

Příloha 4 – Risk analýza

RISK ASSESSMENT FOR RNP AR APCH (LOWI)

Introduction

This Risk Assessment is part of the approval process for RNP AR APCH operations at Innsbruck airport.

The assessment gives an attention to all elements, that could possibly affect safety of conducted operation. These elements are – aircraft performance, RNP capability, operating environment, infrastructure and flight crew procedures.

The purpose of this assessment is to evaluate specific risk aspects of this operation, define their likelihood and establish proper mitigations.

Classification

Occurrence probability (1-5):

Frequent	5	4	3	2	1	Extremely improbable
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Occurrence severity (A-B):

Catastrophic	A	B	C	D	E	Negligible
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Risk assessment matrix:

Risk probability	Risk severity				
	Catastrophic A	Hazardous B	Major C	Minor D	Negligible E
Frequent 5	5A	5B	5C	5D	5E
Occasional 4	4A	4B	4C	4D	4E
Remote 3	3A	3B	3C	3D	3E
Improbable 2	2A	2B	2C	2D	2E
Extremely improbable 1	1A	1B	1C	1D	1E

Safety Risk Assessment Record

Identified hazard	Associated risk(s)	Existing mitigation measures/defences	Current risk index	Further mitigation measures/ defences	Revised risk index
1. Aircraft Failures					
a) System failure: <i>failure of a navigation system, flight guidance system, flight instrument system for the approach or missed approach</i>	Loss of situational awareness Loss of RNP capability Loss of control over the aircraft Obstacle or terrain proximity CFIT	Aircraft design Dual relevant independent systems requirement ATC radars coverage EGPWS	4B	Crew training & procedures Minimum required equipment and its preflight and “before approach” check Contingency procedures implemented in the approach briefing Contingency missed approach procedures based on transition to convention navigation with the intention of guiding the aircraft safely without any conflict with terrain – tuning the NAVAIDs prior to the approach	2D
b) Malfunction of air data system or altimetry	Disagreement of altimeters Airspeed error Vertical speed error Loss of situational Awareness CFIT	Aircraft design (dual relevant independent systems requirement) ATC radars coverage	3C	Crew training & procedures Cross-check between two independent systems	2D
2. Aircraft performance					
a) Inadequate performance to conduct the approach	Excessive lateral or vertical error during the operation Incorrect display of aircraft’s position CFIT	Aircraft design (RNP capability/certification) Flight planning (including RAIM check) Aircraft performance check during flight planning, prior to the flight, prior to the approach	3B	Check of the minimum required equipment Crew training & procedures	1C

b)	Loss of engine	Lower climb gradient (in general lower aircraft performance) CFIT	Aircraft design One engine INOP contingency procedures Aircraft performance check during flight planning, prior to the flight, prior to the approach	2C	Crew training & procedures	1D
3. Navigation services						
a)	Use of NAVAIDs outside of their coverage or in test mode	Incorrect display of aircraft's position Obstacle or terrain proximity CFIT	Aircraft design Morse code verification NOTAMs Check of NOTAMs during preflight briefing ATIS report EGPWS	2D	Crew training & procedures	2E
b)	Navigation database error	Incorrect flight path Obstacle or terrain proximity CFIT	Navigation database update on time EGPWS	4B	Validation in FSTD or during VMC flight before a very first upload Validation procedure due to database updates Check of current nav, database WPT sequence modification is forbidden Comparing FMC nav. data and map display with published approach procedure	1D
4. ATC operations						
a)	Procedure assigned to non-approved aircraft	Required lateral or vertical accuracy is not guaranteed Confusion of the crew Obstacle or terrain proximity	Experienced air traffic controllers with proper training English speaking controllers Airport categorization	2C	Check of the minimum required equipment Proper flight plan filling Airport qualification training - crew is responsible for rejecting such a clearance	1C

