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APAC ALG TRANSPORTATION INFRASTRUCTURE & LOGISTICS

ČVUT ČESKÉ VYSOKÉ UČENÍ TECHNICKÉ V PRAZE

Generic Safety Assessment for the Implementation of IFR Operations

CZCAA IFR Study

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Change History

Version	Status	Date	Affected Pages	Author	Cause and Summary of the Change
00.01	Draft	2017-03-22	All	H. Scherzer	First draft
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01.00	Released	2017-03-30	All	H. Scherzer	Released version

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1 Introduction

1.1 General

This generic safety assessment assesses the risk of IFR operations implemented at uncontrolled aerodromes in the Czech Republic if implemented as defined in [R02] Deliverable D2 - CONOPS Implementation of IFR Procedures in the Czech Republic.

Owner of this document is CZCAA.

1.2 Purpose of this Document

This document is a required input to the [R07] Deliverable D3 - Generic Safety Case for the Implementation of IFR Operations.
This Generic Safety Assessment will be the basis for the aerodrome specific safety assessment as described in [R23] Deliverable D4/D5 - Procedure for IFR Safety Assessment/Certification of a Specific Uncontrolled Aerodrome in the Czech Republic with the goal to minimise the effort for the aerodrome specific safety assessment in a standardised way.

1.3 Maintenance of this Document

This document shall be maintained by the owner of the document and before using the document in an assessment of a specific aerodrome it has to be reviewed for necessary updates.

2 Risk Assessment Initialisation/Planning

2.1 Regulative Baseline

The applicable regulative baseline for this safety case is described in [R24] Regulative Baseline for the Implementation of IFR Operations at Uncontrolled Aerodromes in the Czech Republic.

2.2 Scope of the Generic Safety Assessment

The change to be assessed is the implementation of IFR operations in an uncontrolled environment that are ACCEPTABLY SAFE in a controlled environment.
Only the consequences of the change from controlled to uncontrolled environment were assessed.

2.3 Process

2.3.1 General Methodology

The author tried to identify similar safety assessments already performed with reusable results. The following safety assessments were identified and their assessment results were taken into account for this safety assessment as far as applicable:

- [R04] Safety Study on Implementation of IFR operation at LKHK airport.

Even if the following safety assessments are not similar to the current assessment, the results were reviewed to identify hazards, assumptions, constraints and safety requirements that may be applicable to the current study to ensure completeness.

- [R08] Final OSED for Madrid TMA (Annex Safety Assessment);
- [R09] CAP 1122 - Application for instrument approach procedures to aerodromes without an instrument runway and/or approach control (parts related to risks and safety arguments);
- [R10] Flight Operational Safety Assessment Requirements for New Procedures RNP-AR (hazards);
- [R17] Mielec APV SBAS (LPV) approach safety assessment;
- [R18] Approach with BARO VNAV Preliminary Safety Case;
- [R19] Monastir APV SBAS (LPV) and LNAV/APV Baro approach safety assessment.

A safety case that confirms that the change (in this case the IFR operations implemented at uncontrolled aerodromes in the Czech Republic) is acceptably safe requires credible evidence for all arguments that the safety requirements are met (verified during the SSA).

For a generic safety case, an SSA cannot be performed as there is no implementation that can be verified. A generic safety case confirms that the change CAN BE acceptably safe if the evidence for all arguments specifies the process and the implementation in a way that, if followed during implementation, the change will be acceptably safe.

The [R07] Deliverable D3 - Generic Safety Case for the Implementation of IFR Operations specifies the evidence necessary to consider the specified safety arguments valid and the change safe if implemented accordingly. The goal of the Generic Safety Assessment is to provide the required evidence allocated to the safety assessment.

A qualitative methodology as used in [R04] Safety Study on Implementation of IFR operation at LKHK airport was considered appropriate. Due to the lack of quantitative data for similar occurrences in a similar environment a quantitative approach has no advantage and is questionable.

To avoid unnecessary effort and redundancies [R04] Safety Study on Implementation of IFR operation at LKHK airport will be used as a starting point.

The following steps will be performed:

1) Review of [R04] Safety Study on Implementation of IFR operation at LKHK airport and determination as to whether the quality and conformity with [R06] Air Navigation System Safety Assessment Methodology and [R02] Deliverable D2 - CONOPS Implementation of IFR Procedures in the Czech Republic are sufficient to allow reuse of the safety assessment results in [R07] Deliverable D3 - Generic Safety Case for the Implementation of IFR Operations. The following main reviews will be performed and the gaps to what is required for this Generic Safety Assessment will be recorded:
    a. Applicable regulative baseline;
    b. Applied safety assessment standards;
    c. SOCS;
    d. Scope/limitations of the change;
    e. CONOPS used;
    f. Assessment team composition and competence;
    g. Safety arguments;
    h. Assumptions;
    i. Hazards;
    j. Mitigations;
    k. Safety objectives;
    l. Safety requirements;
    m. Recommendations.
2) If [R04] Safety Study on Implementation of IFR operation at LKHK airport will be considered as an inadequate basis for the Generic Safety Assessment, a new assessment will be initialised and planned.
3) Check results of assessment 1) for hazards, assumptions and mitigations against [R08], [R09], [R10], [R17], [R18] and [R19].
4) Identification of the lowest level arguments in [R07] Deliverable D3 - Generic Safety Case for the Implementation of IFR Operations allocated to safety assessment.
5) Check results of 1) and 3) against what is required by 4).
6) Mitigate gaps (if any) identified by:
    a. Compilation of available information into additional evidence by the author of this document;
    b. Review and contribution by the Generic Safety Assessment Team;
    c. Setup of a safety assessment (FHA, PSSA) workshop to close the gaps (Generic Safety Assessment Team, CZCAA representatives, appropriate [R04] Safety Study on Implementation of IFR operation at LKHK airport participants);
7) Record the FHA/PSSA results in this document (3.3).
8) Determination as to which extent the results of this Generic Safety Assessment provide sufficient evidence that the related arguments can be considered valid.
9) Escalation to CZCAA if arguments cannot be validated by the evidence available.
10) Joint decision with the CZCAA and Generic Safety Assessment Team on how to proceed.

FHA and PSSA workshops can be combined.

2.3.2 Standards

During the Project Kick-off meeting it was agreed that the standard [R06] Air Navigation System Safety Assessment Methodology will be used as the safety assessment methodology, see also [R05] Kick-off meeting minutes (MoM), Prague 2017-01-16.

