International Civil Aviation Organization

Thirty-Fifth Meeting of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG/35)

Bangkok, Thailand, 25 to 27 November 2024

Agenda Item 3: **Performance Framework for Regional Air Navigation Planning and Implementation**

3.1: **AOP**

REPORT ON THE EIGHTH MEETING OF AOP SUBGROUP

(Presented by Chairperson of AOP/SG)

SUMMARY

This paper presents the outcomes of the Eighth Meeting of the APANPIRG Aerodrome Operations and Planning Subgroup (AOP/SG/8, Bangkok, Thailand, from 15 to 19 July 2024) for review by APANPIRG/35.

Strategic Objectives:

A: ***Safety*** *– Enhance global civil aviation safety*

B: ***Air Navigation Capacity and Efficiency*** *— Increase the capacity and improve the efficiency of the global aviation system*

E: ***Environmental Protection*** *— minimize the adverse environment effects of civil aviation activities.*

Action by the Meeting is in paragraph 3.

1. INTRODUCTION

1.1 The Eighth Meeting of the Aerodrome Operations and Planning Sub-Group (AOP/SG/8) was held in Bangkok, Thailand from 15 to 19 July 2024.

1.2 The meeting was attended by 117 participants from 18 States, 1 Special Administration Region and 3 International Organizations.

1.3 A total of 27 Working Papers, 20 Information Papers and 2 Presentations covering 10 Agenda Items were considered by AOP/SG/8.

1.4 Based on the outcomes of discussions on various Agenda Items, the Meeting adopted 4 (Four) Conclusions and 3 (Three) Decision that were of a purely technical or operational nature. In addition, AOP/SG/8 formulated 2 (Two) Draft Conclusions for consideration by APANPIRG/35.

1.5 The full report of AOP/SG/8 is available at the following URL: https://www.icao.int/APAC/Meetings/Pages/2024-AOP-SG-8.aspx

1.6 **Appendices** used in this Working Paper carry the same **Appendix** numbers as those in the Report of AOP/SG/8 for easy reference.

2. DISCUSSION

2.1 Some important discussions of AOP/SG/8 are summarized in the ensuing paragraphs

Relevant Outcomes of ATM/SG/11, ATFM/SG/14, AAITF/19 and ICAO APAC/MID ATM Contingency Planning Workshop

2.2 AOP/SG/8 noted that AAITF/19 had agreed to establish the APAC Common SWIM Aeronautical Information Services Ad hoc Group to discuss the business functionality of APAC Common SWIM Aeronautical Information Services by SWIM TF.

2.3 India expressed willingness to join the APAC Common SWIM Aeronautical Information Services Ad hoc Group in the Meeting.

Asia/Pacific Air Navigation Plans

2.4 AOP/SG/8 noted the structure of the Asia/Pacific Air Navigation Plans and procedures for their amendments. There were three Volumes of Asia/Pacific ANP which can be accessed at https://www.icao.int/APAC/Pages/APAC-eANP.aspx.

Amendment of ANP Volume I, Table AOP I-1 and ANP Volume II, Table AOP II-1

2.5 AOP/SG/8 noted that 286 out of 370 aerodromes used for international operations in Asia and Pacific Regions had been listed in Asia/Pacific Region ANP Volume I as of 25 June 2024 (282 in June 2023).

2.6 AOP/SG/8 urged States to initiate and send proposals to ICAO APAC Office for amendment to APAC ANP Volume I, Table AOP I-1 and ANP Volume II, Table AOP II-1, particularly by States/Administrations identified in **Appendix A** to the Report of AOP/SG/8.

2.7 AOP/SG/8 noted that the airport planning time horizon for the facilities and services to be provided by the State concerned at each aerodrome that were listed/or to be listed in Table AOP II-1 of the APAC ANP should be sufficient for the period of 5 -10 years as Airport Master Plan is generally reviewed in 5 -7 years' time interval.

Report on the Fifth Meeting of the Asia/Pacific Aerodrome Design and Operations Task Force (AP-ADO/TF/5)

2.8 AOP/SG/8 reviewed the Report of the Fifth Meeting of the Asia/Pacific Aerodrome Design and Operations Task Force (AP-ADO/TF/5, 30 January – 2 February 2024, Chiang Rai, Thailand). The full report of the meeting has been posted on the ICAO APAC Office website and can be accessed at: https://www.icao.int/APAC/Meetings/Pages/2023-AP-ADO-TF4.aspx.

Inconsistency Requirement in ICAO Annex 14 Volume I

2.9 Noting the inconsistency observed in Annex 14 Volume I and Aerodrome Design Manual (Doc 9157) Part 4 vis-as-vis some best practices as recommended in ACI Handbook and FAA's study regarding requirements in Taxiway Centerline Marking, Threshold Marking, Taxiway Transverse Stripe Marking, Runway Pavement Edge Flushing and Precision Approach Lighting, AOP/SG/8 adopted Conclusion AOP/SG/8-1 formulated by AP-ADO/TF/5:

Conclusion AOP/SG/8-1: Inconsistency Requirements in ICAO Annex 14 Volume I (Taxiway Centerline Marking, Threshold Marking, Taxiway Transverse Stripe, Pavement Edge Flushing, and Precision Approach Lighting

*That, ICAO HQ should be consulted on the inconsistency in and conflicting ICAO Annex 14 Volume I requirements (Taxiway Centerline Marking, Threshold Marking, Taxiway Transverse Stripe Marking, Pavement Edge Flushing, and Precision Approach Lighting) identified in AP-ADO/TF/5-WP/06 (**Appendix B** to the AP-ADO/TF/5 Report) for further deliberation at the respective Working Groups (such as, Visual Aids Working Group and Aerodrome Design Working Group).*

2.10 ICAO APAC has sent an IOM Ref.: T 11/5.13.2 – AP-AGA0053/24 dated 2 September 2024 along with the AP-ADO/TF/5-WP/06 to the Air Navigation Bureau for further deliberation at the next Meeting of the ADOP Visual Aids Working Group.

Review on the Color Shift Characteristics in relation to the Photometric Testing Requirements Pertaining to the Aeronautical Ground Lighting Systems using Solid State Lighting (LED)

2.11 AOP/SG/8 noted the critical importance of monitoring color shift characteristics in Aeronautical Ground Lighting (AGL) systems, especially with the adoption of Solid-State Lighting (LED) technology.

2.12 Acknowledging the benefit in including colour in the national requirements (as recommendations) to protect the interest of the airports and the regulator for ensuring the 4C's (Configuration, Colour, Candelas and Coverage) compliance of the AGL system, AOP/SG/8 adopted the Conclusion AOP/SG/8-2 formulated by AP-ADO/TF/5.

Conclusion AOP/SG/8-2: Proposal for Amendment to 10.5.3 to 10.5.5 of Annex 14, Volume I for inclusion of the colour measurement

*That, ICAO Visual Aids Working Group is requested to review AP-ADO/TF/5 – WP/08 (**Appendix C** to the Report of AP/SG/8) regarding suggested amendment to 10.5.3 to 10.5.5 of Annex 14, Volume I for inclusion of the colour measurement.*

2.11 ICAO APAC has sent an IOM Ref.: T 11/5.13.2 – AP-AGA0054/24 dated 2 September 2024 along with the AP-ADO/TF/5-WP/08 to the Air Navigation Bureau for further deliberation at the next Meeting of the ADOP Visual Aids Working Group.

Review on the Requirement of the Runway Guard Lights Provision when Stop Bars are available and Recommendations on the Stop Bar Operation Sequence Timings

2.13 AOP/SG/8 noted that AP-ADO/TF/5 had reviewed the need for runway guard lights and the dependency of the stop bar lighting under different operational conditions. As per ICAO Annex 14, Volume I SARPs, the runway guard lights are required to be provided where stop bars are not installed when Runway Visual Range (RVR) is less than 550 meters.

2.14 The aspects of provision of runway guard lights when RVR in range of 550-1200 m when stop bar is installed was proposed as a recommendation in AP-ADO/TF/5 – WP/09. As the standards have not referred any guidance on RVR conditions greater than 1200 m, the same has been proposed as a recommendation for providing the runway guard lights. However, it was suggested to follow based on the need and safety study.

2.15 To enhance runway safety through operations of runway guard lights as part of effective runway incursion prevention measures in all visibility or weather conditions, the AP-ADO/TF/5 had recommended to send the AP-ADO/TF/5 – WP/09 to ICAO HQs Visual Aids Working Group for further deliberation. AOP/SG/8 adopted Conclusion AOP/SG/8-3 formulated by AP-ADO/TF/5, as appended below:

> ***Conclusion AOP/SG/8-3: Review on the Requirement of the Runway Guard Lights Provision when Stop Bars are available and Recommendations on the Stop Bar Operation Sequence Timings***
>
> *That, ICAO Visual Aids Working Group is requested to review AP-ADO/TF/5 – WP/09 (**Appendix D** to the Report of AOP/SG/8) for consideration of recommendations made in the AP-ADO/TF/5 – WP/09 in Section 5.1 b) and c) regarding runway guard lights.*

2.16 ICAO APAC has sent an IOM Ref.: T 11/5.13.2 – AP-AGA0055/24 dated 2 September 2024 along with the AP-ADO/TF/5-WP/09 to the Air Navigation Bureau for further deliberation at the next Meeting of the ADOP Visual Aids Working Group.

Draft Regional Guidance for Design and Operations of Altiports

2.17 AOP/SG/8 noted that the AP/ADO/TF/5 had reviewed in detail the *Draft Regional Guidance for Design and Operations of Altiport* which was developed by the participating States (China, Fiji, India, Indonesia and Nepal (lead)) of the AP-ADO/TF.

2.18 AOP/SG/8 endorsed the following Draft Conclusion formulated by AP-ADO/TF/5 for consideration by APANPIRG/35:

<table>
<tr><th colspan="3">Draft Conclusion AOP/SG/8-4: Regional Guidance for Design and Operations of Altiport</th></tr>
<tr><td colspan="2">What: That, Regional Guidance for Design and Operations of Altiport (Appendix E to the Report of AOP/SG/8) developed by AP-ADO/TF and endorsed by AOP/SG/8 be forwarded to Air Navigation Bureau.</td><td>Expected impact:
☒ Political / Global
☐ Inter-regional
☒ Economic
☐ Environmental
☒ Ops/Technical</td></tr>
<tr><td>Why: To submit the Draft Regional Guidance for review by the Ad hoc Working Group formed under Aerodrome Design and Operation Pannel (ADOP) to develop the Global Guidance on Design and Operations of Altiports.</td><td colspan="2">Follow-up: ☐Required from States</td></tr>
<tr><td>When: 27-Nov-24</td><td colspan="2">Status: Adopted by PIRG</td></tr>
<tr><td colspan="3">Who: ☒Sub groups ☒APAC States ☒ICAO APAC RO ☒ICAO HQ ☐Other: XXXX</td></tr>
</table>

Workshop on Aerodrome Pavement Design and Evaluation including ICAO ACR-PCR Method of Reporting Pavement Strength

2.19 AOP/SG/8 noted with appreciation that the *Workshop on Aerodrome Pavement Design and Evaluation including ICAO ACR-PCR Method of Reporting Pavement Strength* was conducted on 7 - 9 February 2024 at ICAO APAC, Bangkok, Thailand with the subject matter expert's support provided by the US FAA.

Report on the Sixth Meeting of the Asia/Pacific Aerodrome Assistance Working Group (AP-AA/WG/6)

2.20 AOP/SG/8 reviewed the Report of the Sixth Meeting of the Asia/Pacific Aerodrome Assistance Working Group (AP-AA/WG/6, Bangkok, Thailand from 2 to 5 April 2024). The full report of the meeting has been posted on the ICAO APAC Office website and can be accessed at https://www.icao.int/APAC/Meetings/Pages/2024-AP-AA-WG-6.aspx.

