

10:40-11:35 Presentation:

Airlines' and partners' experience with contrail mitigation

**COPENHAGEN
CONTRAILS
CONFERENCE**
25-26 March 2025 • Scandic Copenhagen



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Sustainability, TUI Airline*



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CEO, Satavia



OPERATIONAL CONTRAIL MANAGEMENT

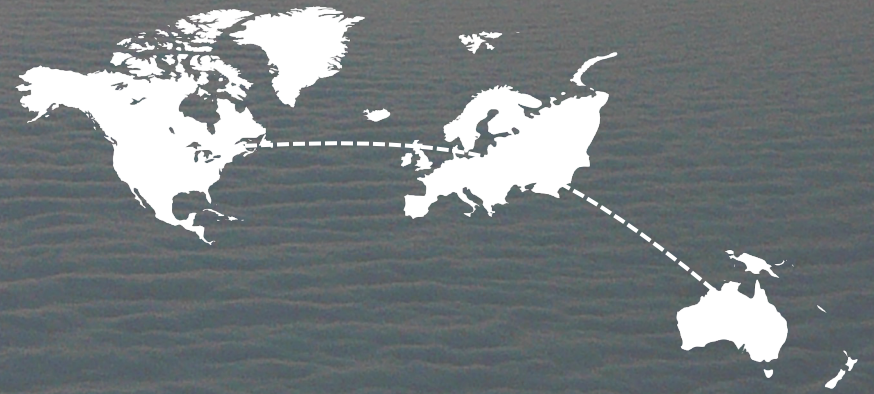
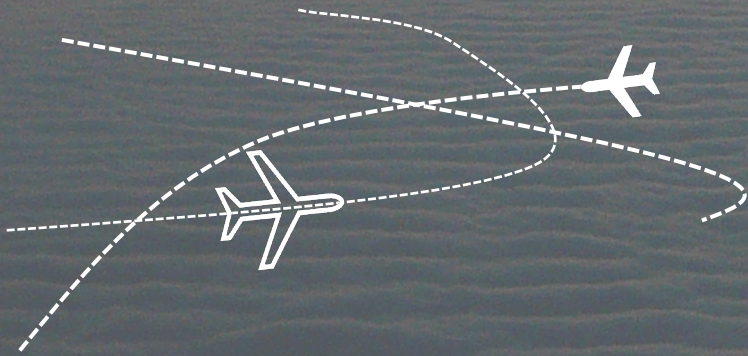
Fast Track to Sustainable Aviation

Alejandra Martin Frias – Head of Sustainability

FL/GHTKEYS
SKYKEYS SPACEKEYS

FL/GHTKEYS
SKYKEYS SPACEKEYS

Who is FL/GHTKEYS



Loretta

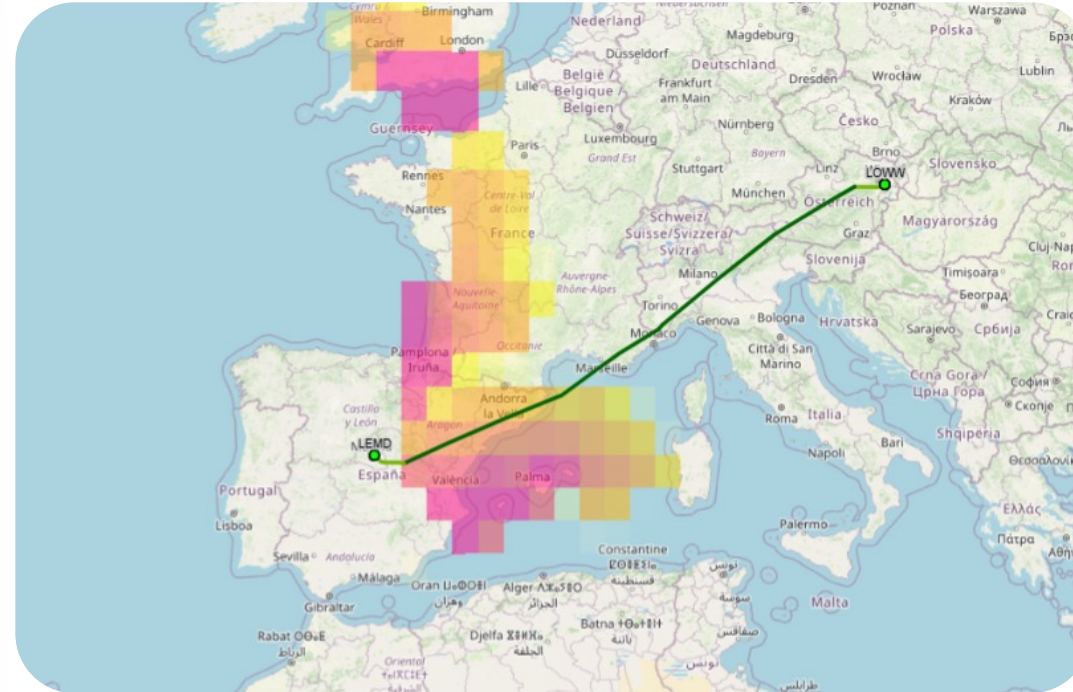
How bad are contrails? A personal perspective

