International Civil Aviation Organization
Seventh Meeting of the Aerodromes Operations and Planning Sub-Group (AOP/SG/7)
Bangkok, Thailand, 3 to 6 July 2023

Agenda Item 4: **Provision of AOP in the Asia/Pacific Region**
－ Reports of Working Group/Task Force Meetings

REPORT ON THE FOURTH MEETING OF THE ASIA/PACIFIC AERODROME DESIGN AND OPERATIONS TASK FORCE (AP-ADO/TF/4)

(Presented by Chairperson of AP-ADO/TF)

SUMMARY

This paper presents the Report of the Fourth Meeting of the Asia/Pacific Aerodrome Design and Operations Task Force (AP-ADO/TF/4).

This paper relates to –

Strategic Objectives:

A: ***Safety*** *–Enhanced global civil aviation safety*
B: ***Air Navigation Capacity and Efficiency –*** *Increase Capacity and improve efficiency of the global civil aviation system*

1. INTRODUCTION

1.1 The Fourth Meeting of the Asia/Pacific Aerodrome Design and Operations Task Force (AP-ADO/TF/4) was held as a Hybrid Meeting in Chiang Rai, Thailand from 10 - 13 January 2023. AP-ADO/TF/4 was attended by 93 participants from 20 Member States, 1 Special Administrative Region and Pacific Aviation Safety Office.

1.2 There were 13 Working Papers, 4 Information Papers and 2 Presentation considered by the Meeting.

1.3 The full report of the meeting is posted on the ICAO APAC Office website and can be accessed through the following link:
https://www.icao.int/APAC/Meetings/Pages/2023-AP-ADO-TF4.aspx

1.4 **Attachment A** to this Paper provides a Summary Report of the AP-ADO/TF/4 Meeting for review by the AOP/SG/7.

1.5 Appendices referred in this Working Paper and **Attachment A** carry the same Appendix numbers as those in the Report of the AP-ADO/TF/4 Meeting for easy reference.

2. DISCUSSION

2.1 Some important discussions of the AP-ADO/TF/4 Meeting are summarized as below:

Runway Turn Pad Specification

2.2 AP-ADO/TF/4 noted the inconsistency observed in Annex 14 Volume I and Aerodrome Design Manual (Doc 9157) Part 1 regarding the basis taken for runway turn pad design (ARC letter versus OMGWS) and ambiguity created by markings of turn pad as shown in Aerodrome Design Manual (Doc 9157) Part 1 and Part 2 (which was actually shown as aircraft cockpit track but misinterpreted/misunderstood by some aerodrome operators as marking) and endorsed the following Draft Conclusion:

Draft Conclusion AP-ADO/TF/4 – 1: Runway Turn Pad Design and Marking	
What: That, the design of runway and taxiway widths is linked to the outer main gear wheel span (OMGWS) of the design aircraft and the size of the runway turn pad depends on aircraft wheelbase, OMGWS and maximum nose wheel steering angle. On the other hand, SARPs on runway turn pad markings are linked to aerodrome reference code (ARC) numbers (5.2.9 of Annex 14, Volume I refer). Therefore, ICAO is requested to review: 1) Annex 14, volume I SARPs 3.3.1 & 3.3.2, where they have provided reference to ARC (code letters); 2) Figure 1-3 of Aerodrome Design Manual (ADM), Part 2 and Figure 4-1 of Aerodrome Design Manual, Part 1 for consistency with Annex 14, Volume I SARPs as specified in 5.2.9 (5.2.9.3 & 5.2.9.7 refer) regarding the runway turn pad marking.	Expected impact: ☒ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical
Why: To review Annex 14, Volume I SARPs 3.3.1 & 3.3.2 and Figure 4-1 of ADM, Part 2 and Figure 1-3 of ADM, Part 1 by ICAO Aerodrome Design Group of Aerodrome Design and Operation Panel	Follow-up: ☐Required from States
When: 13-Dec-23	Status: Draft to be adopted by PIRG
Who: ☒Sub groups ☐APAC States ☒ICAO APAC RO ☒ICAO HQ ☐Other: XXXX	

Review on Requirement of Intermediate Holding Position Lights during CAT I Conditions

2.3 AP-ADO/TF/4 noted the difficulties encountered by pilots in identification of the Intermediate Holding Position (IHP) when taxiway centreline lights (TCLs) are operated in CAT I conditions. In the scenario when the TCLs were switched on, the tendency of the pilot in focusing on the green lights and difficulty in sudden switchovers of identifying the IHP marking could be a challenge. For this reason, it was recommended to provide IHP lights whenever TCLs are operated.

2.4 AP-ADO/TF/4 also noted the benefits in providing IHP lights when the airport had only taxiway edge lights and signs, such as, early information about a junction, less installation cost as configuration requires only 3 lights, increase of situational awareness as identification of IHP marking still could be a challenge from a long distance etc.

2.5 For both cases, it was proposed to have a light distribution of IHP lights similar to TCL's with RVR conditions > 350 m.

2.6 As agreed by AP-ADO/TF/4 the Secretariat had sent the AP-ADO/TF/4-**WP/05** (Revision 1) to the Air Navigation Bureau, ICAO HQ for review by and discussion at the forthcoming meeting of the ICAO HQ Visual Aids Group.

Development of fully integrated safeguarding surfaces to uphold flight safety while facilitating pressing needs of infrastructure/building developments in Hong Kong, China

2.7 AP-ADO/TF/4 noted the successful experience of Hong Kong China in making use of advanced 3-dimensional computer modelling to proactively develop integrated safeguarding surfaces for CNS equipment, aerodrome and flight procedures, and publish them under a regulatory framework to uphold flight safety while minimising constraints to infrastructure/building developments to cope with the pressing needs for lands for developments in the Hong Kong territories.

2.8 AP-ADO/TF/4 also noted that all safeguarding surfaces had been integrated through a highly complex and iterative process with a high degree of accuracy in formulating a combined set of the most limiting surfaces and published as "Airport Height Restriction Plan" (AHRP) under the Hong Kong Airport (Control of Obstructions) Ordinance with effect from 31 May 2022.

2.9 The aviation geographic information system experts from ESRI China (Hong Kong) conducted an online demonstration of integrating the safeguarding surfaces to derive the lowest limiting surface. The model could be verified using captured flight data to understand and demonstrate the surface design in practice. The combined data layers could be exported to a 3D model database or shared as a web application, allowing complex geographic information to be simplified and shared with users.

2.10 AP-ADO/TF/4 encouraged States/Administrations to be fully aware of the potential risks induced by the protrusion of safeguarding surfaces and take proactive steps to engage advanced computer modelling to develop integrated safeguarding with high accuracy and publish them under a regulatory framework to uphold flight safety while facilitating pressing needs of infrastructure/building developments.

Review on Requirement of Sequenced Flashing Lights (SFL) for the Barrette Approach Lighting System in CAT I/II/III Conditions

2.11 As per Annex 14 Volume I – Aerodrome Design and Operations, Sequenced Flashing Lights (SFL) to be provided for Category I approach lighting system for every barrette i.e., from the first barrette to the end of the approach lighting system and for Category II/III approach lighting system the SFL to be provided beyond 300 m.

Precision Approach CAT I Lighting System

2.12 Considering the detailed explanation provided in the working paper and thereby expressing the concern over the provision of SFL for the section from threshold lights to 300 m in the CAT I conditions, it was proposed to amend the Recommendation 5.3.4.17 of Annex 14, Volume I as below:

> 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 beyond 300 m should be supplemented by a flashing light, except where such lighting is considered unnecessary taking into account the characteristics of the system and the nature of the meteorological conditions.*

Precision Approach CAT II and III Lighting System

2.13 It was explained that the CAT II/III condition itself warrants that the meteorological conditions are impaired. Therefore, it was proposed to make two changes in 5.3.4.34 Recommendation of Annex 14, Volume I:

a) change from recommendation to standard, as without SFL identifying the approach lights would be tough task; and

b) in CAT II/III condition, both the characteristics of system perceivability and meteorological conditions are affected, the reference of the same is not required.

2.14 Based on the explanation above, the paper proposed the changes to 5.3.4.34 of Annex 14, Volume I as Standard as below:

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~~ shall be supplemented by a flashing light.~~, except where such lighting is considered unnecessary taking into account the characteristics of the system and the nature of the meteorological conditions~~*

2.15 As agreed by AP-ADO/TF/4 the Secretariat had sent the AP-ADO/TF/4-**WP/07** to the Air Navigation Bureau, ICAO HQ for review by and discussion at the forthcoming meeting of the ICAO HQ Visual Aids Group

Information Papers and Presentations

2.16 The following Information Papers and Presentations were considered by AP-ADO/TF/4:

1) ICAO HQ Update on AGA Matters (IP/03);
2) Introduction of Chengdu Tianfu International Airport (IP/04);
3) Embracing the Change – OLS Transformation (PPT/01);
4) ICAO ACR-PCR Procedure of Reporting Airport Pavement Strength – Introduction to FAA AC 150/5335-5D (PPT/02)

Asia/Pacific Air Navigation Plan

2.17 The Secretariat presented the structure of the Asia/Pacific Air Navigation Plans (APAC ANPs) and the procedures for the amendment of these Plans. All three Volumes of Asia/Pacific Air Navigation Plan and the template of Proposal for Amendments (PfA) to APAC ANPs provided at https://www.icao.int/APAC/Pages/APAC-eANP.aspx.

2.18 AP-ADO/TF noted that among **354** international aerodromes in Asia and Pacific Regions only **269** international aerodromes had been listed in Asia/Pacific Region ANP Volume I by 2022.

Draft Regional Guidance for Design and Operations of Altiports

2.19 The AP-ADO/TF/4 meeting reviewed in detail the Draft Regional Guidance for Design *and Operations of Altiport* which was also posted separately on ICAO Meeting Webpage at https://www.icao.int/APAC/Meetings/Pages/2023-AP-ADO-TF4.aspx as **Attachment** to AP-ADO/TF/4-**WP/09** for comments by States/Administrations for further improvement. The AP-ADO/TF/4 meeting noted the progress in drafting the *Regional Guidance for Design and Operations of Altiport* and which is expected to be completed by the next meeting of the Task Force (AP-ADO/TF/5).

Task List of AP-ADO/TF

2.20 AP-ADO/TF/4 reviewed and updated the task list provided in **Appendix C** to the Report of the AP-ADO/TF/4.

2.21 AP-ADO/TF/4 agreed with the US proposal to organise a "Workshop on Aerodrome Pavement Design and Evaluation including ICAO ACR-PCR Method in Reporting Pavement Strength" back-to-back with next AP-ADO/TF Meeting in Jan/Feb 2024 or as standalone workshop as appropriate at the convenient dates for Asia and Pacific States and to be supported by FAA.

Aerodrome Activity in the Pacific

2.22 Pacific Aviation Safety Office (PASO) provided an overview of aerodrome and ground aids activity undertaken by PASO since 2020 for the ten Pacific States with the funding support from the Australian Department of Foreign Affairs and Trade to continue regulatory audits and surveillance as States have reduced aviation income due to border closures from COVID-19. The work included assisting on ICAO matters including Global Reporting Format training and implementation.

2.23 AP-ADO/TF/4 noted the development of an offsite certification audit process funded by the World Bank enabling States to continue to get PASO support for audits and inspections whilst the State borders were closed due to COVID-19 preventing onsite access by inspectors. AP-ADO/TF/4 also noted the challenges Pacific aerodromes face especially in regard to Annex 14 compliance, aerodrome certification and aerodrome operations. AP-ADO/TF/4 further noted PASO's involvement with States to get all international aerodromes, where PASO provides assistance, to be certificated and removed current State aerodrome deficiencies identified by ICAO.

Proposal for Amendment to AP-ADO/TF TOR

2.24 The Secretariat presented a proposal for an amendment to the current terms of reference of AP-ADO/TF.

2.25 The TOR was proposed to be amended to include in its scope the topics, such as, Surface Movement Guidance and Control System (SMGCS) and Advanced SMGCS (A-SMGCS), Aerodrome Operations (AOP), Aerodrome Operation Centre (AOPC) and Total Airport Management (TAM) provisions of GANP and upcoming new concept of obstacle limitation surfaces (OLS) and runway strength reporting (ACR/PCR) as shown in **Appendix D** to the Report of the AP-ADO/TF/4. The proposed amendment to the TOR would allow additional time for this Task Force to complete the work related to initial as well as additional scope of work and assigned tasks, and to provide some flexibility in the mode of meetings.

2.26 AP-ADO/TF/4 endorsed the following Draft Decision for consideration by AOP/SG/7:

Draft Decision AP-ADO/TF/4-2: Proposal for Amendment to AP-ADO/TF's TOR	
What: That, the Terms of Reference of the Asia/Pacific Aerodrome Design and Operations Task Force be amended as in **Appendix D** to the Report of the AP-ADO/TF/4.	Expected impact: ☐ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical
Why: To allow additional three years of	Follow-up: ☐Required from States

time (until September 2026) to complete the work as per initial and additional scope of the work and assigned tasks and to provide some flexibility in the mode of meetings amid the aftermath of pandemic.	
When: 13-Jan-23	Status: Draft to be adopted by Subgroup
Who: ☒Sub groups ☐APAC States ☒ICAO APAC RO ☐ICAO HQ ☒Other: AP-ADO/TF	

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) review the Summary Report (**Attachment A**) on the Fourth Meeting of AP-ADO/TF;

b) review the **Draft Conclusion** presented in Paragraph 2.2 for endorsement by AOP/SG/7 and further consideration by APANPIRG/34;

c) review the **Draft Decision** presented in Paragraph 2.26 for adoption by AOP/SG/7; and

d) discuss any relevant matters as appropriate.

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Summary Report of the AP-ADO/TF/4 Meeting

INTRODUCTION

1. Meeting

1.1 The Fourth Meeting of Asia/Pacific Aerodrome Design and Operations Task Force (AP-ADO/TF/4) was held as a Hybrid Meeting in Chiang Rai, Thailand from 10 to 13 January 2023.

2. Attendance

2.1 93 participants from 20 Member States, 1 Special Administrative Region and Pacific Aviation Safety Office attended the meeting.

3. Language and Documentation

3.1 The working language of the meeting and all documentation was in English. There were 13 Working Papers, 4 Information Papers and 2 Presentations considered by the Meeting.

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Adoption of Provisional Agenda (WP/01)

The Provisional Agenda was adopted by the Meeting without amendment.

Agenda Item 1: Review Outcome of Relevant Meetings

Agenda Item 2: Planning, Design and Construction of Aerodromes

Agenda Item 3: Regional Air Navigation Plan, Part II, Tables AOP I-1 & II-1

Agenda Item 4: Seamless ANS Plan

Agenda Item 5: AP-ADO/TF Task List

Agenda Item 6: Any other business

Agenda Item 7: Provisional Agenda, Date and Venue for the Next Meeting

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Agenda Item 1: Review Outcome of Relevant Meetings

Relevant Outcomes of AOP/SG/6 (WP/02)

1.1 AP-ADO/TF/4 noted that the following regional guidance materials had been approved by AOP/SG/6:

i) *Generic Surveillance Programme for Certified Aerodromes* developed by the Asia/Pacific Aerodrome Assistance Working Group;

ii) *Asia Pacific Regional Guidance on Development and Implementation of Wildlife Hazard Management Programme* developed by the Asia/Pacific Wildlife Hazard Management Working Group

and both documents had been published on the ICAO Asia/Pacific Regional Office eDocuments webpage: https://www.icao.int/APAC/Pages/eDocs.aspx under AGA heading.

1.2 AP-ADO/TF/4 also noted that the AOP/SG/6 had adopted two Conclusions, as below:

i) *Conclusion AOP/SG/6 – 7: State's Actions on USOAP CMA On-line Framework (OLF);* and

ii) *Conclusion AOP/SG/6 – 9 (AAITF/17-3): Revalidation of Coordinate Data*

1.3 The Final Report of AOP/SG/6 published at https://www.icao.int/APAC/Meetings/Pages/2022-AOP-SG6.aspx provided the detailed descriptions of the above Conclusions.

Relevant Outcomes of APANPIRG/33 (WP/03)

1.4 AP-ADO/TF/4 noted that APANPIRG/33 had adopted the following Conclusions related to aerodrome design and operations:

i) *Conclusion APANPIRG/33/1: Proposal for Amendment to Asia/Pacific ANP Volume I, Table AOP I-1 and ANP Volume II, Table AOP II-1*

ii) *Conclusion APANPIRG/33/2: Publication of procedures for reporting of runway condition report and issuance of the SNOWTAM in AIP*

iii) *Conclusion APANPIRG/33/3: Assistance to APAC States that require assistance in AGA area including certification and surveillance of aerodromes*

iv) *Conclusion APANPIRG/33/4: State Action Plan for Establishment and Implementation of WHMP - Generic Template*

v) *Conclusion APANPIRG/33/14 – Update of Information in APANPIRG Air Navigation Deficiencies Reporting Form*

1.5 The Final Report of APANPIRG/33 published at https://www.icao.int/APAC/Meetings/Pages/2022-APANPIRG33.aspx provided the detailed descriptions of the above Conclusions.

