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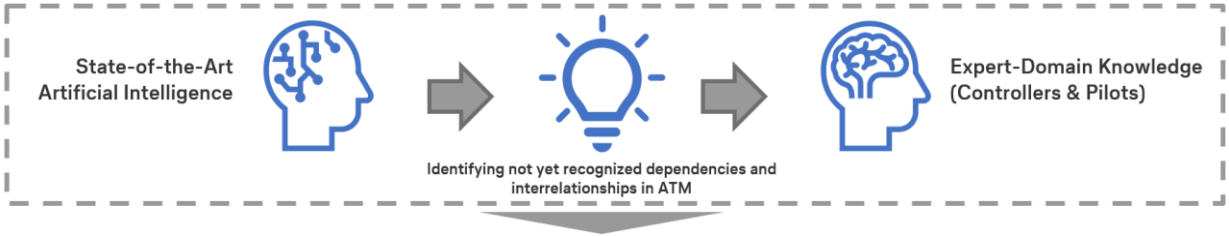
Optimized Vertical Flight Profiles – a Key to Greener Skies

FABEC VFE Workshop

07.12.2021

Lufthansa Group

High Potential: improved vertical flight efficiency contributes to green deal targets – three levers to go for it

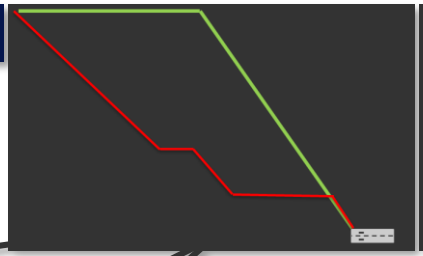


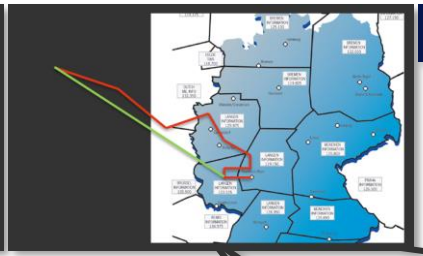
Vertical Optimization

Per 5 NM later descent:

4800t CO2*

1500 t Fuel*





Lateral Optimization

Per 1 NM shortcut:

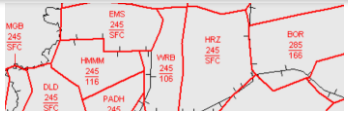
3500 t CO2*

1100 t Fuel*

1.) Operational Concepts

2.) Navigational Procedures

3.) Sector Geometries



* typical values, example Frankfurt for Lufthansa

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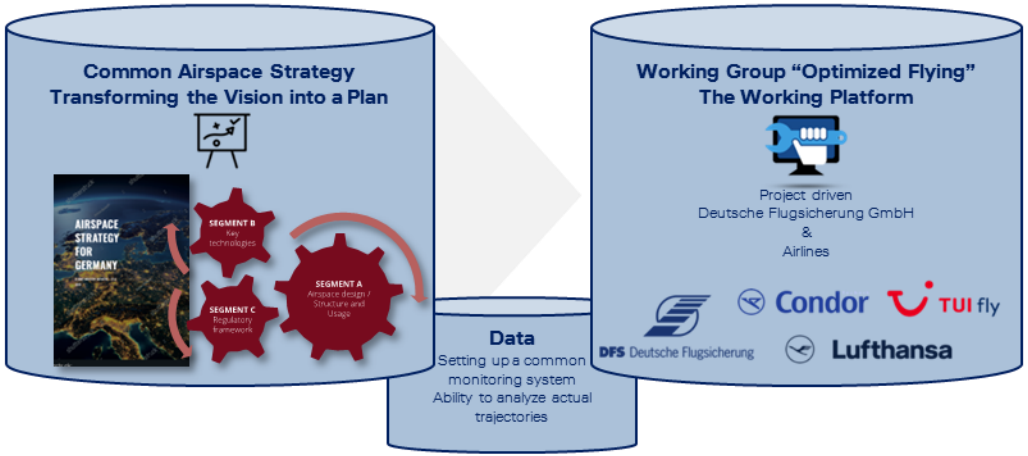
Essential conclusion: Optimizing existing structures, such as deployment of vertical flight efficiency initiatives, requires real collaboration

Setting up the foundation for a change ....



