สำนักงานการบินพลเรือนแห่งประเทศไทย
Civil Aviation Authority of Thailand

Aerodrome Inspection Manual

Issue: 3

Revision: 00

Date: 8 November 2019

CAAT-AGA-AIM (01)

Approved By

Suchat Angthong

Manager of Aerodrome Standards Department

The Civil Aviation Authority of Thailand

UNCONTROLLED WHEN PRINTED OUT

FOREWARD

This manual provides Aerodrome Inspector with the policy, guidance and standard operating procedures for the conduct of aerodrome certification, surveillance and enforcement duties in compliance with Air Navigation Act B.E.2497, section 60/20, 66(1) and as authorized by The Civil Aviation Authority of Thailand Emergency Decree B.E. 2558, Section 37 to regulate, control, inspect and follow up all operations pertaining to aerodromes, S37(1)(n).

All subject matters pertaining to inspections conducted by Aerodrome Inspector, their duties, responsibilities, accountabilities and procedures are included in this manual to the extent possible, together with tools and mechanisms to meet the objectives and policies. Aerodrome Inspector are expected to use good judgement while dealing with the matters where specific guidance is not available.

It is the responsibility of the AGA Department to ensure that this manual is kept up-to-date by immediately inserting a specified revision to accurately reflect changes in Civil Aviation Authority of Thailand (CAAT) policies, regulations, and any related procedures.

Suchat Angthong
Manager of Aerodrome Standards Department

Intentionally Left Blank

0 ADMINISTRATION

0.1 Table of contents

0.2 List of Effective Pages

Page	Revision	Date
0-1	00	8 Nov 2019
0-2	00	8 Nov 2019
0-3	00	8 Nov 2019
0-4	00	8 Nov 2019
0-5	00	8 Nov 2019
0-6	00	8 Nov 2019
0-7	00	8 Nov 2019
0-8	00	8 Nov 2019
0-9	00	8 Nov 2019
0-10	00	8 Nov 2019
0-11	00	8 Nov 2019
0-12	00	8 Nov 2019
0-13	00	8 Nov 2019
0-14	00	8 Nov 2019
0-15	00	8 Nov 2019
0-16	00	8 Nov 2019
0-17	00	8 Nov 2019
0-18	00	8 Nov 2019
0-19	00	8 Nov 2019
0-20	00	8 Nov 2019
0-21	00	8 Nov 2019
0-22	00	8 Nov 2019
0-23	00	8 Nov 2019
0-24	00	8 Nov 2019
0-25	00	8 Nov 2019
0-26	00	8 Nov 2019
1-1	00	8 Nov 2019
1-2	00	8 Nov 2019
1-3	00	8 Nov 2019

Page	Revision	Date
1-4	00	8 Nov 2019
1-5	00	8 Nov 2019
1-6	00	8 Nov 2019
1-7	00	8 Nov 2019
1-8	00	8 Nov 2019
1-9	00	8 Nov 2019
1-10	00	8 Nov 2019
2-1	00	8 Nov 2019
2-2	00	8 Nov 2019
2-3	00	8 Nov 2019
2-4	00	8 Nov 2019
2-5	00	8 Nov 2019
2-6	00	8 Nov 2019
3-1	00	8 Nov 2019
3-2	00	8 Nov 2019
3-3	00	8 Nov 2019
3-4	00	8 Nov 2019
3-5	00	8 Nov 2019
3-6	00	8 Nov 2019
3-7	00	8 Nov 2019
3-8	00	8 Nov 2019
3-9	00	8 Nov 2019
3-10	00	8 Nov 2019
3-11	00	8 Nov 2019
3-12	00	8 Nov 2019
3-13	00	8 Nov 2019
3-14	00	8 Nov 2019
3-15	00	8 Nov 2019
3-16	00	8 Nov 2019

Page	Revision	Date
3-17	00	8 Nov 2019
3-18	00	8 Nov 2019
3-19	00	8 Nov 2019
3-20	00	8 Nov 2019
3-21	00	8 Nov 2019
3-22	00	8 Nov 2019
3-23	00	8 Nov 2019
3-24	00	8 Nov 2019
3-25	00	8 Nov 2019
3-26	00	8 Nov 2019
3-27	00	8 Nov 2019
3-28	00	8 Nov 2019
3-29	00	8 Nov 2019
3-30	00	8 Nov 2019
3-31	00	8 Nov 2019
3-32	00	8 Nov 2019
4-1	00	8 Nov 2019
4-2	00	8 Nov 2019
4-3	00	8 Nov 2019
4-4	00	8 Nov 2019
4-5	00	8 Nov 2019
4-6	00	8 Nov 2019
4-7	00	8 Nov 2019
4-8	00	8 Nov 2019
5-1	00	8 Nov 2019
5-2	00	8 Nov 2019
5-3	00	8 Nov 2019
5-4	00	8 Nov 2019
5-5	00	8 Nov 2019
5-6	00	8 Nov 2019

Page	Revision	Date
5-7	00	8 Nov 2019
5-8	00	8 Nov 2019
5-9	00	8 Nov 2019
5-10	00	8 Nov 2019
5-11	00	8 Nov 2019
5-12	00	8 Nov 2019
5-13	00	8 Nov 2019
5-14	00	8 Nov 2019
5-15	00	8 Nov 2019
5-16	00	8 Nov 2019
5-17	00	8 Nov 2019
5-18	00	8 Nov 2019
5-19	00	8 Nov 2019
5-20	00	8 Nov 2019
5-21	00	8 Nov 2019
5-22	00	8 Nov 2019
5-23	00	8 Nov 2019
5-24	00	8 Nov 2019
5-25	00	8 Nov 2019
5-26	00	8 Nov 2019
5-27	00	8 Nov 2019
5-28	00	8 Nov 2019
5-29	00	8 Nov 2019
5-30	00	8 Nov 2019
5-31	00	8 Nov 2019
5-32	00	8 Nov 2019
5-33	00	8 Nov 2019
5-34	00	8 Nov 2019
5-35	00	8 Nov 2019
5-36	00	8 Nov 2019

Page	Revision	Date
5-37	00	8 Nov 2019
5-38	00	8 Nov 2019
5-39	00	8 Nov 2019
5-40	00	8 Nov 2019
5-41	00	8 Nov 2019
5-42	00	8 Nov 2019
5-43	00	8 Nov 2019
5-44	00	8 Nov 2019
5-45	00	8 Nov 2019
5-46	00	8 Nov 2019
5-47	00	8 Nov 2019
5-48	00	8 Nov 2019
5-49	00	8 Nov 2019
5-50	00	8 Nov 2019
5-51	00	8 Nov 2019
5-52	00	8 Nov 2019
5-53	00	8 Nov 2019
5-54	00	8 Nov 2019
5-55	00	8 Nov 2019
5-56	00	8 Nov 2019
5-57	00	8 Nov 2019
5-58	00	8 Nov 2019
5-59	00	8 Nov 2019
5-60	00	8 Nov 2019
5-61	00	8 Nov 2019
5-62	00	8 Nov 2019
5-63	00	8 Nov 2019
5-64	00	8 Nov 2019
5-65	00	8 Nov 2019
5-66	00	8 Nov 2019

Page	Revision	Date
5-67	00	8 Nov 2019
5-68	00	8 Nov 2019
5-69	00	8 Nov 2019
5-70	00	8 Nov 2019
6-1	00	8 Nov 2019
6-2	00	8 Nov 2019
6-3	00	8 Nov 2019
6-4	00	8 Nov 2019
6-5	00	8 Nov 2019
6-6	00	8 Nov 2019
6-7	00	8 Nov 2019
6-8	00	8 Nov 2019
6-9	00	8 Nov 2019
6-10	00	8 Nov 2019
6-11	00	8 Nov 2019
6-12	00	8 Nov 2019
6-13	00	8 Nov 2019
6-14	00	8 Nov 2019
6-15	00	8 Nov 2019
6-16	00	8 Nov 2019
6-17	00	8 Nov 2019
6-18	00	8 Nov 2019
6-19	00	8 Nov 2019
6-20	00	8 Nov 2019
6-21	00	8 Nov 2019
6-22	00	8 Nov 2019
6-23	00	8 Nov 2019
6-24	00	8 Nov 2019
6-25	00	8 Nov 2019
6-26	00	8 Nov 2019

Page	Revision	Date
6-27	00	8 Nov 2019
6-28	00	8 Nov 2019
6-29	00	8 Nov 2019
6-30	00	8 Nov 2019
6-31	00	8 Nov 2019
6-32	00	8 Nov 2019
6-33	00	8 Nov 2019
6-34	00	8 Nov 2019
6-35	00	8 Nov 2019
6-36	00	8 Nov 2019
6-37	00	8 Nov 2019
6-38	00	8 Nov 2019
6-39	00	8 Nov 2019
6-40	00	8 Nov 2019
6-41	00	8 Nov 2019
6-42	00	8 Nov 2019
6-43	00	8 Nov 2019
6-44	00	8 Nov 2019
6-45	00	8 Nov 2019
6-46	00	8 Nov 2019
6-47	00	8 Nov 2019
6-48	00	8 Nov 2019
6-49	00	8 Nov 2019
6-50	00	8 Nov 2019
6-51	00	8 Nov 2019
6-52	00	8 Nov 2019
6-53	00	8 Nov 2019
6-54	00	8 Nov 2019
6-55	00	8 Nov 2019
6-56	00	8 Nov 2019

Page	Revision	Date
6-57	00	8 Nov 2019
6-58	00	8 Nov 2019
6-59	00	8 Nov 2019
6-60	00	8 Nov 2019
6-61	00	8 Nov 2019
6-62	00	8 Nov 2019
6-63	00	8 Nov 2019
6-64	00	8 Nov 2019
6-65	00	8 Nov 2019
6-66	00	8 Nov 2019
6-67	00	8 Nov 2019
6-68	00	8 Nov 2019
6-69	00	8 Nov 2019
6-70	00	8 Nov 2019
6-71	00	8 Nov 2019
6-72	00	8 Nov 2019
6-73	00	8 Nov 2019
6-74	00	8 Nov 2019
6-75	00	8 Nov 2019
6-76	00	8 Nov 2019
6-77	00	8 Nov 2019
6-78	00	8 Nov 2019
6-79	00	8 Nov 2019
6-80	00	8 Nov 2019
6-81	00	8 Nov 2019
6-82	00	8 Nov 2019
6-83	00	8 Nov 2019
6-84	00	8 Nov 2019
6-85	00	8 Nov 2019
6-86	00	8 Nov 2019

Page	Revision	Date
6-87	00	8 Nov 2019
6-88	00	8 Nov 2019
6-89	00	8 Nov 2019
6-90	00	8 Nov 2019
6-91	00	8 Nov 2019
6-92	00	8 Nov 2019

Page	Revision	Date

0.3 Revision Highlights

This version of the manual is a new issue.

The versions of these manuals published before the date of publication of this manual are considered as cancelled and superseded by this manual.

A vertical black line on the left-hand side of the page identifying the change of this version.

Issue	Revision	Effective	Revised by	Reason
01	00	9 Nov 2018	Pongsatorn P.	Initial Issue
02	00	15 Apr 2019	Chomchanok H.	Revise Procedure
03	00	8 Nov 2019	Pongsatorn P.	Revise contents and procedures according to CAAT re-organization.

0.4 Distribution List

Control Number	Holder of Copy	Remarks
Original	AGA	Hard Copy
01	QAD	Electronic copy on E-document system
02	AGA	Electronic copy on AGA Information Management System (AGA IMS)

Control of Manual

This Manual is approved by the AGA Manager. The AGA Manager shall ensure that this Manual contains legible and accurate information, is easily understood and presented in a format that meets the needs of all CAAT staff.

The contents of this Manual shall not be altered in anyway, reproduced, stored in a retrieval system or transmitted in part or whole in any form, by any means (electronic, mechanical, photocopying or otherwise), without the express written consent of AGA.

AGA shall retain a secure, archived copy of the following documents for a minimum period of 5 years, including:

a. All revisions of this manual;
b. Record of all controlled hard copies with manual control number;
c. Background and/or source references; and
d. Transmittal letters/dissemination control forms.

All obsolete revisions shall be identified and disposed accordingly. Hard copies shall be disposed by shredding, whilst expired e-documents shall be deleted from the primary server and archived.

Review, Revision and Approval Process

This Manual shall be reviewed at least every 12 months. AGA shall format the Manual pages to include the changes and submit the revised manual pages to the AGA Manager for approval. In this regard, the AGA Manager shall:

- ensure the information provided in this manual is updated and current;
- identify the need for updates, by means of effective auditing, consultation with relevant departments and continuous review of the quality requirements; and
- notify AGA staff when this manual is approved or revised.

Dissemination and Transmission

As part of our efforts toward conservation, electronic dissemination and transmission should be the preferred mode. The dissemination and transmission of this Manual shall be communicated by AGA to all CAAT senior management. An electronic version of this manual shall be made available to all Staff members on the CAAT E-document System.

If applicable, controlled hard copies of this manual shall be distributed to the recipients listed in the "Controlled Distribution List" section. Any additional request of controlled hard copies of this manual shall be made in writing to AGA.

Change Request

Any individual or department (Originator) seeking improvements or changes to the contents of this manual, shall notify AGA in writing or via e-mail, providing all supporting information and justification. The submission shall contain sufficient information to identify:

a. Originator Department and Contact Number;
b. Pertinent paragraph reference(s);
c. Concise context of the requested change;
d. Related information or reference documents, if any; and
e. Reason for the requested change.

AGA shall perform a preliminary review of the change request and verify conformance to the Requirements and if necessary, confer with the Originator before submitting the request to the AGA Manager for approval. Upon approval from the AGA Manager, AGA shall inform the relevant Department Director and/or Originator of the change.

Policy and Compliance Statement

AGA Policy

AGA adheres to practices that promote the highest aerodrome standards and safety. We are committed to providing all the resources needed to implement this safety policy, and to meet or exceed all applicable ICAO Standards and Recommended Practices (SARPs).

AGA supports an open and just reporting culture, and encourages honesty, respect and an environment where individuals are accountable for their actions and can expect to be treated fairly. Honest mistakes, those that are not due to negligence, deliberate violations or willful misconduct, should not be punished. We strive to learn from all events, and to promote

safety and risk awareness throughout the aviation industry, with the aim to continually improve the safety level of the Thai aviation industry.

The responsibility for making AGA operations efficient lies with each individual employee and the AGA Manager. The AGA Manager is responsible and accountable for implementing the quality management systems in his or her area, and for ensuring that all reasonable steps are taken to improve quality of work. All processes shall be planned, documented, monitored and evaluated based on regulatory requirements and CAAT procedures, and promulgated via clear and measurable steps so as to maximize quality.

Compliance Statement

The Manual complies with the applicable elements of the ICAO requirements, the terms and conditions of the Air Navigation Act B.E. 2497, and CAAT Emergency Decree B.E. 2558.

The Manual defines the requirements and establishes the CAAT Standard for Aerodrome Inspector to conduct aerodrome audit/inspection with adequacy of procedures required to ensure safe operational practices and Aerodromes in Thailand. The Manual contains procedures designed to verify that all functions are being conducted in accordance with all applicable requirements, standards and procedures.

It is the responsibility of AGA staff to familiarize oneself with the content of this Manual and keep the Manual up-to-date by immediately inserting all revisions when they are issued. The contents of this Manual are confidential. The transmission or revelation of its contents in any manner to persons not associated with CAAT is strictly prohibited.

The AGA Manager shall ensure that the manual accurately reflects the operational policies, regulations and procedures, and all CAAT operations are carried out strictly based on this Manual by the responsible functions.

0.5 Definitions and Acronyms

0.5.1 Definitions

The following terminology based on current ICAO Standards and Recommended Practices is specific to the Aerodrome Inspection Manual (AIM). Aerodrome Inspector(s) must also take account of any slightly different definitions that may apply from time to time in accordance with the Air Navigation Act.

In this document English (Canada) is used to facilitate the reference of all words to ICAO documents when searching in digital PDF format.

Aerodrome	A defined area on land or water (including any buildings, installations and equipment) intended to be used either wholly or in part for the arrival, departure and surface movement of aircraft, ICAO Annex 14 Vol 1; 1.1.
Audit	A systematic and objective review of an entity's operation to verify compliance with aviation regulations, conformity with or adherence to required standards as well as CAA-approved documented policies, processes, and procedures.
Audit activities	Those activities and procedures through which information is obtained to verify the auditee's conformance to applicable regulations and standards. Such activities may include, but are not limited to: interviews, observations, inspections and the review of files and documents.
Auditee	The organization to be audited. This term may be interchanged with "organisation", "company", "operator", "aerodrome operator", "private aerodrome operator".
Audit finding	The determination of non-conformance of a product, process, practice or procedure or a characteristic thereof to a specified regulation or standard. This will be documented on the Non-Compliance Form.

Annual Audit Programme	The annual plan of scheduled audits intended to measure the level of an organization's conformance. These organizations include designated aerodrome operators.
Audit report	A report that outlines the audit process and provides a summary of the audit findings.
Certification	The process of determining competence, qualification, or quality on which the issuance of a Public Aerodrome Operating Certificate is based. This includes the original issuance, renewal, amendment or transfer of the certificate.
Characteristic	Any distinct property or attribute of a product, process, service or practice of which the conformance to a regulation or standard can be measured.
Confirmation	The assurance that audit findings are in accordance with data obtained from different sources.
Competent Official	The Director General and a person appointed by the Minister to execute the duties under Air Navigation Act B.E. 2497 (S4)
Confirmation Request Form (CRF)	A form issued during the inspection portion of an audit to the auditee by the Aerodrome Inspector requesting information that is not readily available. The auditee will be requested to respond within a specified time period.
Conformance	The state of meeting the requirements of a regulation or standard.
Corrective Action Plan (CAP)	A plan submitted to the competent official or to his or her delegate by the auditee, following receipt of the audit report. This plan outlines the manner in which the aerodrome operator proposes to correct the deficiencies identified by the audit findings. Carrying out the plan should bring the auditee into full conformance with regulatory requirements.
Depth	The period of time over which an aerodrome operator will be audited, normally from the last audit up to the present day.

Documented	That which has been recorded in writing, photocopied or photographed and then signed, dated and retained so as to ensure the continuity of the evidence secured.
Follow-up	The activity following an audit that is dedicated to program modification based on an approved Corrective Action Plan. Follow-up ensures that the aerodrome operator or certificate holder meets regulatory requirements.
Inspection	The basic activity of an audit, which involves detailed examination of specific activities, products or services.
Non-conformance	The failure of characteristics, documentation or a procedure to meet the requirements of a regulation or standard, which renders the quality of a product or service unacceptable or uncertain.
Practice	The method by which a procedure is carried out.
Principal Inspector	The aerodrome inspector who hold valid CAAT inspector Credential card that appointed by The Director General.
Product	The end result of a procedure or process.
Procedure	A series of steps followed in a methodical manner to complete an activity or a process, describing what should be done, when and by whom; where and how each step should be carried out; what information, documentation and resources should be used; and how it should all be controlled, ICAO Doc 9735, 1.3.
Process	A set of interrelated or interacting activities that transforms inputs into outputs. Processes within an organization or programme are generally planned and carried out under controlled conditions to add value, ICAO Doc 9735, 1.3.
Public Aerodrome Operating Certificate	A letter issued to the owner or operator of a Licensed Aerodrome or a Licensed Temporary Takeoff and Landing Area, permitted to provide services to the public under Section 60/1 of Air Navigation Act, S4.

Quality	The totality of features and characteristics of a product, process, or service that bears on its ability to satisfy stated or implied needs, ISO 8402.
Quality assurance	Part of quality management focused on providing confidence that quality requirements will be fulfilled (ISO 9000*), ICAO Annex 15, 1.1.
Quality control	Part of quality management focused on fulfilling quality requirements (ISO 9000*), ICAO Annex 15, 1.1.
Quality management	Coordinated activities to direct and control an organization with regard to quality (ISO 9000*), ICAO Annex 15, 1.1.
Quality system	The organizational structure, procedures, processes and resources needed to implement quality management, ISO 8402.
Recommended Practice (ICAO)	Any specification for physical characteristics, configuration, material, performance, personnel or procedure, the uniform application of which is recognized as desirable in the interest of safety, regularity or efficiency of international air navigation, and to which each contracting State undertakes to adopt, so far as it may find practicable, ICAO Annex 14 Vol 1 Foreword & Convention Art 28.
Sampling	The inspection of a representative portion of a particular characteristic to produce a statistically meaningful assessment of the whole.
Scope	The number of functional areas within an aerodrome operator that will be audited.
Standard (generic)	An established criterion used as a basis for measuring an auditee's level of conformance.
Standards (ICAO)	Any specification for physical characteristics, configuration, materiel, performance, personnel or procedure, the uniform application of which is recognized as necessary for the safety or regularity of international air navigation and to which Contracting States will conform in accordance with the Convention; in the event of

	impossibility of compliance, notification to the Council is compulsory under Article 38, ICAO Annex 14 Vol 1; Foreword.
Team leader	The individual appointed by the AGA Manager to conduct audit.
Team member	The individual appointed by the team leader to participate audit.
Special-purpose audit	An audit intended to respond to special circumstances beyond initial certification, requests for additional authority or routine conformance monitoring.
Verification	An independent review, inspection, examination, measurement, testing, checking, observation and monitoring to establish and document that products, processes, practices, services and documents conform to regulatory requirements. This includes confirmation that an activity, condition or control conforms to the requirements specified in contracts, codes, regulations, standards, drawings, specifications, program element descriptions, and technical procedures.
Working papers	All documents required by the auditor or audit team to plan and implement the audit. These may include audit schedules, auditor assignments, checklists and various report forms.

0.5.2 Acronyms

The following list contains key acronyms used in this Manual, as well as others likely to be in common use in the operation of the Aerodrome.

ACN	Aircraft Classification Number
AEP	Aerodrome Emergency Plan
AGA	Aerodrome Standards Department
AGA-PHC	Physical Characteristics Inspector
AGA-VAN	Visual Aids for Navigation Inspector
AGA-AOI	Airside Operations Inspector
AGA-ERF	Emergency Plan and Rescue and Fire Fighting Inspector
AGL	Airfield Ground Lighting
AI	Aerodrome Inspector
AIM	Aerodrome Inspection Manual
ANS	Air Navigation Standards Department
AOCC	Airport Operation Control Centre
AVP	Airside Vehicle Permit
CAAT	The Civil Aviation Authority of Thailand
CAP	Corrective Action Plan
CE	Aerodrome Certification Division
CPR	Cardio Pulmonary Resuscitation
CTL	Certification Team Lead
CRF	Confirmation Request Form
DCA	Department of Civil Aviation
DG	Director General
FATO	Final Approach and Take-Off area
FOD	Foreign Object Debris
LEG	Legal Department
LVP	Low Visibility Procedures
MEHT	Minimum Eye Height over Threshold
NCF	Non-Compliance Form
OJT	On-the-Job Training

PCN	Pavement Certification Number
RCAB	Regulation of Civil Aviation Board
RQCAAT	Requirements of The Civil Aviation Authority of Thailand
RDCA	Requirements of Department of Civil Aviation
RESA	Runway End Safety Area
RVR	Runway Visual Range
SFD	Aviation Security and Facilitation Standards Department
VDGS	Visual Docking Guidance System

Intentionally Left Blank

1 INTRODUCTION

1.1 Objective

The Aerodrome Inspection Manual (AIM) provides policy, guidance and standard procedures to the Aerodrome Inspector (AI) conducting aerodrome audits/inspections to ensure that Civil Aviation audit policies and procedures are applied uniformly.

1.2 Applicability

This manual is part of CAAT document set. It includes processes, flowcharts, letters, forms and other supporting documents that applicable to every Aerodrome Inspector and Aerodrome Standards Department staff (AGA staff).

Responsibility for the development, implementation and maintenance of AIM rests with the Aerodrome Standards Department Manager (AGA Manager) . Specifically, designated Aerodrome Inspector are accountable for the ongoing tasks required to ensure that the contents of AIM are being effectively implemented in order to satisfy the following objectives:

A. To verify the effective implementation of aerodrome standards; and

B. To determine the adequacy and effectiveness of the AIM through the establishment of legislation, regulations, audits and inspections.

1.3 Legislative framework

The AIM establishes various actions an Aerodrome Inspector is required to perform to ensure that aerodrome operations within Thailand are maintained in accordance with the following international standards and recommended practices, and National regulations:

A. <u>ICAO SARPs, guidance materials and other official documents:</u>

a) Annex 14 to the Chicago Convention of the ICAO, Aerodromes Volumes 1 and 2;

b) Manual on Certification of Aerodromes (Doc 9774);

c) Aerodrome Design Manual (Doc 9157);

d) Airport Services Manual (Doc 9137);

e) Safety Management Manual (Doc 9859);

f) PANS-Aerodromes (Doc 9981); and

g) PANS-AIM (Doc 10066).

B. **National regulations:**

a) RCAB No. 80 on Aerodrome construction standards;

b) RCAB No. 82 on Aerodrome safety management system;

c) RQCAAT No.9 on Rules, procedures, and conditions for request to transfer rights under the public aerodrome operating certificate B.E.2560 (2017);

d) RQCAAT No.10 on Rules, procedures for Request to change the operation of a public aerodrome operating certification B.E.2562 (2019);

e) RQCAAT No.14 on Aerodrome Standards B.E.2562 (2019);

f) RDCA on Aerodrome designing and construction standards B.E.2556 (2013);

g) RDCA on Aerodrome operating procedures B.E.2557 (2014);

h) RDCA on Aerodrome manual standards B.E.2556 (2013); and

i) any other directives issued by CAAT, relevant to civil aerodromes.

The AGA Manager is responsible for monitoring developments and revisions of the SARPs, and, in consultation with the Legal Department, ensuring that amendment of the Regulations are appropriate and in accordance with the “CAAT ICAO Annex Management Manual”.

1.4 Authority and responsibilities

This section provides a description of the line of authority (see Figure 1-1) and responsibilities of personnel within AGA in regards to Aerodrome audit and inspection.

Figure1-1 shown line of authority

1.4.1 The Director General (DG)

1.4.1.1 The Director General is responsible for all regulatory audits and inspections and is normally the Competent Official.

1.4.2 Manager of Aerodrome Standards Department (AGA Manager)

1.4.2.1 The AGA Manager is responsible for planning, managing, organizing, directing, overseeing, executing and evaluating operations of the department. The Manager's authority includes decision making and problem- solving regarding aerodrome standards development, aerodrome licensing and certification, aerodrome safety inspection, and aviation environment to ensure compliance with National aerodrome regulations, and ICAO standards and recommended practices.

1.4.3 The Head of Aerodrome Certification Division (Head of CE)

1.4.3.1 The Head of Aerodrome Certification Division is responsible for directing, advising and monitoring the aerodrome safety inspection staff, with requisite regulatory oversight

knowledge, ability, experience and expertise. His/her duties includes decision making and problem-solving regarding aerodrome safety inspection in order to provide efficient and effective safety oversight of aerodromes as well as providing advice on the development of procedures, standards and regulations in compliance with ICAO standards and recommended practices.

1.4.4 Aerodrome Inspectors (AI)

1.4.4.1 Aerodrome Inspectors are responsible for audits and inspections of aerodrome for certification, assessing its compliance or otherwise with the Regulations in respect of its physical characteristics, facilities, equipment, staffing, promulgated information, and operating procedures, and to assure the continued safety oversight of operations at certified aerodromes through guidance, inspection, audit, and investigation, and establish and enforce Regulations in respect of the safety and operation of aerodromes and heliports.

1.4.5 Certification Team Lead (CTL)

1.4.5.1 The CTL is responsible for scheduling, conducting meetings and coordinating any correspondence with the applicant, which includes ensuring that

A. each certification task is completed in accordance with the set and/or agreed timescales;
B. all certification matters are thoroughly coordinated with each team member; and
C. periodic meetings with the certification team are scheduled to ensure that everyone is fully informed of the current status of the certification.

1.4.5.2 The CTL must notify the AGA Manager or Head of CE of any information that may significantly affect or delay certification or that may attract media or political interest.

1.5 Aerodrome Inspectors

1.5.1 General

1.5.1.1 Aerodrome Inspectors are individuals authorized by The DG to audit, inspect and carry out tests on the aerodrome facilities, services, equipment, operating procedures, organization, management, inspect aerodrome operator documents and records, and verify the aerodrome operator's safety management system before a Public Aerodrome Operating Certificate is granted or renewed and subsequently, at any other time, for the purpose of ensuring safety and compliance at the aerodrome.

1.5.2 Duties of Aerodrome Inspectors

1.5.2.1 The general duties of an Aerodrome Inspector are summarised as follows:

A. Review of the Aerodrome Manual for completeness, accuracy and compliance with regulatory requirements, including:
   a) Aerodrome Emergency Plan
   b) Aerodrome Safety Management Systems Manual
   c) Aerodrome Maintenance Manual
   d) Aerodrome Data and Information as promulgated for the aerodrome, AIP AD-2.

B. Audits and inspection of aerodromes in accordance with Authority procedures and current Regulations and Rules;

C. Verification of aerodrome operations procedures; and

D. Review progress of action plans and compliance of the outcomes thereof.

1.5.2.2 Much of the work undertaken is on a cyclical basis during the life of a Public Aerodrome Operating Certificate. The Head of Aerodrome Certification Division is responsible inform to the AGA Manager for the phasing, preparation, and frequency which may differ depending on the nature and detail of the surveillance undertaken and both the operating level and safety and compliance record of the specific aerodrome (i.e. risk-based oversight).

1.5.2.3 Aerodrome Inspector appointed by the Director General under the Air Navigation Act B.E. 2497, Section 60/20, as a Competent Official has powers of inspection and enforcement. Such authorised Aerodrome Inspector may issue directions to the aerodrome operator or take other actions where required to ensure safety under the regulations including:

A. Entering the Licensed Aerodrome or Licensed Temporary Takeoff and Landing Area under the Public Aerodrome Operating Certificate pursuant to this chapter between sunrise and sunset or during operation hours of such place in order to inspect the relevant operation and documents or evidence;

B. Seizing the documents or evidence concerning the operation for the purpose of inspection;

C. Calling upon any person, by a written notice, to give a statement or deliver any document or material for consideration; and

D. Ordering suspension of the operation of the public Aerodrome only for the part that fails to conform to the operating procedures, Safety Management System, Security, internal audit system, aerodrome manual for the [public] Aerodrome or conditions or limitations specified by the Director General under the Air Navigation Act B.E. 2497, Section 60/6 or that may cause unsafe condition to the users.

1.5.2.4 The Aerodrome Inspector shall have the power to order the aerodrome operator to inspect or amend the documents or correct the defect pursuant to the particulars and within a timeframe set by the Aerodrome Inspector when it appears to the Aerodrome Inspector that the aerodrome operator is performing in the following circumstances:

A. Violating or not conforming to the aerodrome operations specifications;

B. Violating or not conforming to the manuals and information already approved or accepted by the competent official;

C. Violating or not conforming to the Air Navigation Act;

D. Violating or not conforming to the rules and procedures for safety set forth by the DCA;

E. Violating or not conforming to the rules and procedures for safety set forth by the CAAT; and

F. Amending the manuals and information with incorrect or outdated procedures while the application for approval of an amendment is being processed in CAAT.

1.5.3 Appointment of an Aerodrome Inspector

1.5.3.1 There are four types of inspector under Aerodrome Standards Department:

A. Physical Characteristics Inspector (PHC)

B. Visual Aids for Navigation Inspector (VAN)

C. Airside Operations Inspector (AOI)

D. Emergency Plan and Rescue and Fire Fighting Inspector (ERF)

1.5.3.2 Staffing of the Aerodrome Standards Department (AGA) with a sufficient number of suitable Aerodrome and Ground Aids Safety Inspector, experienced, qualified and capable of accomplishing the wide range of activities covered in this manual is paramount to the success of the safety oversight program of AGA

1.5.3.3 Aerodrome Inspector have a key role in oversight of the aerodrome's safety management systems. The objective is to ensure that safety management is placed at the heart of the operation and that it is consistently applied throughout the operation, in line with the aerodrome's published policies and procedures, leading to continuing development of the SMS.

1.5.4 Qualifications

1.5.4.1 The Aerodrome Inspector may be an engineer (civil or electrical) with adequate experience in aerodrome/heliport planning, operation or maintenance and should possess sound knowledge of Annex 14 Volume I and Volume II, relevant ICAO manuals, and national regulations and practices. Aerodrome/heliport management experience and knowledge of safety management systems are desirable. Other qualifications, experience and knowledge suitable for carrying out the duties of an aerodrome/heliport inspector may be considered.

1.5.4.2 Minimum qualifications of Aerodrome Inspector are defined in Regulation of CAAT on Qualification, Appointment, Authorization and Supervision of Aviation Inspector B.E. 2561 (2018) and Requirement on Qualification and Training of Inspector Attached to Regulation of CAAT on Qualification, Appointment Authorization and Supervision of Aviation Inspector B.E. 2561 (2018).

1.5.5 Competency Requirement

1.5.5.1 General Competency

An Aerodrome Inspector should have:

A. Sound technical knowledge of the subject area
   - ideally acquired through practical experience;
   - alternatively obtained through a combination of assessed theoretical, practical and on-the-job training;

B. The ability to apply logic to complex situations and derive understanding that enables anomalies identification anomalies and any wider implications;

C. The ability to select, sort, grade and assemble evidence;

D. An understanding of relevant analytical techniques;

E. The ability to approach analytical issues with an open mind, using appropriate verbal and numerical reasoning skills;

F. The ability to assimilate data (written or verbal) and understanding of the figures/information that are presented;

G. The ability to identify anomalies and any wider implications;

H. The ability to explain to others, orally or in writing, in a clear and logical manner, the significance of technical information and its implications in the decision-making process; and

I. The ability to make recommendations or decisions as appropriate based on the analysis undertaken.

1.5.5.2 Audit and Inspection Abilities

Aerodrome Inspectors should demonstrate competence in auditing practices including:

A. The ability to develop an effective and objective program of oversight that includes auditing;
B. Application of a logical and objective approach in utilizing appropriate methods of recordable audit and assessment activities;
C. Demonstration of impartiality, productive working relationships, effective communication and a good understanding of human nature whilst achieving aims of the assessment;
D. Application of a methodical approach when preparing and conducting an audit;
E. Development of reports in both Thai and English language that are clear, unambiguous and objective, and which address the defined compliance criteria;
F. Leadership of audit teams, understanding audit/inspection findings and presentation of accurate interpretations to relevant parties;
G. Implementation of an established assessment program with follow up and record keeping; and,
H. Evaluation of outcomes and make recommendations in support of regulatory action.

1.5.5.3 Enforcement Competency

Aerodrome Inspectors must demonstrate competence in enforcement including:

A. The ability to identify the appropriate means of enforcement, proportionate to the scale of the event, and take appropriate action in light of the law and the local environment;
B. Good comprehension of the rules and processes involved in the gathering of evidence for presentation to CAAT management when required;
C. The ability to correctly identify the points in the enforcement process where the involvement of CAAT Legal Department is either a requirement or an application of best practice;
D. Clear understanding of their own responsibilities regarding delegated competent official actions and appreciate the impact these may have on any subsequent enforcement process; and

E. Presentation of cogent arguments to aerodrome operators and others concerned to explain the reasoning and process of enforcement actions undertaken.

1.5.6 Training for Aerodrome Inspectors

1.5.6.1 All Aerodrome Inspectors will receive both theoretical and practical training in order to fully understand the requirements and demands of their role. They will follow a program of Initial, Specialist and On-The-Job training (OJT) to support them through to qualification, and this will then continue through their career with continued on-going training, ensuring they are kept up to date in a fast-changing environment, and allowing them opportunities for both career and technical development.

Note: *Training requirement for Aerodrome Inspector is provided in the "Training Manual" (CAAT-CRM-TNM).*

1.5.6.2 After completion of all required OJTs, each individual Aerodrome Inspector trainee is required to make a copy of all OJT records and submit to the Training Division for further centralized record keeping prior to applying for a credential card.

Note: *The inspector credentials application procedure is provided in the "Inspector Appointment and Authorisation Procedure" (CAAT-QAD-IAAP).*

2 AUDIT POLICY

This chapter provides AGA audit policies to Aerodrome Inspectors for conducting aerodrome audits and inspections. The subjects covered in this chapter include (1) audit types, (2) audit activities, (3) scope and depth, (4) unity of command, (5) conflict of interest, and (6) Confidentiality.

2.1 Audit Types

The type of audits is determined by the circumstances under which the audit is convened. There are 3 types of aerodrome operator audits:

A. Initial Certification Audits/Inspections,

B. Surveillance Audits/Inspections, and

C. Special-purpose Audits/Inspection.

2.1.1 Initial Certification Audits/Inspections

2.1.1.1 The initial certification audits/ inspections consist of checking compliance of documents and information provided by aerodrome operators with the requirements of the Air Navigation Act, Aerodrome Regulations, and Ministerial Rules, followed by on-site verification, including physical characteristics, aerodrome visual aids, facilities, equipment, staffing and operating procedures for issuing a Public Aerodrome Operating Certificate.

Note: *Processes for Aerodrome Certification is provided in the Aerodrome Standards Department Operation Manual (CAAT-AGA-OM).*

2.1.2 Surveillance Audits/Inspections

2.1.2.1 Once an aerodrome operator has been issued a Public Aerodrome Operating Certificate, a surveillance audit/ inspection(s) will be conducted to ensure that the certificate holder meet their obligations under the terms of the certificate as set out in Conditions, Limitations and certification requirements. This will normally take place within 6 - 24 months following initial certification audits. The interval will be determined by the AGA Manager, in consultation with the Heads of Aerodrome

Certification Division and Aerodrome Inspector depending upon the complexity and compliance and safety record of the aerodrome – also known as risk-based oversight.

Note: *Processes for Aerodrome Safety Oversight is provided in the Aerodrome Standards Department Operation Manual (CAAT-AGA-OM).*

2.1.3 Special-purpose Audits/Inspection

2.1.3.1 A special- purpose audits/ inspection is one conducted to respond to special circumstances other than those requiring an initial certification or surveillance audits/inspections. A special-purpose audits/inspection may be convened with little or no notice and focus on specific areas of concern arising from safety issues. A "no-notice" audit may preclude certain team-member activities and responsibilities that would be normally associated with other types of audits. Alternatively, a special purpose audit may be necessitated by a significant change in operation or planned development of the aerodrome, or after removal of wreckage to ensure safe aerodrome operations.

Note: *Processes for Aerodrome special purpose audit/inspection is provided in the Aerodrome Standards Department Operation Manual (CAAT-AGA-OM).*

2.2 Audit Activities

2.2.1 Audit Process

2.2.1.1 The audit process consists of the following four distinct phases of activities:

A. the pre-audit;
B. the on-site audit;
C. the post-audit; and
D. the audit follow-up.

Notes: *- The contents and process of these four phases of audit are detailed in Chapter 3.*

2.2.2 Personal Protective Equipment

2.2.2.1 All Aerodrome Inspector shall wear appropriate personal protective equipment (PPE) whilst they are airside or in other hazardous areas. This is not just for their own personal protection, but also to set an appropriate example to the auditee. Details on PPE can be found in Appendix D

2.3 Scope and Depth

The scope and depth of the audit is determined by the following:

A. The size and complexity of the aerodrome operator;

B. The time since the last audit;

C. The compliance and safety record of the aerodrome operator; and

The result of scope and depth that use to planning the safety oversight programme will be update annually by CE staff.

Notes: - *The process for calculation of Scope and depth is provided in the Aerodrome Standards Department Operation Manual (CAAT-AGA-OM).*

Notes: - *The result of Scope and depth is detailed in* Appendix F.

2.4 Unity of Command

Inspectors assigned to an audit shall report to the AGA Manager for the duration of the audit. To ensure continuity, inspectors assigned to an audit shall not be released from their audit duties prior to the completion of the audit unless written authorisation has been received by the AGA Manager. Team members must be able to focus on audit activities and must therefore be released from other responsibilities during the term of the audit. Figure 1-2 provides a description of the audit/inspection team.

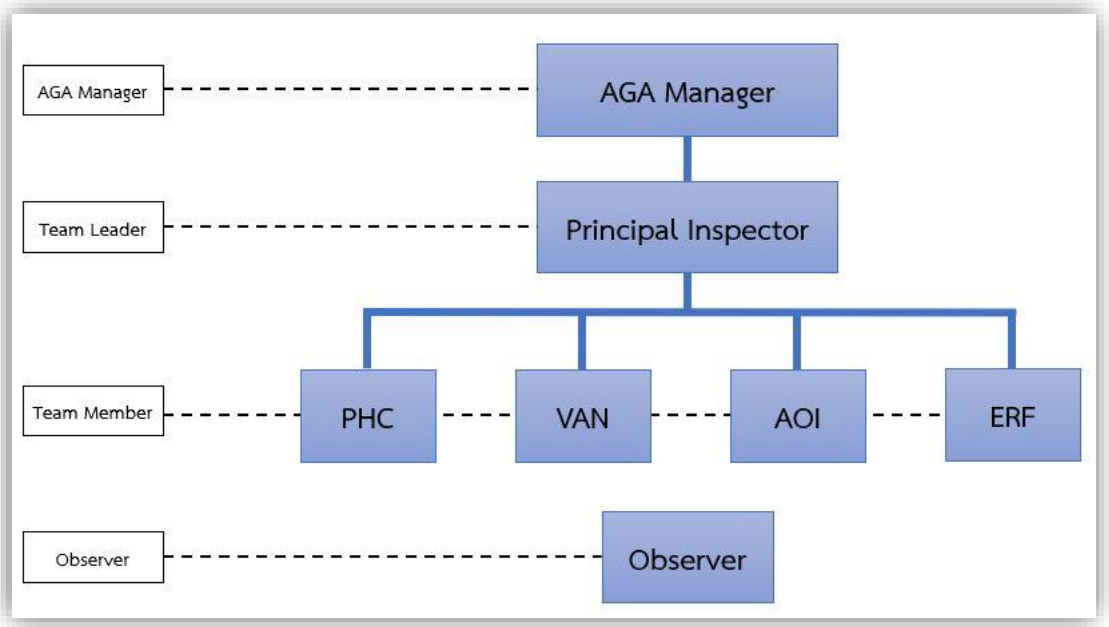


Figure 2-1: Aerodrome Inspector unity of command

2.5 Conflict of Interest

2.5.1.1 Any member of the audit team who believes that their participation may be a conflict of interest shall advise the AGA Manager. The following are potential conflicts of interest:

A. former employment with the aerodrome operator (depending upon recency of employment and the terms under which employment was terminated);
B. organizational ties with the aerodrome operator;
C. direct aerodrome operator involvement; and
D. the holding of aerodrome operator shares by a family member or other family ties with the aerodrome operator.
E. Receipt of benefits from the aerodrome operator, arising from previous employment.

2.6 Confidentiality

2.6.1 Discussion of Audit Content

2.6.1.1 Owing to the sensitive nature of audits, confidentiality is of the utmost importance. Team members shall exercise discretion when discussing audit matters during an audit (whether on or off site). Discussion of audit content shall be limited to the audit team and appropriate CAAT departments, which may include the Air Navigation Service Standards Department (ANS) and Security and Facilitation Standards Department (SFD).

2.6.2 Audit Report

2.6.2.1 The audit report is the documentary result of an audit and is required for each audit. The report outlines the inspection process, provides a summary of the areas under review and includes copies of any audit findings, together with details of both supporting evidence for the findings, and the reference against which each finding arises.

2.6.2.2 In the case of ongoing audits where disclosure of the requested audit documents will be injurious to the decision-making process (and/or the deliberations between CAAT and the aerodrome operators), the AGA Manager, in consultation with The Head of Aerodrome Certification Division, may make recommendations to the DG for non-disclosure of the relevant portions of requested records.

2.6.3 Release of Audit Reports to the Public

2.6.3.1 Audit records shall not be released to the public.

Intentionally Left Blank

3 AUDIT PROCESS

3.1 General

This chapter provides a description of the audit processes for Aerodrome Inspectors to conduct aerodrome audits and inspections.

3.2 Audit process

The audit process consists of the following four distinct phases of activities:

A. the pre-audit (planning and preparation);
B. the on-site audit (implemented in accordance with the audit plan);
C. the post-audit (completion of the audit report); and
D. the audit follow-up (approval of CAP and audit closure)

Each phase covering 4 areas of audits/inspections as follows:

A. **Physical Characteristics (PHC).** Audit and/or inspection of aerodrome physical characteristics (e.g. dimensions and surface condition of runway(s), runway shoulder, runway strip(s), runway end safety areas, stopway(s) and clearways, taxiway(s), taxiway shoulder, taxiway strips and aprons;
B. **Visual Aids for Navigation (VAN).** Audit and/or inspection of aerodrome visual aids for navigation (e.g. markings, lightings, signs);
C. **Airside Operations (AOI).** Audit and/or inspection of aerodrome operations and services (e.g. wildlife strike management, ground servicing of aircraft, ground vehicle operations) and aerodrome safety management system (e.g. SMS manual and its policy and objectives, risk management, safety assurance and safety promotion); and
D. **Emergency Plan and Rescue and Fire Fighting (ERF).** Audit and/or inspection of aerodrome emergency plan and rescue and fire-fighting service (e.g. emergency plan, communication system, rescue and fire-fighting personnel, fire station, fire vehicles and equipment).

