

10:10-10:45 Presentation:

Big hits! Contrail avoidance in the airspace over Denmark

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25-26 March 2025 • Scandic Copenhagen



Julien Lopez

*Head of Green Operations,
Thales*



Anders Næsby

*Lead Product Design,
Air Support A/S*

Big Hits

Contraails avoidance in the airspace
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SESAR CONCERTO : Contrails mitigation over Northern Europe

CONCERTO



Traffic Flow Optimizer based on Total Climate Effect

ATM



ISAVIA
Island



Fintraffic
Finland



Estonia



Norway



Sweden



Ireland



UK



Denmark



Latvia



EUROCONTROL

Industrial

THALES

Airline & Flight Planning

ICELANDAIR



Academics & Met office



DLR



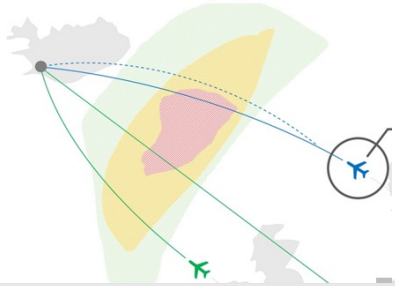
TU Delft



DWD

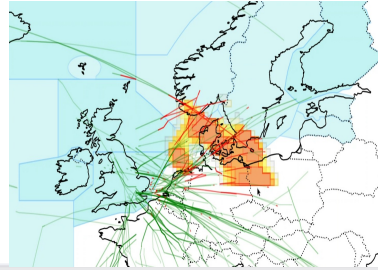


From Operational concept to Experimentation



**Operational
Concept**

2023



**Large scale
simulation**

2024

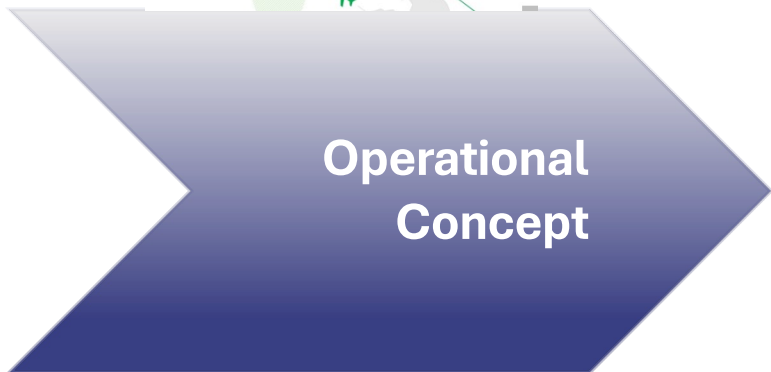
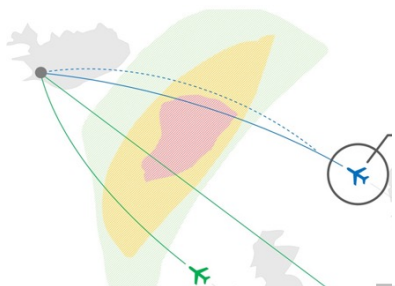


Experimentation

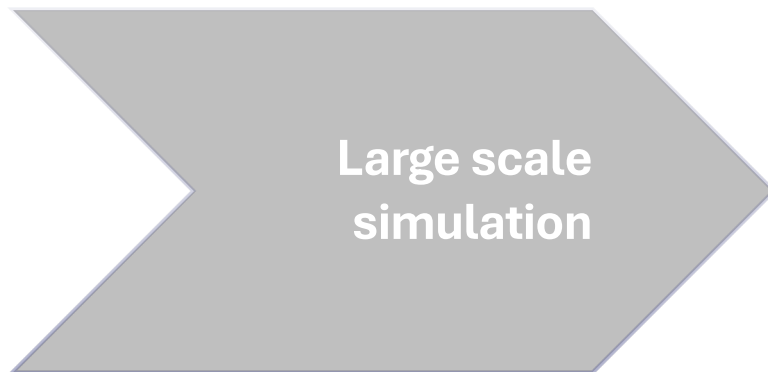
2025

2026

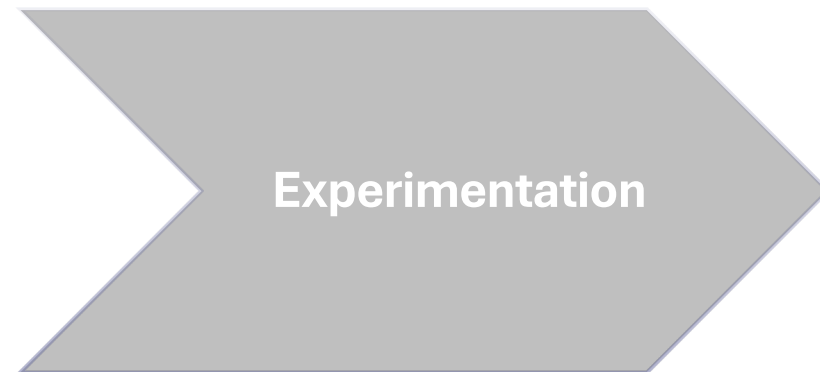
From Operational concept to Experimentation



