



AALTRONAV

Plzeň-Líně operational concept

For the design and implementation of PBN procedures

Description of the background context, business need, design principles and concept of operations.

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Revision History

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1 Introduction

This document forms part of the airspace change process initiated by the ENJOY project consortium in the context of GSA/GRANT/06/2017-18 from the European Global Navigation Satellite Systems Agency (GSA).

The purpose of this document is to serve as an input to the procedure design and safety study for the development, implementation and monitoring of PBN¹ instrument flight procedures at Plzeň-Líně airport (LKLN). Its primary audience are therefore the parties involved in those processes: the procedure design service, the safety consultant, the airport operator, the Czech Air Navigation Services (ŘLP) and the supervisory authority, in this case the Czech Civil Aviation Authority (CAA CZ).

Readers are assumed to have a degree of familiarity with airspace topics generally and PANS-OPS² procedure design specifically, as well as instrument flying and GNSS.³ Nevertheless, to aid the reader the numerous acronyms in the text are expanded in situ when first used.

The present report is divided in six main sections including this introduction as its first part; the second part reproduces the statement of need that motivates this airspace change proposal; then, recognising that some of the stakeholders will not be sufficiently familiar with the geographic, economic and operational context in which these procedures are meant to exist, we have provided ample background on those topics in order to both document our own understanding of the situation and better inform the decision-making process; afterwards we discuss the agreed design principles which serve to define and delimit the scope of the subsequent activities; a concept of operations from the point of view of a user of the system is then presented; finally we offer some concluding remarks and briefly outline the next steps.

1 Performance Based Navigation.

2 Procedures for Air Navigation Services – Aircraft Operations.

3 Global Navigation Satellite Systems.

2 Statement of need

The implementation of instrument procedures at Plzeň-Líně is intended to:

- increase the safety level, especially in periods of reduced cloud ceiling and/or visibility;
- provide improved services to the regional business community, including the ability to operate bizjet, charter and seasonal flights in order to promote cross-border tourism and commercial activity;
- support local training organisations, notably enabling them to fly instrument procedures without the need for transit flights; and
- expand the range of options available to the operator of the Kryštof 07 HEMS service.

To address those points Aaltronav, in collaboration with the airport operator, formulated a series of draft design principles which were then put forward to other stakeholders and the public at large for consultation; these principles were then reviewed in light of the responses received and a final⁴ version was produced.

⁴ Although we refer to them as 'final' principles, we follow an iterative design process in which the principles are constantly reviewed as we gain more information about the solution and may be subject to alteration if deemed necessary to achieve the project goals in an optimal manner from a safety and efficiency standpoint.

3 Context

3.1 Aeronautical environment

Plzeň-Líně⁵ is a public national and private international airport located some 50 nautical miles southwest of Prague and approximately 110 nautical miles northeast of Munich. The airspace is class G.⁶ A flight information service is available from Praha Information, and the airport currently provides a RADIO service in the ATZ.⁷ Radar service may be available from Praha Information down to the surveillance minimum altitude, which varies from 3,500 to 4,800 feet depending on sector, temperature and time of the year.⁸

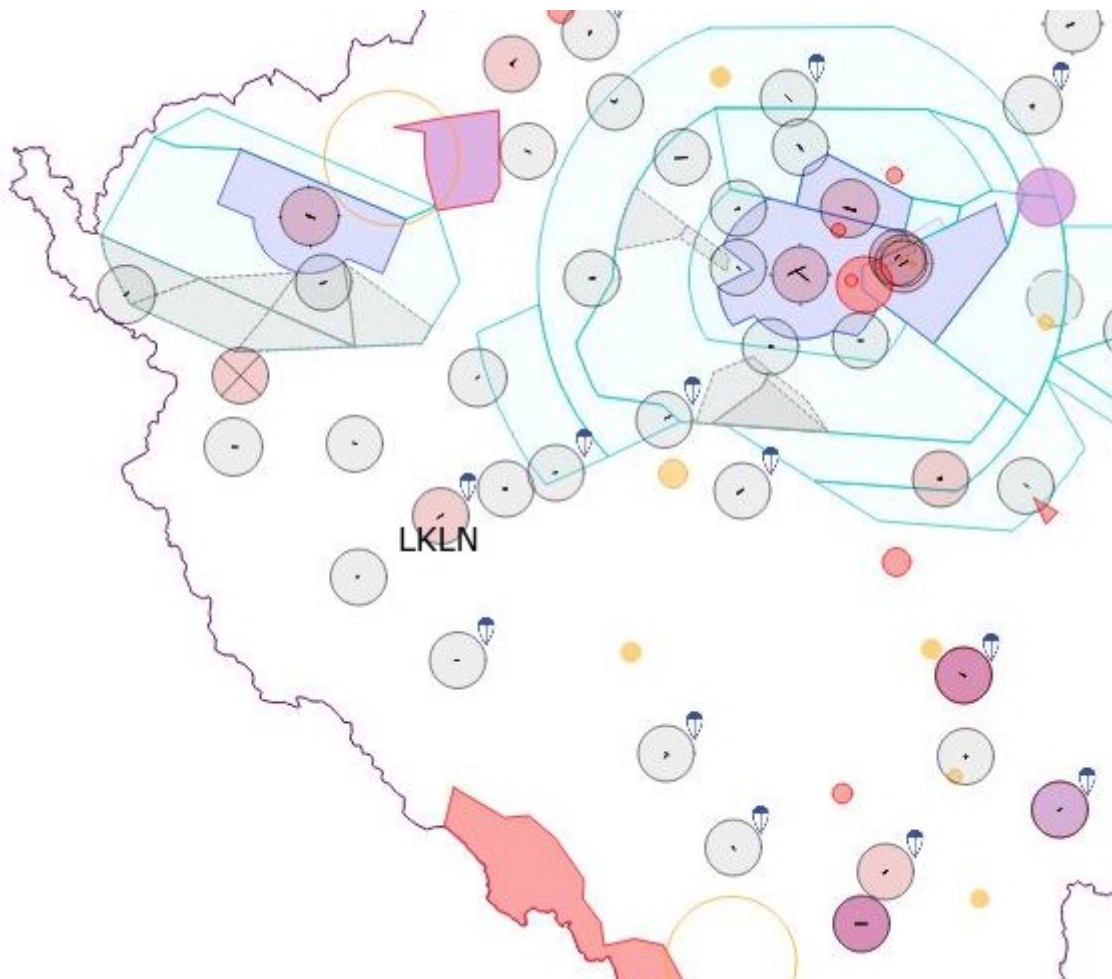


Figure 1: Schematic view of airspace around LKLN (German airspace not shown). Source: AisView.

5 https://aim.rlp.cz/vfrmanual/actual/lkln_text_en.html

6 IFR and VFR flights permitted, separation not provided. Flight information service available on request (ref.: Předpis L 11, hl. 2, § 2.6.1)

7 Aerodrome Traffic Zone. In the Czech Republic generally and in Líně specifically, this is bounded horizontally by a circle of radius 3.5 nautical miles centred at the aerodrome reference point and vertically from ground to 4,000 feet (ref.: Předpis L 11, hl. 1, page 1-4)

8 Refer to AIP CZ ENR 6.9 for details.

3.2 Airport activity

3.2.1 Current flying activity

The airfield is currently home to two flight schools, an aero club, a skydiving operation and a number of private owners of light aircraft and microlights. The airfield is open to traffic during daylight hours.

In addition, the Kryštof 07 medical helicopter operates from Líně 24/7.

3.2.2 History

The airport was built in the early 1950s and started operations in 1952 as a Czechoslovak Air Force base. In the 1980s and early 1990s a number of civilian flights were also operated from the airfield, first by ČSA using Let L-200 and later L-410 aircraft and then by the Škoda company, which eventually based some of their aircraft there and even attempted to run an airline.⁹ It is claimed that during this time instrument approaches were performed with the L-410 down to 200 ft.¹⁰

With the end of the Cold War and the transition to a market economy, operation of the base, now as a civilian airfield, was transferred to Czech company PlaneStation Pilsen s.r.o. on a long term lease. In 2000 the company was bought by an English property development concern (Wiggins Group Plc) which for a while operated, with variable success, Manston airport (EGMH) in Kent and Flugplatz Lahr (EDTL) in Baden-Württemberg, as well as owning Irish low-cost airline EUJet. It was this last venture that ultimately caused Wiggins Group to go out of business in 2005, following EUJet's bankruptcy at the start of the consolidation of the low-cost market.

After the liquidation of Planestation Ltd (a Wiggins Group subsidiary), PlaneStation Pilsen s.r.o. was sold to a Luxembourg entity belonging to global investment firm Babcock & Brown, which itself started liquidation proceedings in 2009, precisely at a time when the sale of the airport by its owner, the Czech Ministry of Defence, was being considered.¹¹

In April 2012, control of the company was transferred to its present owner, PALID a.s.

Despite the various changes of ownership, Plzeň-Líně never ceased to operate during this time although it didn't see any particular development and debts were accumulating, presumably as a result of the fate of the previous parent companies.

By 2013 things came to a head with the Ministry of Defence consequent to those unpaid debts.¹² A series of court challenges were filed by both parties in a dispute that as of this writing still shows no sign of being resolved.

⁹ Planes.cz, „Utajené letectvo – Letecký provoz Škoda Plzeň“, 2013-07-12.

¹⁰ Ibid.

¹¹ iDNES, „Armáda chce prodat letiště Plzeň-Líně současnému nájemci“, 2009-08-08.