Generic Aerodrome SMS Evaluation Tools and Guidance

2.21 AOP/SG/8 reviewed the *Generic Aerodrome SMS Evaluation Tool and Guidance* developed by the AP-AA/WG to provide CAA inspectors and aerodrome operators with a more comprehensive set of guidelines for the evaluation of Aerodrome Safety Management System, and adopted the Decision AOP/SG/8-5 formulated by AP-AA/WG/6:

Decision AOP/SG/8-5: Generic Aerodrome SMS Evaluation Tool and Guidance

*That, the Generic Aerodrome SMS Evaluation Tool (**Appendix F** to the Report of AOP/SG/8) be made available on the ICAO Asia/Pacific Regional Office Website for reference by States/Administrations.*

2.22 The *Generic Aerodrome SMS Evaluation Tool and Guidance* is now available at ICAO APAC Website eDocuments Webpage under AGA Heading at URL: https://www.icao.int/APAC/Pages/eDocs.aspx and also circulated to States through ICAO APAC State Letter Ref.: T 11/5.13.2 – AP110/24 (AGA) dated 3 September 2024.

Runway Safety Team (RST) and Runway Safety Go-Team

2.23 AOP/SG/8 acknowledged the significance of the RSTs in promoting runway safety, encouraged collaborative efforts among stakeholders, and emphasized the value of seeking ICAO assistance through Runway Safety Go-Team Missions to enhance safety standards at aerodromes in the Asia/Pacific Region.

2.24 To gather the information from the States/Administrations on the establishment and operation of the RST at aerodromes, AOP/SG/8 reviewed and approved the RST questionnaire developed by the AP-AA/WG:

Conclusion AOP/SG/8-6: Framework for Monitoring the Establishment and Implementation of Runway Safey Team (RST) at aerodromes in APAC States

*That, the "Framework for Monitoring the Establishment and Implementation of Runway Safey Team (RST) at aerodromes in APAC States" provided in **Appendix G** to the Report of AOP/SG/8 be circulated to States/Administrations for their response. The Framework be also published on the ICAO APAC eDocuments Webpage under AGA Heading.*

2.25 ICAO APAC Office has circulated the State Letter Ref.: T 11/5.13.2 – AP111/24 (AGA) dated 3 September 2024 along with the RST questionnaire with the deadline for the States/Administrations to submit the completed questionnaire by **30 December 2024**. In addition, the RST Questionnaire is available at ICAO APAC Website eDocuments Webpage under AGA Heading at URL: https://www.icao.int/APAC/Pages/eDocs.aspx.

Asia Pacific Generic Guidance Materials (GGMs) and Custodian

2.26 AOP/SG/8 reviewed and updated the list of GGMs developed by the AP-AA/WG including the *ICAO Asia-Pacific Generic Aerodrome SMS Evaluation and Guidance* and adopted the Decision AOP/SG/8-7 formulated by AP-AA/WG/6.

Decision AOP/SG/8-7: Updated List of Asia/Pacific Generic Guidance Materials Developed by the AP-AA/WG with Details of the Custodians

*That, the **Attachment A** to the Procedure for periodic review and update of the Asia/Pacific Generic Guidance Materials (**Appendix H** to the Report of the AOP/SG/8) be published on the ICAO APAC Website at eDocuments Webpage under the AGA heading.*

2.27 The Procedure for periodic review and update of the Asia/Pacific Generic Guidance Materials including the ICAO Asia-Pacific Generic Aerodrome SMS Evaluation and Guidance is now available at ICAO APAC Website eDocuments Webpage under AGA Heading at URL: https://www.icao.int/APAC/Pages/eDocs.aspx and also circulated to States through ICAO APAC State Letter Ref.: T 11/5.13.2 – AP112/24 (AGA) dated 3 September 2024

Report on the Sixth Meeting of the Asia/Pacific Wildlife Hazard Management Working Group (AP-WHM/WG/6)

2.28 AOP/SG/8 reviewed the Report of the Sixth Meeting of the Asia/Pacific Wildlife Hazard Management Working Group (AP-WHM/WG/6) held in Bangkok, Thailand from 14 to 17 May 2024. The full report of AP-WHM/WG/6 provided on ICAO APAC Office website at: https://www.icao.int/APAC/Meetings/Pages/2024-AP-WHM-WG-6.aspx.

ICAO Asia-Pacific Wildlife Hazard Management Go-Team Methodology

2.29 The AP-WHM/WG developed the *Wildlife Hazard Management (WHM) Go-Team Mission Programme Document* to attach to the Asia/Pacific WHM Go-Team Methodology which was approved by APANPIRG/34 in December 2023.

2.30 AOP/SG/8 endorsed the following Draft Conclusion formulated by AP-WHM/WG/6 for further consideration by APANPIRG/35:

Draft Conclusion AOP/SG/8-8: ICAO Asia-Pacific WHM Go-Team Assistance Mission Programme Document	
What: That, • States with needs to enhance WHM be encouraged and invited to host WHM Go-Team Assistance Mission; • ICAO Asia/Pacific WHM Go Team Assistance Mission Programme Document presented in **Appendix I** to the Report of AOP/SG/8 for consideration by APANPIRG/35; and • After approval by APANPIRG/35 the ICAO Asia/Pacific WHM Go Team Assistance Mission Programme Document be included as an Appendix to the ICAO Asia/Pacific WHM Go-Team Methodology and published on the ICAO APAC Website.	Expected impact: ☒ Political / Global ☐ Inter-regional ☒ Economic ☐ Environmental ☒ Ops/Technical

Why:	To assist States in WHM	Follow-up:	☒Required from States
When:	27-Nov-24	Status:	Draft to be adopted by PIRG
Who: ☒Sub groups ☒APAC States ☐ICAO APAC RO ☐ICAO HQ ☐Other: AP-WHM/WG			

Asia Pacific Guidance Materials and Custodian

2.31 AOP/SG/8 reviewed and updated the list of GGMs including the ICAO Asia-Pacific Wildlife Hazard Management Go-Team Assistance Mission Programme Document (**Appendix I** to the Report of AOP/SG/8) developed by the AP-WHM/WG and adopted the Decision AOP/SG/8-9 formulated by AP-WHM/WG/6.

Decision AOP/SG/8-9: Updated List of Asia/Pacific Generic Guidance Materials Developed by the AP-WHM/WG with Details of the Custodians

*That, the **Attachment B** to the Procedure for periodic review and update of the Asia/Pacific Generic Guidance Materials (**Appendix H** to the Report of the AOP/SG/8) be published on the ICAO APAC Website at eDocuments Webpage under the AGA heading after adoption by APANPIRG/35 the ICAO Asia-Pacific Wildlife Hazard Management Go-Team Assistance Mission Programme Document.*

Certification of Aerodromes in the Asia/Pacific Region

Status on Certification of Aerodromes in Asia Pacific States

2.32 AOP/SG/8 noted that out of 370 aerodromes used for international operations in Asia and Pacific Regions **337** aerodromes have been certified as of 25 June 2024 corresponding to 91.08% progress.

2.33 There are still **33** aerodromes used for international operations which are yet to be certified by **12 States** in different Sub Regions of Asia/Pacific Region as shown in **Table 1** below:

Aerodromes	**North Asia (5 States & 2 SARs)**	**South East Asia (11 States)**	**South Asia (8 States)**	**Pacific (15 States & 8 OTs)**
States with Int'l Aerodromes yet to be certified (number and percentage of aerodromes yet to be certified) **[12 States, 33 Aerodromes, 8.92%]**	1) China (3, 3%)	1) Brunei Darussalam (1, **100%**), 2) Lao PDR (3, **75%**) 3) Malaysia (2, 11%) 4) Thailand (2, 20%), 5) Timor-Leste (1, **50%**)	1) Afghanistan (4, **100%**) 2) India (9, 24%)	1) Kiribati (2, **100%**) 2) Micronesia (Federal States of) (4, **100%**), 3) Nauru (1, **100%**), 4) Tuvalu (1, **100%**)

Table 1 – 33 Aerodromes used for international operations and yet to be certified by 12 States in Asia/Pacific Region

2.34 The list of aerodromes used for international operations in Asia/Pacific Region which are yet to be certified is provided in **Appendix J** to the Report of AOP/SG/8.

Publication of the Status of Certification of Aerodromes in AIP

2.35 States / Administrations that have yet to publish the status of certification of aerodromes in AIP AD 1.5 are provided in Table 2.

States	**North Asia (5 States & 2 SARs)**	**South East Asia (11 States)**	**South Asia (8 States)**	**Pacific (15 States & 8 OTs)**
AD 1.5 missing in AIP	--	1) Brunei Darussalam	1) Afghanistan	1) Kiribati 2) Nauru 3) Tuvalu 4) Marshall Is. 5) Micronesia (Federated States of) 6) Palau
Total (8 States)	**0 State**	**1 States**	**1 State**	**6 States / OTs**

Table 2 – Status of AIP AD 1.5 in Sub Regions of Asia/Pacific Region

ICAO Universal Safety Oversight Audit Programme (USOAP) and AGA Findings

ICAO USOAP CMA results in AGA Area

2.36 AOP/SG/8 noted that the APAC Average AGA EI score was 60.73% compared to Global Average of 63.06% as of June 2024.

2.37 AOP/SG/8 also noted the following results:

1) 19 APAC States have their EI in AGA area less than 60%;

2) 5 APAC States have their EI in AGA area more than 60% to less than 75%; and

3) 15 States have their EI in AGA area more than or equal to 75%

2.38 24 States with EI less than 75% would require more resources and efforts to enhance their EI and meet the 75% EI target by 2024 as set forth in the ICAO Global Aviation Safety Plan (GASP) 2023-2025 (Doc 10004).

Report of Small Working Group (SWG) for Task 5/2 of Asia/Pacific Aerodrome Design and Operations Task Force (AP-ADO/TF) on Organizing Workshop on The Transposition of Annex 14 SARPS into National Standards

2.39 AOP/SG/8 noted that Malaysia had agreed to host the Regional Workshop on Transposition of Annex 14 SARPs into National Aerodrome Standards with the objectives in disseminating good practices in the transposition of Annex 14 Volume I SARPs, in particular Recommended Practices, so as to maximise the safety performance of aerodrome operations.

2.40 The workshop will be organized on 17 February 2025 in conjunction with the Sixth Meeting of the Asia/Pacific Aerodrome Design and Operation Task Force (AP-ADO/TF/6) on 18 – 21 February 2025 in Langkawi, Malaysia.

2.41 AOP/SG/8 reviewed the draft workshop program and invited States/Administrations, International Organizations and Aerodrome Operators to contribute to the workshop nominating speakers to share States/International Organizations/Aerodrome Operator's experiences and best practices relevant to the topics proposed for the workshop and requested to contact the Secretariat.

Status of Air Navigation Deficiencies in AOP Field

2.42 AOP/SG/8 reviewed the list of Air Navigation Deficiencies in the AOP field endorsed by APANPIRG/34.

2.43 6 States including Bangladesh, China, Nepal, Thailand, Timor-Leste and Viet Nam provided updates on their Air Navigation Deficiencies in the AOP field.

Resolution of Air Navigation Deficiency in Certification of Aerodromes used for International Operations

2.44 Ninoy Aquino International Airport (RPLL) had been certified and issued the Permanent Aerodrome Certificate on 22 December 2023.

