ICAO Provisions related to Aerodrome Certification

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Aerodrome Certification Workshop

Tirana, Albania | 15-17 January 2019
What is Aerodrome Certification?

- A process of assessing the capability of a certified aerodrome to provide safe and adequate facilities and services to the end users.

- A measure of evaluating the competence of the aerodrome operator to meet the obligations under the applicable rules and regulations.
Why should an aerodrome be certified?

- An obligation of the State safety regulator to comply with the international requirements in ICAO Annex 14, Volume I.
- A responsibility of the Government to provide safe, secure and efficient air travel facilities to its citizens.
- Also a requirement under the national civil aviation regulations.
What is Safety?

Safety is defined by ICAO as:

- "The state in which the risk of harm to persons or property damage is reduced to, maintained at or below, an acceptable level."

How safe is aviation?

Why emphasis on safety?

- Minimise exposure to risks; manage them before the identified hazards lead to serious consequences.
Aerodrome Certification! Safety First!
Aerodrome Certification! Safety First!
Aerodrome Certification!

- Be aware of the fact that the licensing/certification action is to permit operations; does not absolve operator's safety responsibility in any way

- A DGCA/CAA assessment is based on agreement reached and assurances received about safety – a snapshot!

- Public awareness of safety and performance efficiency; Legal liability issues & culpability

- Therefore, aerodrome operational safety assurance through aerodrome certification is essential.

- Due diligence and objectivity are key factors.
Safety and Safety Assurance

What is aerodrome Operational Safety Assurance?

- Ensuring that all facilities, services and equipment at an aerodrome are functioning as designed and continue to provide the same level of safety as originally intended and as needed currently by the air traffic using that aerodrome.
Safety Assurance, Monitoring and Oversight

- Safety Oversight
  - Positive way of managing safety of aircraft operations at aerodromes
  - Responsibility of the State aviation regulator
  - Also the primary duty and responsibility of the airport operator (as well as other aviation service providers)

- Aerodrome inspectors and aerodrome operator’s personnel must have:
  - Complete knowledge of the applicable rules and regulations in the latest edition of ICAO Annex 14, Vol. I on planning, design and operations of aerodromes
  - Comprehensive knowledge of aerodrome certification requirements
Preamble to the Chicago Convention (1944):

THEREFORE, the undersigned governments have agreed on certain principles and arrangements in order that international civil aviation may be developed in a safe and orderly manner and that international air transport services may be established on the basis of equality of opportunity and operated soundly and economically;

Have accordingly concluded this Convention to that end."
A look at the three relevant Articles of the Chicago Convention on International Civil Aviation

**Convention on International Civil Aviation**

**Article 28 –**
States Obligations:
States undertake to provide airports...in accordance with international specifications for global harmonization;

**Article 37-**
States Obligations:
States undertake to adopt international SARPs & procedures developed by ICAO to secure the highest practicable degree of uniformity in regulations, Standards and Procedures.

**Article 44 –**
ICAO Mandate & Objectives
Safe & orderly growth of international civil aviation;
Develop airways, Airports & Air Navigation facilities;
Safe, efficient and economical Air Transport system
Article 38 of the Chicago Convention

- “Any State which finds it impracticable to comply in all respects with any such international standard or procedure to bring its own regulations or practices into full accord with any international standard or procedure……shall give immediate notification to the International Civil Aviation Organization of such differences….. shall make immediate notification to all other States” of these differences.

- Differences will be published as Supplements to the Annex.
ICAO treaty consists of
- 96 articles
- 19 annexes

ICAO determined homogenous standards for 19 subject areas

Publication in form of annexes

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ICAO Annexes

Contents of the annexes:

- Standards and Recommended Practices - **SARPs**
- **Appendices** – part of SARPS
- **Definitions** of terms
- **Tables and figures**, completing and illustrating the SARPs
  - if reference is made to them, they are part of standard or recommended practices and have the same status
- **Miscellaneous**
  - **Forewords** – historical and explanatory material
  - Introduction of parts, chapters or sections of the annex with explanations to assist in the understanding of the application of the text
  - **Notes**, included in the text, where appropriate
    - factual information or references for SARPS
    - not part of SARPS
  - **Attachments** – contain supplementary material to SARPs
ICAO Annexes

- Important deliverables: **SARPS**
  - **Standards**: directives, binding for all member states
  - **Recommended practices**: desirable recommendations of ICAO
  - **Example**:

3.5.5 The width of a runway end safety area shall be at least twice that of the associated runway.

3.5.6 **Recommendation.**— The width of a runway end safety area should, wherever practicable, be equal to that of the graded portion of the associated runway strip.
ICAO Annexes

