



## AIR NAVIGATION COMMISSION

### REVIEW OF THE REPORT OF THE THIRD MEETING OF THE AERODROMES PANEL (AP/3) AND PRELIMINARY REVIEW OF PROPOSED AMENDMENTS TO ANNEX 14, VOLUMES I AND II, AND ANNEX 15 ARISING FROM AP/3 (Item No. 19701)

(Presented by the Chairman of the ANC Working Group of  
the Whole on AN Work Programme Deliverables Production)

|                                                                                                                                                                                                                                                                                                                             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SUMMARY</b><br><br>Proposals from the third meeting of the Aerodromes Panel (AP/3) are presented for consideration by the Air Navigation Commission.<br><br>Action by the Air Navigation Commission is in paragraph 8.                                                                                                   |
| <b>WORK PROGRAMME ITEMS</b><br><br>50, 79, 140, 147, 151, 697, 698, 780, 887, 888                                                                                                                                                                                                                                           |
| <b>COORDINATION</b><br><br>AMO and OPS                                                                                                                                                                                                                                                                                      |
| <b>REFERENCES</b><br><br>*AP/3 Report (yellow cover)                      *Annex 14, Volumes I and II<br>*AN-WP/8793                                              *Annex 15<br><br>This working paper relates to the Safety and Air Navigation Capacity and Efficiency Strategic Objectives.<br><hr/> *Principal references |

## 1. INTRODUCTION

1.1 The third meeting of the Aerodromes Panel (AP/3) was held in Montréal from 7 to 11 April 2014. The meeting was attended by twenty-five panel members, accompanied by twenty-nine

advisers, and one observer from eighteen Member States and eight international organizations. The meeting report is available on the ANC website.

1.2 The meeting considered all eight agenda items and formulated seven recommendations among which recommendations 1/1, 1/2, 2/1, 4/1, 4/2, 5/1 include amendment proposals related to Agenda Items 1, 2, 4 and 5. The proposed amendments to Annex 14 — *Aerodromes*, Volume I — *Aerodrome Design and Operations* and Volume II — *Heliports*, and Annex 15 — *Aeronautical Information Services* are presented in Appendices A, B and C, respectively.

## **2. SUMMARY OF RECOMMENDATIONS AND AMENDMENT PROPOSALS**

### **2.1 Agenda Item 1: Aerodrome design**

2.1.1 Under this agenda item, the meeting developed amendment proposals for incorporation into Annex 14, Volume I, concerning the adoption of a new definition for arresting system, clarification for clearance distances on aircraft stands, publishing RESA and arresting system in AIP, wheel-to-edge clearance for straight portions of code C taxiways, reduced taxiway and taxilane separation distances, and taxiway design guidance for the prevention of runway incursion (Recommendations 1/1 and 1/2 refer).

#### ***Secretariat's comments***

2.1.2 The Secretariat supports Recommendations 1/1 and 1/2 of the AP/3 report.

### **2.2 Agenda Item 2: Visual aids for navigation**

2.2.1 Under this agenda item, the meeting developed amendment proposals for incorporation into Annex 14, Volume I, concerning flashing characteristics and colour specifications for LED lighting, maintenance (simplification and clarification) of Annex 14 Volume I on visual aids, clarification of Figure A2-23 on light intensity distribution, marking and lighting of wind turbines over 150 m in height, location criteria for PAPI obstacle protection surface and mandatory instruction and information markings (recommendations 2/1 refers).

2.2.2 The meeting also discussed a proposal introducing the concept of Autonomous Runway Incursion Warning System (ARIWS) in which the Runway Status Lights (RWSL) could take place. Coordination with the ATMOPS Panel and the FLTOPS Panel was planned to assess the need for modifications in PANS-ATM and PANS-OPS. Preliminary review of this proposal (Appendix 2D of the report) will be presented to the Air Navigation Commission after such coordination.

2.2.3 The meeting also discussed some other topics on visual aids for navigation, including the marking and lighting of tethered objects, exit-only taxiway and related visual aids and taxiway naming convention. There were no amendments agreed on these topics.

***Secretariat's comments***

2.2.4 The Secretariat supports Recommendation 2/1 of the AP/3 report and agrees that further coordination is needed with the ATMOPS Panel and the FLTOPS Panel before presenting a proposed amendment on ARIWS for the Commission's review.

**2.3 Agenda Item 3: Rescue and fire fighting**

2.3.1 Under this agenda item, while no amendment was proposed, the meeting discussed various topics relating to rescue and fire fighting. Concerning performance-based provisions for emergency response at aerodromes, the meeting was advised that no consensus had been reached within the RFFWG and that more guidance was requested as to what exactly was required for "performance-based" provisions. Regarding rescue and fire fighting provisions for general aviation, the meeting reviewed a paper from the FLTOSP and decided that the proposal therein was not mature and that more work and coordination would be needed between the AP and the FLTOSP. The meeting commended the RFFWG for its effort in the comprehensive update of the Airport Services Manual, Part I – Rescue and Fire Fighting (Doc9137).

***Secretariat's comments***

2.3.2 The Secretariat supports the request for guidelines and/or criteria on the mechanisms and feasibility of moving the RFF SARPs to a system of "performance-based" or "risk-based" SARPs. Such guidance is considered necessary to avoid confusion and a reduction in harmonization and safety. In this connection, it should be noted that the issue was revisited by the meeting under Agenda Item 6: Strategic view of ICAO provisions for aerodromes.

**2.4 Agenda Item 4: Aerodrome operations and services**

2.4.1 Under this agenda item, the meeting developed amendment proposals for incorporation into Annex 14, Volume I concerning the prevention of foreign object debris (FOD) and installation of devices for their detection, updated guidance on acceptance criteria concerning runway surface unevenness and proposed amendments related to runway surface condition assessment, measurement and reporting using a global reporting format. 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 (Recommendation 4/1 and 4/2 refer).

2.4.2 The group also considered that the preliminary review of the proposed amendments for a global reporting format (Appendices 4D and 4E of the report) should only take place at such time when all proposals across the relevant Annexes became available in one complete package (Recommendation 4/3 refers).

***Secretariat's comments***

2.4.3 The Secretariat supports Recommendations 4/1, 4/2 and 4/3.

**2.5 Agenda Item 5: Heliport design**

2.5.1 Under this agenda item, the meeting developed amendment proposals for incorporation into Annex 14, Volume II, concerning maintenance (simplification or clarification) of the Annex on definitions and frangibility, and heliport emergency response (Recommendation 5/1 refers).

***Secretariat's comments***

2.5.2 The Secretariat supports Recommendation 5/1.

**2.6 Agenda Item 6: Strategic view of ICAO provisions for aerodromes**

2.6.1 Under this agenda item, the meeting discussed the proposed orientations of the job card AP006 and agreed that 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 Aerodrome Design and Operations Panel (ADOP). 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.

***Secretariat's comments***

2.6.2 The Secretariat supports the establishment of the Annex 14, Volume I Strategic Review Task Force (ASRTF) in order to progress the task described in job card AP006.

**2.7 Agenda Item 7: Review of work programme**

2.7.1 Under this agenda item, the meeting discussed specifically several new tasks, including ground handling at aerodromes, obstacle limitation surfaces and aeronautical study and subjects stemming from the 38th Assembly resolutions and decisions. The meeting also conducted a status review of the existing work programme and discussed a way forward for proposing the future work programme.

2.7.2 The meeting was presented with the status of legacy tasks as well as details of job cards AP001 – AP007 issued by the Commission. The meeting reviewed the various tasks and noted with appreciation that a considerable amount of work had been completed by the various working groups during the last triennium and that there were several sub-items that were required to be progressed in the coming triennium. A summary of the status of legacy tasks and job cards is included in Appendices B and C to the Report on Agenda Item 7.

2.7.3 Considering the anticipated formation of the ADOP with the new terms of reference, the meeting concluded that it had not the legitimacy to propose a future work programme to the ANC, nor to detail its working structure to address a work programme. The meeting agreed to reword its reviewed legacy tasks and propositions in a series of job cards, along with the existing job cards, to be proposed as the initial work programme for the ADOP. 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 the proposed future work programme for the ADOP. During the interim period before the formation of the ADOP, the meeting agreed to continue its present work subject to approval of the ANC.

### **Secretariat's comments**

2.7.4 The Secretariat agrees that the various working groups of the AP continue their present work until such time the ADOP is formally established.

### **2.8 Agenda Item 8: Any other business**

2.8.1 Under this agenda item, a concern was raised, and a statement included in the report, regarding the limited language services provided for AP/3.

## **3. LINKS WITH THE INTEGRATED AIR NAVIGATION PROGRAMME**

3.1 Table 1 below details the links between the amendment proposals and the Integrated Air Navigation work programme.

**Table 1: Links with Integrated Air Navigation work programme**

| <b>Annex</b>     | <b>Element</b> | <b>ROI</b>     | <b>ASBU</b> | <b>AP/3 Report</b> | <b>Initial proposal</b> |
|------------------|----------------|----------------|-------------|--------------------|-------------------------|
| Annex 14 Vol. I  | 50             | ROI-3-2016-1   | B0-SURF     | 2A, 4B             | 8, 15                   |
|                  | 140            | ROI-3-2016-4   |             | 1E, 1F             | 5, 6                    |
|                  | 79             | ROI-4-2016-1   | B1-SURF     | 2E                 | 11                      |
|                  | 147            | ROI-4-2016-2   | B0-APTA     | 2F                 | 12                      |
|                  | 151            | ROI-4-2016-6   |             | 4A, 1G             | 14, 7                   |
| Annex 15         | 887            | ROI-4-2016-9   |             | 1D                 | 4                       |
| Annex 14 Vol. I  | 888            |                |             | 1A, 1C             | 1, 3                    |
| Annex 14 Vol. I  | 697            | REC-A-AGA-2016 |             | 1B, 2B, 2C, 2G, 4C | 2, 9, 10, 13, 16        |
| Annex 14 Vol. II | 780            | ROI-4-2016-3   |             | 5B                 | 18                      |
|                  | 698            | REC-A-AGA-2016 |             | 5A, 5C             | 17, 19                  |

Note 1: Appendices 4B, 1G and 5C are not linked to an element.

Note 2: Appendices 2D (ARIWS), 4D and 4E (GRF) will be presented in a future ANC session.

## **4. APPLICABILITY DATE**

4.1 It is proposed that the applicability date for the amendments to Annex 14, Volume I and Volume II, and Annex 15 be 10 November 2016.

## 5. BENEFITS AND COST IMPACT

5.1 Acceptance of the proposed reduction of taxiway separation distances will significantly improve efficiency and reduce construction costs for many airports in different parts of the world. It may enable additional taxi routes at an airport with important efficiency gains. According to ACI, one large airport estimates time savings due to elimination of restrictions on Code F taxi routes at around 3 minutes per A380 movement. As regards construction costs for reconfigurations of taxiways and aprons, three large airports estimate a combined total of over 500 million US dollars. While these figures are for particular airports and may not be typical, they are indicative of very substantial savings to the industry. In the longer run, for development of new areas of airports, reduced taxiway separations would optimize the use of available ground surfaces. The construction cost saving is estimated at around 2 to 4 per cent in the case of a new development to code F infrastructure standards.

5.2 The future trend for airport lighting will be using new technologies. Incandescent lights will be replaced by light-emitting diode (LED) based lights. The 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. The advent of wind turbines of more than 150 m necessitates some amendments to the SARPs on visual aids for wind turbines. The proposed Recommendations are considered as minimum requirements, and the cost impact remains reasonable for additional lighting, as necessary.

5.3 Regarding heliports, the use of a fixed foam application system for automatic or semi-automatic distribution of extinguishing agent is proposed to provide rapid fire knock down. The cost for such a system depends on the expected size of helicopters using the facility, and it varies between 50,000 – 60,000 euros but can be as high as 120,000 euros.

## 6. IMPLEMENTATION SUPPORT

6.1 Various guidance materials are or will be available to support the implementation of the new or amended SARPs. A complete update of the *Airport Services Manual*, Part 1 — *Rescue and Fire Fighting* (Doc 9137) is available on the ICAONET as of April 2014; guidance in the form of an update of the *Aerodrome Design Manual*, Part 4 — *Visual Aids* (Doc 9157) will be available by 2016; the *Aerodrome Design Manual*, Part 2 — *Taxiways* (Doc 9157) will also be available by 2016 to support the relevant amendments relating to aerodrome design. On Aerodrome Operations and Services, guidance on acceptance criteria concerning runway surface unevenness and collection of aerodrome mapping data is included in the amendment proposal. (Attachment A to Annex 14, Volume I)

6.2 The information on the amendments will be made available to ICAO entities (e.g. the Implementation Planning and Support — Safety Section, Regional Offices and the Technical Cooperation Bureau (TCB)) which may be called upon to assist States in the implementation of the SARPs.

## 7. ANC WG/PDP REVIEW

7.1 On 30 September and 1 October 2014, the ANC Working Group of the Whole on AN Work Programme Deliverable Production (ANC WG/PDP) conducted a preliminary review of this paper and considered the comments contained in Discussion Paper No.1 and Flimsy No.2 developed by Commission Group 5.

7.2 The WG/PDP noted that the Aerodrome Panel did not undertake a guided Impact Assessment using the new ANC Template. There is still a lack of awareness of the ANC decision for Panels to undertake the Impact Assessment of proposed amendments to SARPs. In addition, the WG/PDP noted that it was an unusual practice to combine Panel meeting reports and the ensuring proposals for SARPs amendments into a single report, although the same caution was raised at the 195<sup>th</sup> Session. The WG/PDP recommends that the Secretariat develop an effective communications strategy to sensitize the Panel Chairs and secretaries involved the new ANC procedure and ANC decision.

7.3 The main outcome of the review is reflected in the Appendix A, B and C of this revised version of the paper, in the “Preliminary review by WG/PDP” text box, where appropriate. The content of the text box is intended to present proposals from the ANC WG/PDP for consideration by the Commission. The WG/PDP was not afforded the time required for a complete review. Therefore, the furthest point of the WG/PDP review is noted in the Appendices and is followed by CG-5 comments and recommendations in the “Review by Commission Group 5” text box.

## **8. ACTION BY THE AIR NAVIGATION COMMISSION**

8.1 The Air Navigation Commission is invited to:

- a) review the proposed amendments to the Annex 14, Volumes I and II, and Annex 15 presented in Appendices A, B and C, respectively, to this working paper;
- b) agree that the proposed amendments, as may be modified by action taken in a) above, be transmitted to States and appropriate international organizations for comments;
- c) agree that the applicability date for the proposed amendments to Annex 14, Volumes I and II, and Annex 15 be indicated as 10 November 2016;
- d) request the Secretary to present the results of the consultation in b) above for final review by the Commission in the 199th Session;
- e) take action on the recommendations of AP/3 as indicated in Appendix D;
- f) agree that the report of AP/3 not be published as a saleable document; and
- g) agree that a memorandum recording the action of the Commission on the report of AP/3 be transmitted to the President of the Council by the President of the Air Navigation Commission.