2.45 The following four aerodromes used for international operations in India were added in the list of the Air Navigation Deficiency in AOP Field based on the AD 1.3 & 1.5 of eAIP India effective from 13 June 2024 as they were not certified yet:

a) GORAKHPUR (VEGK);
b) HINDAN (VIDX);
c) JODHPUR (VIJO); and
d) VISAKHAPATNAM (VOVZ)

Publication of the status of certification of aerodromes in AIP AD 1.5

2.46 China, Samoa, Solomon Island, Tonga, Vanuatu and Viet Nam provided evidence on publication of the status of certification of aerodromes in their AIPs.

2.47 Considering the progress made by States in resolving deficiencies related to the certification of aerodromes and publication of the status of certification of aerodromes in AIP AD 1.5, AOP/SG/8 recommended that above deficiencies be removed from APANPIRG Air Navigation Deficiency List in AOP Field (**Appendix L**). AOP/SG/8 also recommended to add four uncertified aerodromes from India in the List of the air Navigation Deficiencies and submit to APANPIRG/35 for consideration.

2.48 The updated list of the Air Navigation Deficiencies in the AOP field including newly identified deficiencies placed at **Appendix L** to the AOP/SG/8 Report will be presented to this Meeting separately in WP/14.

2.49 AOP/SG/8 also discussed several other Working Papers and Information Papers presented by States and International Organizations. All materials of AOP/SG/8 are available at: https://www.icao.int/APAC/Meetings/Pages/2024-AOP-SG-8.aspx.

3. ACTION BY THE MEETING

3.1 The Meeting is invited to:

a) discuss and adopt the Draft Conclusions formulated by AOP/SG/8:

(i) **Draft Conclusion AOP/SG/8-4**: Regional Guidance for Design and Operations of Altiport (paragraph 2.18 refers);

(ii) **Draft Conclusion AOP/SG/8-8**: ICAO Asia-Pacific WHM Go-Team Assistance Mission Programme Document (paragraph 2.30 refers);

b) note the Conclusions and Decisions adopted by AOP/SG/8:

(i) **Conclusion AOP/SG/8-1**: Inconsistency Requirements in ICAO Annex 14 Volume I (Taxiway Centerline Marking, Threshold Marking, Taxiway Transverse Stripe, Pavement Edge Flushing, and Precision Approach Lighting) (paragraph 2.9 refers);

(ii) **Conclusion AOP/SG/8-2**: Proposal for Amendment to 10.5.3 to 10.5.5 of Annex 14, Volume I for inclusion of the colour measurement (paragraph 2.12 refers);

(iii) **Conclusion AOP/SG/8-3**: Review on the Requirement of the Runway Guard Lights Provision when Stop Bars are available and Recommendations on the Stop Bar Operation Sequence Timings (paragraph 2.15 refers);

(iv) **Conclusion AOP/SG/8-6 (AP-AA/WG/6 – 02)**: Framework for Monitoring the Establishment and Implementation of Runway Safey Team (RST) at aerodromes in APAC States (paragraph 2.24 refers);

(v) **Decision AOP/SG/8-5 (AP-AA/WG/6 – 1):** Generic Aerodrome SMS Evaluation Tool and Guidance (paragraph 2.21 refers);

(vi) **Decision AOP/SG/8-7 (AP-AA/WG/6 – 3)**: Updated List of Asia/Pacific Generic Guidance Materials Developed by the AP-AA/WG with Details of the Custodians (paragraph 2.26 refers);

(vii) **Decision AOP/SG/8-9 (AP-WHM/WG/6 – 2):** Updated List of Asia/Pacific Generic Guidance Materials Developed by the AP-WHM/WG with Details of the Custodians (paragraph 2.31 refers);

c) discuss any other relevant matters as appropriate.

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Aerodromes to be listed in Asia Pacific Air Navigation Plan [Updated on 25 June 2024]

S. No. in ICAO APAC Database	S. No	Sub-region	State / Admin	ICAO Code	Name of City	Name of Aerodrome	Type	APAC ANP
1	1	SA	Afghanistan	OAHR	Herat	Herat Intl	UNK	0
4	2	SA	Afghanistan	OAMS	Mazar-e-Sharif	Mazar-e-Sharif	UNK	0
46	3	NA	China	ZBOW	Baotou		UNK	0
47	4	NA	China	ZGBH	Beihai		UNK	0
49	5	NA	China	ZBAD	Beijing	Daxing	UNK	0
50	6	NA	China	ZYCC	Changchun	Longjia	UNK	0
52	7	NA	China	ZSCG	Changzhou	Benniu	UNK	0
53	**8**	**NA**	**China**	**ZUTF**	**Chengdu**	**Tianfu**	**UNK**	**0**
57	9	NA	China	ZLDH	Dunhuang	**Mogao**	UNK	0
58	10	NA	China	ZHES	Enshi	Xujiaping	UNK	0
60	11	NA	China	ZSGZ	Ganzhou	Huangjin	UNK	0
64	12	NA	China	ZUGY	Guiyang	Longdongbao	UNK	0
65	13	NA	China	ZBLA	Hulunbeier	Hailar	UNK	0
66	14	NA	China	ZJHK	Haikou	Meilan	UNK	0
71	15	NA	China	ZWTN	Hotan **HETIAN**	**Kungang**	UNK	0
72	16	NA	China	ZSSH	Huai'an	Lianshui	UNK	0
73	17	NA	China	RCYU	Hualien	Hualien	UNK	0
74	18	NA	China	ZSTX	Huangshan	Tunxi	UNK	0
75	19	NA	China	ZYJM	Jiamusi	**Jiamusi**	UNK	0
76	20	NA	China	ZGOW	Jieyang	Chaoshan	UNK	0
81	21	NA	China	ZULS	Lhasa	Gonggar	UNK	0
82	22	NA	China	ZSLG	Lianyungang	Baitabu **Huaguosha**	UNK	0
83	23	NA	China	ZPLJ	Lijiang	Sanyi	UNK	0
84	24	NA	China	ZSLY	Linyi	Shubuling **Qiyang**	UNK	0
85	25	NA	China	ZHLY	Luoyang	Beijiao	UNK	0
86	26	NA	China	ZPMS	Dehong	Mangshi	UNK	0
87	27	NA	China	ZBMZ	Manzhouli	Xijiao	UNK	0
88	28	NA	China	ZYMD	Mudanjiang	Hailang	UNK	0
89	29	NA	China	ZSCN	Nanchang	Changbei	UNK	0
92	30	NA	China	ZSNT	Nantong	Xingdong	UNK	0
93	31	NA	China	ZSNB	Ningbo	Lishe	UNK	0
94	32	NA	China	ZBDS	Ordos	Ejin Horo	UNK	0
96	**33**	**NA**	**China**	**ZJQH**	**QIONGHA**	**Boao**	**UNK**	**0**

S. No. in ICAO APAC Database	S. No	Sub-region	State / Admin	ICAO Code	Name of City	Name of Aerodrome	Type	APAC ANP
97	34	NA	China	ZYQQ	Qiqihar	Sanjiazi	UNK	0
98	35	NA	China	ZSQZ	Quanzhou	Jinjiang	UNK	0
104	36	NA	China	ZBSJ	Shijiazhuang	Zhengding	UNK	0
107	37	NA	China	RCMQ	Taichung	Cingcyuangang	UNK	0
108	38	NA	China	RCNN	Tainan	Tainan	UNK	0
112	39	NA	China	ZSWH	Weihai	Dashuipo	UNK	0
113	40	NA	China	ZSWZ	Wenzhou	Longwan	UNK	0
115	41	NA	China	ZSWX	Wuxi	Shuofang	UNK	0
116	42	NA	China	ZSWY	Wuyishan		UNK	0
120	43	NA	China	ZLXN	Xining	Caojiabao	UNK	0
121	44	NA	China	ZPJH	Xishuangbanna	Gasa	UNK	0
122	45	NA	China	ZSXZ	Xuzhou	Guanyin	UNK	0
123	46	NA	China	ZSYN	Yancheng	Nanyang	UNK	0
124	47	NA	China	ZYYJ	Yanji	Chaoyangchuan	UNK	0
125	48	NA	China	ZSYT	Yantai	Penglai	UNK	0
126	49	NA	China	ZSYA	Yangzhou	Taizhou	UNK	0
127	50	NA	China	ZHYC	Yichang	Sanxia	UNK	0
128	51	NA	China	ZLIC	Yinchuan	Hedong	UNK	0
129	52	NA	China	ZSYW	Yiwu	**Yiwu**	UNK	0
130	53	NA	China	ZGZJ	Zhanjiang		UNK	0
131	54	NA	China	ZGDY	Zhangjiajie	Hehua	UNK	0
132	55	NA	China	ZHCC	Zhengzhou	Xinzheng	UNK	0
133	56	NA	China	ZSZS	Zhoushan	Putuoshan	UNK	0
134	57	NA	China	ZUZY	Zunyi	Xinzhou	UNK	0
147	58	SA	India	VEBS	Bhubaneswar	**Biju Patnaik Airport**	UNK	0
149	59	SA	India	VICG	Chandigarh		UNK	0
154	60	SA	India	VOGO	Goa		UNK	0
155	**61**	**SA**	**India**	**VEGK**	**GORAKHPUR**		**UNK**	**0**
157	**62**	**SA**	**India**	**VIDX**	**HINDAN**		**UNK**	**0**
159	**63**	**SA**	**India**	**VOHY**	**HYDERABAD**	**Hyderabad International Airport**	**UNK**	**0**
161	**64**	**SA**	**India**	**VIJO**	**JODHPUR**		**UNK**	**0**
162	**65**	**SA**	**India**	**VEIM**		**Imphal Airport**	**UNK**	**0**

S. No. in ICAO APAC Database	S. No	Sub-region	State / Admin	ICAO Code	Name of City	Name of Aerodrome	Type	APAC ANP
163	**66**	**SA**	**India**	**VOKN**		**Kannur International Airport**	**UNK**	**0**
167	**67**	**SA**	**India**	**VOGA**		**Manohar International Airport, MOPA, GOA**	**UNK**	**0**
172	68	SA	India	VOPB	Port Blair		UNK	0
173	69	SA	India	VAPO	Pune		UNK	0
174	**70**	**SA**	**India**	**VAHS**		**Rajkot International Airport**	**UNK**	**0**
175	71	SA	India	VISR	Srinagar		UNK	0
177	**72**	**SA**	**India**	**VOTP**		**Tirupati Airport**	**UNK**	**0**
180	**73**	**SA**	**India**	**VOVZ**	**VISAKHAPATAN**		**UNK**	**0**
222	74	NA	Japan	RJAH	Hyakuri		UNK	0
227	75	NA	Japan	RJNK	Komatsu		UNK	0
244	76	NA	Japan	RJOS	Tokushima		UNK	0
248	77	NA	Japan	RJOH	Yonago	Miho	UNK	0
285	78	PAC	Micronesia	PTSA	Kosrae I.	Kosrae	UNK	0
286	79	NA	Mongolia	ZMCD	Dornod	Choibalsan	UNK	0
306	80	PAC	N. Mariana Is.	PGWT	Tinian I.	West Tinian Tinian Intl	UNK	0
341	81	PAC	Solomon Islands	AGGM	Munda		UNK	0
345	82	SA	Sri Lanka	VCCJ	Jaffna		UNK	0
363	83	PAC	Vanuatu	NVVW	Tanna	Tanna	**UNK**	0
365	84	SEA	Viet Nam	VVDL	Da Lat	Lien Khuong	**UNK**	**0**

Notes:

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

2) **US**

(1) Tinian I./West Tinian [PGWT] for N. Mariana Is. should be added in Table AOP I – 1 of APAC ANP V - I and Table AOP II – 1 of APAC ANP V - II.

(2) JOHNSTON ATOLL/Johnston I (PJON) should be withdrawn from Table AOP I – 1 of APAC ANP V - I and Table AOP II – 1 of APAC ANP V - II as it had been permanently closed.

