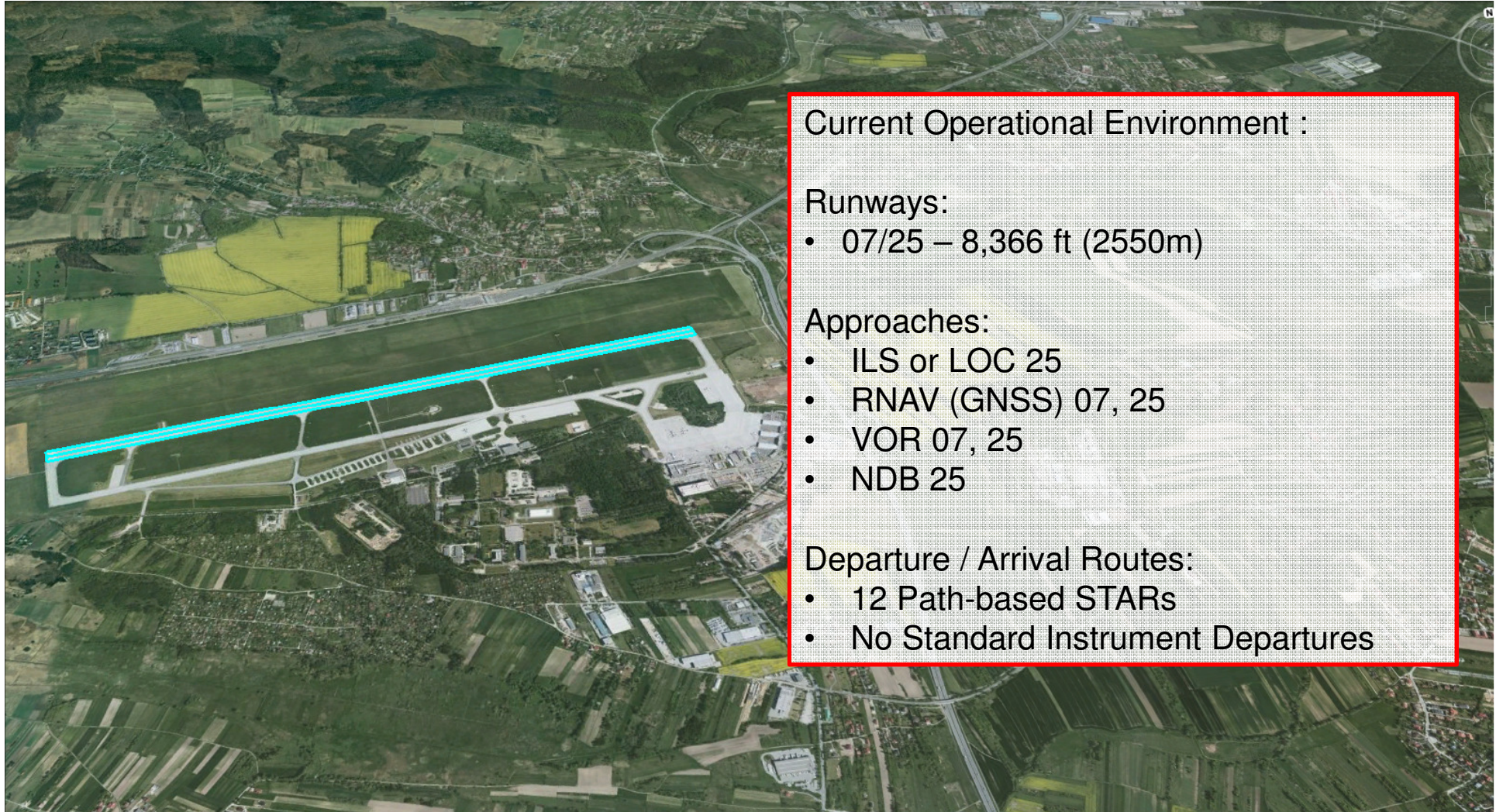


PBN Concepts – Krakow, Poland

EPKK (KRK) Current Operational Environment



Current Operational Environment :

Runways:

- 07/25 – 8,366 ft (2550m)

Approaches:

- ILS or LOC 25
- RNAV (GNSS) 07, 25
- VOR 07, 25
- NDB 25

Departure / Arrival Routes:

- 12 Path-based STARs
- No Standard Instrument Departures

EPKK (KRK) Existing STAR Environment

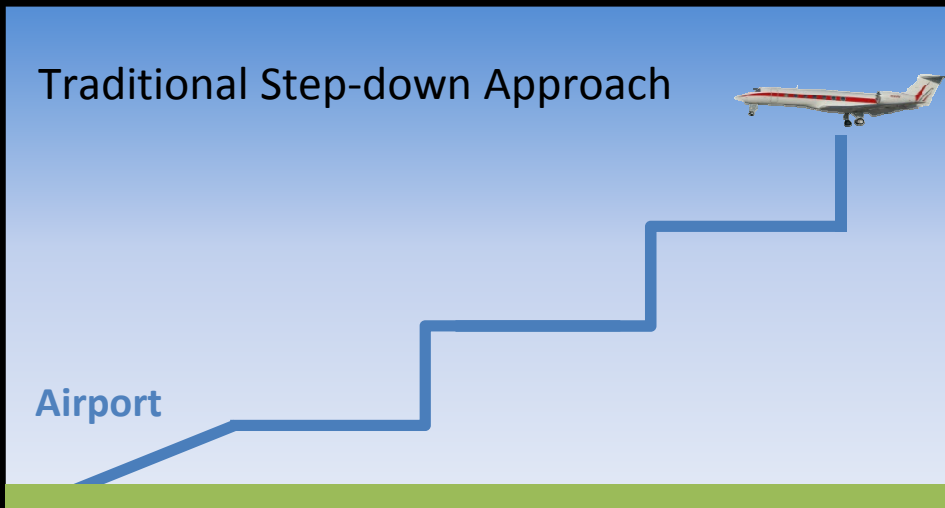
Existing STARs use DME Arcs to arrive some aircraft at IAF