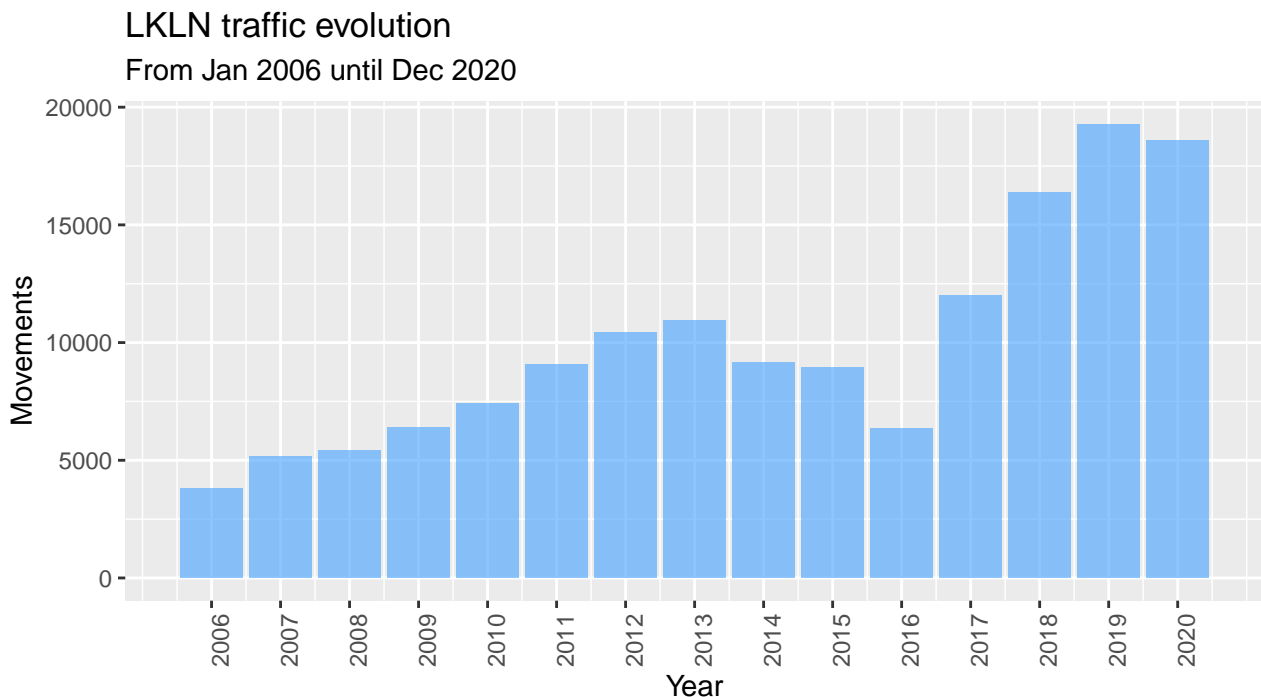
¹² iDNES, „Zaplatte dlužné nájemné, žaluje armáda firmu, která užívá letiště Líně“, 2013-10-24.



The lowest point so far was in late 2015 and the first half of 2016 when the airport came within an inch of ceasing all civil aviation operations¹³ which, with high likelihood, would have resulted in a permanent shutdown. Activity eventually resumed, however, and traffic growth has picked up noticeably since, although by and large it still remains light General Aviation and the helicopter medical service.

3.2.3 Traffic numbers

The airport has seen steady increases in traffic numbers in the 2006¹⁴-2013 period and then from 2017 onwards. This coincides with the aforementioned period of legal uncertainty which culminated with the closure of the airport to most traffic in 2016.



Source: PlaneStation Pilsen

Figure 2: Yearly traffic numbers in Plzeň-Líně.

Traffic levels remain decidedly seasonal as can be expected of a VFR airport in this part of the world, with traffic doubling in the summer months when the monthly average reaches nearly 80 movements¹⁵ per day. These are not necessarily distributed evenly neither in density of traffic nor in its type; for instance, most aero club flying presumably takes place on weekends.

¹³ iDNES, „Letiště Líně je v ohrožení. Nájemce neplatil a pře se s ministerstvem“, 2015-08-11.

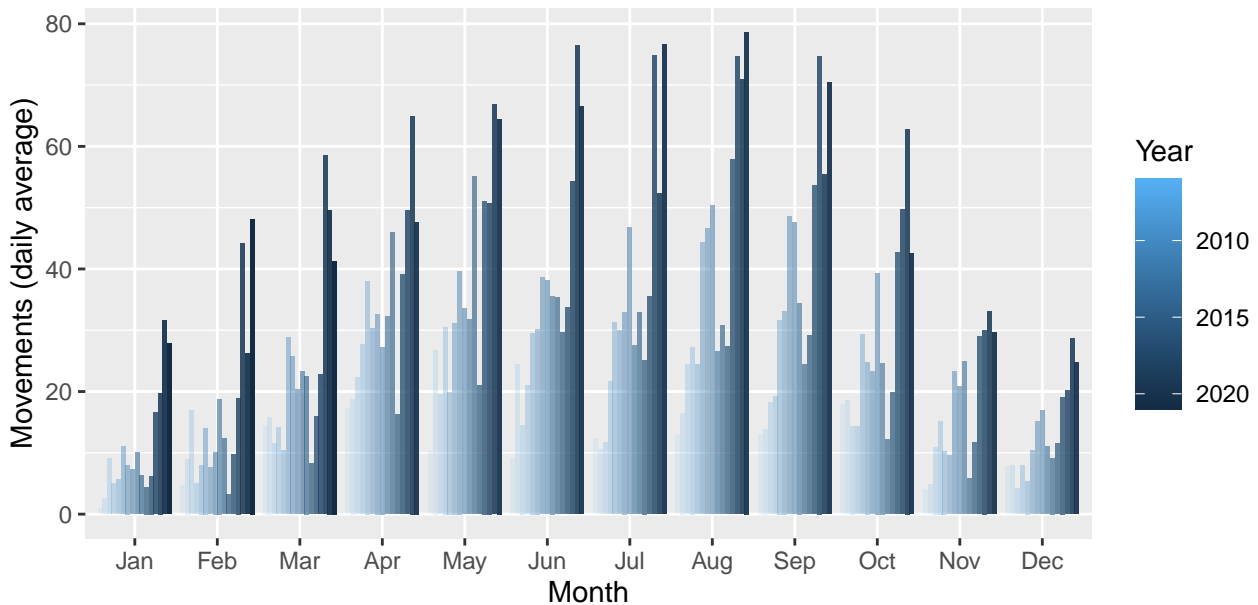
¹⁴ This is the first year for which we have been able to obtain traffic data.

¹⁵ A “movement” can be either a take-off or a landing.



LKLN daily traffic

By month from Jan 2006 until Mar 2021



Source: PlaneStation Pilsen

Figure 3: Average daily traffic.

While it would not be wise to extrapolate specific numbers from the present trend,¹⁶ it can be reasonably expected that traffic will continue to increase, especially as the implementation of instrument procedures should result in a significantly higher despatch rate during the winter months.

At the same time, it should be considered that procedural restrictions which may be imposed as a result of this change proposal may in fact reduce the aerodrome's capacity while an IFR approach is in progress.

3.3 Nearby flying activity

¹⁶ But we've done it anyway: predicted movements for the years 2021 and 2022 are in the intervals 18,500 ±4,350 and 19,500 ±4,500 respectively (95% confidence). A linear regression model ($p < .001$) was used excluding data for 2016.

