1 (b). Since this is the same line, the equation should be the same.
2.1.2 A note is added to point out that it has been practice to use colours the blue-green area where the signal is to be seen and distinguished at long range.
2.1.3 The phrase "*from white*" is added in order to qualify what is the green is to be distinguished from.
2.2.4 & 5 These articles moved to 2.4.1 and 2.4.2, since they are also applicable to LED lights
2.3.1 The equations for green, red, blue and yellow
2.3.1 (a) Same notation as for 2.1.1(a) for PAPI colour.
2.3.1 (e) The equations for boundaries of white are as reported in State Letter AN 4/1.2.24-13/20
2.3.2 Same as 2.1.2 for colour deficient observers.
2.3.3 This recommendation applies to the initial concern to not have a variation of shades of green on the airfield. In essence, if you pick the yellow-green colour then other selections should be in the same area. The article is a recommendation for reason that it has not been shown that there is a safety issue should there be a variation of shades of green. Also, ICAO cannot restrict greens to only the yellow-green, when blue-green is presently specified by some states, e.g., Japan and Australia.
2.4.1 & 2 Colour measurement. Previously 2.2.4 and 2.2.5.

The explanations for each colour are the following.

GREEN: The white boundary for green is now at the restrictive boundary that was specified in the current Annex 14, Appendix 1, article 2.1.3. This provides increased certainty of recognition.

The yellow boundary for green is now a straight vertical line of x=0.310.

The blue boundary for green is moved further from blue to the horizontal line y=0.400. This provides more separation where lights from the blue-green portion of the green area are used.

BLUE: The blue area is reduced by a half on the portion away from the green area.

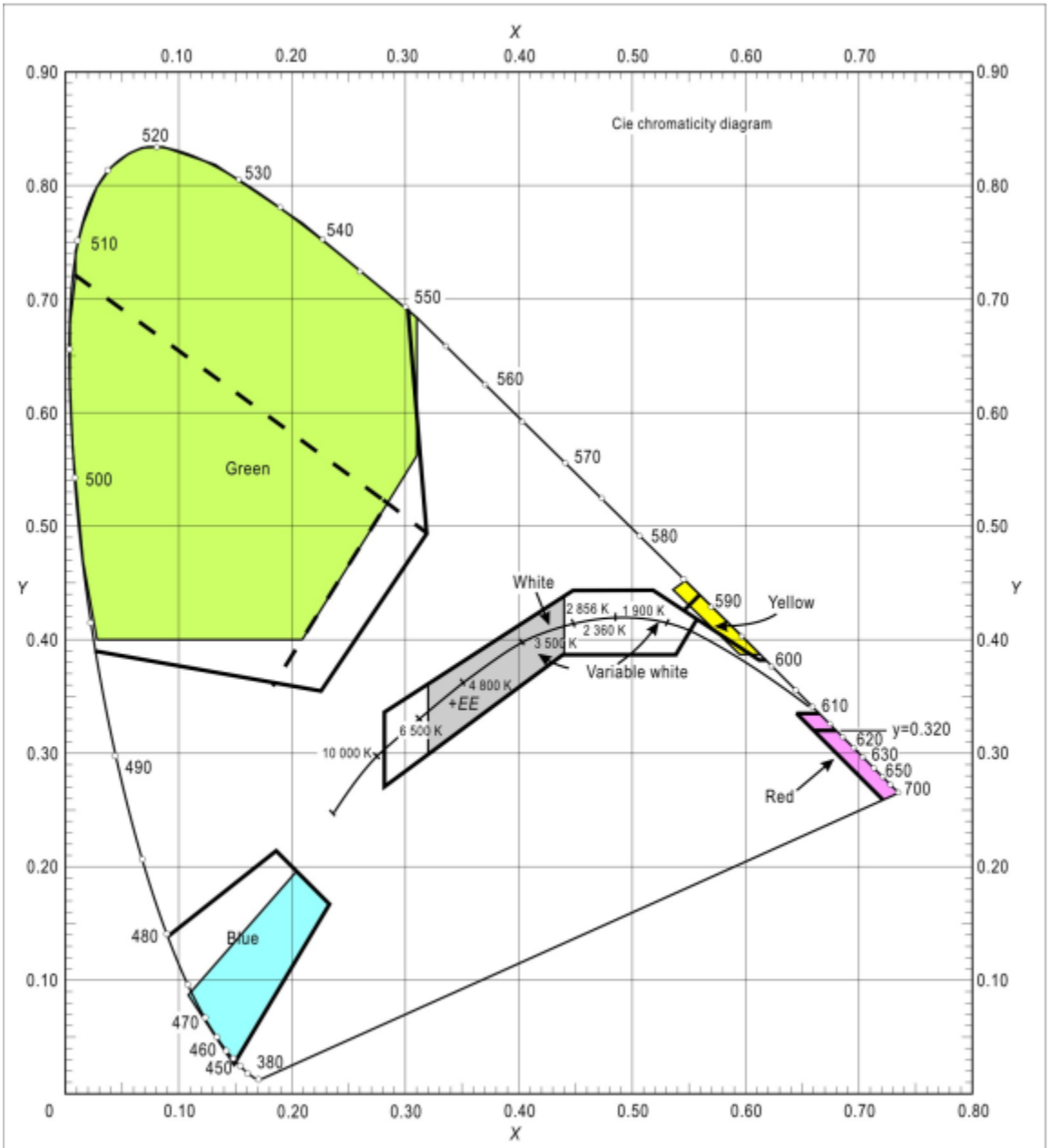
WHITE: The blue and yellow boundaries of white are moved inwards to x=0.320 and x=0.440 respectively. The blue boundary in CIE S004 is at x=0.300 but the Visual Aids Working Group concluded that the blue boundary at x=0.320 is more appropriate for greater certainty of recognition from blue.

The LED specification does not need a "*variable white*" because of the relative stability of colour with dimming. The "*variable white*" which follows the temperature line is only necessary for incandescent lighting whose output colour is dependent upon heating. A section variable white has nevertheless been added because many SARPs of Annex 14 Volume I refer to variable white.

YELLOW: The green boundary of yellow is moved upwards along the spectral locus to y=0.452. Thus the yellow area now includes the yellows specified by Institute of Transportation Engineers (ITE). The red boundary of yellow is moved slightly upwards away from the red area.

RED: The overall red area is the same as that of the current figure. The restrictive boundary at y=0.320 for PAPI (refer Annex 14, article 5.3.5.30) is retained, as it is for incandescent lights.

Finally, please note that the spectral locus (the outer horseshoe shaped curve) is slightly offset in the existing Annex 14 figure used as the source drawing. This will be corrected at some time in the future. For this paper the locus is manually shifted at the red and yellow so that the intersection points match that given in the associated CIE standard. The locus near blue and green is not shifted and one can discern a slight divergence between the locus and the colour boundaries.



Colours for aeronautical ground lights
(LED colours superimposed on current Figure A1-1)

Note: This figure is not part of the amendment.

— — — — — — — —

APPENDIX B

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 PROPOSED AMENDMENT TO ANNEX 14, VOLUME I

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

Rationale
The following modifications are intended to simplify and clarify the existing standards but not to create new ones.
While the reading and interpretation will be improved, no significant impact is expected from these modifications.

. . .

5.4.2 Mandatory instruction signs

Note.— See Figure 5-30 for pictorial representation of mandatory instruction signs and Figure 5-32 for examples of locating signs at taxiway/runway intersections.

. . .

Characteristics

. . .

5.4.2.14 The inscription on a runway designation sign shall consist of the runway designations of the intersecting runway properly oriented with respect to the viewing position of the sign, except that a runway designation sign installed in the vicinity of a runway extremity may show the runway designation of the concerned runway extremity only.

5.4.2.15 The inscription on a category I, II, III, joint II/III or joint I/II/III ~~or joint II/III~~ holding position sign shall consist of the runway designator followed by CAT I, CAT II, CAT III, CAT II/III or CAT I/II/III ~~or CAT II/III~~, as appropriate.

5.4.2.16 The inscription on a NO ENTRY sign shall be in accordance with Figure 5-30.

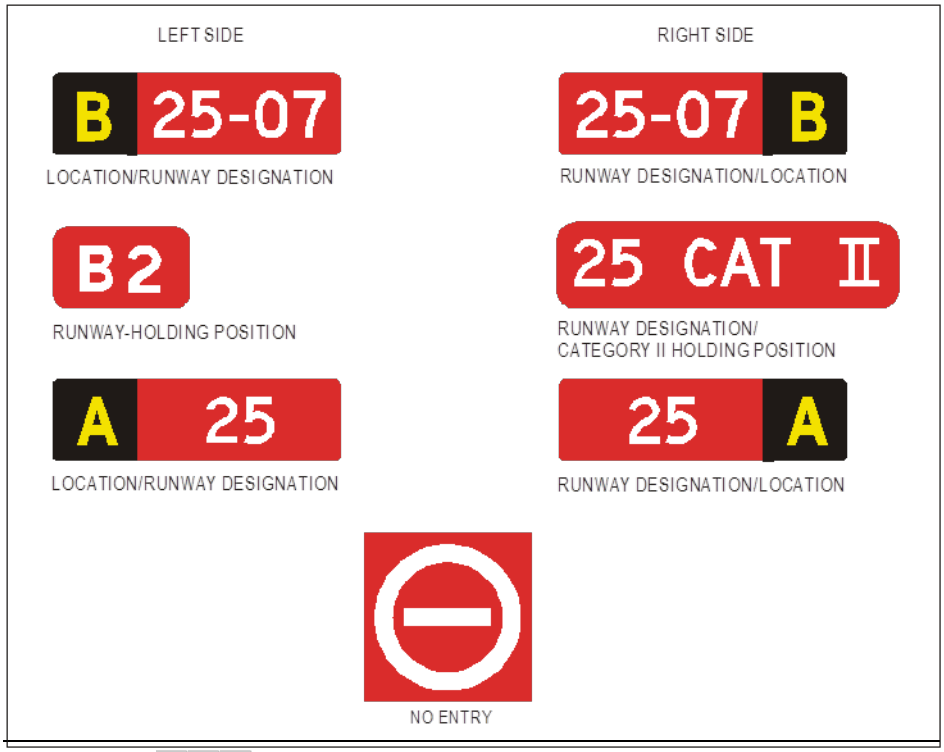
5.4.2.17 The inscription on a runway-holding position sign at a runway-holding position established in accordance with 3.12.3 shall consist of the taxiway designation and a number.

5.4.2.18 Where appropriate, the ~~following~~ inscriptions/symbol of Figure 5-30 shall be used:

~~*Inscription/symbol*~~	~~*Use*~~
~~Runway designation of a runway extremity~~ ~~OR~~ ~~Runway designation of both extremities of a runway~~	~~To indicate a runway-holding position at a runway extremity~~ ~~To indicate a runway-holding position located at other taxiway/runway intersections or runway/runway intersections~~
~~25 CAT I (Example)~~	~~To indicate a category I runway-holding position at the threshold of runway 25~~
~~25 CAT II (Example)~~	~~To indicate a category II runway-holding position at the threshold of runway 25~~
~~25 CAT III (Example)~~	~~To indicate a category III runway-holding position at the threshold of runway 25~~

~~25 CAT II/III (Example)~~	~~To indicate a joint category II/III runway holding position at the threshold of runway 25~~
~~NO ENTRY symbol~~	~~To indicate that entry to an area is prohibited~~
~~B2 (Example)~~	~~To indicate a runway holding position established in accordance with 3.12.3~~

Editorial Note.— Remove existing figure 5-30.



~~Figure 5-30. Mandatory instruction signs~~

Editorial Note.— Insert new Figure 5-30.

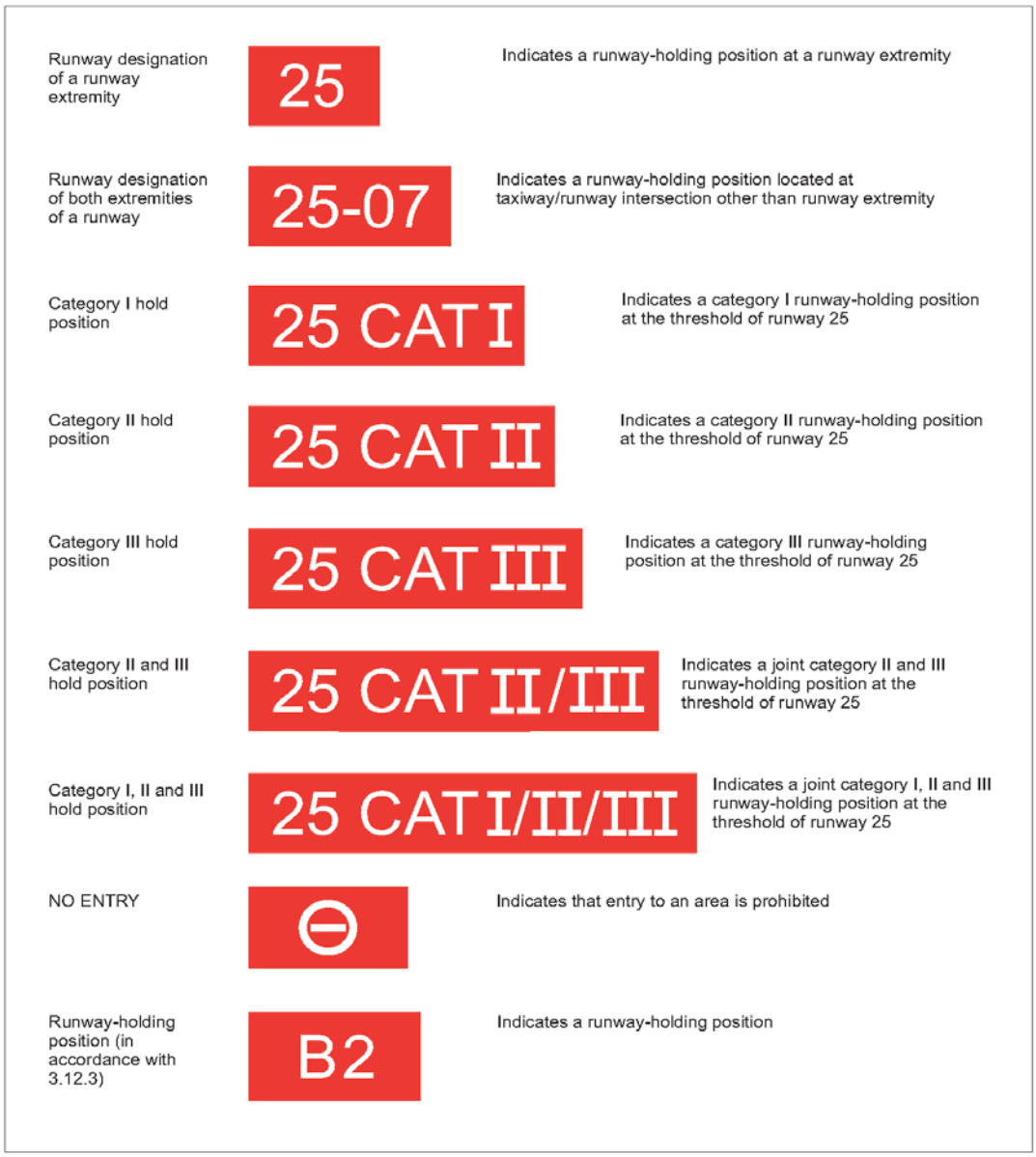


Figure 5-30. Mandatory instruction signs

Origin
VAWG/11-DP/07, APWGs/2-DP/05

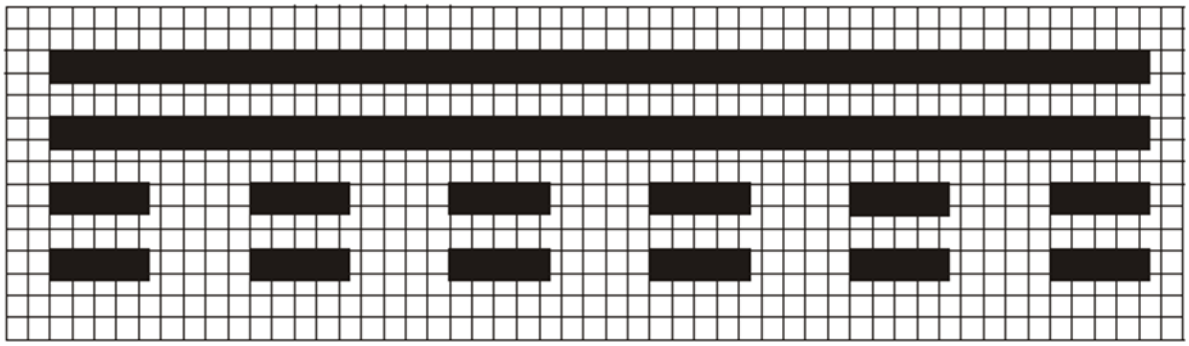
Rationale
Mandatory instruction signs are described in paragraph 5.4.2 with reference to Figure 5-30 *Mandatory Instruction Signs* and Figure 5-32 *Examples of sign positions at taxiway/runway intersections.*
While paragraph 5.4.2.18 describes all the inscription/symbols that shall be used, figure 5-30 shows in two columns, left side and right side, different signs. On the same line, the runway-holding position sign is on the left and the runway designation-category II holding position sign is on the right. This gives the wrong impression that these two signs should be placed on opposite sides when used.

The proposal is to replace the text description of the signs of paragraph 5.4.2.18 by a new figure 5-30. This new presentation would remove possible confusion and illustrate the different signs.
Note: the symmetry (left side/right side) of the signs is illustrated in the examples of Figure 5-32.

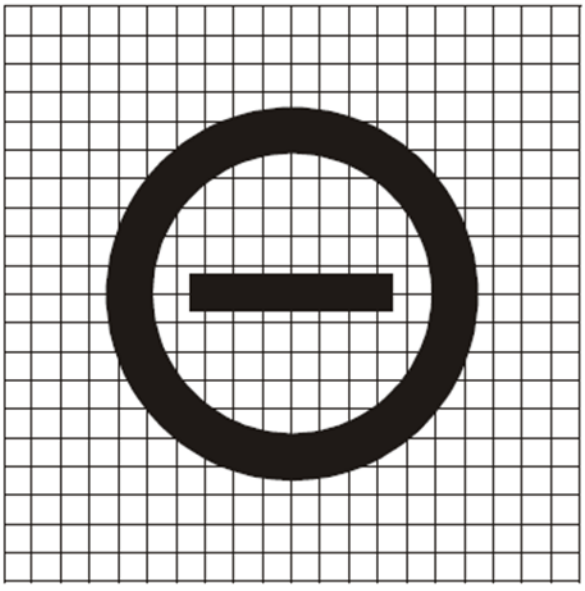
This should clarify any ambiguity with minimal cost impact.

APPENDIX 4

Editorial Note.— Remove the following existing figures for Runway vacated sign and NO-ENTRY sign.



Runway vacated sign

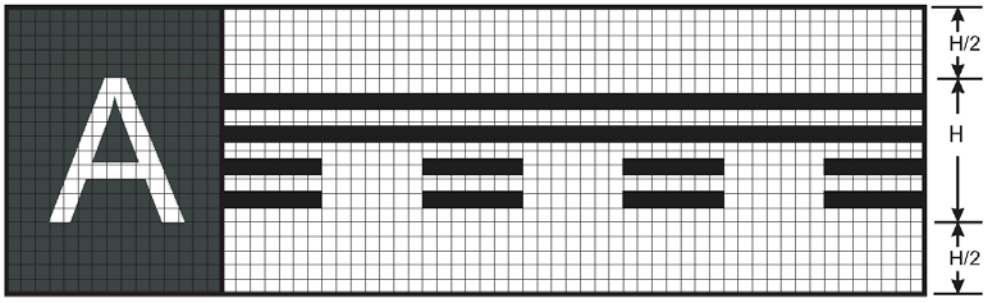


NO ENTRY sign

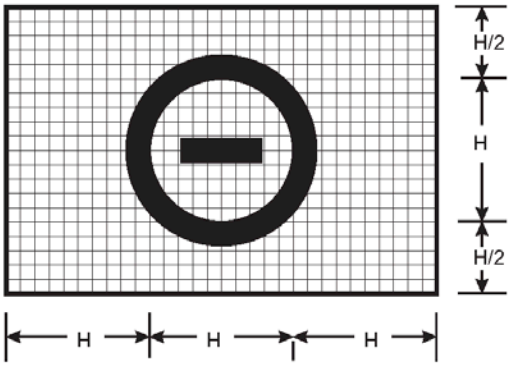
Note.— Existing NO ENTRY signs not conforming to these dimensions are to be replaced not later than 1 January 2012.

Figure A4-2. (cont.)

Editorial Note.— Insert the new figure as follows.



Runway vacated sign (with typical location sign)



NO ENTRY sign

Figure A4-3. Runway vacated and NO ENTRY signs

Editorial Note.— Delete existing figure 5-31.

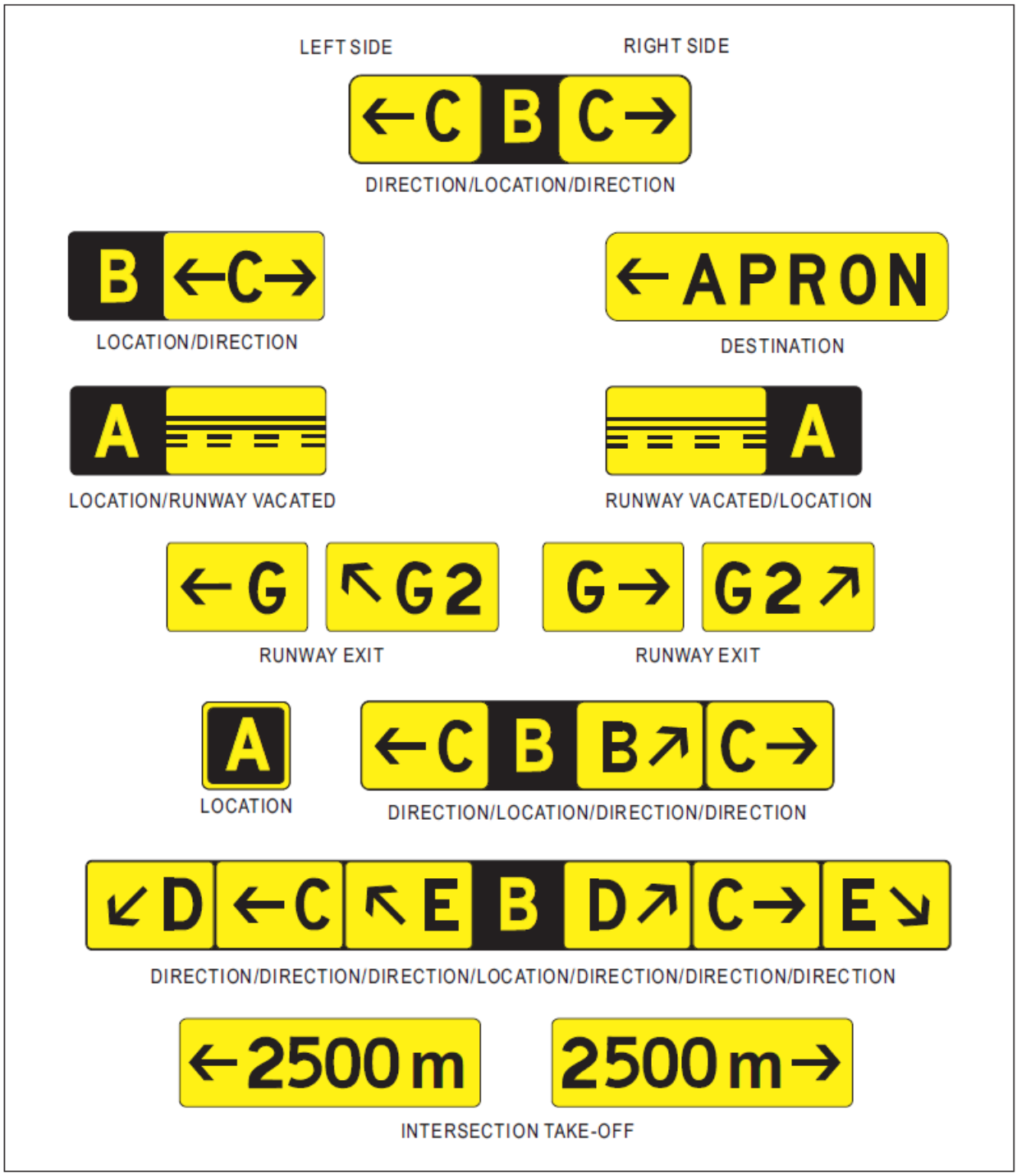


Figure 5-31. Information signs

Editorial Note.— Replace the existing Figure 5-31 with the following new Figure 5-31.

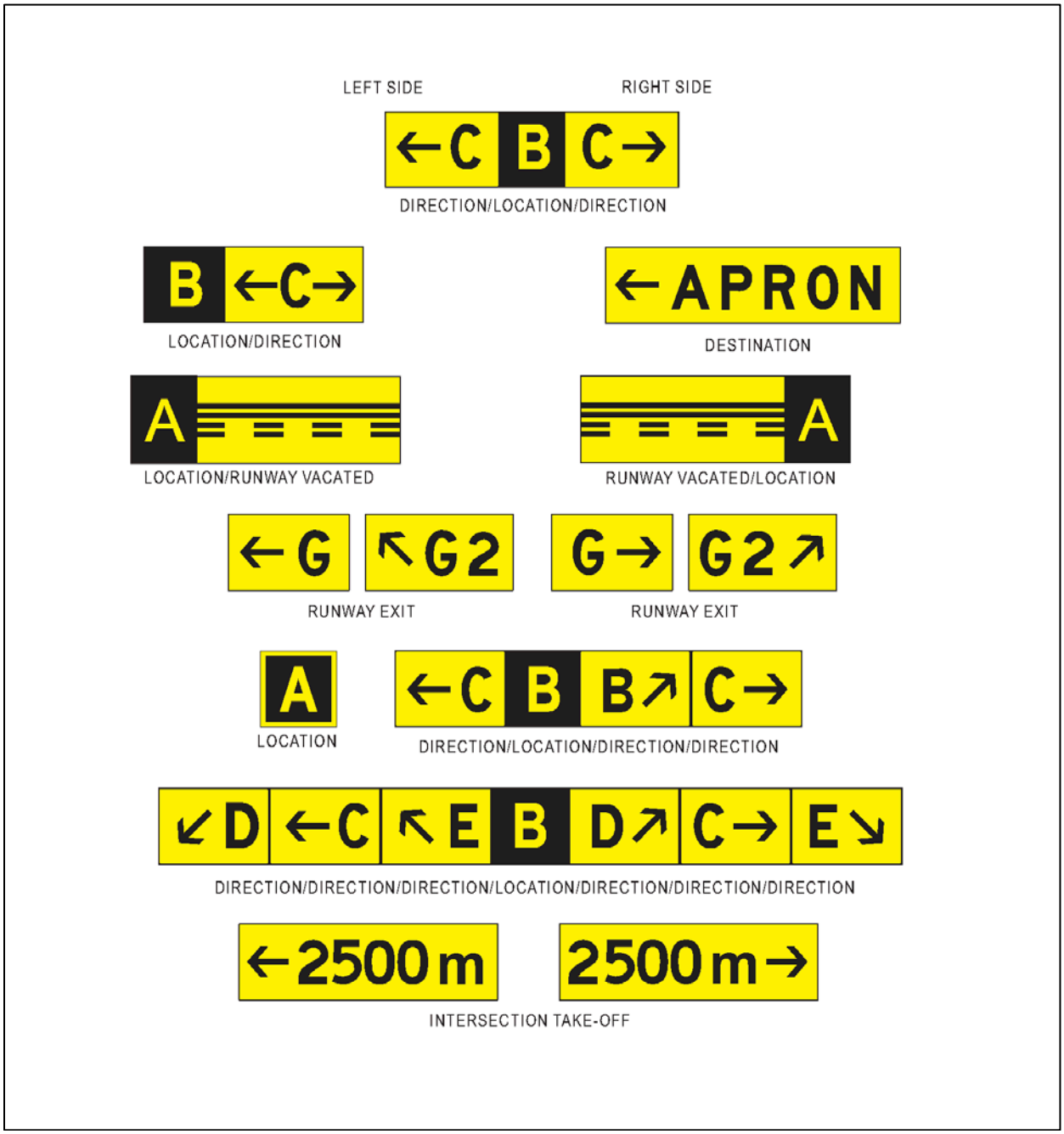


Figure 5-31. Information Signs

Origin
VAWG/11-DP/17, APWGs/2-DP/10

Rationale
The displayed pattern of Figure 5-31 (4 equal gaps) and defined pattern of Figure A4-2 (6 equal gaps) are not congruent. The same applies for the displayed and defined letter “A”.
Similarly, the NO ENTRY sign for which the inscription is defined in Fig. A4-2 but should be rectangular is displayed as a square sign in Fig. 5-30.
It is proposed to remove both inscriptions of runway vacated and NO ENTRY from Fig. A4-2 and create special figures to define the signs themselves. The standard height H is specified in each case.
The runway vacated sign in Figure 5-31 and the NO ENTRY sign in Fig. 5-30 (see previous change) are changed accordingly.
Finally, Fig. 5-31 is also modified to show signs with rectangular corners instead of round corners.

This proposal reconciles SARPs and practice.

Chapter 6

. . .

Table 6-5. Installation setting angles for high-intensity obstacle lights

~~Height of light unit above terrain~~	~~Angle of the peak of the beam above the horizontal~~
~~greater than 151 m AGL~~	~~0°~~
~~122 m to 151 m AGL~~	~~1°~~
~~92 m to 122 m AGL~~	~~2°~~
~~less than 92 m AGL~~	~~3°~~

Height of light unit above terrain (AGL)		Angle of the peak of the beam above the horizontal
Greater than	Not exceeding	
151 m		0°
122 m	151 m	1°
92 m	122 m	2°
	92 m	3°

. . .

Origin
VAWG/11-DP/11, APWGs/2-DP/02

Rationale
From the original table, it is unclear which value of 1 or 2 degree is acceptable for 122 m AGL.
It is proposed to use the format of Table 6-4 to clarify the limit of each range of height. The intended value of 2 degrees is kept for 122 m AGL.

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APPENDIX C

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 PROPOSED AMENDMENT TO ANNEX 14, VOLUME I

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
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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

. . .

APPENDIX 2. AERONAUTICAL GROUND LIGHT CHARACTERISTICS

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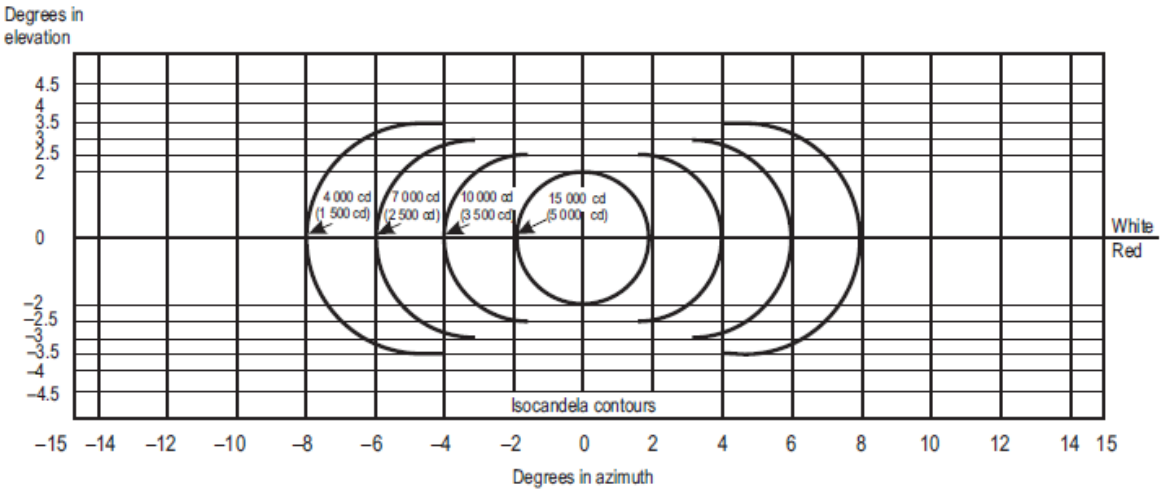


Notes:

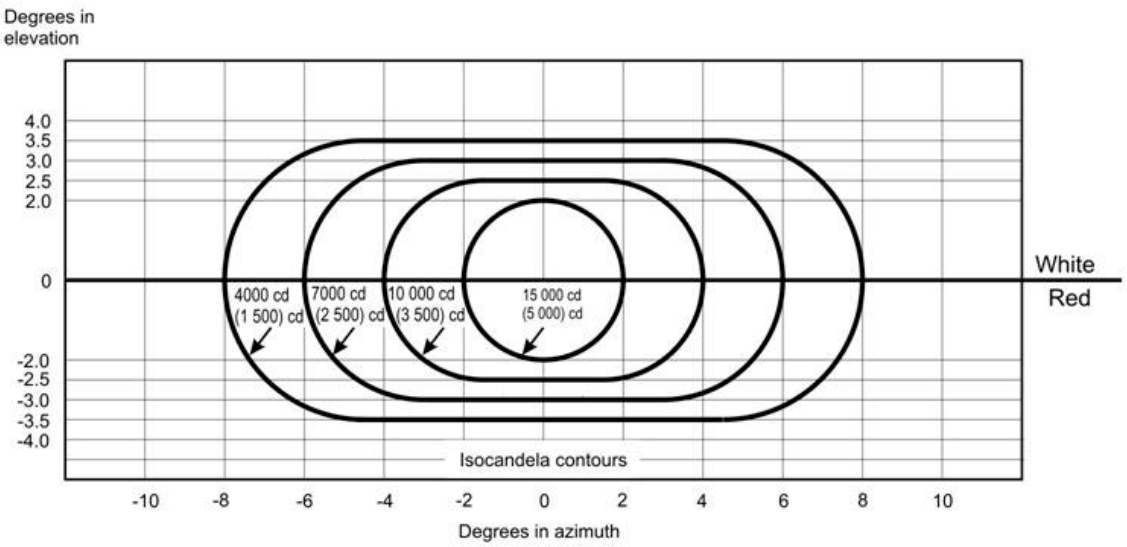
1. These curves are for minimum intensities in red light.