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Agenda Item 2: Planning, Design and Construction of Aerodromes

<u>Runway Turn Pad Specifications (WP/04)</u>

2.1 Presented by India WP/14 discussed the discrepancies on the specifications of Runway Turn Pads as provided in Annex 14 Volume I, Aerodrome Design Manuals Parts 1 and 2.

Annex 14, Volume I Specifications and Aerodrome Design Manual (Doc 9157), Part 1

2.2 Initially runway turn pad was based on the Aerodrome reference code in accordance with Annex 14, Volume I, Table1-1, later in 2018, with the introduction of OMGWS and amendment to Annex 14, Volume I, Table1-1 in 2018, the turn pad should have been delinked from Aerodrome Reference Code (ARC); however, the existing SARPs 3.3.1 and 3.3.2 were still aligned with the ARC.

2.3 The design consideration for the runway turn pad was provided in Aerodrome Design Manual Part 1, Chapter 3; examples of the pavement required for a Code letter "A to F" aircraft to complete a 180-degree turn were given in Figures A4-2 to A4-7. Even though the code letters were mentioned in the figures A4-2 to A4-7 for design criteria, the design was predominantly based on OMGWS and wheelbase. Therefore, the linking of runway turn pad should have been reviewed with respect to ARC.

Markings

2.4 Annex 14, Volume I, Recommendation 5.2.9.3 required that runway turn pad marking should extended parallel to the runway centre line marking for a distance of at least 60 m beyond the point of tangency where the code number is 3 or 4, and for a distance of at least 30 m where the code number is 1 or 2. However, the Figure 1-3 of the Aerodrome Design Manual (Doc 9157) Part 2 depicted the runway turn pad marking as stripe-gap combination and overlapping with the runway centerline marking (Aerodrome operator painted the incorrect markings accordingly)

2.5 Annex 14, Volume I, Standards 5.2.9.7 requires that runway turn pad marking shall be at least 15 cm in width and continuous in length. However, Figure 4-1 in Aerodrome Design Manual (Doc 9157) Part 1 depicted the marking as stripe-gap combination. (Aerodrome operator painted the incorrect markings accordingly).

2.6 Considering the inconsistency observed in Annex 14 Volume I and Aerodrome Design Manual (Doc 9157) Part 1 regarding the basis taken for runway turn pad design (ARC letter versus OMGWS) and ambiguity created by markings of turn pad as shown in Aerodrome Design Manual (Doc 9157) Part 1 and Part 2 (which was actually shown as aircraft cockpit track but misinterpreted/misunderstood by some aerodrome operators as marking), the AP-ADO/TF endorsed the following Draft Conclusion:

Draft Conclusion AP-ADO/TF/4 – 1: Runway Turn Pad Design and Marking	
What: That, the design of runway and taxiway widths is linked to the outer main gear wheel span (OMGWS) of the design aircraft and the size of the runway turn pad depends on aircraft wheel base, OMGWS and maximum nose wheel steering angle. On the other hand, SARPs on runway turn pad markings are linked to aerodrome reference code (ARC) numbers (5.2.9 of Annex 14, Volume I refer). Therefore, ICAO is requested to review: 1) Annex 14, volume I SARPs 3.3.1 & 3.3.2, where they have provided reference to ARC (code letters);	Expected impact: ☒ Political / Global ☐ Inter-regional ☐ Economic ☐ Environmental ☒ Ops/Technical

<table>
<tr><td colspan="2">2) Figure 1-3 of Aerodrome Design Manual (ADM), Part 2 and Figure 4-1 of Aerodrome Design Manual, Part 1 for consistency with Annex 14, Volume I SARPs as specified in 5.2.9 (5.2.9.3 & 5.2.9.7 refer) regarding the runway turn pad marking.</td><td></td></tr>
<tr><td>Why: To review Annex 14, Volume I SARPs 3.3.1 & 3.3.2 and Figure 4-1 of ADM, Part 2 and Figure 1-3 of ADM, Part 1 by ICAO Aerodrome Design Group of Aerodrome Design and Operation Panel</td><td colspan="2">Follow-up: ☐Required from States</td></tr>
<tr><td>When: 13-Jan-23</td><td colspan="2">Status: Draft to be adopted by PIRG</td></tr>
<tr><td colspan="3">Who: ☒Sub groups ☐APAC States ☒ICAO APAC RO ☒ICAO HQ ☐Other: XXXX</td></tr>
</table>

<u>Review on Requirement of Intermediate Holding Position Lights During CAT I Conditions (WP/05)</u>

2.7 India presented the WP/05 which provided the analysis on the requirement of intermediate holding position (IHP) lights during various conditions. Intermediate holding position lights at airports were provided at an intermediate holding position intended for use in runway visual range (RVR) conditions less than 350 m. The IHP lights being switched on along with the taxiway centre line lighting. However, at several airports where taxiway centre line lighting was provided even during CAT I conditions (in lieu of taxiway edge lights), IHP lights were not required to be provided as per Annex 14, Volume I Standards and Recommended Practices (SARPs).

2.8 The WP/05 explained the difficulties from pilot perspective in identification of the IHP position when taxiway centreline lights (TCLs) are operated in CAT I conditions. When the TCLs were switched on, the tendency of the pilot in focusing on the green lights and difficulty in sudden switchovers of identifying the IHP marking were detailed. Difficulties in identification of the transverse IHP marking in the above scenario could be a challenge.

2.9 The difficulties in achieving the balance required in the elements of visual aids, in this case the marking and the lights (longitudinal lighting vs transverse marking), had been discussed in detail. The impact on the historical and the experience factors of the pilot in such situations was also discussed. Based on above discussion points, the Paper strongly recommended that the Intermediate holding position lights be mandatorily provided whenever TCLs were operated.

2.10 The second part of the proposal included a recommendation to provide IHP lights when the airport had only taxiway edge lights and signs. The paper explained the benefits, such as, early information about a junction, less installation cost as configuration requires only 3 lights, increase of situational awareness as identification of IHP marking still could be a challenge from a long distance etc., The issues with the IHP markings had also been detailed, supporting the recommendations for provision of IHP lights in CAT I conditions. However, in such a case, it was proposed to have a light distribution similar to TCL's with RVR conditions > 350 m.

2.11 After discussion on the WP/05 and suggestions received from Pakistan and Nepal, the meeting agreed to send the WP/05 (Revision 1) to ICAO HQ Visual Aids Group for further review and study incorporating the changes in the WP/05 after Paragraph 4.1 b) as follows:

- in 5.3.21.3 added the text in bold font "**at intermediate holding position**" before the text "………. irrespective of runway visual range conditions" and deleted completely 5.3.21.5 as the provision mentioned here was in existence in 5.3.21.6 (renumbered).

Development of fully integrated safeguarding surfaces to uphold flight safety while facilitating pressing needs of infrastructure/building developments in Hong Kong, China (WP/06)

2.12 Hong Kong China shared the successful experience in making use of advanced computer modelling to proactively develop integrated safeguarding surfaces for CNS equipment, aerodrome and flight procedures, and publish them under a regulatory framework to uphold flight safety while minimising constraints to infrastructure/building developments to cope with the pressing needs for lands for developments in the Hong Kong territories. Hong Kong China had revamped the existing CNS safeguarding surfaces based on comprehensive computer modelling for each CNS equipment against the environment in which the equipment operates utilising a state-of-the-art 3-dimensional (3D) computer modelling solution. The CNS safeguarding surfaces derived in a 3D manner were highly accurate to provide sufficient safeguarding protection while minimising constraints to building heights. Resulting of the highly accurate computer simulation, coverage and limiting the height of the revamped safeguarding surfaces could be less stringent as compared with the existing ones.

2.13 Besides, Hong Kong China also integrated all safeguarding surfaces through a highly complex and iterative process with a high degree of accuracy in formulating a combined set of the most limiting surfaces, which were published as *"Airport Height Restriction Plan" (AHRP)* under the *Hong Kong Airport (Control of Obstructions) Ordinance* with effect from 31 May 2022. This gave the AHRP a firm legal footing by incorporation into the laws of Hong Kong China, that also help the potential infrastructure/building developments to comply with the law. Such a comprehensive and systematic approach was considered beneficial to all stakeholders, including Civil Aviation Authorities/Air Navigation Service Providers, airport operators, lands planners, property owners/developers etc., to facilitate development and future aerodrome planning without jeopardising flight safety.

2.14 States/Administrations were encouraged to be fully aware of the potential risks induced by the protrusion of safeguarding surfaces and take proactive steps to engage advanced computer modelling to develop integrated safeguarding with high accuracy and publish them under a regulatory framework to uphold flight safety while facilitating pressing needs of infrastructure/building developments.

2.15 Furthermore, a service provider, ESRI China (Hong Kong), provided a solution for integrating safeguarding surfaces in Hong Kong China. The aviation geographic information system experts from ESRI conducted an online demonstration of integrating the safeguarding surfaces to derive the lowest limiting surface. The model could be verified using captured flight data to understand and demonstrate the surface design in practice. The combined data layers could be exported to a 3D model database or shared as a web application, allowing complex geographic information to be simplified and shared with users.

Review on Requirement of Sequenced Flashing Lights (SFL) for the Barrette Approach Lighting System in CAT I/II/III Conditions (WP/07)

2.16 Presented by India, the WP/07 provided the review on requirement of sequenced flashing lights (SFL) for the barrette approach lighting systems in CAT I/II/III conditions**.**

Precision Approach CAT I Lighting System

2.17 As per Annex 14 Volume I, SFL should be provided for the barrette approach lighting system taking into consideration of the characteristics of the system and the nature of meteorological conditions, which is applicable for both precision approach CAT I and precision approach CAT II/III lighting systems. While for Category I approach lighting system SFL to be provided for every barrette i.e., from the first barrette to the end of the approach lighting system and for Category II/III approach lighting system the SFL to be provided beyond 300 m.

2.18 To understand the problem, the WP/07 provided a detailed analysis on the landing phase of the aircraft, the complexities in the landing phases and the importance of standardization has been explained.

2.19 The concern explained was the deviation in general understanding of AGL system pattern in different categories and elements guiding the expectations of the pilots. In AGL system with the reduction in the visibility the spacing reduces, the supplementary system would be added to configuration or there may not be any change. It is quite unconventional that a section of the system is reduced when the CAT II/III operations are in place. Several references have been made in understanding the importance of the pattern recognition and standardization.

2.20 The WP/07 provided following explanations to justify the proposal of removing the SFL for section from the threshold lights to 300 m for CAT I approach lighting system:

a) SFL function is to provide centreline guidance, which is already met well before 300 m.

b) In CAT I conditions, RVR > 550 m. From a distance of 300 m, pilot can visualize and process the visual aids such as Threshold lighting/Threshold wing bar lighting, the 300 m cross bar and barrettes at every 30 m.

c) Availability of the decision bar at 300 m.

d) Probable distraction of SFL in FOG for the first 300 m. Also, stress has been laid on the depth perception issues after experiencing glare or from being flash blinded by approach or runway lights.

e) Balance of elements and dark adaptation issues.

f) FAA and Canadian standards for the SFL component of the approach lighting system consistently require installing the SFL only after the 300 m cross bar, if available, but never from the first barrette after threshold lights.

g) When a runway provided with both CAT I and CAT II/III barrette approach lights. The probability that the pilot would expect the complete stretch of SFL even for CAT II/III, when the pilot often used to land on CAT I conditions. This could lead an ambiguity for the pilot in a crucial state of landing.

2.21 Considering the detailed explanation provided above and thereby expressing the concern over the provision of SFL lights for the section from threshold lights to 300 m in the CAT I conditions, the WP/07 proposed to amend the Recommendation 5.3.4.17 of Annex 14, Volume I as below:

> 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 beyond 300 m should be supplemented by a flashing light, except where such lighting is considered unnecessary taking into account the characteristics of the system and the nature of the meteorological conditions.*

Precision Approach CAT II and III Lighting System

2.22 The second part of the concern was for the CAT II/III approach lighting system. 5.3.4.34 of Annex 14, Volume I, as appended below:

> 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 flashing light, except where such lighting is considered unnecessary taking into account the characteristics of the system and the nature of the meteorological conditions.

2.23 This was explained stating that the CAT II/III condition itself warrants that the meteorological conditions are impaired. Therefore, the WP/07 proposed to make two changes in 5.3.4.34 of Annex 14, Volume I:

a) change from recommendation to standard, as without SFL lights identifying the approach lights would be tough task; and

b) in CAT II/III condition, both the characteristics of system perceivability and meteorological conditions are affected, the reference of the same is not required.

2.24 Based on the explanation above, the paper proposed the changes to 5.3.4.34 of Annex 14, Volume I as below:

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~~ shall be supplemented by a flashing light.~~, except where such lighting is considered unnecessary taking into account the characteristics of the system and the nature of the meteorological conditions~~*

2.25 After deliberation, the meeting agreed that the WP/07 should be forwarded to ICAO HQ Visual Aids Working Group for further review and study.

ICAO HQ Update on AGA Matters (IP/03)

2.26 Secretariat from ICAO, HQ, updated the meeting with information related to aerodrome activities carried out recently in the Airport Operations and Infrastructure Section, Air Navigation Bureau, ICAO Montreal. The IP/03 provided the recent amendments to Annex 14 Vol I, including updates on guidance materials; outcomes of the discussions at the fourth meeting of the Aerodrome Design and Operations (ADOP/4); details of the upcoming amendment proposals in Annex 14, Volume I & II and PANS-Aerodromes; ongoing work of the ADOP-RPASP Joint Task Force; and brief update on the 41st ICAO Assembly.

2.27 In response to USA's query, the Secretariat clarified that all certificated heliports open for international operations shall have safety management system implemented.

Introduction of Chengdu Tianfu International Airport (IP/04)

2.28 As an international aviation hub in western China, Chengdu Tianfu International Airport played a vital role in connecting China to the world. The airport covers 126,000 square meters and the first phase of construction took 6 years to finish. So far it has already completed 3 runways, 2 terminals with 83 contact gates and 240 stands in the apron area, integrated transportation containing High-speed Railway, metro line and the Airport Expressway. In the future, the airport would be designed to serve 150 million passengers annually and would continue to build 3 more runways and 2 terminals, which would contribute a great social and economic influence.

Embracing the Change – OLS Transformation (PPT/01)

2.29 Secretariat from ICAO, HQ, made a presentation on the upcoming amendment proposals related to Obstacle Limitation surfaces in Annex 14, Volume I and other documents. A brief outline on the proposed changes to Chapter 4 of Annex 14, Vol I and on a new chapter in PANS-

Aerodromes (Doc 9981) was provided. A complete modification and rewrite of Chapter 4 with the introduction of the twofold concept of Obstacle free surface (OFS) and Obstacle evaluation surface (OES) was explained. The introduction of the Aeroplane design group (ADG) in Chapter 1 of Annex 14, Volume I, that consists of a combination of indicated airspeed at threshold and wingspan for extensive usage in Chapter 4, was elaborated. The new chapter in PANS- Aerodromes will contain provisions related to adjustment of surfaces based on operational requirements and the conduct of aeronautical study.

2.30 The meeting was informed that a State Letter for consultation on these amendment proposals expected to be issued by the end of April 2023 and the effective and applicability dates for the OLS amendments would be July 2025 and November 2028 respectively.

<u>ICAO ACR-PCR Procedure of Reporting Airport Pavement Strength – Introduction to FAA AC 150/5335-5D (PPT/02)</u>

2.31 USA made a presentation on ICAO *ACR-PCR Procedure of Reporting Airport Pavement Strength – Introduction to FAA AC 150/5335-5D.*

2.32 The meeting was informed that on 9 March 2020 an *Amendment 15 to Annex 14, Volume 1 to the Convention on International Civil Aviation* was adopted by the Council at the fourth meeting of its 219th Session. Amendment 15 adopted the Aircraft Classification Rating-Pavement Classification Rating (ACR-PCR) as the new ICAO standard method of reporting airport pavement strength. The Amendment became effective on 20 July 2020 with an applicability date of 28 November 2024, and on or before this date the member States must have transitioned to the new method. This amendment culminated nearly a decade of development of the ACR-PCR method by the Airfield Pavement Expert Group (APEG) ACN-PCN Task Force. The system replaces the previous Aircraft Classification Number – Pavement Classification Number method which had been the ICAO standard method of reporting pavement strength since the early 1980s.