Transform individual efforts into a systematic approach
Understand optimization as common task
Integrate perspectives
Respect that it is all about people

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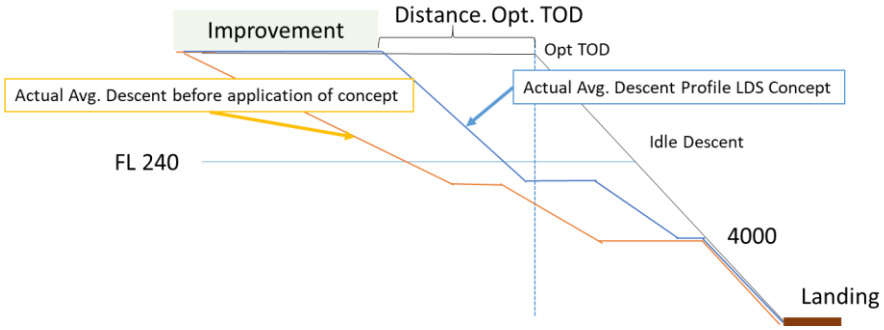
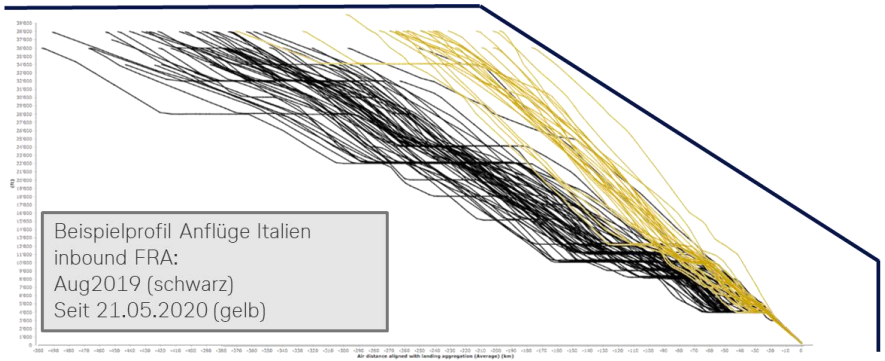
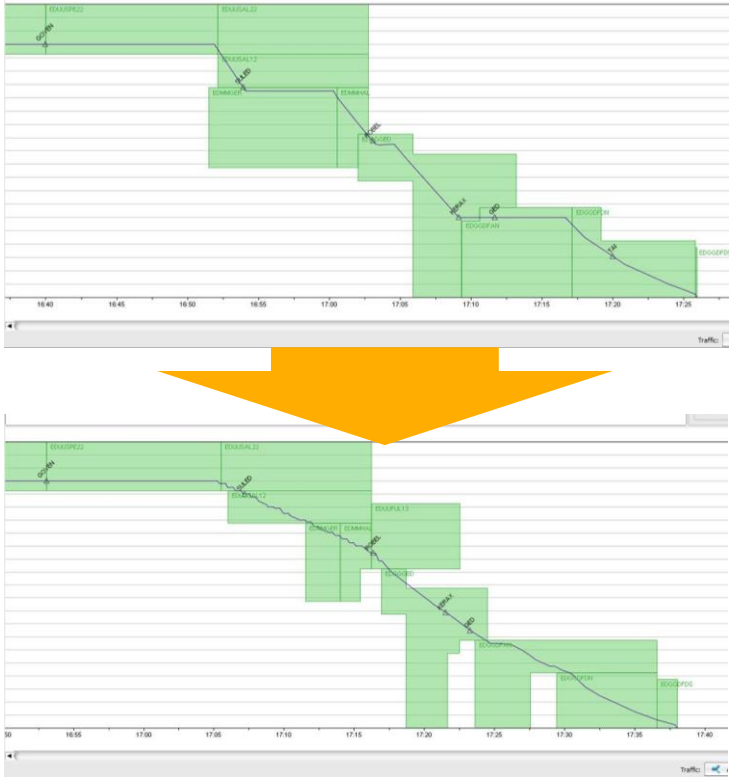
Examples:

a) Low Demand Season Concept
b) HTO: From Cruise level to FL110
c) From FL110 to TD: RNP-Y