2. The intensity value in the white sector of the beam is no less than 2 and may be as high as 6.5 times the corresponding intensity in the red sector.

3. The intensity values shown in brackets are for APAPI.

Figure A2-23. Light intensity distribution of PAPI and APAPI

[Existing figure in Annex 14 volume I to be deleted]



Notes:

1. These curves are for minimum intensities in red light.
2. The intensity value in the white sector of the beam is no less than 2 and may be as high as 6.5 times the corresponding intensity in the red sector.
3. The intensity values shown in brackets are for APAPI.

Figure A2-23. Light intensity distribution of PAPI and APAPI

[New figure to replace Figure A2-23]

Origin
AP/3

Rationale
The arrows and numbers in Figure A2-23 Light intensity distribution of PAPI and APAPI should point to the red area, instead of the white area. This modification clarifies the figure with no impact.

— — — — — — — —

APPENDIX D

PROPOSED AMENDMENT TO

INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

AERODROMES

ANNEX 14

TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

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. . .

1.1 Definitions

. . .

Autonomous Runway Incursion Warning System (ARIWS) : a ground system which is not part of the normal control or guidance systems on the aerodrome and which provides autonomous detection of an incursion or of the occupancy on an active runway and a direct warning to a flight crew or a vehicle operator.

. . .

CHAPTER 9. AERODROME OPERATIONAL SERVICES, EQUIPMENT AND INSTALLATIONS

. . .

9.12 Autonomous Runway Incursion Warning System

Note 1. ¬ The implementation of an Autonomous Runway Incursion Warning System (ARIWS) is a complex issue deserving careful consideration by aerodrome operators, Air Traffic Services and States. It is not intended that the specifications for ARIWS in this section are in any way interpreted as an obligation or a recommendation to install such a system. Attachment A, Section 21, provides information on the use of ARIWS.

Note 2.— An ARIWS may share common sensory components of a SMGCS or A-SMGCS, however, it is not operationally connected to either system.

Application

9.12.1 **Recommendation.—** *Where the provision of an Autonomous Runway Incursion Warning System (ARIWS) is deemed necessary at an aerodrome, this system should not be considered as part of the normal control or guidance systems on the aerodrome.*

Rationale

APWGs/2 acknowledged that RWSL was being deployed in three different States in three different continents which set the cases for standardization of the lights patterns. The VAWG proposal in APWGs/2-DP/14 provisionally fulfilled the remit given by the ANC and the APWGs/2 discussion focussed on the best wording for the applicability clause in chapter 9 because it was the meeting's consensus to ensure that "*the provisions shall in no way be interpreted as an obligation or a recommendation to install such a system*". The two Notes in 9.12 and the recommendation 9.12.1 were written to that purpose.

Proposals for changes to Standard 5.3.30.3 and to the isocandela diagrams were also received. Proposed change to 5.3.30.3 brings clarity without changing the essence and has been incorporated. Proposed changes to isocandela diagrams are deferred to the VAWG for further study and the isocandela diagrams presented in appendix D to this paper is the very same as the one presented in APWGs/2-DP/14.

Characteristics

9.12.2 An ARIWS shall provide autonomous detection and direct warning to a flight crew or vehicle operators of an incursion on an active runway .

9.12.3 An ARIWS shall function and be controlled independently of any other visual system on the aerodrome.

Note 1.— An ARIWS may be installed in conjunction with enhanced taxiway markings, stop bars or runway guard lights. The implementation of an ARIWS is a complex issue deserving careful consideration by aerodrome operators, aircraft operators, Air Traffic Services and States. Guidance on factors to be considered before implementation and procedures required for operation is given in Attachment A, section 21.

Note 2.— It is intended that the system(s) be operated under all weather conditions, including low visibility.

Note 3.— It is important that the signal provided is universally understood, and reacted to in a very short time. While other sensing and logic systems may be developed, it is of high importance that common visual characteristics be defined to enable pilots and vehicle drivers to quickly understand the message and react accordingly.

9.12.4 The visual aid components of an ARIWS, i.e., lights, shall be designed to conform with the relevant specifications in 5.3.

9.12.5 Where an ARIWS is installed at an aerodrome, information on its existence, characteristics and status as well as the procedures for pilots and ATC for its operation shall be promulgated in the AIP as specified in Annex 15, Appendix 1, AD 2.9.

9.12.6 An ARIWS shall be independently switched without interferences with other systems.

Note.— An ARIWS does not require circuit interleaving, secondary power supply or operational connection to other visual aid systems.

9.12.7 Failure of part or all of this system shall not interfere with normal aerodrome operations.

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ATTACHMENT A. GUIDANCE MATERIAL SUPPLEMENTARY TO ANNEX 14, VOLUME I
[referred to in section 9.12]

. . .

21. General description of an Autonomous Runway Incursion Warning System (ARIWS)

Editorial Note.— These Autonomous systems are generally quite complex in design and operation and, as such require some level of involvement by all levels of the industry, from the Regulating Authority to the end User. This guidance is offered to provide a more clear description of the system(s) and offer some suggested actions required in order to properly implement these system(s) at an aerodrome in any State.

21.1 General description Autonomous Runway Incursion Warning System

21.1.1 The operation of an ARIWS is based upon a surveillance system which monitors the actual situation on a runway and automatically returns this information to warning lights at the runway (take-off) thresholds and entrances. When an aircraft is departing from a runway (rolling) or arriving at a runway (short final), red warning lights at the entrances will illuminate indicating it is unsafe to enter or cross the runway. When an aircraft is aligned on the runway for take-off and another aircraft or vehicle enters or crosses the runway, red warning lights will illuminate at the threshold area indicating it is unsafe to start the take-off roll. Additional lights can provide similar warnings for aircraft on the final approach or at runway intersections.

21.1.2 In general an ARIWS is built up out of an independent surveillance system (primary radar, multilateration, specialized cameras, dedicated radar, etc.) and a warning system in the form of extra airfield lighting systems connected through a processor which generates alerts independent from ATC directly to the concerned actors.

21.1.3 In practice, not every entrance or threshold needs to be equipped with warning lights. Each aerodrome will have to assess their needs individually depending on the characteristics of the aerodrome. There are several systems developed offering the same or similar functionality.

21.2 Flight Crew Actions

21.2.1 It is of critical importance that crews understand the warning being transmitted by the ARIWS system. Warnings are provided in near real time, directly to the cockpit because there is no time for “relay” types of communications. In other words, a conflict warning generated to ATS who must then interpret the warning, evaluate the situation and communicate to the aircraft in question, would result in several seconds being taken up where each second is critical in the ability to stop the aircraft safely, and prevent a potential collision. Pilots must be presented with a globally consistent signal which they must be taught means “STOP IMMEDIATELY”. Likewise, pilots receiving an ATS clearance to take-off or cross a runway, and seeing the red light array, must STOP and advise ATS that they aborted/stopped because of the red lights. Again, the criticality of the timeline involved is so tight that there can be no room for (mis)interpretation of the signal. It is of utmost importance that the visual signal is consistent around the world.

21.2.2 It must also be stressed that the extinguishing of the red lights does not, in itself, indicate a clearance to proceed. That clearance is still required from the air traffic control. The absence of red warning lights only means that potential conflicts have not been detected on the way ahead.

21.2.3 In the event that a system becomes unserviceable, one of two things will occur. If the system fails in the extinguished condition, then no procedural changes need to be accomplished. The only thing that will happen is the loss of the automatic, independent warning system. Both ATS operations and flight crew procedures (in response to ATS clearances) will remain unchanged.

21.2.4 If the system fails in the illuminated condition, then alternative procedures should be employed. It will be up to the individual authority to establish those procedures depending on their own circumstances, but it must be remembered that flight crews are instructed to "STOP" at all red lights, so if it becomes necessary for crews to cross an illuminated array, they should do so under specifically worded ATS clearances, and possibly with a follow me vehicle leading. Alternatively, the affected portion of the system, or the entire system can be shut off until repaired, reverting to the extinguished scenario illustrated above.

21.3 Aerodromes

Most aerodromes will not require an ARIWS. Of those that require/desire it, not every runway or taxiway needs to be equipped with the lighting array(s). Not every aerodrome will require a full blown ground surveillance system to feed information to the conflict detection computer. Each aerodrome in each State wishing to install such a system will need to assess their needs individually, depending on their traffic levels, aerodrome geometry, ground taxi patterns, etc. Local user groups such as the Local Runway Safety Team (LRST) can be of assistance in this process. Although there maybe local specific requirements, some basic system requirements hold true:

- the control system and energy power supply of the system must be independent from any other system in use at the aerodrome, especially the other parts of the lighting system;
- the system must operate independently from ATS communications;
- the system must provide a globally accepted visual signal that is consistent and instantly understood by crews; and
- there must be an alternative action plan in the case of failure of a portion of, or the entire system.

21.4 Air Traffic Services

21.4.1 While not directly controlling the ARIWS, Air Traffic Services, most likely the control tower, plays an integral part in its successful operation. The ARIWS is designed as a backup to normal ATS functions, providing warnings only when some conflict has been unintentionally created or missed by normal aerodrome operations. For example, ground control or tower (local) control has provided a clearance to hold short of a runway but the flight crew or vehicle operator has "missed" the hold short portion of their clearance and tower has issued a take-off or landing clearance to that same runway, and the non readback was missed by both. The ARIWS will provide a direct warning.

21.4.2 In any case where a clearance has been issued and a crew reports a non-compliance due to "red lights", or aborting because of "red lights" then it is imperative that the controller immediately assess the situation, and provide additional instructions as necessary. It may well be that the system has generated a false warning, or that the potential incursion no longer exists, however, it may also be a valid warning. In any case, additional instructions and/or a new clearance needs to be provided. In a case where the system has failed, then alternative procedures will need to be put into place as described above. In no case, the illumination of the ARIWS should be dismissed without confirmation that, in fact, there is no conflict. It is worth noting that there have been numerous incidents avoided at aerodromes with such system installed. It is also worth noting that there have been false warnings as well, usually as a result of

the calibration of the warning software, but in any case, a confirmation of the potential conflict must be done.

21.4.3 While many installations may have a visual or audio warning available to ATS personnel, it is in no way intended that they be required to actively monitor the system. Such warnings may assist ATS personnel in quickly assessing the conflict in the event of a warning and help them to provide appropriate further instructions, but the ARIWS should not play an active part in the normal functioning of any ATS facility.

21.4.4 Each State, and perhaps each facility where the system is installed will develop procedures for alternative operations depending upon their unique situation. Again, it must be stressed that under no circumstances should pilots or operators be instructed to “cross the red lights” without some additional mitigation in place such as a follow me vehicle or a specific confirmation of the failure of the system at that specific point. As indicated previously, the use of Local Runway Safety Teams can greatly assist in this development process.

21.5 Promulgation of information

21.5.1 Information on the existence, characteristics and status of an ARIWS at an aerodrome should be promulgated in the AIP section AD 2.9 and its status updated as necessary through NOTAM or ATIS in compliance with Annex 14 Standard 2.9.1.

21.5.2 Aircraft operators should also ensure that flight crews documentation include procedures regarding ARIWS and appropriate guidance information.

21.5.3 In addition aerodromes may provide additional sources of guidance on operations and procedures for their personnel, aircraft operators, ATS and third parties personnel who may have to deal with an ARIWS.

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CHAPTER 5. VISUAL AIDS FOR NAVIGATION

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5.3.30 Runway Status Lights

Note.— Runway Status Lights (RWSL) is an Autonomous Runway Incursion Warning System (ARIWS). The RWSL comes in two basic visual components, Runway Entrance Lights (RELs) and Take-off Hold Lights (THLs). Either may be installed by itself, but the two components are designed to be complementary to each other.

Location

5.3.30.1 Where provided, RELs shall be offset 0.6 m from the taxiway centre line on the opposite side to the taxiway centre line lights and begin 0.6 m before the runway hold position extending to the edge of the runway. An additional single light shall be placed on the runway 0.6 m from the runway centre line and aligned with the taxiway RELs.

5.3.30.2 RELs shall consist of at least 5 light units and shall be spaced at a minimum of 3.8 m and a maximum of 15.2 m longitudinally, depending upon the taxiway length involved, except for a single light installed near the runway centre line.

5.3.30.3 Where provided, THLs shall be offset 1.8 m on each side of the runway centreline lights and extend, in pairs, starting at a point 115 m from the beginning of the runway, or the starting point of the take-off roll and thereafter every 30 m for at least 450 m.

Rationale

This entirely new section is proposed to establish the lighting configuration for Runway Status Lights (RWSL) systems.

The configurations described are being installed over the next few years at major United States airports. Additionally development of similar RWSL systems around the world by at least two other States has prompted this proposal for the configuration.

The primary concern is to provide a direct, independent warning of a potential conflict to the flight crew. As such, the warning must be universally recognized and reacted to very quickly due to the dynamic nature of the conflict. Therefore it is essential to establish a common lighting configuration globally, to ensure the greatest possible recognition and least possible reaction time to the warning.

Much research has been accomplished in the United States by MIT Lincoln Laboratories and by MITRE corporation before the current configuration was agreed to. Prototype systems have been installed at San Diego (KSAN), Dallas-Fort Worth (KDFW), Los Angeles (KLAX) and Boston (KBOS). Information derived from those prototype installations has been used to develop the final configuration of lights proposed here.

For 5.3.30.3, the original "*starting at a point 115 m from the beginning of the runway*" has been modified as there are variations of aircraft types operating from a given aerodrome, as well as indistinctness in where the start for the 115 m commences in the event of an intersection take-off.

The THL is to start where the pilot can best visually identify the THL which is where the "*rear landing gear reaches the point where the runway centerline and taxiway centerline merges (in other words the aircraft is correctly aligned with the runway centerline)*". For example if the smallest aircraft intending to use a given runway is a SAAB 340B, when the rear landing gear of the aircraft intending to take-off reaches the point where the runway centerline and taxiway centerline merges and taking the blind area

into consideration, it is possible to visually identify the THL 16.3 m ahead. Therefore, the starting point of the THL may become that position.
However a sufficient distance shall separate the THLs from the side rows of lights for precision approach runways in order not to confuse the identification of the threshold. Original intention of the design was 112.5 m, but some flexibility is required to cater with aerodrome specifics and intersection take-offs.
Same reasoning applies to THLs length which need some flexibility around the target value of 450 m to accommodate the case of multiple intersection take-offs entries.
Given the variety of situations at the limited planned RWSL installations (less than 30 presently), it was considered that the proposed 5.3.30.3 captured the basic principle and essence of the requirements and that local adaptations could be left to the discretion of the State.

Characteristics

5.3.30.4 Where provided, Runway Entrance Lights (RELs) shall consist of a single line of fixed in-pavement lights showing red in the direction of aircraft approaching the runway.

5.3.30.5 RELs shall illuminate as an array at each taxiway/runway intersection where they are installed within 2 seconds of sensing an incursion.

5.3.30.6 Where provided, Take-off Hold Lights (THLs) shall consist of two rows of fixed in-pavement lights showing red in the direction of aircraft taking off on the runway.

5.3.30.7 THLs shall illuminate as an array on the runway within 2 seconds of sensing an incursion.

5.3.30.8 Intensity and beam spread of RELs shall be in accordance with the specifications of Appendix 2, Figure A2-12 and A2-14.

5.3.30.9 Intensity and beam spread of THLs shall be in accordance with the specifications of Appendix 2, Figure A2-x.

Note.— Consideration for reduced beam width may be required for some REL lights at acute angled runway/taxiway intersections to ensure the RELs are not visible to aircraft on the runway.

5.3.30.10 **Recommendation**。**—** *RELs and THLs should be automated to the extent that the only control over each system will be to disable one or both systems.*

. . .

APPENDIX 2. AERONAUTICAL GROUND LIGHT CHARACTERISTICS

. . .

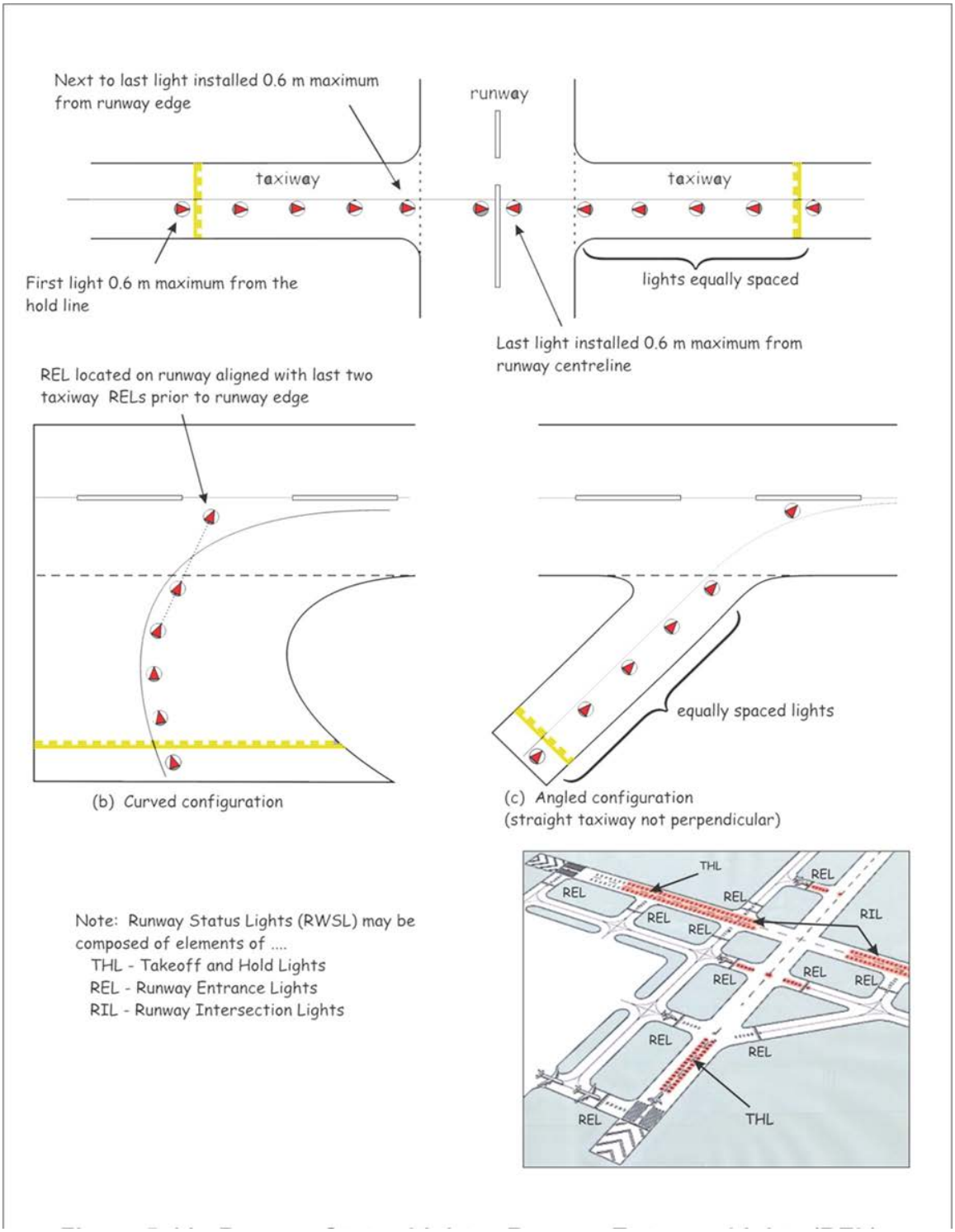
[Modified Notes of Figure A2-14]

Notes:

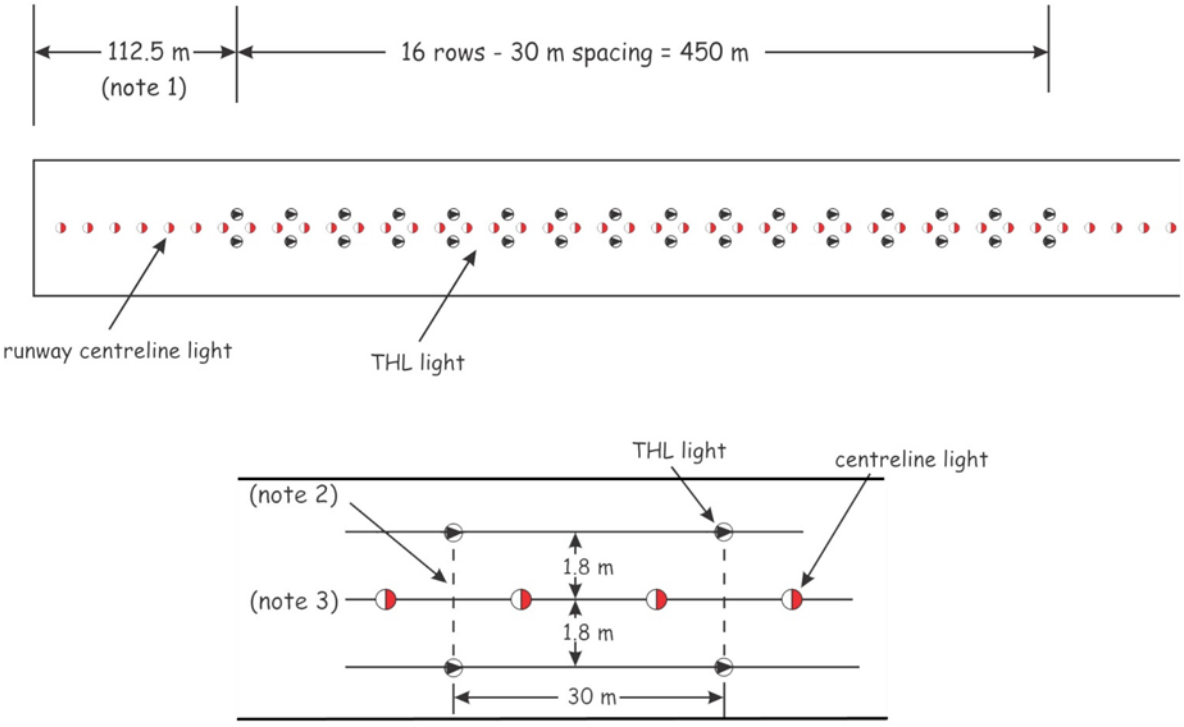
1. Lights on curves to be toed-in 15.75 degrees with respect to the tangent of the curve. This does not apply to RELs.

2. Increased intensities for RELs shall be twice of the specified instensities, respectively Minimum 20 cd, Main beam minimum 100 cd and Minimum average 200 cd.

~~2~~3 See collective notes for Figures A2-12 to A2-21.



[Figure on Runway Entrance Lights, for guidance material]
[Reference to RIL will be removed from that graphic]



Notes:

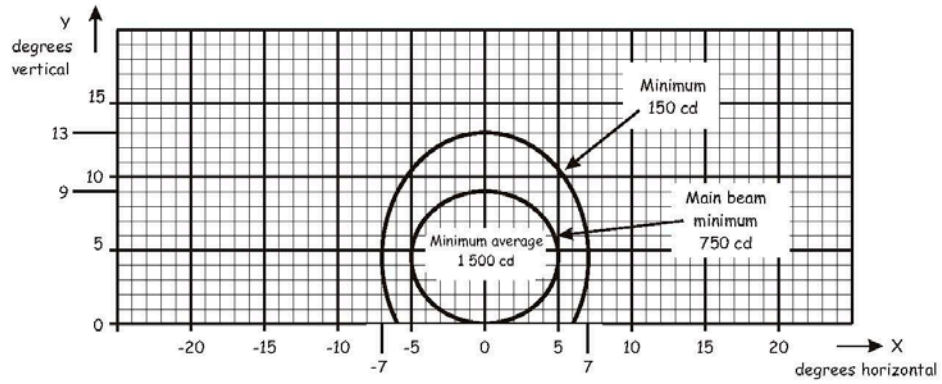
(1) 7 1/2 centreline light spacings.

(2) Preferably the THL is positioned such that a line formed by two THL lights will be near the mid-point between two centreline lights.

(3) If the runway centreline lights are offset from the physical centreline, the THL lights are similarly offset to maintain the 1.8 m dimension.

[Figure for guidance material]

PROPOSED DIAGRAM FOR APPENDIX 2



Notes:

1. Curves calculated on formula: $x^2/a^2 + y^2/b^2 = 1$

a	5.0	7.0
b	4.5	8.5

2. See collective notes for Figures for A2-1 to A2-xx.

Figure A2-x Isocandela diagram for Take-off and Hold Lights (THL) (red light)

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APPENDIX E

PROPOSED AMENDMENT TO

INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

AERODROMES

ANNEX 14

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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

. . .

CHAPTER 6. VISUAL AIDS FOR DENOTING OBSTACLES

. . .

6.2.4 Wind turbines

6.2.4.1 A wind turbine shall be marked and/or lighted if it is determined to be an obstacle.

Note 1 — Additional lighting or markings may be provided where in the opinion of the State such lighting or markings are deemed necessary.

Note 2.— See 4.3.1 and 4.3.2.

Markings

~~6.2.4.1 A wind turbine shall be marked and/or lighted if it is determined to be an obstacle.~~
~~*Note.— See 4.3.1 and 4.3.2.*~~

6.2.4.2 **Recommendation.—** *The rotor blades, nacelle and upper 2/3 of the supporting mast of wind turbines should be painted white, unless otherwise indicated by an aeronautical study.*

Lighting

6.2.4.3 **Recommendation.—** *When lighting is deemed necessary~~, medium-intensity obstacle lights should be used. I~~n the case of a wind farm, i.e. a group of two or more wind turbines, ~~it~~ the wind farm should be regarded as an extensive object and the lights should be installed:*

a) to identify the perimeter of the wind farm;

b) respecting the maximum spacing, in accordance with 6.2.3.15, between the lights along the perimeter, unless a dedicated assessment shows that a greater spacing can be used;

c) so that, where flashing lights are used, they flash simultaneously throughout the wind farm; ~~and~~

d) so that, within a wind farm, any wind turbines of significantly higher elevation are also identified wherever they are located~~.~~; and

e) at locations prescribed in a), b) and d):

i) for wind turbines of less than 150 m in overall height (hub height plus vertical blade height), medium intensity lighting on the nacelle.

ii) for wind turbines from 150 m to 315 m in overall height, in addition to the medium intensity light installed on the nacelle, a second light serving as an alternate should be provided in case of failure of the operating light. The lights should be installed to assure that the output of either light is not blocked by the other.

iii) in addition, for wind turbines from 150 m to 315 m in overall height, an intermediate level at half the nacelle height of at least 3 low intensity Type E lights, as specified in 6.2.1.3, that are configured to flash at the same rate as the light on the nacelle. If an aeronautical

study shows that low intensity type E lights are not suitable, low-intensity type A or B lights may be used.

Note.— The above 6.2.4.3 e) does not address wind turbines of more than 315 m of overall height. For such wind turbines, additional marking and lighting may be required as determined by an aeronautical study.

6.2.4.4 **Recommendation.—** *The obstacle lights should be installed on the nacelle in such a manner as to provide an unobstructed view for aircraft approaching from any direction.*

6.2.4.5 **Recommendation.—** *Where lighting is deemed necessary for a single wind turbine or short line of wind turbines, the installation should be in accordance with 6.2.4.3(e) or as determined by an aeronautical study.*

Table 6-1. Characteristics of obstacle lights

1	2	3	4	5	6	7
			Peak intensity (cd) at given Background Luminance (b)			Light Distribution Table
Light Type	Colour	Signal type/ (flash rate)	Day (Above 500 cd/m^2)	Twilight (50-500 cd/m^2)	Night (Below 50 cd/m^2)	
Low-intensity, Type A (fixed obstacle)	Red	Fixed	N/A	N/A	10	Table 6-2
Low-intensity, Type B (fixed obstacle)	Red	Fixed	N/A	N/A	32	Table 6-2
Low-intensity, Type C (mobile obstacle)	Yellow/Blue (a)	Flashing (60-90 fpm)	N/A	40	40	Table 6-2
Low-intensity, Type D (follow-me vehicle)	Yellow	Flashing (60–90 fpm)	N/A	200	200	Table 6-2
Low-intensity, Type E	Red	Flashing (c)	N/A	N/A	32	Table 6-2 (type B)
Medium-intensity, Type A	White	Flashing (20–60 fpm)	20 000	20 000	2 000	Table 6-3
Medium-intensity, Type B	Red	Flashing (20–60 fpm)	N/A	N/A	2 000	Table 6-3
Medium-intensity, Type C	Red	Fixed	N/A	N/A	2 000	Table 6-3
High-intensity, Type A	White	Flashing (40–60 fpm)	200 000	20 000	2 000	Table 6-3
High-intensity, Type B	White	Flashing (40–60 fpm)	100 000	20 000	2 000	Table 6-3

a) See 6.2.2.6

b) For flashing lights, effective intensity as determined in accordance with the *Aerodrome Design Manual* (Doc 9157), Part 4.

c) For wind turbine application to flash at the same rate as the lighting on the nacelle

Origin

VAWG/10-DP/13, VAWG/11-DP/05, APWGs/2-DP/07

Rationale

The standards for wind turbines were developed at a time when the overall height (nacelle plus vertical blade) of wind turbines were less that 150 m. The advent of wind turbines of more than 150 m necessitates that these be addressed in revised standards.

6.2.4.1 is moved up to be generic. The provisions are considered as minimal requirements and additional lighting may be provided if deemed necessary (note 1).

Because the articles are written with respect to numerous wind turbines in a wind farm, article 6.2.4.5 provides a recommendation in the case of a single wind turbine or a short line of wind turbines,

At least one State in the subgroup suggested that for wind turbines over 150 m the blades and nacelle should be marked by orange or red banding. This proposal retains the current specification that the wind turbine is to be painted white for day protection.

For 6.2.4.3, the subject is now wind farms. The present definition of a wind farm (i.e., two or more wind turbines) is retained.

For the introduction to 6.2.4.3 the text "*medium-intensity obstacle lights should be used*" is removed, because the type of lighting is given in 6.2.4.3 d).

In as much as lights of sufficient intensity cannot in practicality be installed on the blade tips, the revision considers augmenting the nacelle lighting and the addition of an intermediate level of low intensity lighting.

In the case of nacelle lighting, for wind turbines of more than 150 m, one of the lights may be on standby. The issue of redundancy is related to the whole installation and not the source (incandescent or LED) of light used. The mounting is such that the lights are physically on top of each other so that the standby light does not obstruct the output of the operational light.

Low intensity lighting is installed at an intermediate point on the support mast. These lights are made to flash at the same rate as the nacelle light. This increases their conspicuity and the use of a flashing mode would reduce avian fatalities. But States may consider using steady lights, already used in several countries without report of safety issues.

The specification ends at 315 m. It is considered that wind turbines of more than 315 m would require a different approach for protection. Just what this protection might be cannot be determined at this time. Fortunately wind turbines of more than 315 m will not become a reality in the near future.

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APPENDIX F

PROPOSED AMENDENT 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 PROPOSED AMENDMENT TO ANNEX 14, VOLUME I

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

5.3.5 Visual approach slope indicator system

. . .

5.3.5.45 Where an aeronautical study indicates that an existing object extending above an obstacle protection surface (OPS) could adversely affect the safety of operations of aeroplanes one or more of the following measures shall be taken:

a) remove the object

b) ~~a)~~ suitably raise the approach slope of the system;

c) ~~b)~~ reduce the azimuth spread of the system so that the object is outside the confines of the beam;

d) ~~c)~~ displace the axis of the system and its associated obstacle protection surface by no more than 5°;

~~d) suitably displace the threshold; and~~

e) ~~where d) is found to be impracticable,~~ suitably displace the system upwind of the threshold ~~to provide an increase in threshold crossing height equal to the height of the object penetration.~~ such that the object no longer penetrates the OPS; and

f) suitably displace the threshold.

