The Croatian case: LPV implementation benefits Croatia Control

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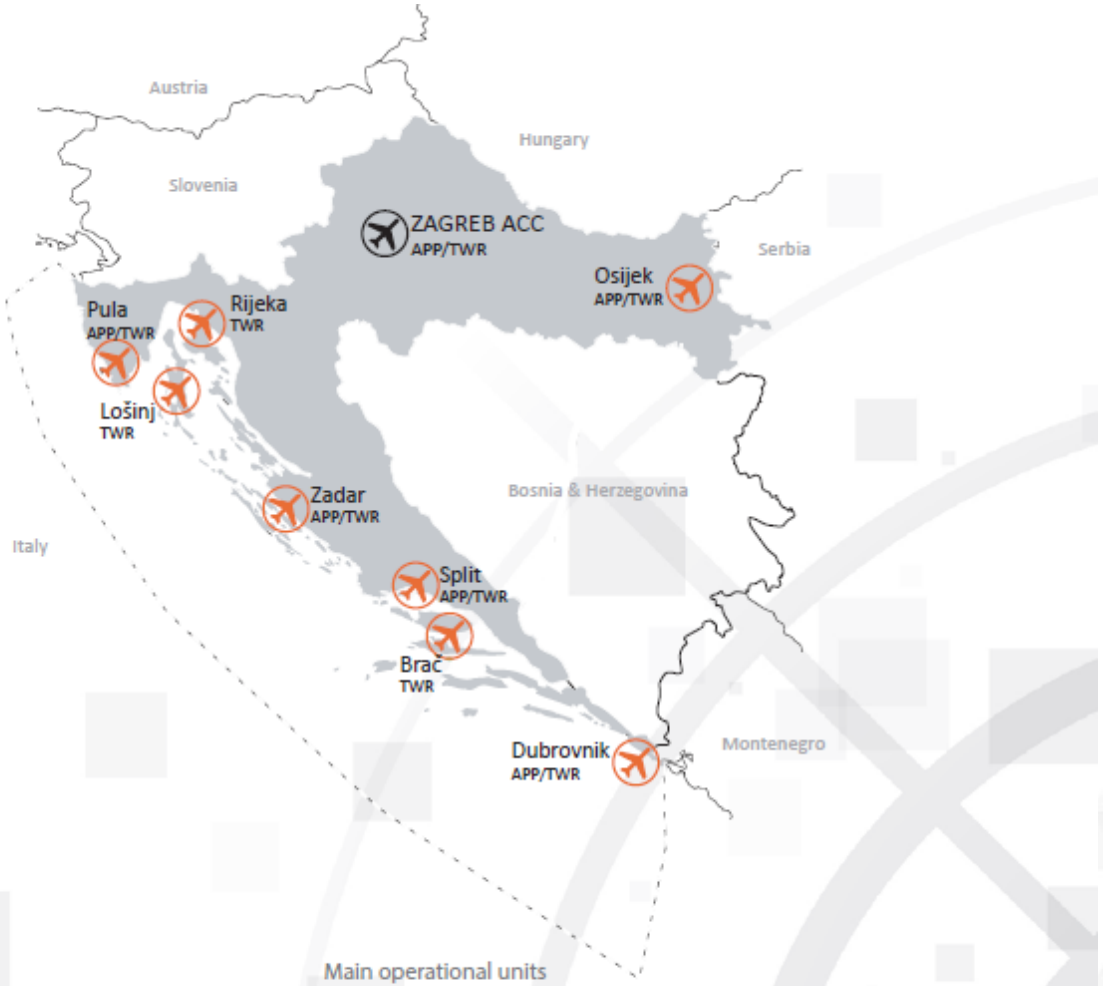
CROATIA CONTROL

CROATIAN INTERNATIONAL AERODROMES



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RNP APPROACH IMPLEMENTATION PLAN

AD	RWY	LPV	IMPLEMENT
LDDU	**11**	LNAV,LNAV/VNAV,LPV	2015-2019
	29	RNP AR	
LDLO	2	NO	WAITING RWY RECONSTRUCTION
	22		
LDOS	**11**	LNAV,LNAV/VNAV,LPV	2017-2018
	29	NO	
LDPL	**9**	LNAV,LNAV/VNAV,LPV	2018
	27	LNAV,LNAV/VNAV,LPV	2018
LDRI	**14**	LNAV,LNAV/VNAV,LPV	05DEC2019
	32	LNAV,LNAV/VNAV,LPV	05DEC2019
LDSB	**4**	LNAV,LNAV/VNAV,LPV	05DEC2019
	22	LNAV,LNAV/VNAV,LPV	05DEC2019
LDSP	**5**	LNAV,LNAV/VNAV,LPV	2018
	23	RNAV VISUAL	2018
LDZA	**5**	LNAV,LNAV/VNAV,LPV	2018
	23	LNAV,LNAV/VNAV,LPV	2018
LDZD	**4**	LNAV,LNAV/VNAV,LPV	2018
	13	LNAV,LNAV/VNAV,LPV	2018
	22	NO	
	31	LNAV,LNAV/VNAV,LPV	2018

