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CONOPS Implementation of IFR procedures in the Czech Republic

CZCAA IFR Study

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01.00	released	2017-03-30	all	I. Agüi	Released version

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1 Introduction

The aim of the present document is to detail the CONOPS for introduction of IFR procedures in the Czech Republic.

The present document follows the feasibility assessment deliverable [R45] D1 - General Feasibility Assessment of the Project, which provided an initial overview of the IFR procedures CONOPS implementation project.

The objective of **section 2** is to provide an overview of preliminary conclusions withdrawn from deliverable [R45] D1 - General Feasibility Assessment of the Project.

The **goal of the section 3** is two-fold: first, to evaluate the current regulatory basis for the present project; and then, to compare and evaluate the compliance of national legislation to current EU regulations and potential changes which may impact the outcome of the present project.

Following the description of the current regulatory basis for the project and compliance assessment of national rules with EU regulatory framework, **section 4** aims to identify any further amendment to the present national legislation necessary to allow for the implementation of the proposed model for the introduction of IFR procedures in uncontrolled aerodromes in Czech Republic.

The following requirements form the baseline for the proposed approach for the introduction of IFR procedures on uncontrolled aerodromes:

- Airspace re-organisation: declaration of RMZ zones in G airspaces around the aerodromes (the German case) - Minimum regulatory impact since RMZ are already defined in the regulation.
- Type of approaches to be implemented (only for aircraft wishing to fly IFR within the concerned airspace): IFR non-precision approaches and APVs. Potential evaluation of LPV 200 (Cat I) - Minimum implementation costs to aerodromes with feasible approaches. The path set already for increased precision approaches.
- Additionally, the current proposal foresees the installation of an AFIS unit, an adequate approach lighting and a visual approach slope indicator system.

Section 5 presents a brief impact assessment of IFR operations on the airport status change and on data integrity assurance.

2 Background: Feasibility Assessment

As the final step of the general feasibility assessment, a set of preliminary conclusions have been outlined as input for the present CONOPS. They include the findings derived from the combination of the comparative analysis between the selected Czech airports and other similar European airports and the IFR procedures possibilities. The conclusions are the following:

- LKHK is the most well equipped and biggest airport from the selected Czech Republic aerodromes and its infrastructure superior or comparable to the NPA approved European airports. Therefore, the implementation of IFR NPAs seems highly feasible in terms of facilities and operations.
- LKCS and LKMH will require more important upgrades to their current equipment, such as adequate lighting systems consisting of a 420 meters SALS in order to ensure safety and enable IFR traffic, as stated in [R05] Aviation Regulation L14.
- **AFIS** implementation is a requirement to implement IFR procedures at LKMH, being the only of the three Czech uncontrolled airports lacking this service. Furthermore, all the European studied airports with IFR operations are provided with at least AFIS.
- Some countries, such as Germany, have declared special zones to deal with GNSS IFR approaches in non-controlled airspaces such as RMZ. Czech regulation already defines these kind of zones even though according to the AIP Czech Republic no RMZ is declared in the whole Czech Republic.
- Regarding the preliminary regulation assessment and based on the current investigation of IFR regulative requirements, the implementation of IFR on uncontrolled airports seems feasible because IFR NPAs have been implemented in EU states in which the same EU legislation is in force. The applicable regulations do not block this project and its implementation but to meet the regulative requirements (resulting from e.g. [R11] Regulation (EC) No 216/2008 and [R27] Commission Regulation (EU) No 139/2014) will cause substantial costs to aerodrome operators.
- The applicable international regulation [R55] ICAO Annex 14 – Aerodromes; Volume I – Aerodrome Design and Operations as applied to the Czech regulation through [R05] Aviation Regulation L14 states that an aerodrome shall have proper visual aids and at least one directional instrumental system to enable non-precision IFR approaches. Even though, no specifications are detailed about visual aids, all the European aerodromes studied include edge, PAPI/PLASI and threshold lights as a minimum standard.
- Among the different options available defining **RMZ** zones in G airspaces, the German case, is one of the feasible scenario for the studied Czech airports as current regulation already provides with the means of RMZ and therefore, only the declaration of the zones would be required (from a regulatory perspective).
- The historical data and the benchmark performed reflect that GNSS IFR approaches in non-controlled aerodromes are a **feasible option** according to the European regulation.
- Given the current situation of the studied Czech airports, their type of traffic and facilities, it is proposed to focus on the implementation of **IFR non-precision approaches and APVs** as an initial step. However, LPV 200 (Cat I) can be studied in case the CZCAA considers it suitable and necessary for any of the aerodromes. Nevertheless, interactions with the CZCAA and affected airspaces users would be of the utmost importance to determine the most suitable type of IFR approach for these three airports.

3 Current EU Regulatory Basis

The goal of the present section is two-fold:

- Evaluate the current regulatory basis for the present project;
- Compare and evaluate the compliance of national legislation to current EU regulations and potential changes which may impact the outcome of the present project.

First, an introduction is provided to the regulatory framework to be considered for the present analysis (international, regional and national level). Then, an identification is performed on current EU legislation and potential anticipated changes. Afterwards, a compliance assessment is performed between national legislation and EU legislation (and potential amendments) identified in the previous section.

3.1 Introduction to the Regulatory Framework

For the evaluation of the current EU regulatory basis for the project area and further compliance assessment of suggested national legislation changes with EU legislation in force, it is necessary to determine the current regulatory basis related to the project.

Three basic layers of safety regulation can be distinguished in Europe, namely:

- International (Global) regulatory arrangements and requirements, established and promulgated by the International Civil Aviation Organisation (ICAO).
- Regional regulatory arrangements and requirements. In Europe, there is an additional and intermediate regulatory layer based upon some ceding of national regulatory functions to supra-national agencies. The objective of creating such bodies is to ensure a high and uniform level of safety in civil aviation, by the adoption of common safety rules and measures in line with ICAO standards and recommended practices.
- National regulatory arrangements and requirements, promulgated in national legislation and other normative acts by the designated State authorities. National safety regulatory requirements should comply with those established at global and regional level.

The principle international organisation is the International Civil Aviation Organisation (ICAO). ICAO is an agency of the United Nations and was established in 1944 through the Convention on International Civil Aviation, known as the Chicago Convention. Through the participation of contracting states, ICAO develops SARPs that cover all aspects of aviation, including safety. SARPs provide the foundation of all safety regulatory regimes at a global scale. By signing the Chicago Convention, a state agrees that adopted standards will be implemented in its own territories, or any difference will be notified to ICAO.

Regulations of the European Council and of the European Commission are the most common legal instruments used for enhancing aviation safety in Europe. In addition, to promote the highest common standards of safety and environmental protection in civil aviation, the European Aviation Safety Agency (EASA) was set up in 2003 as an agency of the European Union. Currently EASA competence covers the initial certification and continuing airworthiness of aircraft and related products, the approval of organisations involved in the design, manufacture and maintenance of aeronautical products and certification of personnel and organisations involved in the operation of aircraft. By 2012, following adoption of the Single European Sky II legislative package, EASA is to extend the scope of its activities to include airport operations and Air Traffic Management, too.

Finally, a national safety regulatory function is established in each state. There is a considerable variation in the implementation of the international safety regulations and arrangements at the national level. This allows for regional flexibility but also leads to some inconsistencies. Many safety regulatory requirements are proving difficult to implement, both in states with limited pre-existing safety regulation and those with well established regulatory regimes.

The following describe with further detail certain legislative aspects relevant to the present assignment.

The EU Legislator

The backbone of the European aviation safety system is constituted by a set of common safety rules which are directly applicable in a uniform manner across the EU. These common safety rules, which apply both to the industry as well as to the civil aviation authorities, constitute the basis of the initial approval and continuing oversight of all undertakings engaged in aviation activities in the internal market.

The European Parliament and the Council act as the EU legislator, with the Commission retaining the right of initiative to propose legislation. In addition, the Commission has, in certain specific cases, the power to adopt regulations. These legal instruments can be described as 'hard law', and includes those codes and regulations that are legally binding.

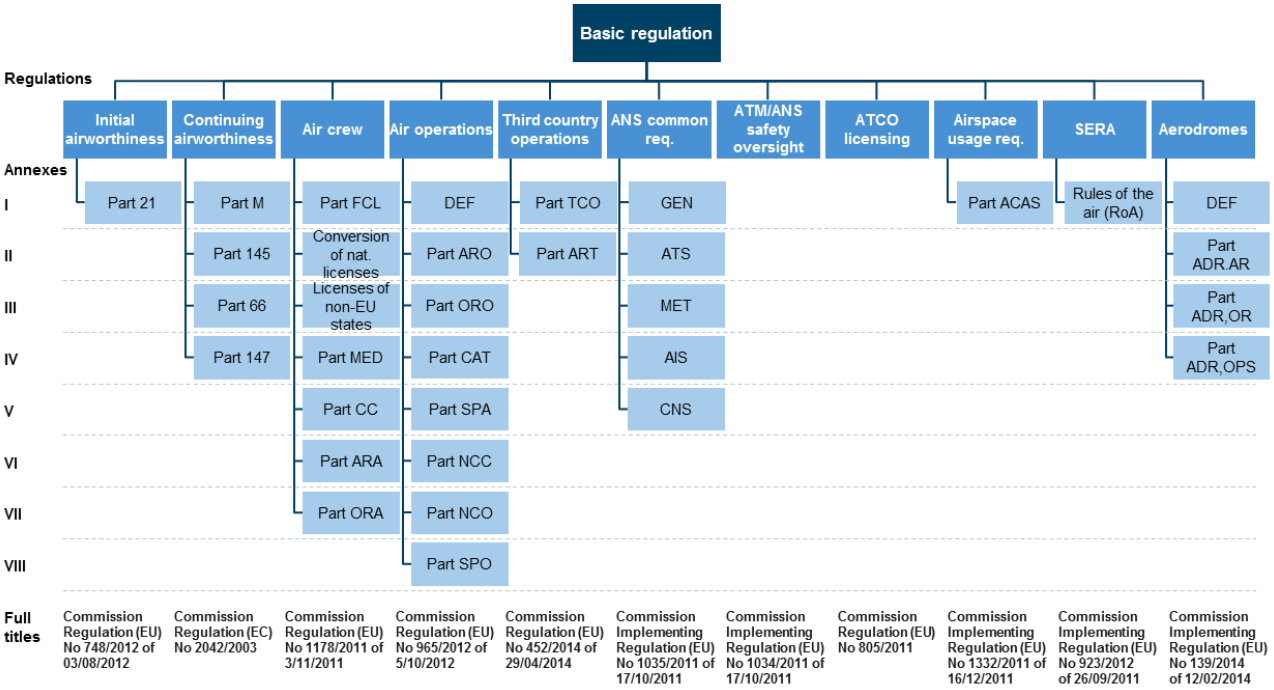

Figure 1: EASA regulations structure

The Basic Regulation

In 2002, with [R44] Regulation (EC) No 1592/2002 the EU adopted a first set of new generation of aviation safety rules. This regulation was replaced by the current Basic Regulation which is composed of [R11] Regulation (EC) No 216/2008 and its amendments. The Basic Regulation also established the European Aviation Safety Agency (EASA) as the cornerstone of the European aviation safety policy. The current rules, fully compliant with ICAO SARPs, cover all issues related to the initial airworthiness, including the design and the production of aircraft and other aeronautical products, their continuing airworthiness and maintenance, as well as aircraft operations and the training & licensing of crew, aeronautical mechanics, technicians and engineers. [R12] Regulation (EC) No 1108/2009 amended [R11] and enabled the EU to lay down, in line with the Standards and Recommended Practices of the Chicago Convention, essential requirements applicable to aeronautical products, parts and appliances, aerodromes, persons and organization involved in the provision of ATM/ANS and to persons and products involved in the training of air traffic controllers.

The role of EASA

EASA carries out, on behalf of the Member States, the functions and tasks of the State of Design, Manufacture and Registry when related to design approval, as specified in the Chicago Convention and its Annexes. EASA is independent in relation to technical matters and has legal, administrative and financial autonomy. It has legal personality and exercises implementing powers conferred on it by regulation, by undertaking tasks and formulating opinions on the design, production and maintenance and operations of aeronautical products, aircraft operations, aerodromes and related equipment and personnel, ATM/ANS operations personnel and organizations. In addition EASA provides the Commission support and assists it in preparing measures and conducting inspections and investigations.

Implementing Rules

Aviation safety implementing rules are adopted by the European Commission on the basis of technical opinions issued by EASA. The proper implementation of the rules is regularly monitored by the Commission with the assistance of EASA which carries out regular standardisation inspections in all Member States. Enforcement actions can be taken if safety deficiencies are detected. These can involve the suspension of the mutual recognition of certificates or penalties imposed on certificate holders.

Each Part to each implementing regulation 'soft law' has its own recommended practices, such as CS, AMC, or GM as adopted by EASA, which are explanations on the content of regulations. The latter, even though not binding, provide a presumption of compliance with the legal requirements. Industry and Member States may deviate from 'soft law' provided they comply with the rule.

Other Authorities contributing in the legislative framework

EUROCONTROL is an international organisation founded in 1960 and composed of Member States from the European Region, including the European Community which became a member in 2002. EUROCONTROL is involved in almost every aspect of air traffic management, in close cooperation with stakeholders. One of its main activities is to support the European Commission, EASA and National Supervisory Authorities in their regulatory activities.

National Supervisory Authorities (NSAs) ensure the supervision of the regulatory framework in all Member States. They are in particular responsible for certifying and overseeing air navigation service providers as well as for the preparation of the national performance plans of the Member States concerned.

3.2 List of EU Regulations and Potential Anticipated Changes

The following subsections detail EU legislation, international standards and requirements related to the project scope below:

a. EU legislation in force (e.g. Regulations, Implementing Regulations, Directives etc.);
b. EASA NPAs, Decisions and Opinions that can potentially impact the proposed project.

3.2.1 EU Legislation

The following European Commission (EC) regulations and implementing regulations have been identified as possibly impacting the current project:

Ref.	Document
[R09]	Regulation (EC) No 550/2004 of the European Parliament and of the Council of 10 March 2004 on the provision of air navigation services in the single European sky (the service provision Regulation)
[R10]	Regulation (EC) No 1070/2009 of the European Parliament and of the Council of 21 October 2009 amending Regulations (EC) No 549/2004, (EC) No 550/2004, (EC) No 551/2004 and (EC) No 552/2004 in order to improve the performance and sustainability of the European aviation system
[R11]	Regulation (EC) No 216/2008 of the European Parliament and of the Council of 20 February 2008 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency, and repealing Council Directive 91/670/EEC, Regulation (EC) No 1592/2002 and Directive 2004/36/EC
[R12]	Regulation (EC) No 1108/2009 of the European Parliament and of the Council of 21 October 2009 amending Regulation (EC) No 216/2008 in the field of aerodromes, air traffic management and air navigation services and repealing Directive 2006/23/EC
[R13]	Commission Regulation (EC) No 1033/2006 of 4 July 2006 laying down the requirements on procedures for flight plans in the pre-flight phase for the single European sky
[R14]	Commission Implementing Regulation (EU) No 428/2013 of 8 May 2013 amending Regulation (EC) No 1033/2006 as regards the ICAO provisions referred to in Article 3(1) and repealing Regulation (EU) No 929/2010
[R15]	Commission Implementing Regulation (EU) 2016/2120 of 2 December 2016 amending Regulation (EC) No 1033/2006 as regards the provisions referred to in Article 3(1)
[R16]	Commission Regulation (EU) No 255/2010 of 25 March 2010 laying down common rules on air traffic flow management
[R17]	Commission Implementing Regulation (EU) 2016/1006 of 22 June 2016 amending Regulation (EU) No 255/2010 as regards the ICAO provisions referred to in Article 3(1)

Ref.	Document
[R18]	Commission Implementing Regulation (EU) No 1035/2011 of 17 October 2011 laying down common requirements for the provision of air navigation services and amending Regulations (EC) No 482/2008 and (EU) No 691/2010
[R19]	Commission Implementing Regulation (EU) No 448/2014 of 2 May 2014 amending Implementing Regulation (EU) No 1035/2011 by updating references to the Annexes to the Chicago Convention
[R20]	Commission Implementing Regulation (EU) No 1034/2011 of 17 October 2011 on safety oversight in air traffic management and air navigation services and amending Regulation (EU) No 691/2010
[R21]	Commission Implementing Regulation (EU) 2016/1377 of 4 August 2016 laying down common requirements for service providers and the oversight in air traffic management/air navigation services and other air traffic management network functions, repealing Regulation (EC) No 482/2008, Implementing Regulations (EU) No 1034/2011 and (EU) No 1035/2011 and amending Regulation (EU) No 677/2011
[R22]	Commission Implementing Regulation (EU) No 923/2012 of 26 September 2012 laying down the common rules of the air and operational provisions regarding services and procedures in air navigation and amending Implementing Regulation (EU) No 1035/2011 and Regulations (EC) No 1265/2007, (EC) No 1794/2006, (EC) No 730/2006, (EC) No 1033/2006 and (EU) No 255/2010
[R23]	Commission Implementing Regulation (EU) 2016/1185 of 20 July 2016 amending Implementing Regulation (EU) No 923/2012 as regards the update and completion of the common rules of the air and operational provisions regarding services and procedures in air navigation (SERA Part C) and repealing Regulation (EC) No 730/2006
[R24]	Commission Regulation (EU) 2015/340 of 20 February 2015 laying down technical requirements and administrative procedures relating to air traffic controllers' licences and certificates pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council, amending Commission Implementing Regulation (EU) No 923/2012 and repealing Commission Regulation (EU) No 805/2011
[R25]	Commission Regulation (EU) No 73/2010 of 26 January 2010 laying down requirements on the quality of aeronautical data and aeronautical information for the single European sky
[R26]	Commission Implementing Regulation (EU) No 1029/2014 of 26 September 2014 amending Regulation (EU) No 73/2010 laying down requirements on the quality of aeronautical data and aeronautical information for the single European sky
[R27]	Commission Regulation (EU) No 139/2014 of 12 February 2014 laying down requirements and administrative procedures related to aerodromes pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council
[R38]	Commission Regulation (EU) No 965/2012 of 5 October 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council
[R39]	Commission Regulation (EU) No 1178/2011 of 3 November 2011 laying down technical requirements and administrative procedures related to civil aviation aircrew pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council

Table 1: Reviewed European Commission (EC) regulations

Within all EU legislation described above, the following IFR regulative requirements identified in the EU legislation in force:

- [R09] Regulation (EC) No 550/2004 as amended by [R10] Regulation (EC) No 1070/2009.

  No IFR regulative requirements identified.

- [R11] Regulation (EC) No 216/2008 as amended by [R12] Regulation (EC) No 1108/2009.

  Initially [R11] did not contain any IFR regulative requirements. Amendment [R12] introduced requirements to aerodromes, including equipment, open to public use and which serve commercial air transport and where operations using instrument approach or departure procedures are provided, and have a paved runway of 800 metres or above; or exclusively serve helicopters. However

member state may decide to exempt an aerodrome which handles no more than 10000 passengers; and 850 movements related to cargo operations per year. The requirements identified are in Annex A: CZCAA IFR study Specific IFR Regulatory Requirements / Reg 216-2008 consolidated.

- [R13] Commission Regulation (EC) No 1033/2006 as amended by [R22] Commission Implementing Regulation (EU) No 923/2012, [R14] Commission Implementing Regulation (EU) No 428/2013 and [R15] Commission Implementing Regulation (EU) 2016/2120.

  [R13] is also applicable to ATS units providing services to general air traffic flying in accordance with instrument flight rules. As ATS can also be ATC or AFIS this regulation is applicable to them. The requirements identified are in Annex A: CZCAA IFR study Specific IFR Regulatory Requirements / Reg 1033-2006 consolidated.

- [R16] Commission Regulation (EU) No 255/2010 as amended by [R22] Commission Implementing Regulation (EU) No 923/2012 and [R17] Commission Implementing Regulation (EU) 2016/1006.

  [R16] is applicable to all flights intended to operate or operating as general air traffic and in accordance with the instrument flight rules in whole or in part. As [R16] is also applicable to ATS units (ATC or AFIS) this regulation is also applicable to them. The requirements identified are in Annex A: CZCAA IFR study Specific IFR Regulatory Requirements / Reg 255-2010 consolidated.

- [R18] Commission Implementing Regulation (EU) No 1035/2011 as amended by [R22] Commission Implementing Regulation (EU) No 923/2012 and [R19] Commission Implementing Regulation (EU) No 448/2014.

  No IFR regulative requirements identified.

- [R20] Commission Implementing Regulation (EU) No 1034/2011.

  No IFR regulative requirements identified.

- [R21] Commission Implementing Regulation (EU) 2016/1377.

  No IFR regulative requirements identified.

- [R22] Commission Implementing Regulation (EU) No 923/2012 as amended by [R24] Commission Regulation (EU) 2015/340 and [R23] Commission Implementing Regulation (EU) 2016/1185.

  [R22] is applicable to the competent authorities of the member states, air navigation service providers, aerodrome operators and ground personnel engaged in aircraft operations. It also contains rules applicable to all IFR flights. The requirements identified are in Annex A: CZCAA IFR study Specific IFR Regulatory Requirements / Reg 923-2012 consolidated.

- [R24] Commission Regulation (EU) 2015/340.

  No IFR regulative requirements identified.

- [R25] Commission Regulation (EU) No 73/2010 as amended by [R26] Commission Implementing Regulation (EU) No 1029/2014.

  [R25] This regulation is also applicable to operators of those aerodromes and heliports, for which IFR procedures have been published in national aeronautical information publications. The requirements identified are in Annex A: CZCAA IFR study Specific IFR Regulatory Requirements / Reg 73-2010 consolidated.

- [R27] Commission Regulation (EU) No 139/2014.

  If no exemption is provided by the member state (see comment of [R11] above.), the aerodrome operator where operations using instrument approach or departure procedures are provided has to fulfil requirements of this regulation [R27]. The requirements identified are in Annex A: CZCAA IFR study Specific IFR Regulatory Requirements / Reg 139-2014.