Note.— Guidance on this issue is contained in the Aerodrome Design Manual *(Doc 9157), Part 4.*

Table 5-3. Dimensions and slopes of the obstacle protection surface

	Runway type/code number								
	Non-instrument Code number					Instrument Code number			
Surface dimensions	1	2	3	4		1	2	3	4
Length of inner edge	60 m	80 m(a)	150 m	150 m		150 m	150 m	300 m	300 m
Distance from ~~threshold~~ the visual approach slope indicator system (e)	D_1+30 m ~~30 m~~	D_1+60 m ~~60 m~~	D_1+60 m ~~60 m~~	D_1+60 m ~~60 m~~		D_1+60 m ~~60 m~~	D_1+60 m ~~60 m~~	D_1+60 m ~~60 m~~	D_1+60 m ~~60 m~~
Divergence (each side)	10%	10%	10%	10%		15%	15%	15%	15%
Total length	7 500m	7 500m(b)	15 000m	15 000m		7 500m	7 500m(b)	15 000m	15 000m
Slope a) T-VASIS and AT-VASIS	–(c)	1.9°	1.9°	1.9°		–	1.9°	1.9°	1.9°
b) PAPI(d)	–	A–0.57°	A–0.57°	A–0.57°		A–0.57°	A–0.57°	A–0.57°	A–0.57°
c) APAPI(d)	A–0.9°	A–0.9°	–	–		A–0.9°	A–0.9°	–	–

a. This length is to be increased to 150 m for a T-VASIS or AT-VASIS.
b. This length is to be increased to 15 000 m for a T-VASIS or AT-VASIS.
c. No slope has been specified if a system is unlikely to be used on runway type/code number indicated.
d. Angles as indicated in Figure 5-20.
e. D1 is the distance of the visual approach slope indicator system from threshold prior to any displacement to remedy object penetration of the OPS (refer Fig. 5-19). The start of the OPS is fixed to the visual approach slope indicator system location, such that displacement of the PAPI results in an equal displacement of the start of the OPS. See 5.3.5.45(e)

[Revised Figure 5-21]

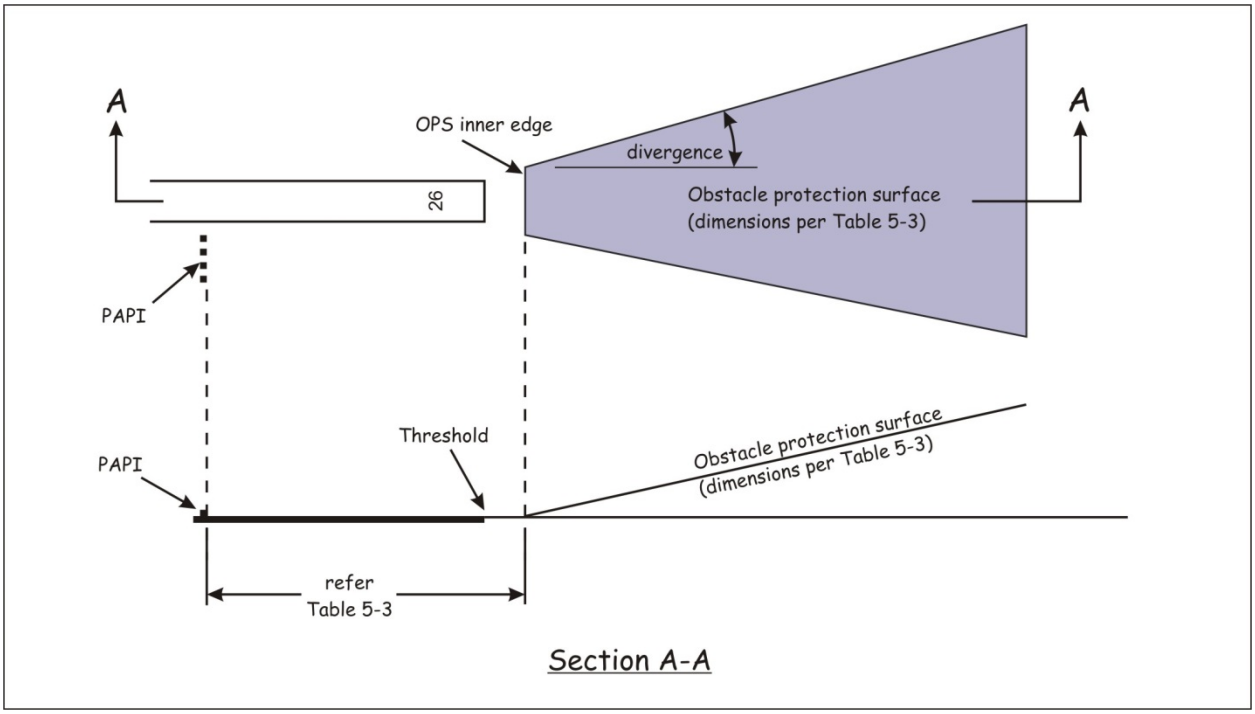

Figure 5-21. Obstacle protection surface for visual approach slope indicator systems

Origin

VAWG/10-DP/12, VAWG/11-DP/12, APWGs/2-DP/04

Rationale

The above amendments are for purpose of facilitating a correct means to remedy a penetration of the OPS by fixing the start of the OPS to the location of the PAPI. The principle of this amendment already exists in Annex 14, i.e., to move the OPS with the PAPI, albeit the criteria of movement given in 5.3.5.45 is incorrect. The correct movement of PAPI is introduced.

The order of listing of remedies in 5.3.5.45 is by priority. Removing the object should be the first possible remedy. Displacing the threshold should be the last considered remedy.

The note (e) to Table 5-3 is necessary to point out that the distance D1 is that obtained prior to movement to remedy an object penetration (D1 is calculated to provide the required MEHT, refer Figure 5-19). Once D1 is known, it becomes a constant. If this statement is not made, the user might interpret D1 to be the distance of the PAPI from threshold after movement and thus, in effect, the OPS remains at its original distance downwind of the threshold and there is no movement.

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APPENDIX G

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 PROPOSED AMENDMENT TO ANNEX 14, VOLUME I

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

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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

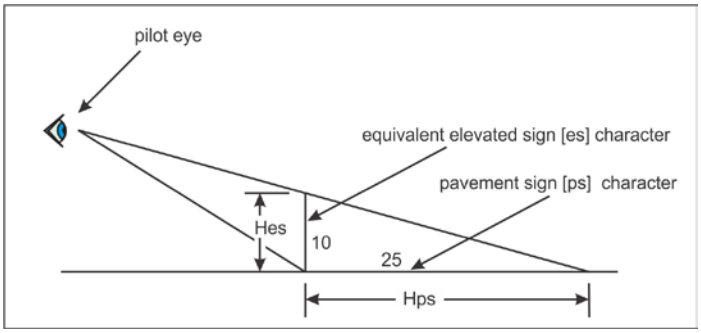
APPENDIX 3. MANDATORY INSTRUCTION MARKINGS AND INFORMATION MARKINGS

Note 1.— See Chapter 5, Sections 5.2.16 and 5.2.17, for specifications on the application, location and characteristics of mandatory instruction markings and information markings.

Note 2.— This appendix details the form and proportions of the letters, numbers and symbols of mandatory instruction markings and information markings on a ~~20 cm~~ grid.

Note 3. — The mandatory instruction markings and information markings on pavements are formed as if shadowed, (i.e., stretched), from the characters of an equivalent elevated sign by a factor of 2.5 as shown in the figure below. The shadowing, however, only affects the vertical dimension. Therefore, the spacing of characters for pavement marking is obtained by first determining the equivalent elevated sign character height and then proportioning from the spacing values given in Table A4-1.

*For example, in the case of the runway designator "10" which is to have a height of 4000 mm (Hps), the equivalent elevated sign character height is 4000/2.5=1600 mm (Hes). Table A4-1(b) indicates numeral to numeral code 1 and from Table A4-1(c) this code has a dimension of 96 mm, for a character height of 400 mm. The pavement marking spacing for "10" is then (1600/400)*96=384 mm.*



Origin

VAWG/10-DP/02, VAWG/11-DP/02, APWGs/2-DP/16

Rationale

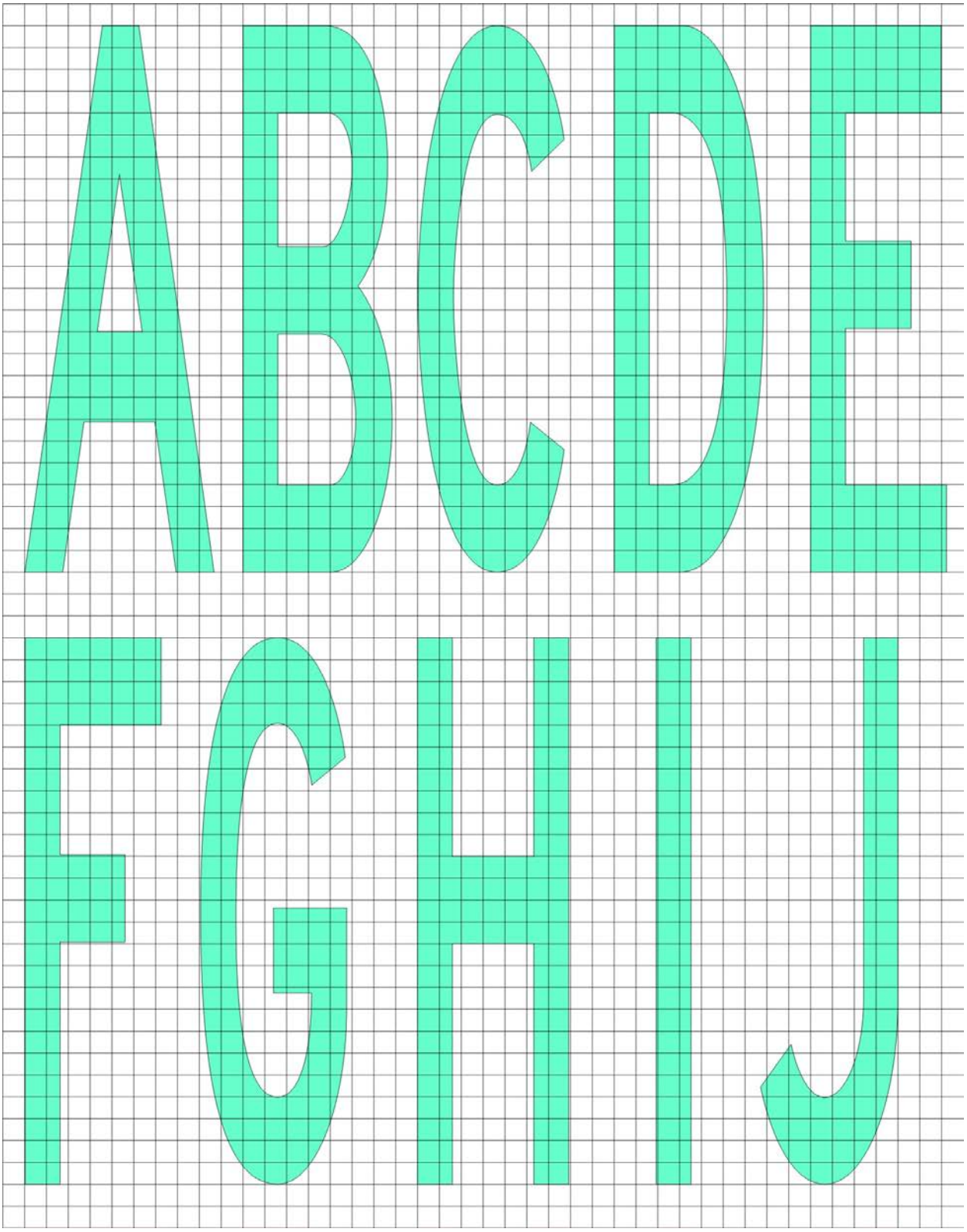
Annex 14, Appendix 3, introduces specification for pavement sign characters – character set on a grid – but does not provide criteria for the spacing of the characters. For elevated guidance signs, the spacing are given in Table A4-1(c) for particular character codes. This proposal gives an explicit method of computing the spacing between pavement sign markings, based on the one used for elevated signs.

An explicit example of calculation of spacing is given and a figure is provided for further clarity.

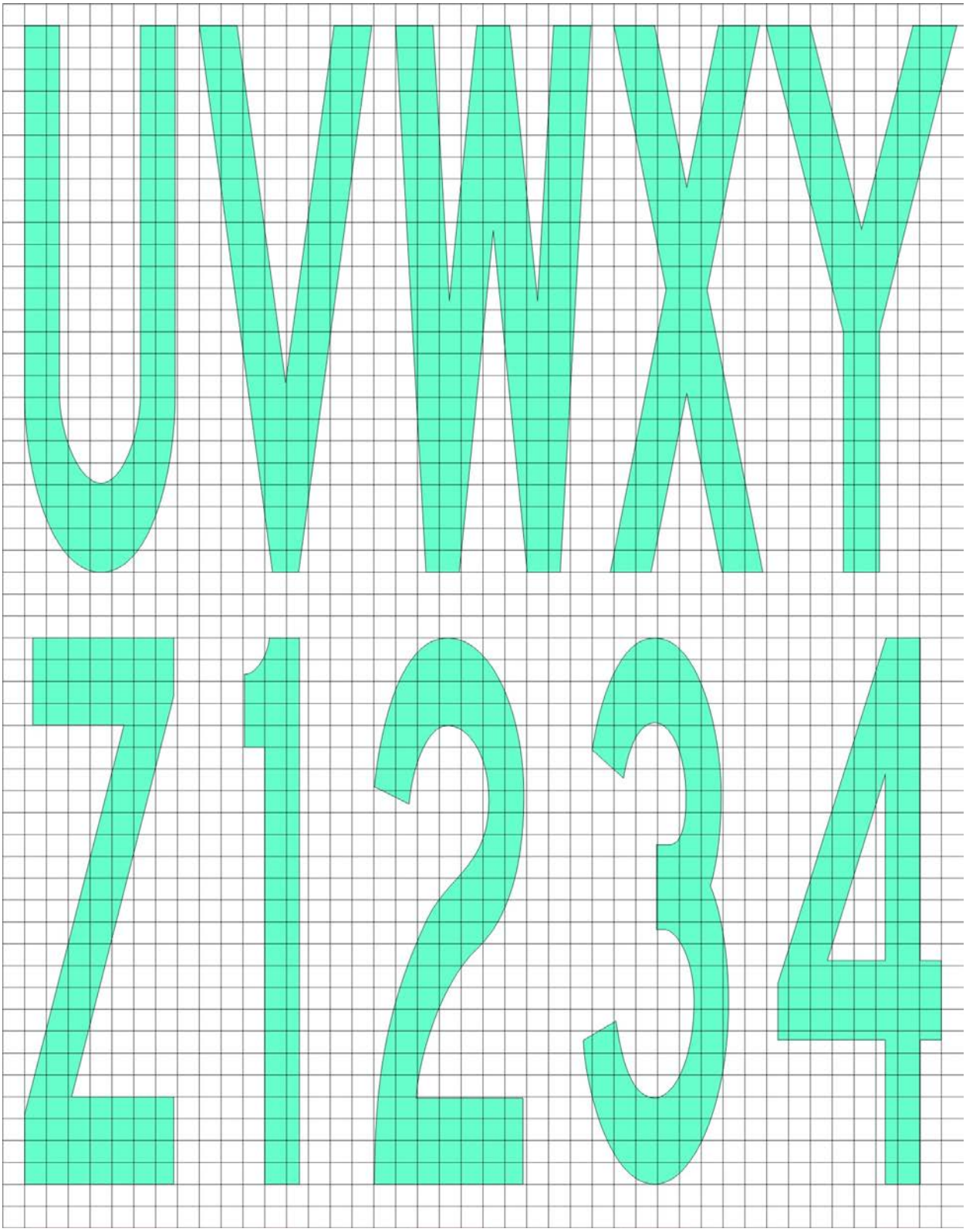
For the grid, as for elevated sign characters in Appendix 4, it is suggested to remove the reference to the dimension of 20 cm and to use a 25 squares height instead of present 20 for ease of conversion.

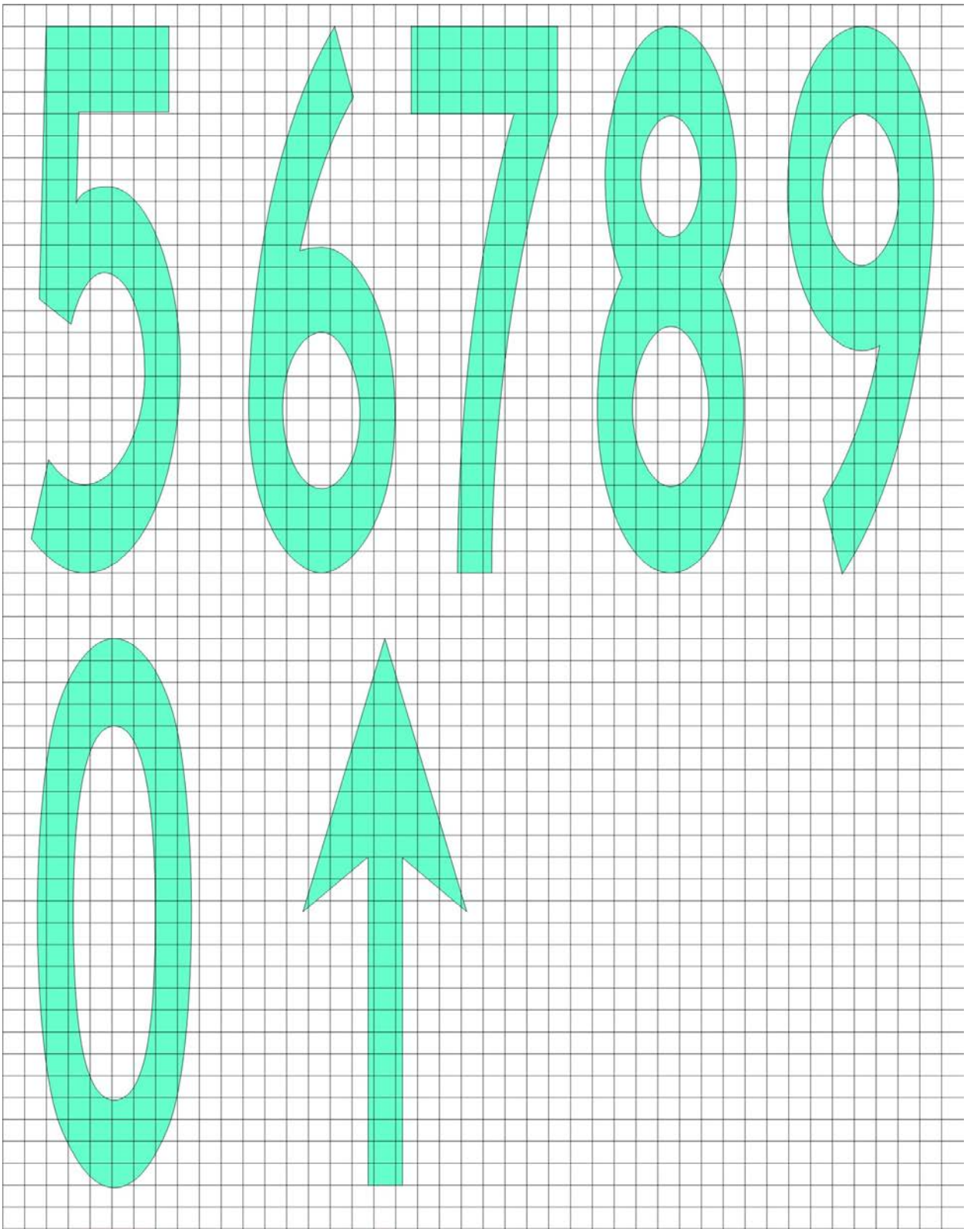
The size of the marking characters is not modified. The cost impact should be minimal.

[Editorial Note – The following figure replaces present figure in Appendix 3]


ABCDE
FGHIJ

KL MNO
PQRST


UWXY
Z1234


5 6 7 8 9
0

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AERODROMES PANEL (AP)

THIRD MEETING

Montréal, 7 to 11 April 2014

AGENDA ITEM 3

The attached constitutes the report on Agenda Item 3 and should be inserted at the appropriate place in the yellow folder.

Agenda Item 3: Rescue and fire fighting

3.1 INTRODUCTION

3.1.1 The meeting reviewed a report by the Rapporteur on the work of the Rescue and Fire Fighting Working Group (RFFWG). It was noted that the RFFWG had held four meetings and was able to propose extensive amendments to Annex 14, Volume II, in collaboration with the Heliport Design Working Group, concerning emergency response and rescue and fire fighting for heliports. The meeting was informed that the RFFWG had successfully completed a comprehensive update of the current 24-year old third edition the *Airport Services Manual* (Doc 9137) Part 1 *Rescue and Fire Fighting* (1990). The items are discussed in more detail in the following paragraphs.

3.2 AERODROME EMERGENCY PLANNING AND RESCUE AND FIRE FIGHTING

Performance-based provisions for emergency response at aerodromes

3.2.1 The meeting recalled that the RFFWG, as part of its work programme, was tasked with the development of new performance-based provisions for the response to an emergency at or in the vicinity of an aerodrome or heliport, taking into account such factors as type/frequency of flight operations, aircraft size/construction/use, location of emergencies and availability and suitability of emergency response.

3.2.2 The meeting was apprised that a proposal had been presented to the RFFWG in which it examined the risk-based proposal which attempted to identify how a performance-based regime/methodology could be developed. The initial proposal recommended that the existing 38 Standards and Recommended Practices (SARPs) in Annex 14, Volume I, Chapter 9, sections 9.1 and 9.2 could be moved from the Annex to the PANS-Aerodromes with the remaining 25 SARPs be made sufficiently performance-based and to continue residing in the Annex.

3.2.3 It was pointed out during the RFFWG meetings that some SARPs, even though very prescriptive, must necessarily remain as SARPs in the Annex. Despite this, a consensus on the proposed format and what it actually portrayed could not be reached by the RFFWG. The group also had difficulty in trying to grasp an understanding of what exactly was required with "*performance-based*" provisions, a view that was supported by ACI during the meeting.

3.2.4 The meeting agreed to task the RFFWG to review the provisions concerning RFF requirements for all-cargo operations in Annex 14, Volume I, paragraph 9.2.6 and the note thereto.

3.2.5 The meeting noted the urgent request from the RFFWG for appropriate guidance on a risk/performance based approach to SARPs development and agreed with the suggestion by the Chair of the AP to revisit this issue under Agenda Item 6.

Rescue and fire fighting provisions for General Aviation

3.2.6 Attention of the meeting was drawn to the subject of exempting aerodromes from the RFF requirements for general aviation flight operations that had been discussed a number of times commencing 2010 with the participation of the International Aircraft Owners and Pilots Association (IAOPA) and the Operations Panel (OPSP).

3.2.7 In October 2012 via the seven ICAO offices, a transmittal was issued to 191 States seeking the required information via a questionnaire as it related to RFFS for GA aerodromes. The general consensus from the feedback received from States did not support exempting aerodromes from the RFF requirements in Annex 14, Volume I in respect of general aviation operations. The meeting noted that the RFFWG were unanimous in their view that States wishing to exempt GA aerodromes from providing RFFS could either file a difference with the Annex requirements or make the appropriate exemption as part of its aerodrome certification regulatory framework as practiced in other States such as Australia.

3.2.8 The meeting reviewed a paper presented by the Secretary of the OPSP which presented proposals emanating from the General Aviation Sub Group of the OPSP concerning proposed amendment to the SARPs in Annex 14, Volume I and Annex 6, Part II. These proposals, offered as a starting point for discussion between the AP and OPSP, were considered not mature and even inappropriate for the proposal relating to Annex 14 by the meeting. Nevertheless, the Chair agreed that the complete package including parallel work on Annex 14, Volume II, Chapter 6 and Annex 6, Part III, Section III and the relevant guidance material in the *Airport Services Manual* (Doc 9137), Part 1 — *Rescue and Fire Fighting* and the *Heliport Manual* (Doc 9261), be coordinated with the RFFWG and HDWG.

3.3 COMPREHENSIVE UPDATE OF DOC 9137 AIRPORT SERVICES MANUAL PART 1 RESCUE AND FIRE FIGHTING

3.3.1 The meeting was cognizant that the current third edition of the *Airport Services Manual* (Doc 9137) Part 1 – *Rescue and Fire Fighting*, containing important guidance material supplementing the associated SARPs in Annex 14, Volume I, was published in 1990. It was considered timely, and urgent, that this guidance material be updated in line with the various amendments to Annex 14, Volume I that had been adopted since the publication of the manual.

3.3.2 In this context, the meeting appreciated that the RFFWG had expended considerable effort in updating the 24-year old manual. The content of the manual was developed over a period of several years with input from numerous subject matter experts in the RFFWG. These included aerodrome rescue and fire fighting experts, airports and pilot representative organizations and aircraft manufacturers and was thereafter submitted for an extensive peer review to collect and take into account comments from the expert communities.

3.3.3 The draft fourth edition incorporated changes and additions resulting from a series of amendments to Annex 14, Volume I, up to and including Amendment 11. Significant additions/revisions to the manual as a result of the revision are:

a) the introduction of the new principal extinguishing agent i.e., performance level C foam (Chapter 2, updated test protocol in Chapter 8);

b) guidance on the use of a task resource analysis in determining the minimum number of rescue and fire fighting personnel (Chapter 10);

c) updated procedures for aircraft rescue and fire fighting (Chapter 12, including training in Chapter 14);

d) guidance on preventive maintenance of vehicles and rescue equipment (Chapter 17);

e) guidance on human factors principles in rescue and fire fighting (Chapter 18); and

f) downloadable and up-to-date crash charts for commonly used aircraft by electronic linkage to aircraft manufacturers' website (Appendix 1)

3.3.4 The Chair commended the work of the RFFWG in progressing the various tasks. In particular, the sterling services of the Rapporteur who had indicated his decision to retire from active service in the following months, was acknowledged with appreciation.

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AERODROMES PANEL (AP)

THIRD MEETING

Montréal, 7 to 11 April 2014

AGENDA ITEM 4

The attached constitutes the report on Agenda Item 4 and should be inserted at the appropriate place in the yellow folder.

Agenda Item 4: Aerodromes operations and services

4.1 INTRODUCTION

4.1.1 The meeting reviewed a report by the Rapporteur on the work of the Aerodrome Operations and Services Working Group (AOSWG). The amendments proposed under this agenda item related to the prevention, and installation of devices for the detection, of Foreign Object Debris (FOD), updated guidance on acceptance criteria concerning runway surface unevenness developed by the Pavement Sub Group (PSG) and proposed amendments related to runway surface condition assessment, measurement and reporting using a global reporting format developed by the multi-disciplinary Friction Task Force (FTF). Guidance material on determination of aerodromes eligible for collection of aerodrome mapping data features had also been developed and coordinated with the AIS-AIM SG. The proposed amendments are discussed in more detail in the following paragraphs.

4.1.2 In respect of the task concerning aerodrome certification, the meeting was encouraged that there had been extensive coordination between AOSWG and the PANS-Aerodromes Study Group (PASG) on the latter's proposal for proposed amendments to Annex 14, Volume I, Chapter 1, section 1.4 Certification of Aerodromes. State letter AN 4/1.1.53-13/81 which had been issued to States and international organizations as part of the consultation process in December 2013 included procedures in, *inter alia*, PANS-Aerodromes Chapter 2 – *Certification of aerodrome* and Chapter 3 – *Safety assessments for aerodromes*. In this regard, the meeting took note that the task of revising the *Manual on Certification of Aerodromes* (Doc 9774), initially scheduled for completion during the first quarter 2015, will be delayed, pending the outcome of the publication of the first edition of PANS-Aerodromes.

4.2 FOREIGN OBJECT DEBRIS

4.2.1 The meeting reviewed and subsequently agreed to the proposed definition, including a modification proposed by a member, for Foreign Object Debris based largely on the work carried out by the European Civil Aviation Conference (ECAC) and European Organization for Civil Aviation Equipment (EUROCAE) FOD working groups.

4.2.2 The meeting also agreed to amend Annex 14, Volume I, paragraph 10.2.1 including Note 2. In this regard, appropriate material on foreign object debris prevention and control, including installation of devices for detection, had been developed based on FAA AC 150/5210-24 as well as to be developed based on work in progress at EUROCAE, all to be included in PANS-Aerodromes.

4.2.3 The proposed amendment to Annex 14, Volume I concerning foreign object debris, as agreed by the meeting, is included as Appendix A to the Report on Agenda Item 4.

4.3 AERODROME MAPPING DATA

4.3.1 The meeting recalled that Amendment 11 to Annex 14, Volume I introduced new provisions concerning aerodrome mapping data. As agreed at the second meeting of the Aerodromes Panel, coordination with the AIS-AIMSG and the Aerodromes Panel was needed to develop the appropriate guidance material as part of the latter's work programme.

4.3.2 The meeting was presented with guidance that had been developed between the AOSWG and the AIS-AIMSG. The material provided prioritisation criteria in connection with the use of the term "*for aerodromes deemed relevant by States*" and contained a thorough list of aerodrome operational factors. Several modifications to the texts of the guidance material were agreed to by the meeting.

4.3.3 There were discussions concerning, inter alia, the location for the guidance material, i.e., either in Attachment to Annex 14, Volume I or in the upcoming PANS-Aerodromes. Considering that the first edition of PANS-Aerodromes and the planned second edition do not include material related to the provision of aeronautical data, the meeting agreed to include the guidance in Attachment A to Annex 14, Volume I.

4.3.4 The proposed revision to the green pages of Annex 14, Volume I concerning AMDB, including the modifications as agreed to by the meeting, is included as Appendix B to the Report on Agenda Item 4.

4.4 PAVEMENT RELATED ISSUES

4.4.1 The meeting noted that the Pavement Sub Group (PSG) was tasked with developing materials related to the use of new technologies such as the multi-layer linear elastic analysis in pavement reporting system, criteria for overloading operations, inspection and maintenance of airfield pavements and effects of magnetic anomalies at aerodromes.

4.4.2 With regards to guidance material, the meeting was apprised that proposed revision to, the *Airport Services Manual* (Doc 9137), Part 2 — *Pavement Surface Conditions* and the *Aerodrome Design Manual* (Doc 9157), Part 3 — *Pavements* were at various stages of development and had been presented at the second meeting of the Aerodromes Panel Working Group in December 2013.

4.4.3 The meeting appreciated that guidance material had been developed by the PSG, in response to a safety recommendation from the UK Air Accidents Investigation Branch, to highlight the importance of ensuring that no airport infrastructure was allowed to alter significantly the local earth's magnetic field density in areas where aircraft hold prior to departure. The guidance would assist aerodrome operators in monitoring and reporting magnetic field distortion and will be included in the next update of the *Airport Services Manual* (Doc 9137), Part 3 or other appropriate manual.

4.4.4 The meeting had before it a proposal to improve the guidance in Annex 14, Volume I, Attachment A (green pages) concerning runway surface unevenness that was developed at the first meeting of the Aerodromes Panel. The issue focused primarily on identifying when an airfield pavement was no longer considered satisfactory due to unacceptable ride quality. The proposed texts including the revisions in Flimsy 1 were aimed at improving the accuracy as well as resolving discrepancies between the tabulated and graphical data. The proposal was accepted by the meeting.

4.4.5 The agreed proposed amendment to the green pages of Annex 14, Volume I concerning surface unevenness is included as Appendix C to the Report on Agenda Item 4.

4.5 ASSESSMENT AND REPORTING OF RUNWAY SURFACE CONDITIONS USING A GLOBAL REPORTING FORMAT

4.5.1 The Friction Task Force (FTF) progressed the task of developing a Global Reporting Format (GRF) for the assessment, measurement and reporting of runway surface conditions in accordance with the directives issued by the Air Navigation Commission in job card AP001.

4.5.2 The meeting was cognizant that runway surface conditions had contributed to many safety events and investigations had revealed shortfalls in the accuracy and timeliness of assessment and reporting methods currently provided for in ICAO provisions and guidance material.

4.5.3 While techniques for the measurement of runway friction provided useful information for runway surface friction maintenance purposes, they were not suitable in all weather conditions when the runway was contaminated and the information when used in reports could be misleading to pilots. Reports used by pilots needed to be reviewed for adequacy, completeness and relevance. Pilots of modern aircraft also needed reports that were directly related to the performance of the aircraft. Aerodrome operators needed clear guidelines on maintaining runway friction and assessing conditions for reports. In addition, both airport operators and pilots needed to understand the meaning of the report contents, including the terms "*damp*" and "*slippery when wet*", and how to use it effectively.

4.5.4 To address the concerns above, the FTF developed the GRF concept, taking advantage of the Take Off and Landing Performance Assessment (TALPA) – Aviation Rulemaking Committee (ARC) project initiated in the United States. The concept, intended for global application, relied on:

a) an agreed set of criteria used in a consistent manner for runway surface condition assessment, aircraft (performance) certification and operational performance calculation;

b) a unique Runway Condition Code (RWYCC) linking the agreed set of criteria with the aircraft landing and take-off performance table, and related to the braking action experienced and eventually reported by flight crews; and

c) a standardized common terminology for runway surface condition description used by aerodrome operator inspection personnel, air traffic controllers, and aircraft operators, noticeably dispatchers and flight crew.

4.5.5 The meeting was apprised that improvement to the safety of aircraft operations on wet and contaminated runways using the GRF would result from the:

a) calculation of take-off and landing operational distances through the provision of performance tables by the aircraft manufacturers correlated to the RWYCC,

b) establishment of standard criteria for the determination of the RWYCC by aerodrome operators,

c) affirmative statement that a runway is slippery when wet instead of a maybe which left the decision and calculation to the pilot without any means to ascertain the runway conditions,

d) improvement of the training of personnel assessing and reporting runway surface conditions,

e) establishment of a uniform global method of reporting runway surface conditions.

4.5.6 In addition, regularity and efficiency of operations would be increased through the calculation of operational take-off and landing distances with proven tables of performance.

4.5.7 The meeting was briefed on the Runway Condition Assessment Matrix (RCAM), the Runway Condition Codes (RWYCC) as well as the standardized terminologies which had been proposed for inclusion in Annex 14, Volume I as well as the key specifications for runway surface conditions assessment and reporting.