## APPENDIX A

### 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

#### ***PDP's Notes***

1. *Comments from PDP/CG are indicated for each Initial Proposal*
2. *New text to be inserted is indicated in red*
3. *All references to Page numbers are with respect to WP8861 unless otherwise stated.*

**TEXT OF THE PROPOSED AMENDMENT TO**  
**AERODROMES**  
**VOLUME I – AERODROME DESIGN AND OPERATIONS**

**INITIAL PROPOSAL 1**

**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 in paragraph 3.5.3 of Annex 14, Volume I. This paragraph, revised in 2013 by Amendment 11A to the Annex, offers States 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.

|                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Review by Commission Group 5</b></p> | <p>1. Since arresting system design specifications and performance characteristics for various aircraft types have not been provided for in the Annex, it would be premature to include the term “predictably” in the definition.</p> <p>2. There is perhaps an inconsistency in the guidance on the performance and predictability of arresting systems in Sections 10.3 and 10.4 of Attachment A to Annex 14 Vol. I. Whereas 10.4 states that “<i>Demonstrated performance of an arresting system can be achieved by a validated design method, which can predict the performance of the system.....</i>” 10.3 states: “<i>Research programmes, as well as evaluation of actual aircraft overruns into arresting systems, have demonstrated that the performance of <b>some</b> arresting systems can be predictable and effective in arresting aircraft overruns</i>”.</p> <p>10.3 emphasizes that the performance of <u>some</u> arresting systems can be predictable whilst others may not be predictable.</p> <p>3. It would be preferable to replace “<i>risk of damage to the aeroplane</i>” with “<i>associated risks</i>” to encompass the risk of injury to passengers.</p> <p><b>CG- Proposal:</b> Amend the definition of Arresting System as follows:<br/> <b>Arresting System.</b> <i>A system beyond the end of a runway, or a stopway where provided, designed to <del>predictably</del> decelerate an aeroplane overrunning the runway to reduce the risk of damage to the aeroplane <u>associated risks</u>.</i></p> |
| <p><b>Preliminary review by WG/PDP</b></p> | <p>The WG/PDP appreciated the amended text for the definition of <i>Arresting System</i> that had been offered by CG5 in DP1 but claimed that the text did not properly reflect what was intended to be conveyed through lengthy discussions. Most members recognized the importance to have a definition of an arresting system at this stage but opined that the definition should not include a requirement of the system and that it should be more simplified. At the same time, one member suggested that it was premature to include the definition before the requirement of the system is incorporated into the Annex.</p> <p>The WG/PDP tasked CG5 to work in coordination with the Secretariat to redraft this paragraph.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <p><b>Review by Commission Group 5</b></p> | <p>CG-5, interested Commissioners and Industry Observers met on October 07, 2014 to undertake the review. The CG considered five proposals for the definition of an <b>Arresting System</b>:</p> <ul style="list-style-type: none"> <li>a) <b>Secretariat:</b> <i>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</i></li> <li>b) <b>CG - 5:</b> <i>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 <u>associated risks</u>.</i></li> </ul> <p><b>Other Proposals from Commissioners</b></p> <ul style="list-style-type: none"> <li>c) <i>A system designed to decelerate an aeroplane overrunning the runway.</i></li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

## Appendix A

|                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                             | <p>d) <i>A system engineered to decelerate an aeroplane overrunning the runway</i></p> <p>e) <i>A series of components used to stop an aircraft by absorbing its momentum in a routine or emergency landing or aborted takeoff.</i></p> <p>f) <b>Overrun Arresting System:</b> <i>A series of components used to stop an aircraft overrunning a runway end by absorbing the aircraft's momentum.</i></p> <p>The CG noted that there is a need to get a clear statement from the Secretariat whether the definition of an Arresting System encompasses the use of cable or net gear for civil applications.</p> <p>The CG noted the several criteria and conditions must be met to achieve “predictability” in the aircraft deceleration (reference: Para 10.2 -10.5 of Attachment A, Annex 14 Vol. I). The CG further recognised that in line with the above, Job Card AP 002 already has a detailed requirement to “<i>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</i>” with a 2017 target date for completion .</p> <p>It would thus be premature to include the term “predictably” in the definition.</p> <p><b>CG's Recommendation:</b> Introduce a <b>Note</b> on the predictability of the performance of an Arresting System under Section 10 of Attachment A.</p> <p>The CG agreed that in the context of Option 2 d), “engineered” means designed and manufactured. The CG noted that the term “engineered” has several meanings which could lead to translation difficulties.</p> <p>The CG was further of the view that the definition of an arresting system:</p> <ul style="list-style-type: none"> <li>- should be kept very simple – thus the phrase “<i>designed to decelerate an aircraft overrunning the runway</i>” adequately conveys the intended of purpose of an Arresting System</li> <li>- should be as generic as possible to cater for all technologies.</li> </ul> <p>In view of the above discussions, the CG endorsed the definition in Option c)</p> <p><b>CG Proposal:</b><br/> <b>Arresting System:</b> <i>A system designed to decelerate an aeroplane overrunning the runway.</i></p> |
| <b>Secretariat comments</b> | <p>The Secretariat supports the original proposal from the panel. It should be noted that according to paragraphs 3.5.3 and 3.5.4 of Annex 14, Volume I, an arresting system is provided in lieu of part or all of a runway end safety area (RESA); therefore, its performance needs to be predicted in order to achieve the equivalent level of safety. The importance of the predictability of an arresting system warrants its inclusion in the definition. Furthermore, the proposed definition is in line with that of RESA, where the location and the main aim of reducing risk of damage to an aeroplane are described.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

## INITIAL PROPOSAL 2

## 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:*

| <i>Code letter</i> | <i>Clearance</i> |
|--------------------|------------------|
| <i>A</i>           | <i>3 m</i>       |
| <i>B</i>           | <i>3 m</i>       |
| <i>C</i>           | <i>4.5 m</i>     |
| <i>D</i>           | <i>7.5 m</i>     |
| <i>E</i>           | <i>7.5 m</i>     |
| <i>F</i>           | <i>7.5 m</i>     |

*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

**Appendix A**

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.

|                                     |                                                           |
|-------------------------------------|-----------------------------------------------------------|
| <b>Review by Commission Group 5</b> | In agreement with Initial Proposal 2                      |
| <b>Preliminary review by WG/PDP</b> | The WG/PDP was also in agreement with Initial Proposal 2. |

|                           |
|---------------------------|
| <b>INITIAL PROPOSAL 3</b> |
|---------------------------|

## **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;

...

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Origin:</b><br><br>ADWG/12<br><br><b>Rationale:</b><br><br>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 the arresting system in the aerodrome data, from both regulatory and operational perspectives.<br><br>Suggestion was made that in addition to the location of an arresting system, it might be necessary 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. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Review by Commission Group 5</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <p>Though pilots may not need detailed data on the arresting system, it would nevertheless be useful for other users of Annex 14. As a minimum, the description of an arresting system could be included.</p> <p><b>CG5 Proposal:</b> Amend 2.5.1 b) above as follows:</p> <p>stopway .....</p> <p>arresting system (if any) —location (which runway end) <u>and description</u></p> <p>Note: A similar amendment should be made to Initial Proposal 1, Appendix C on the consequential amendment to Annex 15.</p> |
| <b>Preliminary review by WG/PDP</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <p>The WG/PDP was in agreement with CG5's proposal.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Secretariat comments</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <p>Agree with the PDP.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

INITIAL PROPOSAL 4

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;<br>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.~~

3.9.43 As of 20 November 2008, 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           | <del>15 m if the taxiway is intended to be used by aeroplanes with a wheel base less than 18 m;</del><br><br><del>18 m if the taxiway is intended to be used by aeroplanes with a wheel base equal to or greater than 18 m</del> |
| 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.

|                                     |                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Review by Commission Group 5</b> | <p>Page A-7, 3.9.4 C</p> <p>“4.5m” and “if the taxiway...” are existing texts and should not be shaded grey. To make it easier to identify the proposed changes to the existing text, re-arrange as follows:</p> <p>4.5 m on curved portions if the taxiway is intended to be used by aeroplanes with a wheel base equal to or greater than 18 m.</p> |
| <b>Preliminary review by WG/PDP</b> | The WG/PDP was in agreement with CG5’s proposal.                                                                                                                                                                                                                                                                                                      |
| <b>Secretariat</b>                  | Agree with the PDP.                                                                                                                                                                                                                                                                                                                                   |

|          |  |
|----------|--|
| comments |  |
|----------|--|

## INITIAL PROPOSAL 5

**Table 3-1 Taxiway minimum separation distances**

| <i>Distance between taxiway centre line and runway centre line (metres)</i> |                           |                    |                    |                    |                               |                    |                    |                    |                                                            |                                                                                    |                                                                                            |                                                               |
|-----------------------------------------------------------------------------|---------------------------|--------------------|--------------------|--------------------|-------------------------------|--------------------|--------------------|--------------------|------------------------------------------------------------|------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|---------------------------------------------------------------|
| <i>Code letter</i>                                                          | <i>Instrument runways</i> |                    |                    |                    | <i>Non-instrument runways</i> |                    |                    |                    | <i>Taxiway centre line to taxiway centre line (metres)</i> | <i>Taxiway, other than aircraft stand taxilane, centre line to object (metres)</i> | <i>Aircraft stand taxilane centre line to aircraft stand taxilane centre line (metres)</i> | <i>Aircraft stand taxilane centre line to object (metres)</i> |
|                                                                             | <i>Code number</i>        | <i>Code number</i> | <i>Code number</i> | <i>Code number</i> | <i>Code number</i>            | <i>Code number</i> | <i>Code number</i> | <i>Code number</i> |                                                            |                                                                                    |                                                                                            |                                                               |
| <i>(1)</i>                                                                  | <i>1</i>                  | <i>2</i>           | <i>3</i>           | <i>4</i>           | <i>1</i>                      | <i>2</i>           | <i>3</i>           | <i>4</i>           | <i>(10)</i>                                                | <i>(11)</i>                                                                        | <i>(12)</i>                                                                                | <i>(13) (12)</i>                                              |
| <i>A</i>                                                                    | 82.5                      | 82.5               | –                  | –                  | 37.5                          | 47.5               | –                  | –                  | <b>23</b> (23.75)                                          | <b>15.5</b> (16.25)                                                                | <b>19.5</b>                                                                                | 12                                                            |
| <i>B</i>                                                                    | 87                        | 87                 | –                  | –                  | 42                            | 52                 | –                  | –                  | <b>32</b> (33.5)                                           | <b>20</b> (21.5)                                                                   | <b>28.5</b>                                                                                | 16.5                                                          |
| <i>C</i>                                                                    | –                         | –                  | 168                | –                  | –                             | –                  | 93                 | –                  | 44                                                         | 26                                                                                 | <b>40.5</b>                                                                                | <b>22.5</b> (24.5)                                            |
| <i>D</i>                                                                    | –                         | –                  | 176                | 176                | –                             | –                  | 101                | 101                | <b>63</b> (66.5)                                           | <b>37</b> (40.5)                                                                   | <b>59.5</b>                                                                                | <b>33.5</b> (36)                                              |
| <i>E</i>                                                                    | –                         | –                  | –                  | 182.5              | –                             | –                  | –                  | 107.5              | <b>76</b> (80)                                             | <b>43.5</b> (47.5)                                                                 | <b>72.5</b>                                                                                | <b>40</b> (42.5)                                              |
| <i>F</i>                                                                    | –                         | –                  | –                  | 190                | –                             | –                  | –                  | 115                | <b>91</b> (97.5)                                           | <b>51</b> (57.5)                                                                   | <b>87.5</b>                                                                                | <b>47.5</b> (50.5)                                            |

### 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

**Appendix A**

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 correct 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 of doing future upgrades.

|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Review by Commission Group 5</b> | <p>Page A-9, Table 3-1</p> <p>There is no explanation in Secretariat's Rationale for introducing the new column, (<i>Aircraft stand taxilane centre line to aircraft stand taxilane centre line</i>) in Table 3-1.</p> <p>The Secretariat subsequently circulated a 26-page Working Paper on the subject developed by the Aerodromes Design Working Group to the CG. The CG is of the view that the ANC and States would still need a brief narrative on the background, benefits and safety analysis made.</p> <p><b>CG's Proposal:</b> Background information, including benefits and safety analysis made should be included in the State Letter.</p> |
| <b>Preliminary review by WG/PDP</b> | The WG/PDP was in agreement with CG5's proposal.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Secretariat comments</b>         | Agree with the PDP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

**INITIAL PROPOSAL 6**

...

**3.9 Taxiways**

*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 designing taxiways 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.

**Appendix A**

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 the needless costs of building unusable pavement and as well as 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 is 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 taxiing 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 a 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 localizer 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 as guidance material (ADM) to give it more visibility.

### Review by Commission Group 5

#### Pages A11 – A13

It would be beneficial to States if the guidance material in Section 21 was also included in the Runway Incursion Prevention Manual (Doc 9870)

**CG's Recommendation:** Job Card AP006 should be revised to include the update of Doc 9870 as indicated above.

#### Page A-11, 21.1 – 21.6

Simplify paragraphs to improve clarity:

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 to ensure that runway incursion aspects are addressed during development of the design phase for new runways and taxiways. ~~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

## Appendix A

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>unobstructed views of the entire runway, and correct taxiways <del>designated</del> <u>identified</u> as hot spots as far as possible.</p> <p>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 <del>is</del> <u>are</u> 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.</p> <p>21.3 <del>For taxiways intersecting with runways, a</del> <u>Avoid</u> designing taxiways <u>intersecting with runways</u> 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.</p> <p>21.4 Existing taxiways <del>with excess width</del> <u>wider than recommended in Annex 14</u>, 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 <del>reconfigure or</del> repaint such locations.</p> <p>21.5 Multi-taxiway entrances to a runway should be parallel to each other and should be distinctly separated by an <del>earthen</del> <u>unpaved</u> 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 the needless costs of building unusable pavement and as well as 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.</p> <p>21.6 Build taxiways that cross a runway as a single straight taxiway <del>on both sides of the taxiway. In other words, a</del> <u>Avoid</u> dividing the taxiway into two after crossing the runway. This design principle avoids constructing “Y-shaped” taxiways known to present opportunities for runway incursions.</p> <p><u>Page A-12, 21.9</u></p> <p>21.9 Avoid the placement of different pavement materials (asphalt and <del>portland</del> 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.</p> <p><u>Page A-12, 21.11 b)</u></p> <p>b) The jet blast impact of aircraft taking off should be considered <u>in consultation</u> with aircraft manufacturers; the extent of take-off thrust should be evaluated when determining the location of a perimeter taxiway.</p> |
|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                     | <p><u>Page A-12, 21.11 c)</u></p> <p><b>Secretariat to re-draft for technical clarity.</b></p> <p><u>Page A-12, 21.11 d)</u></p> <p>The use of screens in the critical or sensitive areas of navigational aids could lead to interference. The example given could be deleted:</p> <p>d) Human factors issues should also be taken into account. <del>For example, screens or other measures</del> <u>Appropriate measures</u> 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.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Preliminary review by WG/PDP</b> | <p><u>21.1</u></p> <p>One member proposed that the word “unnecessary” in the third sentence of 21.1 be deleted. The WG/PDP agreed to delete the word.</p> <p><u>21.11 c)</u></p> <p>The Secretariat proposed that 21.11 c) be reworded by using a more generic term as follows. This is in consideration with the CG5’s comment that possible interference should be considered not only for ILS but also for other landing systems such as MLS, GBAS. Also, the Secretariat proposed to delete the last sentence because “perimeter roads” has already had its specification in Annex 14, Volume 1, Chapter 9. The Secretariat would also like to avoid future confusion.</p> <p>c) The requirement for a runway end safety area, as well as possible interference with the <u>different</u> instrument landing systems, should also be taken into account. <u>For example, in the case of an Instrument Landing System,</u> 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 localizer and the runway increases. <del>Likewise, perimeter roads should be provided where possible.</del></p> <p>One member clarified if landing systems included visual aids and another member commented that other navigation aids should also be considered. The Secretariat responded that visual aids did not have to be included but that other navigation aids could be included. Therefore, he proposed to amend as “landing systems and other navigation aids.”</p> <p>WG/PDP agreed on the Secretariat’s new proposal as follows.</p> <p>c) The requirement for a runway end safety area, as well as possible interference</p> |

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                      | <p>with the instrument landing systems <u>and other navigation aids</u>, should also be taken into account. <u>For example, in the case of an Instrument Landing System</u>, 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 localizer and the runway increases. <u>Likewise, perimeter roads should be provided where possible.</u></p> <p><u>21.11 d)</u></p> <p>Regarding 21.11 d), the Secretariat responded to the CG5 question and proposed to insert a new sentence in order to technically clarify the necessity for the consideration of screens instead of deleting “For example, screens or other measures.”</p> <p>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. <u>When using screens, consideration should be given to avoiding possible interference with different landing systems.</u></p> <p>Nevertheless, the WG/PDP agreed on the CG5’s proposal.</p> <p><u>Others</u></p> <p>CG-5 Lead commented that since both initial proposal 6 and 14 were proposing a new section 21 in Attachment A, either can be considered as section 21 while the other one should be section 22.</p> |
| Secretariat comments | Agree with the PDP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## INITIAL PROPOSAL 7

### 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.

**Appendix A**

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.

|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Preliminary review by WG/PDP</b> | <p><u>5.3.4.17</u></p> <p>One member commented that “flashing light” in 5.3.4.17 is too generic and suggested to include its colour, intensity and frequency. The Secretariat responded that the technical specification of the colour of the light is included in Appendix 1. The CG-5 Lead responded that the frequency was described in 5.3.4.18. However, the intensity is not described. Therefore, the WG/PDP recommended that “high intensity” be added in front of “flashing light” in paragraph 5.3.4.17, 5.3.4.18, 5.3.4.34 and 5.3.4.35.</p> <p>Relating to the amendment of “flashing light,” the Secretariat explained that during the CG5 meeting, one member suggested that 5.3.7.5 be revised so as to exclude the particular technology. The Secretariat indicated that the amendment to 5.3.7.5 will be proposed later.</p> <p><b>WG/PDP recommendation:</b> “high intensity” should be added in front of “flashing light” in paragraph 5.3.4.17, 5.3.4.18, 5.3.4.34 and 5.3.4.35.</p> |
| <b>Review by Commission Group 5</b> | <p>CG-5, interested Commissioners and Industry Observers met on October 07, 2014 to undertake the review.</p> <p><b>Rationale</b><br/>Amend 5.3.4.35 of Initial Proposal 7 by including the reference to 5.3.4.34 to ensure <b>clarity</b> and <b>consistency</b> with 5.3.4.17 &amp; 5.3.4.18.</p> <p><b>CG Proposal</b></p> <p>5.3.4.35 Each <del>capacitor discharge</del> <b>high intensity</b> flashing light <u>as described in 5.3.4.34</u> 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</p>                                                                                                                                                                                                                                 |
| <b>Secretariat comments</b>         | <p>Secretariat disagrees with PDP suggestion of inserting an intensity qualifier in the paragraph. In chapter 5 of Annex 14 Volume I, characteristics of aeronautical ground lights are given in Appendix 2 with isocandela diagrams. To remind that point to the occasional reader, it is proposed to add in the rationale box pA-14:</p> <p>“The characteristics of these lights shall follow Appendix 2, as stated in 5.3.4.21 and 5.3.4.39.”</p> <p>Secretariat agrees with inserting “<i>as described in 5.3.4.34</i>” in 5.3.4.35.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

|  |                                                                                                                                                                                                                                                                                                                                                               |
|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>New proposal for 5.3.7.5:</p> <p style="text-align: center;">5.3.7 Runway lead-in lighting systems</p> <p>...</p> <p>5.3.7.5 <b>Recommendation.</b>— <i>The flashing lights and the steady burning lights should be white, and the steady burning lights gaseous discharge lights.</i></p> <p>Reference to 5.3.7.5 will be added in the rationale box.</p> |
|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

...