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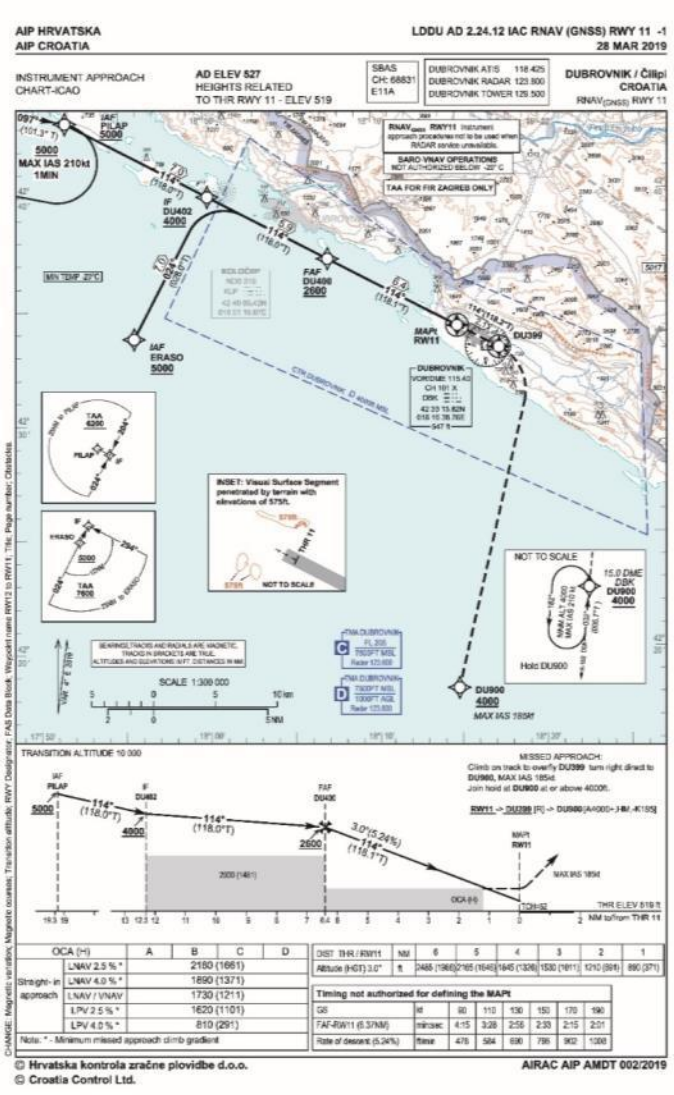
The benefits of LPV implementation

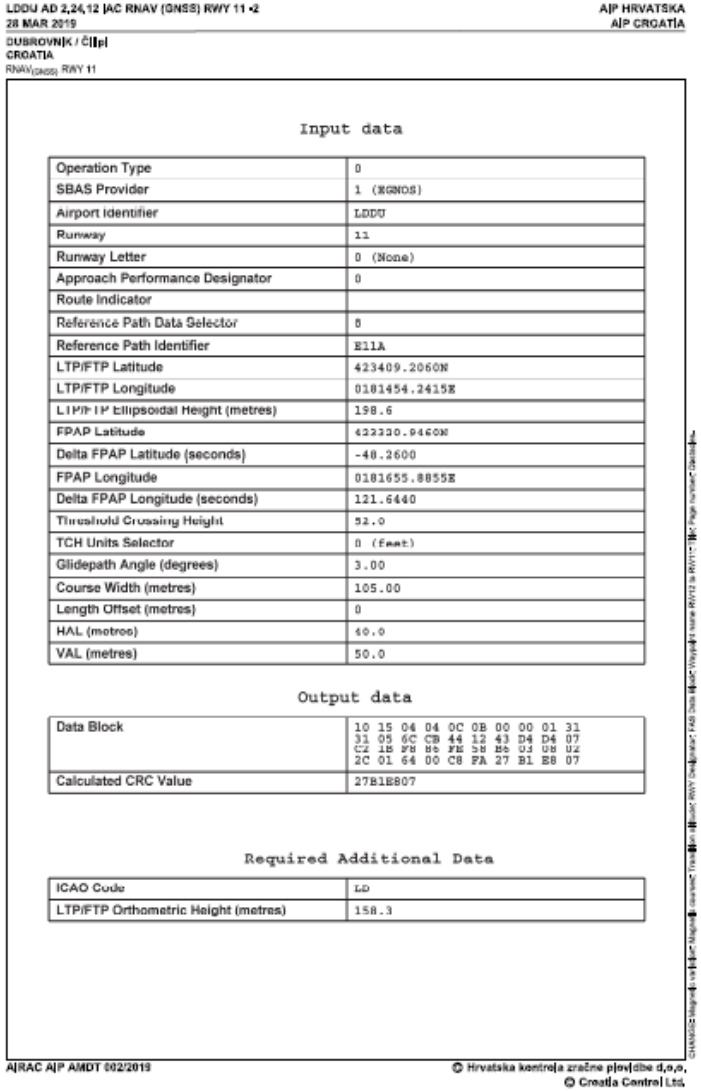
- LPV approaches eliminate the need for critical area limitations associated with an ILS
- LPV procedures have no requirements for ground-based transmiitters at the airport
- From pilot`s viewpoint, an LPV approach looks and flies like an ILS but LPV is more stable due to guidance not being provided via RF technology
- The LPV approach glide slope is based on the SBAS-based altitude versus the barometric altimeter which is subject variations due to extreme temperatures or pilot error in the setting of the local altimeter setting
- LPV enables a continuous descent final approach guidance to the crew as opposed to the „dive and drive“ technique associated with Non-Precision approaches which are cause of many CFIT accidents
- LPV Approaches are added to runways that have not been suitable for IFR operations