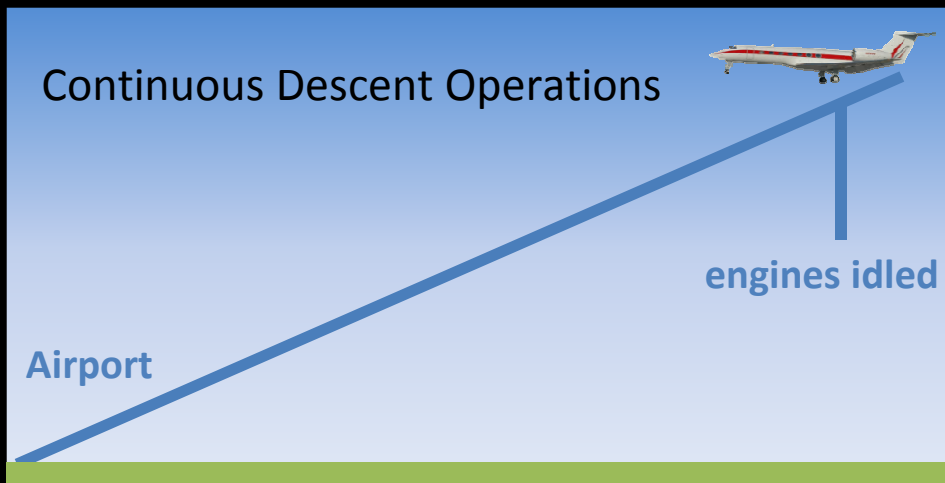
RNAV STARs could be developed using Continuous Descent Operations (CDO)

EPKK Concept RNAV STAR

Traditional Step-down Approach



Continuous Descent Operations



Continuous Descent Operations apply vertical features to PBN STARs that have demonstrated benefits in previous implementations:

- *Approximately 275 kilograms of fuel savings per flight*
- Reduced ATC / Pilot communications by up to 70%
- Reduced noise impacts for affected over-flight communities
- Flight time reductions of *at least* two minutes per flight
- Flight Idle descents from cruise flight to short final

EPKK Concept RNAV STAR Rwy 25 Transitions

Uses existing enroute waypoints to seamlessly integrate into current airspace structure