INTERNATIONAL CIVIL AVIATION ORGANIZATION

REGIONAL GUIDANCE FOR THE DESIGN AND OPERATION OF ALTIPORTS

[DRAFT]

First Edition, ../../ 2024

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:

Table of Contents

CHAPTER 1. GENERAL

1.1 Introduction

1.1.1 This regional guidance material provides general guidance on altiport's 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 in this document.

1.1.5 Since altiports are generally operated under visual meteorological conditions (VMC), the provisions described below are limited to this type of operation [6]:

a) An altiport has at least:

- a steeply sloped runway extended at the top by a low-sloped segment 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 segment 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 segment of the runway is used as an additional factor of acceleration on take-off and deceleration on landing to reduce the length required for both, and thus allow an aerodrome to be located at the site to be served. This principal characteristic of altiport runways **is not without posing important problems** for the operation of

[1] *nevertheless, higher than the maximum permissible slope 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.

Notes: -

1) 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, 6 & 8 of 18" [14])

2) If an engine fails after the decision speed is reached, the aeroplane will have sufficient speed and power available to complete the take-off safely in the remaining take-off distance available. However, because of the high speed, there would be difficulty in stopping the aeroplane in the remaining accelerate-stop distance available [2.3 of Section 2, Attachment A of Annex 14, Volume I].

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 with STOL performance currently being operated at altiports in Indonesia and Nepal are provided in **Appendix 1**.

1.3 Definitions

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:

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 *Annex 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).

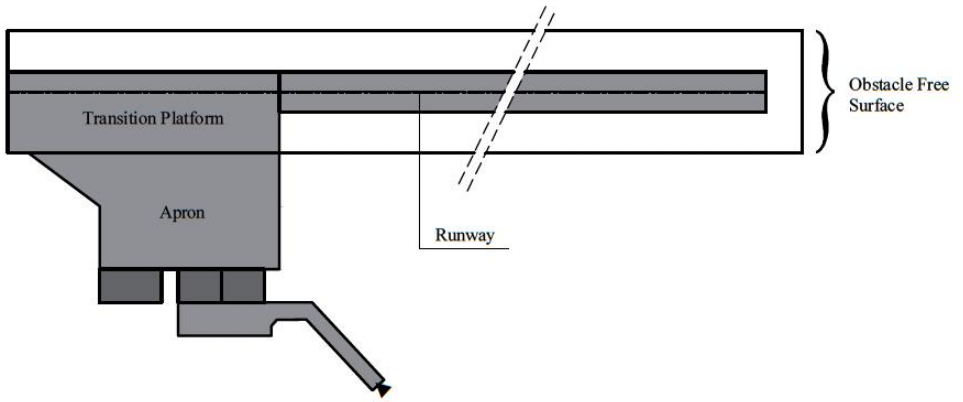

Figure 3 – 1: Schematic diagram of an altiport with paved runway

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 Clearways

3.2.3.1 Where a 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, 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 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 segment 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 segment 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 segment *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 segment of the runway to the segment 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 segment of the steep sloped runway and between last segment of the steep sloped runway and lower segment 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).

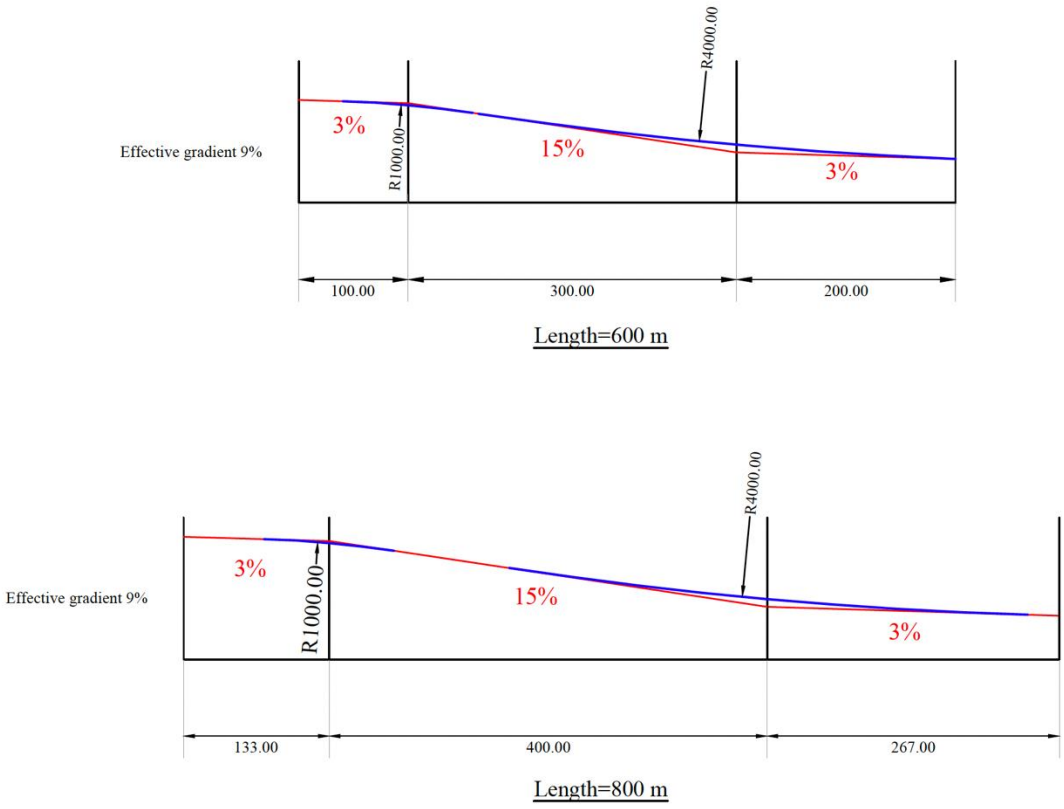

Figure 3 – 2: Schematic longitudinal profile of runway

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 3,000 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 **2.5 per cent** for 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.

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

3.2.6 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.

3.2.7 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 construction 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 aquaplaning from poor drainage 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 segment and the lower segment.

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 runway 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 [6].

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 [6].

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 3, 5 and 9.*

Note.— Guidance on design for frangibility is contained in the Aerodrome Design Manual (Doc 9157), Part 6.

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 - 3 and Figure 3 – 4).

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*.

Figure 3 - 3: Taxiway linking to apron (Alpe d'Huez Airport, France)

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 transitionl platform (or holding area as shown in Figure 3-4) where aircraft perform engine tests at the start up point, which can also be used as a turning pad, or a taxiway link (as shown in Figure 3-3); and
- the apron (aircraft parking area).

3.5.1.3 These components can be unpaved or paved.

3.5.1.4 Except on the upper segment-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**.

3.5.1.5 Where it is practically not possible to locate the apron at the upper platform the apron with taxiway may be located at other appropriate places if the topography and the longitudinal slope of runway permit (as shown in Figure 5-1).

Figure 3 – 4: Transition platform (Courchevel Altiport, France)

3.5.1.6 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.

3.5.1.7 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.

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

Figure 3 – 5: Example of typical altiport apron (Tenzing Hilary Altiport, Lukla, Nepal)

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 daytime 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 the obstacle limitation surfaces 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 associated with a unique approach and take-off path is therefore only indicative and is only intended to provide guidance for altiport planners.

Approach/take-off surfaces

4.2.3 The characteristics in the shape and size of the obstacle limitation surfaces indicate that there is not any difference between approach/take-off surfaces.

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

a) a segment Δ_1 originating at lower side of the strip and having a negative slope at least as steep as that of the centreline of the lower segment of the runway (if slope of centreline of the lower segment of the runway is horizontal or positive then the slope should be equal to the runway strip);

b) a horizontal segment Δ_2; and

c) a segment having positive slope $\Delta 3$, the length of which is sufficient for the aircraft on take-off to clear the surrounding obstacles.

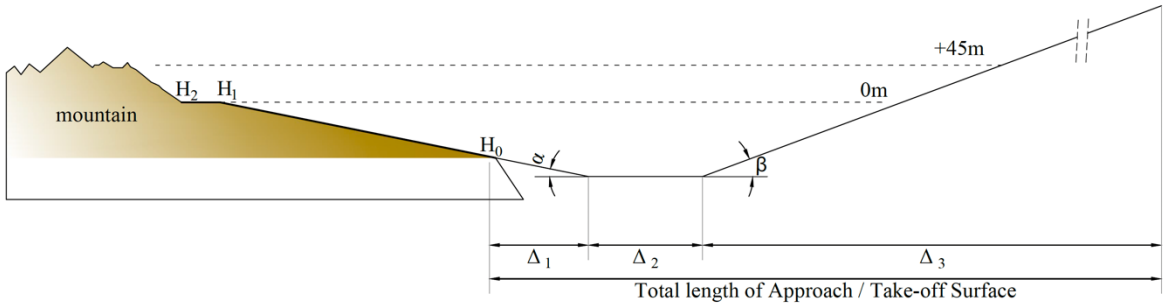

Figure 4 – 1: Longitudinal profile of the approach/take-off surface

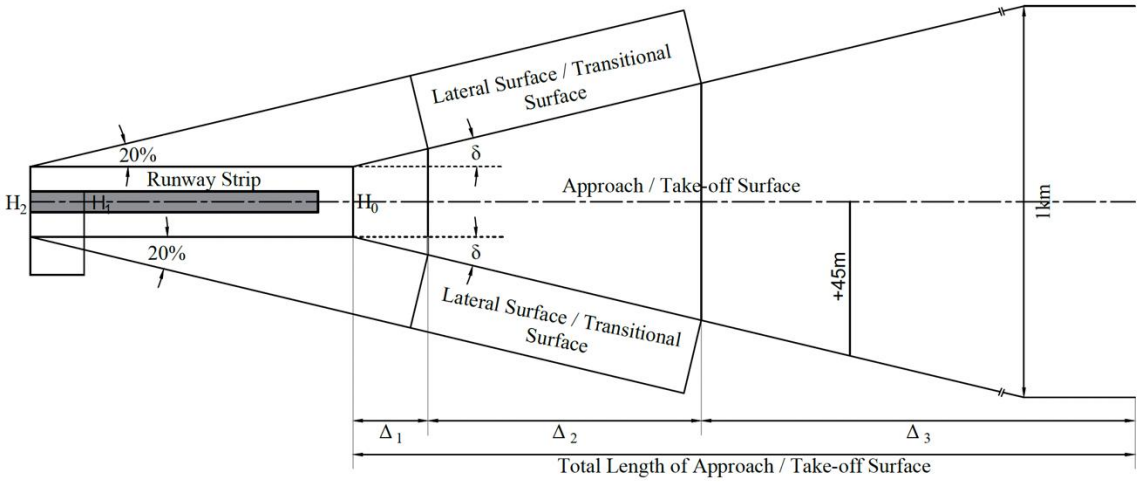

Figure 4 – 2: Plan of altiport approach/take-off surface and lateral/transitional surface

4.2.5 Since the total length of the approach/take-off surface must not be less than **2,000 m**, the values of $\Delta 1$, $\Delta 2$ and $\Delta 3$ 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.

<u>Note:</u> *The value of β may be taken 6% or 15:1 as per STOLPORT manual.*

4.2.6 The plan view of Approach and Take-of Surface is shown in Figure 4-2 and is generally characterized by:

a) an inner edge of specified length (equal to width of runway strip), horizontal and perpendicular to the extended centre line of the runway and located at the outer end of the strip;

b) two sides originating at the ends of the inner edge and diverging uniformly at a specified rate (with the divergence δ being at least **20 per cent** but never exceeding the value of 30 per cent**)** from the extended centre line of the runway until it reaches **1 km**;

c) an outer edge parallel to the inner edge, and beyond that, the width of the approach and take-off surface remains constant and equal to 1 km;

d) the above surfaces shall be varied when lateral offset, offset or curved approaches are utilized, specifically, two sides originating at the ends of the inner edge and diverging uniformly at a specified rate from the extended centre line of the lateral offset, offset or curved ground track;

e) the elevation of the inner edge shall be equal to the elevation of the midpoint of the threshold; and

f) the slope(s) of the approach surface shall be measured in the vertical plane containing the centre line of the runway and shall continue containing the centre line of any lateral offset or curved ground track.