2.3.3 FHA

1. The FHA will be performed based on the high-level specification identified in 2.4 Risk Assessment Baseline as described in 2.3.1.
2. In case 2.3.1/2) is applicable:
    a. During a workshop with the operational, technical and appointed CZCAA experts the FHA will be performed based on the high-level specification identified in 2.4 Risk Assessment Baseline.
    b. The results will be validated against the results of [R04] Safety Study on Implementation of IFR operation at LKHK airport and documented in chapter 3.3 FHA and will be distributed to the CZCAA for review/approval.
3. Identified safety requirements will be documented in 3.3.2 Safety Requirements.

2.3.4 PSSA

The PSSA will be performed based on the high-level specification identified in 2.4 Risk Assessment Baseline as described in 2.3.1.

In case 2.3.1/2) is applicable: The PSSA shall be performed by the operational, technical and CZCAA experts. During the PSSA the following points will be addressed:

1) Allocation of hazards and apportionment of safety objectives to functions and procedures, equipment and human factors providing the services for the functions and definition of the means to achieve the safety requirements.
2) Assessment whether the provisions defined in 2.4 Risk Assessment Baseline are adequate to ensure that the safety objectives are met and if not, definition of additional safety requirements and/or mitigation proposals.

The results will be documented in chapter 3.3 FHA and PSSA and will be distributed to the CZCAA for review/approval.

2.3.5 SSA

As no generic SSA can be performed (because an SSA shall be based on specific evidence) only a review of the draft document [R04] Safety Study on Implementation of IFR operation at LKHK airport and the determination whether the implementation takes the results of the FHA and PSSA into account appropriately were performed and documented in a separate document.

Therefore, SSA planning is not applicable.

2.3.6 Generic Safety Assessment Team

The Generic Safety Assessment Team consists of the following persons:

Team leader:	Hans Scherzer/APAC – safety expert (author).
Other team members:	Jakub Kraus/CTU – safety and operational expert (contribution, validation).
	Andrej Lalis/CTU – safety expert (contribution, validation).
	Michal Mlynarik/APAC – regulatory expert (contribution, validation).

2.3.7 Safety Objective Classification Scheme

The following Safety Objective Classification Scheme (SOCS) is applicable:

Severity	**1 Catastrophic**	**2 Dangerous**	**3 Severe**	**4 Low**	**5 Negligible**
Influence on operation	Accidents	Serious incidents	Major incidents	Significant incidents	Without immediate impact on safety
Examples of influence on operation	• One or more catastrophic accident(s) • One or more collision(s) during the flight • One or more collision(s) on ground • One or more controlled flight(s) into terrain • Complete loss of ability to provide ATC service It cannot be expected that the accident could be avoided by any means.	• Strong decrease of separation (separation is smaller than half of the separation minimum) without the ATC having the situation under control • One or more aircraft deviate from the issued clearance and sudden manoeuvres are required to avoid collision with another aircraft or terrain	• Strong decrease of separation (separation is smaller than half of the separation minimum) whereas ATC has the situation under control and is able to restore normal operation • Small decrease of separation (separation is smaller than separation minimum and bigger than half of the separation minimum) without the ATC having the situation under control	• No direct impact on the safety, but with an indirect effect due to an increased workload for air traffic controllers and / or due to a slight degradation of CNS system performance • Small decrease of separation (separation is smaller than separation minimum and bigger than half of the separation minimum) whereas ATC has the situation under control	• No dangerous conditions arise, the situation has no direct or indirect impact on operation

Table 1 SOCS

2.3.8 The Probability of an Event for Qualitative Assessment

	Probability	
5	Unlikely	Unlikely that the event will occur throughout system lifetime
4	Rare	The event might occur in exceptional cases
3	Occasional	It is probable that this effect will occur from time to time
2	Probable	It is probable that this effect will occur several times
1	Numerous	This effect will occur often

Table 2 Event probability scheme

2.3.9 Risk Matrix - Safety Minimums for Qualitative Assessment

			Probability				
			1	2	3	4	5
			Numerous	Probable	Occasional	Rare	Unlikely
Severity	1	Catastrophic	**A**	**A**	**A**	**B**	**C**
	2	Dangerous	**A**	**A**	**B**	**C**	**D**
	3	Severe	**A**	**B**	**C**	**C**	**D**
	4	Low	**C**	**C**	**C**	**D**	**D**
	5	Negligible	**D**	**D**	**D**	**D**	**D**

Table 3 RCS

2.4 Risk Assessment Baseline

The following form the risk assessment baseline of the current version of the document:

1) [R01] Deliverable D1 - General Feasibility Assessment.
2) [R02] Deliverable D2 - CONOPS Implementation of IFR Procedures in the Czech Republic covering the following areas:
   a. Operational functions involved in the IFR operations;
   b. High-level operational procedures;
   c. Equipment involved;
   d. Human factors (resources, qualification, training).
3) [R04] Safety Study on Implementation of IFR operation at LKHK airport.
4) [R03] Deliverable D6 - Report on Similar European Activities.
5) [R23] Deliverable D4/D5 - Procedure for IFR Safety Assessment/Certification of a Specific Uncontrolled Aerodrome in the Czech Republic.
6) [R24] Regulative Baseline for the Implementation of IFR Operations at Uncontrolled Aerodromes in the Czech Republic.
7) [R06] Air Navigation System Safety Assessment Methodology.
8) 2.3.7 Safety Objective Classification Scheme.
9) 2.3.8 The Probability of an Event for Qualitative Assessment.
10) 2.3.9 Risk Matrix - Safety Minimums for Qualitative Assessment.

2.5 Safety Argument

IFR operations implemented at uncontrolled aerodromes in the Czech Republic can be operated acceptably safely if:

- the implementation and deployment of IFR procedures are performed in accordance with the applicable regulations/standards and [R02] Deliverable D2 - CONOPS Implementation of IFR Procedures in the Czech Republic;
- the 3.2 Assumptions are correct;
- the 3.3.2 Safety Requirements are met;
- the mitigation measures for identified unacceptable risks are applied;
- the operational procedures are adequate; and
- the human resources involved are adequately trained.

3 Safety Assessment Results

3.1 Review of [R04] Safety Study on Implementation of IFR operation at LKHK airport

Review was performed against the checklist under 2.3.1/1).

3.1.1 Ad 1)a Applicable regulative baseline

[R04] does not contain a definition of an applicable regulative baseline as a main attribute of a baseline is completeness.

[R11] Safety Handbook;
[R12] The Safety Assessment and Risk Reduction;
[R13] Implementing Commission Regulation (EU) No. 1035/2011;
can be considered as part of a regulative baseline as it is assumed that [R11] and [R12] define the applicable regulations and [R13] is an EU regulation. The listed standards cannot define a complete baseline as at least the regulations applicable to specific IFR operation are missing.