2.33 In 2022, Aerodrome Design Manual (Doc 9157) Part 3 – Pavements, Third Edition was published providing details on the ACR-PCR method along with recommendations on how member States would be able to adopt the ACR-PCR method as their new standard method of reporting pavement strength. The ACR-PCR method provides a standardized method to develop ACRs for aircraft based on aircraft characteristics such as gear configuration, tire pressure, load distribution and center of gravity. All aircraft manufacturers would develop ACRs using the ICAO standard method. ICAO had also developed a model procedure for computing PCRs using the Cumulative Damage Factor (CDF) concept. ICAO would allow member States to develop their own PCR procedure using the ICAO model procedure, so long as it utilizes the CDF concept. The ICAO PCR procedure did not dictate the use of a preferred subgrade failure/damage model, nor a method for treating the multi-axle loading of complex aircraft landing gear. This allowed member States to adopt the same models that were used in their existing pavement design and evaluation methodologies.

2.34 The FAA issued Advisory Circular (AC) 150/5335-5D Standardized Method of Reporting Airport Pavement Strength – PCR in April 2022. With the publication of this AC the FAA officially adopted the ICAO ACR-PCR Method as the FAA's new standard method of reporting pavement strength. The AC provides guidance on FAA procedures to compute the PCR using its FAARFIELD 2.0 pavement design and evaluation software. The AC also provides guidance on how PCRs would be reported on runways in the Airport Master Record. The FAA had established a deadline of 30 September 2024, for Part 139 Certificated airports to report PCR on paved runways. During the transition period PCNs and PCRs may be reported in an Airport Master Record; however, both values could not be reported for the same runway. After the ICAO implementation deadline of 28 November 2024, the FAA would phase out the reporting of PCNs in master records.

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Agenda Item 3: Regional Air Navigation Plan, Part II, Tables AOP I-1 & II-1

Asia/Pacific Air Navigation Plan (WP/08)

3.1 The Secretariat presented the structure of the Asia/Pacific Air Navigation Plans (APAC ANPs) and the procedures for the amendment of these Plans. All three Volumes of Asia/Pacific Air Navigation Plan and the template of Proposal for Amendments (PfA) to APAC ANPs provided at https://www.icao.int/APAC/Pages/APAC-eANP.aspx.

3.2 The meeting was informed that APAC Office had completed processing of PfAs for five States/Administrations (Hong Kong, China, New Zealand, Nepal, Pakistan and Cook Island) in 2022 and APAC ANP Volumes I & II had been amended accordingly.

3.3 AP-ADO/TF noted that among **354** international aerodromes in Asia and Pacific Regions only **269** international aerodromes had been listed in Asia/Pacific Region ANP Volume I by 2022. The detailed information of aerodromes yet to be listed in APAC ANP by Asia Pacific States/Administrations provided in **Appendix A** to the AP-ADO/TF/4 Report.

3.4 AP-ADO/TF/4 recalled the *Conclusion APANPIRG/33/1* adopted by APANPIRG/33 (22 to 24 November 2022, Bali Indonesia):

Conclusion APANPIRG/33/1: Proposal for Amendment to Asia/Pacific ANP Volume I, Table AOP I-1 and ANP Volume II, Table AOP II-1

That, Asia Pacific States/Administrations are urged to:

a) review the aerodromes listed in APAC ANP Volume I, Table AOP I-1;

b) review the ANP Volume II, Table AOP II-1 for the list of facilities and services to be provided by the State concerned at each aerodrome that is listed in Table AOP I-1; and

c) *initiate and send to ICAO APAC Office proposals for amendment to APAC ANP Volume I, Table AOP I-1 and ANP Volume II, Table AOP II-1 in accordance with the template provided in* ***Appendix B to the Report on Agenda Item 3.1****, if their international aerodromes are not yet listed in Table AOP I-1 or require any amendments to update the information provided in Tables AOP I-1 and AOP II-1.*

3.5 States and Administrations were reminded of the following items when preparing the Proposal for Amendment to Table AOP II-1 of APAC ANP Volume II:

a) the required level of protection expressed by means of an aerodrome rescue and firefighting (RFF) category number, determined in accordance with *Annex 14, Volume I, 9.2,* would be provided under column 2;

b) changes in the level of protection normally available at an aerodrome for RFF should not be detailed in this Table, but should be notified to the appropriate air traffic services unit and aeronautical information services units, in accordance with *Annex 14, Volume I, 2.11.3* and *2.11.4*. Further guidance is available in *ICAO Doc 9137 Airport Services Manual, Part 1 – Rescue and Firefighting, Chapter 16*;

c) the aerodrome reference code (RC) selected for aerodrome planning purposes in accordance with *Annex 14, Volume I, 1.6* should be provided under column 3; and

d) the critical design aircraft selected for determining RC, RFF category and pavement strength should be provided under column 6. Only one critical aircraft type should be shown, if it was used to determine all three elements. Otherwise, different critical aircraft types should be shown for different elements.

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Agenda Item 4: Seamless ANS Plan

NIL

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Agenda Item 5: AP-ADO/TF Task List

Draft Regional Guidance for Design and Operations of Altiport (WP/09)

5.1 China, Fiji, India, Indonesia and Nepal prepared and presented the second draft of the *Regional Guidance for Design and Operations of Altiport*.

5.2 It was noted that altiports in the mountainous areas for the operation of aircrafts with short take-off and landing (STOL) performances defy the standards and recommended practices of *Annex 14, Aerodromes, Volume I – Aerodrome Design and Operations* as well as guidelines provided in *Stolport Manual (Doc 9150)* due to topographical challenges and financial constraints, especially in terms of steep longitudinal slope, inadequate runway strip, infringement by obstacles etc. Furthermore, there were no specific international and globally harmonized guidelines for design, construction and operations of altiports.

5.3 The meeting reviewed in detail the *Draft Regional Guidance for Design and Operations of Altiport*. The *Draft Regional Guidance for Design and Operations of Altiport,* provided in **Appendix B** to this Report was also posted separately on ICAO Meeting Webpage at https://www.icao.int/APAC/Meetings/Pages/2023-AP-ADO-TF4.aspx as **Attachment** to WP/09 in word format for comments by States/Administrations for further improvement. The meeting also noted that the work in drafting the *Regional Guidance for Design and Operations of Altiport* was in progress and expected to be completed by the next meeting of the Task Force (AP-ADO/TF/5)

5.4 In response to the query from India, the Secretariat explained that in one of the States where STOL aircrafts were operating at altiports had a minimum visibility requirement of 5 km for landing and take-off as per their National Regulations. The national requirements, which stipulated other flight safety requirements for operations of aircraft by domestic carriers at altiports was also provided in the draft guidance document as one of the Attachments as a State good practices (*Attachment B – STOL Fields Clearance Requirements - CAA Nepal Practices* of the *Draft Regional Guidance for Design and Operations of Altiport* refer*)*.

5.5 In response to query on lead-in lighting system installation and airfield lighting at altiports, the Secretariat clarified that these technical matters were discussed with instructor pilots who had extensive experience in operating STOL aircrafts at altiports and they expressed that these installations would not give any benefits to airlines as they had to operate in VMC conditions and during day light.

Task List of AP-ADO/TF (WP/10)

5.6 WP/10 provided the task list of AP-ADO/TF for review and update by the meeting.

5.7 The meeting agreed with the US proposal to organise a "*Workshop on Aerodrome Pavement Design and Evaluation including ICAO ACR-PCR Method in Reporting Pavement Strength"* back-to-back with next AP-ADO/TF Meeting in Jan/Feb 2024 or as standalone workshop as appropriate at the convenient dates for Asia and Pacific States and to be supported by FAA.

5.8 The meeting updated the task list of AP-ADO/TF and the updated task list provided in **Appendix C.**

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Agenda Item 6: Any Other Business

Aerodrome Activity in the Pacific (WP/11)

6.1 WP/11 presented by the Pacific Aviation Safety Office (PASO) provided the meeting an overview of aerodrome and ground aids activity undertaken by the Pacific Aviation Safety Office since 2020 for the ten Pacific States which PASO provides regulatory services. The paper acknowledged the funding support from the Australian Department of Foreign Affairs and Trade to continue regulatory audits and surveillance as States have reduced aviation income due to border closures from COVID-19. The work included assisting on ICAO matters including Global Reporting Format training and implementation.

6.2 The development of an offsite certification audit process funded by the World Bank was highlighted. This process enabled States to continue to get PASO support for audits and inspections whilst the State borders were closed due to COVID-19 preventing onsite access by inspectors. The paper outlined challenges Pacific aerodromes face especially in regard to Annex 14 compliance, aerodrome certification and aerodrome operations. The meeting noted PASO's involvement with States to get all international aerodromes, where PASO provides assistance, to be certificated and removed current State aerodrome deficiencies identified by ICAO.

Proposal for Amendment to AP-ADO/TF TOR (WP/12)

6.3 The Secretariat presented a proposal for an amendment to the current terms of reference of AP-ADO/TF.

6.4 Due to COVID-19 pandemic, States and Administrations had re-organized their priorities. In addition, the travel restrictions implemented by States and Administrations had made the face-to-face meeting impossible and necessitated the need for additional time to fulfil the objective of the TOR as envisaged. Moreover, the special task entrusted to the Task Force by the AOP/SG for the development of the *Regional Guidance on Design and Operations of Altiports* was still in progress.

6.5 As a result, the TOR was proposed to be amended to include in its scope the topics, such as, Surface Movement Guidance and Control System (SMGCS) and Advanced SMGCS (A-SMGCS), Aerodrome Operations (AOP), Aerodrome Operation Centre (AOPC) and Total Airport Management (TAM) provisions of GANP and upcoming new concept of obstacle limitation surfaces (OLS) and runway strength reporting (ACR/PCR) as shown in **Appendix D** to the Report of the AP-ADO/TF/4. The proposed amendment to the TOR would allow additional time for this Task Force to complete the work related to initial as well as additional scope of work and assigned tasks, and to provide some flexibility in the mode of meetings.

6.6 Therefore, AP-ADO/TF/4 endorsed the following Draft Decision for consideration by AOP/SG/7:

Draft Decision AP-ADO/TF/4-2: Proposal for Amendment to AP-ADO/TF's TOR	
What: That, the Terms of Reference of the Asia/Pacific Aerodrome Design and Operations Task Force be amended as in **Appendix D** to the Report of the AP-ADO/TF/4.	Expected impact: ☐Political / Global ☐Inter-regional ☐Economic ☐Environmental

<table>
<tr><td colspan="2"></td><td>☒Ops/Technical</td></tr>
<tr><td>Why: To allow additional three years of time (until September 2026) to complete the work as per initial and additional scope of the work and assigned tasks and to provide some flexibility in the mode of meetings amid the aftermath of pandemic.</td><td colspan="2">Follow-up: ☐Required from States</td></tr>
<tr><td>When: 13-Jan-23</td><td colspan="2">Status: Draft to be adopted by Subgroup</td></tr>
<tr><td colspan="3">Who: ☒Sub groups ☐APAC States ☒ICAO APAC RO ☐ICAO HQ ☒Other: AP-ADO/TF</td></tr>
</table>

Election of the Chairperson

6.7 Dr. Punya Raj Shakya, Secretary of the AP-ADO/TF, invited the meeting to provide a nomination to the position of the Chairperson of the Task Force. The post would take effect from AP-ADO/TF/5 onwards.

6.8 The Head of Delegation from Bhutan, Mr. Sangay Wangdi proposed Squadron Leader Dr Somchanok Tiamtiabrat, General Manager of Chiang Rai International Airport, Airports of Thailand (AOT), to be the Chairperson of AP-ADO/TF for next four-year term. Mr. Wangdi provided a brief resume of Dr Somchanok's illustrious career achievements, wide management experience and expressed confidence that Dr Somchanok would be able to provide an effective leadership to AP-ADO/TF in its current challenging environment. This was supported by the Heads of Delegation from Nepal and India. The meeting unanimously elected Dr Somchanok as the Chairperson for the next four-year terms.

6.9 Dr Somchanok thanked the meeting for re-electing him as a Chairperson of AP-ADO/TF for the next four years and expressed appreciation for the tremendous support he received from States/Administrations.

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Agenda Item 7: Provisional Agenda, Date and Venue for the Next Meeting

Provisional Agenda, Date and Venue of Next Meeting (WP/13)

7.1 AP-ADO/TF/4 reviewed the draft agenda proposed by the Secretariat and agreed on the following Provisional Agenda for the AP-ADO/TF/5:

AP-ADO/TF/5

PROVISIONAL AGENDA

Agenda Item 1:	Adoption of Provisional Agenda
Agenda Item 2:	Review Outcome of Relevant Meetings
Agenda Item 3:	Global and Regional Air Navigation Plans
Agenda Item 4:	Planning, Design and Construction of Aerodromes
Agenda Item 5:	Asia and Pacific Regional Guidance on Design and Operations of Altiports
Agenda Item 6:	Airport Innovation
Agenda Item 7:	AP-ADO/TF Task List
Agenda Item 8:	Any other business
Agenda Item 9:	Provisional Agenda, Date and Venue for the Next Meeting

7.2 The next AP-ADO/TF Meeting would be held in January/February 2024 for three to five days. The venue proposed was ICAO APAC Office, Bangkok; however, State/Administration interested to host the meeting was requested to contact the Secretariat. The venue of the meeting would be communicated to States/Administrations through ICAO APAC Invitation Letter for AP-ADO/TF/5 Meeting.

Closing of the Meeting

7.3 Dr. Somchanok, Chairperson of AP-ADO/TF thanked all participants and members of the Task Force attended the AP-ADO/TF/4 Meeting in-persons and virtually for their valuable contribution and cooperation to the Meeting.

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Aerodromes to be listed in Asia Pacific Air Navigation Plan [Updated on 13 May 2022]

Serial #	Sub-region	State / Admin	ICAO Code	Name of City	Name of Aerodrome	Type	APAC ANP
1	SA	Afghanistan	OAHR	Herat	Herat Intl	UNK	0
4	SA	Afghanistan	OAMS	Mazar-e-Sharif	Mazar-e-Sharif	UNK	0
44	SEA	Cambodia	VDSV	Sihanouk	Sihanouk Intl	UNK	0
45	NA	China	ZBOW	Baotou		UNK	0
46	NA	China	ZGBH	Beihai		UNK	0
48	NA	China	ZBAD	Beijing	Daxing	UNK	0
49	NA	China	ZYCC	Changchun	Longjia	UNK	0
51	NA	China	ZSCG	Changzhou	Benniu	UNK	0
55	NA	China	ZLDH	Dunhuang		UNK	0
56	NA	China	ZHES	Enshi	Xujiaping	UNK	0
58	NA	China	ZSGZ	Ganzhou	Huangjin	UNK	0
62	NA	China	ZUGY	Guiyang	Longdongbao	UNK	0
63	NA	China	ZBLA	Hulunbeier	Hailar	UNK	0
64	NA	China	ZJHK	Haikou	Meilan	UNK	0
69	NA	China	ZWTN	Hotan		UNK	0
70	NA	China	ZSSH	Huai'an	Lianshui	UNK	0
71	NA	China	RCYU	Hualien	Hualien	UNK	0
72	NA	China	ZSTX	Huangshan	Tunxi	UNK	0
73	NA	China	ZYJM	Jiamusi		UNK	0
74	NA	China	ZGOW	Jieyang	Chaoshan	UNK	0
79	NA	China	ZULS	Lhasa	Gonggar	UNK	0
80	NA	China	ZSLG	Lianyungang	Baitabu	UNK	0
81	NA	China	ZPLJ	Lijiang	Sanyi	UNK	0
82	NA	China	ZSLY	Linyi	Shubuling	UNK	0
83	NA	China	ZHLY	Luoyang	Beijiao	UNK	0
84	NA	China	ZPMS	Dehong	Mangshi	UNK	0
85	NA	China	ZBMZ	Manzhouli	Xijiao	UNK	0
86	NA	China	ZYMD	Mudanjiang	Hailang	UNK	0
87	NA	China	ZSCN	Nanchang	Changbei	UNK	0
90	NA	China	ZSNT	Nantong	Xingdong	UNK	0
91	NA	China	ZSNB	Ningbo	Lishe	UNK	0
92	NA	China	ZBDS	Ordos	Ejin Horo	UNK	0
94	NA	China	ZYQQ	Qiqihar	Sanjiazi	UNK	0
95	NA	China	ZSQZ	Quanzhou	Jinjiang	UNK	0
101	NA	China	ZBSJ	Shijiazhuang	Zhengding	UNK	0
104	NA	China	RCMQ	Taichung	Cingcyuangang	UNK	0
105	NA	China	RCNN	Tainan	Tainan	UNK	0
109	NA	China	ZSWH	Weihai	Dashuipo	UNK	0