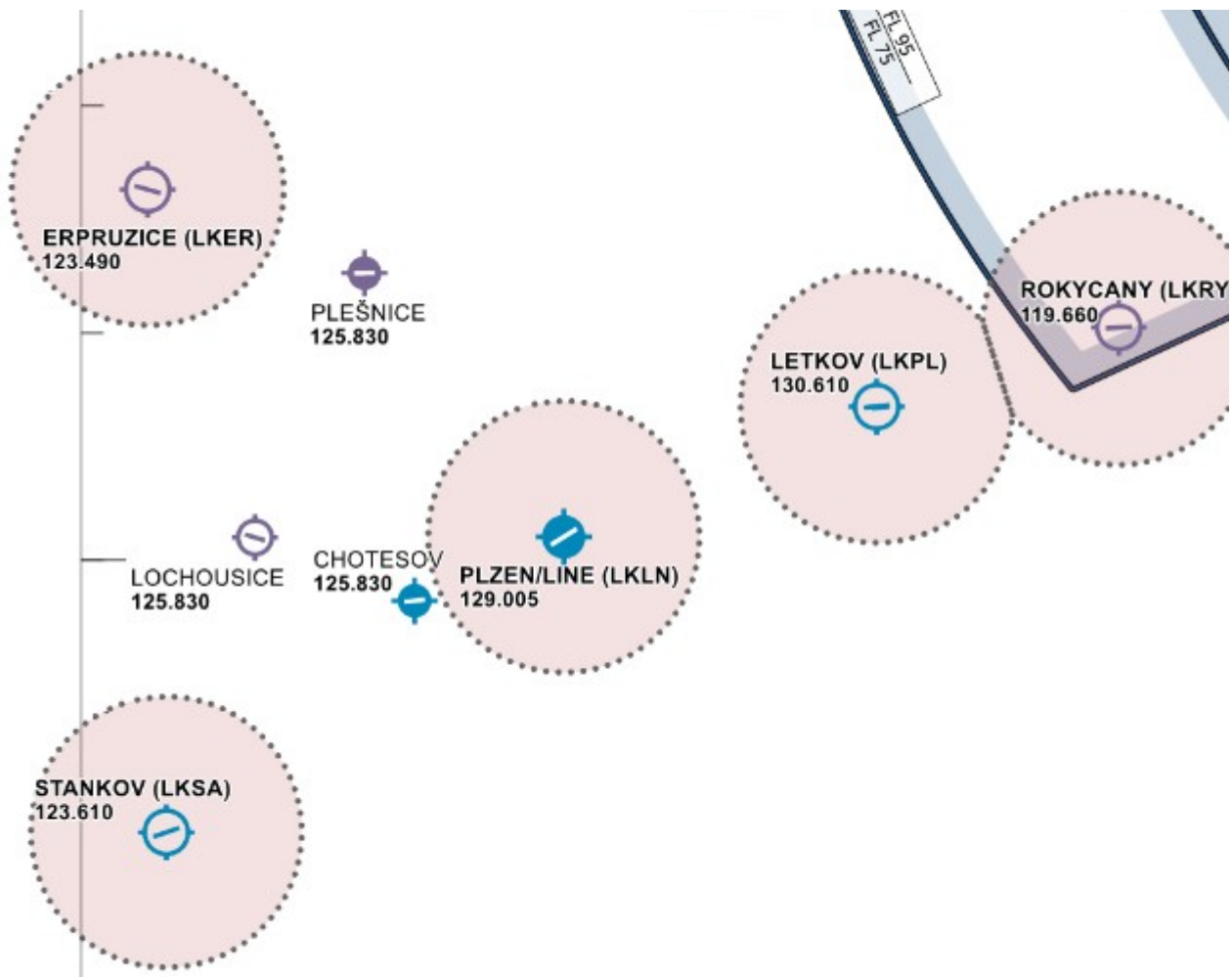


Figure 4: Airfields and microlight strips in the vicinity of LKLN. Heliports not shown.

There is a high density of general aviation and microlight airstrips in the area. Their level of activity has not been quantified as of this writing but it is believed to be substantial during weekends and in the summer.

Of those locations, Letkov and Chotešov are expected to be the two most affected due to their proximity to LKLN and their position on the extended centreline.

3.4 Built environment

The city of Pilsen, with a population of around 180,000 is located some 10 km to the Northeast and communicates with the airport via route 26 going to the village of Líně and then via a tertiary road to the airport itself, in a 20 minute car journey.

Exit 89 of the D5 motorway is reachable via the same route (about 5 km; 8 minutes) and provides a road connection to Prague and the rest of the Czech Republic to the East and to Nürnberg and the rest of Bavaria to the West, becoming the A6 Autobahn at the border.

The mostly single-track railway line connecting Pilsen with the Bavarian border town of Furth im Wald runs close to the airfield, offering a passenger link to Pilsen and Prague from the village of Zbůch, about a five kilometre walk, cycle or drive from the airfield. With some more patience, it is also possible to reach Munich in as little as one connection.

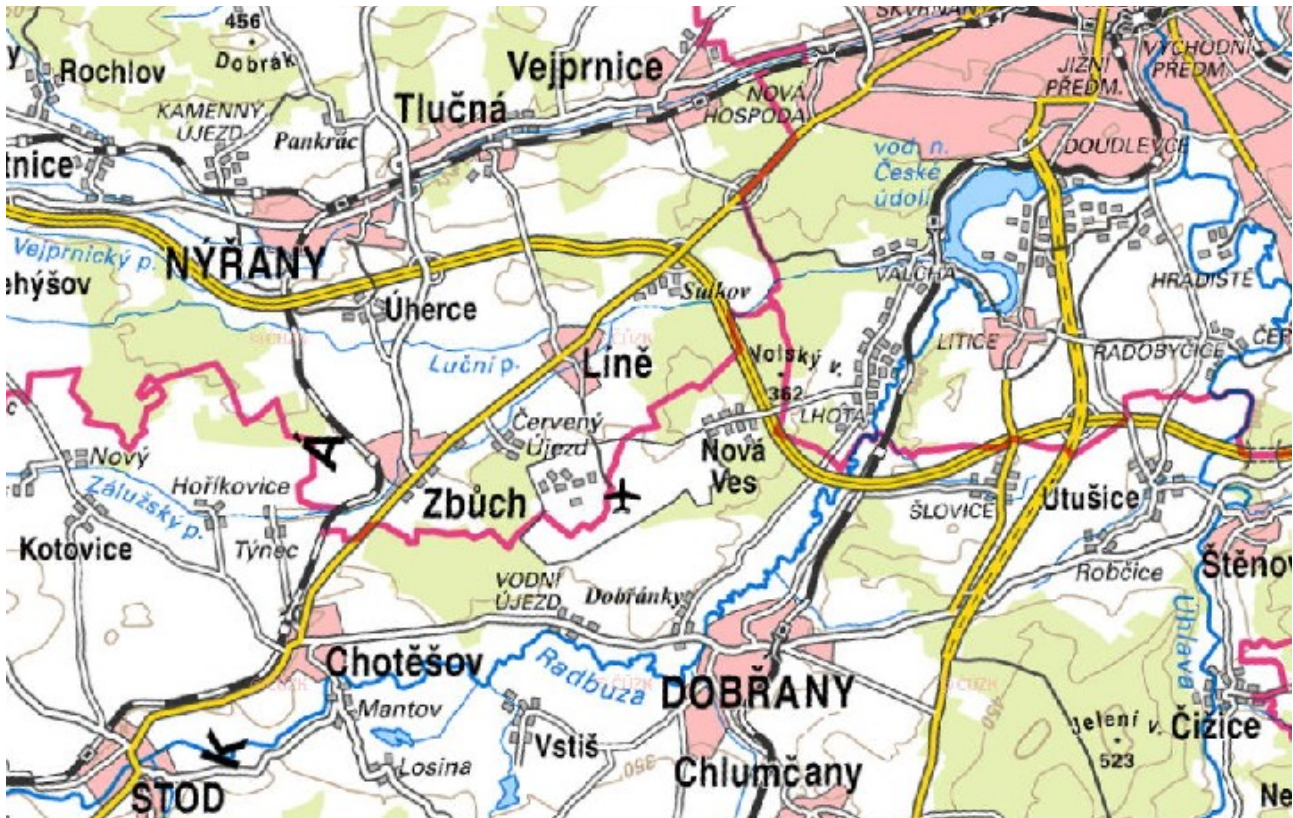


Figure 5: Settlements and transport network. Source: ČÚZK.

The airfield is surrounded by villages and hamlets, with Stod, Chotešov and Mantov expected to be potentially the most affected by approaches to runway 06 (and departures from 24), and Nová Ves, Lhota, Valcha and Litice¹⁷ being concerned by the opposite runway end.

As a point of interest, the airfield is neither within the boundaries of Pilsen nor Líně. The runway, strip, taxiways, and hangars are distributed across four different municipalities: Nová Ves, Dobřany, Vodní Újezd and Červený Újezd.¹⁸

¹⁷ The last three are Pilsen districts.

¹⁸ Some disused bunkers are also within the limits of Chotešov.

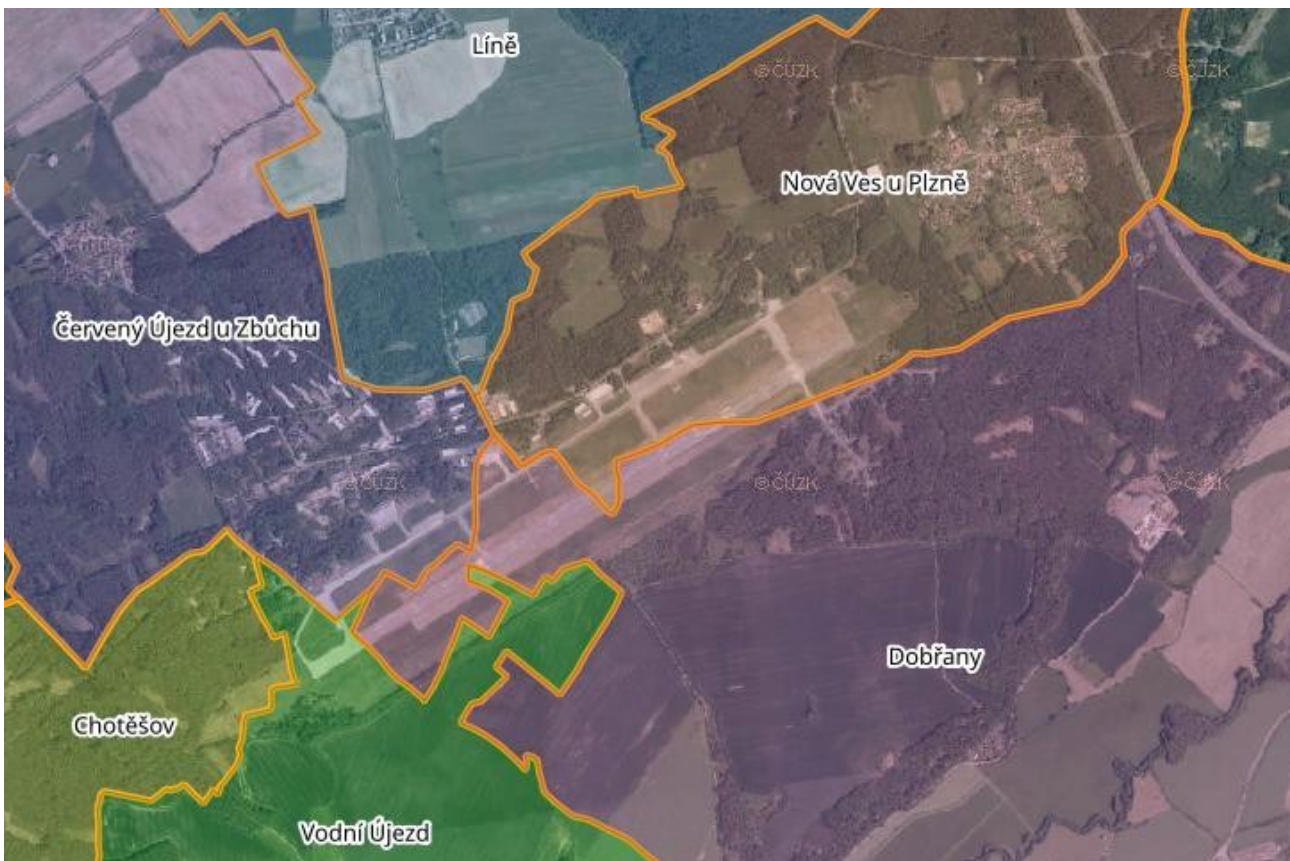


Figure 6: Municipal limits. Source: ČÚZK.