FL/GHTKEYS
SKYKEYS SPACEKEYS



VIE – MAD 3h flight
12 times a year
Mostly, late evening flights

How bad are contrails? A personal perspective



Flight VIE- MAD,
March 20th 19:45
– 20:55

Fuel burn	5830 kg
CO ₂	18364 kg
EF contrail	3.17E13 J
Contrail CO ₂ e,100	8956 kg

Cooperating to succeed

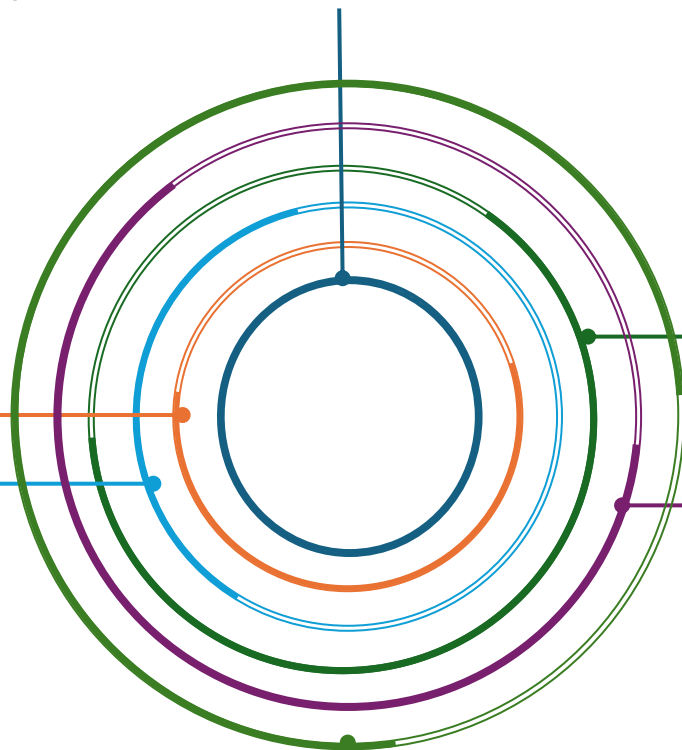
Google



Breakthrough Energy

FL/GHTKEYS
SKYKEYS SPACEKEYS

Imperial College
London



BLUE LINES

MARI



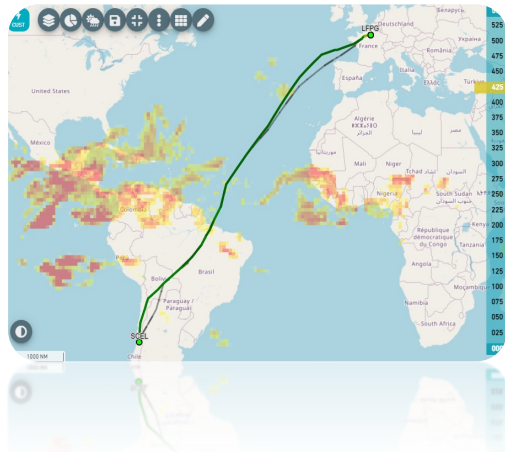
FLIGHTKEYS solution (DEMO on day 2)

FL/GHTKEYS
SKYKEYS SPACEKEYS

Introduction of contrail areas using GRIB data, as a separate weather layer.