Serial #	Sub-region	State / Admin	ICAO Code	Name of City	Name of Aerodrome	Type	APAC ANP
110	NA	China	ZSWZ	Wenzhou	Longwan	UNK	0
112	NA	China	ZSWX	Wuxi	Shuofang	UNK	0
113	NA	China	ZSWY	Wuyishan		UNK	0
117	NA	China	ZLXN	Xining	Caojiabao	UNK	0
118	NA	China	ZPJH	Xishuangbanna	Gasa	UNK	0
119	NA	China	ZSXZ	Xuzhou	Guanyin	UNK	0
120	NA	China	ZSYN	Yancheng	Nanyang	UNK	0
121	NA	China	ZYYJ	Yanji	Chaoyangchuan	UNK	0
122	NA	China	ZSYT	Yantai	Penglai	UNK	0
123	NA	China	ZSYA	Yangzhou	Taizhou	UNK	0
124	NA	China	ZHYC	Yichang	Sanxia	UNK	0
125	NA	China	ZLIC	Yinchuan	Hedong	UNK	0
126	NA	China	ZSYW	Yiwu		UNK	0
127	NA	China	ZGZJ	Zhanjiang		UNK	0
128	NA	China	ZGDY	Zhangjiajie	Hehua	UNK	0
129	NA	China	ZHCC	Zhengzhou	Xinzheng	UNK	0
130	NA	China	ZSZS	Zhoushan	Putuoshan	UNK	0
131	NA	China	ZUZY	Zunyi	Xinzhou	UNK	0
133	PAC	Cook Islands	NCAI	Aitutaki		UNK	0
144	SA	India	VEBS	Bhubaneswar		UNK	0
146	SA	India	VICG	Chandigarh		UNK	0
151	SA	India	VOGO	Goa		UNK	0
162	SA	India	VOPB	Port Blair		UNK	0
163	SA	India	VAPO	Pune		UNK	0
164	SA	India	VISR	Srinagar		UNK	0
202	NA	Japan	RJSA	Aomori		UNK	0
203	NA	Japan	RJEC	Asahikawa		UNK	0
205	NA	Japan	RJSF	Fukushima		UNK	0
207	NA	Japan	RJSI	Hanamaki		UNK	0
209	NA	Japan	RJAH	Hyakuri		UNK	0
210	NA	Japan	ROIG	Ishigaki	New Ishigaki	UNK	0
213	NA	Japan	RJFR	Kitakyushu		UNK	0
214	NA	Japan	RJNK	Komatsu		UNK	0
216	NA	Japan	RJFM	Miyazaki		UNK	0
224	NA	Japan	RJFS	Saga		UNK	0
226	NA	Japan	RJCO	Sapporo	Sapporo	MIL	0
228	NA	Japan	RORS	Shimojishima		UNK	0

Serial #	Sub-region	State / Admin	ICAO Code	Name of City	Name of Aerodrome	Type	APAC ANP
229	NA	Japan	RJNS	Shizuoka		UNK	0
231	NA	Japan	RJOS	Tokushima		UNK	0
234	NA	Japan	RJNT	Toyama		UNK	0
235	NA	Japan	RJOH	Yonago	Miho	UNK	0
269	PAC	Micronesia	PTSA	Kosrae I.	Kosrae	UNK	0
270	NA	Mongolia	ZMCD	Dornod	Choibalsan	UNK	0
292	PAC	N. Mariana Is.	PGWT	Tinian I.	West Tinian	UNK	0
326	PAC	Solomon Islands	AGGM	Munda		UNK	0
330	SA	Sri Lanka	VCCJ	Jaffna		UNK	0
350	SEA	Viet Nam	VVDL	Da Lat	Lien Khuong	UNK	0

Notes:

Australia: Need to finalize the Table AOP II -1, APAC ANP V-II.

US

1) Tinian I./West Tinian [PGWT] for N. Mariana Is. should be added in Table AOP I – 1 of APAC ANP Volume - I and Table AOP II – 1 of APAC ANP Volume - II.
2) JOHNSTON ATOLL/Johnston I (PJON) should be withdrawn from Table AOP I – 1 of APAC ANP Volume - I and Table AOP II – 1 of APAC ANP Volume - II as it had been permanently closed for operation.

INTERNATIONAL CIVIL AVIATION ORGANIZATION

REGIONAL GUIDANCE FOR THE DESIGN AND OPERATION OF ALTIPORTS

[DRAFT]

First Edition, ../../ 20xx

This Guidance Material was developed by AP-ADO/TF and approved by the AOP/SG/.. Meeting and published by ICAO Asia and Pacific Office, Bangkok

RECORD OF AMENDMENTS

AMENDMENTS			
No.	Date Applicable	Date Entered	Entered by:

AMENDMENTS			
No.	Date Applicable	Date Entered	Entered by:

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CHAPTER 1. GENERAL

1.1 Introduction

1.1.1 This regional guidance material provides general guidance on altiports site selection, physical characteristics, obstacle limitation surfaces and visual aids that should be provided at altiports, as well as certain facilities and technical services normally provided at conventional land aerodromes.

1.1.2 Stolport Manual (Doc 9150) defines an ALTIPORT as "a small airport in a mountainous area with a steep gradient runway, used for landing up the slope and for take-off down the slope, thereby making use of only one approach/departure area." (FOREWORD, para 4 refers)

1.1.3 Most of the Annex-14 Volume - I and Stolport specifications may not be applicable to altiports which are constructed in mountainous regions, though some of the STOL aeroplanes in use today are designed to operate from altiports.

1.1.4 As no standards and recommended practices (SARPs) for altiports exist in any of the ICAO documents, this guidance material covers all the aircraft operating aspects of altiports except non-visual navigation aids. The airport terminal building and ground side operations are not addressed.

1.1.5 Since altiports are generally operated under visual meteorological conditions (VMC), the provisions described below are limited to this type of operation:

a) an altiport has at least:

- a steeply sloped runway extended at the top by a low-sloped section, itself associated with a substantially horizontal platform comprising the waiting and parking areas, and/or
- a unique approach and take-off path, which itself is supported by the lower end of the runway strip.

b) The lower part of the steep slope of the runway can be usefully extended by a section of less steep slope[1] allowing the pilot:

- to make contact more comfortable on landing,
- to have a better view of the end of the runway during the take-off roll prior to take-off,
- to limit the length of the runway necessary for a maneuvering during the accelerating-stop in case of one engine failure while an aeroplane is in take-off run [2].

c) The design of an altiport is based on the idea that, since take-off is downhill and landing is uphill, the steep section of the runway is used as an additional factor of acceleration on take-off and deceleration on landing to reduce the lengths required for both, and thus allow an aerodrome to be located at the site to be served. This principle characteristic of altiport runways is not without posing important problems for the operation of

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1 *nevertheless, higher than the maximums retained for the runways of conventional aerodromes.*

2 *minimum requirement for multi-engine aeroplanes carrying more than ten passengers or having a maximum take-off mass of 5,700 kg or less.*

aeroplanes, the use of which are used in the domain of non-conventional flight.

d) The average longitudinal slopes that can be found on altiports are outside the correction ranges covered by the flight manual charts and would require large extrapolations, leading to aeroplanes intended for use on altiports being subject to additional certification.

e) However, for altiports intended to receive only light aeroplanes, a simplified method for determining their runway lengths will be used, as described in Attachment A, Section 1.

f) It should be noted that the classical definitions of take-off and landing on conventional runways do not apply to altiports, for which the passages at 35 ft for take-off and 50 ft for landing have no meaning, and that the length to be given to the runway only refers to the take-off speed at which the aircraft leaves the ground after having initiated its take-off roll as well as, possibly, to the accelerated-stop distance of the most critical aeroplane.

Note: -
At altiport an engine failure is not considered during take-off and climb out until reaching safety altitude of 400 ft above ground level (altiport elevation). Likewise, during approach an engine failure is not considered beyond missed approach point. [Refer to "Supplement No. 178R2 of LET410 UVP-E20, Page, 3 & 8 of 18"]

1.2 Altiport design aeroplanes

1.2.1 For the purposes of this guidance material, the altiport design aeroplane is assumed to be an aeroplane with short take-off landing (STOL) performances that has a reference field length of **800 m or less**. In size, the altiport design aeroplane is assumed to have a wingspan of **15 m up to but not including 24 m** and an outer main gear wheel span (OMGWS) of **4.5 m up to but not including 6 m**. In terms of maximum take-off mass, the altiport design aeroplane is assumed to have a maximum take-off mass of **5,700 kg or less**.

Note:-

STOL operations of Dornier 228 are limited for maximum take-off mass of 5,700Kg (Supplement No 1131, Dornier 228). However, such information is not available in Supplement No. 178R2 of L410 UVP-E20.

1.2.2 List of aeroplanes currently operated at altiports in Indonesia and Nepal and aeroplanes with STOL performance suitable for operations at altiports are provided in **Appendix 1**.

1.3 Definitions

[To be developed]

Refer to *Annex 14 Aerodromes, Volume I Aerodrome Design and Operations* for definitions of terms used for land aerodromes.

When the following terms are used in this manual they have the following meanings:

Aerodrome for conventional take-off and landing (conventional aerodrome). ……

Altiport. ~~A small airport~~ An aerodrome in a mountainous/hilly terrain with a short runway and a steep ~~gradient runway~~ longitudinal slope, used for landing up the slope and for take-off down the slope, thereby making use of only one approach/departure ~~area~~ path in most of the cases and where operations are possible only by aeroplanes with STOL performance capabilities.

Stolport. An airport whose physical characteristics, visual and non-visual aids and total infrastructure are created to support safe and effective public air transport in and out of densely populated urban areas as well as to and from rural areas with difficult terrain.

……………

1.4 Applicability

1.4.1 This guidance material is meant for the use of altiport planners and the appropriate airport authorities in examining the feasibility of altiport operations at existing aerodromes or other sites and in the planning, design and approval of altiports. Interpretation of the material requires the exercise of discretion and the making of decisions, particularly by the airport authorities.

1.5 Site Selection

1.5.1 Before a commitment of resources is made to establish an altiport in a mountainous area, there should be recognized social, environmental, economic, and operational advantages over existing transportation systems. These advantages hinge on the potential of greatly reducing trip time by providing service from urban areas to remote mountainous areas.

1.5.2 An altiport with a short runway requires a protection of less airspace compared to that needed for conventional airport due to the possibility of providing steep obstacle limitation surfaces allowing a greater flexibility in locating the altiport site.

1.5.3 Once an altiport site is provisionally selected, planning authorities will have to consider the details of construction and application of altiport specifications. This consideration might include a series of demonstration flights. The flights would serve several purposes. The community would be reassured about the safety and compatibility of altiport operations; the effects of air turbulence caused by hills could be tested; and route structures and air traffic service (ATS) separation standards could be established.

1.5.4 At the same time, the site would be examined with respect to the provision/or availability of ground transportation up to the nearest possible location from the feasible altiport site, without which some advantage is lost. Another important consideration governing site selection is the nature and composition of the soil and subsoil upon which prepared surfaces will be supported and, in particular, the adequacy of drainage to prevent the erosion of surfaces. Detailed guidance on airport site evaluation and selection is given in the *Airport Planning Manual (Doc 9184), Part 1 – Master Planning*.

1.5.5 Lastly, having established an altiport location, planners will turn to the design using the descriptions provided in this manual to define the physical characteristics, obstacle limitation surfaces and visual aids. This guidance is contained in the following chapters.

CHAPTER 2. ALTIPORT DATA

2.1 General

2.1.1 *Annex 14, Volume I, Chapter 2* sets forth details of aerodrome data to be determined about aerodromes and reported to the appropriate aeronautical information services (AIS). Where applicable, these requirements should be met by an altiport.

2.1.2 Where the use of an altiport is restricted to a particular aeroplane type, the appropriate aeronautical information service should be informed.

2.1.3 Altiport data should be reported as prescribed in *Annexes 4* and *15* and *PANS-AIM (Doc 10066)*.

CHAPTER 3. PHYSICAL CHARACTERISTICS

3.1 General

3.1.1 The planning of an altiport comprises the development of suitable physical characteristics to provide the necessary operating elements for services by the altiport design aeroplanes. In addition, capacity or the forecast rate of utilization should be considered by the planner. The maximum rate of use is dependent on such factors as demand, weather and air traffic control capabilities as much as on altiport features. Although the characteristics described in this chapter are meant only to provide safe and effective field lengths and clearances, it is likely, in light of such external factors, that an altiport whose physical characteristics conform to this chapter could handle any forecast frequency of service.

3.2 Runways

3.2.1 Orientation of runway

3.2.1.1 This guidance material is developed for design and operations of altiport to be used only in visual meteorological conditions and intended for use by day only.

3.2.1.2 It is anticipated that the configuration for the most altiports would be a single runway in which operations are restricted to landing uphill and taking off downhill and an associated parking area (Figure 3-1).

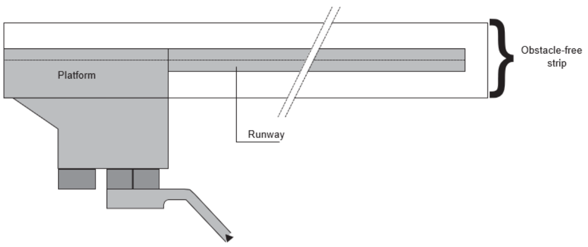

Figure 3 – 1: Schematic diagram of an altiport with paved runway [Replace with a new diagram]

3.2.1.3 An altiport sites may lessen the opportunity for an ideal runway orientation in the direction of the prevailing wind due to topography of the site. Nevertheless, altiport design should aim for maximum usability factor and the orientation of the runway should take into account of crosswind limitation of the altiport design aeroplane. Guidance on factors to be taken into account in the study of wind distribution is given in *Annex 14, Volume I, Attachment A, Section 1*.

3.2.1.4 The decision on runway orientation should also take into account areas over which traffic will operate on approach, missed approach and departure so that obstructions in these areas or other factors will not unduly restrict operations.

3.2.2 Runway length

3.2.2.1 The length of an altiport runway should be determined using take-off and landing performance charts obtained from the aeroplane flight manual of the altiport design aeroplane and considered together with the following factors:

a) whether the approaches are open or restricted;

b) longitudinal slope of the proposed runway;

c) elevation of the site;

d) temperature and humidity of the site; and

e) nature of the runway surface.

3.2.2.2 When the appropriate aeroplane flight manual is not available the length of an altiport runway may be determined as described in **Section 1 of Attachment A**.

3.2.3 Stopways and clearways

3.2.3.1 Where a stopway or clearway is provided, an actual runway length less than that suggested by 3.2.2.1 may be considered satisfactory. In such a case any combination of runway, stopway and clearway should meet the take-off and landing requirements of the altiport design aeroplane, taking into consideration the same factors as in 3.2.2.1. The guidance on the use of stopways and clearways given in *Annex 14, Volume I, Attachment A, Section 2*, is applicable to altiports.

3.2.4 Runway width

3.2.4.1 Detailed guidance for determination of runway width for altiport is provided in **Section 2 of Attachment A**.

3.2.4.2 For paved runways, the absolute minimum width of **18 m** is recommended for use in visual meteorological conditions and intended for use by day only.

3.2.4.3 For unpaved runways, the minimum width of the runway should be at least the width of the graded portion of the runway strip or **60 m**.

3.2.4.4 The site selection and orientation of a runway in the mountains is generally quite constrained, so particular attention must be paid to crosswinds in determining the width of the runway beyond the minimums thus recommended above.

3.2.5 Slopes on runways

Longitudinal slopes of the runway

3.2.5.1 The slope computed by dividing the difference between the maximum and minimum elevation along the runway centre line by the runway length should not exceed **10 per cent**.

3.2.5.2 Along no portion of a runway should the longitudinal slope exceed **15 per cent**.

3.2.5.3 The longitudinal slope of the upper portion of the runway (at least 1/6 of the length of the runway) should not exceed **3 per cent**.

3.2.5.4 The longitudinal slope of the lower portion of the runway (at least 1/3 of the length of the runway) should not exceed **3 per cent**.

Note:-

If landing is to be conducted downhill the slope (opposite direction compared to normal landings at altiports) due to excess tail wind and a favorable less steep slope of the runway, the length of the upper portion of the runway should not be less than one-fourth of the length of the runway.

Longitudinal slope changes

3.2.5.5 In longitudinal profile, the transition from:

a) the upper section of the runway to the section with the steep slope should be accomplished by a curved surface with a rate of change not exceeding 3.4 per cent per 30 m (minimum radius of curvature of 1,000 m); and

b) one slope to another slope at any section of the steep sloped runway and between last segment of the steep sloped runway and lower portion of the runway should be accomplished by a curved surface with a rate of change not exceeding 0.85 per cent per 30 m (minimum radius of curvature of 4,000 m).