- [R38] Commission Regulation (EU) No 965/2012 and [R39] Commission Regulation (EU) No 1178/2011 have not been considered for the present section. However, they have been taken into account for the development of the rest of this CONOPS document.

3.2.2 EASA Documents

The following EASA NPAs, Decisions and Opinions have been identified as possibly impacting the current project:

Ref.	Document
[R28]	Decision 2013/013/R of the Executive Director of the European Aviation Safety Agency of 17 July 2013 adopting the Acceptable Means of Compliance and Guidance Material to Commission Implementing Regulation (EU) No 923/2012 of 26 September 2012 laying down the common rules of the air and operational provisions regarding services and procedures in air navigation and amending Implementing Regulation (EU) No 1035/2011 and Regulations (EC) No 1265/2007, (EC) No 1794/2006, (EC) No 730/2006, (EC) No 1033/2006 and (EU) No 255/20101 'Acceptable Means of Compliance and Guidance Material to the rules of the air'
[R29]	Decision 2016/023/R of the Executive Director of the European Aviation Safety Agency of 13 October 2016 amending the Acceptable Means of Compliance and Guidance Material to Commission Implementing Regulation (EU) No 923/2012
[R30]	NPA 2016-09(A) - Requirements for air traffic services
[R31]	NPA 2016-09(B) - Requirements for air traffic services
[R32]	Decision 2015/010/R of the Executive Director of the European Aviation Safety Agency of 13 March 2015 adopting Acceptable Means of Compliance and Guidance Material to Commission Regulation (EU) 2015/340

Table 2: Reviewed EASA Decisions and NPAs

EASA Notices of Proposed Amendments [R30] NPA 2016-09(A) and [R31] NPA 2016-09(B) contain update proposals of [R21] Commission Implementing Regulation (EU) 2016/1377Commission Implementing Regulation (EU) 2016/1377 and [R22] Commission Implementing Regulation (EU) No 923/2012 as amended by [R24] Commission Regulation (EU) 2015/340 and [R23] Commission Implementing Regulation (EU) 2016/1185.

[R30] NPA 2016-09(A) includes only procedural information, explanatory note and regulatory impact assessment. [R31] NPA 2016-09(B) includes the proposed amendments to both implementing regulations and in this NPA following IFR regulative requirements were identified:

I. For [R21] Commission Implementing Regulation (EU) 2016/1377
   The requirements identified are in Annex A: CZCAA IFR study Specific IFR Regulatory Requirements / NPA 2016-09(B).
II. For [R22] Commission Implementing Regulation (EU) No 923/2012 as amended by [R24] and [R23]
   No IFR regulative requirements identified.

Please note that the specific IFR regulative requirements identified in this section might be introduced in the European legislation and become applicable in the future.

3.3 National Laws Compliance Assessment

The following national laws and rules are identified as being of relevance for the present assessment:

Ref.	Document
[R01]	Aviation Regulation L2 - Rules of the Air
[R02]	Aviation Regulation L3 - Meteorology
[R03]	Aviation Regulation L10/II - Aeronautical Telecommunications; Volume II - Communication Procedures
[R04]	Aviation Regulation L11 - Air Traffic Services
[R05]	Aviation Regulation L14 - Aerodromes
[R06]	Aviation Regulation L4444 - Procedures for Air Navigation Services – Air Traffic Management
[R07]	Aviation Regulation L8168 - Procedures for Air Navigation Services – Aircraft Operations
[R08]	Aviation Regulation L7030 - European Regional Supplementary Procedures

Table 3: Reviewed Czech aviation regulations (L-regulations)

A compliance assessment was performed between the abovementioned Czech regulations and the referred EU legislation and EASA documents listed in section 3.2. No discrepancies have been found as a result of the analysis.

3.4 Impact Assessment of EU Regulations on National Laws

Given that the compliance assessment conducted in the previous section between Czech regulations and EU legislation and EASA documents concluded that there were no discrepancies, it is derived that there is no need to assess the impact of those potential non-compliances on Czech laws relating to the scope of the project.

4 Specific Requirements for the Proposed Approach for Implementation of IFR Procedures

Following the description of the current regulatory basis for the project and compliance assessment of national rules with EU regulatory framework, the present section aims to identified further amendments to the present national legislation to comply with the proposed model for the introduction of IFR procedures in uncontrolled aerodromes in Czech Republic.

The following requirements form the baseline for the proposed approach for the introduction of IFR procedures on uncontrolled aerodromes:

- Airspace re-organisation: declaration of RMZ zones in G airspaces around the aerodromes (the German case) - Minimum regulatory impact since RMZ are already defined in the regulation.
- Type of approaches to be implemented: IFR non-precision approaches and APVs. Potential evaluation of LPV 200 (Cat I) - Minimum implementation costs to aerodromes with feasible approaches. The path set already for increased precision approaches.
- Additionally, the current proposal foresees the installation of an AFIS unit, an adequate approach lighting and a visual approach slope indicator system.

Considering the above mentioned approach, the following sections detail specific requirements in the following areas:

- Competence of AFIS personnel;
- Training for other aviation personnel;
- METEO requirements;
- IFR procedure requirements;
- Flight crew and aircraft facilities requirements;
- Airport equipment requirements;
- Airspace modification requirements.

Section 4.8 summarizes the implementation actions recommended throughout the previous sections.

4.1 Competence of AFIS Personnel

According to ICAO definition, an AFIS Officer is a person properly trained, competent and duly authorized to provide aerodrome flight information service and, if necessary, licensed. Unlike air traffic controllers, except for cases when relaying clearance from air traffic control (ATC), AFIS Officers (AFISO) shall only pass information and warnings to pilots. Pilots are therefore wholly responsible for maintaining proper spacing in conformity with the rules of the air.

Installation of an AFIS unit at uncontrolled aerodromes is one of the baseline requirements for the proposed approach for implementation of IFR procedures in the Czech Republic. The competences of AFIS personnel must be in line with the other relevant proposals for the present implementation:

- Airspace re-organisation: declaration of RMZ zones in G airspaces around the aerodromes;
- Type of approaches to be implemented: IFR non-precision approaches and APVs (only for aircraft wishing to fly IFR within the concerned airspace).

The following subsections detail AFIS staff skill requirements for the proposed approach, gap analysis considering current regulation and identified implementation actions and amendment of current regulation (if necessary).

4.1.1 Staff Skills Requirements

The German case is taken as the reference case for the present assessment as it is in line with the current proposal for introduction of IFR procedures in Czech Republic.

In November 2016, the German Federal Office for Air Traffic Control (Bundesaufsichtsamt für Flugsicherung, BAF) issued a new directive which regulates the details of the certification of AFIS services and the licensing of AFIS specialists. The BAF has already received a request for certification from all service providers in places for which a Radio Mandatory Zone (RMZ) has been set up and in which the AFIS service has already been registered in the Aeronautical Information Publication (AIP).

The following documentation is applicable in the reference case:

- [R42] Directive on Requirements for the Certification and Licensing of AFIS in Germany;
- [R43] Air traffic control personnel training regulation.

According to the [R42] Directive on Requirements for the Certification and Licensing of AFIS in Germany, AFIS Officers in Germany are required to go through the following three training courses:

- Basic course for air traffic management specialists (with the exception of the training module "Introduction to the air traffic management company DFS");
- Permission course for flight data processing;
- General radio operator's certificate for the aviation radio service (AZF).

The following contents are there included in the basic course for air traffic management specialists required for AFIS specialists:

- Introduction to the basic course for air traffic management specialists, especially:
    - Course management and administration;
    - Course content;
    - Performance reviews.
- Human factors, specially:
    - Human achievement;
    - Errors and failures;
    - Communication;
    - Work environment.
- Air law, especially:
    - National and international organizations;
    - Domestic and international air law;
    - Security Management.
- Air traffic control operational procedures, especially:
    - Air Traffic Control Service;
    - Flight Information Service;
    - Alerting Service;
    - Aeronautical Information Service;
    - ATFM.
- Meteorology, especially:
    - Earth’s atmosphere;
    - Weather phenomena;
    - Weather information;
    - Weather reports.
- Navigation, especially:
    - Earth;
    - Aeronautical Charts;
    - Basics of navigation;
    - Navigation methods.
- Aircraft and aerospace costumers, especially:
    - Basic principles of flying;
    - Aircraft categories;
    - Aircraft data.
- Technical air navigation systems, especially:
    - Radio and communication systems;
    - Introduction to the electronic aviation representation;
    - Data processing and transmission systems.

- Aeronautical, especially:
    - Basics;
    - Talk groups.
- Aviation English, especially:
    - Grammar;
    - Aviation-specific vocabulary;
    - Practical applications.
- Practical flight data processing, especially:
    - Flight schedules;
    - Air traffic control messages;
    - Notice to Airmen;
    - History of the flight data;
    - Automation.
- Business Environment.

The following contents are there included in the permission course for flight data processing:

- Introduction to permit course for flight data processing, especially:
    - Course management and administration;
    - Course content;
    - Performance reviews.
- Human factors especially:
    - Psychological factors;
    - Medical and physiological factors;
    - Social and organizational factors;
    - Stress;
    - Human error;
    - Work environment.
- Operating procedures in the flight data processing, especially:
    - Regulations for flight data processing;
    - Operating instructions for workplaces of the flight data processing;
    - Air traffic management;
    - Data management;
    - Automated data processing systems;
    - Technical components and functionalities;
    - Communications systems;
    - Opening procedure in the flight data processing.
- Practical flight data processing, especially:
    - Skills in flight data processing;
    - Handling systems in the workplace of the flight data processing;
    - Flight data processing in exceptional situations.

With respect to the implementation of RNP APCH procedures, in particular for APV BARO-VNAV operations, [R40] EASA AMC 20-27 states that it is expected that air navigation service provision will include data and information to enable correct and accurate altimeter setting on board the aircraft, as well as local temperature. This data will be from measurement equipment at the airport where the approach is to take place (remote or regional pressure setting are not authorised). The specific medium for transmission of this data and information to the aircraft may include voice communication, ATIS or other media. In support of this, it is also expected that MET service providers will assure the accuracy, currency and availability of meteorological data supporting APV BARO-VNAV operations. In order to minimise the potential for miss-setting of barometric reference, Air Traffic Controllers will confirm QNH with flight crews prior to commencement of the approach.

[R41] EASA AMC 20-28 states that RNAV GNSS approach operation to LPV minima using SBAS does not include specific requirements for communication or ATS surveillance. Adequate obstacle clearance is

achieved through aircraft performance, Instrument Approach procedure design and operating procedures. Where reliance is placed on the use of radar to assist contingency procedures, its performance will be shown to be adequate for that purpose, and the requirement for a radar service will be identified in the AIP.

On the other hand, [R36] ICAO EUR RNP APCH Guidance Material (EUR Doc 025) states the following:

> 5.3.10.1.1. Air traffic controllers, who provide control services at airports where RNP approaches have been implemented, should have completed training that covers the items listed below.
>
> 5.3.10.1.2. Core training
>
> a) How area navigation systems work:
>
> - Include functional capabilities and limitations;
> - Accuracy, integrity, availability and continuity including on-board performance monitoring and alerting;
> - GPS receiver, RAIM, FDE, and integrity alerts;
> - Waypoint fly-by versus flyover concept (and different turn performances);
>
> b) Flight plan requirements;
>
> c) ATC procedures;
>
> - ATC contingency procedures;
> - Separation minima;
> - Mixed equipage environment;
> - Transition between different operating environments;
> - Phraseology.
>
> 5.3.10.1.3. Training specific to RNP APCH
>
> a) Related control procedures:
>
> - Radio vectoring techniques (when appropriate);
>
> b) RNP approach and related procedures:
>
> - Including T and Y approaches; and
> - Approach minima;
>
> c) Impact of requesting a change to routing during a procedure.

4.1.2 Gap Analysis

Current situation

According to [R04] Aviation Regulation L11 - Air Traffic Services, Appendix N, the following functions and activities on AFIS unit are defined in Czech Republic:

> **2.2 Functions and activities on AFIS station**
>
> 2.2.1 Following functions are set at AFIS station:
>
> a) Head of AFIS station;
>
> b) AFIS dispatcher.
>
> **2.3 Head of AFIS station**
>
> 2.3.1 Every AFIS station must have an appointed permanent head. Head of AFIS station is subordinate to aerodrome operator representative (for example head of air operations at the aerodrome. His appointment must be verifiable.) and to be able to perform this function, he/she must have valid AFIS dispatcher license.
>
> 2.3.1.1 In urgent operational cases, the function of aerodrome operator representative and head of AFIS station can be combined.

2.3.2 Head of AFIS station is responsible for overall aerodrome flight information and alerting service at aerodrome and in ATZ.

2.3.3 Head of AFIS station obligations are:

a) Development of set documentation for providing the service and station's activities;

b) Creation of work methodology at the station;

c) Coordination of station activities in relation to aerodrome and other organization/people activities;

d) Debating the proposals for coordination and other agreements for cooperation;

e) Organization of schooling, training and re-examination of AFIS station personnel;

f) Responsibility for the use of prescribed station equipment and its technical condition in compliance with valid legislation, and keeping the documentation valid;

g) Carrying out control activities at station and their record in operational logbook of station;

h) Development or approving of list of personnel on duty ("distribution list of duties").

2.4 AFIS dispatcher

2.4.1 AFIS dispatcher is subordinate to Head of AFIS station.

2.4.2 AFIS dispatcher on duty is directly responsible for providing aerodrome flight information and alerting service to known air traffic at aerodrome or in ATZ. Under the conditions stated in 4.9, AFIS dispatcher is responsible for providing aerodrome flight information and alerting service in neighbouring and overlapping airspaces, as well.

2.4.3 AFIS dispatcher has a right to issue orders to people participating in air operations on aerodrome, such as signalman, starter man, time keeping man, winch operator, air drop controller, paratroopers landing zone overseer, etc. These people are obliged to follow the issued orders.

2.4.4 AFIS dispatcher is not authorized to issue any flight clearance. When it is needed to avoid imminent danger, dispatcher can in justified cases issue and order or a prohibition to pilots.

2:4.5 AFIS dispatcher obligations are:

a) Providing aerodrome flight information services in accordance with provision 4;

b) Keeping overview of traffic at aerodrome and in its vicinity;

c) React to unknown traffic and traffic without radio communication;

d) Keeping overview of known traffic in regard to their expected return, if it is agreed so;

e) Coordination with other stations according to valid coordination agreements;

f) Monitoring the status of aerodrome and its equipment (that serves the air operations) serviceability. In order to do so, he/she carries out a control of movement area and equipment before the beginning of operations and whenever the conditions change and makes an entry to operational logbook;

g) Keeping prescribed operations documentation;

h) Ensures updating of correct placement of ground visual signals (see [R01] Aviation Regulation L2 and [R05] Aviation Regulation L14);

i) Informing appropriate authorities about violation of aviation regulations either directly or through the Head of AFIS station.

2.8 Qualification and keeping of AFIS dispatcher license

2.8.1 To perform the function of AFIS dispatcher, one must be holder of valid AFIS dispatcher license. This license is valid at every aerodrome in Czech Republic, that provides AFIS service.

2.8.2 To perform AFIS dispatcher function at international AFIS aerodrome in Czech Republic, during operational hours, the AFIS dispatcher must have language knowledge at level required by provision 1.2.9 of Aviation Regulation L1 and must have the obtained qualification recorded in the AFIS dispatcher license.

2.8.3 If AFIS dispatcher is performing his/her functions at other than home aerodrome, he/she must be taught local conditions and procedures by the Head of AFIS station of that aerodrome and there must be a record of such teaching.

2.8.4 Conditions for obtaining an AFIS dispatcher license are set by the CAA. AFIS dispatcher licenses are issued by the CAA, or by an authorized organization. AFIS dispatcher on duty is obligated to have his/her AFIS dispatcher license on him/her during the duty and shows it to inspecting body upon request.

2.8.5 AFIS dispatcher must be a holder of certificate for radio operator for an aeronautical mobile service, issued by Czech Telecommunication Office.

2.8.6 AFIS dispatcher must undergo schooling about providing AFIS every year and there must be a record of such schooling.

Gap analysis of requirements

The competences of AFIS personnel must be in line with the other relevant proposals for the present implementation:

- Airspace re-organisation: declaration of RMZ zones in G airspaces around the aerodromes (the German case);
- Type of approaches to be implemented: IFR non-precision approaches and APVs (only for aircraft wishing to fly IFR within the concerned airspace).

The following conclusions are drawn:

- Just as the reference German regulation, Czech regulation mandates that AFIS operators must hold a certificate for radio operator for an aeronautical mobile service. As such, Czech regulation is thought to be already in line for the current proposal of airspace re-organization.
- Neither the German nor the Czech regulation refer to specific training relating to RNP APCH operations, even though such specific training is recommended by [R36] ICAO EUR RNP APCH Guidance Material (EUR Doc 025) for ATCO's performing such operations.

4.1.3 Implementation Actions

The competences of AFIS personnel must be in line with the other relevant proposals for the present implementation:

- Airspace re-organisation: declaration of RMZ zones in G airspaces around the aerodromes;
- Type of approaches to be implemented: IFR non-precision approaches and APVs (only for aircraft wishing to fly IFR within the concerned airspace).

After conducting the gap analysis in the previous section, the following implementation actions can be derived:

- AFIS_P1: Regarding the proposed re-structuration of airspace, no implementation actions concerning AFIS personnel training are recommended in the present analysis as Czech regulation mandates that AFIS operators must hold a certificate for radio operator for an aeronautical mobile service.
- AFIS_P2: Regarding the introduction of RNP APCH procedures at uncontrolled aerodromes, revision of the regulation [R04] Aviation Regulation L11 is advised in order to clearly state whether there is the need for specific training of AFIS personnel for the support of IFR approach procedures.

4.2 Training for Other Aviation Personnel

Present section aims to detail the analysis of any required training of other aviation personnel that would be needed for the introduction of IFR procedures on uncontrolled aerodromes in the Czech Republic, especially in terms of safety and operational issues. The competences of other aviation personnel must be in line with the relevant proposals for the present implementation:

- Flight Information Service: Implementation of AFIS units at uncontrolled aerodromes;
- Airspace re-organisation: declaration of RMZ zones in G airspaces around the aerodromes;
- Type of approaches to be implemented: IFR non-precision approaches and APVs (only for aircraft wishing to fly IFR within the concerned airspace).

4.2.1 Identification of Other Aviation Personnel

[R50] ICAO Annex 1 – Personnel Licensing, Chapter 4 establishes guidelines for the licenses and ratings for the following personnel other than Flight Crew members:

- Aircraft maintenance (technician/engineer/mechanic);
- Student air traffic controller;
- Air traffic controller license;
- Air traffic controller ratings;
- Flight operations officer/flight dispatcher license;
- Aeronautical station operator license;
- Aeronautical meteorological personnel.

Note 1: A flight dispatcher (also known as a flight operations officer) assists in planning flight paths, taking into account aircraft performance and loading, en-route winds, thunderstorm and turbulence forecasts, airspace restrictions, and airport conditions. Dispatchers also provide a flight following service and advise pilots if conditions change. They usually work in the operations centre of the airline.

Note 2: The aeronautical station operator license is intended for personnel in charge of communications between aircraft and air traffic controller in oceanic area where HF radio communications are used.

Note 3: The requirements for training and qualifications for all aeronautical meteorological personnel are the responsibility of the World Meteorological Organization (WMO) in accordance with the Working arrangements between the ICAO and the World Meteorological Organization, see [R58] ICAO DOC 7475 – Working Arrangements between the International Civil Aviation Organization and the World Meteorological Organization. The requirements can be found in [R57] WMO-No. 258 – Guidelines for the education and training of personnel in meteorology and operational hydrology - Volume I.

[R55] ICAO Annex 14 – Aerodromes; Volume I – Aerodrome Design and Operations additionally refers to the training of the following personnel:

- Rescue and firefighting personnel;
- Vehicle operators.

Regarding AFIS station maintenance and the maintenance of the upgraded airport equipment for NPA runways, no relevant information about the responsible personnel has been found in the reviewed regulations.

4.2.2 Gap Analysis

The following specifications are to be taken into account:

- [R36] ICAO EUR RNP APCH Guidance Material (EUR Doc 025) does not specify any training/licensing requirements for personnel other than ATC and flight crew (see section 4.2.1) for the implementation of RNP APCH procedures.
- [R37] EUROCONTROL Manual for Aerodrome Flight Information Service (AFIS) specifies the following communication requirements and visual signs for control of ground vehicles and personnel upon AFIS deployment:

4.2.2.1 Entry to the manoeuvring area

The movement of persons or vehicles including towed aircraft on the manoeuvring area shall be subject to authorization[1] by the AFIS unit. Persons, including drivers of all vehicles, shall be required to obtain authorization from the AFIS unit before entry to the manoeuvring area. Notwithstanding such an authorization, entry to a runway or runway strip or change in the operation authorized shall be subject to a further specific authorization by the AFIS unit.

4.2.2.2 Priority on the manoeuvring area

4.1.2.2.1 All vehicles and persons shall give way to aircraft which are landing, taxiing or taking off, except that emergency vehicles proceeding to the assistance of an aircraft in distress shall be afforded priority over all other surface movement traffic. In the latter case, all movement of surface traffic should, to the extent practicable, be halted until it is determined that the progress of the emergency vehicles will not be impeded.

4.2.2.2.2 When an aircraft is landing or taking off, vehicles shall not be permitted to hold closer to the runway-in-use than:

a. at a taxiway/runway intersection — at a runway-holding position; and
b. at a location other than a taxiway/runway intersection — at a distance equal to the separation distance of the runway-holding position.

4.2.2.3 Communication requirements and visual signals

4.2.2.3.1 At AFIS aerodromes all vehicles employed on the manoeuvring area shall be capable of maintaining two-way radio-communication with the AFIS unit, except when the vehicle is only occasionally used on the manoeuvring area and is:

a. accompanied by a vehicle with the required communications capability; or
b. employed in accordance with a pre-arranged plan established with the AFIS unit.