### 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.*

|                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                        |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Origin:</b></p> <p>AP/3</p> <p><b>Rationale:</b></p> <p>The proposed note is provided to point out that solid state light sources, i.e., LED, may not have sufficient 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.</p> |                                                                                                                                                                                                                                                                                                                        |
| <p><b>Review by Commission Group 5</b></p>                                                                                                                                                                                                                                                                                                                                                                   | <p><u>Page A-14</u></p> <p>The opening sentence of the Note is ambiguous: “infrared emitters” could be qualifying either the entire phrase i.e. “Solid state sources without additional enhancements” or “additional enhancements”.</p> <p><b>CG’s Proposal:</b> The Secretariat to re-draft the Note for clarity.</p> |
| <p><b>Preliminary review by WG/PDP</b></p>                                                                                                                                                                                                                                                                                                                                                                   | <p>One member suggested that an alert to the pilot at a specific airport be published in some forms such as AIP about incompatibility with EVS or NVG. However, the Secretariat felt that it is not necessary because all lights at airports have to meet specifications in Annex14.</p>                               |

**Appendix A**

|                             |                                                                                                                                                                                                                                                                                     |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Secretariat comments</b> | The note could be redrafted “Without additional enhancements (e.g., infrared emitters), solid state light sources...”<br>As there are no requirements for accommodating for EVS or NVG in Annex 14, Secretariat feels that if that note is creating confusion, it could be removed. |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## **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.*

|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Review by Commission Group 5</b> | <p><u>Page A-16, Introductory Note</u></p> <p>1. In the Introductory note, various standards (dating back to 1931) of the International Commission on Illumination (CIE) have been referenced to. The CG’s expectation is that upon the development of a policy on SMOs in compliance with Resolution A37-15, a more structured means of updating external Standards in ICAO provisions would be achieved.</p> <p>2. CIE Standard S004 of 2001 should correctly be referenced as “S 004/E of 2001”.</p> <p><b>CG’s Proposal:</b></p> <p><i>The chromaticities for solid state lighting (e.g. LED) are based upon the boundaries given in the standard <del>S004</del> <u>S_004/E</u> of 2001 of the International Commission on</i></p> |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                                     |                                                                                                                                                                                                           |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                     | <i>Illumination (CIE), except for the blue boundary of white.</i>                                                                                                                                         |
| <b>Preliminary review by WG/PDP</b> | The WG/PDP was in agreement with CG5's proposal.                                                                                                                                                          |
| <b>Secretariat comments</b>         | Secretariat would prefer to use the global "S 004/E-2001" in all places, including rationale box. The example above would read: "... <i>given in the standard S 004/E-2001 of the International...</i> ". |

## 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  $x = 0.500$

**Appendix A**

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]~~

**Appendix A****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 sources 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.

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Review by<br/>Commission<br/>Group 5</b> | <p>Page A-17, 2.1.2<br/>         2.1.2 is not included in the proposed amendment. However the following amendment to the text is proposed by the CG (for simplification and clarity)</p> <p><b>2.1.2. Recommendation:</b> <i>Where dimming is not required, or <del>where observers with defective colour vision must be able to determine the colour of the light,</del> to accommodate people with defective colour vision green signals should be within the following boundaries:</i></p> <p>Page A-17, Note<br/>         Editorial on Note below 2.1.2<br/> <i>Note.— Where the colour signal is to be seen from long range, it has been <u>the</u> practice to use colours within the boundaries of 2.1.2.</i></p> <p>Page A-19, 2.3<br/>         Heading of Section 2.3 to be shaded grey (new text):</p> |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Appendix A

|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                     | <p>2.3 Chromaticities for lights having a solid state light source</p> <p>Page A-19, 2.3.2<br/>Simplification of text for clarity:</p> <p>2.3.2 <b>Recommendation.</b>— <del>Where observers with defective colour vision must be able to determine the colour of the light,</del> <i>To accommodate people with defective colour vision, green signals should be within the following boundaries:</i></p> <p>Page A-21, Fig. A1-1a<br/>The CG recommends that the Secretariat cross-checks to ensure that amendments to 2.1.1 (a) and (f) are reflected in the Chart.</p> <p>Page A-23, Rationale Box<br/>The explanation given for the sentence ending “<i>except for the colour orange in Figure A1-2 for ordinary colours for markings and externally illuminated signs and panels.</i>” in the Introductory Note (Page A-16) is not convincing. Secretariat to improve on it.</p>                                                                                                                                                                                                                                                                                                            |
| <b>Preliminary review by WG/PDP</b> | <p>The WG/PDP was in agreement with CG-5’s proposal.</p> <p>Page A-21, Fig. A1-1a<br/>The Secretariat explained that only “y=0.320” was added in new Figure A1-1a and proposed to include an editorial note under the Figure to explain the addition. The WG/PDP was in agreement with the Secretariat’s proposal.</p> <p>Page A-16, Introductory Note<br/>The Secretariat proposed to delete the wordings “for ordinary colours for markings and externally illuminated signs and panels” from the Introductory Note in response to CG5’s comment. The WG/PDP was in agreement with the Secretariat’s proposal.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Secretariat comments</b>         | <p>Secretariat disagrees with PDP recommendation for 2.3.2 and 2.1.2. Paragraph 2.3.2 follows existing wording of 2.1.2 to be consistent. And 2.1.2, as noted by CG5, is not proposed by the current amendment. Secretariat would accept a job card on this wording for an eventual future amendment but does not want to change it in the frame of this current, nor delay the proposal for that matter.</p> <p><u>Editorial changes</u></p> <ul style="list-style-type: none"> <li>- Page A-17, Note below 2.1.2</li> </ul> <p><i>Note.</i>— <del>Where the colour signal is to be seen from long range, it has been the practice to use colours within the boundaries of 2.1.2.</del></p> <ul style="list-style-type: none"> <li>- Page A-19, 2.3</li> </ul> <p>Heading of Section 2.3 to be shaded grey (new text)<br/>2.3 Chromaticities for lights having a solid state light source</p> <ul style="list-style-type: none"> <li>- Page A-16, Introductory Note, and rationale box</li> </ul> <p>The Secretariat proposed to delete the wordings “<i>for ordinary colours for markings and externally illuminated signs and panels</i>” from the Introductory Note and the rationale box</p> |

- Figure A1-1a

An editorial note will be added to new Figure A1-1a explaining the addition of the bar “ $y=0.320$ ” for the red area.

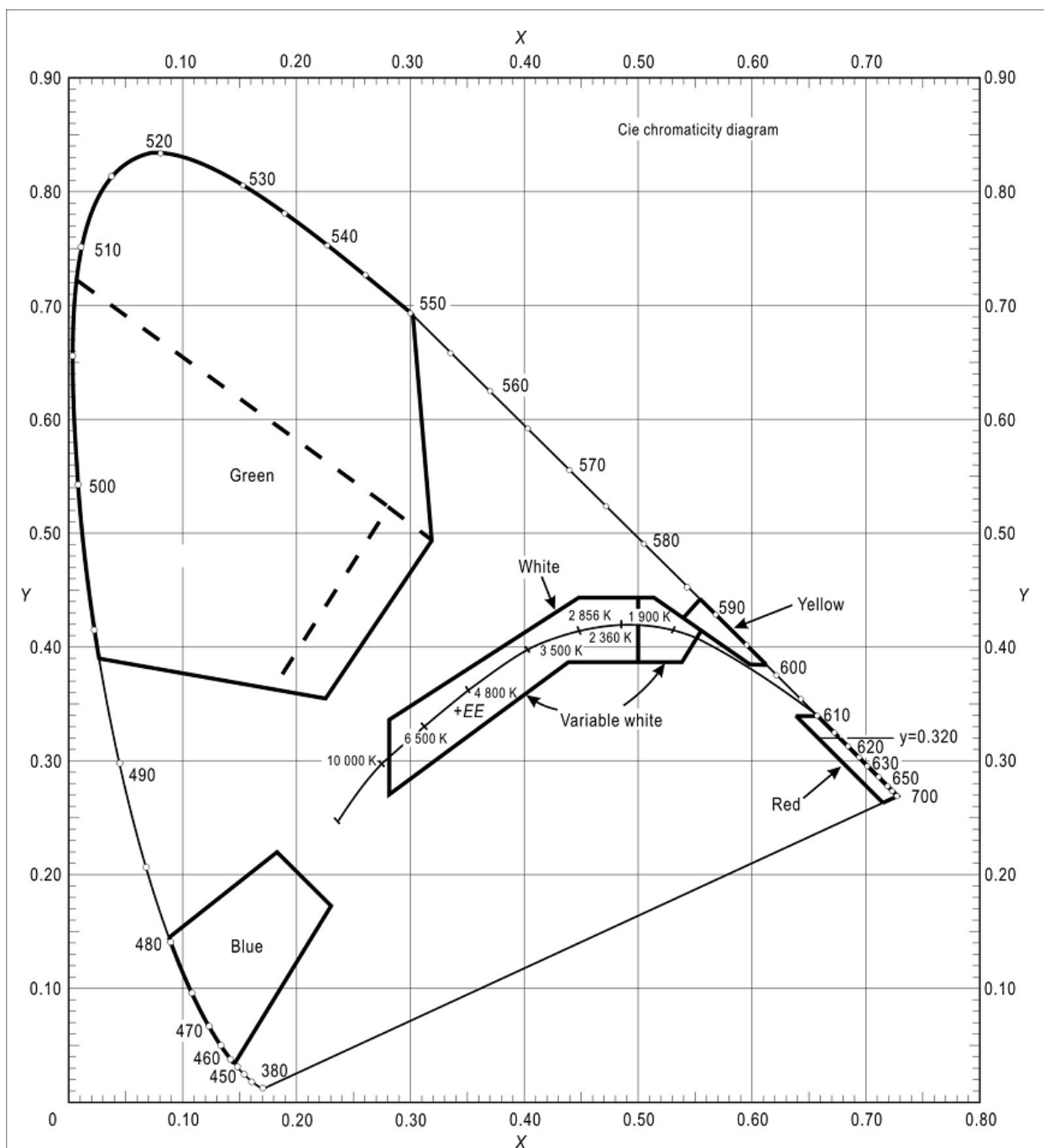
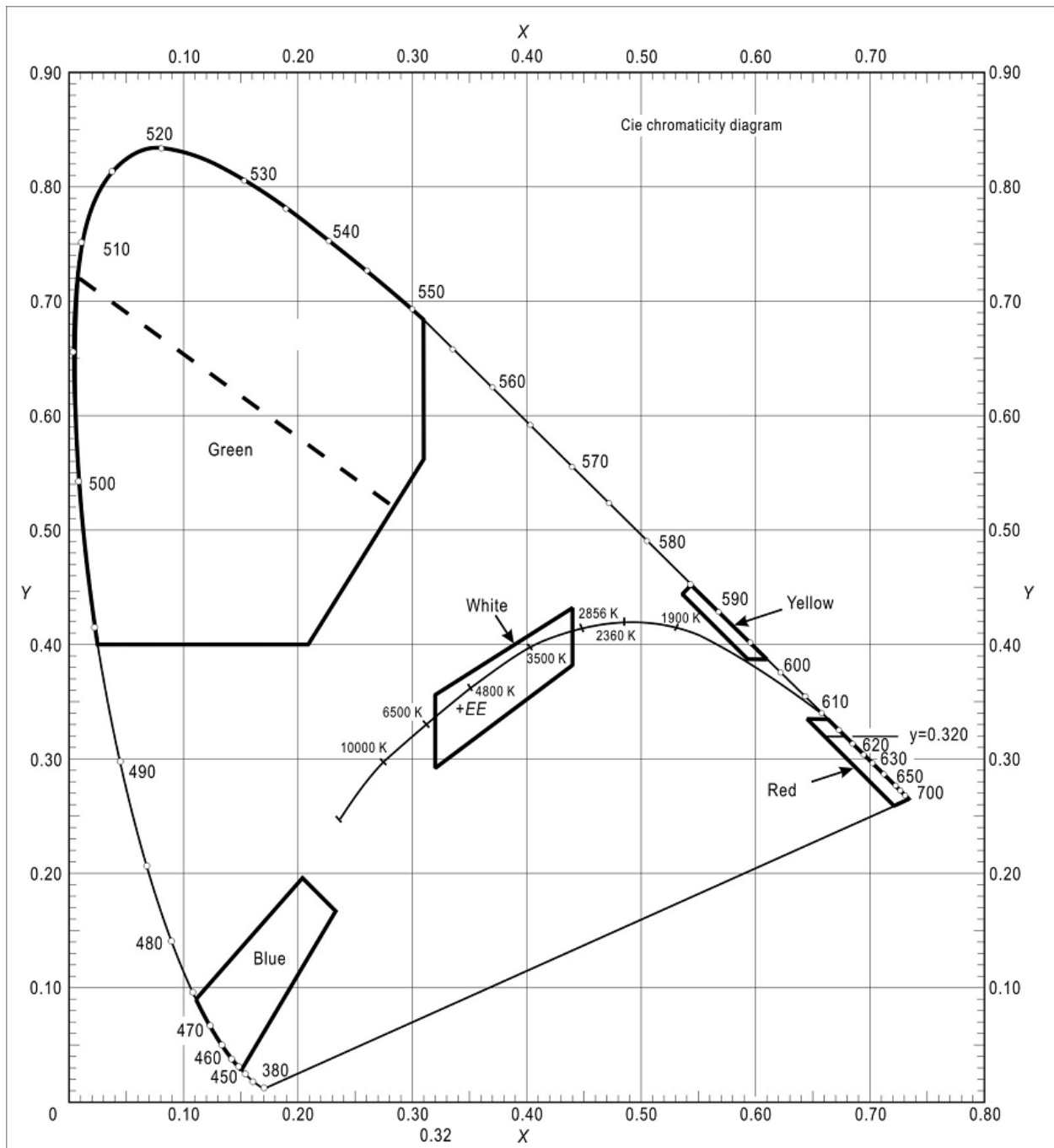


Figure A1-1a: Colours for aeronautical ground lights (filament-type lamps)



**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 because 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 because 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  $y=0.790-0.667x$  because 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 in 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 the green is to be distinguished from.

2.2.4 and 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 the yellow-green colour is picked then other selections should be in the same area. The article is a recommendation because 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 the yellow-green only, 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  $x=0.310$ .

**Appendix A**

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.

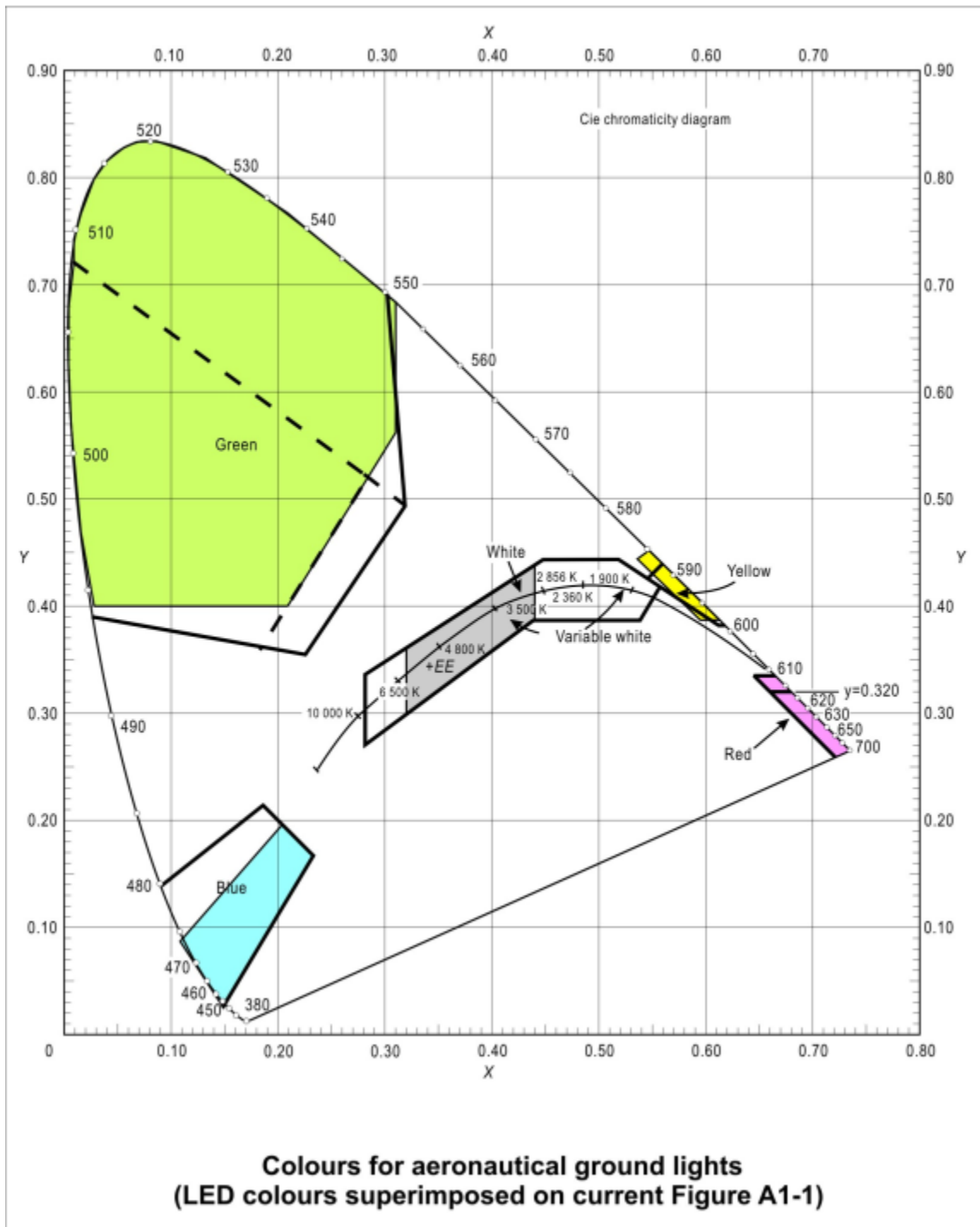
WHITE: The blue and yellow boundaries of white are moved inwards to  $x=0.320$  and  $x=0.440$ , respectively. The blue boundary in CIE S004 is at  $x=0.300$  but the Visual Aids Working Group concluded that the blue boundary at  $x=0.320$  is more appropriate for greater certainty of recognition from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



Note: This figure is not part of the amendment.