This does not invalidate the safety assessment results as long as the safety assessment was not performed in contradiction to the applicable regulative baseline as defined in [R24] Regulative Baseline for the Implementation of IFR Operations at Uncontrolled Aerodromes in the Czech Republic.
Special care has to be applied during the review concerning compliance with the regulative baseline as defined in [R24].

3.1.2 Ad 1)b Applied safety assessment standard

The following principle is applied: if more than one standard is listed as applicable (e.g. [R11], [R12], [R13]) and one standard does not invalidate another, all standards were applicable.

Evidence: [R04] states in "4 SAFETY ASSESSMENT PROCESS" that [R11] and [R12] are compliant with [R13] that is the prevailing regulative standard for this safety assessment.
[R04] states in "4 SAFETY ASSESSMENT PROCESS" that the safety assessment was performed in accordance with [R06].
Conclusion: The standard applied for [R04] is not in contradiction to the safety assessment standard required by this document. Missing safety assessment standards applicable to this safety assessment will be taken/applied as defined in this document.

3.1.3 Ad 1)c SOCS

Evidence: [R04] uses the SOCS applicable to ANS CR and it can be assumed that ANS CR uses a SOCS that meets the requirements of the Czech Republic.
This safety assessment uses the SOCS of [R04].
Conclusion: The SOCS of [R04] is not in contradiction to the SOCS used in this safety assessment.

3.1.4 Ad 1)d Scope/limitations of the change

Evidence: [R04] uses:
[R14] IFR LKHK concept of operations;
[R15] Proposals of coordination agreements;
[R16] Proposals of instrument charts;
to describe the scope and limitations of the change.

An overview in [R04] identified the following main scope assessed:

- Aerodrome;
- Airspace;
- Procedures;
- Operational Procedures;
- Approach procedure to runway 34R;
- Departure via TBV, VLM (or VOZ);
- Departure via LEMBI, ARTUP.

It is not explicitly stated in [R04] but confirmed by the content of the document that the change to be assessed is the implementation of IFR operations in an uncontrolled environment that are ACCEPTABLY SAFE in a controlled environment.

Conclusion: It cannot be determined at the stage of initialisation whether the scope will be as complete as required for any safety assessment at any aerodrome under consideration, but it is assumed that the major functions are addressed and therefore the assessment results of the FHA/PSSA can be used as a baseline for the assessment of another specific aerodrome.

3.1.5 Ad 1)e CONOPS used

Evidence: The CONOPS information used is described in:
[R14] IFR LKHK concept of operations;
[R15] Proposals of coordination agreements;
[R16] Proposals of instrument charts;
[R04] Safety Study on Implementation of IFR operation at LKHK airport.

Conclusion: The CONOPS information used is described for a specific aerodrome and therefore far more detailed than it is necessary for a generic safety assessment and it can be described in a generic CONOPS as [R02] Deliverable D2 - CONOPS Implementation of IFR Procedures in the Czech Republic.
The CONOPS information available in and referenced in [R04] Safety Study on Implementation of IFR operation at LKHK airport was reviewed against [R02] Deliverable D2 - CONOPS Implementation of IFR Procedures in the Czech Republic and no contradiction to or substantial deviation from [R02] Deliverable D2 - CONOPS Implementation of IFR Procedures in the Czech Republic was identified. Completeness was not assessed and confirmed as this will be assessed during the generic safety assessment anyway.

The results of [R04] Safety Study on Implementation of IFR operation at LKHK airport based on the CONOPS used in [R04] are considered as a valid but not necessarily complete basis for the generic safety assessment.

3.1.6 Ad 1)f Assessment team composition and competence

Evidence: [R04] Safety Study on Implementation of IFR operation at LKHK airport in chapter 4 SAFETY ASSESSMENT PROCESS describes in detail the participants in the safety assessment of LKHK.

Conclusion: The excessive inclusion of stakeholders, operational, technical and safety management experts supports the conclusion that a sound and valid result of the safety assessment was achieved. Only if the basis for the functions assessed during the generic safety assessment or the additional functions have to be assessed, a new safety assessment will be considered necessary.

3.1.7 Ad 1)g Safety arguments

The safety arguments applicable to the generic safety assessment are described in [R07] Deliverable D3 - Generic Safety Case for the Implementation of IFR Operations.

Evidence: [R04]/3 SAFETY ARGUMENT describes the safety arguments' structure and traceability to the conclusions.

Conclusion: The structure of [R04] is not the same as described in [R07] as [R04] is based on a project safety case structure and [R07] on a preliminary safety case structure, but this doesn't invalidate the results to be used as a basis. However, for each argument of [R07] it has to be verified whether it can be mapped to a safety argument of [R04] and evidence for fulfilling the safety argument can be found in [R04]. If not, the safety assessment process necessary for this safety argument has to be performed.

Please note: For an aerodrome specific safety assessment a project safety case argument structure is more appropriate and should be proposed by the template for specific safety assessments.

3.1.8 Ad 1)h Assumptions

Evidence: [R04]/4.4 Assumptions are mostly specified in a very aerodrome specific way.

Conclusion: More general assumptions have to be derived from the aerodrome specific assumptions and validated as well as completed by the requirements of the [R02] Deliverable D2 - CONOPS Implementation of IFR Procedures in the Czech Republic.

3.1.9 Ad 1)i Hazards and 1)k Safety objectives

Evidence: [R04]/4.5.1 Identified hazards.

Conclusion: [R04]/4.5.1 Identified hazards described the hazards identified in a very aerodrome specific wording, but with a bit of generalisation most of them will be applicable also to a generic safety assessment and other aerodromes.
With the limitation described above [R04]/4.5.1 Identified hazards provides a good basis for the generic hazard assessment.
The hazard list has to be validated and completed against [R02] Deliverable D2 - CONOPS Implementation of IFR Procedures in the Czech Republic, [R08], [R09], [R10], [R17], [R18] and [R19] and shall be subject to expert judgement. The same is applicable to the criticality, the derived safety objectives and the probability of occurrence.

3.1.10 Ad 1)j Mitigations

Evidence: Mitigations related to the safety objective classification are described in [R04]/4.5.1 Identified hazards and additional mitigations were identified in 4.6.1 The validity of the safety argument.

Conclusion: The applicability of the mitigations has to be validated in the generic safety assessment taking into account more generic assessment results. It may be necessary to derive more generic mitigations.

3.1.11 Ad 1)l Safety requirements and 1)m Recommendations

Evidence: [R04]/4.5.6 Safety requirements and 4.5.7 Recommendations.