4.2.2.3.2 When communications by a system of visual signals is deemed to be adequate, or in the case of radio-communication failure, the signals given hereunder shall have the meaning indicated therein:

Light signal from AFIS unit	**Meaning**
Green flashes	Permission to cross landing area or to move onto taxiway
Steady red	Stop
Red flashes	Move off the landing area or taxiway and watch out for aircraft
White flashes	Vacate manoeuvring area in accordance with local instructions

Table 4: AFIS unit light signals (nominal conditions)

4.2.2.3.3 In emergency conditions or if the signals in 4.1.2.3.2 are not observed, the signal given hereunder shall be used for runways or taxiways equipped with a lighting system and shall have the meaning indicated therein.

Light signal from AFIS unit	**Meaning**
Flashing runway or taxiway lights	Vacate the runway and observe the tower for light signal

Table 5: AFIS unit light signals (emergency conditions)

4.2.2.3.4 When employed in accordance with a plan prearranged with the AFIS unit, constructional and maintenance personnel should not normally be required to be capable of maintaining two-way radio- communication with the AFIS unit.

[1] Corresponding information on AFIS Phraseology for vehicles/persons on the maneuvering area is given in Annex B: AFIS Phraseology for Vehicles/Persons on the Manoeuvring Area.

5.1.1 The communications procedures shall be in accordance with [R54] ICAO Annex 10 – Aeronautical Telecommunications; Volume II – Communication Procedures including those with PANS status, and pilots, ATS personnel and other ground personnel shall be thoroughly familiar with the radiotelephony procedures contained therein.

4.2.3 Implementation Actions

The competences of other aviation personnel must be in line with the relevant proposals for the present implementation:

- Flight Information Service: Implementation of AFIS units at uncontrolled aerodromes;
- Airspace re-organisation: declaration of RMZ zones in G airspaces around the aerodromes;
- Type of approaches to be implemented: IFR non-precision approaches and APVs (only for aircraft wishing to fly IFR within the concerned airspace).

Regarding the last two points described above, no implementation actions in the context of training of other aviation personnel for the introduction of IFR procedures in uncontrolled aerodromes.

The following implementation action is recommended:

- T_OP1: Regarding AFIS implementation in compliance with the proposed model, the main implementation action identified is the possible requirement for training of ground vehicle operators relating to:
    - Communication with AFIS unit; and
    - Communication procedures.

  It is advised that upon deployment of AFIS units at aerodromes not previously providing such service, training is provided to these actors. In addition, it would also be recommended to include a reference in the Czech legislation regarding the maintenance personnel in charge of the AFIS equipment and the required airport equipment (described in Section 4.6 Airports Equipment Requirements).

4.3 METEO Requirements

The supply of METEO information and METEO equipment in uncontrolled aerodromes where IFR procedures are to be introduced must be in line with the relevant proposals for the present implementation:

- Flight Information Service: Implementation of AFIS units at uncontrolled aerodromes;
- Airspace re-organisation: declaration of RMZ zones in G airspaces around the aerodromes;
- Type of approaches to be implemented: IFR non-precision approaches and APVs (only for aircraft wishing to fly IFR within the concerned airspace).

4.3.1 Information Requirements

According to [R33] ICAO Circular 211 - AN / 128 Aerodrome Flight Information Service (AFIS), the basic elements of information to be provided to aircraft by an AFIS unit should include, as appropriate, meteorological information for aircraft about to take off or to land, including SIGMET information. Such information should, to the extent possible, be the same as that provided to aerodrome traffic by aerodrome control towers, i.e.:

- The current surface wind direction and speed, including significant variations;
- The QNH altimeter setting and, either on a regular basis in accordance with local arrangements or If so requested by the aircraft , the QFE altimeter setting;
- The air temperature for the runway to be used, in the case of take-off by turbine-engined aircraft;
- The current visibility representative of the direction of take-off and initial climb, or in the approach and landing area, if less than 10km or, when available to the AFIS officer, the current runway visual range for the runway to be used;
- Significant meteorological conditions in the take-off and climb-out area, or in the approach and landing area, This includes the occurrence or expected occurrence of cumulonimbus or thunderstorm, moderate or severe turbulence, wind shear, hail, moderate or severe icing, severe line squall, freezing rain, marked mountain waves, sand storm, dust storm, blowing snow, tornado or waterspout;
- The present weather and the amount and height of base of low cloud, in the case of aircraft making an approach in Instrument meteorological conditions.

On the other hand, [R37] EUROCONTROL Manual for Aerodrome Flight Information Service (AFIS), Appendix B, specifies the following AFIS requirements for information:

1. Meteorological Information

1.1 General

1.1.1 AFIS units shall be supplied with up-to-date information on existing and forecast meteorological conditions as necessary for the performance of their respective functions. The information shall be supplied in such a form as to require a minimum of interpretation on the part of AFIS personnel and with a frequency which satisfies the requirements of the AFIS units concerned.
1.1.2 AFIS units should be supplied with available detailed information on the location, vertical extent, direction and rate of movement of meteorological phenomena in the vicinity of the aerodrome, and particularly in the climb-out and approach areas, which could be hazardous to aircraft operations.

1.2 AFIS units

1.2.1 AFIS units shall be supplied with meteorological information listed in 1.2.2 below for the aerodrome with which they are concerned. Special reports and amendments to forecasts shall be communicated to the AFIS units as soon as they are necessary in accordance with established criteria, without waiting for the next routine report or forecast.
1.2.2 The following meteorological information shall be supplied, as necessary, to an AFIS unit by its associated meteorological office:

a) local routine and special reports, METAR and SPECI, TAF and trend forecasts and amendments thereto, for the aerodrome concerned;
b) SIGMET and AIRMET information, wind shear warnings and alerts and aerodrome warnings;
c) any additional meteorological information agreed upon locally, such as forecasts of surface wind for the determination of possible runway changes.

> 1.2.3 AFIS units shall be provided with current pressure data for setting altimeters for the aerodrome concerned.

For RNP APCH to LNAV/VNAV minima, the theoretical vertical descent profile is defined by a geometrical path with fixed flight path angle. The vertical path angle is computed between 50ft above the runway threshold and a final capture point which corresponds to the location of the FAF associated with the NPA RNP APCH. The final path starts when the aircraft intersects the vertical final guidance. But this point of intersection is very close to FAF of NPA RNP APCH. **Given that the vertical path is based on barometric inputs, it is very important that the correct local pressure setting (QNH) is entered into the system (this should be transmitted using AFIS)**. The final descent is also influenced by temperature: temperature limits are published on the chart.

According to [R33] ICAO Circular 211 - AN / 128 Aerodrome Flight Information Service (AFIS), an AFIS unit should be connected with the associated flight information centre (FIC) or area control centre (ACC) and, as appropriate, with the meteorological office serving the aerodrome.

4.3.2 Equipment Requirements

[R37] EUROCONTROL Manual for Aerodrome Flight Information Service (AFIS), Appendix B, specifies the following AFIS requirements for information:

> 1.2.4 AFIS units shall be equipped with surface wind display(s). The display(s) shall be related to the same location(s) of observation and be fed from the same sensor(s) as the corresponding display(s) in the meteorological station, where such a station exists. Where multiple sensor(s) are used, the displays to which they are related shall be clearly marked to identify the runway and section of the runway monitored by each sensor.
> 1.2.5 AFIS units at aerodromes where runway visual range values are measured by instrumental means shall be equipped with display(s) permitting read-out of the current runway visual range value(s). The display(s) shall be related to the same location(s) of observation and be fed from the same sensor(s) as the corresponding display(s) in the meteorological station, where such a station exists.
> 1.2.6 AFIS units at aerodromes where the height of cloud base is assessed by instrumental means should be equipped with display(s) permitting read-out of the current value(s) of the height of cloud base. The displays should be related to the same location(s) of observations and be fed from the same sensor(s) as the corresponding display(s) in the meteorological station, where such a station exists.
> 1.2.7 AFIS units shall be supplied with information on wind shear, when available, which could adversely affect aircraft on the approach or take-off paths or during circling approach and aircraft on the runway during the landing roll or take-off run.

4.3.3 Gap Analysis

Current situation

According to [R04] Aviation Regulation L11 - Air Traffic Services, Appendix N:

> **3.5 Requirements for meteorological equipment**
>
> 3.5.1 AFIS station must be equipped with:
>
> a) Suitable device for measuring and displaying direction and speed of ground wind;
> b) Suitable device for measuring and displaying data about actual QNH in hectopascals;
> c) Suitable device for measuring outside temperature at aerodrome;
> d) Table (scheme) for determining visibility.
>
> 3.5.2 Meteorological devices listed in 3.5.1 a) and b) must meet the following criteria:
>
> a) Their parameters must meet criteria listed in various sections of [R02] Aviation Regulation L3;
> b) They must have a valid calibration;
> c) The device must be installed and operated according to the relevant requirements of Regulation [R02] Aviation Regulation L3 and §17 of [R65] Act No 49/1997 Coll. on civil aviation, amended;
> d) The device must be approved for use in civil aviation according to §16 of [R65] Act No 49/1997 Coll. on civil aviation, amended.

According to [R06] Aviation Regulation L4444 - Procedures for Air Navigation Services – Air Traffic Management:

6.6 Information to arriving aircraft

Note 1: Above mentioned meteorological information are similar to those required for ATIS radio broadcast to arriving aircraft in accordance with [R04] Aviation Regulation L11, provision 4.3.8 l) to t), and are taken from local regular and exceptional meteorological reports, in accordance with Chapter 11, provision 11.4.3 of [R06] Aviation Regulation L4444.

Note 2: To aircraft arriving according to IFR rules to aerodrome with AFIS services, must be given meteorological information minimally to extent of provision 4.3.1 of Appendix N of [R04] Aviation Regulation L11. Additional information (for example to extent of provision 6.6 of [R06] Aviation Regulation L4444) may be given to arriving traffic, if this information is available to AFIS or ATC station, providing services in accordance with provision 4.5.6, Appendix N of [R04] Aviation Regulation L11.

Finally, regarding the connection with the meteorological office serving the aerodrome mentioned in [R33] ICAO Circular 211 - AN / 128 Aerodrome Flight Information Service (AFIS) states the following:

3.3.1 If there is another ATS station, firefighting unit and/or **meteorological station** at aerodrome, the AFIS station must have a direct telephone connection with them.

4.3.4 Implementation Actions

The supply of METEO information and METEO equipment in uncontrolled aerodromes where IFR procedures are to be introduced must be in line with the relevant proposals for the present implementation:

- Flight Information Service: Implementation of AFIS units at uncontrolled aerodromes;
- Airspace re-organisation: declaration of RMZ zones in G airspaces around the aerodromes;
- Type of approaches to be implemented: IFR non-precision approaches and APVs (only for aircraft wishing to fly IFR within the concerned airspace).

Both the requirements regarding meteorological information and equipment to comply with the three points mentioned above have been considered and transposed in the Czech regulations, according to present analysis performed. Hence, no specific implementation actions nor amendments in the Czech legislation are required in this field.

4.4 IFR Procedures Requirements

The general requirements derived from each of the various RNP APCH approach procedures have been gathered as an introduction to this chapter, describing both non-precision 2D approaches (LNAV and LP) and APV 3D approaches (LNAV/VNAV and LPV).

Traditionally, there have been two types of Instrument Approach Procedure:

- **Precision Approach** (PA) uses for the final approach segment an instrument landing system (e.g. ILS, GBAS, MLS) which provides both lateral and vertical guidance on a geometrically defined continuous descent path.
- **Non-Precision Approach** (NPA) uses for the final approach segment, conventional navigation aids (e.g. NDB, VOR, DME) or basic **GNSS** (e.g. GPS) and provide only lateral guidance along the final approach segment.

LNAV, LNAV/VNAV, LPV and LP are different levels of approach service and are used to distinguish the various minima lines on the RNAV (GNSS) chart. The minima line to be used depends on the aircraft capability and approval.

LNAV – Lateral Navigation. The minima line on the chart for RNP Approaches without vertical guidance.

LNAV/VNAV – the minima line based on BARO-VNAV system performances that can be used by aircraft approved. LNAV/VNAV minima can also be used by SBAS capable aircraft.

LPV – Localiser Performance with Vertical Guidance: the minima-line based on SBAS performances that can be used by aircraft approved.

LP – At some airports, it may not be possible to meet the requirements to publish an approach procedure with LPV vertical guidance. This may be due to: obstacles and terrain along the desired final approach path, airport infrastructure deficiencies, or the inability of SBAS to provide the desired availability of vertical guidance (i.e., an airport located on the fringe of the SBAS service area). When this occurs, a State may provide an LP approach procedure based on the lateral performance of SBAS. The LP approach procedure is a non-precision approach procedure with angular lateral guidance equivalent to a localizer approach. As a non-precision approach, an LP approach procedure provides lateral navigation guidance to a minimum descent altitude (MDA); however, the SBAS integration provides no vertical guidance.

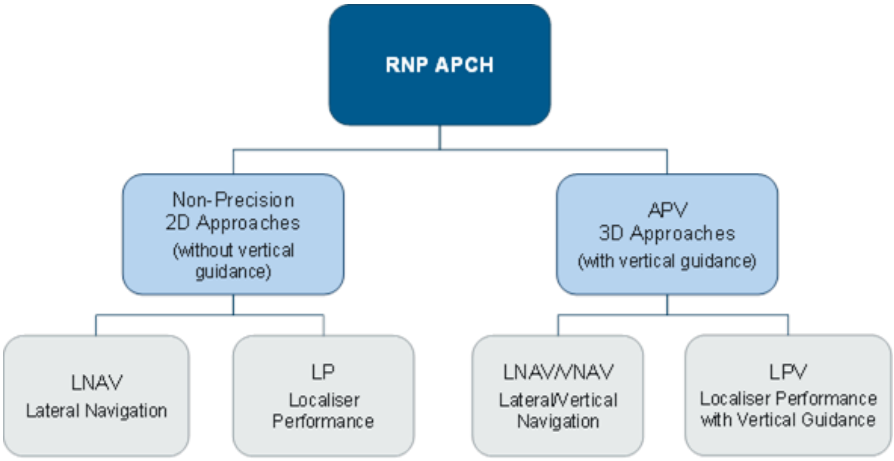

Figure 2: Approach procedures breakdown classification

RNAV approaches are described by a series of waypoints, legs, altitude and speed constraints published and stored in the on-board navigation database.

GNSS-based RNAV capabilities were initially used to fly NPA procedures. These procedures are published with a Minimum Descent Altitude/Height (MDA/H), as with any conventional NPA procedure. The MDA/H is indicated in the LNAV minima line on the RNAV (GNSS) instrument approach chart. Hence, the LNAV approach procedure can be considered as the baseline.

It is essential to bear in mind that no modifications to the cockpit instruments are in principle necessary to use RNP APCH on-board.

The important distinction between the different types of RNP APCH operations is the **provision of vertical guidance**. RNP APCH to LNAV and LP minima include only lateral guidance and are published with a MDA while RNP APCH procedures with vertical guidance (APV) are published with a DA, which may be lower than the MDA thus potentially increasing airport accessibility. In addition, the provision of vertical guidance improves pilot situational awareness, thus improving safety.

Approaches with vertical guidance (APV)

In addition to lateral RNAV capabilities, modern multi-sensor RNAV systems provide a VNAV function which allows a vertical path to be flown with a constant rate of descent based on the barometric altimeter, or on GPS augmented SBAS position. Provision of both lateral and vertical guidance may also be based on LPV capability of an aircraft.

The RNAV procedures using BARO-VNAV for vertical guidance are called APV BARO-VNAV and are flown to a Decision Altitude/Height indicated in the LNAV/VNAV minima line on the chart. Aircraft equipped with SBAS systems can also fly procedures designed for APV BARO-VNAV if the State publishing the procedure permits it.

For RNP APCH to LNAV/VNAV minima, the theoretical vertical descent profile is defined by a geometrical path with fixed flight path angle. The vertical path angle is computed between 50ft above the runway threshold and a final capture point which corresponds to the location of the FAF associated with the NPA RNP APCH. The final path starts when the aircraft intersects the vertical final guidance. But this point of intersection is very close to FAF of NPA RNP APCH. Given that the vertical path is based on barometric inputs, it is very important that the correct local pressure setting (QNH) is entered into the system (this should be transmitted using **AFIS**). The final descent is also influenced by temperature: temperature limits are published on the chart.

RNP APCH to LPV minima is based on **GNSS core constellation and SBAS**. The vertical guidance is angular and the final approach segment profile is defined in the Final Approach Segment Data Block (FAS DB). The vertical path angle is defined (not computed) and published in degrees (mainly 3°).

RNP APCH has the potential to provide **better minima** than conventional Non- Precision Approach. Consequently, **better airport accessibility** can be achieved at those airports without precision approach capability, as well as at airports where precision approach aid is out of service.

Additionally, RNP APCH also brings improved **situational awareness** for the pilots in both the horizontal and vertical domain (in the case of APV), as well as the means to perform a **stabilised approach**, both of which contribute to **improve safety**.

Note that **all three levels of RNP APCH can be published on a single chart** only in the case where the procedure design solution for LNAV does not utilize step-down fixes within the final approach segment. In this case, it is recommended that RNP APCH (LNAV) and RNP APCH (LNAV/VNAV and/or LPV) should be published on separate charts.

It is recommended that, whenever possible, all three levels of RNP APCH procedure be implemented at the same time for a particular runway.

Regarding its implementation, [R36] ICAO EUR RNP APCH Guidance Material (EUR Doc 025) recommends the consideration of six elements during the assessment of the need to implement RNP APCH, as stated in Figure 3. Additional comments are provided below for a better understanding.

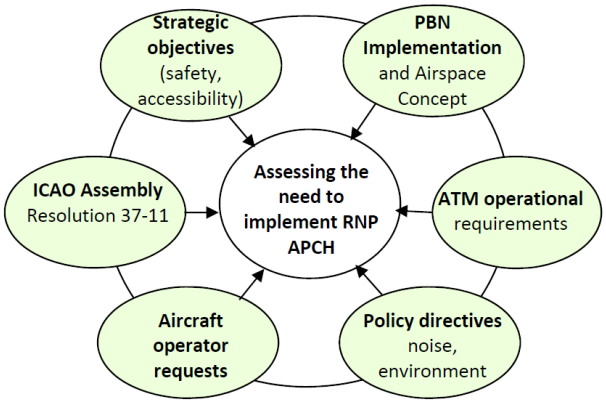

Figure 3: Factors to consider for RNP APCH implementation

[R48] ICAO Assembly Resolution A37-11 - Performance-based navigation global goals presents RNP APCH to LNAV minima as an acceptable alternative to APV in places where APV implementation is not possible or does not make sense as no aircraft are suitably equipped for APV operations. This could be the case for small airports with only general aviation. RNP APCH implementation is part of the resolution for ICAO PBN deployment, the main objective of which is to improve safety.

ICAO **strategic objectives** include the increase of safety, airport accessibility and pilot situational awareness.

4.4.1 Minimum IFR Procedures Requirements

The following points are detailed in the following subsections:

1. Operational minima for RNP APCH procedures;
2. GNSS coverage and availability of the RAIM function;
3. RNP APCH procedure design guidelines;
4. RNP APCH procedure publication guidelines.

4.4.1.1 Operational Minima for RNP APCH Procedures

According to [R36] ICAO EUR RNP APCH Guidance Material (EUR Doc 025), an RNAV(GNSS) approach covers three possible types of approach procedure:

Non-precision approach	Identified on by the minima line	LNAV - MDA/MDH
APV BARO-VNAV approach	Identified on by the minima line	LNAV/VNAV - DA/DH
APV SBAS approach	Identified on by the minima line	LPV - DA/DH

Table 6: Types of RNAV(GNSS) approaches

Furthermore, according to [R38] Commission Regulation (EU) No 965/2012 in its Annex VIII: Specialised Operations (SPO), Subpart B: Operational Procedures (OP), the following requirements apply to operational minima for RNP APCH procedures:

SPO.OP.110 Aerodrome operating minima — aeroplanes and helicopters

For instrument flight rules (IFR) flights, the operator or the pilot-in-command shall specify aerodrome operating minima for each departure, destination and alternate aerodrome to be used. Such minima shall:

(1) not be lower than those established by the State in which the aerodrome is located, except when specifically approved by that State; and

(2) when undertaking low visibility operations, be approved by the competent authority in accordance with Annex V (Part-SPA), Subpart E to [R38] Commission Regulation (EU) No 965/2012.

When specifying the aerodrome operating minima, the operator or the pilot-in-command shall take the following into account:

(1) the type, performance and handling characteristics of the aircraft;

(2) the competence and experience of the flight crew and, if applicable, its composition;

(3) the dimensions and characteristics of the runways and final approach and take-off areas (FATOs) that may be selected for use;

(4) the adequacy and performance of the available visual and non-visual ground aids;

(5) the equipment available on the aircraft for the purpose of navigation and/or control of the flight path, during the take-off, the approach, the flare, the landing, the rollout and the missed approach;

(6) the obstacles in the approach, the missed approach and the climb-out areas required for the execution of contingency procedures;

(7) the obstacle clearance altitude/height for the instrument approach procedures;

(8) the means to determine and report meteorological conditions; and

(9) the flight technique to be used during the final approach.

The minima for a specific type of approach and landing procedure shall only be used if:

(1) the ground equipment required for the intended procedure is operative;

(2) the aircraft systems required for the type of approach are operative;

(3) the required aircraft performance criteria are met; and

(4) the flight crew is qualified appropriately.

SPO.OP.111 Aerodrome operating minima — NPA, APV, CAT I operations

The decision height (DH) to be used for a non-precision approach (NPA) flown with the continuous descent final approach (CDFA) technique, approach procedure with vertical guidance (APV) or category I (CAT I) operation shall not be lower than the highest of:

(1) the minimum height to which the approach aid can be used without the required visual reference;

(2) the obstacle clearance height (OCH) for the category of aircraft;

(3) the published approach procedure DH where applicable;

(4) the system minimum (200ft for LPV and 250ft for LNAV and LNAV/VNAV); or

(5) the minimum DH specified in the Aircraft Flight Manual (AFM) or equivalent document, if stated.

