Civil Aviation Authority
Grand-Duchy of Luxembourg

AERODROME
CERTIFICATION AND ONGOING OVERSIGHT GUIDANCE

Version 2.1

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1. Introduction

Regulation (EC) 2018/1139 and IR regulation (EU) 139/2014 is directly applicable to aerodromes and set out in general the requirements for aerodromes and within the IR "Acceptable means of compliance" (AMC) for procedures and "Design Criteria" (DS) for infrastructure elements. Additional guidance material for the initial certification, safety and change management is provided within this document.

This document provided by DAC contains additional statements and minimum requirements for the Luxembourg international Airport (ELLX) for obtaining and maintaining a certificate within the meaning of regulation (EC) 2018/1139 and IR regulation (EU) 139/2014.

2. Scope

ADR.OR.A.005

Civil aerodromes within the meaning of Art. 2 sub 1. e) of regulation (EC) 2018/1139

- public use,
- used for commercial air transport,
- instrument approach and/or take off procedures in place
- paved runway of at least 800m (physical length)

Based on these definitions in Luxembourg only **Luxembourg International Airport (ELLX**) is within the scope of regulation (EC) 2018/1139 and (EU) 139/2014. Additional aerodromes within Luxembourg for which an exemption according Art. 2 sub. 7. of regulation (EC) 2018/1139 are valid, are not existing.

3. Certification

3.1 Information to aerodrome operator

DAC respect that the process of certification is associated with high human and financial resources for an aerodrome operator. For this reason, it is possible, to have information meetings with DAC to find out additional information about the type and scope of certification.

It is also possible that for unclear infrastructural situations, representatives of DAC discuss these items during a meeting or if deemed necessary, a local visit can be conducted.

Within the aerodrome department of DAC, **Mr. David GREISCH** is the nominated focal point for certification and ongoing oversight.

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In case of longer absence of Mr. Greisch, **Mr. Regis OSSANT** will act as focal point for certification and ongoing oversight.

3.2 Aerodrome Operator

According regulation (EC) 2018/1139 and (EU) 139/2014 on one aerodrome there is only one aerodrome operator, with responsibilities and coordination functions. The aerodrome operator can contract some activities to other entities, but he remains accountable and responsible – as far as outlined within regulation (EU) 139/2014 - for the safe operations and compliance with regulation (EC) 2018/1139 and IR regulation (EU) 139/2014 at the aerodrome.

3.3 Application

The nominated Accountable Manager of the aerodrome submits an application (form see Appendix 1) to DAC for the initial issue of a certificate in accordance with Regulation (EU) 139/2014 not later than 12 months prior the date set out in the regulation (EU) 139/2014 for the final certification (for existing aerodromes), respectively the intended start of operations (for new aerodromes).

With submitting an application (see Appendix 1) in accordance with the regulations (EC) 2018/1139 and (EU) 139/2014 the Accountable manager submits following completed items:

- Aerodrome manual according ADR.OR.E.005
- Certification base and organisational and operational base including evidences (see chapter 3.4)
- Nomination of persons performing the following functions on the aerodrome (including CV and qualification statements for the relevant function)
  - Person responsible for Safety Management System (Safety Manager)
  - Person responsible for Compliance Monitoring System
  - Person responsible for Airside Operation (Airside Operations Manager)
  - Person responsible for Airside Maintenance (Airside Maintenance Manager)

  Within the aerodrome manual or if necessary with additional information during the application process, conclusive and traceable job descriptions including responsibilities for the above mentioned functions must be provided to DAC.

  Additional, the Accountable Manager has to provide also his own CV and qualifications statements to DAC. A job description including responsibilities for the Accountable manager is not necessary due to the overall accountability and responsibility.

  If the application is not complete, DAC will send a letter for correction to the aerodrome operator.

3.4 Certification Base and organisational and operational base

DAC will provide the aerodrome operator with a proposed certification base and an organisational and operational base for organisational, operational and infrastructural requirements in electronic form. The proposed certification base will be based on the actual regulation version available on the EASA website at the day of application entry.

https://www.easa.europa.eu/document-library/general-publications/easy-access-rules-aerodromes-regulation-eu-no-1392014-0

For existing aerodromes CS.DSN and GM Issue 3 – 08/12/2016 and the organisational and operational base will base on AMC and GM Issue 1 including amendment RFF has been taken as reference document.

First step:

Submitting draft of certification base for infrastructure and organisational and operational base for organisational, operational to the aerodrome operator.

Draft - EASA Compliance Checklist for ELLX - Luxembourg	
Draft Certification Basis	
Requirement	
Book I, Certification Specifications (CS ADR-DSN) + Book II, Guidance Material (GM ADR-DSN)	
Chapter A - General	General
CS ADR-DSN.A.001	Applicability
GM1 ADR-DSN.A.001	Applicability
CS ADR-DSN.A.002	Definitions
CS ADR-DSN.A.005	Aerodrome reference code
GM1 ADR-DSN.A.005	Aerodrome reference code
CS ADR-DSN.A.010	Intentionally blank
Chapter B - Runways	
CS ADR-DSN.B.015	Number, siting and orientation of runways
GM1 ADR-DSN.B.015	Number, siting and orientation of runways
CS ADR-DSN.B.020	Choice of maximum permissible crosswind components
GM1 ADR-DSN.B.020	Choice of maximum permissible crosswind components
CS ADR-DSN.B.025	Data to be used
GM1 ADR-DSN.B.025	Data to be used
CS ADR-DSN.B.030	Runway threshold
GM1 ADR-DSN.B.030	Runway threshold
CS ADR-DSN.B.035	Actual length of runway and declared distances
GM1 ADR-DSN.B.035	Actual length of runway and declared distances
CS ADR-DSN.B.040	Runways with stopways or clearways
GM1 ADR-DSN.B.040	Runways with stopways or clearways

Example of infrastructure requirements

The aerodrome operator will give comments on this proposal back to DAC. After negotiation between the aerodrome operator and DAC, DAC will send the final version of the certification and organisational and operational base to the aerodrome operator.

Second step:

The aerodrome operator adds within the column “Applicability” all items, which are applicable on the aerodrome and send it back to DAC for negotiation.

Draft - EASA Compliance Checklist		
Draft Certification Basis		
Requirement		**Applicability**
Book I, Certification Specifications (CS ADR-DSN) + Book II, Guidance Material (GM ADR-DSN)		
Chapter A - General	General	
CS ADR-DSN.A.001	Applicability	Applicable
GM1 ADR-DSN.A.001	Applicability	
CS ADR-DSN.A.002	Definitions	Applicable
CS ADR-DSN.A.005	Aerodrome reference code	Applicable
GM1 ADR-DSN.A.005	Aerodrome reference code	
CS ADR-DSN.A.010	Intentionally blank	
Chapter B - Runways		
CS ADR-DSN.B.015	Number, siting and orientation of runways	Applicable
GM1 ADR-DSN.B.015	Number, siting and orientation of runways	
CS ADR-DSN.B.020	Choice of maximum permissible crosswind components	Applicable
GM1 ADR-DSN.B.020	Choice of maximum permissible crosswind components	
CS ADR-DSN.B.025	Data to be used	Applicable
GM1 ADR-DSN.B.025	Data to be used	
CS ADR-DSN.B.030	Runway threshold	Applicable
GM1 ADR-DSN.B.030	Runway threshold	
CS ADR-DSN.B.035	Actual length of runway and declared distances	Applicable
GM1 ADR-DSN.B.035	Actual length of runway and declared distances	
CS ADR-DSN.B.040	Runways with stopways or clearways	Not applicable
GM1 ADR-DSN.B.040	Runways with stopways or clearways	
CS ADR-DSN.B.045	Width of runways	Applicable
GM1 ADR-DSN.B.045	Width of runways	
CS ADR-DSN.B.050	Minimum distance between parallel non-instrument runways	Not applicable
GM1 ADR-DSN.B.050	Minimum distance between parallel non-instrument runways	
CS ADR-DSN.B.055	Minimum distance between parallel instrument runways	Not applicable

Example of infrastructure requirements and applicability

Third step:

The aerodrome operator undertakes extensive and detailed surveys on existing infrastructure (**infrastructure requirements**). With the result of these surveys, the aerodrome operator adds for each infrastructure element an estimation of compliance ("compliant" or "non-compliant") within the column "estimation of compliance" including the option for deviation (ELOS, SC, or DAAD), if necessary. It must be noted, that for each item in the certification base, all elements within the borders of the aerodrome must be checked. The certification base shall reflect at the end all available infrastructure elements with their individual technical specifications.

For organisational and operational items, the aerodrome operator verifies all existing procedures and the management functions in regard to the acceptable means of compliance and guidance material. With the result of these verification, the aerodrome operator adds an estimation of compliance ("compliant" or "non-compliant") within the column "estimation of compliance" including the deviation (AltMoc), if necessary.

Example for infrastructure base:

CS ADR-DSN.M.730 – Stop bar lights.

Stop bar lights must be spaced equal but not more than 3m. If on stop bar light on the whole aerodrome has a single spacing of 3,5m CS ADR-DSN.M.730 is "non-compliant" with the remark of the specific stopbar. Comment should be that only stop bar lights on TWY (W) are not compliant. For this single item, a corrective action until initial certification or a deviation will be done.

For evidences which are requested by DAC, please refer to chapter 3.6 evidences.

Draft - EASA Compliance Checklist					
Draft Certification Basis					
Requirement		Applicability	RWY 06	RWY 24	TWY A
Book I, Certification Specifications (CS ADR-DSN) + Book II, Guidance Material (GM ADR-DSN)					
Chapter A - General	General				
CS ADR-DSN.A.001	Applicability	Applicable			
GM1 ADR-DSN.A.001	Applicability				
CS ADR-DSN.A.002	Definitions	Applicable			
CS ADR-DSN.A.005	Aerodrome reference code	Applicable	C	C	N/A
GM1 ADR-DSN.A.005	Aerodrome reference code				
CS ADR-DSN.A.010	Intentionally blank				
Chapter B - Runways					
CS ADR-DSN.B.015	Number, siting and orientation of runways	Applicable	C	C	N/A
GM1 ADR-DSN.B.015	Number, siting and orientation of runways				
CS ADR-DSN.B.020	Choice of maximum permissible crosswind components	Applicable	SC	SC	N/A
GM1 ADR-DSN.B.020	Choice of maximum permissible crosswind components				
CS ADR-DSN.B.025	Data to be used	Applicable	C	C	N/A
GM1 ADR-DSN.B.025	Data to be used				
CS ADR-DSN.B.030	Runway threshold	Applicable	DAAD	DAAD	N/A
GM1 ADR-DSN.B.030	Runway threshold				
CS ADR-DSN.B.035	Actual length of runway and declared distances	Applicable	C	C	N/A
GM1 ADR-DSN.B.035	Actual length of runway and declared distances				
CS ADR-DSN.B.040	Runways with stopways or clearways	Not applicable			
GM1 ADR-DSN.B.040	Runways with stopways or clearways				
CS ADR-DSN.B.045	Width of runways	Applicable	C	C	N/A
GM1 ADR-DSN.B.045	Width of runways				

Forth step:

The aerodrome operator sends the certification and organisational and operational base to DAC for review and negotiation. Within this step, no evidences, procedures or documents for possible deviations must be provided.

Fifth step:

After negotiation DAC will send the latest version of the certification and organisational and operational base to the aerodrome operator to finish the documents with evidences, procedures (see chapter 3.6) and required deviation documents (see chapter 3.5). After finishing the certification and organisational and operational base, these documents must be attached to the application for certification (see chapter 3.3).

During the certification process the relevant issues of CS.DSN and GM and also AMC and GM can be changed by EASA. DAC will inform the aerodrome operator in which way during the certification procedure, these changes will come into force.

After the initial certification phase, a change management procedure of DAC will lead the change of issues by EASA (see chapter 8.4).

3.5 Sharepoint system

The aerodrome department of DAC has set up an internet platform on CTIA in a way that for the aerodrome operator an exclusively network is available. In this network, all information, documents, the aerodrome manual the certification basis and all deviations have to be documented. These information are available for the aerodrome operator as well as the members of the aerodrome department of DAC. The documents on this network shall present at any time the latest versions of the necessary documents.

3.6 Deviations

Deviations from operational requirements (AltMoc) and from infrastructure requirements (ELOS, SC or DAAD) are allowed under regulation (EU) 139/2014.
Each deviation must be mentioned within the application form and the required documents shall be added to the certification base.

All by DAC approved deviations will be part of the initial certificate and will be published – if required – within the AIP.

A deviation document for each deviation shall be within a traceable format including all necessary and mentioned information, as outlined within the next point.

Deviation from Certification Specifications CS (infrastructure requirements)
Deviations in general, are usually a way to solve some of the existing infrastructure problems. However, deviations always include an additional risk for the aerodrome operator in case of an accident on the airside. This additional risk must be considered by the aerodrome operator in advanced. If other options are possible to achieve the requirement, these options should be considered.

- **ELOS** (Equivalent level of safety)
  In general, an equivalent level of safety for infrastructure requirements can be applied for each item. The duration of an ELOS is variable until infinite. The aerodrome operator must be aware of the fact, that his documents for an equivalent level of safety must be conclusive and traceable.