(a) Low Demand Effects







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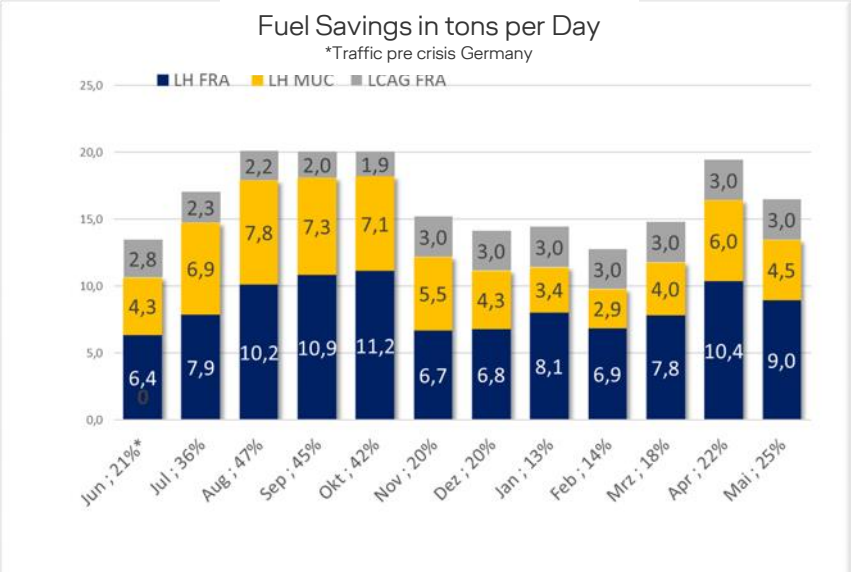
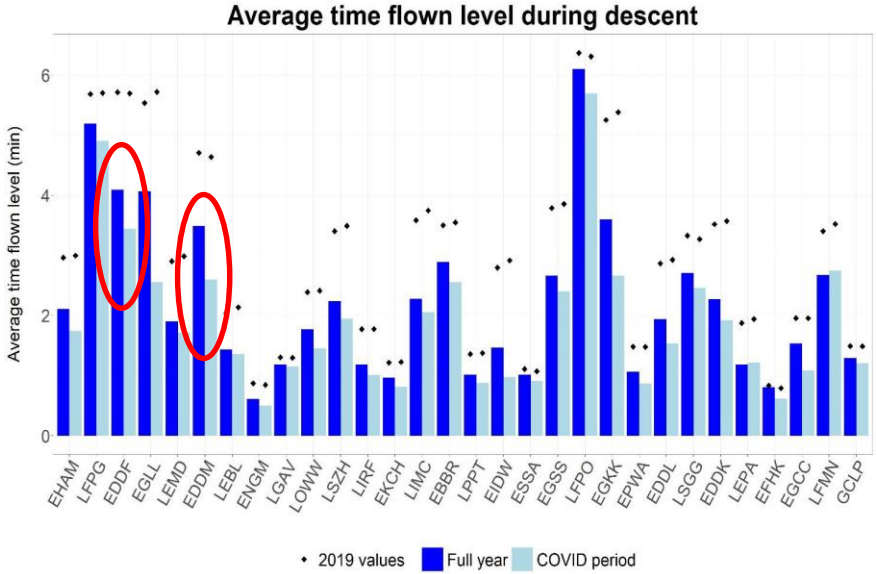
(a) Low Demand Savings





Source: EUROCONTROL Performance Review Commission 2021

Up to 63.000kg CO2 Saving per Day

18,8 Mio kg CO2 Saving per Year

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(b) EDDF EMPAX STAR

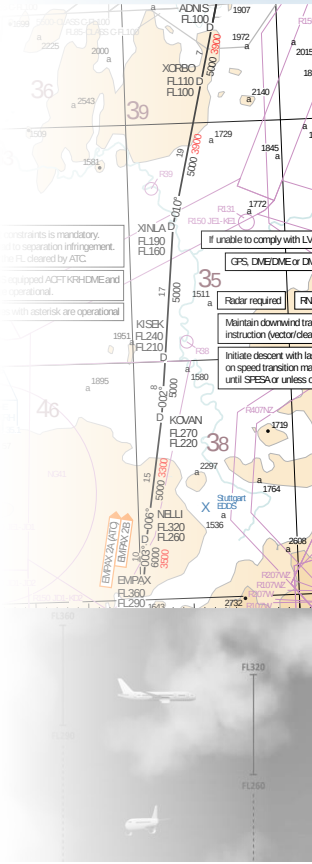
Objectives are

from **Airline perspective**:

- To fly as long as possible at cruising level until reaching top of descent
- to enable a descent with idle power for fuel and CO2 savings

from **ATC perspective:**

- To enable a CDO from cruising level and at the same time to protect other airspaces and crossing airways (or crossing aircraft) by using a procedure
- To reduce the amount of radio telephony – savings of about 50% to 70 % possible – to increase the sector capacity



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(b) EDDF EMPAX STAR Savings

EDDF EMPAX3W STAR

Fleet	#FLights HTO	avg LW HTO	NM EMPAX-FRA Approach HTO	Fuel EMPAX-FRA Approach HTO	NM in FRA Approach HTO	# Flights non-HTO	Avg LW non-HTO	NM EMPAX-FRA Approach non-HTO	Fuel EMPAX-FRA Approach non-HTO	NM in FRA Approach non-HTO	Fuel Empax-Landing HTO	Fuel EMPAX-Landing non-HTO	Fuel EMPAX-14000ft HTO	Fuel EMPAX-14000ft non-HTO	NM 150NM circle - FRA Approach HTO	NM 150NM circle - FRA Approach non-HTO
319	326	53'792	73	189	102	2'202	54'233	74	257	105	573	621	149	212	129	131
320	178	57'783	73	181	103	1'506	58'712	74	265	104	582	634	150	217	130	132
321	453	68'607	73	184	104	3'633	69'383	74	246	104	635	672	144	205	132	132
32A	332	57'949	73	191	102	2'399	59'054	74	244	104	569	[illegible]	146	206	130	131
32M	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
32N	93	58'820	73	160	103	1'320	60'142	74	222	105	[illegible]	537	122	180	131	131
32Q	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
32V	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	[illegible]	n/a	n/a	n/a	n/a	n/a	n/a
333	16	158'131	73	359	90	468	161'892	74	309	[illegible]	1'023	1'092	258	268	127	129
343	1	166'413	72	307	132	129	175'726	73	[illegible]	129	1'655	1'413	204	326	127	129
346	0	n/a	n/a	n/a	n/a	2	212'755	n/a	[illegible]	n/a	n/a	1'367	n/a	307	n/a	n/a
359	n/a	n/a	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
388	n/a	n/a	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
733	n/a	n/a	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
735	n/a	n/a	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
744	13	249'450	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	74	586	100	1'791	1'846	326	467	129	132
74H	46	296'175	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	73	513	111	2'085	2'083	357	437	130	131
(unknown)	11	61'452	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	73	220	109	557	639	140	188	132	131