Figure 3-1 below summarizes the activities undertaken for each audit phase for all areas of aerodrome audits/inspections.

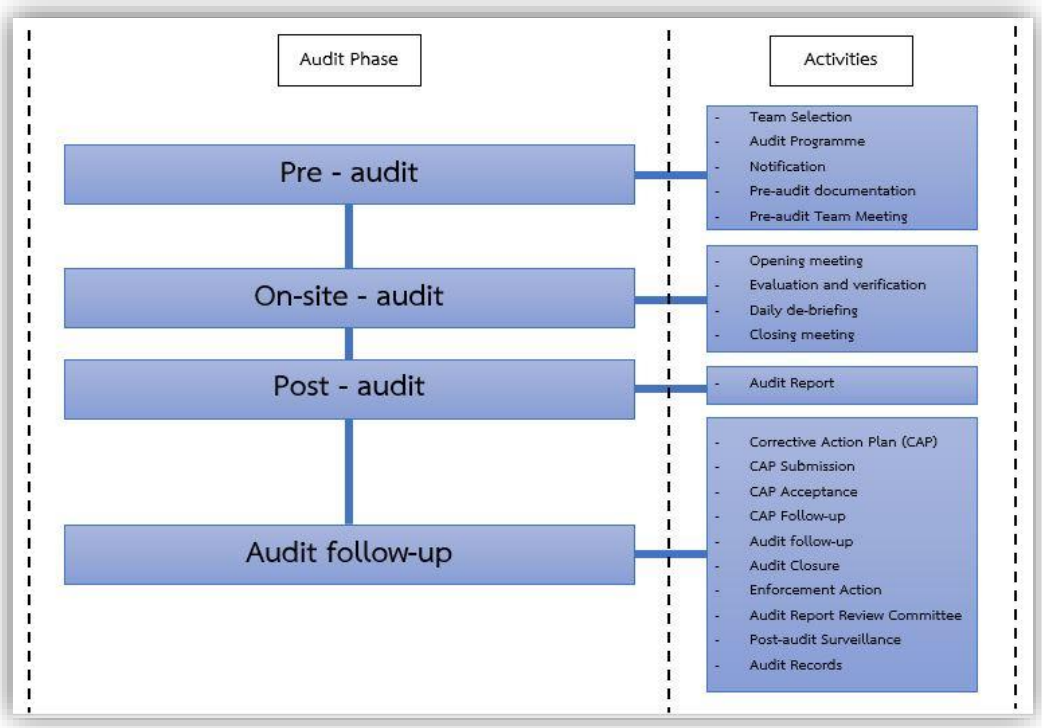


Figure 3-1 shown Aerodrome audits process

3.3 The Pre – Audit Phase

Planning and preparation during the pre-audit phase will ensure that the objectives of the audit are achieved effectively, efficiently and economically. The scope and depth of the proposed audit, to be addressed and justified within the audit programme, will determine the time schedule, personnel and financial resources required. The pre-audit process is illustrated by the following figure.

Figure 3-2: Pre-audit activities

3.3.1 Team Selection

3.3.1.1 The audit team will normally consist of one team leader, team members and observers as appropriate. For audits of smaller aerodromes, the team may be reduced in size.

3.3.1.2 Team Leader

The AGA Manager will appoint the audit team leader (Principal Inspector). Depending on the scope, depth and complexity of the audit, a team leader may delegate selected duties to one or more deputies.

A. Qualifications

1) completed the applicable Speciality Course and Audit Techniques Course;
2) experience related to the type of aerodrome operator to be audited;
3) hold valid CAAT inspector credentials;

4) possess sound knowledge of aeronautical legislation and regulations; and
5) have demonstrated skills in communication and management.

B. Responsibilities

1) support and assist the AGA Manager regarding the audit;
2) select appropriate team members;
3) direct and control his or her speciality team's activities;
4) become familiar with the audit terms of reference;
5) revise the audit checklists applicable to the assigned functional areas;
6) keep the AGA Manager informed of the audit progress;
7) review and verify draft audit findings and specific sections of the audit report as required by the AGA Manager; and
8) brief audit management on his or her speciality area during daily briefings and at the closing meeting.

3.3.1.3 Team Member

Team leaders will appoint team members in consultation with the AGA Manager and Head of Aerodrome Certification Division.

A. Qualifications

1) have completed the applicable Speciality Course and Audit Techniques Course;
2) have experience related to the type of organization to be audited; and
3) possess sound knowledge of aeronautical legislation and regulations.

B. Responsibilities

1) become familiar with auditing procedures and associated auditee's documentation;
2) become familiar with the auditee's policies and procedures;
3) revise the audit checklists applicable to the assigned audit functions;
4) conduct audit fieldwork and document audit findings;
5) liaise with the team leader to ensure that audit progress is reported and potential problems are addressed; and

6) review the validity and applicability of audit findings by ensuring that all are tied to applicable regulations or standards and supported by specific examples.

3.3.1.4 Observer

An observer may join the audit team by mutual agreement of the AGA Manager, appropriate team leader and auditee. This observer may be a CAAT inspector or any other authorized person. Observer may not participate in conversations with the auditee's representatives.

3.3.2 Audit Programme

3.3.2.1 The Head of CE will develop an audit programme**.** This plan ensures that the audit will be conducted in an organised manner and in accordance with predetermined criteria**.** Appropriate sections of the programme will be distributed to each member of the audit team to provide guidance and direction throughout the audit**.** The audit programme should address the following items**:**

3.3.2.2 Objective

The audit programme should state the class and type of audit (i.e., initial certification audit, surveillance audit, or special-purpose audit).

3.3.2.3 Scope and Depth

The following factors should be considered when determining the scope and depth of an audit:

A. the areas of the aerodrome operators to be audited (the entire manual/operation or a specific area);
B. the depth (i.e. how far back in time and how much evidential detail) to which the audit will reach;
C. the geographical dispersion; and
D. the sample sizes to be used versus the population being sampled.

3.3.2.4 Methodology

The audit programme methodology should cover the following:

A. the manner in which the audit is to be conducted (i.e., whether it is an initial certification or special-purpose audit);
B. the specific procedures to be followed (specialist guidance such as checklists, forms and guidance materials provided in the appropriate control manual);
C. the sampling method(s) to be used; and
D. the specific procedures to be followed.

3.3.2.5 Specialist Assistance

The audit programme should address the issue of specialist assistance by determining whether:

A. Computers will be used to monitor company systems;
B. There are team members who understand these systems;
C. Specialists will be required (those with non-destructive testing, engineering, or private-sector expertise); and
D. Specialist equipment used by the aerodrome operator may be involved in the audit, such as surface friction tester, RFF foam testing, AGL earth testing, AGL workshop or in-field measurement of the intensity, flight inspection, laser range and height finding, falling weight deflectometer, 3m straight rule or sand patch testing.

3.3.2.6 Scheduling

The following points should be considered when scheduling an audit:

A. the feasibility of the audit dates and timeframes;
B. the sufficiency of time allotted for the preparation and completion of the audit;
C. the time allotted for the on-site audit, with a daily schedule of inspection for each specialist functional area (PHC, VAN, AOI, ERF, SMS) taking account of location and any necessary daily travel;
D. travel time and mode to site; and
E. the preparation of the audit findings and distribution of the audit report.

3.3.2.7 Communications

The audit plan should identify the communication protocols that the audit team is to follow. This will include internal communications within the audit team and AGA personnel, other CAAT departments such as ANS, SFD and as well as external communications with the auditee, external agencies and the public.

3.3.3 Notification

3.3.3.1 The Aerodrome operator will normally be contacted 14 to 60 days prior to the planned audit date to confirm the audit schedule. The notification period for audits planned on shorter notice will be at the discretion of the AGA Manager in unusual circumstance or in response to a safety concern.

3.3.4 Pre - Audit Documentation

3.3.4.1 This includes a thorough review of all of the auditee files, occurrence reports from ANS and SFD, and documentation and the opening of an aerodrome operator audit file. Information gathered during the pre-audit phase will assist the audit team in determining the specific areas, systems and activities that warrant examination; supplementing audit checklists; or amending the scope of the audit. This audit phase should:

A. ensure that all references (manuals and documents) to be used during the audit are readily available and include the latest approved amendments;
B. review the auditee's approved manuals for conformance to the appropriate Regulations guidelines;
C. review the auditee's files and records;
D. itemise areas which require further review;
E. select the appropriate checklist items from Appendix A, as applicable, in accordance with the scope, depth and complexity of the audit;
F. select appropriate questions from question banks for use in conjunction with the audit checklist;
G. ensure that all audit documentation is chronologically recorded on the aerodrome operator audit sub-file; and

H. ensure that each team member has received appropriate portions of the audit plan, previous inspection or Audit Reports; accident or incident data; any enforcement action; appropriate extracts from regulations, standards and policies.

Note: *Guidance on Assessment of Aerodrome Manual is provided in Chapter 5*

3.3.5 Pre – audit Team Meeting

3.3.5.1 This meeting should**:**

A. provide an opportunity for team members to raise any matters such as conflict of interest, essential conflicting commitments, etc.;

B. confirm individual team members' duties and responsibilities;

C. ensure that all team members have received appropriate portions of the audit plan;

D. ensure that all team members are aware of restrictions regarding confidentiality in general and audit report distribution in particular;

E. outline the overall audit programme;

F. clarify any outstanding issues or problems;

G. include a briefing by the AGA Manager or team leader on current aerodrome operator activities, trends, performance or other information related to previous audits. This may be issues at international, national or departmental level; and

H. address the issues of availability, confidentiality and access to information.

3.4 The on-site Audit Phase

The on-site audit phase will be implemented in accordance with the audit programme. It includes the entry meeting with the audit, the determination of audit findings through interviews, inspections and the evaluation and verification of files and records, functional area debriefings and the exit meeting.

During aerodrome inspections, All Aerodrome Inspector will wear appropriate PPE whilst they are airside or in other hazardous areas (a list of PPEs is provided in Appendix D). Figure 3-3 illustrates the on-site audit process.

Figure 3-3: On-site audit activities

3.4.1 Opening Meeting

3.4.1.1 The opening meeting should set the tone for the audit, both the physical and documentary aspects, and should be attended by the auditee's senior management and all members of the audit team**.** It will outline the audit process to the aerodrome operator and confirm any administrative requirements so that the audit may be conducted both effectively and efficiently, while minimising disruptions to the aerodrome operations**.**

3.4.1.2 The opening meeting should:

A. take place on the auditee's premises;
B. be attended by the auditee's senior management;
C. specify audit details and procedures; and
D. be brief, specific and courteous.

3.4.1.3 The AGA Manager or Team Leader shall:

A. explain the purpose of the opening meeting;
B. introduce audit team members, including specialists and observers;
C. state the objective, scope and depth of the audit;
D. address the means of communication between the audit team and the auditee;
E. explain that aerodrome personnel will be briefed daily on progress of the audit;
F. describe the manner in which any audit finding detected will be handled;
G. provide examples of potential safety critical items that could inhibit the award or continuation of a certificate, such as runway incursion, failure to deploy the RFF, or allocation of an undersized stand to an aircraft without additional safety measures in place;
H. provision of evidence upon request and consequences for lack of evidence;
I. establish a location and time for the closing meeting;
J. emphasise that the purpose of an audit is to identify non-conformances and that enforcement action may result from any of these findings; and
K. respond to all questions from the auditee.

3.4.1.4 The auditee should provide:

A. adequate, preferably private, working space;
B. access to a photocopier and facsimile machines;
C. appropriate measuring or test equipment, including an operator if required;
D. access and admission to all facilities;
E. access to company files and records;
F. security and facility passes;
G. required personnel for interviews; and

H. knowledgeable company advisors or liaison officers where appropriate;

I. suitable and compliant airside transport, which may involve a competent airside driver, yellow vehicle obstacle light, airside vehicle permit, fully functioning lights, radio suitable for the task, seats and seat belts for all occupants.

3.4.2 Evaluation and verification

3.4.2.1 In the evaluation and verification phase, the aerodrome operator' s level of conformance with regulations and aerodrome operator's manuals will be assessed.

Note: *Guidance on evaluation and verification of each areas is provided in Chapter 5*

The following are possible means of evaluation that the auditors may use:

3.4.2.2 Interviews

Interviews with the aerodrome operator's personnel are important during the evaluation phase to determine whether the control system documented in the manual is that in use, and to assess the knowledge of supervisory personnel of their duties and responsibilities. Interviews may also confirm the validity of audit findings reached through observation or sampling. The following guidelines will be useful when preparing for an interview:

A. prepare carefully prior to the interview by defining the areas to be explored and setting specific objectives;

B. explain why the interview is taking place;

C. use open questions and avoid complex questions or phrases;

D. try to avoid asking negative questions, as the answers are often ambiguously positive or negative;

E. listen carefully to answers and allow the interviewee to do most of the talking;

F. avoid being side-tracked from your original objectives;

G. ensure that questions are understood;

H. prepare how to handle resistance;

I. terminate the interview if the atmosphere becomes highly negative or confrontational;

J. document all responses; and

K. thank the interviewee at the conclusion of the interview, explaining what happens next.

3.4.2.3 Verification

A. During this phase, the audit team will gather information to determine the aerodrome operator's level of conformance. Specifically, verification will:
   1) determine whether the aerodrome operates effectively and as intended;
   2) determine whether the aerodrome operation conforms to the regulations and standards contained in the audit checklists; and
   3) analyse particular deficiencies to assess their effects and identify the causes.

B. Aerodrome files or records should not be accessed without appropriate authorisation and, when possible, aerodrome personnel should be present during the review of these files and records.

C. If the review and verification phases do not provide sufficient evidence of the aerodrome operator's level of conformance, further evidence will be required to ensure that any evidence obtained up to that point supports the audit findings and conclusions. In short, other supporting documentation and/or evidence must be acquired and secured.

D. Verification includes various types of inspections. These may be Runway Inspections, Airside Operations Inspection. These inspections may be carried out as co-ordinated inspections.

E. During onsite inspections, the aerodrome inspectors will wear the PPE

F. Note: PPEs list is provided in Appendix D

G. All evidence collected from onsite audits/inspections includes:
   1) Still photography
   2) Video recordings
   3) Audio recordings
   4) Copies of documents and records
   5) Completed checklists
   6) Occurrence, incident and accident records and observations
   7) Physical demonstrations and tests, particularly when measurable by time, or distance or other measurable output, e.g. standby power switch-over time

8) Interview records

3.4.2.4 Confirmation Request Form (CRF)

A. The CRF is an effective audit tool in the following cases:

1) where evidence indicates an audit finding, the aerodrome operator will be given the opportunity to show otherwise;
2) Aerodrome Inspector will determine the course of action to be adopted based on the auditee's response;
3) Aerodrome Inspector will observe the state of the aerodrome records management system from the auditee's perspective;
4) arbitrary audit findings based on subjective examples will be eliminated;
5) the auditee will not be surprised at the end of the audit, as all contentious issues will have been discussed openly during the on-site audit, and reported at the daily de-briefing;
6) Aerodrome Inspector can concentrate on auditing rather than on researching aerodrome files and records; and
7) Aerodrome Inspector will receive a signed document from the audit for inclusion in the supporting documentation package.

Note: *The CRF template is provided in Appendix A*

B. The CRF shall be sent to the team leader or a delegate at the outset to avoid untimely surprises. The CRF shall be recorded with a control number containing the letters "CRF" followed by the 3-letter code for the area of inspection (PHC, VAN, AOI, ERF or SMS) and the 3-digit issue number. (e.g. CRF-PHC-001.). All CRFs control number will be issued sequentially to ensure that, upon completion of the on-site audit, responses have been received and appropriate actions have been taken.

C. At the end of each day, the CRF control log should be compared with the returned CRF to update the CRF status. For a large audit, this can be done at the daily de-briefing with the aerodrome personnel. In this manner, both the aerodrome operator and the audit team will be updated as to the status of these documents. Regardless of the way in which the control log is maintained, all

CRFs should be cleared prior to the completion of the on-site audit at that site or base.

D. When the CRF has been returned and appropriate actions have been taken, this material should be filed according to the appropriate audit area, allowing documentation relating to high-profile items to be maintained for later reference. This file will also provide background and evidence for any enforcement action to be taken at a later date.

3.4.2.5 Audit Finding(s)

A. Finding(s) are the result(s) of an observed action once it has been compared to the required approved documentation. An observation of a documented requirement or an implemented requirement will indicate whether compliance with required procedures is achieved or not. Non-compliance is classified as a finding, and should be accompanied by a request for corrective action. Findings are not opinion, but statements of facts as observed by Aerodrome Inspector. As such they must be backed up by proof, or other evidence of non-compliance, such as photographs or completed checklists, and explanation of deficiency, or a statement of finding(s) by Aerodrome Inspector.

B. For all finding of non-compliance identified by the Aerodrome Inspector, details regarding the non-compliance such as root cause analysis and corrective / preventative actions, will be recorded and communicated via Non-Compliance Form presented in Appendix A.

C. Each finding was assessed against compliance with Aerodrome Standards regulations and other regulations. The terminology used for compliance assessment of each item in the audit checklist, and its meaning is shown in the following table.

Ser.	Assessment	Meaning
a.	Satisfactory	Complies with regulations, aerodrome manual and associated documents
b.	Not Satisfactory	Not compliant: the audit found the aerodrome's standard on this issue to not comply with regulations, aerodrome manual and associated documents
c.	N/A	Not applicable

D. An assessment of Satisfactory can only be given for an item that complies with the standards and recommended practices of the State and ICAO. Additionally, where a procedure is stated in the aerodrome manual and associated documents, but actual observation during this audit found that the procedure is either incorrect or ineffective, the result was assessed as Not Satisfactory.

E. A Not Satisfactory item was considered by the aerodrome inspector as an aerodrome safety audit finding, which in turn must be classified as one of three different levels shown in the table below.

Level	Description
1	Any non-compliance is detected with the regulations, requirements, standards, aerodrome procedures and manuals, the terms of an approval or certificate which lower standard or has the potential to result in loss of life, serious injury or damage to facilities. ***Note:*** *the immediate corrective action might be either a withdrawal or reduction of facilities, or correction of the shortcoming.*
2	Any non-compliance is detected with the regulations, requirements, standards, aerodrome procedures and manuals, the terms of an approval or certificate which could lower standard or has the potential to cause significant safety problems.
Observation	A comment intended to identify possible improvement or trends toward non-compliances. Probable non-compliance with upcoming standards

F. Situations resulting in level 1 findings include:

1) Failure to give Aerodrome Inspector access to the aerodrome's facilities during normal operating hours and after two written requests;
2) Obtaining or maintaining the validity of the aerodrome operating certificate by falsification of submitted documentary evidence;
3) Evidence of malpractice or fraudulent use of the aerodrome operating certificate; and
4) The lack of an accountable manager.

G. In case of level 1 finding(s) Aerodrome Inspector shall take immediate and appropriate action to prohibit or limit activities, and if appropriate, it shall take action to revoke the public aerodrome operating certificate or specific approval, or to limit or suspend it in whole or in part, depending upon the extent of the level 1 finding, until successful corrective action has been taken by the aerodrome operator.

H. Because of the impact of a level 1 finding(s) on aerodrome, Aerodrome Inspectors must consult with the AGA Manager before the finding is confirmed. Confirmation of a level 1 finding must be made in writing to the aerodrome operator. If the AGA Manager considers that the non-compliance does not warrant such action, the finding may be reduced to a level 2, perhaps with a short timescale for remedial action if appropriate, and the aerodrome operator shall be informed in writing.

I. On receipt of an audit report, the aerodrome operator is required to submit a Corrective Action Plan (CAP) to AGA for approval within 30 days.

3.4.2.6 Non-Compliance Form (NCF)

A. Non-Compliance Form must be completed accurately as they form the basis of the audit report and a successful audit.

B. Since a number of team members will be completing Non-Compliance Form, it is important that a standardised approach to inputting data on the form is taken to minimise errors or confusion.

C. All supporting documentation will be included with the completed Non-Compliance Form for review by the Team leader. Although this documentation will not be included in the audit report, it will be retained in the audit file.

D. All hand-written copies of Non-Compliance Form will be filed according to functional area and will form part of the supporting documentation in the audit report for ease of reference.

E. Where it is determined that corrective action and subsequent follow-up to a non-conformance is required in a period less than that which occurs through the use of an approved corrective action plan (typically 30 days), an audit finding may be issued during the on-site audit. This type of finding is usually made where safety is compromised and corrective action is required immediately, or at the very least, prior to completion of the audit. The corrective action section of the Non-Compliance Form includes a checkbox and a line to specify the date/time that corrective action is required by aerodrome operator. The aerodrome operator must respond to the audit finding by the date/time specified in the corrective action section of the finding form using a NCF form.

F. For instance, immediate issuance of NOTAMs notifying particular aerodrome conditions/warnings will be required for the following situations:

   1) Runway surface friction readings are bellowed the minimum level;
   2) PAPI units set incorrectly by 5 or more minutes or
   3) A reduction in RFF category.

G. Issuance of audit findings during the on-site audit will only be contemplated when the team leader agrees with the Aerodrome Inspector and signing the NCF to take such action.

H. For the purposes of follow-up to corrective actions taken during the on-site audit, the Aerodrome inspector will accept submitted corrective actions by signing the NCF.

3.4.2.7 Completion of Non-Compliance Form (NCF)

Non-conformances are recorded on Non-Compliance Form. When completing these forms, Aerodrome Inspector(s) shall use the following checklist:

A. **In the top portion of the NCF:**

1) identify the finding number (NCF No.) in accordance with procedures specified in the appropriate functional area as below;

XXXXYY-ZZZ-000

X = 4-letter ICAO aerodrome code

Y = 2-digit Year of audit/inspection

Z = 3-letter Area of audit/inspection code (PHC, VAN, AOI or ERF

0 = 3-digit Finding number

Example

The code **VTBS18-PHC-001** refers to finding number 1 for Suvarnabhumi Airport, in the year 2018, in the physical characteristic area.

2) correctly identify the NCF issue date;
3) correctly identify the aerodrome name;
4) correctly identify the finding level (1, 2 or observations);
5) correctly identify the name of aerodrome operator representatives;
6) correctly identify the Aerodrome Inspector's name;
7) correctly identify the audit/inspection methodology (physical, manual, operation or interviews);
8) correctly identify the type of audits/inspections (initial certification, surveillance or special-purpose), and
9) correctly identify the date of audits/inspections.

B. **In the "Finding" section:**

1) identify the regulatory reference;
2) specify the area of non-compliance;
3) ensure that the information illustrates non-compliance with the particular regulatory requirement be it a regulation, standard or procedure manual requirement;

4) make reference to any evidence or supporting documentation that confirms the validity of the finding;
5) enter the aerodrome operator's representative name, position, signature date, and
6) enter Aerodrome Inspector's name, signature and date.

C. **in the "Corrective Action" section:**
1) corrective action plan should be recorded by the aerodrome operator;
2) specify root cause;
3) specify corrective action plan;
4) specify a target completion date that corrective action is required by, if open;
5) specify means to verify effectiveness of corrective actions, and
6) enter the aerodrome operator's representative name, position, signature date.

D. **in the "Acceptance of proposed corrective actions" section:**
1) The aerodrome inspector accepts the "root cause" information by checking the "Yes" box. Otherwise check "No" and provide a reason;
2) The aerodrome inspector accepts the "Corrective Action Plan" information by checking "Yes" box. Otherwise check "No" and provide a reason, and
3) The aerodrome inspector accepts the "Means to verify effectiveness of CAP" information by checking "Yes" box. Otherwise check "No" and provide a reason.

E. **in the "Follow up" section:**
1) enter follow up details;
2) specify whether the finding is open/closed/in process;
3) reason for audit finding closure;
4) enter date of finding closure, and
5) enter Aerodrome Inspector's name, signature and date

3.4.3 Daily de-briefings

3.4.3.1 **Audit team briefings** will be held at the end of each day during the audit to:

A. ensure adherence to the audit programme;

B. validate confirmation requests and audit findings;

C. review findings and give priority to safety even if conflicts with other issues found (e.g. land use, environment)

D. resolve issues or problems arising from the day's activities; and

E. update the AGA Manager if necessary.

3.4.3.2 **Aerodrome operator briefings** will be held at the end of each day, following the audit team briefings, to update the auditee's management on audit progress. The AGA Manager or team leaders may elect to have specialist team members brief aerodrome operator representatives on specific items. Each of these de-briefs will normally be limited to 15 minutes.

3.4.4 Closing Meeting

3.4.4.1 The Closing meeting with the aerodrome operator's senior management should provide an overview of the audit. The meeting should summarise the audit findings, stating areas of strength and weakness. A controversial discussion with aerodrome operator representatives regarding audit report content must be avoided. The process for the closing meeting is as follows:

A. Normally, the team leader and all team members will attend the closing meeting.

B. Team members may be required to speak and/or present technical findings at the closing meeting. The team leader is responsible for coordinating such presentations with the team in advance.

C. All audit findings should have been discussed on a daily basis, both with aerodrome representatives as each functional area was completed, and then reported in each daily de-briefing. New audit findings should not normally be identified at the closing meeting. The meeting will provide an overview of the audit and should not become a debate between the team and the aerodrome

operator. The aerodrome operator will be advised that the aerodrome operator will have an opportunity to respond formally to the audit report.

D. The aerodrome operator will be advised of those audit findings that may be subject to enforcement action. The aerodrome operator will also be advised of the aerodrome operator's responsibility to take appropriate action to correct all non-conformances and prevent their recurrence.

E. The team leader shall advise the aerodrome representatives that the audit report will be forwarded to the aerodrome operator within 30 days and that a CAP must be submitted to AGA within 30 days after the aerodrome operator has received the report. The aerodrome operator may submit a draft CAP in advance of receiving the formal audit report.

3.5 The post - Audit Phase

Post-audit activities focus on the completion of the audit report, as follows:

A. The audit report is normally presented to the aerodrome operator within 30 days after on-site audit. Any delay must be documented and communicated to the operator since the validity of the audit will be compromised if the report is not presented in a timely manner. Draft Non-Compliance Form may be left with the aerodrome operator as a courtesy at the end of the audit.

B. The team leader is responsible for the preparation of the audit report and its approval by the DG.

C. A sample covering letter and audit report is provided in Appendix A. The audit report will include:

1) Part I — Audit description, which identifies the aerodrome and summarizes the audit process;

2) Part II — Summary of results, provides a summary of significant findings;

3) Part III / IV— Specialty Area Summaries, which contains summaries of findings for each area of audit/inspection; and

4) Appendix - Audit Findings (Non-Compliance Form), which contains the audit findings assigned during the audit.

5) The DG will sign the covering letter, with a copy of the audit report, to the aerodrome operator. The letter will outline the procedure for responding to audit findings and specify the required response time of 30 days from the time the aerodrome operator receives the report.

3.6 The Audit Follow-up Phase

Audit follow-up includes the development and approval of the aerodrome operator's Corrective Action Plan and ensures full implementation of the CAP. The head of CE will appoint an aerodrome inspector who will be responsible for tracking and verifying the progress of the aerodrome operator's approved CAP. Follow-up report will be sent to aerodrome operator to ensure finding status every 6 months after on-site audit. Figure 3-4 illustrates the on-site audit.

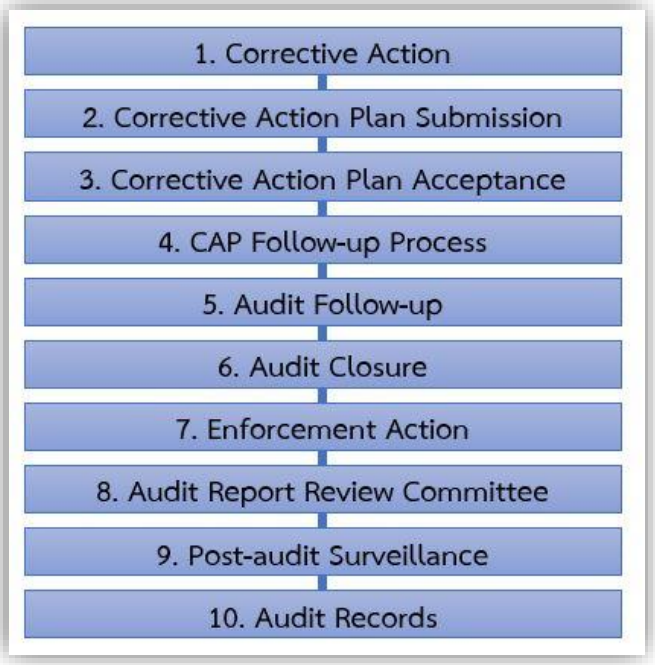


Figure 3-4: Audit follow-up activities

3.6.1 General

3.6.1.1 Upon completion of the audit, The AGA Manager will delegate follow- up responsibilities to the head(s) of division, principal inspector(s) and/or other assigned persons, responsible for regulatory oversight of the appropriate aspect of the aerodrome's operation or as specified in the appropriate control manual.

3.6.1.2 The responsible person referred to above will ensure that:

A. the corrective action plans (CAP) and audit follow-ups have been entered in the functional area database;

B. where applicable, corrective actions required by a specific date, as indicated on the corrective action section of the NCF have been completed by the date specified; and

C. the corrective action plan is submitted in the appropriate time period, and is approved, implemented and effective in rectifying the applicable non-conformances.

3.6.1.3 Audit follow-up is considered complete when:

A. the applicable aerodrome inspector has accepted all audit finding corrective actions;

B. corrective action status has been recorded in the audit file; and

C. DG has been advised and a letter forwarded to the aerodrome operator advising them that the audit is closed. A sample letter is attached in Appendix A. Quality Assurance Activities will be used to determine the effectiveness of audit follow up.

3.6.2 Corrective Action

3.6.2.1 The corrective action has two components. The first component involves identifying the root cause of the problem and indicating measures the aerodrome will take to prevent a recurrence. These measures should focus on a system change. The second component is a timetable for the aerodrome operator implementation of the corrective action. Subject to the following paragraph, the corrective action will take place within 90 days and will include a proposed completion date.

3.6.2.2 Some corrective actions may require time periods in excess of 90 days (e.g. major equipment purchases, and physical characteristics). In this case, refer to Audit Closure section 3.6.7, which explains how to deal with audit findings both beyond 90 days and closure of findings within 12 months. Where applicable, the aerodrome operator

will include milestones or progress review points at 90 days intervals leading up to the proposed completion date for each audit finding.

3.6.2.3 In all cases the aerodrome operator will normally need to take remedial action until the final solution is complete to ensure an acceptable level of safety is maintained. Such action may include promulgation, subject to PANS AIM Document 10066, and/or a limitation of operation in the affected area.

3.6.3 Corrective Action Plan Submission

3.6.3.1 The cover letter of the audit report will advise the auditee that it must

A. where applicable, submit corrective action forms for each audit finding requiring corrective actions by the date specified in the corrective action section of the NCF form; and

B. submit a corrective action plan addressing all other audit findings within 30 days from the date of receipt of the audit report. Normally, this deadline will not be extended without the Head of Aerodrome Certification Division approval.

C. The Head of Aerodrome Certification Division will include the name(s) of the person(s) to whom the corrective action plan shall be sent in the audit report cover letter. This person will normally be the responsible manager.

D. Corrective action plans received from the aerodrome should include completed corrective action forms and, where applicable, supporting documentation that may take the form of technical record entries, purchase orders, memoranda, revised audit procedure cards, manual amendments, etc.

3.6.4 Corrective Action Plan Acceptance

3.6.4.1 Where the corrective action plan is accepted, the aerodrome will be so advised and the appropriate information (administrative/on-site follow-up, proposed completion date) will be entered on the corrective action form or, where applicable, the "corrective action tracking" form, for the purpose of follow-up. A sample corrective action tracking form can be found in Appendix A.

3.6.4.2 Databases can also be used to track the progress of audit follow up.

3.6.4.3 Before accepting plans that include corrective actions exceeding 90 days as permitted in subsection 3.6.2.2, the AGA Manager must be satisfied that the proposed corrective action is reasonable and that safety will not be jeopardised. These findings will then be considered closed for the purposes of corrective action plan follow-up, provided the requirements of subsection 3.6.2 are met.

3.6.4.4 If the aerodrome's corrective action plan is not acceptable, the Aerodrome Inspector or other assigned person will request that the plan be revised and re-submitted within 15 days of the request. Where the aerodrome is unresponsive to this action, an alternative course of action may be pursued; where applicable, such action could include sending of a Notice of Suspension to the aerodrome operator issued by the Head of Aerodrome Certification Division or the responsible manager.

3.6.5 CAP Follow-up Process

3.6.5.1 Where the audit findings are of a minor nature, no threat to aviation safety exists and the aerodrome has a reputable quality assurance or internal audit program, an "administrative follow-up" may be acceptable. In this case, the documents referred to in subsection 3.6.4 must be reviewed and found acceptable. All other findings require "on-site follow-up" to ensure that non-conformances have been rectified and that corrective actions are effective.

3.6.5.2 Progress will be monitored as the aerodrome operator completes the audit finding corrective actions. This will be accomplished by using the follow-up section on the corrective action tracking form or functional area database. the form shall identify the finding number, the type of audit follow-up (administrative or on-site) and the date upon which the corrective action was completed.

3.6.5.3 Corrective actions that have been accepted in accordance with subsection 3.6.4 will be followed-up by the Aerodrome Inspector, or another assigned person, who will advise the responsible manager when the item is complete. This follow-up will be confirmed through surveillance audits/inspections.

3.6.5.4 Where a corrective action plan does not result in appropriate action be taken within agreed timelines, increased oversight or any enforcement actions (administrative or legal enforcement can be taken by AGA within 30 days).

3.6.6 Audit Follow-up

3.6.6.1 The personnel assigned to perform the audit follow-up will:

A. monitor the aerodrome to ensure that the 30-day response time for corrective action plan submission is observed or, where applicable, that corrective actions required by a specific date (indicated on the corrective action section of the NCF) have been completed;

B. ensure that the corrective action plan is prioritised and addresses the most important findings first;

C. ensure that each proposed corrective action will rectify the root cause of the finding to prevent its recurrence;

D. determine that the aerodrome has developed a reasonable timetable for corrective action and ensure that the proposed completion date is indicated on the appropriate section of the corrective action form, entered on the corrective action tracking form or entered in the applicable functional database;

E. accept the corrective action plan in co-ordination with the responsible manager and, where necessary, the AGA Manager and appropriate team leader and/or team member;

F. determine, for each corrective action plan item, whether the follow-up is to be administrative or onsite, and indicate so on the corrective action form, corrective action tracking form or applicable functional database;

G. monitor the progress of the corrective action plan by maintaining the follow-up section of the corrective action form, the corrective action tracking form or

applicable functional database and ensuring that the appropriate follow-up (administrative or on-site) has been conducted;

H. ensure that all completed corrective action forms and corrective action tracking forms, together with any supporting documentation, are placed on the audit file; and

I. advise the responsible manager when all corrective actions have been completed.

3.6.7 Audit Closure

3.6.7.1 To enable AGA to close regulatory audits within 12 months following Corrective Action Plan (CAP) acceptance, the following rule should be applied: the CAP should aim at having all corrective action in place within 90 days of acceptance by the Aerodrome Inspector or other assigned person. However, it is not always possible to meet these deadlines and special consideration may be required to ensure audit closure in a timely fashion.

3.6.7.2 Finding(s) will be categorized as follows:

A. Corrected Immediately; A corrective action must be carried out immediately for level 1 findings to stop the unsafe activities. The finding should be written into the report and corrective action plan must be filed.

B. Corrected within 90 days; normally the majority of findings should fall into this category. The accepted CAP must indicate corrective action put in place within 90 days. The applicable principal inspector or other assigned person will ensure follow-up.

C. Corrected between 90 days and 12 months; in cases where it is anticipated that the corrective action will take more than 90 days after CAP acceptance, or request for extension of CAP progress will communicated using the “Non-Compliance Extension Form” provided in Appendix A. The principal inspector or other assigned person will follow-up the aerodrome operator progresses and update the findings status.

D. Longer than 12 months; in cases where it is not possible or reasonable to apply the corrective action within 12 months of acceptance of the CAP, a risk assessment/aeronautical study should be completed by the aerodrome operator. The Aerodrome Inspector will evaluate this risk assessment/aeronautical study for acceptance or otherwise. The risk remains with the aerodrome operator and its accountable manager. If the risk assessment confirms that the proposed period of time is justified, an exemption should be issued. The corrective action would therefore be completed.

3.6.7.3 The regulatory audit can be closed 12 months after CAP acceptance, since the corrective action has either been completed or assessed to the point whereby an exemption could be issued.

3.6.7.4 The AGA Manager will confirm that all follow-up actions have been completed, entered in the functional area database and will so advise the Head of Aerodrome Certification Division. The Head of Aerodrome Certification Division will formally notify the aerodrome operator that the audit is closed.

3.6.8 Enforcement Action

3.6.8.1 Where appropriate, Enforcement action can be administrative or legal depending on the severity of the violation of the regulation and its impact on aviation safety. This paragraph might apply where an aerodrome operator has consistently failed to rectify a finding.

3.6.8.2 Administrative action in the form of a warning letter or correction letter may be considered appropriate when legal action is deemed unnecessary. Administrative enforcement action is intended to bring the violation to the attention of the aerodrome operator, to document corrective action and to require future compliance. Such actions are warranted when the violation does not result in a significant unsafe condition, is not caused by incompetence or lack of required qualifications on the part of the aerodrome operator, is not deliberately caused, the

attitude of the operator is constructive and positive towards compliance with the regulations and there is no history of such a violation by the aerodrome operator

3.6.8.3 Formal legal enforcement action my be warranted to prevent future violations of the regulations. Such action may include the imposition of sanctions after the act to deter violations. Such sanctions may include revocation, suspension or amendment of the public aerodrome certificate.

3.6.9 Audit Report Review Committee

3.6.9.1 The audit report review committee will be convened at the discretion of the DG or the AGA Manager. Those audit reports that involve multiple level one findings, technical cross discipline findings, such as Airfield Ground Lighting (AGL) related to instrument approach procedures, or potential high- profile outcomes, such as reducing runway declared distances will normally be subject to committee review.

3.6.9.2 The purpose of the audit report review committee is as follows:

A. to confirm the technical accuracy of the report with special attention given to the auditee's description, the functional and specialty area summaries, and the audit findings;
B. to ensure that the report is an objective account of the audit and that no subjective statements are included in the report;
C. to ensure that statements made in the functional and specialty area summaries are supported by the actual audit findings; and
D. to determine if any findings identified in the report should be subject to investigation by LEG.

3.6.9.3 The audit report review committee will consist of the following as applicable to the type, category and classification of audit:

A. The AGA Manager;
B. The Head of Aerodrome Certification Division;
C. The Audit team leader and team members, and

D. Comparable members from other CAAT departments, such as ANS, SFD and OPS.

3.6.9.4 To facilitate an effective review, it will be necessary to provide copies of the report to committee members in advance. Yet it is acknowledged that the meeting must be held shortly thereafter in order to provide time to finalise the report and forward the final report to the aerodrome operator within the time period specified in subsection 3.4

3.6.9.5 Recommendations resulting from the committee review will be retained at the office of the Head of Aerodrome Certification Division.

3.6.10 Post-Audit Surveillance

3.6.10.1 During audit follow-up, surveillance is the only means to ensure that aerodrome operators with non-conformances comply with regulatory requirements and respond satisfactorily to audit findings. Post-audit surveillance can be conducted as informal visits or as a more structured follow-up audit.

3.6.11 Audit Records

3.6.11.1 All documents relevant to the audit or inspection should be retained and placed on the aerodrome certificate holder's file (aerodrome file) after completion of the audit. These should include, where applicable, the following:

A. A copy of the initial notification of the audit;
B. The audit programme;
C. Completed checklists;
D. All notes made during the audit by the audit team;
E. Records of any interviews;
F. Records of opening and closing meetings;
G. A copy of the Corrective Action Plan (CAP);
H. Results of follow-up activities to ascertain compliance, and
I. Corrective action form from the aerodrome operator (see Appendix A).

3.6.11.2 It is the responsibility of the Head of Aerodrome Certification Division to file all the findings gained from the audits and inspections of all aerodrome certificate holders. The Head of Aerodrome Certification Division is responsible for:

A. ensuring that the certified status of the aerodrome and details as per Aerodrome Regulations (ICAO Doc 10066 Appendix A, AD 1.5) are updated in the AIP revision by the next AIRAC Publication date.

B. Establish and maintain an audit database that will be utilized by AGA to monitor the overall certification process, audit results and State's level of compliance. Ensure that secure backup files are saved.

Intentionally Left Blank

4 AERODROME CERTIFICATION

4.1 Aerodrome certification process

Fundamentally, the aerodrome certification process comprises the following five phases:

A. Pre-application Phase (Dealing with the expression of interest);

B. Formal Application Phase (Assessing the formal application);

C. Document Evaluation Phase (Evaluation of the aerodrome manual);

D. Demonstration and Audit Phase (Assessing the aerodrome facilities and equipment); and

E. Certification Phase (Issuing or refusing a Public Aerodrome Operating Certificate and promulgating the certification status and the required details in AIP).

4.1.1 Pre-application Phase

4.1.1.1 One of the first steps in the process of certification of an aerodrome is to consider the letter of interest of the applicant requesting the grant of an aerodrome certificate.

4.1.1.2 CAAT will then acknowledge the receipt of the application, giving an indication of the likely date by when the processing would be completed.

4.1.2 Formal Application Phase

4.1.2.1 The Certification Package shall be checked initially by the CTL to verify that all documents required for application have been submitted, The Certification Document Checklist (AGA-CE-209) in Appendix A will be filled in by the CTL to check methodically that the all initial requirements have been met.

4.1.3 Document Evaluation Phase

4.1.3.1 The third step and major one is checking the contents of the aerodrome manual itself. The aerodrome manual shall be thoroughly checked to see if the following information has been provided in an organised manner:

A. General information and Details of the aerodrome site set out in RDCA on Aerodrome Manual Standard B.E.2556 (2013).

B. Details of the aerodrome data required to be reported to the aeronautical information service as specified in RDCA on Aerodrome Manual Standard B.E.2556 (2013).

C. Compliance with the aerodrome operating procedures and safety measures as set out in the RDCA on Aerodrome Manual Standard B.E.2556 (2013). This may include references to air traffic procedures such as those relevant to low-visibility operations. Air traffic management procedures with a cross-reference to the aerodrome manual. This aspect of liaison and co-ordination with ATS and cross referencing needs to be ensured.

D. Details of the aerodrome administration and the safety management system as set out in RDCA on Aerodrome Manual Standard B.E.2556 (2013).

E. Has any exemption from compliance with the RQCAAT No.14 on Aerodrome Standards B.E.2562 (2019) been requested? If yes, has an aeronautical study been conducted by the applicant? Have the number of any previous exemption order/communication, date of the order and conditions/procedures to ensure equivalent levels of safety been included?

F. Does the aerodrome operator have competent operational and maintenance personnel?

G. Is the aerodrome rescue and fire fighting service available at all hours? Does the aerodrome RFFS have fully functional RFF equipment, trained personnel and extinguishing agents as specified for the given aerodrome category in RQCAAT No.14 on Aerodrome Standards B.E.2562 (2019)

H. Does the aerodrome manual confirm that there is adequate and definitive co-ordination with other service providers such as the Air Traffic Services, Meteorological Services, Aeronautical Information Services etc.

I. Does the aerodrome have a safety management system in place? As part of this information, is the organisation chart of the aerodrome available with the contact details of all key officials? Does the aerodrome have an internal audit system? How frequently is the audit carried out?

J. How does the aerodrome operator coordinate the activities of other agencies working at the aerodrome, such as fixed base operators, ground handling agencies, etc. to ensure safety? How are they audited?

K. How is the notification and reporting of all relevant information to the AIS including any change in the facilities, equipment and level of service at the aerodrome carried out?

L. What process has been identified for reporting any penetrations of the aerodrome obstacle limitation surfaces, existence of any hazardous situation on or in the vicinity of the aerodrome, or closure of any part of the movement area, or of any work in progress that may have an impact of the safety of aircraft operations?

M. What aerodrome inspection regime is in place and if this is in accordance with the aerodrome regulations?

N. Does the aerodrome have a system for posting hazard warning notices if any low-flying aircraft at or in the vicinity of the aerodrome, or taxiing aircraft is likely to be hazardous to public?

O. Is there a need for a flight operations assessment to be conducted? Has such an assessment been conducted by the applicant? Was it satisfactory or not? If not, what were the reasons? And how does the applicant plan to resolve this satisfactorily?

P. Has an environmental study been carried out in collaboration with the concerned government department(s)? What was the result of such a study?

Q. If there are certain obstacles near the aerodrome, what operational procedures have been put in place? Have the instrument approach procedures been evaluated and validated recently?