    - Description of the situation
    - Description of deviation regarding regulation (EU) 139/2014
    - Description of deviation regarding Annex 14 for a possible notification to ICAO
    - Reasons for the deviation
    - Short description of verified alternatives to achieve the requirement
    - A signed safety (risk) assessment including hazard identification and mitigation. The safety (risk) assessment must be designed and carried out according the procedures of the aerodrome operators Safety management system. (Guidance for safety (risk) assessment see chapter 10.3)
    - Identification of changes in existing procedures
    - Technical documents, surveying maps, statements of civil engineering, eg.
    - Proposal for an aeronautical publication of the outcome of the safety (risk) assessment
    - Definition of reasonability's for the outcome of the assessment and the mitigations (Who is responsible for what, when, eg.)

- **SC** (Special condition)
  The use of the "SC" as an option for deviation is restricted. Generally special, actually local immutable circumstances (such as topography, obstruction situation, or special local situations on the aerodrome eg.) must apply. If a special condition as deviation is considered, DAC should be informed in advance. The duration of a Special condition is variable until infinite. It is only noted that the detection requires a comprehensive treatment on the subject of air safety.
  The aerodrome operator must be aware of the fact, that his documents for a special condition must be conclusive and traceable and must include a comprehensive treatment on the subject of safe operation.

    - Description of the local situation
    - Explanation of special immutable circumstances (terrain, obstacles, eg.)
    - Additional explanation for the need of a SC for the infrastructure item (why it was considered not to follow the regulation, eg.)

  - Description of deviation regarding regulation (EU) 139/2014
  - Description of deviation regarding Annex 14 for a possible notification to ICAO
  - Reasons for the deviation
  - Description of verified alternatives to achieve another deviation or the requirement
  - A signed safety (risk) assessment including hazard identification and mitigation. The safety (risk) assessment must be designed and carried out according the procedures of the aerodrome operator.
  - Identification of changes in existing procedures
  - Technical documents, surveying maps, statements of civil engineering, eg.
  - Proposal for an aeronautical publication of the outcome of the safety (risk) assessment
  - Definition of reasonability's for the outcome of the assessment and the mitigations (Who is responsible for what, when, eg.)

- **DAAD** (Deviation and Action Document)
- In general, a Deviation and Action Document for infrastructure requirements can be applied for each infrastructure item, which was built (and in operation) before **06.03.2014**. The duration of a DAAD is limited until the special item is changed according the requirement. The time scheduled for the change will be fixed within the application for this deviation. The time schedule shall be adequate for the purpose of the change and shall not exceed in general 10 years (exemptions for special issues possible). The aerodrome operator must be aware of the fact, that his documents for a deviation and action document must be conclusive and traceable and must include documents for the safe operation until the change will happen and a signed document by the Accountable manager as an action document.

  - Description of the local situation
  - Description of deviation regarding regulation (EU) 139/2014
  - Description of deviation regarding Annex 14 for a possible notification to ICAO
  - Reasons for the deviation
  - Description of planned actions including realistic timeframes
  - A signed commitment of the accountable manager for planned actions and timeframe
  - Change identification of planned actions
  - A signed safety (risk) assessment including hazard identification and mitigation. The safety (risk) assessment must be designed and carried out according the procedures of the aerodrome operator.
  - Identification of changes in existing procedures
  - Technical documents, surveying maps, statements of civil engineering, eg.
  - Proposal for an aeronautical publication of the outcome of the safety (risk) assessment
  - Definition of reasonability's for the outcome of the assessment and the mitigations (Who is responsible for what, when, eg.)

Deviation from operational requirements (AMC)

- **AltMoc** (Alternative means of compliance)

AMC1 ADR.AR.A.015(d)(3)

In contrast to a deviation on infrastructure compliance, a deviation on operational requirement must be notified after approval of the Competent Authority to EASA and to all other Member states. Additional, EASA has basically the option to give comments on the approved deviation or a finding within the next oversight.

For this reason, if the aerodrome operator is planning to use and AltMoc, DAC should be informed in advance. DAC will explain the required documents and the timeframe for approval and notification of the planned AltMoc.

3.7 Evidences

For infrastructure, organisational and operational requirements, evidences for each item must be provided once during the initial certification, and during each changes to the bases by the aerodrome operator to DAC.
Within the **sixth step** of the certification base, DAC will provide some basic guidance on evidences to each element.

Evidences for Infrastructure requirements

Evidences should be technical documents, surveying maps, statements of civil engineering, eg., which are generally not older than 3 years. (Except confirmations of Manufacturer for products, if there is an evidence, that this product is used on the airside). Each evidence must be conclusive and traceable and, if there is another understanding of evidences, comparable to the mentioned documents above.

Evidences for operational requirements

Evidences should be procedures, methods or instructions, which were revised not later than 3 years ago. (Except instructions of Manufacturer for products, if there is an evidence, that this product is used on the airside). Each evidence must be conclusive and traceable and, if there is another understanding of evidences, comparable to the mentioned documents above.
Procedures, methods or instructions are basically documents from the aerodrome manual. For this reason, these documents should be according the recommendation set out under chapter 4 (aerodrome manual)

3.8 Aerodrome operator and Air navigation service provider

Under regulation (EU) 139/2014 the aerodrome operator has to apply for a certificate for the airside of the aerodrome. Within the regulation it is not mentioned, that the aerodrome operator itself has to create all necessary documents. If other partners of the aerodrome operator provide documents (procedures, evidences, eg.) to the aerodrome operator, he has to check if these documents meet his own criteria and then provide them during the initial certification to DAC for compliance. Additional, the aerodrome operator has to guaranty, that all partners, contracted companies on the aerodrome provide the necessary access to facilities, personnel, documents and records to DAC as Competent Authority.

4. Aerodrome manual

The aerodrome manual contains all relevant and required documents for safe operation on the airside. The aerodrome manual must be updated and amended after the initial certification according an internal procedure of the aerodrome operator. The latest version of the aerodrome manual must be available on the aerodrome and at DAC.

The structure of the manual must be according ADR.OR.E.005.

All in cooperated procedures, methods, checklists or instructions must be complete and have at least following characteristics:

- Clear and traceable name
- Controlled according to the version and date
- Define responsibility (owner)
- Amendment history

Procedures, methods, checklists or instructions must be created for a specific aerodrome and also according to the operational size of the aerodrome. Within these documents duties, responsibilities and coordination issues ("Who does what how and if needed in coordination with whom") must be clearly defined. Additional, these documents must be written basically in English (additional languages possible) and must kept as clear and simple as possible, that everybody – who has to work with - can read and understand these documents easily.

5. Changes

5.1 Changes requiring approval by DAC

Regarding following items, amended procedures, methods, checklists or instructions must grant a prior approval from DAC before implementation. For those changes, all necessary documents and a safety statement or safety assessment according point 8.4 Guidance on risk and change management has to send for prior approval to DAC using the attached form.

- Low-visibility operations and procedures
- Safety Management and Change procedures
- any changes significantly affecting the organisation chart, policies or culture of the aerodrome operator's management system
- Changes to the published firefighting category of the aerodrome
- Higher codeletter operation
- Changes to any obstacles, developments and other activities within the areas monitored by the aerodrome operator in accordance with ADR.OPS.B.075, which may endanger safety and adversely affect the operation of an aerodrome.
- Changes to the process by which changes not requiring prior approval are managed

5.2 Changes to the certification base (infrastructure) – Approval by DAC

If infrastructure elements changes (changes to an infrastructure item or construction of a new element) the certification base for infrastructure elements has to be amended by the aerodrome operator and to send for approval and an amendment of the certificate to DAC, using the attached form. For this reason, if the aerodrome operator is planning to amend the certification base, DAC should be informed in advance.

Additionally, if, based on an amendment of regulation (EU) 139/2014 or an Annex to regulation, the certification base for infrastructure elements have to be amended, DAC will inform the aerodrome operator on new or amended items within this base.

Aerodrome Operator should be aware that significant maintenance projects may result into a change and in a secondary effect on the Certification Basis e.g. installation of new airfield ground lighting as part of a runway/taxiway rehabilitation project and may, therefore require prior approval. DAC shall be consulted in advance.

5.3 Changes not requiring prior approval

The aerodrome operator shall develop a procedure that describes the process by which changes not requiring prior approval are managed. The procedure must be approved by DAC prior to their use. This procedure is part of the aerodrome manual and shall describe the process for notifying DAC of changes not requiring prior approval. The timescale for frequency of notification is to be agreed by DAC.

The aerodrome operator should be cognisant of ADR.AR.C.040 (f) when notifying DAC of changes. If the Aerodrome Operator is uncertain that a proposed change meets the intent of the procedure or the rules they should ensure that DAC is aware of the proposed change prior to implementation.

Guidance including information/notification of DAC will be found within chapter 9.4.

6. Regulation (EC) 2018/1139 and (EU) 139/2014 – Annex 14

Primarily the aerodrome certification and the aerodrome manual must be according regulation (EU) 139/2014. However, Luxembourg signed the Chicago Convention and therefor, the applicable contents of the relevant Annexe of ICAO apply for Luxembourg.

It is true, that the contents of the relevant Annexe of ICAO doesn´t apply directly to an aerodrome operator, however, within the initial certification; DAC will also have to focus on the SARPS of the relevant Annexe. The differences between the contents of the regulation (EU) 139/2014 and Annex 14 are not very big, but the main focus of DAC is to fulfil both requirements or have the relevant documents to send a deviation to ICAO.

Within Annex 14 Chapter 1 point1.4 it is stated:
"…When an aerodrome is granted a certificate, it signifies to aircraft operators and other organizations operating on the aerodrome that, at the time of certification, the aerodrome meets the specifications regarding the facility and its operation, and that it has, according to the certifying authority, the capability to maintain these specifications for the period of validity of the certificate. The certification process also establishes the baseline for continued monitoring of compliance with the specifications…"

Following obligations are relevant during certification:

- Aerodrome manual, ICAO 14, Chapter 1, point. 1.4.4;
- Management-System including Safety Management: ICAO 14, Chapter 1, point. 1.4.4, Safety Management Manual (Doc. 9859);

- Monitoring-, Action- and Information responsibility regarding conditions of movement areas and adjacent facility, ICAO 14 Chapter 2 point. 2.91 f.;
- Dealing with obstacles, ICAO 14, Chapter 4 and 6, Appendix 6;
- Rescue and firefighting: ICAO 14, Chapter 2, point. 2.11 and Chapter 9 point. 9.2, Airport Services Manual Part 1: Rescue and Fire Fighting (Doc. 9137);
- Emergency planning, ICAO 14, Chapter 9, point 9.1, Airport Services Manual Part 7: Airport Emergency Planning (Doc. 9137);
- Wildlife hazard management, ICAO 14 Chapter 9 point. 9.4 and 9.10.1; Airport Services Manual Part 3: Wildlife Control and Reduction (Doc. 9137);
- Management and control on movement areas, ICAO 14, Chapter 9 point 9.8, Manual of Surface Movement Guidance and Control Systems (Doc. 9476);
- Fencing, ICAO 14, Chapter 9, point 9.10.2;
- Maintenance management, ICAO 14, Chapter 10, point. 10.1; Airport Services Manual, Part 9: Airport Maintenance Practices (Doc. 9137);
- Snow, slush and ice removal on movement areas, ICAO 14 Chapter 10, point 10.3.; Airport Services Manual, Part 2: Pavement Surface Conditions and Part 9. Airport Maintenance Practices (Doc. 9137);
- Fuelling, Manual on Civil Aviation Jet Fuel Supply, Chapter 2, point. 2.2.2.b (Doc. 9977).

7. Certification procedure

As the aerodrome was never certified according to ICAO Annex 14 Vol 1 before, DAC has to carry out a full scope certification for Luxembourg-Findel (ELLX). Therefore, the aerodrome operator has to provide following additional documents to the application:

- Financial statements
- Approval documents for existing flight procedures
- MET statistics of last 5 years for layout of runway

After submitting the application form for initial certification by the aerodrome operator, DAC will start the certification procedure.

Submitting condition of use and certification schedule
DAC will submit the condition of use for the aerodrome until the certification process is finalized. Additional, the schedule for certification will be communicated.

Check of documentation
All submitted forms, documents (aerodrome manual, certification and organisational and operational base, Safety management manual, deviation documents, eg.) and all declarations will be verified for completely, tractability and accordance with regulation (EU) 139/2014. In some cases, also according this aerodrome certification guideline of DAC.

Visit (Implementation)

After familiarization with all submitted documents, DAC will schedule together with the aerodrome operator the necessary audits and site visits for verifying compliance (operational and infrastructure) of the aerodrome and the aerodrome operator. Additional, during the visit, the compliance of the management system will be checked through interviews.

Correction / Improvements prior certification

Both elements will be scheduled by DAC in such a manner, that enough time will be for necessary corrections or improvements by the aerodrome operator prior certification. DAC will send an official finding report after the on site visits to the aerodrome operator, including a deadline for submitting corrections and improvements prior certification. DAC will – if necessary – conduct a second on site visit to verify the implemented corrections and improvements prior certification.