122	180
n/a	n/a
n/a	n/a
258	268
204	326
n/a	307
n/a	n/a

- A32X class apprx. **60kg fuel** saving per flown EMPAX STAR

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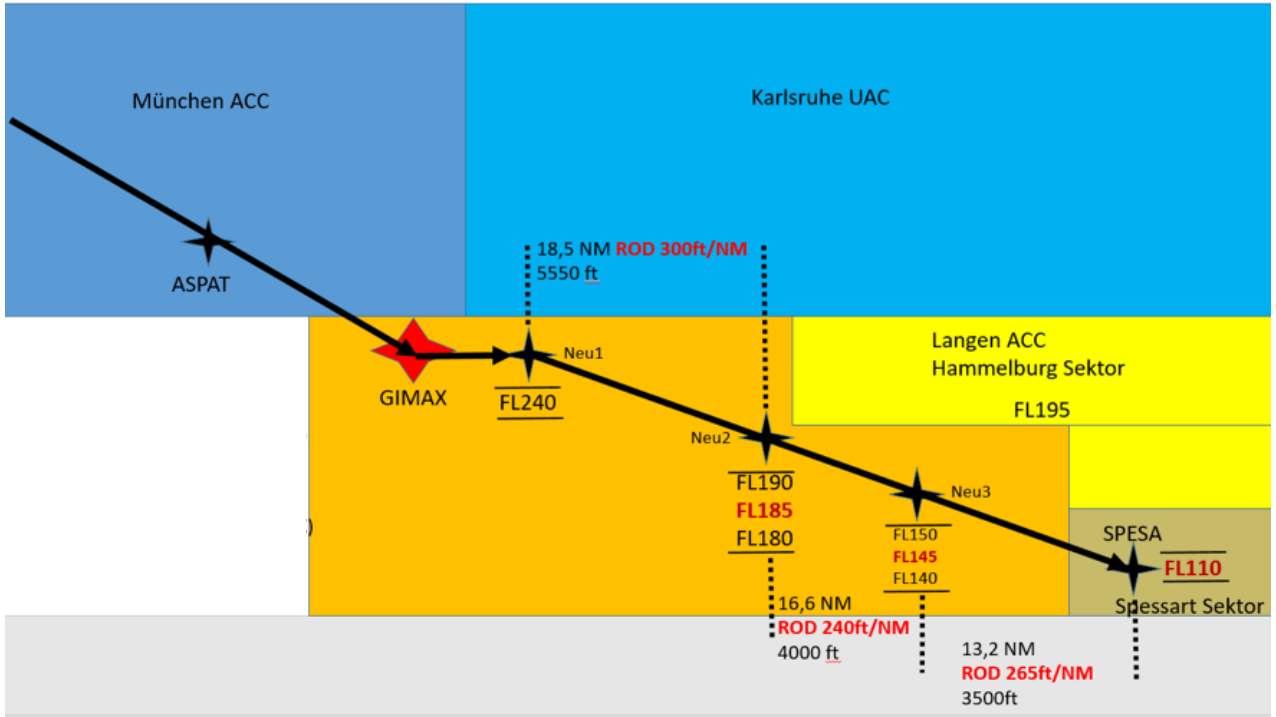
(b) EDDF FAWUR STAR



- Enabling a procedural described CDO while not changing airspace geometry
- Airspace geometry and handover policies limit the CDO procedure below FL240

Is Airspace Geometry really "untouchable"?

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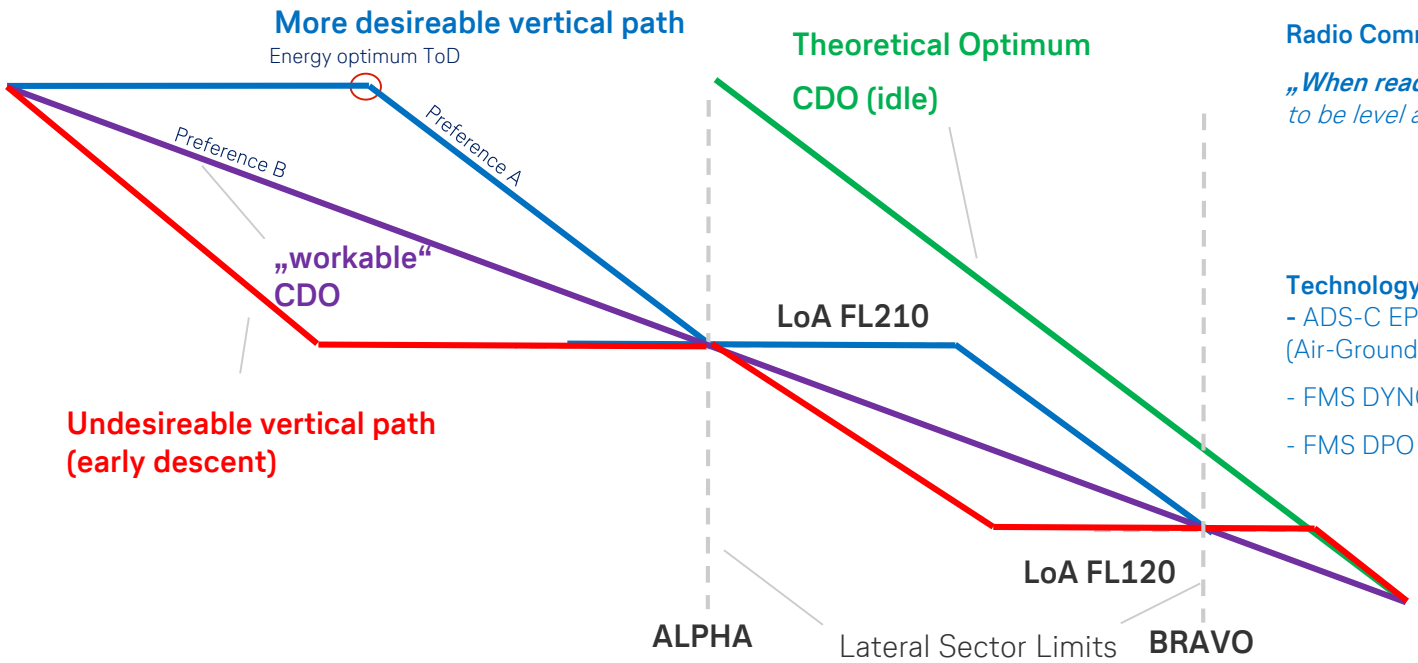
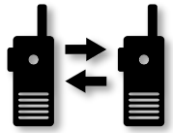
(b) Challenge of varying A/C Performance: Stay as high as possible as long as possible!