4.5.8 The FTF had, in coordination with the PANS-Aerodromes Study Group (PASG), developed globally harmonized procedures for assessing and reporting the runway surface conditions. These procedures were intended for application on a world-wide basis with a built-in flexibility to allow for local variations to match the specific climate, infrastructure and other particular conditions. The procedures which had been presented at the second meeting of the Aerodromes Panel Working Group in December 2013 were proposed for inclusion in chapter 5 of the 2nd edition of PANS-Aerodromes.

4.5.9 Due to the multi-disciplinary nature of the task, consequential amendments were required in Annexes 3, 6, 8, 15, PANS-ATM (Doc 4444) and other ICAO documentations. These consequential amendments had been coordinated with the relevant sections of the Secretariat, i.e., MET, ATM, OPS, IIS-AIM, and the competent Panels and Study groups. The meeting noted the draft roadmap in the Appendix C of AP/3 – WP/10 outlining the dates for a complete package of proposed amendments across several Annexes, PANS and guidance materials. The meeting agreed to the proposal to recommend to the Air Navigation Commission a complete package of all the modifications in the various Annexes and PANS when they become available.

4.5.10 A question was raised concerning the definitions of "*Wet runway*" and "*Standing Water*" that did not address the issue when the water depth equals to 3 mm. The meeting was apprised that the issue that the FTF faced in deciding whether the threshold value of 3 mm depth was to be included in the definition of "*Wet runway*" or in the definition of "*Standing water*" was the conflicting practice under EASA and FAA regulations. It was noted that EASA regulations already require contaminated runway performance data to be published under CS25.1591. The Acceptable Means of Compliance (AMC) to this rule stated that it applied only to standing water or slush depth in excess of 3 mm, considering 3 mm and below as a wet runway. On the other hand, in publishing the rules for runway condition reporting in the TALPA-ARC's Field Condition Report (FICON), the FAA decided to consider the threshold value of 1/8" (approx. 3 mm) depth as contaminated, based on input of the manufacturers of small jets, for which precipitation drag could be significant, and considerations on aquaplaning. In the end, the FTF Rapporteur agreed to provide clarifications in the PANS-Aerodromes or other appropriate document for situations where the assessed water depth equals to 3 mm.

4.5.11 On the question regarding the meaning of "*significant portion of the runway surface area*" in the definition of "*contaminated runway*", the meeting was apprised that from a performance point of view, a runway was considered contaminated when more than 25% of the surface intended to be used was covered. This threshold was not stated in the definition, since a definition was not considered the right place to cover procedural aspects. These were more complex than a simple value, since in fact, in order for prescribed margins on dry runway performance to cover the most critical case of a runway that was icy on 25% of its surface, this contamination must not be concentrated in a small area, but should be roughly evenly distributed. In terms of reporting, that meant that a runway should be reported as contaminated when the coverage on one of the runway thirds exceeds 25%. This would be detailed in guidance to be covered in PANS-Aerodromes.

4.5.12 In response to a question on proposed changes to Annex 8, the meeting was briefed that the FTF-Annex 6/8 subgroup was currently reviewing proposed changes to some few provisions in Annex 8 to require publication of in-flight landing distances in the aircraft flight manual (AFM) of new

aircraft types. The issue with Annex 8 was that it was not retroactive. That was the reason why, in order to cover the flying fleet, it would be required in Annex 6 that operators provide these distances to their flight crews in the operating manuals. Operators typically turned to the manufacturers to provide what was required by operational regulation. In some cases the manufacturer was not able to provide this information. The meeting noted that the TALPA ARC had developed generic factors that can be applied to the unfactored AFM dry landing distance of unsupported aircraft. The subgroup was in the process of deciding how to use these factors, which currently resided in a Technical Paper published by Transport Canada. One possibility was that it might be referenced to or included in an attachment to the Aeroplane Performance Manual.

4.5.13 The meeting agreed to propose the removal of the runway state group from the METAR/SPECI when information provided by the proposed GRF with associated procedures was introduced. This removal was felt necessary in order to avoid the possibility of conflicting information through two separate procedures. In this regard, the meeting requested the consensus of the OPSP for a joint recommendation to be made to the Air Navigation Commission for such removal which would entail proposed amendment to the relevant provision in Annex 3.

4.5.14 In regard to proposed amendment to Annex 15, the meeting noted the confirmation by the AIM-AIS Secretariat that the FTF, in collaboration with the subgroup of the AIS-AIM SG, would propose amendment to the current edition of Annex 15, including the existing Appendix, with an expected delivery timeline during the third quarter of 2014.

4.5.15 The meeting was apprised that the implementation of the GRF had already begun in one State on a voluntary basis, and some major aircraft manufacturers were revising their AFM in accordance with the RWYCC and its agreed set of criteria. Operational trials had been initiated in some States with positive results.

4.5.16 The development of the GRF was seen as a major global effort in reducing runway excursions, consequently, the meeting agreed that as part of the roll-out process, a series of workshops and training sessions be organized for the practical implementation for States which did not have the resources and competence to develop the corresponding regulations and guidance on their own.

4.5.17 The proposed amendment to Annex 14, Volume I, including the various modifications suggested and agreed during the meeting as well as in Flimsy 1 and Flimsy 8 Rev. 1, is included as Appendix D to the Report on Agenda Item 4.

4.5.18 The proposed amendment to Annex 3 concerning the removal of the runway state group from the METAR/SPECI is included as Appendix E to the Report on Agenda Item 4.

(Post-meeting notes: The following comments had been received by email from the OPS/ATM Secretariat.

Concerns had been raised concerning the applicability of the GRF with regards to take-off operations as well as to current and legacy aircraft such as the 727s and older generation of 737s. With respect to the first concern, it was noted that for many aircraft types this data had been developed by manufacturers to comply with existing JAA and EASA regulation, but might not have been made available to airlines operating under FAR 121. The second concern pertained to the applicability as they relate to Parts 23, 25 and 26 (retrofit) aircraft. ICCAIA replied that in order to cover aircraft no longer supported by a manufacturer, factors had been developed by the TALPA ARC to adjust certification landing distances conservatively to the six braking action levels matching the RWYCC to be reported by the aerodromes.

*With regards to compatibility with legacy aircraft in the ATM system, it was pointed out that the reporting of runway conditions was not a new concept. It was noted that in the current environment when the information was available, it was provided to pilots by such means as NOTAMS and ATIS. Pilots of aircraft that were able to use the information would use them whilst pilots of aircraft that cannot use them would simply ignore them. The verbal dissemination of the information was provided by ATC "*on request*" by the pilot.*

It is unlikely that pilots of an aircraft that cannot relate the runway condition information (provided at that aerodrome) to their take-off or landing performance would ask for it. However, when requested by the pilot, then ATC would provide it in the same way. In the current situation, ATC did not make (nor should they) any differentiation based on who they are providing the information to.

Seen in the above light, as there would not be any difference with the GRF initiative, the issue with ATC regarding legacy aircraft should not arise. Furthermore, the aforementioned would not hinder the Annex 6 part of the initiative which would allow more legacy aircraft to participate by being able to use GRF information in determining expected aircraft performance.

*Another contending point of view was that the ATC requirement with respect to the future GRF environment was simply that the GRF environment must not change the existing situation, i.e., ATC needed not to discriminate aircraft based on legacy/certification matters. This would require all flight crew of aircraft not intending to use the GRF, to be sufficiently trained/aware with respect to the GRF and the consequential need for such flight crew to explicitly request information in other legacy formats. In a GRF environment, ATC would also be operating in a "*GRF-mode*", however ATC would be able to provide information in other formats, but cannot and should not discriminate the "*non-GRF aircraft*". It was also felt important that the GRF should include the means by which "*non-GRF*" flight crew training/awareness would be achieved.)*

4.6 RECOMMENDATION

In the light of the above discussion, the following recommendations were developed:

RSPP **Recommendation 4/1 – Amendment to Annex 14, Volume I: Aerodrome operations and services**

That Annex 14 Volume I be amended as shown in the Appendices A through D to the report of this agenda item.

RSPP **Recommendation 4/2 – Amendment to Annex 3**

Subject to endorsement by the OPSP, that concerning the removal of the need to report the state of runway group from the aerodrome observation (METAR/SPECI), Annex 3 be amended as shown in Appendix E to the report of this agenda item.

Recommendation 4/3 – ANC to consider proposed amendments for a global reporting format for runway surface condition in one complete package

The ANC defer preliminary review on Recommendations 4/1 and 4/2 on the proposed amendments for a global reporting format until such time when all proposals across the relevant Annexes become available in one complete package, tentatively scheduled for 198th session.

APPENDIX A

PROPOSED AMENDMENT TO

INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

AERODROMES

ANNEX 14

TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

VOLUME I (AERODROME DESIGN AND OPERATIONS)

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CHAPTER 1. GENERAL

….

1.1 Definitions

….

Foreign Object Debris (FOD). Any solid, inanimate object within the movement area which has no operational or aeronautical function.

Origin: AP-WG-WHL/7, AOSWGs/10 to 13, PASG/5, APWG/2, EUROCAE WG/83, FAA AC 150/5210-24

Rationale:

The term Foreign Object Debris (FOD) has been precisely defined, notably, to make a clear distinction with wildlife. This is also necessary to introduce the section on FOD Control which is being introduced with the development of PANS Aerodromes 2nd edition. Initial draft PANS material is under review by the PANS Aerodrome Study Group and is presented in a separate IP.

CHAPTER 10. AERODROME MAINTENANCE

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10.2 Pavements

10.2.1 The surfaces of all movement areas including pavements (runways, taxiways and aprons) and adjacent areas shall be inspected and their conditions monitored regularly as part of an aerodrome preventive and corrective maintenance programme with the objective of avoiding and eliminating any ~~loose objects/debris~~ foreign object debris (FOD) that might cause damage to aircraft or impair the operation of aircraft systems.

….

Note 2.— ~~Guidance~~ Procedures on carrying out daily inspections of the movement area and control of FOD ~~is~~ are given in the ~~Airport Services Manual *(Doc 9137), Part 8,*~~ *PANS-Aerodromes (Doc xxxx), the* Manual of Surface Movement Guidance and Control Systems (SMGCS) *(Doc 9476) and the* Advanced Surface Movement Guidance and Control Systems (A-SMGCS) Manual *(Doc 9830).*

Rationale:
Part of referenced information in Doc 9137 ASM Part 8 is proposed to be moved to *PANS-Aerodromes* (Doc xxxx), specific reference to be included later.

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APPENDIX B

PROPOSED AMENDMENT TO

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ATTACHMENT A. GUIDANCE MATERIAL SUPPLEMENTARY TO ANNEX 14, VOLUME I

Origin: AP/2, AOSWG/13, AIS AIM SG/8, APWG/2

Rationale:

Whilst approving the inclusion of provisions on aerodrome mapping data in ICAO material, guidance was requested on the determination of aerodromes eligible for collection of aerodrome mapping data features. The purpose is to have ICAO criteria for prioritisation of AMDB implementation.

The draft guidance has been developed in coordination between the AIS AIM SG and the AOSWG, as requested in the AP/2 Report recommendation 6/1 and paragraph 6.7.

21. Aerodrome mapping data

21.1 Introduction

Chapter 2, 2.1.2 and 2.1.3 contain provisions related to the provision of aerodrome mapping data. The aerodrome mapping data features are collected and made available to the aeronautical information services for aerodromes designated by States with consideration of the intended applications. These applications are closely tied to an identified need and operational use where the application of the data would provide a safety benefit or could be used as mitigation to a safety concern.

21.2 Applications

21.2.1 Aerodrome mapping data include aerodrome geographic information that support applications which improve the user's situational awareness or supplement surface navigation, thereby increasing safety margins and operational efficiency. Aerodrome mapping data sets with appropriate data element accuracy support requirements for collaborative decision making, common situational awareness, aerodrome guidance applications and are intended to be used in the following air navigation applications:

a) on-board positioning and route awareness including moving maps with own ship position, surface guidance and navigation;

b) traffic awareness including surveillance and runway incursion detection and alerting (such as respectively in A-SMGCS level 1 and 2);

c) positioning and route awareness including moving maps with ships and vehicles position and taxi route, surface guidance and navigation (such as A-SMGCS level 3 and 4);

d) facilitation of aerodrome related aeronautical information, including NOTAMs;

e) resource and aerodrome facility management; and

f) aeronautical chart production.

21.2.2 The data may also be used in other applications such as training / flight simulators and on-board or ground enhanced vision systems (EVS), Synthetic Vision Systems (SVS) and Combined Vision Systems (CVS).

21.3 Determination of aerodromes eligible for collection of aerodrome mapping data features

In order to determine which aerodromes may use of applications requiring the collection of aerodrome mapping data features, the following aerodrome characteristics may be considered:

- safety risks at the aerodrome ;
- visibility conditions ;
- aerodrome layout ;
- traffic density.

21.4 Safety risks at the aerodrome

21.4.1 The safety hazards which can be taken into consideration include:

- runway excursion;
- excursion of the operational surface of a taxiway or apron;
- land short of runway / undershoot;
- runway incursion;
- other incursion (i.e. on taxiway or in ramp area);
- landing or take-off on a taxiway;
- ground collision.

21.4.2 The analysis of these hazards, notably through analysis of past safety occurrences and proactive analysis of possible hazards scenarios, will allow to determine how the applications may reduce the probability of occurrence of the hazards or mitigate the risks associated to their occurrences taking into account the type of aircraft, operations, fleet and the level of the aerodrome air traffic control services.

21.5 Visibility conditions

21.5.1 If the aerodrome operations take place in all visibility conditions, an A-SMGCS or on-board aerodrome navigation system may improve the safety and maintain the runway throughput in low visibility conditions. Consequently, the number of low visibility days per year is a key factor. An

aerodrome with no low visibility conditions does not need the same type A-SMGCS level or AMDB quality as an aerodrome with a substantial number of days of fog for instance.

21.5.2 Four levels of visibility conditions can be considered:

-condition 1: visibility sufficient for the pilot to taxi and to avoid collision with other traffic on taxiways and at intersections by visual reference, and for personnel of control units to exercise control over all traffic on the basis of visual surveillance ;

-condition 2: visibility sufficient for the pilot to taxi and to avoid collision with other traffic on taxiways and at intersections by visual reference, but insufficient for personnel of control units to exercise control over all traffic on the basis of visual surveillance ;

-condition 3: visibility sufficient for the pilot to taxi but insufficient for the pilot to avoid collision with other traffic on taxiways and at intersections by visual reference with other traffic, and insufficient for personnel of control units to exercise control over all traffic on the basis of visual surveillance. For taxiing this is normally taken as visibilities equivalent to a RVR less than 400 m but more than 75 m;

-condition 4: visibility insufficient for the pilot to taxi by visual guidance only. This is normally taken as a RVR of 75 m or less.

21.5.3 In order to simplify, visibility conditions 3 and 4 are considered low visibility conditions and an aerodrome is considered affected by low visibility conditions when conditions 3 and 4 are met during more than 15 days per year.

21.6 Aerodrome layout

21.6.1 A complex aerodrome layout requires close attention from the air traffic controllers and from the pilots and vehicle drivers. In particular in adverse weather conditions the complexity of an aerodrome can provoke high stress situations for the tower controllers and can lead to misinterpretations and false estimations by pilots and drivers.

21.6.2 The following categories of aerodrome layout can be used:

- Basic: An aerodrome with one runway and one taxiway to one apron area ;
- Simple: An aerodrome with one runway, having more than one taxiway to one or more apron areas ;
- Complex: An aerodrome with more than one runway, having many taxiways to one or more apron areas.

Some other parameters need also to be considered to make a layout complex:

- an aerodrome has a great number of entry taxiways for a runway ;
- an aerodrome has a great number of exit taxiways, and particularly rapid exit taxiways, for a given runway ;
- an aerodrome has a taxiway system with a great number of intersections. Especially in bad weather conditions, a false estimation by pilots or drivers is possible and likely to occur ;

- a taxiway has to be shared by landing and departing aircraft or by aircraft and vehicles at the same time. These situations occur when the terminal has an adverse location with reference to the runway ;
- the location of the air traffic control tower is such that the visibility of the runways, taxiways or aprons is hampered by buildings, by the relief or by sheer distance.

21.7 Traffic density

21.7.1 Criteria for addressing the aerodrome characteristics in terms of number of movements in the mean busy hour is available in Annex 14, Volume I, Chapter 1, section 1.1 Definitions – Aerodrome Traffic Density.

21.7.2 The traffic density parameter could be complemented by the notion of the annual number of movements in addition to the definition in this Annex. This figure is useful to establish a ranking among aerodromes. Above a certain threshold one can consider that the traffic management requires specific tools to achieve an efficient use of the nominal aerodrome capacity. According to traffic density and ATC experience, two thresholds can be defined to distinguish the light / medium / heavy aerodromes, as follows:

- First threshold light / medium: between 40 000 and 60 000 movements per year

- Second threshold medium / heavy: between 140 000 and 160 000 movements per year

21.7.3 Another aspect is the *mix of arriving and departing movements* on the aerodrome that means crossing flows of aircraft going to and from different aprons or parking areas. This situation increases the risks of conflict on the aerodrome. It could also be noticed that there is a strong correlation with the weather conditions which increase the size of the problem as they worsen to the limit of VFR operation. In adverse weather conditions such as low visibility, the surface traffic on the aforementioned aerodromes is further reduced by the absence of VFR flights. Therefore the tower controllers are able to focus their concentration on the guidance of the mobiles.

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APPENDIX C

PROPOSED AMENDENT TO

INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

AERODROMES

ANNEX 14

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ATTACHMENT A. GUIDANCE MATERIAL SUPPLEMENTARY TO ANNEX 14, VOLUME I

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5. Runway surface evenness

5.1 In adopting tolerances for runway surface irregularities, the following standard of construction is achievable for short distances of 3 m and conforms to good engineering practice:

> Except across the crown of a camber or across drainage channels, the finished surface of the wearing course is to be of such regularity that, when tested with a 3 m straight-edge placed anywhere in any direction on the surface, there is no deviation greater than 3 mm between the bottom of the straight-edge and the surface of the pavement anywhere along the straight-edge.

5.2 Caution should also be exercised when inserting runway lights or drainage grilles in runway surfaces to ensure that adequate smoothness of the surface is maintained.

5.3 The operation of aircraft and differential settlement of surface foundations will eventually lead to increases in surface irregularities. Small deviations in the above tolerances will not seriously hamper aircraft operations. In general, isolated irregularities of the order of 2.5 cm to 3 cm over a 45 m distance are ~~tolerable~~ acceptable, as shown in Figure A-3. Although maximum acceptable deviations vary with the type and speed of an aircraft, the limits of acceptable surface irregularities can be estimated to a reasonable extent. The following table describes ~~maximum,~~ acceptable, ~~and temporarily acceptable~~ excessive and unacceptable limits:

a) if the ~~maximum~~ acceptable limits are exceeded, corrective action should be undertaken as soon as reasonably practicable to improve the ride quality. This is considered “temporarily acceptable”;

b) if the ~~temporarily acceptable~~ excessive limits are exceeded, the portions of the runway that exhibit such roughness should have corrective measures taken immediately if aircraft operations are to be continued;

c) if the unacceptable limits are exceeded, the area of the runway where the roughness resides should be closed until repairs are made to restore the condition to the acceptable region

Surface Irregularity	Minimum acceptable length of irregularity (m)								
	3	6	9	12	15	20	30	45	60
~~Maximum~~ Acceptable surface irregularity height (cm)	~~3~~ 2.9	~~3.5~~ 3.8	~~4.0~~ 4.5	5	~~5.5~~ 5.4	~~6.0~~ 5.9	6.5	~~8.0~~ 8.5	10
~~Temporary acceptable~~ Excessive surface irregularity height (cm)	~~3.5~~ 3.9	5.5	~~6.5~~ 6.8	~~7.5~~ 7.8	~~8.0~~ 8.6	~~9.0~~ 9.6	11	~~13.0~~ 13.6	~~15~~ 16
Unacceptable surface irregularity height (cm)	5.8	7.6	9.1	10	10.8	11.9	13.9	17	20

Note that "surface irregularity" is defined herein to mean isolated surface elevation deviations that do not lie along a uniform slope through any given section of a runway. For the purposes of this concern, a "section of a runway" is defined herein to mean a segment of a runway throughout which a continuing general uphill, downhill or flat slope is prevalent. The length of this section is generally between 30 and 60 metres, and can be greater, depending on the longitudinal profile and the condition of the pavement.

The maximum permissible step type bump, such as that which could exist between adjacent slabs, is simply the bump height corresponding to zero bump length at the upper end of the acceptable region of the roughness criteria of Figure A-3. The bump height at this location is 1.75 cm.

5.4 Figure A-3 illustrates a comparison of the surface roughness criteria with those developed by the United States Federal Aviation Administration.

5.5 Deformation of the runway with time may also increase the possibility of the formation of water pools. Pools as shallow as approximately 3 mm in depth, particularly if they are located where they are likely to be encountered at high speed by landing aeroplanes, can induce aquaplaning, which can then be sustained on a wet runway by a much shallower depth of water. Improved guidance regarding the significant length and depth of pools relative to aquaplaning is the subject of further research. It is, of course, especially necessary to prevent pools from forming whenever there is a possibility that they might become frozen.

Origin
AP/1, AP-WG-WHL/7, AOSWGs/10 to 13, AP-WGs/2

Rationale
The revision to the table is to correct the surface irregularity bump heights corresponding to the applicable minimum lengths. Additionally, data was added to define the unacceptable region of the roughness criteria, thereby aiding in the planning or undertaking of any corrective actions which may be required for a pavement.

Guidance is now provided for step type bumps which typically are found on rigid pavements that have undergone some differential settlement. A minor correction was made to Figure A-3 regarding the FAA smoothness criteria for new construction

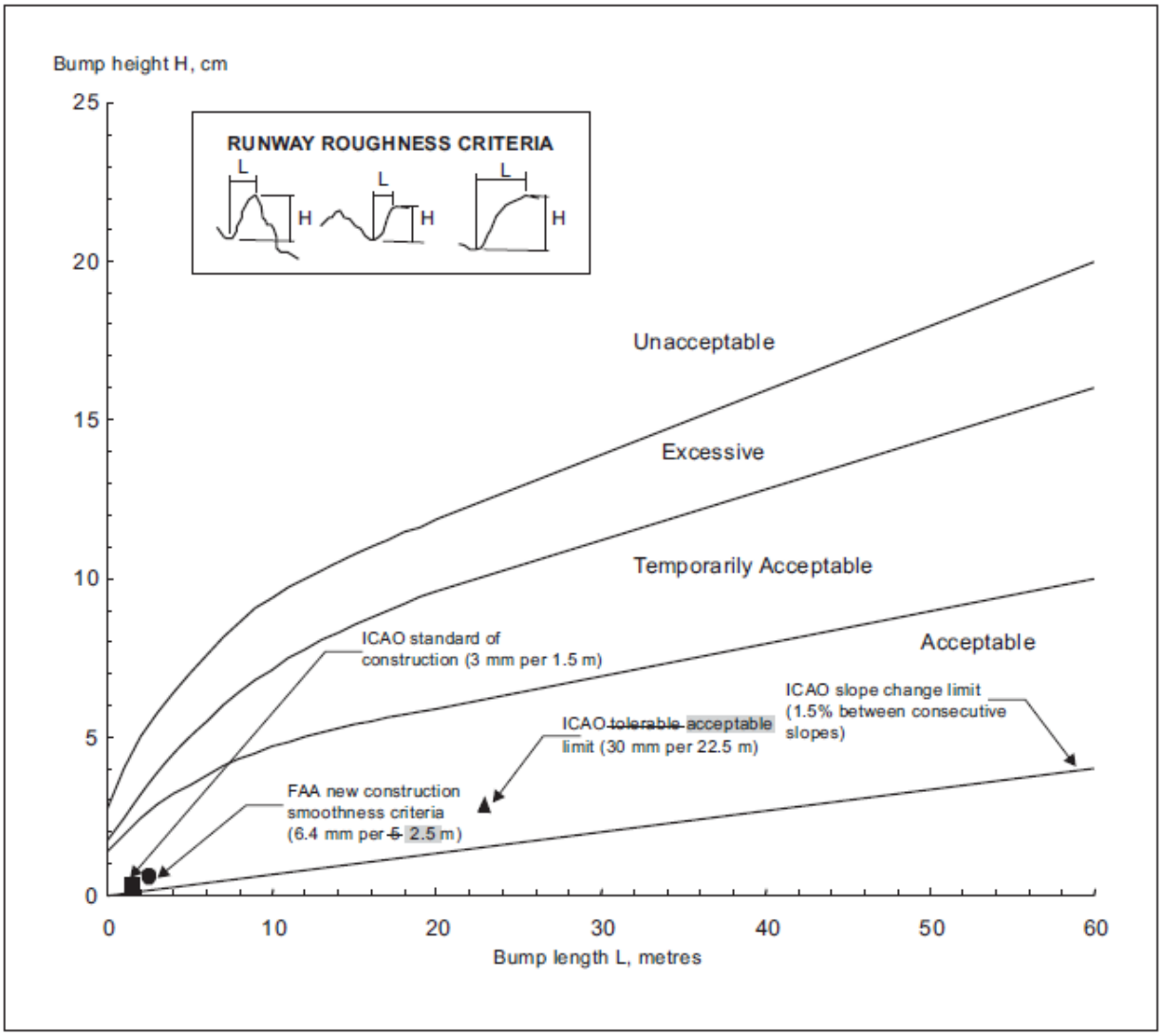

Figure A-3. Comparison of roughness criteria

Note.— This criteria addresses single event roughness, not long wavelength harmonic effects nor the effect of repetitive surface undulations.

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APPENDIX D

PROPOSED AMENDMENT TO

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CHAPTER 1. GENERAL

….

1.1 Definitions

….

Global reporting format. A comprehensive global information system relative to runway surface conditions and its effect on the aircraft landing and take-off performance.

*(Editorial note: The term "*global reporting format*" used in this proposal is only for the interim. The exact term will be decided after consultation with the AIS-AIMSG and all references to global reporting format will be replaced using the new term.)*

….

Origin: AP-WG/WHL-7, AOSWGs/10 – 13, ANC Job Card AP001, APWG/2

Rationale:

The origin of the concept of a global reporting format stems from the operational need of having one reporting format crossing state borders. A flight crew should not need to relate to various reporting formats. As a basis for such a global reporting format, the US FAA-initiated Take-off and Landing Performance Assessment – Aviation Rulemaking Committee (TALPA ARC) approach was chosen since this approach establishes the common and performance-relevant language between aerodrome, aeroplane manufacturer and aeroplane operator and was already used in aeroplane performance manuals provided by the major aeroplane manufacturers.

The need for a definition of the global reporting format became apparent at the FTF/12 meeting in October 2012. The FTF was of the opinion that a name was needed for easy identification of the runway state information. This view takes into consideration the experience of identifying the SNOWTAM information when presented to the flight crew and others in the information chain together with other NOTAM information. The FTF/12 was informed by ICAO Secretariat that the use of terms like ASHTAM and SNOWTAM might be discontinued as part of Annex 15 "work in progress".
The output from the global reporting format is an information string resulting from an assessment process using procedures described in the PANS-Aerodromes.

Runway. A defined rectangular area on a land aerodrome prepared for the landing and take-off of aircraft.

Runway Condition Assessment Matrix (RCAM): A matrix allowing the assessment of the Runway Condition Code, using associated procedures, from a set of observed runway surface condition(s) and pilot report of braking action.

Runway Condition Code (RWYCC). A number derived from the RCAM and associated procedures. The purpose of the RWYCC is to permit an operational aircraft performance calculation by the flight crew.

Note.— Procedures for the determination of the RWYCC are described in PANS-Aerodromes *(Doc xxxx).*

Rationale:

The RWYCC is reported to the flight crew as a result of an assessment of the runway surface condition by the runway inspectors using the Runway condition assessment matrix (RCAM) and associated procedures in the PANS-Aerodromes. The RWYCC reflects the effect on aircraft stopping performance of water or naturally occurring contaminants on the runway surface. With this information, flight crew can compute the necessary stopping distance of an aircraft under the prevailing conditions based on performance information provided by the aeroplane manufacturer. The RWYCC is reported for each third of runway intended to be used.

….

Runway visual range (RVR). The range over which the pilot of an aircraft on the centre line of a runway can see the runway surface markings or the lights delineating the runway or identifying its centre line.

Runway surface condition(s). A description of the condition(s) of the runway surface used in the global reporting format which establishes the basis for the determination of the RWYCC for aeroplane performance purposes.

(Editorial note: please note important order of indents.)

a) ***Dry runway.*** A runway is considered dry if its surface is not wet or contaminated and free of visible moisture within the area intended to be used.

Rationale:

Although this definition is by default, it is felt that a separate definition for DRY is needed.

b) ***Wet runway.*** The runway surface is covered by any visible dampness or water less than 3 mm deep.

Rationale:

The definition makes reference to water depth and includes the condition where the surface is just damp. There is no definition for DAMP. From a performance point of view, a damp runway is considered wet. The definition of wet includes visible dampness.

c) ***Slippery wet runway:*** *a wet runway where the surface friction characteristics of a significant portion of the runway in critical stopping areas has been determined to be degraded.*

Rationale:

Links the term *slippery wet runway* to the noticeably reduced braking deceleration or directional control experienced on such a runway. See also rationales for 2.9.9 and 2.9.10.

d) ***Contaminated runway.*** A runway is contaminated when a significant portion of the runway surface area (whether in isolated areas or not) within the length and width being used is covered by one or more of the substances listed in the runway surface condition descriptors.

Rationale:

The term *contaminated runway* as defined above differs from the term currently in Annex 6, the latter to be amended if accepted.

The term *contaminated runway* as defined above contain the term *runway surface condition descriptors* and the various descriptors must be regarded as one entity identifying contaminated runway as relevant to aeroplane performance in the context of the global reporting format.

e) ***Runway surface condition descriptors.*** One of the following elements on the surface of the runway:

Rationale:

The *runway surface condition descriptors* are defined in a way which facilitate their determination by the aerodrome personnel in charge of runway surface condition assessment whatever technological means available at the aerodrome.

(Editorial note: please note important order of indents. Items i) to viii) below are subsets of e).)

i) ***Compacted snow.*** Snow that has been compacted into a solid mass such that aeroplane tires, at operating pressures and loadings, will run on the surface without significant further compaction or rutting of the surface.

Rationale:

Specific gravity has no impact on the aeroplane performance effect of compacted snow, which is considered a hard contaminant, only affecting effective wheel to ground friction and not contaminant drag. Furthermore, these descriptions are meant as useful instructions to runway inspectors for the identification of the correct runway conditions as relevant for aeroplane performance. Density cannot be measured simply and is thus not included in the criteria of this document, despite the fact that performance models for contaminant drag make assumptions for density for certain contaminant types.

The definition of compacted snow is meant to include both an artificially compacted surface and one resulting from natural compaction.

ii) ***Dry snow.*** Snow from which a snowball cannot readily be made.

Rationale:

The TALPA ARC definition includes the aspect that dry snow can be blown by the wind. It was decided that this aspect was not useful in identifying dry snow.

iii) ***Frost.*** Frost consists of ice crystals formed from airborne moisture on a surface whose temperature is below freezing. Frost differs from ice in that the frost crystals grow independently and therefore have a more granular texture.

Note 1.— Below freezing refers to air temperature equal to or less than the freezing point of water ($0^{O}C$).

Note 2.— Under certain conditions frost can cause the surface to become very slippery, it should then be reported appropriately as reduced braking action.

Rationale:

The purpose of Note 2 is to appeal to local knowledge and specificities in judging the effect of frost thickness and formation method as to its slipperiness.

iv) ***Ice.*** Water that has frozen or compacted snow that has transitioned into ice, in cold and dry conditions.

Note.— Under certain conditions ice can cause the surface to become very slippery, it should then be reported appropriately as reduced braking action in line with procedures in PANS Aerodromes (Doc xxxx).

Rationale:

The main aspect is that the ice should be cold and dry, distinct from wet ice. However for the sake of description it appeared important not to exclude a possible mechanism of formation of such ice, even if it has little impact on the eventual effect on aeroplane performance. Black ice was mentioned in the discussions, but is not different in how it occurs. Freezing rain is now included in the definition of wet ice since from a performance point of view, that is what it must be associated with. In doubt a CFME measurement and runway inspector local judgement can allow to correctly classify icy surfaces.

v) ***Slush.*** Snow that is so water saturated that water will drain from it when a handful is picked up or will splatter if stepped on forcefully.

vi) ***Standing water.*** Water of depth equal to or greater than 3 mm.

Note. Running water of depth equal to or greater than 3 mm is reported as standing water by convention.

Rationale:

The definition of standing water includes the threshold defined by aeroplane performance criteria, namely the onset of aquaplaning. The term "standing water" was considered usual and useful in the differentiation from "wet".

vii) ***Wet ice.*** Ice with a layer of water on top of it or ice that is melting.

Note: Freezing precipitation can lead to runway conditions associated with wet ice from an aeroplane performance point of view.

Rationale:

In the definition of frost there is indirect reference to this wet ice condition. Under certain conditions ice can cause the surface to become very slippery, it should then be reported appropriately as reduced braking action in line with procedures in PANS-Aerodromes.

viii) ***Wet snow.*** Snow that contains enough water content to be able to make a well-compacted, solid snowball, but water will not squeeze out.