2023



2024



2025

2026

Optimizing Climate impact vs. Operational acceptability for ATM & airlines

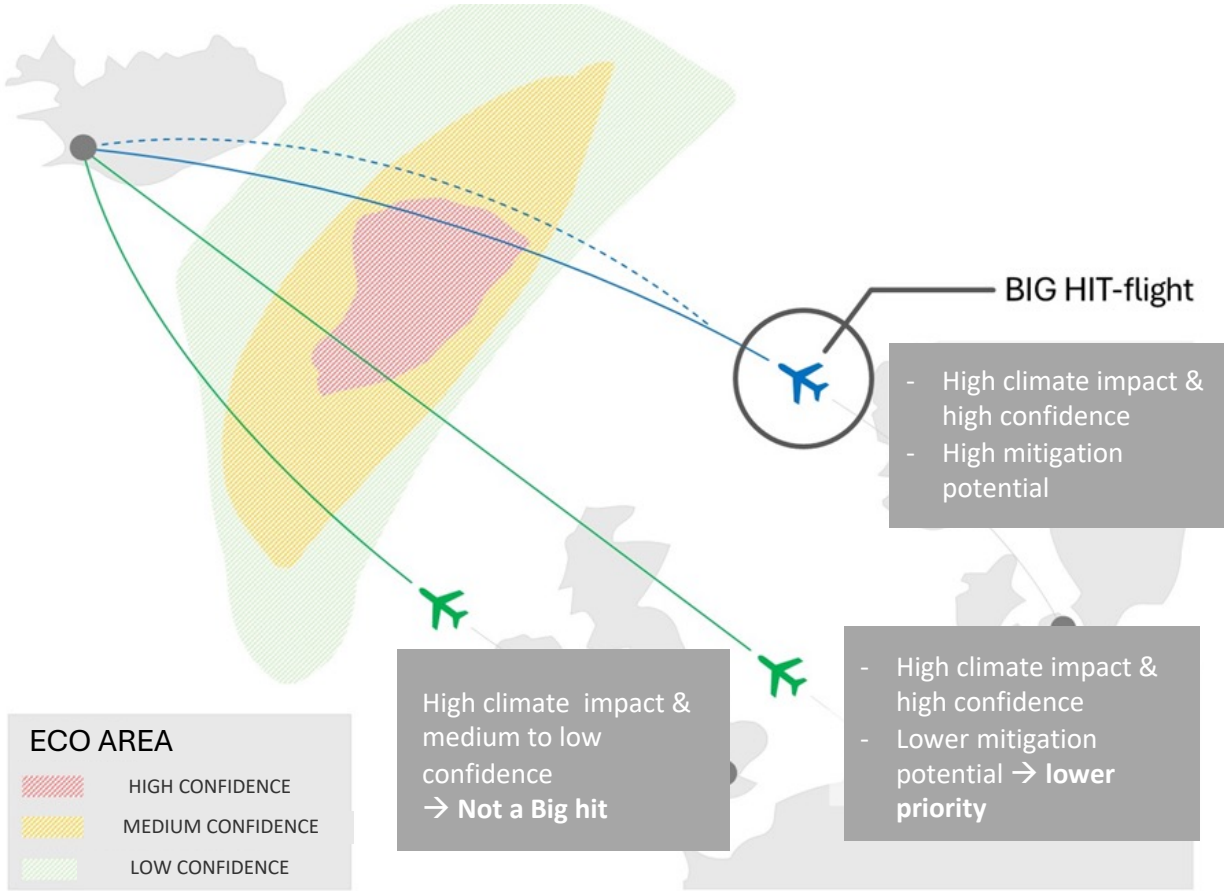
ATM perspectives

- What is the **Air Traffic impact** for the « Big Hit flights » of the day ?
- What is the **acceptable additional complexity**?
- What is the strategy leading to an **optimum at a flow level**?