R. Are there any other safety-related issues that need to be addressed/ resolved?

S. Has the aerodrome developed and published an up to date disabled aircraft removal plan in accordance with national requirements?

4.1.4 Demonstration and Audit Phase

4.1.4.1 Once the office work of evaluating the aerodrome manual is complete, a field verification of the aerodrome facilities, services and equipment shall be undertaken with due co-ordination with the applicant. The attached Checklist in Appendix A shall be used for this verification inspection.

4.1.5 Certification Phase

4.1.5.1 The Certification Phase covers the final assessment of the previous phases, the issuance of a certificate, and promulgation of the data, information and certification status of the applicant's aerodrome including aerodrome name and ICAO location indicator, date and validity of certification and remarks.

4.1.6 The process

4.1.6.1 Refer to The Aerodrome Standards Department Operation Manual (CAAT-AGA-OM).

4.2 Exemption process

4.2.1 General

4.2.1.1 CAAT may exempt, in writing, an aerodrome operator from complying with specific provisions of these regulations. When an aerodrome does not meet the requirement of a standard or practice specified in the RQCAAT No.14 on Aerodrome Standards B.E.2562 (2019), the CAAT may determine, after carrying out aeronautical studies, only if and where permitted by the standards, the conditions and procedures that are necessary to ensure a level of safety equivalent to that established by the relevant standard. Before it is decided to exempt the aerodrome operator will take into account all safety-related aspects.

4.2.1.2 An exemption is subject to the aerodrome operator complying with the conditions and procedures specified by CAAT in the aerodrome certificate as being necessary in the interest of safety. Deviation from a standard and the conditions and procedures referred to in the RQCAAT No.14 on Aerodrome Standards B.E.2562 (2019), shall be set out in an endorsement on the aerodrome certificate. The certificate should also contain the number and file reference of exemptions granted pursuant to the relevant clause of the RQCAAT No.14 on Aerodrome Standards B.E.2562 (2019)

4.2.2 Classification of exemptions for aerodrome

4.2.2.1 Exemptions for non-compliance shall be:

A. **Temporary Exemptions**: where the non-compliance is expected to be removed and inter-operability is the predominant aspect of the requirement, such as mandatory signs, availability of runway strip etc.

B. **Permanent Exemptions**: where non-compliance is not reasonably, be removed and interoperability is not the predominant aspect of the requirement, such as the infringement of high ground into an obstacle limitation surface etc.

Note: *Processes for Exemption is presented in the "Exemption Policy and Procedure Manual (CAAT-LEG-EXE)".*

4.2.3 Non-Compliances

4.2.3.1 Non-compliances are primarily related to the following aspects at the aerodrome for which some examples are given below:

A. Facilities and equipment

a) Visual and non-visual aids.

b) Obstacles on the strip and the obstacle limitation surfaces i.e.

c) approach, departure and transitional surfaces.

d) Strip areas - dimensions and quality.

B. Inadequate runway strip with, inadequate taxiway width and lack of fillets

a) Runway end safety areas.

b) Inadequate runway.

c) taxiway separation distances.

d) Landing systems.

e) Rescue and fire-fighting vehicles and equipment.

f) Meteorological equipment.

g) Rescue and fire-fighting.

4.2.4 The process

4.2.4.1 Refer to The Aerodrome Standards Department Operation Manual (CAAT-AGA-OM).

4.3 Aerodrome safety oversight process

4.3.1 Continued Oversight

4.3.1.1 Upon granting the certificate to the aerodrome operator, AGA will continue safety oversight in order to ensure that the compliance to the given conditions and requirements is maintained.

4.3.1.2 The periodic inspections will be organised as follows:

A. Pre-inspection briefing with aerodrome management, including coordination with air traffic control tower personnel.
B. Administrative inspection of the aerodrome safety management system.
C. Movement area inspection including the inspection and checking of runways and taxiways, markings, lighting, signs, shoulders, strips and runway end safety areas; checking for potentially hazardous conditions if construction work is in progress; checking ground vehicle operations in the movement area; checking for wildlife hazards and wildlife attractants; and checking landing direction indicators and wind direction indicators.
D. Rescue and fire-fighting services, their training records; the category requirements; time response drill; checking the alarm system; checking and examining proximity suits, other protective clothing and fire-fighting and rescue tools.
E. Fuel facilities including spot checking, including fuel sampling, for compliance with the applicable requirements.
F. Night inspections of runway, taxiway and apron lighting and signage; pavement markings; aerodrome beacons; wind direction indicator lighting; obstacle lighting and
G. the marking and lighting of construction areas.
H. Post inspection briefing with the aerodrome management, including the determination of appropriate enforcement action for non-compliance with the regulations.

4.3.1.3 Other safety functions which may require to be addressed by the aerodrome inspector are:

A. first-hand evaluation of full-scale airport emergency exercises to identify problems and deficiencies;

B. the provision of guidance at the design and construction stages of aerodrome projects, particularly complex projects or where there is significant work that may impact compliance with the regulations;

C. final inspection of completed projects involving complex or significant work to identify problems or deficiencies that need to be corrected in order to comply with the requirements of the regulations;

D. the organization of, and participation in, aerodrome safety seminars and other training programmes to promote a safety culture.

4.3.2 Increased Oversight

4.3.2.1 When an aerodrome's corrective action plan does not ensure that appropriate corrective action has been taken within acceptable timelines, and after coordination between AGA and the aerodrome operator, AGA may decide that increased oversight of this operator is necessary. The scope of increased oversight may cover specific subjects or be all-encompassing.

4.3.2.2 AGA will notify the aerodrome operator in writing:

A. that it is being placed under increased oversight and outline the subjects concerned and from which date;

B. the reasons for the increased oversight and what it consist of; and

C. what actions are required by the aerodrome.

4.3.2.3 When an aerodrome is placed under increased oversight, AGA will:

A. carry out appropriate oversight actions on the subjects concerned;

B. follow very carefully the implementation of the corrective actions plan; and

C. allocate sufficient time/resources to the oversight of the concerned aerodrome.

4.3.2.4 The oversight actions carried out under increased oversight are the same as those carried out normally, but are more exhaustive and address all the subjects concerned.

4.3.2.5 When increased oversight is concluded on an aerodrome for a specific subject, the State should advise the aerodrome operator in writing, stating the end of the procedure and the reason.

4.3.2.6 The aerodrome certificate can be amended, suspended or revoked according to the outcome of the increased oversight.

Note: *The processes for aerodrome certificate amendment, suspension and revocation are detail in The Aerodrome Standards Department Operation Manual (CAAT-AGA-OM).*

4.3.3 Planning (determined scope and depth)

4.3.3.1 Specific and targeted actions, in addition to the planned activities, carried out by AGA, for example, in relation to changes, analysis of occurrences, safety of aerodrome works, monitoring of corrective action plans, or those related to the State safety programme. AGA also have to address other issues regarding aerodrome safety depending on the aerodrome organization, such as obstacle control or oversight of ground handlers.

4.3.3.2 The interval will be determined by the AGA Manager, in consultation with the Heads of CE and Aerodrome Inspector depending upon the complexity and compliance and safety record of the aerodrome **–** also known as Risk based oversight.

Note *- Complexity of aerodrome form is presented in Appendix A*

Note *– Result of scope and depth is provided in Appendix F*

4.3.4 The process

4.3.4.1 Refer to The Aerodrome Standards Department Operation Manual (CAAT-AGA-OM).

5 GUIDANCE FOR INSPECTIONS

This chapter provides guidance to Aerodrome Inspector on the procedures to conduct aerodrome inspection in accordance to the audit policy and process provided in chapters 2 and 3 respectively, covering the pre-audit and on-site audit phases. Figure 5-1 lists the guidance materials used for each area of audits/inspections, where the pre-audit phase consists of assessing the aerodrome manual (section 5.1), the aerodrome emergency plan (section 5.11) and the aerodrome safety management manual (section 5.18).

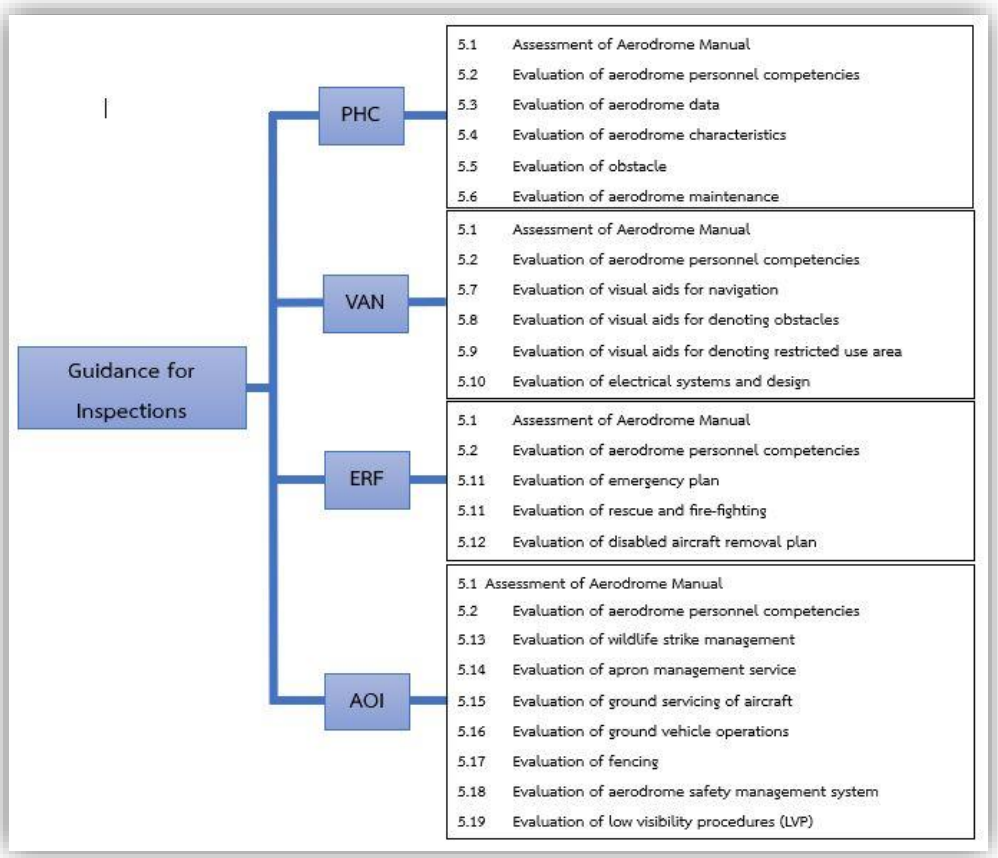


Figure 5-1: list of guidance materials for Aerodrome inspections.

5.1 Assessment of Aerodrome Manual

The assessment of the aerodrome manual should determine whether the manual complies with the RDCA on Aerodrome Manual Standards B.E.2556. In addition to the assessment of the aerodrome manual, Aerodrome Inspector must be satisfied that the aerodrome operator has the necessary competence and experience to comply with the RDCA on Aerodrome Manual Standards B.E.2556. The aerodrome operator must specify the process for revising and distributing the aerodrome manual. The aerodrome operator must notify CAAT, as soon as practicable, of any changes that the aerodrome operator wishes to make, or has made to the aerodrome manual.

5.1.1 Guidance for assessment of aerodrome manual

Aerodrome Inspector shall use the Aerodrome Manual Checklist presented in Appendix A to ensure that the following obligation are met:

Part 1 – General

General information, shall include the following;

A. Purpose and scope of the aerodrome manual

B. The legal requirement for an aerodrome certificate and an aerodrome manual as prescribed in the Air Navigation Act B.E.2497 and related regulations.

C. Conditions for use of the aerodrome – a statement to indicate that the aerodrome shall at all times, when it is available for the take-off and landing of aircraft, be so available to all persons on equal terms and conditions.

D. The available aeronautical information system and procedures for its promulgation. The Aerodrome Inspector should refer to PANS AIM Doc 10066 Appendix A, and the supporting text in the document. Promulgation is an important element of aerodrome certification.

E. The system for recording aircraft movement.

F. Obligations of the aerodrome operator

Part 2 – Particulars of the aerodrome site

Information on particulars of the aerodrome site shall include the following:

A. A plan of the aerodrome showing the main aerodrome facilities for the operation of the aerodrome including, particularly, the location of each wind direction indicator.

B. A plan of the aerodrome showing the aerodrome boundaries.

C. A plan showing the distance of the aerodrome from the nearest city, town or other populous areas, and the location of any aerodrome facilities and equipment outside the boundaries of the aerodrome.

D. Particulars of the title of the aerodrome site. If the boundaries of the aerodrome are not defined in the title documents particulars of the title to, or interest in, the property on which the aerodrome is located and a plan showing the boundaries and position of the aerodrome.

Part 3 – Particulars of the aerodrome required to be reported to the aeronautical information service (AIS)

As part of the review of the aerodrome manual, the aerodrome and obstacle WGS84 survey will be reviewed in accordance with the ICAO WGS-84 Manual, (Doc 9674). There are several potential pitfalls, so the Aerodrome Inspector should check:

A. The surveyor is experienced in ICAO compliant WGS 84 surveys;

B. Evidence is provided of the connection to the international terrestrial reference frame, as per Doc 9674;

C. Photographs and descriptions are included in the survey report, removing any ambiguity as to exactly what points are surveyed (e.g. stands and thresholds);

D. Quality control including equipment certificates is included in the report;

E. Declared distances identical to the AIP and aerodrome manual are used in the survey report;

F. The Aerodrome Reference Point (ARP) is correctly described, its coordinates are located as described and the ARP has not been moved; and

G. The correct vertical datum (EGM96) has been used (EGM2008 or local datum is not acceptable).

H. The information about visual approach slope indicator system installations.

General information

General information requirements refer to the RDCA on Aerodrome Manual Standards B.E.2556 and Appendix A of Doc 10066 AD2.

Aerodrome dimensions and related information

The following aerodrome dimensions and related information in the RDCA on Aerodrome Manual Standards B.E.2556 and Appendix A of DOC 10066 AD2, shall be measured and described:

A. All related runway data is provided, including GEOID undulation, magnetic variation AND annual rate of change, designation number, length, width, displaced threshold location, slope, surface type, type of runways and, for a precision approach runway, the existence of an obstacle free zone;

B. Length, Width and surface type of
   - Runway Strip;
   - Runway end safety areas;
   - Stopway (a commercial feature that may permit an increased payload in departing aircraft, therefore, stopway should only be permitted where full compliant strip and full length of RESA, e.g. 240m for code 4, is provided); and
   - Taxiway.

C. Apron surface type and aircraft stands

D. Clearway length and ground profile. Where clearway is provided, there should be no obstacles listed in the take-off climb surface. If there are obstacles listed in the take-off climb surface then consider a finding to require the removal of the obstacle or cancelation of clearway;

E. Visual aids for approach procedures (e.g. approach lighting type and PAPI/APAPI, including MEHT for each runway served by PAPI, marking and lighting of runways, taxiways, and aprons);

F. Runways, taxiways, and aprons; other visual guidance and control aids on taxiways and apron, runways-holding position, intermediate holding positions, visual docking guidance system and secondary power supply;

G. The location and radio frequency of VOR aerodrome checkpoints, and if mentioned in the list of signs;

H. The location and designation of standard taxi routes;

I. The location co-ordinates of each threshold;

J. The geographical co-ordinates of appropriate taxiway centre line points;

K. Exactly what point has been used for the geographical co-ordinates of each aircraft stand.

L. The geographical co-ordinates and the top elevation of significant obstacles in the approach and take off areas, in the circling area and in the vicinity of the aerodrome, and whether lit and/or marked, see also (c) and (d) above.

M. Pavement surface type and bearing strength using the Aircraft Classification Number – Pavement Classification Number (ACN-PCN) method;

N. One or more pre-flight altimeter check location established on an apron and their elevation;

O. Declared distances:

- Take-off run available – TORA
- Take-off distance available – TODA
- Accelerate stop distance available – ASDA
- Landing distance available - LDA

P. Disable aircraft removal plan: the telephone/telex/facsimile numbers and email address of the aerodrome coordinator for the removal of a disabled aircraft on or adjacent to the movement area, information on the capability to remove a disabled aircraft, expressed in terms of the largest type of aircraft which the aerodrome is equipped to remove;

Q. Rescue and fire fighting: the level of protection provided, expressed in terms of the category of the rescue and fire fighting services, which should be in accordance with the longest aircraft normally using the aerodrome and the type and amount of extinguishing agents normally available at the aerodrome;

The Aerodrome Inspector may use following method and tools to check the information:

- Carry out sample calculations to check that the MEHT provides the required wheel clearance over threshold, normally 9 metres, for the critical aircraft intended to use the runway.
- Carry out similar sample calculations to check that the ILS RDH provides the required wheel clearance over threshold, normally 9 metres, for the critical aircraft intended to use the runway
- Using google earth or other mapping application, plot sample coordinates to check that they are located as described and expected.

  Note: *PAPI installation design and inspection guidance is detailed in Attached A-2*

Part 4 – Particulars of the aerodrome operating procedures and safety measures

Aerodrome reporting

Particulars of the procedures for reporting any changes to the aerodrome information set out in the AIP and procedures for requesting the issue of NOTAMs in full compliance with Doc 10066 (2018), including the following:

A. Ensure that there are clear directions in accordance with ICAO Annex 15 para 6.3.2.3/4 regarding what does and does not require the issue of a NOTAM, e.g. establishment, withdrawal or significant changes to visual aids DOES require a NOTAM, but partial failure of aerodrome/heliport lighting facilities where such failure does not directly affect aircraft operations, AND closure of movement area parts in connection with planned work locally coordinated of duration of less than one hour DO NOT require a NOTAM.

B. Arrangement for reporting any changes to CAAT and recording the reporting of change during and outside the normal hours of aerodrome operations.

C. The name and roles of persons responsible for notifying the change, and their telephone numbers during and outside the normal hours of aerodrome operations.

D. The address and telephone numbers, as provided by CAAT, of the place where changes are to be reported to CAAT.

Access to the aerodrome movement area

Particulars of the procedures to control access to the movement area are to be followed in coordination with airport aviation security and police as specified in the RDCA on Aerodrome Manual Standards B.E.2556, checking:

A. The role of the aerodrome operator, the aircraft operator, aerodrome fixed-base operators, the aerodrome security entity, CAAT and other government departments, as applicable, are all clearly defined, and
B. Reference is made to the airport security plan.

Aerodrome Emergency Plan

A. Aerodrome emergency plan;
B. Details of tests and frequency of tests of the emergency plan, including modular tests, response tests, table top exercises, etc., as exemplified in Doc 9137 part 7, and
C. Records of aerodrome emergency committee.

Rescue and fire fighting

Particulars of the facilities, equipment, personnel and procedures for meeting the rescue and fire-fighting requirement, including the names and roles of the persons responsible for dealing with the rescue and fire-fighting services at the aerodrome

Inspection of the aerodrome movement area and obstacle limitation surface by the aerodrome operator

Particulars of the procedures for the inspection of the aerodrome movement area and obstacle limitation surfaces, as specified in the RDCA on Aerodrome Manual Standards B.E.2556, including the following:

A. runway friction both using self-wetting equipment, and, when required surface friction testing in natural rainfall conditions;
B. Arrangements for keeping an inspection logbook and the location of the logbook;
C. Details of inspection intervals and times appropriate to the movement area pavement condition, seasonal conditions, and operational needs; and

D. Inspection checklist and reporting.

Visual aids and aerodrome electrical systems

Particulars of the procedures for the inspection and maintenance of aeronautical light (including obstacle lighting), signs, markers and aerodrome electrical systems, in accordance with the RDCA on Aerodrome Manual Standards B.E.2556, including the following:

A. Arrangements for carrying out inspections during and outside the normal hours of aerodrome operation, and the checklist for such inspections;
B. Arrangements for recording the result of inspections and for taking follow-up action to correct deficiencies;
C. Arrangements for secondary power supplies, if any and, if applicable, the particulars of any other method of dealing with partial or total system failure; and
D. The names and roles of the persons responsible for the inspection and maintenance of the lighting, and the telephone numbers for contacting those persons during and after working hours.

Maintenance of the movement area

Particulars of the facilities and procedures for the maintenance of the movement area, including:

A. Arrangements for maintaining the paved areas, including emergency repairs and pre-planned maintenance;
B. Arrangements for maintaining the unpaved runways and taxiways;
C. Arrangements for maintaining the runway and taxiway strips;
D. Arrangements for the maintenance of aerodrome drainage; and
E. Evidence of calculation of the PCN(s).

Aerodrome works – safety

Particulars of the procedures for planning and carrying out construction and maintenance work safely as required in the RDCA on Aerodrome Manual Standards B.E.2556.

Apron management

Particulars of the apron management procedures, as required in the RDCA on Aerodrome Manual Standards B.E.2556, including the following checks:

A. Stand allocation list showing the aircraft size limits for each stand;
B. Contingency for ad hoc aircraft larger than stands available;
C. Details of the boundary(ies) between the apron(s) and manoeuvring area; and
D. Details of the layout of apron safety lines and the rules for drivers to comply with the apron safety lines and aircraft separation distances.

Apron safety management

Procedures to ensure apron safety in the RDCA on Aerodrome Manual Standards B.E.2556

Airside vehicle control

Particulars of the procedure for the control of surface vehicles operating on or in the vicinity of the movement area as the RDCA on Aerodrome Manual Standards B.E.2556, including the following checks:

A. AVPs for all vehicles including those that remain airside permanently;
B. the method of issuing driving permits for operating vehicles in the movement area, including any classification of different permits such as for runway access, and whether aviation English language testing is required for runway access driver permits; and
C. the requirements for marking and lighting of vehicles are fully compliant with the RDCA on Aerodrome Manual Standards B.E.2556.

Wildlife hazard management

Particulars of the procedures to deal with wildlife hazards in the RDCA on Aerodrome Manual Standards B.E.2556 including the following:

A. Use of bird distress call equipment;
B. Use, storage, and control of pyrotechnics, shotguns, gas canon, and laser guns; and
C. Definition of bird strikes within the aerodrome's procedures, and how wildlife strikes are recorded and analysed.

Obstacle control

Particulars setting out the procedures for:

A. Monitoring, assessing and controlling the obstacle limitation surfaces and Type A Chart for obstacles in the take-off surface;
B. Controlling new developments in the vicinity of aerodromes; and
C. Notifying CAAT of the nature and location of obstacles and any subsequent addition or removal of obstacles for action as necessary, including amendment of the AIS publications.

Removal of disabled aircraft

Particulars of the procedures for removing a disabled aircraft on or adjacent to the movement area, including the following:

A. The roles of the aerodrome operator and the holder of the aircraft certificate of registration;
B. Arrangement for notifying the holder of the holder of the certificate of registration;
C. Arrangements for liaising with the air traffic control unit;
D. Arrangements for obtaining equipment and personnel to remove the disabled aircraft; and
E. The names, role and telephone numbers of persons responsible for arranging for the removal of disabled aircraft.

Handling of hazardous materials

Particulars of the procedures for the safe handling and storage of hazardous materials on the aerodrome, including the following:

A. Arrangements for special areas on the aerodrome to be set up for the storage of inflammable liquids (including aviation fuels) and any other hazardous materials, and
B. The method to be followed for the delivery, storage, dispensing and handling of hazardous materials.

Low-visibility operations

Particulars of procedures to be introduced for low-visibility operations, including the measurement and reporting of runway visual range as and when required, and the names and telephone numbers, during and after working hours, of the persons responsible for measuring the runway visual range, and the visibility or RVR at which LVPs are commenced.

Protection of sites for radar and navigational aids

Particulars of the procedures for the protection of sites for radar and radio navigational aids located on the aerodrome to ensure that their performance will not be degraded, including the following:

A. Arrangements for the control of activities in the vicinity of radar and navaids installations;
B. Arrangements for ground maintenance in the vicinity of these installations; and
C. Arrangements for the supply and installation of signs warning of hazardous microwave radiation.

Part 5 – Aerodrome administration and safety management system (SMS)

Aerodrome Administration

Particulars of the aerodrome administration, including the following:

A. An aerodrome organizational chart showing the names and positions of key personnel, including their responsibilities;
B. The name, position and telephone number of the person who has overall responsibility for aerodrome safety; and
C. Airport committees.

Safety Management System (SMS)

Particulars of the safety management system established for ensuring compliance with all safety requirements and achieving continuous improvement in safety performance, the essential features being:

A. The safety policy, insofar as applicable, on the safety management process and its relation to the operational and maintenance process.

B. The structure of organization of the SMS, including staffing and the assignment of individual and group responsibilities for safety issues.

C. SMS strategy and planning, such as setting safety performance targets, allocating priorities for implementing safety initiatives and providing a framework for controlling the risks to as low a level as is reasonably practicable keeping always in view the requirements of the Standards and Recommended Practices in Volume I of Annex 14, and the national regulations, standards, rules or orders.

D. SMS implementation, including facilities, methods and procedures for the effective communication of safety messages and the enforcement of safety requirements.

E. A system for the implementation of, and action on, critical safety areas which require a higher level of safety management integrity (safety measures program).

F. Measures for safety promotion and accident prevention and a system for risk control involving analysis and handling of accidents, incidents, complaints, defects, faults, discrepancies and failures, and continuing safety monitoring.

G. The internal safety audit and review system detailing the systems and programs for quality control of safety.

H. The system for documenting all safety-related airport facilities as well as airport operational and maintenance records, including information on the design and construction of aircraft pavements and aerodrome lighting. The system should enable easy retrieval of records including charts.

I. Staff training and competency, including the review and evaluation of the adequacy of training provided to staff on safety-related duties and of the certification system for testing their competency.

J. The incorporation and enforcement of safety-related clauses in the contracts for construction work at the aerodrome.

5.1.2 Acceptance of an Aerodrome Manual

AGA will determine whether the aerodrome manual sufficiently conforms to the requirements in the RDCA on Aerodrome manual standards B.E.2556, and subsequently the RDCA on Aerodrome Manual Standards B.E.2556. If it does conform, AGA will accept the document as part of the certification process prior to granting the public aerodrome operating certificate.

5.2 Evaluation of aerodrome personnel competencies

5.2.1 Purpose

5.2.1.1 To provide guidance and information to aerodrome inspectors to use when checking or evaluating aerodrome personnel competencies.

5.2.2 Reference

A. RQCAAT on Aerodrome Standards B.E.2562 (2019)

B. Checklist reference PHC, VAN, ERF, AOI and SMS Checklist

5.2.3 Guidance and Procedures

5.2.3.1 The aerodrome inspector shall ensure that the aerodrome operator employ an adequate number of qualified and skilled personnel to perform all critical activities for aerodrome safety, operation and maintenance, and implement a programme to enhance the competency of the personnel. Checklist presented in Appendix A relating to aerodrome personnel competencies of each area as follows:

A. Aerodrome safety management

B. Airside operations

C. Aerodrome physical characteristics

D. Rescue and fire fighting services

E. Aerodrome Maintenance

5.2.4 Evaluation

5.2.4.1 The AI must determine if:

A. The Accountable Executive, Senior Managers, the Safety Manager, Safety Group members and staff responsible for safety management should be selected with particular reference to training, experience and knowledge on Safety Management Systems relevant to aircraft and aerodrome operators. Collective background knowledge must include that from the following, appropriate to this level of management and the individual tasks:

a) Principles of safety management, as detailed in ICAO Document 9859 Safety Management Manual, including risk assessment matrixes and their appropriate use

b) General management systems, procedures and techniques, including principles of human and organisational factors – problem solving styles, interpersonal communications; role conflicts; stress at work and task analysis

c) Specific safety management systems, including safety risk management, and its applicability to aerodrome operations.

d) Organisational processes for:

- occurrence reporting, investigation and follow-up
- safety risk management
- change management
- data collection, storage setting and measuring safety performance metrics
- inspection and auditing accident/incident reporting and investigation
- communicating aerodrome safety rules, regulations and information
- safety performance monitoring, measurement and follow-up, using safety auditing, studies, reviews and surveys
- co-ordination and control of airside activities

e) Aerodrome Emergency Plan

f) Human factors principles

g) Knowledge of aerodrome operations, including a basic understanding of aircraft operations, sufficient to be able to identify and understand potential hazards

h) Any other national regulations issued in the subject matter from time to time

B. Aerodrome operation control centre (AOCC) staffs responsible for planning, design, operation, monitoring and maintenance of the AOCC must be trained on all AOCC functional and interface areas that relate to aircraft safety. Background knowledge must include that from the following, again appropriate to the individual tasks:

a) Wildlife Control at Aerodromes

b) Dangerous Goods Regulations (as they apply to aerodromes)

c) Aeronautical Information Service (AIS), NOTAMs, Aeronautical Information Regulation and Control (AIRAC) cycles
d) Aeronautical Information Publication Thailand
e) Maps and charts
f) Notice to Airmen (NOTAM)
g) Surface Movement Guidance Control System (SMGCS)
h) Company SMS, including processes/procedures for:
- occurrence reporting, investigation and follow-up
- safety risk management
- change management
- data collection, storage setting and measuring safety performance metrics
- inspection and auditing accident/incident reporting and investigation
- communicating aerodrome safety rules, regulations and information
- safety performance monitoring, measurement and follow-up, using safety auditing, studies, reviews and surveys
- LVPs
- Works-in Progress (WIP)
- co-ordination and control of airside activities
- disabled aircraft recovery

i) Wildlife Management
j) Airside Vehicle Operations
k) Apron management and operations, including refueling practices
l) Aerodrome Emergency Plan
m) Human factors principles
n) Knowledge of aerodrome operations, including a basic understanding of aircraft operations, sufficient to be able to identify and understand potential hazards
o) Any other national regulations issued in the subject matter from time to time

C. Aerodrome operator's staff responsible for planning, design, operation and maintenance must be trained on the SMGCS and Electrical Systems, including the operational objectives and the application of human factors principles.

Background knowledge must include that from the following, appropriate to the individual tasks:

a) ICAO Airport Services and Aerodrome Design Manuals
b) Other relevant ICAO guidance docs, including Docs 9476 Manual of Surface movement Guidance and Control systems (SMGCS), Doc 9830 Advanced SMGCS, and Doc 9870 Runway Incursion Prevention
c) Aerodrome operating minima
d) Differences in precision and non-precision approaches and the part that precision approach facilities play in the accuracy of delivery of the aircraft to the runway and hence levels of risks to aircraft safety
e) Any other national regulations issued in the subject matter from time to time

D. The staff responsible for the planning and execution of works that affect the aerodrome movement area and obstacle limitation surfaces must have training on aerodrome works in progress. Background knowledge must include that from the following, again appropriate to the individual tasks:

a) Adverse weather, day and night operations
b) Air Traffic Control operations and practices
c) Aircraft performance – landing and take-off
d) Aerodrome cleaning and sweeping programme
e) Aerodrome power supply and standby systems
f) Aerodrome systems and procedures
g) Assessment of temporary obstacles
h) Wildlife control procedures
i) SMS safety requirements, including occurrence or safety concern reporting
j) Environmental procedures, including methods of controlling aircraft and work noise
k) Implications of work permits, contractors briefings, NOTAMs, Air Traffic Information Service (ATIS), operational safety notices, organisational safety policy for outside works
l) Inspection, recording, reporting and other documentation systems
m) National legislation related to standard safety and working practices
n) National Aviation Security Programme

o) Regulatory and organisational inspection/audit systems
p) Regulatory and organisational standards and objectives
q) Standard aircraft operation procedures
r) Standard engineering practices and procedures, work methods and temporary repair options
s) Work access and provision of Rescue and Fire Fighting Service (RFFS)
t) Any other national regulations issued in the subject matter from time to time

E. Staff responsible for overseeing/ensuring safe apron operations must have training on Apron operations and management, including airside vehicle operations. Background knowledge must include that from the following, again appropriate to the individual tasks:

a) AOCC operations
b) Accident reporting and investigation procedures
c) Adverse weather operations, LVPs and their effect on apron operations
d) Aircraft hazards, blast, ingestion, propellers etc.
e) Aerodrome apron and associated road systems
f) Aerodrome safety audits and inspections
g) Airside security requirements
h) Airside Driving Permit (ADP) and Airside Vehicle Permit (AVP) Systems
i) Appreciation of aerodrome and operating companies' driver training programmes for general and specialist vehicles
j) Standards for vehicle maintenance and operation and appreciation of operating companies' vehicle maintenance programmes
k) Communication of aerodrome safety rules, regulations and information including Aerodrome Safety Committee/Board
l) General driving rules on roads, aprons and associated taxiways, including the giving way to positioning priority to refueling vehicles when refueling on stand, and emergency vehicles when responding to an emergency.
m) Interaction of aircraft servicing operations and related vehicles, procedures, hazards, accidents and incidents
n) Organisational and regulatory standards for driver training

o) Procedures for reporting spillages, removing Foreign Object Debris and reporting wildlife observations
p) Rules of the Air relevant to ground movement
q) Systems for road signs, markings and lights, and for traffic control, speed limits and parking, particularly in relation to the aircraft operating zones of aircraft stands
r) Any other national regulations issued in the subject matter from time to time

F. Staff responsible for overseeing/ensuring the safe movement of persons and vehicles/equipment at airside must have training on Airside Vehicle Operations. Background knowledge must include that from the following, again appropriate to the individual tasks:

a) Accident reporting and investigation procedures
b) Adverse weather operations, LVPs and their effect on airside driving
c) Aircraft hazards, blast, ingestion, propellers etc.
d) Aerodrome layout, road systems, aprons
e) Aerodrome safety audits and inspections
f) Airside security requirements
g) Airside Driving Permit (ADP) and Airside Vehicle Permit (AVP) Systems
h) Appreciation of aerodrome and operating companies' driver training programmes for general and specialist vehicles
i) Appreciation of operating companies' vehicle maintenance programmes
j) Communication of aerodrome safety rules, regulations and information including Aerodrome Safety Committee/Board
k) General driving rules on roads, aprons, taxiways and runways
l) Interaction of aircraft servicing operations and related vehicles, procedures, hazards, accidents and incidents
m) Organisational and regulatory standards for driver training
n) Procedures for reporting spillages and removing Foreign Object Debris
o) Rules of the Air relevant to ground movement
p) Standards for vehicle maintenance and operation

q) Systems for road signs, markings and lights, and for traffic control, speed limits and parking, particularly in relation to runway incursion prevention and apron management

G. Staff responsible for carrying out technical inspection of the runway must have training on Runway Surface Friction Characteristics. Background knowledge must include that from the following, again appropriate to the individual tasks:

a) ICAO Annexes 14 and 15 to the Convention
b) ICAO Airport Services Manual Part 2 – Pavement Surface Conditions
c) Aircraft operating limitations
d) Definitions of surface contaminants and effect of painted surface on friction
e) Friction classification, Friction calibration tests and Interpretation of test results
f) Obtaining information on weather conditions and trends
g) Operating instructions for runway surface friction measuring equipment
h) Procedures relating to periodic friction monitoring
i) Promulgated aerodrome information, NOTAM and SNOTAM procedures
j) Runway surface construction and friction characteristics
k) Any other national regulations issued in the subject matter from time to time

H. The staff responsible for ensuring availability of all equipment including the requisite amount of extinguishing agents, to achieve the rated category of the RFFS must be trained on Fire and Rescue Operations. Background knowledge must include that from the following, again appropriate to the individual tasks:

a) Categorisation of Rescue and Firefighting services (RFFS):
   - CAR Series B, Part I Aerodrome Design and Operations
   - Aeronautical Information Publication, India – RFF promulgation
   - ICAO Airport Services Manual, Part 1
   - Any other CAR/ Directions issued in the subject matter from time to time

b) Training:
   - Basic training in fire fighting
   - Specialised training in aircraft fires
   - Fire and rescue training practices
   - Command and Control

- Medical/First Aid training
- Relevant Health and Safety legislation
- The impact of dangerous goods regulations

c) Policies and procedures for maintaining the adequacy of:

- Additional water supplies
- Communication facilities and procedures
- Difficult terrain/environments
- Emergency access roads
- Equipment performance and functionality
- Equipment testing
- Handling dangerous cargo
- LVOs
- Medical services
- Medical standards
- Response times
- Staffing levels, rosters etc

5.3 Evaluation of aerodrome data

5.3.1 Purpose

5.3.1.1 The purpose to provide guidance and information to aerodrome inspectors to use when checking or evaluating aerodrome data required to be published in the Aeronautical information Publication.

5.3.2 Reference

A. RQCAAT on Aerodrome Standards B.E.2562

B. ICAO Annex 14 Vol.1 Chapter 2

C. Checklist reference Aerodrome Manual, Aerodrome data Checklist

5.3.3 Guidance and Procedures

5.3.3.1 General Information

A. Chapter 2 of Annex 14 vol. I contains a complete list of aerodrome data to be originated and included by the Aerodrome Operator in the Aerodrome Manual. The information must be available to the operator prior to initial certification.

B. Before being sent to the Aeronautical Information Services for publication in the AIP, AGA must be satisfied that the information is adequate. It must be ensured that all parties in the data chain including the data originator, the data provider and the data publisher have quality systems for maintaining the integrity of aeronautical data.

C. Any proposed changes by the Aerodrome Operator to published information in the AIP must be checked and approved by AGA before being sent to AIS for publication.

5.3.4 Checklist

Part 3 and Subpart 4.1 of Part 4 of the Aerodrome Manual Checklist, (AGA-CE-201) and Aerodrome data checklist (AGA-CE-214) contained in Appendix A relating to aerodrome data and aerodrome reporting procedures must be completed by the Aerodrome Inspector when assessing aerodrome data during initial certification and during the inspection for certificate renewal. Subpart 4.1 of Part 4 of the same Checklist could be used in evaluating reporting procedures during surveillance inspections

5.3.5 Evaluation

5.3.5.1 The AI must determine if:

A. There is a system to forward any new data or variation of existing data to the aeronautical information service;

B. There is a quality system for protecting aeronautical data from the point of origination in the data chain to the next intended user;

C. There is a system for prompt notification of changes to variable and permanent data.

***Note**: Information requiring engineering survey and assessment should be gathered for verification by qualified technical person.*

5.3.5.2 Examples of temporary data are limitations and warnings such as temporary runway or taxiway closure, temporary obstacles, runway surface condition reports, system failures and bird hazards.

5.3.5.3 Examples of variable data are runway declared distances, hours of operation, visual aids and such facilities as rescue and firefighting.

5.3.5.4 Examples of permanent data are aerodrome reference point, runway strength, runway dimensions and layout, elevations and permanent obstacle.

5.4 Evaluation of aerodrome physical characteristics

5.4.1 Purpose

5.4.1.1 The purpose is to provide guidance and information to aerodrome inspectors to use when evaluating the aerodrome physical characteristics of an aerodrome.

5.4.2 References

A. RDCA on Aerodrome designing and constructing standards B.E.2556
B. RQCAAT on Aerodrome Standards B.E.2562 (2019)
C. ICAO Annex 14 (Physical Characteristics)
D. ICAO Doc. 9157 Part 1 (Runways)
E. ICAO Doc. 9157 Part 2 (Taxiways, Aprons and Holding Bays)
F. ICAO Doc 9981, PANS Aerodrome
G. Checklist reference PHC Checklist (AGA-CE-204)

5.4.3 Guidance and Procedures

5.4.3.1 General Information

A. Prior to the initial certification, the aerodrome designs and drawings must be evaluated by the appropriate Aerodrome Inspector(s) and coordinated with SFD to ensure that they meet the Aerodrome Regulations and civil aviation security measures and ANS to ensure the procedure and measure comply with standards before initial approval is given by CAAT for commencement of aerodrome construction work. Such drawings may include a hardcopy or softcopy (AutoCAD) format:

a) Apron layout showing markings for aircraft, vehicles parking, apron safety lines, lead-in lines, location of aircraft stand identification marking, passenger boarding bridge parking and prohibited areas;
b) Aerodrome layout drawing;
c) Aerodrome and local area grid map(s);
d) PAPI siting drawing;

e) Evidence of wheel tracks at taxiway curves and intersections showing requisite outer main gear and nosewheel separation distances from edge of pavement;

f) Schematic power and standby power supply;

g) Obstacle limitation surface contour drawings;

h) All AIP charts; and

i) Runway, taxiway and apron pavement construction drawings, for new pavements.

B. Details relating to the physical characteristics in approved designs/drawings must be consistent with what is to be provided in the aerodrome manual, in the AIP AD2, and on site.

C. Changes to physical characteristics of airside facilities at an aerodrome include:

a) Construction, realignment, or alteration any runway or other aircraft landing or takeoff area of an aerodrome;

b) Construction or realignment, of a taxiway associated with a landing or takeoff area of an Aerodrome; and

c) Any change in dimensions of any pavement, including blast pads and paved shoulders.

5.4.4 Checklist

Aerodrome Physical Characteristics Inspection Checklist presented in Appendix A relating to aerodrome movement area, must be completed prior to initial certification and during certificate renewal inspection. Normally this will be provided to the aerodrome certificate applicant/operator for their completion prior to the on-site verification phase.

5.4.5 Evaluation

A. During initial certification inspection, the Aerodrome Inspector must check the dimensions, by sampling measurements both on-site and on digital mapping, such as AutoCAD and Google Earth, and also check the physical surface conditions of runway(s), runway shoulders, runway strip(s), runway end safety areas, stopway(s) and clearways, taxiway(s), taxiway shoulders, taxiway strips and aprons and verify the declared distances.

B. **Declared Distances** are verified by checking the drawing provided by the aerodrome operator that shows all four declared distances in each direction for each runway, with separate labelling of the start and end of each declared distance. The check should include a calculation of the approach and take-off climb surfaces based on the obstacle data provided, not forgetting the transitional surface connecting to the sides of the approach surface.

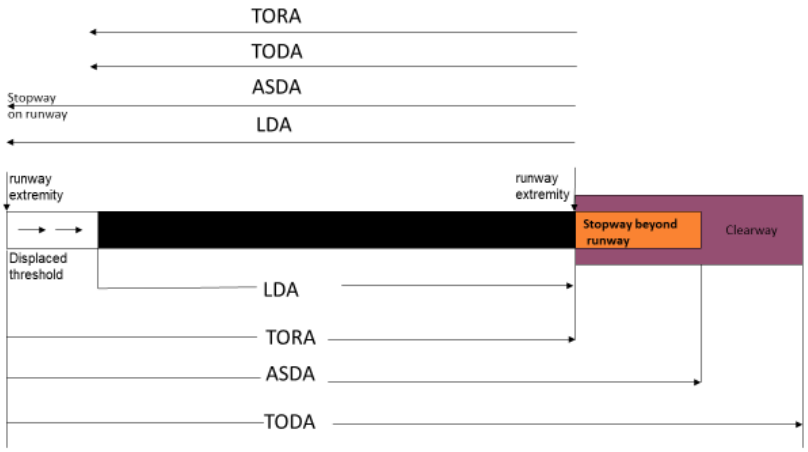


Figure: Sample declared distances drawing (threshold displaced due to obstacles)

C. The obstacle limitation surfaces are clear of obstacles or any permitted obstacles have been allowed by an aeronautical study, or as marked, lit, frangible and delethalised (in graded areas and RESA) permitted aids to safety or air navigation that have been approved by CAAT.

D. **Pavement.**

Aerodrome Inspector must determine if all pavements available for aircraft use including loading aprons and parking areas, are maintained to meet the required conditions:

a) Check the pavement lips—the area between full-strength pavement and shoulders or paved shoulders and safety areas—to assure that they are no greater than necessary to allow water to drain off the pavement. check the pavement edges to assure that they are no greater than necessary to allow water to drain off the pavement. A lip height not greater than 25 mm to 35 mm is usually sufficient to allow proper drainage. The surface of the shoulder that abuts the runway should be flush with the surface of the runway and its transverse slope should not exceed 2.5 per cent. The surface

of the strip that abuts the runway shoulder should be flush with the surface of the shoulder.

b) Determine if there are any unsealed cracks wide enough to either:

c) cause directional control problems for an aircraft, or

d) generate loose material on the surface of the pavement

e) Determine if there are any holes that could cause directional control problems for an aircraft.

f) Check the condition of pavement areas for unsealed cracks, scaling, spalling, bumps, low spots, and for debris that could cause foreign object damage (FOD) to aircraft, or any holes, cracks or edges that could generate FOD.

g) Check for vegetation growth along runway and taxiway edges that may impede drainage from the pavement surface or be ingested by aircraft engines.

h) Check for vegetation growth in cracks.

i) Check for any vegetation growth in the runway strip that is higher than the normal grass height, which for bird control purposes is normally kept between 15 to 20cm height.

j) Ensure that the aerodrome operator has a procedure in place to monitor any cracks, holes, variations and vegetation that can cause loss of aircraft directional control or may cause pavement damage, including damaged caused by damming, obstructed water ways or ponding water: observe evidence and/or demonstration.

k) If a crack or surface variation is found and appears to create a marginal condition which could impair directional control of aircraft, advise the aerodrome operator representative so that corrective action can be taken as needed. Where conditions are found involving possible pavement deterioration (evidence of cracking, ponding, settling, blow-ups, etc.), the aerodrome operator should be made aware of the possible pavement deterioration immediately. Longitudinal cracks are more likely to affect directional control of aircrafts than the transverse cracks. Each case should be evaluated at the discretion of the Aerodrome Inspector, but generally no

cracks or holes are permitted in pavements that form part of a certified aerodrome.