The minimum descent height (MDH) for an NPA operation flown without the CDFA technique shall not be lower than the highest of:

(1) the OCH for the category of aircraft;

(2) the system minimum (200ft for LPV and 250ft for LNAV and LNAV/VNAV); or

(3) the minimum MDH specified in the AFM, if stated.

4.4.1.2 GNSS Coverage and Availability of the RAIM Function

It is up to the operator to ensure that there is GNSS coverage for the flights he is planning. According to [R36] ICAO EUR RNP APCH Guidance Material (EUR Doc 025):

> 5.2.8.6. In order to support pre-flight planning, models of GPS and EGNOS allow predicting the impact on the navigation service of known and scheduled GNSS systems/subsystems outages. EUROCONTROL makes available a web-based service called Augur (http://augur.ecacnav.com) which provides GPS RAIM predictions to users. It (will) also display information about EGNOS availability to support LPV operations, according to information provided by the ESSP.
>
> 5.2.8.7. Such GPS RAIM and LPV availability predictions may also be provided in the form of NOTAMs . The ESSP can provide relevant information for EGNOS NOTAMs to interested NOTAM Offices (for APV SBAS). The details of such a service are described and agreed with individual ANSP in the scope the EGNOS Working Agreement (EWA, as mentioned in section 5.2.6.4.6). Inputs for NOF to generate RAIM NOTAM are also available from other sources (e.g. the DFS). GPS RAIM NOTAM can also be generated by the EUROCONTROL Augur system.

4.4.1.3 RNP APCH Procedure Design Guidelines

According to [R36] ICAO EUR RNP APCH Guidance Material (EUR Doc 025), the following **RNP APCH procedure design** guidelines should be followed:

> 5.3.2.1. The procedure design criteria for RNP APCH operations are relatively new, therefore limited expertise is available today. Early identification of any issue related to procedure design expertise would allow time for training and procurement of such know-how that is indispensable during next implementation phase. Special consideration should be given when designing an LNAV RNP APCH procedure using step-down fixes. The use of the step-down fix is a valid design criteria permitting additional descent within a segment by identifying a point at which a controlling obstacle has been safely over-flown. However, due to the fact that RNP APCH procedures rely on navigation databases and Flight Management Systems (FMS) it has been recognized that there are some avionics limitation in handling coded step-down fixes (SDF) within the final approach segment. It is also clear that some State regulators will not accept SDFs in the final segment coded into the navigation database under any circumstances. In that case, the State regulator that does not accept SDF coding, should advise the navigation data-houses through an official letter. It is highly recommended to publish for each SDF both the procedure altitude to be maintained to the SDF (along the profile) and the minimum obstacle clearance altitude (MOCA) available up to the SDF (as a shaded block). These two values are very often different and publishing both is of helpful for pilots.
>
> 5.3.2.2. [R61] ICAO DOC 8168 – Procedures for Air Navigation Services – Aircraft Operations, Volume II, Part III, and [R53] ICAO Annex 10 – Aeronautical Telecommunications; Volume I – Radio

Navigation Aids include requirements for RNAV training for procedure designers. However, it is recognised that the current ICAO material does not provide for the complete training needs of procedures designers. [R64] ICAO DOC 9906 – Quality Assurance Manual for Flight Procedure Design, Volume 2 – Flight Procedure Designer Training provides additional guidance for the establishment of flight procedure designer training. Training is the starting point for any quality assurance programme. This volume provides guidance for the establishment of a training programme.

5.3.2.3. Procedure design will be performed accounting for the categories of aircraft operating on the airport.

5.3.2.4. The procedures design criteria regarding different RNP APCH operations can be found in [R61] ICAO DOC 8168 – Procedures for Air Navigation Services – Aircraft Operations, Volume II.

5.3.2.5. The criteria for RNP APCH procedures to LNAV minima (non-precision approach) are provided in [R61] ICAO DOC 8168 – Procedures for Air Navigation Services – Aircraft Operations, Volume II, Part III, Section 3, Chapter 3.

5.3.2.6. The criteria for RNP APCH with vertical guidance based on BARO-VNAV (APV BARO-VNAV) design are described in [R61] ICAO DOC 8168 – Procedures for Air Navigation Services – Aircraft Operations, Volume II, Part III, Section 3, Chapter 4.

5.3.2.7. The criteria for RNP APCH with vertical guidance based on SBAS (APV SBAS) criteria are provided in [R61] ICAO DOC 8168 – Procedures for Air Navigation Services – Aircraft Operations, Volume II, Part III, Section 3, Chapter 5.

4.4.1.4 RNP APCH procedure approach publication

According to [R36] ICAO EUR RNP APCH Guidance Material (EUR Doc 025), the following AIS requirements apply concerning **RNP APCH approach publication**:

5.3.8.1.1. For charting, general criteria apply as specified in [R61] ICAO DOC 8168 – Procedures for Air Navigation Services – Aircraft Operations, Volume II, Part I, Section 4, Chapter 9. The title of the instrument approach chart shall be RNAV(GNSS) Rwy XX. The minima box could include OCA/H values for NPA (LNAV), APV BARO-VNAV (LNAV/VNAV) and LPV minima.

5.3.8.1.2. When possible, it is recommended to have one RNAV chart including all three minima lines, i.e. LNAV, LNAV/VNAV and LPV. If multiple RNAV approaches exist to the same runway, a suffix is added to each of the applicable approach identifiers, for example RNAV (GNSS) Y RWY 27 and RNAV (GNSS) Z RWY 27. The Z suffix normally represents the preferred approach. Using a suffix is a common rule not specific to RNP APCH procedures.

5.3.8.1.3. Procedure designers need to ensure that the procedures can be coded in ARINC 424 format. They have to be familiar with the path terminators used to code RNAV systems and functional capabilities of different RNAV systems. A close co-operation should exist between procedure designers and the data houses that compile the coded data for the navigation database. Both procedure designers and data houses belong to the ANSP family according to the EASA Basic Regulation. All procedures must be based upon WGS-84 coordinates.

5.3.8.1.4. The State AIP should clearly indicate that the navigation application is RNP APCH. The navigation data published in the State AIP for the procedures and supporting navigation aids must meet the charting requirements of [R51] ICAO Annex 4 – Aeronautical Charts, Chapter 11, paragraph 11.10.9 and [R56] ICAO Annex 15 – Aeronautical Information Services (as appropriate).

5.3.8.1.5. A coding table or a formal textual description should be published on the back of the chart providing the coordinates of all the waypoints (and Fixes) used in the procedure. If it is not possible to put this information on the back of the chart a separate, properly referenced sheet can be used.

5.3.8.1.6. In the case of LPV, the data required to code the procedure includes a FAS Data Block, which contains an eight character hexadecimal representation of the calculated remainder bits called the CRC remainder. The CRC remainder is used to determine the integrity of the FAS data during transmission and storage and it is computed electronically using a FAS data block software tool. The content of the FAS Data Block should be published on the verso of the chart in order to ensure that the procedure is correctly coded in the navigation database.

5.3.8.1.7. A FAS DB tool is made available by EUROCONTROL (http://fas.ecacnav.com). This tool allows the calculation of the CRC value for a FAS DB, generates an electronic version of the FAS DB

and converts electronic FAS DB into a textual form. Generally, FAS DB tools also generate a Data Block representation as a hexadecimal string. It is recommended that the textual description only, together with the CRC remainder value should be made available on the verso of the chart.

5.3.8.1.8. Experience gained by certain States through recent implementation projects highlights the importance of good project management allowing a reasonable amount of time for unexpected events, especially those related to procedure coding. For example, four months were actually needed for a procedure to become available in the navigation database, instead of the planned two months and a half.

5.3.8.1.9. Another detail concerning the publication of LPV procedures is that a unique SBAS channel number is needed for every published approach. ICAO will implement a global system of SBAS Channel assignments. Currently, as agreed with ICAO and FAA, EUROCONTROL is the focal point in Europe for SBAS channel allocation. The Procedure designer is expected to request the appropriate organisation for a channel number. The SBAS channel number is a five digit number that must be regionally unique and shall be in the range of 40,000 to 99,999. Channel number assignments are required for LPV and LP procedures and shall be promulgated on the SBAS LPV and LP approach charts respectively. It should be noted that SBAS LP minima will not be published at the same location as SBAS LPV minima. LP procedures will only be published at locations where LPV is not possible.

5.3.8.1.10. The information regarding the establishment of new RNP APCH procedure(s) shall be provided in accordance with the AIRAC system. It is recommended that new RNP APCH procedures should be considered by States AIS as 'major changes' in respect of circumstances listed in Appendix 4, Part 3 of [R56] ICAO Annex 15 – Aeronautical Information Services (guidance on what constitutes a 'major change' is included in [R59] ICAO DOC 8126 – Aeronautical Information Services Manual). Therefore, it is recommended that new RNP APCH information should be distributed by the AIS unit at least 56 days in advance of the planned effective date.

4.4.2 Gap Analysis

A review of the regulations used in the Czech Republic in terms of IFR procedures requirements has been undertaken in order to analyse the existing gap with the European regulations in this field. This gap analysis has been conducted for each of the four areas (operational minima, GNSS coverage, RNP APCH design guidelines and publications) analysed in the previous section. The main applicable regulations considered for this analysis have been [R46] Aviation Regulation L10/I and [R61] ICAO DOC 8168 – Procedures for Air Navigation Services – Aircraft Operations, Volume II.

Regarding the operational minima for RNP APCH procedures, [R61] ICAO DOC 8168 – Procedures for Air Navigation Services – Aircraft Operations, Volume II in its Part I Section 4, presents the following statements regarding the Obstacle Clearance Altitude/Height (OCA/H) for NPAs and APVs:

5.4.1.2 *Precision approach procedures/approach procedures with vertical guidance (APV)*

a) *OCA/H.* In a precision approach procedure (or APV), the OCA/H is defined as the lowest altitude/height at which a missed approach must be initiated to ensure compliance with the appropriate obstacle clearance design criteria.

b) *Reference datum.* The OCA is referenced to mean sea level (MSL). The OCH is referenced to the elevation of the relevant runway threshold.

5.4.1.3 *Non-precision approach procedure (NPA)*

a) *OCA/H.* In a non-precision approach procedure, the OCA/H is defined as the lowest altitude or alternatively the lowest height below which the aircraft cannot descend without infringing the appropriate obstacle clearance criteria.

b) *Reference datum.* The OCA is referenced to mean sea level (MSL). The OCH is referenced to:

1) aerodrome elevation; or

2) runway threshold elevation when the threshold elevation is more than 2m (7ft) below the aerodrome elevation.

5.4.3.1 Aligned straight-in approach

The OCA/H for a straight-in, non-precision approach where the angle between the track and the extended runway centre line does not exceed 5 degrees shall provide the following minimum obstacle clearance (MOC) over the obstacles in the final approach area:

a) 75m (246ft) with FAF; and

b) 90m (295ft) without FAF.

In terms of aerodrome operating minima, the OCA/H is one of the factors taken into account in establishing operating minima for an aerodrome in accordance with [R52] ICAO Annex 6 – Operation of Aircraft.

Furthermore, [R61] ICAO DOC 8168 – Procedures for Air Navigation Services – Aircraft Operations, Volume II, Part III Section 3 details dedicated OCA/H and OAS calculation methods for all types of approaches (BARO-VNAV, SBAS NPAs, APVs and PAs CAT I) for the various approach segments. In addition, in terms of promulgation there is a reference to the minima box, which is a table of OCA/H values for each aircraft category that may be promulgated for SBAS operations at the particular aerodrome. All APV and CAT I SBAS OCA/H's are promulgated as LPV lines of minima. All NPA OCA/Hs shall be promulgated as LP (localizer performance) lines of minima. LPV and LP lines of minima shall not be published on the same chart.

In conclusion, the requirements and specifications in the Czech legislation regarding approach operational minima are highly exhaustive and detailed. However, the Czech legislation lacks detail in terms of aerodrome operational minima, which could be adapted from European legislation described in section 4.4.1.1.

Regarding the GNSS coverage and availability of the RAIM function, [R46] Aviation Regulation L10/I includes two tables with various GNSS specifications per type of operation. The first table presents the requirements for non-precision approaches (NPA) and approaches with vertical guidance (APV) in terms of accuracy (horizontal and vertical), integrity, time-to-alert, continuity and availability of service.

Typical operation	Accuracy horizontal 95% (Notes 1 and 3)	Accuracy vertical 95% (Notes 1 and 3)	Integrity (Note 2)	Time-to-alert (Note 3)	Continuity (Note 4)	Availability (Note 5)
En-route	3.7 km (2.0 NM) (Note 6)	N/A	$1 - 1 \times 10^{-7}$/h	5 min	$1 - 1 \times 10^{-4}$/h to $1 - 1 \times 10^{-8}$/h	0.99 to 0.99999
En-route, Terminal	0.74 km (0.4 NM)	N/A	$1 - 1 \times 10^{-7}$/h	15 s	$1 - 1 \times 10^{-4}$/h to $1 - 1 \times 10^{-8}$/h	0.99 to 0.99999
Initial approach, Intermediate approach, Non-precision approach (NPA), Departure	220 m (720 ft)	N/A	$1 - 1 \times 10^{-7}$/h	10 s	$1 - 1 \times 10^{-4}$/h to $1 - 1 \times 10^{-8}$/h	0.99 to 0.99999
Approach operations with vertical guidance (APV-I)	16.0 m (52 ft)	20 m (66 ft)	$1 - 2 \times 10^{-7}$ per approach	10 s	$1 - 8 \times 10^{-6}$ in any 15 s	0.99 to 0.99999

Table 7: GNSS signal performance requirements for NPAs and APV

Furthermore, the table below shows the horizontal and vertical alert limits (in kilometres and nautical miles) to be considered for the NPA and APV approaches.

Typical operation	Horizontal alert limit	Vertical alert limit
En-route (oceanic/continental low density)	7.4 km (4 NM)	N/A
En-route (continental)	3.7 km (2 NM)	N/A
En-route, Terminal	1.85 km (1 NM)	N/A
NPA	556 m (0.3 NM)	N/A
APV-I	40 m (130 ft)	50 m (164 ft)

Table 8: GNSS signal performance requirements (horizontal and vertical alert limits) for NPAs and APV

Even though GNSS performance requirements are provided, the Czech legislation is lacking information concerning the RAIM function and GNSS NOTAMs.

Regarding the RNP APCH procedure design guidelines, [R61] ICAO DOC 8168 – Procedures for Air Navigation Services – Aircraft Operations, Volume II is the main regulation within aviation regulations applicable in Czech Republic, together with [R46] Aviation Regulation L10/I. The main criteria for procedures design for the different RNP APCH operations are included in [R61] ICAO DOC 8168 – Procedures for Air Navigation Services – Aircraft Operations, Volume II, which are categorised by approach type:

LNAV minima (non-precision approach) design guidelines are provided in its Volume II, Part III, Section 3, Chapter 3. Vertical guidance approaches based on BARO-VNAV (APV BARO-VNAV) design guidelines are described in the following chapter (Chapter 4). Finally, design guidelines for approaches with vertical guidance based on SBAS (APV SBAS) are provided in Chapter 5 of the same section of [R61] ICAO DOC 8168 – Procedures for Air Navigation Services – Aircraft Operations, Volume II.

Regarding the RNP APCH procedure publication guidelines, legislation requirements are integrated in [R61] ICAO DOC 8168 – Procedures for Air Navigation Services – Aircraft Operations, Volume II. In its Part I, Section 4: Arrival and approach procedures has a dedicated chapter for the topic of charting and AIP, including the procedures to name the arrival and approach charts that illustrate the RNP APCH procedures.

Furthermore, [R61] ICAO DOC 8168 – Procedures for Air Navigation Services – Aircraft Operations, Volume II, Part III PBN has a dedicated section (Section 5) addressing the publication of PBN procedures, specifying publication details for LNAV, LNAV/VNAV, LP and LPV approaches. This section also includes the aeronautical database publication requirements and the derivation of the SBAS obstacle assessment surfaces (OAS).

4.4.3 Implementation Actions

After conducting the gap analysis in the previous section, the following implementation action can be derived:

- IFR_PROC1: Specific information about GNSS NOTAMs and the requirements on RAIM function availability could be integrated in Aviation Regulation [R46] Aviation Regulation L10/I as an amendment.

4.5 Flight Crew and Aircraft Equipment Requirements

Present section aims to detail any required flight crew training and aircraft equipment for the introduction of IFR procedures on uncontrolled aerodromes in the Czech Republic, especially in terms of safety and operational issues. The competences of flight crew and aircraft equipment of flights operating within the airspace of the concerned aerodromes must be in line with the relevant proposals for the present implementation:

- Airspace re-organisation: declaration of RMZ zones in G airspaces around the aerodromes;
- Type of approaches to be implemented: IFR non-precision approaches and APVs.

As baseline, the same requirements for IFR operations already applicable in the country should be extended to new aerodromes operation IFR procedures, unless the use of new technology is considered.

4.5.1 Flight Crew: Minimum Requirements

Concerning the airspace re-organization proposal for the present implementation (declaration of RMZ zones in G airspaces around the aerodromes), the licensing requirements established by [R50] ICAO Annex 1 – Personnel Licensing for flight crew operating under IFR are compliant with radiotelephony requirements for RMZ zones (communication procedures and phraseology as applied to aircraft operations under IFR and action to be taken in case of communication failure).

On the other hand, a training syllabus for flight crew concerning the implementation of RNP APCH procedures is provided in [R40] EASA AMC 20-27 and [R41] EASA AMC 20-28:

- [R40] EASA AMC 20-27 Airworthiness Approval and Operational Criteria for RNP APPROACH Operations including APV BARO-VNAV Operations provides an acceptable mean that can be used to obtain airworthiness approval of an RNAV system based on a GNSS standalone receiver or multisensory system including at least one GNSS sensor in order to conduct RNP APCH operations.
- [R41] EASA AMC 20-28 Airworthiness Approval and Operational Criteria related to RNAV for GNSS approach operation to LPV minima using SBAS provides an acceptable mean that can be used to obtain airworthiness approval of an RNAV system based on a GNSS standalone receiver or multisensory system including at least one GNSS sensor in order to conduct RNP APCH operations.

For RNP APPROACH (RNP APCH) Operations Including APV BARO-VNAV Operations - [R40] EASA AMC 20-27

Each pilot should receive appropriate training, briefings and guidance material in order to safely conduct RNP APCH operations without or with vertical guidance (APV BARO-VNAV). This material and training should cover both normal and abnormal procedures.

Standard training and checking, such as recurrent aeroplane/STD training and proficiency checks, should include RNP APCH procedures. Based on this, the operator should determine what constitutes a qualified crew.

The operator should ensure that during line operations each pilot can perform assigned duties reliably and expeditiously for each procedure to be flown in:

a. normal operations; and
b. abnormal operations.

The operator should ensure that altimeter settings procedures and cold temperature limitations during APV BARO-VNAV operation are respected.

a) Altimeter setting

Flight Crews should take precautions to switch altimeter settings at appropriate times or locations and request a current altimeter setting if the reported setting is not recent, particularly at times when pressure is reported or is expected to be rapidly decreasing. Remote (regional) altimeter settings are not allowed.

Note: The operational crosscheck between altimeter read-out and charted altitude values at FAF or other profile fixes does not protect against altimeter setting errors.

b) Cold Temperature

When cold weather temperatures exist, the pilot should check the chart for the instrument approach procedure to determine the limiting temperature for the use of BARO-VNAV capability. If the airborne system contains a temperature compensation capability, manufacturer instructions should be followed for use of the

BARO-VNAV function, and the operational use of the temperature compensation function must be authorised by the Air Navigation Service Provider.

A training programme should be structured to provide sufficient theoretical and practical training.

The flight crew training programme should be structured to provide sufficient theoretical and practical training, using a simulator, training device, or line training in an aircraft, in the concept of RNP APCH operations without or with vertical guidance (APV BARO-VNAV) and the use of the aircraft's RNAV system in such operations to ensure that pilots are not just task-oriented.

For RNP APPROACH (RNP APCH) Operation to LPV minima using SBAS - [R41] EASA AMC 20-28

The Flight Crew should receive appropriate training, briefings and guidance material in order to safely conduct an LPV approach. This material and training should cover both normal and abnormal procedures. Standard training and checking should include LPV approach procedures. Based on this, the operator should determine what constitutes a qualified crew. The operator should ensure that during line operations Flight Crew can perform assigned duties reliably and expeditiously for each procedure to be flown in:

a. normal operations; and
b. abnormal operations.

A training program should be structured to provide sufficient theoretical and practical training.

The Flight Crew training program should be structured to provide sufficient theoretical and practical training, using a simulator, training device, or line training in an aircraft, in the concept of RNAV GNSS approach operations to LPV minima and the use of the aircraft's approach system in such operations to ensure that Flight Crew are not just task oriented.

4.5.2 Flight Crew: Gap Analysis

Regarding flight crew training in the scope of RNP APCH procedures, [R47] Commission Regulation (EU) 2016/539 amending [R39] Commission Regulation (EU) No 1178/2011 as regards pilot training, testing and periodic checking for performance-based navigation states the following:

(1) Article 4a

Performance-based navigation instrument rating privileges

1. **Pilots may only fly in accordance with performance-based navigation ("PBN") procedures after they have been granted PBN privileges as an endorsement to their instrument rating ("IR")**.

2. A pilot shall be granted PBN privileges where he or she fulfils all of the following requirements:

a. the pilot has successfully completed a course of theoretical knowledge including PBN, in accordance with FCL.615 of Annex I (Part-FCL);

b. the pilot has successfully completed flying training including PBN, in accordance with FCL.615 of Annex I (Part-FCL);

c. the pilot has successfully completed either a skill test in accordance with Appendix 7 to Annex I (Part-FCL) or a skill test or a proficiency check in accordance with Appendix 9 of Annex I (Part-FCL).