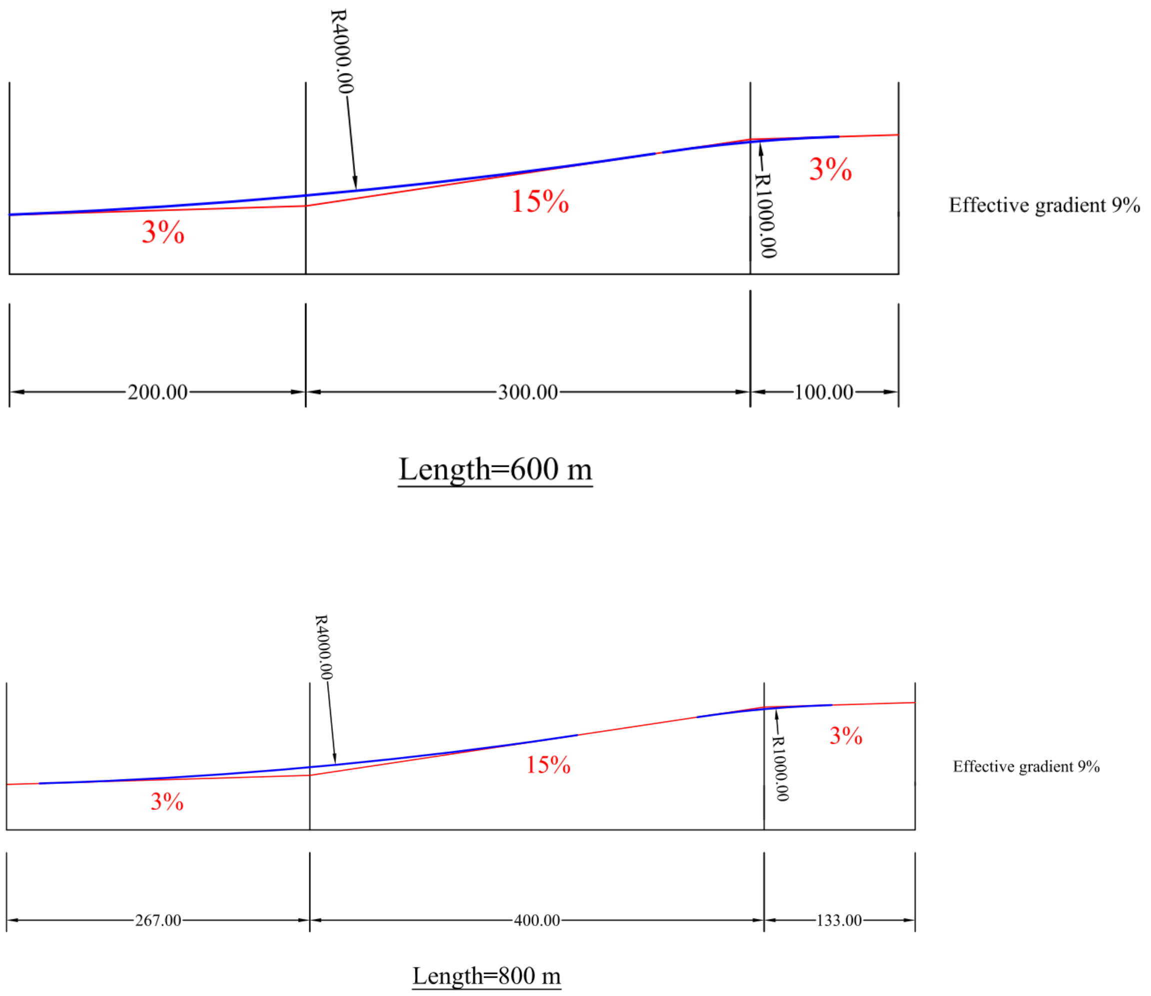

Figure 3 – 2: Schematic longitudinal profile of runway

Distance between slope changes

3.2.5.6 Undulations or appreciable changes in slopes located close together along a runway with steep slope should be avoided. The distance between the points of intersection of two successive curves should not be less than:

a) the sum of the absolute numerical values of the corresponding slope changes multiplied by minimum radius of curvature of 4,000 m; or

b) 45 m;

whichever is greater.

3.2.5.7 Guidance on implementing this specification is given in *Annex 14, Volume I, Attachment A, Section 4.*

Transverse slopes of runway

3.2.5.8 To promote the most rapid drainage of water, the runway surface should either be cambered or sloped from high to low in the direction of the wind most frequently associated with rain. A transverse slope should not exceed **2 per cent** for paved and unpaved runways. For a cambered surface the slope on each side of the centre line should be symmetrical.

3.2.5.9 The transverse slope should be substantially the same throughout the length of the runway except at the intersection with a taxiway where an even transition should be provided taking account of the need for adequate drainage.

3.2.5.10Guidance on transverse slopes is given in the *Aerodrome Design Manual (Doc 9157), Part 3*.

3.2.3 Strength of runways

3.2.6.1 A runway should have a bearing strength capable of supporting continual traffic of the altiport design aeroplane along the length of the declared take-off run or the declared landing distance, and throughout its full width.

3.2.6.2 A normal landing may impose little or no impact load on the landing surface. However, the load factors arising from an emergency, or a badly controlled landing should be considered.

3.2.4 Surface of runways

3.2.7.1 The surface of an altiport runway should be constructed without irregularities that would affect aeroplane performance during take-off or landing. Surface unevenness that would cause vibration or other control difficulties of an aeroplane should be avoided. Guidance on runway surfaces is given in the *Aerodrome Design Manual (9157), Part 3.*

3.2.7.2 Special attention must be paid to the installation of the upper layers, which is difficult due to the existence of a fairly steep slope. The possibility of more rapid erosion due to this slope should also be considered.

3.2.7.3 The texture of the surface of an altiport runway requires special attention in view of the short-field landing requirements. A rough texture surface that is conducive to braking should be used. Where hydroplaning is anticipated to be prevalent, considerations should be given to grooving the runway surface. A grooved surface has been shown to be effective in providing braking action on wet runways. Guidance on methods used to measure surface texture is given in the *Airport Services Manual (9137), Part 2*, while guidance on grooving runways is contained in the *Aerodrome Design Manual (9157), Part 3*.

3.3 Runway strips

3.3.1 General

3.3.1.1 The runway should be included in a runway strip. The purpose of a runway strip is to provide for the following operational considerations:

a) a graded area for aeroplanes accidentally running off the runway;

b) a cleared area for aeroplanes drifting from the runway after take-off;

c) a cleared area for aeroplanes carrying out a missed approach;

d) an area for the installation of essential visual aids; and

e) an area for drainage and run-off from the runway.

3.3.2 Runway strip width and length

3.3.2.1 A runway strip is an area free of any obstacle containing at least the runway including its upper section and the lower part.

3.3.2.2 To allow the best use of the whole length of the runway, it is recommended to extend the strip beyond the upper end of the paved runway by **a length at least equal to half of the maximum wingspan** of the critical altiport design aeroplane.

3.3.2.3 In the case of a paved runway only, the strip shall extend **30 m** beyond the lower end of the runway.

3.3.2.4 An altiport runway strip width of at least **30 m** on either side of the centre line is adequate for day-time operations in visual meteorological conditions.

3.3.3 Graded areas

3.3.3.1 To provide for a) in 3.3.1.1, the portion of a runway strip outside the runway and within a distance of **30 m** from the centre line of the strip should be graded. The surface of that portion of the runway strip that abuts the runway edge should be flushed with the surface of the paved runway.

3.3.3.2 To protect a landing aeroplane from the danger of an exposed edge, the runway strip should be prepared against blast erosion to at least **30 m** before the start of a runway.

3.3.3.3 Where deemed necessary for proper drainage, an open-air storm water conveyance may be allowed after the graded portion of a runway strip and would be placed as far as practicable from the runway.

3.3.4 Longitudinal and transverse slopes of runway strips

3.3.4.1 The longitudinal slope of the lateral parts of the strip should preferably be identical to that of the runway.

3.3.4.2 When carried out, snow and ice removal must be done on the width of the paved runway. A 0.50 m difference in level at the edge of the runway followed by a 15% upward slope to the lateral limit of the strip may be allowed on both sides.

3.3.4.3 When the runway **-** whether paved or unpaved **-** is only groomed, the grooming must be carried out over a minimum width of 30 m, beyond which an upward slope, at a maximum of 15 %, will be extended up to the lateral limit of the strip.

3.3.4.4 The transverse slopes on runway strips should conform to those specified in *Annex 14, Volume I*, for a strip associated with a runway with code number 1.

3.3.5 Objects on runway strips

3.3.5.1 For safety considerations, no object, unless essential as an aid to air navigation, should be installed on a runway strip. Air navigation equipment that must be located on a runway strip should be marked, be of minimum mass and height, and frangibly designed so as to constitute the minimum hazard to aircraft. Frangibility requirements are set out in *Annex 14, Volume I, Chapters 5*.

3.4 Taxiways

3.4.1 General

3.4.1.1 As mentioned in 3.2.1.2, the likely configuration of an altiport is a single runway served by taxiway (s) (if provided) or upper transitional platform to link the apron (See Figure 3 - 2a and Figure 3 – 2b).

3.4.1.2 A taxiway should be designed so that when the cockpit of the design aeroplane is over the taxiway centre line markings, the clearance distance between the outer main wheel of the aeroplane and the edge of the taxiway should not be less than **2.25 m**.

3.4.1.3 When designing taxiways at an altiport, the specifications should conform to the Standards and Recommended Practices described in Annex 14, Volume I, Chapter 3. Guidance on design of taxiways is given in the *Aerodrome Design Manual (9157), Part 2*.

Insert Figure 3 - 2a: Show the details taxiway linking to apron as per 3.4.1.1

3.5 Aprons

3.5.1 General

3.5.1.1 It will be necessary to provide an apron to permit the loading and unloading of passengers and cargo as well as aircraft servicing without interfering with altiport traffic. The distance from the edge of an apron to the edge of a runway strip should be sufficient for an aeroplane parked on the apron not to penetrate the transitional surface.

3.5.1.2 The upper platform of an altiport consists of:

- the upper part of the runway that can be used for landing or take-off maneuvers,
- a holding area where aircraft perform engine tests at the start up point, which can also be used as a turning pad,
- the apron (aircraft parking area).

3.5.1.3 These components can be unpaved or paved.

3.5.1.4 Except on the upper portion of the runway, which may be sloped up to **3 per cent**, the slope of the upper platform shall not exceed **2 per cent** in any direction. On an aircraft parking stand area, the maximum slope should not exceed **1 per cent**.

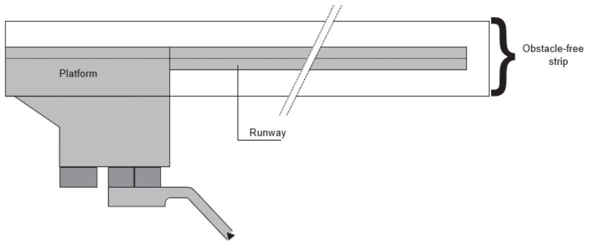

Figure 3 – 2b: Show the details of transition platform as per 3.5.1.4

3.5.1.5 Side-by-side parking of aeroplanes and helicopters is not recommended. Since helicopters frequently use the altiports[3], it is recommended to reserve a specific parking area for them.

3.5.1.6 The Figures 3 -1 and Figure 3 – 2 show a schematic diagram of an altiport with a paved runway as well as the longitudinal profile of the runway in its simplest configuration.

3.5.2 Size of aprons

3.5.2.1 The necessary altiport capacity to handle planned or predicted altiport traffic will be the main determinant in establishing an apron's size. An apron's size should be sufficient to contain an adequate number of aircraft parking bays or spaces to cater to the altiport's traffic volume at its highest level.

3.5.2.2 As the number of aircraft parking bays or spaces required will depend, in part, on parking bay occupancy or turnaround time, aircraft operators intending to use the altiport should be consulted with respect to scheduling and other matters that affect the time an aeroplane needs to occupy the apron.

3.5.2.3 The size of an apron will also be governed by the size of the altiport design aeroplane and the parking method selected for use on the apron. While nose-in parking uses less space, economy and convenience will probably dictate self-manoeuvring, angled nose-in or angled nose-out parking. Figure 3-3 depicts a typical altiport apron.

Figure 3 – 3: Example of typical altiport apron

[3] *In this case, the helicopters do not use the steep runway but a final approach and take-off area specifically dedicated to them.*

3.5.3 Strength of aprons

3.5.3.1 An apron should have sufficient bearing strength to support the mass of the altiport design aeroplane, keeping in mind that parts of the apron will be subject to higher stresses owing to slow moving and stationary aeroplanes and other vehicles/equipment.

3.5.4 Slopes of aprons

3.5.4.1. The slopes of an apron should be sufficient to prevent accumulation of water but should not exceed **1 per cent** in any direction.

3.5.4.2. Because of the possibility of spilled fuel and the ensuing fire hazard, an apron should not slope down towards a terminal building.

CHAPTER 4. OBSTACLE LIMITATION SURFACES

4.1 General

4.1.1 Obstacle limitation surfaces are established to define the airspace over and around an altiport that must be kept free of obstacles. The obstacle limitation surface sets out the limits above which objects should not extend.

4.1.2 In the planning and design of an altiport, obstacle limitation surfaces require careful consideration. In fact, the presence of objects located in the vicinity or planned for construction near an otherwise suitable altiport site may be the overriding factor in whether an altiport will be a realistic project. The operation of an altiport may be significantly affected by features beyond the altiport boundary such as buildings, bridges and towers or mountains, hills etc. Objects that penetrate the obstacle limitation surfaces described in this chapter may, therefore, impose take-off mass limitations, cause an increase in weather minima or both. They may also necessitate the displacement of the threshold.

4.1.3 Once a commitment is made to the establishment of an altiport, the sectors of the local airspace covered by the obstacle limitation surfaces should be regarded as integral to the altiport and therefore inviolable. Consequently, enactment of zoning legislation may be needed to preserve unobstructed airspaces for take-off, approach, missed approach and circling procedures. Legislation aside, the altiport authorities should be involved in community consultation and should maintain close liaison with local development planners to ensure that altiport requirements are included in forecasts and well-integrated into plans.

4.1.4 Altiport obstacle limitation surface requirements are normally set on the assumption that take-offs and landings will be made in a single direction. Therefore, the functions of surfaces may be integrated and the requirements of one surface nullified because of the more stringent requirements of another.

4.1.5 The obstacle limitation surfaces to be defined at an altiport will depend on terrain and the type of operation envisaged at the altiport. At the very minimum, for day time operations in visual meteorological conditions, the surfaces requiring protection are the take-off and approach surfaces and the transitional surface.

4.1.6 Obstacle limitation surfaces (OLS), specified in Annex 14 Volume I for aerodromes reference code 1are not suitable for altiports.

4.1.7 Criteria for evaluating obstacles are contained in the *Procedures for Air Navigation Services - Aircraft Operations PANS OPS (Doc 8168,*) Volume II - Construction of Visual and Instrument Flight Procedures.

4.2 French practices for altiport OLS

4.2.1 The variety of runway configurations that can be encountered means that obstacle limitation surfaces that can be selected for an altiport can only be chosen after a study of the approach and departure procedures of the aeroplane.

4.2.2 The description given below of the obstacle limitation surfaces that can be associated with a unique approach and take-off path is therefore only indicative and is only intended to provide guidance for altiport planners.

Approach and take-off surfaces

4.2.3 The characteristics in the shape and size of the obstacle limitation surfaces mean that there is no any difference between approach and take-off surfaces.

4.2.4 The longitudinal profile of the centreline of the approach and take-off surface as shown in Figure 4 - 1 is generally characterized by:

a) a segment Δ_1 originating on the centre of the width of lower side of the strip and having a negative slope at least as steep as that of the centreline of the lower runway section (if slope of centreline of the lower portion of the runway is positive then the slope of the runway strip);

b) a horizontal segment Δ_2; and

c) a segment having positive slope Δ3, the length of which is sufficient for the aircraft on take-off to clear the surrounding obstacles.

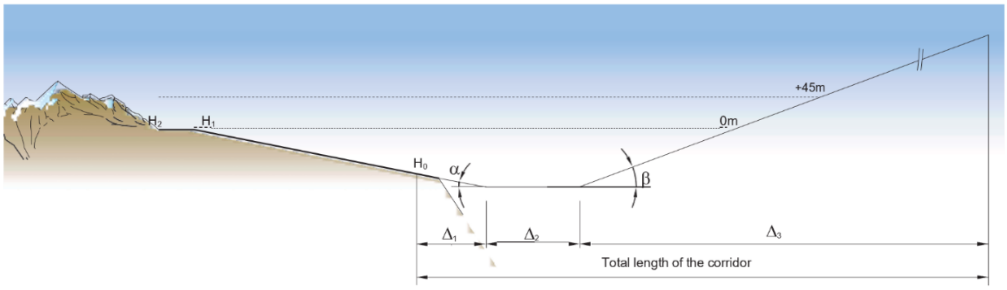

Figure 4 – 1: Longitudinal profile of the approach/take-off surface

4.2.5 Since the total length of the approach/take-off surface must not be less than **2,000 m**, the values of Δ1, Δ2 and Δ3 will be set on a case-by-case basis according to:

a) the reference code corresponding to the most critical design aeroplane to be served by the altiport to select the slope (β); and

b) the operating constraints specific to the site studied.