E. **Strips and Runway End Safety Areas.**

The Aerodrome Inspector should:

a) Determine if there are any hazardous ruts, depressions, humps or variations from the normal smooth surface.

b) Check to ensure no object is located in a safety area, except objects that must be in the strip and RESAs because of their functions (such as runway lights, signs, or navigational aids). These objects must be constructed on frangible mounted structures of the lowest practical height, on delethalised bases if in the graded areas or RESA, and marked and lit if the aerodrome is to be certified for night use, and can only be installed as obstacles with the prior approval of AGA.

c) Determine if the base for any equipment in strips and RESA areas flushes with surrounding ground, are delethalised and equipment and NAVAIDs are mounted on frangible couplings.

d) Check to ensure that manhole covers are at grade/surface level and can support vehicles and aircraft. Check to ensure that mounts for light fixtures are at grade level, and if required, delethalised ((5)(ii) above).

e) Check for surface variation and other damage caused by rodents or other animals and reptiles.

f) Take note of any objects that are not frangible or not at grade level. Also note extraneous equipment and objects, such construction equipment, power equipment, unmarked rear sides of signs and surface variations that would cause damage to an aircraft or impede emergency response vehicles.

g) Aerodrome Inspector must determine if all unpaved areas available for aircraft, including loading aprons and parking areas, are maintained to meet the required conditions; if the RESAs and runway strips are maintained to the required conditions. Unusual aerodrome conditions caused by seasonal variations, such as, mud, water, etc., are evaluated on a case-by-case basis.

h) Aerodrome Inspector may have the vehicle operator drive in portions of the strips and RESA to evaluate surface conditions, provided conditions allow it.

If conditions do not allow it, then ask the aerodrome operator to justify the capability of the strip to support aircraft in the graded are and fire vehicles outside the graded area for an instrument runway. Consideration will have to be given to the location and design of drains on a runway strip to prevent damage to an aircraft accidentally running off a runway. Open drains are not permitted in the graded area, and therefore could prevent a runway from being designated as precision instrument approach due to the wider graded area at code 4 for precision runways. Suitably designed drain covers may be required. Where open-air or covered storm water conveyances are installed, consideration will have to be given to ensure that their structure does not extend above the surrounding ground so as not to be considered an obstacle. Particular attention needs to be given to the design and maintenance of an open-air storm water conveyance in order to prevent wildlife attraction, notably birds. If needed, it can be covered by a net or suitably spaced wires.

5.5 Evaluation of obstacle

5.5.1 Purpose

5.5.1.1 The purpose is to provide guidance and information to aerodrome inspectors to use when evaluating obstacle limitation surfaces associated with aerodromes.

5.5.2 References

A. Under section 58 and 59 of Air Navigation Act B.E.2497

B. RQCAAT on Aerodrome Standards B.E.2562 (2019)

C. ICAO Annex 14 Vol I and 2 chapter. 4 (Obstacle restriction and removal).

D. ICAO Doc. 9137 Part 6 (Control of Obstacles).

5.5.3 Guidance and Procedures

5.5.3.1 General Information

A. It is required that a number of imaginary surfaces be established around the vicinity of aerodromes operated under section 58 and 59 of Air Navigation Act. These surfaces must be free of penetration by any object including structures, vegetation (e.g. trees) and terrain.

B. The aerodrome operator is required to establish a process for monitoring the airspace around their aerodromes to ensure that they are free, and will be kept free from these objects. Aerodrome operators are also required to report new or on-going construction around aerodrome to CAAT who is statutorily responsible for determining whether such construction would constitute a hazard to air navigation and subsequently providing aviation height clearance.

C. In determining whether an object constitutes a hazard to air navigation, an Aerodrome Inspector must apply the ultimate development approach in his evaluation. In the ultimate development approach, the obstacle limitation surface of the ultimate layout of the system of runways as provided in the aerodrome master plan is taken into account in determining whether or not a permanent obstacle would constitute a hazard. Temporary obstacles may be evaluated based on existing development only. For example, the provision of clearway can significantly affect the take-off climb surface.

5.5.4 Checklist

Aerodrome Physical Characteristics Inspection Checklist in Appendix A relating to obstacle limitation surfaces, would normally have to be completed during initial certification and updated during certificate renewal inspections and may be used during surveillance and special-purpose audits/inspections. As circumstances warrant, depending on the objective and scope of the inspection, the checklist may be tailored to meet specific needs.

5.5.5 Evaluation

5.5.5.1 Aerodrome Inspector must determine that:

A. All fixed and mobile objects, as defined in the Aerodrome Standards regulations are either marked or lighted or removed, unless marking and lighting is determined to be unnecessary by an aeronautical study or by the shielding principle, where applicable.

B. There are no objects extending above the obstacle protection surface for PAPIs and that the approach light plane is free of infringements, except for minor unavoidable interruptions by the localiser antenna array.

C. The aerodrome operator has conducted a WGS-84 obstacle survey to produce charts and if follow-up surveys are conducted whenever significant changes occur. The Aerodrome Chart shall show a plan view of the entire aerodrome and its environs to the outer limit of the conical or outer horizontal surfaces where established, together with profile views of all obstacle limitation surfaces. Each obstacle should be identified in both plan and profile with its description and height above the datum, which should be specified on the chart.

D. The aerodrome operator has established a program of regular and frequent visual inspection, of all areas around the aerodrome including a daily observation of all obstacle lights both on and off the aerodrome and corrective action in the case of light failure, in order to be sure that any construction activity or natural growth (e.g. trees) likely to infringe any of the obstacle limitation surface is discovered before it may become a problem. For this purpose, the operator requires an obstacle listing that indicates the location, type, name, elevation, marking and lighting of every obstacle, together with who is responsible for the lighting.

E. The siting or performance of visual and non-visual aids to navigation is not adversely affected by objects under the approach surface.

5.6 Evaluation of Aerodrome Maintenance

5.6.1 Purpose

5.6.1.1 The purpose is to provide guidance and information to aerodrome inspectors to use when inspecting and evaluating aerodrome maintenance programmes and their levels of implementation at aerodromes.

5.6.2 References

A. RDCA on Aerodrome operating procedures B.E.2557

B. RQCAAT on Aerodrome Standards B.E.2562 (2019)

C. ICAO Annex 14 Vol I chapter 10 (Aerodrome Maintenance)

D. ICAO Doc. 9137 Part 2 (Pavement Surface Condition)

E. ICAO Doc. 9137 Part 9 (Pavement Maintenance Practices)

5.6.3 Guidance and Procedures

5.6.3.1 General Information

A. It is required that the surface frictional characteristic of runway pavements be periodically determined by the aerodrome operator using a continuous friction measuring device with self-wetting features for the purpose of the monitoring pavement friction characteristics and taking prompt preventive maintenance action.

B. Surface friction testing may also be required by the Aerodrome Regulations in conditions of natural rainfall to check for ponding.

C. It is essential to establish a comprehensive routine maintenance system for servicing light and other equipment so that the installation complies with specified requirements.

D. As November 2020 approaches, be aware of the preparation for and implementation of the significant changes in Annexes 6, 11 and 14 in respect of runway condition reporting.

E. The Aerodrome Regulations obligate operators to include in their aerodrome manual, maintenance programs for paved and unpaved movement areas, runway strips and aerodrome drainage.

F. The purpose of promoting efficiency and regularity of aeronautical operations encourage operators to include maintenance programs for other aspects, namely terminal facilities including passenger loading bridges, elevators, travelators, lifts, conveyor belts, chillers, Flight information displays, etc. Guidance for the development of maintenance programs for these areas is contained in ICAO Doc 9137 Part 9 on Aerodrome Maintenance Practices.

5.6.4 Checklist

5.6.4.1 Physical Characteristics Inspection Checklist presented in Appendix A. and relating to Maintenance, would normally have to be completed during initial certification and certificate renewal inspections and used during surveillance inspections and other special purpose inspections relating to Airport Pavement Friction Assessment.

5.6.5 Evaluation

5.6.5.1 The Aerodrome Inspector must determine that:

A. Preventive maintenance procedures have been established for pavements, unpaved area, visuals aids, power supply, drainage and buildings and specialized vehicles such as rescue and fire fighting vehicles. Check procedures for calibration of PAPI. These procedures should also be addressed in the aerodrome manual.

B. Maintenance procedures are being implemented. Check maintenance records for airfield lighting, power supply and RFF vehicle and compare with sample maintenance schedules.

C. Debris, rubber deposit removal and friction measurement programs have been developed. Check friction test report when the last friction measurement was conducted and review result against minimum requirement in RDCA Aerodrome Operating Procedure B.E. 2557 Article 13. If the friction measuring equipment is owned and operated by aerodrome operator's personnel, check if personnel have been trained on the use of the equipment and if the equipment is calibrated as required before use.

D. The pavements are free of debris and surface irregularities (cracks depressions or other distress features). Aerodrome Inspector should use his judgement to determine when a pavement distress is significant to constitute a finding.

E. The unpaved areas are proper maintenance for the safety of aircraft on operating area. To ensure that the vegetation length is not obscuring light, signs, markers etc. including to limit the attraction of birds and other wildlife. It will be necessary to ensure that mounds of grass cutting are not left on area where engine ingestion is possible.

F. Marking and lighting systems on the aerodrome are well maintained. Maintenance action shall include: cleaning, replacing, or repairing any faded, missing, or non-functional item of marking or lighting; keeping each item clearly visible; and ensuring that each item provides an accurate reference (this includes alignment of fixtures) to the user. If the aerodrome operator owns a standby generator for movement area lighting, inquire about testing procedures, and inspect records of test and the switch-over times achieved. Aerodrome Inspector

should observe a test operation of the generator if periodic testing procedures do not appear to be adequate.

G. There are adequate spares for replacement of any electrical fixture that may become defective.

H. Ensure that aerodrome operator have a process for determining and providing relevant information that a runway, or part of, may be slippery when wet, including the minimum friction level for reporting of slippery runway conditions as specified in the Aerodrome regulation.

5.7 Evaluation of Visual Aids for Navigation

5.7.1 Purpose

5.7.1.1 The purpose is to provide guidance and information to aerodrome inspectors to use when evaluating visual aids for navigation.

5.7.2 References

A. RQCAAT on Aerodrome Standards B.E.2562 (2019)

B. ICAO Annex 14 Vol I chapter. 5 (Visual Aids for Navigation)

C. ICAO Doc. 9157 Part 4 (Visual Aids)

5.7.3 Guidance and Procedures

5.7.3.1 General Information

A. It is required that all licensed aerodromes operated under the Air Navigation Act are equipped with visual aids. The type of aids to be provided depend on traffic density, instrument approach type and limits, visibility / RVR minima for both landing and take-off, and complexity of the aerodrome layout.

B. Plan for lighting, signs and markings is required to meet the aerodrome regulation and would need to take into account the density of air traffic and the visibility conditions under which operations are intended. The plan should be integrated as a whole into the aerodrome's runways incursion and collision avoidance strategy. Further guidance is provided in ICAO DOC9476 Chapter 2.

C. Whether a change to the configuration and specification of visual aids at an aerodrome is proposed by the aerodrome operator.

D. Proposed change to visual aids at an aerodrome may arise from:

a) Construction, realignment, or alteration of any runway or other aircraft landing or takeoff area of an aerodrome;
b) Construction or realignment, of a taxiway associated with a landing or takeoff area of an aerodrome;
c) Change status from non-instrument through to precision instrument (see 4.9.2 A-3)) approach category 3;
d) Change in time of use from daylight operation to day and night operations;
e) Replacement and/or upgrading of light fittings; and
f) Addition of new AGL such as simple touchdown zone lights or runway guard lights for operational or safety reasons.

5.7.4 Checklist

Visual Aids for Navigation Inspection Checklist presented in Appendix A relating to Visual Aids, would normally have to be completed during initial certification and certificate renewal inspections. Checklist in Appendix A may be used when evaluating alterations made to an airside visual aid. The checklist is to be used during surveillance and special- purpose audits/ inspections. As circumstances warrant, depending on the objective and scope of the inspection, the checklist should be tailored to meet specific needs.

5.7.5 Evaluation

A. **Marking**

Aerodrome Inspector must determine if:

a) The status of markings with respect to correct colour-coding, peeling, blistering, chipping, fading, and obscurity due to rubber build-up are adequate or not.
b) All runway hold position markings are clearly visible.
c) During and after construction projects, new markings are compliant with Aerodrome Regulations.
d) If the markings have glass beads, the reflectivity of glass beads is adequate at night.
e) There are non-standard marking or markings that are obscured, faded or deteriorating.

B. **Signs**

The Aerodrome Inspector must determine if:

a) Signs are easy to read, have been procured and certified by the manufacturer in accordance with colour standards, retro-reflective if required (not illuminated), and that all lighted signs are working with appropriate controls and not obscured by vegetation, dirt, etc.

b) Signs are frangible mounted and concrete bases are properly delethalised if required.

c) Signs are installed in the correct order, e.g. location signs outboard of runway designations at runway holding positions.

d) Sign panels are not missing or damaged, that they have the correct legend and arrow orientation, and that they are not cracked or broken.

e) During and after construction projects, new signs are in compliance with specifications in the Aerodrome Regulations.

f) During periods of darkness and low visibility operations, if applicable, signs are properly illuminated. If mandatory instruction signs are illuminated with the associated runway lighting system, check the signs for correct operations: that they are on the correct circuits, they do not flicker, and they follow the intensity setting of the runway or taxiway lights.

g) Non-standard sign or any sign that is not functioning, faded or damaged, are removed.

h) The provision of fixed or variable message signs shall take into account the surface movement guidance and control system (SMGCS) requirements.

C. **Lighting**

The Aerodrome Inspector must determine if:

a) The following are operable, if installed, and that vegetation or deposits of foreign material do not obscure the light fixture:

- Runway and taxiway edge lights;
- Apron edge lights;
- Runway centre line and touchdown zone lights;
- Taxiway centre line lights or centre line reflectors;
- Runway threshold/end lights;

- Runway guard lights (both elevated and in-pavement);
- Rapid exit taxiway indicator lights;
- Simple touchdown zone lights;
- Stop bars with linked lead on taxiway centreline lights (interlocking system) – check for correct operation that both the stop bar and lead-on lights cannot be illuminated at the same time;
- Stop bars, where installed – check its controlled by air traffic services if they are operated throughout operational hours, and for all aircraft and vehicles accessing a runway. The formal contingency arrangements are in place in the event of a switching failure, and
- Stop bars shall be installed at all taxiways leading to runway operated with runway visual range below 550 m.
- The aerodrome where selective switching of stop bars and taxiway centre line lights is installed for surface movement guidance and control system (SMGCS), The aerodrome inspector shall ensure it is installed in accordance with the requirements and controlled by ATS.
- The intensity of runway lighting shall be adequate for the minimum conditions of visibility and ambient light in which use of the runway is intended, and compatible with that of the nearest section of the approach lighting system when provided.
- The aerodrome inspector must review the evidence of the control of lighting intensity (e.g. procedures, lighting intensity records, equipment, etc.)

b) The following are operable, if installed:
   - Apron lights and floodlights (used in construction to ensure they are properly shielded);
   - Obstruction lights;
   - Lighting in fuel storage areas, and
   - Security fence lighting.

c) Note all missing fixtures and lights that are not working or appear dim or uneven intensities in a set of lights.

d) Note any missing or broken light fixture lenses.

e) Runway and taxiway lights and runway threshold lights are the proper colour and are orientated correctly.

f) For a runway meant for use in runway visual range conditions less than a value of 550 m, the electrical systems for the power supply, lighting and control of the lighting systems shall be so designed that an equipment failure will not leave the pilot with inadequate visual guidance or misleading information.

g) Note on the inspection whether the colour is achieved by filters or dichroic lenses, as filters may be more prone to misalignment within the lens.

h) All AGL bases are secure without any missing or corroded bolts.

i) The aerodrome has an operational wind direction indicator to provide aerodrome surface wind direction information visible from flight and on the movement area, particularly in the area of the thresholds and touchdown zones, and from any helicopter FATOs. If the aerodrome is open to flight operations during hours of darkness, the required wind direction indicators must be lighted. The Aerodrome Regulations provide specifications for the construction of a circular band around at least one wind direction indicator. The segment circle must be clear of vegetation and be seen easily from the air.

j) An aerodrome or identification beacon has been installed to specification where conditions necessitate such installation.

k) Performance level objectives for approach and runway lighting in a precision approach lighting system are in accordance with specification.

l) Performance level objectives for runway light used for runway meant for take-off in runway visual range conditions less than a value of 550 m. and in condition of 550 m. or greater are in accordance with specification.

Note: *for j) and k), particular attention should be paid to situations where* two or more consecutive lights are missing or unserviceable.

- Road holding position signs and marking are provided at runway/road intersections, with lights where required by low visibility operations – test the operation of the lights in accordance with the procedure in the aerodrome manual.

- There is a visual docking guidance system meet the requirement on the aerodrome regulation including evaluation, location, characteristic specifications, and azimuth and stopping guidance, or painted self manoeuvring markings which provide alignment and stopping position guidance, where marshaling services are not provided.
- If the aerodrome uses the 30 m spacing option for the provision of runway centre line lights. Aerodrome inspector shall ensure that runway is intend to use in runway visual range 350 M or greater and can maintain serviceability level of runway.

5.8 Evaluation of visual aids for denoting obstacles

5.8.1 Purpose

5.8.1.1 The purpose is to provide guidance and information to aerodrome inspectors to use when evaluating visual aids denoting obstacles.

5.8.2 References

A. RQCAAT on Aerodrome Standards B.E.2562 (2019)

B. ICAO Annex 14 Vol I Chapter 5 (Visual Aids for Denoting Obstacles)

C. ICAO Doc. 9157 Part 4 (Visual Aids)

5.8.3 Guidance and Procedures

5.8.3.1 General Information

A. It is required that the operators of aerodromes regulated under section 58 and 59 of Air Navigation Act should establish a mechanism for continually monitoring existing obstacles on the aerodrome and in the vicinity of aerodrome for the purpose of:

a) ensuring that markings and lights fitted to these obstacles are maintained in serviceable condition.

b) That changes to obstacles are assessed, and, if required, promulgated.

c) That instrument approach, and other flight procedures, remain protected.

d) That radio and navigation aids remain protected.

B. Aerodrome Inspector must ensure that aerodrome operators carry out a regular inspection or visual monitoring of their obstacle limitation surfaces around airport

to ensure that serviceable marking and lighting are in place and the height of such structures have not increased without approval.

5.8.4 Checklist

The Visual Aids for Navigation Inspection Checklist in Appendix A may be used during special-purpose audits/inspections to the extent applicable.

5.8.5 Evaluation

5.8.5.1 The Aerodrome Inspector must:

A. Determine if marking and lighting are in accordance with specification in Aerodrome Regulations

B. Determine if wind direction indicator, apron floodlight and other tall structures within the airside are fitted with obstacle light and if obstacle lights are operable. Check Aerodrome Manual for a list of lighted obstructions that includes who is responsible for each light's maintenance.

C. Check to see if any construction is underway on or near the aerodrome that could affect aircraft operations, check for any vegetation, especially trees, that may penetrate the obstacle limitation surfaces.

D. Check to ensure that any construction equipment, especially tall cranes being used at construction sites, are not an obstruction.

E. Determine if obstructions are properly marked and lighted.

F. Report any obstacle light that is missing, inoperative or damaged, and any object that appears to be an obstruction and is not properly marked or lit.

G. Ensure the aerodrome comply with requirements for the extinguishing, screening or modification of non-aeronautical lights which could present a hazard to aircraft safety, when these ones are located outside the boundaries of the aerodrome.

5.9 Evaluation of visual aids for denoting restricted use area

5.9.1 Purpose

5.9.1.1 The purpose is to provide guidance and information to aerodrome inspectors to use when evaluating visual aids denoting obstacles.

5.9.2 References

A. RQCAAT on Aerodrome Standards B.E.2562 (2019)

B. ICAO Annex 14 Vol I chapter 7 (Visual Aids for Denoting Restricted Use Area)

C. ICAO Doc. 9157 Part 4 (Visual Aids)

5.9.3 Guidance and Procedures

A. **General Information**

1) Aerodrome Inspector will check the safety precautionary measures to be taken during routine and major construction work on or adjacent to the airside of an aerodrome. It is required that aerodrome operators establish procedures to prevent aircraft from entering permanently closed runways, taxiways by obliterating runway and taxiway markings and the removal of lighting

2) It is required that aerodrome operators establish procedures to mark permanent and temporary movement area closures and meet location and characteristic specifications

3) Safety precautionary measures for major construction work in an aerodrome airside are to be incorporated in a work safety plan which must be approved by AGA before the commencement of such work. Aerodrome Inspector should use the work safety checklist in Appendix A as guidance when reviewing an operator's plan.

4) Where circumstances necessitate the imposition of restriction on the use of a runway such as would result in a reduction in the length of the runway, the aerodrome operator is required to ensure that runway threshold and/or end are displaced using appropriate specification of markings and light if applicable, and that temporary PAPI/APAPI are provided if required, such as for jet aircraft using code 3 and 4 runways.

5) Where an aerodrome certificate is suspended or withdrawn by AGA or voluntarily surrendered by the aerodrome operator, AGA shall carry out inspection to ensure that appropriate measures have been taken to prevent inadvertent use of the runway, taxiway or aerodrome as the case may be. These may include removal of the runway markings, and/or installation of unfit for use X markings or elevated illuminated X, depending on the permanent or temporary nature of the closure.

5.9.4 Checklist

The Visual Aids Inspection Checklist in Appendix A is to be used by AGA while inspecting aerodrome works;

5.9.5 Evaluation

The Aerodrome Inspector must determine if:

6) Procedures have been established for temporary and permanent movement area closures, for reduction of declared distances or displacement of threshold/end. Where threshold or runway end have been displaced, displaced threshold marking and PAPIs, end of runway markers and lighting should be evaluated.

7) Procedures have been established by the aerodrome operator for briefing of contractors for avoiding damage to existing utilities or other underground facilities. When a complex construction project is in progress, the Aerodrome Inspector shall inquire about the existence of and adherence to the safety plan.

8) Procedures have been established by the aerodrome operator for avoiding damage to existing utilities, such as the review of appropriate utility plans prior to construction.

9) Each construction area, construction equipment construction roadway, NAVAID area, and unserviceable area, is marked, and lighted if appropriate, in an acceptable manner.

10) Procedures are in place to repair any accidental damage to existing utilities.

5.10 Evaluation of electrical systems and design

5.10.1 Purpose

5.10.1.1 The purpose is to provide guidance and information to aerodrome inspectors to use when evaluating visual aids denoting obstacles.

5.10.2 References

A. RQCAAT on Aerodrome Standards B.E.2562 (2019)

B. ICAO Annex 14 Vol I chapter. 8 (Electrical Systems)

C. ICAO Doc. 9157 Part 5 (Electrical Systems)

5.10.3 Guidance and Procedures

A. **General Information**

1) It is required that electrical systems provided at aerodromes are of adequate design to facilitate the steady operation of aerodrome lighting system.

2) The capacity of power supply and design of electrical systems at an aerodrome are dependent on the type of operation at the aerodrome and the category of lighting supported, including take-off minima that might be lower than approach minima and therefore dictate more demanding switch-over times.

3) A proposed change by an aerodrome operator from a non-instrument through to precision instrument category 3, or day only to day and night operation, or a reduction in the minima for take-off would require an inspection of the aerodrome electrical system before a determination is made.

5.10.4 Checklist

Visual Aids for Navigation Inspection Checklist presented in Appendix A relating to Power supply and Electrical Systems, would normally have to be completed during initial certification, certificate renewal inspections and surveillance audits/inspections.

5.10.5 Evaluation

The Aerodrome Inspector must determine if:

1) Adequate primary and secondary power supply are available at the aerodrome for the safe functioning of visual and non-visual aids. Check if steady power supply is assured through availability of automatic switchover time system need to be observed at the secondary power supply such as generator sub-station and see if the switchover time requirement for the category of operation, specified in Aerodrome Regulations, is met.

2) Adequate precautions have been put in place against system failure. Examples of such precautions are: interleaving of circuits supplying the runway lighting system, and phasing of the supply to approach lighting system.

3) There is a "monitoring and intensity control" panel for airfield lighting, where applicable, and control is from one point (e.g. the control tower supported by a backup control point in the event of failure of the panel in the control tower).

4) There is a method to monitor lighting system reliability and indicate any fault, appropriate to the type and level of operations.

5.11 Evaluation of emergency plan and rescue and fire fighting

5.11.1 Purpose

5.11.1.1 The purpose is to provide guidance and information to aerodrome inspectors to use when evaluating visual aids denoting obstacles.

5.11.2 References

A. RDCA on Aerodrome operating procedures B.E. 2557

B. RDCA on Aerodrome manual standards B.E. 2556

C. RQCAAT on Aerodrome Standards B.E.2562 (2019)

D. ICAO Annex 14 Vol I chapter. 9 (Aerodrome Operational Services, Equipment and Installations)

E. ICAO Doc. 9137 Part 1 (Rescue and Fire Fighting)

F. ICAO Doc. 9137 Part 7 (Aerodrome Emergency Planning)

5.11.3 Guidance and Procedures

A. **General Information**

1) It is required that the level of rescue and fire-fighting service provided at an aerodrome be adequate to support the designated fire-fighting category of the aerodrome.

2) During initial certification, the evaluation of rescue and fire fighting service at the aerodrome should be based strictly on the dimensions of the longest aircraft planned for the aerodrome, that is, the aircraft overall length and fuselage width, and where helicopters operate, that the size of the helicopter operating is considered where helicopter fire categories are provided to enable helicopter operations, rather than aerodrome fire categories. Note the 2 minutes response time for helicopter operations, not just on the operational runway.

3) A provisional aerodrome emergency plan should be available before commencement of flight operations at the aerodrome. The aerodrome operator should constitute an emergency committee as part of drafting and testing the emergency plan. A satisfactory test of the emergency plan must have occurred before an aerodrome certificate can be issued.

5.11.4 Checklist

Emergency Plan and Rescue and Fire-Fighting Inspection Checklist presented in Appendix A relating to aerodrome emergency plan and aircraft rescue and fire fighting services, would normally have to be completed during initial certification and certificate renewal inspections and surveillance and other special purpose inspection relating to wild life hazard management.

5.11.5 Evaluation

1) **Aerodrome Emergency Plan**

The Aerodrome Inspector must determine if:

a) The aerodrome operator should also be encouraged to include procedures for response to other utility failures in addition to electrical power failure such as fuel spills, hazardous materials, natural gas, water and sewage.

b) It is written in sufficient detail to give adequate guidance to all concerned.

c) The certificate holder has made adequate provisions for the agencies and personnel addressed in the AEP to participate in the development of the plan. Look for agency listing, or letters addressing meetings/reviews, and coordination.

d) The plan contains procedures for notifying facilities, agencies, and personnel of the location of an aircraft emergency. incident or accident on the aerodrome, the number of persons involved, and any other necessary information as soon as it is available. At the discretion of the Aerodrome Inspector, conduct a communications test of the emergency plan notification procedures of mutual aid agencies to evaluate the timeliness and effectiveness of the notification procedures. Select at

random a number of telephone numbers listed in the emergency plan and contact the mutual aid agency listed to verify telephone number currency.

e) If applicable, aerodrome close to water, the AEP addresses water rescue or other difficult environment provisions, The availability and coordination of specialist rescue services to be include in the AEP. Significant bodies of water or marsh lands are considered adjacent to the aerodrome if they are under the approach/departure flight paths, out to the “final approach fix” on runways with published approaches. If an aerodrome operator cannot obtain cooperation from other jurisdictions concerning water rescue provisions “to the extent practicable”, documentation demonstrating that a reasonable provision has been made shall be maintained in the manual.

f) All aerodrome operating staff having duties and responsibilities under the AEP are familiar with their assignments and are properly trained. Randomly question personnel in the AEP, not just the RFF, to determine validity of the training program and to ensure that all aerodrome personnel having duties and responsibilities under the plan are familiar with their assignments and are properly trained. Testing, written or oral may be used if determined to be necessary by the Aerodrome Inspector.

g) The AEP is reviewed with all participating agencies in the preceding 12 months. An annual review of the AEP may consist of the aerodrome operator conducting a tabletop exercise or a review meeting with a representative of each of the agencies with which the plan was coordinated or after a full-scale or partial emergency has been carried out. Look for letters addressing tabletop exercise, full-scale and partial exercises, AEP review meetings and AEP revisions. During pre-inspection preparation, look for letters concerning annual review in the aerodrome files.

h) The aerodrome operator has conducted a full-scale exercise of its AEP in the preceding 2 years:

- During pre-inspection preparation, look for letters concerning full scale exercise of the AEP. Examine any record of critique. The full-scale aerodrome exercise must involve, to the extent practicable, all mutual aid participants, a reasonable amount of equipment specified in the AEP, and include a summary report and/or critique. Aerodromes which have experienced an aircraft accident and exercised a substantial portion of their AEP related to, or as would respond to, an air carrier accident can substitute this accident for the full-scale exercise. If such a substitution is made, the certificate holder should conduct a critique of their performance during the accident response.
- For the purpose of this requirement, the biennial exercise may be conducted within the calendar month it is due. For example, if the last biennial exercise was held on August 4, 2018, the next biennial exercise is due by August 31, 2020. Unique or special cases may affect the need to vary the schedule slightly, not exceeding 3 months, and where supportable justification exists, a reasonable extension may be approved. For example: the biennial is due in April, but the region is planning a much larger exercise for June in which the aerodrome will play an important part and gain the same benefit.
- The purpose of this biennial exercise is to test the effectiveness of AEP through a response of the aerodrome and its mutual aid for a disaster at the aerodrome. It should also be used to familiarize emergency mutual aid personnel with the location of staging areas and other aerodrome facilities. For these reasons the full-scale

exercise should be conducted at the aerodrome. However, at the discretion of the Aerodrome Inspector, the exercise may be conducted on property adjoining or adjacent to the aerodrome (such as for a water rescue exercise) if the AEP can still be properly exercised, or the staging element at the RVP has been exercised in an intermediary exercise.

i) The facilities in the Emergency Operations centre and the mobile command post are adequate. The communication equipment in these facilities should be tested for adequacy and serviceability.

j) When possible, Public aerodrome managers participate in off-aerodrome disaster exercises involving downed aircraft and provide their expertise and resources. Such activities should be encouraged.

k) Aerodrome Inspector are encouraged to attend the full-scale exercise of the AEP whenever possible.

2) **Rescue and Fire Fighting Service:**

The Aerodrome Inspector must determine if:

a) The provision of rescue and fire fighting services at all aerodrome which takes into account the aerodrome location and the surrounding terrain.

b) The aerodrome category is determined from the Aerodrome Regulations, based on the longest aircrafts normally using the aerodrome and their fuselage width. To categorize the aircrafts using the aerodrome, first evaluate their overall length and second, their fuselage width. If, after selecting the category appropriate to the longest aircraft's overall length, that aircraft's fuselage width is greater than the maximum width for that category, then the category for that aircraft shall actually be one category higher. However, if the operating aircraft that determines the fire category is larger than the average within that category, such as the B777-300, then the aerodrome operator should re-calculate the amount of water and discharge rates

should be re-calculated and increased accordingly. Requirements for providing rescue and fire-fighting equipment and services is given in the Aerodrome Regulations. During anticipated periods of reduced activity, the level of protection available shall be no less than that needed for the highest category of aircraft planned to use the aerodrome during that time irrespective of the number of movements.

c) Where any change of the RFF protection. Ensuring that the aerodrome operator has process for notify changes in the level of aircraft rescue and fire fighting (RFF) protection normally available at an aerodrome to air traffic service and aeronautical information services.

d) Where helicopters operate, the 2-minute response time to any area of the aerodrome on which helicopters start-up, taxi, train, take-off or land is met. Checks should be made bearing in mind the reduced quantity of fire fighting media required compared with most aircraft categories.

The following examples illustrate the method for determination of the aerodrome category.

Example

Aircraft	Overall length	Fuselage width	Category
A380	72.7 m.	7.14 m.	10

The longest aircrafts are categorized using Table 9-1 of Annex 14 by first evaluating their over-all length and second, their fuselage width. The aerodrome in this case would fall into a category 10.

3) **Extinguishing Agents.**

The Aerodrome Inspector must determine if:

a) RFF vehicle discharge capacities and agent capacities meet Table 9-2 of Annex 14 requirements.

b) The amounts of water for foam production meet the requirement in Table 9-2 of Annex 14.

c) The amount of water and foam concentrate separately provided on vehicles for foam productions are adequate.

d) The quantity of foam in reserve is adequate.

e) The discharge rates of foam solution are adequate.

f) There is a means of supplementary water supply for expeditious replenishment; water tanker(s) or other suitable means is acceptable taking into account the manpower required to deliver such supplies to the accident site.

4) **Emergency Rescue and Fire Fighting Vehicles**

The Aerodrome Inspector must determine if:

a) The aerodrome is equipped with RFF vehicles meeting the aerodrome firefighting category specification and minimum number required during flight operations. RFF equipment required to meet the category must be listed in the aerodrome manual.

b) Each required RFF vehicle is equipped with appropriate radio communications, flashing blue obstacle lights for mobile objects, yellow obstacle lights for non-emergency use, and is marked in yellowish green or red colors to contrast with the background and optimize daytime/nighttime visibility.

c) Each required vehicle is operationally capable of performing the required functions. A required RFF vehicle is inoperative during preventive maintenance if it cannot meet response requirements. At aerodromes which do not have extra RFF equipment, maintenance must be scheduled during periods when aircraft operators are not operating. Notification of zero or reduced category by NOTAM to ATS and aircraft operator would be expected when RFF equipment required to meet Category requirements breaks down and cannot be immediately repaired.

5) **Rescue Equipment**

The Aerodrome Inspector must determine if Rescue equipment commensurate with the level of fire protection is provided for use at the accident site in accordance with ICAO Doc 9137 Part 1 Table 5-2. If fire vehicles plan to leave the scene for replenishment, then their absence, and the absence of the equipment that they carry, should be discounted when the Aerodrome Inspector is calculating the level of rescue equipment that is provided against what is required.

6) **Personnel**

The Aerodrome Inspector must determine if:

a) Sufficient RFF personnel are available to operate the required RFF vehicles taking into account the requirement specified in the Aerodrome Regulations.

b) a task and resource analysis should be done to identify the minimum number of personnel required to undertake identified tasks in real time before supporting external services are able to effectively assist RFFS

c) Training requirement is available, incorporating initial and recurrent training, and covering the subject areas enumerated in the Aerodrome Regulations. Check if such training program has been developed and is being implemented, including training in human performance and team coordination.

d) Training records are maintained and readily available and the records indicate that all RFF personnel have participated in live-fire drill and pressure-fed fuel fires. “Live-fire drill” has the same meaning as “simulated aircraft fire.”

e) All RFF personnel are equipped in a manner needed to perform their duties. Such equipment shall include protective coat, protective trousers, protective helmet, gloves and respiratory equipment. This requirement might not apply to RFF vehicle driver/operators unless they are expected to man handlines or effect rescue operations, as determined in the task resource

analysis. The RFF vehicle driver/operator shall have protective equipment readily accessible.

f) All personnel assigned to rescue duties have been given first aid and cardio pulmonary resuscitation (CPR) training, including AED training where such equipment is available. At least two full time members per shift of the aerodrome rescue and firefighting service or other on-aerodrome personnel should be trained accordingly.

7) **Response Time.**

The Aerodrome Inspector must determine if:

a) At least one required RFF vehicle achieves a response time not exceeding 2 minutes to any point of each operational runway. That vehicle must be capable of discharge at a rate of at least 50% of the discharge rate required for the category. Any other vehicles should arrive no more than one minute after the first responding vehicles. At the option of the Aerodrome Inspector, a discharge of water may be used in lieu of other agents for a timed response. However, a demonstration of the discharge of the agents not used in the response drill is to be conducted for at least one required response vehicle before the conclusion of the inspection to insure the adequate capability.

b) The alarm system is acceptable. The timing for the response requirement begins upon activation of the first alarm signal to the RFF unit responsible for RFF at the aerodrome. This will normally be ATC activating whatever alarm system is used by the aerodrome. The signal may be audible (klaxon, telephone ring, siren, etc.), visual (dormitory illumination, strobe light, etc.), or a combination. The RFF unit is usually the fire station where the vehicles and crews are stationed. It is important that the timing begin with the activation of the first alarm signal and include any message passing, crew assembly, coordination, and other processes which occur as part of the response. If there are

problems with meeting the response time it may be that the alarm enters the fire station at the wrong point, and that the system needs to be changed to modify or eliminate time consuming communications, coordination, etc. Delays in passing the emergency message and/or permission to proceed on the manoeuvring area are all part of the response time.

During the certification inspection, the Aerodrome Inspector should request that a refractometer test be conducted by RFF personnel on at least one required response vehicle with a foam proportioning system. By observing the preparation for and performance of this test the following will be achieved:

- Get an indication of RFF personnel knowledge of the vehicle and its systems. In some cases, RFF personnel may have a refractometer but not know how to use it. In those cases, be prepared to conduct a refractometer test and provide some basic training. If the RFF department does not conduct periodic refractometer test advise them to do so. Other refractometer procedures may be used. Be sure to read manufacturer's instructions.

- Gain some indication of the maintenance level for the foam proportions and, therefore, vehicle systems. If the results of the refractometer test indicate a foam mixture that is too lean or rich, advise the RFF officer in charge that the system needs to be checked to determine if the proportioning device is adjusted properly.

RFF response drills may be conducted at night or during inclement weather. However, discretion shall be used to ensure that safety is not reduced. If there is a question as to whether or not a test can be conducted safely, it should be postponed until later. When conducting the timed response, the Aerodrome Inspector should keep in mind that the times given in Aerodrome Regulations are in optimum visibility and surface

conditions. If the test is conducted in other than optimum conditions, the times may be adjusted at the discretion of the Aerodrome Inspector to allow for the adverse condition, in which case an audit of response test records must be carried out to ensure that the response times can be met.

It shall be at the Aerodrome Inspector discretion as to the location from which he/she conducts the response test on the aerodrome.

8) **Emergency Access Road**

The Aerodrome Inspector must determine if all designated emergency access roads are maintained for all weather conditions. Emergency access roads are those required to meet RFF requirements. Roads constructed specifically for use by emergency vehicles must be considered as an emergency access road. Additionally, service roads that are located in the strips must be considered by the aerodrome operator as an emergency access road and maintained during all weather conditions. Check to ensure that access roads at the edge of runways are surfaced for the required distance.

9) **Fire Station**

The Aerodrome Inspector must determine if adequate shelter is provided to protect RFF vehicles from the harmful effects of exposure to the sun and elements, and providing sufficient space for each vehicle and a surrounding area minimum clearance of 1.2 metre.

10) **Communication and Alerting System**

The Aerodrome Inspector must determine if:

a) A discrete communication system links all the fire stations within the aerodrome, the control tower and rescue and fire fighting vehicles.

b) An alerting system links all the fire stations within the aerodrome, the control tower and rescue and fire fighting vehicles. The alerting system should be such that it can be operated from the fire station.

c) A capability exists for a fire officer to communicate with the pilot of an aircraft on the ground in an emergency. This capability

must include both the communication equipment, such as VHF air band radio on frequency 121.600 MHz with suitable noise cancelation (headsets and special microphones) or insulation (inside the vehicle cab) and English language.

5.12 Evaluation of disabled aircraft removal plan

5.12.1 Purpose

5.12.1.1 The purpose is to provide guidance and information to aerodrome inspectors to use when evaluating visual aids denoting obstacles.

5.12.2 References

A. RQCAAT on Aerodrome Standards B.E.2562 (2019)

B. ICAO Annex 14 Vol I chapter 9 (Disabled Aircraft Removal)

C. ICAO Doc. 9137 Part 5 (Removal of disabled aircraft)

5.12.3 Guidance and Procedures

A. **General Information**

The Aerodrome Inspector must determine if:

1) The aerodrome operator has developed a disabled aircraft removal plan. The plan should be developed in consultation with aircraft owners and operators. The extent of the plan will depend on user aircraft weights and sizes and the density of air traffic at the aerodrome.

2) The plan provides for permission to disturb the accident site to be obtained from Aircraft Accident Investigation Committee. Where a disabled aircraft has been involved in an accident, notwithstanding this general rule, the aircraft may be moved where necessary to preserve life or to prevent additional hazard to persons or property. A claim for damages could follow an attempt to move a crashed aircraft if it was proven the act of moving worsened the damage. Therefore, the invariable rule is that only aircraft owner, operator or his appointed representatives should control the aircraft removal operation.

5.12.4 Checklist

ERF Inspection Checklist presented in Appendix A relating to disabled aircraft removal plan, would normally have to be completed during initial certification and certificate renewal inspections, and used for surveillance and other special purpose inspection relating to disabled aircraft removal plan .The checklist may be further tailored to meet specific needs.

5.12.5 Evaluation

The plan should include:

3) Nominated person or organization authorized to act on their behalf at the aerodrome owner or operators using the aerodrome to avoid delay.
4) Nominated representative of the aerodrome operator to coordinate the aircraft removal operation. All major users of the aerodrome will be informed of the aerodrome management's preparations and capabilities, as well as policies regarding disabled aircraft removal. The officer assigned responsibility to coordinate this plan should be made known to all aircraft owners or operators.
5) A list of equipment available on or near the aerodrome on demand.
6) A list of additional equipment available from nearby aerodromes or aircraft operators on request.
7) A list of nominated agents acting on behalf of each aircraft operator at the aerodrome.
8) A statement of the aircraft operator arrangements for the use of pooled specialist equipment.
9) A list of local contractors (with names and telephone numbers) with suitable removal equipment for hire.

5.13 Evaluation of wildlife strike management

5.13.1 Purpose

5.13.1.1 The purpose is to provide guidance and information to aerodrome inspectors to use when evaluating visual aids denoting obstacles.

5.13.2 References

A. RQCAAT on Aerodrome Standards B.E.2562 (2019)

B. ICAO Annex 14 Vol I chapter. 9 (Wildlife Strike Hazard Reduction)

C. ICAO Doc. 9137 Part 3 (Bird Control and Reduction)

5.13.3 Guidance and Procedures

A. **General Information**

It is required that aerodromes exposed to wildlife hazard analyze the level of risk posed by the existing hazards to enable a determination of the need for a wildlife hazard management plan. It is not anticipated that such a determination can always be reached before the commencement of initial operations at the aerodrome. Data collection on bird activity in the vicinity of the aerodrome and subsequent analysis may take some time after aerodrome operations begin before a meaningful conclusion can be drawn concerning wildlife management program to be implemented, where applicable. However, it is anticipated that a procedure for monitoring bird activity, controlling birds and other wildlife, and of recording and reporting wildlife strike be established and incorporated in the Aerodrome Manual before approval of the Manual is given by AGA.

B. **Checklist**

Airside operations Inspection Checklist presented in Appendix A relating to wildlife hazard management, would normally have to be completed during initial certification and certificate renewal inspections and surveillance and other special purpose inspection relating to wild life hazard management.

C. **Evaluation**

The Aerodrome Inspector must determine that:

1) The aerodrome operator has adequate procedures to take immediate measures to alleviate wildlife hazards whenever they are detected. During the movement area inspection, the Aerodrome Inspector should be on the lookout for wildlife of a size or in numbers capable of triggering the conduct of an ecological study. If the Aerodrome Inspector feels that wildlife activity on or in the vicinity of the aerodrome constitutes a wildlife hazard, the

conduct of an ecological study must be addressed in the corrective plan of action. The ATC shall also be consulted concerning wildlife hazards.

2) Records of reported strike are maintained and transmitted to CAAT for onward transmission to ICAO.

3) Procedures are established by the aerodrome operator for the conduct of a wild life risk assessment

4) A Wildlife Hazard Management Plan is in effect. The Aerodrome Inspector must review the following:

   a) Its effectiveness in dealing with the wildlife hazard.

   b) Indications that the existence of the wildlife hazard, described In the ecological survey, should be re-evaluated.

   c) Personnel with responsibilities in the Wildlife Hazard Management Plan are adequately trained.

   d) Procedures outlined in the Plan, such as inspections prior to air carrier operations, are carried out.

5) Status of habitat modification projects or changes in land use are identified in the Plan.

5.14 Evaluation of apron management service.

5.14.1 Purpose

5.14.1.1 The purpose is to provide guidance and information to aerodrome inspectors to use when evaluating visual aids denoting obstacles.

5.14.2 References

A. RQCAAT on Aerodrome Standards B.E.2562 (2019)

B. ICAO Annex 14 Vol I chapter. 9 (Apron Management Service)

C. ICAO Doc. 9137 Part 8 (Airport Operational Services)

D. ICAO Doc 9476 (Manual of Surface Movement Guidance and Control Systems (SMGCS))

5.14.3 Guidance and Procedures

A. **General Information**

When warranted by the volume of traffic and operating conditions, an aerodrome should appropriate apron management service on an apron by an

aerodrome ATS unit, by another aerodrome operating authority, or by a cooperative combination of these, in order to:

1) Regulate movement with the objective of preventing collisions between aircraft, and between aircraft and obstacles;
2) Regulate entry of aircraft into, and coordinate exit of aircraft from, the apron with the aerodrome control tower; and
3) Ensure safe and expeditious movement of vehicles and appropriate regulation of other activities.