Transitional Surfaces (Lateral Surfaces)

4.2.7 The transitional surfaces consist of two surfaces at either side of the runway. The lower and upper limits of these Transitional (Lateral) Surfaces, are:

a) on the lower edge, the limit is defined by the length of the strip along the edge of the strip and from there extending along the bottom of the approach/take-off surface up to the first two segments of longitudional profile (Δ1 and Δ2 and) defined above; and

b) on the upper edge, the horizontal lines originating from the upper corners of the strip and forming a divergence of **20 per cent (**but never exceeding the value of 30 per cent) with the vertical plane containing the runway centreline.

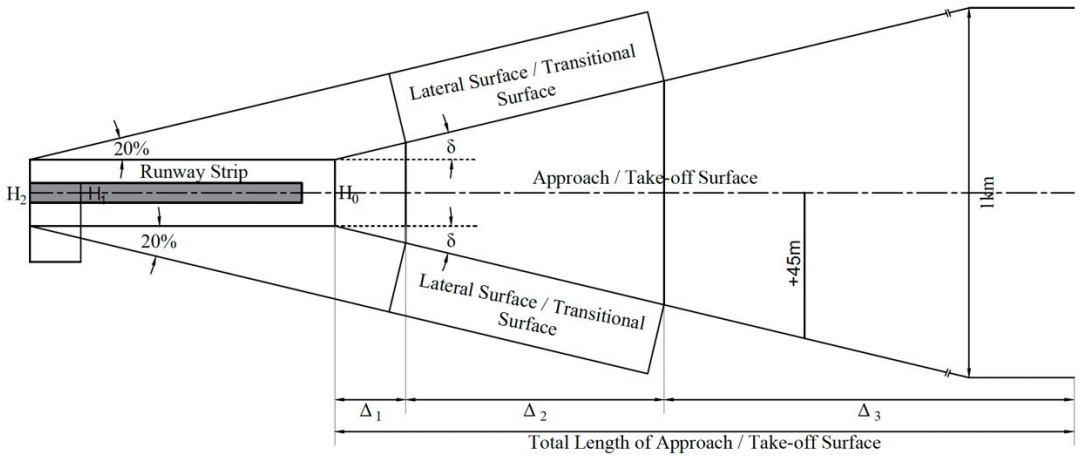

Figure 4 – 3: Plan of altiport approach/take-off surface and lateral/transitional surface

Inner horizontal surface

4.2.8 The selected site must also allow an aeroplane to make a low-level circling over the facilities before landing in order to ensure, if necessary, that the runway is clear on its upper segment.

4.2.9 The conditions of circling will also be the subject of a specific study, the conclusions of which will be associated with the extent of an inner horizontal surface. This surface will be positioned at a minimum height of 45 m, measured from upper platform, this surface will cover an area within a circular sector, centered on the upper platform, with a radius of 2,000 m and with sufficient opening (at least minimum of **65 degrees** towards each side of the runway centreline) to allow circling of a critical aircraft selected for the altiport.

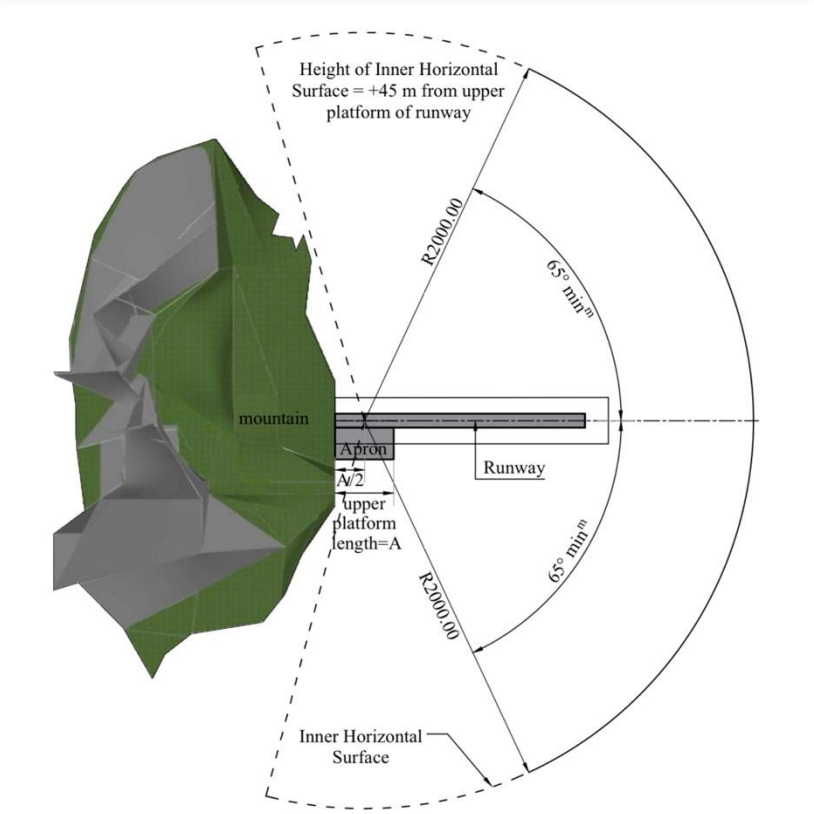

Figure 4 – 4: Inner Horizontal Surface

Missed approach surfaces

4.2.10 It is also recommended to provide a missed approach surfaces to protect the missed approaches.

4.2.11 When the terrain permits this missed approach surfaces can be constructed to be aligned as an extension of the runway (in the case of altiport with mountain pass) as shown in Figure 4-5 below. Its characteristics (width, slope and divergence) of lower edge will match with the take-off climb surface of a runway with normal characteristics (on conventional aerodromes) accommodating the same types of aircraft.

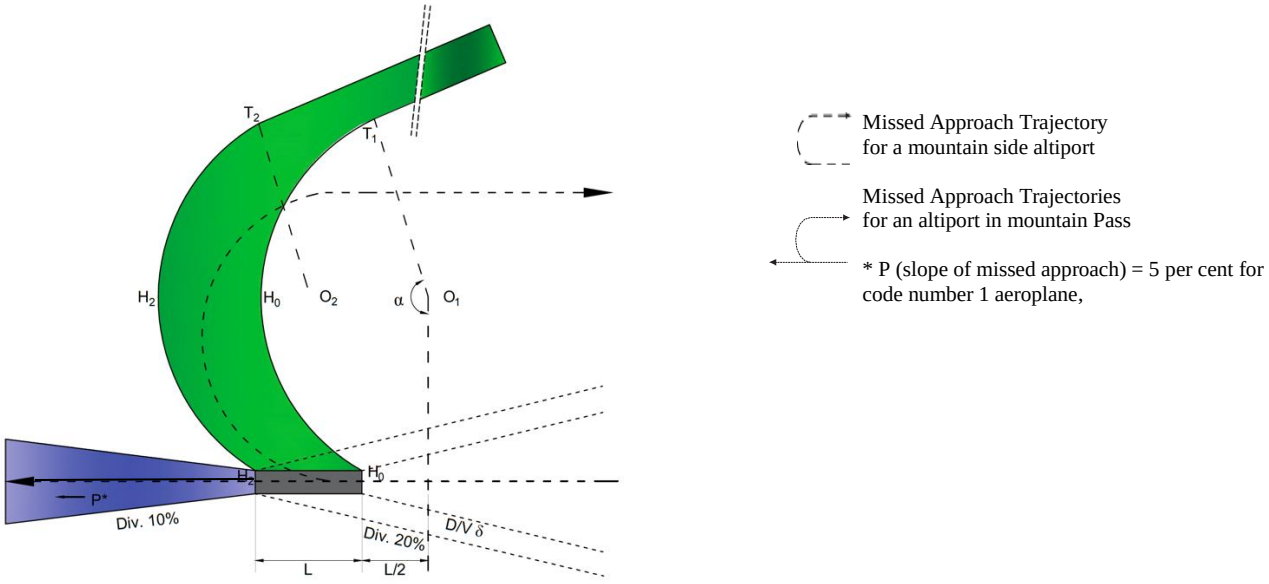

Figure 4 – 5: Missed approach surfaces (Plan)

4.2.12 However, when the terrain does not allow the missed approach to continue along the extension of the runway (e.g. altiports on the side of a mountain), the missed approach can only be carried out laterally (See Figure 4 – 5 with curved missed approach surface and Figure 4 –6).

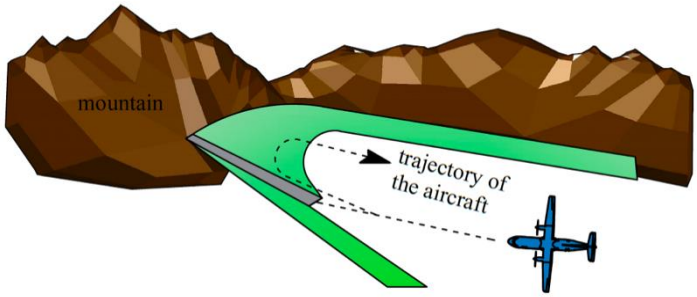

Figure 4 –6: Missed approach surfaces at altiport on a mountain side

4.2.13 The obstacle limitation surfaces protecting the missed approach should be constructed as shown in Figure 4-5, on the side where the missed approach is to be carried out:

a) the horizontal half-plane having elevation H_o as of the lower end of the strip;

b) the defined surface (cylindrical then flat) whose origin will be contained in a plane parallel to the center line of the runway and whose directions will be successively:

i. two horizontal arcs of a circle with elevations Ho and H2 (the latter being that of the upper side of the runway strip), each having a radius of at least 600 m, tangent to the plane containing centreline of the runway and the arc length of sectors (of circles) will be equal to the minimum angle (α) of the turn (depending on the terrain) to be carried out by the aircraft; and

ii. the horizontal tangents at the end of each of these two arcs (as shown in Figure 4 – 5 **as T1 and T2**).

4.2.14 The circular arc at elevation Ho should be centered at the extended runway centre line at a distance equal to one-half of the length of its main segment with a steep slope, from its lower

end.

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

4.2.16 As far as possible, this lateral missed approach surface should complement the missed approach surface along the extended centerline of the runway as shown in Figure 4-7, when the latter can be provided.

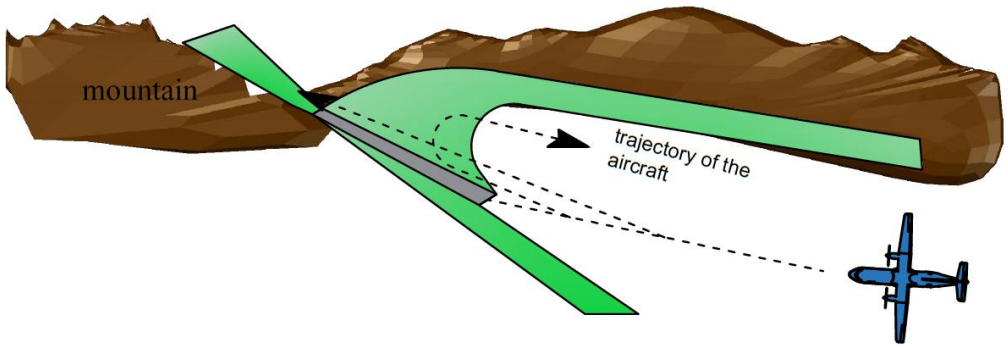

Figure 4 – 7: Missed approach surfaces at altiports in mountain pass or on dome shaped landforms

CHAPTER 5. VISUAL AIDS FOR NAVIGATION

5.1 General

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

5.1.2 Centre 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 – 45 m** and width of the stripe should be **4 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 any side (left or right) wherever feasible.