Note:- The value of β may be taken 6% or 15:1 as per STOLPORT manual.

4.2.6 In a plan view, as shown in Figure 4 – 2, the approach and take-off surface is connected to the segment perpendicular to the plane containing centreline of the runway passing through the center of the lower width side of the strip (inner edge of the approach surface). Equal at the origin to that of the strip, the width of the approach and take-off surface grows linearly until it reaches **1 km**, with the divergence δ being at least **20 per cent**[4]. Beyond that, the width of the approach and take-off surface remains constant and equal to 1 km.

4 *without having to exceed the value of 30%.*

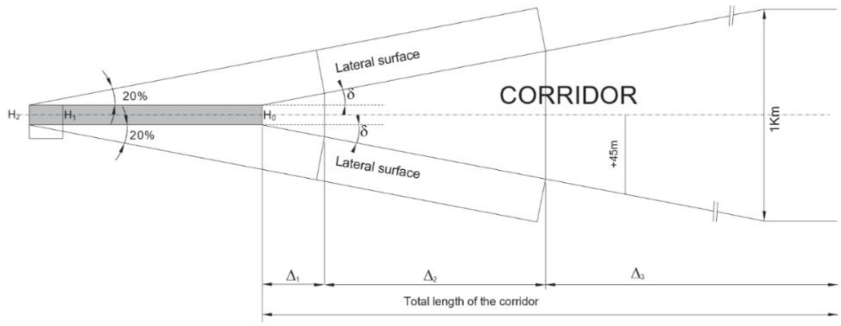

Figure 4 – 2: Plan of altiport approach/take-off surface and transitional surface

Transitional Surfaces

4.2.7 The transitional surfaces consist of two surfaces. The lower and upper limits of these lateral OLS, are:

a) on the one hand, the guideline defined by the long sides of the strip and the sides of the trapezoids at the bottom of the approach/take-off surface corresponding to the first two long profile segments defined above; and

b) on the other hand, the horizontal lines originating from the upper corners of the strip and forming a divergence of **20 per cent** with the vertical plane containing the runway centreline.

c) The slope of the transitional surface should be measured in a vertical plane at right angles to the centre line of the runway should be **20 per cent** from the edge of the runway strip (as per Annex 14, Volume I for Code 1 aeroplane and as per STOLPORT Manual).

Inner horizontal surface

4.2.8 The selected site must also allow an aeroplane to make a low-level pass over the installations before landing in order to ensure that the runway is clear at the top, if necessary.

4.2.9 The conditions of this overfly will also, in each case, be the subject of a particular study to the conclusions of which will be associated the extent of a horizontal obstacle limitation surface (i.e., inner horizontal surface). This surface will be placed at a minimum height of **45 m**, measured from the upper platform, and will cover an area included in a circular sector, centred on the runway end of the upper platform, with a radius equal to **2,000 m** and with a sufficient opening[5] (at least minimum of **65 degrees** towards each side of the runway centreline) to allow the turning (circling) of an critical aeroplane selected for the altiport.

Insert Fig. 4 – 2a: Inner Horizontal Surface

Missed approach surfaces

4.2.10 It is further recommended that a missed approach surfaces be provided to protect the missed approaches.

4.2.11 When the terrain allows this missed approach surfaces to be centred on the extension of the runway (in the case of a mountain pass altiport), it may be constructed as shown in Figure 4-3a below. Its characteristics (lower edge width, slope and divergence) will then be those of the take-off climb surface of a runway as per *Annex 14, Volume I Chapter 4* for aerodrome

[5] *An opening of 135° seems to be a minimum.*

reference code 1 (accommodating the same types of aeroplane).

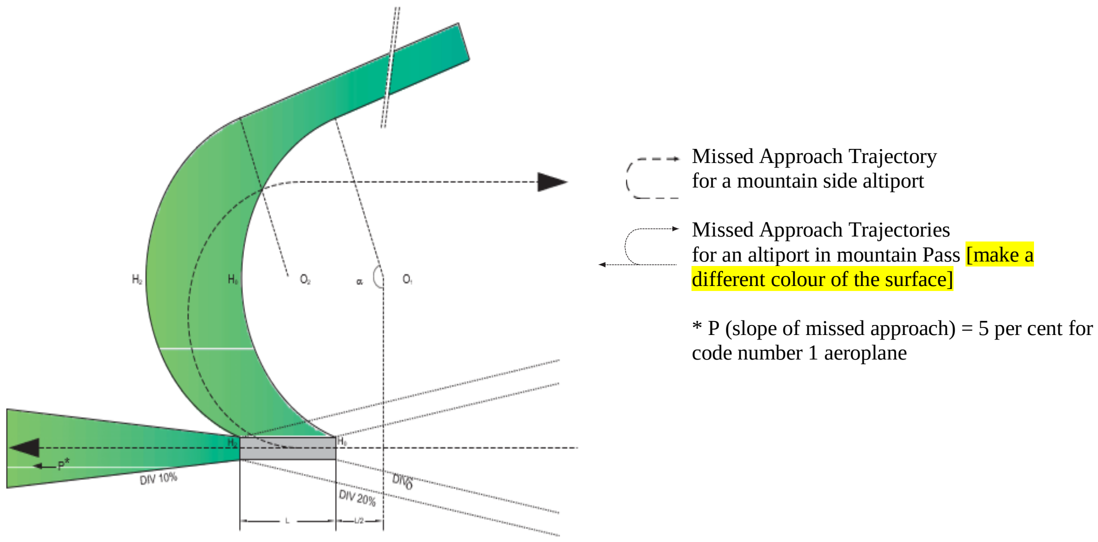

Figure 4 – 3a: Missed approach surfaces (Plan)

4.2.12 However, when the terrain does not allow the go-around to continue along the runway (e.g. altiports on the side of a mountain), the approach can only be aborted laterally (See Figure 4 – 3a with curved missed approach surface and Figure 4 – 3b).

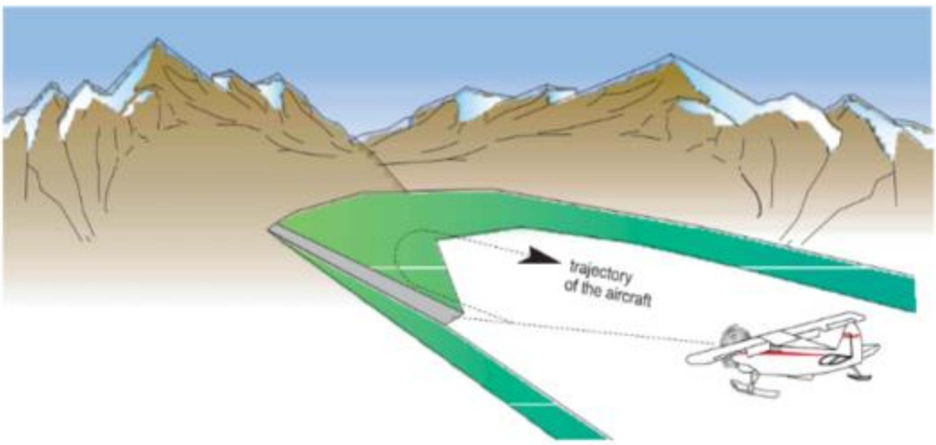

Figure 4 – 3b: Missed approach surfaces at altiport on a mountain side

4.2.13 The obstacle limitation surfaces protecting the missed approach should be constructed as shown in Figure 4-3a, on the side where the missed approach is to be carried out:

a) the horizontal plane having dimension of the lower end of the strip at elevation H_o and the length equal to half of the runway on the extended runway centreline;

b) the missed approach surface (cylindrical then flat) forming a series of planes parallel to the plane on the runway centreline and whose boundaries should be defined by:

i. two horizontal arcs of circle at elevation H_o and H_2 (the latter being that of the small upper side of the runway), each having a radius of at least **600 m**, tangent to the plane along the centreline of the runway and whose opening should be equal to the minimum angle (α) of the turn (function of the terrain) to be carried out by the aeroplane; and

ii. the horizontal tangents at the end of each of these two arcs (depict these points on Figure 4 – 3a).

4.2.14 The arc at elevation H_o shall be centred beyond the runway at a distance from its lower end equal to one-half the length of its main steep section.

4.2.15 The arc at elevation H_2 shall be centred at the midpoint of the runway.

4.2.16 Whenever possible, this lateral missed approach surface will complement the missed approach surface along the extended runway centreline where it can be provided, as shown in Figure 4-3c.

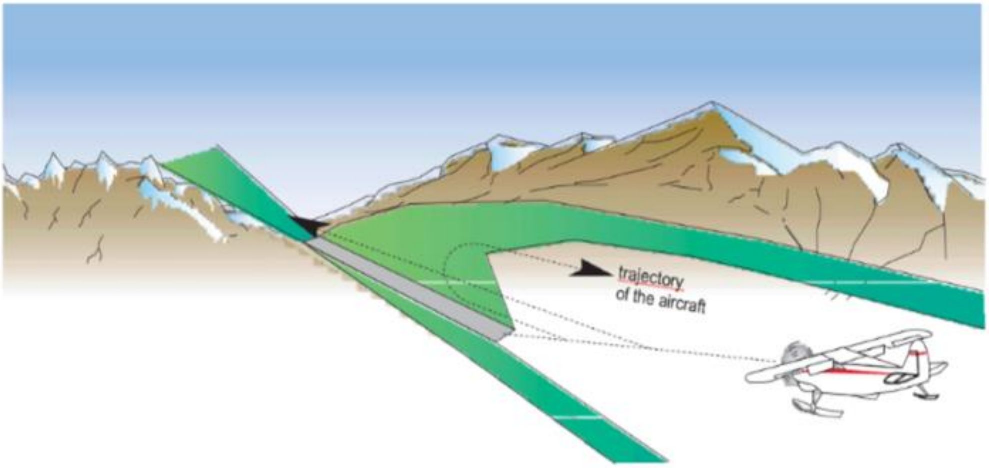

Figure 4 – 3c: Missed approach surfaces at altiports in mountain pass or on dome shaped landforms

CHAPTER 5. VISUAL AIDS FOR NAVIGATION

5.1 General

5.1.1 In general, the specifications of Annex 14 Volume I for markings, lights, signs and markers are applicable for altiports.

5.1.2 Center line marking is optional for unpaved runways; however, it may be necessary, at least on the upper part of the runway, to compensate for the lack of visibility caused to the pilot by the change of slope at the beginning of the rolling phase before take-off.

5.1.3 When an altiport is kept in operation without being cleared of snow, the edges of its runway will be marked with red flags spaced **25 m** apart.

5.1.4 Since an altiport can be subject to rapid variations in wind direction and intensity, it is necessary to have a windsock near the holding area for aeroplane taking off, and another at the runway threshold for aeroplane landing, since the conditions at these two points can be very different.

5.1.5 The visual aids provided at an altiport must serve to provide the pilot with the elements of guidance required to execute safe operations at the altiport.

5.2 Markings

5.2.1 The markings described in this chapter are suitable for altiport operations in visual meteorological conditions. Markings should be conspicuous and provide the maximum possible contrast under various conditions.

5.2.2 Runway markings should be white; taxiway and aircraft stand markings should be yellow and of a consistency that will reduce the risk of uneven braking.

5.3 Runway markings

5.3.1 Runway designation marking

5.3.1.1 A runway designation marking should be provided at the thresholds of a paved and unpaved runway as practicable. It should consist of a two-digit number that is the whole number nearest the one tenth of the magnetic azimuth of the centre line of the runway measured clockwise from magnetic north when viewed from the direction of approach. However, where an altiport is located in an area of compass unreliability a runway designation marking should display true azimuth rather than magnetic azimuth. Runway designation marking shall be in accordance with Annex 14, Volume I, Chapter 5, 5.2.2 as applicable.

5.3.2 Threshold marking

5.3.2.1 A runway threshold should be marked on paved runway with a series of white stripes **15 m** long, **1.8 m** wide, spaced 1.8 m apart located at the runway end.

5.3.2.2 A runway threshold marking should consist of a pattern of longitudinal stripes of uniform dimensions disposed symmetrically about the centre line of a runway. The number of stripes should be **4** for the runway width 18 m.

5.3.2.3 Where the threshold of an altiport runway is a displaced threshold, the beginning of the altiport runway should be indicated by a transverse stripe at least **1.8 m** wide. The portion of the runway before the displaced threshold should be marked with arrows and all other markings should be obliterated.

5.3.2.4 The arrows leading to a displaced threshold should be spaced at intervals of **30 m** with the point of the arrow immediately preceding the displaced threshold at **30 m** from the transverse stripe.

5.3.2.5 Guidance on the form and dimensions of the arrows are set out in Figure 5-4 A and B of *Annex 14, Volume I*.

5.3.3 Aiming point marking

5.3.3.1 An aiming point marking for paved runway should be provided at **150 m** from the threshold.

5.3.3.2 An aiming point marking should consist of two conspicuous stripes. The length of the stripe should be **30 – 40 m** and width of the stripe should be **5 m** and the lateral spacing between their inner sides should be 6 m.

5.3.4 Runway centre line marking

5.3.4.1 The runway centre line marking for paved runway should be in accordance with Annex 14, Volume I, Chapter 5, 5.2.2 as applicable.

5.3.5 Runway side stripe marking

5.3.5.1 A runway side stripe marking on paved runway should be provided between the thresholds of a paved runway where there is a lack of contrast between the runway edges and the shoulders or the surrounding terrain. A runway side stripe marking should consist of two stripes, one placed along each edge of the runway with the outer edge of each stripe approximately on the edge of the runway. A runway side stripe should have an overall width of at least **0.45 m**.

5.4 Taxiway marking

5.4.1 The taxiway edge and/or centerline markings should be provided in an altiport. The taxiway markings specified in Annex 14, Volume I, Chapter 5, are considered suitable for altiports.

5.4.2 At an intersection of a taxiway with a runway where the taxiway serves as an exit from the runway, the taxiway centre line marking should be curved into the runway centre line marking. The taxiway centre line marking should consist of a continuous yellow line **15 cm** wide parallel to and **1.8 m** from the runway centre line marking for **30 m** curving at a specified radius to join the taxiway centre line as shown in *Figures 5-6 of Annex 14, Volume I*. The turning radii of the taxiway centerline marking at the intersection of runway and taxiway should be **30 m** at **90 degree** exits.

Figure 5 – 1: Runway marking at Phaplu Airport, Nepal

5.5 Wind direction indicator

5.5.1 Since an altiport can be subject to rapid variations in wind direction and intensity, it is necessary to have a windsock near the holding area for aircraft taking off, and another at the runway threshold for aircraft landing, since the conditions at these two points can be very different. The specifications for wind direction indicators in *Annex 14, Volume I, Chapter 5*, are considered suitable for altiports.

5.6 Signs

5.6.1 General

5.6.1.1 Signs may be provided at an altiport to give information or instructions. The guidance on the sizes of signs, their inscriptions, methods of illumination, location, abbreviations commonly used and frangibility of signs given in the *Aerodrome Design Manual (Doc 9157), Part 6*, is applicable to signs at altiports.

5.6.1.2 A sign should be located as near to the edge of the pavement as possible. Signs should be lightweight and frangibly designed and mounted sufficiently low to preserve clearance with any overhanging part of the critical aeroplane.

5.6.1.3 Only mandatory signs on a movement area should use the colour red for background. A sign should be legible from the cockpit of an aeroplane at the farthest point of viewing.

5.6.2 Mandatory instruction signs

5.6.2.1 When provided, mandatory instruction signs should comprise runway holding position signs and NO ENTRY signs. A NO ENTRY sign should be located at the beginning of an area to which entry is prohibited.

5.6.2.2 Wherever possible, runway holding position signs and NO ENTRY signs should be located on each side of a taxiway facing the direction of approach to the runway or prohibited area. Where for some reason only one sign is utilized it should be located anyside (left or right) wherever feasible.

5.6.2.3 A mandatory instruction sign should consist of a white inscription on a red background. Where applicable, the mandatory instruction sign inscriptions set forth in *Annex 14, Volume I, Chapter 5, 5.4.2.12* should be used.