Load contrail weather data

01



First round of contrail analysis

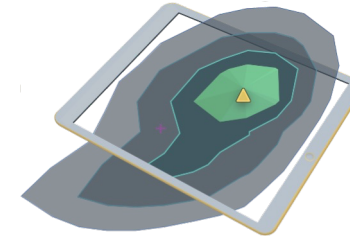
All flights can be analysed to see which ones will generate the most warming.

02

Using a cost-based approach. We set up a price per ton of CO₂e for the optimization.

Pre-tactical avoidance

03



Loretta

Tactical avoidance

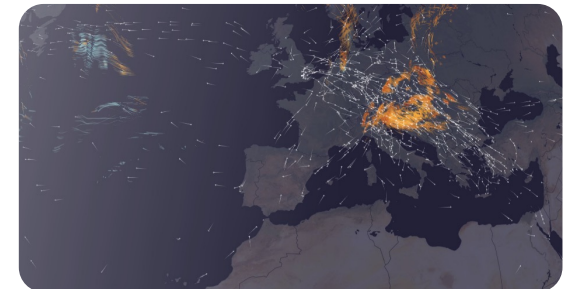
Performed by pilots in flight using our EFB tool, Loretta.

04

In coordination with Beakthrough Energy and Google, to improve the prediction models.

Validation and verification

05



A look into 2024-2025

84,839 flights

simulated. Summer 2023 and winter 2024.

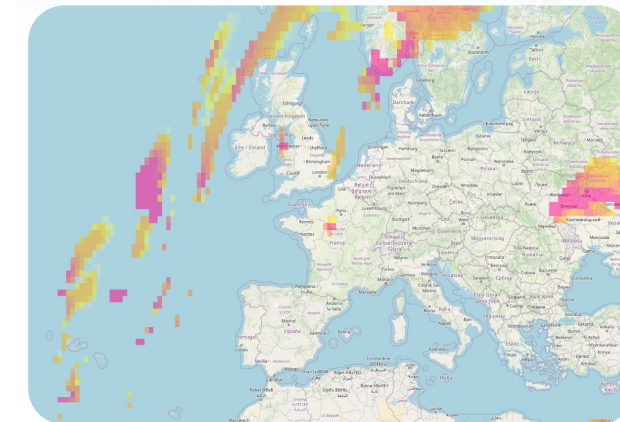
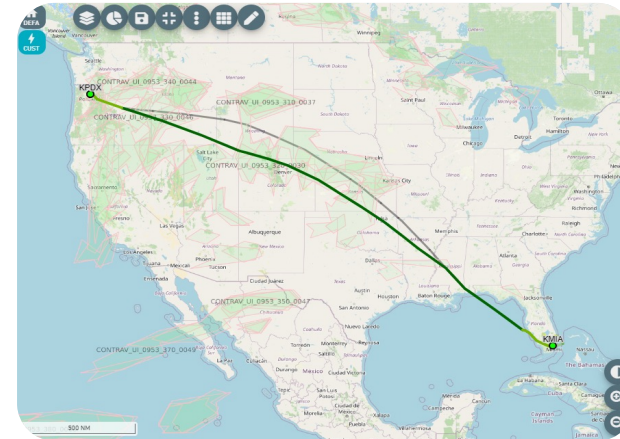
Polygon based approach



*Feasibility of contrail avoidance in a commercial flight planning system: an operational analysis – IOPscience (Frias et al., 2024)

Cost based approach

Different cost prices were considered for re-routing, leading to different optimization scenarios.



- More flexibility in re-routings
- Less load on the optimizer
- More realistic solution

A look into 2024-2025

84,839 flights

simulated. Summer 2023 and winter 2024.