Other operational benefits:

- Reduces trajectory dispersion(predictability and noise footprint reduction)
- More flexible use of airspace
- Enabling CDA/CDFA techniques (fuel consumption and noise footpint reduction)
- LPV offer potential to remove circling approaches
- Potentially enabling VOR, NDB, ILS removal, reducing the associated installation/maitenance costs
- Limited impact on the FMS
- Low training requirements for flight crews

First LPV procedure implemented aerodrome Dubrovnik 2015





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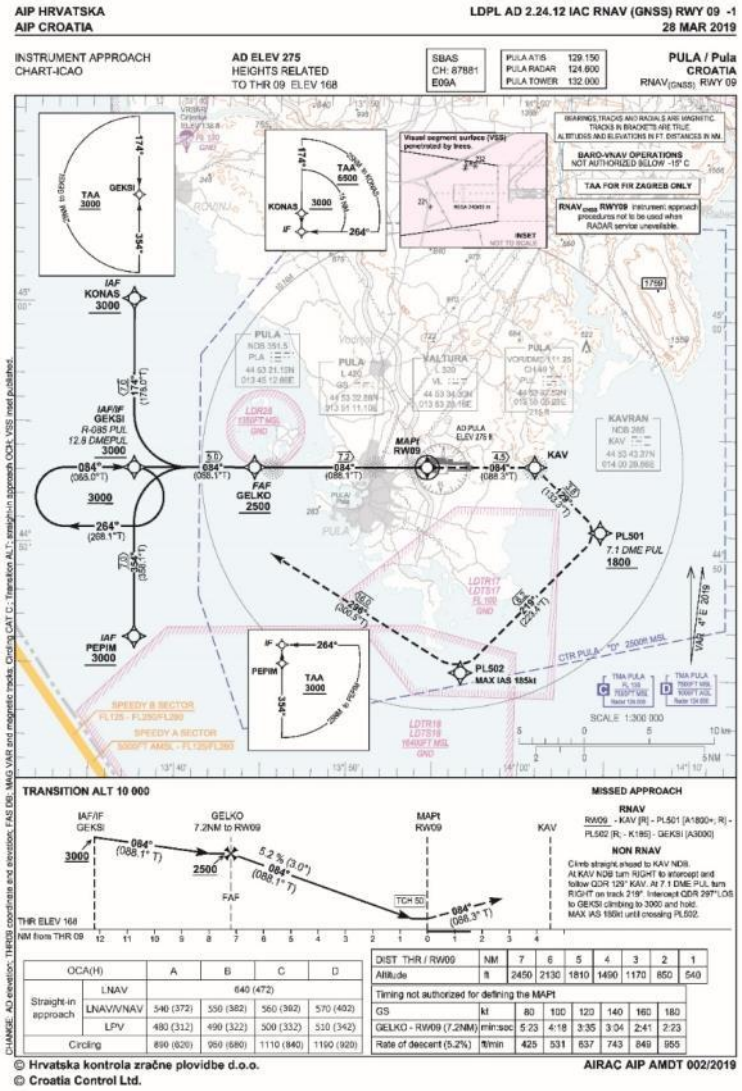
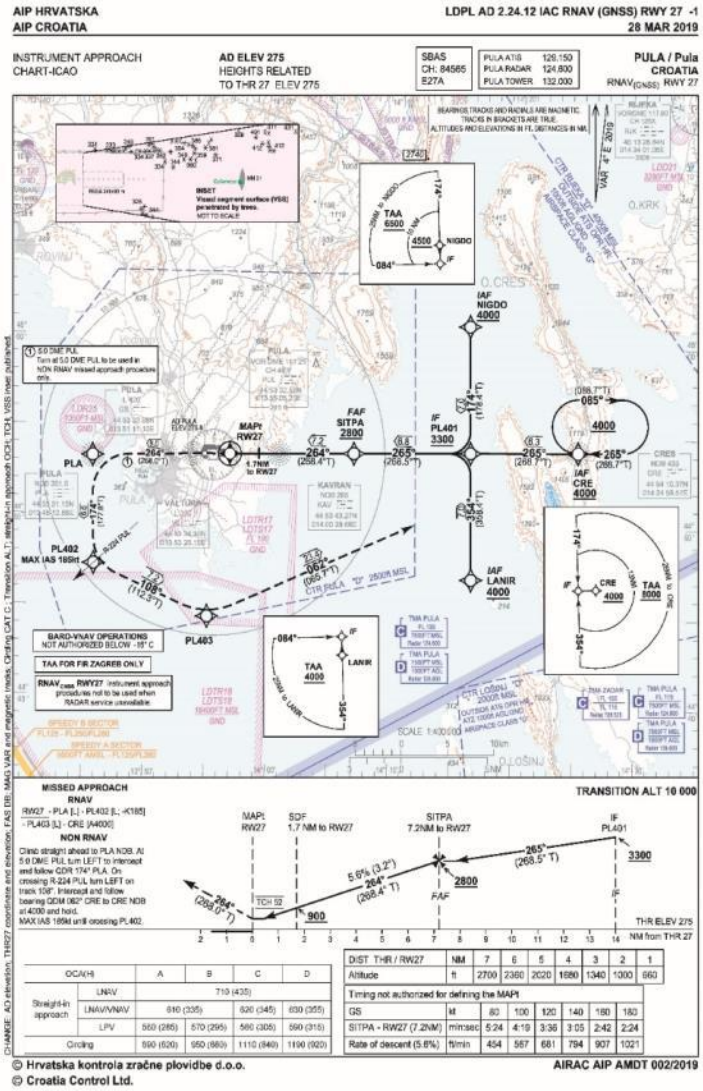
Aerodrome Pula RWY 09 had only VOR&NDB Non-Precision approach