## INITIAL PROPOSAL 8

### 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:

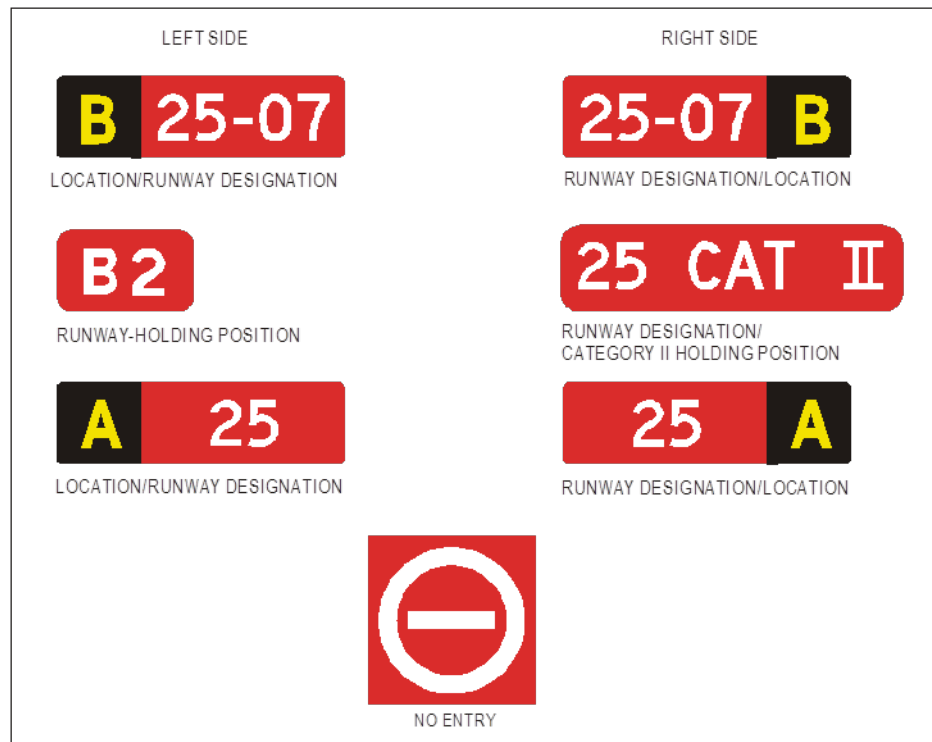
| <i>Inscription/symbol</i>                          | <i>Use</i>                                                                                                         |
|----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| Runway designation of a runway extremity           | To indicate a runway holding position at a runway extremity                                                        |
| OR                                                 |                                                                                                                    |
| Runway designation of both extremities of a runway | To indicate a runway holding position located at other taxiway/runway intersections or runway/runway intersections |

|                            |                                                                                           |
|----------------------------|-------------------------------------------------------------------------------------------|
| 25 CAT I<br>(Example)      | To indicate a category I runway holding position at the threshold of runway 25            |
| 25 CAT II<br>(Example)     | To indicate a category II runway holding position at the threshold of runway 25           |
| 25 CAT III<br>(Example)    | To indicate a category III runway holding position at the threshold of runway 25          |
| 25 CAT II/III<br>(Example) | To indicate a joint category II/III runway holding position at the threshold of runway 25 |
| NO ENTRY<br>symbol         | To indicate that entry to an area is prohibited                                           |
| B2<br>(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.

|                                                     |                                                                                     |                                                                                                        |
|-----------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| Runway designation of a runway extremity            | <b>25</b>                                                                           | Indicates a runway-holding position at a runway extremity                                              |
| Runway designation of both extremities of a runway  | <b>25-07</b>                                                                        | Indicates a runway-holding position located at taxiway/runway intersection other than runway extremity |
| Category I hold position                            | <b>25 CAT I</b>                                                                     | Indicates a category I runway-holding position at the threshold of runway 25                           |
| Category II hold position                           | <b>25 CAT II</b>                                                                    | Indicates a category II runway-holding position at the threshold of runway 25                          |
| Category III hold position                          | <b>25 CAT III</b>                                                                   | Indicates a category III runway-holding position at the threshold of runway 25                         |
| Category II and III hold position                   | <b>25 CAT II/III</b>                                                                | Indicates a joint category II and III runway-holding position at the threshold of runway 25            |
| Category I, II and III hold position                | <b>25 CAT I/II/III</b>                                                              | Indicates a joint category I, II and III runway-holding position at the threshold of runway 25         |
| NO ENTRY                                            |  | Indicates that entry to an area is prohibited                                                          |
| Runway-holding position (in accordance with 3.12.3) | <b>B2</b>                                                                           | Indicates a runway-holding position                                                                    |

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

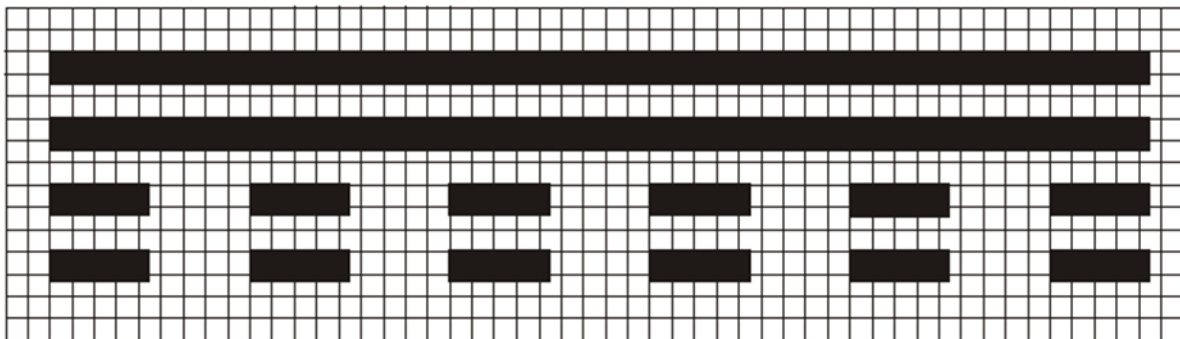
|                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Origin</b><br>VAWG/11-DP/07, APWGs/2-DP/05 | <b>Rationale</b><br>Mandatory instruction signs are described in paragraph 5.4.2 with reference to Figure 5-30 <i>Mandatory Instruction Signs</i> and Figure 5-32 <i>Examples of sign positions at taxiway/runway intersections</i> .<br><br>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.<br><br>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.<br>Note: the symmetry (left side/right side) of the signs is illustrated in the examples of Figure 5-32.<br><br>This should clarify any ambiguity with minimal cost impact. |
| <b>Review by Commission Group 5</b>           | <u>Page A-26, 5.4.2.18</u><br><br>Suggests deletion of “Where appropriate” - makes the Standard weak.<br><br><u>CG’s Proposal:</u><br><del>Where appropriate, the</del> <b>The</b> following inscriptions/symbol of Figure 5-30 shall be used: <sup>1</sup><br><br><u>Page A-34, Table 6-5</u><br>Column headings “Greater than” and “Not exceeding” are new text : to be shaded grey                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Preliminary review by WG/PDP</b>           | The WG/PDP was in agreement with CG-5’s proposal.<br><br><u>Figure 5-30</u><br>One member clarified that a new font was intentionally used in the amendment to Figure 5-30. The Secretariat will check and respond later.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Secretariat comments</b>                   | Secretariat disagrees with removing “ <i>Where appropriate</i> ” in 5.4.2.18 as all the signs cannot be applicable at all locations. This wording but simply states that the appropriate sign has to be used for a given location and does not weaken the standard.<br><br><u>Page A-34, Table 6-5</u><br>Column headings “ <b>Greater than</b> ” and “ <b>Not exceeding</b> ” are new text and will be shaded grey.<br><u>Figure 5-30</u><br>The font used needs to be changed. The figure has already been corrected by Editorial and will be included in the States letter.                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

## APPENDIX 4

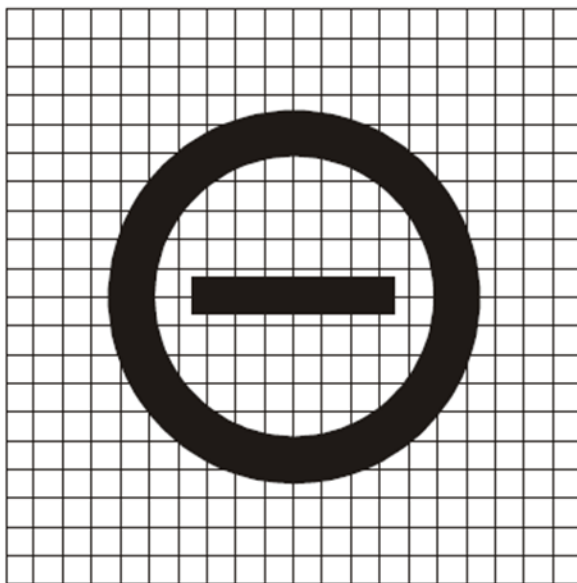
---

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

---



Runway vacated sign



NO ENTRY sign

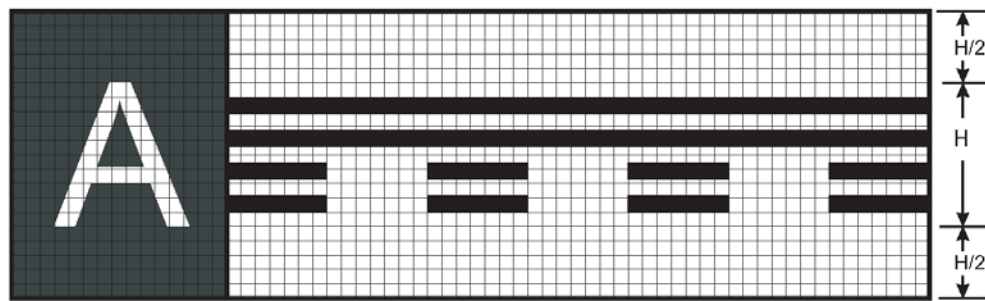
*Note.*— Existing NO ENTRY signs not conforming to these dimensions are to be replaced not later than 1 January 2012.

Figure A4-2. (cont.)

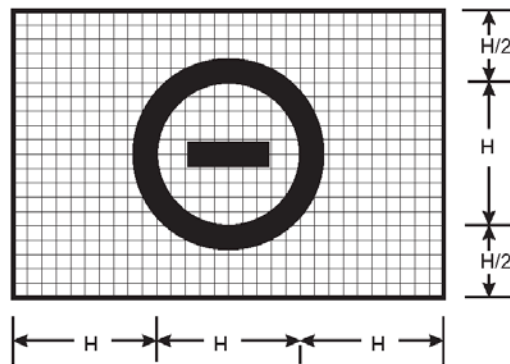
---

*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.

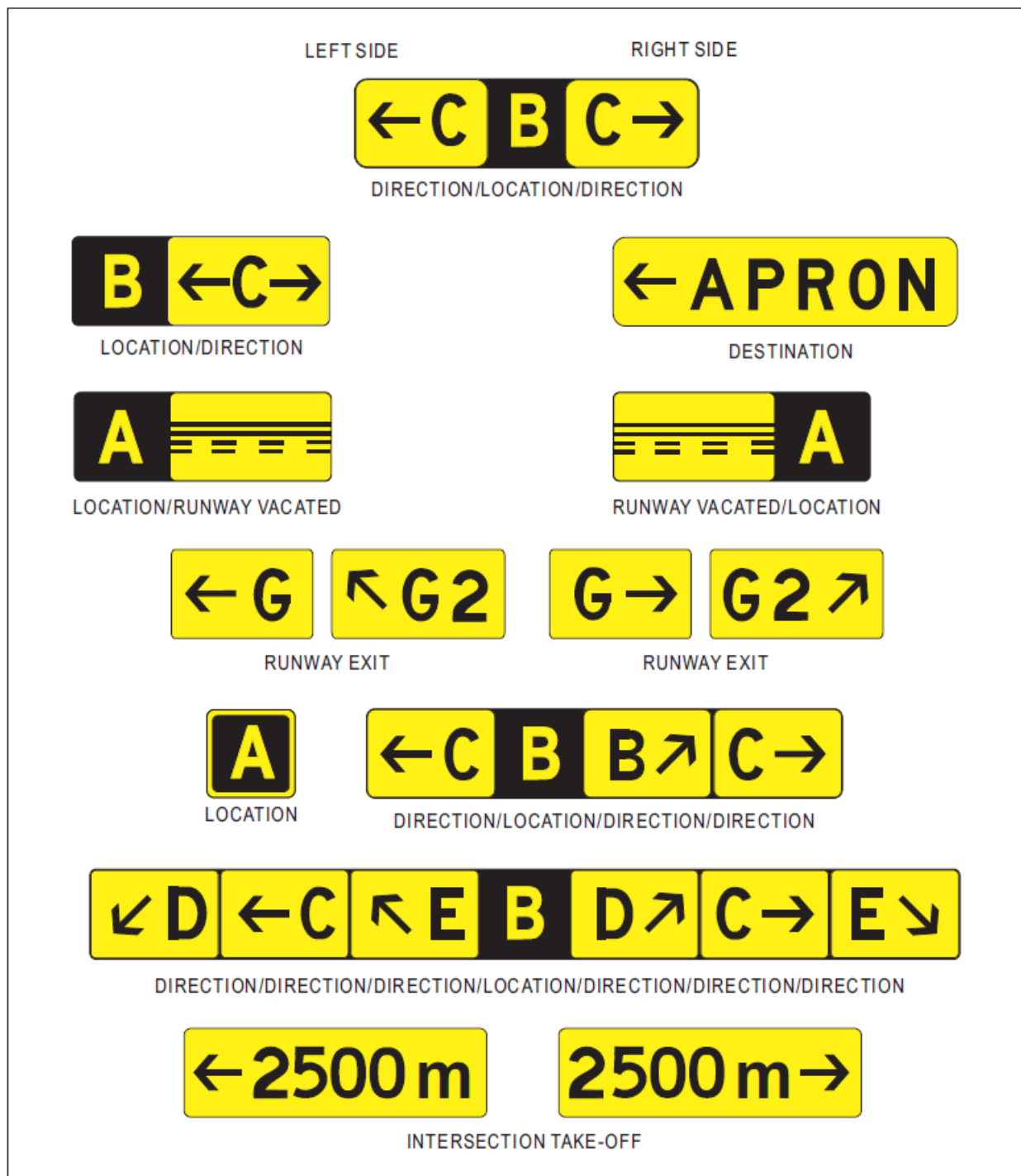
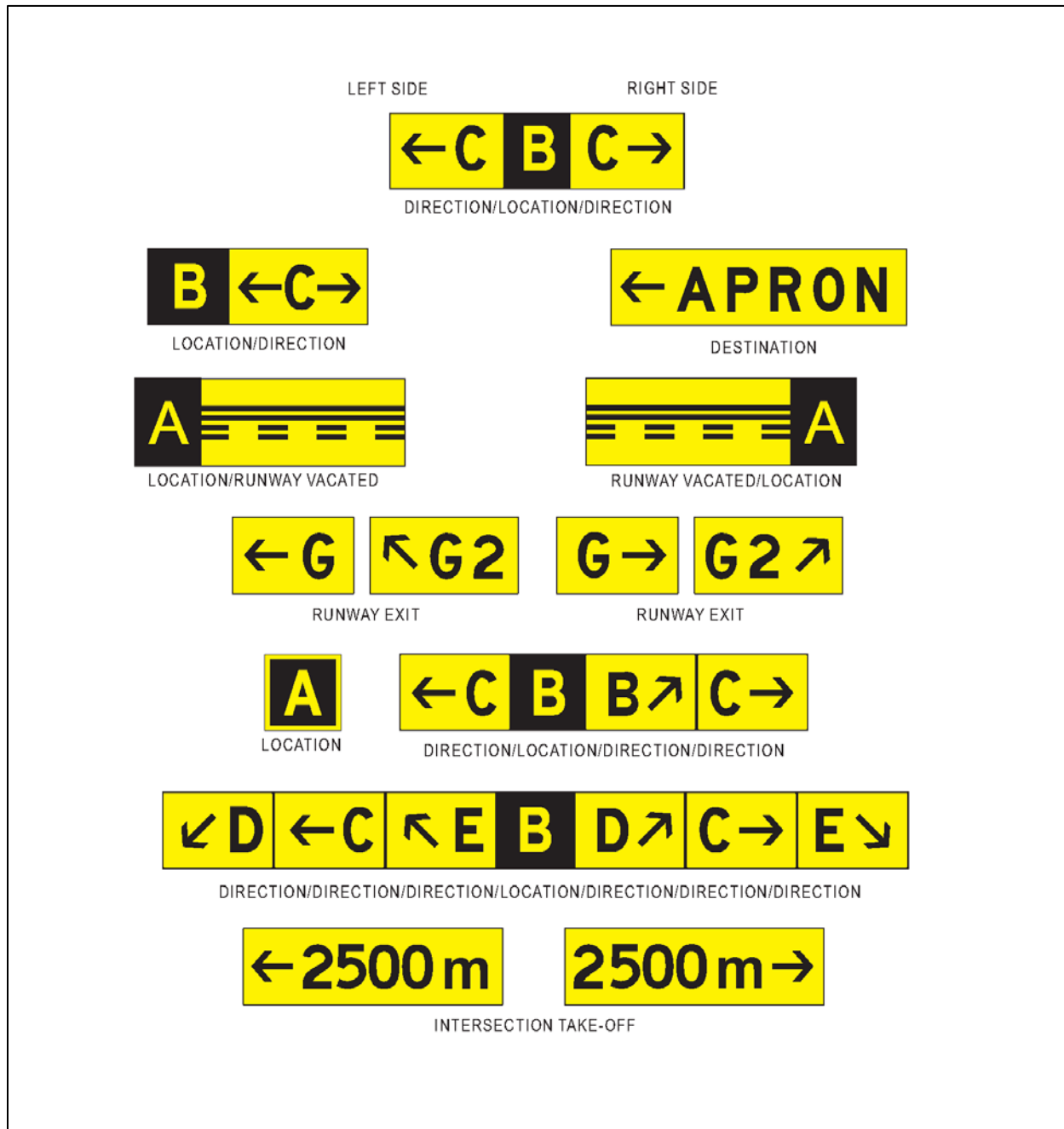


Figure 5-31. Information signs

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



**Figure 5-31. Information Signs**

**Appendix A****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 Figure A4-2 should be rectangular but is displayed as a square sign in Figure 5-30.