May radio communication or communication technology help to get there?



Radio Communication:

„When ready, *descend FL 210 to be level at ALPHA“*



Technology for Performance Prediction:

- ADS-C EPP Function (Air-Ground Com)
- FMS DYNCAT
- FMS DPO Function

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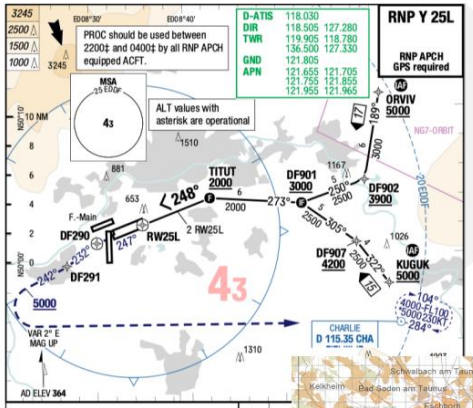
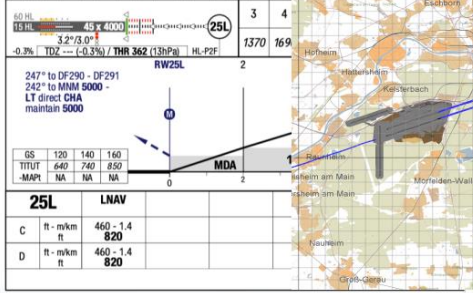
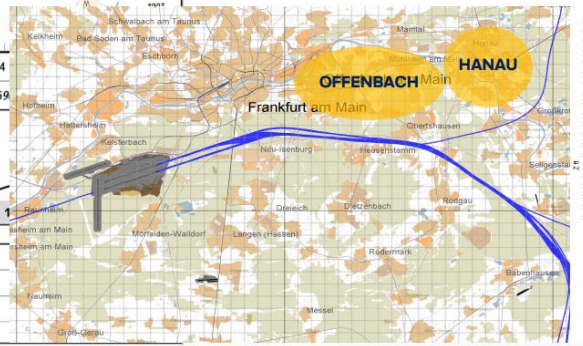
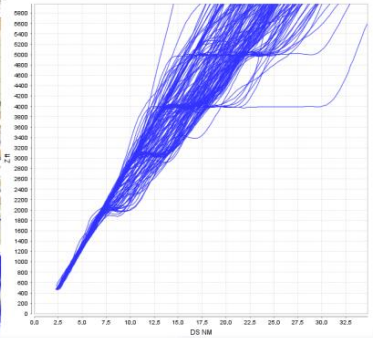
(c) EDDF RNPY – A WIN-WIN for Efficiency and Noise

A **collaborative** project of DFS, Lufthansa Group and FRAPORT









MAR-OCT 2021: 2100 RNP Y flown
iso
350.000kg CO2 Saving

Within 1hour 22:00LT-23:00LT
- 7800 less highly annoyed people
- 23000 less within 43dB LaEQ contour