Standard

Any specification for physical characteristics, configuration, material, performance, personnel or procedure, the uniform application of which is recognized as necessary for the safety and regularity of international air navigation and to which contracting states will confirm in accordance with the convention; in the event of impossibility of compliance, notification to the council is compulsory under article 38.
ICAO Annexes

Recommendation

Any specification for physical characteristics, configuration, material, performance, personnel or procedure, the uniform application of which is recognized as desirable for the safety and regularity of international air navigation and to which contracting states will endeavour to confirm in accordance with the convention.
ICAO Annexes

Measures of contracting states (art.38 of Chicago convention)
- Obligation to report deviations from standards
- Request for report deviations from recommendations
- Obligation to publish information affecting operation of aircraft

ICAO does not have jurisdiction! :
- ICAO rules
  - Do not apply directly
  - Must be implemented in national legislation
Annex 14 « Aerodromes » to « The Convention on International Civil Aviation »

- Vol I : Aerodrome Design and Operations
- Relevant for design, dimensioning and aerodrome layout
- Comprising most important specifications for new construction, design, expansion and aerodrome operations
An Overview of ICAO Annex 14

- Uniform, standardized set of international specifications on airport design and operations

- Global harmonization for interoperability

- Intended to lead to uniform levels of safety

- ICAO safety initiatives & efforts in this regard

- Need to improve current safety levels to retain public confidence and expectations

- Aviation safety – definition, current levels in terms of accident rates & traffic growth
Annex 14

- Chapter 1: General
- Chapter 2: Aerodrome Data
- Chapter 3: Physical Characteristics
- Chapter 4: Obstacle Restriction and Removal
- Chapter 5: Visual Aids for Navigation
- Chapter 6: Visual Aids for denoting obstacles
- Chapter 7: Visual Aids for denoting restricted, Unusable Areas
- Chapter 8: Electrical systems
- Chapter 9: Emergency Services Equipment and Installations
- Chapter 10: Aerodrome Maintenance
Annex 14: Chapter 1 - General

- Provides general guidance on the document content including:
  - Definitions
  - Applicability of specifications
  - Common Reference systems to be used
  - Certification of aerodromes
  - Safety management
  - Airport Design
  - Aerodrome reference codes - importance & flexibility of using them
Annex 14: Chapter 2 - Aerodrome Data

- Specifies the need for measuring, monitoring and reporting data related to facilities, services and equipment at an aerodrome:

  - Aeronautical Data – quality, accuracy and integrity
  - Aerodrome Reference Point
  - Aerodrome and runway elevations, geoid undulations etc.
  - Aerodrome Reference temperature
  - Aerodrome Dimensions and related information including availability of an arrestor bed (where provided) for each runway
  - Strength of Pavements in terms of ACN/PCN
Annex 14: Chapter 2 - Aerodrome Data (Cont’d.)

- Pre-flight altimeter check and location
- Declared Distances
- Condition of movement area & related facilities
- Disabled aircraft removal
- Rescue and Fire Fighting services
- Visual Approach Slope Indicator Systems
- Co-ordination between Aeronautical Information Services and Aerodrome authorities
Annex 14: Chapter 3 - Physical Characteristics

- Runways
- Runway Shoulders
- Runway turn pads
- Runway Strips
- Runway End Safety Areas (RESA)
- Clearways and stopways
- Radio-altimeter operating area
Annex 14: Chapter 3 - Physical Characteristics (Cont’d.)

- Taxiways, Wheel-to-pavement edge clearance ($\delta$)
- Width of a TWY ($WTWY=OMGWS+2x\delta$)
- TWY curves, junctions and intersections, provision of fillets;
- TWY Minimum Separation Distances in Table 3-1
- TWY Shoulders
- TWY Strips & TWYs on bridges
- Holding bay, runway-holding position or road-holding position in Table 3-2
- Apron
- Isolated parking positions and
- De-/Anti-icing pads
Annex 14: Chapter 4 - Obstacle Limitation Surfaces

- Various obstacle limitation surfaces – OHS, IHS, Conical Surface, Transitional surface, Approach and take-off climb surfaces, Inner approach surface, Inner transitional surface, Balked landing surface

- Obstacle free zone (OFZ) dimensions

- OLS for NINST RWYs, for NPA RWYs, & for PA RWYs

- Objects existing and new, impact on safety and their removal/risk mitigation

- Dimensions of various surfaces in Tables 4-1 (Approach runways) and in Table 4-2 (Take-off runways)

- Objects beyond OLS and their impact to be assessed
Annex 14: Chapter 5 - Visual Aids for Navigation

- Indicators and signalling devices – Wind direction indicators, Landing direction indicators and Signalling lamps.