It is proposed to remove both inscriptions of runway vacated and NO ENTRY from Figure 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 Figure 5-30 (see previous change) are changed accordingly.

Finally, Figure 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<br>above terrain | Angle of the peak of the beam<br>above the horizontal |
|---------------------------------------|-------------------------------------------------------|
| <del>greater than 151 m AGL</del>     | 0°                                                    |
| <del>122 m to 151 m AGL</del>         | 1°                                                    |
| <del>92 m to 122 m AGL</del>          | 2°                                                    |
| <del>less than 92 m AGL</del>         | 3°                                                    |

| Height of light unit above terrain (AGL) |               | Angle of the peak of the beam above the<br>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 degrees is acceptable for 122 m AGL.

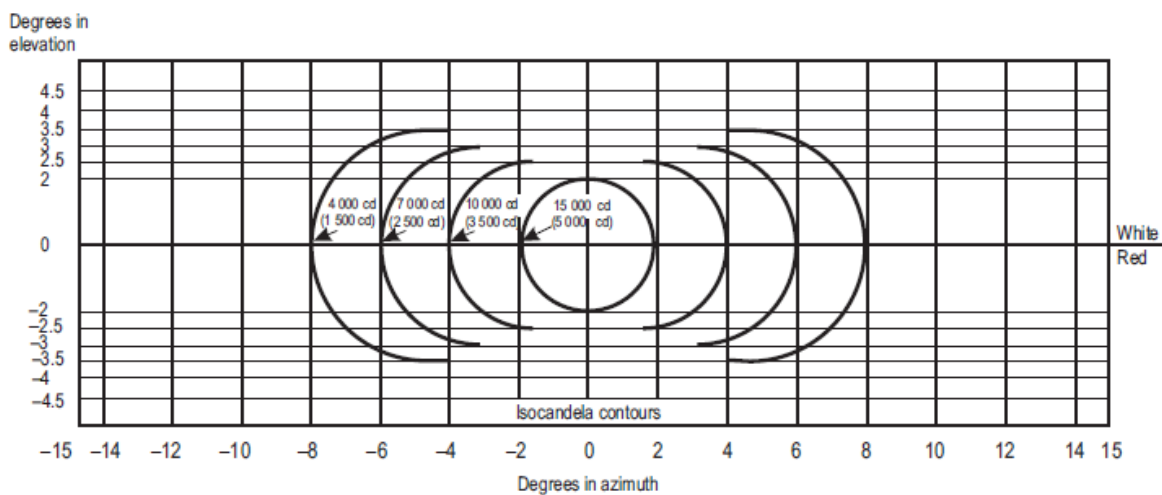
It is proposed to use the format of Table 6-4 to clarify the limit of each range of height. The intended value of 2 degrees is kept for 122 m AGL.

## INITIAL PROPOSAL 9

...

## APPENDIX 2. AERONAUTICAL GROUND LIGHT CHARACTERISTICS

...

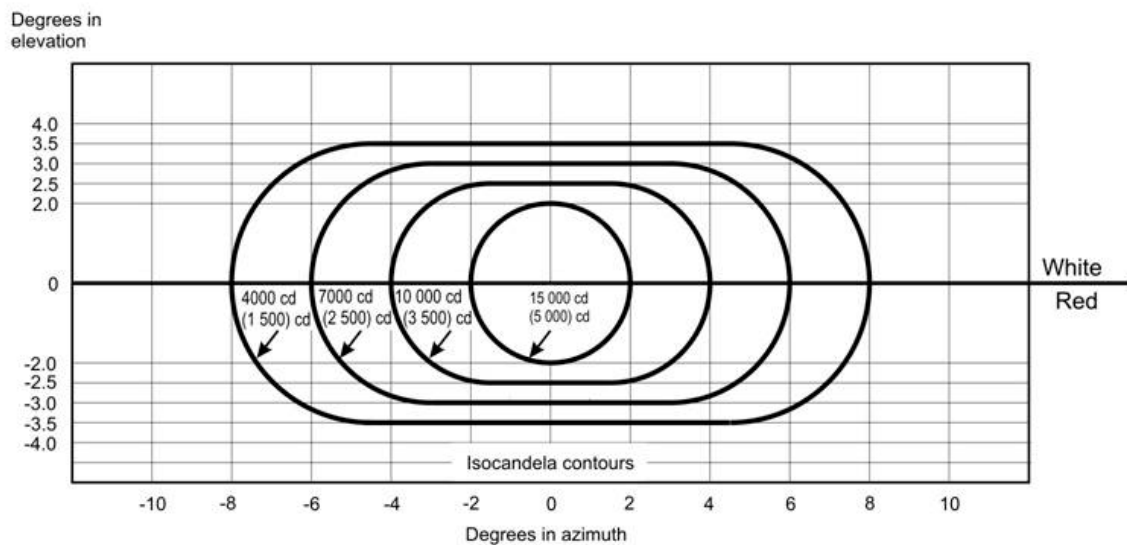


## Notes:

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]

|                                                                                                                                                                                                                           |                                                           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| <b>Origin</b><br>AP/3                                                                                                                                                                                                     |                                                           |
| <b>Rationale</b><br>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. |                                                           |
| <b>Review by Commission Group 5</b>                                                                                                                                                                                       | In agreement with Initial Proposal 9                      |
| <b>Preliminary review by WG/PDP</b>                                                                                                                                                                                       | The WG/PDP was also in agreement with Initial Proposal 9. |

|                     |
|---------------------|
| INITIAL PROPOSAL 10 |
|---------------------|

...

**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.~~ In the case of a wind farm, i.e. a group of two or more wind turbines, ~~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                        |
|----------------------------------------------|--------------------|------------------------------|-------------------------------------------------------|-----------------------------------------|----------------------------------------|--------------------------|
| Light Type                                   | Colour             | Signal type/<br>(flash rate) | Peak intensity (cd) at given Background Luminance (b) |                                         |                                        | Light Distribution Table |
|                                              |                    |                              | Day<br>(Above 500 cd/m <sup>2</sup> )                 | Twilight<br>(50-500 cd/m <sup>2</sup> ) | Night<br>(Below 50 cd/m <sup>2</sup> ) |                          |
| Low-intensity, Type A<br>(fixed obstacle)    | Red                | Fixed                        | N/A                                                   | N/A                                     | 10                                     | Table 6-2                |
| Low-intensity, Type B<br>(fixed obstacle)    | Red                | Fixed                        | N/A                                                   | N/A                                     | 32                                     | Table 6-2                |
| Low-intensity, Type C<br>(mobile obstacle)   | Yellow/Blue<br>(a) | Flashing<br>(60-90 fpm)      | N/A                                                   | 40                                      | 40                                     | Table 6-2                |
| Low-intensity, Type D<br>(follow-me vehicle) | Yellow             | Flashing<br>(60-90 fpm)      | N/A                                                   | 200                                     | 200                                    | Table 6-2                |
| Low-intensity, Type E                        | Red                | Flashing<br>(c)              | N/A                                                   | N/A                                     | 32                                     | Table 6-2<br>(type B)    |
| Medium-intensity, Type A                     | White              | Flashing<br>(20-60 fpm)      | 20 000                                                | 20 000                                  | 2 000                                  | Table 6-3                |
| Medium-intensity, Type B                     | Red                | Flashing<br>(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,<br>Type A                    | White              | Flashing<br>(40-60 fpm)      | 200 000                                               | 20 000                                  | 2 000                                  | Table 6-3                |
| High-intensity,<br>Type B                    | White              | Flashing<br>(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

**Appendix A****Origin**

VAWG/10-DP/13, VAWG/11-DP/05, APWG/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 was less than 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.

|                                     |                                                                                                                                                                                                                                                                           |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Review by Commission Group 5</b> | In agreement with Initial Proposal 10.<br>However, it is suggested that the last two sentences in the Secretariat's Rationale Box be deleted. Could be replaced with: "Future work of the Aerodromes Design and Operations Panel would consider the appropriate approach" |
| <b>Preliminary review by</b>        | The WG/PDP was in agreement with CG5's proposal.                                                                                                                                                                                                                          |

|                             |                                                                                               |
|-----------------------------|-----------------------------------------------------------------------------------------------|
| <b>WG/PDP</b>               |                                                                                               |
| <b>Secretariat comments</b> | Secretariat agrees that the last two sentences in the Secretariat's Rationale Box be deleted. |

## INITIAL PROPOSAL 11

### 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) ~~e)~~ displace the axis of the system and its associated obstacle protection surface by no more than 5°;
- ~~e) 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.*

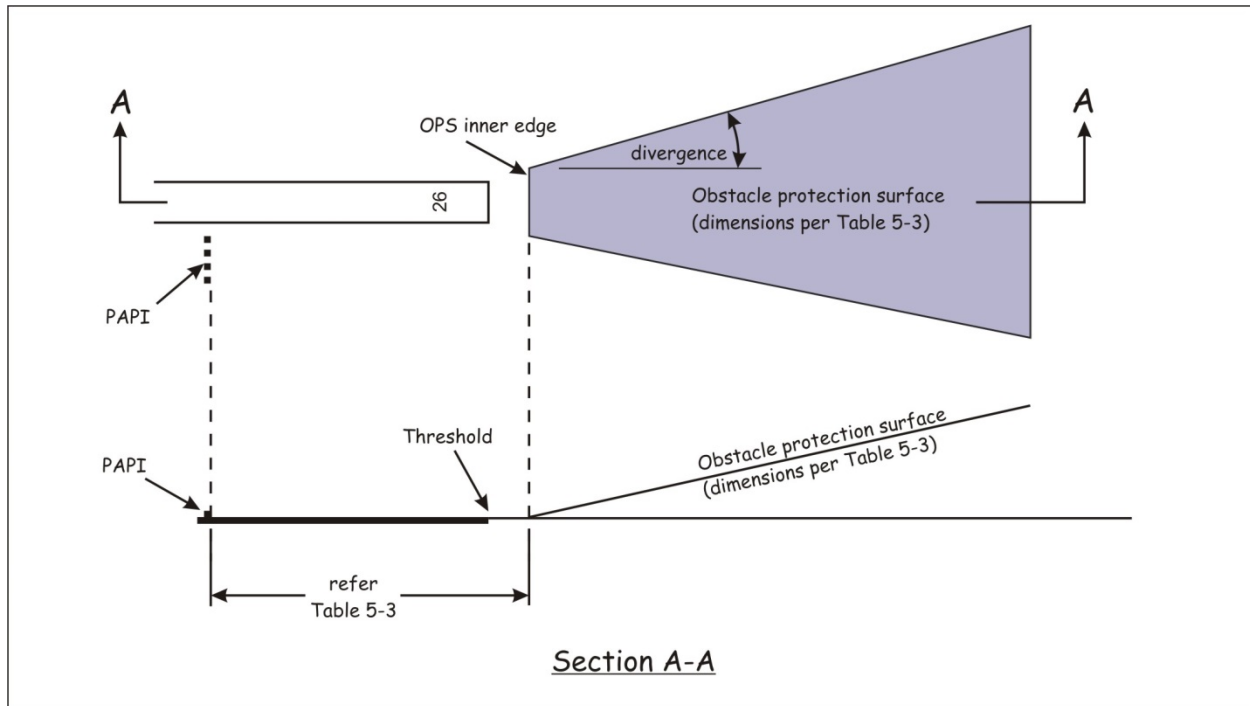
**Table 5-3. Dimensions and slopes of the obstacle protection surface**

|                                                                        | 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) | <del>D<sub>1</sub>+30 m</del><br>30 m | <del>D<sub>1</sub>+60 m</del><br>60 m | <del>D<sub>1</sub>+60 m</del><br>60 m | <del>D<sub>1</sub>+60 m</del><br>60 m | <del>D<sub>1</sub>+60 m</del><br>60 m | <del>D<sub>1</sub>+60 m</del><br>60 m | <del>D<sub>1</sub>+60 m</del><br>60 m | <del>D<sub>1</sub>+60 m</del><br>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                               |
| <i>Slope</i>                                                           |                                       |                                       |                                       |                                       |                                       |                                       |                                       |                                       |
| 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°                                | —                                     | —                                     |

**Appendix A**

- 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 Figure 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 the 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. |                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Review by Commission Group 5</b>                                                                                                                                  | <p>Page A-41, 5.3.5.45</p> <p>CG was of the view that under 5.3.5.45 f, displacing the threshold would also involve the displacement of the associated PAPI or VASI</p> <p><b>CG's Proposal:</b></p> <p>f) suitably displace the threshold <u>and the associated PAPI or VASI.</u></p> <p>The Secretariat to confirm if implementation of f) would involve displacement or alignment of other systems in addition to the PAPI or VASI.</p> |
| <b>Preliminary review by WG/PDP</b>                                                                                                                                  | <p>The Secretariat proposed a more generic term instead of using PAPI and VASI as follows:</p> <p>f) suitably displace the threshold <u>and the associated visual approach slope indication system.</u></p> <p>The WG/PDP was in agreement with the Secretariat's proposal.</p>                                                                                                                                                            |
| <b>Secretariat comments</b>                                                                                                                                          | <p>The final opinion of the Secretariat is remove item f) as displacing the threshold is not a primary mean of solving the penetration problem with this amendment proposal.</p> <p>As Figure 5-21 was modified, old figure 5-21 will be included in the amendment proposal.</p>                                                                                                                                                           |

## INITIAL PROPOSAL 12

### 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.*

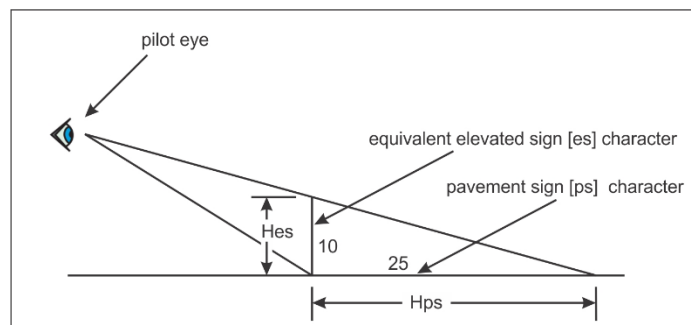
*Note 2.— This appendix details the form and proportions of the letters, numbers and symbols of mandatory instruction markings and information markings on a 20 cm grid.*

*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*

## Appendix A

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 4 000 mm ( $H_{ps}$ ), the equivalent elevated sign character height is  $4\,000/2.5=1\,600$  mm ( $H_{es}$ ). 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  $(1\,600/400)*96=384$  mm.



### Origin

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

### Rationale

Annex 14, Appendix 3, introduces specifications 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 is 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.