Polygon based approach



*Feasibility of contrail avoidance in a commercial flight planning system: an operational analysis – IOPscience (Frias et al., 2024)

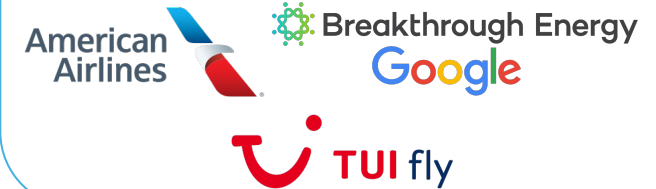
Cost based approach

Different cost prices were considered for re-routing, leading to different optimization scenarios.



Flight Trials

Flight trails will allow us to verify the models and methods we are using for contrail avoidance



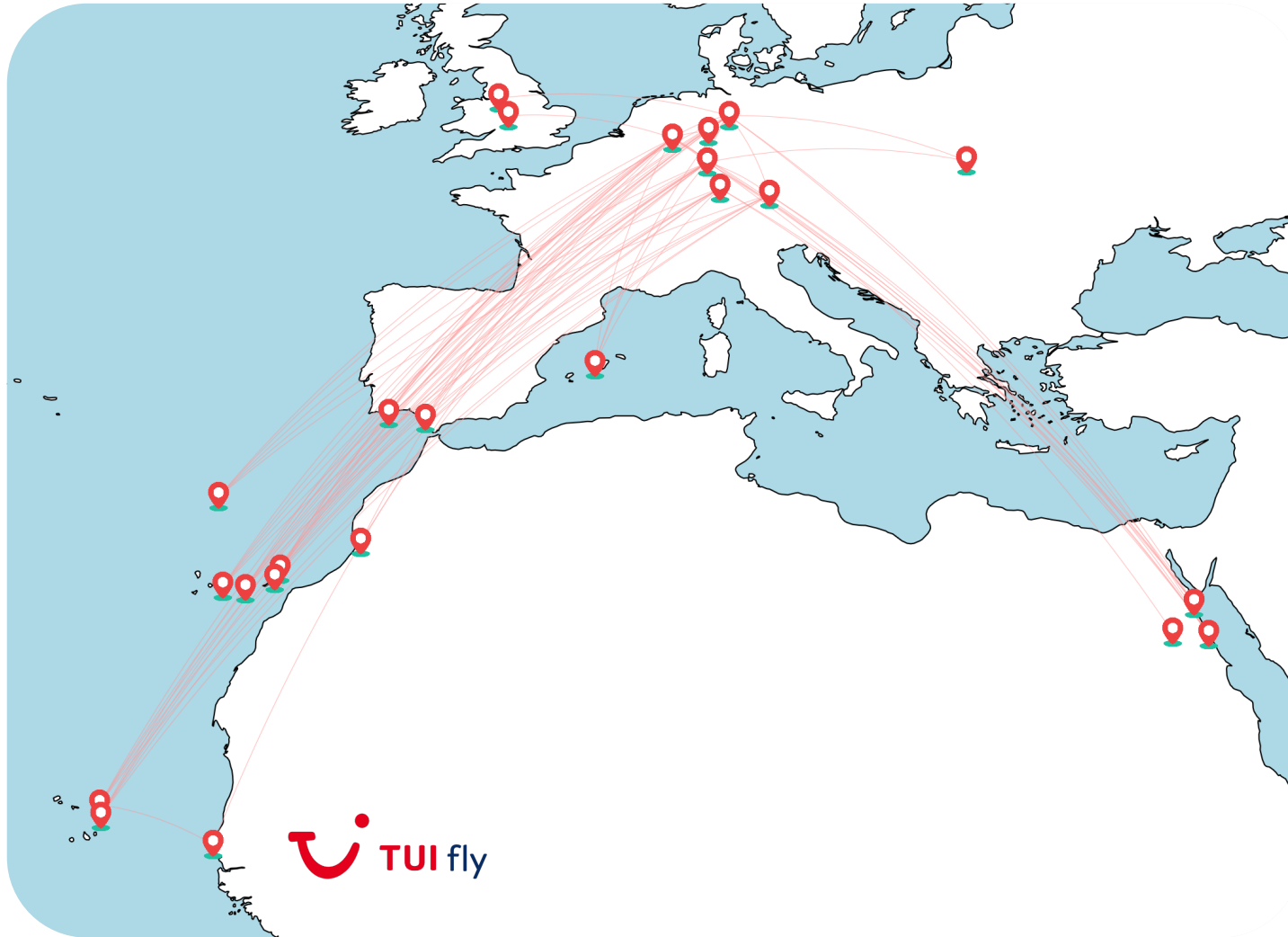
A4 Climate

Aims to improve contrail prediction methods and test them on 400 avoidance flights



Preliminary TUI trial results

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312 flights