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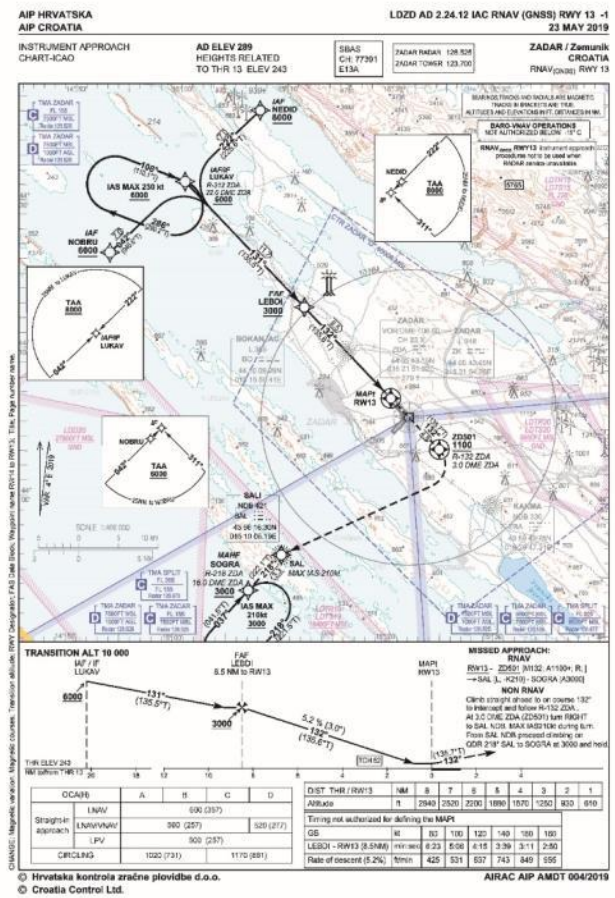
Aerodrome Zadar (only RWY 14 ILS Precision approach)



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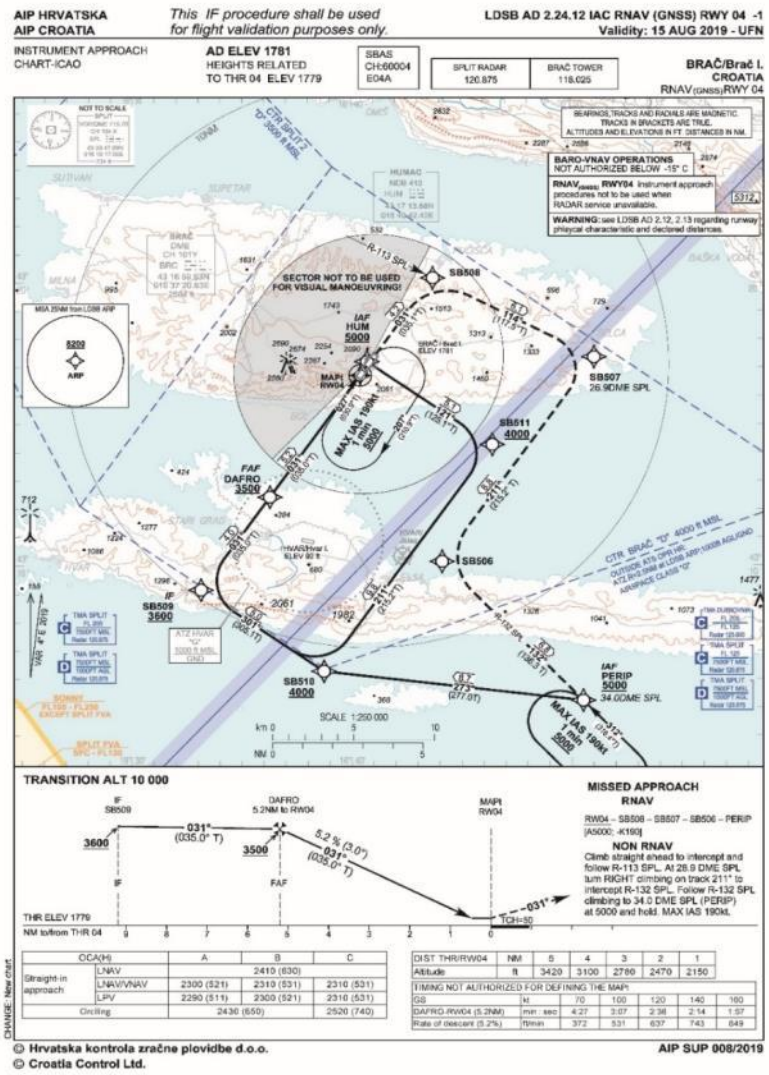
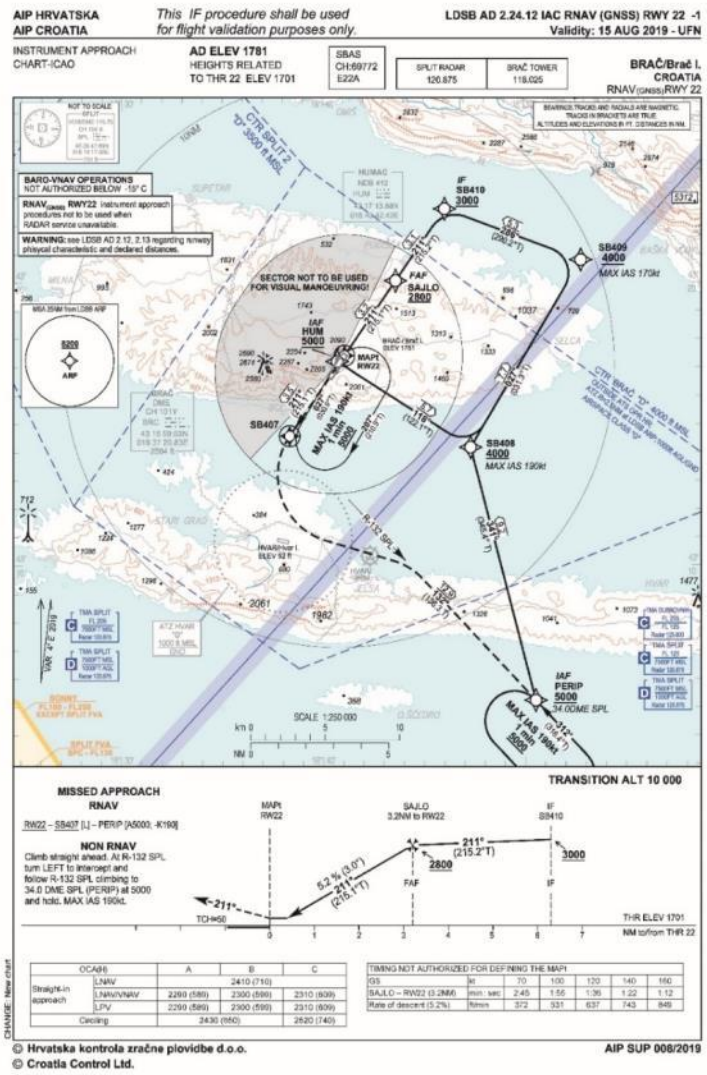
Aerodrome Brač I.(only NDB Non-Precision Approach)