- **Final Corrective Actions**

  All open issues, which could not be solved by the aerodrome operator prior certification, shall be incorporated into a corrective action plan. The aerodrome operator has to provide within an agreed timeframe prior certification to DAC a corrective action plan including corrective actions (short-term, mid-term and long-term actions), the summary of a root cause analyses for each finding and observation and a timeframe for deliverables to propose the fulfilment of a corrective action to DAC. The aerodrome operator shall also indicate, if additional training or qualification are needed to correct the finding. The corrective action plan will be assessed by DAC and after approval attached to the terms of certificate.

  Example for a corrective action plan:

Finding	Reference	Classification	Statement Aerodrome Operator	Summary root cause analyse	Short-term corrective actions	Mid-term corrective actions	Long-term corrective actions	Deliverable including timeframe	Responsible person(s) for action

- **Criteria for issuing of a Certificate**

  DAC will issue a certificate under the provisions of regulation (EC) 2018/1139 and IR regulation (EU) 139/2014,

  1. if the aerodrome operator has submitted adequately:
     a. an application for certification
     b. an aerodrome manual
     c. a declaration of compliance
     d. a declaration of implementation of SMS
     e. a coordinated and completed certification base including adequate evidences
     f. all necessary evidences for deviations

  2. if the key personal of the aerodrome operator
     a. are nominated and in place
     b. are aware of their accountabilities and responsibilities

c. are adequately trained

3. if the infrastructure:
    a. meets the coordinated certification base
    b. can be operate safely taking into consideration all notified deviations

4. if within the Safety management
    a. all accountabilities and responsibilities are defined
    b. and the system is implemented at least as set out in this guidance material (point 10.2)
    c. the interfaces with other partners are defined and perform in a good manner

5. if all procedures, methods, checklists or instructions of the aerodrome manual
    a. meet the coordinated certification base
    b. are capable to operate the aerodrome in a safe manner

6. if all staff working on the airside
    a. have adequate training plans and programmes
    b. are adequately trained to operate the aerodrome in a safe manner

7. if DAC after checking the application, document and the airside during visits has no open finding (for which a corrective action plan was agreed) or no other reason that the operation on the airside is not capable to operate the aerodrome in a safe manner.

8. identified deviations (AltMoc, ELOS, SC and DAAD) to regulation (EU) 139/2014 are approved by DAC and the results – were necessary – are published within the AIP.

The certificate is basically valid for an unlimited period and will be check during the ongoing oversight activities of the Competent Authority.

8. Ongoing oversight

Planning of ongoing oversight after initial certification

DAC will evaluate the performance and risk on the aerodrome using different parameters (Safety management system, Training, staff, management system, Infrastructure complexity, occurrences, result of last oversight activity and corrective actions, eg.) at least once a year. The outcome of this assessment will be the oversight cycle of DAC (12, 24, 36 or 48 month) for fulfilling a full scope audit. The aerodrome operator will be informed on a yearly base of the audit cycle, and not later than 3 months prior a scheduled audit. Additional DAC will perform unannounced inspections during the year.

Note: The audit cycle of the safety and compliance monitoring of the aerodrome operator shall base on the performance and risk evaluation of DAC, however according regulation (EU) 139/2014 the audit cycle shall not exceed 48 months.

Scheduled audits

The timeframe of scheduled audits will be announced at least 1 month prior of the audit to the aerodrome operator. These audits will be used to perform a full scope audit within the oversight cycle of DAC. Therefore, one or more audits will be performed by DAC. The detailed audit schedule will be provided to the aerodrome operator at least 6 weeks prior the audit.

The aerodrome operator is obliged to coordinate the audit schedule with all relevant departments, partners and organizations on the aerodrome to have the necessary access, documents and personnel available for DAC.

Once a year during an audit, DAC will schedule a meeting with the accountable manager and the nominated persons of the aerodrome operator to have a management discussion.

Follow up and corrective actions

After a scheduled audit, DAC will send a draft detailed report to the accountable manager for comments and proposed corrective actions within 14 working days. After this timeframe, DAC will assess the proposed corrective action and issue the final report.

The corrective actions and corrective action plan shall be drafted by the aerodrome operator according the guidance under point 7 (final corrective actions) including the necessary documents and analyses.

Unannounced Inspections

To ensure compliance and a high level of implementation, DAC will perform unannounced inspections, mainly on infrastructure elements and implementation of procedures of the aerodrome manual. Unannounced inspections will deal only with special parts of the aerodrome manual, the Certification base or of regulation (EC) 2018/1139 and IR regulation (EU) 139/2014. As during unannounced inspections, it cannot be expected to have the accountable manager or a nominated person of the aerodrome operator present on the aerodrome, DAC will inform at the beginning of the inspection, the duty officer of the unannounced inspection.

After an unannounced inspection, a draft detailed report will be send to the accountable manager. The accountable manager is obliged to give comments on the report within 14 working days. After this timeframe, DAC will issue the final report.

If immediate actions will be required during the unannounced inspection, the timeframe for the accountable manager will be adapt according the required action.

Auditors of Competent Authority

Auditors will be personnel of DAC or external personnel accompanied by at least one member of DAC. Personnel of DAC hold an ID card to identify themselves as personnel of DAC. For audits, DAC will indicate within the detailed audit schedule the name and audit filed of each nominated auditor.

During unannounced audits, personnel of DAC have to identify themselves at the beginning of the audit at a responsible person of the aerodrome operator.

Monitoring of corrective actions

DAC will monitor the agreed corrective action plan and – if necessary – inform the accountable manager about deviations.

Validation of certificate

During the ongoing oversight activities of DAC including the monitoring of agreed corrective actions, the validation of the issued certificate (including terms of certificate) will be checked. The mentioned criteria under point 7 for issuing a certificate, will be checked regularly during audits and unannounced inspections.

Enforcement

If during the ongoing oversight and the monitoring of agreed corrective actions, any doubt appears, that the criteria under point 7 for issuing a certificate are not respected or fulfilled by the aerodrome operator, enforcement measures will be taken by DAC. This enforcement measure follows an escalation procedure starting with a letter to the accountable manager to the revocation of the certificate.

9. Additional guidance material for initial certification

This guidance material is published in support of regulation (EC) 2018/1139 and IR regulation (EU) 139/2014. Procedures, which are mentioned in the following chapters could be attached to the aerodrome manual. It is not necessary, that each of the mentioned procedure shall be documented independently. When it´s necessary, procedures can be combined.

9.1 Safety Management System

An SMS is a system to assure the safe operation of aerodromes through effective management of safety risk. This system is designed to continuously improve safety by identifying hazards, collecting and analysing data and continuously assessing safety risks. The SMS seeks to proactively contain or mitigate risks before they result in aviation accidents and incidents. It is a system that is commensurate with the organisation's regulatory obligations and safety goals. It is important to recognise that Safety Management Systems are top down driven systems, which means that the Accountable Manager of the organisation is responsible for the implementation and continuing compliance of the SMS. Without the wholehearted support of the Accountable Manager an SMS will not be effective.
There is no 'one size fits all' model of an SMS that will cater for all types of organisations. A complex SMS is unlikely to be appropriate for small organisations, and such organisations need to tailor their SMS to suit the size, nature and complexity of the operation and allocate resources accordingly.

A safety management system consists of at least following components and elements:

1. Safety Policy and Objectives
Element 1.1 Management commitment and responsibility
Element 1.2 Safety accountabilities
Element 1.3 Appointment of key safety personnel
Element 1.4 Coordination of emergency response planning
Element 1.5 SMS documentation
2. Safety risk management
Element 2.1 Hazard identification
Element 2.2 Risk assessment and mitigation
3. Safety assurance
Element 3.1 Safety performance monitoring and measurement
Element 3.2 The management of change
Element 3.3 Continuous improvement of the SMS
4. Safety promotion
Element 4.1 Training and education
Element 4.2 Safety communication.

SMS Documentation

The SMS documentation covers all elements and processes of the SMS and normally includes:
(a) A consolidated description of the SMS components and elements such as -
(1) document and records management ;
(2) regulatory SMS requirements ;
(3) framework, scope and integration;
(4) safety policy and safety objectives ;

(5) safety accountabilities and key personnel ;
(6) voluntary hazard reporting system;
(7) incident reporting and investigation procedures;
(8) hazard identification and risk assessment processes;
(9) safety performance indicators;
(10) safety training and communication;
(11) continuous improvement and SMS audit ;
(12) management of change; and
(13) emergency or operations contingency planning;

(b) A compilation of current SMS related records and documents such as;
(1) hazards report register and samples of actual reports;
(2) safety performance indicators and related charts;
(3) record of completed or in-progress safety assessments;
(4) SMS internal review or audit records;
(5) safety promotion records;
(6) personnel SMS/ safety training records;
(7) SMS/ Safety committee meeting minutes;
(8) SMS implementation plan (during implementation process); etc.

Safety Performance Indicators

An SMS defines measurable performance outcomes to determine whether the system is truly operating in accordance with design expectations and not simply meeting regulatory requirements. The safety performance indicators are used to monitor known safety risks, detect emerging safety risks and to determine any necessary corrective actions. These safety performance indicators also provide objective evidence for the regulator to assess the effectiveness of the service provider's SMS and to monitor achievement of its safety objectives. The service provider's safety performance indicators consider factors such as the organisation's safety risk tolerance, the cost/ benefits of implementing improvements to the system, regulatory requirements and public expectations. Safety performance indicators must be selected and developed by the aerodrome operator.

Implementation of a Safety Management System

An SMS implementation plan is developed in consultation with the Accountable Manager and managers responsible for the delivery of products and services related to, or in support of, the safe operation of the aerodrome. Once completed, the Accountable Manager endorses the plan. The SMS implementation plan includes timelines and milestones consistent with the requirements identified in the gap analysis process, the size of the service provider and the complexity of its products or services. The plan should address coordination with external organisations or contractors where applicable.
The service provider's implementation plan may be documented in different forms, varying from a simple spreadsheet or specialised project management software. The implementation plan should address gaps, through completion of specific actions and completion of milestones according to the stated timeline. Assignment of each task assures accountability throughout the implementation process. The plan should be reviewed regularly and updated as necessary.

Full implementation of all components and elements of the SMS framework may take up to five years, depending on an organisation's maturity and complexity.

With respect to the situation at Luxembourg International Airport (ELLX), for initial certification, the aerodrome operator must show compliance to all of the following questions (including evidences for each item). After this first step during the initial certification, the next steps to fully implement an SMS must be in accordance with the signed implementation plan.

Certification phase:

a. Is there a written safety policy endorsed by the Accountable Manager?
b. Has the safety policy been communicated effectively throughout the organisation?
c. Is there a safety police signed by the accountable manager in place?
d. Are the safety accountabilities and responsibilities of the Accountable Manager and other key staff members clearly defined and published for all staff and contractors to see?
e. Does the Accountable Manager have full responsibility for the SMS and authority to make decisions regarding the budget?
f. Has the management structure of the organisation been defined?
g. Are all staff members aware of their safety roles and responsibilities?
h. Has a Safety Manager for the SMS been appointed?
i. Is there a direct reporting line between the Safety Manager and the Accountable Manager?
j. Does the Safety Manager have the appropriate SMS knowledge and understanding?
k. Does the organisation have a Safety Review Board or equivalent?
l. Is the Safety Review Board or equivalent required to monitor the safety performance and the effectiveness of the SMS?
m. Does the Safety Review Board or equivalent required to meet at least annually and are the meetings to be minuted?
n. Has an emergency response plan (ERP) been developed and required to be kept up to date?
o. Are the roles, responsibilities and actions of key staff members defined in the ERP?
p. Is the ERP required to be regularly reviewed and tested?
q. Is there a clear and understandable safety management manual?
r. Is it required to be regularly reviewed?
s. Is there a system for the recording and storage of SMS documentation and records i.e. hazard logs, risk assessments, safety reports from staff/contractors and safety cases?
t. Is there a confidential safety reporting system?
u. Are safety reports assigned an ‘owner’ and reviewed by the Safety Review Board or equivalent?
v. Is there feedback to the reporter?
w. Is there a written procedure describing how hazards are identified?
x. Have the major hazards associated with the organisation been identified?
y. Is there a risk assessment process in place?
z. Is the risk tolerability matrix appropriate and can it be applied consistently?
aa. Is there a process for deciding any necessary risk mitigation?

bb. Are risk mitigations and controls required to be verified/audited to confirm the effectiveness?
cc. Are risks required to be managed to a reasonable level?
dd. Are the hazards and risks recorded on a hazard log or risk register?
ee. Have safety performance indicators been defined?
ff. Are the safety performance indicators required to be reviewed regularly to identify any trends?
gg. Is there a process to proactively identify hazards and to mitigate risks when significant changes in the organisation occur?
hh. Are safety investigations required to be carried out after incidents or accidents to establish root cause?
ii. Are the hazards identified from safety investigations required to be addressed and communicated to the rest of the organisation?
jj. Is continuous improvement in the safety performance required to be achieved?
kk. Are internal safety audits and surveys required to be carried out?
ll. Have all staff been appropriately trained in respect of the SMS and their duties, safety roles and responsibilities?
mm. Does the system require safety related information to be communicated to all staff members as appropriate?
nn. Does relevant safety information reach external users/customers etc.?
oo. Is there an SMS implementation plan?
pp. Is the implementation plan on target?