Rationale:

The FAA definition was retained in favour of the last FTF definition, which does not make a clear distinction with slush.

(Editorial note: The three Notes below apply to the main title ***Runway surface condition(s)*** *(below RVR). Proper indenting important.)*

Note 1.— The runway surface conditions used in the global reporting format establish the performance requirements between the aerodrome operator, aeroplane manufacturer and aeroplane operator.

Note 2. The descriptions for e) i) to viii) are used solely in the context of the global reporting format and are not intended to supersede or replace any existing WMO definitions.

Note 3. Aircraft de-icing chemicals and other contaminants are also reported but are not included in the list of runway surface condition descriptors because their effect on runway surface friction characteristics and the RWYCC cannot be evaluated in a standardized manner.

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Signal area. An area on an aerodrome used for the display of ground signals.

~~***Slush.*** Water-saturated snow which with a heel-and-toe slap-down motion against the ground will be displaced with a splatter; specific gravity: 0.5 up to 0.8.~~

~~*Note. — Combinations of ice, snow and/or standing water may, especially when rain, rain and snow, or snow is falling, produce substances with specific gravities in excess of 0.8. These substances, due to their high water/ice content, will have a transparent rather than a cloudy appearance and, at the higher specific gravities, will be readily distinguishable from slush.*~~

~~***Snow (on the ground).***~~

~~a) *Dry snow.* Snow which can be blown if loose or, if compacted by hand, will fall apart again upon release; specific gravity: up to but not including 0.35.~~

~~b) *Wet snow.* Snow which, if compacted by hand, will stick together and tend to or form a snowball; specific gravity: 0.35 up to but not including 0.5.~~

~~c) *Compacted snow.* Snow which has been compressed into a solid mass that resists further compression and will hold together or break up into lumps if picked up; specific gravity: 0.5 and over.~~

Rationale:

The current definitions had their origins back in 1960's within UK. They were developed for reporting and research purposes with the intent to link them to aeroplane performance. However, a direct link to Annex 6 and Annex 8 was never achieved. The definitions are now recommended to be changed to the ones now used as part of development of the global reporting format. The global reporting format is based upon the TALPA ARC recommendations to FAA and the ICAO SNOWTAM format. A new family of definitions of the terms used to link runway contaminants to aeroplane performance is proposed. This will represent a major step forward on global harmonisation since these terms will be used in the manuals for aeroplane performance.

Station declination. An alignment variation between the zero degree radial of a VOR and true north, determined at the time the VOR station is calibrated.

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CHAPTER 2. AERODROME DATA

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2.9 Condition of the movement area and related facilities

2.9.1 Information on the condition of the movement area and the operational status of related facilities shall be provided to the appropriate aeronautical information services units, and similar information of operational significance to the air traffic services units, to enable those units to provide the necessary information to arriving and departing aircraft. The information shall be kept up to date and changes in conditions reported without delay.

Note.— Nature, format and conditions of the information to be provided are specified in Annex 15 and PANS-ATM (Doc 4444).

2.9.2 The condition of the movement area and the operational status of related facilities shall be monitored, and reports on matters of operational significance affecting aircraft and aerodrome operations shall be provided in order to take appropriate action, particularly in respect of the following:

a) construction or maintenance work;

b) rough or broken surfaces on a runway, a taxiway or an apron;

c) water, snow, slush, ice, or frost on a runway, a taxiway or an apron;

~~d) water on a runway, a taxiway or an apron;~~

d) anti-icing or de-icing liquid chemicals or other contaminants on a runway, taxiway or apron;

e) snow banks or drifts adjacent to a runway, a taxiway or an apron;

~~f) anti-icing or de-icing liquid chemicals or other contaminants on a runway, taxiway or apron;~~

~~g~~f) other temporary hazards, including parked aircraft;

~~h~~g) failure or irregular operation of part or all of the aerodrome visual aids; and

~~i~~h) failure of the normal or secondary power supply.

Note 1.— Other contaminants may include mud, dust, sand, volcanic ash, oil and rubber. ~~*Annex 6, Part I, Attachment C provides guidance on the description of runway surface conditions. Additional guidance is included in the*~~ Airport Services Manual ~~*(Doc 9137), Part 2.*~~ *Procedures for monitoring and reporting the conditions of the movement area are included in* PANS-Aerodromes *(Doc xxxx).*

Rationale: Water can be listed together with snow, slush, ice or frost and existing item d) can be deleted. The relevant part of the guidance in Airport Services Manual (Doc 9137), Part 2 is proposed to be rewritten and moved to PANS-Aerodromes.

Note 2.— Annex 6, [location to be decided within Annex 6 documentation] provides guidance on aircraft performance calculation requirements regarding description of runway surface conditions in 2.9.2 c), d), e) and f) [to be confirmed with Annex 6 & 8 subgroups].

Rationale:

The reference to Annex 6 documentation needs to be updated pending the outcome from Annex 6/8 subgroup discussions.

Note 3.— Origin of data, assessment process and the procedures are prescribed in PANS-Aerodromes (Doc xxxx). These procedures are intended to fulfil the requirements to achieve the desired level of safety for aeroplane operations prescribed by Annex 6 and Annex 8 and to provide the information fulfilling the syntax requirements for dissemination specified in Annex 15 and PANS-ATM *(Doc 4444).*

Rationale:

The current text in the Note to 2.9.1 – Nature, format and conditions of the information to be provided – appear confusing when only related to Annex 15 and PANS-ATM (Doc 4444). Annex 15 and PANS-ATM give the syntax and format for dissemination, but do not provide or contain the operational requirements (Annex 6 and Annex 8) dictating the data collection and origin of the information (Annex 14) to be disseminated. There seems to be confusion related to the understanding of how information are provided and disseminated, and the purpose of this dissemination. The proposed Notes attempt to bring more clarity to this issue.

~~*Note 2.— Particular attention would have to be given to the simultaneous presence of snow, slush, ice, wet ice, snow on ice with anti-icing or de-icing liquid chemicals.*~~

~~*Note 3.— See 2.9.11 for a list of winter contaminants to be reported.*~~

Rationale:

Existing Note 2 is proposed to be relocated to PANS-Aerodromes. Note 3 is there as a consequence of Note 2 and points to another paragraph. When Note 2 is moved Note 3 can be removed.

~~2.9.3 To facilitate compliance with 2.9.1 and 2.9.2, inspections of the movement area shall be carried out each day at least once where the code number is 1 or 2 and at least twice where the code number is 3 or 4.~~

2.9.3 To facilitate compliance with 2.9.1 and 2.9.2, the following inspections shall be carried out each day:

a) for the movement area, at least once where the aerodrome reference code number is 1 or 2 and at least twice where the aerodrome reference code number is 3 or 4; and

b) for the runway(s), inspections in addition to a) whenever the runway surface conditions significantly change due to meteorological conditions.

Rationale:

Additional inspection on the runway(s) is proposed whenever the runway surface conditions changes significantly due to meteorological conditions. The proposed Note 2 describes what may constitute "significant changes".
"Aerodrome reference" added in front of "code" for not to be confused with *runway condition code*.

Note 1.— ~~Guidance~~ Procedures on carrying out daily inspections of the movement area ~~is~~ are given in ~~the~~ Airport Services Manual ~~(Doc 9137), Part 8~~ PANS-Aerodromes (Doc xxxx). Further guidance are available ~~and~~ in the Airport Services Manual *(Doc 9137), Part 8, in the Manual of Surface Movement Guidance and Control Systems (SMGCS) (Doc 9476) and in the* Advanced Surface Movement Guidance and Control Systems (A-SMGCS) Manual *(Doc 9830).*

Note 2: A change in the runway surface condition(s) used in the global reporting format is considered significant whenever there is an effect on the RWYCC, type and depth of contaminant. Further information is available in PANS-Aerodromes *(Doc xxxx).*

Rationale:

The content in Airport Services Manual (Doc 9137), Part 8 dealing with wet and contaminated runways is proposed to be relocated to PANS-Aerodromes.

Text to be moved/rewritten:

Chapter 6 – Adverse Weather Conditions
Chapter 7 – Measurement of Surface Friction

In addition it is proposed to edit the note to include (Doc 9830). This to be consistent with the Note 2 to Annex 14, Vol. I paragraph 10.2.1.

2.9.4 **~~Recommendation~~.—** Personnel assessing and reporting runway surface conditions required in 2.9.2 and 2.9.~~8~~5 ~~should~~ shall be trained ~~and competent to meet criteria set by the State~~ to perform their duties.

Note 1.—Guidance on training of personnel is given in Attachment A, Section 6.

Note 2.— ~~Guidance on criteria~~ Information on training for personnel assessing and reporting runway surface conditions ~~is included in the~~ Airport Services Manual ~~(Doc 9137), Part 8, Chapter 7.~~ is available in PANS-Aerodromes (Doc xxxx).

Rationale:

The information provided by personnel assessing and reporting runway surface condition is crucial to the success of the global reporting format. This requires personnel assessing and reporting runway surface condition to be trained to perform their duties; consequently, the existing Recommendation is proposed to be upgraded to the level of a Standard. It is important to note, however, that a misreported runway condition alone should not lead to an accident or incident. Operational margins should cover for a reasonable error in the assessment, including unreported development of the runway condition. But a misreported runway condition can mean that the margins are no longer available to cover for other operational variance (unexpected tailwind, high and fast above threshold or long flare).

This is further justified by the need to provide the assessed information under the proper format for dissemination, which requires insight into the limitations set by the syntax for dissemination. This in turns restrict the wording of plain text remarks that can be provided. To achieve the desired safety level for aeroplane performance on wet and contaminated runways it becomes essential to follow standard procedures when providing assessed information on the runway surface conditions.

Existing wording included a requirement for personnel competency, but the APWGs/2 considered this requirement could not be transposed in an applicable regulation, was redundant with the requirement for training and should be removed.

The training material in *Airport Services Manual* (Doc 9137), Part 8, Chapter 7 is proposed reviewed and moved to *PANS Aerodromes*.

~~***Water on a runway***~~

Runway surface condition(s) for use in the global reporting format

Introductory note. — The philosophy of the global reporting format is that the aerodrome operator assesses the runway surface conditions whenever water, snow, slush, ice or frost are present on an operational runway. From this assessment, a runway condition code (RWYCC) and a description of the runway surface are reported which can be used by the flight crew for aeroplane performance calculations. This report, based on the type, depth and coverage of contaminants, is the best assessment of the runway surface condition by the aerodrome operator; however, all other pertinent information may be taken into consideration. See Attachment 6 for further details. PANS-Aerodromes (Doc xxxx) contains procedures on the use of the global reporting format and assignment of the RWYCC in accordance with the Runway Condition Assessment Matrix (RCAM).

Rationale:

The existing titles “Water on a runway” and “Snow, slush, ice or frost on a runway” are proposed to be removed. The reason for this deletion is linked to the introduction of the global reporting format. The background and philosophy behind the global reporting format is described in a new introductory note.

This implies that wet runway conditions needs to be reported, not only when associated with snow and ice as in the SNOWTAM format.

Annex 14 Vol I should list the defined terms to be used in the global reporting format. This can be achieved by including them in the terms listed in para. 2.9.11 which will then also include the terms related to DRY and the various wet terms to be used. The PANS Aerodromes should then list guidance on special action on all the topics listed.

The paragraphs from 2.9.5 to 2.9.11 have been listed in a more logical order. Some paragraphs that have a strikethrough are moved to new locations.

~~2.9.5 **Recommendation.** *Whenever water is present on a runway, a description of the runway surface conditions should be made available using the following terms:*~~

~~*DAMP — the surface shows a change of colour due to moisture.*~~
~~*WET — the surface is soaked but there is no standing water.*~~
~~*STANDING WATER — for aeroplane performance purposes, a runway where more than 25 per cent of the runway surface area (whether in isolated areas or not) within the required length and width being used is covered by water more than 3 mm deep.*~~

2.9.5 The runway surface condition shall be assessed and reported through a runway condition code (RWYCC) and a description using the following terms:

DRY
WET ICE
WATER ON TOP OF COMPACTED SNOW
DRY SNOW
DRY SNOW ON TOP OF ICE
WET SNOW ON TOP OF ICE
ICE
SLUSH
STANDING WATER
COMPACTED SNOW
WET SNOW
DRY SNOW ON TOP OF COMPACTED SNOW
WET SNOW ON TOP OF COMPACTED SNOW
WET

FROST
CHEMICALLY TREATED
SANDED

Note 1.— The runway surface conditions are those conditions for which, by means of the methods described in PANS Aerodromes (Doc xxxx), the flight crew can derive appropriate aeroplane performance.

Note 2.— The conditions, either singly or in combination with other observations, are criteria for which the effect on aeroplane performance is sufficiently deterministic to allow assignment of a specific runway condition code.

Rationale:

For wet runways, when not associated with snow and ice, the wet information is reported not using the full global reporting format, but according to a separate procedure specified in PANS-Aerodromes.

DAMP is part of the definition of wet.

~~2.9.6 Information that a runway or portion thereof may be slippery when wet shall be made available.~~

~~*Note. The determination that a runway or portion thereof may be slippery when wet is not based solely on the friction measurement obtained using a continuous friction measuring device. Supplementary tools to undertake this assessment are described in the* Airport Services Manual *(Doc 9137), Part 2.*~~

2.9.6 Whenever an operational runway is contaminated an assessment of the contaminant depth and coverage over each third of the runway shall be made and reported.

Rationale:

The importance of reporting by runway thirds is recognized. From the Annex 6/8 subgroup this has been highlighted in the FTF/12 IP/04 - *Rational for 25% Coverage Threshold for Wet/Contaminated Reporting.*

The procedures associated with the global reporting format reporting based on the TALPA RCAM assign Runway Condition Codes below 6 only when more than 25% of the runway are wet or contaminated. This was based on a demonstration made in the frame of the TALPA, the assumptions of which are important to note and implement in the assessment procedures.

When revisiting these reporting rules at ICAO level, it is of major importance that the "by third of runway length rule" described above is implemented. Otherwise the worst case of 25% of full runway length contamination concentrated at runway end would not be covered by the 15% margin on the In-Flight Landing Distance.

~~2.9.7 Notification shall be given to aerodrome users when the friction level of a paved runway or portion thereof is less than that specified by the State in accordance with 10.2.3.~~

~~*Note. — Guidance on conducting a runway surface friction characteristics evaluation programme that includes determining and expressing the minimum friction level is provided in Attachment A, Section 7.*~~

Rationale:

Existing paragraph 2.9.7 is proposed to be relocated to (new) 2.9.10 as the order of sequence is considered more logical and easier to read and understand.

~~Snow, slush, ice or frost on a runway~~

~~*Note 1. — The intent of these specifications is to satisfy the SNOWTAM and NOTAM promulgation requirements contained in Annex 15.*~~

~~*Note 2. — Runway surface condition sensors may be used to detect and continuously display current or predicted information on surface conditions such as the presence of moisture, or imminent formation of ice on pavements.*~~

Rationale:

Note 1 is proposed to be deleted. This information is provided in the proposed notes 2 and 3 to paragraph 2.9.2. there should be no need to duplicate this information even though the reporting format is not specifically named in note 2 and 3 to paragraph 2.9.2 .

Note 2 is also proposed to be deleted as it may be too detailed at the level of a SARP. It is proposed to place the deleted guidance in the PANS-Aerodromes.

~~2.9.8 Whenever an operational runway is contaminated by snow, slush, ice or frost, the runway surface condition shall be assessed and reported.~~

~~*Note. — Guidance on assessment of snow- and ice-covered paved surfaces is provided in Attachment A, Section 6.*~~

Rationale:

Existing paragraph 2.9.8 is proposed to be merged with new paragraph 2.9.6.

~~2.9.9 **Recommendation.** — *Runway surface friction measurements made on a runway that is contaminated by slush, wet snow or wet ice should not be reported unless the reliability of the measurement relevant to its operational use can be assured.*~~

~~*Note. — Contaminant drag on the equipment's measuring wheel, amongst other factors, may cause readings obtained in these conditions to be unreliable.*~~

2.9.7 When friction measurements are used as part of the overall runway surface assessment on compacted snow- or ice-covered surfaces, the friction measuring device shall meet the standard set or agreed by the State.

Rationale:

Due to inherent difficulties with readings from friction measuring devices, their use shall be controlled by the State. See also rationale for new paragraph 2.9.8.

2.9.8 **Recommendation. —** *Friction measurements made on runway surface conditions with contaminants other than compacted snow and ice should not be reported.*

Rationale:

Promulgation of mu-values, by use of friction measuring devices for flight operation purposes on other surfaces than compacted snow and ice, has traditionally not been supported as misleading readings could be provided. Operational measurements on wet runways are also not supported as the scales that has been associated with wet runways have had another origin than those provided for snow and ice. They have not been interchangeable.

Friction numbers that were reported had been used with the understanding that pilots could "learn" from their use how they related to their aeroplane operations. Since this was introduced and more experience gained, it was recognized that one had to distinguish between devices of different kinds and the extension describing the device used should be attached to the readings.

Further experience revealed that devices of same make and kind did have a significant variability in their readings ie issues associated with repeatability and reproducibility. This experience was gained under controlled experiments on wetted runways (Wetted by the measuring device's own watering systems).

Through the European Aviation Safety Agency (EASA) Runway Friction Characteristics and Measurement and Aircraft Braking (RuFAB) project it was also revealed that devices were not time stable. Research post RuFAB has revealed that this quality is tied up with how devices are used/controlled and the time stability can be improved with present days knowledge.

The uncertainty attached to readings from friction measuring devices has several aspects which are not controlled at aerodromes according to the way they generally use the devices today. Further to this the industry has not been able to provide a reference to which friction measuring devices can be harmonized. For this reason it is not proper to use the term accuracy when referring to readings from friction measuring devices. They can only be used for comparison or trend monitoring.

The problems above have been addressed by the "industry" and by organisations developing international standards. Both within the American Society for Testing of Materials (ASTM) and the European Committee for Standardization (Comité Européen de Normalisation-CEN) there are activities addressing the issues. States do participate within these standard developments, either directly or by monitoring the development and it is expected that some of the issues can be further controlled and the uncertainty reduced provided that the new knowledge are used when controlling the fleet of devices used.

It will be the responsibility of the State in their approval process for the devices to be used, either for operational use on snow and ice or for maintenance purposes, to incorporate this knowledge.

A single measurement with a continuous friction measuring device is not enough to relate it to operational use (aeroplane performance).

2.9.9 Information that a runway or portion thereof is slippery wet shall be made available.

Note. The surface friction characteristics of a runway or a portion thereof can be degraded due to rubber deposits, surface polishing, poor drainage or other factors. The determination that a runway or portion

thereof is slippery wet stems from various methods used solely or in combination. These methods may be functional friction measurements, using a continuous friction measuring device, that fall below a minimum standard as defined by the State, observations by aerodrome maintenance personnel, repeated reports by pilots and aircraft operators based on flight crew experience or through analysis of airplane stopping performance that indicates a substandard surface. Supplementary tools to undertake this assessment are described in the PANS-Aerodromes *(Doc xxxx).*

Rationale:

The term *may be slippery when wet* has been changed to *slippery wet.* This reflect the definition of a **Slippery wet runway.** See rationales for the term **Slippery wet runway** in section 1.1 Definitions/Runway surface condition(s)/(c) and 2.9.9 and 2.9.10.

The Airport Services Manual describes in 3.1.1

> *"There is an operational need for information on paved runways that may become slippery when wet. To this end, there is a need to measure periodically the friction characteristics of a paved runway surface to ensure that they do not fall below an agreed level. An indication of the friction characteristics of a paved runway can be obtained by friction-measuring devices; however, further experience is required to correlate the results obtained by such devices with airplane braking performance due to the many variables involved, such as runway temperature, tire inflation pressure, test speed, tire-operating mode (locked wheel, brake slip), anti-skid system efficiency, and measured speed and water depth.*

The further experience gained has revealed more uncertainty and the method is now considered as flawed when related to aeroplane performance.

The method described in the Airport Services Manual, Part 2, Appendix 1 – *Method for Determining the Minimum Friction Level* – is not fully understood and is not validated as appropriate. Its value as guidance to States is questionable and it should be removed from Airports Services Manual, Part 2.

Through the TALPA ARC recommendations it has been proposed to relate the slippery when wet to aeroplane braking performance medium. This is an arbitrarily arrived threshold value for aeroplane performance not substantiated in any direct relationship, but it is indicated that the flawed method using friction measuring devices as described in ICAO provisions can be used for arriving at this relationship. The method used in ICAO provisions has its main input from research performed by US and equally reflected in the FAA AC 150/5320-12 – Measurement, construction, and maintenance of skid-resistant airport pavement surfaces. (From 1975 to latest version 12 C in 1997 with later updated information on manufacturers of friction measuring devices)

It is recommended to delete the material describing specifically this method in the ICAO provisions and instead make reference to updated methods used by States. States have developed and develops different approaches, using different approved devices and with different threshold values. Furthermore the State set levels should not be set by another State without close consideration of the rationale of that State's approved method.

Revised guidance to the methods applicable for assessment of runway surface friction characteristics are described at a high global level in Attachment A, Section 6. Detailed guidance including references of States best practices are documented in ICAO Circular 329 – *Assessment, Measurement and Reporting of Runway Surface Conditions*.

~~2.9.10 **Recommendation.** — *When friction measurements are taken as part of the assessment, the performance of the friction measuring device on compacted snow- or ice-covered surfaces should meet the standard and correlation criteria set or agreed by the State.*~~

~~*Note. — Guidance on criteria for, and correlation between, friction measuring devices is included in the* Airport Services Manual *(Doc 9137), Part 2.*~~

2.9.10 Notification shall be given to aerodrome users when the friction level of a paved runway or portion thereof is less than the minimum friction level specified by the State in accordance with 10.2.3.

Note 1.— Guidance on determining and expressing the minimum friction level is provided in the ICAO Circular 329 – Assessment, Measurement and Reporting of Runway Surface Conditions.

Note 2.— Procedures on conducting a runway surface friction characteristics evaluation programme is provided in PANS-Aerodromes *(Doc xxxx).*

Rationale:

The minimum friction level is the level specified by the State corresponding to maintenance criteria under which the surface of a paved runway may become slippery under wet conditions. The change in 2.9.10 is editorial for clarification.
This guidance was included in Annex 14, Volume 1, Attachment A and in the Airport Services Manual, Part 2. It should be rewritten to address the proposed changes and split into harmonized procedures and guidance in PANS-Aerodromes and in a "State level" to be located in a revised Cir 329 – Assessment, Measurement and Reporting of Runway Surface Conditions – see rationale given for paragraph 10.2.3.

~~2.9.11 **Recommendation.** — *Whenever snow, slush, ice or frost is present and reported, the description of the runway surface condition should use the following terms:*~~

~~*DRY SNOW;*~~
~~*WET SNOW;*~~
~~*COMPACTED SNOW;*~~
~~*WET COMPACTED SNOW;*~~
~~*SLUSH;*~~
~~*ICE;*~~
~~*WET ICE;*~~
~~*FROST;*~~
~~*DRY SNOW ON ICE;*~~
~~*WET SNOW ON ICE;*~~
~~*CHEMICALLY TREATED.*~~
~~*SANDED.*~~

~~*and should include, where applicable, the assessment of contaminant depth.*~~

Rationale:
Revised terms are listed in new paragraph 2.9.5.

2.9.12 ~~**Recommendation.** — *Whenever dry snow, wet snow or slush is present on a runway, an assessment of the mean depth over each third of the runway should be made to an accuracy of approximately 2 cm for dry snow, 1 cm for wet snow and 0.3 cm for slush.*~~

Rationale:
Existing 2.9.12 is considered to prescriptive and is proposed to be relocated to PANS-Aerodromes.

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2.13 Coordination between aeronautical information services and aerodrome authorities

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2.13.3 Of a particular importance are changes to aeronautical information that affect charts and/or computer-based navigation systems which qualify to be notified by the aeronautical information regulation and control (AIRAC) system, as specified in Annex 15, Chapter 6 and Appendix 4. The predetermined, internationally agreed AIRAC effective dates in addition to 14 days postage time shall be observed by the responsible aerodrome services when submitting the raw information/data to aeronautical information services.

2.13.4 The aerodrome services responsible for the provision of raw aeronautical information/data to the aeronautical information services shall do that while taking into account accuracy and integrity requirements for aeronautical data as specified in Appendix 5 to this Annex.

Note 1.— Specifications for the issue of NOTAM and ~~SNOWTAM~~ global reporting format are contained in Annex 15, Chapter ~~5~~? and Appendices ~~6~~? and ~~2~~?, respectively.

Note 2.— AIRAC information is distributed by the AIS at least 42 days in advance of the AIRAC effective dates with the objective of reaching recipients at least 28 days in advance of the effective date.

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CHAPTER 10. AERODROME MAINTENANCE

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10.2 Pavements

10.2.2 The surface of a runway shall be maintained in a condition such as to prevent formation of harmful irregularities.

Note.— See Attachment A, Section 5.

10.2.3 A paved runway shall be maintained in a condition so as to provide surface friction characteristics at or above the minimum friction level specified by the State.

Note.— The ~~Airport Services Manual *(Doc 9137), Part 2,*~~ *Circular 329 contains further information on this subject, on improving surface friction characteristics of runways.*

Rationale:
Information is available in the current Cir 329 – Assessment, Measurement and Reporting of Runway Surface Conditions. See rationale for 2.9.10 for further details.

10.2.4 Runway surface friction characteristics for maintenance purposes shall be periodically measured with a continuous friction measuring device using self-wetting features and documented. The frequency of these measurements shall be sufficient to determine the trend of the surface friction characteristics of the runway.

Note 1.— Guidance on evaluating the runway surface friction characteristics ~~*of a runway*~~ *is provided in* ~~*Attachment A, Section 7. Additional guidance is included in the*~~ ~~Airport Services Manual *(Doc 9137), Part 2.*~~ *Circular 329.*

Note 2.— The objective of 10.2.3 to 10.2.6 is to ensure that the surface friction characteristics for the entire runway remain at or above a minimum friction level specified by the State.

~~*Note 3.— Guidance for the determination of the required frequency is provided in Attachment A, Section 7 and in the*~~ ~~Airport Services Manual *(Doc 9137), Part 2, Appendix 5.*~~

Rationale:
Referenced information proposed updated and moved to a revised Cir 329 – *Assessment, Measurement and Reporting of Runway Surface Conditions.* See also rationale box for 2.9.10 .

10.2.4A When runway surface friction measurements are made for maintenance purposes using a self-wetting continuous friction measuring device, the performance of the device shall meet the standard set or agreed by the State.

10.2.4 B Personnel measuring runway surface friction required in 10.2.4 A shall be trained to fulfil their duties.

Rationale:

Amendment 11 to Annex 14 Vol I introduced two new recommendations to assess performances of friction measuring devices used on snow- or ice-covered runways and to specify training criteria for personnel. However, Annex 14 Vol I does not contain similar recommendation for devices and personnel in the case of maintenance assessments.

Use of CFMD for maintenance should be controlled by the States as well as their use on contaminated runways.

10.2.5 Corrective maintenance action shall be taken to prevent the runway surface friction characteristics for either the entire runway or a portion thereof from falling below a minimum friction level specified by the State.

Note.— A portion of runway in the order of 100 m long may be considered significant for maintenance or reporting action.

~~10.2.6 **Recommendation.** — *When there is reason to believe that the drainage characteristics of a runway, or portions thereof, are poor due to slopes or depressions, then the runway surface friction characteristics should be assessed under natural or simulated conditions that are representative of local rain, and corrective maintenance action should be taken as necessary.*~~

10.2.6 **Recommendation** *The runway surface should be visually assessed, as necessary, under natural or simulated rain conditions for ponding or poor drainage and where required, corrective maintenance action taken.*

Rationale:

10.2.6 has been rephrased to be more precise in addressing the visual aspect of assessing ponding and standing water on the runway. In addition, ponding and standing water are visual manifestations of poor slopes/depressions and are easily detected by the aerodrome personnel in a practical manner.

….

10.3 Removal of contaminants

10.3.1 Snow, slush, ice, standing water, mud, dust, sand, oil, rubber deposits and other contaminants shall be removed from the surface of runways in use as rapidly and completely as possible to minimize accumulation.

Note.— The above requirement does not imply that winter operations on compacted snow and ice are prohibited. ~~Guidance~~ Information on snow removal and ice control and removal of other contaminants is given in the ~~Aerodrome Services Manual (Doc 9137), Parts 2 and 9.~~ PANS-Aerodromes (Doc xxxx).

Rationale:
Guidance on snow removal and ice control and removal of other contaminants need be updated and moved to PANS Aerodromes part as harmonised procedures and part as guidance.

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10.3.4 **Recommendation.—** *Whenever the clearance of snow, slush, ice, etc., from the various parts of the movement area cannot be carried out simultaneously, the order of priority after the runway(s) in use should be set in consultation with the affected parties such as rescue and fire fighting service and documented in a snow plan.*

Note 1. — See Annex 15, Appendix 1, Part 3, AD 1.2.2 for information to be promulgated in an AIP concerning a snow plan. The Aeronautical Information Services Manual *(Doc 8126), Chapter 5 contains guidance on the description of a snow plan including general policy concerning operational priorities established for the clearance of movement areas.*

~~*Note 2. — The* Airport Services Manual *(Doc 9137), Part 8, Chapter 6, specifies that an aerodrome snow plan clearly defines, inter alia, the priority of surfaces to be cleared.*~~

Rationale:

Note 2 is proposed to be removed

The *Airport Services Manual* (Doc 9137), Part 8, Chapter 6 is proposed to be rewritten and moved to PANS-Aerodromes. See rationale box for paragraph 2.9.3 Note.

The content of the snow plan is closely linked to the introduction of the SNOWTAM format and are part of the basic framework. Both were introduced in Amendment 10 to Annex 15 (applicable 8 February 1968) (Source: Aeronautical Information Services and Aeronautical Charts Division (1966)). It can further be traced to proposals by IATA for the development of a comprehensive system for dissemination of information on snow, slush, ice and water o aerodrome pavements. The IATA proposals are further detailed in AN-WP/2669 dated 22/3/63 from which is quoted:

"As a justification for this comprehensive system, IATA advances its belief that recent experience during the severe 1962-1963 winter conditions in Europe has shown that this information on runway conditions is of operational importance equal to "other weather phenomena" presently determining the operational usability of aerodromes for high speed turbine powered aircraft."

Accordingly it was agreed that the following basic framework for the dissemination of this information would meet the requirements:-

a) States should prepare, as required, a SNOW PLAN which would describe the methods by which snow, ice, slush and standing water on runways, taxi-ways and aprons would be measured, reported and disseminated. This plan should contain full information concerning the methods to be used for clearing runways taking into account the operational requirements of the airlines. This plan should be circulated to operators as basic information relating to the service to be provided at that location.

….

The proposed global reporting format implies substantial changes to the ICAO SNOWTAM format. Information related to maintenance activities are no longer communicated. This has implications on the content of the snow plan and on the present text contained in The Airport Services Manual *(Doc 9137),* Part 8, Chapter 6. This text is proposed to be removed and rewritten into Doc 9981 taking into consideration the data origination constraints and also the progress and development since the early 1960's.

A significant change brought by the proposed global reporting format and influencing the snow plan is the inclusion of the assessment and reporting of wet condition on a whole year basis, not only the presence of snow and ice during the exposed seasons.

The content of the snow plan is currently under review by the AIS-AIMSG,
The AIS-AIMSG has very recently established a group to assist FTF to structure the future information in line with data origination constraints.

10.3.5 **Recommendation.—** *Chemicals to remove or to prevent the formation of ice and frost on aerodrome pavements should be used when conditions indicate their use could be effective. Caution should be exercised in the application of the chemicals so as not to create a more slippery condition.*

Note.— ~~*Guidance*~~ *Information on the use of chemicals for aerodrome pavements is given in the* ~~Airport Services Manual *(Doc 9137), Part 2*~~ *PANS-Aerodromes (Doc xxxx).*

10.3.6 Chemicals which may have harmful effects on aircraft or pavements, or chemicals which may have toxic effects on the aerodrome environment, shall not be used.

….

Rationale:

Chemicals, complying with international industry standards and locally applicable environmental regulations might be harmful to aircraft. When use of chemicals known to have such qualities cannot be avoided by an aerodrome operator there is a need to bring this to the knowledge of the aircraft operators using that particular aerodrome, in order to adjust their maintenance programme.

The following Note :

“When use of chemicals which may have an harmful effect to aircraft cannot be avoided, information on the impact of the chemicals used may be given to aircraft operators for the purpose of aircraft maintenance.”

had been proposed for inclusion but the initial APWGs/2 opinion was that standard 10.3.6 included two contradictory requirements and might be degraded to a Note while the proposed Note should be a recommendation. Conclusion was not to retain the proposed Note but to specify a new task to address the issue to be presented at AP/3.

ATTACHMENT A. GUIDANCE MATERIAL SUPPLEMENTARY TO ANNEX 14, VOLUME I

Rationale:

Section 6 is proposed to be rewritten with new guidance to align with the global reporting format. A brief concept of the global reporting format is described in this Attachment. Guidance on the training required for personnel assessing and reporting runway surface conditions have been included. Further material on, inter alia, assigning runway condition code is available in PANS-Aerodromes .