Conclusion: [R04]/4.5.6 Safety requirements describe the derived safety requirements in a very aerodrome specific wording, but with more generalisation most of them will be applicable also to a generic safety assessment and other aerodromes.
With the limitation described above [R04]/4.5.6 Safety requirements provides a good basis for the generic hazard assessment.
The 4.5.6 Safety requirements list has to be validated and completed against [R02] Deliverable D2 - CONOPS Implementation of IFR Procedures in the Czech Republic, [R08], [R09], [R10], [R17], [R18] and [R19] and shall be subject to expert judgement. The same is applicable to 4.5.7 Recommendations.

3.1.12 Overall Conclusion of Review of [R04]

[R04] Safety Study on Implementation of IFR operation at LKHK airport is a good basis for the generic safety assessment with the constraints identified above. Generic safety assessment results cannot be derived from [R04] in a formal way and an expert based validation and completion will be necessary for the generic safety assessment.

3.2 Assumptions

Please note: If the assumptions defined in this chapter are not fulfilled, the generic safety assessment results are invalid.

Numbering syntax: XAYY.
X = {G, aerodrome identifier used to indicate which specific assessment is performed}.
Y = {0..9}.
A = Assumption.
To assure traceability to the source of the assumption “G” is used for the Generic Safety Assessment and a specific letter shall be defined for the aerodrome specific assessments. “L” is used for the LKHK assessment even if the text is generalised.

ID	Assumption
GA01	The landing and take-off procedures implemented are acceptably safe in an ATC controlled environment.
GA02	An aerodrome specific safety assessment will be performed for each aerodrome and certification will be based on the results of this safety assessment.
GA03	IFR operations will be performed in accordance with the provisions set forth in the applicable regulations and ICAO requirements.
GA04	METEO equipment requirements of the Czech regulations are implemented and operational.
GA05	Human resources will mitigate system failures.
GA06	Human resources will not intentionally adversely affect safety.
GA07	Changes to operational procedures were subject to safety assessments.
GA08	Changes to operational procedures are acceptably safe.
GA09	The flight procedure has been designed according to the requirements of ICAO Doc 8168, including the calculation of procedure minima. [R17]/SR.1.
GA10	Terrain, obstacle and aerodrome data used in the design of the flight procedure shall comply with the data quality requirements of ICAO Annex 14 and ICAO Annex 15. [R17]/SR.2.
GA11	The flight procedure was published in the State AIP. [R17]/SR.7.
GA12	A transition concept (subject to CZCAA approval) including an operational test period is defined and executed.
GA13	The safety requirements identified are implemented appropriately before the transition test period starts.
LA01	Only aircraft of approach categories capable of safely performing landing and take-off procedures track as well as for missed approach are allowed to perform IFR take-off and landing.
LA02	Only one aircraft performs IFR arrival or departure in the RMZ concerned.
LA03	Only runways equipped according to the IFR requirements will be used.
LA04	ACCs and APPs concerned are informed about activated areas and departures.
LA05	Other surrounding AFIS are informed about arrivals and departures.

LA06 LoAs with other airspace users concerned are in place allowing and ensuring request for restriction/suspension of their operation by the AFIS responsible for the departure/arrival aerodrome.
LA07 The required MET and AIS information is provided to the ACC/APP concerned.
LA08 Emergency procedures are coordinated and defined with the ACC/APP and aerodromes concerned.
LA09 Adequate and safe missed approach procedures are defined and published.

3.3 FHA and PSSA

A high level PSSA is performed by allocation of the hazards and their attributes to the following areas (no apportionment of the safety objectives was performed):

- Flight planning;
- MET information;
- Flight operation;
- Equipment incl. infrastructure;
- Human factors.

This structure of areas was chosen to facilitate the reuse of the LKHK assessment results.

Effect on ATM service:

- O1: Total inability to provide safe ATM service;
- O2: Partial inability to provide safe ATM service;
- O3: Transition to another mode of operation;
- O4: Increased workload.

Environmental conditions valid for all hazards:

- Complex traffic situation;
- Adverse weather conditions;
- No additional operational staff available to reduce workload;
- Hazard severity is defined according to the worst credible scenario.

3.3.1 Hazards

No relevant hazards were identified in addition to the hazards already described in [R04] Safety Study on Implementation of IFR operation at LKHK airport. The event traceability of the hazards is provided in 4.5.1 Identified hazards, column “Possible consequences” of [R04].

IDs:
???.H?? in brackets of the text refers to [R04] Safety Study on Implementation of IFR operation at LKHK airport.
???-H?? is specific to this Generic Safety Assessment.
The probability in column “Probability” specifies the expert judgement of this Generic Safety Assessment based on the assumption that the safety requirements specified are implemented appropriately.
[*probability*] in column “Probability” refers to the “Real probability” allocated in [R04] Safety Study on Implementation of IFR operation at LKHK airport.

ID	Hazard	Effect on Service	E-Class	Severity	Safety Objective	Probability	Already existing Mitigations according to [R04]
Flight Planning							
FPL-H01	Missing IFR arrival information at AFIS concerned (FPL.H01)	No IFR activities at aerodrome concerned can be allowed SR20	-	5	-	Rare/[Rare]	Mitigations: • Voice communication • Flight plans available
FPL-H02	Other units concerned have no information about actual activities at aerodrome concerned (FPL.H02)	No other IFR activities at aerodrome concerned can be allowed SR03	O4	4	Rare	Rare/[Rare]	Mitigations: • Telephone communication
FPL-H03	Other units concerned have no flight plan data of IFR departure from aerodrome concerned (FPL.H03)	The flight plan data shall be communicated before clearance by unit concerned	O4	4	Rare	Rare/[Rare]	Mitigation: • Departure is subject to clearance by APP concerned
FPL-H04	IFR arrival outside opening hours of aerodrome concerned (FPL.H04)	• APP concerned will not allow landing • Pilot has to coordinate next steps with APP concerned	O4	4	Rare	Rare/[Rare]	Mitigation: • Opening hours published in AIP • Approval process for flight plan • Coordination agreements with other aerodromes
MET Information							
MET-H01	Incomplete/incorrect MET information provided to the pilot (QNH, RVR, cloud base height, etc.) cloud (MET.H01)	Missed approach R05, SR09, SR13, SR60	O2	2	Unlikely	Unlikely/ [Unlikely]	
MET-H02	Incomplete/incorrect runway conditions provided to the pilot - missing information on braking performance of RWY (MET.H03)	Runway excursion	O1	2	Unlikely	Unlikely/ [Unlikely]	Mitigation: • Flight Crew and its procedures
MET-H03	Missing/incomplete/incorrect MET information (including runway condition, QNH, RVR, cloud base height, etc.) update to the pilot (MET.H04)	Serious incident SR09, SR13, SR60	O1	2	Unlikely	Unlikely/ [Unlikely]	Mitigation: • Obligation of aerodrome concerned to inform of significant changes