5.6.2.3 A mandatory instruction sign should consist of a white inscription on a red background.

5.6.2.4 Where applicable, the mandatory instruction sign inscriptions set forth in *Annex 14, Volume I,*

*Chapter 5, 5.4.2*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.

5.6.3.3 Where applicable, the information sign inscriptions set forth in *Annex 14, Volume I, Chapter 5, 5.4.3* should be used.

5.7 Markers

5.7.5 General

5.7.5.1 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.*

5.7.6 Unpaved runway edge and runway strip markers

5.7.6.1 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 and Figure 5-3.

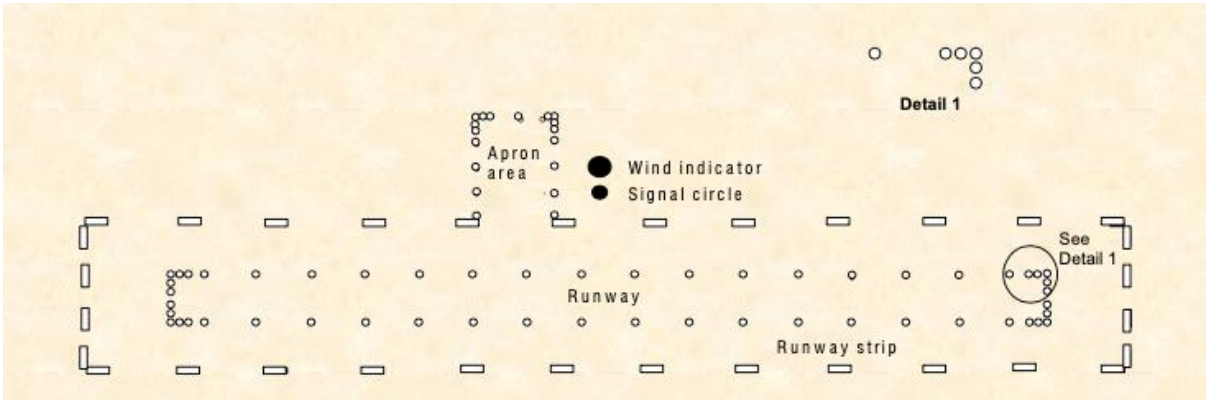

Figure 5 – 2: Runway and runway strip markers

5.7.6.2 Markers of conical shape for runway and markers of flat rectangular shape for runway strip should be used to clearly delineate the runway and runway strips limits on unpaved runways.

5.7.6.3 If flat rectangular markers are used to delineate the limit of the runway strip, 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 to delineate the runway limit, they should not be more than **30 cm** high and **0.4 m** base diameter.

5.7.6.4 The runway strip should be marked by using cones, gable markers or tires. 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.

5.7.6.5 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.

5.7.7 Edge markers for snow covered runways

5.7.7.1 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 **90 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.

5.7.7.2 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.

5.7.8 Unpaved taxiway edge markers

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

5.7.8.2 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**.

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

Figure 5 – 3: Example of Runway and Threshold markers

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*.

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 *STOLPORT Manual (Doc 9150)*.

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

8.1 Electrical power supply systems for air navigation facilities

8.1.1 Adequate power supply should be available at altiport for the safe functioning of air navigation facilities.

8.1.2 Where provided, the following aerodrome facilities should be provided with a power supply:

a) the signalling lamp and the minimum lighting necessary to enable air traffic services personnel to carry out their duties;

Note.— The requirement for minimum lighting may be met by other than electrical means.

b) all obstacle lights which, in the opinion of the appropriate authority, are essential to ensure the safe operation of aircraft;

c) meteorological equipment;

d) essential security lighting,

e) essential equipment and facilities for the aerodrome responding emergency agencies;

8.1.3 Requirements for a power supply should be met by either of the following:

— the public power, which is a source of power supplying the aerodrome service from a substation through a transmission line; or

— standby power unit(s), which are engine generators, solar-wind power, UPS batteries, etc., from which electric power can be obtained.

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 firefighting

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 17,* 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, Chapter 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 Safety

9.5.1 Procedures on apron safety are specified in the *PANS-Aerodromes (Doc 9981), Part II, Chapter 7.*

9.6 Altiport vehicle operation

9.6.1 *Annex 14, Volume 1, Attachment A, Section 18* and *PANS-Aerodromes (Doc 9981), Part II, Chapter 9 may be used for altiport vehicle operation.*

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 lateral (transitional) surface should be of minimum mass and height, frangibly designed and sited to reduce hazards to a minimum. Guidance on the frangibility requirements 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 shoulders is contained in *Annex 14, Volume I, Attachment A, Section8.1*, 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 9137), Part 9.*

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APPENDIX 1 - ALTIPORT DESIGN AEROPLANES

Notes:- Table 1 contains a list of aeroplanes in operations at altiports in Indonesia and Nepal. It should be noted that operations by these aeroplanes require special authorization by the manufacturers for Maximum Performance STOL Operations and approved by the local regulatory authority.

Table 1

S. No	Aeroplanes	Remarks
A)	**Indonesia**	
1	Cessna - 206	
2	Cessna - 208	
3	PC-6	
4	DHC - 4 Carribou	
5	DHC - 6	
B)	**Nepal**	
	DHC 6 - 300	
	DHC 6 - 400 (Viking)	
	DO 228 - 212	
	L 410 UVP – E20	

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[4] 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:

$$\mathbf{a}_\alpha = \mathbf{a}_H + g.\ sin\ \alpha \text{ ------A}$$

Figure A1-1

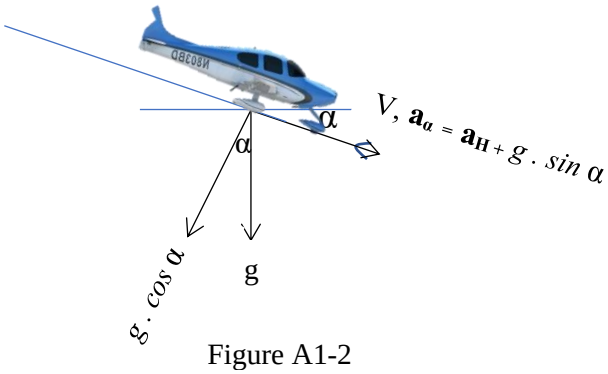

Figure A1-2

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:

$$\mathbf{a}_\alpha = \mathbf{a}_H - g\ .\ sin\ \alpha\ .\ \text{-------- B}$$

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 segment of runway i of constant slope αi and applying the newton's law of motion elimination of the time variable between

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

expressions the distance traveled on the axis and the speed leads to the relation:

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

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.

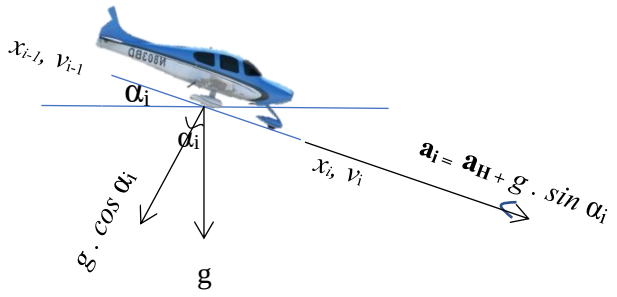

Figure A1-3

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

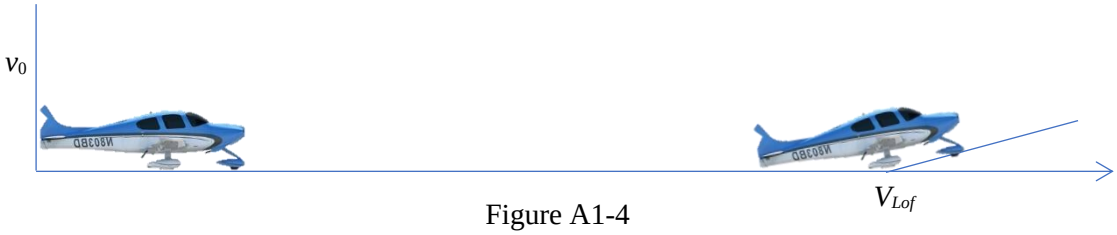

Figure A1-4

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 $\alpha = 0$, 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[5] 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[5] 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.

[5] *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

CAA NEPAL PRACTICES FOR SHORT TAKE-OFF AND LANDING (STOL) OPERATIONS

(Refer to Chapter – 14, Part I - Flight Crew and Part II - STOL Fields Clearance Requirements)

URL:

https://caanepal.gov.np/storage/app/media/file%20upload/fora-6th-edition-consolidated-1-026262626.pdf

ATTACHMENT C

OBSTACLES LIMITATION SURFACES

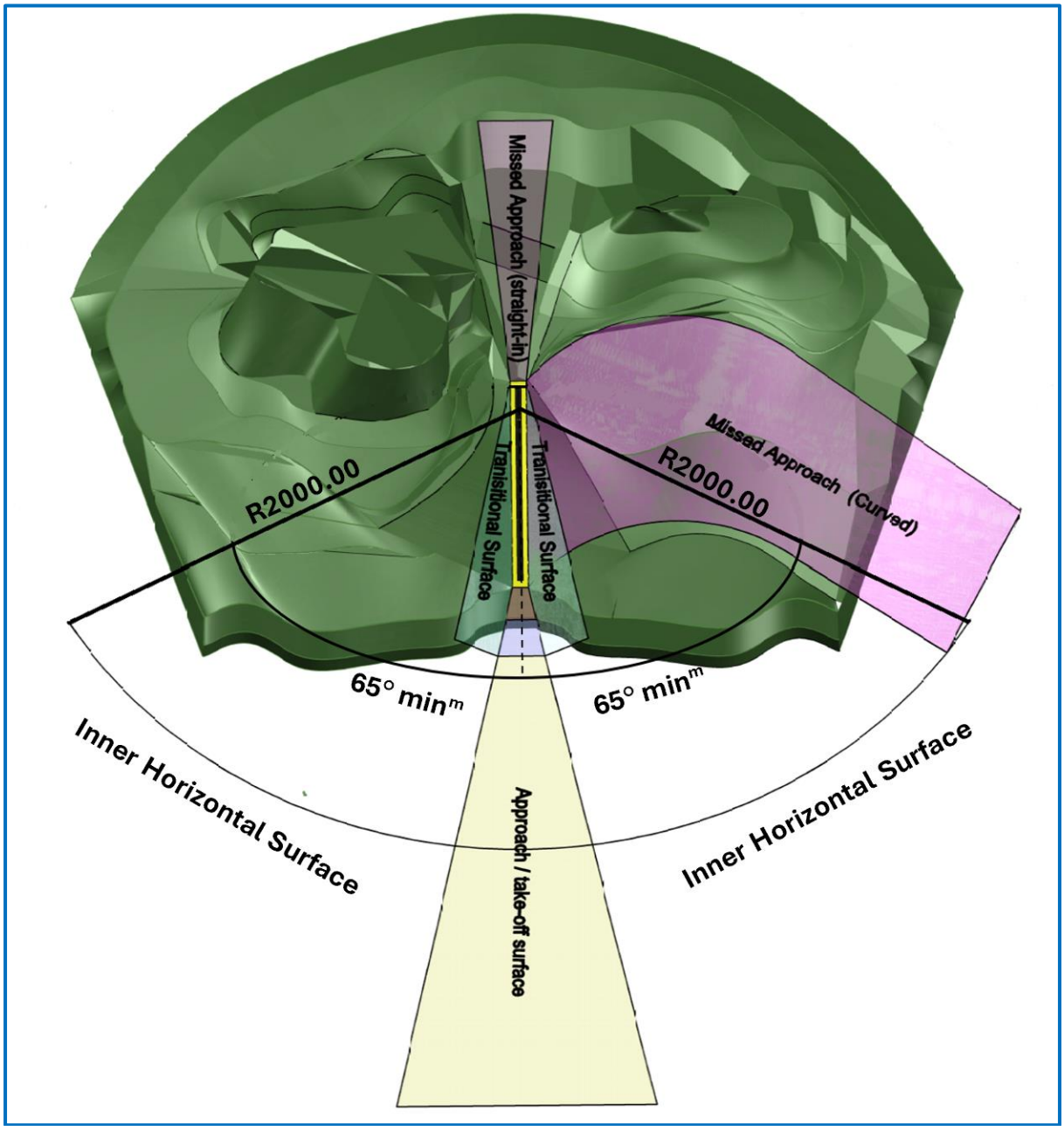

Figure ATT C-1: Missed approach surfaces at altiports in mountain pass or on dome shaped landforms