b)	ATC commands that cannot be achieved	Navigation system's error/confusion Vectoring into terrain Incorrect flight path of RF leg with possibility of CFIT	Experienced air traffic controllers with proper training	3B	Crew training & procedures Crew knowledge of aircraft performance specifics Crew is responsible for rejecting the command	1C
c)	Inconsistent phraseology between controller and the flight crew	Language barrier Misunderstanding of controller's or crew's command/request Collision with another aircraft in the air or on the runway Collision with obstacle or terrain	Aircraft design (TCAS) EGPWS Experienced air traffic controllers with proper training English speaking crew and controllers	2C	Only experienced crew with adequate amount of flight hours and level of english	1C
5. Flight crew operations						
a)	Altimeter setting error	Altimeters disagreement Incorrect reading Late go-around Obstacle or terrain proximity CFIT	Aircraft design EGPWS	4A	Crew training & procedures Check of current local altimeter setting Cross-check of altimeters Verifying the crossing altitude	1C
b)	Incorrect procedure selection or loading	Navigation system's error/confusion Confusion of the crew Incorrect flight path	ATC radars coverage Procedure is visible on the map display	3C	Crew training & procedures Comparing FMS/map display and chart Crosscheck of data entered in FMS	1D
c)	Incorrect flight control mode selected	Incorrect flight path Excessive accuracy errors Early go-around		3C	Crew training & procedures Crosscheck of selected modes using FMA	1D

d)	Incorrect RNP entry	Excessive accuracy errors Confusion of the crew Early go-around	Aircraft design (pre-loaded RNP in FMS) RNP value on published charts	3D	Crew training & procedures Verifying that RNP limits are set in FMS	1C
e)	Missed approach	Late go-around Obstacle or terrain proximity	DA/H and missed approach procedures on published charts Aircraft performance ATC commands EGPWS	2B	Experienced crew with adequate amount of flight hours Crew training & procedures Missed approach procedures and contingency procedures	1E
f)	Poor meteorological conditions	Loss of visual reference and go-around Obstacle and terrain proximity CFIT	Aircraft design (WX radar) Aircraft performance ATIS reports TAF/METAR reports EGPWS	2D	Experienced crew with adequate amount of flight hours Preflight briefing (check TAFs and adverse weather) Crew training in IMC	1E
6. Infrastructure						
a)	GNSS failure	Loss of RNP capability Excessive accuracy errors Incorrect display of aircraft's position Incorrect flight path Loss of situational awareness	Aircraft design (use of convention NAVAIDs/IRS) NOTAMs Flight planning (including RAIM check) Conventional NAVAIDs	2B	Crew training & procedures Contingency procedures implemented in the approach briefing Contingency missed approach procedures based on transition to convention navigation with the intention of guiding the aircraft safely without any conflict with terrain – tuning the NAVAIDs prior to the approach Checking the displayed alerts	1D
b)	Loss of GNSS signals	Loss of RNP capability	Aircraft design (dual relevant independent systems requirement + IRS)	3B	Checking the displayed alerts	2D

	<p>Excessive accuracy errors</p> <p>Incorrect display of aircraft's position</p> <p>Incorrect flight path</p> <p>Loss of situational awareness</p>	<p>Flight planning (including RAIM check)</p> <p>Conventional NAVAIDs</p>		<p>Contingency procedures implemented in the approach briefing</p> <p>Contingency missed approach procedures based on transition to conventional navigation with the intention of guiding the aircraft safely without any conflict with terrain – tuning the NAVAIDs prior to the approach</p>	
7. Operating conditions					
a) Tailwind conditions	<p>Terrain or obstacle proximity</p> <p>Runway excursion</p>	<p>Aircraft design (wind components shown on map display)</p> <p>ATIS/METAR report</p> <p>Possibility of landing RWY change</p>	3C	<p>EGPWS requirement</p> <p>Crew training & procedures</p> <p>Pilots cannot accept RNP AR with tailwind component exceeding 5 KT (request opposite RWY)</p>	1D
b) Wind conditions	<p>Excessive lateral and vertical errors due to turbulences or strong winds</p> <p>Go-around</p>	Aircraft design	3C	<p>Experienced crew with adequate amount of flight hours</p> <p>Crew training & procedures</p> <p>Pilots cannot commence RNP AR APCH if windspeed exceeds 25 KT and gust exceeds 40 KT</p>	1C