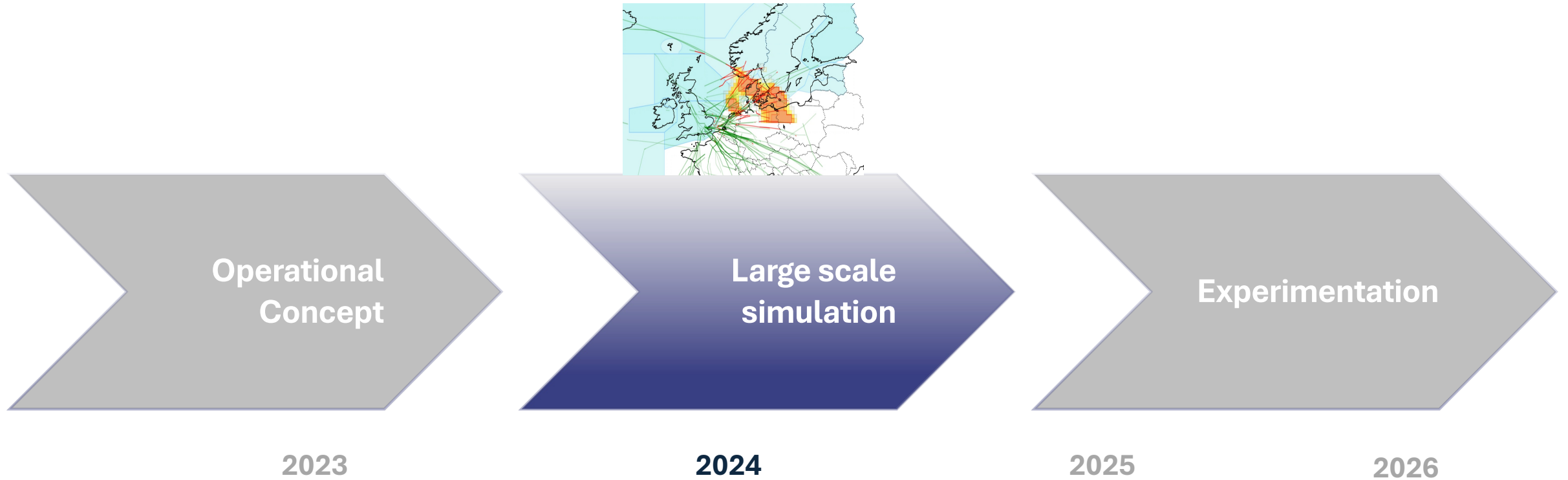


Airlines perspectives

- What is the **acceptable extra-fuel / extra time** ?



From Operational concept to Experimentation



Large-scale simulation



Objectives

- Quantify potential climate impact reduction
- Assess operational acceptability

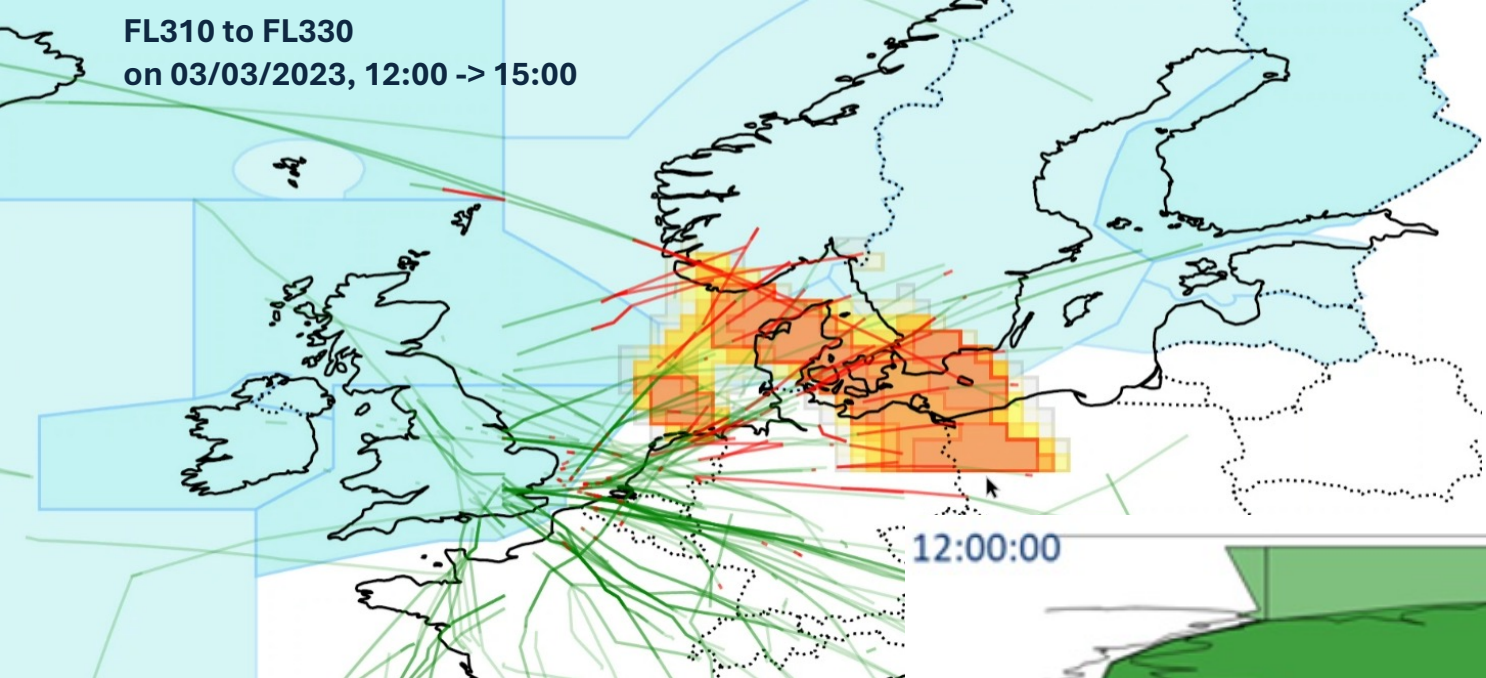
Scope

- 16 representative days of 2023 traffic over Borealis airspace
- ~10,000 flights /day → 160,000+ flights analysed