MAPIK

NAVUR

KOTEK

Connects to the IAFs of PBN/GLS approach procedures

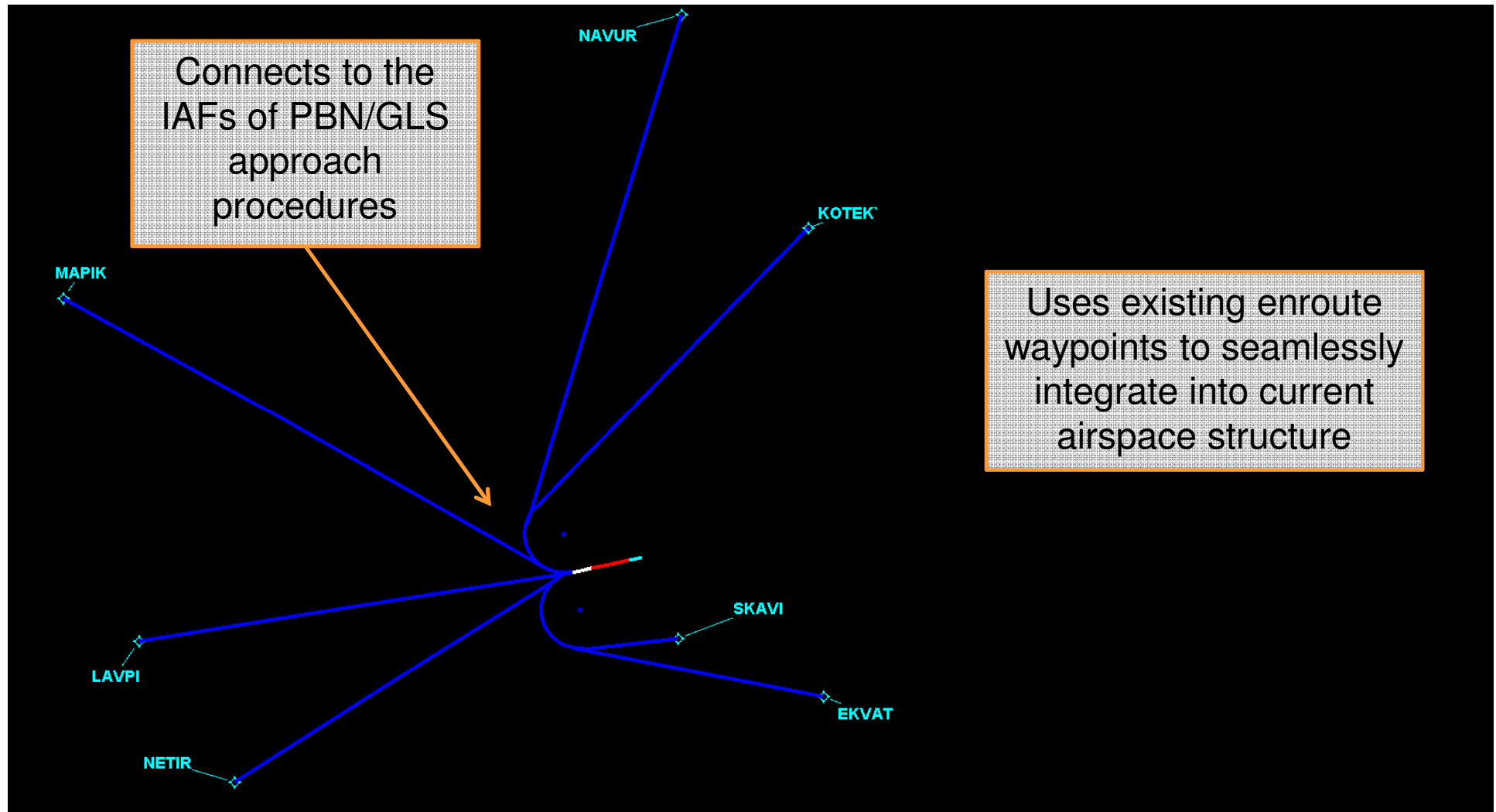
LAVPI

SKAVI