The obstacle limitation surfaces (OLS) have not been calculated yet, so it is not possible at this time to determine the extent of penetration, if any, and therefore the necessity to address existing or future penetration for instance in the local zoning plans, or the need for aeronautical easements.

3.5 Natural environment

3.5.1 Climate

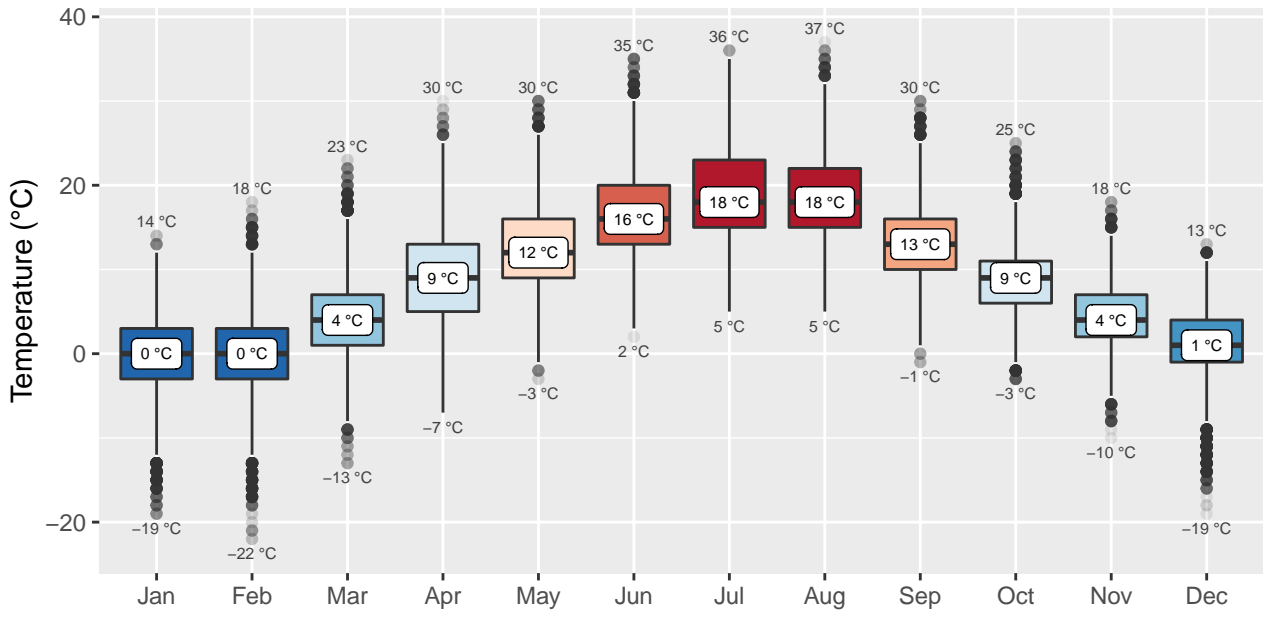
3.5.1.1 Temperatures

As in most of the country, the local climate is moderate continental with relatively cold winters and warm but not usually hot summers, although both high and low extremes of temperature are known to occur.



LKLN monthly temperatures

METAR data between Jan 2009 and Apr 2021



Source: Aaltronav

Figure 7: Monthly temperature distribution in LKLN.

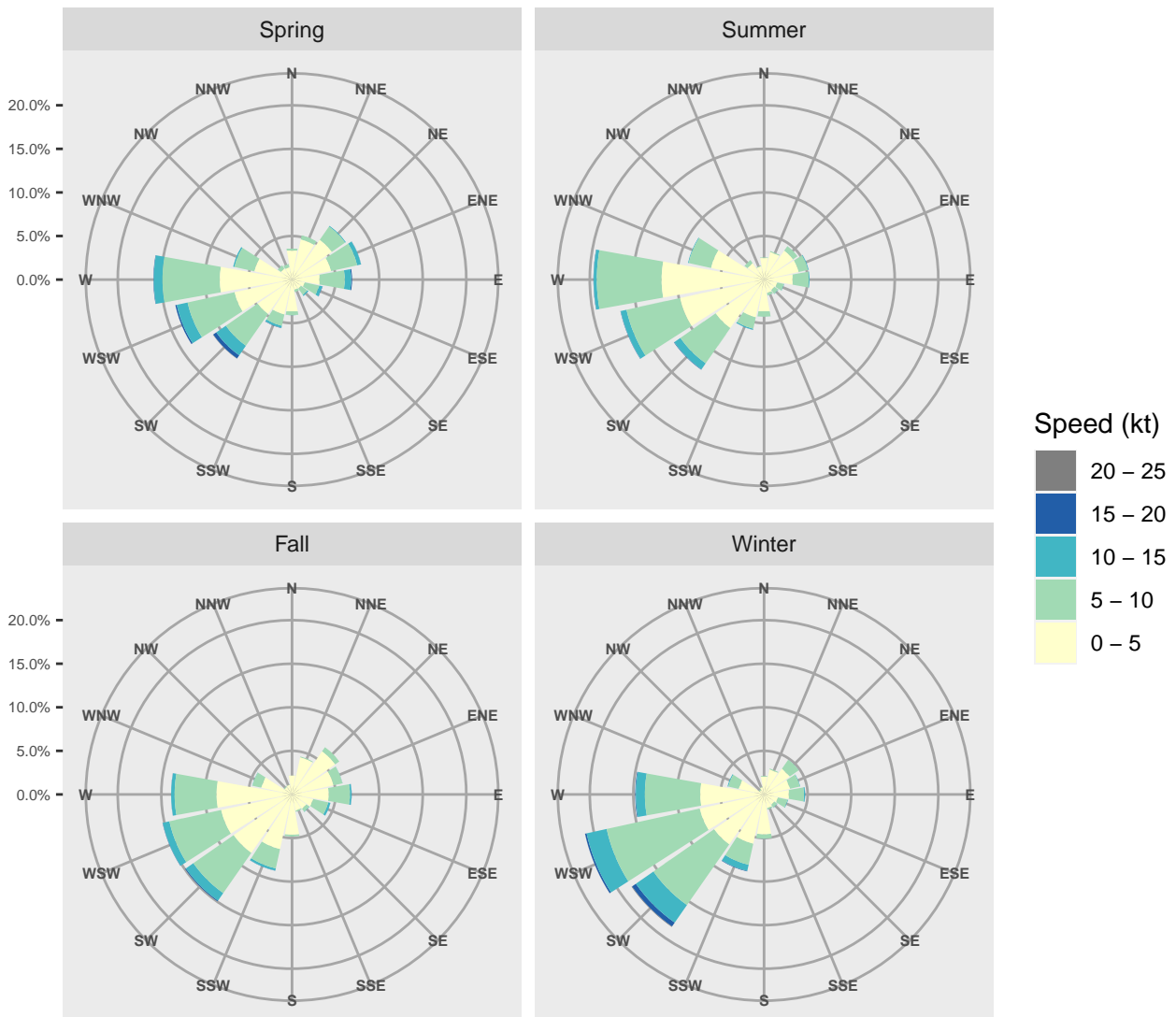
3.5.1.2 Winds

Due to its relatively low position in the Radbuza river basin and the hilly terrain around it, the airfield is fairly well sheltered. The predominant winds are from the West-southwest, veering slightly onto a Westerly direction in the summer months. This favours runway 24 year around.



LKLN predominant winds

METAR data between Jan 2009 and Apr 2021



Source: Aaltronav

Figure 8: Seasonal winds in LKLN.

3.5.2 Geography

Plzeň-Líně is situated in the *Plzeňská pahorkatina* (Pilsen uplands) thus being, as the name suggests, in a hilly but neither high nor mountainous area. There are some higher elevations to the West and South near the state borders but those are quite far away and not expected to be a concern.