Managed data

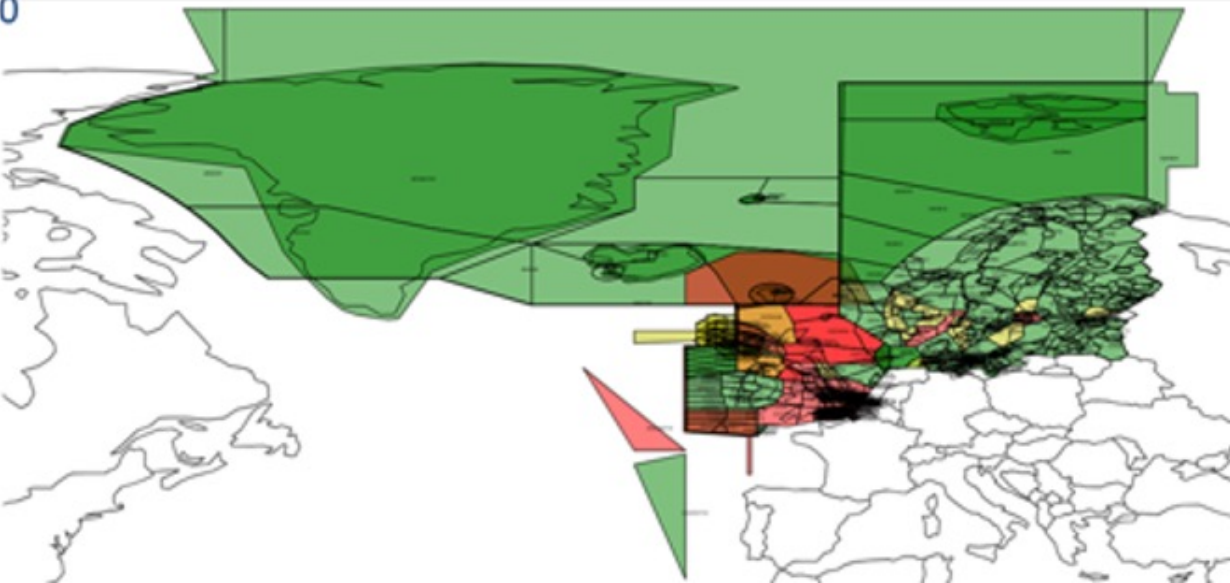
- Flight Plan of all the flights over Borealis on each day
- Weather data (forecast & reanalysis) on each day