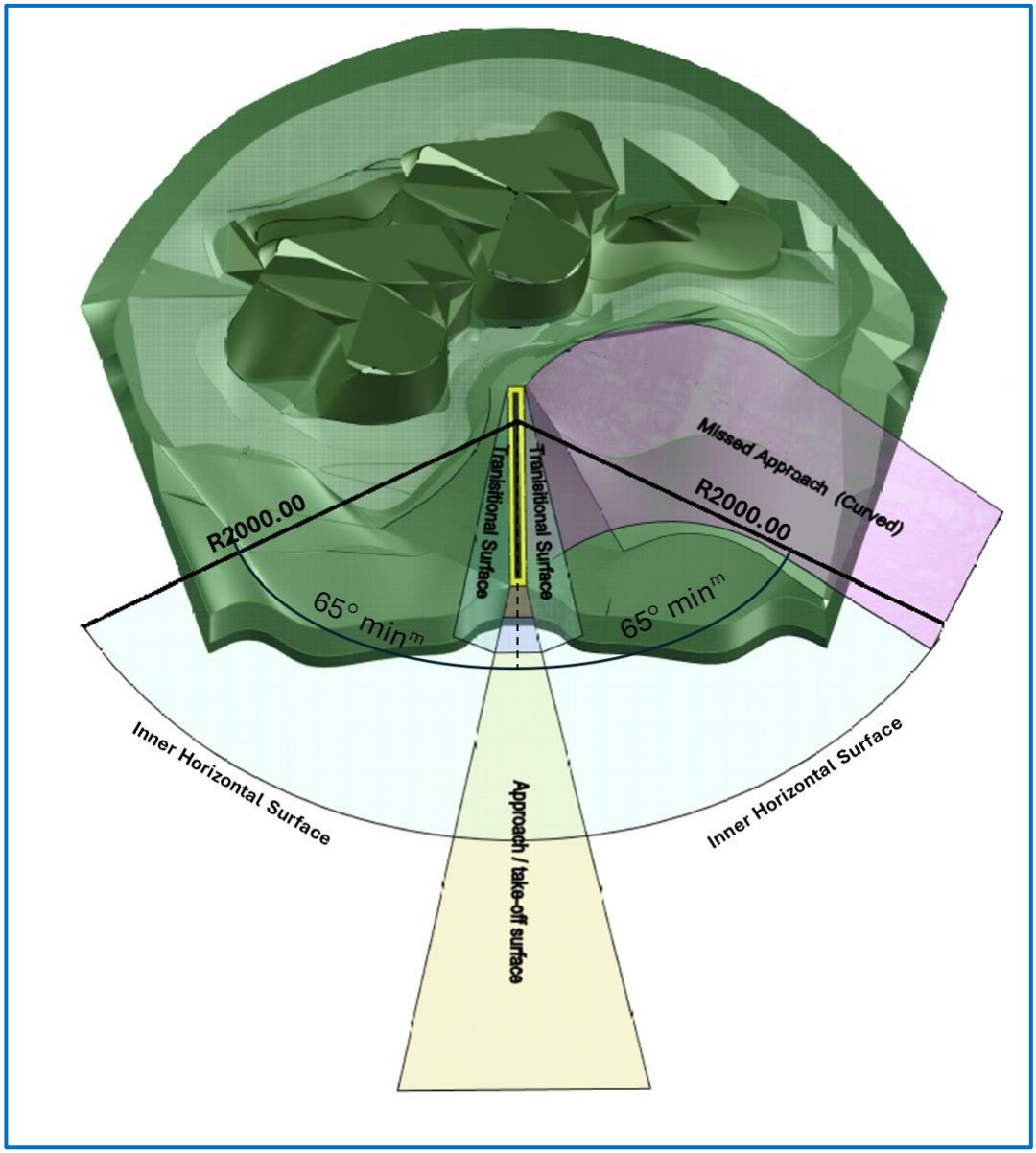

Figure ATT C-2: Missed approach surfaces at altiport on a mountain side

ATTACHMENT D

REFERENCES

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) AC139-6 Aerodrome design, Aeroplanes at or Below 5700 kg MCTOW (2015)

14) Supplement No. 178R2 of LET410 UVP-E20

15) Supplement No 1131, Dornier 228

16) PSM1 – 64 – POH, DHC – 6 – Twin Otter – Pilot Operating Handbook, Section 10.10.1 - Maximum Performance STOL Operations into Section 10 of PSM1-64-POH, after Temporary Revision 23.

ASIA PACIFIC GENERIC GUIDANCE MATERIALS AND CUSTODIANS

Procedure for periodic review and update of the Asia/Pacific Generic Guidance Materials in the area of Aerodromes and Ground Aids
[Second Edition, September 2024 approved by AOP/SG/8]

1. INTRODUCTION

1.1 In accordance with the TORs and task lists of the various Working Groups and Task Forces of AOP/SG, a number of Generic Guidance Materials (GGMs) were developed by these Working Groups/Task Forces and approved by AOP/SG and APANPIRG. All Generic Guidance Materials are published on ICAO APAC Website at eDocuments Webpage under AGA heading for use/reference by States/Administrations and can be accessed using URL: https://www.icao.int/APAC/Pages/eDocs.aspx.

1.2 The list of Asia/Pacific GGMs developed by various Working Groups and Task Forces and approved by AOP/SG and APANPIRG including the details of the Custodians is provided in **Attachments A to D**.

2. PROCEDURE

2.1 The Working Groups/Task Forces identify a custodian of the individual Asia/Pacific GGM from State(s)/ International Organization(s)/Industries with the responsibility to review and update the respective Asia/Pacific GGM(s) in coordination with ICAO APAC Office whenever it becomes necessary.

2.2 For periodic review and update of the Asia/Pacific GGMs in the area of AGA in future, the following process should be followed by the Custodians and the Secretariat:

a) The Secretariat would inform to the respective custodian(s) of the Asia/Pacific GGM(s) once ICAO approved amendments to ICAO SARPs and PANS-Aerodromes (Doc 9981), revisions to Airport Services Manuals and other relevant ICAO documents that may necessitate the review and update of the GGM(s);

b) The Secretariat/Custodian(s) exchange information about newly developed States/Industries good practices relevant to Asia/Pacific GGM(s) as soon as they become aware of their availability;

c) The custodian of the respective GGM coordinates with the relevant subject matter experts of the respective Working Group/Task Force and the Secretariat to initiate the review of the GGM;

d) Once the review and revision of the GGM is completed the custodian would present the revised GGM through the Working Paper at the respective WG/TF meeting for its endorsement with a draft conclusion for adoption by the AOP/SG; and

e) After the adoption of the draft conclusion by the AOP/SG the revised GGM(s) should be uploaded by the Secretariat on the ICAO APAC Website on eDocuments Webpage under AGA heading.

Attachment A

List of GGMs developed by AP-AA/WG and approved by AOP/SG with details of the custodians

S. No	APAC Generic Guidance Materials	Edition/Version, Date	States involved in the Development of Generic Guidance Materials	Custodian (Responsible party for future review and updates)
1	Asia Pacific Regional Guidance on AIP – AD 1.5 Status of Certification of Aerodromes	Version 1.0, Dec 2020	Secretariat	**Secretariat** apac@icao.int pshakya@icao.int
2	Generic Aerodrome Certification Procedure	Version 1.0, Dec 2020	Thailand (lead) and Philippines	**Thailand** - Mr. Teeravee Yongwattanajiaranon (Ling) teeravee.y@caat.or.th
3	Generic Procedures for Accepting Non-compliance in Aerodromes	Version 1.0, Dec 2020	Nepal (lead) and Malaysia	**Nepal** - Mr. Babu Ram Paudel paudelbabu@gmail.com
4	Generic Training Programme and Training Plan for Aerodrome Inspectors	Version 1.0, 2 July 2021	India	**India** - Mr. Amit Srivastava amits.dgca@nic.in
5	Generic Aerodrome Inspector Handbook	Version 2.0, 2023	Thailand (lead) and Bangladesh	**Thailand** - Mr. Teeravee Yongwattanajiaranon (Ling) teeravee.y@caat.or.th
6	Generic Aerodrome Manual	Version 1.0, 2 July 2021	India	**India** - Mr. Sudhir Singh sudhir_singh@hotmail.com and Mr. Amit Srivastava amits.dgca@nic.in
7	Generic Aerodrome Certification Specific Operating Regulations	Version 1.0, 2 July 2021	Malaysia (lead), India and Nepal	**Malaysia** - Mr. Mahyuddin Bin Sajuri mahyuddin@caam.gov.my
8	Generic Organization Structure of the Aerodrome Regulatory Unit	Version 1.0, 2 July 2021	Malaysia (lead), India and Nepal	**Malaysia** - Mr. Mahyuddin Bin Sajuri mahyuddin@caam.gov.my
9	Generic Surveillance Programme by Aerodrome Operators	Version 1.0, 2 July 2021	Malaysia (lead), India and Nepal	**Malaysia** - Mr. Mahyuddin Bin Sajuri mahyuddin@caam.gov.my
10	Generic Surveillance Programme for Certified Aerodromes	Version 1.0, August 2022	Malaysia (lead), India and Nepal	**Malaysia** - Mr. Mahyuddin Bin Sajuri mahyuddin@caam.gov.my

11	ICAO Asia-Pacific Aerodrome Assistance Go-Team Methodology	March 2024	ACI	**ACI** - Mr. SL Wong sl@aci-asiapac.aero ICAO Secretariat apac@icao.int
12	Asia-Pacific Generic Aerodrome Enforcement Policy and Procedures Manual	October 2023	Malaysia (Lead) and India	**Malaysia** - Mr. Mahyuddin Bin Sajuri mahyuddin@caam.gov.my
13	Asia-Pacific Generic Aerodrome Exemptions Policy and Procedures Manual	October 2023	Australia (Lead) and India	**Australia [TBC]**
14	Asia-Pacific Generic Aerodrome SMS Evaluation Tool and Guidance	First Edition, September 2024	Thailand (Lead), Australia, and Maldives.	**Thailand** - Angsana Panmongkon angsana.r@caat.or.th

Attachment B

List of GGMs developed by AP-WHM/WG and approved by AOP/SG with details of the custodians