~~**6. Assessing the surface friction characteristics of snow-, slush-, ice- and frost-covered paved surfaces**~~

~~6.1 There is an operational need for reliable and uniform information concerning the surface condition of contaminated runways. Contaminant type, distribution and for loose contaminants, depth are assessed for each third of the runway. An indication of surface friction characteristics is helpful in conducting runway condition assessment. It can be obtained by friction measuring devices; however, there is no international consensus on the ability to correlate the results obtained by such equipment directly with aircraft performance. However, for contaminants such as slush, wet snow and wet ice, contaminant drag on the equipment's measuring wheel, amongst other factors, may cause readings obtained in these conditions to be unreliable.~~

~~6.2 Any friction measuring device intended predict aircraft braking performance according to an agreed local or national procedure should be shown to correlate such performance in a manner acceptable to the State. Information on the practice of one State providing correlation directly with aircraft braking performance can be found in Appendix A of *Assessment, Measurement and Reporting of Runway Surface Conditions* (ICAO Cir 329).~~

~~6.3 The friction conditions of a runway can be assessed in descriptive terms of "estimated surface friction". The estimated surface friction is categorized as good, medium to good, medium, medium to poor, and poor, and promulgated in Annex 15, Appendix 2, "SNOWTAM format" as well as in PANS-ATM, Chapter 12, 12.3, "ATC phraseologies".~~

~~**Figure A-3. Comparison of roughness criteria**~~

~~6.4 The table below with associated descriptive terms was developed from friction data collected only in compacted snow and ice and should not therefore be taken to be absolute values applicable in all conditions. If the surface is affected by snow or ice and the estimated surface friction is reported as "good", pilots should not expect to find conditions as good as on a clean dry runway (where the available friction may well be greater than that needed in any case). The value "good" is a comparative value and is intended to mean that aeroplanes should not experience directional control or braking difficulties, especially when landing. The figures in the "Measured Coefficient μ" column are given as an indication. At each aerodrome a specific table can be developed according to the measuring device used on the aerodrome and according to the standard and correlation criteria set or agreed by the State. The μ values given will be specific to each friction measuring device as well as to the surface being measured and the speed employed.~~

~~*Measured coefficient μ*~~	~~*Estimated surface friction*~~	~~*Code*~~
~~0.40 and above~~	~~Good~~	~~5~~
~~0.39 to 0.36~~	~~Medium to good~~	~~4~~
~~0.35 to 0.30~~	~~Medium~~	~~3~~
~~0.29 to 0.26~~	~~Medium to poor~~	~~2~~
~~0.25 and below~~	~~Poor~~	~~1~~

~~6.5 Relating braking action to friction measurements has been elusive over the years. The main reason is that the industry to date has not achieved the ability to control the total uncertainty associated with the readings from these devices. Consequently, readings from a friction measuring device should be used only as part of an overall runway condition assessment. A major difference between the decelerometer type of devices and the other types is that when using the decelerometer type the operator is an integrated part of the measuring process. In addition to carrying out the measurement, the operator can feel the behaviour of the vehicle where the decelerometer is installed and by that feel the deceleration process. This gives additional information in the total assessment process.~~

~~6.6 It has been found necessary to provide assessed surface condition information, including estimated surface friction, for each third of a runway. The thirds are called A, B and C. For the purpose of reporting information to aeronautical service units, section A is always the section associated with the lower runway designation number. When giving landing information to a pilot before landing, the sections are however referred to as first, second or third part of the runway. The first part always means the first third of the runway as seen in the direction of landing. Assessments are made along two lines parallel to the runway, i.e. along a line on each side of the centre line approximately 3 m, or that distance from the centre line at which most operations take place. The objective of the assessment is to determine the type, depth and coverage of the contaminants and their effect on estimated surface friction, given the prevailing weather conditions for sections A, B and C. In cases where a continuous friction measuring device is used, the mean values are obtained from the friction values recorded for each section. In cases where a spot measuring friction measuring device is used as part of the total assessment of estimated surface friction, each third of the runway should have a minimum of three tests carried out on it where~~

~~achievable. Information collected and assessed on the state of pavement surface is disseminated using forms prepared by the State for SNOWTAM and NOTAM (see the *Airport Services Manual* (Doc 9137) Part 2).~~

~~6.7 The *Airport Services Manual* (Doc 9137), Part 2 provides guidance on the uniform use of test equipment and other information on removal of surface contamination and improvement of friction conditions.~~

6. Global reporting format for reporting runway surface condition

6.1 On a global level, there is a multitude of climatic exposure to the movement area and consequently a significant difference in the condition to be reported. The global reporting format describes a basic methodology applicable for all these climatic variations. and is structured such that States can adjust them to the climatic conditions applicable for that State or region.

6.2 The concept of the global reporing format is premised on:

- an agreed set of criteria used in a consistent manner for runway surface condition assessment, aircraft (performance) certification and operational performance calculation ;
- a unique Runway Condition Code (RWYCC) linking the agreed set of criteria with the aircraft landing and take-off performance table, and related to the braking action experienced and eventually reported by flight crews;
- a standardized common terminology and phraseology for the description of runway surface conditions used by aerodrome operator inspection personnel, air traffic controllers, and aircraft operators , noticeably flight crew;
- globally harmonized procedures for the establishment of the RWYCC with a built-in flexibility to allow for local variations to match the specific climatic, infrastructure and other particular conditions.

6.3 These harmonized procedures are reflected in a Runway Condition Assessment Matrix (RCAM) which correlates the RWYCC, the agreed set of criteria and the braking action which the flight crew should expect for each value of the RWYCC.

6.4 The procedures which relates to the use of the RCAM are provided in the PANS Aerodromes (Doc xxxx).

6.5 It is recognized that information provided by the aerodrome’s personnel assessing and reporting runway surface condition is crucial to the success of the global reporting format. A misreported runway condition alone should not lead to an accident or incident. Operational margins should cover for a reasonable error in the assessment, including unreported development of the runway condition. But a misreported runway condition can mean that the margins are no longer available to cover for other operational variance (unexpected tailwind, high and fast above threshold or long flare).

6.6 This is further amplified by the need for providing the assessed information in the proper format for dissemination, which requires insight into the limitations set by the syntax for dissemination. This in turns restrict the wording of plain text remarks that can be provided.

6.7 To achieve the desired safety level for aeroplane performance on wet and contaminated runways, it ~~becomes~~ is essential to follow standard procedures when providing assessed information on the runway surface conditions These personnel should be trained in the relevant fields of competence and their competence verified in a manner required by the State to ensure confidence in their assessments.

6.8 The training syllabus may include initial and periodic recurrent training in the following areas:

a) aerodrome familiarization, including aerodrome markings, signs and lighting;
b) aerodrome procedures as described in the aerodrome manual;
c) aerodrome emergency plan;
d) Notice to Airmen (NOTAM) initiation procedures;
e) Completion of/ initiation procedures for Global Reporting Format;
f) aerodrome driving rules;
g) air traffic control procedures on the movement area;
h) radiotelephone operating procedures;
i) phraseology used in aerodrome control, including the ICAO spelling alphabet;
j) aerodrome inspection procedures and techniques;
k) type of runway contaminants and reporting;
l) assessment and reporting of runway surface friction characteristics;
m) use of runway friction measurement device;
n) calibration and maintenance of runway friction measurement device;
o) low visibility procedures.

~~7. Determination of surface friction characteristics for construction and maintenance purposes~~

Rationale:

The AOSWG/13 preferred to consolidate this and other related guidance in a single location ie.in a yet-to-be updated version of Cir 329. This solution, in the absence of a universally applicable method, allows reference to States' existing best practices for the determination of surface friction characteristics for construction and maintenance purposes and provides more practical guidance to States and aerodrome operators. See also rationale in 2.9.10.

Note. — The guidance in this section involves the functional measurement of friction related aspects related to runway construction and maintenance. Excluded from this section is the operational, as opposed to functional, measurement of friction for contaminated runways. However, the devices used for functional measurement could also be used for operational measurement, but in the latter case, the figures given in Airport Services Manual (*Doc 9137), Part 2, Table 3-1 are not relevant.*

7.1 The surface friction characteristics of a paved runway should be:

a) assessed to verify the surface friction characteristics of new or resurfaced paved runways (Chapter 3, 3.1.25); and

b) assessed periodically in order to determine the slipperiness of paved runways (Chapter 10, 10.2.4).

7.2 The condition of a runway pavement is generally assessed under dry conditions using a self-wetting continuous friction measuring device. Evaluation tests of runway surface friction characteristics are made on clean surfaces of the runway when first constructed or after resurfacing.

7.3 Friction tests of existing surface conditions are taken periodically in order to avoid falling below the minimum friction level specified by the State. When the friction of any portion of a runway is found to be below this value, then such information is promulgated in a NOTAM specifying which portion of the runway is below the minimum friction level and its location on the runway. A corrective maintenance action must be initiated without delay. Friction measurements are taken at time intervals that will ensure the identification of runways in need of maintenance or of special surface treatment before their condition becomes serious. The time intervals and mean frequency of measurements depend on factors such as: aircraft type and frequency of usage, climatic conditions, pavement type, and pavement service and maintenance requirements.

7.4 Friction measurements of existing, new or resurfaced runways are made with a continuous friction measuring device provided with a smooth tread tire. The device should use self-wetting features to allow measurements of the surface friction characteristics to be made at a water depth of 1 mm.

7.5 When it is suspected that the surface friction characteristics of a runway may be reduced because of poor drainage, owing to inadequate slopes or depressions, then an additional measurement is made, but this time under natural conditions representative of a local rain. This measurement differs from the previous one in that water depths in the poorly cleared areas are normally greater in a local rain condition. The measurement results are thus more apt to identify problem areas having low friction values that could induce aquaplaning than the previous test. If circumstances do not permit measurements to be conducted during natural conditions representative of a rain, then this condition may be simulated. (See section 8.)

7.6 When conducting friction tests using a self-wetting continuous friction measuring device, it is important to note that, unlike compacted snow and ice conditions, in which there is very limited variation of the friction coefficient with speed, a wet runway produces a drop in friction with an increase in speed. However, as the speed increases, the rate at which the friction is reduced becomes less. Among the factors affecting the friction coefficient between the tire and the runway surface, texture is particularly important. If the runway has a good macro-texture allowing the water to escape beneath the tire, then the

~~friction value will be less affected by speed. Conversely, a low macro-texture surface will produce a larger drop in friction with increase in speed.~~

~~7.7 Annex 14, Volume I, requires States to specify a minimum friction level below which corrective maintenance action should be taken. As criteria for surface friction characteristics of new or resurfaced runway surfaces and its maintenance planning, the State can establish a maintenance planning level below which appropriate corrective maintenance action should be initiated to improve the friction. The *Airport Services Manual* (Doc 9137), Part 2, provides guidance on establishing maintenance planning and minimum friction levels for runway surfaces in use.~~

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APPENDIX E

PROPOSED AMENDMENT TO

INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

METEOROLOGICAL SERVICE FOR INTERNATIONAL AIR NAVIGATION

ANNEX 3 TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

EIGHTEENTH EDITION — JULY 2013

NOTES ON THE PRESENTATION OF THE PROPOSED AMENDMENT TO ANNEX 3

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

APPENDIX 3. TECHNICAL SPECIFICATIONS RELATED TO METEOROLOGICAL OBSERVATIONS AND REPORTS

. . .

4. OBSERVING AND REPORTING OF METEOROLOGICAL ELEMENTS

. . .

4.8 Supplementary information

4.8.1 Reporting

. . .

4.8.1.5 **Recommendation.—** *In METAR and SPECI, ~~the following information should be included in the supplementary information, in accordance with regional air navigation agreement:~~*

~~*a)*~~ *information on sea-surface temperature, and the state of the sea or the significant wave height, from aeronautical meteorological stations established on offshore structures in support of helicopter operations~~; and~~ should be included in the supplementary information, in accordance with regional air navigation agreement.*

~~*b) information on the state of the runway provided by the appropriate airport authority.*~~

Note ~~1~~.— The state of the sea is specified in the ~~WMO Publication No. 306,~~ Manual on Codes *(WMO No. 306), Volume I.1, Part A —* Alphanumeric Codes, Code Table 3700.

~~*Note 2.— The state of the runway is specified in WMO Publication No. 306,* Manual on Codes, *Volume I.1, Part A — Alphanumeric Codes, Code Tables 0366, 0519, 0919 and 1079.*~~

Table A3-2. Template for METAR and SPECI

Key: M = inclusion mandatory, part of every message;
C = inclusion conditional, dependent on meteorological conditions or method of observation;
O = inclusion optional.

Note 1.— The ranges and resolutions for the numerical elements included in METAR and SPECI are shown in Table A3-5 of this appendix.

Note 2.— The explanations for the abbreviations can be found in the Procedures for Air Navigation Services — ICAO Abbreviations and Codes *(PANS-ABC, Doc 8400).*

Element as specified in Chapter 4	*Detailed content*	*Template(s)*	*Examples*
. . .			
Supplementary information (C)	Recent weather (C)[2, 9]	REFZDZ *or* REFZRA *or* REDZ *or* RE[SH]RA *or* RERASN *or* RE[SH]SN *or* RESG *or* RESHGR *or* RESHGS *or* REBLSN *or* RESS *or* REDS *or* RETSRA *or* RETSSN *or* RETSGR *or* RETSGS *or* RETS *or* REFC *or* REVA *or* REPL *or* REUP[12] *or* REFZUP[12] *or* RETSUP[12] *or* RESHUP[12]	REFZRA RETSRA
	Wind shear (C)[2]	WS Rnn[L] *or* WS Rnn[C] *or* WS Rnn[R] *or* WS ALL RWY	WS R03 WS ALL RWY WS R18C
	Sea-surface temperature and state of the sea or significant wave height (C)[15]	W[M]nn/Sn *or* W[M]nn/Hn[n][n]	W15/S2 W12/H75
	~~State of the runway (C)[16]~~ — ~~Runway designator (M)~~	~~R nn[L]/ *or* Rnn[C]/ *or* Rnn[R]/~~ R/SNOCLO	~~R99/421594~~ ~~R/SNOCLO~~ ~~R14L/CLRD//~~
	~~Runway deposits (M)~~	~~n *or* /~~ ~~CLRD//~~	
	~~Extent of runway contamination (M)~~	~~n *or* /~~	
	~~Depth of deposit (M)~~	~~nn *or* //~~	
	~~Friction coefficient or braking action (M)~~	~~nn *or* //~~	
Trend forecast (O)~~[17]~~[16] . . .	Change indicator (M)~~[18]~~[17]	NOSIG — BECMG *or* TEMPO	NOSIG BECMG FEW020

Notes.—

• • •

15. To be included in accordance with 4.8.1.5 ~~a)~~.
~~16. To be included in accordance with 4.8.1.5 b).~~
~~17~~16. To be included in accordance with Chapter 6, 6.3.2.
~~18~~17. Number of change indicators to be kept to a minimum in accordance with Appendix 5, 2.2.1, normally not exceeding three groups.

• • •

Table A3-5. Ranges and resolutions for the numerical elements included in METAR and SPECI

Element as specified in Chapter 4			*Range*	*Resolution*
. . .				
~~State of the runway~~	~~Runway designator:~~	~~(no units)~~	~~01 – 36; 88; 99~~	~~1~~
	~~Runway deposits:~~	~~(no units)~~	~~0 – 9~~	~~1~~
	~~Extent of runway contamination:~~	~~(no units)~~	~~1; 2; 5; 9~~	~~—~~
	~~Depth of deposit:~~	~~(no units)~~	~~00 – 90; 92 – 99~~	~~1~~
	~~Friction coefficient/braking action:~~	~~(no units)~~	~~00 – 95; 99~~	~~1~~
. . .				

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AERODROMES PANEL (AP)

THIRD MEETING

Montréal, 7 to 11 April 2014

AGENDA ITEM 5

The attached constitutes the report on Agenda Item 5 and should be inserted at the appropriate place in the yellow folder.

Agenda Item 5: Heliport design

5.1 INTRODUCTION

5.1.1 The meeting reviewed several papers from the Heliport Design Working Group (HDWG) on topics which it had been requested to study. It noted that the HDWG had held three meetings (HDWG/06 to HDWG/08) to progress its work.

5.2 MAINTENANCE OF ANNEX 14, VOLUME II

5.2.1 It was noted that Annex 14 — *Aerodromes*, Volume II — *Heliports* defines terms that are used in the particular context of Volume II. The terms contained in both Volumes I and II are only defined in Volume I. To respect this rule, the proposal was to remove duplicate definitions from Chapter 1 of Annex 14, Volume II. Only two important definitions, i.e., heliport and obstacles, were kept and identified as such.

5.2.2 The meeting agreed to the amendment proposal. The proposed amendment is shown in Appendix A to the report of this agenda item.

5.3 HELIPORT EMERGENCY RESPONSE

5.3.1 The HDWG and RFFWG had reviewed the current SARPs as set out in Annex 14, Vol. II. Chapter 6 was last amended in 1995 and contains many provisions which do not represent state of the art technology and today's best practices. Also, the structure of the Chapter is not in line with the rest of Volume II and with the corresponding Chapter 9 of Annex 14 Volume I. Consequently a rather comprehensive set of changes is presented affecting the entire Chapter 6. The most important changes are the introduction of a new Chapter 6.1 for *Heliport Emergency Planning*, new sections in Chapter 6.2 for *Application*, *Communication and Alerting system*, *Personne*l and *Means of Escape*. Further changes include a recalculation of the amount of water for foam production and the establishment of Fixed Foam Application System as a generic term for automated or semi-automated fire-fighting systems. The proposal includes an alignment with those SARPs of Annex 14 Volume I which also apply to heliports.

5.3.2 The rapporteur reminded the group that the existing response times were kept in the proposal and, as mentioned in 2.2 of the paper, that the HDWG would like to see two new definitions to be introduced in Annex 14 in the future (*application rate* and *discharge rate*).

5.3.3 The meeting reviewed the amendments to Annex 14, Volume II, being proposed and the following points were discussed:

a) the last sentence of the definition of Fixed Foam Application System became a note;

b) the title of chapter 6.1 was aligned with Annex 14 Volume I;

c) the content of 6.1.3 and 6.1.5 has been amended to be less prescriptive and similar to the specifications in Annex 14 Volume I chapter 9;

d) "*immediate vicinity*" and "*surroundings*" are used in various places of Annex 14, Volumes I and II. The definition of "*immediate vicinity*" is only in guidance material for Annex 14 Volume I. The meeting agreed that future work should address this issue, notably because the understanding of the immediate vicinity of an heliport may differ from a fixed-wing aeroplane aerodrome's one;

e) the standard 6.2.14 about FFAS seems too prescriptive to apply on all heliports and a new wording was proposed to limit its applicability;

f) the rationale will provide some information about the cost impact.

5.3.4 With the above modifications, the meeting agreed to the amendment proposal. The proposed amendment is shown in Appendix B to the report of this agenda item.

5.4 OFFSHORE AND FRANGIBILITY SARPS FOR ANNEX 14, VOLUME II

5.4.1 This paper presents a proposed minor amendment to 4 sections in the offshore portion of Chapters 3 and 5 of Annex 14, Volume II. The HDWG offshore subgroup identified some terminology and philosophies concerning frangibility at helidecks that are carried over from fixed-wing operations that are not applicable and cannot be substantiated. Additionally, one minor amendment is proposed that addresses touchdown marking dimensions at smaller helideck locations. The issue of frangibility applicability at on-shore surface and elevated/roof-top heliports will be addressed in future amendments to chapter 3.

5.4.2 The meeting agreed to the amendment proposal, with minor modifications. The words "*as low as possible"* were added to paragraphs 3.3.12 and 3.4.14 and the group decided to revisit the issue of frangibility in future work.

5.4.3 The proposed amendment is shown in Appendix C to the report of this agenda item.

5.5 RECOMMENDATION

In the light of the above discussion, the following recommendation was developed:

RSPP Recommendation 5/1 – Amendment to Annex 14, Volume II: Heliport design

That Annex 14 Volume II be amended as shown in the Appendices A through C to the report of this agenda item.

APPENDIX A

PROPOSED AMENDMENT TO

INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

AERODROMES

ANNEX 14

TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

VOLUME II (HELIPORTS)

NOTES ON THE PRESENTATION OF THE PROPOSED AMENDMENT TO ANNEX 14, VOLUME II

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

. . .

1.1 Definitions

Annex 14, Volume I, contains definitions for those terms which are used in both volumes. When the following terms are used in this volume, they have the same meanings as in Annex 14, Volume I.

Heliport. An aerodrome or a defined area on a structure intended to be used wholly or in part for the arrival, departure and surface movement of helicopters.

Obstacle. All fixed (whether temporary or permanent) and mobile objects, or parts thereof, that:

a) are located on an area intended for the surface movement of aircraft; or

b) extend above a defined surface intended to protect aircraft in flight; or

c) stand outside those defined surfaces and that have been assessed as being a hazard to air navigation.

Rationale:

Two definitions need to be kept in Annex 14,Volume II for easy reference even though they are already defined in Annex 14, Volume I.

An introductory note details the redundancy between the two volumes.

When the following terms are used in this volume, they have the meanings given below. ~~Annex 14, Volume I, contains definitions for those terms which are used in both volumes.~~

~~***Accuracy.*** A degree of conformance between the estimated or measured value and the true value.~~

~~*Note. — For measured positional data, the accuracy is normally expressed in terms of a distance from a stated position within which there is a defined confidence of the true position falling.*~~

~~***Calendar.*** Discrete temporal reference system that provides the basis for defining temporal position to a resolution of one day (ISO 19108*).~~

~~***Cyclic redundancy check (CRC).*** A mathematical algorithm applied to the digital expression of data that provides a level of assurance against loss or alteration of data.~~

. . .

~~***Data quality.*** A degree or level of confidence that the data provided meet the requirements of the data user in terms of accuracy, resolution and integrity.~~

~~* ISO Standard 19108, Geographic information — Temporal schema~~

Datum. Any quantity or set of quantities that may serve as a reference or basis for the calculation of other quantities (ISO 19104**).

. . .

Ellipsoid height (Geodetic height). The height related to the reference ellipsoid, measured along the ellipsoidal outer normal through the point in question.

. . .

Geodetic datum. A minimum set of parameters required to define location and orientation of the local reference system with respect to the global reference system/frame.

Geoid. The equipotential surface in the gravity field of the Earth which coincides with the undisturbed mean sea level (MSL) extended continuously through the continents.

Note. — The geoid is irregular in shape because of local gravitational disturbances (wind tides, salinity, current, etc.) and the direction of gravity is perpendicular to the geoid at every point.

Geoid undulation. The distance of the geoid above (positive) or below (negative) the mathematical reference ellipsoid.

Note. — In respect to the World Geodetic System — 1984 (WGS-84) defined ellipsoid, the difference between the WGS-84 ellipsoidal height and orthometric height represents WGS-84 geoid undulation.

Gregorian calendar. Calendar in general use; first introduced in 1582 to define a year that more closely approximates the tropical year than the Julian calendar (ISO 19108***).

Note. — In the Gregorian calendar, common years have 365 days and leap years 366 days divided into twelve sequential months.

. . .

Heliport. An aerodrome or a defined area on a structure intended to be used wholly or in part for the arrival, departure and surface movement of helicopters.

. . .

Integrity (aeronautical data). A degree of assurance that an aeronautical data and its value has not been lost nor altered since the data origination or authorized amendment.

Integrity classification (aeronautical data). Classification based upon the potential risk resulting from the use of corrupted data. Aeronautical data is classified as:

** ISO Standard 19104, Geographic information — Terminology

*** ISO Standard 19108, Geographic information — Temporal schema

~~a) routine data: there is a very low probability when using corrupted routine data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe;~~

~~b) essential data: there is a low probability when using corrupted essential data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe; and~~

~~c) critical data: there is a high probability when using corrupted critical data that the continued safe flight and landing of an aircraft would be severely at risk with the potential for catastrophe.~~

~~***Obstacle.*** All fixed (whether temporary or permanent) and mobile objects, or parts thereof, that:~~

~~a) are located on an area intended for the surface movement of aircraft; or~~

~~b) extend above a defined surface intended to protect aircraft in flight; or~~

~~c) stand outside those defined surfaces and that have been assessed as being a hazard to air navigation.~~

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

. . .

~~***Station declination.*** An alignment variation between the zero degree radial of a VOR and true north, determined at the time the VOR station is calibrated.~~

. . .

Rationale:

All other duplicated definitions can be safely deleted.

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APPENDIX B

PROPOSED AMENDMENT TO

INTERNATIONAL STANDARDS AND RECOMMENDED PRACTICES

AERODROMES

ANNEX 14

TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

VOLUME II (HELIPORTS)

NOTES ON THE PRESENTATION OF THE PROPOSED AMENDMENT TO ANNEX 14, VOLUME II

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
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Origin

RFFWG 6-DP/4:	Passive fire protection and technology for heliports
RFFWG 6-DP/8:	H1-H4 Categories for elevated heliports
RFFWG 7-DP/10:	Heliport Emergency Plans
RFFWG 7-DP/12:	Comparison between provisions of Annex 14 Vol. I and Annex 14 Vol. II
RFFWG 8-DP/09:	Technical Standards for inclusion into Annex 14, Vol. II
HDWG 6-DP/04:	Alignment of provisions of Annex 14 Vol. I Chapter 9 and Vol. II Chapter 6
RFFWG 11-DP/11:	Review of SARPs in Annex 14 Vol. II Chapter 6

Rationale

Chapter 6 was last amended in 1995 and contains many provisions which do not represent state of the art technology and today's best practices. Also, the structure of the Chapter is not in line with the rest of Volume II and with the corresponding Chapter 9 of Annex 14 Volume I. Consequently a rather comprehensive set of changes is presented affecting the entire Chapter 6.

CHAPTER 1. GENERAL

1.1 Definitions

Helicopter fuselage length. Length between the nose of the helicopter and the end of the tail boom.

Helicopter fuselage width. Largest overall width of the occupied portion of the helicopter excluding the undercarriage.

Fixed Foam Application System (FFAS). A fixed system installed on a heliport for the automatic or semi-automatic distribution of extinguishing agent for the purpose of maximizing fire knock down while protecting personnel to optimize the escape of people aboard an impaired helicopter.

Note.— FFAS may include, but not be necessarily limited to, foam monitor systems, deck integrated fire fighting systems and ring-main systems.

Rationale

The critical area calculation is based on the length and width of the fuselage which requires definition of those terms. The Fixed Foam Application System (FFAS) is introduced as a generic term for automatic or semi-automatic fire fighting systems requiring its definition.

CHAPTER 6. HELIPORT ~~SERVICES~~ EMERGENCY RESPONSE

6.1 Heliport Emergency Planning

Heliport emergency planning is the process of preparing a heliport to cope with an emergency that takes place at the heliport or in its vicinity. Examples of emergencies are helicopter emergencies such as crashes on or off the heliport, medical emergencies, dangerous goods occurrences, fires and natural disasters.

The purpose of heliport emergency planning is to minimize the impact of an emergency by saving lives and maintaining helicopter operations.

The heliport emergency plan sets out the procedures for co-ordinating the response of heliport agencies or services (air traffic services unit, fire fighting services, heliport administration, medical and ambulance services, aircraft operators, security services, and police) and the response of agencies in the surrounding community (fire departments, police, medical and ambulance services, hospitals, military, and harbour patrol or coast guard) that could be of assistance in responding to the emergency.

6.1.1 A heliport emergency plan shall be established at a heliport commensurate with the helicopter operations and other activities conducted at the heliport.

6.1.2 The plan shall identify agencies which, could be of assistance in responding to an emergency at the heliport or in its vicinity.

6.1.3 ***Recommendation.—*** *The heliport emergency plan should provide for the coordination of the actions to be taken in an emergency occurring at a heliport or in its vicinity.*

Note.— Examples of emergencies are: helicopter crash within and outside the heliport perimeter; and medical emergencies.

6.1.4 **Recommendation.—** *Where an approach/departure path at a heliport is located over water, the plan should identify which agency is responsible for co-ordinating rescue in the event of a helicopter ditching and indicate how to contact that agency.*

6.1.5 **Recommendation.—** *The plan should include, at a minimum, the following information:*

a) the types of emergencies planned for;

b) how to initiate the plan for each emergency specified;

c) the name of agencies on and off the heliport to contact for each type of emergency with telephone numbers or other contact information;

d) the role of each agency for each type of emergency;

e) a list of pertinent on-heliport services available with telephone numbers or other contact information;

f) copies of any written agreements with other agencies for mutual aid and the provision of emergency services; and

g) a grid map of the heliport and its immediate vicinity.

6.1.6 **Recommendation.—** *All agencies identified in the plan should be consulted about their role in the plan.*

6.1.7 **Recommendation.—** *The plan should be reviewed and the information in it updated yearly.*

6.1.8 **Recommendation.—** *A test of the emergency plan should be carried out at least once every 3 years at a heliport that provides a scheduled service for the transport of passengers.*

Rationale

Based on discussions held during RFFWGs, a consensus was reached that the Emergency planning provisions incorporated in the *Annex 14 Volume I Chapter 9.1* were too prohibitive for Heliports. There was agreement that *Annex 14 Volume II* should contain a section about Emergency Response Planning which addresses the special needs of the heliport world. Therefore, this proposal presents a high level approach to implement SARPs for Heliport Emergency Response Planning which follows the basic principal of the provisions in Annex 14 Volume I Chapter 9.1 while being not overly prescriptive and detailed.

A Heliport Emergency Response Plan is an important tool especially for the heliport operator to define the required tasks to successfully cope with a helicopter emergency and to improve the chances to save lives in such an event.

6.~~1~~2 Rescue and fire fighting

General

Introductory Note.— ~~These specifications apply to surface-level heliports and elevated heliports only. The specifications complement those in Annex 14, Volume I, 9.2, concerning rescue and fire fighting requirements at aerodromes.~~ Helidecks are included in the definition of heliports for the purpose of this Chapter.

The principal objective of a rescue and fire fighting ~~service~~ response is to save lives. For this reason, the provision of means of dealing with a helicopter accident or incident occurring at or in the immediate vicinity of a heliport assumes primary importance because it is within this area that there are the greatest opportunities for saving lives. This must assume at all times the possibility of, and need for, extinguishing a fire which may occur either immediately following a helicopter accident or incident or at any time during rescue operations.

The most important factors bearing on effective rescue in a survivable helicopter accident are the ~~training received, the effectiveness of the equipment and the speed with which personnel and equipment designated for rescue and fire fighting purposes can be put into use~~ speed of initiating a response and the effectiveness of that response.

~~For an elevated heliport,~~ ~~r~~ Requirements to protect any building, fuel storage or structure on which the heliport is located are not taken into account. On elevated heliports and helidecks, the effect that fire may have on the structural integrity of the platform or its supporting structure is not taken into account in this document.

~~Rescue and fire fighting requirements for helidecks shipboard heliports may be found are available in the~~ ~~Heliport Manual *(Doc 9261).*~~

Where a heliport is located close to water/swampy areas, or difficult terrain, and/or where a significant portion of approach or departure operations takes place over these areas, an assessment may need to be carried out to determine if specialist rescue services and fire fighting equipment appropriate to the hazard and risk should be made available.

Further guidance is available in the Airport Services Manual *(Doc 9137), Part 1 and the* Heliport Manual *(Doc 9261).*

Rationale

The revised *Introductory Note* clarifies that helidecks are included for the purpose of this chapter. The content of the second paragraph is now part of the *Application Section*.

Paragraph 3 states the importance of the speed of initiating a response and the effectiveness of that response.

Paragraph 4 clarifies that the effect fire may have on the structural integrity of the platform or its supporting structure is not taken into account. These issues are in many states outside the jurisdiction of aviation authorities and are incumbent on building codes.

Paragraph 6 addresses emergency response in difficult environments. In principal the content equals *Standard 9.2.2* of *Annex 14 Volume I.* However this aerodrome standard would be by far too prescriptive

for heliports. With the note the issue is clearly pointed out to the state which may decide to take further action for the heliports falling into that category on a case by case basis.

Application

6.2.1 Except for unattended heliports, a rescue and fire fighting response shall be provided for surface level heliports, elevated heliports and helidecks.

Note 1. — For areas for the exclusive use of helicopters at an aerodrome primarily meant for the use of aeroplanes distribution of extinguishing agents, response time, rescue equipment and personnel has not been considered; see Annex 14, Volume I, Chapter 9. Rescue and fire fighting requirements for shipboard heliports are addressed in the Heliport Manual *(Doc 9261).*

Note 2.— A response can be provided by personnel with suitable equipment and/or by a Fixed Foam Application System (FFAS) or a combination of these. A FFAS may include automatic detection of a fire.

6.2.1A ***Recommendation****.— At unattended heliports, a risk assessment should be performed to determine the appropriate rescue and fire fighting response.*

Rationale

An application section was missing. This gap of Chapter 6 needed to be closed in order to stay in line with Annex 14 Volume I Chapter 9.2. The former application paragraph within the *Introductory Note* is now part of this section.

The section indicates that a rescue and fire fighting response shall be provided at all heliports. Exemptions are pointed out.

Note 1 addresses the issue of heliport facilities on fixed wing aerodromes. Those facilities are covered by Annex 14 Volume I Chapter 9.

Note 2 illustrates how a response can be provided.