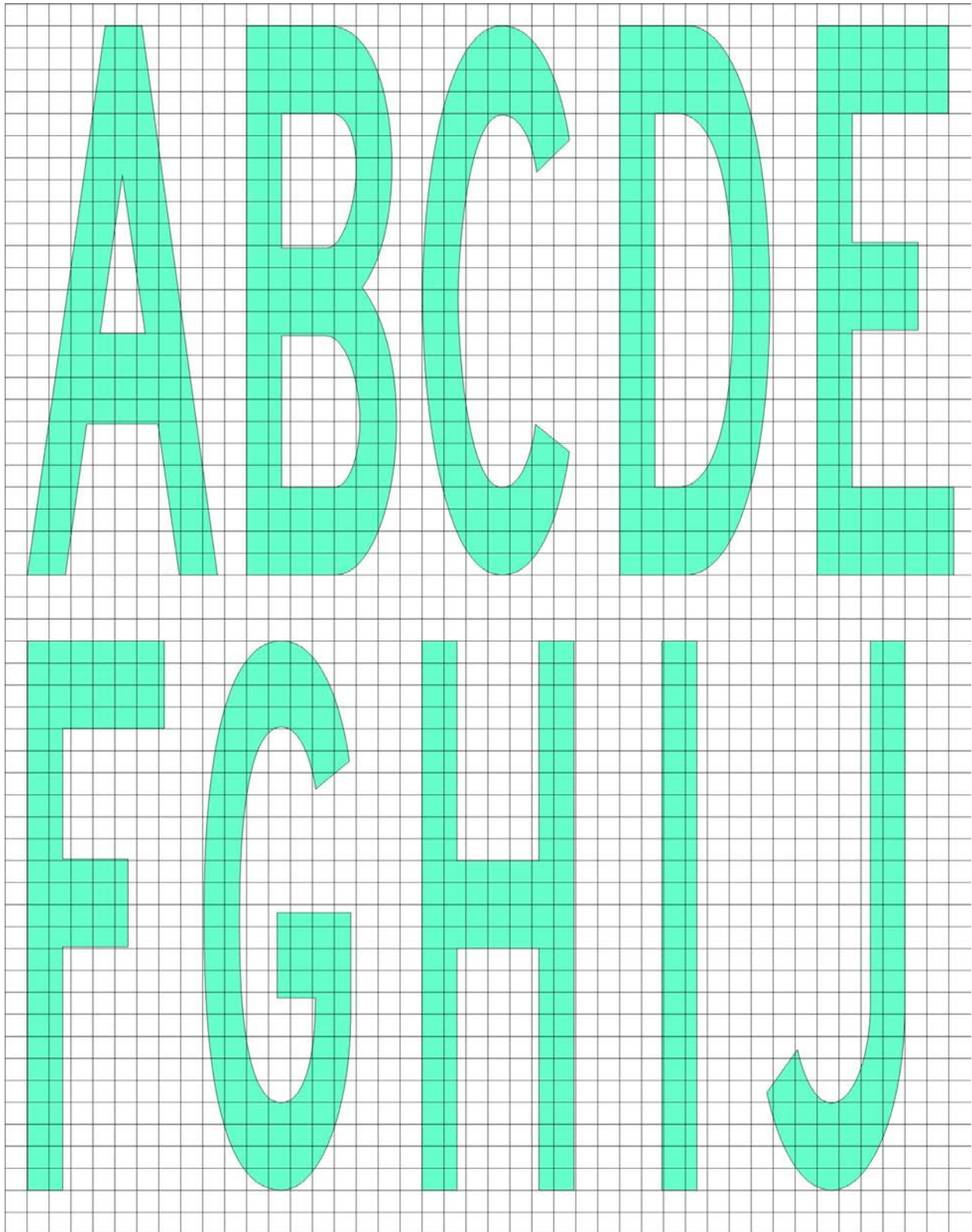
An explicit example of calculation of spacing is given and a figure is provided for further clarity.

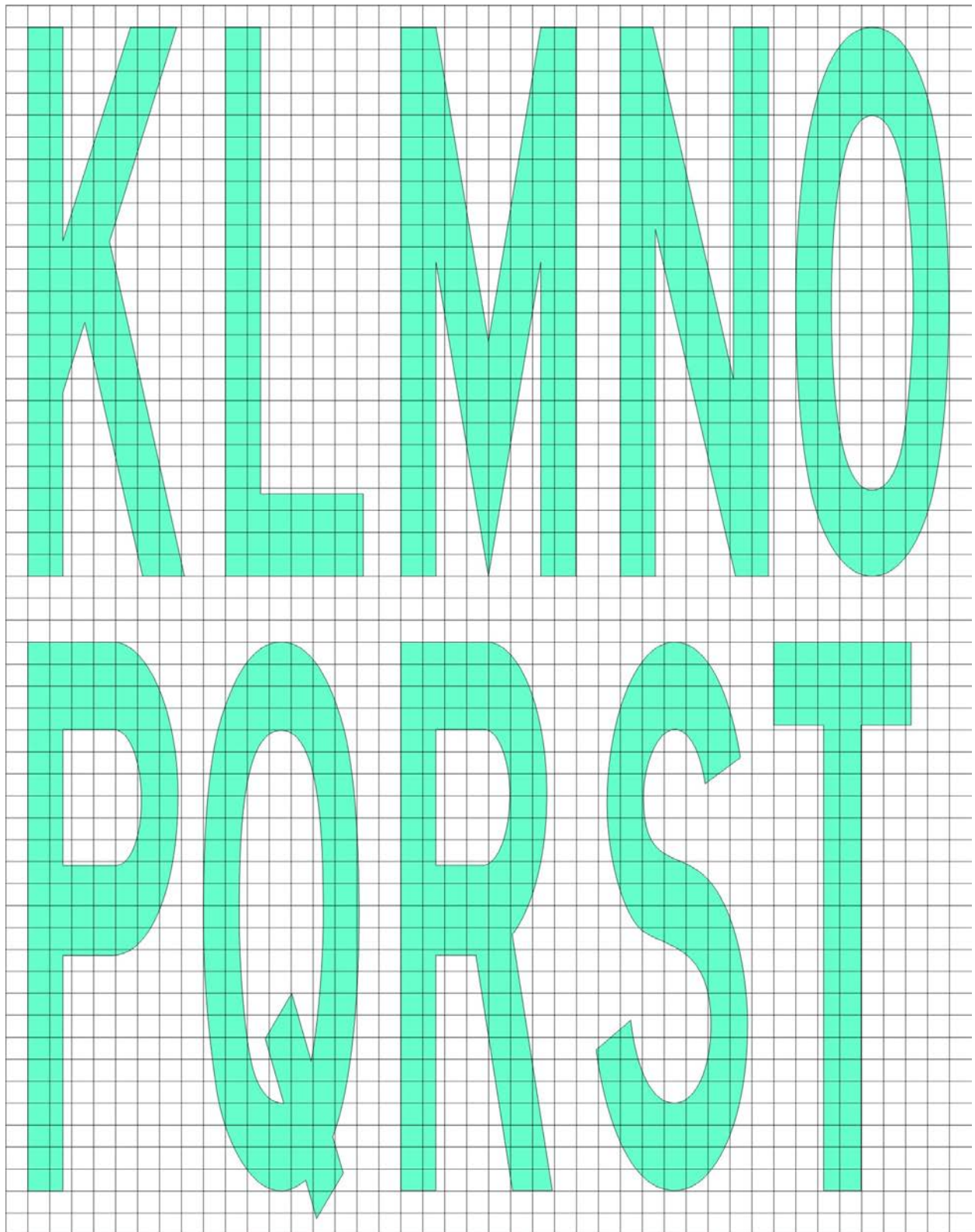
For the grid, as for elevated sign characters in Appendix 4, it is suggested to remove the reference to the dimension of 20 cm and to use a 25 squares height instead of present 20 for ease of conversion.

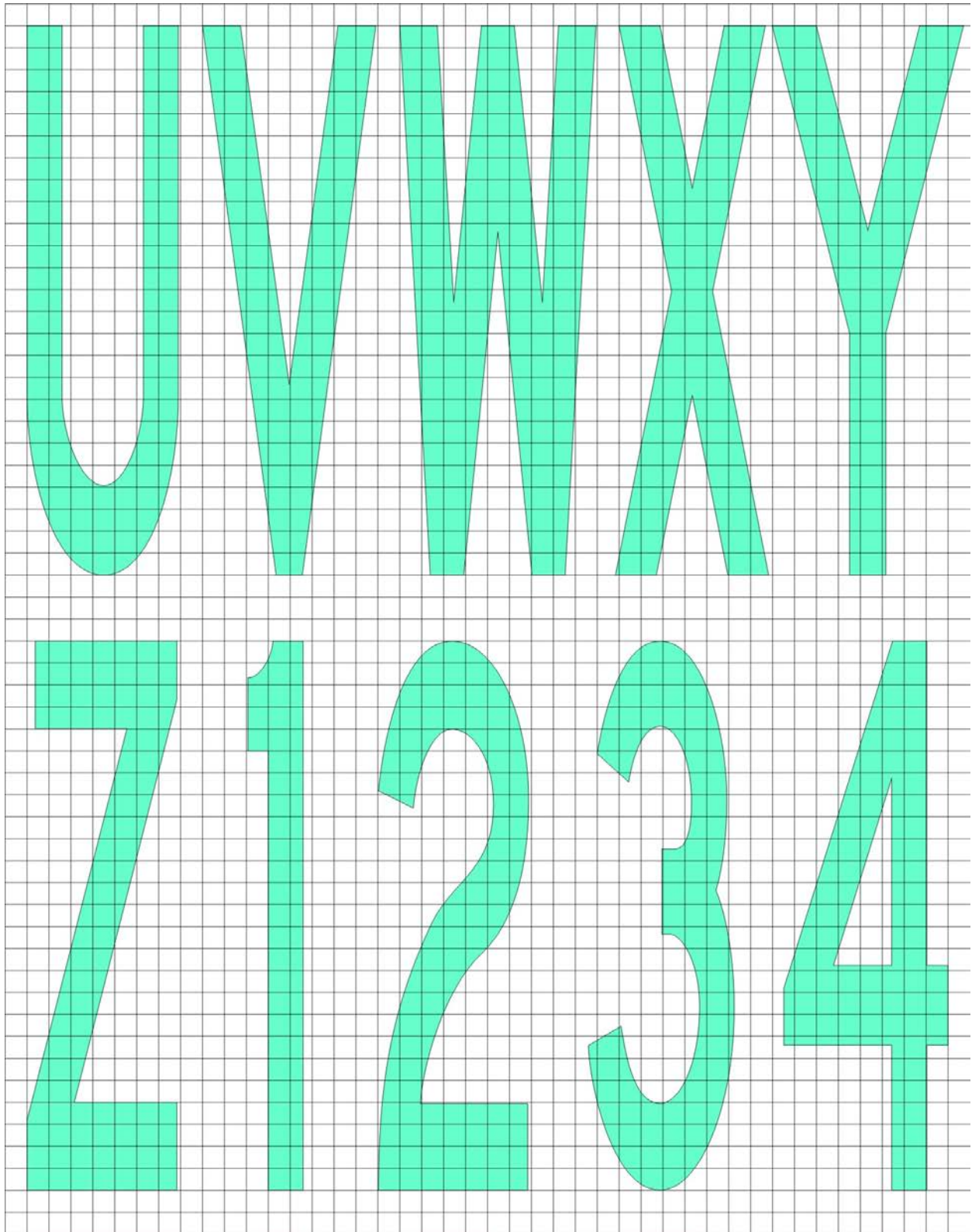
The size of the marking characters is not modified. The cost impact should be minimal.

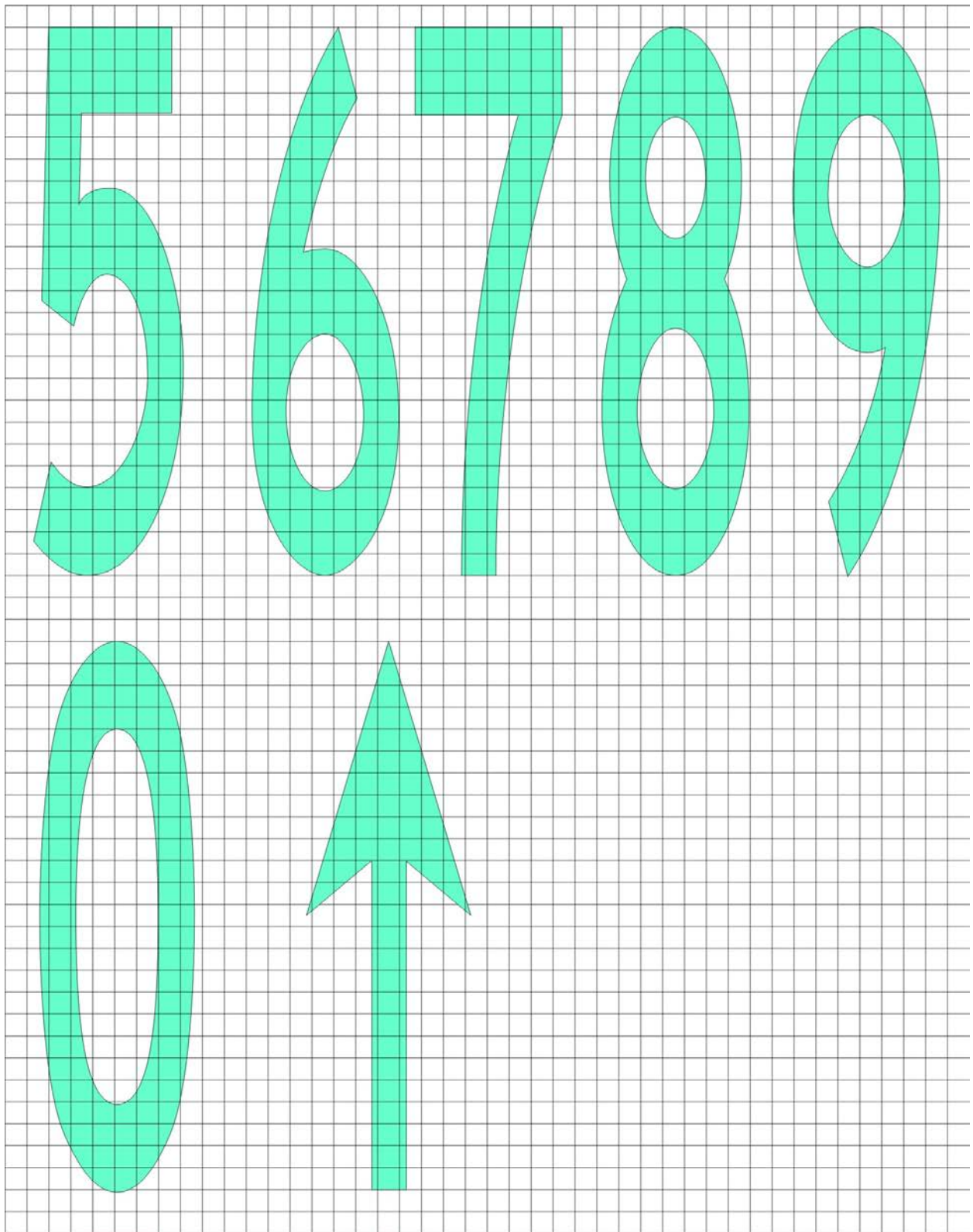
|                                     |                                                                                                                                                                                       |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Review by Commission Group 5</b> | In agreement with Initial Proposal 12<br><br>However, it is advisable in the figure above, to keep the pilot's eye in monochrome (rather than blue). Could have several connotations! |
| <b>Preliminary review by WG/PDP</b> | The WG/PDP was in agreement with CG5's proposal.                                                                                                                                      |
| <b>Secretariat comments</b>         | Secretariat is in agreement with PDP proposal.                                                                                                                                        |

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









## INITIAL PROPOSAL 13

## 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 from wildlife. This is also necessary to introduce the section on FOD Control which is being introduced with the development of PANS Aerodromes 2<sup>nd</sup> 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

....

## 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 9981), 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).~~

**Appendix A**

|                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Rationale:</b><br>Part of referenced information in Doc 9137 ASM Part 8 is proposed to be moved to <i>PANS-Aerodromes</i> (Doc 9981), specific reference to be included later. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Review by Commission Group 5</b>                                                                                                                                               | <u>Page A-49</u><br><br><u>Definition of Foreign Object Debris (FOD)</u><br>CGs comments:<br>1. The use of the word “any” in the definition could strictly imply that even the tiniest object e.g. a grain of sand, could be described as a FOD.<br>2. The CG is of the view that “solid” is superfluous in the definition as “ inanimate object” in this context, connotes a similar meaning.<br>3. To provide further clarification to the definition of a FOD, the CG proposes an amendment to the definition as follows:<br><br><b>Foreign Object Debris (FOD).</b> <del>Any solid,</del> <u>An</u> inanimate object within the movement area which has no operational or aeronautical function <u>and which has the potential to be a hazard to aircraft operations.</u> |
| <b>Preliminary review by WG/PDP</b>                                                                                                                                               | The WG/PDP was in agreement with CG5’s proposal.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Secretariat comments</b>                                                                                                                                                       | Secretariat agrees with the proposed changes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

## INITIAL PROPOSAL 14

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

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Origin</b><br>AP/2, AOSWG/13, AIS AIM SG/8, APWG/2                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Rationale</b><br>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.<br>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, and 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 levels 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 levels 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 make 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 ;

**Appendix A**

- aerodrome layout ; and
- 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;
- landing short of runway / undershoot;
- runway incursion;
- other incursion (i.e. on a taxiway or in a ramp area);
- landing or take-off on a taxiway; and
- 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 with 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. For instance, 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.