5.14.4 Checklist

Airside operations Inspection Checklist presented in Appendix A related to apron management services would normally have to be completed during initial certification and certificate renewal inspections and surveillance and other special purpose inspection relating to wild life hazard management.

5.14.5 Evaluation

The Aerodrome Inspector must determine if:

4) Responsibility for marshalling service, follow-me service, stand and parking allocation, start up, push back and taxi clearances, control of vehicles on the apron, operation of VDGS, manoeuvring areas are clearly and unambiguously assigned.
5) A written agreement exists between the air traffic service unit and apron management unit, defining method of coordination and points of transfer of responsibilities, where coordination between both parties is required.
6) Adequate aircraft stand separation distances between aircraft and obstacles and apron safety lines have been provided in accordance with Aerodrome Regulations. Apron safety lines include such separation distance lines, equipment restraint areas, and service road boundary lines.
7) The required separation distances to be achieved and checked are not between wingtips, but are between any part of a moving aircraft, onto or off a stand, and any object. Objects may include passenger boarding bridges and staged ground service equipment, as well as other aircraft.
8) An aircraft stand shall be visually monitored to ensure that the recommended clearance distance are provide to an aircraft using the stand.

9) An emergency vehicle responding to an emergency shall be given priority overall other surface movement traffic.

10) A vehicle operating on an apron shall give way to an emergency vehicle, an aircraft taxiing, about to taxi, or being pushed or towed.

5.15 Evaluation of ground servicing of aircraft

5.15.1 Purpose

5.15.1.1 The purpose is to provide guidance and information to aerodrome inspectors to use when evaluating visual aids denoting obstacles.

5.15.2 References

A. RQCAAT on Aerodrome Standards B.E.2562 (2019)

B. ICAO Annex 14 Vol I chapter 9 (Ground Servicing of Aircraft)

5.15.3 Guidance and Procedures

A. **General Information**

1) It is required that aerodrome operators have qualified personnel who are familiar with safety precautionary measures which should be in place during the fueling and defueling of aircraft by fueling companies.

2) The scope of inspection by Aerodrome Inspector should cover both the facilities of the fueling companies at the operational base and an actual aircraft fueling on the apron.

5.15.4 Checklist

Airside operations Inspection Checklist in Appendix A relating to aircraft ground services (e.g. the handling and storage of aviation fuel) is to be used during initial certification, certificate renewal and special purpose inspections.

5.15.5 Evaluation

The Aerodrome Inspector must determine that:

3) Fire extinguishing equipment are positioned sufficiently close to areas designated for ground servicing of aircraft.

4) Extinguishing agents bear serviceability tags and the dates on tags.

5) An efficient means is available for quickly summoning rescue and firefighting service in the event of a fire or major fuel spill. Apron management unit and RFF service are connected on a designated

frequency. Where apron management unit is not available, check if airline or ground staff or aerodrome personnel who have responsibilities on the apron are familiar with the frequency or other means by which to reach RFF service.

5.16 Evaluation of aerodrome vehicle operations

5.16.1 Purpose

5.16.1.1 The purpose is to provide guidance and information to aerodrome inspectors to use when evaluating visual aids denoting obstacles.

5.16.2 References

A. RQCAAT on Aerodrome Standards B.E.2562 (2019)

B. ICAO Annex 14 Vol I chapter 9 Aerodrome Vehicle Operations)

C. ICAO Doc .9476 (Surface Movement Guidance and Control Systems (SMGCS))

5.16.3 Guidance and Procedures

A. **General Information**

Each employee, tenant, or contractor, who operates a ground vehicle on any portion of the airside of an aerodrome is required to be familiar with and complies with the aerodrome's airside driving rules and procedures. In order to comply with this section, the aerodrome operator shall develop an appropriate driver's training program for aerodrome personnel, tenants, contractors and others who operate on, or have access to movement areas.

5.16.4 Checklist

Airside operations Inspection Checklist presented in Appendix A relating to airside vehicle control, would normally have to be completed during initial certification and certificate renewal inspections, and used for surveillance and other special purpose inspection relating to ground vehicle operations. The checklist may be further tailored to meet specific needs.

5.16.5 Evaluation

The Aerodrome Inspector must determine that:

1) Roads located on the movement areas and safety areas are restricted to only those vehicles necessary for aerodrome operations. During the course of the inspection, be on the lookout for unnecessary operations of vehicles

on or adjacent to movement areas. Vehicles authorized in the movement area include RFF vehicles, ambulances, mowers, aerodrome operations and maintenance vehicles, fuel trucks, catering vehicles, toilet service vehicles, etc.

2) Procedures for these vehicles to cross the runway or taxiway such as two-way communications with the Control Tower or escort have been established for continued operations. Vehicles must be radio equipped or escorted, and marked and equipped with an operating yellow obstacle light(s). These procedures need to be clearly addressed in the aerodrome manual.
3) For aerodromes with a Control Tower in operation, each vehicle operating on the movement areas is controlled by two-way radio, or by escort vehicle with two-way radio.
4) For aerodromes without a Control Tower in operation, adequate procedures are established to control ground vehicles through prearranged signals or other procedures.
5) SMGCS should be designed to assist in the prevention of inadvertent incursions of aircraft and vehicles onto an active runway.
6) SMGCS should be designed to assist in the prevention of collisions between aircraft, and between aircraft and vehicles or objects, on any part of the movement area.
7) Look for distribution of aerodrome procedures/training curriculum or permit process to control applicable tenants. At aerodromes with a SMGCS Plan, requirements should also be included in the driver training as applicable.

5.17 Evaluation of fencing

5.17.1 Purpose

5.17.1.1 The purpose is to provide guidance and information to aerodrome inspectors to use when evaluating visual aids denoting obstacles.

5.17.2 References

A. RQCAAT on Aerodrome Standards B.E.2562 (2019)

B. ICAO Annex 14 Vol I chapter. 9 (Fencing)

5.17.3 Guidance and Procedures

A. **General Information**

Aerodrome shall provide fence or other suitable barrier to prevent the entrance to the movement area of animals large enough to be a hazard to aircraft and deter the inadvertent or premeditated access of an unauthorized person onto a non-public area of the aerodrome.

5.17.4 Checklist

Airside operations Inspection Checklist presented in Appendix A relating to fencing, would normally have to be completed during initial certification and certificate renewal inspections, and used for surveillance and other special purpose inspection relating to ground vehicle operations. The checklist may be further tailored to meet specific needs.

5.17.5 Evaluation

The Aerodrome Inspector must determine if:

1) The aerodrome operator has appropriate safeguards to deter against inadvertent entry to the movement area by unauthorized persons or vehicles, and to prevent entry by animals and Off-aerodrome ground installations and facilities, including sewers, ducts and tunnels. These safeguards may consist of a combination of natural barriers, fencing and warning signs which are effective in deterring personnel or vehicles from inadvertently entering the movement area, and must include grills or similar where fence cross open or closed drainage channels. Or any runways or taxiways which pass over public roads, and determination of studies when greater security is thought necessary. Normally an area of 3m must be clear on each side of a security fence to minimise climbing aids. If in any doubt the Aerodrome Inspector should consult counterparts in SFD.

2) Coordinate with SFD to ensure security lighting of the security fence has been deemed desirable at the fence and/or at the access control points.

3) The aerodrome operator has provided reasonable protection of persons and property from aircraft blast. This includes persons who are required to use air stairs; and public areas adjacent to air carrier aprons and the movement area.

4) Coordinate with ANS and SFD to ensure appropriate safeguards to deter against inadvertent entry to the movement area by unauthorized persons or vehicles, and to prevent entry by animals and Off-aerodrome ground installations and facilities, including sewers, ducts and tunnels.

5.18 Evaluation of aerodrome safety management system

5.18.1 Purpose

5.18.1.1 The purpose is to provide guidance and information to aerodrome inspectors to use when evaluating visual aids denoting obstacles.

5.18.2 References

A. RCAB No.82

B. ICAO Annex 19

C. Doc9859 Safety Management Manual

5.18.3 Guidance and Procedures

A. **General Information**

The safety management system established for ensuring compliance with all safety requirements and achieving continuous improvement in safety performance.

5.18.4 Checklist

Safety Management System Manual and Safety Management System Inspection Checklist presented in Appendix A and relating to aerodrome safety management system, would normally have to be completed during initial certification and certificate renewal inspections and to be used for surveillance and other special purpose inspection relating to aerodrome safety management system. The checklist may be further tailored to meet specific needs.

5.18.5 Evaluation

The Aerodrome Inspector must determine that:

1) **Safety Policy and Objective**

a) **Management commitment and responsibility**

Is/ does the safety policy:

- reflect organizational commitment regarding safety;
- include a clear statement about the provision of the necessary resources for the implementation of the safety policy;
- include safety reporting procedures;
- clearly indicate which types of behaviours are unacceptable related to the service provider's aviation activities and include the circumstances under which disciplinary action would not apply;
- be signed by the accountable executive of the organization;
- be communicated, with visible endorsement, throughout the organization; and
- be periodically reviewed to ensure it remains relevant and appropriate to the aerodrome operator

b) **Safety Accountabilities**

Does the aerodrome operator have?

- identify the accountable executive who, irrespective of other functions, has ultimate responsibility and accountability, on behalf of the organization, for the implementation and maintenance of the SMS;
- clearly define lines of safety accountability throughout the organization, including a direct accountability for safety on the part of senior management;
- identify the accountabilities of all members of management, irrespective of other functions, as well as

of employees, with respect to the safety performance of the SMS;

- document and communicate safety responsibilities, accountabilities and authorities throughout the organization; and
- define the levels of management with authority to make decisions regarding safety risk tolerability

c) **Appointment of key safety personnel**

Does the aerodrome operator:

- appoint a safety manager who is responsible for the implementation and maintenance of an effective SMS.

d) **Coordination of emergency response planning**

- Does aerodrome have an emergency plan that outlines the roles and responsibilities in the event of a major incident, crisis or accident?
- Does an emergency plan address the necessary coordination of its emergency response / contingency procedures in the event of a major incident, crisis or accident?

e) **SMS documentation**

- Does the aerodrome develop an SMS implementation plan, formally endorsed by the organization, that defines the organization's approach to the management of safety in a manner that meets the organization's safety objectives?
- Does the aerodrome operator develop and maintain SMS documentation that describes?
  - the safety policy and objectives;
  - SMS requirements;
  - SMS processes and procedures;
  - accountabilities, responsibilities and authorities for SMS processes and procedures; and

- SMS outputs.

– Does the aerodrome operator develop and maintain an SMS manual as part of its SMS documentation?

2) **Safety Risk Management**

a) **Hazard Identification and Risk Assessment**

Are there procedures for:

– evaluating identified hazard(s);
– prioritizing and processing for risk assessment (as appropriate);
– appropriate level of management review and approve the completed safety assessments;
– evaluating the effectiveness of the corrective, preventive and recovery measures that have been developed; and

b) **Safety risk assessment and mitigation**

Are there procedures for:

– periodic review of completed safety assessments and documenting their outcomes
– Is there a documented Hazard Identification and Risk Mitigation (HIRM) procedure involving the use of objective risk analysis tools?
– Is there a procedure to account for mitigation actions whenever unacceptable risk levels are identified?

3) **Safety Assurance**

a) **Safety Performance Monitoring and Measurement**

Are there procedures for:

– Mandatory Reporting System (i.e. accident, incident, occurrence report); and
– Voluntary Reporting System (i.e. hazard report)
– Is there a distinction made between mandatory reports, which are required to be notified to the CAAT?
– Is there a procedure for collecting the safety report in an appropriate database to facilitate the necessary analysis?

- Is there a process to develop and maintain a set of safety performance indicators and their associated performance targets?
- Is there a process of monitoring the performance of these SPIs including corrective or follow-up action to be taken when targets are not achieved and alert levels are exceeded / breached?
- Is there a procedure for periodically review of the safety performance indicators?
- Are there procedures:
- to ensure that reported accidents, incidents and occurrences are investigated internally;
- to disseminate the completed investigation reports internally as well as to the CAAT as applicable;
- for ensuring that corrective actions taken or recommendations carried out; and
- for evaluating outcomes / effectiveness;
- Are there procedures
- to ensure that hazards / threats identified or uncovered during incident / accident investigation processes are appropriately accounted for and integrated into the organization's hazard collection and risk mitigation procedure?

b) **Management of Change**

Are there procedures to ensure that:

- substantial organizational of operational changes take into consideration any impact which they may have on existing safety risks;
- appropriate safety assessment is performed prior to introduction of new equipment or process which have safety risk implications;

- Is there a procedure for review of existing safety assessments whenever there are changes to the associates process or equipment?

c) **Continuous Improvement and SMS Audit**

- Is there a process for regular internal review / audit of the organization's SMS to ensure its continuing suitability, adequacy and effectiveness?
- Ensure that organizations performing activities at the aerodrome comply with the aerodrome safety requirements and the aerodrome operator monitors such compliance.

4) **Safety Promotion**

a) **Training and Education**

- Is there a program to provide SMS training / familiarization to personnel involved in the implementation or operation of the SMS?
- Is training program include:
- Training syllabus;
- Eligibility and requirement;
- Validation process to measures the effectiveness of training; and
- Initial, recurrent and refresher training;

b) **Safety communication**

Is there a process for safety communication within the organization?

- to ensures personnel are aware of the SMS to a degree commensurate with their positions;
- conveys safety-critical information;
- explains why particular safety actions are taken; and
- explains why safety procedures are introduced or changed

5.19 Evaluation of Low visibility Procedures (LVP)

5.19.1 Purpose

5.19.1.1 The purpose is to provide guidance and information to aerodrome inspectors to use when evaluating visual aids denoting obstacles.

5.19.2 References

A. RQCAAT on Aerodrome Standards B.E.2562 (2019)

B. ICAO Annex 14 Vol. 1 Chapter 9

C. Doc 9137 Part 8

5.19.3 Guidance and Procedures

A. **General Information**

During conditions of low visibility, normally caused by fog, special procedures will be required to ensure that vehicles or workers on foot do not inadvertently lose their way and enter active runways or taxiways. In such conditions the time available for aircraft and possibly vehicles to take evasive action will be too short to avoid an accident. Once low visibility procedures have been implemented aerodrome operator should remain in force until there is a clear trend of improving visibility. Again a slightly higher visibility should he selected at which to terminate low visibility procedures.

5.19.4 Checklist

Airside operations Inspection Checklist presented in Appendix A relating to Low Visibility Procedures (LVPs) would normally have to be completed during initial certification and certificate renewal inspections, and used for surveillance and other special purpose inspection relating to personnel and ground vehicle operations restriction in LVP. The checklist may be further tailored to meet specific needs.

5.19.5 Evaluation

The Aerodrome Inspector must determine that

1) When Low Visibility Operations are likely to occur ATC should notify aerodrome operation department and aircraft operator prior to LVP actually beginning.
2) Aerodrome operation should respond to the call by arranging for the tasks detailed below, as appropriate, to be carried out;

a) Advise aerodrome security so that airside access for vehicle and personnel if restricted.

b) Prohibited areas are closed off by lighting, portable or switched.

c) Ensure that all working in manoeuvring area are evacuated.

d) Check that any lights provided to ILS are switched on and working.

e) Notify the following

- Rescue and fire fighting services
- Secure control staff
- Apron management staff

3) Where LVPs are in effect, persons and vehicles operating on an apron shall be restricted to the essential minimum.

4) During LVPs aerodrome operator should restricted construction or maintenance activities in the proximity of aerodrome electrical system.

Intentionally Left Blank

6 APPENDIX

6.1 Appendix A - Forms

The form would normally have to be completed during audit activities. As circumstances warrant, depending on the objective and scope of the audit. **Table A-1** below summarize forms.

Document code	Description	Responsible person
AGA-CE-101	Annual Audit Programme	All AGA Inspector
AGA-CE-102	On-Site Audit Programme	All AGA Inspector
AGA-CE-103	Audit Activity Attendance Form	All AGA Inspector
AGA-CE-104	Confirmation Request Form	All AGA Inspector
AGA-CE-105	Non-Compliance Form	All AGA Inspector
AGA-CE-106	Non-Compliance Extension Request Form	All AGA Inspector
AGA-CE-107	Corrective Action Tracking Form	All AGA Inspector
AGA-CE-108	Audit Report	All AGA Inspector
AGA-CE-109	Follow-up Report	All AGA Inspector
AGA-CE-201	Aerodrome Manual Checklist	All AGA Inspector
AGA-CE-202	Aerodrome Emergency Plan Checklist	ERF Inspector
AGA-CE-203	SMS Manual Checklist	SMS Inspector
AGA-CE-204	PHC Inspection Checklist	PHC Inspector
AGA-CE-205	VAN Inspection Checklist	VAN Inspector
AGA-CE-206	AOI Inspection Checklist	AOI Inspector
AGA-CE-207	ERF Inspection Checklist	ERF Inspector
AGA-CE-208	SMS Inspection Checklist	SMS Inspector
AGA-CE-209	Aerodrome Work Safety Checklist	All AGA Inspector
AGA-CE-210	Processing Application Checklist	All AGA Inspector
AGA-CE-211	Certification Package Checklist	All AGA Inspector
AGA-CE-212	Complexity of aerodrome	All AGA Inspector
AGA-CE-213	Exemption Process Checklist	All AGA Inspector
AGA-CE-214	Aerodrome Data Checklist	All AGA Inspector

Table A-1: List of form

Intentionally Left Blank

6.2 Appendix B - Assessment of Declared and Re-Declared Distances

Introduction

A. As part of an application for an aerodrome certificate, the aerodrome manual must contain not just a description and the data details of the runway declared distances, as promulgated in section 2.13 of the aerodrome's AIP AD2 entry, but also all pertinent procedures and responsibilities for re-calculating and implementing declared distances.

B. Reduced declared distances may be necessary or desirable in the event of work in progress (pre-planned) or a disabled aircraft or other obstacle (contingency).

C. In either case, safety must be maintained at the same level as if the original declared distances and aids were still in use.

D. This chapter addresses calculating the varying distances and provides guidance on managing temporary lighting, markers, markings, barriers, and promulgation.

E. The aerodrome operator must observe caution in both the calculation and implementation, as failure to do so may have catastrophic consequences

F. This document does not include any actions under the aerodrome emergency plan, but is intended to assist in the contingency actions after an emergency and/or in the pre-planned reduction in declared distances to facilitate WIP.

G. The purpose of this chapter is to

1) explain the concept and practical use of re-declaring runway distances, and
2) describe the practical challenges of achieving a successful change from a normal runway length situation to a safe but shortened runway operation to approved criteria;
3) outline the considerations that an aerodrome and ground aids safety inspector must assess before approving or not approving an application that involves declare distances
4) Outline examples of temporary marking and temporary lighting, reduced lighting patterns, and obscured marking and lighting that may be required.
5) Outline withdrawal of and effect on navigation aids and approach

procedures

H. Scope: whether required in the event of an unplanned obstruction or pre-planned, this document details the following four operations:

1) Landing over an obstacle
2) Landing towards and obstacle
3) Taking-off towards and obstacle
4) Taking-off away from an obstacle

Responsible Person

A. The aerodrome operator must appoint a named person or preferably several persons, who are trained, competent and current in the calculation and implementation of runway declared distances. Achievement and maintenance of such competence involves:

1) Basic to advanced training in the applicable standards based on the aerodrome regulations equivalent to chapters 3, 4, 5, 6, 7 of ICAO Annex 14 Volume 1, to the level of consistent and independent understanding of the subject matter.
2) Certification with training records by a competent instructor/assessor.
3) Recency not exceed 6 months, in both theoretical and practical, which can be modular, of calculation and implementation of re-declared distances.
4) The scope of both the training and the recency must include all scenarios that are permitted by the aerodrome operator. Some aerodrome operators might not permit landing over an obstacles, in which case, this need not be practiced by the competent person
5) This scope includes the following elements of re-declared distances:
    i) Legal requirements and obligations of the aerodrome operator
    ii) Arithmetic calculations
    iii) Relating the arithmetic calculations to the actual runway layout on the ground
    iv) Instrument and visual approach procedure requirements.
    v) Non-visual aid requirements
    vi) Visual aid requirements

vii) Changes to non-visual and visual aids as a result of the changes in declared distances

viii) Implementation procedures

ix) Promulgation content, methodology and obligations

x) Checking (quality control) methods

B. For the purposes of this document the responsible competent person for declared distances is referred to as the aerodrome operator.

Responsibilities – Aerodrome / Aircraft Operators / Regulator / ANS & AIS

A. The primary responsibilities of the **aerodrome operator**/ certificate holder in regard to declared distances are:
   1) Risk assessment
   2) Correct calculation of declared distances
   3) Compliant marking, lighting and markers of threshold and runway in use
   4) Correct promulgation of declared distances and changes to marking, lighting, markers and operational procedures

B. The primary responsibilities of the aircraft operator/ certificate holder in regard to declared distances are:
   1) Risk assessment
   2) Correct calculation of distances required
   3) Compliance with performance limitations arising from reduced distances
   4) Compliant operation of the aircraft

C. The responsibilities of CAAT (AGA) in regard to declared distances are:
   1) Acceptance of the aerodrome manual
   2) Audit of procedures and competence as detailed in the aerodrome manual
   3) Audit, and if appropriate, investigation of unusual circumstances on an aerodrome

D. The responsibilities of the air traffic service and aeronautical information service jointly in regard to declared distances are:
   1) Correct and timely promulgation of essential aerodrome information and changes as notified by the aerodrome operator

Declaring Reduced Distances -

A. The aerodrome operator should be familiar with all aspects of the normal declared distances for the aerodrome, including where they start and finish, and why the extremities are located where they are. Definitions and diagrams of declared distances, stopway and clearway are included in Appendix A.

B. The aerodrome operator should be familiar with the re-declaring details and process as detailed in the Aerodrome Manual and AIP AD2.

C. The aerodrome operator should be familiar with the statutory requirements as

detailed in the Aerodrome Regulations.

D. The aerodrome operator is reminded to exercise CAUTION by ensuring that all the calculations are verified by a second competent person prior to promulgation for use. If a second competent person is not available, then at least two other persons must independently verify the re-declared distance calculations, of whom at least one must be a manager in the aerodrome operations directorate. If in doubt, do not proceed with the re-declared distance operation.

E. Close liaison is required with aerodrome controller and supervisor of the ANSP.

F. Close liaison is required with CNS duty engineer and supervisor of the ANSP.

G. Preliminary examination should show whether the obstacle can be moved within a short period of time, negating the need for any change in declared distances. All inbound aircraft should be able to hold for at least 20 minutes before having to divert. If the obstacle cannot be moved, the aerodrome operator may consider reducing the runway declared distances for landing and/or take-off. The types of aircraft, likely to want to operate, and their take-off runs required, must not determine the distances and OLS slopes to be used.

H. The exact location of the obstacle must be established by measuring the distance in metres along the runway, parallel to the runway centreline from a charted runway feature such as threshold, end, aiming point marking, PAPI, numbered runway light.

I. Similarly, the distance of the obstacle offset from the runway centre line must be measured.

J. Then the location of the obstacle is plotted on both an aerodrome chart, normally at a scale of 1:2500, and a sketch of the revised declared distances.

K. The height should be measured, in metres for calculation purposes, but at the end of the calculations will be promulgated in feet as a height and elevation. It may be necessary to measure the height of the obstacle in more than one place if the obstacle is large, e.g. B747-400 with both a high tail and high front of fuselage. Although an aircraft's known dimensions from the manufacturer's airplane planning characteristics manual can be used for heights of the aircraft, it is important to take account of changes in an aircraft configuration, such as a

collapsed or sunken nosewheel that increases the height of the tail. Any equipment, such as a crane brought in to remove the fin etc, or lift the aircraft must also be considered in calculating the height of the obstacle, before relating to the obstacle limitation surfaces involved.

L. The elevation of the ground, in metres, on which the obstacle is located should be obtained from aerodrome charts, extrapolating between spot heights if necessary.

M. To aid in re-declaring runway distances an expeditious way, it is advantageous to have some known datum distances already prepared, for example, taxiway entry points, marked and numbered runway edge and centre line lights, where accurate calculation can be taken, as well as elevation along the runway centreline, and at intervals in the runway strip.

N. Once the location and elevation has been confirmed, it is possible to establish whether any useful runway distance remains.

O. If the wind is calm, or light and variable, then it may be possible to use the obstructed runway for take-offs away from the obstacle and landing in the opposite direction towards the obstacle.

P. Once calculated, the reduced runway declared distances will need to be promulgated by

1) NOTAM, and
2) RT via ATC, and
3) ATIS, and
4) Directly to the aircraft operators' representatives at the airport.

Q. CAUTION: Double check to ensure that:

1) Re-declared distances are correct, especially that a clearway has not been accidentally retained when taking off towards an obstacle
2) NOTAM, ATIS, ATC's essential aerodrome information, calculated distances all concur
3) any and all temporary threshold and revised runway end locations are in the exact position required in accordance with the calculations.
4) any required AGL have been isolated or covered
5) colour coded runway edge or centreline lights have been covered or

changed to the correct colour

6) taxiways have been marked, and lights obscured that lead into closed portions of the runway

Use and Availability - Take-off Runway

A. There are significant difference between landing only and take-off only runways.

B. There is no transitional surface requirement for the take-off runway.

C. A take-off runway is not an instrument approach runway and therefore has the narrower strip widths of a non-instrument runway:

1) Code 3 and 4: 75m each side of centreline

2) Code 2: 40m

3) Code 1: 30m

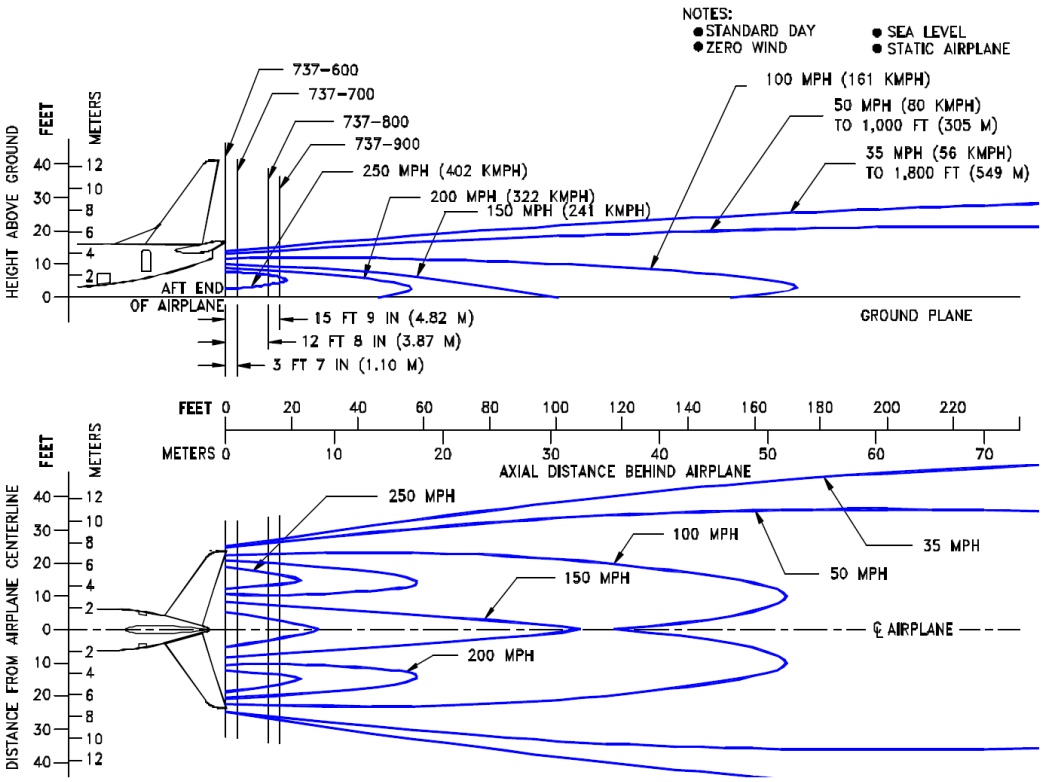
D. To allow aircraft to take-off away from a disabled aircraft requires much less preparation than taking off towards, or landing over an obstacle.

E. If the obstacle is outside the above strip widths, and the runway is not damaged, and the strip is not significantly damaged, then aircraft can usually be allowed to depart with the aircraft in place, subject to RFF category being available, and suitable safeguards to keep any personnel and equipment involved in the disabled aircraft out of the runway strip. This can be a very useful alternative to empty the passenger terminal of all aircraft, and all passengers whose aircraft have already landed.

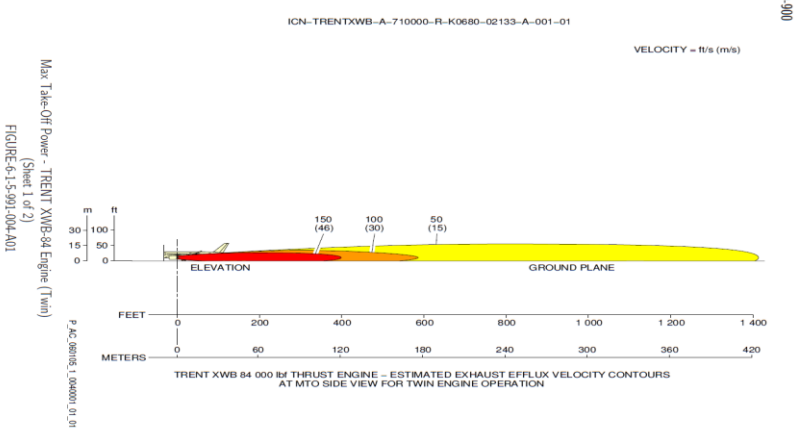
F. Existing promulgated intersection departures may still be available without any additional preparation, allowing prompt departures after a disabled aircraft event.

G. When taking off away from the obstacle on or close to the runway, an allowance must eb made for engine blast. This should be decided in advance based on manufacturer's data, for example:

6.1.9 PREDICTED JET ENGINE EXHAUST VELOCITY CONTOURS
- TAKEOFF THRUST
MODEL 737-600, -700, -800, -900 ALL MODELS



**ON A/C A350-900



Max. Take-Off Power - TRENT XWB-84 Engine (Twin)
(Sheet 1 of 2)
FIGURE-6-1-5-991-004-A01

TAKE-OFF CLIMB OBSTACLE CLEARANCE LIMITATION SURFACES

Code number	**3 or 4**	2	1
Length of inner edge	**180 m**	80 m 150m if clearway provided	60 m 150m if clearway provided
Distance of inner edge from end of take-off run *	**60 m**	60 m	30 m
Divergence (each side)	**12.5%**	10%	10%
Final width	**1200 m** (See Ann 14 where intended track includes change of heading greater than 15^0)	580 m	380 m
Length	**15 000 m**	2500 m	1600 m
Slope	**2%** **(1:50)**	4% (1:25)	5% (1:20)

* Where clearway is provided the inner edge is at the end of clearway.

Where there are no obstacles the take-off climb surface (code 3 or 4) is reduced to the actual obstacle or 1.6%, whichever is lower.

Use and Availability - Landing Runway

A. Except for pre-planned work in progress, or for light aircraft not requiring to use a certified or licensed aerodrome, landing over an obstacle is not normally provided both because it takes longer to prepare the runway for use but also because most aircraft will require the provision of PAPI. Landing over an obstacle will involve:

1) temporary markings and lighting for a temporary displaced threshold,
2) the installation of PAPIs for most commercial aircraft operations, e.g. all jets on code 3 and 4 runways.
3) affects the approach lights

4) affects the instrument approach procedure

B. Landing towards an obstacle requires strip and RESA between the end of LDA and the obstacle, but does not require a take-off climb surface beyond the re-declared LDA, but otherwise the approach is unaffected

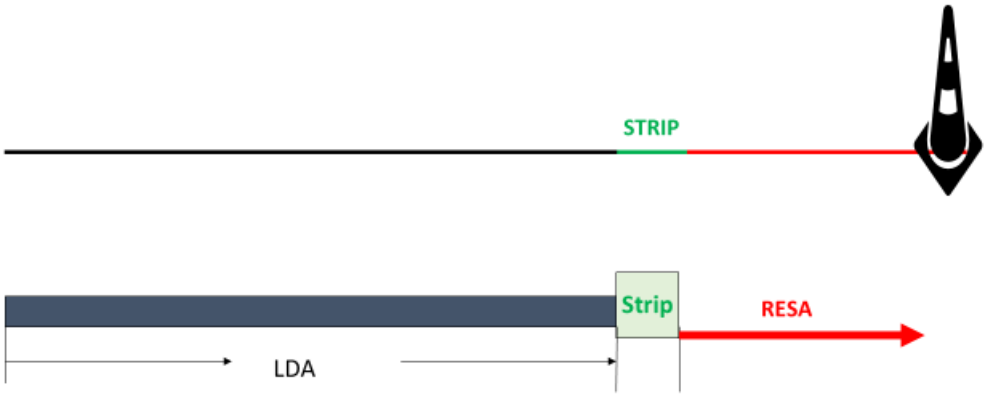
APPROACH OBSTACLE CLEARANCE LIMITATION SURFACES

	Precision Instrument Approach Runways		Non-precision Instrument Approach Runways		Non-instrument runways			
Code Number:	**3 or 4**	1 or 2	**3 or 4**	1 or 2	**4**	3	2	1
Length of inner edge	**280 m**	140 m	**280 m**	140 m	**150 m**	150 m	80 m	60 m
Distance before threshold	**60 m**							30 m
Divergence each side	**15%**				**10%**			
Length of first section	**3000 m**			4500 m	**3000 m**		2500 m	1600 m
Slope of first section	**2% (1:50)**	2.5% (1:40)	**2% (1:50)**	3.33% (1:30)	**2.5% (1:40)**	3.33% (1:30)	4% (1:25)	5% (1:20)
Length of second section	**3600 m**	2500m	**3600m**	Not applicable				
Slope of second section	**2.5% (1:40)**	3% (1:33.3)	**2.5% (1:40)**					
Length of horizontal section	**8400 m**	9500m	**8400m**					

Calculation of Reduced Declared Distances – Landing towards an obstacle

To calculate the LDA landing towards an obstacle:

A. The runway end is determined by measuring from the threshold up to the obstacle and subtracting 300m. This takes into account 60m from the strip end plus a further 240m for the RESA.



Calculation of Reduced Declared Distances – Taking-off towards the obstacle

For the situation where aircraft can take-off towards the obstacle, as illustrated below:

A. To determine the end of the TORA: the height of the obstacle above end of TORA is measured and a slope of 1:50 (2%), or less if the original gradient is less than 1:50, is measured back along the centre line to clear the obstacle.

B. Add 60m (strip end), and

C. The resultant point is the end of the TORA, and ASDA, and LDA if landing on the same runway.

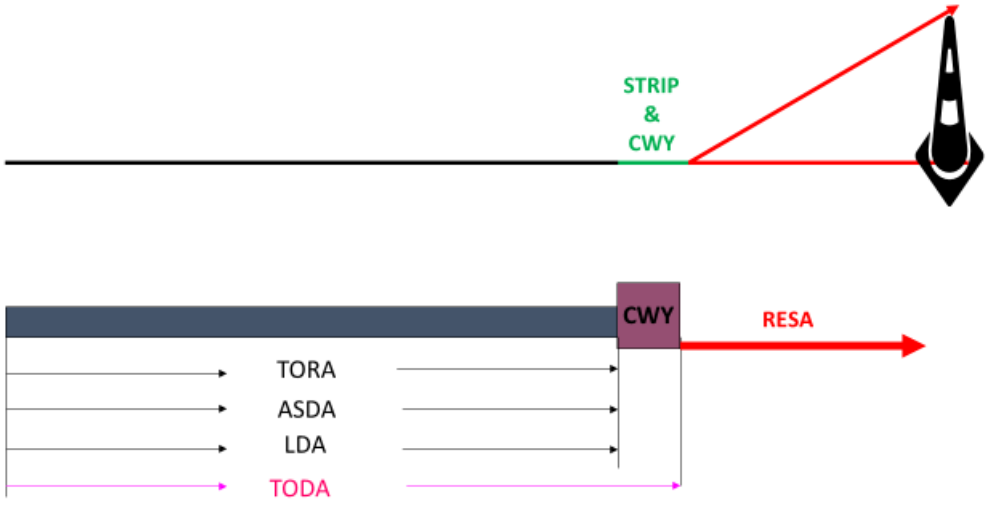
D. Remember that a RESA is needed:

i. If the obstacle is over 4.8m high then there is adequate space for the RESA under 1:50 slope, namely a 240m RESA (4.8x50=240m).

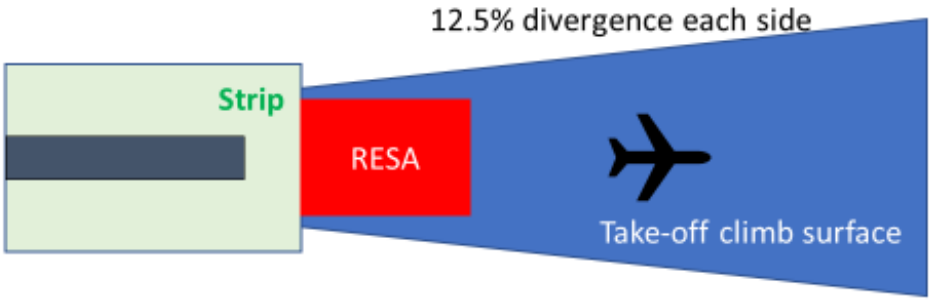
E. If the height of the obstacle is less than 4.8m in height, then a further 240m must be added from the end of strip to the first obstacle, or part thereof, to be included in the displacement.

F. The height of the obstacle must be taken as the obstacle's height above the end of TORA, and re-checked when the exact location of end of TORA is known.

G. The 60m strip end can be declared as clearway if desired. The take-off climb surface starts at 60m beyond the end of TORA or at the end of clearway where clearway is declared.

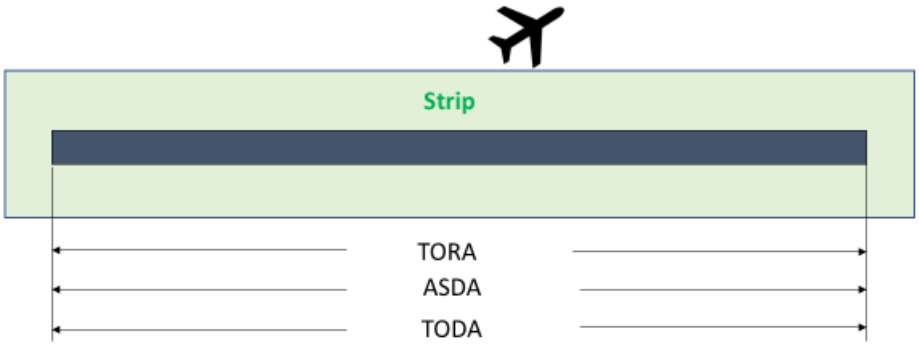


Plan view (code 3 or 4)

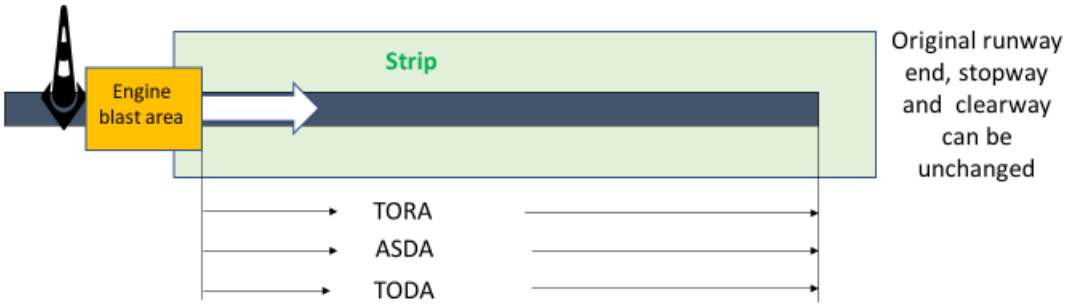


Calculation of Reduced Declared Distances – Taking-off away from the obstacle

A. If the obstacle is off the active runway to one side outside the take-off strip, 75m from centreline (code 4), and there is neither debris nor significant runway or strip surface damage, then the start of the TORA can be unaffected.



B. However, If the obstacle is on the runway then sufficient displacement of the start of the TORA must be allowed to minimise the effects of engine blast on the obstacle and associated recovery works. This will be assessed on site dependant on aircraft types departing on the reduced TORA. Displacements can be between 300-500m where large aircraft are involved, as illustrated above for A350 and B737 aircraft types as examples.



C. Accelerate-stop Distance Available (ASDA) Take-off Distance Available (TODA):

Whilst the simplest solution is always to declare the ASDA and TODA at the same distance as the reduced TORA, as illustrated above, being easier to mark and light, when taking off away from the obstacle, the existing stop way and clearway, if any, are unchanged and therefore the ASDA and TODA are reduced by the same as the TORA, as illustrated below

D. When the re-declared distances produce a runway length that is equivalent to a lowed aerodrome reference code, such as a code 4 runway being shortened to 1150 metres, then the strip dimensions, transitional surface, approach and take-off climb surfaces should be retained at the original criteria, such as 1:50 (2%) approach surface, and 240m RESA. This is to provide the original level of safety to aircraft in so far as is practicable.

Calculation of Reduced Declared Distances – Landing over an obstacle

A. It is not normally practical to provide a short notice displaced threshold for landing over an obstacle, but this can be a practical option when planning re-surfacing a runway.

B. The following elements will need pre-planning and promulgation in advance, normally on an AIRAC cycle, in an AIP supplement:

1) Re-located PAPIs with published MEHT, and compliant wheel clearance over the displaced threshold for the critical aircraft
2) Re-calculated nominal glidepath for the instrument approach procedures, such as PBN, DVOR/DME, GP inoperative ILS/DME.
3) Approach lighting: either extended or promulgated as interrupted or disabled
4) Threshold lighting, with wing bars due to the displaced threshold
5) Displaced threshold marking
6) Obscure or remove as much as possible of the original threshold and runway markings in the closed portion of the runway

C. If arriving aircraft are required to land over an obstacle the position of the threshold for an instrument runway is established by measuring a slope of 1:50 (2%) from the highest point of the obstacle down to a point on the runway centre line. A further 60m (strip end) is added and this creates the position of the temporary threshold.

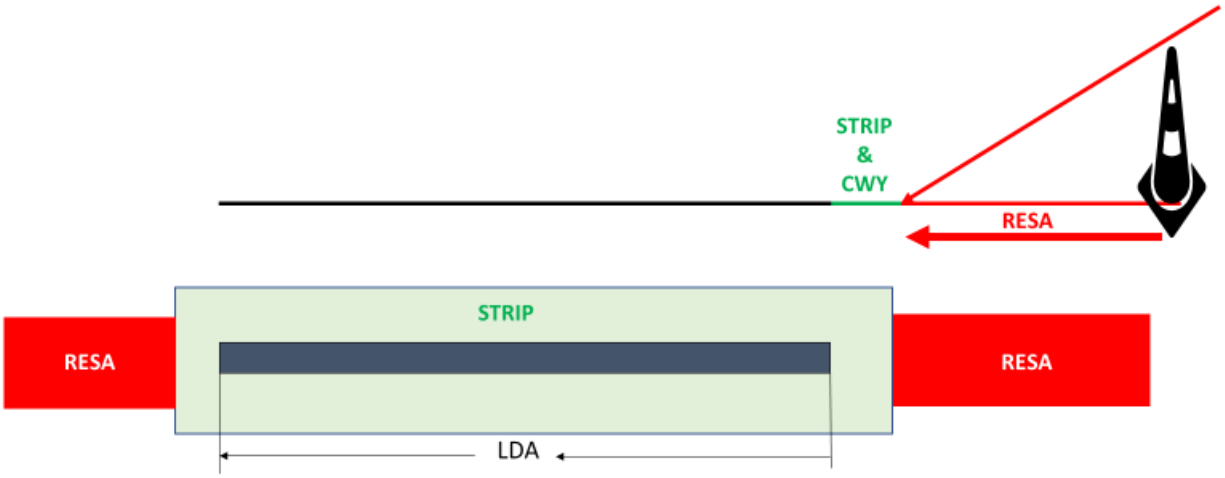
D. Remember that a RESA is needed:

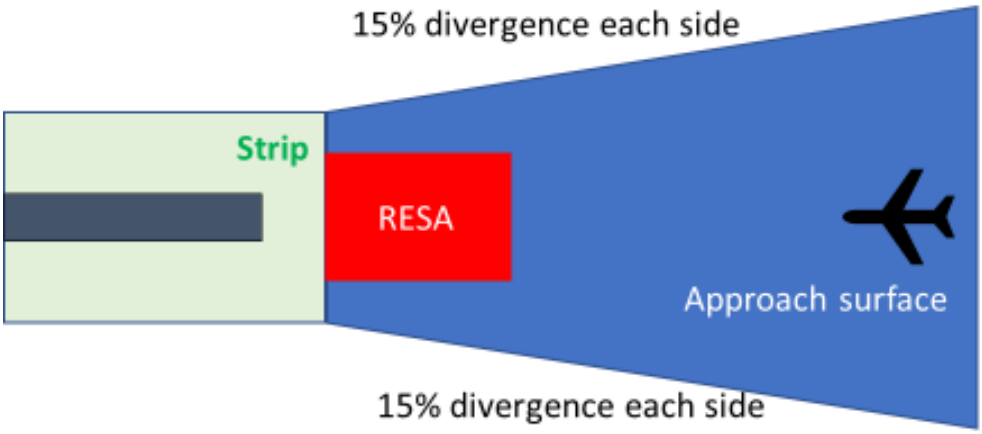
1) If the obstacle is over 4.8m high then there is adequate space for the RESA under 1:50 slope, namely a 240m risk (4.8x50=240m).