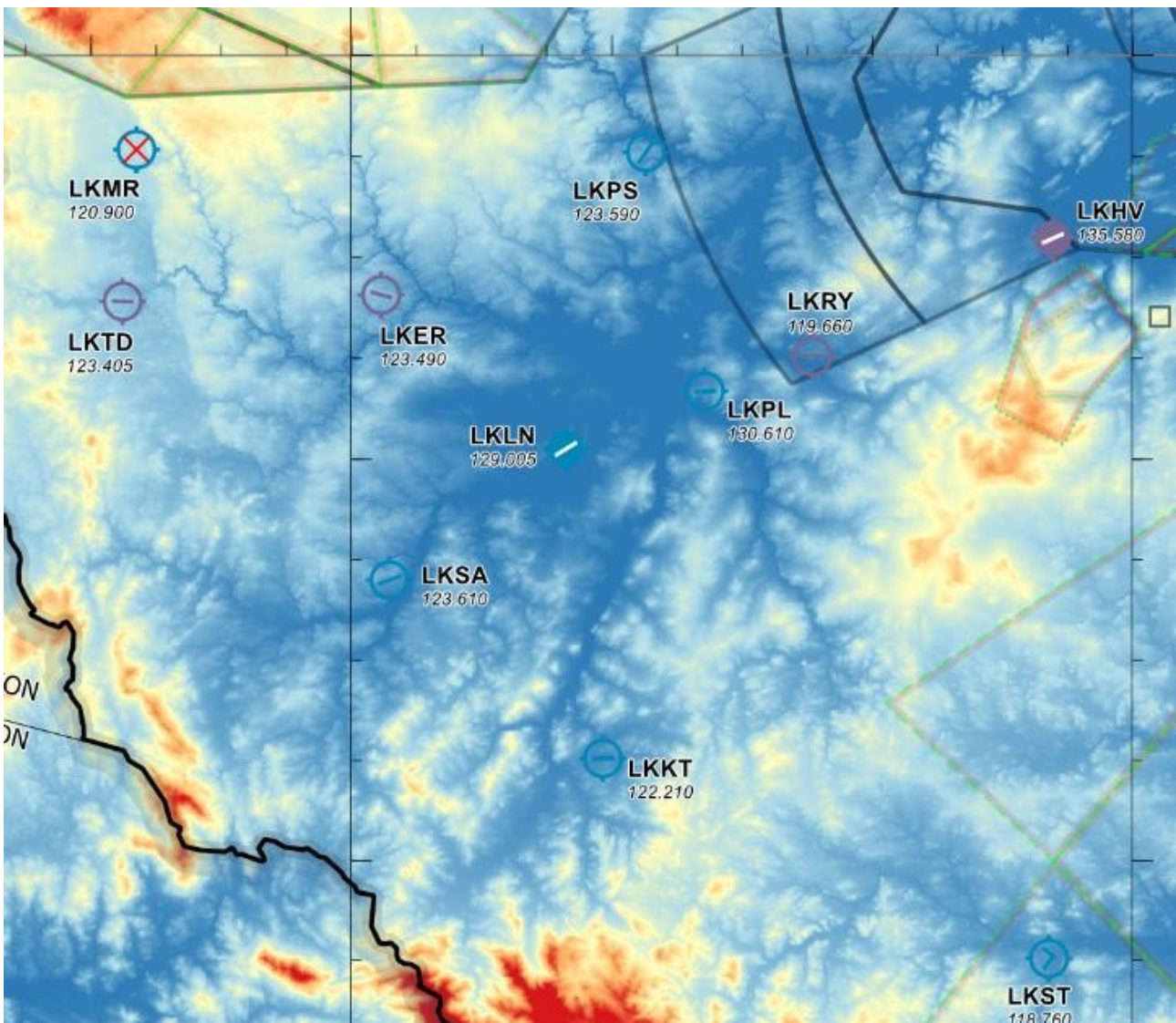


Figure 9: Terrain elevation in the Pilsen region. Dark blue is airport elevation (360 m) or less; red is 1,000 m or greater and less than 1,100 m. Source: NASADEM.

3.5.3 Vegetation

The vegetation in the area consists mostly of commercial crops with scattered patches of forest. Since the 1990s trees have been allowed to grow in the extended centreline affecting both runway ends. As mentioned in section 3.4, it is not currently known how the obstacle limitation surfaces may be affected by this.

3.5.4 Protected sites

Within a six nautical mile radius¹⁹ of the airfield we have identified 83 hectares of protected land, distributed in five different sites.

¹⁹ This is where we can expect to find relatively low-flying arriving and departing aircraft.



Name	IUCN type	Area (ha)	Description
Pod Smutným koutem	IV ²⁰	8.7	Oak forest. ²¹
Čertova kazatelna	III ²²	2.3	Rock outcrop in the outskirts of Pilsen. ²³
Nový rybník	IV	12.8	Bird nesting area. ²⁴
Šlovický vrch	IV	41.2	Former military training ground. ²⁵
Zlín	IV	17.7	Oak forest. ²⁶

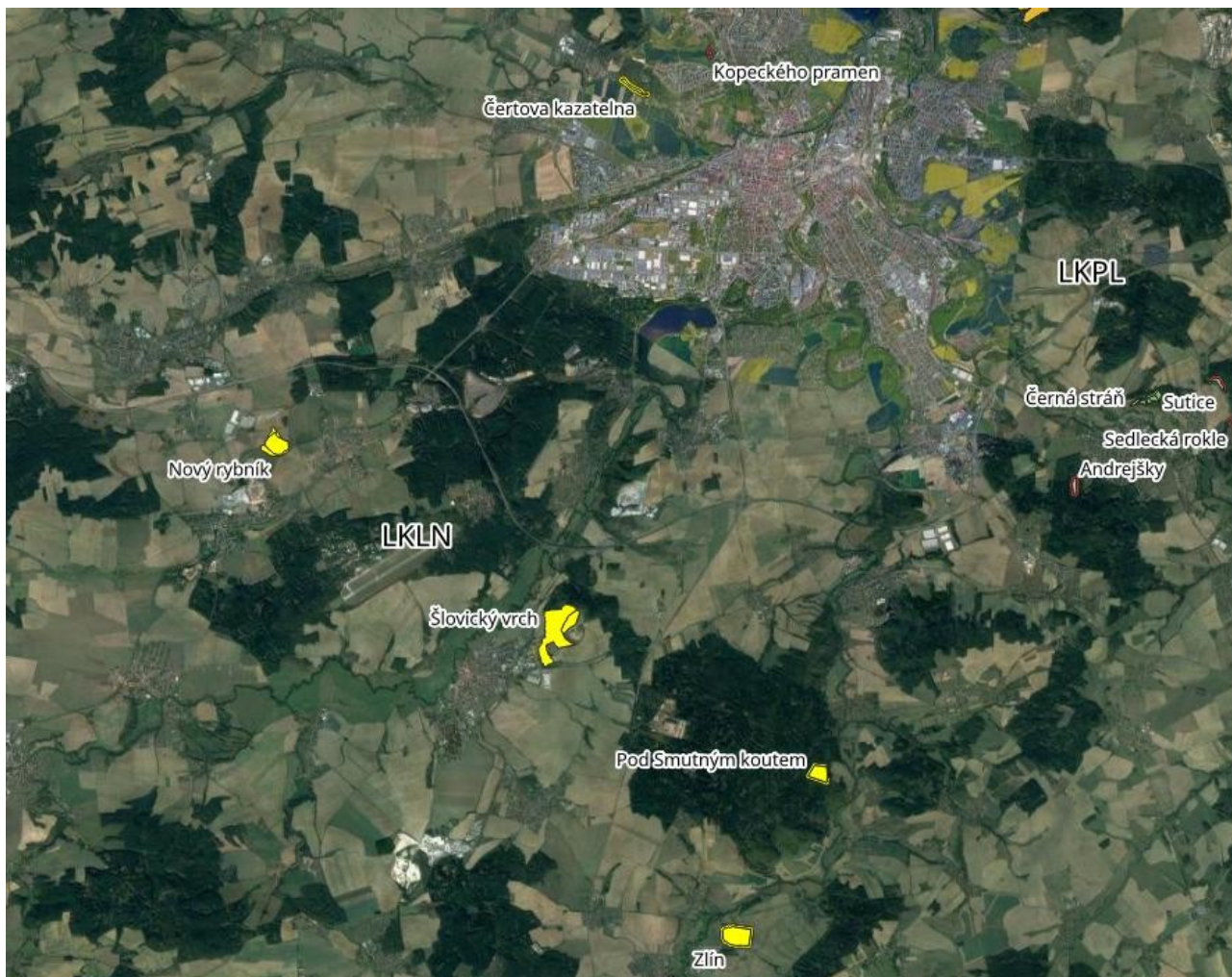


Figure 10: Protected areas in the vicinity of LKLN. Source: Agentura Ochrany Přírody A Krajiny České Republiky (AOPK ČR).

20 Habitat/Species Management Area.

21 <http://www.plzenskonakole.cz/cz/prirodni-pamatka-pod-smutnym-koutem-u-cizic-567.htm>

22 Natural Monument or Feature.

23 <https://plzenoviny.cz/poznavame-plzen-certova-kazatelna/>

24 https://drusop.nature.cz/ost/chrobjekty/zchru/index.php?SHOW_ONE=1&ID=12531

25 <https://www.dobrany.cz/kultura-vzdelani-sport/priroda/slovicky-vrch/>

26 <https://www.dolni-lukavice.cz/obec/turistika/zajimava-mista-1/prirodni-rezervace-zlin/>

A number of biosphere reserves and other large protected areas exist within a 15-20 nautical mile radius. A priori those are not expected to be affected by this project but will be taken into consideration during the design process.