Level of protection to be provided

6.~~1.1~~2.2 **Recommendation.—** *Except for helidecks, the level of protection to be provided for ~~rescue and~~ fire fighting should be based on ~~the overall length of the longest helicopter normally using the heliport~~ a critical area calculation that is a combination of the largest fuselage length and fuselage width of the design helicopter and in accordance with the heliport fire fighting category determined from Table 6-1~~, except at an unattended heliport with a low movement rate~~.*

~~Note. — Guidance to assist the appropriate authority in providing rescue and fire fighting equipment and services at surface-level and elevated heliports is given in the~~ Heliport Manual *~~(Doc 9261).~~*

Table 6-1. Heliport fire fighting category

Category	~~Helicopter overall length*~~ Fuselage length	Maximum fuselage width
(1)	(2)	(3)
H0	up to but not including 8 m	1.5 m
H1	~~up to but not including 15 m~~ from 8 m up to but not including 12 m	2 m
H2	from ~~15~~ 12 m up to but not including ~~24~~ 16 m	2.5 m
H3	from ~~24~~ 16 m up to ~~but not including~~ 20 m	3 m

~~* Helicopter length, including the tail boom and the rotors~~

To determine the appropriate Heliport fire fighting category in column 1, the higher category of fuselage length in column 2 or fuselage width in column 3, where different, should be applied.

Note .— For helicopters which exceed one or both of the dimensions for a category H3 heliport it will be necessary to recalculate the level of protection using a critical area calculation based on the actual fuselage length and the actual fuselage width of the helicopter.

6.2.3 **Recommendation.—** *The level of protection to be provided for a fire-fighting response for helidecks should be based on the diameter of the largest circle which can be accommodated within the boundary of the TLOF.*

6.~~1.2~~2.4 **Recommendation.—** *During anticipated periods of operations by smaller helicopters, the heliport fire fighting category may be reduced to that of the highest category of helicopter ~~planned to use~~ using the heliport during that time.*

Rationale

This section sets out that the heliport category will be based on the length and width of the fuselage rather than the overall length of the helicopter (D-value). The critical area calculation for all heliports except for helidecks was always based on fuselage length and width. The D-value has only been used to categorise heliports. Because information on fuselage length and width is as readily available as the D-value it was felt more appropriate to align the concepts for categorisation facilities in Annex 14 Volume I and Volume II.

The critical area calculation for helidecks is related to the largest circle which can be accommodated within the boundary of the TLOF. This concept is linked to the provisions of the Code for Mobile Offshore Drilling Units (Modu-Code) of the International Maritime Organisation (IMO) taking into account the fact that usually no outside assistance can be provided. This approach to the critical area concept is already endorsed in the current Heliport Manual (doc 9261).

Extinguishing agents

~~6.1.3~~ 6.2.5 **Recommendation.—** *The principal extinguishing agent should be:*

a) a foam meeting the minimum performance level B~~.~~; or

b) a foam meeting the minimum performance level C.

Note.— Information on the required physical properties and fire extinguishing performance criteria needed for a foam to achieve an acceptable performance level B or C rating is given in the Airport Services Manual *(Doc 9137) Part 1.*

6.2.6 **Recommendation.—** *The complementary extinguishing agent should be a dry chemical powder suitable for extinguishing hydrocarbon fires. Dry chemical powders should only be substituted with an agent that has equivalent or better fire fighting capabilities. The discharge rate of complementary agents should be selected for optimum effectiveness of the agent used.*

Note .— When selecting dry chemical powders for use with foam, care needs to be exercised to ensure compatibility.

6.2.7 Complementary agents shall comply with the appropriate specifications of the International Organization for Standardization (ISO).

6.2.8 **Recommendation.—** *For helidecks complementary agents of a total capacity of not less than 45 kg if the D value is less than 16 m and 90 kg if the D value is 16 m or greater should be provided.*

6.2.9 **Recommendation.—** *For surface level and elevated heliports gaseous means of a total capacity of not less than 9 kg and for helidecks of a total capacity of not less than18 kg should be provided.*

Note.— Gaseous means may be preferred for small helicopter fires in areas where use of the principal extinguishing agent or complementary agents would cause unnecessary damage, e.g., in the avionics compartment or engine bay.

Rationale

The new performance Level C fire fighting foam is introduced and all foams, whether Level B or C, must comply with ISO standards (changes in accordance to a similar amendment in Annex 14 Volume I).

6.2.6 and 6.2.7 are also part of Annex 14 Volume I and equally apply to heliports.

6.2.8 clarifies the amount of complementary agent necessary for helidecks because those facilities are not part of Table 6-3 which regulates the amount of complementary agent for elevated heliports. For helidecks with a D-value of less than 16 m 45 kg of complementary agent is required (equal to elevated heliport category H 2) and 90 kg for helidecks with a D-value of 16 m or more (equal to elevated heliport category H 3).

6.2.9: A requirement for "gaseous means" has been added in order to account for specific fire scenarios of helicopters.

6.2.10 **Recommendation.—** *The amounts of water for foam production should be calculated for the critical area for a duration of at least 2 min for surface level heliports and at least 5 min for elevated heliports and helidecks.*

~~6.1.4~~ 6.2.11 **Recommendation.—** *Except for helidecks, the ~~amounts of water for foam production and the complementary agents to be provided~~ requirements for fire fighting agents should be in accordance with the heliport fire fighting category determined under 6.1.~~1~~2 and Table 6-2 or Table 6-3 as appropriate.*

Note 1.— The amounts of water specified for elevated heliports, and for helidecks, do not have to be stored on or adjacent to the heliport if there is a suitable adjacent pressurized water main system capable of sustaining the required discharge rate.

Note 2.— The amounts of water specified for foam production are predicated on an application rate of 5.5 L/min/m^2 for a foam meeting performance level B and 3.75 L/min/m^2 for a foam meeting performance Level C.

Table 6-2. Minimum usable amounts of extinguishing agents for surface-level heliports

	Foam meeting performance level B		Foam meeting performance level C		Complementary agents				
Category	Water (L)	Discharge rate foam solution/minute (L)	Water (L)	Discharge rate foam solution/minute (L)	Dry chemical powder (kg)	~~or~~	~~Halons (kg)~~	~~or~~	~~CO_2 (kg)~~
(1)	(2)	(3)	(4)	(5)	(~~4~~6)		~~(5)~~		~~(6)~~
H 0	500	250	330	165	23				
H 1	~~500~~ 800	~~250~~ 400	540	270	23		~~23~~		~~45~~
H 2	~~1 000~~ 1 200	~~500~~ 600	800	400	45		~~45~~		~~90~~
H 3	1 600	800	1 100	550	90		~~90~~		~~180~~

Table 6-3. Minimum usable amounts of extinguishing agents for elevated heliports

	Foam meeting performance level B		Foam meeting performance level C		Complementary agents				
Category	Water (L)	Discharge rate foam solution/minute (L)	Water (L)	Discharge rate foam solution/minute (L)	Dry chemical powder (kg)	~~or~~	~~Halons (kg)~~	~~or~~	~~CO_2 (kg)~~
(1)	(2)	(3)	(4)	(5)	(~~4~~6)		~~(5)~~		~~(6)~~
H 0	1 250	250	825	165	23				
H 1	~~2500~~ 2 000	~~250~~ 400	1 350	270	~~23~~ 45		~~23~~		~~45~~
H 2	~~5000~~ 3 000	~~500~~ 600	2 000	400	45		~~45~~		~~90~~
H 3	4 000	800	2 750	550	90		~~90~~		~~180~~

Note — The amount of water for foam production for elevated heliports is based on a 5 minute application by use of Fixed Foam Application Systems (FFAS) that are demonstrated to provide a rapid fire knock down capability. If fire fighting systems are selected which do not provide a distribution of foam that is at-least equivalent to an automatic or semi-automatic delivery through an FFAS, the discharge duration of the alternative system may need to be increased accordingly.

Rationale

6.2.10 is introduced to clearly indicate the duration of application. So far these figures could be calculated indirectly out of Table 6-2 and 6-3.

Tables 6-2 and 6-3:
While the concept of calculation of the critical area which is stated in the current Heliport Manual remains unchanged the calculation is now based on the biggest helicopter in each category and not the average mean. This leads to an increase of the amount of water to be provided on surface level heliports.

For elevated heliports the same approach is used. The duration of application from former 10 minutes to now 5 minutes is suggested for the following reasons:

1. FFAS systems have proven to provide rapid fire knock down usually in a time frame of less than 2 minutes. Thus, a 10 minute application seems to be overly conservative. E.g. for an H 1 elevated heliport with level B foam 4000 L of media would be needed under a 10 minute duration of application which puts it slightly above aerodrome category 4 (Annex 14 Volume I). This huge amount of media would increase costs for elevated heliports not only for the provision of media but also for storage (environmental rules) of the applied media. At some facilities it may not even be possible to integrate such a system (building limitations especially at existing facilities/hospitals). Also acceptance of such fire fighting systems may suffer from these unnecessary requirements that would contradict the effort to endorse the use of FFAS.
2. For helidecks the time frame was always 5 minutes so the SARPs for helidecks and elevated heliports coincide now.
3. The calculation is based on the biggest helicopter in each category not the average mean which is a rather conservative approach.

In order to address systems with less capabilities than the ones of a FFAS an explanatory note has been added.
Halon and CO_2 are deleted as complementary agents in correspondence to Vol. I. Chapter 9.

~~6.1.5 **Recommendation.** — *At a surface-level heliport it is permissible to replace all or part of the amount of water for foam production by complementary agents.*~~

~~6.1.6 **Recommendation.** — *The discharge rate of the foam solution should not be less than the rates shown in with the heliport fire fighting category determined under Table 6-2 or Table 6-3 as appropriate. The discharge rate of complementary agents should be selected for optimum effectiveness of the agent used.*~~

~~6.1.7~~ 6.2.12 ~~**Recommendation.** —~~ At ~~an elevated~~ heliports, at least one hose spray line capable of delivering foam in a jet spray pattern ~~at~~ in the range of 225 L/min to 250 L/min ~~should~~ shall be provided. ~~Additionally at elevated heliports in categories 2 and 3, at least two monitors should be provided each having a capability of achieving the required discharge rate and positioned at different locations around the heliports so as to ensure the application of foam to any part of the heliport under any weather condition and to minimize the possibility of both monitors being impaired by a helicopter accident.~~

Note — On elevated heliports and helidecks hose lines are preferably located at access points.

6.2.13 **Recommendation**. — *At a helideck with a D value of greater than 16.0 m, a second hose spray line capable of delivering foam in a jet spray pattern in the range of 225 L/min to 250 L/min should be provided.*

6.2.14 At elevated heliports and at helidecks first put into service on or after 1 January 2019, a Fixed Foam Application System (FFAS) shall be provided having a capability of achieving at least the required discharge rate and duration.

6.2.15 **Recommendation**. — *The FFAS installed should be capable of delivering foam solution to all parts of the heliport.*

Note. — Guidance on FFAS, e.g. foam monitors or deck integrated fire-fighting systems or ring-main systems, as well as for passive fire-retarding systems is given in the Heliport Manual *(Doc 9261).*

6.2.15A ***Recommendation****: At elevated heliports and at helidecks first put into service prior to 1 January 2019 and where practical, a Fixed Foam Application System (FFAS) should be provided having a capability of achieving at least the required discharge rate and duration.*

Rationale

6.1.5: While Standard 9.2.11 of Annex 14 Vol. I allows to replace the amount of water for foam production by use of complementary agents, the provision has been deleted from Chapter 6 of Annex 14 Vol. II. The amounts of complementary agents required are usually impractical for heliports and nearly impossible to handle by the limited personnel available. Because of the unique characteristics of heliport operations safety concerns are connected to this provision making it impossible to retain.

A new term for Fixed Foam Application System (FFAS) is introduced to cover foam monitors, deck integrated fire-fighting or ring-main systems as a standard for elevated heliports and helidecks. Because of the risk associated with fires on elevated heliports and helidecks especially for third parties this standard is without alternative as accidents have shown.

It is recommended that the principal media on an elevated heliport or a helideck is capable of delivering foam solution to all parts of the heliport or helideck.

The requirement – standard instead of recommendation – is for one hose spray line for surface level heliports, elevated heliports and helidecks. At larger helidecks, a second hose spray line is recommended in order to deal with large helicopters which may carry a substantial number of passengers in an environment which usually prohibits external support.

Cost impact for FFAS

The market for FFAS is diverse as is the complexity of the different systems. Costs will also depend on the size of the heliport and the expected size of helicopters to use that facility. For elevated heliports in Category H 2 or higher, a FFAS (namely a dual foam monitor system) were always required. A cost impact analysis should therefore be limited to Heliports in Category H 1 or lower. A ring main system as one potential FFAS could be considered as an inexpensive system while a dual foam monitor system would be more costly. A Deck Integrated Fire Fighting System is usually regarded as more expensive than other systems but, in association with a passive retarding deck, the fire fighting response is most effective. The higher cost for a FFAS compared to a hose spray line may be compensated because the amount of personnel could be reduced. Usually the handling of a hose line requires 2-3 personnel. Automated or semi-automated systems require usually only one person to conduct the rescue operation.

On unattended facilities a fully automated system could be considered limiting expenses for personnel. Due to the fact that operating a FFAS is usually much simpler than operating a hose line, a reduced effort in training the RFF personnel could be expected. The higher safety standard could also reduce liability in case of an emergency.

Rescue ~~equipment~~ arrangements

~~6.1.8~~ 6.2.16 **Recommendation.—** ~~*At an elevated heliport rescue equipment should be stored adjacent to the heliport.*~~ *Rescue arrangements commensurate with the overall risk of the helicopter operation should be provided at the heliport.*

Note.— Guidance on the rescue arrangements e.g. options for rescue and for equipment to be provided at a heliport is given in the Heliport Manual *(Doc 9261).*

Response time

~~6.1.9~~ 6.2.17 **Recommendation.—** *At a surface-level heliport, the operational objective of the rescue and fire fighting ~~service~~ response should be to achieve response times not exceeding two minutes in optimum conditions of visibility and surface conditions.*

Note 1.— Response time is considered to be the time between the initial call to the rescue and fire fighting service and the time when the first responding vehicle(s) (the service) is (are) in position to apply foam at a rate of at least 50 per cent of the discharge rate specified in Table 6-2.

Note 2.—For surface level heliports, especially those with a runway type FATO, a suitable vehicle may need to be considered to meet the response time objective.

~~6.1.10~~ 6.2.18 **Recommendation.—** *At ~~an~~ elevated heliports/helidecks, the ~~rescue and~~ fire fighting ~~service~~ response should be immediately available on or in the vicinity of the heliport/helideck while helicopter movements are taking place.*

6.2.19 Foam delivery at the minimum application rate shall start within 15 seconds of FFAS activation.

Communication and alerting system

6.2.20 **Recommendation.—** *A suitable alerting and/or communication system should be provided in accordance with the emergency plan.*

Personnel

Note.—The provision of rescue and fire fighting personnel may be determined by a task resource analysis. Guidance is given in the Heliport Manual *(Doc 9261).*

6.2.21 When provided the number of rescue and fire fighting personnel shall be sufficient for the required task.

6.2.22 When provided rescue and fire fighting personnel shall be trained to perform their duties and maintain their competence.

6.2.23 Rescue and fire fighting personnel shall be provided with protective equipment.

Means of escape

6.2.24 Elevated heliports and a helidecks shall be provided with a main access and an alternative means of escape.

6.2.25 **Recommendation**.— *Access points should be located as far apart from each other as is practicable.*

Note .— Providing alternative means of escape is necessary for evacuation and for access of rescue and fire fighting personnel. The size of an emergency egress route may require considerations of the amount of passengers and of special operations like Helicopter Emergency Medical Service (HEMS) which may require passengers to be carried on a stretcher.

Rationale

The term *Rescue Arrangements* has been introduced in order to allow for a more generic approach which is more suitable to the various types of heliports and helidecks. Options will be provided in the *Heliport Design Manual*.

6.2.19 gives a definition when the minimum application shall be achieved in order to standardise systems and to meet the safety objective.

Sections for Communication and alerting and Personnel are introduced for the first time in accordance with Annex 14 Volume I but with consideration of the specific situation of heliports.

6.2.24 and 6.2.25 closes a gap within Chapter 6. The Code for Mobile Offshore Drilling Units (Modu-Code) of the International Maritime Organisation (IMO) already contains provisions for emergency egress routes on helidecks. Because of the limited space on elevated heliports the introduction of a standard for this facility is inevitable. In case of an accident the helicopter may block the primary access point so a second escape route is necessary. The escape route also serves as an access point for rescue and fire fighting personnel. Accidents on rooftop heliports have shown that the provision of a second access point on helidecks and elevated heliports is without alternative and is one of the most important factors to save lives.

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APPENDIX C

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CHAPTER 3. PHYSICAL CHARACTERISTICS

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3.3 Helidecks

Note.— The following specifications are for helidecks located on structures engaged in such activities as mineral exploitation, research or construction. See 3.4 for shipboard heliport provisions.

Final approach and take-off areas and touchdown and lift-off areas

Note 1.— For helidecks that have a 1 D or larger FATO it is presumed that the FATO and the TLOF will always occupy the same space and have the same load bearing characteristics so as to be coincidental. For helidecks that are less than 1 D, the reduction in size is only applied to the TLOF which is a load bearing area. In this case, the FATO remains at 1 D but the portion extending beyond the TLOF perimeter need not be load bearing for helicopters. The TLOF and the FATO may be assumed to be collocated.

Note 2.— Guidance on the effects of airflow direction and turbulence, prevailing wind velocity and high temperatures from gas turbine exhausts or flare-radiated heat on the location of the FATO is given in the Heliport Manual *(Doc 9261).*

Note 3.— Guidance on the design and markings for Helideck Parking Areas is given in the Heliport Manual *(Doc 9261).*

3.3.1 The specifications in paragraphs 3.3.14 and 3.3.15 shall be applicable for helidecks completed on or after 1 January 2012.

3.3.2 A helideck shall be provided with one FATO and one coincident or collocated TLOF.

3.3.3 A FATO may be any shape but shall be of sufficient size to contain an area within which can be accommodated a circle of diameter of not less than 1 D of the largest helicopter the helideck is intended to serve.

3.3.4 A TLOF may be any shape but shall be of sufficient size to contain:

a) for helicopters with an MTOM of more than 3 175 kg, an area within which can be accommodated a circle of diameter not less than 1 D of the largest helicopter the helideck is intended to serve; and

b) for helicopters with an MTOM of 3 175 kg or less, an area within which can be accommodated a circle of diameter not less than 0.83 D of the largest helicopter the helideck is intended to serve.

3.3.5 **Recommendation.—** *For helicopters with a MTOM of 3175 kg or less, the TLOF should be of sufficient size to contain an area within which can be accommodated a circle of diameter of not less than 1 D of the largest helicopter the helideck is intended to serve.*

3.3.6 A helideck shall be arranged to ensure that a sufficient and unobstructed air-gap is provided which encompasses the full dimensions of the FATO.

Note.— Specific guidance on the characteristics of an air-gap is given in the Heliport Manual *(Doc 9261). As a general rule, except for shallow superstructures of three stories or less, a sufficient air-gap will be at least 3 m.*

3.3.7 **Recommendation.—** *The FATO should be located so as to avoid, as far as is practicable, the influence of environmental effects, including turbulence, over the FATO, which could have an adverse impact on helicopter operations.*

3.3.8 The TLOF shall be dynamic load-bearing.

3.3.9 The TLOF shall provide ground effect.

3.3.10 No fixed object shall be permitted around the edge of the TLOF except for frangible objects, which, because of their function, must be located thereon.

3.3.11 For any TLOF 1D or greater and any TLOF designed for use by helicopters having a D-value of greater than 16.0 m, objects installed in the obstacle-free sector whose function requires them to be located on the edge of the TLOF shall not exceed a height of 25 cm.

3.3.12 **Recommendation.—** *For any TLOF 1D or greater and any TLOF designed for use by helicopters having a D-value of greater than 16.0 m, objects installed in the obstacle-free sector whose function requires them to be located on the edge of the TLOF should be as low as possible and in any case not exceed a height of 15 cm.*

RATIONALE for frangibility and height restriction

For those helidecks that are <1D and 16.0 m or less, Standards are already adopted from tranche 1 and tranche 2 respectively which limit essential objects around the TLOF to 5 cm (2’’) rather than to 25 cm (10’’). For smaller helidecks, it is concluded that a review of the height and location of objects has already been completed.

For helidecks which are either >16.0 m and/or 1D or larger, a Recommendation is added to restrict essential objects, such as perimeter lights etc., to a height of no more than 15 cm (6’’) when these are located on the edge of the TLOF. In general, those objects should be as low as possible.

RATIONALE for 15 cm

A 15 cm height restriction is considered to strike a good balance between the competing objectives to minimise the height of essential objects around the helideck, to as low as possible, but without compromising the functionality of essential systems that are sited around the helideck for the purpose of safety of operations. (A good example is the Ring Main System being introduced in Chapter 6 as a means of compliance for a Fixed Foam Application System (FFAS). Manufacturer derived data confirms that these systems need to ‘sit’ about 15 cm above helideck level in order to perform effectively the function for which they are intended, i.e., the uniform distribution of foam to all parts of the landing area).

3.3.12~~3~~ For any TLOF designed for use by helicopters having a D-value of 16.0 m or less, and any TLOF having dimensions of less than 1D, objects installed in the obstacle-free sector whose function requires them to be located on the edge of the TLOF, shall not exceed a height of 5 cm.

~~3.3.13 For any TLOF having dimensions of less than 1 D, the maximum height of such objects in the obstacle-free sector whose function requires them to be located on the edge of the TLOF shall not exceed a height of 5 cm.~~

Note.— Lighting that is mounted at a height of less than 25 cm is typically assessed for adequacy of visual cues before and after installation.

3.3.14 Objects whose function requires them to be located within the TLOF (such as lighting or nets) shall not exceed a height of 2.5 cm. Such objects shall only be present if they do not represent a hazard to helicopters.

Note.— Examples of potential hazards include nets or raised fittings on the deck that might induce dynamic rollover for helicopters equipped with skids.

3.3.15 Safety devices such as safety nets or safety shelves shall be located around the edge of a helideck but shall not exceed the height of the TLOF.

3.3.16 The surface of the TLOF shall be skid-resistant to both helicopters and persons and be sloped to prevent pooling of water.

Note.— Guidance on rendering the surface of the TLOF skid-resistant is contained in the Heliport Manual *(Doc 9261).*

3.4 Shipboard heliports

3.4.1 The specifications in paragraph 3.4.16 and 3.4.17 shall be applicable to shipboard heliports completed on or after 1 January 2012 and 1 January 2015, respectively.

3.4.2 When helicopter operating areas are provided in the bow or stern of a ship or are purpose-built above the ship's structure, they shall be regarded as purpose-built shipboard heliports.

Final approach and take-off areas and touchdown and lift-off areas

Note.— Except for the arrangement described in 3.4.8 b), for shipboard heliports it is presumed that the FATO and the TLOF will be coincidental. Guidance on the effects of airflow direction and turbulence, prevailing wind velocity and high temperature from gas turbine exhausts or flare-radiated heat on the location of the FATO is given in the Heliport Manual *(Doc 9261).*

3.4.3 A shipboard heliport shall be provided with one FATO and one coincidental or collocated TLOF.

3.4.4 A FATO may be any shape but shall be of sufficient size to contain an area within which can be accommodated a circle of diameter of not less than 1 D of the largest helicopter the ~~helideck~~ shipboard heliport is intended to serve.

3.4.5 The TLOF of a shipboard heliport shall be dynamic load-bearing.

3.4.6 The TLOF of a shipboard heliport shall provide ground effect.

3.4.7 For purpose-built shipboard heliports provided in a location other than the bow or stern, the TLOF shall be of sufficient size to contain a circle with a diameter not less than 1 D of the largest helicopter the heliport is intended to serve.

3.4.8 For purpose-built shipboard heliports provided in the bow or stern of a ship, the TLOF shall be of sufficient size to:

a) contain a circle with a diameter not less than 1 D of the largest helicopter the heliport is intended to serve; or

b) for operations with limited touchdown directions, contain an area within which can be accommodated two opposing arcs of a circle with a diameter of not less than 1 D in the helicopter's longitudinal direction. The minimum width of the heliport shall be not less than 0.83 D. (See Figure 3-7.)

Note 1.— The ship will need to be manoeuvred to ensure that the relative wind is appropriate to the direction of the helicopter touchdown heading.

Note 2.— The touchdown heading of the helicopter is limited to the angular distance subtended by the 1 D arc headings, minus the angular distance which corresponds to 15 degrees at each end of the arc.

3.4.9 For non-purpose-built shipboard heliports, the TLOF shall be of sufficient size to contain a circle with a diameter not less than 1 D of the largest helicopter the heliport is intended to serve.

3.4.10 A shipboard heliport shall be arranged to ensure that a sufficient and unobstructed air-gap is provided which encompasses the full dimensions of the FATO.

Note.— Specific guidance on the characteristics of an air-gap is given in the Heliport Manual *(Doc 9261). As a general rule, except for shallow superstructures of three stories or less, a sufficient air-gap will be at least 3 m.*

3.4.11 **Recommendation.—** *The FATO should be located so as to avoid, as far as is practicable, the influence of environmental effects, including turbulence, over the FATO, which could have an adverse impact on helicopter operations.*

3.4.12 No fixed object shall be permitted around the edge of the TLOF except for frangible objects, which, because of their function, must be located thereon.

3.4.13 For any TLOF 1D or greater and/or designed for use by helicopters having a D-value of greater than 16.0 m, objects installed in the obstacle-free sector whose function requires them to be located on the edge of the TLOF shall not exceed a height of 25 cm.

3.4.14 **Recommendation.—** *For any TLOF 1D or greater and any TLFO designed for use by helicopters having a D-value of greater than 16.0m, objects installed in the obstacle-free sector whose function requires them to be located on the edge of the TLOF should be as low as possible and in any case not exceed a height of 15 cm.*

RATIONALE for frangibility and height restriction (shipboard heliports)

For those helidecks and shipboard heliports that are <1D and 16.0 m or less, Standards have already been adopted from tranche 1 and tranche 2 respectively which limit essential objects around the TLOF to 5 cm (2'') rather than to 25 cm (10''). For smaller shipboard heliports, it is concluded that a review of the height and location of objects has already been completed.

For shipboard heliports which are either >16.0 m and/or 1D or larger, a Recommendation is added to restrict essential objects, such as perimeter lights etc., to a height of no more than 15 cm when these are located on the edge of the TLOF. In general, those objects should be as low as possible.

RATIONALE for 15 cm

A 15 cm height restriction is considered to strike a good balance between the competing objectives to minimise the height of essential objects around a shipboard heliport, to as low as possible, but without compromising the functionality of essential systems that are sited around the heliport for the purpose of safety of operations. (A good example is the Ring Main System being introduced to Chapter 6 as a means of compliance for a Fixed Foam Application System (FFAS). Manufacturer derived data confirms that these systems need to 'sit' about 15 cm above helideck level in order to perform effectively the function for which they are intended, i.e., the uniform distribution of foam to all parts of the landing area).

3.4.145 For any TLOF designed for use by helicopters having a D-value of 16.0 m or less, and any TLOF having dimensions of less than 1D, objects in the obstacle-free sector, whose function requires them to be located on the edge of the TLOF, shall not exceed a height of 5 cm.

~~3.4.15 For any TLOF having dimensions of less than 1 D, the maximum height of such objects in the obstacle-free sector whose function requires them to be located on the edge of the TLOF shall not exceed a height of 5 cm.~~

Note.— Lighting that is mounted at a height of less than 25 cm is typically assessed for adequacy of visual cues before and after installation.

3.4.16 Objects whose function requires them to be located within the TLOF (such as lighting or nets) shall not exceed a height of 2.5 cm. Such objects shall only be present if they do not represent a hazard to helicopters.

3.4.17 Safety devices such as safety nets or safety shelves shall be located around the edge of a shipboard heliport, except where structural protection exists, but shall not exceed the height of the TLOF.

3.4.18 The surface of the TLOF shall be skid-resistant to both helicopters and persons.

…

CHAPTER 5. VISUAL AIDS

…

5.2.2 Heliport identification marking

…

5.2.2.8 **Recommendation.—** *On a helideck ~~and~~ or a shipboard heliport where the D value is 16.0 m or larger the size of the heliport identification H marking should have a height of 4 m with an overall width not exceeding 3 m and a stroke width not exceeding 0.75 m. Where the D value is less than 16.0 m, the size of the heliport identification H marking should have a height of 3 m with an overall width not exceeding 2.25 m and a stroke width not exceeding 0.5 m.*

…

5.2.10 Touchdown/positioning marking

…

5.2.10.5 A touchdown positioning marking shall be a yellow circle and have a line width of at least 0.5 m. For a helideck or a purpose-built shipboard heliport with a D value of 16.0 m or larger, the line width shall be at least 1 m.

Rationale for the reduction of size of touchdown markings for small helidecks and shipboard heliports:

The standard 1 m TD/PM circle used for larger (>16 m) helidecks and shipboard heliports provides adequate and effective visual cues for pilots operating to these helidecks and shipboard heliports by day. For smaller helidecks and shipboard heliports (<16 m) the smaller load-bearing surface area (the TLOF) has to accommodate all the same essential markings as the larger decks. However, the "standard" size of these markings results in an 'over-busy' or "overlapping" deck marking arrangement (i.e. markings are found to be too 'concentrated' so as to extend or confuse the mental process of recognition for a pilot required to interpret safety information conveyed by markings in an expeditious manner).

Additionally, a narrower landing circle marking allows for improved accuracy (reduction in scatter) in the landing manoeuvre, so a thinner TD/PM marking of 0.5 m is proposed that will still provide adequate visual cues for the reduced size decks while providing improved obstacle clearance.

The proposal also includes a reduction in the size of the heliport identification "H" marking (to correspond with the smaller landing circle marking – whose new dimensions are between the larger offshore "H" marking and the smaller onshore "H" marking).

The 16 m 'cut-off' is broadly consistent with other offshore SARPS in both Chapters 3 and 6.

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AERODROMES PANEL (AP)

THIRD MEETING

Montréal, 7 to 11 April 2014

AGENDA ITEM 6

The attached constitutes the report on Agenda Item 6 and should be inserted at the appropriate place in the yellow folder.

Agenda Item 6: Strategic view of ICAO provisions for aerodromes

6.1 STRATEGIC VIEW OF ANNEX 14 VOLUME I AND PANS-AERODROMES

6.1.1 The meeting was apprised that during the preliminary review of the first edition of Procedures for Air Navigation Services (PANS) – Aerodromes and proposed amendment to Annex 14, Volume I, the Air Navigation Commission agreed that a job card be issued addressing issues associated with the strategic view of ICAO provisions for aerodromes.

6.1.2 It was noted that Annex 14, Volume I required Standards and Recommended Practices (SARPs) that reflected the development and maintenance of an aerodrome, whilst the PANS should provide procedures on the operation of an aerodrome, not its design. In this regard, both Annex 14, Volume I and PANS-Aerodromes should be complementary documents, need to be structured in an appropriate way, contain provisions written in a suitable manner, and allow for simple further amendment. The Annex needed to contain SARPs written in a style that allowed aerodrome design to apply best practices and development that were constraint-free but safe. The Annex also had to allow certification to take into consideration the infrastructure provided and also any associated procedures or other measures that combined to provide safe surface movement of aircraft. The PANS therefore needed to focus on operational procedures, the day-to-day management of aerodrome operations that facilitated air traffic and aircraft operations.

6.1.3 According to the ANC job card AP006, Annex 14 Volume I specified SARPs and guidance material (green pages) for aerodrome design and operations. The introduction of the B747-400 and then the A380 aircraft highlighted that, as the basis for the design, the aerodrome reference code placed limitations on developing aerodromes and the length of runway no longer had the same relevance as it did when the code was introduced in the early 1980's. While the existing runway proved suitable, the physical characteristics of the taxiways and aprons did not always meet the Annex 14 specifications for the size of aircraft; however, according to the job card, the lack of compliance was rarely an operational impediment or resulted in an increase in safety risk.

6.1.4 The meeting recalled that solutions for the introduction of new large aircraft were provided in Circular 305, while on a wider scale the procedures in the PANS-Aerodromes had permitted aerodromes to be operated, albeit with restrictions, to achieve an acceptable level of safety. Seen in this light, the aerodrome design aspects were seen to be one such deficiency; there were others. Guidance material need to be reviewed and, where necessary updated, or developed to support the regulatory provisions.

6.1.5 The ANC job card AP006 specifies four tasks as follows:

1) Restructure and develop Annex 14 Volume I to provide provisions suitable for the design and development of aerodrome infrastructure, facilities and services provided and aerodrome operations;

2) Review the Aerodrome Reference Code design method and governing parameters to provide provisions suitable for the design and development of aerodrome infrastructure and facilities; amend the relating detailed design specifications as required;

3) Develop a PANS-Aerodromes outlining procedures for the operation of the aerodrome, to support and maintain operations, complementary to Annex 14 Volume I; and

4) Review, update and develop guidance material to support the regulatory provisions.

6.1.6 Appended to job card AP006 was AN-WP/8669.DP4, prepared by one Commissioner, which included orientations for the strategic review of Annex 14 Volume I and draft new tables of contents for the Annex and PANS-Aerodromes.

6.1.7 The meeting discussed these proposed orientations and considered the following strategic orientations.

6.1.8 The performance-based approach is unclear for the development of aerodrome related provisions due to the variety of technical areas addressed and the meeting preferred to adopt an operationnally-based and risk-based approach. The principle is to define the objectives in terms of operation and of acceptable risks. Indeed these objectives can not be specified in the same manner for every aerodrome technical area (visual aids and rescue and fire-fighting do not pertain to the same logic).

6.1.9 One point was made that formulation of objectives needed to be specified in more detail and directions given to the panel. In addition, an objective written in an open or unverifiable manner may imply legal risks.