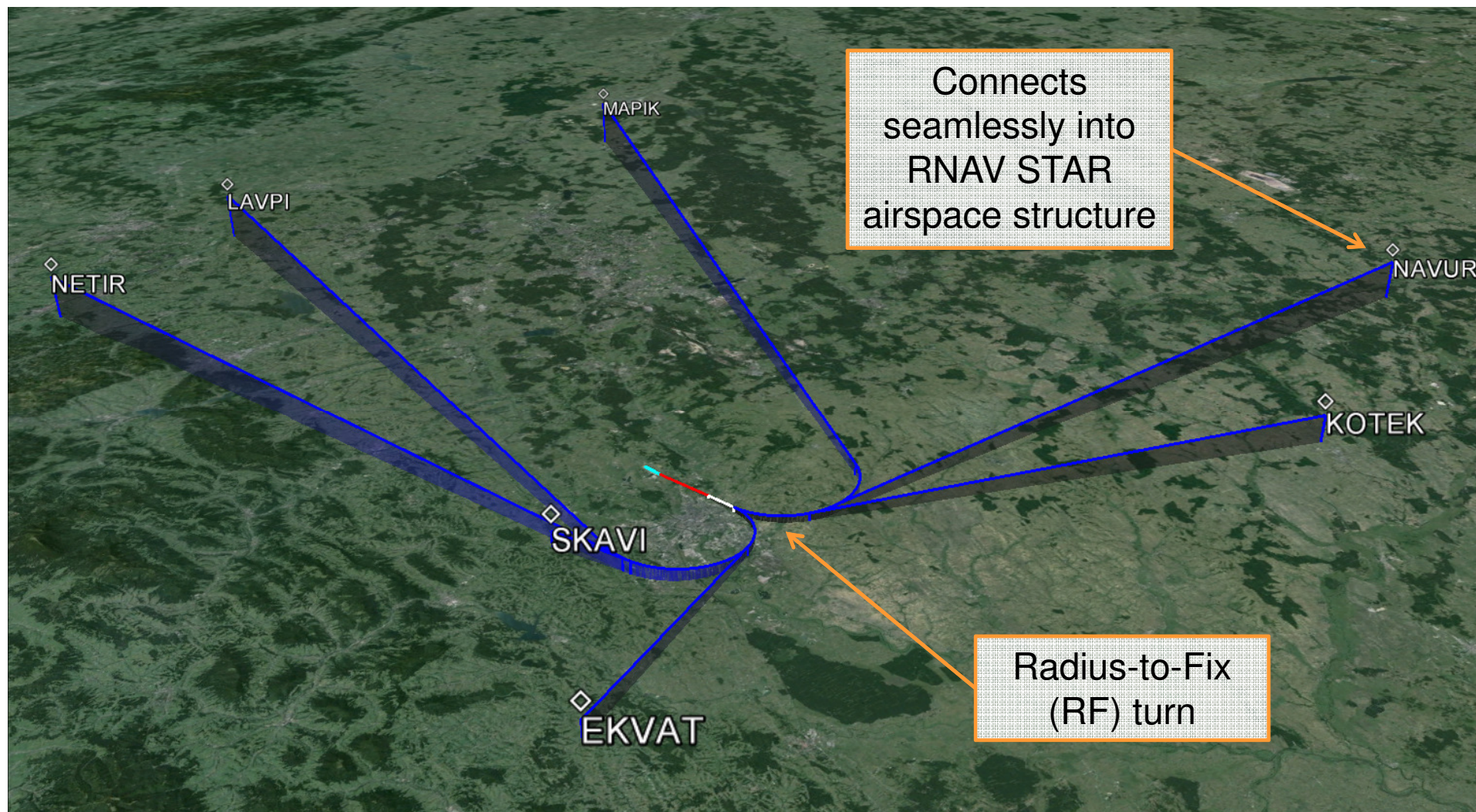
EKVAT

NETIR

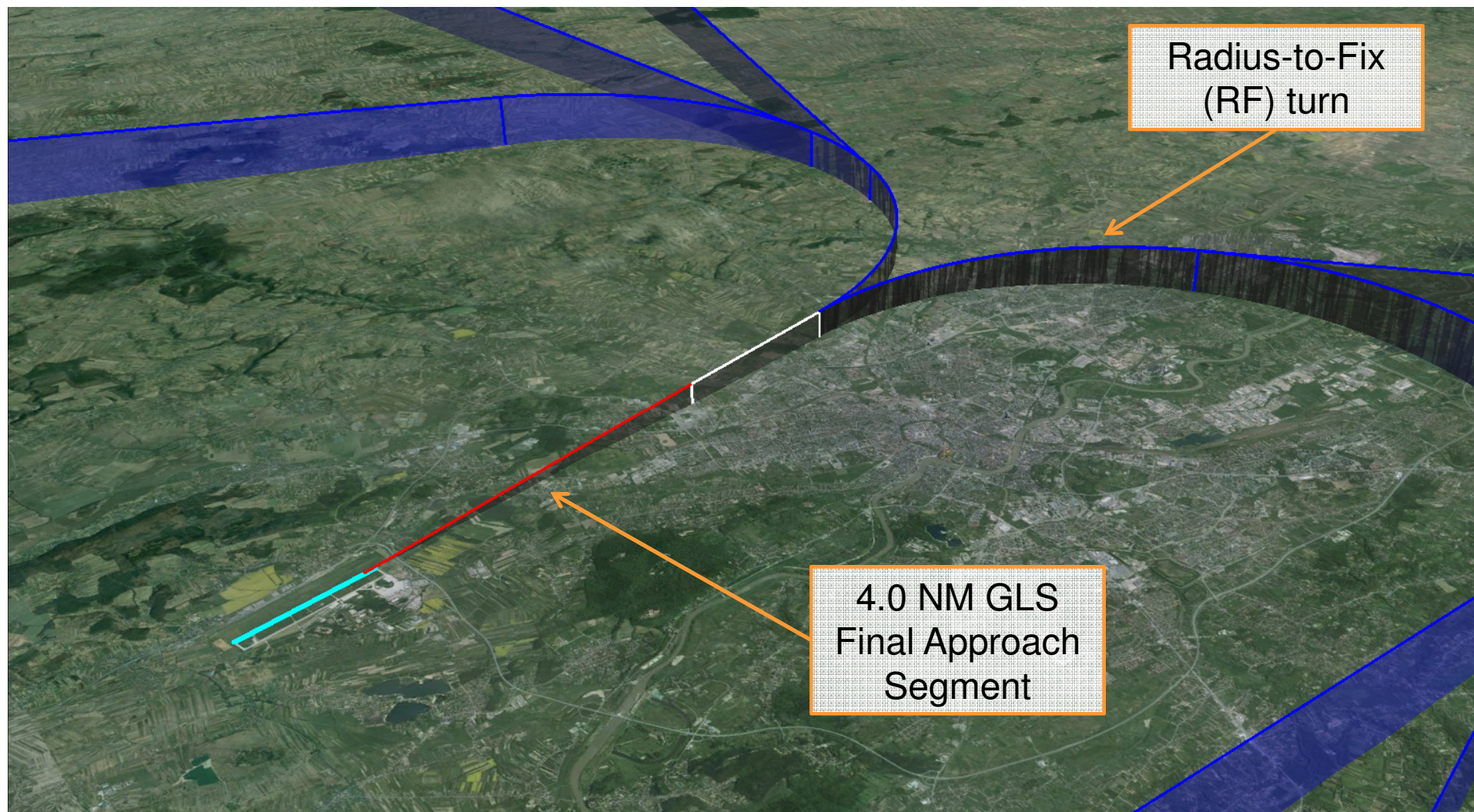
EPKK Concept RNAV STAR Rwy 07 Transitions