3. The requirements of paragraph 2(a) and (b) shall be deemed to have been fulfilled where the competent authority considers that the competence acquired, either through training or from familiarity with PBN operations, is equivalent to the competence acquired through the courses referred to in paragraph 2(a) and (b) and the pilot demonstrates such competence to the satisfaction of the examiner at the proficiency check or skill test referred to in paragraph 2(c).

4. A record of the successful demonstration of competency in PBN shall, upon completion of the skill test or the proficiency check referred to in paragraph 2(c), be entered in the pilot's logbook or equivalent record and signed by the examiner who conducted the test or check.

5. IR pilots without PBN privileges may only fly on routes and approaches that do not require PBN privileges and no PBN items shall be required for the renewal of their IR, until 25 August 2020; after that date, PBN privileges shall be required for every IR.

[R47] Commission Regulation (EU) 2016/539 amending [R39] also states following:

(2) in Article 10a, the following paragraph 5 is added:
5. Pilot training organisations shall ensure that the IR training course they offer include training for PBN privileges compliant with the requirements of Annex I (Part-FCL) by 25 August 2020 at the latest.

Points (1) and (2) of the regulation [R47] shall apply from 25 August 2018.

4.5.3 Flight Crew: Implementation Actions

The competences of flight crew of flights operating within the airspace of the concerned aerodromes must be in line with the relevant proposals for the present implementation:

- Airspace re-organisation: declaration of RMZ zones in G airspaces around the aerodromes;
- Type of approaches to be implemented: IFR non-precision approaches and APVs (only for aircraft wishing to fly IFR within the concerned airspace).

Concerning the first point above, it is concluded from the present analysis that no further training to the flight crew or amendment to current legislation is necessary in the scope of the proposed declaration of RMZ zones in G airspaces around the aerodromes concerned.

Concerning the second point:

- FC1: [R47] Commission Regulation (EU) 2016/539 amending [R39] Commission Regulation (EU) No 1178/2011 as regards pilot training, testing and periodic checking for performance-based navigation indicates that after 2020 all pilots licensed for operating under IFR shall have the necessary training to conduct RNP APCH procedures. As such, after 2020 it is assumed that no additional flight crew requirements will be necessary to approach uncontrolled aerodromes which aim to implement the referred procedures other than the standard IFR flight training.
  Before this period of time, it is advised as an implementation action in the scope of the present assignment that an annex to Czech regulation is published concerning aircrew licensing specifying the required training and licensing of aircrew wishing to fly to aerodromes concerned.
  In addition, publishing the referred changes through AIC and AIP is recommended in order to provide awareness to all flight crew entering affected airspace.

4.5.4 Aircraft Facilities: Minimum Requirements

The table below summarizes the minimum sensor needs for the RNP APCH procedures concerned in the present analysis, in ICAO PANS-OPS and corresponding PBN terminology.

PANS-OPS Terminology	PBN Terminology	Chart Minima	Minimum Sensor
NPA	RNP APCH down to	LNAV (MDA)	Basic GNSS*
APV BARO-VNAV	RNP APCH down to	LNAV/VNAV (MDA)	Basic GNSS + BARO-VNAV
No criteria available	RNP APCH down to	LP (MDA)	SBAS
APV SBAS	RNP APCH down to	LPV (DA)	SBAS

* Basic GNSS refers to core constellation combined with ABAS

Table 9: Minimum sensor needs for RNP APCH procedures

For aircraft flying RNP APCH down to LNAV or LNAV/VNAV minima, the Airworthiness or Operational Requirements for aircraft equipment compliance are detailed in:

- [R40] EASA AMC 20-27 Airworthiness Approval and Operational Criteria for RNP APPROACH Operations including APV BARO-VNAV Operations provides an acceptable mean that can be used to obtain airworthiness approval of an RNAV system based on a GNSS standalone receiver or multisensory system including at least one GNSS sensor in order to conduct RNP APCH operations.

For RNP APCH down LPV minima, the Airworthiness or Operational Requirement are detailed in:

- [R41] EASA AMC 20-28 Airworthiness Approval and Operational Criteria related to RNAV for GNSS approach operation to LPV minima using SBAS provides an acceptable mean that can be used to obtain airworthiness approval of an RNAV system based on a GNSS standalone receiver or multisensory system including at least one GNSS sensor in order to conduct RNP APCH operations.

4.5.5 Aircraft Facilities: Gap Analysis

[R38] Commission Regulation (EU) No 965/2012 of 5 October 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council indicates **navigational instruments and associated equipment for standard operations under IFR**:

NCC.IDE.A.125 Operations under IFR — flight and navigational instruments and associated equipment

Aircraft operated under IFR shall be equipped with:

a) a means of measuring and displaying the following:

(1) magnetic heading;
(2) time in hours, minutes and seconds;
(3) pressure altitude;
(4) indicated airspeed;
(5) vertical speed;
(6) turn and slip;
(7) attitude;
(8) stabilised heading;
(9) outside air temperature;
(10) Mach number whenever speed limitation are expressed in terms of Mach number;

b) a means of indicating when the supply of power to the gyroscopic instruments is not adequate;

c) whenever two pilots are required for the operation, an additional separate means of displaying for the second pilot:

(1) pressure altitude;
(2) indicated airspeed;
(3) vertical speed;
(4) turn and slip;
(5) attitude;
(6) stabilised heading;
(7) Mach number whenever speed limitation are expressed in terms of Mach number;

d) a means of preventing malfunction of the airspeed indicating systems required in a)(4) and c)(2) due to condensation or icing;

e) an alternate source of static pressure;

f) a chart holder in an easily readable position that can be illuminated for night operations;

g) a second independent means of measuring and displaying altitude; and

h) an emergency power supply, independent of the main electrical generating system, for the purpose of operating and illuminating an attitude indicating system for a minimum period of 30 minutes. The emergency power supply shall be automatically operative after the total failure of the main electrical generating system and clear indication shall be given on the instrument that the attitude indicator is being operated by emergency power.

In the regulation described above there are no references to aircraft equipment, navigation capabilities, airworthiness and operational approval for common IFR flights coinciding with those described for RNP APCH operations are described in the previous section.

4.5.6 Aircraft Facilities: Implementation Actions

The competences of flight crew and aircraft equipment of flights operating within the airspace of the concerned aerodromes must be in line with the relevant proposals for the present implementation:

- Airspace re-organisation: declaration of RMZ zones in G airspaces around the aerodromes;
- Type of approaches to be implemented: IFR non-precision approaches and APVs (only for aircraft wishing to fly IFR within the concerned airspace).

Concerning the first point above, it is concluded from the present analysis that no upgrades in aircraft facilities nor amendment to current legislation are necessary in the scope of the proposed declaration of RMZ zones in G airspaces around the aerodromes concerned.

Concerning the implementation of IFR non-precision approaches and APVs:

- AC1: aircraft equipment, navigation capabilities, airworthiness and operational approval for aircraft entering the airspace affected by the present assignment shall be compliant to [R40] EASA AMC 20-27 Airworthiness Approval and Operational Criteria for RNP APPROACH Operations including APV BARO-VNAV Operations and [R41] EASA AMC 20-28 Airworthiness Approval and Operational Criteria related to RNAV for GNSS approach operation to LPV minima using SBAS. As these specifications differ from general specification for standard IFR flight operations, it is advised that such approaches are dully published in the corresponding information channels. No amendments to the legislation are proposed as it is assumed that Czech regulation is compliant to the EU implementing rules corresponding to the referred AMCs.

  In short, the following implementation action is recommended in line with [R36] ICAO EUR RNP APCH Guidance Material (EUR Doc 025):

  - States are recommended to use AIC and AIP to provide information to users regarding the GNSS and SBAS. Both type of avionics i.e. basic GNSS and augmented GNSS (SBAS) support all phases of flight from departure through RNP approach. GNSS-related elements providing the navigation service for en-route purposes shall be published in the State AIP ENR 4 section. When the same aid i.e. Basic GNSS and/or SBAS is used for both enroute and aerodrome purposes, a description must also be given in AIP AD 2 and/or (if appropriate) AD 3 sections.

4.6 Airports Equipment Requirements

The present section details the analysis concerning aerodrome equipment requirements for the proposed approach for introduction of IFR procedures in uncontrolled aerodromes. The equipment of the affected aerodromes must be in line with the relevant proposals for the present implementation:

- Flight Information Service: Implementation of AFIS units at uncontrolled aerodromes;
- Type of approaches to be implemented: IFR non-precision approaches and APVs (only for aircraft wishing to fly IFR within the concerned airspace).

The present sub-section focuses on requirements concerning the implementation of IFR non-precision approaches and APVs, of key importance for the current rationale.

4.6.1 Minimum Requirements

4.6.1.1 Runway Requirements

A Non-Precision Approach (NPA) runway enables both NPAs and APVs with GNSS/SBAS, according to ICAO Approach categorisation.

The new approach classification as introduced by Amendment 11-B to ICAO Annex 14, and communicated by ICAO in [R49] ICAO State Letter AN 4/1.2.24-13/20 - Adoption of Amendment 11 to Annex 14, Volume I, is illustrated in Figure 4. The applicability date of Amendment 11-B was 13 November 2014.

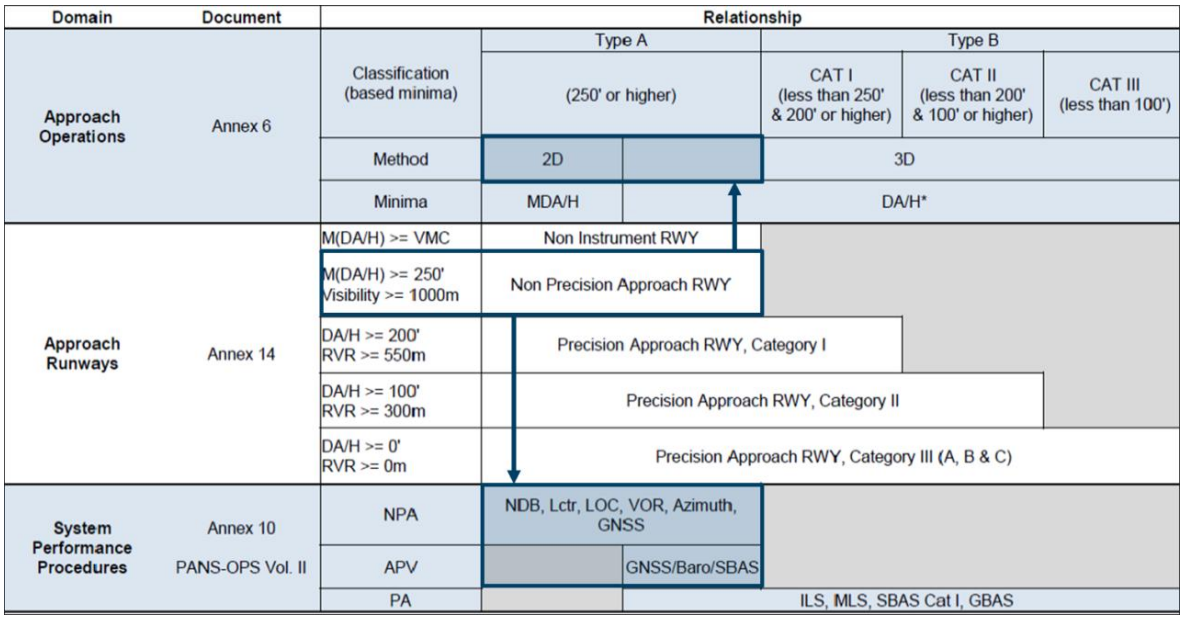

Figure 4: ICAO Approach categorisation

In case LPV CAT I approaches (CAT I – Type B) are envisaged, a Precision Approach RWY would be required. Requirements for different RWYs are detailed in [R55] ICAO Annex 14 – Aerodromes; Volume I – Aerodrome Design and Operations.

The following sub-sections highlight key runway requirements for non-precision approach runways (focusing on differences between these and precision approach RWYs), as defined by [R55] ICAO Annex 14 – Aerodromes; Volume I – Aerodrome Design and Operations (Seventh Edition, July 2016). The following list in non-exhaustive.

Numbering of paragraphs in the following subsections are the same as the numbering indicated in [R55] ICAO Annex 14 – Aerodromes; Volume I – Aerodrome Design and Operations.

5.2.2 Runway designation markings

Location

5.2.2.3 A runway designation marking shall be located at a threshold as shown in Figure 5 as appropriate.

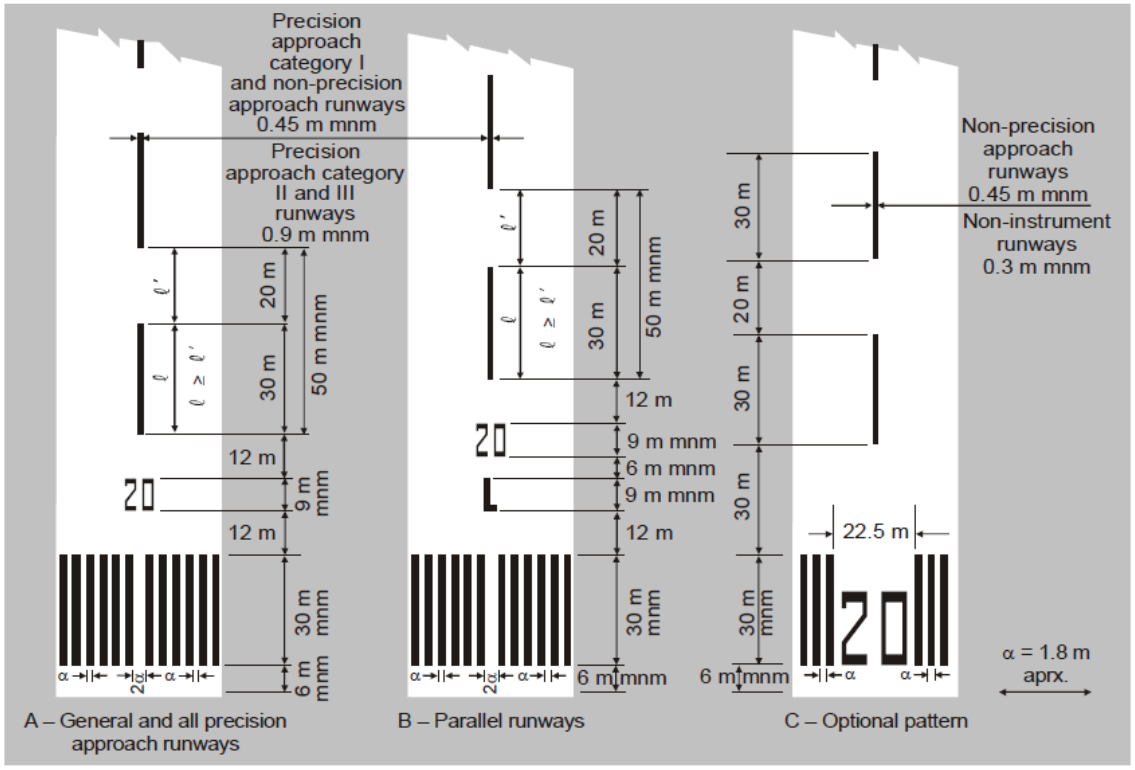

Figure 5: Runway designation markings ([R55] ICAO Annex 14 – Aerodromes; Volume I – Aerodrome Design and Operations)

5.2.3 Runway centre line marking

Characteristics

5.2.3.3 A runway centre line marking shall consist of a line of uniformly spaced stripes and gaps. The length of a stripe plus a gap shall be not less than 50m or more than 75m. The length of each stripe shall be at least equal to the length of the gap or 30m, whichever is greater.

5.2.3.4 The width of the stripes shall be not less than:

- 0.90m on precision approach category II and III runways;
- **0.45m on non-precision approach runways where the code number is 3 or 4, and precision approach category I runways; and**
- **0.30m on non-precision approach runways where the code number is 1 or 2, and on non-instrument runways.**

5.3.4 Approach lighting systems

Application

5.3.4.1 Application

A.— Non-instrument runway

Recommendation.— Where physically practicable, a simple approach lighting system as specified in 5.3.4.2 to 5.3.4.9 should be provided to serve a non-instrument runway where the code number is 3 or 4 and intended for use at night, except when the runway is used only in conditions of good visibility and sufficient guidance is provided by other visual aids.

Note.— A simple approach lighting system can also provide visual guidance by day.

B.— Non-precision approach runway

Where physically practicable, a simple approach lighting system shall be provided to serve a non-precision approach runway, except when the runway is used only in conditions of good visibility or sufficient guidance is provided by other visual aids.

Note.— It is advisable to give consideration to the installation of a precision approach category I lighting system or to the addition of a runway lead-in lighting system.

C.— Precision approach runway category I

Where physically practicable, a precision approach category I lighting system shall be provided to serve a precision approach runway category I.

Simple approach lighting system

Location

5.3.4.2 A simple approach lighting system shall consist of a row of lights on the extended centre line of the runway extending, whenever possible, over a distance of not less than 420m from the threshold with a row of lights forming a crossbar 18m or 30m in length at a distance of 300m from the threshold.

5.3.4.3 The lights forming the crossbar shall be as nearly as practicable in a horizontal straight line at right angles to, and bisected by, the line of the centre line lights. The lights of the crossbar shall be spaced so as to produce a linear effect, except that, when a crossbar of 30m is used, gaps may be left on each side of the centre line. These gaps shall be kept to a minimum to meet local requirements and each shall not exceed 6m.

Note 1.— Spacings for the crossbar lights between 1m and 4m are in use. Gaps on each side of the centre line may improve directional guidance when approaches are made with a lateral error, and facilitate the movement of rescue and fire fighting vehicles.

Note 2.— See [R55] ICAO Annex 14 – Aerodromes; Volume I – Aerodrome Design and Operations, Attachment A, Section 12, for guidance on installation tolerances.

5.3.4.4 The lights forming the centre line shall be placed at longitudinal intervals of 60m, except that, when it is desired to improve the guidance, an interval of 30m may be used. The innermost light shall be located either 60m or 30m from the threshold, depending on the longitudinal interval selected for the centre line lights.

5.3.4.5 Recommendation.— If it is not physically possible to provide a centre line extending for a distance of 420m from the threshold, it should be extended to 300m so as to include the crossbar. If this is not possible, the centre line lights should be extended as far as practicable, and each centre line light should then consist of a barrette at least 3m in length. Subject to the approach system having a crossbar at 300m from the threshold, an additional crossbar may be provided at 150m from the threshold.

5.3.4.6 The system shall lie as nearly as practicable in the horizontal plane passing through the threshold, provided that:

a) no object other than an ILS or MLS azimuth antenna shall protrude through the plane of the approach lights within a distance of 60m from the centre line of the system; and
b) no light other than a light located within the central part of a crossbar or a centre line barrette (not their extremities) shall be screened from an approaching aircraft.

Any ILS or MLS azimuth antenna protruding through the plane of the lights shall be treated as an obstacle and marked and lighted accordingly.

Characteristics

5.3.4.7 The lights of a simple approach lighting system shall be fixed lights and the colour of the lights shall be such as to ensure that the system is readily distinguishable from other aeronautical ground lights, and from extraneous lighting if present. Each centre line light shall consist of either:

a) a single source; or
b) a barrette at least 3m in length.

Note 1.— When the barrette as in b) is composed of lights approximating to point sources, a spacing of 1.5m between adjacent lights in the barrette has been found satisfactory.

Note 2.— It may be advisable to use barrettes 4m in length if it is anticipated that the simple approach lighting system will be developed into a precision approach lighting system.

Note 3.— At locations where identification of the simple approach lighting system is difficult at night due to surrounding lights, sequence flashing lights installed in the outer portion of the system may resolve this problem.

5.3.4.8 Recommendation.— Where provided for a non-instrument runway, the lights should show at all angles in azimuth necessary to a pilot on base leg and final approach. The intensity of the lights should be adequate for all conditions of visibility and ambient light for which the system has been provided.

5.3.4.9 Recommendation.— Where provided for a non-precision approach runway, the lights should show at all angles in azimuth necessary to the pilot of an aircraft which on final approach does not deviate by an abnormal amount from the path defined by the non-visual aid. The lights should be designed to provide guidance during both day and night in the most adverse conditions of visibility and ambient light for which it is intended that the system should remain usable.

Precision approach category I lighting system

Location

5.3.4.10 A precision approach category I lighting system shall consist of a row of lights on the extended centre line of the runway extending, wherever possible, over a distance of 900m from the runway threshold with a row of lights forming a crossbar 30m in length at a distance of 300m from the runway threshold.

Note.— The installation of an approach lighting system of less than 900m in length may result in operational limitations on the use of the runway. See [R55] ICAO Annex 14 – Aerodromes; Volume I – Aerodrome Design and Operations, Attachment A, Section 12.

5.3.4.11 The lights forming the crossbar shall be as nearly as practicable in a horizontal straight line at right angles to, and bisected by, the line of the centre line lights. The lights of the crossbar shall be spaced so as to produce a linear effect, except that gaps may be left on each side of the centre line. These gaps shall be kept to a minimum to meet local requirements and each shall not exceed 6m.

Note 1.— Spacings for the crossbar lights between 1m and 4m are in use. Gaps on each side of the centre line may improve directional guidance when approaches are made with a lateral error, and facilitate the movement of rescue and fire fighting vehicles.

Note 2.— See Attachment A, Section 12, for guidance on installation tolerances.

5.3.4.12 The lights forming the centre line shall be placed at longitudinal intervals of 30m with the innermost light located 30m from the threshold.

5.3.4.13 The system shall lie as nearly as practicable in the horizontal plane passing through the threshold, provided that:

a) no object other than an ILS or MLS azimuth antenna shall protrude through the plane of the approach lights within a distance of 60m from the centre line of the system; and
b) no light other than a light located within the central part of a crossbar or a centre line barrette (not their extremities) shall be screened from an approaching aircraft.