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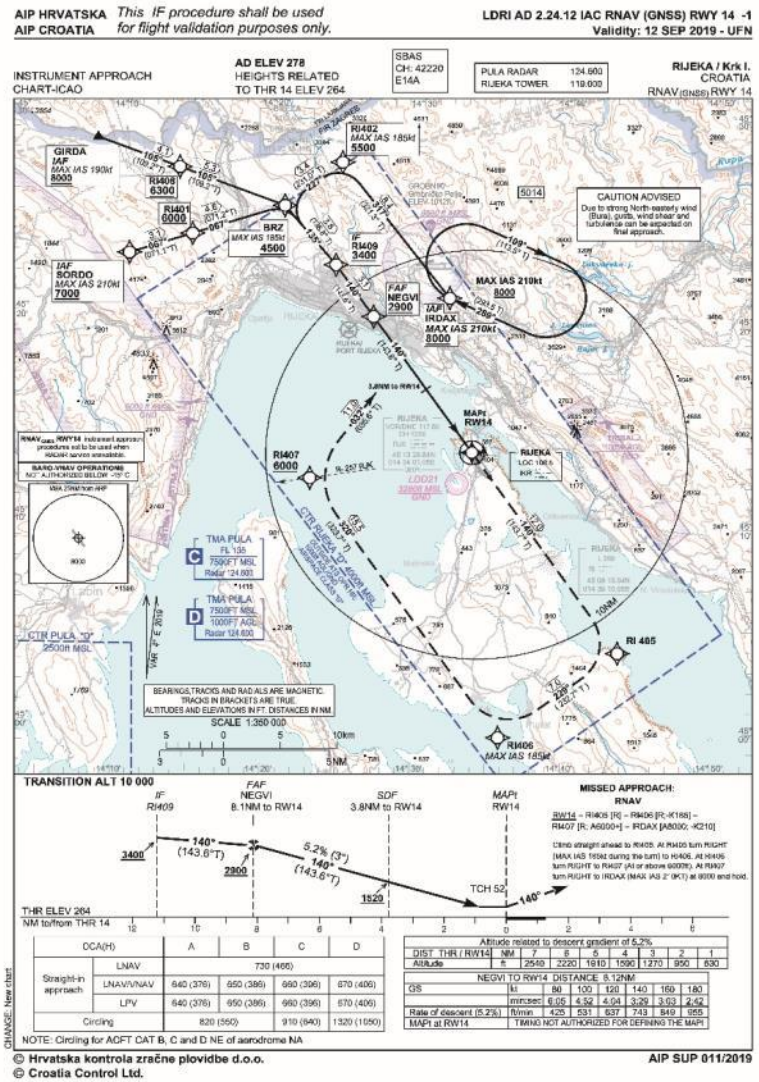
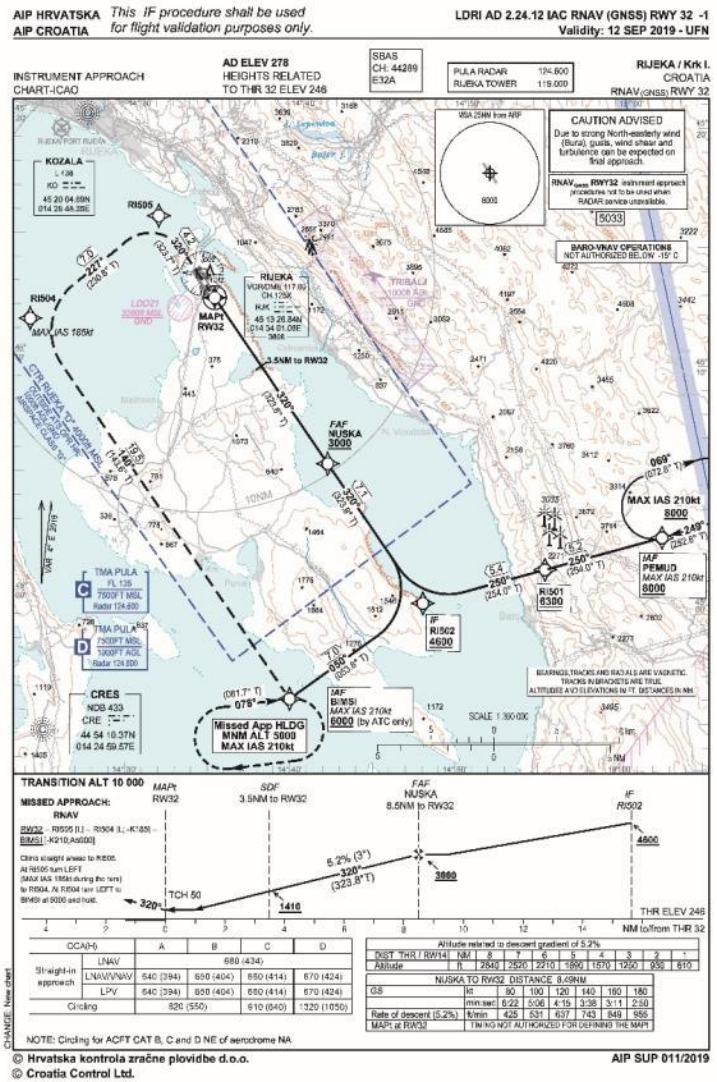
Aerodrome Rijeka Krk I.(RWY 32 only VOR&NDB Non-Precision Approach)