- Airfield Markings – Interruption of markings where needed, colour and conspicuity of RWY markings, TWY markings and Apron safety lines.

- Runway markings – Designation markings, Centre line markings, THR (normal & displaced) markings, Aiming Point markings, TDZ markings, & RWY side stripe markings.
Annex 14: Chapter 5 – Visual Aids for Navigation (Cont’d.)

Markings
- TWY markings –Centre line markings, RWY turn pad markings, RWY holding positions markings, Intermediate holding position markings, VOR aerodrome check-point markings
- Aircraft stand markings, Apron safety lines, Road holding position
- Mandatory Instruction marking, Information markings

Lights
- Light and laser emissions that endanger aircraft safety
- Lights which may cause confusion
- Frangible light fixtures and supporting structures
- Light intensity and control
- Emergency lighting
- Aeronautical beacons
- Approach lighting systems
- Visual Approach Slope Indicator system
Annex 14: Chapter 5 - Visual Aids for Navigation (Cont’d.)

Lights:

- Circling guidance lights
- RWY Lead-in Lighting systems
- RWY THR Identifier Lights
- RWY Edge lights
- RWY THR and Wing bar lights
- RWY end lights
- RWY Centre line lights
- RWY TDZ lights (2 types)
- Rapid –exit TWY indicator lights
Annex 14: Chapter 5 - Visual Aids for Navigation (Cont’d.)

Lights:

- TWY Centre line lights
- TWY Edge lights
- RWY Turn Pad lights
- Stop bar lights
- Intermediate holding position lights
- De-/anti-icing lights
- RWY guard lights
- Apron floodlighting
- VDGS & Advanced VDGS
- Aircraft stand manoeuvring lights
- Road holding position lights
Annex 14: Chapter 5 - Visual Aids for Navigation (Cont’d.)
Annex 14: Chapter 5 - Visual Aids for Navigation (Cont’d.)

**Signs:**
- Mandatory Instruction signs
- Information signs
- VOR Aerodrome checkpoint signs
- Aerodrome Identification sign
- Aircraft stand identification signs
- Road holding position signs

**Markers:**
- Unpaved RWY edge markers; Snow-covered RWY edge markers;
- TWY edge markers; TWY Centre line markers;
- Boundary markers
Annex 14: Chapter 5 - Visual Aids for Navigation (Cont’d.)

- **Runway designation of a runway extremity (Example):**
  - 25
  - Indicates a runway holding position at a runway extremity

- **Runway designation of both extremities of a runway (Example):**
  - 25-07
  - Indicates a runway holding position located at a taxiway/runway intersection other than a runway extremity

- **Category I hold position (Example):**
  - 25 CAT I
  - Indicates a category I runway holding position at the threshold of runway 25

- **Category II hold position (Example):**
  - 25 CAT II
  - Indicates a category II runway holding position at the threshold of runway 25

- **Category III hold position (Example):**
  - 25 CAT III
  - Indicates a category III runway holding position at the threshold of runway 25

- **Category I and III hold position (Example):**
  - 25 CAT I/III
  - Indicates a joint category I and III runway holding position at the threshold of runway 25

- **Category II and III hold position (Example):**
  - 25 CAT II/III
  - Indicates a joint category II and III runway holding position at the threshold of runway 25

- **No Entry:**
  - Indicates that entry to an area is prohibited

- **Runway holding position (Example):**
  - B2
  - Indicates a runway holding position (in accordance with ICAO Doc. 9422)
Annex 14: Chapter 6 - Visual Aids for Denoting Obstacles

- Objects to be marked and lighted
- Marking and lighting of objects – colour, location
- Specifications of various types of lights to be used
- Marking of temporary obstacles – mobile objects, construction vehicles and cranes etc.
- Wind turbines
Annex 14: Chapter 7 - Visual Aids for Denoting Restricted Use areas

- Closed Runways, Taxiways and parts thereof
- For denoting Non-load bearing surfaces
- Pre-threshold area
- Unserviceable areas
Annex 14: Chapter 8 - Electrical Systems

- Electrical power supply systems for air navigation facilities
- Switch-over times in Table 8-1
- System design to ensure that pilot is not left without adequate visual cues.
- Monitoring operational status of lighting systems
Annex 14: Chapter 9 - Aerodrome Operational Services, Equipment and Installations:

- Aerodrome emergency planning
- Emergency Operations Centre and Command Post
- Communication system
- Aerodrome Emergency exercise
- Emergencies in difficult environments
- Rescue and Firefighting
- Disabled aircraft removal
Annex 14: Chapter 9 - Aerodrome Operational Services, Equipment and Installations:

- Wildlife strike
- Apron management service
- Ground servicing of aircraft
- Aerodrome vehicle operations
- Surface movement guidance and control systems
- Siting of equipment and installations on operational areas
- Fencing
- Security lighting
Annex 14: Chapter 10 - Aerodrome Maintenance

- General
- Pavements
- Runway pavement overlays
- Visual Aids
Annex 14: Appendices

- Appendix 1. Colours for Aeronautical Ground Lights, Markings, Signs And Panels
- Appendix 2. Aeronautical Ground Light Characteristics
- Appendix 3. Mandatory Instruction Markings and Information Markings
- Appendix 4. Requirements Concerning Design Of Taxiing Guidance Signs
- Appendix 5. Aeronautical Data Quality Requirements
- Appendix 6. Location of Light on Obstacles

ATTACHMENT A. Guidance Material Supplementary to Annex 14, Volume I
ICAO PANS and Manuals

- **ICAO PANS**
  - status:
    - Not like SARPs of annexes
    - PANS are supplemental documents to SARPs
    - SARPs must be adopted by council
    - PANS recommended to the contracting states for further application
    - No obligation to report deviations from rules to ICAO
    - But: significant deviations have to be published in AIP (see GEN 1-7)
  - PANS may include guidelines (can be transferred to SARPs in the future)
  - Aims to support SARPS implementation

- **ICAO manuals**:
  - i.e. Aerodrome Design Manual, Airport Services Manual
  - Status: less legally binding character than PANS
ICAO Manuals: APM

- **Airport Planning Manual (Doc 9184)**
  - Divided into three parts
  - In this case important: Part 1 - Master Planning
    - References and procedures for optimal location and orientation of runways
    - Guidelines and suggestions for design of runways and adjacent taxiways
  - Of subordinate importance:
    - Part 2 - Land Use and Environmental Control
    - Part 3 - Guidelines for Consultant and Construction Services
ICAO Manuals: ADM

- Aerodrome Design Manual (Doc 9157)
- Primary targets:
  - Standardization of processes of dimensioning and planning of airports
  - Consideration of SARPS of Annex 14 in detail
- Aerodrome Design Manual consists of 6 parts:
  - Part 1: Runways,
  - Part 2: Taxiways, Aprons and Holding bays,
  - Part 3: Pavements,
  - Part 4: Visual Aids,
  - Part 5: Electrical Systems,
  - Part 6: Frangibility,
- Important parts, 1-4 and 6
ICAO Manuals: ASM

Airport Services Manual (ASM)

- Internationally accepted guidelines of ICAO for operation of aerodromes
- Content general procedures which must be taken into account in daily business of an airport
- 9 different parts:
  - Part 1 – Rescue and firefighting
  - Part 2 – Strength of pavements
  - Part 3 – Bird control and reduction
  - Part 4 – Dispersal of patch of fog (retreated)
  - Part 5 – Removal of disabled aircraft
  - Part 6 – Control of obstacles
  - Part 7 – Airport emergency planning
  - Part 8 – Airport operational services
  - Part 9 – Airport maintenance practices
Further relevant materials - ACI Materials

Apron Markings and Signs Handbook – (ACI)

- AMSH, 2nd edition, 2009
- Main objective of that document:
  - Global uniform design of markings and signs on airports (mainly apron)
  - Clear design of air traffic on taxi and apron facilities
  - Manual presented to ICAO for integrating in Annex 14
- Nearly the only international accepted publication concerning these aspects (expect Annex 14)
Further relevant materials - FAA Materials

- FAA guidelines
  - In form of so called ACs (Advisory Circulars)
  - Author: supreme US-American aviation authority and main national institution of this kind – the Federal Aviation Administration (FAA)
  - Partial content differences to corresponding international publications of ICAO or IATA
    - Different types of markings, dissenting separation minima, differences in the classification of aircraft types or airports, etc.

- National legislations of USA
  - applicability to airports of other nations!

- Guidelines and standards of FAA – exclusively national character in USA
Further relevant materials - EASA Materials

- EASA (European Aviation Safety Agency)
  - Founded in 2002
  - Placed in Cologne (GER) since November 2004

- Working basis: EU regulations

- Competence i.e. type certification, environmental certifications

- EU Regulation 2009
  - Responsibility Extension to aerodromes
Further relevant materials - EASA Materials

- Basic Regulation (BR)
  - Contains Essential Requirements (ER)
- Implementing Rules (IR)
  ➔ Hard Law-binding

- Certification Specifications (CS)
  - Application in the certification process
- Acceptable Means of Compliance (AMS)
  - Illustrate measures which serve to fulfill the BR, IR and CS
- Guidance Material (GM)
  - Promotes the illustration of the importance of an IR or CS
  ➔ Soft Law-not binding