17 – 23 of February 2025 flights

203 flights

predicted
to form warming contrails

84 flights

Planned and re-routed

312 flights → 84 flights
17 – 23 of February 2025 flights Planned and re-routed

0.48%

Increase in operational cost

0.39%

Increase in time

0.52%

Increase in fuel

-100.37%

Decrease in forecasted
contrail EF

-42.86%

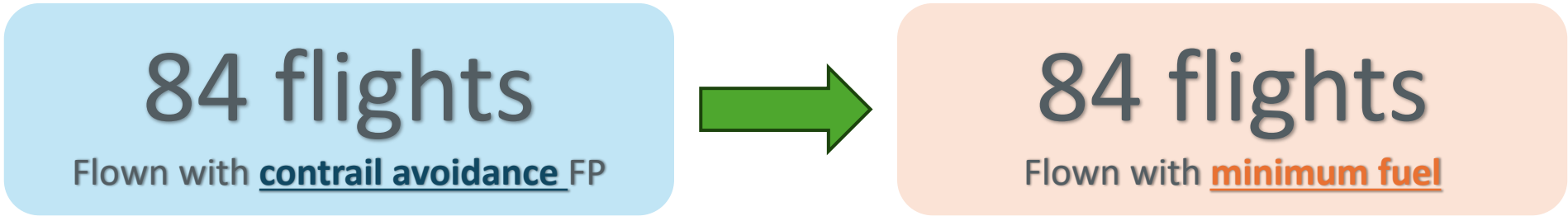
Decrease in re-analysis
contrail EF

-13.42%

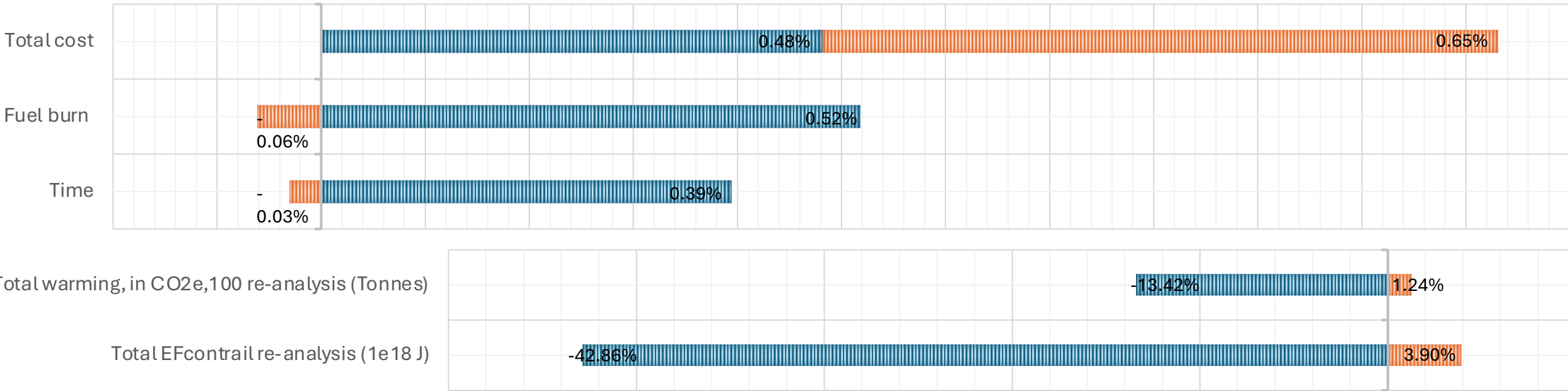
Decrease in total re-analysis
warming (CO₂e) TH=100

Preliminary TUI trial results

Now, let’s imagine that instead of contrail avoidance, we planned for minimum fuel burn....