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 Simply, 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 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 which make a layout complex, need also to be considered:

- 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 The criteria for addressing the aerodrome characteristics in terms of number of movements in the mean busy hour are 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 air 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:

- Light / medium: between 40 000 and 60 000 movements per year
- Medium / heavy: between 140 000 and 160 000 movements per year

**Appendix A**

21.7.3 Besides the different types of aircraft that affects aerodrome capacity, another aspect is the movement on the ground of arriving and departing 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 increases the complexity as they reduce 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 attention on the guidance of the mobile objects.

|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Review by Commission Group 5</b> | Break the second sentence into two and simplify for clarity.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Page A-50, 21.2.1                   | 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 <del>requirements for</del> collaborative decision making, common situational awareness, and aerodrome guidance applications. <u>Aerodrome mapping data sets</u> are intended to be used in the following air navigation applications:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Page A-50, 21.2.1 a) , c)           | <p>The CG noted that although the dictionary definition of “ship” includes aircraft, spaceship and large sea - faring vessels, it would be appropriate in the context of the guidance material to use the term “aircraft” in place of ship in a) and c). This would eliminate confusion over its interpretation .particularly by non-native English speakers.</p> <p>The CG noted that “on-board positioning” (within aircraft) could be confused with “positioning” (on ground) in c) although “A-SMGCS” provides clarification that c) refers to ground – positioning . CG recommends that “positioning” be changed to “ground - positioning” for further clarity</p> <p>CG's proposal:</p> <p>a) on-board positioning and route awareness including moving maps with own <del>ship</del> <u>aircraft</u> position, surface guidance and navigation;</p> <p>c) <u>ground</u> - positioning and route awareness including <del>moving maps</del> <u>situational displays</u> with <del>ships</del> <u>aircraft</u> and vehicles position and taxi route, surface guidance and navigation (such as A-SMGCS levels 3 and 4);</p> |
| Page A-51, 21.2.2                   | <b>Editorial:</b> There is lack of consistency in nomenclature used: “EVS” - signification is in lowercase and for “SVS”, it is with initial caps. Secretariat to review and correct.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Page A-51, 21.3                     | CG Proposal for Heading of 21.3:<br><b>21.3 Determination of aerodromes eligible to be <u>considered for</u> collection of</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                   | <p><b>aerodrome mapping data features</b></p> <p>The Secretariat to re-draft opening sentence of 21.3 for clarity. Overuse of the word “may”</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Page A-51, 21.4.1 | <p><b>ground collision</b> – Secretariat to include types of collision for clarity</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Page A-51, 21.5.1 | <p>delete “the” in line 2 of 21.5.1</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Page A-52, 21.5.3 | <p>delete “ simply” and “ considered” in line 1.</p> <p>21.5.3 <del>Simply, v</del> Visibility conditions 3 and 4 are <del>considered</del> low visibility conditions and an aerodrome is considered affected by low visibility conditions when conditions 3 and 4 are met more than 15 days per year.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Page A-52, 21.6.1 | <p>Include ground controllers in text to cover apron and other ground movement controllers.</p> <p>New 21.6.1 : 21.6.1 A complex aerodrome layout <u>has more than one runway</u> and requires close attention from the air traffic <u>/ground</u> controllers and from the pilots and vehicle drivers. <del>In particular in adverse weather conditions the</del> <u>The</u> 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.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Page A-52, 21.6.2 | <p>Simplify 21.6.2 by deleting the paragraphs preceding “Some other parameters”.</p> <p><u>Revised 21.6.2:</u></p> <p>21.6.2 Some other parameters which make a layout complex, need also to be considered:</p> <ul style="list-style-type: none"> <li>- an aerodrome has a great number of entry taxiways for a runway ;</li> <li>- an aerodrome has a great number of exit taxiways, and particularly rapid exit taxiways, for a given runway ;</li> <li>- 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 ;</li> <li>- 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 ;</li> <li>- 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.</li> </ul> |
| Page A-53, 21.7.1 | <p>Edit last sentence as follows: Therefore the tower controllers are able to <u>increase their focus</u> <del>their attention</del> on the guidance of the mobile objects.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

**Appendix A**

|                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Pages A-51 to A-53<br>21.4 to 21.7            | Re-number 21.4, 21.5, 21.6 and 21.7 as 21.3.1, 21.3.2, 21.3.3 and 21.3.4 respectively for clarity since they only expand 21.3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Revised Proposal by Commission Group 5</b> | <p><b><u>CG's Rationale</u></b></p> <p>During the previous CG meeting held on September 24 2014, the CG observed that the proposed new guidance on Aerodrome Mapping Database (AMDB) lacked clarity and maturity and undertook an editorial of the Proposal. The CG further considered an option to limit the material to be added to the green pages of the Annex, to only the concept and applications of AMDB.</p> <p>The CG reviewed both options and recommends as follows:</p> <p><b><u>CG's Revised Proposal</u></b></p> <ol style="list-style-type: none"> <li>1. Maintain the CG's comments and proposals on Sections 21.1, 21.2 and 21.3 of WP8661.DP1</li> <li>2. The superfluous, but very useful material contained in Sections 21.4 to 21.7 (subordinate Sections to 21.3) should be "cut" from the Initial Proposal.</li> <li>3. The Secretariat or the appropriate body should be tasked with the complete review of Sections 21.4 to 21.7 bearing in mind the need for clarity, simplicity and consistency. The reviewed material should subsequently be re-located to the appropriate Manual.</li> <li>4. A Note should be provided under Section 21.3 (of Attachment A) to link the relocated subordinate Sections to 21.3.</li> </ol> |
| <b>Preliminary review by WG/PDP</b>           | The WG/PDP was in agreement with the CG's Revised Proposal.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Secretariat comments</b>                   | Secretariat agrees with the review by PDP. Secretariat also proposes the following:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Page A-50, 21.2.1                             | <p>All three sentences of 21.2.1 start with "Aerodrome mapping data..." Secretariat suggests wordsmithing as follow:</p> <p>21.2.1 Aerodrome mapping data.....margins and operational efficiency. <del>Aerodrome mapping data sets</del> <del>With appropriate data element accuracy, these data sets support requirements for collaborative decision making, common situational awareness and aerodrome guidance applications. Aerodrome mapping</del> The data sets are intended to be ....</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Page A-51 21.2.2                              | In accordance with Editorials nomenclature, the words are to be written in lower case with acronyms in upper case.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Page A-51 21.4.1 and                          | Types of collision will be clarified. All modifications including those by CG5/PDP will be migrated to a suitable manual such as Doc 9137 Airport Services Manual Part 8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

|           |                               |
|-----------|-------------------------------|
| following | Airport Operational Services. |
|-----------|-------------------------------|

## INITIAL PROPOSAL 15

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

...

#### 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;

**Appendix A**

- 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                  |
| <del>Maximum</del><br>Acceptable<br>surface<br>irregularity<br>height (cm)                | <del>3</del><br>2.9                           | <del>3.5</del><br>3.8 | <del>4.0</del><br>4.5 | 5                     | <del>5.5</del><br>5.4 | <del>6.0</del><br>5.9 | 6.5  | <del>8.0</del><br>8.5   | 10                  |
| <del>Temporary</del><br>acceptable<br>Excessive<br>surface<br>irregularity<br>height (cm) | <del>3.5</del><br>3.9                         | 5.5                   | <del>6.5</del><br>6.8 | <del>7.5</del><br>7.8 | <del>8.0</del><br>8.6 | <del>9.0</del><br>9.6 | 11   | <del>13.0</del><br>13.6 | <del>15</del><br>16 |
| Unacceptable<br>surface<br>irregularity<br>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.

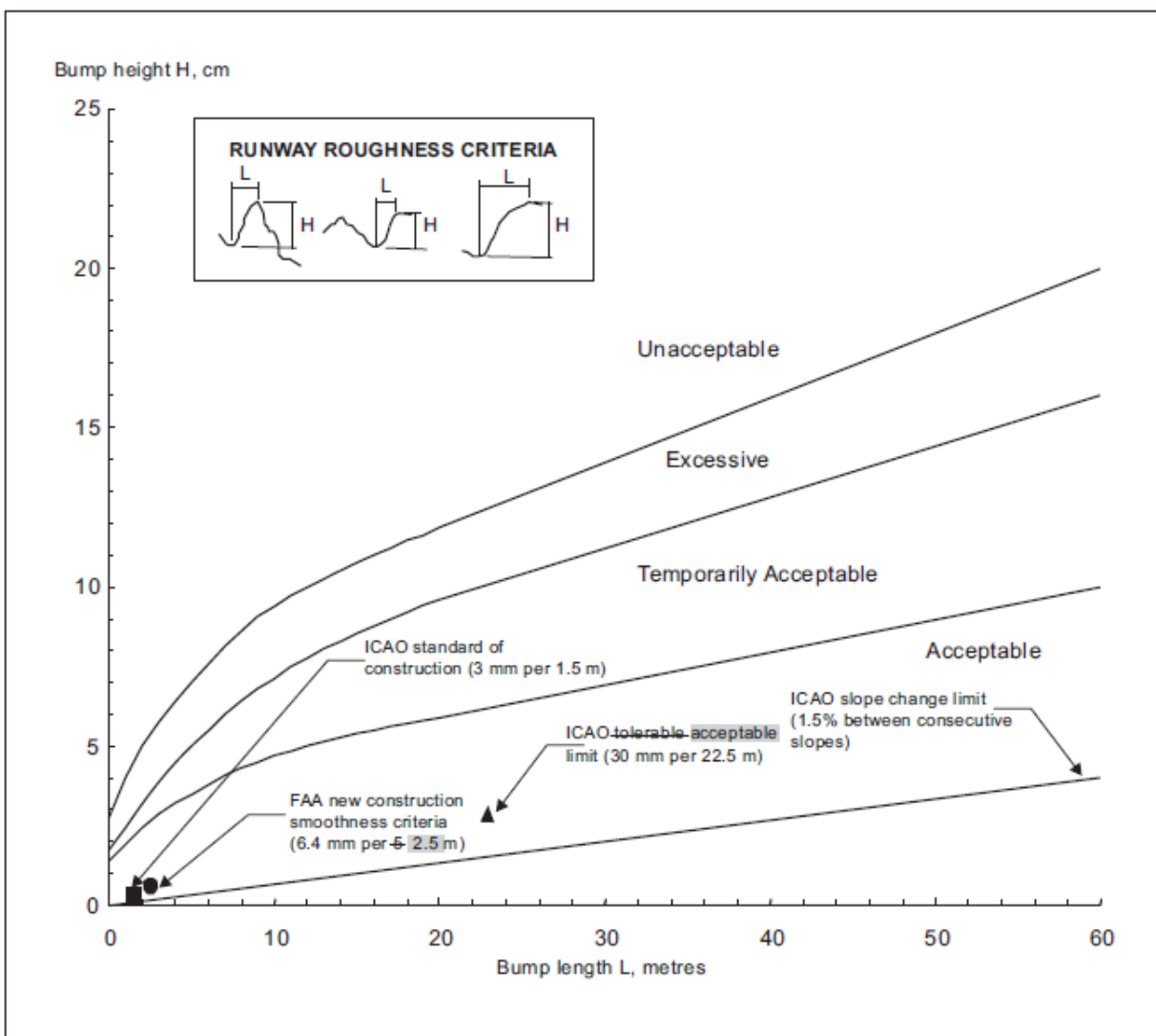
**Origin**

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.— These criteria address single event roughness, not long wavelength harmonic effects nor the effect of repetitive surface undulations.*

|                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Review by Commission Group 5</b></p>           | <p><u>Pages A-53 to A-56</u></p> <ol style="list-style-type: none"> <li>1. The CG and Secretariat could not agree on the interpretation of the chart (Figure A-3) linked to the table. The Secretariat indicated that the original source of the Figure was from Boeing.</li> <li>2. The descriptions in 5.3b) and 5.3c) appear to have the same meaning.</li> <li>3. The expression “exceeding unacceptable limits” as it appears in paragraph 5.3.c) could not be understood from the graph.</li> </ol> <p><b>CG’s Proposal:</b> Secretariat to liaise with the appropriate bodies for further clarification and re-draft relevant sections of Initial Proposal 15 accordingly to ensure clarity.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <p><b>Revised Proposal by Commission Group 5</b></p> | <p><u><b>CG’s Rationale</b></u></p> <p>The CG had requested the Secretariat to liaise with appropriate bodies for clarification of the Chart on the comparison of roughness criteria (Figure A-3) and to re-draft relevant sections of Initial Proposal 15 to ensure clarity. The Secretariat accordingly submitted a revised proposal for review by the CG. Additional proposals received from a member of the CG and an Industry Observer were also reviewed.</p> <p>The proposed changes are in <b>Red</b>.</p> <p><u><b>CG’s Revised Proposal</b></u></p> <p>...</p> <p><b>5. Runway surface evenness</b></p> <p>...</p> <p>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 <del>tolerable</del> 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 <del>maximum</del>, acceptable, and temporarily acceptable <del>excessive</del> and unacceptable <del>tolerable</del> limits:</p> <p>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”;</p> <p>b) if the temporarily acceptable excessive limits are exceeded, the portions of the</p> |

runway that exhibit such roughness should have corrective measures taken immediately if aircraft operations are to be continued;

e) 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

a) if the irregularities exceed the acceptable limit but are less than the tolerable limit, corrective action should be undertaken as soon as reasonably practicable to improve the ride quality. The runway may remain in service.

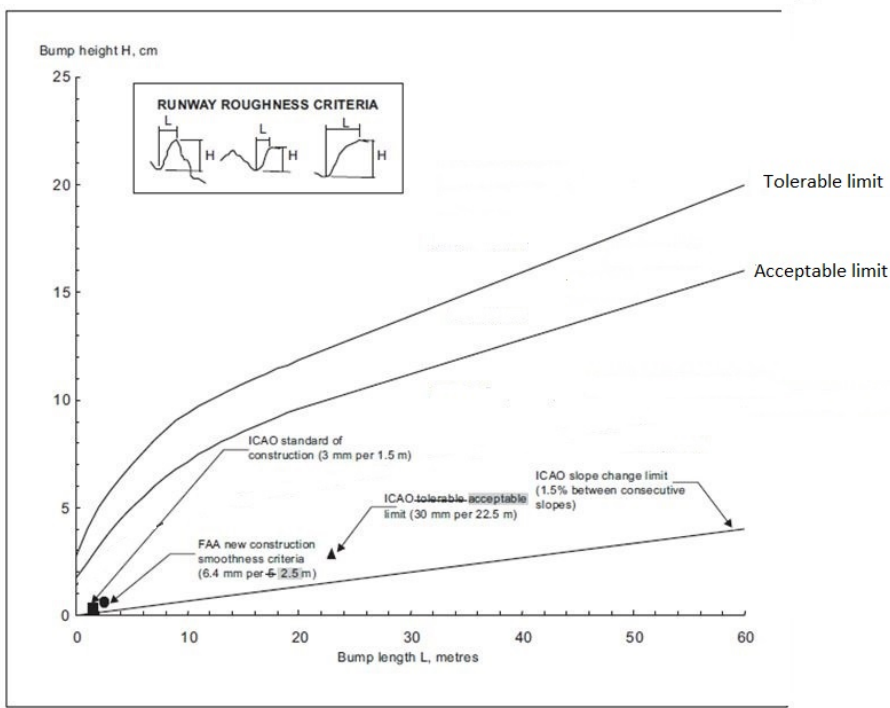
b) if the irregularities exceed the tolerable limit, the area of the runway where the roughness resides should be closed immediately until repairs are made to restore the condition to within the acceptable limit.

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

... 5.4 Figure A-3 illustrates a comparison of the surface roughness using the “Boeing Bump” criteria with those developed recommended by the United States Federal Aviation Administration.

...