2) If the height of the obstacle is less than 4.8m in height, then a further 240m must be added from the end of strip to the first obstacle, or part thereof, to be included in the displacement.

E. In the case of landing over an obstacle, the original gradient of the approach surface, such as 1: 50 (2%) should be preserved, in order to preserve comparable levels of safety with the original scenario.

F. Where the obstacle is higher than 4.8m above the displaced threshold, then the available RESA may be longer than 240 m, as illustrated above, on the right of the diagram.





Plan view: first section of Approach surface

Marking and Lighting

A. It is essential that any reduced distance involved in runway operations is supported by correct, appropriate and promulgated visual clues to enable pilots to operate safety in these changed or unusual conditions. Such visual clues include temporary painted markings, marker boards and, or aeronautical ground lighting.

B. Markings

1) Wherever possible runway markings, especially threshold markings, within any closed portion of a runway should be obscured, This can be achieved by:

i) Water based temporary paint

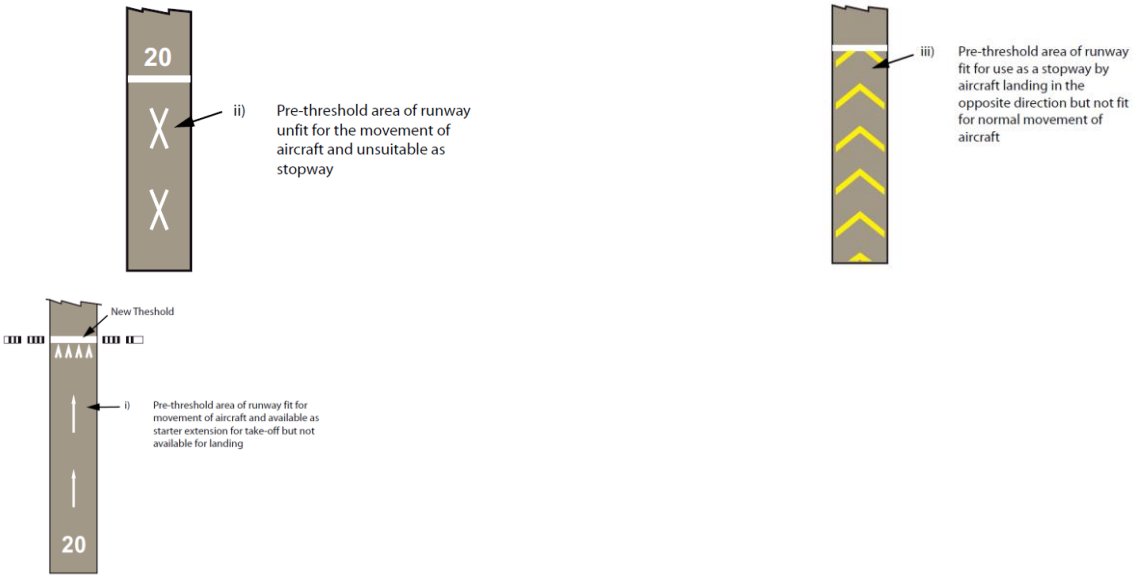
ii) Sand or similar material laid on the markings

iii) Weighted down boards on the markings

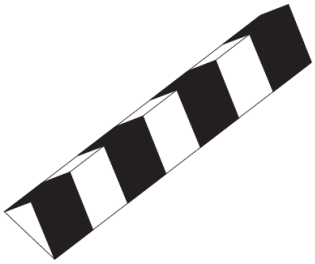
iv) Rolls of weighted different coloured material, such as carpet, on the markings

v) It may not be necessary to totally obscure threshold and TDZ markings, but it will help to break up their patterns.

2) There are three layouts of pre-threshold marking depending on the usability of the pre-threshold area:

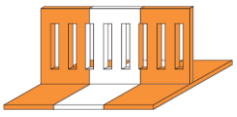


3) Temporary threshold marking boards, black and white tri-boxed markers; in accordance with chapter 5 of Annex 14 can be used to show a temporary displaced threshold, displaced start of TORA and displaced end of runway.



At displaced thresholds on both side of runway.

Black and white triangular box section marking displaced threshold.



Along the boundary of the designated area.

Along the boundary of the designated area.

C. Lighting

1) High intensity runway lighting can be a useful aid to visually indicate to the approaching and departing pilot which parts of the runway are closed and which are in use. AGL is mandatory for a runway used at night, and also by day in low visibility and as an instrument runway. The runway must meet the requirements equivalent to its status, such as

1) Precision instrument approach runway, where the stop end has been shortened
2) Non-instrument runway with an instrument approach to VMC
3) Non-instrument runway, code 3 or 4 used by jet aircraft by day
4) Any runway used by night.

2) Minimum AGL is likely to include:
1) PAPI
2) Threshold
3) Runway edge
4) Runway end
5) Taxiway edge or centreline
6) Obstacle lighting
7) Signs.

D. During a re-declared runway distance situation all lighting within the portion of a runway which is not available for operational use must be withdrawn, except that runway edge lights may be changed to red. Withdrawing lights can be achieved by the following methods
1) Isolating each light or secondary cable's associated with those fittings.
2) Removing light fittings and replacing them with blanking plates
3) Covering / masking fittings with suitable ventilated cover; cones may be suitable for elevated edge lights as long as they are not higher than the clearance beneath an engine of any aircraft that may taxi nearby, e.g. B737

E. Temporary Threshold Lighting
1) As previously stated, PAPI, correctly designed, ground calibrated and flight inspected are required for a displaced threshold that is originally code 3 or 4 and is used by jet aircraft.
2) During the period of a temporary threshold markers are deployed, temporary green threshold wing bar lighting will be required. These would be located both sides of the runway abeam the temporary threshold and should be secured in place to ensure no effect from jet blast.

F. Temporary departure end of runway lighting (stop end)

1) Runway AGL, except for threshold, is not intended to designate the declared distances, but indicates the extremities of the runway in use: sides, and two ends

G. For permanent thresholds that remain in use, there will be no change to approach, threshold and PAPI lights.

H. Temporary Obstacle Lighting should be used for ALL temporary obstacles when the runway or any adjacent FATO will be used at night. Every vehicle involved in the temporary obstacle must have a compliant and operating yellow obstacle light on the highest part of each and every vehicle.

I. Any floodlights used must not either distract from AGL or cause dazzle to pilots

Use of Navigational Aids.

A. Based on the ICAO definition of a non-instrument runway, an instrument approach procedure may continue to be used down to VMC even when the status of that runway is reduced to non-instrument, for example when the strip width is reduced, or the instrument threshold is displaced.

B. If the threshold has been displaced, then it is likely that the instrument approach procedures can only be used with advanced planning, in excess of 2 months due to the AIRAC notification cycle and advance notice requirements.

C. However, if the obstacle is within the instrument strip, but outside the non-instrument strip, and therefore outside the non-instrument clear and graded areas, the runway can be brought into service and operate as a non-instrument runway, i.e. in visual meteorological conditions. In this instance the navigational aids, particularly the ILS may continue to be used if the threshold has not been displaced but the minima must be raised to the point beyond which an approaching aircraft can continue in VMC. Such increased minima must be pre-planned and agreed with CAAT AGA, ANS and Flight Ops Departments, and stated in the aerodrome manual. This is because the criteria for VMC are dependent on several factors, including the presence of controlled airspace,

ANSP agreement and aircraft speed, ICAO Annex 2, Ch. 4, as detailed in Appendix A.

Declared Distances Definitions

Definitions

Word/abbreviation	Meaning	Reference
accelerate-stop distance available (ASDA).	the length of the take-off run available plus the length of the stopway, if provided	ICAO Annex 14 Vol 1; 1.1
approach surface	an obstacle limitation surface: an inclined plane or combination of planes preceding the threshold	ICAO Annex 14 Vol 1; 1.1
ASDA	accelerate-stop distance available	ICAO Annex 14 Vol 1; 1.1
clearway	a defined rectangular area on the ground or water under the control of the appropriate Authority/entity, selected or prepared as a suitable area over which an aeroplane may make a portion of its initial climb to a specified height. *Note: should be under control of aerodrome operator*	ICAO Annex 14 Vol 1; 1.1
decision height/altitude	a specified altitude or height in a 3D instrument approach operation at which a missed approach must be initiated if the required visual reference to continue the approach has not been established	ICAO Annex 6, Vol 1, Ch.1
declared distances	take-off run available (TORA), take-off distance available (TODA), accelerate-stop distance available (ASDA), landing distance available (LDA)	ICAO Annex 14 Vol 1; 1.1

Word/abbreviation	Meaning	Reference
displaced threshold	a threshold not located at the extremity of a runway	ICAO Annex 14 Vol 1; 1.1
foot	0.3048 of one metre	ICAO Annex 5; Ch. 1
landing distance available	the distance from the point on the surface of the aerodrome above which the aeroplane can commence its landing, having regard to the obstructions in its path, to the nearest point in the direction of landing at which the surface of the aerodrome is incapable of bearing the weight of the aeroplane under normal operating conditions or at which there is an obstacle capable of affecting the safety of the aeroplane	ICAO Annex 14 Vol 1; 1.1
landing distance available	the distance from the point on the surface of the aerodrome above which the aeroplane can commence its landing, having regard to the obstructions in its path, to the nearest point in the direction of landing at which the surface of the aerodrome is incapable of bearing the weight of the aeroplane under normal operating conditions or at which there is an obstacle capable of affecting the safety of the aeroplane	ICAO Annex 14 Vol 1; 1.1
LDA	landing distance available	ICAO Annex 14 Vol 1; 1.1

Word/abbreviation	Meaning	Reference
metre	3.2808 feet	ICAO Annex 5; Ch. 1 (inverse)
minimum descent height/altitude	a specified altitude or height in a 2D instrument approach operation or circling approach operation below which descent must not be made without the required visual reference	ICAO Annex 6, Vol 1
non-instrument runway	a runway intended for the operation of aircraft using visual approach procedures or an instrument approach procedure to a point beyond which the approach may continue in visual meteorological conditions.	ICAO Annex 14 Vol 1; 1.1
obstacle clearance altitude	the lowest altitude or the lowest height above the elevation of the relevant runway threshold (height) or the aerodrome elevation (altitude) as applicable, used in establishing compliance with appropriate obstacle clearance criteria	ICAO Annex 6, Vol 1
stopway	a defined rectangular area on the ground at the end of take-off run available prepared as a suitable area in which an aircraft can be stopped in the case of an abandoned take-off	ICAO Annex 14 Vol 1; 1.1
take-off climb surface	an obstacle limitation surface: an inclined plane or other specified surface beyond the end of a runway or clearway	ICAO Annex 14 Vol 1; 4.1.25
take-off run available	the length of runway declared available and suitable for the ground run of an aeroplane taking off	ICAO Annex 14 Vol 1; 1.1

Word/abbreviation	Meaning	Reference
take-off run required	the take-off run required is the greater of the following: 1.15 times the distance required with all engines operating to accelerate from a standing start to take-off safety speed; 1.0 times the distance required to accelerate from a standing start to take-off safety speed assuming the critical engine to fail at the power failure point.	ICAO Annex 6 Vol 1; Att B, 2.6
take-off runway	a runway intended for take-off only	ICAO Annex 14 Vol 1; 1.1
THR	threshold	ICAO Annex 14 Vol 1; 1.1
threshold	the beginning of that portion of the runway usable for landing	ICAO Annex 14 Vol 1; 1.1
TODA	take-off distance available	ICAO Annex 14 Vol 1; 1.1
TORA	take off run available	ICAO Annex 14 Vol 1; 1.1
transitional surface	an obstacle limitation surface: a complex surface along the side of the strip and part of the side of the approach surface, that slopes upwards and outwards to the inner horizontal surface	ICAO Annex 14 Vol 1; 1.1
visual meteorological conditions	Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling, equal to or better than specified minima.	ICAO Annex 2, Ch. 1

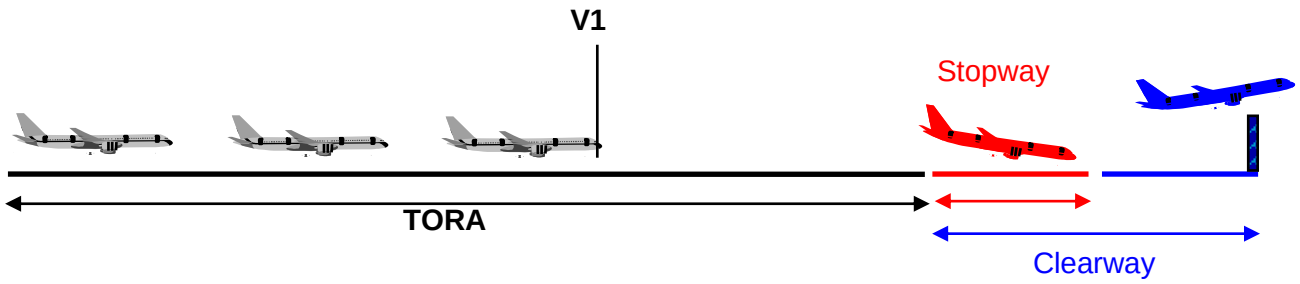
Visual Meteorological Conditions (VMC)

The application of the ICAO definition of a non-instrument runway in the circumstances where the status of the runway is reduced by an obstacle from instrument to non-instrument depends very much on the application of the criteria for visual meteorological conditions (VMC) in which the approaching aircraft must continue after passing its minimum descent height (as revised in the procedures to displace the threshold). The relevant VMC criteria are reproduced below form ICAO Annex 2. The default visibility for such a displaced threshold and revised instrument approach situation is a met visibility of 5km or more, assuming that the observed visibility at the aerodrome can be equated to in flight visibility for VMC purposes, but on occasions the in-flight visibility may be lower than the aerodrome visibility, or vice versa.

Ser.	Altitude band	Airspace class	Flight visibility	Distance from cloud
1	At and below 3 000 ft AMSL, or 1 000 ft above terrain, whichever is the higher	A*** B C D E	5 km	1 500 m horizontally 1 000 ft vertically
2		F G	1,500m to 5 km**	Clear of cloud and with the surface in sight
Notes:		The VMC minima in Class A airspace are included for guidance to pilots and do not imply acceptance of VFR flights in Class A airspace.	** When so prescribed by the CAAT operational condition authority: a) flight visibilities reduced to not less than 1 500 m may be permitted for flights operating: 1) at speeds that, in the prevailing visibility, will give adequate opportunity to observe other traffic or any	

			obstacles in time to avoid collision; or 2) in circumstances in which the probability of encounters with other traffic would normally be low, e.g. in areas of low volume traffic. b) Helicopters may be permitted to operate in less than 1 500 m flight visibility, if manoeuvred at a speed that will give adequate opportunity to observe other traffic or any obstacles in time to avoid collision.	

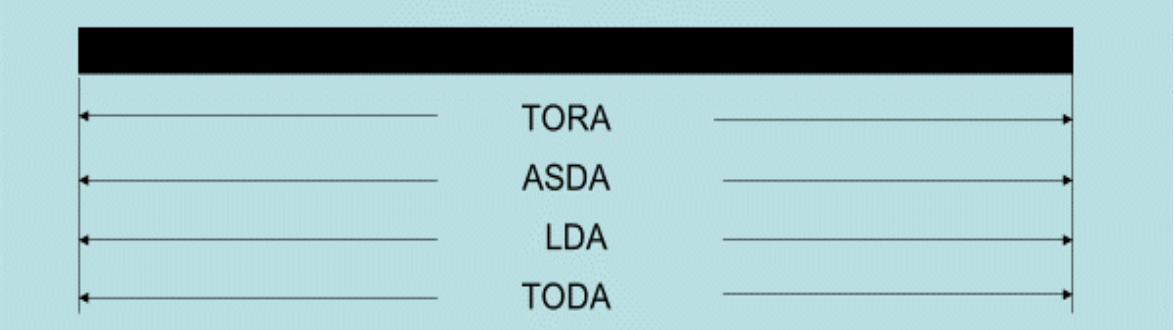
Declared Distances Diagrams



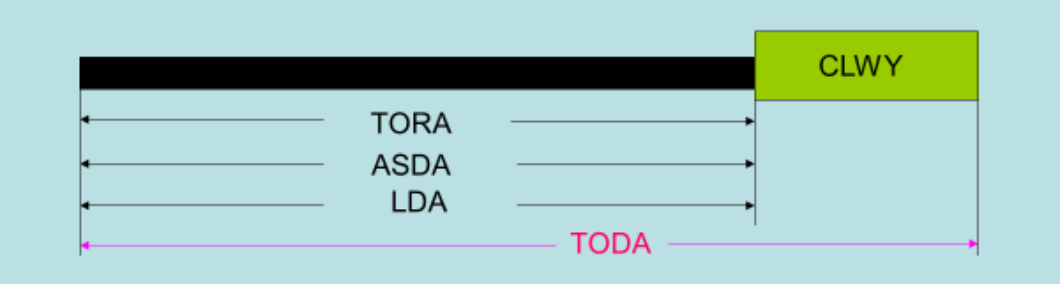
Note:

V_1 is the Decision speed or critical engine failure speed, by which any decision to reject a

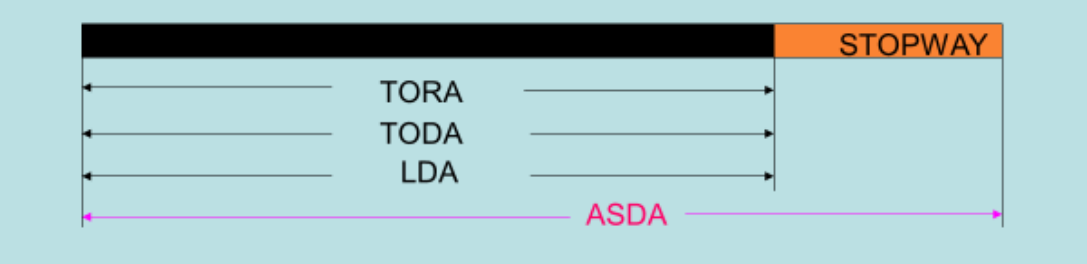
takeoff must be made. Above V_1, the take-off must be continued unless there is reason to believe that the aircraft will not fly. An engine failure identified not later than V_1 should always result in a rejected takeoff. If the decision is made to reject, the aircraft can be brought to a stop within the Accelerate Stop Distance Available (ASDA). If the decision is made to continue the takeoff, either in a non-engine failure case which occurs prior to V_1 or in an engine failure case which occurs at or after V1, the aircraft can get airborne and achieve or exceed the appropriate screen height within the Takeoff Distance Available (TODA). If a reject is initiated at a speed above V_1, a runway excursion is probable.



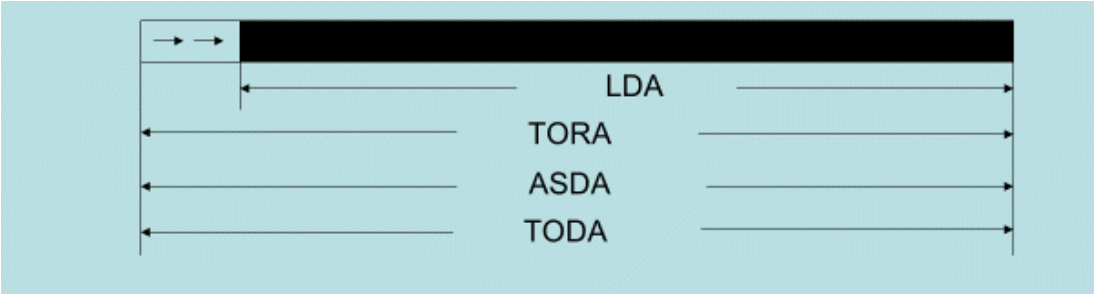
No Stopway or clearway, all distances the same



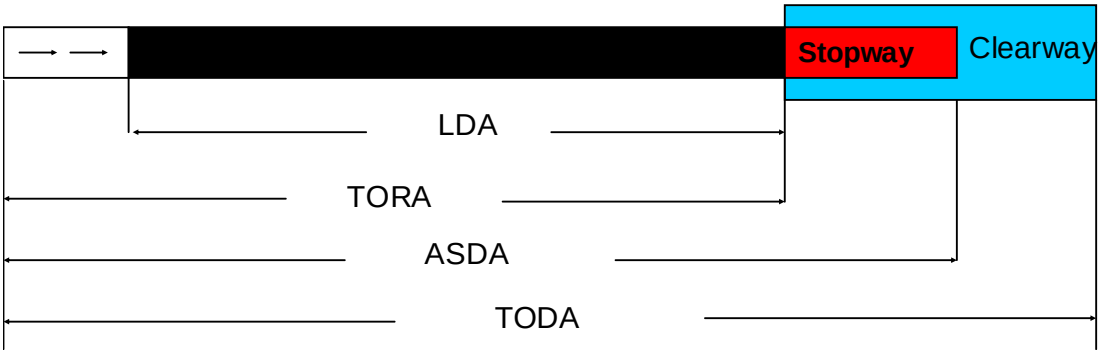
Clearway only, no stopway



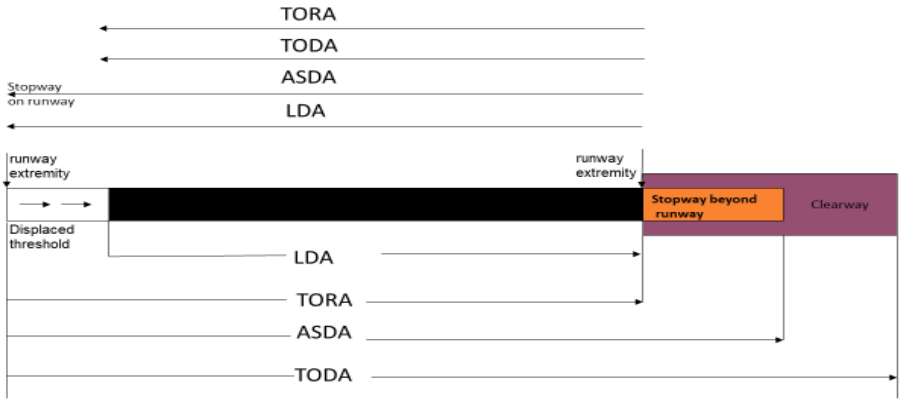
Stopway, no clearway



Displaced threshold, no clearway or stopway



Combinations of different declared distances on the same runway, one direction



Different combinations of declared distances on the same runway, both directions

6.3 Appendix C- PAPI installation design and inspection

Introduction

CAUTION: DO NOT LOOK DIRECTLY AT AN ILLUMINATED PAPI LAMP, THE INTENSITY COULD BE DANGEROUS TO THE NAKED EYE

This attachment is provided for information and guidance purposes for Aerodrome Inspectors (AIs) on the design calculation, layout, siting, promulgation and inspection of precision approach path indicators at Thai aerodromes. It does not change, create, amend or permit deviations from regulatory requirements, nor does it establish minimum standards, but provides technical guidance for AIs. It applies to each and any aerodrome and heliport where PAPI or APAPI are installed.

The two most common non-compliances of PAPIs are:

A. Insufficient wheel clearance over the threshold at minimum eye height over threshold;

B. Inadequate delethalisation of concrete bases on which the PAPIs are mounted within the graded area of the runway strip, as illustrated in the picture below for the middle two PAPI units.

LED Single unit PAPIs with integral monitoring

References

The following reference documents are used in or are applicable to this document:

A. ICAO Annex 14 Volume 1
B. ICAO Annex 14 Volume 2 where PAPI or APAPI are used instead of HAPI for helicopters
C. ICAO Annex 10 Volume 1 Navigation Aids
D. ICAO Doc 8891
E. ICAO Doc 9157 Part 4 Visual Aids

Background

From the early 1980s precision approach path indicators (PAPI & APAPI) started to replace visual approach slope indicators (VASIS) at aerodromes because the PAPI and APAPI are:

A. Useable to a lower height above the runway
B. More precise
C. More visible/higher intensity
D. Smaller installation site
E. Use less power
F. Require less maintenance

VASIS are not used in Thailand, become obsolete in ICAO in 2020, and may not be installed at Thai aerodromes. PAPI installations need to be coordinated / harmonised with the following:

A. Instrument approach procedures
B. Location of the ILS glidepath and reference datum height
C. Aiming point marking
D. Threshold and start of runway surface for aircraft wheel clearance over the threshold or start of runway pavement

Requirement for PAPI/APAPIs

Annex 14 Volume 1, 5.3.5.1, 5.3.5.3, 5.3.5.5-6, and the Aerodrome Regulations state that PAPI are required in the following circumstances:

A. the runway is used by turbojet or other aeroplanes with similar approach guidance requirements;

B. the pilot of any type of aeroplane may have difficulty in judging the approach due to:
   1) inadequate visual guidance such as is experienced during an approach over water or featureless terrain by day or in the absence of sufficient extraneous lights in the approach area by night; or
   2) misleading information such as is produced by deceptive surrounding terrain or runway slopes;

C. the presence of objects in the approach area may involve serious hazard if an aeroplane descends below the normal approach path, particularly if there are no non-visual or other visual aids to give warning of such objects;

D. physical conditions at either end of the runway present a serious hazard in the event of an aeroplane undershooting or overrunning the runway;

E. terrain or prevalent meteorological conditions are such that the aeroplane may be subjected to unusual turbulence during approach.

F. PAPI {not APAPI) shall be provided where the code number is 3 or 4 when one or more of the conditions specified in (i) to (v) above exist.

G. PAPI or APAPI shall be provided where the code number is 1 or 2 when one or more of the conditions specified in (i) to (v) above exist.

H. Where a runway threshold is temporarily displaced from the normal position and one or more of the conditions specified in (i) to (v) above exist, a PAPI should be provided except that where the code number is 1 or 2 an APAPI may be provided.

   Given the application of the above conditions, it is likely that most runways in Thailand require either PAPI or APAPI to be installed.

Siting

The order in which siting should be calculated is as follows:

A. Determine the critical aircraft for design that will use the approach, this may be the B747-400 due to the high pilot's eye to wheel height, or the B737 due to its extremely low pilot's eye to ILS glidepath antenna height.

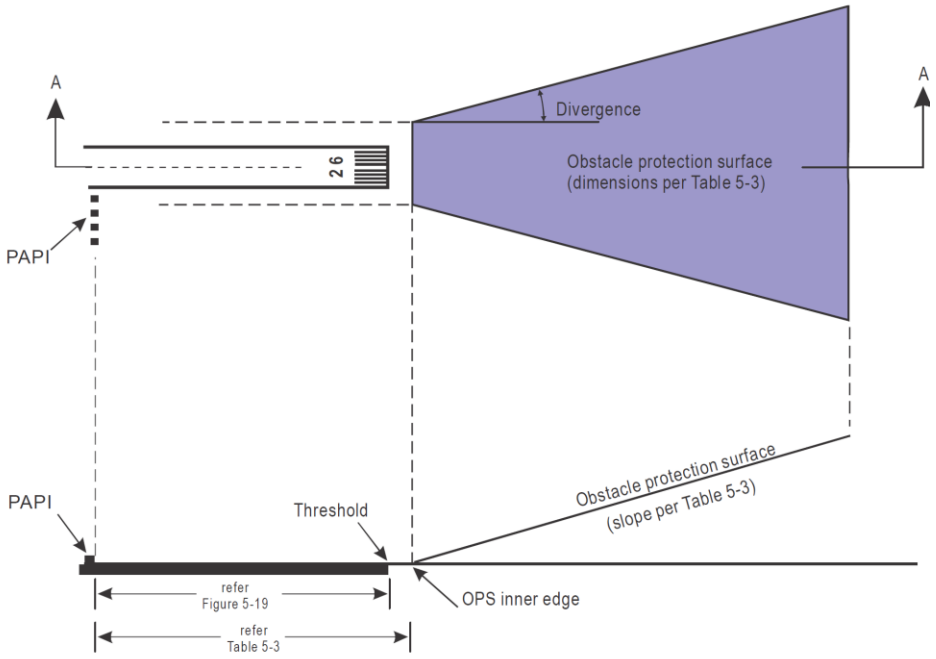
B. Design the location of the ILS glidepath and the resulting reference datum height.

C. The RDH will not be confirmed until after ILS installation, so the following steps may need to be carried out provisionally pending flight calibration of the ILS.

D. For the spread of design aircraft design, as below, the harmonization of the ILS glidepath, and any other nominal glidepaths of instrument approach procedures such that the maximum number of aircraft types for which the runway is designed will receive on glidepath indications from BOTH ILS and PAPI to the lowest height possible on the approach.

E. Ensure that this design provides the required wheel clearance for the most critical aircraft when the aircraft is at MEHT. This is often the critical design element and tends to drive the RDH towards its upper limit of 18m.

F. Ensure that the provisionally designed location of the PAPI has a clear obstacle protection surface, Annex 14 Vol 1 5.3.5. Note that the width of the PAPI visibility on approach can be baffled in the event of obstacles to the side of the OPS, 5.3.5.40. Note that the width of the OPS has not been reduced along with the width of the strip and approach surface in amendment 14 (2018) of Annex 14 Volume 1. The dimensions are given in Annex 14 Vol 1, Table 5-3.:



G. Ideally delay the final PAPI design until the result of the ILS flight calibration, and therefore the RDH, is known. This enable the final harmonization location of the PAPIs to be calculated.

H. Install the PAPIs in accordance with the Regulations, noting the switching requirements for only one runway direction selectable at any one time, anti-condensation measures, delethalised mountings and bases, and compliant wheel clearance, harmonised with the ILS and other instrument approach procedures.

I. Then, when the origin of the PAPI slope, normally 3 degrees, at the runway centreline is known, paint the aiming point marking, if necessary, adjusting the distribution and number of touch down zone markings in accordance with Annex 14 5.2.5.3 and 5.2.6.4.

J. Flight inspect the PAPIs.

K. Promulgate the details of the PAPIs.

Survey

In order to calculate the location of the PAPIs, as well as knowing the details of the ILS, or other, glidepath above, it is necessary to know the relative elevations and relative distances of the centre of the PAPI lenses, ideally all four units form a horizontal line, and the runway threshold, and, if the threshold is displaced, the start of the runway pavement. It is the elevation of PAPI unit B, Annex 14 Fig 5-19, third from the runway, as this is the unit that derives the MEHT.

These elevations and distances may form part of the WGS84 aerodrome survey, or be specifically surveyed to identify only the relative levels of PAPI lens and threshold, start of runway, and distance in between. Because for PAPI siting calculations, the survey data needed is only relative between the PAPI and threshold/start of runway, the survey need not be to WGS84 / EGM96 standards for PAPI calculations, but does need to be to comparable accuracy between the points surveyed. However, survey datums must not be mixed within the PAPI calculations. For example, it is not acceptable to survey the PAPI site to UTM and the threshold to WGS84 and/or mixing vertical datums between EGM96 and EGM2008.

Harmonization with IAPs

The aim of harmonization is so that when the pilots on approach transition from instrument flight to visual approach, their transition from on-glidepath on the ILS will be to on-glidepath on the PAPI, i.e. 2-whites and 2-reds. The consequences of lack of harmonization may include:

A. De-stabilisation of the approach
B. Go-around due to perceived destabilisation of the approach, or lack of confidence in the approach
C. Excessive sink rates when attempting to capture the PAPI glideslope
D. Attempts to capture the PAPI glideslope with possible consequence of ground proximity warnings
E. The pilot does not know which is the correct glideslope: ILS or PAPI.

This harmonization can be achieved reasonably easily for a core mix of aircraft types, for example, ranging from the B737-300 to the B737-700. However, aircraft where the pilots sit on the upper deck, may need to be excluded from the harmonization spread of aircraft, these may include B747, An124/225, C17. For this reason, some aerodrome operators publish the eye height above threshold for not just 2-whites, but also for 3 and 4-whites, see below..

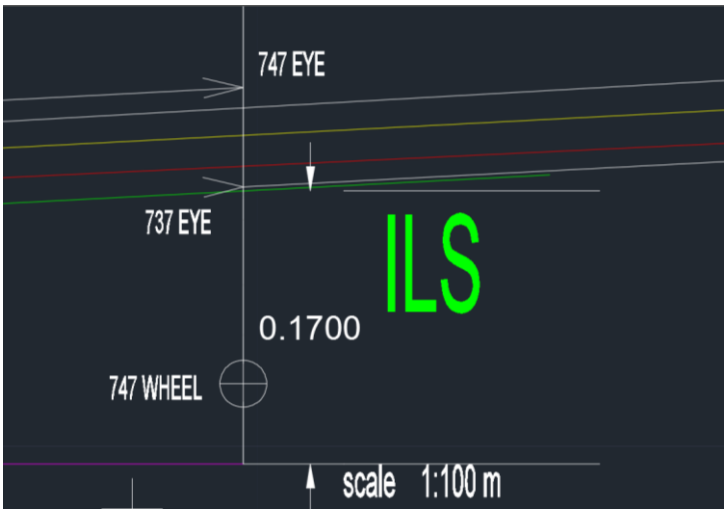
There are two principal methods of deriving the harmonization of the PAPIs with the instrument approach procedure: calculation base on aircraft groups (Annex 14), drawing based calculation using AutoCAD for specific aircraft.

Annex 14 method

The Annex 14 method in Annex 14 Vol 1 Fig 5-19 and Doc 9157 Part 4, 8.3.25 and Appendix 6, uses a group of aircraft to design harmonisation, but by calculation it is difficult to represent the harmonization and wheel clearance for any particular aircraft type and model. The model series of an aircraft type is important as the extended lengths of some models can significantly affect the eye and antennae to wheel heights in the approach configuration.

AutoCAD

A method using AutoCAD or similar software can not only devise the ideal PAPI siting but also demonstrate the harmonisation of the two most extreme critical aircraft for design showing the distance from touchdown or from threshold where both the lowest and highest aircraft lose PAPI on-slope indication, as illustrated below for the B737 and B747. In this diagram, the top white line is the top of the 2-whites and 2-reds, the yellow line is the 3 degree PAPI slope, the red line the bottom of the 2-whites and 2-reds indication, and the green line is the ILS 3-degree glideslope.



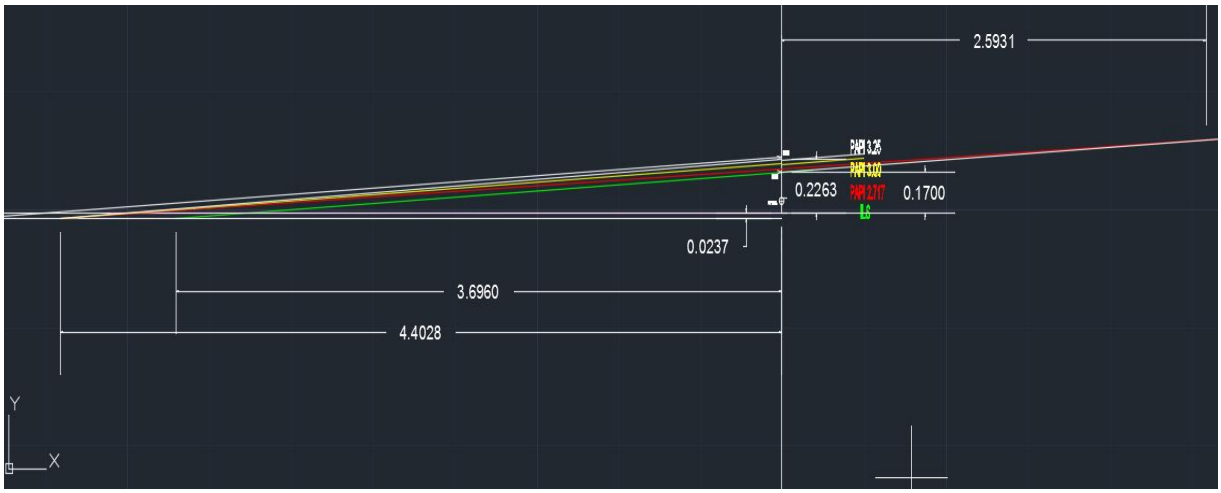
B747 and B737 on ILS loss of PAPI

The AutoCAD method requires the drawing from the start of runway to the intended ILS glidepath and PAPI sites, with accurate relative elevations of:

A. Reference datum height as flight calibrated over the threshold
B. PAPI B unit centre of lens
C. Threshold
D. Start of runway before the threshold if the threshold is displaced

This is illustrated below for an ILS GP at 324m from threshold, with an RDH of 17m, PAPI slope origin on a level runway at 390m from threshold.

The above example is for a PAPI lens that is level with the threshold. Usually, there is a difference in levels, as shown in the following example, in this case the threshold is 2.37m above the PAPI:

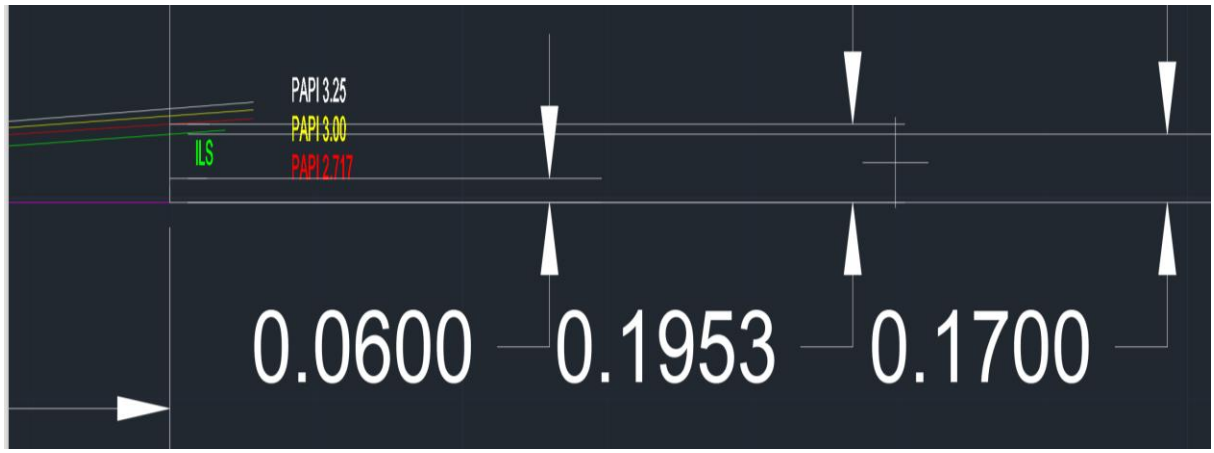


Once the ILS and PAPI slopes are drawn, the differences between the heights over the threshold can be seen, and then explored. The illustration below indicates:

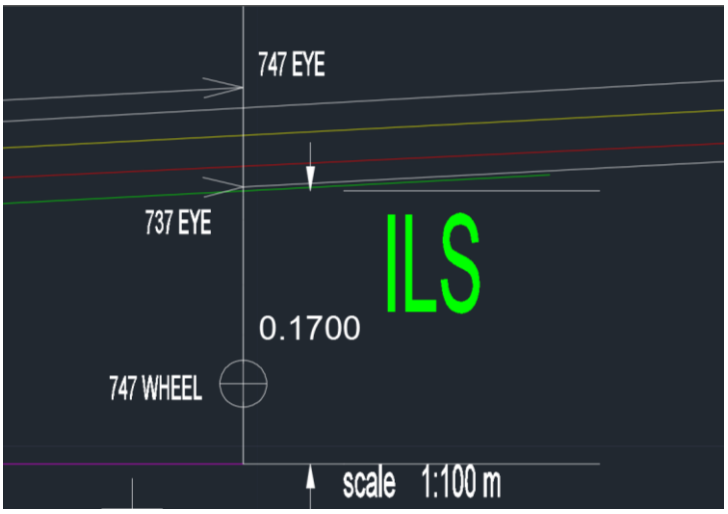
RDH: 17m

MEHT: 19.53m

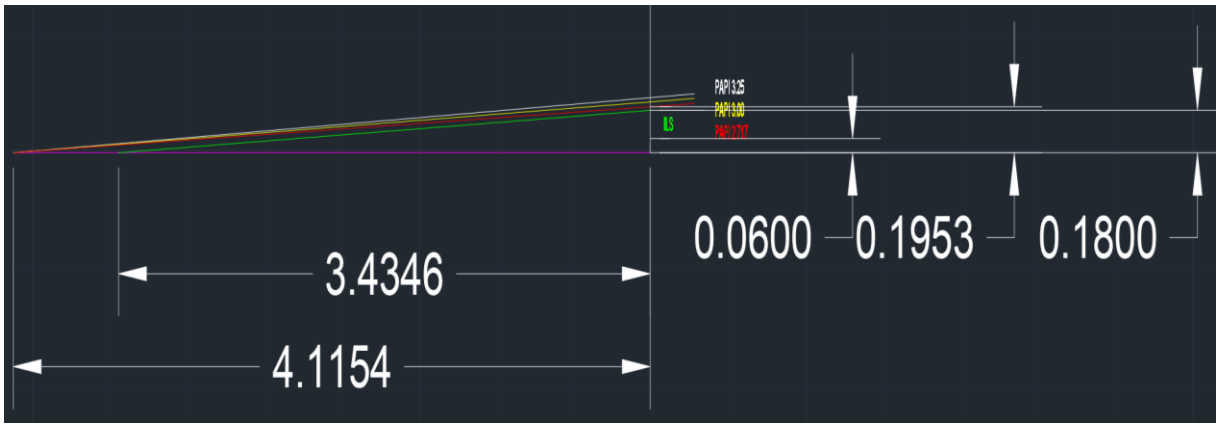
ILS to MEHT: 2.53m (19.53-17m)



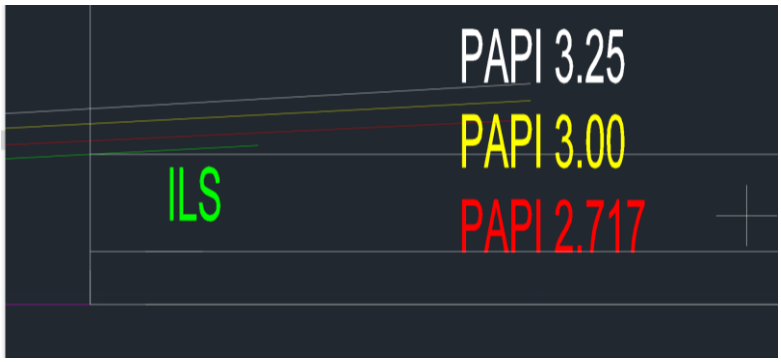
An advantage of using AutoCAD for the PAPI design is that aircraft at the bottom and top of the range of eye to antenna and eye to wheel height can be clearly shown on the drawing and the point at which those aircraft on the ILS glidepath lose the PAPI on-slope indication is clearly seen, or their separation from the PAPI on-slope indication as they cross the threshold, as illustrated below:



The same drawing can also be used to explore increasing the RDH and its effect on both wheel clearance over threshold and the distance of the PAPI along the runway from the threshold, in this case a distance of 411.5m



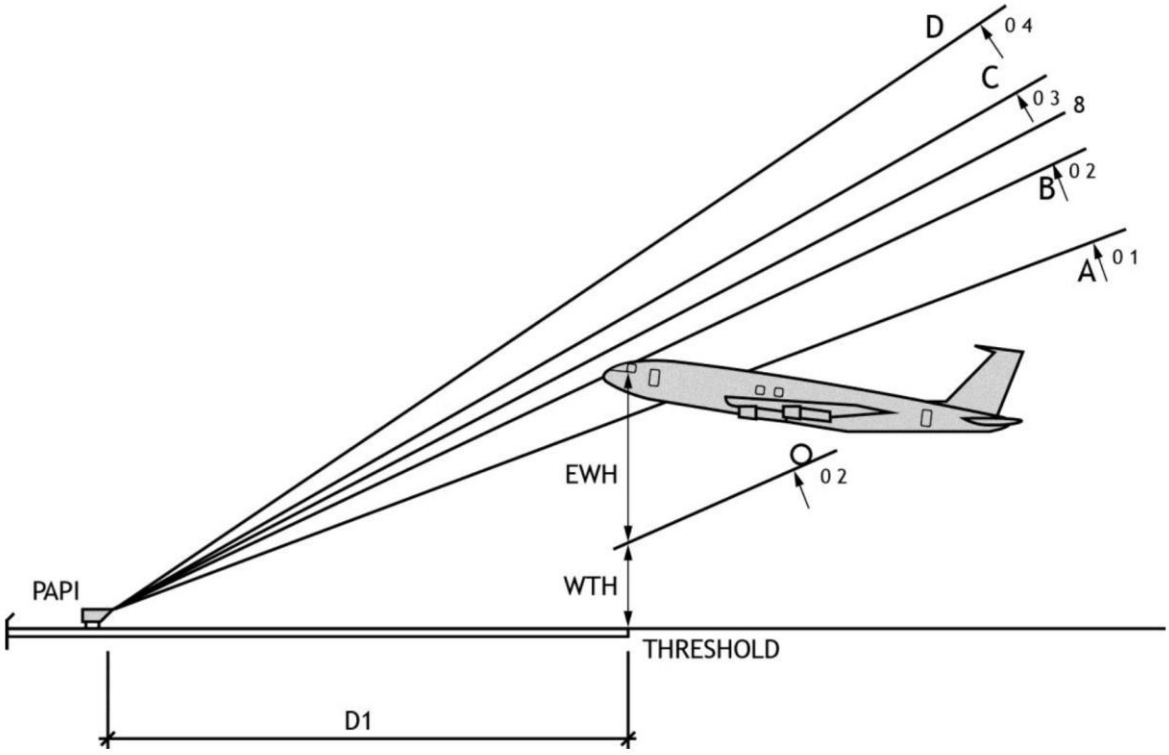
All of the above illustrations use a 30 minutes of arc PAPI on course sector. In Thailand, this is necessary not just for harmonisation with ILS but also for harmonisation with PBN and other instrument approach procedures that use the aircraft's altimeter for the nominal glideslope calculation. This is due to the high ambient temperatures of 15 degree Celsius or more above international standard atmosphere, as each increase of temperature of 15 degrees Celsius induces an altimeter error that creates an increase in nominal glideslope flown of 0.2 of one degree. Therefore the unit B is set at 2°45', and unit C at 3°15', but a further 2 minutes is deducted from 2°45' for the calculation of MEHT at 2°43', equivalent to 2.717 degrees, as shown below:



Wheel clearance

The wheel clearance requirements of Annex 14 Vol 1 Table 5-2, on which the following table is based, are often misinterpreted meaning that the 9m wheel clearance shown in column 2 is not mandatory. The clearances listed in Column 2 of the table are the minimum wheel clearance applicable to most commercial aircraft, and the reduced wheel clearance of 6m is only permissible when the threshold is displaced AND the wheel clearance in column 2, for most situations 9m, is achieved at the start of the runway pavement on the equivalent slope to the MEHT at the displaced threshold.