Fully implemented Safety Management System:

a. The organisation has a reporting system to captures errors, hazards and near misses that is simple to use and accessible to all staff.
b. The organisation has proactively identified all the major hazards and assessed the risks related to its current activities.
c. Safety investigations are carried out to identify underlying causes and potential hazards for existing and future operations.
d. Safety reports are acted on in a timely manner.
e. Hazard identification is an ongoing process and involves all key personnel and appropriate stakeholders.
f. Personnel express confidence and trust in the organisations reporting policy and process.
g. Human performance related hazards are being identified.
h. There is a structured process for the management of risk that includes the assessment of risk associated with identified hazards, expressed in terms of likelihood and severity
i. There are criteria for evaluating the level of risk the organisation is willing to accept and risk assessments and risk ratings are appropriately justified.
j. The organisation has risk control strategies that deliver effective and robust mitigations and controls and where applicable corrective action.
k. Corrective actions resulting from the risk assessment, including timelines and allocation of responsibilities are documented.
l. Safety performance indicators have been defined, promulgated and are being monitored and analysed for trends.

m. Risk mitigations and controls are being verified/audited to confirm they are working and effective.
n. Safety Assurance and Compliance Monitoring activities feed back into the hazard identification and risk management process.
o. Safety assurance takes into account activities carried out in all directly contracted / sub-contracted organisations.
p. The organisation is monitoring its current, future and third party safety risks and is taking action to address unacceptable safety risks.
q. The organisation has established a process and conducts formal hazard analyses/risk assessment for major operational changes, major organisational changes and changes in key personnel.
r. Key stakeholders are involved in the change management process.
s. During the change management process previous risk assessments and existing hazards are reviewed for possible effect.
t. The SMS is periodically reviewed (at least annually) for improvements in safety performance.
u. Aerodrome Safety Committees and documentation are in place (c.f. AMC1 ADR.OR.D.027)
v. Outcomes of Aerodrome Safety Committees are evaluated
w. There is a safety policy that includes a commitment towards achieving the highest safety standards signed by the Accountable Manager
x. The safety policy is communicated to all employees with the intent that they are made aware of their individual contributions and obligations with regard to Safety.
y. The safety policy includes a commitment to continuous improvement, observe all applicable legal requirements, standards and best practice providing appropriate resources and defining safety as a primary responsibility of all Managers.
z. The safety policy actively encourages safety reporting
aa. The safety policy is reviewed periodically to ensure it remains current
bb. A Just Culture policy has been defined that clearly identifies the conditions under which punitive action would be considered (e.g. illegal activity, negligence or wilful misconduct)
cc. An Accountable Manager has been appointed with full responsibility and ultimate accountability for the SMS to ensure it is properly implemented and performing effectively.
dd. The Accountable Manager is fully aware of their SMS roles and responsibilities in respect of the safety, policy, safety standards and safety culture of the organisation.
ee. Staff at all levels are aware of and understand their safety accountabilities, authorities and responsibilities regarding all safety management processes, decisions and actions.
ff. A competent person with the appropriate knowledge, skills and experience has been nominated to manage the operation of the SMS and fulfils the required job functions and responsibilities.

gg. An emergency response plan (ERP) that reflects the size, nature and complexity of the operation has been developed and defines the procedures, roles, responsibilities and actions of the various organisations and key personnel.

hh. The organisation has a process to communicate and distribute the ERP procedures and key personnel in an emergency have easy access to the ERP at all times.

ii. The ERP is periodically tested for the adequacy of the plan and the results reviewed to improve its effectiveness

jj. There is documentation that describes the safety management system and the interrelationships between all of its elements

kk. SMS documentation, including SMS related records, are regularly reviewed and updated with appropriate version control in place

ll. SMS documentation is readily available to all personnel

mm. There is a documented process to identify Safety Management training requirements, including initial and recurrent training, so that personnel are competent to perform their duties, including appropriate training records.

nn. Significant events and investigation outcomes are communicated to staff, including contracted organisations where appropriate.

9.2 Management of changes

Changes may affect the appropriateness or effectiveness of existing safety risk mitigation strategies. In addition, new hazards, and related safety risks may be inadvertently introduced into an operation whenever change occurs. Such hazards should be identified so as to enable the assessment and control of any related safety risks. Safety reviews, as discussed in the discussion on safety performance monitoring and measurement, can be valuable sources of information to support decision making processes and manage change effectively.

The organisation's management of change process should take into account the following three considerations:

Criticality. Criticality assessments determine the systems, equipment or activities that are essential to the safe operation on an aerodrome. While criticality is normally assessed during the system design process it is also relevant during a situation of change. Systems, equipment and activities that have higher safety criticality should be reviewed following change to make sure that corrective actions can be taken to control potentially emerging safety risks.

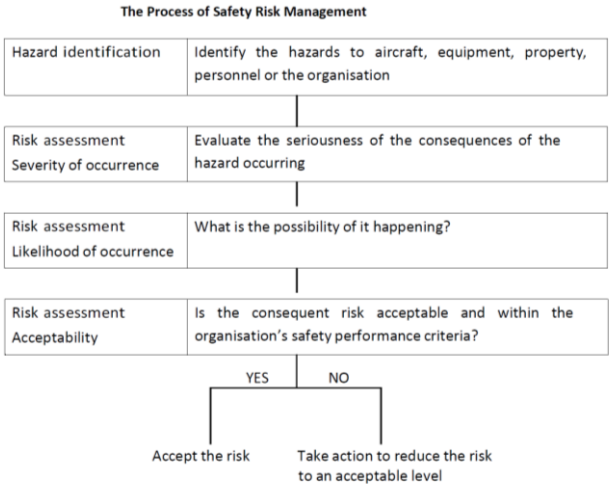
Stability of systems and operational environments: Changes may be planned and under direct control of the organisation. Such changes include organisational growth or contraction, the expansion of products or services delivered, or the introduction of new technologies. Unplanned changes may include those related to economic cycles, labour unrest, as well as changes to the political, regulatory or operating environments.

Past performance: Past performance of critical systems and trend analyses in the safety assurance process should be employed to anticipate and monitor safety performance under situations of change. The monitoring of past performance will also assure the effectiveness of corrective actions taken to address safety deficiencies identified as a result of audits, evaluations, investigations or reports.

As systems evolve, incremental changes can accumulate, requiring amendments to the initial system description. Therefore, change management necessitates periodic reviews of the system description and the baseline hazard analysis to determine their continued validity.
An adequate change management process must be part of the Safety management system.

9.3 Safety (risk) management

The aerodrome operator has to ensure that the safety risks encountered in aviation and aerodrome activities are controlled in order to achieve their safety performance targets. This process is known as safety risk management and includes hazard identification, safety risk assessment and the implementation of appropriate remediation measures.
The safety risk management component systematically identifies hazards that exist within the context of the delivery of its products or services. Hazards may be the result of systems that are deficient in their design, technical function, human interface or interactions with other processes and systems. They may also result from a failure of existing processes or systems to adapt to changes in the service provider's operating environment. Careful analysis of these factors during the planning, design, and implementation phases can often identify potential hazards before the system becomes operational.
Understanding the system, and its operating environment are also essential for achievement of high safety performance. Hazards may be discovered during the operational life cycle, through employee reports or incident investigations. Analysis of these hazards should be conducted in the context of the system. This context is key to avoid attribution of events to "human error," where defects in the system may be neglected, remaining latent for future and potentially more serious events to occur. Guidance on hazard identification and risk assessment procedures and format are addressed in the following two elements.



Safety risk management (SRM) requires the aerodrome operator to develop and maintain a formal process to identify hazards that may contribute to aerodrome safety-related occurrences. Hazards may exist in ongoing aviation and aerodrome activities or be inadvertently introduced into an operation whenever changes are introduced to the aviation and or aerodrome system. In this case, hazard identification is an integral part of the change management processes.
Hazard identification is based on a combination of reactive, proactive and predictive safety data collection methods. Hazard identification is the first step in the SRM process. The corresponding safety risks are then assessed within the context of the potentially damaging consequences related to the hazard. Where the safety risks are assessed to be unacceptable, additional safety risk controls must be built into the system.
The process starts with the identification of hazards and their potential consequences. The safety risks are then assessed in terms of probability and severity, to define the level of safety risk (safety risk index). If the assessed safety risks are deemed to be tolerable, appropriate action is taken and the operation continues. The completed hazard identification and safety risk assessment and mitigation process is documented and approved as appropriate and forms part of the safety information management system.

If the safety risks are assessed as intolerable, the following questions become relevant:

(a) Can the hazards and related safety risk(s) be eliminated? If the answer is yes, then action as appropriate is taken and documented. If the answer is no, the next question is:

(b) Can the safety risk(s) be mitigated? If the answer is no, related activities must be cancelled. If the answer is yes, mitigation action as appropriate is taken and the next question is:

(c) Do any residual safety risks exist? If the answer is yes, then the residual risks must be assessed to determine their level of tolerability, as well as whether they can be eliminated or mitigated, as necessary to ensure an acceptable level of safety performance.

Safety risk assessment involves an analysis of identified hazards that includes two components — the severity of a safety outcome as well as the probability that it will occur.
Once risk have been assessed, the aerodrome operator will engage in a decision making process to determine the need to implement risk mitigation measures.
This decision making process involves the use of a risk categorization tool that may be in the form of an assessment matrix.
The aerodrome operator should consider suspension of any activities that continue to expose the organisation to intolerable safety risks in the absence of mitigating actions that reduce the risks to an acceptable level.

After safety risks have been assessed, appropriate mitigations can be implemented. Mitigation measures may include a number of alternatives including, but not limited to, modifications to existing operating procedures, training programmes, or equipment used in the delivery of aviation products or services. Additional alternatives may include the introduction of new operating procedures, training programmes, technologies or supervisory controls. Almost invariably these alternatives will involve deployment or re-deployment of the three traditional aviation safety defences - technology, training and regulations. A determination of any unintended consequences, particularly the introduction of new hazards, should be made prior to the implementation of any risk mitigation measures.
Each risk mitigation exercise is to be documented progressively. This may be accomplished using a variety of applications ranging from basic spreadsheets or tables to customised commercial risk mitigation software. Completed risk mitigation documents should be approved by appropriate level of management.

Finished Safety assessments including the conditions of the safety assessment shall be reviewed within regular intervals and shall be also implemented in the management of change.

Additional, all prosed and accepted deviation shall be continuous monitored including the prepared documents and safety assessments.

9.4 Guidance on risk and change management and notification and information to DAC

It has to be considered that all temporary and permanent (constructional, operational, technical and organisational) changes concerning infrastructure as well as procedures and processes, which affect the airside of the aerodrome, are subject to the change management of the aerodrome operator.

For all planned changes (constructional, operational, technical and organisational), the aerodrome has to elaborate processes for

- the definition and identification of changes which may have impacts on defined infrastructure, processes, procedures or service,
- the evaluation of changes which may have impacts on defined infrastructure, processes, procedures or service,
- the description of provision and evaluation for the guarantee of safety related service before the implementation of changes (e.g. safety assessment / aeronautical study)
- the implementation of the necessary measure before putting into operation
- the definition of responsibilities for measures which are to be implemented
- the monitoring and control of compliance of the defined changes and measures
- the repeal / change of measures for control of safety risks which are not required anymore due to changes of the operation environment.

Preparation of a planned change

All departments and relevant service providers which perform works, services, and activities on the airside of the aerodrome have to be informed about the change management. In this course, the internal contact point of the aerodrome operator for planned changes at the aerodrome has to be announced.

Identification

The identification of planned changes which can have constructional, operational, technical or organisational effects on the infrastructure or procedures and processes is not easy. One reason for this is the complexity of organisations on the aerodrome, the other reason are the not concrete definitions of planned changes. A complete identification of all changes in a complex organisation can take several years.
For this reason, an internal template has to be elaborated which contains at least the following points. This template has to be filled by the person responsible for the planned change already starting in the planning phase.

- detailed description of the planned change
- constructional, operational, technical or organisational changes
- site of change in case of constructional or organisational change
- planned start of change (in case of constructional works also the start of the works)
- planned end of change (in case of constructional works also the end of the works), this is dropped in case of permanent changes
- person responsible for the change
- affected organisations or staff

- measures or mitigation already defined in the course of planning of the change to ensure safety of aviation
- description of the process of implementation of the planned change

In course of the identification it has to be taken into account that every planned project (infrastructural and/or process-related) has to be analysed to clarify if it is a safety-related change in a functional system. It has to be taken into account that a functional system integrally includes the necessary respectively affected persons, technical/hardware/software infrastructure, including information/data and processes/procedures/regulations. Safety relevance is given if affects on the safety of aviation can be identified.

The term „change“

For every planned change it has to be analysed in this context, if a „change“ is given. The term „change“ means the implementation of a new functional system or the modification of an existing functional system including all components, and it includes among other things the implementation or modification of technical systems and components, the implementation or modification of processes, the implementation of new tasks/activities with the initial certification involved, or the change of qualification of engaged employees. Three different types of changes have to be distinguished, whereby in case of doubt it has to be assumed that the project is a safety relevant change:

- safety relevant changes of a functional system,
- not safety relevant changes of a functional system and
- projects which are no changes of a functional system.