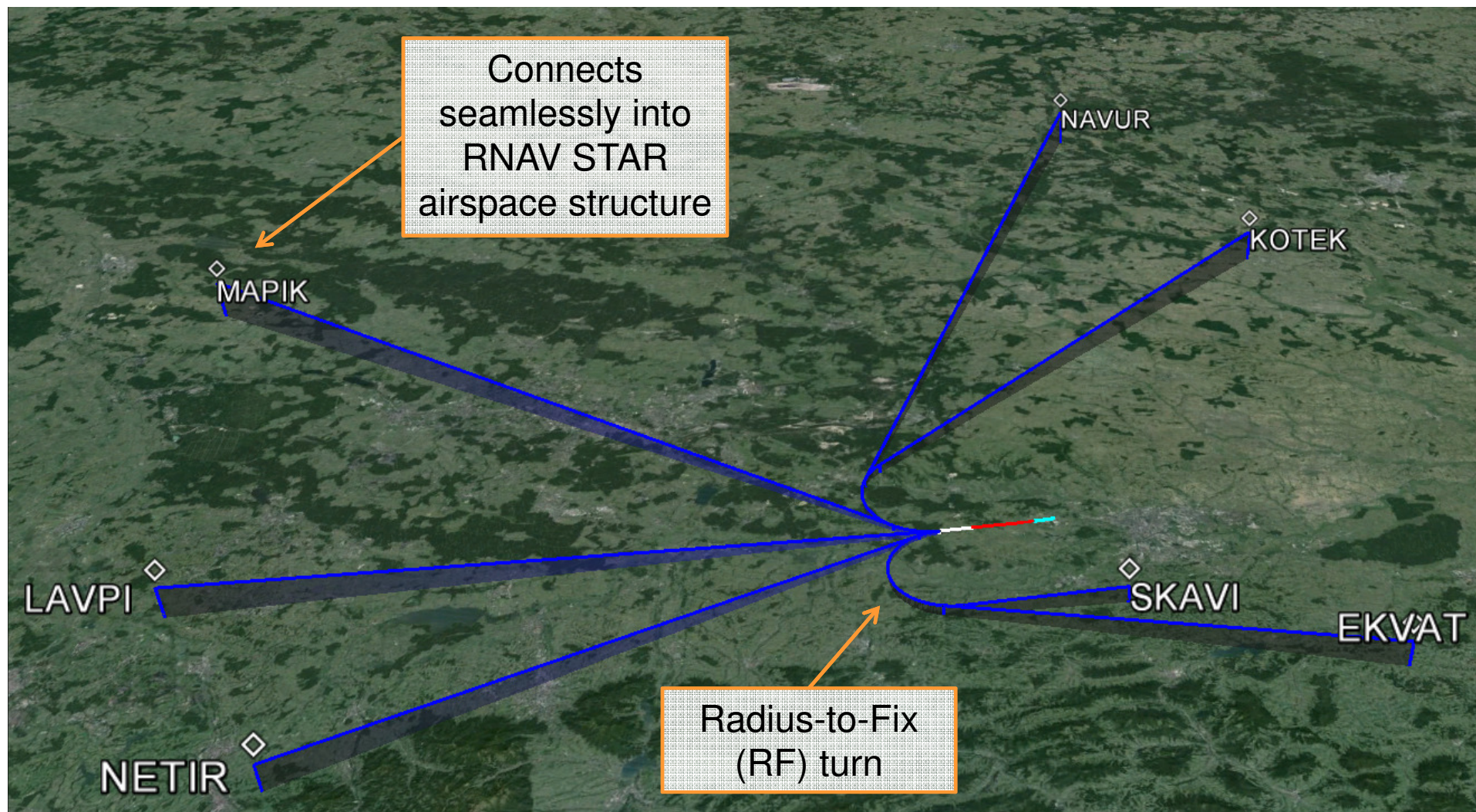
EPKK (KRK) Concept GLS 25



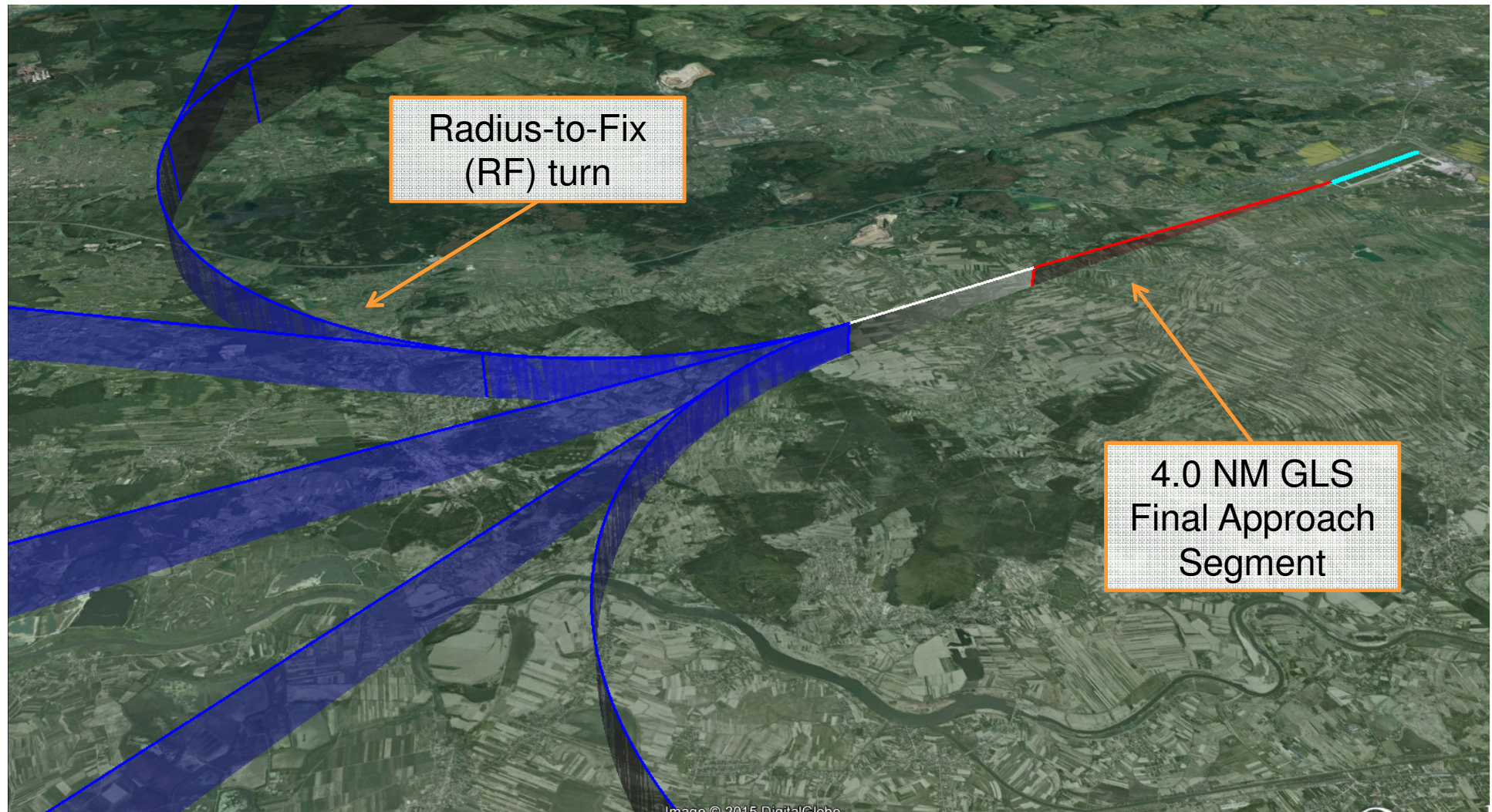
EPKK (KRK) Concept GLS 25



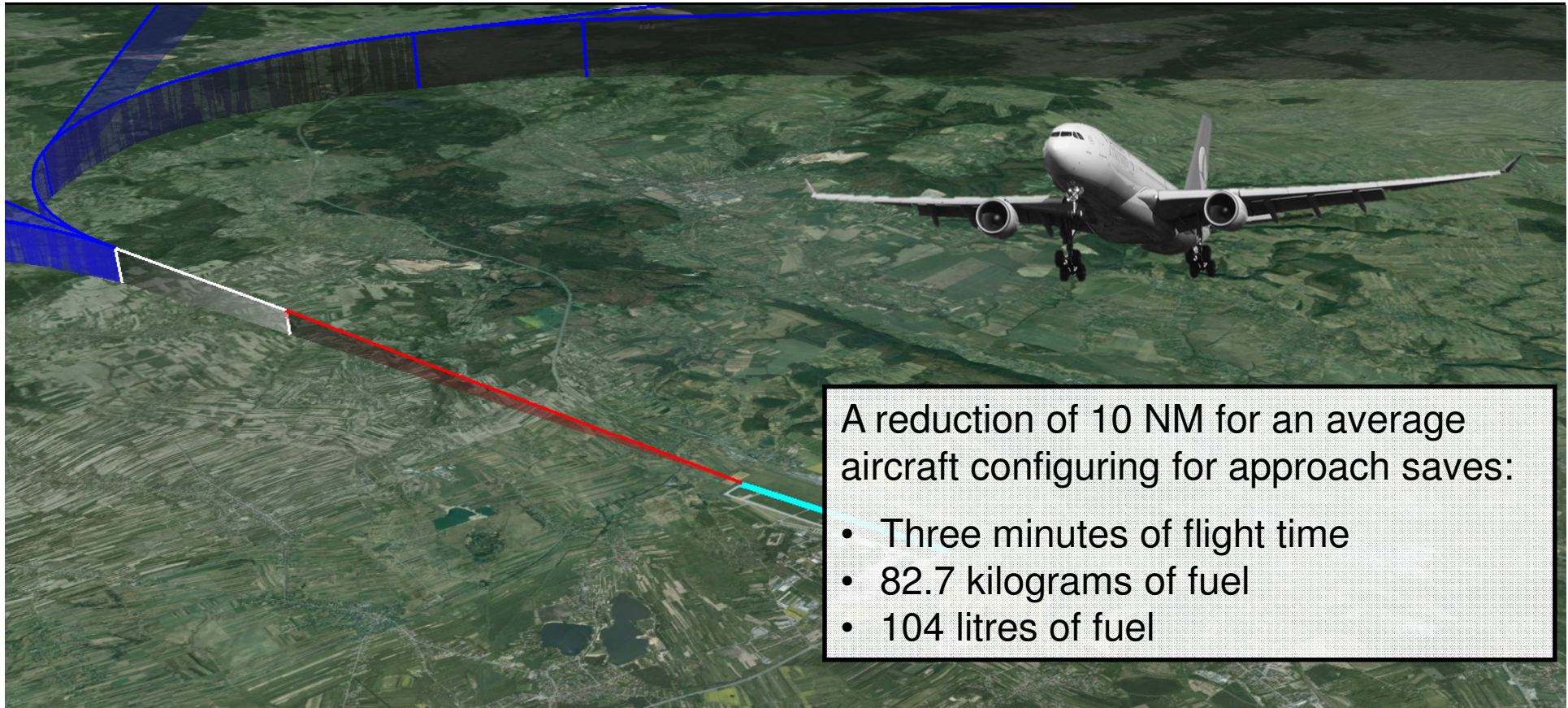
EPKK (KRK) Concept GLS 07



EPKK (KRK) Concept GLS 07