Mapping Contrails climate sensitivity with Air traffic complexity



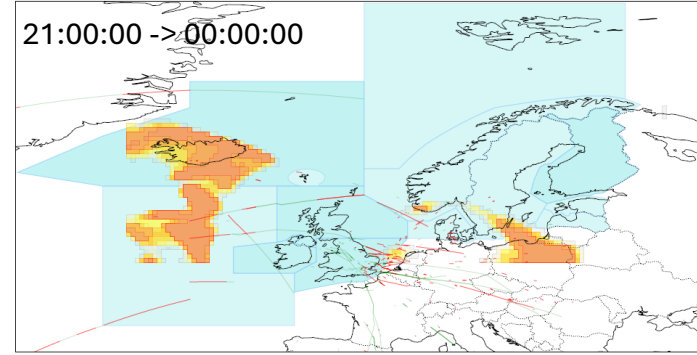
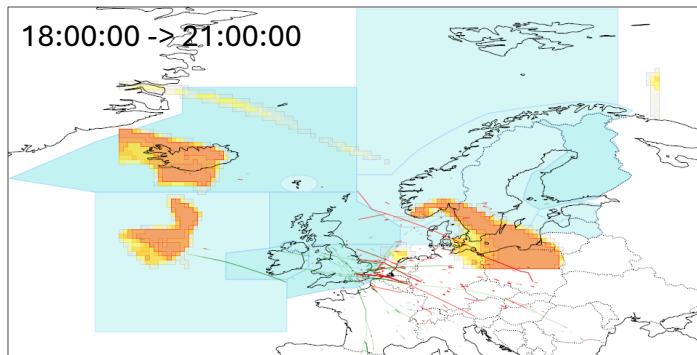
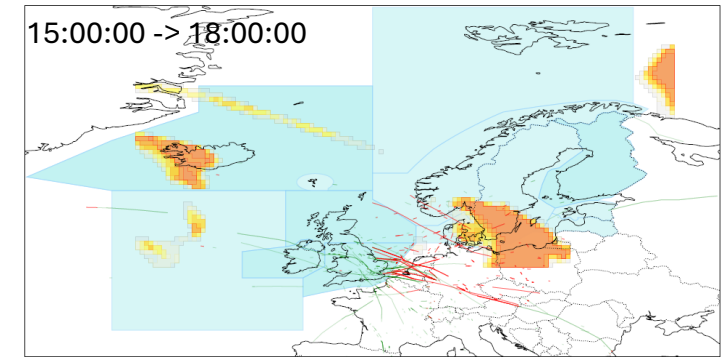
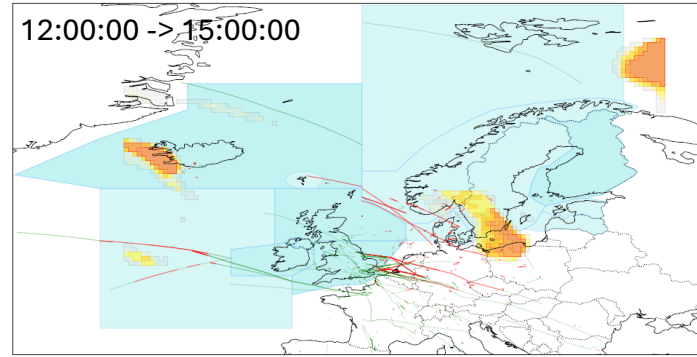
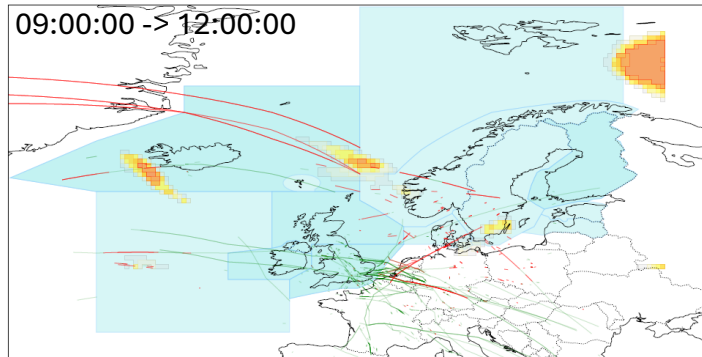
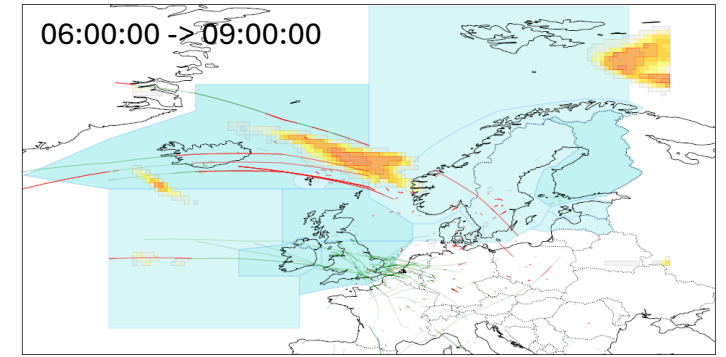
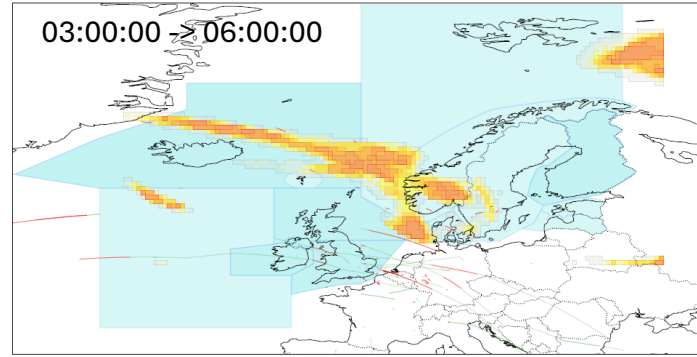
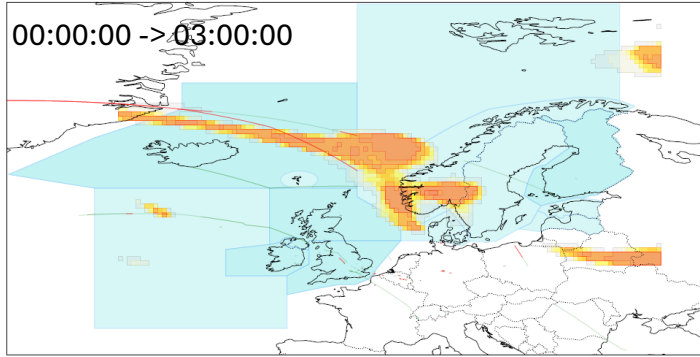
DLR
Climate sensitive area computation
based on total non-CO2 effects
using GWP100 metric

Thales
Traffic complexity computation
based on Air Traffic Control data
(traffic prediction, sector plan...)