The following not exhaustive criteria can be indicators for the classification of a project as „change“:

- The project demands the implementation of new basic regulations or new processes on the aerodrome.
- Technical systems or new infrastructure elements are implemented or changed due to the project.
- Processes and/or educational processes on the aerodrome are being changed basically due to the project.
- New entitlements or permits are necessary due to the project.
- The implementation of the project demands a change or supplement of the processes described in AIP.
- Due to the project, deviations from national or international regulations (ICAO or EASA) occur.
- The project has impact on the services of the air traffic service provider or other service providers on the aerodrome

The following projects are not classified as „change“:

- projects which have no effects on a functional system
- re-change to a former, already evaluated stage
- maintenance and service measures which are described completely within organisation-inherent rules, if they have already been safety-evaluated

- replacement of elements/parts/devices/assemblies which are compatible with the target state of the relevant functional system and which are released and taken into account regarding their implementation and effects in a safety evaluation
- measures which are part of the operative daily business and fully described in organisation-inherent operational documents (operational handbooks, operational rules etc.).

Methods of identification

The identification of hazards and related events can follow different methods. In any case, the involvement of technical experts of the relevant topics is important, depending on the planned change.

The following general methods for hazard and event identification are possible:

Brainstorming

Method of finding ideas which shall encourage the generation of new, unusual ideas in group of experts. For this, planned meetings are held under the leadership of the safety management of the civil aerodrome with experts of different technical fields. (e.g. cause-effect chain / bow-tie / event tree analysis (ETA).)

Historical

Analyse of known incidents and accidents, reports of incidents or other reports as well as results of ongoing or finished safety evaluations and safety-/risk assessments. Findings out of ongoing evaluation of finished changes and related implemented measures have to be taken into account.

Systematically

Systematically, sequential analyse of single processes or parts of processes, regarding possible sources of error. Different approaches described in literature can be chosen for this.

Identification fields

It has to be taken into account within the identification, that all fields are being analysed in course of a planned change.
The essential fields are:

- processes and procedures
- education and training
- infrastructure

Process of identification

Based on the template for identification of the planned change which has been elaborated by the aerodrome operator, the safety- and compliance management has to determine if the planned change is compliant with the certification basis of the aerodrome and furthermore, if no criterion of point 3a (term „change“) is being affected.

If the change is compliant with the certification basis and with no criterion of point changes, the planned change has to be classified as „not significant“, and the template of the civil aerodrome operator has to be filed verifiably with the assessment statement and the date.

If this is not the case, or a criterion is applicable, a safety evaluation with the Safety-, Compliance and Airside Operation Manager (or deputy) has to be done. In this course, the possible hazards and the planned measures have to be evaluated according the definitions of the risk classification within the Safety Management Manual of the aerodrome operator. If the result of the safety evaluation shows only “green” elements according a risk classification scheme, the safety evaluation is finished. The safety evaluation has to be documented and recorded for at least 5 years.

If the safety evaluation identifies any risk with a higher probability or severity as “green” according a risk classification scheme, a safety assessment has to be conducted. This change including the documentation and safety assessment has to be send to DAC prior implementation for approval, using the attached form.

Evaluation of the change

The evaluation of the planned change has to be carried out in course of a safety evaluation or a safety assessment, regarding the safety of aviation (safety management) as well as regarding the fulfilment of regulations (compliance management).
The evaluation can be done by the person responsible for the change or directly by the safety and compliance management of the civil aerodrome operator. But finally, the safety and compliance management of the civil aerodrome operator has to check and to document all evaluations.
The evaluation has to analyse the planned change and its effects of constructional, operational, technical and organisational issues, as well as persons and organisations, and has to show all identified hazard potentials. These potentials have to be evaluated regarding probability of occurrence and degree of impact.
Within this course, a balanced approach of qualitative and quantitative evaluation has to be chosen dependent on the planned change. Also, a balanced approach of estimates of technical experts and empirical data should be taken into account.

The qualitative evaluation mainly bases on estimations of probability of occurrence and degree of impact of experts, as concrete empirical data of incidents and accidents is not available, and finally can be expressed as probability of occurrence x degree of impact = risk.
The quantitative evaluation mainly bases on empirical data which are applicated to the change respectively to the identified hazards. Furthermore, these empirical data are used for a comprehensive fault analysis (e.g. fault tree analysis, bow-tie analysis) to identify also errors of subfields or subsystems and to derive appropriate measures.

Safety assessment

Safety assessments are a part respectively a possibility to evaluate and show safety relevant effects of a planned change as well as measures mitigating the probability of occurrence respectively the degree of impact in course of the general risk management.
The safety management system of the civil aerodrome operator has to elaborate and attach to the aerodrome manual a process which shows the way of implementation and extent of a safety assessment. Results of safety assessments – if applicable – have to be published within the AIP.

It has to be made sure that in this process the following points are considered:

- Definitions of the terms „accident“, „serious incident“, impacts mitigated to a level as low as reasonably practicable (ALARP)
- Presentation and definition of safety principles and -objectives of the civil aerodrome operator
- Explanation and presentation of the evaluation principles (probabilities of occurrence, impacts) and the related evaluation matrix
  It is stated here that the evaluation matrix has to be the same for all safety relevant evaluations on a civil aerodrome.
- Description of necessary involvement of persons and/or organisations
  It is stated here that a safety assessment makes only sense with the involvement of persons who are familiar with the topic. Furthermore, the group of persons has to be chosen in a way that it can be made sure that all hazards can be identified and mitigated.
- description of the object of analysis (as detailed as possible)
- description of the method of identification of hazards
- presentation of the evaluation regarding the impacts separated for human and device
- description of the classification of evaluation according to probability of occurrence and impacts following the evaluation matrix
- description of the process of mitigation of identified hazards
- presentation of acceptance of remaining risk
- description of the process regarding measures which have to be implemented
- description of form and documentation of an applied assessment
- description of the way of internal announcement of results of the assessment
- Results of a safety assessment have to be published via AIP or NOTAM.

All relevant safety assessments have to be uploaded to the provided sharepoint system and have to be evaluated during each change and additional within a regular timeframe.

Aeronautical Study

The Aeronautical Study is a method to show deviations of the SARPs of annex 14 respectively the explanations of the regulation (EU) 139/2014 and the national regulations, and to suggest alternative measures or mitigation measures to fulfill the requirements concerning guarantee of safety in aviation.

The safety management system of the civil aerodrome operator has to elaborate and attach a process to the aerodrome manual which shows the way of implementation as well as the general extent of the Aeronautical Study. It must be stated that the method and the extent of an Aeronautical Study clearly depends on the planned deviation, but the relevant study has to contain at least general points. These are, among others:

- description of the necessary involvement of persons and/or organisations
- description of the object of analysis (as detailed as possible)
- presentation of the national and/or international regulations
- presentation of the respective planned deviations
- presentation of the reasons of the need for planned deviations
- if existent, presentation and description of international examples
- implementation of a safety assessment, whereby congruent contents (description of the situation, involvement of persons) are taken over.

So the Aeronautical Study includes a comprehensive presentation of the planned deviations from national and/or international regulations and a safety evaluation.

Results of safety assessments – if applicable – have to be published within the AIP.

Process of safety assessments and Aeronautical Studies

The hazard and risk evaluation is an essential part of the safety management system of aerodromes and deals with the following points:

- identification of hazards
- risk analysis and risk evaluation
- measures for defence and control of hazards and risks and their evaluation

If no sufficient risk evaluation can be done on the level of the aerodrome, a comprehensive risk analysis and evaluation has to be carried out with the support of external technical experts, e.g. in form of an „Aeronautical Study“.
In case that for certain risks no decision can be made regarding their tolerability on the technical level, the management board has to be involved.

Mitigation of hazards

To mitigate or exclude inacceptable risks, possibilities of control and defence have to be established.

Risk minimizing measures:

- substitute (eliminate)
- technical measures
- organisational measures
- personal protection measures

In case of deviations from existing processes, the hazard is prevented by recovery of the defined target. If the identified hazard comes from an existing process, it has to be adapted to prevent the hazard (change management).

In case of hazards which cannot be related to an existing process, an appropriate process has to be elaborated for defence. Independent from existing or not existing processes, in case of danger ahead everything has to be done to sustain a safe aerodrome operation.
The defined measures have to be documented in processes.
The safety manager checks the compliance with of the defined control and defence possibilities, identifies deviations and directs corrections. If there is no possibility of minimizing a risk, it has to be decided if the identified risk can or has to be accepted. If necessary, the decision has to be made by the management.

Process of a safety assessment:

- composition of the group of technical experts
- description of the process to be analysed and its operational environment
- registration and assessment of the valid legal regulations and standards
- determination of possible impacts
- identification of hazards
- classification of identified hazards according to probability and consequence
- risk evaluation following the matrix
- development of countermeasures (mitigating measures)
- determination of responsibilities for countermeasures (mitigating measures)
- renewed classification according to probability of occurrence
- authorisation- respectively announcement obligations
- development of control mechanisms
- documentation

Presentation of a safety assessment:

A consistent presentation of safety assessments on a civil aerodrome should be given according to the SMS handbook.
The presentation should show clearly the results of the implemented safety assessment and contain all mitigations, persons responsible for mitigations and all necessary documents (e.g. changes in processes, new processes etc.).

Example:

N°	GEFAHR	AUSWIRKUNG	Schadensausmaß	Eintrittswahrscheinlichkeit		Akzepanz vor Mitigation	Mitigationen	Verantwortlicher für Mitigation	Dokumente	Eintrittswahrscheinlichkeit	Akzepanz nachMitigation	Ergebnis
1	Obstacle clearance on wingtip less than 7,5 meters during taxiing towards aircraft stand of aircraft on own power	Collision with adjacent aircraft	B	3	3B	Tolerable	All inbound aircraft are guided by a follow me vehicle. Marshalling is always done for inbound aircraft. Stop bar available for aircraft			2	2B	
2	Bearing strength of apron surface. ACN of aircraft too high for PCN on aircraft stands	Possible damage of apron surface, incident with parked aircraft	C	3	3C	Tolerable	Aircraft parked on positions are not loaded. PCN measurements have been conducted			2	2C	
3	Aircraft wing positioned over service road on the apron.	Possible collision with aircraft	B	3	3B	Tolerable	Adjacent service roads will be closed when aircraft is positioned on stand			2	2B	
4	Other obstacle clearances (equipment)	Collision with obstacle	B	3	3B	Tolerable	Ground Service Equipment is not stored on the parking positions. Aircraft stands are empty when aircraft arrives			2	2B	
5	Jet blasts inbound / outbound aircraft	Risks for vehicles and persons	C	2	2C	Tolerable	Aircraft is guided from taxiway directly onto parking positions (entry L6, L7, L8, L9 or L10). Vehicles may not cross and shall wait at stop signs. Pedestrians are not allowed on the internal road			1	1C	
6	Movement of handling vehicles on apron service roads	Collision with adjacent aircraft Collision with vehicles	B	3	3B	Tolerable	Handling vehicles will use the service roads / internal road available in order to move towards / leave the aircraft			2	2B	
7	Moving of handling vehicles	Increased traffic on internal road	D	3	3D	Tolerable	Installation of alternative internal road			2	2E	

Furthermore, the safety assessments have to be filled in the provided sharepoint system in point „Safety Assessment“ and checked regarding currency in course of the necessary periodic evaluation by the aerodrome operator. This evaluation has to be documented in the sharepoint system.

9.5 Low-visibility procedure

Aircraft operations at aerodromes during reduced visibility or low cloud conditions present additional hazards to aircraft and to other aerodrome users. As visibility reduces, the ability of ATC, pilots, vehicle drivers and other personnel to identify hazards and to take remedial action in a timely manner becomes limited. In conditions of low cloud, the time available for the pilot of an approaching aircraft to visually assess the aerodrome environment is reduced.

Low Visibility Operations is a general term used for airside operations in conditions of reduced visibility and consists of low visibility safeguarding and low visibility procedures.

Low visibility procedures are the actions carried out by ATC and the aerodrome operator in respect of aircraft operations and vehicle movements. This may include restricted access to the manoeuvring area, the protection of the ILS critical and sensitive areas and a reduced aircraft movement rate.

The point at which Low visibility procedures are implemented will and will depend on local conditions and facilities available. However, a period of time is required to prepare the aerodrome and, in particular, the manoeuvring area, in readiness for Low visibility procedures.

The safeguarding measures must ensure that at the point when Low visibility procedures are declared to be in force, all actions to protect aircraft operations have been put in place.

Procedures at which stage (RVR values) safeguarding should be initiated including all procedures (withdrawal of vehicles, cease of work in progress, suspensions of maintenance work, eg.) shall be clearly defined.

The aerodrome operator, in conjunction with ATC, should develop actions that ensure that, in good time prior to the introduction of Low visibility procedures, all airlines and other organisations with manoeuvring area access are notified. This is particularly important where companies exercise control over their own apron areas and maintenance facilities adjacent to the manoeuvring area.

Particular attention should be given to the protection of the runway and radio navigational aids. Access to the manoeuvring area should be restricted to essential operational safety vehicles and personnel.

Low visibility procedures shall be suitable for the lowest RVR limit possible.

Additional within the Low Visibility Operations procedures, all operational issues on the airside (aircraft operations and vehicle movements) shall be considered including the necessary equipment on the infrastructure (lights, markings, eg.). The movement rate of aircrafts during Low Visibility Operations shall also be well defined in accordance to the existing infrastructure. For these, all necessary items of an SMGCS and/or A-SMGCS shall be considered, if there is a need for items during the Low Visibility Operations.