PBN Fuel Savings

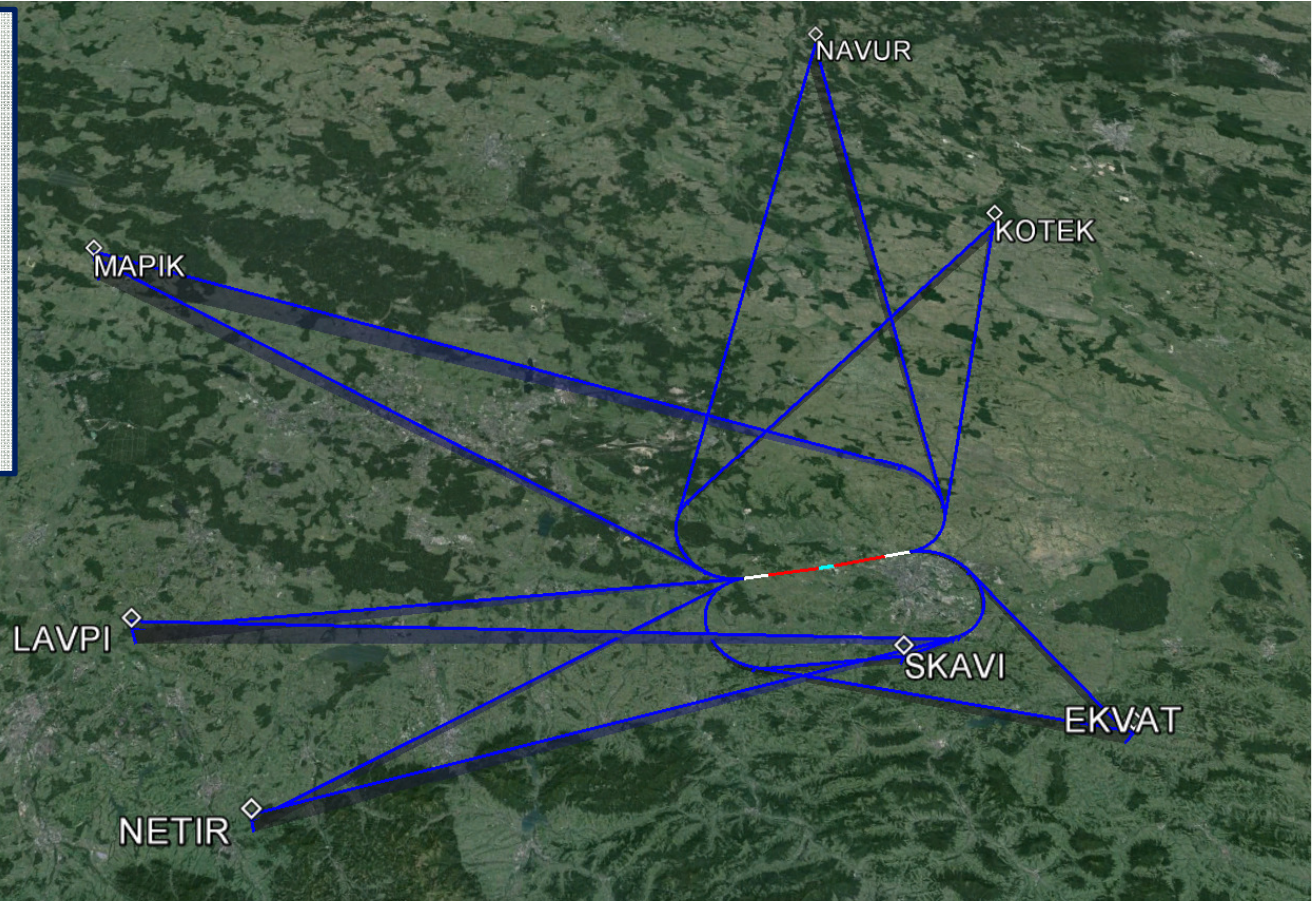


RNAV (RNP) can curve the final approach to begin on the downwind leg and provide lateral and vertical guidance to the runway end or to a GLS intercept.