What are the operational and environmental changes compared to the cost optimal solution:





Contrails:
No time to waste
No reason to wait

FL/GHTKEYS
SKYKEYS SPACEKEYS

11:15-12:00 Showcase Part 1:

**First two of four companies working hands-on
with contrail management present their practical
solutions: Flightkeys & Satavia**

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Raimund Zopp

Director Innovation, Flightkeys



Adam Durant

CEO, Satavia



Integrated Contrail Management

World's first end-to-end Contrail Solution

Raimund Zopp – Director Innovation

FL/GHTKEYS
SKYKEYS SPACEKEYS

Complete Contrail Solution

- FLIGHTKEYS is acknowledged as most advanced flight planning service provider
- World-wide customer base (airlines, cargo operators and business aviation)
- 380000 flight plans calculated per day
- Automated contrail management fully integrated
- Cost-based avoidance algorithm provides full control over cost/benefit ratio
- Reality-checked in live airline operations
- End-to-end functionality: Full Pre-flight and In-flight Support
- Developed by pilots for pilots
- Available NOW for all FLIGHTKEYS customers with latest software release



The First Complete Solution

Science

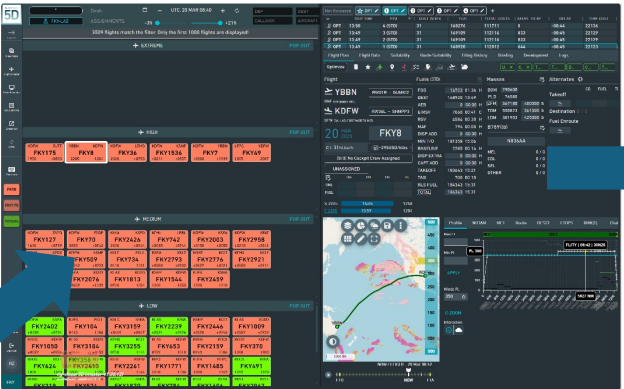
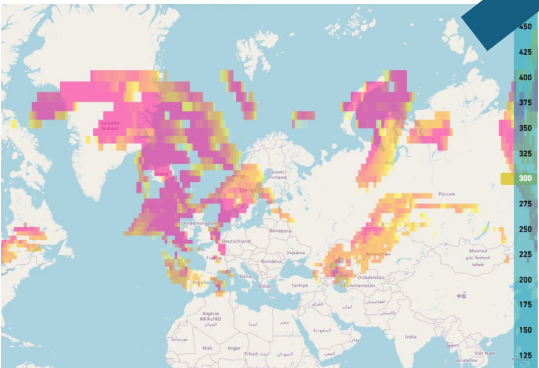
Airline Dispatch

Flight Deck

Science



Gridded 4D Contrail Forecast Model

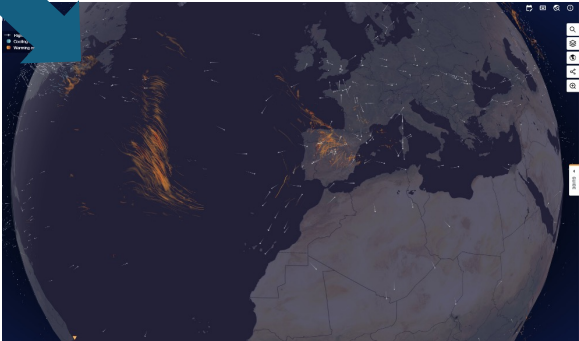


Automated Flight planning



Inflight Decision Support

Re-Analysis & Observation





now let's go live!

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SKYKEYS SPACEKEYS

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