9.6 Monitoring and inspection of movement areas

Aerodrome pavements to runways, taxiways and aprons are critical to ensure that hazards to aircraft are minimised and to the safe, efficient and economic operation of an aerodrome. As such they represent a significant capital investment that must be preserved in a suitable condition for the particular demands of aircraft operations.

Aerodrome pavements are complex structural systems and their performance depends on a large number of variables relating to the unique mix of aircraft operations, pavement materials and environmental conditions at each aerodrome. As with all aerodrome assets, the most effective means of preserving these pavements in a suitable condition is to implement appropriate inspection and maintenance procedures.

The Aerodrome operator should be aware of the importance of timely and disciplined core runway inspections and have suitable procedures to ensure that such inspections are undertaken effectively. Regular inspections should be planned so as to ensure that an appropriate level of vigilance is maintained at all times. These will also improve the level of understanding of the changes under local conditions and allow for maintenance activities to be proactive. The inspections should address the following related items:

- Inspection of the runway surface condition, including water drainage
- characteristics;
- FOD detection and removal;
- Aeronautical ground lighting fittings within the pavement including the structural integrity of the fittings;
- Signage, markings and other visual aids;
- Cleared and graded areas;
- Wildlife control and the removal of remains.

A runway inspection involves the deliberate entry of an active runway. It is therefore essential that any hazards associated with this activity are identified and addressed so that each agency with an inspection duty has a clear understanding of what is involved and how the task is carried out safely.
All personnel with a task that involves entering a runway should clearly understand their responsibilities and the identified hazards. This training should be recorded and a system of review should be established so that new hazards can be identified and new training needs satisfied.
The aerodrome operator should ensure that the development and use of runway inspection procedures are addressed in the safety management system employed at the aerodrome.

Detailed Pavement Inspection and Evaluation

The inspection procedures above address the functional condition of the surface of the aerodrome pavement but do not consider the structural condition of the pavement construction as a whole. In order to monitor the change in the condition of aerodrome pavements over time, it is recommended that the aerodrome operator in cooperation with PCH establish a formal index to define pavement condition.
The pavement structure has a limited operational life that will be related in part to the declared Pavement Classification Number (PCN). The aerodrome should review declared PCN values in the light of the functional condition.

A detailed pavement inspection of functional condition should normally be undertaken every 6-12 months and a detailed pavement structural evaluation every 5-10 years. However, the frequency will depend on the age, condition and usage of each area.

The regular inspection and evaluation of aerodrome pavements can be the first step in establishing a formal management system that will provide significant advantages to aerodromes by improving the ability to predict, plan and budget for future maintenance work.

Documentation

All aerodrome inspections and evaluations, maintenance activities and matters arising from such should be formally documented by the aerodrome operator within the aerodrome manual and all necessary records maintained for future reference.
Each inspection or evaluation shall include a reporting mechanism to ensure that appropriate action is taken. Reports should include details of the task(s); any remedial action(s) necessary or taken; should identify the person/agency responsible for undertaking the task and/or further action; and should identify the timescale by which it should be completed.

Procedures for monitoring and inspection of movement areas shall clearly define the working programmes for daily, weekly, annual and optional Inspections. Also the content of these inspections (pavement, visual aids, shoulders, strip, runway end safety area, drainage system, eg.) shall be in cooperated.

9.7 Pavement classification number

During the initial certification, the actual PCN values of the movement areas shall be determined accordingly. DAC recommends for determination of PCN values for movement areas following international methods:

FAA - Federal Aviation Administration

Advisory circular AC No: 150/5320-6E in combination with
Advisory circular AC 150/5335-5C and the COMFAA – Software
Dated 2009 and 2014 and available for free

Arbeitsgemeinschaft Deutscher Verkehrsflughäfen

„Ermittlung der Pavement Classification Number – PCN – von Flugbetriebsflächen“ dated 1981 – available from DAC – if necessary.

The determination must be documented conclusive and traceable and, if there is another understanding of determination, comparable to the mentioned methods above.

After the initial visit, the method described under chapter “Detailed Pavement Inspection and Evaluation” shall be established on the aerodrome. During the evaluation of a pavement and reviewing the PCN, the method to determine the PCN shall be documented.

9.8 Aerodrome works

Wherever works affecting operational areas is planned, the aerodrome operator must be satisfied that unacceptable risks generated by these works have been identified and removed, and that procedures are provided and followed which ensure no adverse impact upon levels of safety.

Part of effective safety management in connection with works lies in timely and comprehensive planning, conducted in consultation with all involved parties, including ATC and users. The aims of such consultation should be the identification of all those measures necessary for the work to be undertaken safely and the early notification to all who need to know of resulting operational changes.

Procedures for the control of works should include any or all of the following tasks including responsibilities (this list is not exhaustive):

- Works permit procedures;
- Relevant safety procedures;
- Restrictions during low visibility conditions;
- R/T communications;
- Staff briefing;
- Site marking, by day or night, or in low visibility;
- Hot works where relevant;
- Aerodrome operating procedures during the works;
- Emergency procedures;
- Supervisory and contact information;
- Plans and diagram
- Aeronautical publications (AIP, AIC, AIP-SUP or NOTAM)

The aerodrome operator shall put in place measures to monitor the safety of the aerodrome and aircraft operations during permitted works such that timely corrective action is taken when necessary to assure continued safe operations.

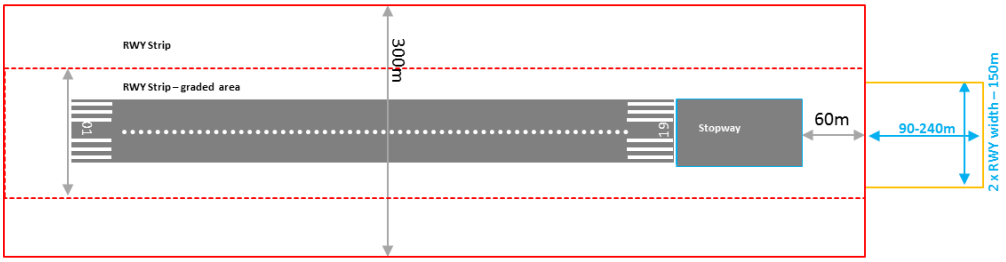
For major works on the runway or within the runway strip (including runway end safety area), if necessary including a reduced runway length operation, DAC shall be consulted at least 6 months before the works starts.

9.9 Infrastructure items

Infrastructure elements shall be explained for initial certification including necessary compliance checks and evidences.

9.9.1 Runway end safety area

Dimensions of a runway end safety area for an ICAO/EASA Code 4 airport:



Runway strip:

Runway strip length:	**60m** beyond end of runway
Runway strip width:	**140m** each side of the runway centre line
Graded portion of strip:	**75m** each side of the runway centre line

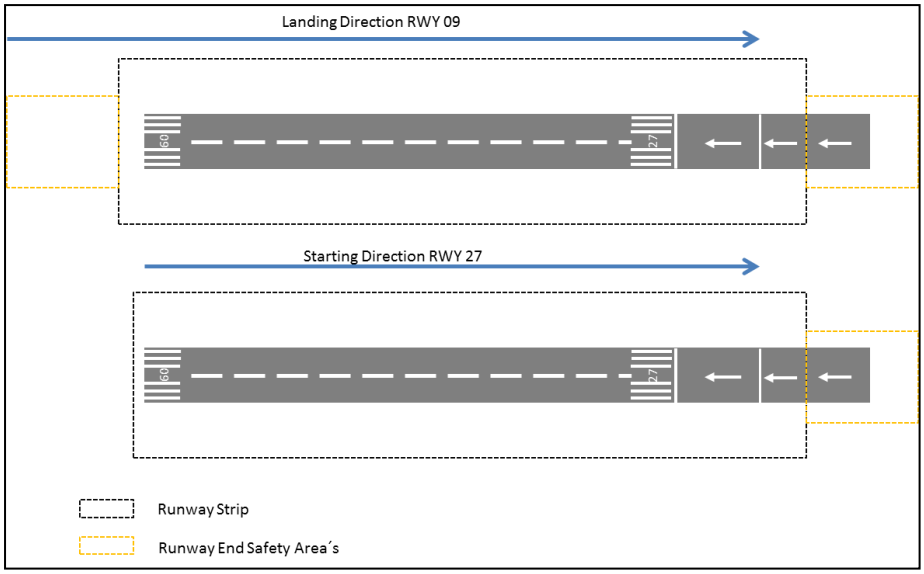
Runway end safety area:

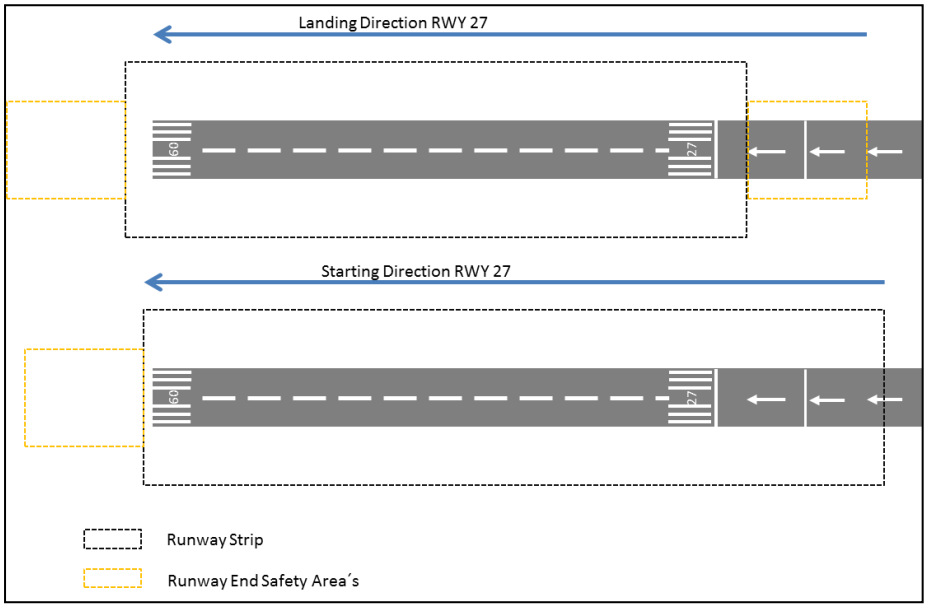
Runway end safety area length:	minimum **90m** beyond runway strip
Runway end safety area length recommendation (where practicable)	**240m** beyond runway strip
Runway end safety area width:	**2 x RWY width**
Runway end safety area width recommendation:	**75m** each side of the runway centerline

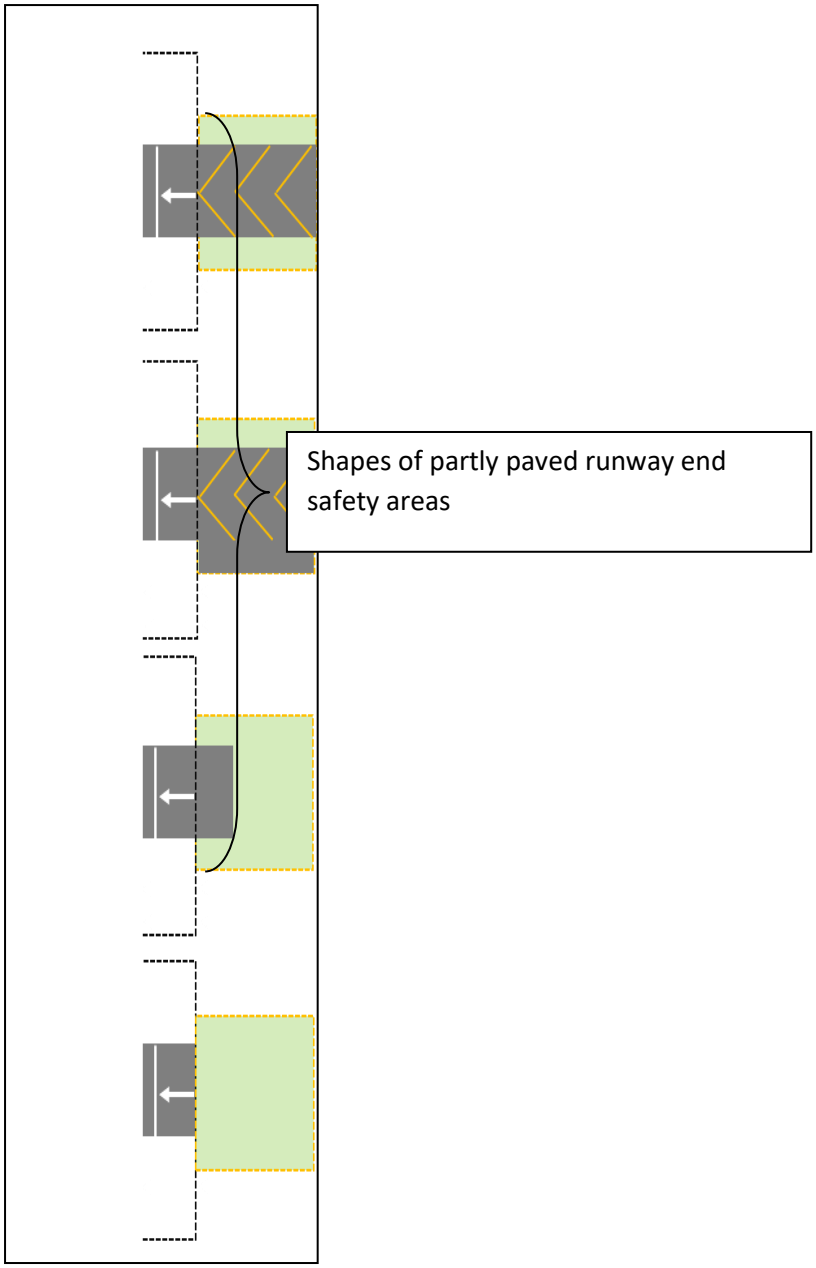
The following two drawings show the locations of the runway end safety area and the runway strip for each direction of a runway. For a specific runway, all the different positions of the runway end safety areas must be combined to find out the two mostly demanding runway end safety areas for the airport to provide these safety areas in an event of an overrun or an undershoot of an aircraft.