ID	Hazard	Effect on Service	E-Class	Severity	Safety Objective	Probability	Already existing Mitigations according to [R04]
Flight Operation							
OPS-H01	Due to IFR activities at the aerodrome concerned activities at other aerodromes are not possible (OPS.H01)	• Delays • Possible increase of workload Impact increases with density of traffic.	O4	4	Rare	Rare/[Rare]	Mitigation: • Telephone coordination among aerodromes • Standard procedures
OPS-H02	Conflict of IFR arrival or departure with VFR traffic (OPS.H02, OPS.H03)	Inadequate separation SR12, SR26, SR28, SR57, SR61, SR63	O2	2	Unlikely	Unlikely/[Probable/ Rare[1]]	Mitigation: • Various procedures that may be aerodrome specific
OPS-H03	IFR departure from aerodrome concerned with deviation from specified routes SID (OPS.H04)	Inadequate separation R05, SR10. SR11	O2	2	Unlikely	Unlikely/ [Rare]	Mitigations: • AIP publication • AFISO information to pilot with emphasis to follow established SID • Training of adjacent units
OPS-H04	Departure from aerodrome concerned without clearance (OPS.H05)	• More than one IFR flight in RMZ • Violation of separation minima • Increased workload for the units concerned SR34	O3	3	Unlikely	Unlikely/ [Unlikely]	Mitigations: • Announcement of the pilot on frequency • Obligation to request clearance
OPS-H05	Missed approach (OPS.H06)	Inadequate separation R05, SR12, SR26, SR28, SR62	O2	2	Unlikely	Unlikely/ [Occasional/ Rare[2]]	Mitigations: • Information distribution about any known traffic to the pilot of IFR flight • Visual monitoring of traffic by flight crew • TCAS • Restriction of VFR traffic upon entry of IFR flight into RMZ • Publication of planned IFR arrivals and departures to/from aerodrome concerned

[1]As justification for “probable” of H03 in [R04] is partially based on the assumption that airspace users don’t adhere to the already applicable rules, which is a questionable argument. The statistical data provided in Note 4 is related to different environments with different traffic characteristics and amount and also no analysis of the causes of the occurrences was provided. Taking into account that [R04] lists 10 existing barriers, the experts involved in this Generic Safety Assessment consider the estimation of “probable” for the “Real occurrence” too high and estimate it “rare”.

[2] As justification for “occasional” of H06 in [R04] is partially based on the assumption that airspace users don’t adhere to the already applicable rules, which is a questionable argument. The statistical data provided in Note 4 is related to different environments with different traffic characteristics and amount and also no analysis of the causes of the occurrences was provided. Taking into account that [R04] lists 8 existing barriers, the experts involved in this Generic Safety Assessment consider the estimation of “occasional” for the “Real occurrence” too high and estimate it “rare”.

ID	Hazard	Effect on Service	E-Class	Severity	Safety Objective	Probability	Already existing Mitigations according to [R04]
OPS-H06	Adjacent units have no information about operation in RMZ (OPS.H07)	Inadequate separation SR12, SR17	O2	2	Unlikely	Unlikely/ [Occasional/ Rare[3]]	Mitigations: • Information distribution about any known traffic to the pilot of IFR flight • Restriction of VFR traffic upon entry of IFR flight into RMZ • Publication of planned IFR arrivals and departures to/from aerodrome concerned • Forwarding of known traffic to adjacent units by AFIS of aerodrome concerned • Obligation to report upon entering RMZ
OPS-H07	Possible conflict of IFR operations with flights controlled by other units (e.g. MIL) (OPS.H08)	Inadequate separation SR14	O2	2	Unlikely	Unlikely/ [Occasional/ Unlikely[4]]	Mitigations: • Information distribution about any known traffic to the pilot of IFR flight • Visual monitoring of traffic by flight crew • TCAS • Restriction of VFR traffic upon entry of IFR flight into RMZ • Publication of planned IFR arrivals and departures to/from aerodrome concerned • Forwarding of known traffic to adjacent units by AFIS of aerodrome concerned • Obligation to report upon entering RMZ
OPS-H08	Conflict of VFR and IFR by runway occupation at aerodrome concerned (OPS.H09)	Missed approach -> inadequate separation R05, SR12, SR26, SR28	O2	2	Unlikely	Unlikely/ [Occasional/ Unlikely[5]]	Mitigations: • Visual contact with the landing airplane on the runway
OPS-H09	Diversion of flights into aerodrome concerned (NSS.H01)	• Increased workload • Unusual situation that may even lead to conflict with other aircraft that may lead to OPS-H01...OPS-H05	O4	4	Rare	Rare/[Rare]	Mitigations: • Telephone coordination
OPS-H10	Extraordinary air events at aerodrome concerned (NSS.H02)	• Delays • Increased workload SR06	O4	4	Rare	Rare/[Rare]	Mitigations: • Agreements on procedures with the event organiser for IFR arrivals • Closing for IFR flights during event

[3] Taking into account that [R04] lists 3 existing barriers and 3 more can be allocated, the experts involved in this Generic Safety Assessment consider the estimation of "occasional" for the "Real occurrence" too high and estimate it "rare".

[4] Also for [R04] conditions the probability is considered "unlikely" by the experts involved in this Generic Safety Assessment, as the possibility of two IFR flights in the same airspace controlled by two different ATS units and without communication between them is unlikely. In RMZ, aircraft are on AFIS frequency, and outside of RMZ, aircraft are on ATC frequency.

[5] Also for [R04] conditions the probability is considered "unlikely" by the experts involved in this Generic Safety Assessment, because the RWY is "controlled" by AFISO.