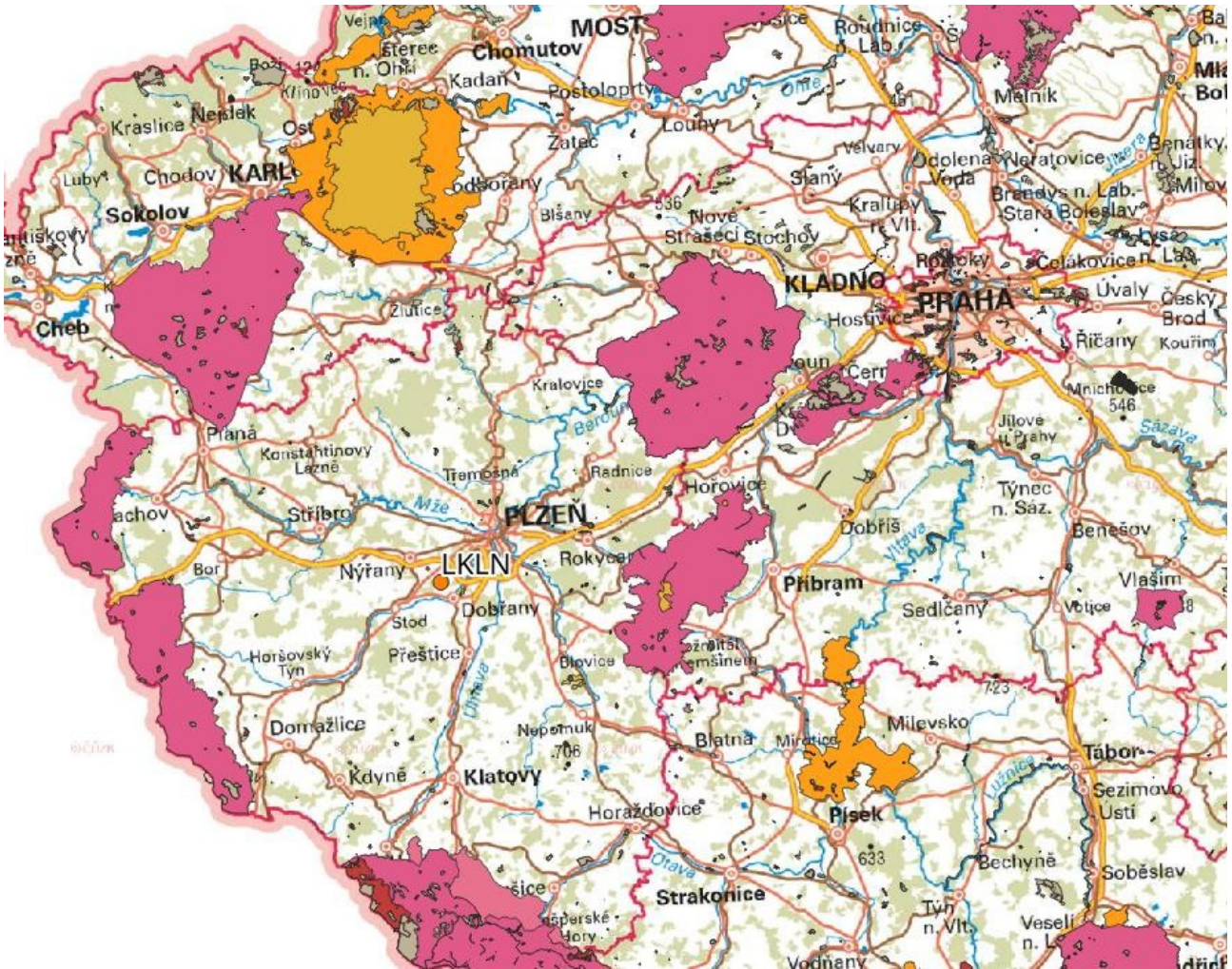


Figure 11: Larger protected areas in the region. Source: Agentura Ochrany Přírody A Krajiny České Republiky (AOPK ČR).



3.6 Safety considerations

3.6.1 Present state

Data on accidents and incidents at LKLN obtained from ÚZPLN²⁷ shows that four events were registered²⁸ in the period 2006–2010:

Event number	Type	Description
CZ-11-0125	Accident	Microlight crash
CZ-17-0376	Incident	Ground collision
CZ-18-0166	Incident	Ground collision
CZ-20-0184	Incident	Runway incursion

None of the reported events took place during landing or take off and none was related to the provision of air traffic services.

3.6.2 Future state

We searched for incidents having taken place in similar scenarios as the one we intend to develop, namely instrument approaches to uncontrolled airports frequented by General Aviation users. One notable incident of relevance occurred on the 21st of December 2019 in Zell am See (LOWZ) wherein a private pilot in a light aircraft attempted to fly the RNP approach and land in miserable weather conditions, resulting in a fatal accident.²⁹

The investigation carried out by the Sicherheitsuntersuchungsstelle des Bundes³⁰ concluded that a probable factor in the crash was the pilot's obstinacy in continuing the flight despite the clearly unsuitable weather.³¹

We consider this event relevant because of the similarity in the type of operations and traffic that we can expect at Líně. It shows us that the effect of human factors cannot be underestimated as it can wreck even the best thought out safety cases.

The behavioural profile and motivations of the expected users shall therefore be taken into careful consideration during the safety study and design phases with the goals of minimising the probability of occurrence of safety events and reducing their potential severity.³²

²⁷ Ústav pro odborné zjišťování příčin leteckých nehod. The Czech air accident investigation office.

²⁸ This does not include skydiving accidents, gliders, paragliders and other types of non powered flight.

It also excludes any events outside ÚZPLN's area of responsibility, notably military aircraft.

²⁹ https://www.bmk.gv.at/dam/jcr:14a1d339-20eb-49d0-88ef-e833a26fba65/191221_Fischhorn_85279.pdf

³⁰ Austrian federal air accident investigation office.

³¹ „Subjektiver auferlegter, psychologischer Druck das Ziel wegen des geplanten Aufenthalts während der Weihnachtsfeiertage ohne Verzögerung zu erreichen. (im Englischen auch bekannt als: Get-There-Itis).“

³² Cf. French Civil Aviation Authority (2020) "Horizon 2023 – Strategic Safety Enhancement Plan", p.3

4 Design principles

4.1 List of design principles

The following design principles have been adopted after discussion with stakeholders:

ID	Description	Type	Rank
DP1	Maintain a high level of safety. This is to be interpreted in a wide sense and applies without limitation to users of the proposed airspace change; other airspace users; operators of ground facilities (including LKLN itself and other facilities); personnel, customers and passengers or visitors of the aforementioned; local residents and visitors; and the public at large. Qualitative or quantitative assessments of safety levels should be made as appropriate.	<u>Must</u>	A
DP2	Approach procedures must be LPV / LPV200. This is a contractual constraint in order to receive GSA funding.	<u>Must</u>	A
DP3	Allow Cat A, B approaches. The bulk of currently identified prospective users fly in Cat A, B and H aircraft. The first two are also a grant agreement requirement.	<u>Must</u>	A
DP4	Allow daytime approaches. The procedures must be flyable by day without too many unnecessary restrictions.	<u>Must</u>	A
DP5	Emergency flights take priority. Regardless of any traffic restrictions that might be imposed when an IFR approach is in progress, VFR or IFR emergency flights such as air ambulance, fire fighting, police or aircraft in distress must take precedence unless safety would be compromised.	<u>Must</u>	A
DP6	Minimise the pilot workload. With the possible exception of Kryštof 07, most operations are expected to be single-pilot IFR GA flown by students or low hour pilots.	Should	A
DP7	Allow commercial operations. The solution should be usable by some Commercial Air Transport (CAT) operations, even if limited in scope – for instance, charter flights with Cat B passenger aircraft or cargo delivery.	Should	A
DP8	Cater for helicopter approaches. The needs of helicopter pilots and operators must be considered both to take into account use of IFR in a HEMS context and for private General Aviation activity (air taxi, private owners, ...) This may take the form of specific Cat H procedures or the standard approach may be used down to Cat A minima, provided it is acceptable to rotary wing pilots.	<u>Must</u>	B



ID	Description	Type	Rank
DP9	<p>Minimise environmental impact. Includes minimisation of CO₂ and noise emissions, avoidance of protected sites, and other measures designed to mitigate the effects on the environment.</p>	Should	B
DP10	<p>Minimise impact on other airspace users. Due to the density of aerodromes in the area, some impact on their operations will be unavoidable but ways should be found to adopt a solution that is as little disruptive as possible.</p>	Must	B
DP11	<p>Keep infrastructure costs affordable. Required changes to the airport infrastructure should be within the means of the airport operator, even if that means implementing a more restrictive solution.</p>	Should	B
DP12	<p>Keep maintenance costs affordable. Operational changes and recurring costs incurred as a result of this project should be kept at affordable levels in order to ensure continuity of operations and their safety.</p>	Should	B
DP13	<p>Avoid overflight of densely populated areas. Overflying populated areas both increases risk to people on the ground and causes disturbance due to noise.</p>	Should	C
DP14	<p>Provide an upgrade path. This project is envisaged as a first step to gain technical and operational experience and competence in the provision of IFR services in a new (for the Czech Republic) category of operations, namely instrument approaches in uncontrolled airspace. It should serve as a stepping stone towards a latter expansion of the range of services (night, larger aircraft, low visibility operations, etc.)</p>	Should	C
DP15	<p>Allow night-time approaches (IMC/VMC). Consideration shall be given to the possibility of allowing some form of night operations, even if limited, while addressing the issue of night-time aviation noise and after consultation with the local administrations. This might be of particular interest to Kryštof 07.</p>	Should	B
DP16	<p>No operations in low-visibility conditions. Low visibility operations are specifically excluded from the scope of this project due to the risk induced by their complexity and the associated infrastructure and implementation costs.</p>	Won't	C
DP17	<p>No allowance for Cat D, E approaches. These categories are excluded from the scope of this project. Note that category C aircraft are neither included nor excluded.</p>	Won't	C

4.2 Design principles consultation

A consultation with stakeholders was held online in the last days of April 2021, with a soft cut-off date of April the 30th.