If, as shown in the pictures, a displaced threshold is provided, normally a runway end safety area for undershoot with a partly paved surface (part of the runway) with the width of the runway (plus paved shoulders if provided) is available.

For the take-off run, a runway strip at the beginning of the take-off run with a safety margin of ½ wingspan plus additional 4,5m is needed. A runway end safety area at the beginning of the take-off run is not necessary. At the end of the take-off run, on the other end of the runway in use, a runway strip and a runway end safety area is needed (see picture below) and cannot be used for the take-off run. This is necessary for airports with short runways to improve the distances for take-off (TORA; TODA; ASDA). The standard of a shorter runway strip at the beginning of the rake-off run is set out within CAP 168 Figure 3.2 by CAA UK.


Landing Direction RWY 09
09
27
Starting Direction RWY 27
09
27
Runway Strip
Runway End Safety Area´s


Landing Direction RWY 27
09
27
Starting Direction RWY 27
09
27
Runway Strip
Runway End Safety Area´s



Shapes of partly paved runway end safety areas

A fully paved runway end safety area is not shown in the pictures above.

Runway veer-off statistics show that a veer-off at the end of the runway occurs along or near the runway centerline in more than 90 percent. To provide a paved area within the runway end safety area, an area with a width of the runway (plus paved shoulders if provided) is enough to protect an aircraft in an event of overrun.

The **main facts** of a runway end safety area:

- Different shaping
- normally consisting of two different surfaces
- The use of a runway end safety area at the beginning of the rake-off run is possible
- On short runways, a paved area with the width of the runway is provided to improve the distances for take-off (TORA; TODA; ASDA) and the level of safety

- Fully paved runway end safety areas have no benefit to improve level of safety
- Runway veer-off at the end of the runway along or near the runway centerline

After discussing the general requirements of ICAO and the European Commission (EASA) to runway end safety areas and showing some examples, the question remains open which runway end safety area (length, width, surface or EMAS) is adequate for a special airport.

It is not possible to find a general definition for dimensions and surfaces of runway end safety areas which will fit for each airport. Each airport is unique with its infrastructure, obstacles in the surrounding, the specific weather situations and the spread in mix of aircrafts using the airport. This uniqueness of an airport has to be considered in shaping the runway end safety areas.

Within the definitions of ICAO and EASA, the main issues of a runway end safety area are to provide adequate areas with more or less no irregularities and a surface which does not have a negative impact on the airplane which using this area.

The term "*enhance aeroplane deceleration*" which is found in the EASA guidance material does not mean that this can only be achieved by a natural ground surface, in which the tire of an aircraft sink in. This term also includes that the surface within the runway end safety area provides adequate steering and breaking friction on a paved surface. A combination of paved and unpaved areas within a runway end safety area is also an option, if both surfaces fulfill their functions. Both surfaces have their own pros (unpaved: natural deceleration; paved: steering and breaking action and no hazard to aircraft) and cons (unpaved: strength of surface under all conditions; paved: friction within winter period).

To find out the adequate dimensions and surfaces of a runway end safety area for an airport, the following minimum consideration should be done to achieve an adequate level of safety on the airport:

Information on Engineered Materials Arresting Systems (EMAS) for Aircraft Overruns

An EMAS option will not be preferred by DAC. The following information are given to highlight the pros and cons of an EMAS system.

Engineered Materials Arresting Systems was designed to stop aircrafts in an event of overrun within a shorter distance than the recommended length of ICAO. Some international airports which cannot provide the sufficient dimensions of a runway end safety area due to infrastructure or terrain reasons, construct an EMAS to provide an alternative level of safety.

Within the design process of an EMAS for an airport, many different criteria (Design Aircraft, MTOW, landing gear configuration, tire pressure etc.) have to be considered.

EASA explained within Commission Regulation (EU) No. 139/2014 that the basic design specifications of FAA (AC 150/5220-22B) can also be used within Europe.

Within this FAA planning guidance material a set of difficult parameters is set out:

- Not suitable for aircrafts with less than MTOW of 11.4 to
- Find adequate design aircraft for the airport

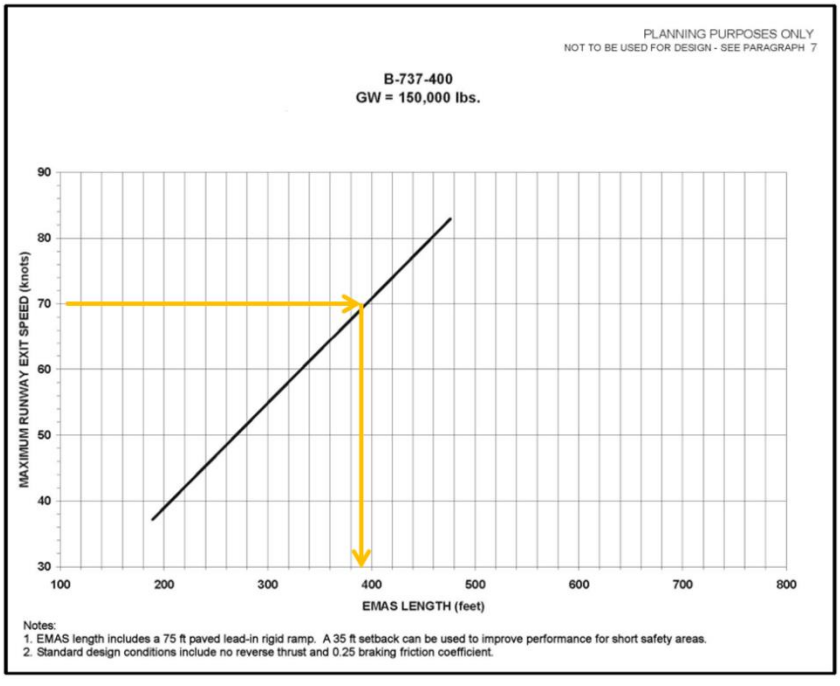
- Determining runway exit speed

For aircrafts with an MTOW of less than 11.400kg (25.000lbs), the EMAS is not suitable. For these aircrafts, the EMAS with its structure is more or less a longer paved surface at the end of the runway.

Each airport has a different mix of aircrafts using the airport. A design of an EMAS has to consider this. For the structure of the EMAS, the most demanding aircraft out of the mix of aircrafts has to be defined. Normally, due to the wide spread of aircrafts on an airport, the design of an EMAS is based on a fictitious aircraft which is representative for the aircraft mix on this airport.

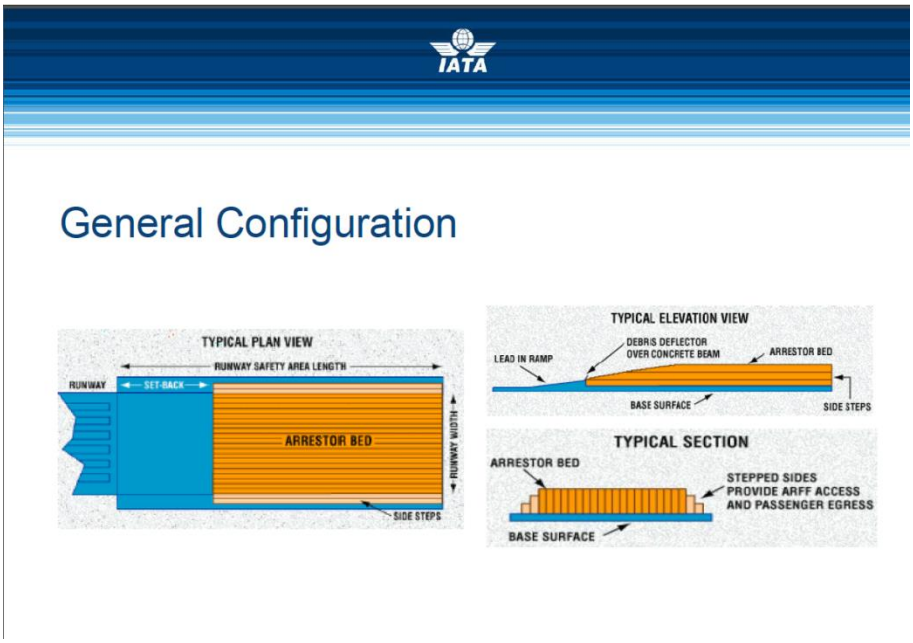
FAA explained that 90% of aircrafts performing an overrun leave the runway with an exit speed of around 70 knots. As a consequence, the FAA guidance material (AC 150/5220-22B) explains that an EMAS should be designed for runway exit speeds between 40 and 70knots. A reduction of runway exit speed reduces the ratio of effective coverage of overruns. The runway exit speed directly influences the overall length of the EMAS, as shown in the following picture.

For undershoots, an EMAS should provide adequate protection for aircrafts that touch down in front of the runway threshold.



Origin: (AC 150/5220-22B) – Example B737-400 with runway exit speed of 70 knots = EMAS length 395 ft

The FAA guidance material (AC 150/5220-22B) states, that the width of the EMAS System should cover the same width as the relevant runway. IATA shows an EMAS in the following picture.



Origin: IATA Presentation

As outlined, ICAO and the European Commission explained that an EMAS can reduce the length of a runway end safety area, but there is no statement to reduce also the width. So, in addition to an EMAS there has to be sufficient space on each side of the system to fulfill the ICAO and EASA standards and recommendations. In these cases, a total runway end safety area consists of an EMAS with sufficient calculated length and other areas on each side of this system.

Origin: IATA Presentation - EMAS System KSFO

Aeronautical Information Publication (AIP) - examples:

San Francisco - KSFO

ENGINEERED MATERIALS ARRESTING SYSTEM (EMAS) 373 FT IN LENGTH BY 227 FT IN WIDTH LCTD AT THE DER 19L.

John F. Kennedy International Airport- KJFK

EMAS NON-STD ARRESTING GEAR/SYTEM: ENGINEERED MATERIALS ARRESTING SYSTEM (EMAS) 405 FT IN LENGTH BY 227 FT WIDTH LCTD AT DER 22L

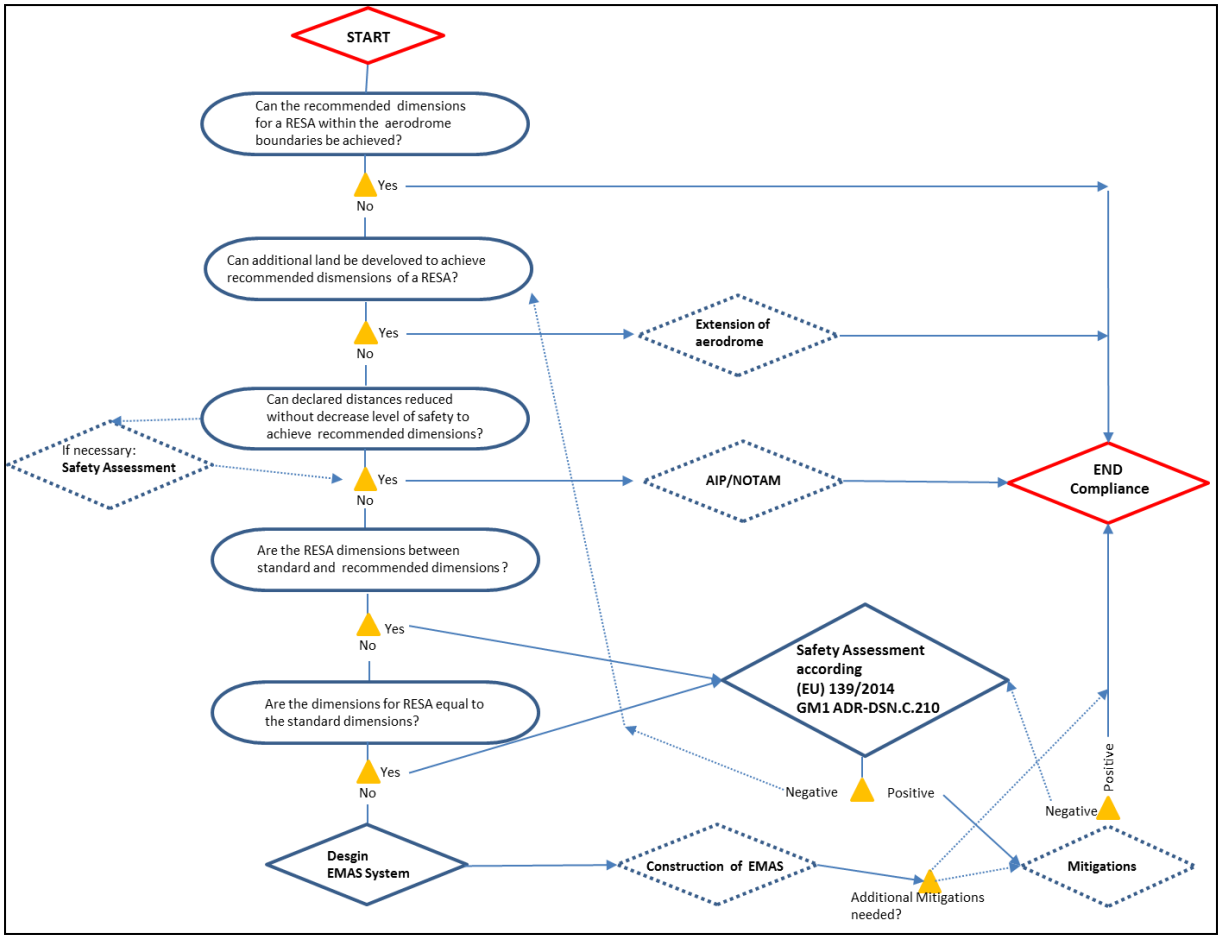
These examples show that the width of an EMAS is equal to the runway width, and that also non-standard EMAS are provided. As explained within the FAA guidance material (AC 150/5220-22B), only a standard EMAS can provide an adequate level of safety comparable to the standard dimensions of a runway end safety area.