6.1.10 Some examples proposed in AN-WP/8669.DP4 showed two different possibilities for specifying the organization of operations at aerodromes and it was reminded that it is not the role of ICAO to allocate responsibilities in the State's organization.

6.1.11 The meeting agreed that such approach would allow for more flexibility in the Annex 14 provisions and that flexibility was needed as not two aerodromes are alike. However there should be a proper balance between operationnaly- or risk-based standards and prescriptive standards. It was suggested to follow the PANS-OPS approach which sets the objective as a standard and then develops one or several recommended means to meet the objective.

6.1.12 Some members consider that this approach corresponds to a service-level philosophy which will result in slight changes across most part of Annex 14: a refocused evolution more than a complete redirection. Consequently, it is recommended to first address the SARPs then amend or develop the PANS which supplement them.

6.1.13 The meeting agreed that in order to fulfill the job card AP006 remit, it was necessary to develop a strategy document including guidance on development of operationally- and risk-based SARPS, and a target structure for Annex 14 Volume I and PANS-Aerodromes. This strategy document will serve as guidance for future work of the Aerodromes Design and Operations Panel (ADOP).

6.1.14 To this end the meeting has established a task force, the Terms of Reference of which are attached as Appendix A to the Report on Agenda Item 6. The strategy document should be presented for adoption at the first meeting of the ADOP for submission to the ANC for approval.

6.1.15 As regards the job card AP006 specific tasks listed in 6.1.5 above, the meeting noted that tasks 2, 3 and 4 were already under way, notably task 2 as part of the ADWG workprogramme. As regards task 1 the preliminary task is the development of the strategy document which would be later expanded with the development of the ADOP work programme.

APPENDIX A

Terms of Reference

Annex 14 Volume I Strategic Review Task Force (ASRTF)

The ANC job card AP006 specifies four tasks as follows:

1. Restructure and develop Annex 14 Volume I to provide provisions suitable for the design and development of aerodrome infrastructure, facilities and services provided and aerodrome operations;
2. Review the Aerodrome Reference Code design method and governing parameters to provide provisions suitable for the design and development of aerodrome infrastructure and facilities; amend the relating detailed design specifications as required;
3. Develop a PANS-Aerodromes outlining procedures for the operation of the aerodrome, to support and maintain operations, complementary to Annex 14 Volume I; and
4. Review, update and develop guidance material to support the regulatory provisions.

The AP discussed the job card and attached AN-WP/8669.DP4 and considered the following strategic orientations:

a. The performance-based approach is unclear for the development of aerodrome related provisions due to the variety of technical areas addressed and an operationally-based and risk-based approach is preferred. The principle is to define the objectives in terms of operation and of acceptable risks. Indeed these objectives cannot be specified in the same manner for every aerodrome technical area (visual aids and rescue and fire-fighting do not pertain to the same logic).

b. Formulation of objectives needs to be specified in more details and directions given to the panel. In addition an objective written in an open or unverifiable manner may imply legal risks.

c. Some examples proposed in AN-WP/8669.DP4 showed two different possibilities for specifying the organization of operations at aerodromes and it was reminded that it is not the role of ICAO to allocate responsibilities in the State's organization.

d. Such approach would allow for more flexibility in the Annex 14 provisions and that flexibility was needed as not two aerodromes are alike. There should be a proper balance between operationally- or risk-based standards and prescriptive standards. Consideration should be given to the PANS-OPS approach which sets the objective as a standard and then develops one or several recommended means to meet the objective.

e. This approach corresponds to a service-level philosophy which will result in slight changes across most part of Annex 14 Volume I: a refocused evolution more than a complete redirection. Consequently, it is recommended to first address the SARPs then amend or develop the PANS which supplement them.

f. In order to fulfill the job card AP006 remit, it was necessary to develop a strategy document including guidance on development of operationally- and risk-based SARPS, and a target

structure for Annex 14 Volume 1 and PANS-Aerodromes. This strategy document will serve as guidance for future work of the Aerodromes Design and Operations Panel.

The Annex 14 Volume I Strategic Review Task Force (ASRTF) is formed to develop the strategy document identified in e. above.

The ASRTF shall:

- Review the aerodrome relevant part of the ICAO GANP and GASP, of the AN work programme, the AP proposition for a future work programme, and the Terms of Reference of the future Aerodrome Design and Operations Panel;
- Identify the scope and technical areas which should be covered by ICAO SARPS and PANS;
- Develop guidance detailed for each technical area for the development of operationally- and risk-based provisions;
- Specify the types of provisions which should be SARPS or PANS and how they interrelate for each technical area relevant to aerodromes;
- Propose a working structure and methods for the strategic review of Annex 14 Volume I and other tasks included in the work programme of the ADOP; and
- Document its findings in a report to be submitted to the ADOP at its first meeting.

The rapporteur of the ARSTF is Mr. Jean-Louis Pirat and comprises the following subject matter experts:

- M. Brad Bachtel (ICCAIA)
- M. David Gamper (ACI)
- M. Guy Heneault (Canada)
- Mr. Zhao Hongyuan (China)
- Mr. Pablo Sancho (Spain)
- Mr. Jan Goosen (Australia)
- Mr. Robert Bonanni (USA)
- Mr. Heriberto Salazar (IFALPA)
- Mr. Andrew Badham (United Kingdom)
- Mr. Jean-François Grout (IATA)
- Valery Nekrasov (IAC)
- Marcello Macedo (Brazil)

The above nominees will eventually designate a subsidiary to perform the actual work.

The ASRTF will work in close coordination with the ICAO Secretariat and the ANC as appropriate.

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AERODROMES PANEL (AP)

THIRD MEETING

Montréal, 7 to 11 April 2014

AGENDA ITEM 7

The attached constitutes the report on Agenda Item 7 and should be inserted at the appropriate place in the yellow folder.

Agenda Item 7: Review of work programme

7.1 GROUND HANDLING AT AERODROMES

7.1.1 The meeting recognized that airport operations had become increasingly complex with the growth of air traffic. More and larger aircraft, an increase in ground support equipment and faster turnaround times all contributed to the challenge of improving operational safety. A comfortable, safe and reliable flight required a whole range of ground services to be safely and successfully completed on the ground between aircraft arrival and departure, according to a common set of requirements that could be implemented worldwide in a standardized manner.

7.1.2 The task contained in the ANC job card AP007 described the need to look at safety, efficiency and standardisation issues associated with ground handling and to determine the status and future needs of ICAO provisions in relation to ground handling at aerodromes.

7.1.3 The meeting was cognizant of various initiatives currently in progress as well as those that were already well developed that were related to ground handling. These included such undertakings as Chapter 5 of the PANS-Aerodromes pertaining to aerodrome operational management, the IATA Safety Audit for Ground Operations (ISAGO) and its complementary ISAGO Standards Manual, IATA Ground Operations Manual (IGOM) and other industry documentation such as those produced by ACI and IBAC. The meeting appreciated the participation of Airport Services Association (ASA), an association representing over 250 000 ground handling employees in over 150 countries, at the meeting. The provisions of these international organizations could be recognized by ICAO as a foundation for minimum standards in ICAO documentation.

7.1.4 In order to progress the task, the meeting noted that a gap analysis needed to be conducted to determine what was needed in the way of ICAO provisions that would complement and complete an international package of needed provisions and best practices. Job card AP007 contained two deliverables as follow:

1) perform gap analysis of current and planned ICAO/industry provisions and programmes for ground handling at aerodromes.

2) provide recommendation on what ICAO should consider for its future work programme that would complement and complete a regulatory package for the safety, efficiency and standardisation of ground handling operations

7.1.5 In reviewing WP/30 and IP/1, the meeting noted the specific areas of ground operations that needed to be addressed in order to enhance the safety and efficiency of ground handling operations on a global basis. The meeting agreed to the draft Terms of Reference, included as Appendix A to the Report on Agenda Item 7, that had been developed for the task force which will be led by the member from the United Kingdom and assisted by members from DGAC France, ACI, ASA, IATA and ICCAIA and a member to be provided by the OPSP and the SMP in order to progress the work. In view of the complexity of the task, the timescale for delivery of the task indicated in job card AP007 was agreed to be deferred to March 2015.

7.2 OBSTACLE LIMITATION SURFACES AND AERONAUTICAL STUDY

7.2.1 The meeting reviewed WP/27 Rev. 1 and WP/34 Rev. 1 concerning the need for ICAO to establish minimum standards to facilitate an aeronautical study and a proposal to modify the approach and inner horizontal surfaces.

7.2.2 It was noted that Annex 14 Volume I, paragraphs 4.2.4, 4.2.11 and 4.2.20 specified that new objects or extensions of existing objects should not be permitted above the conical surface or inner horizontal surface except when, in the opinion of the appropriate authority, the object would be shielded by an existing immovable object, or after aeronautical study it is determined that the object would not adversely affect the safety or significantly affect the regularity of operations of aeroplanes.

7.2.3 However, the meeting was apprised that since no international guidelines for the aeronautical study were available, there existed a danger to aviation safety as a result of erecting objects extending above obstacle limitation surface due to States permitting the construction of such obstacles by taking their own consideration. A concern was raised that granting exception through aeronautical study may adversely affect the internationally harmonized standards for the aerodrome obstacle limitation requirement.

7.2.4 The meeting agreed to refer the issues raised in the working papers to the IFPP/AP task force for further action. In addition, the Republic of Korea was invited to participate in the IFPP/AP task force in order to progress the work.

7.3 REVIEW OF 38TH ASSEMBLY RESOLUTIONS AND DECISIONS RELATING TO AERODROME PANEL

7.3.1 The meeting reviewed WP/33 which contained information on relevant resolutions and decisions emanating from the 38th session of the ICAO Assembly (Montreal, 24 September to 4 October, 2013) that had an impact on the work of the Aerodromes Panel.

7.3.2 The subject areas included:

a) criteria for the certification of aerodromes (A38 – WP/122);
b) obstacle limitation surfaces (A38 – WP/143);
c) runway end safety areas (A38 – WP/298);
d) state emergency response and contingency planning (State ERP connecting all relevant Annexes, A38 – WP/325); and
e) state emergency response and contingency planning (airports in hazard-prone areas, A38 – WP/149).

7.3.3 The meeting noted the issues contained in the Assembly papers above and would take them into consideration when developing the future work program.

7.4 STATUS REVIEW OF WORK PROGRAMME

7.4.1 The meeting was presented with WP/08 which contained the status of legacy tasks as well as details of job cards AP001 – AP007 issued by the Air Navigation Commission.

7.4.2 The meeting reviewed the various tasks related to aerodrome design, visual aids, rescue and firefighting, aerodrome operation and services, and heliports as contained in the legacy work program and the job cards. The meeting noted with appreciation that a considerable amount of work had been completed by the various working groups during the last triennium. There were several sub-items that were required to be progressed in the coming triennium.

7.4.3 In respect of the task on developing performance-based provisions for rescue and firefighting, there were views that a risk-based approach would be better suited to the task. States and international organizations were invited to share their experience in developing their national risk-based provisions that could be of assistance to the RFFWG.

7.4.4 Another view was that the subject of developing performance-based provisions for emergency response and rescue and firefighting was not a technical endeavour but should be seen as a "service level" requirement. In this context, it was felt that the AOSWG would perhaps be in a better position to undertake the task. This proposal was agreed to by the Rapporteur of the RFFWG.

7.4.5 On the subject of Airport Collaborative Decision Making (A-CDM), which constitutes an important component of the ASBU block B1-ACDM, the meeting was apprised that China was developing A-CDM with almost all major airports being involved, and relevant procedures were under development. ACI was to develop industry best practice guidance material on the introduction of Airport CDM, in collaboration with CANSO and IATA, intended for worldwide use, that could be submitted to ICAO as content for its manual.

7.4.6 Possible new tasks identified by the meeting concern:

- wildlife hazard management for which it may be necessary to assess the evolution of the risk and provide guidance on new means and methods to prevent or mitigate it;
- de-icing on the basis of the contradictory requirements in standard 10.3.6 of Annex 14 Volume I.

7.4.7 Regarding HDWG, the amount of work and lack of resources were noted. Particularly, the update of the twenty-year old *Heliport Manual* (Doc 9261) was suggested by the Secretariat as the highest priority. The HDWG rapporteur raised the concern of resources and asked the panel members for more support.

7.4.8 For the legacy tasks of VAWG, the rapporteur expressed similar lack of resources for tasks like consequential change of definition between Cat II and Cat III (RVR 350 m to 300 m) or for comprehensive review of visual aids. The need for future work on A-SMGCS, already present in the current work program was noted. The need for better coordination between AP and OPSP for the LED issue and low visibility operations was noted.

7.4.9 A summary of the status of legacy tasks and job cards is included in Appendix B and C to the Report on Agenda Item 7.

7.5 PROPOSED FUTURE WORK PROGRAMME

7.5.1 Considering the anticipated formation of the Aerodromes Design and Operations Panel with the new terms of reference and revised membership, the meeting concludes it has not the legitimacy to propose a future work programme to the ANC, nor to detail its working structure to address a work programme.

7.5.2 The meeting agreed to reword its reviewed legacy tasks and propositions in a series of job cards to be proposed as initial work programme for the ADOP.

7.5.3 This rewording will be performed by the AP chairperson assisted by the present rapporteurs of the five existing working groups and in close coordination with the secretariat. The result will be submitted to the AP for review and comments through correspondence and ultimately delivered in a document separated from the present report to the ANC as proposed future work programme for the ADOP.

7.5.4 During the interim period before the formation of the ADOP, the meeting agreed to continue its present work subject to approval of the ANC.

7.5.5 As Mr. Christopher Baillie from Transport Canada has stepped down from his position of co-rapporteur of the HDWG, Mr. Stephan Zass from Germany has been nominated Rapporteur of the HDWG by the AP. The meeting thanked Mr. Christopher Baillie for his extraordinary leadership, endeavour and efficiency in managing the HDWG work.

APPENDIX A

Terms of reference

Ground handling task force

The Air Navigation Commission requests the Aerodromes Panel to perform a gap analysis to determine what ICAO provisions were needed to complement and complete the existing international package of provisions and best practices. Job card AP007 contains two deliverables as follow:

(1) perform gap analysis of current and planned ICAO/industry provisions and programmes for ground handling at aerodromes;

(2) provide recommendation on what ICAO should consider for its future work programme that would complement and complete a regulatory package for the safety, efficiency and standardisation of ground handling operations.

The task force shall:

- review AP/3-WP/30 and IP/1 which propose specific areas of ground operations to be addressed in order to enhance the safety and efficiency of ground handling operations on a global level
- review a series of existing provisions, best practices or undertakings such as Chapter 5 of the PANS-Aerodromes pertaining to aerodrome operational management, the IATA Safety Audit for Ground Operations (ISAGO) and its complementary ISAGO Standards Manual, IATA Ground Operations Manual (IGOM) and other industry documentation such as those produced by ACI and IBAC
- analyze the available ground damage databases to identify the primary areas of safety concern
- in light of the above develop prioritized recommendations for actions within ICAO
- document its findings in a report to be delivered to the ANC in March 2015

The ground handling task force report will be reviewed by the AP/ADOP through electronic correspondence. The scope of the gap analysis excludes facilitation, security and health and occupational safety aspects.

The task force is chaired by Mr. Andrew Badham (United Kingdom CAA) and comprises one member of each of the following States or professional bodies: French DGAC, IATA, ACI, Airport Services Association (ASA), ICCAIA, OPS panel, Safety Management Panel.

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TITLE	TASK DESCRIPTION	EXPECTED OUTPUT	EXPECTED OUTPUT DATE	RELATED AP/3 PAPER(S)	STATUS*	REMARKS
Aerodrome Design Specifications	a) Review the basis and the adoption of a risk-based approach for the development of aerodrome design SARPs on physical characteristics, based on the aerodrome reference code and the consequential development of revised SARPs as deemed necessary	Amendments to Annex 14, Vol I	30/03/2014	WP/13, WP/5, WP/11, WP/23	FC	The ADWG has addressed taxiway separation distances, taxiway width on code C taxiways, parking stand clearance distances and taxiway design guidance for preventing runway incursions, etc. The task can be deemed as completed in general. However, there is still some ongoing work that the group considers necessary to accomplish in the future, and a new job card may be submitted, taking into account the job card AP006.
	b) Development of guidance material in the Aerodrome Design Manual	Revised and updated guidance material for ADM, Part 1 - Runways	30/03/2015		PC	Work is ongoing to update GM corresponding to and supplementing, as necessary the above amendments to SARPs.
	c) Explore development of performance based provisions for runway end safety areas that takes into account: 1) A risk-based approach for determining runway end safety requirements 2) A risk-based approach for determining requirements for a combined RESA and arresting system 3) Defining an arresting system and its requirements 4) The risk-based approach should be linked with SMS as defined in Annex 14.	Amendments to Annex 14, Vol I; Revised and updated guidance material for ADM, Part 1 - Runways	30/03/2015	WP/03	PC	A definition of arresting system is proposed for endorsement. Some guidance material on RESA and arresting system has been included in the ADM, Part I, providing guidance on assessing RESA using a risk-based approach. More guidance may be needed in the future depending on any new development on SARPs. See also job cards AP002 and AP006.
	d) In regard to runway shoulders, consider making paragraph 3.2.6 a Standard and determine what could be removed from Annex 14 and placed into PANS-Aerodromes				PC	Work is ongoing,
SMGCS routing naming convention	Within the context of the routing function of a (A)SMGCS and runway incursion prevention, develop a standardized naming convention in Annex 14, Volume I, for taxiways/lanes and runway/intermediate holding positions	Amendments to Annex 14, Vol. I	30/03/2014	WP/31		Work initially progressed by ADWG and transferred to VAWG. Proposal from Member addressed to VAWG.

TITLE	TASK DESCRIPTION	EXPECTED OUTPUT	EXPECTED OUTPUT DATE	RELATED AP/3 PAPER(S)	STATUS*	REMARKS
Runway surface characteristics assessment and reporting (Phase 2)	a) Complete the development of provisions and develop procedures for the assessment and reporting of runway surface conditions including a standard reporting format and taxonomy, including consideration of the inclusion of "Nil" as a braking action reported by a pilot	Amendments to Annex 14, Vol. I and consequential amendments to other Annexes/PANS	30/03/2014	WP/10	PC	a) Amendments to Annex 14 Vol I completed per AP/3-WP/10. b) Consequential amendments to other Annexes/PANS expected by Q3/2014 per Appendix C of AP/3-WP/10. c) APWGs/2 - IP/04 contains proposed draft procedures to be included in PANS-Aerodromes. These draft procedures currently being coordinated with PASG
	b) Complete the development of guidance material for the measurement and assessment of runway surface friction for maintenance purposes	Revised and updated guidance material for ASM Part 2 – Pavement Surface Conditions	30/03/2015			The guidance in ASM Part 2 is planned to be updated and migrated to PANS-Aerodromes. ASM Part 2 is expected to be declared obsolete. Interim guidance may be developed in a revised version of ICAO Circular 329
Licensing/certification of aerodromes	a) In collaboration with the PASG: 1) Update existing provisions in Annex 14, Volume I on certification of aerodromes, including providing guidance on the definition and scope of "public use", particularly with regard to aerodromes with predominantly general aviation operations 2) Develop aerodrome certification procedures for inclusion in PANS-Aerodromes 3) Develop further guidance in Doc 9774 Manual on Certification of Aerodromes	Amendments to Annex 14, Vol. I Procedures for PANS-Aerodromes Revised and updated guidance material in Doc 9774	30/03/2014 31/12/2011 30/03/2015			State letter AN 4/1.1.53-13/81 contains proposed amendment to A14VI SARPs on certification and proposed 1st Edition of PANS-Aerodromes arising from the work of PASG/AOSWG. Consequently, the task of revising Doc 9774, Manual on Certification of Aerodromes has been postponed pending responses to SL and the publication of the first edition of PANS Aerodromes.
	b) At a later date (to be determined) provide a report on the implications of implementing safety management system principles in lieu of the use of a specific "aeronautical study"			WP/27		Work in progress

TITLE	TASK DESCRIPTION	EXPECTED OUTPUT	EXPECTED OUTPUT DATE	RELATED AP/3 PAPER(S)	STATUS*	REMARKS
Aerodrome operations, facilities and services	a) Develop provisions for the prevention, and the installation of devices for the detection, of Foreign Object Debris (FOD)	Amendments to Annex 14, Vol. I	30/03/2014	WP/07	FC	Definition of FOD and A14VI Chapter 10 SARP amendment proposed
	b) In collaboration with the PASG develop procedures for the use of devices for the detection of Foreign Object Debris (FOD)	Procedures for PANS-Aerodromes	30/03/2015	WP/07	PC	Draft procedures developed per APWG/2 – IP/2 being coordinated with PASG
	c) Aircraft pavement related issues incorporating new technologies in pavement reporting system, criteria for overloading operations, inspection and maintenance of airfield pavements and effects of magnetic anomalies at aerodromes.	Revised and updated guidance material for ADM Part 3	30/03/2014	WP/18	FC (surface unevenness) PC (others)	Revised guidance on surface unevenness proposed in green pages of A14VI per AP/3-WP/18. Other guidance in progress per APWG/2-IP/7
Aerodrome/heliport emergency planning and response	a) With an evolution of existing provisions in mind and taking account of the tasks involved and applicable risk, develop new performance-based provisions for the response to an emergency at or in the vicinity of an aerodrome or heliport, with regard to: 1) the type and frequency of operations, including rotorcraft and general aviation; 2) the size, construction and use of the aircraft; 3) typical emergency response scenarios, including details addressing accidents occurring at specific locations such as on or near the extended runway centreline; 4) the availability and suitability of emergency response resources when needed; and 5) the development of risk and task analysis criteria and methodologies	Amendments to Annex 14, Volumes I & II and consequential amendment to Annex 6, Part III	30/03/2014	WP/12 WP/21	PC (A14VI) FC (A14VII)	Draft performance-based SARPs developed per: APWG/1 – DP/5 APWG/2 – DP/18 also RFFWG/9 – DP/4 RFFWG/10 – DP/8 RFFWG/11 – DP/8 Awaiting further guidance from AP/ANC on development of “performance-based" SARPs Proposed amendment to Chapter 6, A14VII

TITLE	TASK DESCRIPTION	EXPECTED OUTPUT	EXPECTED OUTPUT DATE	RELATED AP/3 PAPER(S)	STATUS*	REMARKS
	b) On the basis of a) above, develop generic procedures and/or guidance on the development of procedures for the emergency response at or in the vicinity of an aerodrome or heliport for incorporation in PANS-Aerodromes	Revised and updated guidance material for ASM Part I and Doc 9261 Heliport Manual	30/03/2015		FC (Doc 9137 ASM Part 1)	Draft, unedited, advance version Doc 9137 Part 1 posted on ICAONET Draft procedures for ERP and RFF in 2nd Edition PANS-Aerodromes being progressed by PASG. Need to update Chapter 6, HM (Doc 9261)
Heliport Design and operations	a) Complete the development of provisions for the applicability of Annex 14 Volume II, the certification of heliports and the implementation of safety management	Amendments to Annex 14, Vol. II	30/03/2014			Proposal for amendments submitted by HDWG at APWGs/2 reverted to the group as the applicability clause needed revision and certification and safety management ones accompanying guidance (ref APWGs/2 report).
	b) Review and where necessary develop amendments to Annex 14, Volume II, Section 5.3, Lights	Revised and updated guidance material for Doc 9261 Heliport Manual	30/03/2015			Pending review of FATO/TLOF surface characteristics (item d).
	c) Develop provisions for heliport instrument approaches and departures and Airway Width specifications at visual heliports					Task pertaining mainly to IFPP and OPSP. Proposal to delete it.
	d) Review and where necessary develop new provisions for FATO surface characteristics including slopes					Work is ongoing.
	e) Review the format of the Heliport Manual and update where necessary					The rapporteur ask the panel members for more support.

TITLE	TASK DESCRIPTION	EXPECTED OUTPUT	EXPECTED OUTPUT DATE	RELATED AP/3 PAPER(S)	STATUS*	REMARKS
Visual Aids	a) The ANC is concerned that recent and proposed future additions to Annex 14 for visual aids might, in the context of proliferation, have a detrimental impact on aerodrome safety and operational efficiency; hence, review the appropriateness and effectiveness of current and emerging aerodrome visual aid systems for day/night and all weather operations and runway safety taking into account human factors and aircraft performance, navigation capabilities and operations, and develop new or amended provisions as necessary	Amendments to Annex 14, Vol. I Revised and updated guidance material for ADM Part 4	30/03/2014 30/03/2015			Lack of ressources. Progressing this work may require resources from States in conducting in-filed studies and trials, etc.
	b) In consideration of a), review the adequacy of existing provisions in the following areas and develop new or amended provisions as necessary:					
	1) the consequential change of definition between Cat II and Cat III (350m to 300m)					Lack of ressources. Progressing this work may requre resources from States in conducting in-filed studies and trials, etc.
	2) PAPI harmonization with ILS					Further work needed by VAWG
	3) VASI glide slope obstacle clearance			WP/25	PC	Need updated guidance in ADM part 4
	4) lighting system for use with PBN approaches				FC	Obsolete.
	c) Review the appropriateness and effectiveness of current obstacle lighting and marking provisions, including wind turbines, and develop new provisions taking into account the objectives, human factors and aircraft operations			WP/16 WP/20	PC	Case of Wind Turbines is addressed. Case of Tethered Objects is refered to the VAWG. Method for reducing city lighting under development.

TITLE	TASK DESCRIPTION	EXPECTED OUTPUT	EXPECTED OUTPUT DATE	RELATED AP/3 PAPER(S)	STATUS*	REMARKS
Use of light emitting diode (LED) technology in visual aids	Review the existing specifications for visual aids and, where necessary, develop new provisions to allow for the use of LED technology Note – new provisions should not preclude the use of other light technologies and should be limited to specifications that provide adequate visual cues to users	Amendments to Annex 14, Vol. I Related guidance material	30/03/2014 30/03/2015	WP/04	FC	Main changes are delivered. A paper dealing with changes of lights by segments is under development. Further work in coordination with OPS Panel. Need updated guidance in ADM part 4
New technologies for the prevention of runway incursions	a) Develop new provisions as necessary for: 1) technological solutions for the prevention of runway incursions 2) visual aids for the reduction of runway incursions and for A-SMGCS	Amendments to Annex 14, Vol. I	30/03/2014	WP/17	PC	Proposal submitted on autonomous runway incursion warning system (ARIWS), which involves runway status lights.
	b) With regard to Runway Status Lights: 1) development of an appropriate ICAO document on RWSL including procedures associated with its implementation; and 2) development of material on how this system ties into and/or affects A/SMGCS and other technologies	Document (TBD)	30/03/2013		PC	Consequential for PANS-ATM and PANS-OPS need to be developped.

(*) FC = Fully Completed, PC = Partly Completed

JC No./ TITLE	TASK DESCRIPTION	EXPECTED OUTPUT	EXPECTED OUTPUT DATE[1]	RELATED AP/3 PAPER(S)	STATUS[2]	REMARKS
AP001: Assessment and reporting of runway surface conditions	1. Develop provisions for the reporting of runway surface conditions	a) Proposed amendments to Annex 14 Volume 1 and other related Annexes	Q2/2014	WP/10	PC	Amendments to A14VI completed per AP/3-WP/10. Consequential amendments to other Annexes expected by Q3/2014 per Appendix C of AP/3 - WP/10
		b) Proposed amendments to PANS-Aerodromes and PANS-ATM	Q2/2015			Draft procedures in PANS-Aerodromes developed per APWGs/2 – IP/04. Draft procedures in PANS-ATM developed.
	2. Develop guidance material for the assessment of runway surface conditions, including friction level and where contamination exists	a) Proposed amendments to PANS-Aerodromes	Q2/2015			The guidance in ASM Part 2 (doc 9137) is planned to be updated and migrated to PANS-Aerodromes. ASM Part 2 is expected to be declared obsolete. Interim guidance may be developed in a revised version of ICAO Circular 329.
		b) Proposed amendments to Doc 9137	Q1/2016			
	3. Develop guidance material for the measurement and maintenance of runway friction	a) Proposed amendments to PANS-Aerodromes b) Proposed amendments to Doc 9137	Q2/2015 Q1/2016			The guidance in ASM Part 2 is planned to be updated and migrated to PANS-Aerodromes.ASM Part 2 is expected to be declared obsolete. Interim guidance may be developed in a revised version of ICAO Circular 329
AP002: Aircraft arresting systems	1. Develop further provisions for the installation of an arresting system in lieu of part or all of a RESA to address operational issues, including undershoots and access by emergency services	Proposed amendments to Annex 14 Volume 1, Annex 15, PANS-Aerodromes and guidance material in manuals, as necessary	Q2/2014	WP/06	FC	Amendment proposal on publishing RESA and arresting system is submitted for endorsement; Some general guidance on addressing undershoots and emergency access has been included in the green pages of Annex 14, Volume I. It is possible that ADWG will propose more guidance on addressing undershoots in the near future.
	2. Develop further provisions on the criteria for the design specification and acceptance by a State of an arresting system in lieu of part or all of a RESA	Proposed amendment to Annex 14, Volume I, PANS-Aerodromes and guidance material in manuals, as necessary	Q4/2017			Work is ongoing
AP003: Runway guard lights	Develop provisions for the purpose and installation criteria for runway guard lights	Proposed amendments to Annex 14 Volume 1 and Doc 9157	Q2/2014			Paper for VAWG/12.
AP004: Marking of heliports	Develop provisions for the marking of heliports	Proposed amendments to Annex 14 Volume II and Doc 9261	Q1/2015			Physical characteristics to be reviewed first.

JC No./ TITLE	TASK DESCRIPTION	EXPECTED OUTPUT	EXPECTED OUTPUT DATE(1)	RELATED AP/3 PAPER(S)	STATUS(2)	REMARKS
AP005 rev1 Obstacle limitation surfaces at aerodromes and heliports/helidecks	1. Develop provisions for the obstacle limitation surfaces of aerodromes	Proposed amendments to Annex 14 Volume I	Q1/2015	WP/34		AP (support IFPP and OPSP)
	2. Develop provisions for the obstacle limitation surfaces of heliports/helidecks	Proposed amendments to Annex 14 Volume II	Q1/2015			AP (support IFPP and OPSP)
	3. Develop guidelines for conducting aeronautical studies to assess permissible penetrations of obstacle limitation surfaces	Proposed guidance material (Doc 9261 and new version of Doc 9137 part 6)	Q1/2015	WP/27		AP (support IFPP and OPSP)
AP006: Strategic view of ICAO provisions for aerodromes	1. Restructure and develop Annex 14 Vol I to provide provisions suitable for the design and development of airport infrastructure, facilities and services provided, and airport operations	Proposed amendments to Annex 14 Volume I	Q4/2017	WP/09		An ad hoc group of AP has been established at AP/3 to develop a ToR and strategic guidance on how to progress this task
	2. Review the Aerodrome Reference Code design method and governing parameters to provide provisions suitable for the design and development of aerodrome infrastructure and facilities; amend the relating detailed design specifications as required	Proposed amendments to Annex 14 Volume 1 and Doc 9157	Q4/2017		PC	Work is ongoing
	3. Develop a PANS-Aerodromes outlining procedures for the operation of the airport, to support and maintain operations, complementary to Annex 14 Vol I	Draft first edition of PANS-Aerodromes	Q4/2015	(State letter AN 4/1.1.53-13/81)	PC	1st Edition PANS-Aerodromes in progress. SL issued to States and intl orgs for consultation. Expected applicability date with A14VI SARPs Nov 2015. Second Edition: chapter 5 on Aerodrome Operation Management in drafting phase
	4. Review, update and develop guidance material to support the regulatory provisions	Draft guidance material	Q4/2016			
AP007: International provisions addressing ground handling at aereodromes	1. Perform gap analysis of current and planned ICAO/industry provisions and programmes for ground handling at aerodromes.	Gap analysis	Q3/2014	WP/30		An ad hoc group of AP has been established at AP/3 to develop a ToR and strategic guidance on how to progress this task. It was proposed at AP/3 that Q2/2015 would be a more realistic date.
	2. Provide recommendation on what ICAO should consider for its future work programme that would complement and complete a regulatory package for the safety, efficiency and standardisation of ground handling operations	Proposed work programme	Q3/2014	WP/30		An ad hoc group of AP has been established at AP/3 to develop a ToR and strategic guidance on how to progress this task. It was proposed at AP/3 that Q2/2015 would be a more realistic date.

(1) ANC

(2) FC = Fully Completed, PC = Partly Completed

--END --

AERODROMES PANEL (AP)

THIRD MEETING

Montréal, 7 to 11 April 2014

AGENDA ITEM 8

The attached constitutes the report on Agenda Item 8 and should be inserted at the appropriate place in the yellow folder.

Agenda Item 8: Any other business

8.1 The following statement was proposed by one member and the meeting agreed to include it in the report:

Appreciating interpreters and translators the Third meeting of the Aerodrome Panel (AP/3), nevertheless, notes that:

- *since AP/2, only the introductions and the resolving parts of working papers proposing amendments to SARPS are being translated;*
- *at AP/3 conception, WPs containing important information on SARPs and PANS formulation were issued in English only;*
- *interpretation was not provided during discussions of some Agenda Items.*

This practice does not meet ICAO Assembly Resolutions, in particular A 37-25, and inhibits ICAO to benefit existing experience and knowledge of all involved Member States and Organizations in field of aerodromes, equipment and implementation of new technologies.

— END —