S. No	APAC Generic Guidance Materials	Edition/Version, Date	States involved in the Development of Generic Guidance Materials	Custodian (Responsible party for coordination for future review and updates)
1	Composition of National Wildlife Hazard Management Committee	Sep. 2019	Nepal, Bhutan, Lao PDR	**Nepal** Mr. Deo Chandra Lal Karna, d_karna@hotmail.com
2	Terms of References of National Wildlife Hazard Management Committee	Sep. 2019	Nepal, Bhutan, Lao PDR	**Nepal** Mr. Deo Chandra Lal Karna, d_karna@hotmail.com
3	Asia Pacific Guidance for Evaluation of Aerodrome Wildlife Hazard Management Programme	First Edition, 2 July 2021	WBA, Australia, Bangladesh, India, Thailand and ACI	**WBA** Ms. Lalita Vaswani lalita@worldbirdstrike.com
4	Asia Pacific Guidance for Establishment of National Procedure for Recording and Reporting Wildlife Strikes to Aircraft	First Edition, 2 July 2021	Philippines, Sri Lanka, Nepal, WBA, IFALPA	**WBA** Ms. Lalita Vaswani lalita@worldbirdstrike.com
5	Asia Pacific Guidance on Development and Implementation of Airport Wildlife Hazard Management Programme	First Edition, August 2022	Australia, Fiji, India, WBA, AAPA	**WBA** Ms. Lalita Vaswani lalita@worldbirdstrike.com
6	ICAO Asia Pacific Wildlife Hazard Management Go-Team Methodology	Second Edition, …. 2024	Australia, India, Thailand, ACI and WBA	**Australia** Ashley McAlpine Ashley.Mcalpine@casa.gov.au

Attachment C

List of GGMs developed by AOPC/SWG and approved by AOP/SG

S. No	APAC Generic Guidance Materials	Edition/Version, Date	States involved in the Development of Generic Guidance Materials	Custodian (Responsible party for coordination for future review and updates)
1	Asia/Pacific Regional Guidance on Aerodrome Operations Personnel Competency Requirement Framework	Version 1.0 – December 2020	Bangladesh, Cambodia, China, Macao, China (Lead), Maldives, Myanmar Singapore, ACI	Mr. Pedro Cavem (Yangon International Aerodrome, Myanmar) Email: Pedro.Cavem@yangon.aero

Attachment D

List of GGMs developed by WA/SWG and approved by APANPIRG

S. No	APAC Generic Guidance Materials	Edition/Version, Date	States involved in the Development of Generic Guidance Materials	Custodian (Responsible party for coordination for future review and updates)
1	Sample APAC Regulations for Water Aerodromes	First Edition (unedited version) — March 2015	Indonesia, Maldives (Lead), Sri Lanka, New Zealand and USA	CAA Maldives Ms. Fathimath Ramiza Email: ramiza@caa.gov.mv
2	Asia Pacific Regional Guidance on Requirements for the Design and Operations of Water Aerodromes for Seaplane Operations	First Edition — January 2019	Indonesia, Maldives (Lead), Sri Lanka, New Zealand and USA	CAA Maldives Ms. Fathimath Ramiza Email: ramiza@caa.gov.mv

—END—

ICAO APAC WHM Go Team Assistance Mission Programme Document

1. Purpose

This document offers a structured program for a five-day mission of an ICAO Wildlife Hazard Management (WHM) Go Team. The program content may be customised to align with the specific needs and environment of the Host State.

2. Preparations Before the Mission

The leader of the Go Team mission should send an ICAO APAC questionnaire on WHM to the Host State at least 6 weeks before the mission. The Host State is expected to complete the questionnaire at least two weeks before the mission, enabling a better understanding of their WHM requirements and challenges. The Host State is also expected to identify and invite well in advance relevant stakeholders in their State to participate in the Go Team activities.

Members of the Go Team mission should send necessary documents to the Host State for security clearance and preparation of airside permits. The onus of obtaining the necessary permits and clearances for airside access shall be the sole responsibility of the State in coordination with the airport well in advance taking into consideration the duration of the Go Team program, as the State specific security regulations may vary and the application process take time.

3. Mission Program

The Go Team may follow or adapt the mission program detailed below to suit the needs of the Host State. The program should be communicated at least two weeks in advance to the Host State for effective coordination and planning with relevant stakeholders.

Day	Activities	Action By or Participants
Day 1	Initial meeting and introductions	Host State and Go team
	Explain mission by Go Team, including objective of mission, ICAO requirements and guidance on WHM e.g. Annex 14, doc 9137 Part 3, and industry guidance (WBA, ACI guidance)	Go Team
	Explain the framework of State Safety Programme (SSP) to establish a national plan and procedures related to wildlife hazard management, not only at the aerodrome but also in its vicinity.	Host State
	Present an overview of WHM in State, including regulations, SSP, national plan, procedures, established committees, and wildlife strikes data.	Host State
	Identify and review key WHM concerns and adjust mission program as needed based on the questionnaire completed by Host State before the mission and the discussions in the morning of Day 1.	Host State and Go Team

Day	Activities	Action By or Participants
Day 2	Morning session - discussion on key concerns and actions taken so far. Considering location, resourcing, and any environmental factors, discuss potential practical mitigation options available. Afternoon session - Fieldwork to assess current WHM practices such as: • Habitat management; • Risk assessment and mitigation; • Identification of species, wildlife survey and monitoring, and strike data; and • Wildlife hazard control measures.	Host State and Go Team
Day 3	Based on discussions and evidence gathered on previous days and in consultation with the Go Team, Host State to propose an outline action plan and to prepare roadmap to progress and complete action plan. Reference documents for preparation of action plan and roadmap: • State WHM Program and documents, e.g. audit procedure • Airport WHM Plan (agree on an alternative if Airports do not have a WHMP, e.g. any relevant documents available providing essential elements of a WHM Plan) • State regulations and procedures related to WHM	Go Team accompanied by the relevant stakeholders of the Host State

Day 4	In the morning, continuation of discussion on recommendations and action plan.
	
	In the afternoon draft initial report consisting of:
	
	• *Key observations*:
	  • Summary of Key WHM Concerns: Go-Team members should compile a concise summary of the most critical WHM concerns identified during the mission (Day 1-4). These should be the issues that have the highest potential impact on aviation safety.
	
	• *Observations*:
	  • Achievements and opportunities for improvements in the Host State's existing
		Host State and Go Team
		
		Go Team

Day	Activities	Action By or Participants
	WHM program covering aspects such as documentation, training, monitoring, reporting, and coordination. • Detailed WHM Findings: Provide details of the WHM situation in the host state based on the mission's observations. • Implementation of ICAO SARPs recommended practices of international associations guidance related to WHM. Identify and document any areas where there may be deviations or room for improvement. • *Recommendations*: • Mitigation Measures and enhancements to existing practices: Offer specific recommendations for addressing the identified and emerging WHM concerns. These recommendations should be actionable and tailored to the context of the Host State. These may include suggestions to improve existing regulatory framework, protocols, equipment, or training programs. • Discussions of potential improvements in implementation of ICAO SARPs. • *Roadmap* • Timelines: Develop a timeline for implementing the recommended actions. Specify short-term and long-term goals, indicating when each action should be completed. • Action Items: List the specific tasks or actions required to achieve each recommendation. These action items should be detailed, outlining the steps needed to carry out the recommendations effectively.	
Day 5	Presentation of initial report with preliminary observations and recommendations, recommended action plan and roadmap to undertake and complete agreed actions. Discussions and comments on initial report	Go Team and Relevant Stakeholders Host State and relevant Stakeholders

4. Follow Up After the Mission

The Go Team should submit a final report on the mission based on the agreed initial report to the Host State with a copy to the Regional Office of ICAO APAC within 6 weeks after the mission.

The Host State should review and provide any comment on the report back to the Go Team via the Regional Office of ICAO APAC within 3 months after receiving the report.

References

- Annex 14 Aerodromes
- Annex 19 Safety Management
- Doc 9981 PANS Aerodrome
- Doc 9137 Part 3 on Wildlife Hazard Management of the Airport Services Manual
- Doc 9332 Manual on the ICAO Bird Strike Information System (IBIS) (new 2024 edition expected)
- WHM Go Team Methodology (Appendix D to WHM-WG/5 Report)
- ACI Wildlife Hazard Management Handbook
- ICAO APAC Regional WHM documents (under the AGA tab)
- Survey Questionnaire - State's problems /issues /deficiencies on Wildlife Hazard Management (Attachment to State Letter T 11/5.9 — AP069/19 (AGA))
- WBA guidance documents

Additional References

- Australian Airport Association (AAA) Airport Practice Note 9 - Wildlife Hazard Management at Airports
- Australian Airport Association (AAA) Airport Practice Note 6 - Managing Bird Strike Risk-Species Information
- Australian Aviation Wildlife Hazard Group (AAWHG) Recommended Practice 1.3 Wildlife Risk Assessment and Analysis

- End -

List of Aerodromes used for International Operations in APAC Region that have to be certified

S. No in APAC Database	Sub-region	State / Admin	ICAO Code	Name of City	Name of Aerodrome
1	SA	Afghanistan	OAHR	Herat	Herat Intl
2	SA	Afghanistan	OAKB	Kabul	Kabul Intl
3	SA	Afghanistan	OAKN	Kandahar	Kandahar Intl
4	SA	Afghanistan	OAMS	Mazar-e-Sharif	Mazar-e-Sharif
42	SEA	Brunei	WBSB	Brunei	Brunei Intl
73	NA	China	RCYU	Hualien	Hualien
107	NA	China	RCMQ	Taichung	Cingcyuangang
108	NA	China	RCNN	Tainan	Tainan
149	SA	India	VICG	Chandigarh	
154	SA	India	VOGO	Goa	
155	SA	India	VEGK	GORAKHPUR	
157	SA	India	VIDX	HINDAN	
161	SA	India	VIJO	JODHPUR	
172	SA	India	VOPB	Port Blair	
173	SA	India	VAPO	Pune	
175	SA	India	VISR	Srinagar	
180	SA	India	VOVZ	VISAKHAPATAN	
250	PAC	Kiribati	PLCH	Kiritimati	Christmas I.
251	PAC	Kiribati	NGTA	Tarawa	Bonriki Intl
253	SEA	Lao PDR	VLLB	Luangprabang	Luangprabang Intl
254	SEA	Lao PDR	VLSK	Kaisonphimvihan	Savannakhet Intl
255	SEA	Lao PDR	VLPS	Pakse	Pakse Intl
264	SEA	Malaysia	WMKD	Kuantan	Haji Ahmad Shah
266	SEA	Malaysia	WBKL	Labuan	
282	PAC	Micronesia	PTPN	Pohnpei I.	Pohnpei Intl
283	PAC	Micronesia	PTKK	Weno I.	FM Chuuk Intl
284	PAC	Micronesia	PTYA	Yap I.	Yap Intl
285	PAC	Micronesia	PTSA	Kosrae I.	Kosrae
292	PAC	Nauru	ANYN	Nauru I.	Nauru intl
321	SEA	Philippines	RPVK	Kalibo, Aklan	Kalibo Intl*
325	SEA	Philippines	RPLC	Pampanga	Diosdado Macapagal Intl*
326	SEA	Philippines	RPVP	Puerto Princesa City	Puerto Princesa Intl*
327	SEA	Philippines	RPSP	Panglao	Bohol-Panglao Intl*
350	SEA	Thailand	VTSG	Krabi	
355	SEA	Thailand	VTSB	Surat Thani	

S. No in APAC Database	Sub-region	State / Admin	ICAO Code	Name of City	Name of Aerodrome
357	SEA	Timor Leste	WPDB	Suai	Commander-in-Chief of the FALINTIL – Kay Rala Xanana Gusmão Intl
360	PAC	Tuvalu	NGFU	Funafuti	Funafuti Intl

* Airports granted with temporary aerodrome certificates