We proposed a list of draft principles and made it clear that those were for discussion and that feedback should be provided.

The consultation was, and continues to be, available to the public at large in the interests of openness and transparency. For the same reason, we minimised the use of technical language and provided clarification where necessary.

It can be found at the URL:

<https://aaltronav.eu/design/2021/lkln/principles/>

The address was emailed or otherwise communicated to industry stakeholders, with particular attention to users and operators based in LKLN and surrounding aeronautical facilities, including both airports and microlight strips.

We received responses from a number of stakeholders, which we analysed and used to update the design principles.

4.2.1 Feedback




4.2.1.1 Summary of responses

The feedback received is summarised in the following table. A 👍 denotes approval of the respective item with or without further comment. Responses are reproduced verbatim and in their original language for traceability.





	Safety and Compliance Engineer	HEMS pilot W3A, navigátor 243. vrtulníkové letky Kbely	Head of training	CAA CZ	ATCO APP/TWR LKPR
DP1	👍 The use of PNB approach procedures should ensure a safety level at least equal to that of ILS procedures.		👍	Safety must be applied to everyone (e.g. aerodrome operator, operators of ground facilities etc.) I would recommend to extend scope of DP1)	
DP2	👍		👍		
DP3	👍 It's not defined which category can fly with these procedures. I guess the hugest different, in terms of use, is the on-board equipment. As reported, "currently" the foreseen aircraft	Dobrý den, v tomto bodě bych chtěl poprosit alespoň o zmínku, že je tento postup akceptovatelný i pro kategorii H, čímž bychom měli možnost tento postup legálně využívat i pro naše létání s vrtulníky (máme	👍		

	Safety and Compliance Engineer	HEMS pilot W3A, navigátor 243. vrtulníkové letky Kbely	Head of training	CAA CZ	ATCO APP/TWR LKPR
	categories for the PJ. are A and B.	představu, že bychom chtěli využít tento postup nejen pro lety HEMS, ale i pro cvičné létání s vrtulníky W3A SOKOL a Mi-17)			
DP4	It's not defined yet. I suppose that PNB procedures should be used and validated the same way as for the instrumental ground-based equipment procedures.		👍 Most of our trainings are done in daytime, so it would be of course very good.		
DP5	👍		👍		
DP6			👍 Exactly right.		👍 I have a secondary note to that - as you mentioned, it is gonna be used as you exactly wrote - mainly by low hour pilots. It is a need to have another aerodrome with instrument approaches availability in western Bohemia region, pilots in flight schools used to

	Safety and Compliance Engineer	HEMS pilot W3A, navigátor 243. vrtulníkové letky Kbely	Head of training	CAA CZ	ATCO APP/TWR LKPR
					train in LKKV but also in LKPR during the low density of traffic caused by covid pandemic. After covid is gone, LKPR aerodrome is not going to be longer able to provide its services for pilots in training, low hour pilots, etc. Therefore I find it important there is going to be another aerodrome with instrument capability so close to Prague. After the project is finished and is being used by its users, I expect high interest of pilots and generally flight schools going for approaches in LKLN.
DP7	👍		👍 Since we do not have AOC, I do not have exact opinion, but it would be surely nice.		
DP8	👍		👍		
DP9	👍		👍		

	Safety and Compliance Engineer	HEMS pilot W3A, navigátor 243. vrtulníkové letky Kbely	Head of training	CAA CZ	ATCO APP/TWR LKPR
	PNB procedures can foreseen curvilinee approach procedures due to their flexibility. This allows to minimise the impact on the environment (CO2 emission and noise). They can fly IFR even over zone where there are no Navigation Aids.				
DP10	 <p>The curvilinear approach based on GNSS allows to cut the path to be executed anytime.</p>			<p>Změna rozdělení vzdušného prostoru bude MUSET být projednána na národní úrovni podle podmínek zákona o civilním letectví a související prováděcí vyhlášky. Doporučuji proto toto kritérium povýšit na povinnost.</p>	 <p>There should be taken facts into consideration such as airfield LKPL which is close to LKLN, LKPL is a busy gliding airfield and design of instrument approach paths should be as sensitive as possible to the relation between LKLN traffic and LKPL traffic. Thinking of future instrument approach charts and so on, there should be visible warning about high density gliding</p>

	Safety and Compliance Engineer	HEMS pilot W3A, navigátor 243. vrtulníkové letky Kbely	Head of training	CAA CZ	ATCO APP/TWR LKPR
					area in vicinity etc..
DP11	👍		👍		
DP12	👍		👍		
DP13	👍		👍		
DP14	👍		👍		👍 I am truly a fan of implementing such procedures into uncontrolled airspace and airfields in it. I have the feeling the more aerodromes with instruments procedures we have the safer the airspace is, it will possibly avoid some visual approaches taken in bad weather conditions, instead the crew will use the possibility of an instrument approach therefore it increases the level of safety. Thumbs up.
DP15	👍	Naprosto souhlasím, možnost využití tohoto postupu i v noci je pro	👍	Doporučuji toto kritérium řešit od počátku s místní samosprávou. Téma	👍 I think there should be similar way of thinking as

	Safety and Compliance Engineer	HEMS pilot W3A, navigátor 243. vrtulníkové letky Kbely	Head of training	CAA CZ	ATCO APP/TWR LKPR
		nás naprosto zásadní. Kryštof 07 má nastavenou operabilitu na H24, takže tato možnost by byla velkým bonusem.		hadiny hluku je velice citlivé mezi obyvatelstvem v okolí letišť.	in the case of RNP approach into Motol Hospital in Prague. If there is a possibility to provide instrument approach for HEMS for the cases of IMC or NIGHT, then definitely go for it.
DP16	 <p>As reported, there are many aspects to be considered for the low-visibility conditions (related to the GNSS errors and the operational procedures). I suppose that "low-visibility conditions" aspect is a fundamental step to take in the future, in order to have a fully working system.</p>				
DP17					
Other	Retrofitting of the fleet, if not encompassed in D11 and D12.	Děkuji za tuto aktivitu. Je to pro nás něco trochu jako světlo na konci tunelu. V současné době			

	Safety and Compliance Engineer	HEMS pilot W3A, navigátor 243. vrtulníkové letky Kbely	Head of training	CAA CZ	ATCO APP/TWR LKPR
		jsme obzvláště v noci limitováni počasím, jehož vývoj se nedá vždy úplně přesně předpovídat a mnoho letů je tudíž z naší strany odmítáno. Tento postup by pro nás byl velmi znatelným přínosem.			



4.2.1.2 Conclusions and final text

4.2.1.2.1 DP1 – Maintain a high level of safety

4.2.1.2.1.1 Original text

"Applies to users of the proposed airspace change, other airspace users and people on the ground."

4.2.1.2.1.2 Feedback results

The original wording was deliberately general and implicitly applied to everyone who might be affected by this proposal in one way or another. Without loss of generality, the new text is more explicit regarding certain categories of stakeholders.

Likewise, mention is made of the need to apply metrics to this principle in order that the safety level can be measured objectively.

4.2.1.2.2 DP2 – Approach procedures must be LPV / LPV200

4.2.1.2.2.1 Original text

"This is a contractual constraint in order to receive GSA funding."

4.2.1.2.2.2 Feedback results

There was agreement on this principle hence it remains unchanged.

4.2.1.2.3 DP3 – Allow Cat A, B approaches

4.2.1.2.3.1 Original text

"The bulk of currently identified prospective users fly in Cat A and B (and H) aircraft. It is also a grant agreement requirement."

4.2.1.2.3.2 Feedback results

Following comments from the 243rd helicopter squadron it is clear that rotary wing operators must be considered as first class stakeholders. The wording was changed slightly to reflect this.



4.2.1.2.4 DP4 – Allow daytime approaches

4.2.1.2.4.1 Original text

"The procedures must be flyable by day without too many unnecessary restrictions."

4.2.1.2.4.2 Feedback results

There was agreement on this principle hence it remains unchanged.

4.2.1.2.5 DP5 – Emergency flights take priority

4.2.1.2.5.1 Original text

"Regardless of any traffic restrictions that might be imposed when an IFR approach is in progress, VFR or IFR emergency flights such as air ambulance, fire fighting, police or aircraft in distress must take precedence unless safety would be compromised."

4.2.1.2.5.2 Feedback results

There was agreement on this principle hence it remains unchanged.

4.2.1.2.6 DP6 – Minimise the pilot workload

4.2.1.2.6.1 Original text

"With the possible exception of Kryštof 07, most operations are expected to be single-pilot IFR GA flown by students or low hour pilots."

4.2.1.2.6.2 Feedback results

There was agreement on this principle hence it remains unchanged.

4.2.1.2.7 DP7 – Allow commercial operations

4.2.1.2.7.1 Original text

"The solution should be usable by some Commercial Air Transport (CAT) operations, even if limited in scope – for instance, charter flights with Cat B passenger aircraft or cargo delivery."

4.2.1.2.7.2 Feedback results

There was agreement on this principle hence it remains unchanged. It is noted that this principle has received support also amongst General Aviation operators. This is



welcome as sustainable commercial operations are important to ensure the long-term viability of Plzeň-Líně airport.

4.2.1.2.8 DP8 – Cater for helicopter approaches

4.2.1.2.8.1 Original text

"The needs of helicopter pilots and operators should be considered both to take into account use of IFR in a HEMS context and for private General Aviation activity (air taxi, private owners, ...)"