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FAS database coding list

RIJEKA / Krk I.
CROATIA
RNAV(GNSS) RWY 14

Input data

Operation Type	0
SBAS Provider	1 (EGNOS)
Airport Identifier	LDRI
Runway	14
Runway Letter	0 (None)
Approach Performance Designator	0
Route Indicator	
Reference Path Data Selector	0
Reference Path Identifier	E14A
LTP/FTP Latitude	451332.3610N
LTP/FTP Longitude	0143341.1580E
LTP/FTP Ellipsoidal Height (metres)	124.9
FPAP Latitude	451227.4075N
Delta FPAP Latitude (seconds)	-64.9535
FPAP Longitude	0143448.7030E
Delta FPAP Longitude (seconds)	67.5450
Threshold Crossing Height	52.0
TCH Units Selector	0 (feet)
Glidepath Angle (degrees)	3.00
Course Width (metres)	105.00
Length Offset (metres)	0
HAL (metres)	40.0
VAL (metres)	50.0

Output data

Data Block	10 09 12 04 0C 0E 00 00 01 34 31 05 92 A3 68 13 4C C4 3F 06 E1 18 8D 04 FE B2 0F 02 08 02 2C 01 64 00 C8 FA 1E 38 B9 AC
Calculated CRC Value	1E38B9AC

Required Additional Data

ICAO Code	LD
LTP/FTP Orthometric Height (metres)	80.6

CHANGE: New chart

RIJEKA / Krk I.
CROATIA
RNAV(GNSS) RWY 32

Input data

Operation Type	0
SBAS Provider	1 (EGNOS)
Airport Identifier	LDRI
Runway	32
Runway Letter	0 (None)
Approach Performance Designator	0
Route Indicator	
Reference Path Data Selector	0
Reference Path Identifier	E32A
LTP/FTP Latitude	451227.4075N
LTP/FTP Longitude	0143448.7030E
LTP/FTP Ellipsoidal Height (metres)	119.1
FPAP Latitude	451332.3610N
Delta FPAP Latitude (seconds)	64.9535
FPAP Longitude	0143341.1580E
Delta FPAP Longitude (seconds)	-67.5450
Threshold Crossing Height	50.0
TCH Units Selector	0 (feet)
Glidepath Angle (degrees)	3.00
Course Width (metres)	105.00
Length Offset (metres)	0
HAL (metres)	40.0
VAL (metres)	50.0

Output data

Data Block	10 09 12 04 0C 20 00 00 01 32 33 05 1F A8 66 13 FE D3 41 06 A7 18 73 FB 01 4E F0 FD F4 01 2C 01 64 00 C8 FA 17 74 39 4A
Calculated CRC Value	1774394A

Required Additional Data

ICAO Code	LD
LTP/FTP Orthometric Height (metres)	75.0

CHANGE: New chart

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Thank you for your attention

Questions?