ID	Hazard	Effect on Service	E-Class	Severity	Safety Objective	Probability	Already existing Mitigations according to [R04]
OPS-H11	Emergency actions interfere with RMZ (NSS.H03, NSS.H04)	• An aircraft in emergency has priority • Delays • Increased workload SR36	O4	4	Rare	Rare/[Rare]	Mitigations: • Stop arrivals and departures • Standard procedures
Equipment (SW, HW)							
EQP-H01	Failure of G/G voice communication at aerodromes concerned (EQP.01)	Inability to use direct connections; switch to mobile phones	-	5	-	Rare/[Rare]	Mitigations: • Mobile phones
EQP-H02	Failure of A/G voice communication at aerodrome concerned (EQP.02)	• Use of alternative communication • Relaying via adjacent units • Termination of AFIS service and publication • Increased workload SR16, SR37	O4	4	Rare	Rare/[Rare]	Mitigations: • Backup system • Mobile transceiver
EQP-H03	Failure of runway equipment (e.g. lightening) (EQP.03)	• Aircraft commander decides on landing or missed approach procedure • Aerodrome concerned informed other units concerned by phone and issues NOTAM SR38	-	5	-	Rare/[Rare]	
EQP-H04	Failure of any G/G communication means other than voice communication (EQP.04)	• No distribution of MET information from AFIS concerned • MET information has to be requested by phone from other units concerned • Increased workload	O4	4	Rare	Rare/[Rare]	Mitigations: • Voice communication
EQP-H05	Failure MET information source at aerodrome concerned (EQP.05)	• Unavailability of weather information to flight crews • In the event of a complete breakdown of all means, termination of the AFIS services, publication in NOTAMs and by telephone	O4	4	Rare	Rare/[Rare]	Mitigations: • At least 2 independent sources
Human Factors							
HFA-H01	Units concerned may newly provide services in airspace class G. (L-S01)						
HFA-H02	IFR traffic at the aerodrome without ATC is a concept unused in the Czech Republic so far. (L-S02)						
HFA-H03	RMZ is a concept unused in the Czech Republic – is not known among the flying community. (L-E01)						
HFA-H04	In the Czech Republic there are relatively frequent Airspace Infringement Occurrences within General Aviation Flights. A similar situation can be assumed in relation to the RMZ (entering RMZ without announcement at AFIS frequency). (L-E02)						

Table 4 Hazards

3.3.2 Safety Requirements

IDs SR01..SR49 provide reference to SR* in [R04] Safety Study on Implementation of IFR operation at LKHK airport.
IDs ≥ SR50 are new.

ID	Safety requirement	Hazard	Implemented by
SR03	Describe the obligation for information distribution in coordination agreements.	FPL-H02	A) CZCAA in cooperation with MoT: Implementation of proposed amendment [R20] Aviation Regulation L11 - Air Traffic Services (CZCAA and J.Kraus update proposals) to Aviation Regulation L11. B) CZCAA: Create checklist of must-be completed requirements for aerodrome operators when implementing IFR operation at uncontrolled aerodromes (including all related safety requirements of this Generic Assessment but not limited to).
SR06	Conclude agreements with Organizers of air events at aerodrome concerned which describe the case Procedures for IFR Arrival at the time of the event if any.	OPS-H10	Implemented by SR03/B)
SR09	Include AFISO obligation in the documentation of AFIS unit concerned to monitor the current information about significant clouds.	MET-H01 MET-H03	Implemented by SR03/A)
SR10	Develop a basis for the publication of changes to the AIP Czech Republic.	OPS-H03	Implemented by SR03/B)
SR11	Include AFISO duty in AFIS documentation of unit concerned to notify the IFR departure on the necessity of observing the specified SID.	OPS-H03	Implemented by SR03/A)
SR12	Ensuring awareness of the aviation community about RMZ concept and aerodrome with only AFIS and IFR flights.	OPS-H02 OPS-H05 OPS-H06 OPS-H08	CZCAA in cooperation with MoT: C) Publishing the basic concept of IFR operation at uncontrolled aerodrome in AIC and at Aeroclub of the Czech Republic (AeCR) in cooperation with Light Aircraft Association of the Czech Republic; D) Organising meeting/training regarding the new concept of operations in the Czech Republic.

ID	Safety requirement	Hazard	Implemented by
SR13	ENSURE that AFISO at AFIS training concerned includes identification of meteorological phenomena (equivalent to Issuing reports SPECI) and the determination of cloud below 1500 m (5000 ft) in the provision of meteorological services.	MET-H01 MET-H03	Implemented by [R22] Directive CAA/S-SLS-004-4/2011 Directive for certification of Aerodrome Flight Information Service (AFIS) operators (proposed Czech amendments to Czech version)
SR14	Coordination Agreement between AFIS concerned and adjacent units concerned (e.g. for the transmission of information on operation in RMZ).	OPS-H07	Implemented by SR03/A) and B)
SR16	Check radio coverage of communication means (transceivers and ICOM) in RMZ.	EQP-H02	Implemented by SR03/B)
SR17	Describe in the coordination agreement: AFIS concerned must transmit all take-offs of IFR Departures to adjacent units.	OPS-H06	Implemented by SR03/A) and B)
SR20	ENSURE sending and confirmation of flight plan messages and related ATFM reports by AFIS concerned.	FPL-H01	Implemented by SR03/B)
SR26	Describe the procedures and authority of AFISO in different situations against VFR operations in case of IFR traffic entering/performing flight in RMZ and familiarise with them all staff concerned.	OPS-H02 OPS-H05 OPS-H08	Implemented by SR03/A)
SR28	ENSURE that a list of planned IFR arrivals and departures to / from aerodrome concerned was published and kept up-to-date on websites concerned.	OPS-H02 OPS-H05 OPS-H08	Implemented by SR03/B)
SR34	Define procedures for flow management for IFR departures from aerodrome concerned (uncontrolled aerodromes) including responsibility for compliance of CTOT.	OPS-H04	CZCAA and MoT in cooperation with ANSP of the Czech Republic: Implementation into AIP ENR 1.9
SR36	Introduce an obligation of AFISO to inform adjacent APPs if there is aircraft in emergency in the RMZ.	OPS-H11	Implemented by SR03/A)
SR37	Establish procedures in the event of failure of the A/G communication at aerodrome concerned to inform adjacent units.	EQP-H02	Implemented by SR03/A) and B)
SR38	Establish procedures in the event of failure of runway equipment at aerodrome concerned to inform adjacent units.	EQP-H03	Implemented by SR03/A) and B)
SR51	Assure competence of AFIS personnel [R02]/4.1.	All	Implemented by [R22] Directive CAA/S-SLS-004-4/2011 Directive for certification of Aerodrome Flight Information Service (AFIS) operators (proposed Czech amendments to Czech version)
SR52	Training for other aviation personnel [R02]/4.2.	All	Implemented by SR03/B)
SR56	Implementation of aerodrome equipment requirements [R02]/4.6.	EQP-H01 EQP-H02 EQP-H03 EQP-H04 EQP-H05	Implemented by SR03/A) and B)
SR57	Implementation of airspace modification requirements [R02]/4.7.	OPS-H02	Implemented by SR03/A)
SR58	SMS and safety performance monitoring.	All	Implemented by SR03/B)