5.6.3 Information signs

5.6.3.1 Given the compressed area and simplicity of a typical altiport, little use of information signs is foreseen. Where required, an information sign should convey information such as a specific location or destination on a movement area. Whenever possible an information sign on a taxiway should be located any side of the taxiway (left or right) wherever feasible.

5.6.3.2 An information sign should consist of either black inscriptions on a yellow background or yellow inscriptions on a black background.

5.7 Markers

5.7.1 General

5.7.1.1 Markers should be lightweight and frangibly mounted. Those located near a runway or taxiway should be sufficiently low to preserve clearance with any overhanging part of the critical aeroplane. Guidance on the frangibility of markers is given in the *Aerodrome Design Manual (Doc 9157), Part 6.*

5.7.2 Unpaved runway edge and runway strip markers

5.7.2.1 On unpaved runways, where the runway strip is not maintained to normal grading standards, the runway must be marked using edge markers, except that runway edge markers may be omitted if the full width of the runway strip is maintained suitable for aeroplane operations and the runway strip is marked using strip markers. Where the runway is not provided with edge markers, the threshold locations need to be marked appropriately in the shape of a └──┘ as shown in Figure 5-2.

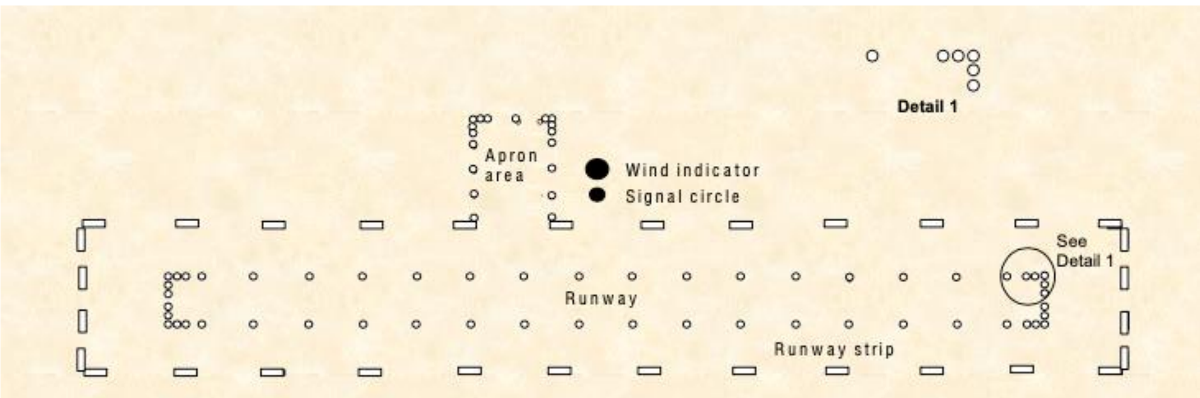

Figure 5 – 2: Runway and runway strip markers

5.7.2.2 If flat rectangular markers are used, they should measure at least **1 m** wide by **3 m** long, and be placed with the longer dimension parallel to the runway centre line. If conical markers are used, they should not be more than **30 cm** high and **0.4 m** base diameter.

5.7.2.3 Markers of flat rectangular or conical shape should be located to delineate the runway limits clearly.

5.7.2.4 The runway strip should be marked by using cones, gable markers or tyres. Runway strip cone markers should have a **0.75 m** base diameter and be **0.5 m** in height. Gable markers should be **3 m** in length.

5.7.2.5 Cone or similar size markers need to be spaced not more than **90 m** apart. Gable or similar size markers need to be spaced not more than **180 m** apart.

5.7.3 Edge markers for snow covered runways

5.7.3.1 When the limits of a snow-covered runway are not otherwise indicated, it is recommended that edge markers should be provided. Edge markers for snow covered runways should be placed along the edges at intervals of not more than **100 m** and far enough from the centre line to not interfere with aeroplane on the runway. The threshold and end of the runway should be marked.

5.7.3.2 Evergreen trees **1.2 m to 1.5 m** high or other conspicuous, lightweight markers are appropriate to be used as edge markers for snow covered runways.

5.7.4 Unpaved taxiway edge markers

5.7.4.1 Taxiway edge markers should be provided where the limits of an unpaved taxiway are not obvious, markers should be provided and taxiway centre line or edge light or taxiway centre line markers are not provided.

5.7.4.2 A taxiway edge marker should be retroreflective blue. The marked surface as viewed by the pilot should be rectangle and should have a minimum viewing are of **150 cm^2**.

5.7.4.3 Taxiway edge markers should be frangible. Their height should be sufficiently low to preserve clearance for propellers.

CHAPTER 6. VISUAL AIDS FOR DENOTING OBSTACLES

6.1 Objects to be marked and lighted

6.1.1 The marking and/or lighting of obstacles is intended to reduce hazards to aircraft by indicating the presence of obstacles. It does not necessarily reduce operating limitations which may be imposed by an obstacle.

6.1.2 A fixed obstacle that extends above an approach, or take-off climb surface within **2,000 m** of the inner edge should be marked and lighted except that:

a) such marking and lighting may be omitted when the obstacle is shielded by another fixed obstacle; and

b) the marking may be omitted when the obstacle is lit by day by high intensity obstacle lights.

6.1.3 A fixed obstacle above an inner horizontal surface should be marked and lighted except that:

a) such marking and lighting may be omitted when:

1) the obstacle is shielded by another fixed obstacle;

2) For an inner horizontal surface extensively obstructed by immovable objects or terrain, circling procedures have been established to ensure safe vertical clearance below the circling flight paths; or

3) the appropriate authority determines that the obstacle has no operational significance through an aeronautical study; and

b) the marking may be omitted when the obstacle is lit by day by high intensity obstacle lights.

6.1.4 Mobile equipment and vehicles, other than aircraft, on the movement area of an altiport are obstacles and should be marked and lighted except that equipment and vehicles used only on aprons may be exempt.

6.2 Marking and lighting of objects

6.2.1 Objects should be marked and lighted in accordance with *Annex 14, Volume 1, Chapter 6, 6.2 or 6.3* as applicable.

CHAPTER 7. VISUAL AIDS FOR DENOTING RESTRICTED USE AREAS

7.1 Closed runway and taxiway marking

7.1.1 Markings denoting a closed runway should be placed at each end of the runway and along the runway at intervals of not more than **300 m**.

7.1.2 Markings denoting a closed taxiway should be placed at each end of the taxiway or part of the taxiway that is closed,

7.1.3 Closed runway and taxiway markings should be painted on the surface if permanent but may be made of other materials if the closing is temporary. The marking should be in the form of an **"X"**, each arm of which should be at least **6 m** long and **0.9 m** wide as shown in Figure 7-1 of *Annex 14, Volume 1*.

7.2 Unserviceable-area marking

7.2.1 Unserviceable portions of a maneuvering area should be conspicuously marked with devices like cones, flags or marker boards placed at intervals that clearly mark the unserviceable area. Characteristics of unserviceable area marking devices are:

a) a cone should be at least **0.5 m** high;

b) a flag should be at least **0.5 m** square;

c) a marker board should be at least **0.5 m** high and **0.9 m** long; and

d) the foregoing devices should be red, orange or yellow or one of these colors in combination with white.

7.3 Pre-threshold area

7.3.1 Where the surface leading to the runway threshold is paved but is not suitable for normal use by aircraft and exceeds **60 m** in length, the entire pre-threshold should be marked with yellow chevron markings.

7.3.2 The chevrons should be formed of yellow stripes **0.9 m** wide and should be set at an angle of **45 degrees** to the extended runway centre line as shown in Figure 7.2 of *Annex 14, Volume I*.

7.4 Non-Loadbearing Surface Marking

7.4.1 Shoulders for taxiways, runway turn pads, aprons and other non-loading bearing surfaces which cannot readily be distinguished from load-bearing surfaces and which, if used by aeroplane, might result in damage to the aeroplane should have the boundary between such areas and the load-bearing surface marked by a taxi side stripe marking.

7.4.2 A taxi side stripe marking should consist of a pair of solid lines, each **15 cm** wide and spaced **15 cm** apart and the same colour as the taxiway centre line marking should be placed along the edge of the load-bearing pavement, with the outer edge of the marking approximately on the edge of the load-bearing pavement.

CHAPTER 8. EQUIPMENT AND INSTALLATIONS

[Reserved]

CHAPTER 9. ALTIPORT OPERATIONAL SERVICES, EQUIPMENT AND INSTALLATIONS

9.1 Altiport emergency planning

9.1.1 To prepare an altiport to cope with an emergency, altiport planners should use the specifications in *Annex 14, Volume I, Chapter 9*, and the emergency planning guidance contained in the *Airport Services Manual (Doc 9137), Part 7*, to develop an altiport emergency plan commensurate with aircraft operations and other activities.

9.1.2 When established, an altiport emergency plan should provide for the actions to be taken in an emergency occurring at the altiport or in its vicinity. The plan should co-ordinate the response or participation of all agencies that could assist in responding to an emergency. The outline of aerodrome emergency plan is given in *Appendix 2 of Airport Service Manual (Doc 9137), Part 7*.

9.1.3 There should be a procedure established for testing an altiport emergency plan with a view to improvement.

9.1.4 If the formal altiport emergency plan cannot be established, the altiport operator should establish an emergency management procedure in accordance with State regulations, which should include the followings:

(a) the positions of those who constitute the membership of the altiport emergency committee (if established);

(b) the description of the role of each emergency service organisation involved in the emergency response arrangements, as applicable;

(c) the procedures for liaison with the authorised person responsible for local emergency planning arrangements;

(d) the procedures for notification and initiation of an emergency response;

(e) the procedures for activation, control and coordination of altiport-based emergency responders (if any) during the initial stages of an emergency;

(f) the procedures for use of the altiport's emergency facilities (if any);

(g) the procedures for facilitating altiport access and the management of assembly areas (if any);

(h) the procedures for an altiport to respond to a "local stand-by" event, if applicable;

(i) the procedures for initial response to a "full emergency" event on, or in the immediate vicinity of, the altiport;

(j) the arrangements for keeping altiport emergency facilities, access points and assembly areas (if any) in a state of readiness;

(k) arrangements to ensure emergency preparedness by both on and off-altiport responders; and

(l) the arrangements to return the altiport to operational status after an emergency.

9.2 Rescue and fire fighting

9.2.1 An altiport should be provided with appropriate rescue and firefighting equipment and services, the primary objective of which is to save lives in the event of an aircraft accident or fire at the altiport. This objective would be met by making a fire-free escape route for the evacuation or rescue of passengers and crew. A secondary objective is to protect property by containing or extinguishing fire resulting from an aircraft accident.

9.2.2 Rescue and firefighting services should also have a standby function, coming to a high state of readiness when an in-flight emergency is declared. Altiport operators should be guided on rescue and firefighting equipment and services by the specifications in *Annex 14, Volume I, Chapter 9,* and the material in *Annex 14, Volume I, Attachment A, Section 18,* and *the Airport Services Manual (Doc 9137), Part 1*.

9.2.3 When it is not feasible to provide the rescue and firefighting services at an altiport, the altiport operator should establish the following:

a) Installation of fire hydrants and firefighting facilities in appropriate places at an altiport;

b) Ensure the mechanism to deal with rescue operation in normal and difficult terrain during any aircraft incident or accident at or in the vicinity of an altiport;

c) Provision of basic firefighting training to operate the fire hydrants and installed firefighting equipment to the security staff or other available staff at an altiport in an event of fire incident; and

d) MOU with the local security and medical authorities from the vicinity of an altiport for necessary assistance in an event of aircraft incident and accident and structural fire.

9.3 Disabled aircraft removal

9.3.1 An altiport emergency plan should include a plan for removing a disabled aircraft that is on or adjacent to the movement area. Guidance on removal of a disabled aircraft is given in the *Airport Services Manual (Doc 9137), Part 5*.

9.3.2 If an altiport does not have a plan for removal of disabled aircraft, the altiport should have the procedures for removing an aircraft that is disabled on or near the movement area. The procedures may include the following:

a) identifying the roles of the altiport operator and the holder of the aircraft's certificate of registration;

b) notifying the holder of the certificate of registration;

c) obtaining appropriate equipment and persons to remove the aircraft;

d) identifying:

   1) the names and roles of the persons responsible for arranging the removal of an aircraft; and

   2) the telephone numbers for contacting the relevant individuals during and after normal working hours.

9.3.3 The procedures described in 9.3.2 should be in line with national regulations or local government regulations.

Note:- Light aircrafts can also be removed manually without necessitating any specialized equipment.

9.4 Wildlife strike hazard reduction

9.4.1 An altiport operator should institute a method of controlling wildlife (birds and animals) that constitute a hazard to aircraft operations. Guidance on wildlife hazard management is given in the *PANS-Aerodromes (Doc 9981), Part II, Chapters 1 and 6* and *Airport Services Manual (Doc 9137), Part 3*.

9.4.2 An altiport operator should institute a method of controlling wildlife hazard for the safe operation of an aircraft.

9.4.3 An altiport should have wildlife hazard management procedures to deal with the hazards to aircraft operations caused by the presence of wildlife on or in the vicinity of the altiport, including details of the arrangements for the following:

a) monitoring wildlife activities at the aerodrome;

b) assessing any wildlife hazard;

c) mitigating any wildlife hazard;

d) reporting wildlife hazards to aircraft through one or more of the following as applicable: the AIP, NOTAM, air traffic control;

e) identifying proposed or actual sources of wildlife attraction outside the altiport boundary; and

f) liaising with the relevant planning authorities or proponents to facilitate wildlife hazard mitigation.

9.5 Apron management service

9.4.1 When warranted by the volume of traffic and operating conditions, an appropriate altiport apron management service should be provided. Procedures on apron safety are specified in the *PANS-Aerodromes (Doc 9981)*. Guidance on an apron management service is given in the *Airport Services Manual, Part 8 (Doc 9137),* and *in the Manual of Surface Movement Guidance and Control Systems (Doc 9476)*.

9.6 Altiport vehicle operation

8.5.1 Guidance on aerodrome vehicle operation is contained in *Annex 14, Volume 1, Attachment A, Section 19* and *PANS-Aerodromes (Doc 9180), Part II, Chapter 9.*

9.7 Siting of equipment and installations on operational areas

9.7.1 Unless its function requires it to be there for air navigation or for aircraft safety purposes, no equipment or installation should be:

a) on a runway strip, a taxiway strip if it would endanger an aircraft; or

b) on a clearway if it would endanger an aircraft in the air.

9.7.2 Any equipment or installation required for air navigation or for aircraft safety purposes which must be located on a runway strip and which:

a) penetrates the transitional surface should be of minimum mass and height, frangibly designed and sited to reduce hazards to a minimum. Guidance on the siting of navigation aids is contained in the *Aerodrome Design Manual (Doc 9157), Part 6.*

9.8 Fencing

9.8.1 A fence or other suitable barrier should be provided on an altiport:

a) to prevent the entrance to the movement area of animals large enough to be a hazard to aircraft; and

b) to deter the inadvertent or premeditated access of an unauthorized person onto a non-public area of the altiport.

9.8.2 Suitable means of protection should be provided to deter the inadvertent or premeditated access of unauthorized persons into ground installations and facilities essential for the safety of civil aviation located off the altiport.

9.8.3 A fence or other means should separate the movement area and other facilities or zones on the altiport essential to safe operations from areas open to the public.

9.8.4 Wherever fencing is not feasible to be provided some kind of mechanism should be employed to protect the movement area for the safety of aircraft operations.

CHAPTER 10. ALTIPORT MAINTENANCE

10.1 General

10.1.1 A maintenance programme, including preventive maintenance, should be established at an altiport to maintain facilities in a condition that does not impair safety, regularity or efficiency of air navigation.

10.1.2 A maintenance programme developed in accordance with *Annex 14, Volume I, Chapter 10*, and using the following guidance would be suitable for an altiport.

a) Guidance on the maintenance of runway or stopway shoulders is contained in *Annex 14, Volume I, Attachment A, Section 9.1*, and in the *Aerodrome Design Manual (Doc 9157), Part 2*.

b) Guidance on maintenance of a runway surface to preclude harmful irregularities is given in *Annex 14, Volume I, Attachment A, Section 5*.

c) Guidance on runway condition report for reporting runway surface condition is given in *Annex 14, Volume I, Attachment A, Section 6, PANS-Aerodromes (Doc 9981), Part II, Chapter 2 and Circular 355*.

d) Guidance on improving braking action and on the clearing of runways is given in the *Airport Services Manual (Doc 9137), Part 2*.

e) Guidance on suitable chemicals for removing or preventing frost or ice on pavements is given in the *Airport Services Manual (Doc 9137), Part 2*.

10.1.3 A system of preventive maintenance of visual aids should be employed to ensure marking system reliability. Guidance on preventive maintenance of visual aids is given in the *Airport Services Manual (Doc 9157), Part 9*.