Any ILS or MLS azimuth antenna protruding through the plane of the lights shall be treated as an obstacle and marked and lighted accordingly.

Characteristics

5.3.4.14 The centre line and crossbar lights of a precision approach category I lighting system shall be fixed lights showing variable white. Each centre line light position shall consist of either:

a) a single light source in the innermost 300m of the centre line, two light sources in the central 300m of the centre line and three light sources in the outer 300m of the centre line to provide distance information; or
b) a barrette.

5.3.4.15 Where the serviceability level of the approach lights specified as a maintenance objective in 10.5.10 can be demonstrated, each centre line light position may consist of either:

a) a single light source; or
b) a barrette.

5.3.4.16 The barrettes shall be at least 4m in length. When barrettes are composed of lights approximating to point sources, the lights shall be uniformly spaced at intervals of not more than 1.5m.

5.3.4.17 Recommendation.— If the centre line consists of barrettes as described above each barrette should be supplemented by a flashing light, except where such lighting is considered unnecessary taking into account the characteristics of the system and the nature of the meteorological conditions.

5.3.4.18 Each flashing light as described in 5.3.4.17 shall be flashed twice a second in sequence, beginning with the outermost light and progressing toward the threshold to the innermost light of the system. The design of the electrical circuit shall be such that these lights can be operated independently of the other lights of the approach lighting system.

5.3.4.19 If the centre line consists of lights as described above, additional crossbars of lights to the crossbar provided at 300 m from the threshold shall be provided at 150m, 450m, 600m and 750m from the threshold. The lights forming each crossbar shall be as nearly as practicable in a horizontal straight line at right angles to, and bisected by, the line of the centre line lights. The lights shall be spaced so as to produce a linear effect, except that gaps may be left on each side of the centre line. These gaps shall be kept to a minimum to meet local requirements and each shall not exceed 6m.

Note.— See [R55] ICAO Annex 14 – Aerodromes; Volume I – Aerodrome Design and Operations, Attachment A, Section 12, for detailed configuration.

5.3.4.20 Where the additional crossbars described in 5.3.4.19 are incorporated in the system, the outer ends of the crossbars shall lie on two straight lines that either are parallel to the line of the centre line lights or converge to meet the runway centre line 300m from threshold.

5.3.4.21 The lights shall be in accordance with the specifications of [R55] ICAO Annex 14 – Aerodromes; Volume I – Aerodrome Design and Operations, Appendix 2, Figure A2-1.

Note.— The flight path envelopes used in the design of these lights are given in Attachment A, Figure A-6.

5.3.8 Runway threshold identification lights

Application

5.3.8.1 Recommendation.— Runway threshold identification lights should be installed:

a) at the threshold of a **non-precision approach** runway when additional threshold conspicuity is necessary or where it is not practicable to provide other approach lighting aids; and
b) where a runway threshold is permanently displaced from the runway extremity or temporarily displaced from the normal position and additional threshold conspicuity is necessary.

Location

5.3.8.2 Runway threshold identification lights shall be located symmetrically about the runway centre line, in line with the threshold and approximately 10m outside each line of runway edge lights.

Characteristics

5.3.8.3 Recommendation.— Runway threshold identification lights should be flashing white lights with a flash frequency between 60 and 120 per minute.

5.3.8.4 The lights shall be visible only in the direction of approach to the runway.

5.3.10 Runway threshold and wing bar lights

Application of runway threshold lights

5.3.10.1 Runway threshold lights shall be provided for a runway equipped with runway edge lights, except on a non-instrument or **non-precision approach runway** where the threshold is displaced and wing bar lights are provided.

Location of runway threshold lights

5.3.10.2 When a threshold is at the extremity of a runway, the threshold lights shall be placed in a row at right angles to the runway axis as near to the extremity of the runway as possible and, in any case, not more than 3m outside the extremity.

5.3.10.3 When a threshold is displaced from the extremity of a runway, threshold lights shall be placed in a row at right angles to the runway axis at the displaced threshold.

5.3.10.4 Threshold lighting shall consist of:

a) on a non-instrument or non-precision approach runway, at least six lights;
b) on a precision approach runway category I, at least the number of lights that would be required if the lights were uniformly spaced at intervals of 3m between the rows of runway edge lights; and
c) on a precision approach runway category II or III, lights uniformly spaced between the rows of runway edge lights at intervals of not more than 3m.

5.3.10.5 Recommendation.— The lights prescribed in 5.3.10.4 a) and b) should be either:

a) equally spaced between the rows of runway edge lights; or
b) symmetrically disposed about the runway centre line in two groups, with the lights uniformly spaced in each group and with a gap between the groups equal to the gauge of the touchdown zone marking or lighting, where such is provided, or otherwise not more than half the distance between the rows of runway edge lights.

Application of wing bar lights

5.3.10.6 Recommendation.— Wing bar lights should be provided on a precision approach runway when additional conspicuity is considered desirable.

5.3.10.7 Wing bar lights shall be provided on a non-instrument or non-precision approach runway where the threshold is displaced and runway threshold lights are required, but are not provided.

Location of wing bar lights

5.3.10.8 Wing bar lights shall be symmetrically disposed about the runway centre line at the threshold in two groups, i.e. wing bars. Each wing bar shall be formed by at least five lights extending at least 10m outward from, and at right angles to, the line of the runway edge lights, with the innermost light of each wing bar in the line of the runway edge lights.

8.1 Electrical power supply systems for air navigation facilities

8.1.1 Adequate primary power supply shall be available at aerodromes for the safe functioning of air navigation facilities.

8.1.2 The design and provision of electrical power systems for aerodrome visual and radio navigation aids shall be such that an equipment failure will not leave the pilot with inadequate visual and non-visual guidance or misleading information.

Note.— The design and installation of the electrical systems need to take into consideration factors that can lead to malfunction, such as electromagnetic disturbances, line losses, power quality, etc. Additional guidance is given in [R62] ICAO DOC 9157 – Aerodrome Design Manual, Part 5 – Electrical Systems.

8.1.3 Recommendation.— Electric power supply connections to those facilities for which secondary power is required should be so arranged that the facilities are automatically connected to the secondary power supply on failure of the primary source of power.

8.1.4 Recommendation.— The time interval between failure of the primary source of power and the complete restoration of the services required by 8.1.10 should be as short as practicable, except that for visual aids associated with non-precision, precision approach or take-off runways the requirements of Table 10 for maximum switch-over times should apply.

Runway	Lighting aids requiring power	Maximum switch-over time
Non-instrument	Visual approach slope indicators[a]	See 8.1.4 and 8.1.9
	Runway edge[b]	
	Runway threshold[b]	
	Runway end[b]	
	Obstacle[a]	
Non-precision approach	Approach lighting system	15 seconds
	Visual approach slope indicators[a, d]	15 seconds
	Runway edge[d]	15 seconds
	Runway threshold[d]	15 seconds
	Runway end	15 seconds
	Obstacle[a]	15 seconds
Precision approach category I	Approach lighting system	15 seconds
	Runway edge[d]	15 seconds
	Visual approach slope indicators[a, d]	15 seconds
	Runway threshold[d]	15 seconds
	Runway end	15 seconds
	Essential taxiway[a]	15 seconds
	Obstacle[a]	15 seconds

Table 10: Maximum switch-over time per type of approach

Visual aids

Application

8.1.6 For a precision approach runway, a secondary power supply capable of meeting the requirements of Table 10 for the appropriate category of precision approach runway shall be provided. Electric power supply connections to those facilities for which secondary power is required shall be so arranged that the facilities are automatically connected to the secondary power supply on failure of the primary source of power.

8.1.7 For a runway meant for take-off in runway visual range conditions less than a value of 800m, a secondary power supply capable of meeting the relevant requirements of Table 10 shall be provided.

8.1.8 Recommendation.— At an aerodrome where the primary runway is a non-precision approach runway, a secondary power supply capable of meeting the requirements of Table 10 should be provided except that a secondary power supply for visual aids need not be provided for more than one non-precision approach runway.

8.1.9 Recommendation.— At an aerodrome where the primary runway is a non-instrument runway, a secondary power supply capable of meeting the requirements of 8.1.4 should be provided, except that a secondary power supply for visual aids need not be provided when an emergency lighting system in accordance with the specification of 5.3.2 is provided and capable of being deployed in 15 minutes.

8.1.10 Recommendation.— The following aerodrome facilities should be provided with a secondary power supply capable of supplying power when there is a failure of the primary power supply:

a) the signalling lamp and the minimum lighting necessary to enable air traffic services personnel to carry out their duties;
Note.— The requirement for minimum lighting may be met by other than electrical means.
b) all obstacle lights which, in the opinion of the appropriate authority, are essential to ensure the safe operation of aircraft;
c) approach, runway and taxiway lighting as specified in 8.1.6 to 8.1.9;
d) meteorological equipment;
e) essential security lighting, if provided in accordance with 9.11;
f) essential equipment and facilities for the aerodrome responding emergency agencies;
g) floodlighting on a designated isolated aircraft parking position if provided in accordance with 5.3.24.1; and
h) illumination of apron areas over which passengers may walk.
Note.— Specifications for secondary power supply for radio navigation aids and ground elements of communications systems are given in [R53] ICAO Annex 10 – Aeronautical Telecommunications; Volume I – Radio Navigation Aids, Chapter 2.

8.1.11 Recommendation.— Requirements for a secondary power supply should be met by either of the following:

- independent public power, which is a source of power supplying the aerodrome service from a substation other than the normal substation through a transmission line following a route different

from the normal power supply route and such that the possibility of a simultaneous failure of the normal and independent public power supplies is extremely remote; or

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

Note.— Guidance on electrical systems is included in [R62] ICAO DOC 9157 – Aerodrome Design Manual, Part 5 – Electrical Systems.

5.3.5 Visual approach slope indicator systems

5.3.5.1 A visual approach slope indicator system shall be provided to serve the approach to a runway whether or not the runway is served by other visual approach aids or by non-visual aids, where one or more of the following conditions exist:

a) **the runway is used by turbojet or other aeroplanes** with similar approach guidance requirements;
b) the pilot of any type of aeroplane may have difficulty in judging the approach due to:
   (1) inadequate visual guidance such as is experienced during an approach over water or featureless terrain by day or in the absence of sufficient extraneous lights in the approach area by night; or
   (2) misleading information such as is produced by deceptive surrounding terrain or runway slopes;
c) the presence of objects in the approach area may involve serious hazard if an aeroplane descends below the normal approach path, particularly if there are no non-visual or other visual aids to give warning of such objects;
d) physical conditions at either end of the runway present a serious hazard in the event of an aeroplane undershooting or overrunning the runway; and
e) terrain or prevalent meteorological conditions are such that the aeroplane may be subjected to unusual turbulence during approach.

Note.— Guidance on the priority of installation of visual approach slope indicator systems is contained in Attachment A, Section 13.

5.3.5.2 The standard visual approach slope indicator systems shall consist of the following:

a) T-VASIS and AT-VASIS conforming to the specifications contained in 5.3.5.7 to 5.3.5.23 inclusive;
b) PAPI and APAPI systems conforming to the specifications contained in 5.3.5.24 to 5.3.5.41 inclusive;

as shown in Figure 6.

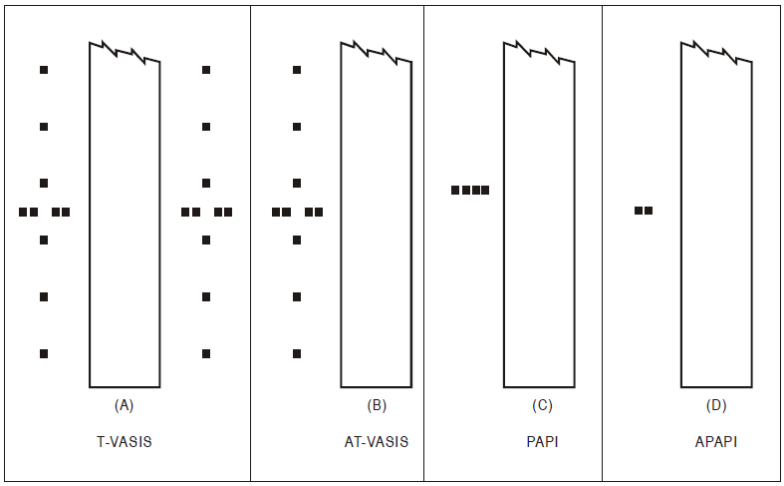

Figure 6: Visual approach slope indicator systems

5.3.5.3 PAPI, T-VASIS or AT-VASIS shall be provided where the code number is 3 or 4 when one or more of the conditions specified in 5.3.5.1 exist.

5.3.5.4 Recommendation.— As of 1 January 2020, the use of T-VASIS and AT-VASIS as standard visual approach slope indicator systems should be discontinued.

5.3.5.5 PAPI or APAPI shall be provided where the code number is 1 or 2 when one or more of the conditions specified in 5.3.5.1 exist.

5.3.5.6 Recommendation.— Where a runway threshold is temporarily displaced from the normal position and one or more of the conditions specified in 5.3.5.1 exist, a PAPI should be provided except that where the code number is 1 or 2 an APAPI may be provided.

Attachment A, Section 13. Priority of installation of visual approach slope indicator systems

13.1 It has been found impracticable to develop guidance material that will permit a completely objective analysis to be made of which runway on an aerodrome should receive first priority for the installation of a visual approach slope indicator system. However, factors that must be considered when making such a decision are:

a) frequency of use;
b) seriousness of the hazard;
c) presence of other visual and non-visual aids; type of aeroplanes using the runway; and
d) frequency and type of adverse weather conditions under which the runway will be used.

13.2 With respect to the seriousness of the hazard, the order given in the application specifications for a visual approach slope indicator system, 5.3.5.1 b) to e) of Chapter 5, may be used as a general guide. These may be summarized as:

a) inadequate visual guidance because of:
   - approaches over water or featureless terrain, or absence of sufficient extraneous light in the approach area by night;
   - deceptive surrounding terrain;
b) serious hazard in approach;
c) serious hazard if aeroplanes undershoot or overrun; and
d) unusual turbulence.

13.3 The presence of other visual or non-visual aids is a very important factor. Runways equipped with ILS or MLS would generally receive the lowest priority for a visual approach slope indicator system installation. It must be remembered, though, that visual approach slope indicator systems are visual approach aids in their own right and can supplement electronic aids. When serious hazards exist and/or a substantial number of aeroplanes not equipped for ILS or MLS use a runway, priority might be given to installing a visual approach slope indicator on this runway.

13.4 Priority should be given to **runways used by turbojet aeroplanes**.

4.6.1.2 GNSS Infrastructure

Other than runway design requirements, GNSS infrastructure must be taken in to account in the present assignment as RNP APCH procedures are being analysed. Concerning GNSS infrastructure for RNP APCH approaches, [R36] ICAO EUR RNP APCH Guidance Material (EUR Doc 025) provides the most comprehensive summary. The paragraphs below are quoted from the referred document.

5.2.6.4.1. All RNP APCH operations rely on the use of Basic GNSS and the appropriate authority needs to agree to the use of GNSS in their airspace.

5.2.6.4.2. **APV procedures flown to LPV minima rely on the use of GPS augmented by SBAS**. The European Geostationary Navigation Overlay Service (EGNOS) is the regional SBAS. As EGNOS is a Pan-European Service used by aircraft and ANSPs and provided by an organisation established in the territory of the EU Member States, it is subject to the SES Regulations. Article 7 of Regulation (EC) 550/2004 referred to as the service provision regulation requires that providers of air navigation services are subject to certification. The common requirements for the provision of Air Navigation Services are described in Regulation (EC) 2096/2005. The application for certification must be made to the NSA of the Member State where the applicant has its principle place of operation.

5.2.6.4.3. The EGNOS service is provided by the European Satellite Services Provider (ESSP) whose headquarters is in Toulouse, France. It is therefore the French NSA that provided the ESSP with certification as an Air Navigation Service Provider on the 12th July 2010. The EGNOS Safety of Life (SoL) service commissioning took place on 2 March 2011. The EGNOS SoL is provided free of direct user charges.

5.2.6.4.4. After approval as a provider of air navigation services the ESSP was then required to submit a Declaration of Verification (DoV) for the system as required by Regulation (EC) 552/2004, often referred to as the Interoperability Regulation. The objective of this declaration, also to the French NSA, is to confirm compliance with the Essential Requirements described in this regulation and to demonstrate compliance with the Standards and Recommended Practices (SARPs) in ICAO Annex 10. The DoV was submitted in July 2010 together with a supporting technical file.

5.2.6.4.5. With the changing role of EASA with Regulation (EC) 1108/2009 where their responsibilities will be extended to cover Aerodromes, Air Traffic Management and Air Navigation Services it is anticipated that the competent authority for safety oversight of EGNOS will transfer from the French NSA to EASA.

5.2.6.4.6. **APV procedures flown to LPV minima rely on the use of EGNOS SoL service**. An ANSP implementing LPV is required by its State Civil Aviation Authority to have a working agreement with the EGNOS service provider. (For the EU States EC Regulation No 550/2004 Article 10 is applicable).

5.2.6.4.7. In case implementation of RNP APCH to LPV minima is planned, an assessment should be made to confirm if suitable EGNOS service is available at the aerodrome concerned. EGNOS coverage is described in the Service Definition Document (SDD) available on the ESSP web site (http://www.essp-sas.eu).

5.2.6.4.8. According to ICAO recommendations, a legal recording mechanism should be put in place for any navigation system to be used in operations. This recommendation applies to GNSS. The archived data will be useful in the context of post accident/incident investigations. ANSPs or States do not necessarily have to set up their own recording system; they can have agreements with other parties to provide them with the necessary data (e.g. IGS for GPS or ESSP for EGNOS).

5.2.6.4.9. Concerning the availability of a real-time monitoring for GNSS systems, this is not considered as a requirement for RNP APCH Implementation. Indeed the performance observed on the ground with a receiver is not likely to be representative of the performance experienced onboard approaching aircraft: with PBN there is no longer a direct link between navigation systems on the ground (and in space) and the aircraft capability to perform an operation. In such conditions, real-time GNSS system status information is not useful for operations.

5.2.6.4.10. Moreover, in the case of RNP APCH, ATC will not be aware of the type of minima an aircraft will fly to (approach clearance is according to approach name - RNAV – and not to the type of minima). An aircraft will follow the same lateral path whether performing an approach down to LNAV, LNAV/VNAV or LPV minima available on the same chart.

5.2.6.4.11. A signal availability and spectrum check should be performed once as a pre-implementation step at the intended location, but a real time GNSS signal monitoring is not required. Integrity is monitored on board the aircraft. More details on this subject are available in ICAO Annex 10.

4.6.1.3 AFIS Equipment Requirements

Requirements concerning required METEO equipment for AFIS units are detailed in section 4.3.

Additional recommendations for accommodation and equipment of AFIS units are provided in [R37]EUROCONTROL Manual for Aerodrome Flight Information Service (AFIS) as follows:

- AFIS should preferably be provided from a tower at a location which ensures the best possible view of the aerodrome, the surrounding area and, in particular, the manoeuvring area. As an interim measure, AFIS could also be provided from a room in a comparable location, facing the aerodrome and at least the approach ends of the runway, with large, unobstructed windows.
- The equipment in the AFIS unit should be the same as that required for an aerodrome control tower at an aerodrome with low traffic density.

4.6.2 Gap Analysis

- Current legislation [R05] Aviation Regulation L14 does not specify the clear requirements for **visual approach slope indicator systems** for non-precision runways. Nonetheless, even though no specifications are detailed about visual aids, all the European aerodromes analysed in the previous feasibility study [R45] include edge, PAPI/PLASI and threshold lights as a minimum standard.
- Current legislation [R05] Aviation Regulation L14 does not specify **GNSS infrastructure requirements** for non-precision runways as recommended by guidelines transposed in previous sections 4.6.1.2.

4.6.3 Implementation Actions

The equipment of the affected aerodromes must be in line with the relevant proposals for the present implementation:

- Flight Information Service: Implementation of AFIS units at uncontrolled aerodromes;
- Type of approaches to be implemented: IFR non-precision approaches and APVs (only for aircraft wishing to fly IFR within the concerned airspace).

After conducting the gap analysis in the previous section, the following implementation actions can be derived:

- AE1: Equipment for AFIS units should be supplied to affected aerodromes following the guidelines described in section 4.6.1.3. Such requirements should also be further detailed in [R05] Aviation Regulation L14.
- AE2: Approach lighting system requirements should be further assessed in the scope of a safety case. In case the safety case concludes that approach lighting system for uncontrolled aerodromes who which to comply to IFR procedures are recommended, an annex to current [R05] Aviation Regulation L14 is advised specifying the recommendation for edge, PAPI/PLASI and/or threshold lights as minimum standards for uncontrolled aerodromes who wish to comply to IFR procedures.
- AE3: An annex to current [R05] Aviation Regulation L14 is recommended specifying GNSS infrastructure requirements for non-precision runways in order to allow for RNP APCH procedures in uncontrolled aerodromes as recommended by the following [R36] ICAO EUR RNP APCH Guidance Material (EUR Doc 025) guidelines, namely:
    - APV procedures flown to LPV minima rely on the use of EGNOS SoL service. An ANSP implementing LPV is required by its State Civil Aviation Authority to have a working agreement with the EGNOS service provider. (For the EU States [R09] Regulation (EC) No 550/2004 Article 10 is applicable)
    - In case implementation of RNP APCH to LPV minima is planned, an assessment should be made to confirm if suitable EGNOS service is available at the aerodrome concerned.

4.7 Airspace Modification Requirements

The following requirement forms the baseline for the proposed approach for the introduction of IFR procedures on uncontrolled aerodromes:

- Airspace re-organisation: declaration of RMZ zones in G airspaces around the aerodromes (the German case) - Minimum regulatory impact since RMZ are already defined in the regulation.

The following sub-sections detail current and minimum airspace requirements and recommended implementation actions following the proposed airspace re-organization.