ID	Safety requirement	Hazard	Implemented by
SR60	Flight crew will contact AFIS before the FAF and will confirm that the QNH previously set on the altimeter at the beginning of approach is correct. [R17]/SR.20.	MET-H01 MET-H03	Implemented by SR03/A) and B)
SR61	Flight crew has to report aircraft position at FAF to AFIS. Subsequently, AFIS will pass on the information about traffic plus any additional information. This procedure shall be included in the operational instruction for aerodrome and AFIS. [R17]/SR.30.	OPS-H02	Implemented by SR03/B)
SR62	The LPV procedure shall include a baro-altitude cross-check against a published altitude on passing a specific point. This involves including a reference point (for instance, 4 NM before the missed approach waypoint/runway threshold) and the associated altitude. [R17]/SR.28.	OPS-H05	Implemented by SR03/B)
SR63	Implementation of [R21] Aviation Regulation L2 - Rules of the Air (CZCAA update proposal).	OPS-H02	CZCAA in cooperation with MoT: Implementation into Aviation Regulation L2

Table 5 Safety Requirements

3.3.3 Recommendations

ID	Recommendation	Responsibility	Ref.
R05	Consider the speed limit for IFR departure and missed approach (to comply with defined tracks).	CZCAA in cooperation with MoT	OPS-H03 OPS-H05
R06	Implementation of IFR procedure requirements in CZ regulations [R02]/4.4 (Specific information about GNSS NOTAMs and the requirements on RAIM function availability could be integrated in Aviation Regulation L10/I as an amendment.)	CZCAA in cooperation with MoT	All
R07	Implementation of flight crew and aircraft facilities requirements [R02]/4.5	CZCAA in cooperation with MoT	All

Table 6 Recommendations

3.4 SSA

Not applicable.

4 Conclusion

4.1 Explanation for deriving the conclusion

In chapter 3.3 FHA and PSSA it was analysed which part of [R04] Safety Study on Implementation of IFR operation at LKHK airport is relevant for the generic safety assessment.

A) If also applicable to the generic safety assessment, the Assumptions of [R04] were generalised if necessary and combined with general assumptions in 3.2 Assumptions derived based on a generic assessment environment.

B) A similar approach was applied to 3.3.1 Hazards. Hazards that were identified in [R04] were analysed as to whether they may also be applicable to any uncontrolled aerodrome. If they are applicable, they were included in 3.3.1 Hazards but expressed in a more generic way.

C) As the severity and the safety objectives for the hazards identified in [R04] were specified and validated by a very competent assessment team based on a safety assessment environment that is also applicable for this assessment, the safety severity and the safety objectives were used also for this generic safety assessment.

D) Based on the author's expertise and results of other assessments such as [R08], [R09], [R10], [R17], [R18] and [R19] the Assumptions and the Hazards (including the severity and the safety objectives) were validated and extended as appropriate.

E) Safety requirements of [R08] were taken into account in 3.3.2 Safety Requirements if they need to be implemented to achieve the safety objectives (objective >= probability) and extended as appropriate to make all safety objectives achievable.

F) The probability achieved is specified in [R04] as "real probability". It has to be noted that the real probability in [R04] was assessed without complete implementation of the safety requirements already specified in [R04]. In [R04] the safety objectives for the hazards OPS.H02, OPS.H03, OPS.H04, OPS.H06, OPS.H07, OPS.H08 and OPS.H09 were not achieved by the "real probability" and therefore the implementation of the IFR procedures at LKHK was not considered as acceptably safe. Another issue in [R04] was also that for the implementation of the safety requirements the regulative baseline was partially missing.

G) In this general safety assessment it is specified in column "Implemented by" of Table 5 Safety Requirements by which means the implementation of the respective safety requirement is ensured (e.g. change of the Czech regulation).

H) The 4.2 Preliminary conclusion describes the result of the safety assessment if the operation is in line with [R02] Deliverable D2 - CONOPS Implementation of IFR Procedures in the Czech Republic, the 3.2 Assumptions are fulfilled and the 3.3.2 Safety Requirements are fulfilled by an appropriate implementation.

4.2 Preliminary conclusion

If the operation is in line with [R02] Deliverable D2 - CONOPS Implementation of IFR Procedures in the Czech Republic, the 3.2 Assumptions are fulfilled and the 3.3.2 Safety Requirements are fulfilled by an appropriate implementation, an acceptably safe implementation of the IFR operation within the scope of this undertaking is achievable but has, of course, to be verified by an aerodrome specific safety assessment including SSA.

4.3 Validation of the Generic Safety Assessment

The initial draft of the Generic Safety Assessment was produced by the Team Leader. Jakub Kraus reviewed/commented it and provided additional inputs. The candidate for the final draft version was then reviewed/commented by Andrej Lalis and Michal Mlynarik including for consistency with the other referenced documents. The offline reviews were also complemented by review telephone conferences.
A final draft was produced (all relevant comments were incorporated) and distributed to the project teams of CZCAA and ALG for final review. A final review meeting took place on 30 March 2017. The results were documented in the minutes of the meeting and incorporated into the released version of this document.

An additional validation of the Generic Safety Assessment will implicitly take place when this document will be the basis for a safety assessment of a specific aerodrome as described in [R23] Deliverable D4/D5 - Procedure for IFR Safety Assessment/Certification of a Specific Uncontrolled Aerodrome in the Czech Republic.

5 Abbreviations and Definitions

A/G	Air / Ground
ACC	Area Control Centre
AD	Aerodromes
AeCR	Aeroclub of the Czech Republic
AFIS	Aerodrome Flight Information Service
AFISO	Aerodrome Flight Information Service Officer
AIC	Aeronautical Information Circular

AIP	Aeronautical Information Publication
AIS	Aeronautical Information Service
ALG	Advanced Logistics Group
AMC	Acceptable Means of Compliance
ANS CR	Air Navigation Services of the Czech Republic (Czech ANSP)
ANSP	Air Navigation Service Provider
APAC	Austrian Product Assurance Company
APCH	Approach
APP	Approach
APV	Approach with Vertical Guidance
ATC	Air Traffic Control
ATFM	Air Traffic Flow Management
ATM	Air Traffic Management
ATS	Air Traffic Services
BARO	Barometric (pressure)
CAA	Civil Aviation Authority
CAP	Civil Aviation Publication
CNS	Communication, Navigation, Surveillance
CONOPS	Concept of Operations
CTOT	Calculated Take-off Time
CTU	Czech Technical University in Prague, Faculty of Transportation Sciences
CZCAA	Civil Aviation Authority of Czech Republic
EC	European Commission
EGNOS	European Geostationary Navigation Overlay Service
ENR	En Route
EQP	Equipment
EU	European Union
EUR	European
EUROCONTROL	European Organisation for the Safety of Air Navigation
FAF	Final Approach Fix
FHA	Functional Hazard Assessment
FPL	Flight Planning
G/G	Ground / Ground
GNSS	Global Navigation Satellite System
HAZID	Hazard Identification
HFA	Human Factors
HW	Hardware
ICAO	International Civil Aviation Organization
ICAO EUR	ICAO European Office
ID	Identifier