"This may take the form of specific Cat H procedures or the standard approach may be used down to Cat A minima, provided it is acceptable to rotary wing pilots."

4.2.1.2.8.2 Feedback results

As already seen from feedback on DP3, we had underestimated the interest from and importance of rotary wing stakeholders. In recognition of that, this design principle has been changed to a "Must". The practical implications are that helicopters must be explicitly considered in all safety activities, including flight validation.

4.2.1.2.9 DP9 – Minimise environmental impact

4.2.1.2.9.1 Original text

"Includes minimisation of CO₂ and noise emissions, avoidance of protected sites, and other measures designed to mitigate the effects on the environment."

4.2.1.2.9.2 Feedback results

There was agreement on this principle hence it remains unchanged.

We welcome the suggestion to consider the use of RF³³ path terminators but we feel that this conflicts with DP6 and imposes onerous restrictions on the type of navigation equipment that may be used.

4.2.1.2.10 DP10 – Minimise impact on other airspace users

4.2.1.2.10.1 Original text

"Due to the density of aerodromes in the area, some impact on their operations will be unavoidable but ways should be found to adopt a solution that is as little disruptive as possible."

33 Radius to a fix.



4.2.1.2.10.2 Feedback results

We have made this criterion mandatory³⁴ in accordance with the feedback received.

The comment about the need to highlight in the charts the presence of other airspace users in the area is well noted.

4.2.1.2.11 DP11 – Keep infrastructure costs affordable

4.2.1.2.11.1 Original text

"Required changes to the airport infrastructure should be within the means of the airport operator, even if that means implementing a more restrictive solution."

4.2.1.2.11.2 Feedback results

There was agreement on this principle hence it remains unchanged.

4.2.1.2.12 DP12 – Keep maintenance costs affordable

4.2.1.2.12.1 Original text

"Operational changes and recurring costs incurred as a result of this project should be kept at affordable levels in order to ensure continuity of operations and their safety."

4.2.1.2.12.2 Feedback results

There was agreement on this principle hence it remains unchanged.

4.2.1.2.13 DP13 – Avoid overflight of densely populated areas

4.2.1.2.13.1 Original text

"Overflying populated areas both increases risk to people on the ground and causes disturbance due to noise."

4.2.1.2.13.2 Feedback results

There was agreement on this principle hence it remains unchanged.

³⁴ As had been originally suggested by PlaneStation Pilsen.



4.2.1.2.14 DP14 – Provide an upgrade path

4.2.1.2.14.1 Original text

"This project is envisaged as a first step to gain technical and operational experience and competence in the provision of IFR services in a new (for the Czech Republic) category of operations, namely instrument approaches in uncontrolled airspace. It should serve as a stepping stone towards a latter expansion of the range of services (night, larger aircraft, low visibility operations, etc.)"

4.2.1.2.14.2 Feedback results

There was agreement on this principle hence it remains unchanged.

The comment highlighting the human factors aspect is noted and further addressed in section 3.6.2 of this report.

4.2.1.2.15 DP15 – Allow night-time approaches (IMC/VMC)

4.2.1.2.15.1 Original text

"Consideration will be given to the possibility of allowing some form of night operations, even if limited. This might be of particular interest to Kryštof 07."

4.2.1.2.15.2 Feedback results

This design principle has been changed to a "Should" on account of the operational benefits this is likely provide to the HEMS system and the resulting social impact. The wording was expanded to make explicit mention of the need to consider the disturbances caused by night-time aviation noise and address this important change in cooperation with the local municipalities.

4.2.1.2.16 DP16 – No operations in low-visibility conditions

4.2.1.2.16.1 Original text

"Low visibility operations are specifically excluded from the scope of this project due to the risk induced by their complexity and the associated infrastructure and implementation costs."

4.2.1.2.16.2 Feedback results

There was agreement on this principle hence it remains unchanged. Nothing prevents low visibility operations from being considered in the future if there is a clear and justifiable need for it.

4.2.1.2.17 DP17 – No allowance for Cat D, E approaches

4.2.1.2.17.1 Original text

"These categories are excluded from the scope of this project. Note that category C aircraft are neither included nor excluded."

4.2.1.2.17.2 Feedback results

There was agreement on this principle hence it remains unchanged.

4.2.1.3 Other feedback

4.2.1.3.1 Fleet retrofit

That is indeed one of the objectives of the ENJOY project but outside the scope of the flight procedure design activities covered by this report therefore it is not addressed here.

4.2.1.3.2 Comment from the HEMS operator

We gratefully acknowledge their feedback and welcome their support for this activity.

We recognise that we should have approached this stakeholder at a much earlier stage in the project and look forward to a fruitful cooperation.

5 Concept of approach operations

This section sets out the high-level discrete processes within the scope of the proposed activity as encountered from a user perspective in the normal scenario.

The processes described herein are in addition to usual procedures by the respective actors. While allowing for normal human factors considerations, it is assumed that the actors carry out their tasks conscientiously.

Approach operations comprise these phases, each of which is further described in the following paragraphs:

- Pre-flight
- Arrival
- Approach
- Missed approach



5.1 Pre-flight

In addition to the usual pre-flight procedures, pilots intending to conduct GNSS approaches to LKLN satisfy themselves that:

- Their operation is compliant with AMC 20-27 and AMC 20-28.³⁵
- They are qualified and authorised to fly PBN procedures.
- They are authorised to fly the specific procedures at LKLN.³⁶
- They have the charts and database valid at the time of initiating the approach.
- The procedures are available; i.e., the airport is not closed and there are no applicable NOTAM restrictions. Particular attention is paid to the available EGNOS protection level³⁷ in the case of LPV procedures.
- They have selected an adequate alternate or alternates. An acceptable alternate is one that either has usable conventional procedures or where there is a very high likelihood that a visual approach can be completed.
- Permission to fly the procedure has been requested and received from the airfield operator.³⁸
- A flight plan has been filed.

5.2 Arrival

The arrival phase starts when the flight leaves the en-route structure or when the pilot otherwise navigates to the IAF³⁹ within 25 nautical miles of the airfield. It ends at the IAF.

In addition to their usual tasks and procedures at this stage of flight, pilots will:

- Load the relevant procedure from the database, including missed approach.
- Ensure that the correct procedure has been loaded, by comparison with the corresponding approach charts and checking at least that:

35 Or equivalent alternative means of compliance and accompanying evidence duly accepted by the authority.

36 This might require verification of their qualifications and operational compliance, theoretical and practical training, satisfactory completion of airfield familiarisation, or other safety assurance requirements.

37 Vertical Protection Level (VPL) must be at ≤ 35 m for LPV200 and at ≤ 50 m for LPV. The Horizontal Protection Level (HPL) must be ≤ 40 m in either case.

38 Without a control service it is not clear that an obligation to obtain permission to merely fly an approach (without landing) can be imposed by the operator itself, absent regulatory intervention by the authority.

39 Initial Approach Fix.



- the procedure name is correct;
- the waypoint sequence is correct;
- the leg directions and lengths look correct;
- the final segment angle / slope is correct.
- Conduct a briefing (self-briefing if single pilot) with particular attention to the minima and actions-on.
- Communicate their position and intentions.

5.3 Approach

This refers to the phase of flight that starts at the IAF and ends either when a missed approach is initiated or at the MAPt⁴⁰ or DA/H⁴¹ when the pilot acquires uninterrupted visual contact with the runway environment.

In addition to their usual tasks and procedures at this stage of flight, pilots will:

- Maintain sharp situational awareness both in terms of their own position along the approach and the position, direction of flight and intentions of any other traffic in the air or on the ground.
- Pay special attention to the appropriate minima and look for the presence of integrity or other navigational alerts from the onboard systems as well as monitor flight technical error.
- Communicate position and intentions.

5.4 Missed approach

A missed approach must be carried out⁴² if any of the following events occur:

- Database error.
- Loss of GNSS guidance.
- Integrity or position alerts.
- Discrepancy between multiple systems, if installed.

⁴⁰ Missed Approach Point.

⁴¹ Decision Altitude / Height.

⁴² The pilot in command may exercise his discretion and elect to continue the approach if, in his judgement, that would be the safest course of action (for instance, if sufficient references are available to continue visually).

- Loss of LPV capability.⁴³
- Excessive flight technical error (FTE).
- Any other circumstances demand it.

The missed approach will be based on dead reckoning (e.g., heading to altitude.)⁴⁴

Following the missed approach the pilot may attempt another landing or divert to a different airport. If able, the pilot will communicate his intentions.

6 Conclusion and next steps

As part of the definition phase of this airspace change proposal we have identified a group of aviation industry and community stakeholders with whom we have engaged to elicit their inputs and identify their needs and concerns. We used the feedback received to amend and refine our design principles. A concept of operations was also outlined to serve as the basis for the development of an appropriate safety case.

After development of a conceptual design and safety study in close cooperation with the national air navigation services provider and other relevant parties a wider consultation with a much larger group will be undertaken, when a mature set of design options will be presented.

This also concludes ENJOY project task 2.1, with this report constituting deliverable D2.1.

Correspondence may be addressed to hello@aaltronav.eu.

We thank all those who contributed to this process and we welcome further input and questions at any time.

End of report

⁴³ The pilot may choose to transition to an LNAV approach and continue if all these conditions are met: still above MDA/H; LNAV capability is available (no RAIM alerts, etc.); transition to the LNAV procedure in the specific case of loss of LPV capability on final has been explicitly covered in the approach briefing.

⁴⁴ If the missed approach has been initiated for a reason unrelated to the operation of the GNSS system, the pilot may continue to use GNSS guidance during the missed approach.