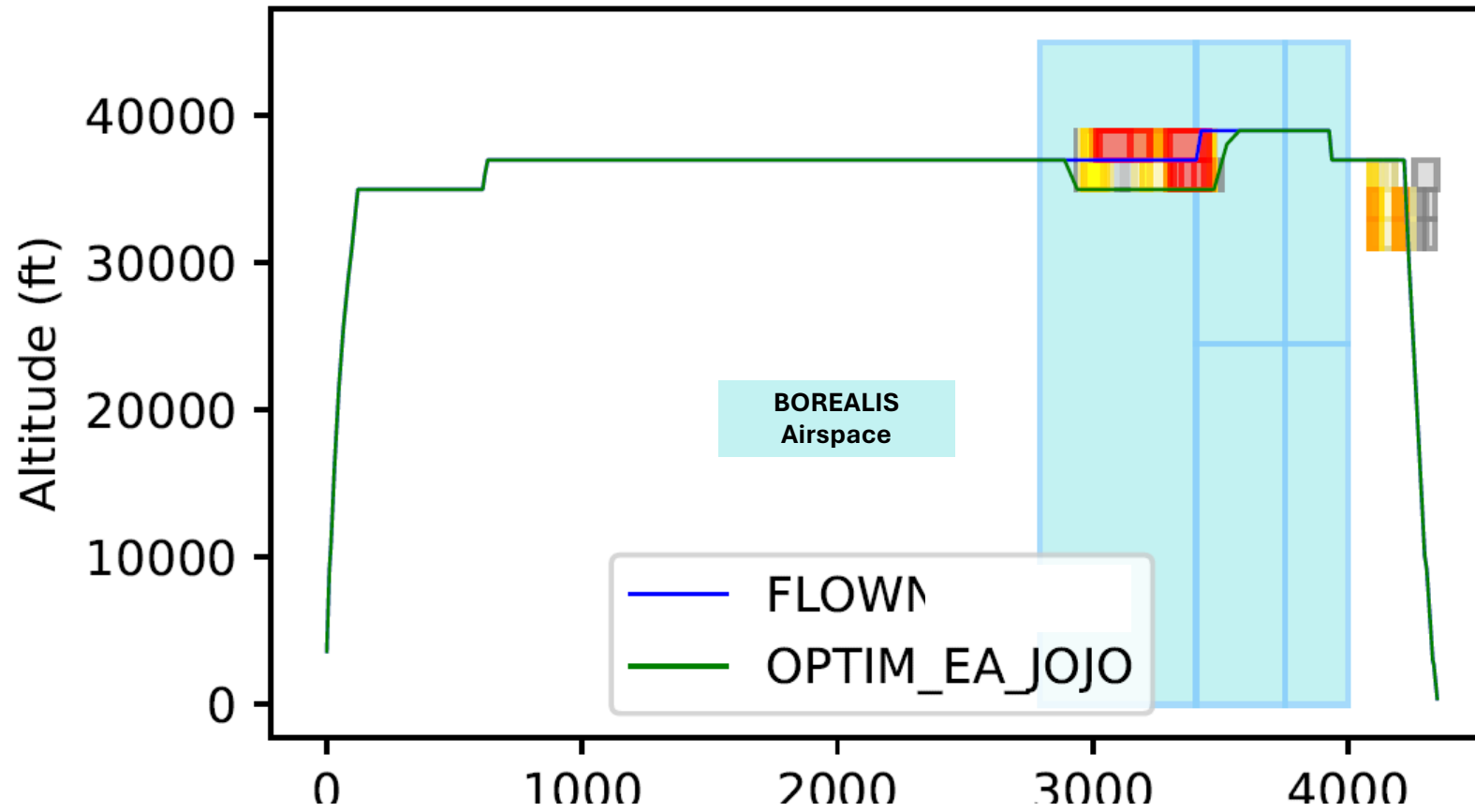
Time evolution of climate sensitive areas

FL310 to FL330 on 03/03/2023



Climate sensitive areas are moving along the days, spanning large bands of Flight Levels and wide areas

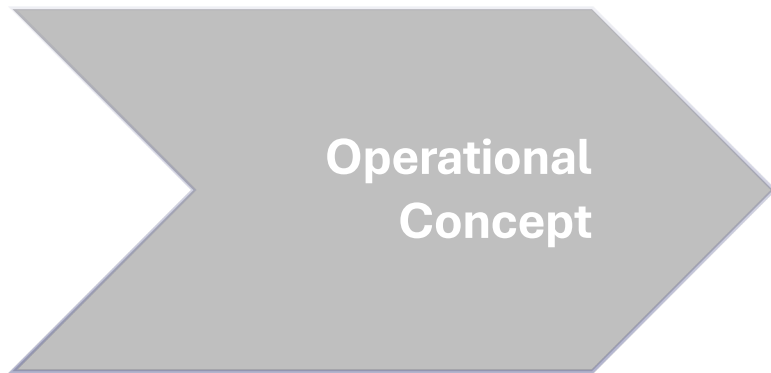
A typical contrail avoidance trajectory



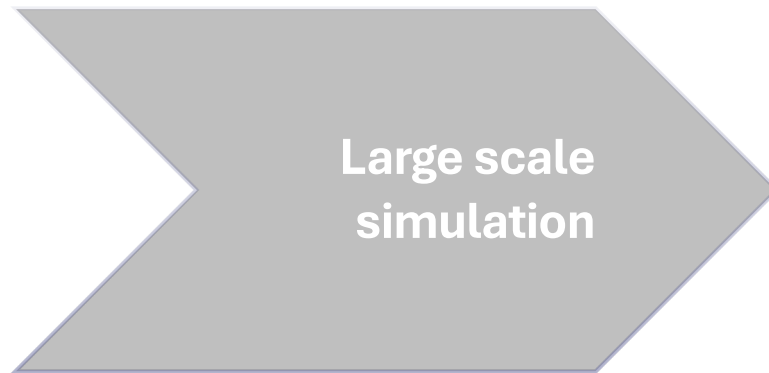
Simulation results

	Scenario 1 Max avoidance	Scenario 2 Max avoidance TOP 100	Scenario 3 Extra fuel < 2%	Scenario 4 Extra fuel < 2% TOP100
Impacted flights	1243 flights / day 13,8%	100 flights / day 1,1%	678 flights / day 7,5%	100 flights / day 1,1%
Extra-Fuel	440 tons / day +350 kg / rerouted (+1,31%) +47 kg / flight (+0,355%)	76 tons / day +760 kg / rerouted (+2,82%) +8 kg / flight (+0,062%)	104 tons / day +150 kg / rerouted (+0,57%) +11 kg / flight (+0,084%)	34 tons / day +340 kg / rerouted (+1,27%) +4 kg / flight (+0,028%)
CO2 + Non-CO2 impact (GWP100)	-72000 tons / day -58000 kg / rerouted -7800 kg / flight -25,8% Borealis GWP100	-31700 tons / day -317000 kg / rerouted -3400 kg / flight -11,4% Borealis GWP100	-29700 tons / day -44000 kg / rerouted -3200 kg / flight -10,6% Borealis GWP100	-18500 tons / day -185000 kg / rerouted -2000 kg / flight -6,6% Borealis GWP100