Eye to wheel height of aeroplane in the approach configuration	Wheel clearance over start of the runway pavement		Wheel clearance over displaced threshold
(1)	(2)	(3)	(4)
Up to but not including 3 m	6m	If the threshold is displaced, as long as the clearance in column (2) is provided at the start of pavement, a reduced clearance not lower than that in Column(4) is permitted	3m
3 m up to but not including 5 m	9m		4m
5 m up to but not including 8 m	9m		5m
8 m up to but not including 14 m	9m		6m



Wheel clearance over threshold on PAPIs.

A sample table of different aircraft types and models showing an assessment for a sample RDH and MEHT is at Appendix 4. If an aeronautical study is used by the aerodrome operator to justify the use of the reduced wheel clearances of column 3, in accordance with the Annex 14 note c. "The wheel clearances in column (2) may be reduced to no less than those in column (3) where an aeronautical study indicates that such reduced wheel clearances are acceptable", then the following factors may be considered:

A. Existence of paved area before the threshold due to displaced threshold, or taxiway aligned with the runway and on the extended runway centreline, or paved blast pad, or other hardstanding;

B. OPS clear of obstacles;

C. Risk of overrun or risk to overrunning aircraft at the stop end of the runway direction under consideration;

D. Slope of touch down zone;

E. Other visual and non-visual aids, such as ILS glidepath, simple touchdown zone lights, that encourage pilots to touchdown within the TDZ;

F. Better than mandatory threshold marking and/or lighting, such as threshold lights at 3m spacing and/or wing bars, and/or runways threshold identification lights.

Electrical system

A. The PAPI and APAPI are part of the aerodrome's aeronautical ground lighting system and must meet the design requirements of the Regulations and Annex 14 Vol 1 ch. 5 and 8. This includes remote control by the aerodrome controller with back indication, standby power supply.

B. Unlike other AGL circuits PAPIs are not usually provided by two circuits, as the failure of one circuit would leave most PAPI installations unusable, unless PAPI are installed on the left and right of the runway, when each complete set of PAPIs can be on different circuits.

C. The switch-over time for PAPI is 15 secs except where the approach is over hazardous terrain, when the required switch-over time is 1 second.

Condensation

PAPI rely on a clear optical transmission of light to give pilots a correct coloured signal. Therefore, when PAPI are switched on, prior to being ready for use, any condensation must be cleared, this can be achieved by any one of three methods, ICAO Doc 9157 Part 4, 8.3.15:

A. Heater elements can be provided within the PAPI units to prevent the build-up of condensation, or

B. The PAPI, when not selected, can be operated at very low power that does not provide a visible signal but provides sufficient black heat to prevent the formation of condensation, or

C. PAPI can be operated on full power for up to 15 minutes to warm up and disperse condensation before operation use by aircraft.

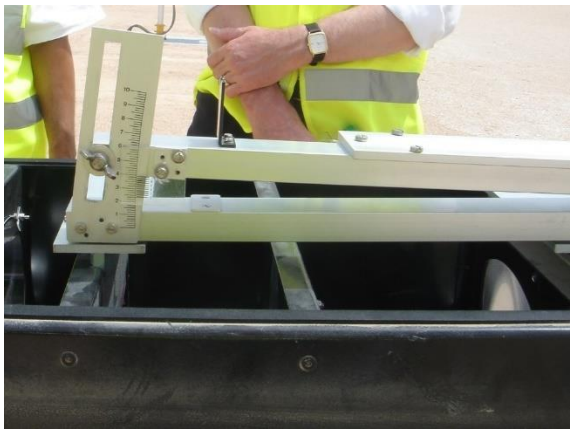
Calibration

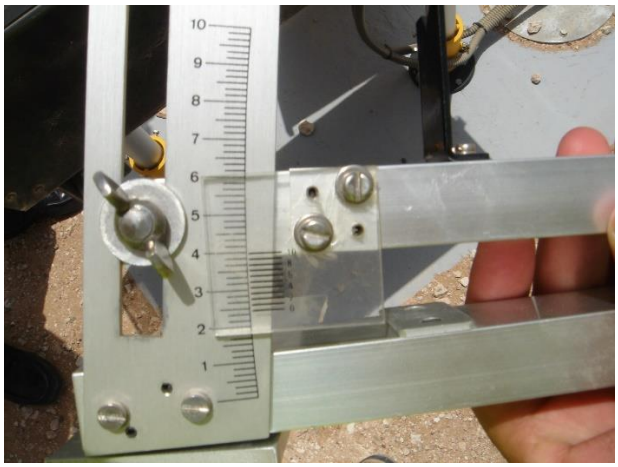
ICAO Doc 9157 Part 4, 8.3.18 states that errors of one minute of arc or more should be corrected. Unfortunately some older, but otherwise quite serviceable PAPI units may not be equipped for checking, measuring and adjusting the angles of each unit to this level of

accuracy. This challenge is illustrated below for the different types of mechanical clinometer, followed by an example of a more modern digital clinometer.

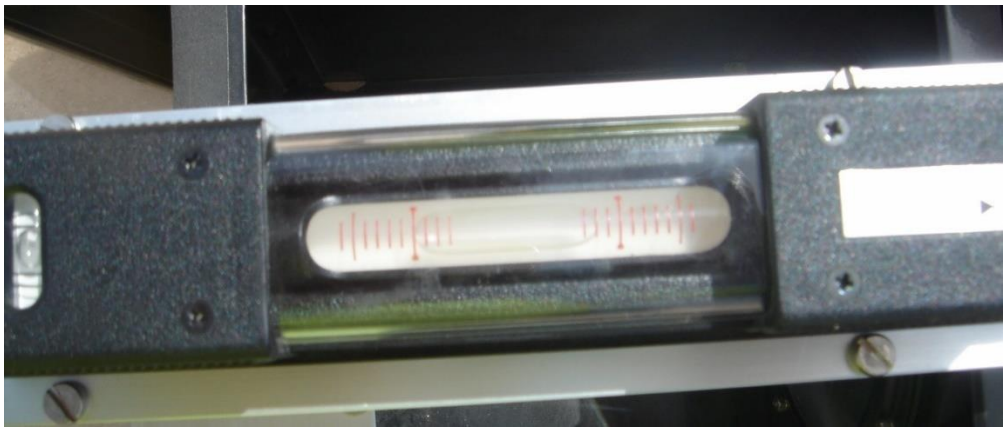
Clinometers

Four types of clinometer are illustrated and described:

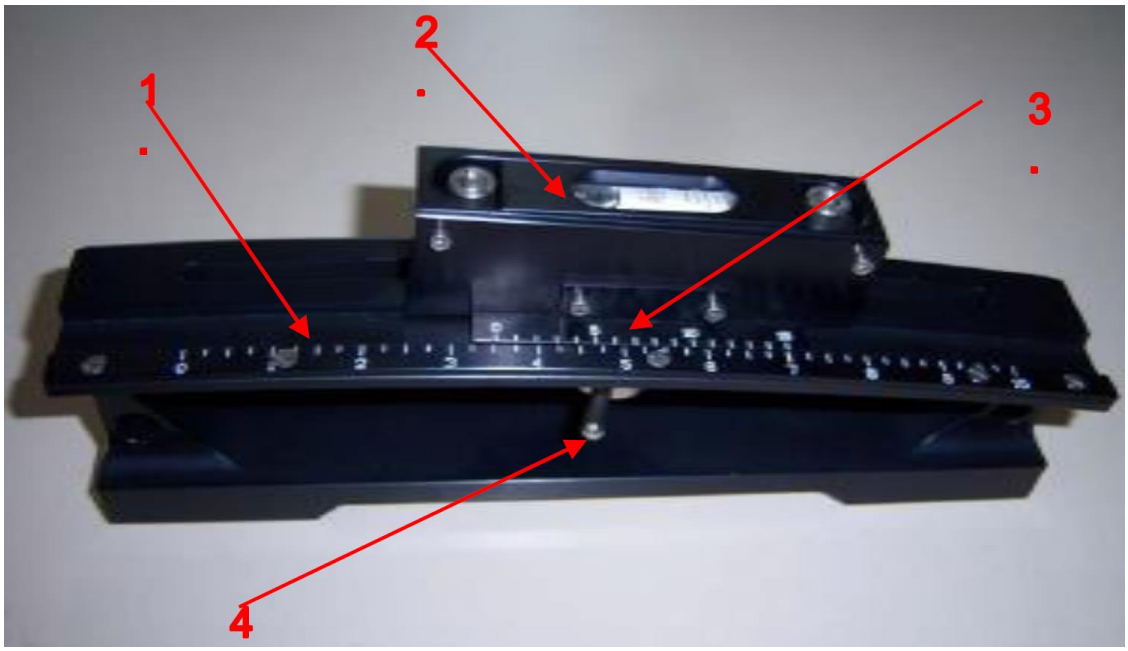


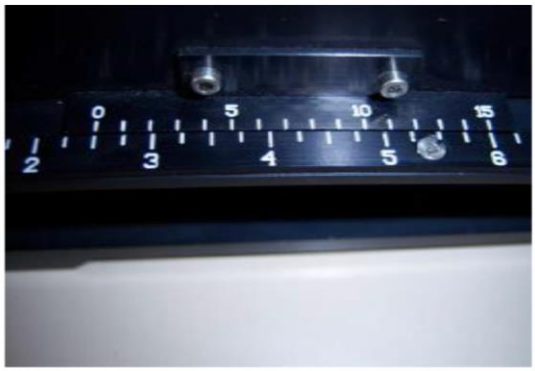


The original clinometer with a retaining wing nut to hold a sliding scale is difficult to adjust and set to the required angle. This is shown below in use, where the spirit level bubble indicates the error on the selected scale.



A later version of a mechanical clinometer is easier and more precise to adjust, but still relies on a clamp (4) to hold the adjusted scales (1) and (2) with a similar spirit level indication (2) in the two pictures below:



Setting the clinometer at 2 ° 30 '	
(a) The strip of 0 "level" is opposite the 2nd graduation after graduation 2 ° (b) 2 ° + (2X15 ') (equivalent to each graduation 15') (c) Secure the level position with the clamp	

An improvement to the setting mechanism is in a third type of clinometer, still using a spirit level, but with a screw adjustable scale:

The latest version is much improved, and has the angle sensors built into the equipment with a digital angel indicator on the exterior of the PAPI housing. This digital readout can also be

remoted to a control location such as the engineering control. Digital clinometer readout and control is illustrated below:

Setting up this latest version of PAPI, in this case, LED projectors, uses a laser level, as shown above.

Finally, in addition to calibrating the PAPI on the ground, they can be calibrating from the air using a specialist aircraft, normally that also flight inspects the ILS and other NAVAIDS.

Flight calibration

Whilst flight calibration is necessary for the commissioning of a new PAPI installation, it is an expensive and impractical method for routine calibration and setting of the PAPIs. Flight calibration works by:

A. The angle of each PAPI unit is measured during a level flight inbound to the runway threshold. The pilot marks the moment of the red-to-white transition of each PAPI unit with a pushbutton on the control wheel. The real-time flight inspection computer samples the aircraft position in that moment and calculates the elevation angle from the PAPI system aiming point to the aircraft. The PAPI system aiming point coordinates and the PAPI units' nominal angles are precalculated in the office and stored in the flight inspection computer database. The aircraft position is sampled at 10 Hz with a 10 cm accuracy.

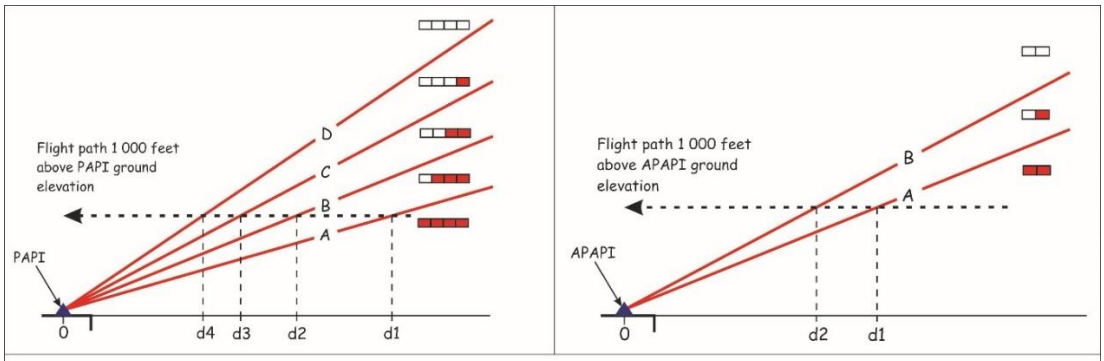
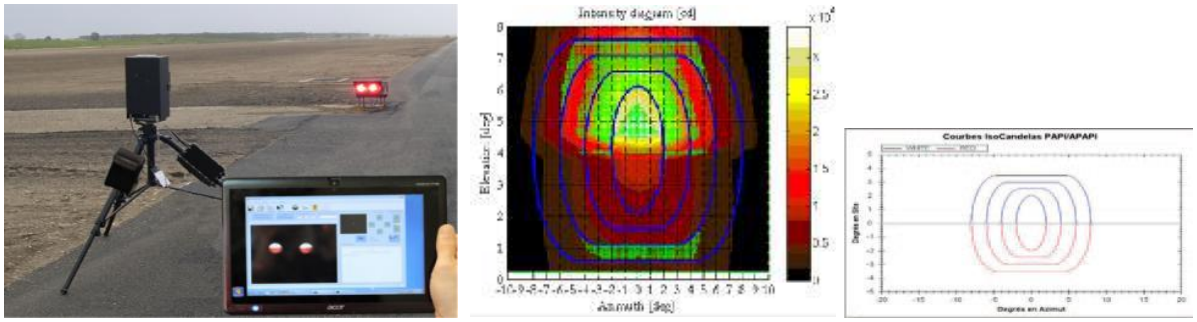


Figure 1 : Flight Path through light beams

B. The flight inspection of PAPI also assesses the flyability of the PAPI, and their visibility range, and checks for uniformity at each intensity setting.

Luminance testing

In addition to the angular set up, monitoring and flight inspection, the PAPI should also be tested regularly for luminance. This can be undertaken using specialist equipment devised for testing PAPI, usually different to that equipment used for the luminance testing of runway lights, and example is shown below:



Tolerances

There are three key elements to tolerances applicable to PAPI installations:

A. The angular settings of each unit,

B. Wheel clearance over the threshold, and if the threshold is displaced, the start of runway pavement, and

C. Harmonization with the ILS and other NAVAIDS and their instrument approach procedures.

Firstly, the elements that may affect angles of the visual signals that are flown by the pilot include:

A. Angular setting

B. Focus

C. Location of the PAPI

D. Levelling of each PAPI unit

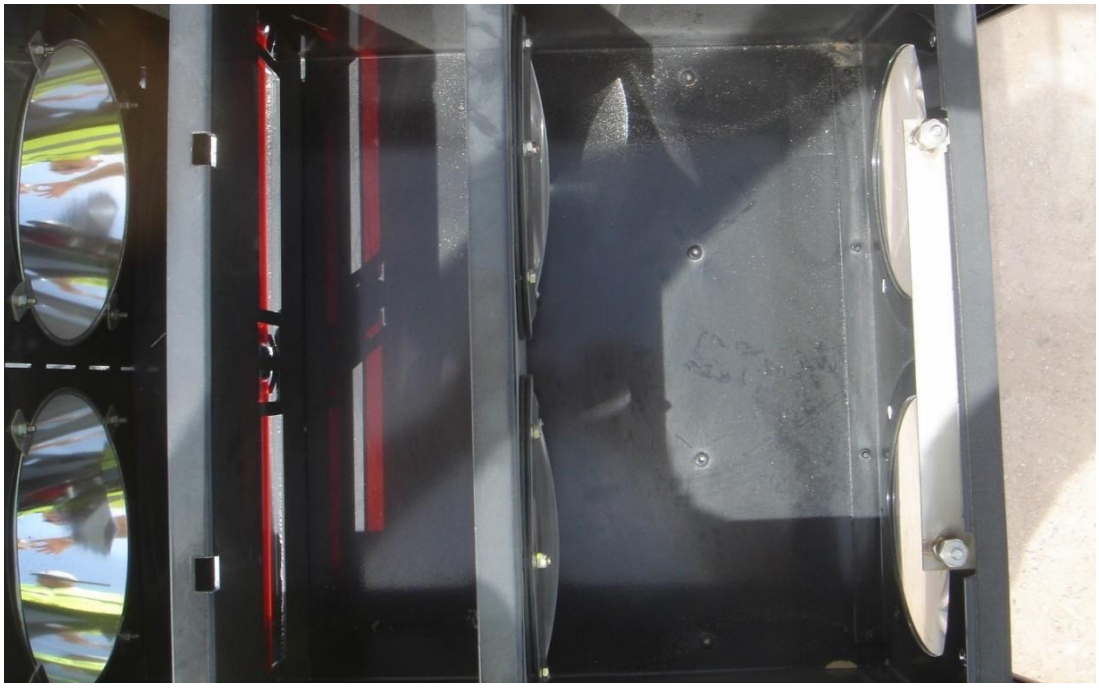
E. Elevation of each PAPI unit

Angular setting has been described above in the section entitled calibration.

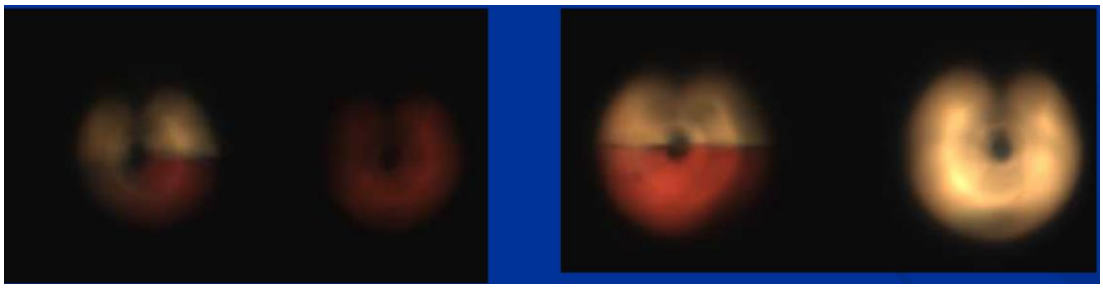
ICAO Annex 14 uses 2 minutes of arc to set the angle at which MEHT is calculated. However, this 2 minutes will be nothing compared to the transition between red and white if

Focus

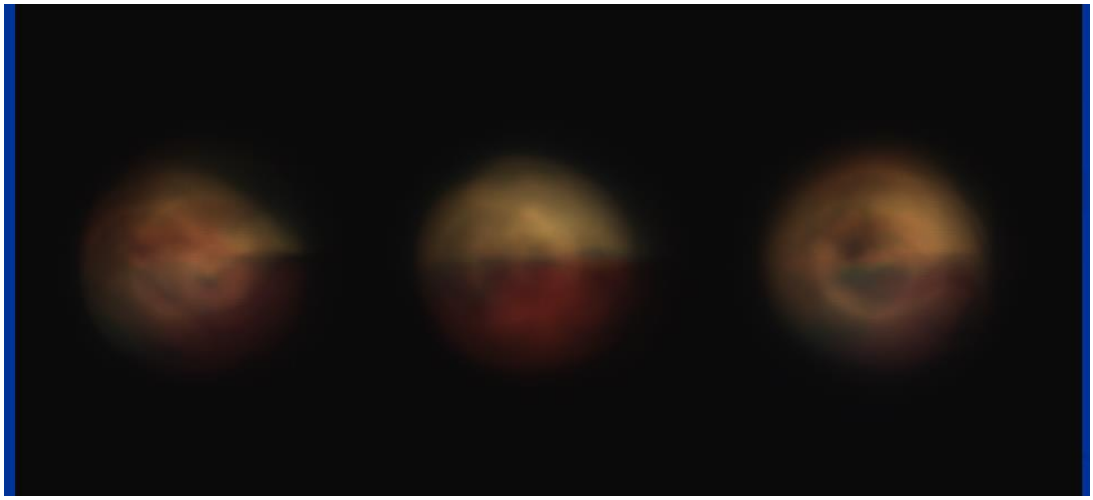
It is important that each element within each PAPI unit is secure, correctly fitted and correctly aligned in each direction. The security of all of these parts, projector lamp, reflector, filters, lenses, and outer glass within the PAPI unit, as illustrated below, is critical to ensure that there are no errors due to misalignment.



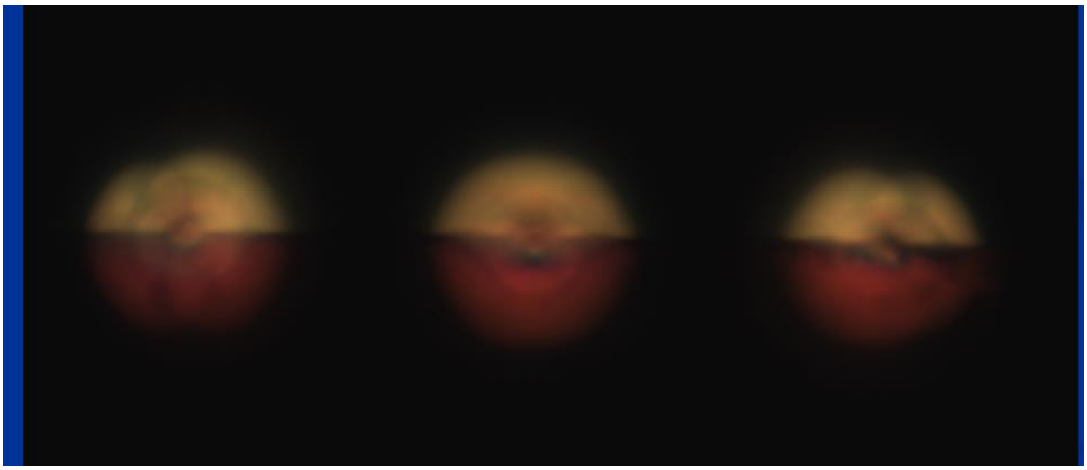
Any of these elements could affect the projection of the lights signal: an example of misaligned lamps in a two lamp unit is illustrated below:



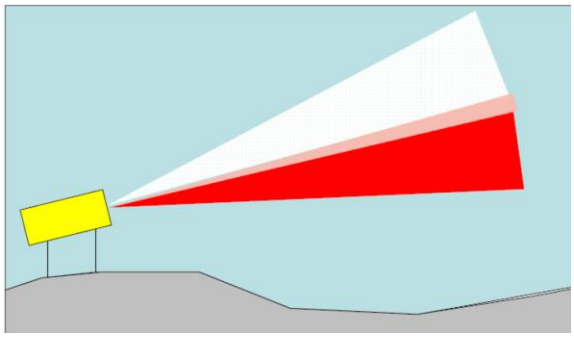
The following is an example of lamps out of focus in a three lamp unit:



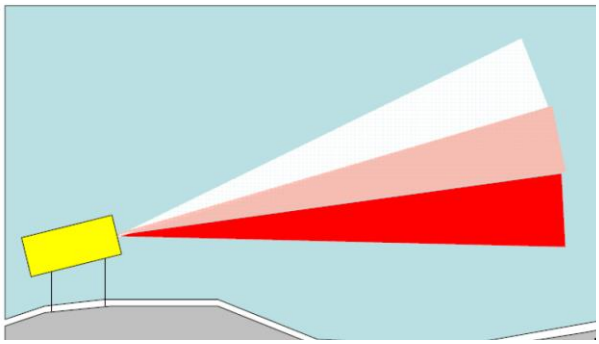
When corrected the same lamps will show a uniform clear transition and alignment:



One of the effects of misalignment or focus errors is to widen the transition between white and red through a larger arc of pink, as illustrated diagrammatically below.



Narrow arc of transition



Wide arc of transition

Maintenance

Chapter 10 of Annex 14 requires a maintenance plan for AGL. This must include the PAPIs, in particular:

A. Frequency of external and internal inspection of PAPI units
B. Frequency of cleaning of external lens, and internal components
C. Frequency of electrical testing
D. Frequency of ground calibration and procedures for setting angles
E. Frequency of flight calibration or inspection

Promulgation

PANS AIM (ICAO Doc 10066) requires a detailed description of the PAPIs to be published in the AIP. This normally includes as a minimum:

A. Provision of PAPI or APAPI for each runway designator
B. Location: left or right, or both sides of the runway
C. Minimum eye height above threshold
D. Remarks
E. Location of the PAPI/APAPI on the ICAO aerodrome chart.

Additionally, it is useful for aerodrome operators to also publish the following optional information:

F. Location: distance from threshold, measured along the runway centreline
G. MEHTs based on 3 whites/ 1 red; and 4 whites; but NOT 3 reds/ 1 white

Two examples of these are shown below, for Singapore Changi and for London Heathrow airports. Note that in both cases the aiming point marking is indicated on the chart as coincident with the PAPIs.

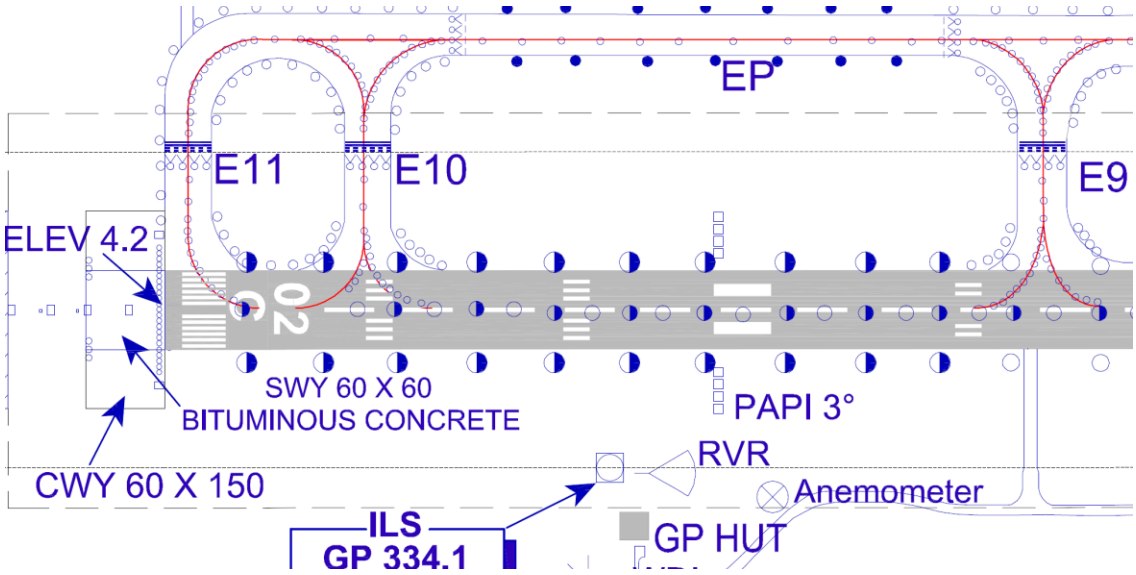
WSSS AD 2.14 APPROACH AND RUNWAY LIGHTING

RWY	APCH LGT Type, LEN, Intensity	THR LGT colour WBAR	PAPI (MEHT)	TDZ LGT LEN	RWY Centreline LGT, LEN, spacing, colour, INTST	RWY Edge LGT, LEN, spacing, colour, INTST	RWY End LGT colour	SWY LGT colour
1	2	3	4	5	6	7	8	9
02L	CAT II High Intensity approach lighting (900m) consisting of extended centreline and Red row barrettes, 2 crossbars, 2 approach beacons and sequenced flashing lights.	Green supplemented by Green wing-bar and 2 THR ident lights.	PAPI 003° located either side of RWY, 422m behind RWY THR. 2 White LGT and 2 Red LGT (20.0m), 3 White LGT and 1 Red LGT (24.0m), 4 White LGT (26.4m). ACFT with eye-to-wheel height greater than 8m are advised to fly with 2 White and 2 Red LGT visible so as to achieve sufficient wheel clearance.	White	Inset High Intensity centreline lights as follow: From THR to 900m from RWY end: White, 300m to 900m from RWY end: ALTN Red/ White, 300m to RWY end: Red.	Bi-directional raised White/Amber edge lights.	Red	Elevated Red

PAPI 3° (MEHT)*

Pilot's eye height over the threshold when the following PAPI lights come into view.	RUNWAY			
	02L	20R	02C	20C
2 White lights and 2 red lights	20.0m	20.0m	19.8m	19.8m
3 White lights and 1 red light	24.0m	22.6m	23.7m	23.7m
4 White lights	26.4m	25.0m	26.2m	26.2m

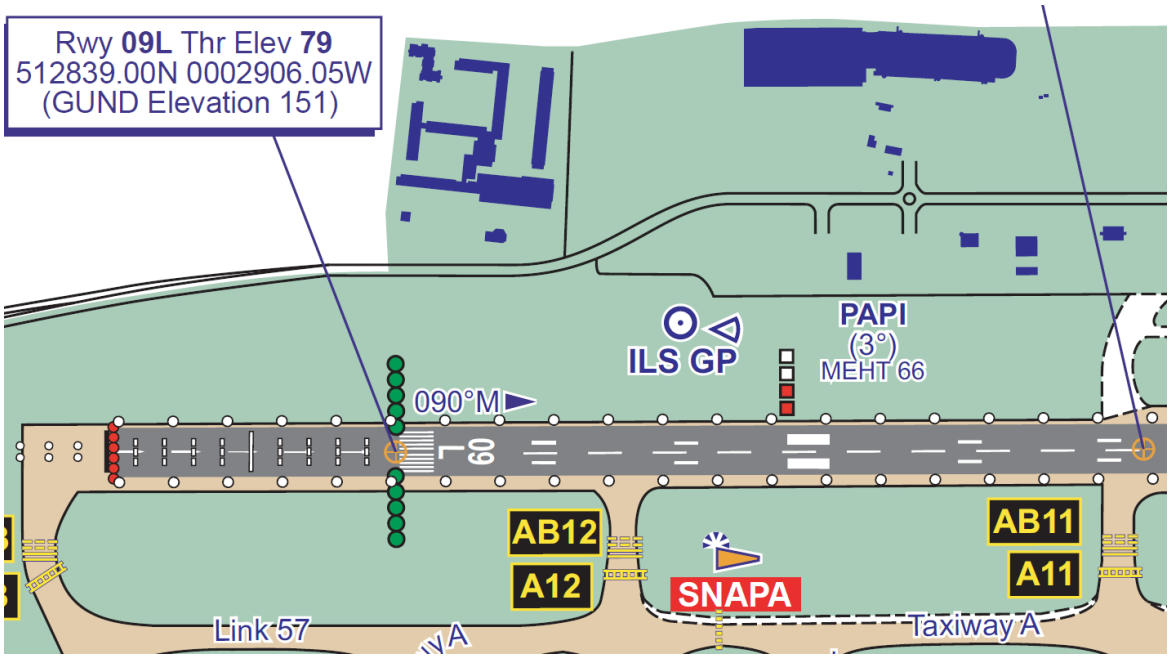
* MEHT . Minimum Eye Height Over the Threshold.
Note . Aircraft with eye-to-wheel height greater than 8 metres are advised to fly with 2 white lights and 2 red lights visible so as to achieve sufficient wheel clearance.



Singapore Changi International Airport, AIP AD2, dated 13 September 2018

EGLL AD 2.14 APPROACH AND RUNWAY LIGHTING

RWY	Approach lighting Type/ Length/ Intensity	Threshold lighting Colour/ Wing bars	VASIS/ MEHT/ PAPI	TDZ lighting Length	Runway Centre Line lighting Length/ Spacing/ Colour/ Intensity	Runway edge lighting Length/ Spacing/ Colour/ Intensity	Runway end lighting Colour/ Wing bars	Stopway lighting Length/ Colour	Remarks
1	2	3	4	5	6	7	8	9	10
09L	860 m Light intensity high.	HI Green with HI wingbars	PAPI/3° 66 ft	900 m	HI Bi-directional colour coded 15 m spacing 3901 m Length	HI Bi-directional 60 m spacing 3901 m Length White.	Red.		**Approach Lighting:** Coded centre-line with five crossbars Supplementary lighting inner 300 m **PAPI dist from THR:** 417 m Runway 09L: On full length departures, the first 300 m of edge lights are red due to displaced threshold



London Heathrow Airport, AIP AD2 Amendment 10/2018

Appendix A: Abbreviations

Word/abbreviation	Meaning	Reference
APAPI	abbreviated precision approach path indicator	ICAO Doc 8400

Word/abbreviation	Meaning	Reference
critical aeroplane	the type of aeroplane which is the most demanding for the relevant elements of the physical infrastructure and the facilities for which the aerodrome is intended Note: there might be more than one critical aeroplane for an aerodrome, e.g. B747 for PAPI, An124 for taxiway strips, A340-600 for stand length	ICAO Doc 9981
delethalisation	within the general area of the strip adjacent to the runway, measures should be taken to prevent an aeroplane's wheel, when sinking into the ground, from striking a hard vertical face. Special problems may arise for runway light fittings or other objects mounted in the strip or at the intersection with a taxiway or another runway. In the case of construction, such as runways or taxiways, where the surface must also be flush with the strip surface, a vertical face can be eliminated by chamfering from the top of the construction to not less than 30 cm below the strip surface level. Other objects, the functions of which do not require them to be at surface level, should be buried to a depth of not less than 30 cm	ICAO Annex 14, Vol 1, Att. A, 9.2
displaced threshold	a threshold not located at the extremity of a runway	ICAO Annex 14 Vol 1; 1.1
glide path	a descent profile determined for vertical guidance during a final approach	ICAO Annex 4
HAPI	helicopter approach path indicator	ICAO Annex 14 Vol 2

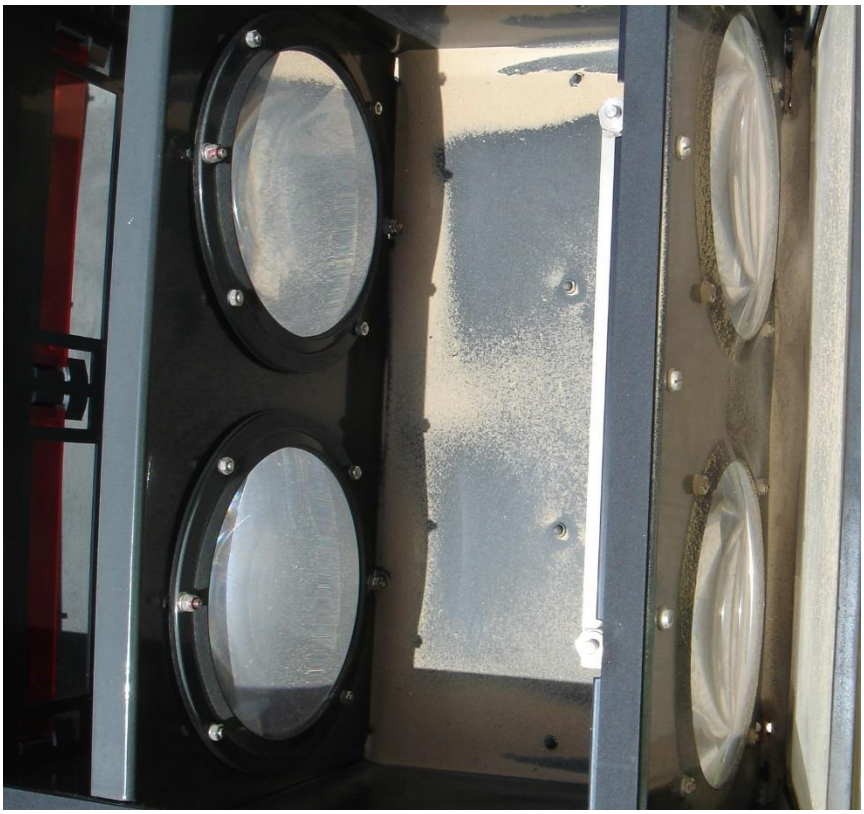
Word/abbreviation	Meaning	Reference
height	the vertical distance of a level, a point or an object considered as a point, measured from a specified datum	ICAO Doc 4444
LED	light emitting diode	ICAO Annex 6, Vol 1
MEHT	minimum eye height over threshold	ICAO Doc 8400
obstacle protection surface	a surface that defines the volume of airspace in front of the precision approach path indicators to be kept free of obstacles	ICAO Annex 14 Vol 1; 5.3.5.42-46
OPS	obstacle protection surface	ICAO Annex 14 Vol 1; 5.3.5.42
PAPI	precision approach path indicator	ICAO Doc 8400
performance-based navigation (PBN)	area navigation based on performance requirements for aircraft operating along an ATS route, on an instrument approach procedure or in a designated airspace.	ICAO Annex 3
RDH	reference datum height (of the ILS over the threshold)	ICAO Doc 8400
RTIL	runway threshold identification lights	ICAO Annex 14 Vol 1; 5.3.8
TDZ	touchdown zone	ICAO Doc 8400
threshold	the beginning of that portion of the runway usable for landing	ICAO Annex 14 Vol 1; 1.1

Word/abbreviation	Meaning	Reference
touchdown zone (TDZ)	the portion of a runway, beyond the threshold, where it is intended landing aeroplanes first contact the runway	ICAO Annex 14 Vol 1; 1.1

Appendix A: Illustrations and Diagrams

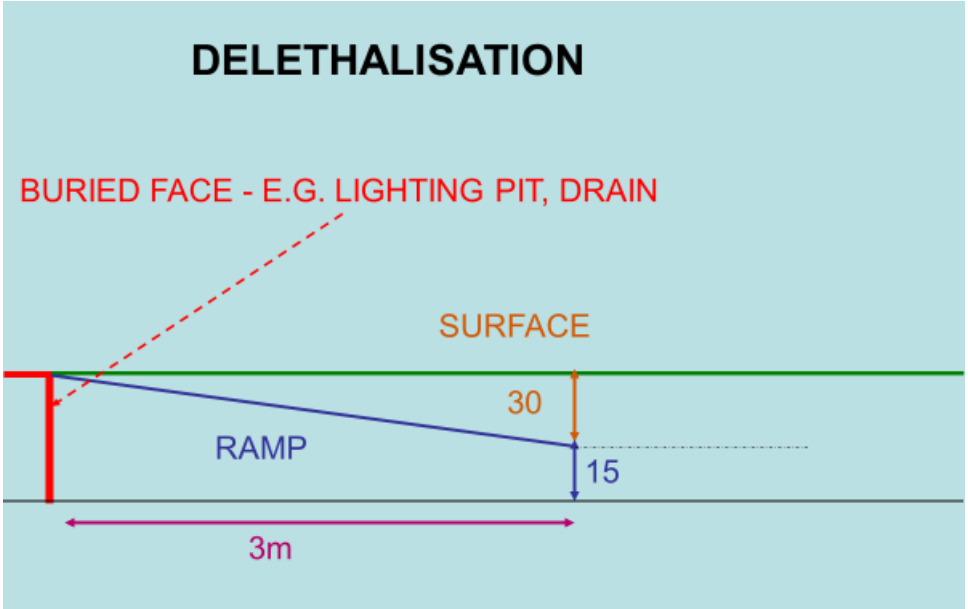
PAPI unit with lid removed, mounted on concrete plinth in graded sand and gravel having a CBR capable of supporting the aircraft that use the aerodrome, in this case B737-800.