The **main facts** of an EMAS:

- Achieve an adequate level of safety, where no land development or a reduction in declared distances is possible
- Not suitable for aircrafts with less than 11.4 to MTOW
- Find adequate design aircraft for the airport
- Determining runway exit speed
- Fulfill not the width of a runway end safety area – additional area should be provided
- After an overrun, maintenance work is needed – for this time, decrease in level of safety (mitigations are needed)
- No length-advantage compared with a RESA for undershoot design
- Higher ordinary maintenance is required

Runway end safety area length assessment

The situation of all Runway end safety areas on the aerodrome must be assessed as follows:

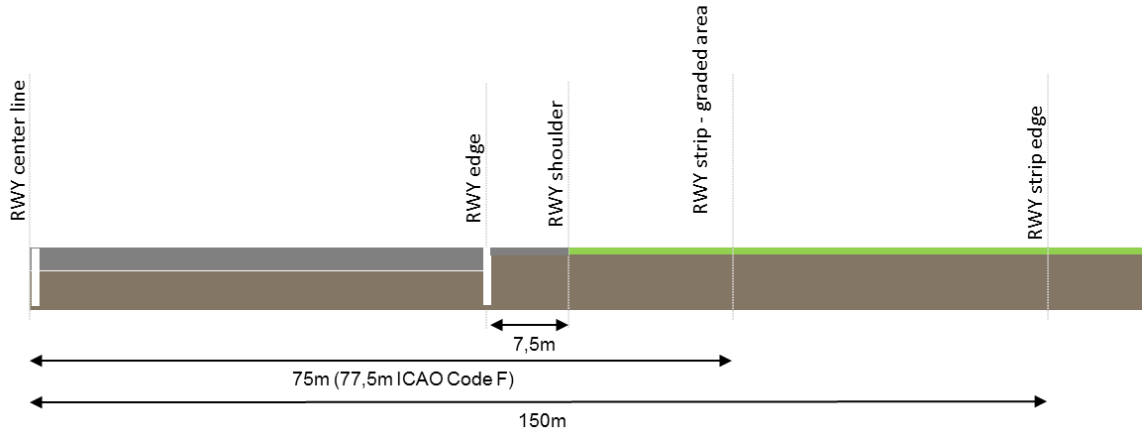


General Note to runway end safety areas:

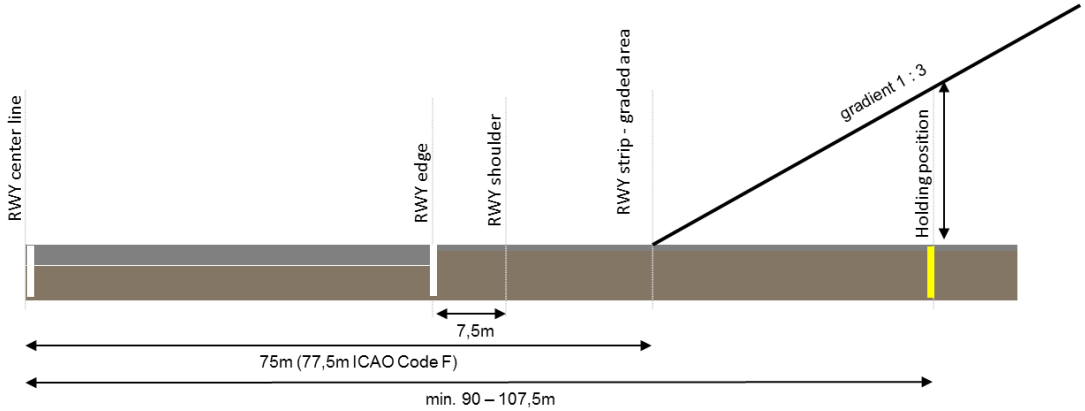
Any safety area (runway strip and runway end safety area) or EMAS can only provide a level of safety if an aircraft is forced to use it. Under normal flying conditions, an aircraft should take-off and land on the available runway. No safety area or designed EMAS can decrease the outcome of every aircraft veering off the runway near to zero. All standards and recommended practices for safety areas and all guidelines to design an EMAS are developed - based on many international accidents - to provide as much safety as possible to an aircraft using these areas. However, not all circumstances (pilot errors, malfunctions etc.) of an aircraft veering off a runway can be calculated in advance. There is always a residual risk which cannot be calculated.

9.9.2 Runway strip

Dimensions of the runway strip on a Code 4 aerodrome.

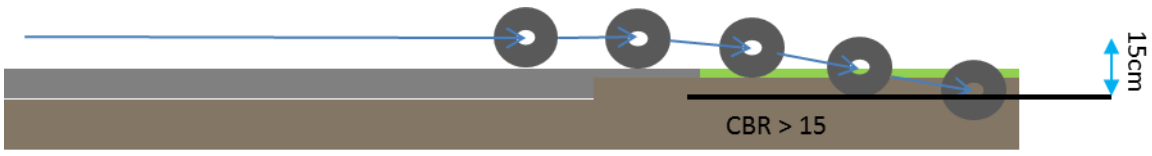


No fixed object, except mandatory navigation aids, shall be within and new object shall not be permitted within the runway strip.



The obstacle free zone (OFZ) – gradient 1:3 – shall be free of temporary and fixed objects during CAT II / III operation on the runway. The graded area of the runway strip must be constructed, as followed:

"Since the graded portion of a strip is provided to minimize the hazard to an aircraft running off the runway, it should be graded in such a manner as to prevent the collapse of the nose landing gear of the aircraft. The surface should be prepared in such a manner as to provide drag to an aircraft and below the surface, it should have sufficient bearing strength to avoid damage to the aircraft."



The proposal from many Civil Aviation Authorities to supplement the guidance material with the sentence that this sustainability should be adequate and measured under dry conditions is I discussion. FAA and Transport Canada already recommend this method to their airports within their technical guidelines. DAC recommends the method of FAA and Transport Canada. An adequate test including a report shall be provided within the initial certification.

All objects below the surface including parts of taxiways or roads within the graded portion of the runway strip and the runway end safety area shall be chamfered to minimize the hazard to aircrafts running of the runway. Chamfering shall be made with a gradient between 1:10 and 1:4 (not exceeding these values) down to a depth of at least minus 30cm.

9.9.3 Visual aids

Markings

Markings of movement areas shall be accordance regulation (EU) 139/2014 and Annex 14. Additional markings, which are not mentioned within these regulations, shall be according the ACI Handbook for Signs and markings (Second Edition). This Handbook is available at DAC.

For the initial certification the movement areas of an aerodrome shall be assessed by the local safety teams (Runway safety team and apron safety team). Within this assessment all existing and necessary mandatory markings shall be checked against the above mentioned standards.
Additional the movement areas shall be assessed regarding the need for information markings. If there is a need of an information marking, this marking shall be according the mentioned standards.
The whole assessment shall be documented including maps, which shows all assessed markings.
A procedure for new or additional markings according this chapter shall be created an attached to the aerodrome manual. An additional procedure for the maintenance of markings shall be attached to the aerodrome manual.

Lights

For the initial certification in-field measurement of the intensity, beam spread and orientation of all existing lights (Approach lights of all categories, all runway lights, stopbar lights and taxiway centre line lights) shall be undertaken and documented accordingly. A procedure for the maintenance of lights shall be attached to the aerodrome manual.

Backlit signs

For the initial certification all existing backlit signs shall be checked against CS ADR-DSN.N.775.
Within this check all existing and necessary mandatory signs shall be checked against the mentioned standard.

Additional, information signs shall be assessed by the local safety teams (Runway safety team and apron safety team).
Additional the movement areas shall be assessed regarding the need for information signs. If there is a need of an information sign, this sign shall be according the mentioned standard.

The whole checks and assessments shall be documented.
A procedure for new or additional signs according this chapter shall be created an attached to the aerodrome manual. An additional procedure for the maintenance of signs shall be attached to the aerodrome manual.

9.9.4 Apron and Apron stand

Taxilane (TL)
A Taxilane (TL) is part of an apron, which is used by aircrafts to taxi to and from aircraft stands to taxiways. All existing taxilanes shall be checked against CS ADR-DSN.D.245, CS ADR-DSN.D.250, CS ADR-DSN.D.255 and CS ADR-DSN.D.260. The whole checks shall be documented.
Additional, the situation on and adjacent to taxilanes in relation to push-back procedures, jet blast, equipment parking areas and roads on the apron (including taxilane crossings) shall be assessed by the local apron safety team. This assessment should include or should be included within the marking assessment mentioned under 10.8.3 (visual aids). However, within this assessment all road markings shall also be assessed.
The whole checks and assessments shall be documented. A procedure for new or additional markings according this chapter shall be created an attached to the aerodrome manual.
During winter operation, procedures shall be attached to the aerodrome manual, for snow clearance of the taxilane centre line marking and lights for safe operation of aircrafts.

Size of Apron stands
All apron stands shall be checked against CS ADR-DSN.E.355, CS ADR-DSN.E.360 and CS ADR-DSN.E.365. Additional adequate procedures for the accommodation of aircrafts on apron stands depending on the size of the apron stand shall be attached to the aerodrome manual.

Push back procedures
For the initial certification all push back procedures shall be attached to the aerodrome manual. For assessing the push back procedures, see chapter 10.8.4 taxilanes (TL).

Marking of Aprons

Markings an aprons shall be uniformly on the whole aerodrome. DAC recommends for markings on aprons (except markings mentioned within the regulation (EU) 139/2014 or Annex 14) the use of the ACI Handbook for Signs and markings (Third Edition). This Handbook is available on ACI's website for acquisition or can be consulted at DAC's. Markings on the apron shall be assessed by the local apron safety team. The whole assessments shall be documented. During winter operation, procedures shall be attached to the aerodrome manual, for snow clearance of relevant markings for safe operation of aircrafts.

Apron floodlight

For the initial certification all apron stands on aprons with ground handling shall be measured according CS ADR-DSN.M.750. DAC shall be consulted for the measurement and the measurement grid.
The whole checks shall be documented.
On apron stands without the required illumination according CS ADR-DSN.M.750, ground handling is not permitted.

9.9.5 New aircraft type operation

The aircraft industry constantly develops new aircrafts types or implements changes to existing types (Span, length, gear geometry, eg.). New or substantially modified aircraft types may cause new or additional requirements to the existing infrastructure. Following items (this list is not exhaustive) therefore shall be considered within procedures:

- Aircraft classification number
- Taxiway width and taxiway curves
- Electrical interferences with navigation aids
- Location and height of mandatory and information signs
- Taxiway and taxilane separation distance
- Size of apron stands
- Push-back procedures
- Blast areas
- Markings
- Ground handling procedures
- Procedures for RFF services

Within these procedures, responsibilities shall be clearly defined, that aircrafts operating or planning to operate on the aerodrome are checked according this chapter.

9.9.6 Qualification and Training

Only if the aerodrome operator and all companies working on the airside have sufficient qualified personnel, all procedures of the aerodrome manual can be fully and safely implemented. Qualifications can be either brought by the employees or with the appropriate training. Training consists of classroom elements and also sufficient practical exercises.
Adequate training programmes and plans including basic and recurrent training and a system for an internal oversight of the implementation of these programmes (including the need of recurrent training) and plans shall be created and attached to the aerodrome manual. Additional it is necessary, that for each person, the successfully completed training is adequate documented.

These procedures shall also explain, the internal enforcement measures, if unsuccessfully training or a lack of training is identified.
If there is another understanding of training programmes and plans, these programmes and plans and also the documentation must be comparable to the mentioned documents above.

10.Appendix

1. Application for initial certification form
2. First version of Certification Base
3. Application for amendment to Certification base
4. Application for a change with prior approval