(Replace Figure A-3 with the chart below)

|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <p><b>Preliminary review by WG/PDP</b></p>   | <p><u>CG's Revised Proposal: 5b)</u><br/>One member commented that “immediate” should be deleted based on the reasoning that it is not practical to close the runway if irregularities simply exceed the tolerable limit, and that it is not appropriate to use the word in a guidance material. A few members supported the comment, but the majority supported to keep “immediately” for the clarification of when the action should be taken. However, the WG/PDP was not satisfied with the proposed text and tasked the Secretariat and some interested members to further study the text.</p> <p><u>CG's Revised Proposal: Figure A-3</u><br/>One member commented that a specific State name such as FAA should be avoided in the ICAO document. However, one member commented on the issue of intellectual property of the figure and asked the Secretariat to check whether the figure could be changed. The CG-5 Lead responded that the existing paragraph 5.4 has already described the relationship between the figure and FAA and has indicated that there is no harm to include the FAA's criteria in the figure. The WG/PDP agreed on the new Figure A-3 proposed by CG-5.</p> |
| <p><b>Proposal by Commission Group 5</b></p> | <p>CG-5, interested Commissioners and Industry Observers met on October 07, 2014 to undertake the review.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

|                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                             | <p>5.3 b): The CG noted that since the material in Initial Proposal 15 was all guidance material, the use of the word “immediately” made the paragraph appear mandatory like a Standard. The CG consequently adopted an appropriate expression from the FAA Advisory Circular 150/5380-9, paragraph 2.3 b. 3)</p> <p>5.4: The entire 5.4 was re-drafted to indicate the sources of the Chart</p> <p><b>CG-5 Revised Proposal:</b></p> <p>5.3 b) if the irregularities exceed the tolerable limit, the area of the runway where the roughness resides <del>should be closed immediately</del> <u>warrants immediate closure</u> until repairs are made to restore the condition to within the acceptable limit. <u>The operators should be advised of the surface condition and a NOTAM should be issued promptly.</u></p> <p>5.4 Fig A-3 illustrates a comparison of the surface roughness criteria with those developed by the United States Federal Aviation Administration. <u>Further guidance can be found in Doc 9157 Aerodrome Design Manual Part 3 Pavements.</u></p> |
| <b>Secretariat comments</b> | <p>Secretariat considers CG5’s revised proposal to include NOTAM in the revised texts to be redundant since Annex 14, Vol I already contains a Standard in para 2.9.1 requiring information on the condition of the movement area and operational status of related facilities to be provided to arriving and departing aircraft via appropriate AIS and ATS units. Secretariat propose the following modifications to 5.3 b):</p> <p>5.3b) if the irregularities exceed the tolerable limit, the area of the runway where the roughness resides <del>should be closed immediately</del> <u>warrants immediate closure</u> until repairs are made to restore the condition to within the acceptable limit <u>and the aircraft operators be advised of the surface condition.</u></p> <p>Secretariat agrees with CG-5 revised proposal for paragraph 5.4. The manual may contain more detailed information on specific US FAA AC’s on the subject.</p>                                                                                                                         |

— — — — —



## **APPENDIX B**

### **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

#### ***PDP's Notes***

1.   *Comments from PDP/CG are indicated for each Initial Proposal*
2.   *New text to be inserted is indicated in red*
3.   *All references to Page numbers are with respect to WP8861 unless otherwise stated.*

**TEXT OF THE PROPOSED AMENDMENT TO  
AERODROMES**

**VOLUME II –HELIPORTS**

**INITIAL PROPOSAL 1**

**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

|                                     |                                                                                                                                                                        |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Review by Commission Group 5</b> | <p>1. Move Proposal box for Initial Proposal 1 to beginning of Page B-3 to properly identify Initial Proposal 1</p> <p>2. Delete the word “Appendix A” on Page B-2</p> |
| <b>Preliminary review by WG/PDP</b> | The WG/PDP was in agreement with the CG’s Proposal.                                                                                                                    |
| <b>Secretariat comments</b>         | Secretariat agrees with Editorial changes proposed by PDP.                                                                                                             |

...

### 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\*).~~

\* ISO Standard 19108, Geographic information — Temporal schema

**Appendix B**

**~~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.

**~~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.*

...

**~~Helipport.~~** 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.

...

---

\*\* — ISO Standard 19104, Geographic information — Terminology

\*\*\* — ISO Standard 19108, Geographic information — Temporal schema

~~**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:~~

- ~~— 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.~~

...

|                                                         |                                                           |
|---------------------------------------------------------|-----------------------------------------------------------|
| <b>Rationale:</b>                                       |                                                           |
| All other duplicated definitions can be safely deleted. |                                                           |
| <b>Review by Commission Group 5</b>                     | In agreement with Initial Proposal 1.                     |
| <b>Preliminary review by WG/PDP</b>                     | The WG/PDP was also in agreement with Initial Proposal 1. |

## INITIAL PROPOSAL 2

### 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

*Introductory Note.— 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;*

**Appendix B**

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 three 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 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.

**6.42 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, the~~ 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.

### **Review by Commission Group 5**

#### Page B-7

Editorial to Introductory Note

*Introductory Note.— 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~~ include crashes on or off the heliport, medical emergencies, dangerous goods occurrences, fires and natural disasters.*

#### Page B-7, 6.1.1

Editorial – too many references to “heliport”

*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.*

#### Page B-7, Note

Delete Note under 6.1.3. – Contents already stated in Introductory Note

#### Page B-7, 6.1.5

Editorial: replace “as” with “an” in the first line

**Appendix B**

|                                     |                                                     |
|-------------------------------------|-----------------------------------------------------|
| <b>Preliminary review by WG/PDP</b> | The WG/PDP was in agreement with the CG's Proposal. |
| <b>Secretariat comments</b>         | Secretariat agrees with PDP's proposal.             |

***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 have 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 in 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***

6.2.2**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*<br>Fuselage length                                    | Maximum fuselage width |
|----------|----------------------------------------------------------------------------------|------------------------|
| (1)      | (2)                                                                              | (3)                    |
| H0       | up to but not including 8 m                                                      | 1.5 m                  |
| H1       | <del>up to but not including 15 m</del><br>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.

**6.2.4 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 categorize 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.

**Appendix B**

|                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                         | <p>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).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <p><b>Review by Commission Group 5</b></p>                              | <p><u>Page B-9 ,6.2.1</u></p> <p>6.2.1 Except for unattended heliports <u>and unattended helidecks</u>, a rescue and fire fighting response shall be provided for surface level heliports, elevated heliports and helidecks</p> <p><u>Page B-9, Note 2</u><br/>Editorial : delete “and/or” and replace with “or”</p> <p><u>Page B-9, 6.2.1A</u><br/>6.2.1 A appears to contradict 6.2.1. Secretariat to delete or re-draft for clarity</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <p><b>Preliminary review by WG/PDP</b></p>                              | <p><u>Table 6-1. Heliport fire fighting category</u><br/>One member commented that D value should be considered instead of introducing fuselage length because D value is commonly used in the field. Another member responded that the physical size of the helicopter should be considered in firefighting because the actual size will affect the amount of complementary agents to be supplied. Another member pointed out that the D value is used in determining the amount of complementary agents. The WG/PDP requested the Secretariat to clarify the rationale of the proposed amendment.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <p><b>Secretariat comments</b></p> <p>6.2.1</p> <p>Page B-9, 6.2.1A</p> | <p>Secretariat disagree with the proposal since helidecks are already included in the definition of heliports – see proposed amendment to <b>6.2 Rescue and Firefighting, General</b>, on page B-8.</p> <p>The intent of 6.2.1A is for States to use a risk assessment in order to define the level of safety. This means an analysis if a response should be provided and what its level should be. Secretariat proposes the following modification:</p> <p><b>6.2.1A Recommendation.</b> – <i>At unattended heliports, a risk assessment should be performed to determine the need for appropriate rescue and fire fighting response.</i></p> <p>In response to PDP comments, it is generally accepted that although the amount of fuel carried by helicopters is less than that carried by aeroplanes, a more serious fire situation can occur as the fuel tank is located, in most cases, underneath the occupied portion of the fuselage and close to the engine. Burning fuel in a helicopter crash is more likely to remain within the area adjacent to the helicopter and thus the resulting fire situation may be more serious than one involving an aeroplane of similar size. Historically, it was considered desirable to use the fuselage length instead of the overall length since the rotors should not normally be a factor to be considered for RFF purposes. The occupied portion of a helicopter was even considered more significant than fuselage length.</p> |

|  |                                                                                                                                                                                                                                                                                                                                                                                                              |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | However, information at that time on the occupied portion was not readily available and for the purposes of standardization, it was desirable to use the same method of categorization as is used for aeroplanes ie. the overall length. However, the HDWG considered that this is no longer true as information on fuselage length and width is now readily available. See also rationale box on page B-11. |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### ***Extinguishing agents***

**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 than 18 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.

**Appendix B**

|                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                | <p>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).</p> <p>6.2.9 A requirement for “gaseous means” has been added in order to account for specific fire scenarios of helicopters.</p>                                                                                                                                            |
| <b>Review by Commission Group 5</b>                                                            | <p><u>Page B-11</u></p> <p>Introduce a new Recommendation in line with Chapter 9.2.8 of Annex 14 Vol. 1 as introduction to both Principal and Complementary Agents:</p> <p><b>New:</b> <u>Recommendation 6.2.5: Both principal and complementary agents should normally be provided by an aerodrome</u></p> <p><u>Page B-11</u><br/>Renumber following sections accordingly</p> <p><u>Page B-12, 6.2.7</u><br/>Secretariat to verify and confirm the specific ISO Standards.</p>                                                                                                                                                                                                                                           |
| <b>Preliminary review by WG/PDP</b>                                                            | <p><u>New: Recommendation 6.2.5</u></p> <p>The Secretariat agreed in principle on CG-5’s proposal but suggested a minor correction whereby “an aerodrome” be replaced by “a heliport.”</p> <p>One member suggested deleting “normally.” CG-5 responded that the proposed text is consistent with paragraph 9.2.8 in Annex 14, Volume 1. The WG/PDP agreed on no change.</p> <p><u>Note under 6.2.9</u><br/>One member described what “Gaseous means” include. The Secretariat responded that it includes CO<sub>2</sub>, Halon and DCP (dry powder).</p>                                                                                                                                                                   |
| <b>Secretariat comments</b><br><br>CG5<br>Page B-12<br>6.2.7<br><br>PDP<br>Note under<br>6.2.9 | <p>Unless stated otherwise, Secretariat agrees with CG5 and PDP comments.</p> <p>Secretariat suggests the inclusion of a footnote, as currently appear in Annex 14, Volume I, footnote on page 9-7, with the texts:</p> <p>* See ISO Publication 7202 (Powder).</p> <p>It was noted during the discussions in the HDWG that the helicopter environment still requires the provision of “gaseous media”, e.g. to cope with fires in the avionics compartment where the use of powder would cause unnecessary damage. It was decided to be more appropriate to use the generic term “gaseous media” instead of limiting to a specific type of media like CO<sub>2</sub> as a complementary agent because it represents a</p> |

|  |                                                                                                                                                         |
|--|---------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | potential threat for occupants in the small cabin of a helicopter. It is up to the States to decide what kind of “gaseous media” they find appropriate. |
|--|---------------------------------------------------------------------------------------------------------------------------------------------------------|

**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.*

**6.2.11 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 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<sup>2</sup> for a foam meeting performance level B and 3.75 L/min/m<sup>2</sup> for a foam meeting performance Level C.*

**Table 6-2. Minimum usable amounts of extinguishing agents for surface-level heliports**

| Category | Foam meeting performance level B |                                         | Foam meeting performance level C |                                         | Complementary agents     |                |                         |
|----------|----------------------------------|-----------------------------------------|----------------------------------|-----------------------------------------|--------------------------|----------------|-------------------------|
|          | 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 <sub>2</sub> (kg) |
| (1)      | (2)                              | (3)                                     | (4)                              | (5)                                     | (6)                      | (7)            | (8)                     |
| H 0      | 500                              | 250                                     | 330                              | 165                                     | 23                       |                |                         |
| H 1      | 500<br>800                       | 250<br>400                              | 330<br>540                       | 165<br>270                              | 23                       | 23             | 45                      |
| H 2      | 1 000<br>1 200                   | 500<br>600                              | 330<br>800                       | 165<br>400                              | 45                       | 45             | 90                      |
| H 3      | 1 600                            | 800                                     | 1 100                            | 550                                     | 90                       | 90             | 180                     |

**Appendix B****Table 6-3. Minimum usable amounts of extinguishing agents for elevated heliports**

| Category | Foam meeting performance level B |                                         | Foam meeting performance level C |                                         | Complementary agents     |                |                         |
|----------|----------------------------------|-----------------------------------------|----------------------------------|-----------------------------------------|--------------------------|----------------|-------------------------|
|          | 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 <sub>2</sub> (kg) |
| (1)      | (2)                              | (3)                                     | (4)                              | (5)                                     | (6)                      | (7)            | (8)                     |
| H 0      | 1 250                            | 250                                     | 825                              | 165                                     | 23                       |                |                         |
| H 1      | 2 500<br>2 000                   | 250<br>400                              | 1 350                            | 270                                     | 23<br>45                 | 23             | 45                      |
| H 2      | 5 000<br>3 000                   | 500<br>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**

6.2.11 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 in 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 4 000 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<sub>2</sub> are deleted as complementary agents in correspondence to Annex 14, Volume 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.*

**6.2.12 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**

**Appendix B**

6.1.5: While Standard 9.2.11 of Annex 14, Volume 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, Volume 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 are 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 that will use that facility. For elevated heliports in Category H 2 or higher, a FFAS (namely a dual foam monitor system) was 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 number 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.

|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Review by Commission Group 5</b> | <p><u>Page B-15, 6.2.14</u></p> <p>This Standard could impose a cost burden on the heliports operators. A risk assessment should first be undertaken.</p>                                                                                                                                                                                                                                                                                                    |
| <b>Preliminary review by WG/PDP</b> | <p>The Secretariat explained that the second paragraph in the Rationale box prescribed the cost benefit analysis and that 5 years is sufficient to prepare the requirement in 6.2.14. However, the PDP/WG recognized that the requirement of 6.2.14 was demanding and recommended to change it from a Standard to a Recommendation.</p>                                                                                                                      |
| <b>Secretariat comments</b>         | <p>With the expected applicability date of para 6.2.14 (Std) in November 2016, States are given more than two years to prepare for the change. As far as cost impact for FFAS is concerned, this is envisaged to be minimal as explained in the section <b>Cost impact for FFAS</b> in the rational box. Secretariat, however, agrees with the proposal that 6.2.14 be downgraded to a Recommendation with a view that upgrading it to a Standard may be</p> |

|                            |
|----------------------------|
| carried out in the future. |
|----------------------------|

### **Rescue equipment arrangements**

**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**

**6.2.17 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.

**6.2.18 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.

**Appendix B**

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 number of passengers and of special operations such as 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 *Helicopter 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 close 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.

|                                     |                                                                                                                                                                                                                                     |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Review by Commission Group 5</b> | <p><u>Page B-17, 6.2.21</u></p> <p>Editorial : insert a comma after “provided”</p> <p><u>Page B-17, 6.2.24</u></p> <p>Delete “an” before “alternative means of escape”, to provide flexibility to have several means of escape.</p> |
| <b>Preliminary review by WG/PDP</b> | <p><u>6.2.21 and 6.2.22</u></p> <p>One member commented that it was not appropriate to use “when provided” in the Standard provision. The CG5 Lead explained that this is related to paragraph 6.2.which</p>                        |

|                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                             | <p>describes that a rescue and fire fighting response shall be provided except for unattended heliports. Another member suggested that “When provided” in paragraph 6.2.21 be changed to “Where provided” and that “When provided” in paragraph 6.2.22 simply be deleted. The WG/PDP agreed on the proposed change suggested by the last commenter.</p> <p>One member commented that the guidance should be provided to determine “sufficient” fire fighting personnel. The Secretariat responded that Heliport Manual (Doc 9261) be amended to include the guidance based on the current Aerodrome Service Manual (Doc 9137), part 1.</p> <p><u>6.2.24</u><br/>The Secretariat suggested deleting “a” in front of “helidecks.”</p> <p><u>Personnel</u><br/>One member commented that the “Note” under “Personnel” be moved to below 6.2.23. The Secretariat responded that since the “Note” refers not only to 6.2.23 but also to 6.2.21 and 6.2.22, it is appropriate to put “Note” under “Personnel.” The WG/PDP agreed on no change.</p> |
| <b>Secretariat comments</b> | Secretariat agrees with the comments from CG5 and PDP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

### INITIAL PROPOSAL 3

## CHAPTER 3. PHYSICAL CHARACTERISTICS

...

### 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.*

**Appendix B**

*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 in) rather than to 25 cm (10 in). 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 in) 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 minimize 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<sup>3</sup> 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.~~

**Appendix B**

*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 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.*

**Appendix B****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 in) rather than to 25 cm (10 in). 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).

|                                     |                                                                                                                                                                      |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Review by Commission Group 5</b> | <u>Page B-21, 3.4.4</u><br>Replace “Shipboard heliport” with “helideck”                                                                                              |
| <b>Preliminary review by WG/PDP</b> | <u>Page B-21, 3.4.4</u><br>The Secretariat proposed to use “heliport” instead of “helideck.” WG/PDP agreed on the Secretariat’s proposal instead of CG-5’s proposal. |
| <b>Secretariat comments</b>         | Secretariat agrees with comments by PDP.                                                                                                                             |

3.4.14<sup>5</sup> 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.

— — — — —



## **APPENDIX C**

### **PROPOSED AMENDMENT TO ANNEX 15**

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. | <del>Text to be deleted is shown with a line through it.</del>                                                                            | text to be deleted                |
| 2. | New text to be inserted is highlighted with grey shading.                                                                                 | new text to be inserted           |
| 3. | <del>Text to be deleted is shown with a line through it</del> followed<br>by the replacement text which is highlighted with grey shading. | new text to replace existing text |

#### ***PDP's Notes***

1. *Comments from PDP/CG are indicated for each Initial Proposal*
2. *New text to be inserted is indicated in red*
3. *All references to Page numbers are with respect to WP8861 unless otherwise stated.*

**TEXT OF THE PROPOSED AMENDMENT TO  
AERONAUTICAL INFORMATION SERVICES  
ANNEX 15**

|                           |
|---------------------------|
| <b>INITIAL PROPOSAL 1</b> |
|---------------------------|

**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);
- 13) the existence of an obstacle-free zone; and
- 14) remarks.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Origin:</b><br><br>ADWG/12<br><br><b>Rationale:</b><br><br>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. |                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Review by Commission Group 5</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <u>Page C-3, Rationale Box</u><br><br>Though Pilots may not need detailed data on the arresting system, it would nevertheless be useful for other users of Annex 14. As a minimum, the description of an arresting system could be included.<br><br><u>Page C-2, AD 2.12</u><br><br><b>CG5 Proposal:</b> Amend 12) as follows:<br><br>12) location (which runway end) <u>and description</u> of arresting system (if any); |
| <b>Preliminary review by WG/PDP</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | The WG/PDP was in agreement with the CG's Proposal.                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Secretariat comments</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Agree with the PDP.                                                                                                                                                                                                                                                                                                                                                                                                        |