PAPI as seen from low on the ground at night



PAPI unit with an unacceptable level of dirt inside

A similar unit that has been cleaned, with no loose dirt, just about to an acceptable standard. Note the reflectors showing signs of deterioration- scratching and oxidation.



delethalisation	within the general area of the strip adjacent to the runway, measures should be taken to prevent an aeroplane's wheel, when sinking into the ground, from striking a hard vertical face. Special problems may arise for runway light fittings or other objects mounted in the strip or at the intersection with a taxiway or another runway. In the case of construction, such as PAPI bases, a vertical face can be eliminated by chamfering from the top of the construction to not less than 30 cm below the strip surface level. Alternatively, the concrete plinth, when not required to be at surface level, can be buried to a depth of not less than 30 cm, and the frangible mounting poles extended through the surface to the units	ICAO Annex 14, Vol 1, Att. A, 9.2

PAPI Data Sheet & Calculation

PAPI SITING SUMMARY

AERODROME: **RUNWAY:**

APPROACH ANGLE:

Obstacle Protection Surface SUMMARY:

UNIT SETTINGS: (outer) **D:**
C:
B:
(inner)**A:**

MEHT ANGLE: Unit 2 less $0^0 02'$

THRESHOLD ELEVATION:

PAPI ELEVATION:

MINIMUM EYE HEIGHT OVER (displaced) THRESHOLD:

=

NOTE:

PAPI units are above/below* runway elevation

Threshold is above/below* runway touchdown/aiming point

Start of runway surface is ___ metres before displaced threshold and is above/below* threshold elevation

* delete as applicable

Reference angles:

Instrument Approach Procedure		No Instrument Approach Procedure		
Angle	**Tangent**	**Angle**	**Tangent**	
$3^0 35'$		$3^0 30'$		Unit D
$3^0 15'$		$3^0 10'$		Unit C
$3^0 00'$		$3^0 00'$		Glidepath angle
$2^0 45'$		$2^0 50'$		Unit B, min GP
$2^0 43'$		$2^0 48'$		Unit B less $2'$
$2^0 25'$		$2^0 30'$		Unit A
$1^0 27'$		$1^0 33'$		OPS

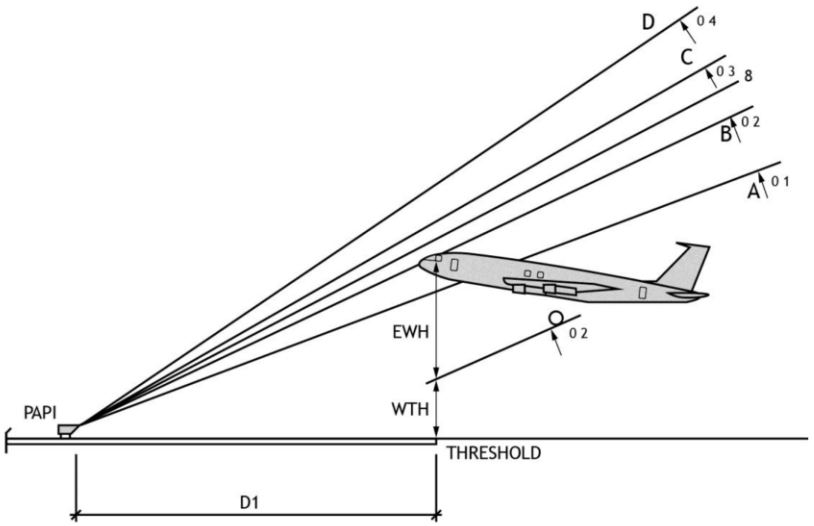
Basic Siting Calculation

Theoretical location of system

The theoretical location of the system can be calculated by following the procedure below:

Step	Action
1	Select the class of the aircraft (Appendix 6 of Aerodrome Design Manual Part 4) to determine the EWH (eye-to-wheel height)
2	Determine WTH (wheel-to-threshold height), according to the EWH selected (see previous page, columns 2 or 3)
3	Theoretical distance from threshold to PAPI is calculated from the formula: **D1 = (EWH + WTH). cotg (θ2 –2')** in which: • EWH is the eye-to-wheel height • WTH is the wheel-to-threshold height • θ2 is the setting angle of unit B in a PAPI (glide path angle minus 10 minutes) or is the setting angle of unit A in an APAPI (glide path angle minus 15 minutes)

Illustration



Wheel clearance above threshold sample database

(for 49ft MEHT, and 54.2ft RDH)

Aerodrome	**Sample**					
Runway	**Sample**					
	MEHT(ft) enter the MEHT in feet for the runway	RDH (ft) enter the RDH in feet for the ILS for the same runway	Wheel clearance above threshold when:			
	49	**54.2**	Aircraft is at MEHT	Aircraft is at RDH on ILS	PAPI Result: compliant?	ILS Result: compliant?
			Using eye to wheel path	Using ILS to wheel path		
Aircraft type and series	**Eye path to wheel path (ft)**	**ILS beam to wheel path (ft)**	(ft)	(ft)		
A300-B2, B4	32.0	22.9	17.0	31.3	NO	OK
A300B4-200*#	30.1	21.0	18.9	33.2	NO	OK
A300-600	32.6	23.4	16.4	30.8	NO	OK
A300-600R*#	30.5	21.3	18.5	32.9	NO	OK
A310-300	29.9	20.8	19.1	33.4	NO	OK
A310-300*#	31.3	22.2	17.7	32.0	NO	OK
A318-100*#	21.4	15.3	27.6	38.9	NO	OK
A319-100*#	21.8	15.7	27.2	38.5	NO	OK
A320	23.8	17.8	25.2	36.4	NO	OK
A320-200*#	22.5	16.4	26.5	37.8	NO	OK
A321-200*#	22.6	16.4	26.4	37.8	NO	OK
A330-200*#	34.9	25.8	14.1	28.4	NO	NO
A330-300*#	35.9	26.8	13.1	27.4	NO	NO
A340-200*#	35.2	26.1	13.8	28.1	NO	NO
A340-300*#	35.8	26.7	13.2	27.5	NO	NO
A340-500*#	35.9	20.6	13.1	33.6	NO	OK
A340-600*#	38.2	23.0	10.8	31.2	NO	OK
A350-900*#	35.2	26.6	13.8	27.6	NO	NO
A380-800*#	36.7	19.5	12.3	34.7	NO	OK
B707-320B Non-ADV	21.9	20.9	27.1	33.3	NO	OK
B717-200#	19.6	13.7	29.4	40.5	NO	OK
B727-200	23.2	22.4	25.8	31.8	NO	OK
B737-200	18.9	18.1	30.1	36.1	OK	OK
B737-200 ADV	20.5	19.9	28.5	34.3	NO	OK
B737-300#	18.5	17.7	30.5	36.5	OK	OK
B737-400#	19.1	18.3	29.9	35.9	OK	OK

B737-500#	18.0	17.2	31.0	37.0	OK	OK
B737-600#	18.6	17.8	30.4	36.4	OK	OK
B737-700#	19.2	18.4	29.8	35.8	OK	OK
B737-800#	19.1	18.2	29.9	36.0	OK	OK
B737-900#	18.7	17.7	30.3	36.5	OK	OK
B747-100/200 Wing gear	44.7	24.2	4.3	30.0	NO	OK
B747-100/200 Body gear	44.6	24.2	4.4	30.0	NO	OK
B747-300# Wing gear+	45.3	24.4	3.7	29.8	NO	OK
B747-400#	44.4	23.4	4.6	30.8	NO	OK
B757-200#	28.6	22.5	20.4	31.7	NO	OK
B757-300#	28.0	21.8	21.0	32.4	NO	OK
B767-200 B767-200ER	30.2	23.5	18.8	30.7	NO	OK
B767-300	30.7	24.0	18.3	30.2	NO	OK
B767-300ER#	29.9	23.1	19.1	31.1	NO	OK
B767-400ER#	32.0	25.2	17.0	29.0	NO	NO
B777-200#	35.5	22.6	13.5	31.6	NO	OK
B777-300#	37.2	24.3	11.8	29.9	NO	OK
DC-8-71#	24.7	18.1	24.3	36.1	NO	OK
DC-8-72#	23.1	16.5	25.9	37.7	NO	OK
DC-8-73#	23.2	16.5	25.8	37.7	NO	OK
DC-9-10#	17.4	11.5	31.6	42.7	OK	OK
DC-9-20#	20.1	14.7	28.9	39.5	NO	OK
DC-9-30#	21.7	16.3	27.3	37.9	NO	OK
DC-9-33#	20.9	15.3	28.1	38.9	NO	OK
DC-9-40#	21.6	16.0	27.4	38.2	NO	OK
DC-9-50#	23.1	17.7	25.9	36.5	NO	OK
DC-10-30#	37.5	17.2	11.5	37.0	NO	OK
DC-10-40#	38.8	18.3	10.2	35.9	NO	OK
Fokker 50	11.8	9.9	37.2	44.3	OK	OK
Fokker 100	19.1	16.4	29.9	37.8	OK	OK

IL-76TD	23.8	17.1	25.2	37.1	NO	OK
IL-76TF Pitch att 2.0 deg	24.7	18.0	24.3	36.2	NO	OK
IL-76TF Pitch att-2.0 deg	19.6	12.3	29.4	41.9	NO	OK
IL-86	29.2	22.8	19.8	31.4	NO	OK
IL-96-300	27.7	22.2	21.3	32.0	NO	OK
IL-96-400T	29.6	23.1	19.4	31.1	NO	OK
IL-114	14.4	8.5	34.6	45.7	OK	OK
MD-80/81/82 /83/88#	25.6	20.1	23.4	34.1	NO	OK
MD-87#	24.2	18.7	24.8	35.5	NO	OK
MD-90#	25.4	19.8	23.6	34.4	NO	OK
MD-11#	38.0	17.9	11.0	36.3	NO	OK
NOTES:	*manufacturer's data					
	# V_{REF}+5kts used					
	All others: source ICAO Doc 9157 Pt4, at max pitch attitude at V_{REF}					
	+ Wing gear is lowest part of aeroplane until pitch attitude exceeds 8 degrees					

--- END ---

6.4 Appendix D - Personal Protective Equipment

All Aerodrome Inspector will wear appropriate personal protective equipment (PPE) whilst they are airside or in other hazardous areas. This is not just for their own personal protection, but also to set an appropriate example to the auditee.

Airside PPE

Airside PPE includes:

A. Hi visibility clothing, vest, and, if required trousers
B. Waterproof clothing, hi-visibility or hi-visibility outer garment
C. ID card worn on the outside of the hi-visibility clothing, preferably in a see-through pocket
D. If an ID lanyard is worn it must be of the break-away type in case it is caught in moving machinery
E. Safety shoes, preferably with no steel content but with composite protective sole inserts and toe-caps
F. Hearing protection
G. Eye protection
H. Skin protection if required, either clothing or sunscreen
I. Eye protection appropriate to the risk, ranging from sunglasses, through safety glasses to goggles.
J. Sun and/or rain hat secured but with break away straps

Construction site PPE

Construction site PPE include, in addition to that listed above:

A. Hard hat
B. Protective gloves
C. Protective jacket, hi-visibility on the outside.

6.5 Appendix E - Assessment of Aeronautical Studies

Introduction

A. PURPOSE: An aeronautical study is conducted to assess the impact of deviations from the aerodrome standards specified in Volume I to Annex 14 to the Convention on International Civil Aviation, and the national regulations / requirements, to

1) present alternative means of ensuring the safety of aircraft operations,
2) to estimate the effectiveness of each alternative and
3) to recommend procedures to compensate for the deviation.

B. APPLICABILITY: An aeronautical study may be carried out when aerodrome standards cannot be met as a result of development. Such a study is most frequently undertaken during the planning of a new airport or during the certification of an existing aerodrome. Aeronautical studies may not be conducted in cases of deviations from the standards, if not specifically recommended in Annex 14, Volume I, except that in Thailand the CAAT authorises the use of aeronautical studies for reduced RESA length or width, but not for the absence of any RESA

C. TECHNICAL ANALYSIS: Technical analysis will provide justification for a deviation on the grounds that an equivalent level of safety can be attained by other means. It is generally applicable in situations where the cost of correcting a problem that violates a standard is excessive but where the unsafe effects of the problem can be overcome by some procedural means which offers both practical and reasonable solutions. In conducting a technical analysis, inspectors will draw upon their practical experience and specialized knowledge. They may also consult other specialists in relevant areas. When considering alternative procedures in the deviation approval process, it is essential to bear in mind the safety objective of the aerodrome certification regulations and the applicable standards so that the intent of the regulations is not circumvented.

D. APPROVAL OF DEVIATIONS: In some instances, the only reasonable means of providing an equivalent level of safety is to adopt suitable procedures and to require, as a condition of certification, that cautionary advice be published in the appropriate AIS publications, usually the AIP AD2 entry for the aerodrome

concerned. The determination to require caution will be primarily dependent on two considerations:

1) a pilot's need to be made aware of potentially hazardous conditions; and
2) the responsibility of the CAA to publish deviations from standards that would otherwise be assumed under certificate status

E. Before the CAAT decides to exempt the aerodrome operator, the CAA must take into account all safety related aspects, but it remains the aerodrome operator's responsibility to undertake the relevant analyses and studies.

F. Each study is specific to a particular deviation or change; hence, caution should be exercised in considering applicability to other situations and locations (Doc 9981)

G. If the outcome of the CAAT's assessment of an aeronautical study is to permit a deviation from a Requirement of the CAAT an endorsement concerning such deviation must be noted on the aerodrome certificate, and may need to be published in the AD2 section of the AIP under the relevant aerodrome name.

H. A list of definitions and abbreviations is contained in Appendix A.

Applicability – when can an aeronautical study be used

A. ICAO Doc 9774, Aerodrome Certification Manual, Appendix 3, clearly states that "Aeronautical studies may not be conducted in cases of deviations from the standards, if not specifically recommended in Annex 14, Volume I."

B. In addition, due to the layout existing in Thai aerodromes when runway end safety areas were introduced into Annex 14, CAAT permits and aeronautical study for the assessment of non-compliances where a runway end safety area's dimensions do not meet the Requirements., provided that the runway and its strip are otherwise fully compliant with the Requirements of CAAT Aerodromes. Note that a RESA is required for both aircraft undershooting and overrunning.

C. Therefore, an aeronautical study may only be used by an aerodrome operator to address non-compliances within the aerodrome standards summarised below. This list is in more detail in Appendix A.

1) Dimensions of a runway end safety area
2) Width of a radio altimeter operating area

3) The separation distance between the centre line of a taxiway and the centre line of a runway, the centre line of a parallel taxiway or an object
4) Anything which may endanger aeroplanes on the movement area or in the air within the limits of the inner horizontal and conical surfaces
5) Permitting new objects or extensions of existing objects above the conical surface or inner horizontal surface, or approach surface beyond 3,000 m from the inner edge, the conical surface or inner horizontal surface
6) Permitting existing objects above an approach surface, a transitional surface, a take-off climb surface, the conical surface and inner horizontal surface or above any of the surfaces required by Annex 14 Vol 1, 4.2.7
7) Objects which extend to a height of 150 m or more above ground elevation
8) Marking and lighting of a fixed obstacle that extends above a take-off climb or an approach surface within 3 000 m of the surface's inner edge or above a transitional surface, or above a horizontal surface, or other objects that could constitute a hazard to aircraft
9) Marking and lighting of overhead wires, cables, etc., crossing a river, waterway, valley or highway and their supporting towers, and other objects outside the obstacle limitation surfaces
10) Extended beam spread of medium and high-intensity obstacle lights
11) Use of high-intensity obstacle lights
12) Marking and lighting of wind turbine rotor blades, nacelle and supporting mast
13) The wheel clearances above threshold
14) The azimuth spread of the PAPI/APAPI light beam
15) Removal of, or actions for objects above a PAPI/APAPI obstacle protection surface
16) Not providing a location sign in conjunction with a direction sign

D. Additionally, aerodrome operators should make arrangements with local authorities and organisations, including military and other State entities, to enable the appropriate authority to be consulted concerning proposed construction beyond the limits of the obstacle limitation surfaces that extend above a 150m, in order to permit an aeronautical study of the effect of such

construction on the operation of aeroplanes.

E. Aeronautical studies are NOT used for the non-compliance of Rescue and fire-fighting response times

F. Compliance studies and risk assessments are referred to in ## below.

Aerodrome Responsibilities

A. The aerodrome operator is responsible for ensuring that all elements of the certification requirements are met. Where the aerodrome operator does not undertake that responsibility themselves, then a contract or memorandum of understanding or letter of agreement must be in place to clearly identify who carries out such delegated responsibilities.

Example: separation distance between the centre lines of a taxiway and runway

The State Letter AN 4/1.1.57-17/44 dated 19 April 2017 for the amendment of Annex 14 Vol 1 in 2018 provides a good example of the assessment of risks associated with reduced separation distances. A small element of that State Letter is reproduced here:

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

BACKGROUND INFORMATION

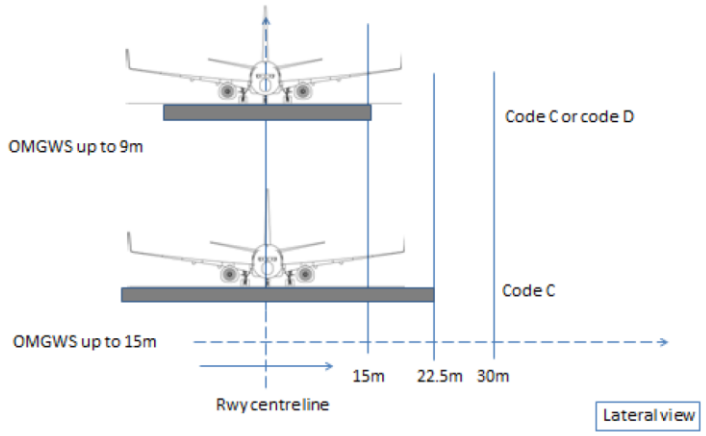
As part of the Annex 14 — *Aerodromes*, Volume I — *Aerodrome Design and Operations, Chapter 3 review, the aerodrome design specifications were extensively discussed within the Aerodrome Design and Operations Panel (ADOP). In general, the ADOP had considered that the existing specifications were derived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

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

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

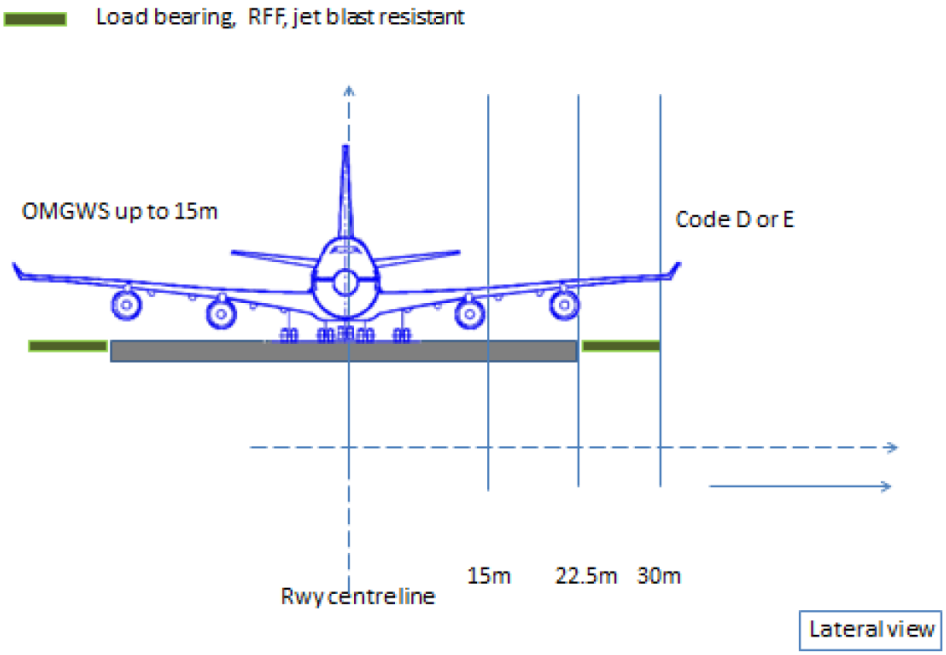
1.1 The following diagrams show the different runway and shoulders for OMGWS above 6m and up to 15m (covering nearly all commercial aeroplanes, Codes C, D, E and F)

Rwy widths/shoulders (Code C and D)

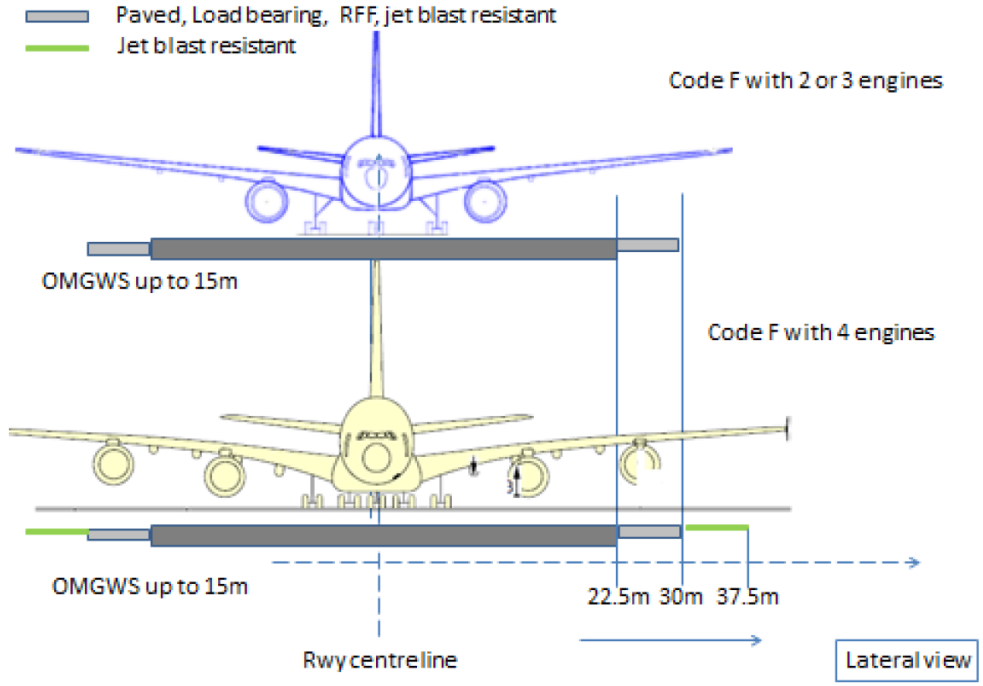


Attachment A A-2

Rwy widths/shoulders (Code D and E)



Rwy widths/shoulders (Code F)



Use of Safety Studies

A. Safety studies by other organisations can help to generate a wider picture of the risks involved. The inspector must always ensure that any such studies are from authoritative sources, such as:

1) Eurocontrol's Skybary, but not Wikipedia,
2) ICAO,
3) Eurocontrol,
4) EASA,
5) FAA,
6) CASA etc

B. Some specific examples are:

1) European Action Plan for the Prevention of Runway Excursions, Edition 1.0, January 2013
2) Federal Aviation Administration AC 91-79A Mitigating the Risks of a Runway Overrun Upon Landing, April 2016
3) Flight Safety Foundation
    i) Reducing the Risk of Runway Excursions - Report of the Runway Safety Initiative
    ii) Runway Excursion Risk Assessment Tool
    iii) Runway Overrun After Unstabilised Approach (OGHFA SE)
    iv) Runway Overrun On Landing (OGHFA SE)
    v) Runway Excursion (OGHFA SE)
4) Eurocontrol HindSight Articles
    i) HindSight 1 Runway Excursion Southwest Airlines;
    ii) HindSight 2 Runway Excursion - Did we do everything we could?
    iii) HindSight 12, published in December 2010 focused on the issue of Runway Excursions and has a large number of articles on the subject.
5) Airbus Safety Library
    i) Airbus Landing Techniques Briefing Note - Bounce Recovery - Rejected Landing;
    ii) Lateral Runway Excursions upon Landing, M. Mayolle, S. Pellet

& X. Lesceu, Safety First #20, July 2015

6) Netherlands National Aerospace Laboratory (NLR)

i) "Running out of runway" Analysis of 35 years of landing overrun accidents; 2005

ii) Hydroplaning of modern aircraft tires; 1999

iii) Safety Aspects of tailwind operations ; 2001

iv) A study of Runway excursions from a European Perspective; May 2010

Risk Assessments

A. Risk assessments form part of the day to day safety management system of the aerodrome operator, especially the management of change.

B. An aeronautical study will include a risk assessment, but not vice versa.

Compatibility Studies

A. ICAO Doc 9981, PANS Aerodrome includes compatibility studies, see Doc 9981 Part I Ch 4

B. One example is in 4.1.6 of Doc 9981: Compatibility studies related to taxiway width and potential deviations can include:

1) the use of taxiway deviation statistics to calculate the taxiway excursion probability of an aeroplane depending on taxiway width. The impact of taxiway guidance systems and meteorological and surface conditions on taxiway excursion probability should be assessed whenever possible;

2) view of the taxiway from the cockpit, taking into account the visual reference cockpit cut-off angle and pilot eye height; and

3) the aeroplane outer main gear wheel span.

C. Compatibility studies may form an element of an aeronautical study.

Bibliography

New Larger Aeroplanes — Infringement of the Obstacle Free Zone: Operational Measures and Aeronautical Study (Cir 301)

New Larger Aeroplanes – Infringement of the Obstacle Free Zone: Collision Risk Model and Aeronautical Study (Cir 345)

ICAO Doc 9981 PANS Aerodrome

ICAO Doc 9859 Safety Management Manual

ICAO Doc 9774 Manual on Certification of Aerodromes

Appendix A: Aeronautical Study Definitions

Definitions

Word/abbreviation	Meaning	Reference
aeronautical study	a study of an aeronautical problem to identify possible solutions and select a solution that is acceptable without degrading safety	ICAO Doc 9774 App 3
applicable regulation	regulations applicable to the aerodrome and to the aerodrome operator that are transposed from international specifications and other relevant regulations	ICAO Doc 9981
assessment	an appraisal of procedures or operations based largely on experience and professional judgement	ICAO Doc 9735, 1.3
certified aerodrome	an aerodrome whose operator has been granted an aerodrome certificate	ICAO Annex 14 Vol 1; 1.1
change management	a formal process to manage changes within an organization in a systematic manner, so that changes which may impact identified hazards and risk mitigation strategies are accounted for, before the implementation of such changes	ICAO Doc 9859
compatibility study.	a study undertaken by the aerodrome operator to address the impact of introducing an aeroplane type/model new to the aerodrome. A compatibility study may include one or several safety assessments	Doc 9981 Pt 1 Ch 1

Word/abbreviation	Meaning	Reference
confidence level	the probability that the true value of a parameter is within a certain interval around the estimate of its value. *Note.— The interval is usually referred to as the accuracy of the estimate*	ICAO Annex 15, 1.1
critical aeroplane	the type of aeroplane which is the most demanding for the relevant elements of the physical infrastructure and the facilities for which the aerodrome is intended *Note: there might be more than one critical aeroplane for an aerodrome, e.g. B747 for PAPI, An124 for taxiway strips, A340-600 for stand length*	ICAO Doc 9981
errors (safety context)	an action or inaction by an operational person that leads to deviations from organisational or the operational person's intentions or expectations	ICAO Doc 9859
high-consequence indicators	safety performance indicators pertaining to the monitoring and measurement of high-consequence occurrences, such as accidents or serious incidents. High-consequence indicators are sometimes referred to as reactive indicators	ICAO Doc 9859
HIRA	hazard identification and risk assessment	ICAO Doc 9859
HIRM	hazard identification and risk mitigation	ICAO Doc 9859

Word/abbreviation	Meaning	Reference
industry codes of practice	guidance material developed by an industry body, for a particular sector of the aviation industry to comply with the requirements of the International Civil Aviation Organization's Standards and Recommended Practices, other aviation safety requirements and the best practices deemed appropriate	ICAO Annex 19
lower-consequence indicators	safety performance indicators pertaining to the monitoring and measurement of lower-consequence occurrences, events or activities such as incidents, non-conformance findings or deviations. Lower-consequence indicators are sometimes referred to as proactive/predictive indicators	ICAO Doc 9859
obstacle	in relation to an aerodrome, means all fixed (whether temporary or permanent) and mobile objects, or parts thereof, that are located on an area intended for the surface movement of aircraft or that extend above a defined surface intended to protect aircraft in flight, or stand outside those defined surfaces and that have been assessed as being a hazard to air navigation	ICAO Annex 14 Vol 1; 1.1 EC 139/2014 Art 2
obstacle limitation surfaces	a series of surfaces that define the volume of airspace at and around an aerodrome to be kept free of obstacles in order to permit the intended aeroplane operations to be conducted safely and to prevent the aerodrome from becoming unusable by the growth of obstacles around the aerodrome	ICAO Doc 9774

Word/abbreviation	Meaning	Reference
obstacle protection surface	a surface that defines the volume of airspace in front of the precision approach path indicators to be kept free of obstacles	ICAO Annex 14 Vol 1; 5.3.5.42-46
procedure	a series of steps followed in a methodical manner to complete an activity or a process, describing what should be done, when and by whom; where and how each step should be carried out; what information, documentation and resources should be used; and how it should all be controlled	ICAO Doc 9735, 1.3
process	a set of interrelated or interacting activities that transforms inputs into outputs. Processes within an organization or programme are generally planned and carried out under controlled conditions to add value.	ICAO Doc 9735, 1.3
promulgation	the act of formally notifying official information to the aviation community	ICAO Doc 9981
reactive indicators	safety performance indicators pertaining to the monitoring and measurement of high-consequence occurrences, such as accidents or serious incidents. Also referred to as high-consequence indicators	ICAO Doc 9859
recommended practice	Any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as desirable in the interest of safety, regularity or efficiency of international air navigation, and to which each contracting State undertakes to adopt, so far as it may find practicable.	ICAO Annex 14 Vol 1 Foreword & Convention Art 28

Word/abbreviation	Meaning	Reference
requirement	need or expectation that is stated, generally implied or obligatory (ISO 9000*)	ICAO Annex 15, 1.1
safety	the state in which risks associated with aviation activities, related to, or in direct support of the operation of aircraft, are reduced and controlled to an acceptable level	ICAO Annex 19
safety assessment	an element of the risk management process of an SMS that is used to assess safety concerns arising from, inter alia, deviations from standards and applicable regulations, identified changes at an aerodrome or when any other safety concerns arise	ICAO Doc 9981
safety data	a defined set of facts or set of safety values collected from various aviation-related sources, which is used to maintain or improve safety	ICAO Annex 19, Ch. 1
safety information	safety data processed, organized or analysed in a given context so as to make it useful for safety management purposes	ICAO Annex 19 Ch.1
safety management system (SMS)	systematic approach to managing safety, including the necessary organizational structures, accountability, responsibilities, policies and procedures	ICAO Annex 19; Ch. 1 EC 139/2014 Ann I
safety performance	a State's or service provider´s safety achievement as defined by its safety performance targets and safety performance indicators	ICAO Annex 19

Word/abbreviation	Meaning	Reference
safety performance indicator	a data-based safety parameter used for monitoring and assessing safety performance	ICAO Annex 19
safety performance target	the State or service provider's planned or intended target for a safety performance indicator over a given period that aligns with the safety objectives	ICAO Annex 19
safety risk	the predicted probability and severity of the consequences or outcomes of a hazard	ICAO Annex 19
SARPs	standards and recommended practices	ICAO Annex 19
standard (noun)	any specification for physical characteristics, configuration, matériel, performance, personnel or procedure, the uniform application of which is recognized as necessary for the safety or regularity of international air navigation and to which Contracting States will conform in accordance with the Convention; in the event of impossibility of compliance, notification to the Council is compulsory under Article 38.	ICAO Annex 14 Vol 1; foreword
unserviceable area	a part of the movement area that is unfit and unavailable for use by aircraft	ICAO Doc 9774
usability	the percentage of occasions on which the crosswind component is below a specified value. The usability may be determined for any combination of take-off and landing directions available at an aerodrome.	ICAO Annex 14 Vol 1

Word/abbreviation	Meaning	Reference
usability factor	the percentage of time during which the use of a runway or system of runways is not restricted because of the cross-wind component	ICAO Annex 14 Vol 1; 1.1
validation	confirmation, through the provision of objective evidence, that the requirements for a specific intended use or application have been fulfilled (ISO 9000*	ICAO Annex 15, 1.1
verification	confirmation, through the provision of objective evidence, that specified requirements have been fulfilled (ISO 9000*)	ICAO Annex 15, 1.1

Appendix A: Aeronautical Study Applicability

ICAO Annex 14 Volume 1: SARPS to which an aeronautical study may be applied or considered

Note: *Recommendation* is included only as a background indicator to the inspector, it is not relevant to the assessment of risk. Rather, the aeronautical study assess the risk against the acceptable level of safety and the requirements of the State.

3.5	Provision, dimensions and characteristics of runway end safety areas: 3.5.1 A runway end safety area shall be provided at each end of a runway strip where: — the code number is 3 or 4; and — the code number is 1 or 2 and the runway is an instrument one. 3.5.2 Recommendation.— A runway end safety area should be provided at each end of a runway strip where the code number is 1 or 2 and the runway is a non-instrument one.
3.8.3, & ATT A 4.3	Recommendation.— A radio altimeter operating area should extend laterally, on each side of the extended centre line of the runway, to a distance of 60 m, except that, when special circumstances so warrant, the distance may be reduced to no less than 30 m if an aeronautical study indicates that such reduction would not affect the safety of operations of aircraft.
3.9.7 & Doc 9157, Pt 2	Recommendation.— The separation distance between the centre line of a taxiway and the centre line of a runway, the centre line of a parallel taxiway or an object should not be less than the appropriate dimension specified in Table 3-1, except that it may be permissible to operate with lower separation distances at an existing aerodrome if an aeronautical study indicates that such lower separation distances would not adversely affect the safety or significantly affect the regularity of operations of aeroplanes.

4.2.4	Recommendation.— New objects or extensions of existing objects should not be permitted above the conical surface or inner horizontal surface except when, in the opinion of the appropriate authority, the object would be shielded by an existing immovable object, or after aeronautical study it is determined that the object would not adversely affect the safety or significantly affect the regularity of operations of aeroplanes.
4.2.11	Recommendation.— New objects or extensions of existing objects should not be permitted above the approach surface beyond 3 000 m from the inner edge, the conical surface or inner horizontal surface except when, in the opinion of the appropriate authority, the object would be shielded by an existing immovable object, or after aeronautical study it is determined that the object would not adversely affect the safety or significantly affect the regularity of operations of aeroplanes.
4.2.12	Recommendation.— Existing objects above any of the surfaces required by 4.2.7 should as far as practicable be removed except when, in the opinion of the appropriate authority, the object is shielded by an existing immovable object, or after aeronautical study it is determined that the object would not adversely affect the safety or significantly affect the regularity of operations of aeroplanes.
4.2.20	Recommendation.— New objects or extensions of existing objects should not be permitted above the conical surface and the inner horizontal surface except when, in the opinion of the appropriate authority, an object would be shielded by an existing immovable object, or after aeronautical study it is determined that the object would not adversely affect the safety or significantly affect the regularity of operations of aeroplanes.

4.2.21	Recommendation.— Existing objects above an approach surface, a transitional surface, the conical surface and inner horizontal surface should as far as practicable be removed except when, in the opinion of the appropriate authority, an object is shielded by an existing immovable object, or after aeronautical study it is determined that the object would not adversely affect the safety or significantly affect the regularity of operations of aeroplanes.
4.2.27	Recommendation.— Existing objects that extend above a take-off climb surface should as far as practicable be removed except when, in the opinion of the appropriate authority, an object is shielded by an existing immovable object, or after aeronautical study it is determined that the object would not adversely affect the safety or significantly affect the regularity of operations of aeroplanes.
4.3.1	Recommendation.— Arrangements should be made to enable the appropriate authority to be consulted concerning proposed construction beyond the limits of the obstacle limitation surfaces that extend above a height established by that authority, in order to permit an aeronautical study of the effect of such construction on the operation of aeroplanes.
4.3.2	Recommendation.— In areas beyond the limits of the obstacle limitation surfaces, at least those objects which extend to a height of 150 m or more above ground elevation should be regarded as obstacles, unless a special aeronautical study indicates that they do not constitute a hazard to aeroplanes. Note.— This study may have regard to the nature of operations concerned and may distinguish between day and night operations.
4.4.2	Recommendation.— Anything which may, in the opinion of the appropriate authority after aeronautical study, endanger aeroplanes on the movement area or in the air within the limits of the inner horizontal and conical surfaces should be regarded as an obstacle and should be removed in so far as practicable.

Table 5-2(c)	The wheel clearances [over threshold] in column (2) may be reduced to no less than those in column (3) where an aeronautical study indicates that such reduced wheel clearances are acceptable.
5.3.5.40	The azimuth spread of the light beam shall be suitably restricted where an object located outside the obstacle protection surface of the PAPI or APAPI system, but within the lateral limits of its light beam, is found to extend above the plane of the obstacle protection surface and an aeronautical study indicates that the object could adversely affect the safety of operations. The extent of the restriction shall be such that the object remains outside the confines of the light beam.
5.3.5.45	Existing objects above an obstacle protection surface shall be removed except when, in the opinion of the appropriate authority, the object is shielded by an existing immovable object, or after aeronautical study it is determined that the object would not adversely affect the safety of operations of aeroplanes.
5.3.5.46	Where an aeronautical study indicates that an existing object extending above an obstacle protection surface (OPS) could adversely affect the safety of operations of aeroplanes, one or more of the following measures shall be taken: a) remove the object; b) suitably raise the approach slope of the system; c) reduce the azimuth spread of the system so that the object is outside the confines of the beam; d) displace the axis of the system and its associated obstacle protection surface by no more than 5°; and e) suitably displace the system upwind of the threshold such that the object no longer penetrates the OPS. Note 1.— Guidance on this issue is contained in the Aerodrome Design Manual (Doc 9157), Part 4. Note 2.— The displacement of the system upwind of the threshold reduces the operational landing distance.

5.4.3.11	A location sign shall be provided in conjunction with a direction sign, except that it may be omitted where an aeronautical study indicates that it is not needed.
6.1.1.4	A fixed obstacle that extends above a take-off climb surface within 3 000 m of the inner edge of the take-off climb surface should be marked and, if the runway is used at night, lighted, except that: a) such marking and lighting may be omitted when the obstacle is shielded by another fixed obstacle; b) the marking may be omitted when the obstacle is lighted by medium-intensity obstacle lights, Type A, by day and its height above the level of the surrounding ground does not exceed 150 m; c) the marking may be omitted when the obstacle is lighted by high-intensity obstacle lights by day; and d) the lighting may be omitted where the obstacle is a lighthouse and an aeronautical study indicates the lighthouse light to be sufficient.
6.1.1.6	A fixed obstacle that extends above an approach surface within 3 000 m of the inner edge or above a transitional surface shall be marked and, if the runway is used at night, lighted, except that: a) such marking and lighting may be omitted when the obstacle is shielded by another fixed obstacle; b) the marking may be omitted when the obstacle is lighted by medium-intensity obstacle lights, Type A, by day and its height above the level of the surrounding ground does not exceed 150 m; c) the marking may be omitted when the obstacle is lighted by high-intensity obstacle lights by day; and d) the lighting may be omitted where the obstacle is a lighthouse and an aeronautical study indicates the lighthouse light to be sufficient.

6.1.1.7	Recommendation.— A fixed obstacle that extends above a horizontal surface should be marked and, if the aerodrome is used at night, lighted, except that: *a)* such marking and lighting may be omitted when: *1)* the obstacle is shielded by another fixed obstacle; or *2)* for a circuit extensively obstructed by immovable objects or terrain, procedures have been established to ensure safe vertical clearance below prescribed flight paths; or *3)* an aeronautical study shows the obstacle not to be of operational significance; *b)* the marking may be omitted when the obstacle is lighted by medium-intensity obstacle lights, Type A, by day and its height above the level of the surrounding ground does not exceed 150 m; *c)* the marking may be omitted when the obstacle is lighted by high-intensity obstacle lights by day; and *d)* the lighting may be omitted where the obstacle is a lighthouse and an aeronautical study indicates the lighthouse light to be sufficient.
6.1.1.9	Recommendation.— Other objects inside the obstacle limitation surfaces should be marked and/or lighted if an aeronautical study indicates that the object could constitute a hazard to aircraft (this includes objects adjacent to visual routes e.g. waterway or highway). Note.— See note accompanying 4.4.2.
6.1.1.10	Recommendation.— Overhead wires, cables, etc., crossing a river, waterway, valley or highway should be marked and their supporting towers marked and lighted if an aeronautical study indicates that the wires or cables could constitute a hazard to aircraft.
6.1.2.2	Recommendation.— Other objects outside the obstacle limitation surfaces should be marked and/or lighted if an aeronautical study indicates that the object could constitute a hazard to aircraft (this includes objects adjacent to visual routes e.g. waterway, highway).
6.1.2.3	Recommendation.— Overhead wires, cables, etc., crossing a river, waterway, valley or highway should be marked and their supporting towers marked and lighted if an aeronautical study indicates that the wires or cables could constitute a hazard to aircraft.

Table 6-3 Note	Light distribution for medium- and high-intensity obstacle lights according to benchmark intensities of Table 6-1 Note.— An extended beam spread may be necessary under specific configuration and justified by an aeronautical study.
6.2.3.38	Recommendation.— High-intensity obstacle lights, Type A, should be used to indicate the presence of an object if its height above the level of the surrounding ground exceeds 150 m and an aeronautical study indicates such lights to be essential for the recognition of the object by day.
6.2.4.2	Recommendation.— The rotor blades, nacelle and upper 2/3 of the supporting mast of wind turbines should be painted white, unless otherwise indicated by an aeronautical study.

6.2.4.3	Recommendation.— When lighting is deemed necessary, in the case of a wind farm, i.e. a group of two or more wind turbines, the wind farm should be regarded as an extensive object and the lights should be installed: a) to identify the perimeter of the wind farm; b) respecting the maximum spacing, in accordance with 6.2.3.15, between the lights along the perimeter, unless a dedicated assessment shows that a greater spacing can be used; c) so that, where flashing lights are used, they flash simultaneously throughout the wind farm; d) so that, within a wind farm, any wind turbines of significantly higher elevation are also identified wherever they are located; and e) at locations prescribed in a), b) and d), respecting the following criteria: i) for wind turbines of less than 150 m in overall height (hub height plus vertical blade height), medium-intensity lighting on the nacelle should be provided; ii) for wind turbines from 150 m to 315 m in overall height, in addition to the medium-intensity light installed on the nacelle, a second light serving as an alternate should be provided in case of failure of the operating light. The lights should be installed to assure that the output of either light is not blocked by the other; and iii) in addition, for wind turbines from 150 m to 315 m in overall height, an intermediate level at half the nacelle height of at least three low-intensity Type E lights, as specified in 6.2.1.3, should be provided. If an aeronautical study shows that low-intensity Type E lights are not suitable, low-intensity Type A or B lights may be used. Note.— The above 6.2.4.3 e) does not address wind turbines of more than 315 m of overall height. For such wind turbines, additional marking and lighting may be required as determined by an aeronautical study.
6.2.4.5	Recommendation.— Where lighting is deemed necessary for a single wind turbine or short line of wind turbines, the installation should be in accordance with 6.2.4.3 e) or as determined by an aeronautical study.

6.2.5.8	Recommendation.— High-intensity obstacle lights, Type B, should be used to indicate the presence of a tower supporting overhead wires, cables, etc., where: a) an aeronautical study indicates such lights to be essential for the recognition of the presence of wires, cables, etc.; or b) it has not been found practicable to install markers on the wires, cables, etc.

6.6 Appendix F - Scope and depth of aerodromes

The result of scope and depth of aerodromes as below *(last update 31 October 2019)*

Complexity of aerodrome

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	-10
Aerodrome	Operator	Number of movement 1 = < 10,000 2 = 10,001-50,000 3 = 50,001-150,000 4 = 150,001-250,000 5 = >250,000	Passenger Number 1 = < 10,000 2 = 10,001-100,000 3 = 100,001-1,000,000 4 = 1,000,001-10,000,000 5 = >10,000,000	Runway Code 1 = 1 2 = 2 3 = 3 4 = 4	RFF Cate 1 = 1&2 2 = 3&4 3 = 5&6 4 = 7&8 5 = 9&10	Largest Aircraft (Coded) 1 = B 2 = C 3 = D 4 = E 5 = F	Complexity Rating Sumarry of (3) to (7)	Score (/10)	Rank
Phuket International Airport (VTSP)	AOT/INTL	3	4	4	5	4	16	1.6	3
Hat Yai International Airport (VTSS)	AOT/INTL	2	4	4	5	4	15	1.5	2
Chiang Mai International Airport (VTCC)	AOT/INTL	3	4	4	5	4	16	1.6	3
Mae Fah Luang Chiang Rai International Airport (VTCT)	AOT/INTL	2	4	4	5	4	15	1.5	2
Suvanabhumi International Airport (VTBS)	AOT/INTL	5	5	4	5	5	19	1.9	1
Don Mueang International Airport (VTBD)	AOT/INTL	5	5	4	5	4	19	1.9	1

The time since last audit

Aerodrome	Operator	Last audit date	Calculation date	Time (days)	Score (/100)	Rank
Phuket International Airport (VTSP)	AOT/INTL	11/8/2017	10/1/2019	517	5.17	4
Hat Yai International Airport (VTSS)	AOT/INTL	19/5/2017	10/1/2019	601	6.01	1
Chiang Mai International Airport (VTCC)	AOT/INTL	27/7/2017	10/1/2019	532	5.32	3
Mae Fah Luang Chiang Rai International Airport (VTCT)	AOT/INTL	23/6/2017	10/1/2019	566	5.66	2
Suvanabhumi International Airport (VTBS)	AOT/INTL	3/11/2017	10/1/2019	433	4.33	6
Don Mueang International Airport (VTBD)	AOT/INTL	22/9/2017	10/1/2019	475	4.75	5

The compliance and safety record

Aerodrome	Operator	Remaining finding since last audit					Occurrence report					finding score (/10)	report score	Total	Rank
		PHC	VAN	AOI	SMS	ERF	Bird strike (/100)	RAMP (Groundling) (/10)	ADRM (Aerodrome Falcilities)	GCOL (Ground collision) (/10)	RI (Runway Incursion)				
Phuket International Airport (VTSP)	AOT/INTL	0	0	1	1	1	1.14	0.6	0	0.3	2	0.3	4.04	4.34	3
Hat Yai International Airport (VTSS)	AOT/INTL	0	4	3	4	1	0.67	0	0	0	2	1.2	2.67	3.87	4
Chiang Mai International Airport (VTCC)	AOT/INTL	0	0	0	1	1	1.05	0	0	0	0	0.2	1.05	1.25	6
Mae Fah Luang Chiang Rai International Airport (VTCT)	AOT/INTL	0	1	3	2	3	0.55	0.1	0	0	0	0.9	0.65	1.55	5
Suvanabhumi International Airport (VTBS)	AOT/INTL	1	2	0	1	1	12.58	2.6	2.1	0.1	2	0.5	19.38	19.88	1
Don Mueang International Airport (VTBD)	AOT/INTL	5	0	1	2	1	4.04	2.8	0.01	1	1	0.9	8.85	9.75	2

Summary

Aerodrome	Operator	Complexity of aerodrome score	The time since last audit score	The compliance and safety record score	Summary	Rank
Phuket International Airport (VTSP)	AOT/INTL	1.6	5.17	4.34	11.11	4
Hat Yai International Airport (VTSS)	AOT/INTL	1.5	6.01	3.87	11.38	3
Chiang Mai International Airport (VTCC)	AOT/INTL	1.6	5.32	1.25	8.17	6
Mae Fah Luang Chiang Rai International Airport (VTCT)	AOT/INTL	1.5	5.66	1.55	8.71	5
Suvanabhumi International Airport (VTBS)	AOT/INTL	1.9	4.33	19.88	26.11	1
Don Mueang International Airport (VTBD)	AOT/INTL	1.9	4.75	9.75	16.4	2

---------- END ----------