CROATIA AIRLINES

A STAR ALLIANCE MEMBER

Davor Mišić
Chief pilot DASH-8 Q400
Croatia Airlines

CROATIA AIRLINES

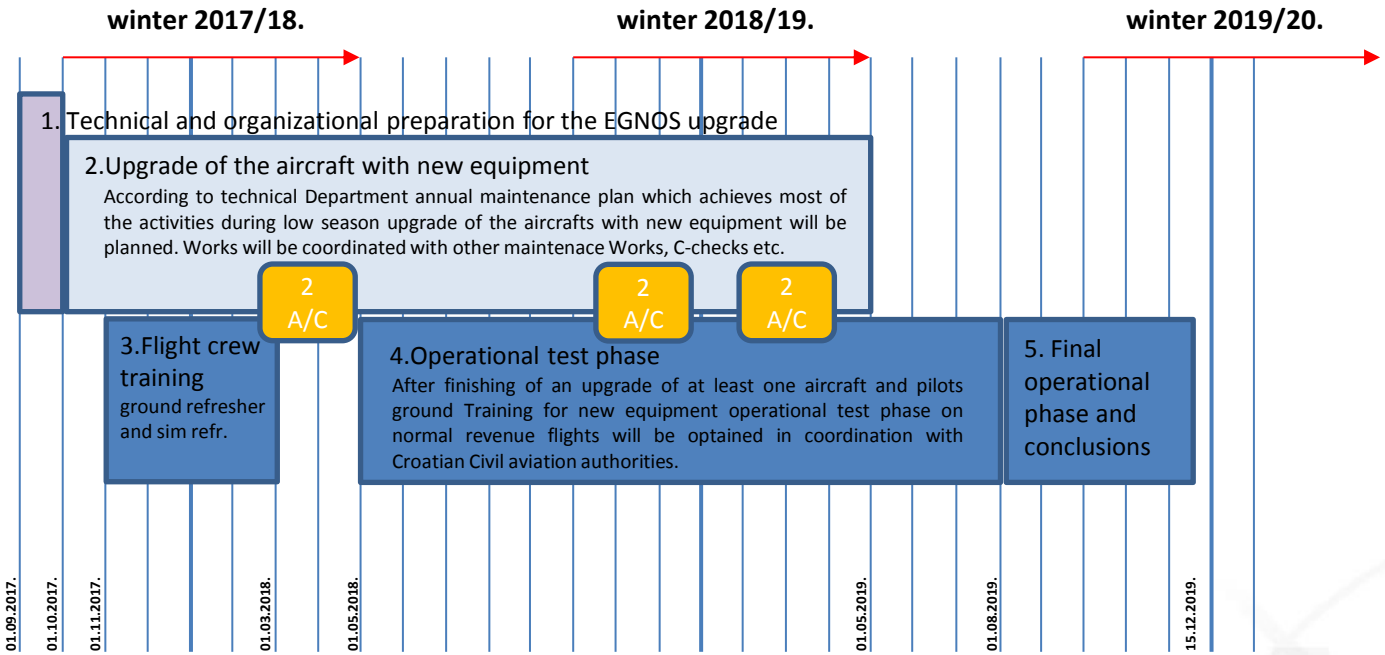
- state-owned flag carrier
- this year Croatia Airlines is celebrating 30th anniversary
- fleet - consisting of 12 aircraft, 2 Airbus A-319 , 4 Airbus A-320 and 6 Dash 8 –Q400