- A GNSS approach with a 4 NM final would **save 10.6 NM per flight.**

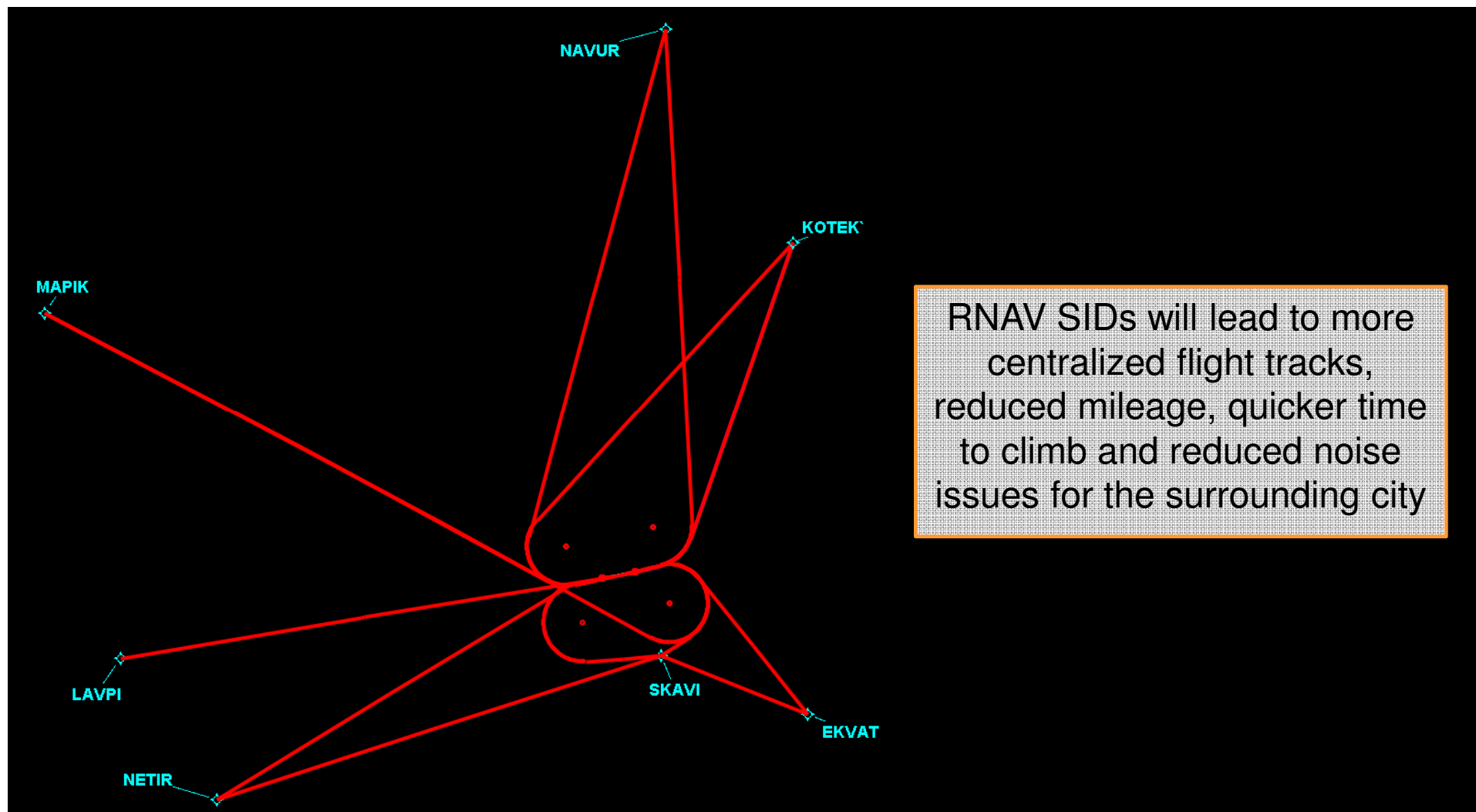
EPKK (KRK) Concept GLS 07/25

- Airspace Challenged Environment
- SmartPath Precision Final Landing minimums
- Coupled Automatic Landing



GBAS/GLS procedure will connect seamlessly into existing airspace structure using a Continuous Descent Approach STAR to provide a precision straight-in approach.