IFR	Instrument Flight Rules
LKHK	Hradec Králové aerodrome
LNAV	Lateral Navigation
LoA	Letter of Agreement
LPV	Localiser Performance Approach with Vertical Guidance
MET	Meteorology
METEO	Meteorology
MIL	Military
MoM	Minutes of Meeting
MoT	Ministry of Transport
NOTAM	Notice to Air Men
NPA	Non Precision Approach
OPS	Operations / Operational
OSED	Operational Services and Environment Description
PA	Precision Approach
PAPI	Precision Approach Path Indicator
PLASI	Pulse Light Approach Slope Indicator
PSSA	Preliminary System Safety Assessment
QNH	Atmospheric Pressure at mean sea level
R*	Recommendation
RAIM	Receiver Autonomous Integrity Monitoring
RCS	Risk Classification Scheme
RMZ	Radio Mandatory Zone
RNAV	Area Navigation
RNP	Required Navigation Performance
RNP-AR	Required Navigation Performance Authorization Required
RVR	Runway Visual Range
RWY	Runway
SBAS	Satellite Based Augmentation System
SID	Standard Instrument Departure
SMS	Safety Management System
SOCS	Safety Objective Classification Scheme
SoL	Safety of Life
SPECI	Aviation selected SPECIal weather report
SR*	Safety Requirement
SSA	System Safety Assessment
STAR	Standard Instrument Arrival
SW	Software
TCAS	Traffic Collision Avoidance System
TMA	Terminal Maneuvering Area

VFR	Visual Flight Rules
VNAV	Vertical Navigation

Aircraft Category: A: Landing speed 90 knots or less; B: Landing speed between 91 and 120 knots; ... https://en.wikipedia.org/wiki/Aircraft_approach_category

6 References

Ref.	Document name / identifier / author / date
[R01]	Deliverable D1 - General Feasibility Assessment / CZCAA IFR study 00019 01.00 Released / Alsina, Nuria/ALG / 2017-03-30
[R02]	Deliverable D2 - CONOPS Implementation of IFR Procedures in the Czech Republic / CZCAA IFR study 00020 01.00 Released / Alsina, Nuria/ALG / 2017-03-30
[R03]	Deliverable D6 - Report on Similar European Activities / CZCAA IFR study 00036 02.00 Released / Kraus, Jakub/CTU / 2017-03-30
[R04]	Safety Study on Implementation of IFR operation at LKHK airport / CZCAA IFR study 00014 01.05 Draft / ANS CR / 2016-04-21
[R05]	Kick-off meeting minutes (MoM), Prague 2017-01-16 / CZCAA IFR study 00004 01.00 Draft / Mlynarik, Michal/APAC / 2017-01-19
[R06]	Air Navigation System Safety Assessment Methodology / SAF.ET1.ST03.1000-MAN-01, Edition 2.1, Released / EUROCONTROL / 2006-10-03
[R07]	Deliverable D3 - Generic Safety Case for the Implementation of IFR Operations / CZCAA IFR study 00040 01.00 Released / Scherzer, Hans/APAC / 2017-03-30
[R08]	Final OSED for Madrid TMA (Annex Safety Assessment) / OFA 02.01.01 WP 05.07.04. WS1 version 00.01.00 / Miguel Capote/INECO / 2012-04-02
[R09]	CAP 1122 - Application for instrument approach procedures to aerodromes without an instrument runway and/or approach control / CAP 1122 / CAA UK / 2014
[R10]	Flight Operational Safety Assessment Requirements for New Procedures RNP-AR / - / Claudia Cabaco / 2010
[R11]	Safety Handbook / directive no. 01/14/ÚPB/003, version 2.7 / ANS CR / -
[R12]	The Safety Assessment and Risk Reduction / Directive no. 01/14/ÚPB/010, version 2.6 / ANS CR / -
[R13]	Implementing Commission 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 / - / European Commission / 2011-10-17
[R14]	IFR LKHK concept of operations / - / Kvitek, Tomas/LSHK / 2016-02-15
[R15]	Proposals of coordination agreements - Coordination Agreement between the aerodrome Hradec Králové and Jaroměř, 2015-12-17; - Agreement on the Coordination and transfer of Air Traffic Control between LPS LS Pardubice and LS Hradec Kralove, V2; - Agreement on the Coordination and transfer of Air Traffic Control Procedures between ANS CR and LS Hradec Kralove, V2; - Agreement on the Coordination and transfer of Air Traffic Control Procedures between ANS CR and LS LPS Pardubice, 06/14/DPRO/013.
[R16]	Proposals of instrument charts - RNAV (GNSS) approach to runway 34R LKHK, - STAR RWY 34R LKHK, - SID RWY 34R LKHK, - SID RWY 16L LKHK.
[R17]	Mielec APV SBAS (LPV) approach safety assessment / P924D001 V0.66 released / Helios / 2010-07-16

Ref.	Document name / identifier / author / date
[R18]	RNP Approach with BARO VNAV Preliminary Safety Case / 1.0 / Eurocontrol / 2010-04-19
[R19]	Monastir APV SBAS (LPV) and LNAV/APV Baro approach safety assessment / 0.7 / Helios / 2013-09-23
[R20]	Aviation Regulation L11 - Air Traffic Services (CZCAA and J.Kraus update proposals) / CZCAA IFR study 00029 00.02 WDraft / Kraus, Jakub/CTU / 2017-03-27
[R21]	Aviation Regulation L2 - Rules of the Air (CZCAA update proposal) / CZCAA IFR study 00028 00.01 WDraft / CZCAA / 2016
[R22]	Directive CAA/S-SLS-004-4/2011 Directive for certification of Aerodrome Flight Information Service (AFIS) operators (proposed Czech amendments to Czech version), / CZCAA IFR study 00059 04.01 WDraft / Kraus, Jakub/CTU / 2017-03-27
[R23]	Deliverable D4/D5 - Procedure for IFR Safety Assessment/Certification of a Specific Uncontrolled Aerodrome in the Czech Republic / CZCAA IFR study 00052 00.01 Released / Scherzer, Hans/APAC / 2017-03-30
[R24]	Regulative Baseline for the Implementation of IFR Operations at Uncontrolled Aerodromes in the Czech Republic / CZCAA IFR study 00043 01.00 Released / Scherzer, Hans/APAC / 2017-03-30

7 Appendix 1: [R02] Deliverable D2 - CONOPS Implementation of IFR Procedures in the Czech Republic/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

Areas of implementation	Implementation actions
	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 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): o 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: o 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

Areas of implementation	**Implementation actions**
	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 7 Summary implementation plan