A STAR ALLIANCE MEMBER

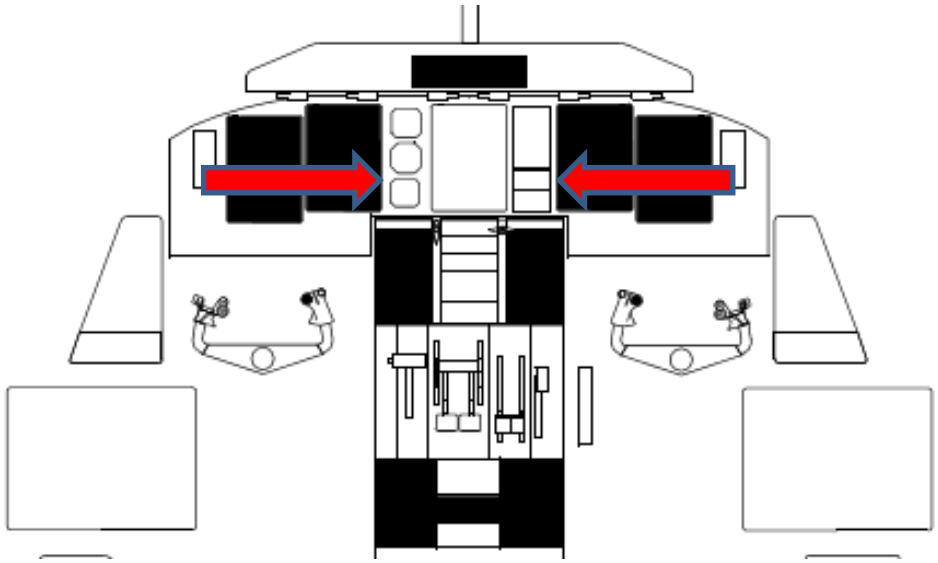
CROATIA AIRLINES

LPV project

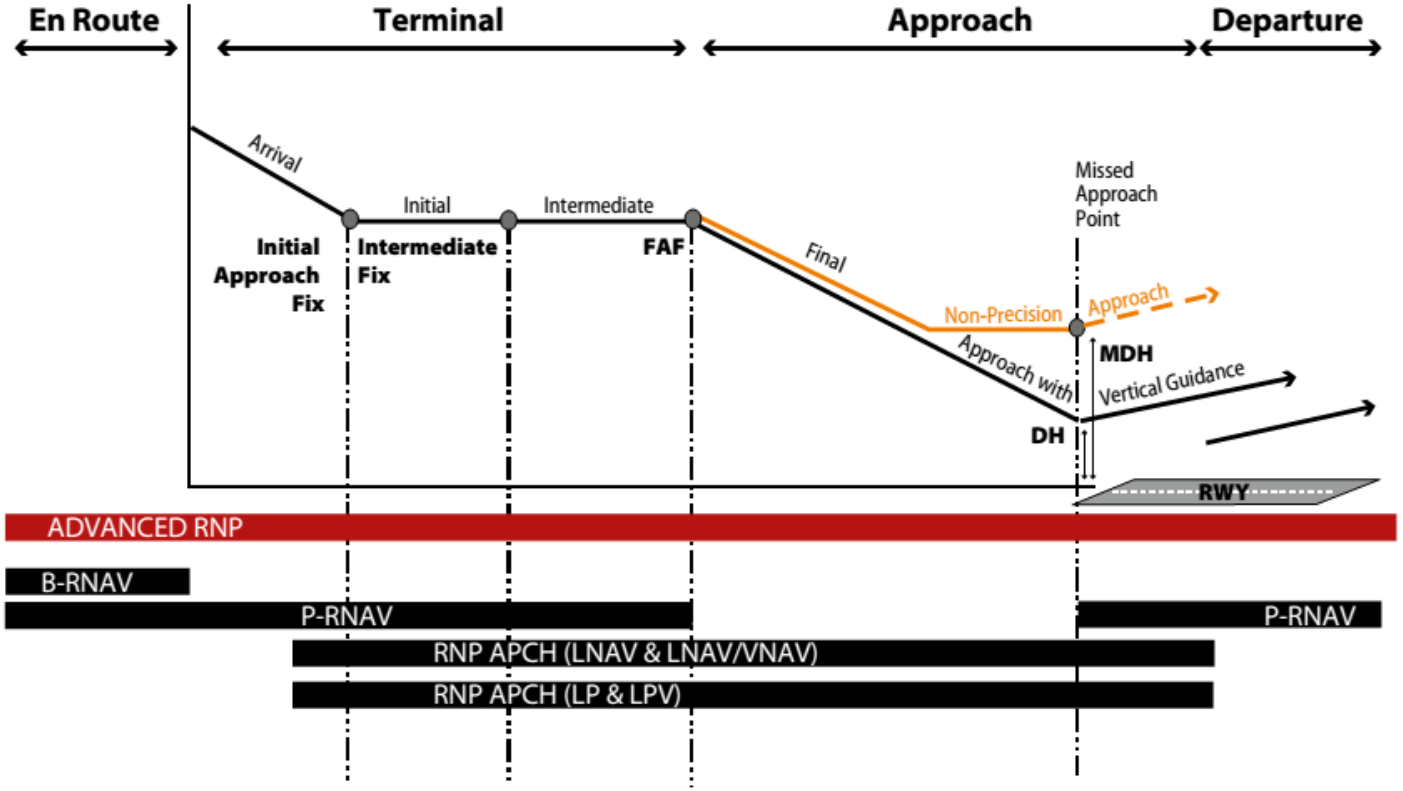
- recognized as future, modern aviation instrument approach
- modernization of Dash8 Q400 fleet, new FMS's installed
- Funding by EU (85%)
- introducing of complete new operation (LPV approach)
- low training costs according EASA AMC 20-27 (RNP APCH) and EASA AMC 20-28 (LPV)
- more reliable and stable operation


winter 2017/18.
winter 2018/19.
winter 2019/20.
1. Technical and organizational preparation for the EGNOS upgrade
2.Upgrade of the aircraft with new equipment
According to technical Department annual maintenance plan which achieves most of the activities during low season upgrade of the aircrafts with new equipment will be planned. Works will be coordinated with other maintenace Works, C-checks etc.
2 A/C
2 A/C
2 A/C
3.Flight crew training
ground refresher and sim refr.
4.Operational test phase
After finishing of an upgrade of at least one aircraft and pilots ground Training for new equipment operational test phase on normal revenue flights will be optained in coordination with Croatian Civil aviation authorities.
5. Final operational phase and conclusions
01.09.2017.
01.10.2017.
01.11.2017.
01.03.2018.
01.05.2018.
01.05.2019.
01.08.2019.
15.12.2019.

NEW!!! STC - LOS (Level of Service) Annunciator in the cockpit



"LOS annunciators are necessary when installing LP/LPV capable FMS. The LPV/LNAV/VNAV and LNAV only approach LOS must be annunciated from FMS."


En Route
Terminal
Approach
Departure
Arrival
Initial
Intermediate
Missed
Approach
Point
Initial
Approach
Fix
Intermediate
Fix
FAF
Final
Non-Precision
Approach
Approach with
Vertical Guidance
MDH
DH
RWY
ADVANCED RNP
B-RNAV
P-RNAV
P-RNAV
RNP APCH (LNAV & LNAV/VNAV)
RNP APCH (LP & LPV)

Pula LPV approach runway 09

Plans for future

- **RNP AR APCH** according EASA AMC 20-26 – new approval (RF LEG/IRS STC and FMS STC connection if needed)

QUESTIONS?

Thank you for your attention

Questions?