4.7.1 Current and Minimum Airspace Requirements

Current requirements:

According to the Czech AIP, the Czech airspace is structured and classified following the ICAO airspace directives, the classification of uncontrolled airspace is declared as airspace G, whilst the classification of controlled airspace is designated as C, D or E. Nevertheless, airspace F is currently not used in Czech Republic. Airspaces A and B are not declared nor used in the Czech Republic.

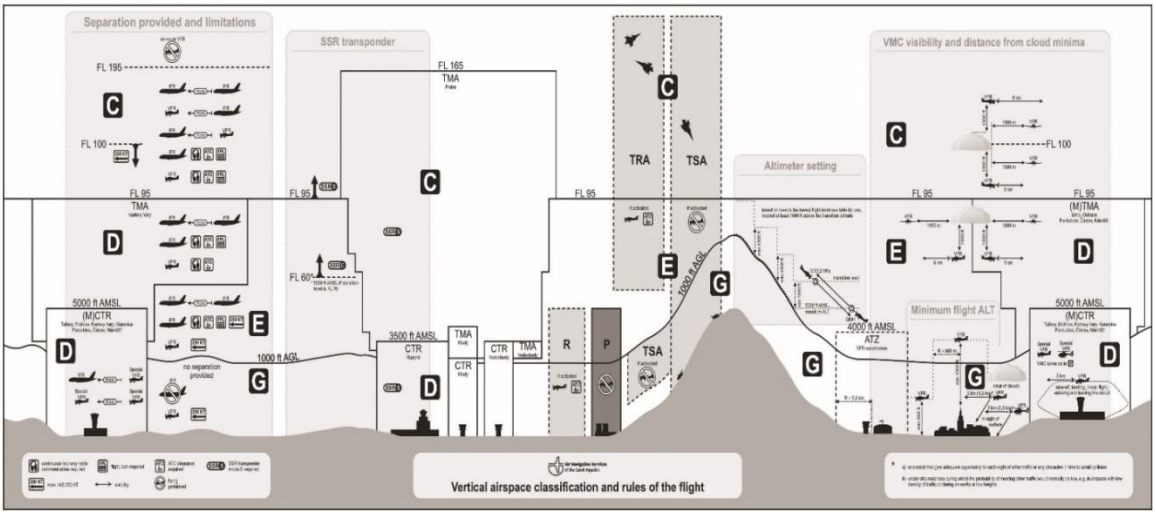

Figure 7: Overview of airspace classification

Czech Republic airspace also contemplates special airspace zones such:

- **Aerodrome Traffic Zones (ATZ)**, aircraft within an ATZ must obey the instructions of the tower controller (if present), or must make radio contact with the Aerodrome Flight Information Service unit or Air/Ground Communication Service unit for the aerodrome before entering the zone (in the case of an uncontrolled airfield), or must obey ground signals if non-radio. In the Czech Republic, ATZs are currently only used for uncontrolled aerodromes.
- **Radio Mandatory Zones (RMZ)**[2], airspace wherein the carriage and operation of radio equipment is mandatory.
  - VFR flights operating in parts of Classes E, F or G airspace and IFR flights operating in parts of Classes F or G airspace designated as a radio mandatory zone (RMZ) by the competent authority shall maintain continuous air-ground voice communication watch and establish two-way communication, as necessary, on the appropriate communication channel, unless in compliance with alternative provisions prescribed for that particular airspace by the competent authority.
  - Before entering a radio mandatory zone, an initial call containing the designation of the station being called, call sign, type of aircraft, position, level, the intentions of the flight and other information as prescribed by the competent authority, shall be made by pilots on the appropriate communication channel.

[2] No declared RMZ has been identified during the Czech AIP analysis

- **Transponder mandatory zone (TMZ)**, airspace wherein the carriage and operation of transponder equipment is mandatory.
    - Aircraft must be equipped by SSR transponders capable of operations in mode A, C or S and must be using this transponder when flying in TMZ, unless stated otherwise by air navigation services provider.

The following additional requirements are detailed in [R01] Aviation Regulation L2:

3.2.5.8 A pilot of the aircraft when intending to conduct a local flight operation from another site inside the ATZ or intervening with ATZ or when passing through the ATZ, within operational hours of an aerodrome, shall coordinate his/her intended activity with the AFIS unit, unit Providing information to known traffic or with the aerodrome operator in advance, unless given otherwise in the appropriate letter of agreement.

3.2.5.9 A pilot conducting flight in active RMZ must keep continuous communications with AFIS.

3.2.5.10 In case of an IFR flight being conducted in RMZ, the AFIS dispatcher can, with regard to possible danger, prohibit entering RMZ or its part.

3.2.5.11 In case a pilot did not obtain an information about RMZ activation, he/she must establish communication with the relevant AFIS dispatcher.

3.2.5.12 Provisions regarding flight activity in RMZ are superior to those provisions regarding flight activity in ATZ.

Minimum requirements

For the current assignment, the following requirements laid down in [R22] Commission Implementing Regulation (EU) No 923/2012 must be considered:

SERA.5025 IFR — Rules Applicable to IFR flights outside controlled airspace

a) Cruising levels

An IFR flight operating in level cruising flight outside of controlled airspace shall be flown at a cruising level appropriate to its track as specified in the table of cruising levels in Appendix 3, except when otherwise specified by the competent authority for flight at or below 900m (3000ft) above mean sea level.

b) Communications

An IFR flight operating outside controlled airspace but within or into areas, or along routes, designated by the competent authority in accordance with SERA.4001(b)(3) or (4) **shall maintain an air-ground voice communication watch on the appropriate communication channel** and establish two-way communication, as necessary, with the air traffic services unit providing flight information service.

c) Position Reports

An IFR flight operating outside controlled airspace and required by the competent authority to maintain an air-ground voice communication watch on the appropriate communication channel and establish two-way communication, as necessary, with the air traffic services unit providing flight information service, shall report position, as specified in SERA.8025 for controlled flights.

4.7.2 Gap Analysis

Currently, uncontrolled aerodromes in Czech Republic are under airspace classification G.

To comply with the above mentioned minimum requirements laid down in [R22], an IFR flight operating outside controlled airspace shall maintain an air-ground voice communication watch on the appropriate communication channel and establish two-way communication, as necessary, with the air traffic services unit providing flight information service. In the Czech Republic, only ATZs are currently used for uncontrolled aerodromes, implying that must make aircraft radio contact with the AFIS unit or Air/Ground Communication Service unit for the aerodrome before entering the zone (in the case of an uncontrolled airfield), or must obey ground signals if non-radio.

On the other hand, it is detailed in current Czech legislation that a pilot conducting a flight in an active RMZ must keep continuous communications with AFIS. Therefore, it is induced that IFR operations operating within airspace G with an associated RMZ in Czech Republic are compliant to the IFR operation requirements laid down in SERA regulation.

4.7.3 Implementation Actions

Even though RMZ are defined in the Czech legislation, no declared RMZ has been identified during the Czech AIP analysis. It is therefore advised that RMZ in Class G airspace in the immediate vicinity of uncontrolled aerodromes where IFR flight operations are to be established, following the German case. Such measure should imply minimum regulatory impact since RMZ are already defined in the regulation.

The German case

To facilitate IFR flight operations at uncontrolled aerodromes, Germany applied in the past the "Airspace F model" with certain national deviations from ICAO provisions (higher VMC minima). Up to that point, there were no IFR operations allowed in airspace G, so some airfields had a F(HX), which was activated for IFR arrivals and departures, and carried higher weather minima for VFR traffic when active. Pursuant to [R22] Commission Implementing Regulation (EU) No 923/2012 (SERA: Standardized European Rules of the Air), the application of airspace F with national deviations from ICAO provisions was no longer possible.

In order to ensure IFR flight operations at uncontrolled aerodromes, a group of experts comprising representatives of the Federal Ministry of Transport and Digital Infrastructure (BMVI), the federal Supervisory Authority for Air Navigation Services (BAF), DFS as well as airspace user groups (Military Aviation, Commercial Aviation, General Aviation) and aerodrome associations developed a new airspace model that complies with SERA/ICAO. This new airspace model entailed the establishment of radio mandatory zones (RMZ) in Class G airspace in the immediate vicinity of these aerodromes. Furthermore the Class E airspace will be lowered locally to 1000ft AGL.

In the new airspace model, the established procedures and requirements for IFR flight operations were kept as far as possible. This restructuration of the airspace was implemented in 2014. The figure below shows the airspace modification over a dummy aerodrome.

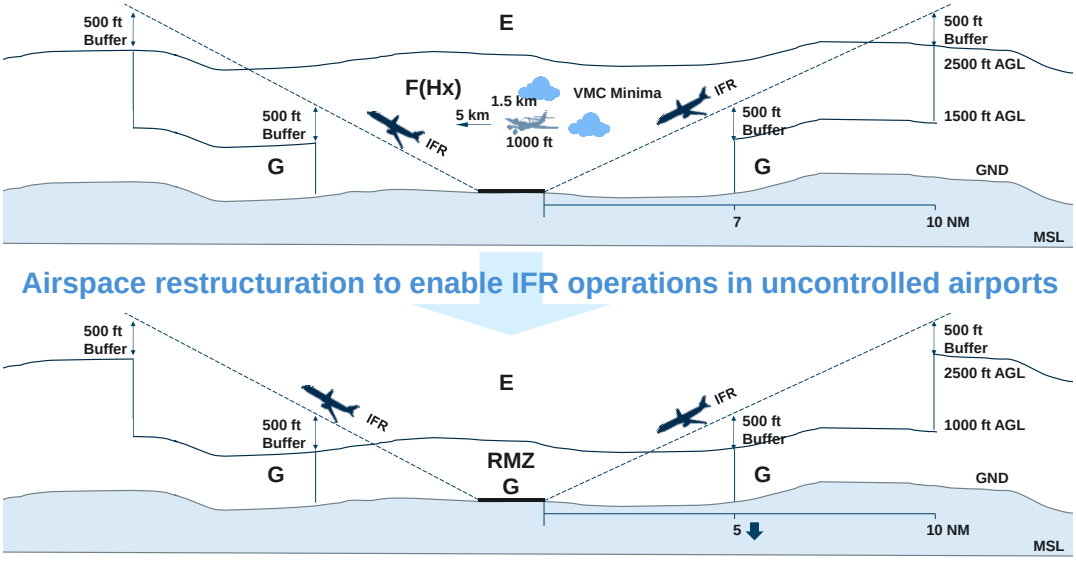

Figure 8: German Airspace Restructuration

It is considered in the present analysis that the German case is a suitable example for the present project of introduction of IFR procedures in uncontrolled airports in Czech Republic. Specifically, the following is advised:

- AM1: Airspaces surrounding uncontrolled aerodromes intended to provide for IFR operations shall be designated as radio mandatory zone (RMZ) and such shall be duly promulgated in the Czech AIP.
- AM2: An amendment is advised to [R01] Aviation Regulation L2 such that the referred regulation explicitly mentioning that uncontrolled aerodromes serving IFR flights shall be under airspace G classification with an associated RMZ.

4.8 Summary Implementation Plan

The following table summarizes the implementation actions recommended throughout the previous sections:

Areas of implementation	Implementation actions
Competence of AFIS personnel (see section 4.1)	• AFIS_P1: Regarding the proposed re-structuration of airspace, no implementation actions concerning AFIS personnel training are recommended in the present analysis as Czech regulation mandates that AFIS operators must hold a certificate for radio operator for an aeronautical mobile service. • AFIS_P2: Regarding the introduction of RNP APCH procedures at uncontrolled aerodromes, revision of the regulation [R04] Aviation Regulation L11 is advised in order to clearly state whether there is the need for specific training of AFIS personnel for the support of RNP APCH procedures.
Training for other aviation personnel (see section 4.2)	• T_OP1: Regarding AFIS implementation in compliance with the proposed model, the main implementation action identified is the possible requirement for training of ground vehicle operators relating to: o Communication with AFIS unit; and o Communication procedures. It is advised that upon deployment of AFIS units at aerodromes not previously providing such service, training is provided to these actors. In addition, it would also be recommended to include a reference in the Czech legislation regarding the maintenance personnel in charge of the AFIS equipment and the required airport equipment (described in Section 4.6 Airports Equipment Requirements).
METEO requirements (see section 4.3)	No specific implementation actions nor amendments in the Czech legislation are required in this field.
IFR procedure requirements (see section 4.4)	• IFR_PROC1: Specific information about GNSS NOTAMs and the requirements on RAIM function availability could be integrated in Aviation Regulation [R46] Aviation Regulation L10/I as an amendment.
Flight crew and aircraft facilities requirements (see section 4.5)	• FC1: [R47] Commission Regulation (EU) 2016/539 amending [R39] Commission Regulation (EU) No 1178/2011 as regards pilot training, testing and periodic checking for performance-based navigation indicates that after 2020 all pilots licensed for operating under IFR shall have the necessary training to conduct RNP APCH procedures. As such, after 2020 it is assumed that no additional flight crew requirements will be necessary to approach uncontrolled aerodromes which aim to implement the referred procedures other than the standard IFR flight training. Before this period of time, it is advised as an implementation action in the scope of the present assignment that an annex to Czech regulation is published concerning aircrew licensing specifying the required training and licensing of aircrew wishing to fly to aerodromes concerned. In addition, publishing the referred changes through AIC and AIP is recommended in order to provide awareness to all flight crew entering affected airspace. • AC1: aircraft equipment, navigation capabilities, airworthiness and operational approval for aircraft entering the airspace affected by the present assignment shall be compliant to [R40] EASA AMC 20-27 Airworthiness Approval and Operational Criteria for RNP APPROACH Operations including APV BARO-VNAV Operations and [R41] EASA AMC 20-28 Airworthiness Approval and Operational Criteria related to RNAV for GNSS approach operation to LPV minima using SBAS. As these specifications differ from general specification for standard IFR flight

Areas of implementation	Implementation actions
	operations, it is advised that such approaches are dully published in the corresponding information channels. No amendments to the legislation are proposed as it is assumed that Czech regulation is compliant to the EU implementing rules corresponding to the referred AMCs. In short, the following implementation action is recommended in line with [R36] ICAO EUR RNP APCH Guidance Material (EUR Doc 025): ○ States are recommended to use AIC and AIP to provide information to users regarding the GNSS and SBAS. Both type of avionics i.e. basic GNSS and augmented GNSS (SBAS) support all phases of flight from departure through RNP approach. GNSS-related elements providing the navigation service for en-route purposes shall be published in the State AIP ENR 4 section. When the same aid i.e. Basic GNSS and/or SBAS is used for both enroute and aerodrome purposes, a description must also be given in AIP AD 2 and/or (if appropriate) AD 3 sections.
Airport equipment requirements (see section 4.6)	• AE1: Equipment for AFIS units should be supplied to affected aerodromes following the guidelines described in section 4.6.1.3. Such requirements should also be further detailed in [R05] Aviation Regulation L14. • AE2: Approach lighting system requirements should be further assessed in the scope of a safety case. In case the safety case concludes that approach lighting system for uncontrolled aerodromes who which to comply to IFR procedures are recommended, an annex to current [R05] Aviation Regulation L14 is advised specifying the recommendation for edge, PAPI/PLASI and/or threshold lights as minimum standards for uncontrolled aerodromes who wish to comply to IFR procedures. • AE3: An annex to current [R05] Aviation Regulation L14 is recommended specifying GNSS infrastructure requirements for non-precision runways in order to allow for RNP APCH procedures in uncontrolled aerodromes as recommended by the following [R36] ICAO EUR RNP APCH Guidance Material (EUR Doc 025) guidelines, namely: ○ APV procedures flown to LPV minima rely on the use of EGNOS SoL service. An ANSP implementing LPV is required by its State Civil Aviation Authority to have a working agreement with the EGNOS service provider. (For the EU States EC Regulation No 550/2004 Article 10 is applicable) ○ In case implementation of RNP APCH to LPV minima is planned, an assessment should be made to confirm if suitable EGNOS service is available at the aerodrome concerned.
Airspace modification requirements (see section 4.7)	• AM1: Airspaces surrounding uncontrolled aerodromes intended to provide for IFR operations shall be designated as radio mandatory zone (RMZ) and such shall be duly promulgated in the Czech AIP. • AM2: An amendment is advised to [R01] Aviation Regulation L2 such that the referred regulation explicitly mentioning that uncontrolled aerodromes serving IFR flights shall be under airspace G classification with an associated RMZ.

Table 11: Summary implementation plan

5 Impact Assessments of IFR Operations

Present section aims at providing a brief overview of the possible impact of the impact of introducing IFR procedures in uncontrolled aerodromes, regarding the impact of airport status change (possible impact on traffic of affected aerodromes) and data integrity assurance.

5.1 Airport Status Change

The main benefit of implementing RNP APCH is to improve safety. The RNP APCH operations reduce the risk of CFIT by providing stabilised approach. Also, better situational awareness is provided to pilots through provision of vertical guidance. RNP APCH implementation can support the withdrawal of some conventional navaids thus saving costs for maintenance and flight calibration flights. This can lead to fewer building constraints on and around aerodromes and the possibility to develop and improve services.

The safety objective alone can be a sufficient argument to implement RNP APCH procedures, particularly in the cases when most aircraft operators in a particular airspace already have on-board RNAV capabilities. Some States have already implemented RNP APCH procedures for this purpose and their experience can be used by other States.

As an example, the Shoreham Aerodrome (Brighton City Airport Ltd), UK, is currently undergoing a consultation process for the introduction of new approach procedures at the aerodrome. The Civil Aviation Authority (CAA) stated that the proposals constitute an Airspace Change Proposal and this process requires BCAL to undertake a consultation exercise with the aviation community, aerodrome stakeholders, local authorities and the general public. In the published consultation document, information regarding the impact of introducing new approach procedures is outlined.

Shoreham Aerodrome has instrument approach procedures using the GNSS for the tarmac runways 02 & 20. They are known as RNAV approaches and provide information of position, but not altitude, for pilots flying IFR.

BCAL commissioned a CAA approved company to design new GNSS approaches that include vertical guidance (GNSS RNAV LPV) which comply with the design parameters set out by ICAO. These designs no longer require a dependence on the NDB radio beacon for the missed approach procedure and holding pattern.

The vast majority of aircraft movements (landing and departing) at Shoreham do so under VFR. This can be seen by the graph below:

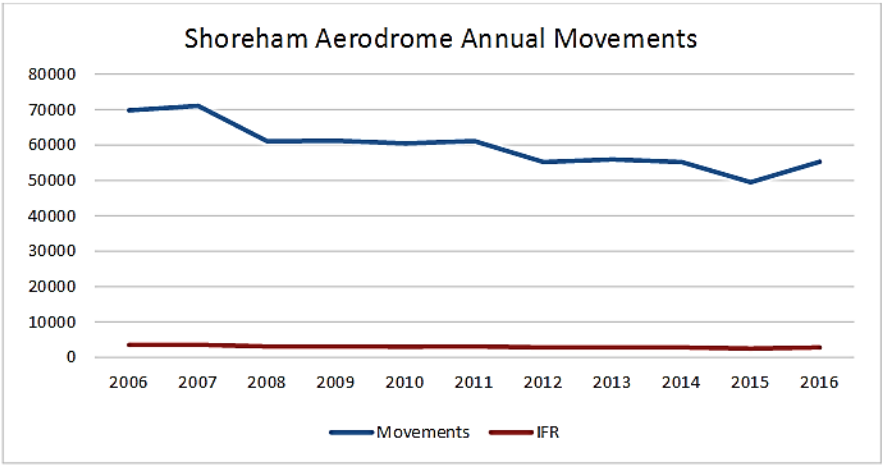

Figure 9: Shoreham Aerodrome Annual Movements (Consultation document)

The number of IFR aircraft that use the aerodrome annually is approx. 5% of the total. **The aerodrome does not envisage this percentage to change significantly if approval for the new instrument approach procedures is obtained**. It is acknowledged by BCAL that having these more accurate procedures in place **may encourage aircraft operators to land at Shoreham rather than looking further afield when planning their flights**. If the possibility of an operator establishing a scheduled service (assuming four flights per day) is added then BCAL estimates that the percentage of IFR flights will increase to 8-9%.

The Brighton aerodrome example can be extrapolated into the Czech case in order to obtain a possible order of magnitude of impact in traffic due to the introduction of IFR procedures in certain aerodromes. In the

present analysis, the Hradec Králové Airport (LKHK) is taken as an illustrative example due to similarity in traffic volume with the Brighton aerodrome. Since 2008[3], LKHK has experience a Compound Annual Growth Rate (CAGR) of approximately 13,3%, reaching 70876 movements/year in 2016. If a constant growth rate equal to the referred CAGR is assumed until 2020, the high-level traffic forecast illustrated in Figure 10 is obtained.

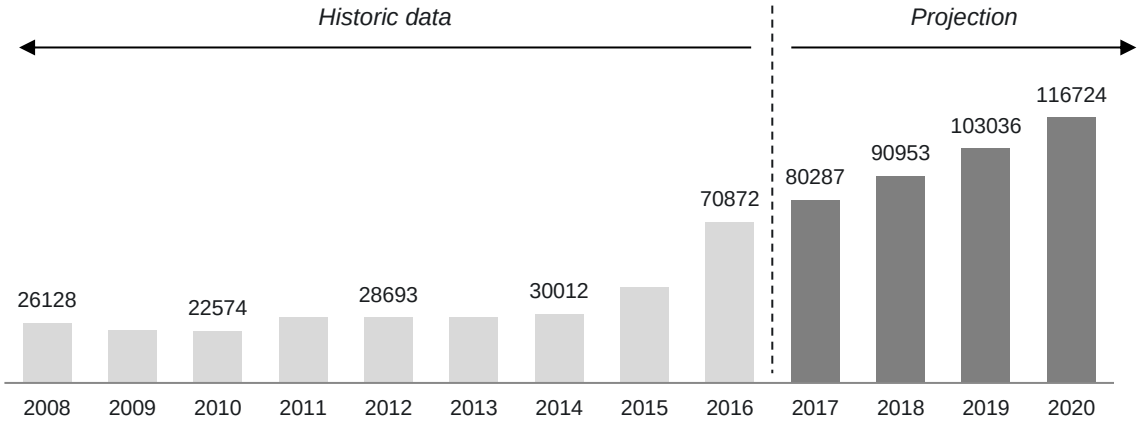

Figure 10: High-level traffic forecast (VFR movements per year) – LKHK Airport, historic data retrieved from aerodrome webpage

If one assumes that by introducing IFR procedures at LKHK airport the percentage of IFR flights within total movements will be approximately the same as the one currently experienced by Brighton airport (5%), while maintaining the same total number of movements, then the results illustrated in Figure 11 are obtained.