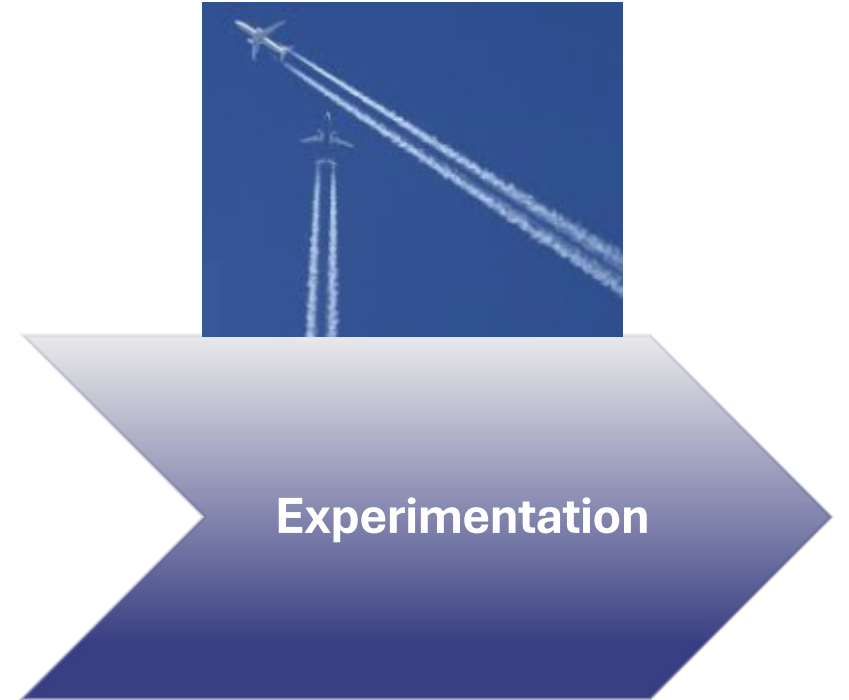
From Operational concept to Experimentation



2023



2024



2025

2026

2 kinds of experimentations



Airline-led contrail avoidance



- Verify proper integration into Airlines operational process
- Shadow mode & actual flights