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APPENDIX 1 - ALTIPORT DESIGN AEROPLANES

Notes:- Table 1 contains a list of some aeroplanes in operations at altiports in Indonesia and Nepal. It also contains some aeroplanes whose performance may be suitable for altiport operations. It should be noted that altiport operations may depend not only on an aeroplane's reference field length but also on its ability to achieve certain departure climb and approach angles.

Table 1 [Yet to be finalized]

S. No	Aeroplanes	Gross Take-off Mass (Kg)	Reference Code	Wing Span (m)	Outer Main Gear Wheel Span (m)	Remarks
A)	**Indonesia**					
1	Cessna - 206					
2	Cessna -208					
3	PC-6					
4	DHC-4 Carribou					
5	DHC-6	5,670	1B			
B)	**Nepal**					
	DHC 6-300 & 400	5,670	1B			
	DO 228	6,400				
	L 410 UVP – E20	6,600	1B			
C)	**Others**					
1	PC-12	2,280	2B			Doc 9157, Part 1 – Runways
2	SKYTRADER SCOUT (16 PAX)	4,536				Doc 9150, Stolport Manual

ATTACHMENT A – GUIDANCE MATERIAL SUPPLEMENTARY TO ASIA PACIFIC GUIDANCE ON DESIGN AND OPERATIONS OF ALTIPORTS

1. Runway length

1.1 As for conventional aerodromes, the determination of the length[6] of an altiport runway requires the involvement of an expert service or organization. The simplified method, which is described below, is nevertheless a fairly good approximation for light aeroplanes.

1.2 For the longitudinal profile slopes adopted at altiports, the acceleration of an aeroplane at take-off is only significantly affected, in its rolling phase, compared to what it would be on a substantially horizontal runway, by the effect of the orthogonal projection of the aeroplane's weight on the runway's axis.

1.3 Therefore, if aH denotes the acceleration of the aircraft traveling at speed V on a horizontal runway Figure A1 - 1, the acceleration aα of the same aircraft traveling at the same speed on a slope of an angle α to the horizontal as shown in the Figure A1 - 2 has the value:

$\mathbf{a_{\alpha}} = \mathbf{a_H} + g.\ sin\ \alpha$ **------A**

Figure A1-1

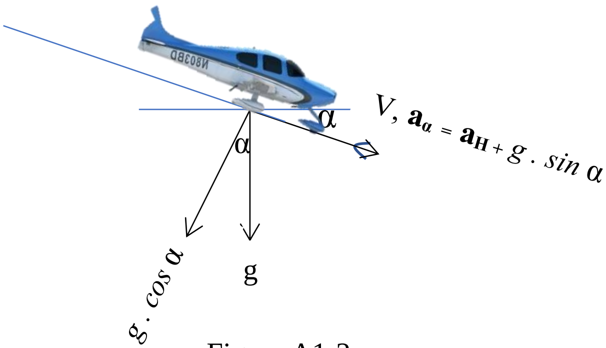

Figure A1-2

1.4 In the case of the deceleration corresponding to an acceleration-stop procedure the force due to gravity would be in opposite direction with respect to deceleration hence the equation-A may be rewrite as:

$\mathbf{a_{\alpha}} = \mathbf{a_H} - g\ .\ sin\ \alpha\ .$ **-------- B**

1.5 The assumption is made below that an acceleration aH is invariant of the aeroplane type which makes this method as the approximation method.

1.6 Let us take the scenario with the multiple slopes of the runway, where the aeroplane movement uniformly accelerated (respectively decelerated) on each section of runway portion i of constant slope αi and applying the newton's law of motion elimination of the time variable between expressions the distance traveled on the axis and the speed leads to the relation:

6 *In view of the significant slopes, it is specified that the length referred to here is that measured on the ground.*

$2ad = v_f^2 - v_i^2$;

where,

'a' is an acceleration, 'd' is distance travelled and v_f^2 is the final velocity and v_i^2 is the initial velocity of any object/aeroplane.

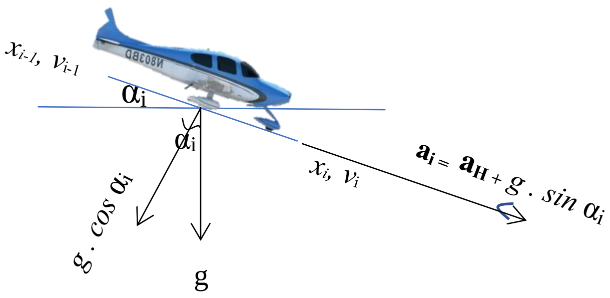

Figure A1-3

$2\ \mathbf{a}_i \cdot (x_i - x_{i-1}) = v_i^2 - v_{i-1}^2$ ---------**C**

in which:

- ✓ $\mathbf{a}_i = \mathbf{a_H} + g.\ sin\ \alpha_i$
- ✓ $(x_i - x_{i-1})$ is the length of the section**,**
- ✓ v_{i-1} is the speed at the origin of said section,
- ✓ v_i is the speed at its end.

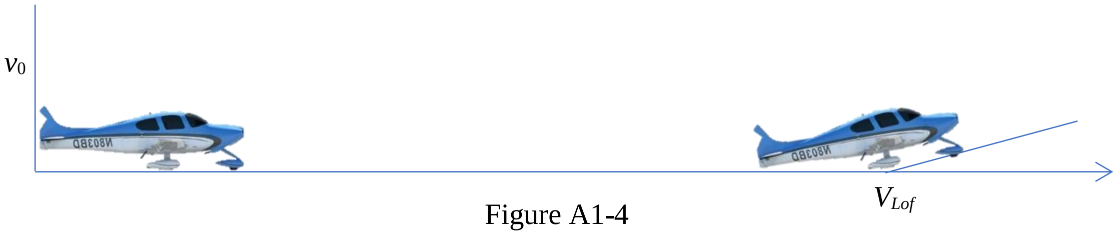

Figure A1-4

1.7 By successively writing this relation for each section of constant slope since the release brake (v_0 = 0) until the speed reaches the flight speed V_{Lof}, we obtain a series of equalities, which, by addition, results in the formula giving the length of runway preceding the point where the reference aeroplane leaves the ground after having initiated it's pitch up Figure A1-4.

$2\ \Sigma\ \mathbf{a}_i \cdot (x_i - x_{i-1}) = V_{Lof}^2$---------**D**

1.8 Note that by making α = 0, in the equation-**D** allows to substitute for the parameter $\mathbf{a}_i$ by value $\mathbf{a_H}$, whose value is not published with respect to the speed V_{Lof} and the distance at the end of at which this speed is reached on a horizontal runway.

1.9 For altiports intended to accommodate exclusively only light aeroplane, to which the method above is intended, the length to be given to the runway is taken equal to the product by **1.25** of the distance thus calculated from the equation-**D**.

1.10 The length of the runway determined under 1.9 should be increased at the rate of 7 per cent per 300 m elevation.

1.11 The length of runway determined under 1.10 should be further increased at the rate of 1 per cent for every 1°C by which the aerodrome reference temperature exceeds the temperature in the standard atmosphere for the aerodrome elevation (see *Table 3-1 of Aerodrome Design Manual (Doc 9157), Part 1 Runways*). If, however, the total correction for elevation and temperature exceeds 35 per cent, the required corrections should be obtained by means of a specific study. The operational characteristics of certain altiport design aeroplanes may indicate that these correction constants for elevation and temperature are not appropriate, and that they may need to be modified by results of aeronautical study based upon conditions existing at the particular site and the operating requirements of such aeroplanes.

1.12 Although current regulations do not require accelerate-stop for light aeroplanes, there is no reason why the possibility of a rejected take-off should not be considered in determining the runway length. Since the above reason applies to the deceleration introduced by the initiation of an accelerate-stop procedure, the decision speed, as may be, as it has been developed, can be determined within its possible range.

1.13 The length of an altiport runway does not necessarily have to provide for operations by the design aeroplane at its maximum mass. Rather, the aeroplane mass selected should be the mass required to carry out its allocated task and different take-off and landing masses may be determined for each site served by the design aeroplane.

2. Runway width

2.1 The width of an altiport runway may be determined by reference to the minimum values previously provided[7] for conventional aerodromes, according to the reference code of the most critical altiport design aeroplane to be accommodated.

2.2 On the basis of this information, if the code letter of an aeroplane does not seem to specify it differently for an altiport than for conventional aerodromes, the fact that the reference field length of the same aeroplane is not in itself significant for an altiport, should not, considering the correlation that exists between this distance and the one necessary for this aeroplane to reach its speed of rotation, be considered as removing all validity to the use of the code number[8] that is associated with it.

2.3 The minimum widths previously provided for conventional aerodromes will therefore be applicable without correction to altiports.

2.4 Thus, the minimum width of the runway will be **60 m** in unpaved configuration.

2.5 For paved runways, the absolute minimum width is **18 m**.

2.6 The site selection and orientation of a runway in the mountains is generally quite constrained, so particular attention must be paid to crosswinds in determining the width of the runway beyond the minimums thus defined.

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[8] *although this situation cannot be established as a rule, it should be noted that, as they use a short take-off and landing runway, the aircraft used at the altiport generally use the code number 1*

ATTACHMENT B – STOL FIELDs CLEARANCE REQUIREMENTS

CAA Nepal Practices

Provide an URL for access to this document

ATTACHMENT C

REFERENCES

[List to be expanded]

1) ICAO Annex 14 Aerodromes, Volume I Aerodrome Design and Operations

2) Aerodrome Design Manual (Doc 9157, Part 1 to 6

3) Airport Planning Manual (Doc 9184), Part 1 – 3

4) Airport Services Manual (Doc 9137), part 1 - 8

5) Stolport Manual (Doc 9150);

6) Instruction Technique sur les Aérodromes Civils (ITAC),DGAC France

7) UNDP/ICAO Project, NEP/82/009, High –altitude STOL Performance Criteria Study, DHC 6 – 300 Series Twin Otter Aircraft, Nepal, February 1988

8) CAAN Flight Operations Requirements Aeroplane, Appendix 9 - STOL Field Clearance Requirements

9) Minimum Safety Requirements for Temporary / Unlicensed Aerodromes, DGCA India;

10) CASA CAAP 92A-1(0): Guidelines on Aerodromes intended for Small Aeroplanes conducting RPT Operations;

11) FAA AC 150/5325-4B: Runway Length Requirements for Airport Design, Chapter 2 Runway Length for Small Airplanes;

12) FAA AC 150/5220-22B: Engineered Materials Arresting Systems (EMAS) for Aircraft Overruns;

13)

AP-ADO/TF TASK LIST
(Updated by AP-ADO/TF/4)

	ACTION ITEM/PLANNED ACTIVITIES	RESPONSIBLE PARTY	TIME FRAME	STATUS	REMARKS
1/1	Identify experts in various AOP fields and maintain a database for the Asia/Pacific Region	States – nomination of experts Secretariat – maintaining database	Continuous	Open	From TOR
1/2	Draft regional guidance for the design and operations of:				From AP-ADO/TF/1 AP-ADO/TF/2 WP/13
	(a) Altiports	Nepal to lead; assisted by China, Fiji, India and Indonesia	December 2021 Final Draft to be submitted by ~~AP-ADO/TF/4~~ AP-ADO/TF/5	Ongoing	Modified in AP-ADO/TF/2 AP-ADO/TF/3-WP/09 - First draft of the GM AP-ADO/TF/4-WP/09 – Second Draft of the GM
1/3	- Study and discuss aerodrome SARPs and guidance materials related to aerodrome planning, design and operations including PANS-Aerodromes; and - Provide expert advice and clarification to APAC States on any issues related to the implementation of the requirement specified in the SARPs and guidance materials. [Reference: From TOR]	States and AP-ADO/TF AP-ADO/TF and Secretariat	Continuous Continuous	Ongoing Ongoing	~~From TOR~~ 1st sub-item: – AP-ADO/TF/2 WP/05, WP/06, IP/02, IP/03 & IP/04 – AP-ADO/TF/3-IP/04 – AP-ADO/TF/4-IP/03, PPT/01 & 02; WP/04, 05, 06 & 07

	ACTION ITEM/PLANNED ACTIVITIES	RESPONSIBLE PARTY	TIME FRAME	STATUS	REMARKS
1/4	- Review and discuss AOP parts of the Asia/Pacific ANP and Seamless ANS Plan; and	AP-ADO/TF	Continuous	Ongoing	~~From TOR~~ 1st sub-item: – AP-ADO/TF/2 WP/03 & WP/08 – AP-ADO/TF/3-WP/08 – AP-ADO/TF/4-WP/08
	- Formulate amendment proposals to the APAC ANP Table AOP I - 1 and Table AOP II – 1 as necessary. [Reference: From TOR]	States and Secretariat	Continuous	Ongoing	PfAs from 5 States had been processed and completed in 2022
2/1	Conduct seminars / workshops for aerodrome regulatory and aerodrome operator staff in APAC Region		Continuous	Ongoing	China, India & Thailand implemented GRF on 4 Nov. 2021. Conducted GRF Webinars in 2021 in coordination with: – FTF, ACI, IFALPA, IFATCA and IFAIMA – Japan incorporating winter operations
3/1	Technical assistance/Workshop for APAC States that have yet to implement GRF	United States FAA (upon request and on case by case basis)	2022		Nil request received from States

	ACTION ITEM/PLANNED ACTIVITIES	RESPONSIBLE PARTY	TIME FRAME	STATUS	REMARKS
3/2	GRF Seminar	China (Lead), ACI & ICAO	Q3, 2022	Completed	Seminar on GRF - *Ten Months into GRF, Challenges Met and Lessons Learnt in Asia-Pacific* conducted by ICAO jointly with China and ACI on 29 Sep. 2022
AP-ADO/TF/4					
4/1	Workshop on Aerodrome Pavement Design and Evaluation including ICAO ACR-PCR Method in Reporting Pavement Strength for Asia and Pacific Regions	With FAA support and Secretariat	Q1, 2024		To organize back-to-back with AP-ADO/TF/5 Meeting in Jan/Feb 2024 or as standalone workshop at the convenient dates

Asia/Pacific Aerodrome Design and Operations Task Force (AP-ADO/TF)

TERMS OF REFERENCE
(Proposal for Amendment to AP-ADO/TF's TOR)

Objective:

The main purpose of the AP-ADO/TF is to achieve some specific deliverables of the AOP/SG through the systematic works of the Task Force.

Scope of works:

To meet the above objective the AP-ADO/TF shall carry out the following tasks:

(1) **Study and discuss** aerodrome SARPs and guidance materials related to aerodrome planning, design and operations including PANS-Aerodromes and provide expert advice and clarification to APAC States on any issues related to the implementation of the requirement specified in the SARPs and guidance materials.

(2) **Review and discuss** AOP parts of the Global Air Navigation Plan (GANP), the Asia/Pacific ANP and Seamless ANS Plan and formulate amendment proposals to the APAC ANP Table AOP I - 1 and Table AOP II – 1 as necessary.

(3) **Review** provisions of facilities and services at international aerodromes specified in AOP Table of ANP through monitoring the following information published in the AIP and other official documents of the States:

- Upcoming new concept of Obstacle limitation surfaces;
- visual aids;
- rescue and firefighting services and emergency planning;
- assessment and reporting of the runway surface condition;
- preventive maintenance programme;
- runway safety programme including establishment of a runway safety team at international aerodromes;
- SMGCS & A-SMGCS;
- Pavement Strength reporting (ACR/PCR)

(4) **Review and discuss** Airport Operations Plan (AOP), Airport Operations Centre (APOC) and Total Airport Management (TAM) provisions of GANP;

(4)(5) **Assist in conducting** seminars/workshops/trainings for the aerodrome regulatory and aerodrome operator staff in APAC region;

(5)(6) **Identify** experts in various AOP fields and **maintain** Asia/Pacific database;

(6)(7) **Participate** in ICAO's activities/initiatives in aerodromes, if necessary.

Composition: The Task Force is composed of subject matter experts nominated by APAC States/Administrations and International Organization satisfying the criteria:

(1) Minimum 3 years of experience in Aerodrome Regulatory functions of CAA or in Aerodrome Operations at international airports or in the International Organizations;

(2) Familiar with Annex 14, PANS-Aerodromes (Doc 9981) and its guidance materials, GANP, GASP, APAC Seamless ANS Plan, APAC ANP; and
(3) The nominated expert would continue to be a member for a minimum of three consecutive years.

Additional membership could be invited from other regions, if required.

Working Methods: The Task force will hold at least one face-to-face meeting a year. Video teleconference may be held in lieu of face-to-face meeting when travel restrictions are in place. The work would be carried out through electronic correspondences and web conference as far as practicable.

Time frame: The tenure of the Task Force would last until September ~~2023~~ 2026.