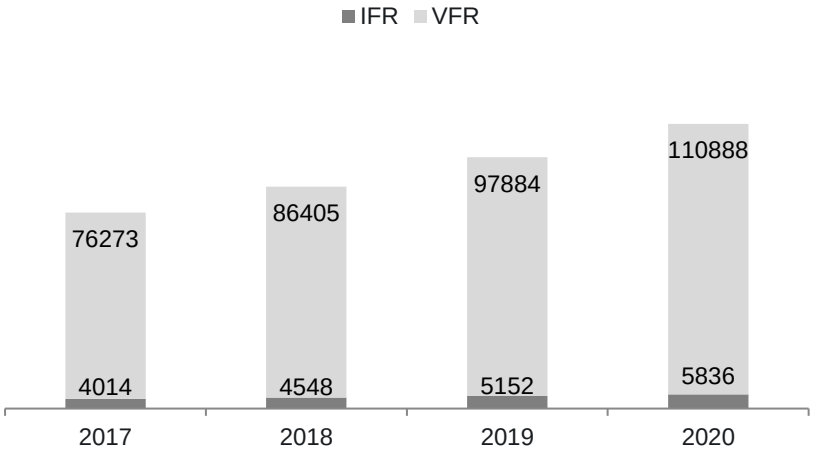

Figure 11: High level traffic forecast considering 5% of operations are turned into IFR (IFR and VFR movements per year) – LKHK Airport

Additionally, the impact in total traffic can be computed by assuming that the introduction of IFR procedures could potentially increase the total number of yearly movements of affected aerodromes. In Figure 12 below, traffic results are illustrated by considering an 8% increase in IFR movements (representative of additional IFR movements brought by the establishment of new potential schedule services, as assumed in Brighton analysis) on top of the values presented in Figure 11.

[3] Data concerning previous years is not publicly available.

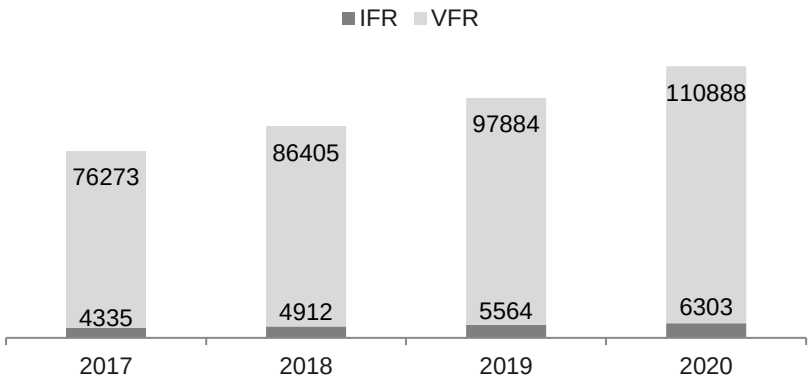

Figure 12: High level traffic forecast considering 5% of operations are turned into IFR and that IFR traffic is increased by 8% – LKHK Airport

Nonetheless, values illustrated in Figure 10, Figure 11 and Figure 12 are the result of a very preliminary analysis and shall therefore be interpreted with caution. Further investigation on the possible impact of the present assignment in the traffic of selected aerodromes must be conducted in order to ensure the relevance of the above mentioned values.

Using the same rationale, the following results are obtained for České Budějovice (LKCS) Airport:

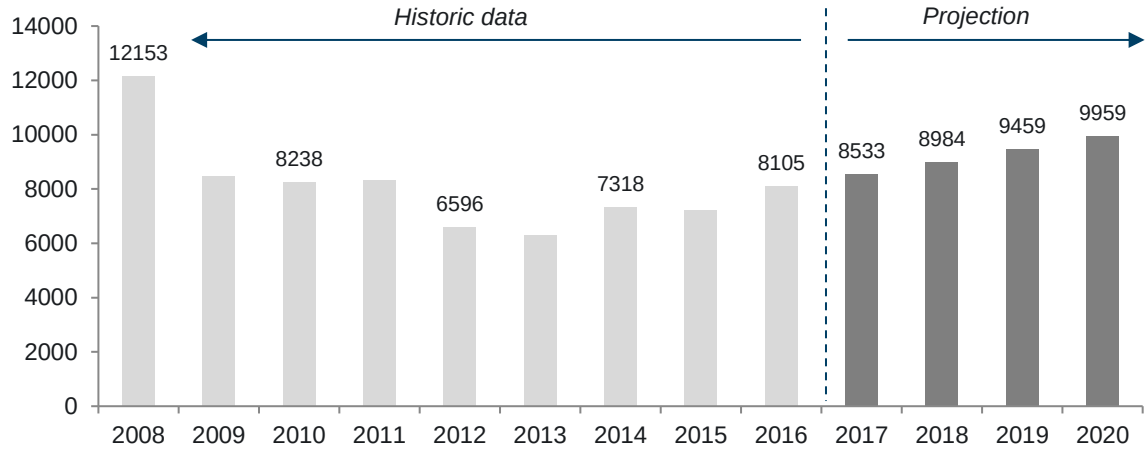

Figure 13: High-level traffic forecast (VFR movements per year) – LKCS Airport, historic data retrieved from aerodrome webpage (Note: $CAGR_{2012\text{-}2016}$ of 5,3% extrapolated in time period 2017-2020)

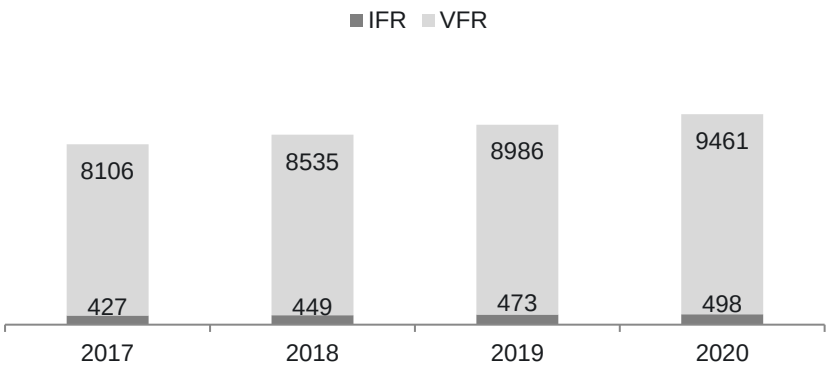

Figure 14: High level traffic forecast considering 5% of operations are turned into IFR (IFR and VFR movements per year) – LKCS Airport

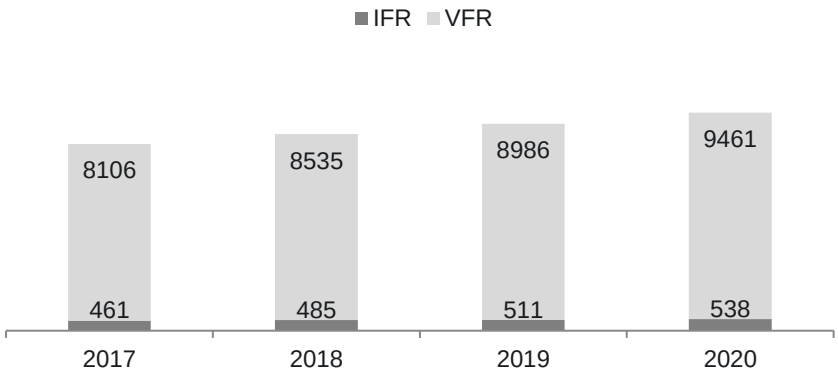

Figure 15: High level traffic forecast considering 5% of operations are turned into IFR and that IFR traffic is increased by 8% – LKCS Airport

No extrapolation is done for the third Czech airport considered in the previous deliverable [R45] D1 - General Feasibility Assessment of the Project as no reliable traffic data was found publicly available for this airport.

Operational improvements that can be quantified are also those associated with avoidance of delay and diversion that may result from the reduced operational minima possible with RNP APCH operations (particularly those when vertical guidance is provided – APV). One way of performing such a benefit assessment is to use the Benefit Model provided in the RNAV Approach Benefit Analysis document (V2.1, May 2009, produced by Helios for Eurocontrol[4]). This model describes a method of calculating the number of avoided cancellations and diversions based on meteorological data (cloud ceiling and runway visibility) versus the minima improvement.

5.2 Data Integrity Assurance

[R25] Commission Regulation (EU) No 73/2010, commonly known as 'the ADQ IR', lays down the requirements on the quality of aeronautical data and aeronautical information for the Single European Sky (SES). The overall objective of this Implementing Rule is to achieve aeronautical information of sufficient quality, accuracy, timeliness and granularity as a key enabler of the European Air Traffic Management Network (EATMN).

The ADQ IR entered into force on 26 January 2010, and was subsequently appended by [R26] Commission Implementing Regulation (EU) No 1029/2014 on 26 September 2014 for the updating document references.

With the increasing reliance on co-ordinate data implicit in area navigation (RNAV) and global navigation satellite systems (GNSS), the integrity and quality of such data become critical.

[R25] Commission Regulation (EU) No 73/2010 introduces high-level performance requirements, in the form of provisions, which place controls on the processes applied to aeronautical data/information, including the origination, handling and publication phases Through this approach, the integrity of aeronautical data/information is assured by demonstrating that the processes applied give the required degree of assurance that the data will not be adversely affected.

[R25] Commission Regulation (EU) No 73/2010 states that aeronautical data/information of appropriate quality is required to ensure safety and support new operational concepts throughout the European Air Traffic Management Network (EATMN). ICAO currently defines data quality requirements in terms of:

- Accuracy;
- Resolution;
- Integrity.

Furthermore, in addition to the data quality requirements listed above, additional characteristics, such as completeness, consistency, timeliness and the need to determine the origin of data, are also addressed by

[4] Available at https://www.eurocontrol.int/sites/default/files/content/documents/navigation/p723D003-business-case-final-report-v2-1.pdf

[R25] Commission Regulation (EU) No 73/2010. Consequently, these criteria must be met and maintained within the EATMN when originating and processing aeronautical data/information.

Of particular relevance for the present assignment are the data integrity constraints related to the implementation of RNP APCH procedures.

[R36] ICAO EUR RNP APCH Guidance Material (EUR Doc 025) provides details on the requirements for the Final approach segment (FAS) data block. The APV database for SBAS includes a FAS Data Block. The FAS Data Block information is protected with high integrity using a cyclic redundancy check (CRC).

In the case of LPV, the data required to code the procedure includes a FAS Data Block, which contains an eight character hexadecimal representation of the calculated remainder bits called the CRC remainder. The CRC remainder is used to determine the integrity of the FAS data during transmission and storage and it is computed electronically using a FAS data block software tool. The content of the FAS Data Block should be published on the verso of the chart in order to ensure that the procedure is correctly coded in the navigation database.

From a data quality and integrity level stand point, some elements of the FAS DB are classified as critical data requiring the highest possible resolution for latitude/longitude & elevation (hundredth of sec and 1 foot respectively). Therefore, attention should be paid throughout the entire chain of involved actors i.e. procedure designer – AIS expert - data ware-house specialist – avionics representative in order that the high demanding navigation database requirements for RNP APCH should be closely coordinated as well as it would be a collaborative process.

6 Abbreviations and Definitions

ACC	Area Control Centre
AD	Aerodromes
ADQ IR	Aeronautical Data and Information Quality Implementing Rule
AFIS	Aerodrome Flight Information Service
AFISO	Aerodrome Flight Information Service Officer
AFM	Aircraft Flight Manual
AGL	Above Ground Level
AIC	Aeronautical Information Circular
AIP	Aeronautical Information Publication
AIRAC	Aeronautical Information Regulation And Control
AIRMET	Airmen's Meteorological Information
AIS	Aeronautical Information Service
ALG	Advanced Logistics Group
AMC	Acceptable Means of Compliance
ANS	Air Navigation Services
ANSP	Air Navigation Service Provider
APAC	Austrian Product Assurance Company
APAPI	Abbreviated Precision Approach Path Indicator
APCH	Approach
APV	Approach procedures with Vertical Guidance
ARINC	Aeronautical Radio Incorporated
ATC	Air Traffic Control
ATCO	Air Traffic Controller
ATFM	Air Traffic Flow Management
ATIS	Automatic Terminal Information Service
ATM	Air Traffic Management
ATS	Air Traffic Services
AT-VASIS	Abbreviated 'T' Visual Approach Slope Indicator System
ATZ	Aerodrome Traffic Zone
AZF	Allgemeines Funksprechzeugnis (General Radio Operator Certificate)
BAF	Bundesaufsichtsamt für Flugsicherung (German National Supervisory Authority)
BARO	Barometric
BCAL	Brighton City Airport Ltd
BMVI	Bundesministerium für Verkehr und digitale Infrastruktur (German Federal Ministry of Transport and Digital Infrastructure)
CAA	Civil Aviation Authority
CAGR	Compound Annual Growth Rate
CAT I	Category I

CDFA	Continuous Descent Final Approach
CFIT	Controlled Flight into Terrain
CONOPS	Concept of Operations
CRC	Cyclic Redundancy Check
CS	Certification Specifications
CTU	Czech Technical University in Prague, Faculty of Transportation Sciences
CZCAA	Civil Aviation Authority of the Czech Republic
DA/H	Decision Altitude/Height
DB	Data Block
DFS	Deutsche Flugsicherung (German ANSP)
DME	Distance Measuring Equipment
DoV	Declaration of Verification
E-GNSS	European GNSS
EASA	European Aviation Safety Agency
EATMN	European Air Traffic Management Network
EC	European Commission
EGNOS	European Geostationary Navigation Overlay Service
ENR	En Route
ESSP	European Satellite Services Provider
ETA	Estimated Time of Arrival
EU	European Union
EUR	European
EUROCONTROL	European Organisation for the Safety of Air Navigation
EWA	EGNOS Working Agreement
FAA	Federal Aviation Administration
FAF	Final Approach Fix
FAS	Final Approach Segment
FATO	Final Approach & Take-Off area
FCL	Flight Crew Licensing
FDE	Flight Data Exchange
FIC	Flight Information Centre
FMS	Flight Management System
FSPersAV	Flugsicherungspersonalausbildungs-Verordnung (Air traffic control personnel training regulation)
GBAS	Ground Based Augmentation System
GM	Guidance Material
GND	Ground
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HF	High Frequency

IAF	Initial Approach Fix
ICAO	International Civil Aviation Organization
ICAO EUR	ICAO European Office
IFR	Instrument Flight Rules
IGS	Instrument Guidance System
ILS	Instrument Landing System
IR	Instrument Rating or Implementing Rule
LKCS	České Budějovice Airport
LKHK	Hradec Králové Airport
LKMH	Mnichovo Hradiště Airport
LNAV	Lateral Navigation
LP	Localiser Performance
LPV	Localiser Performance with Vertical Guidance
L-Regulation	Czech Aviation Regulation
MDA/H	Minimum Decision Altitude/Height
MET	Meteorology
METAR	METeorological Aerodrome or Aeronautical Report
METEO	Meteorology
MLS	Microwave Landing System
MOCA	Minimum Obstacle Clearance Altitude
MSL	Mean Sea Level
N/A	Not Applicable
NDB	Non-Directional Beacon
NM	Nautical Mile
NOTAM	Notice to Air Men
NPA	Notice of Proposed Amendment or Non-Precision Approach
NSA	National Supervisory Authority
OAS	Obstacle Assessment Surfaces
OCA/H	Obstacle Clearance Altitude/Height
OP	Operational Procedures
PA	Precision Approach
PANS OPS	Procedures for Air Navigation Services - Aircraft Operations
PAPI	Precision Approach Path Indicator
PBN	Performance-Based Navigation
PLASI	Pulse Light Approach Slope Indicator
QFE	Atmospheric pressure at aerodrome elevation
QNH	Atmospheric pressure at nautical height
RAIM	Receiver Autonomous Integrity Monitoring
RMZ	Radio Mandatory Zone
RNAV	Area Navigation

RNP	Required Navigation Performance
RVR	Runway Visual Range
RWY	Runway
SALS	Simple Approach Lighting System
SARPs	Standards and Recommended Practices
SBAS	Satellite-Based Augmentation Systems
SDD	Surveillance Data Distribution
SDF	Step-Down Fix
SERA	Standardised European Rules of the Air
SES	Single European Sky
SIGMET	Significant Meteorological Information
SoL	Safety of Life
SPA	Specific Approvals
SPECI	Aviation selected SPECIal weather report
SPO	Specialised Operations
SSR	Secondary Surveillance Radar
STD	Standard
TAF	Terminal Area (Aerodrome) Forecast
TMZ	Transponder Mandatory Zone
T-VASIS	'T' Visual Approach Slope Indicator System
UK	United Kingdom
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions
VNAV	Vertical Navigation
VOR	VHF Omnidirectional Range
WGS	World Geodetic System
WMO	World Meteorological Organisation

7 References

The present section lists the references used in the preparation of the present deliverable.

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[R02]	Aviation Regulation L3 - Meteorology, amendment 77-A (transposed ICAO Annex 3 with additions based on EU legislation and Czech specifics) / - / - / Ministry of Transport of the Czech Republic / 2016-11-10
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[R07]	Aviation Regulation L8168 - Procedures for Air Navigation Services – Aircraft Operations, amendment 7 (transposed ICAO DOC 8168, Vol. I) / - / - / Ministry of Transport of the Czech Republic / 2016-11-10
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[R41]	EASA AMC 20-28 Airworthiness Approval and Operational Criteria related to RNAV for GNSS approach operation to LPV minima using SBAS (Annex II to ED Decision 2012/014/R) / - / - / EASA / 2012-09-24
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Annex A: CZCAA IFR study Specific IFR Regulatory Requirements

Filename: CZCAA IFR study 00032 02.00 Released IFR reg requirements.xls

Annex B: AFIS Phraseology for Vehicles/Persons on the Manoeuvring Area

As retrieved from [R37] EUROCONTROL Manual for Aerodrome Flight Information Service (AFIS):

5.5.1 VEHICLE TRAFFIC ... where detailed instructions are required ... general	*a) *[vehicle call sign]] [location]* REQUEST PROCEED TO *[intentions]*; b) PROCEED TO HOLDING POINT *[number]* [RUNWAY *(number)*] [HOLD SHORT OF RUNWAY *(number)* (*or* CROSS RUNWAY *(number)*)]; *c) *[vehicle call sign]* REQUEST DETAILED INSTRUCTIONS; d) PROCEED TO HOLDING POINT *[number]* [RUNWAY *(number)*] VIA *(specific route to be followed)* [HOLD SHORT OF RUNWAY *(number)* (*or* CROSS RUNWAY *(number)*)]; e) TAKE (*or* TURN) FIRST (*or* SECOND) LEFT (*or* RIGHT); f) PROCEED VIA *(identification of taxiway)*; g) PROCEED VIA RUNWAY *(number)*; h) PROCEED TO TERMINAL (*or other location, e.g.* GENERAL AVIATION AREA)]; *i) *(vehicle call sign) (location) REQUEST PROCEED TO (destination on aerodrome)*; j) PROCEED STRAIGHT AHEAD; k) PROCEED WITH CAUTION; l) GIVE WAY TO *(description and position of aircraft or other vehicle)*; *m) GIVING WAY TO *(traffic)*; *n) TRAFFIC *(or type of aircraft)* IN SIGHT; o) FOLLOW *(description of other aircraft or vehicle)*; p) VACATE RUNWAY *(number)*; *q) RUNWAY *(number)* VACATED; r) EXPEDITE *[(reason)]*; *s) EXPEDITING; t) [CAUTION] proceed SLOWER *[reason]*; *u) SLOWING DOWN. * Denotes vehicle driver transmission.
5.5.2 HOLDING - VEHICLES ... to hold not closer to a runway than specified	‡a) HOLD *(direction)* OF *(position, runway number, etc.)*; ‡b) HOLD POSITION; ‡c) HOLD *(distance)* FROM *(position)*; ‡d) HOLD SHORT OF *(position)*; *e) HOLDING; *f) HOLDING SHORT. ‡ Requires specific acknowledgement from the vehicle driver. * Denotes vehicle driver transmission. The procedure words ROGER and WILCO are insufficient acknowledgement of the instructions HOLD, HOLD POSITION and HOLD SHORT OF (position). In each case the acknowledgement shall be by the phraseology HOLDING or

	HOLDING SHORT, as appropriate.
5.5.3 TO CROSS A RUNWAY – VEHICLES *Note.— The driver will, when requested, report "RUNWAY VACATED" when the vehicle is beyond the relevant runway holding position.*	*a) REQUEST CROSS RUNWAY *(number)*; *Note.— If the AFIS unit is unable to see the crossing vehicle/person (e.g. night, low visibility), the instruction should always be accompanied by a request to report when the runway has been vacated.* b) CROSS RUNWAY *(number)* [REPORT VACATED]; c) EXPEDITE CROSSING RUNWAY *(number)* TRAFFIC *(aircraft type) (distance)* KILOMETRES (*or* MILES) FINAL; d) PROCEED TO HOLDING POINT *[number]* [RUNWAY *(number)*] VIA *(specific route to be followed),* [HOLD SHORT OF RUNWAY *(number)*] or [CROSS RUNWAY *(number)*]; *e) RUNWAY VACATED. * Denotes driver transmission

For more detailed information concerning the above, please refer to [R37] EUROCONTROL Manual for Aerodrome Flight Information Service (AFIS).