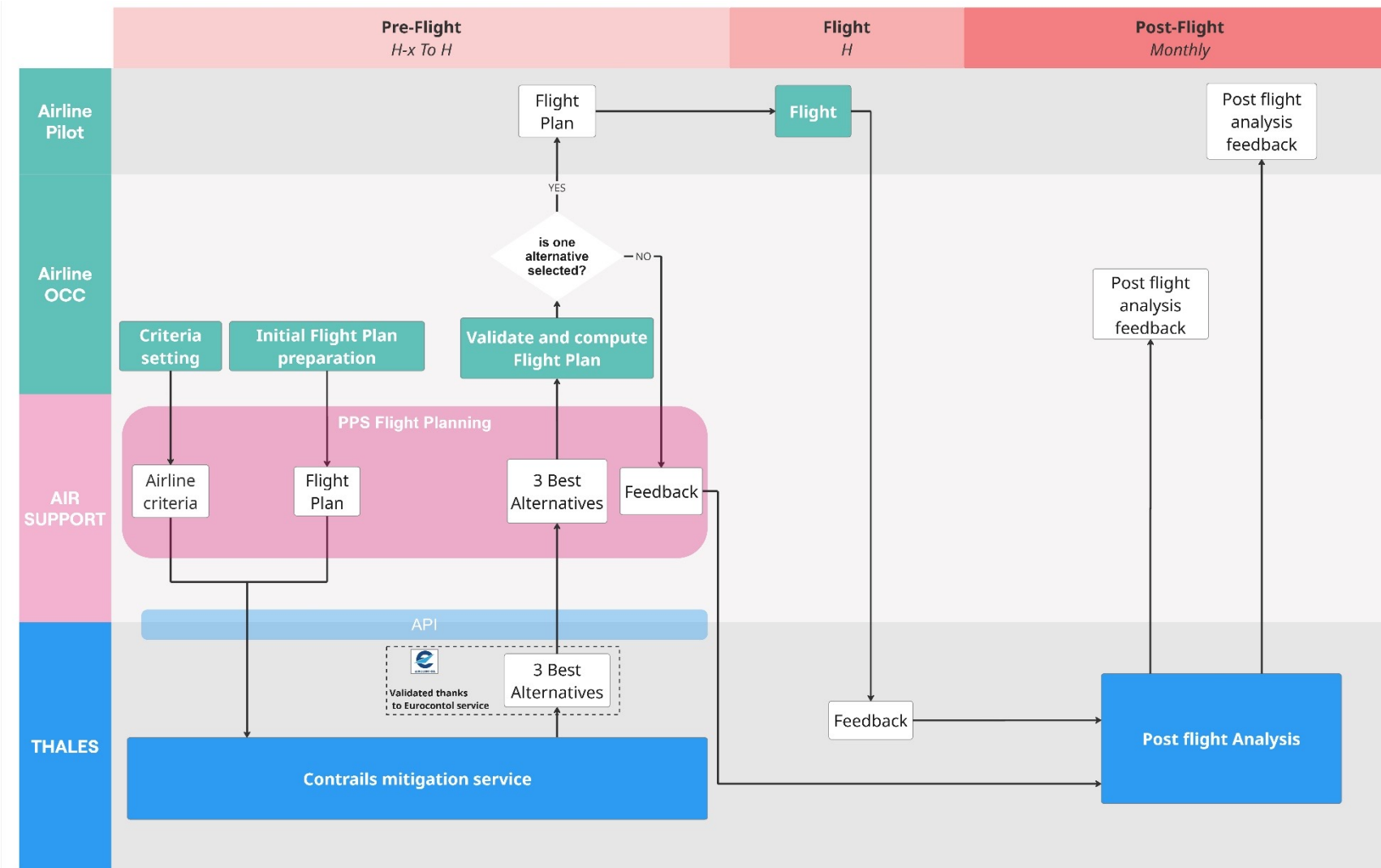
ATM-led contrail avoidance



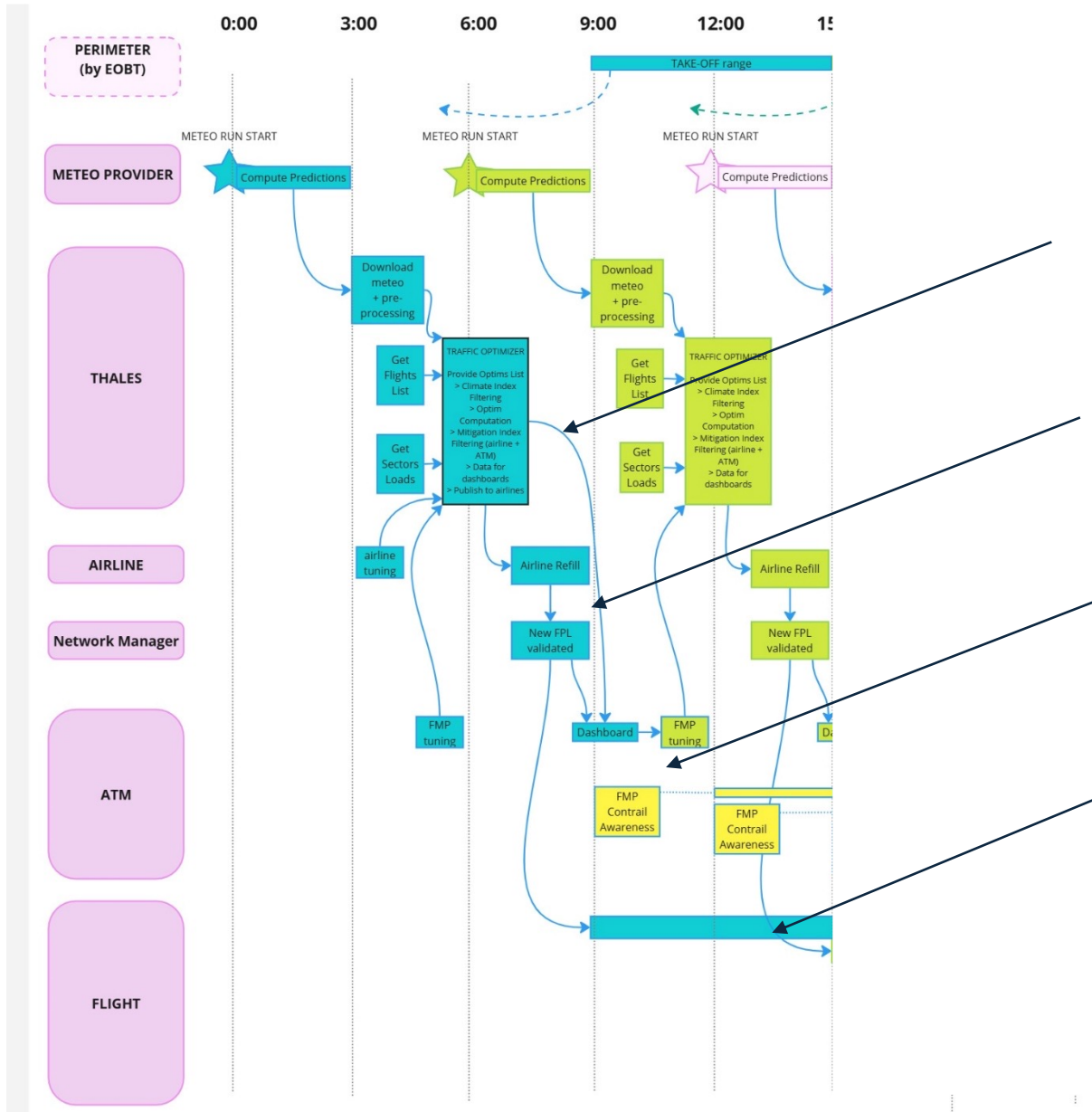
- Verify proper integration into ATM operational process
- Shadow mode & actual flights



Process for airline-led contrail avoidance



Process for ATM-led contrail avoidance



List of Big Hit flights with proposed avoidance, taking into account ATM & airlines strategies

Airlines : Flight Plan refileing

ATM : follow-up & tuning

Actual flights

THALES
Building a future we can all trust

 **AIR SUPPORT**

Thank you

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