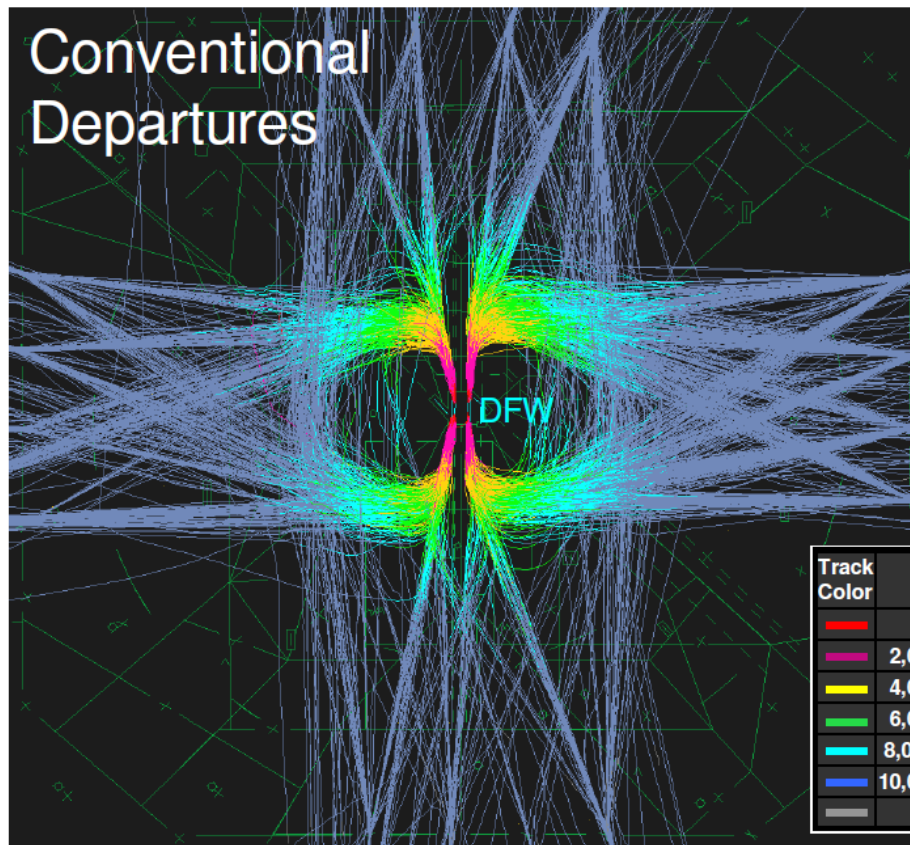
EPKK (KRK) Concept RNAV SID



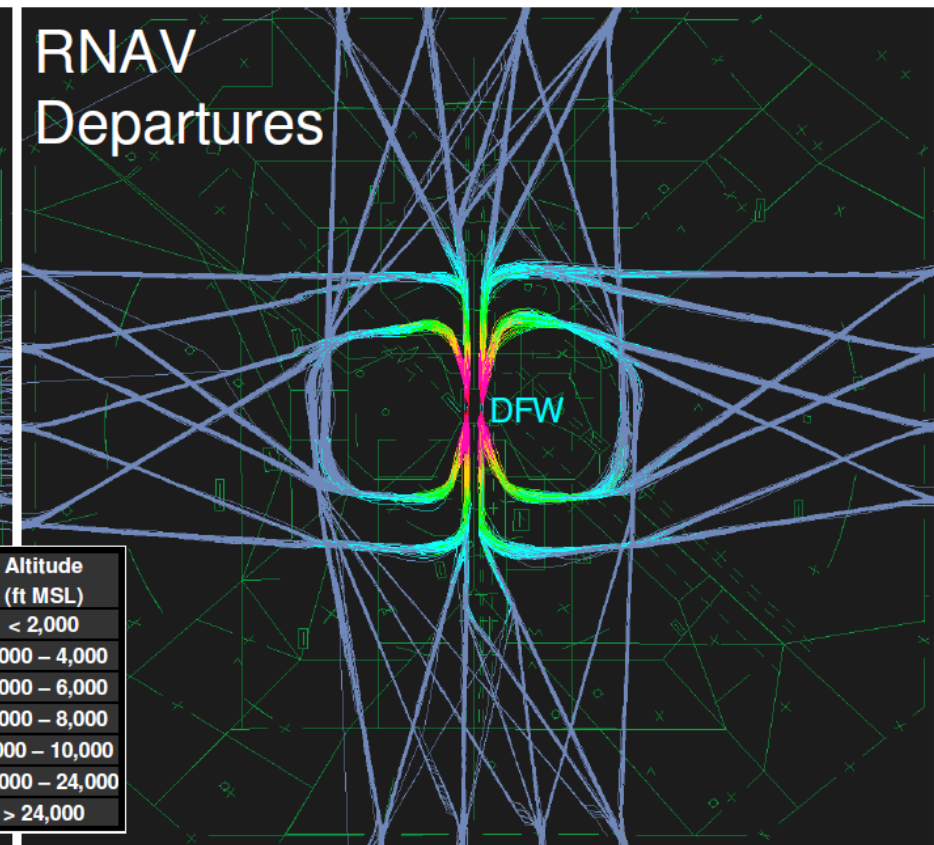
EPKK (KRK) Concept RNAV SID

Dallas/Fort Worth replaced conventional ground based departures with RNAV based departures and increased the efficiency of their airspace.

Conventional Departures

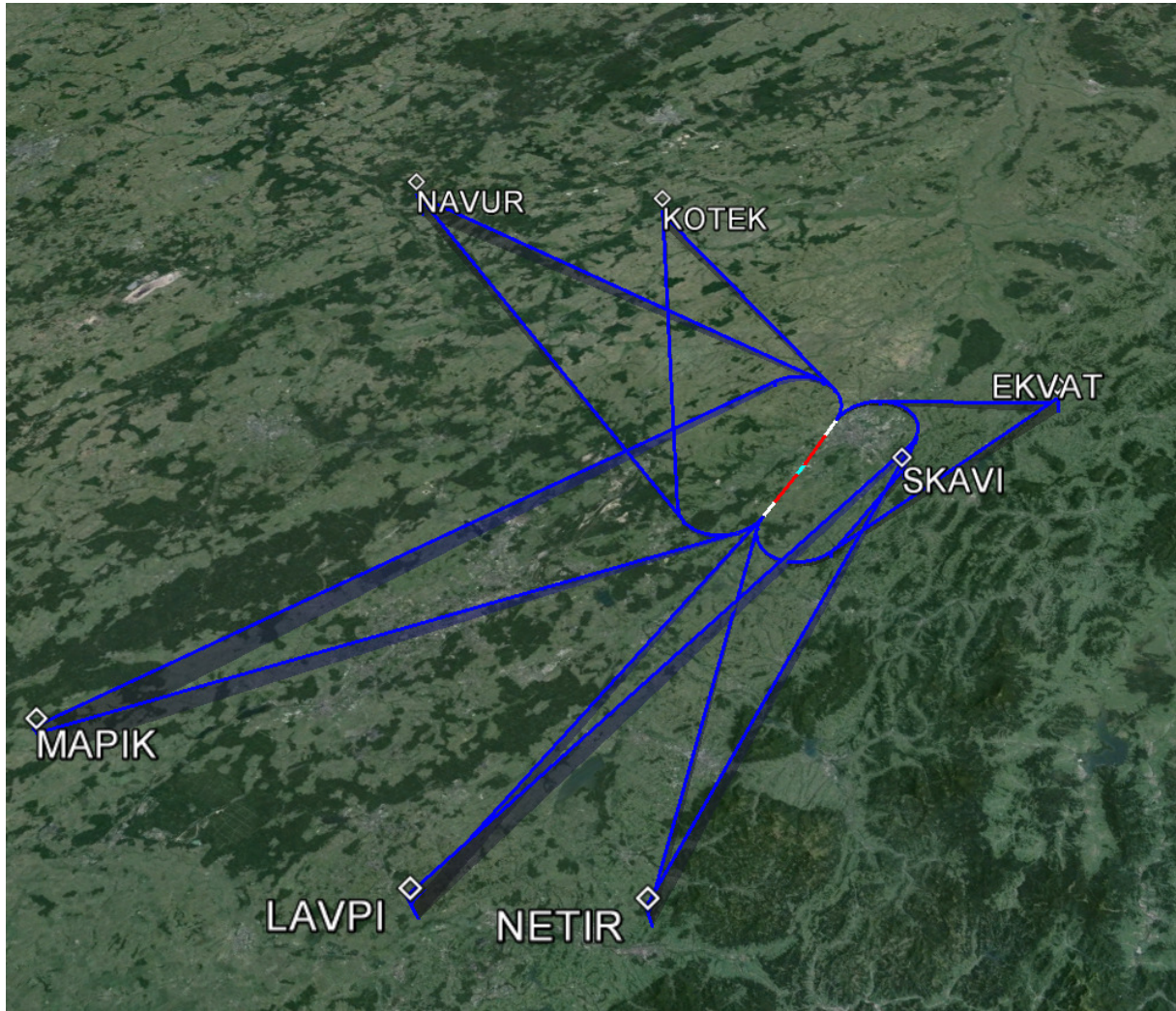


RNAV Departures



Track Color	Altitude (ft MSL)
Red	< 2,000
Purple	2,000 – 4,000
Yellow	4,000 – 6,000
Green	6,000 – 8,000
Cyan	8,000 – 10,000
Blue	10,000 – 24,000
Grey	> 24,000

EPKK (KRK) Concept Overview



Improved Access to Airports & Airspace

Enabling better access to:

- Terrain challenged airports
- Congested airspace
- Airports in the vicinity of restricted airspace

Efficiency of Operations

- Time and fuel savings
- Shorter, more efficient routes
- Improved noise footprint

Stabilized Approach

- Defined lateral and vertical flight paths
- Enhanced situational awareness
- Guided missed approach procedures