Optimized Profiles

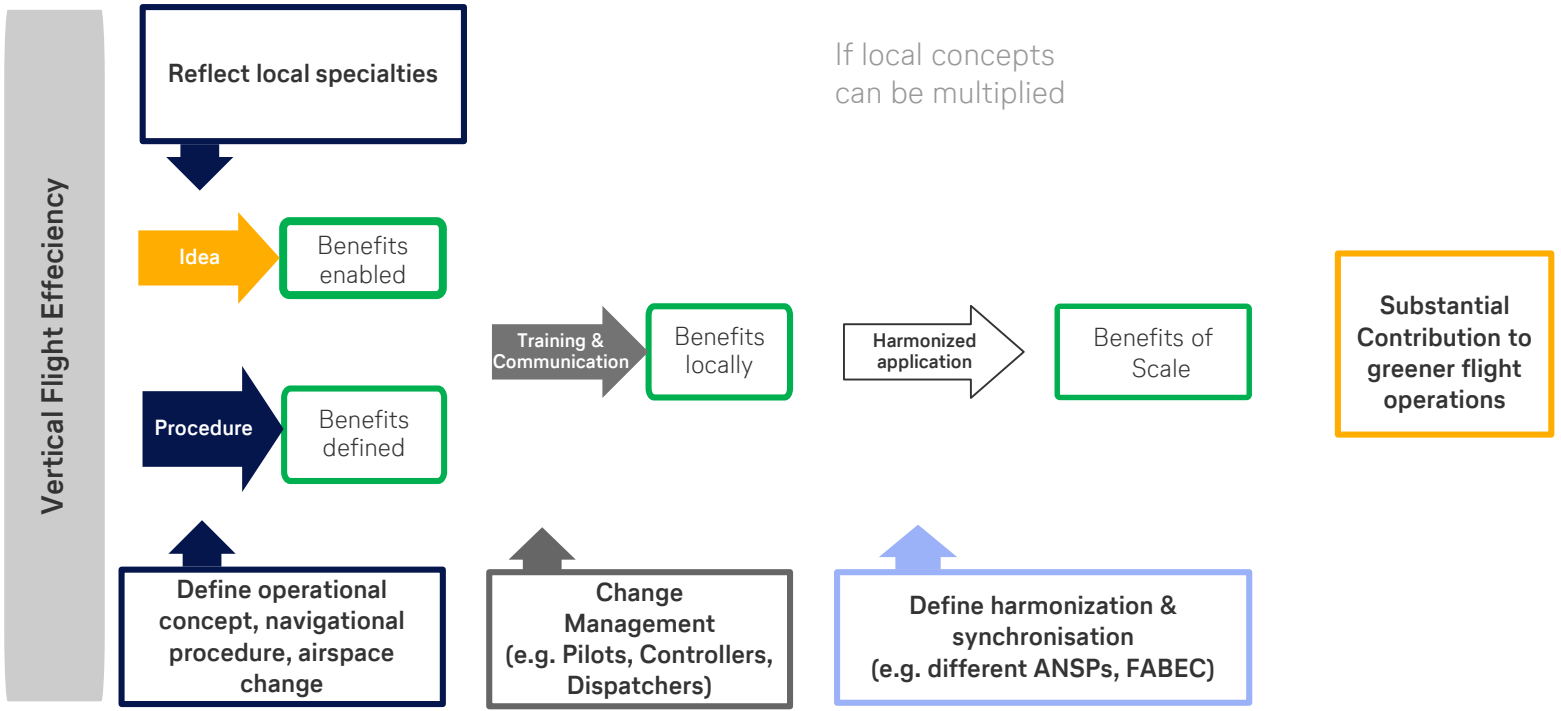
- Standard Navigation Procedure with **defined** track mileage
- **Enabling the Continuous Descend** within TMA
- **Avoiding** long downwind vectors

Challenges in Operation

- changed working method for approach controllers
- new approach coordination and preparation for pilots

Intense communication to pilots and controllers required

Local solutions generating higher vertical flight efficiency may be transferred to serve as a best practice approach – To „sweep in front of one‘s own door“ is key



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Our Questions to the FABEC VFE Community

- Airspace geometry really untouchable?
- Modified cross-sector agreements required?
- Prioritization of high volume traffic streams thinkable to optimize VFE?

- Are ground and cockpit procedures aligned (SOP‘s)?
- Is correct communication indeed seen as enabler for VFE? (R/T, Datalink, Trajectory Intent, ADS-C EPP)

- How much specific training (Pilot/ ATCO individual or combined) is required?
- How much communication (Pilot/ ATCO individual or combined) is required?

Open for your comments and questions!

Thank you very much for your attention!

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