Performance
through
Innovation

EUROCONTROL

Mitigating the climate impact of non-CO2 emissions: EUROCONTROL MUAC Live Trial 2021

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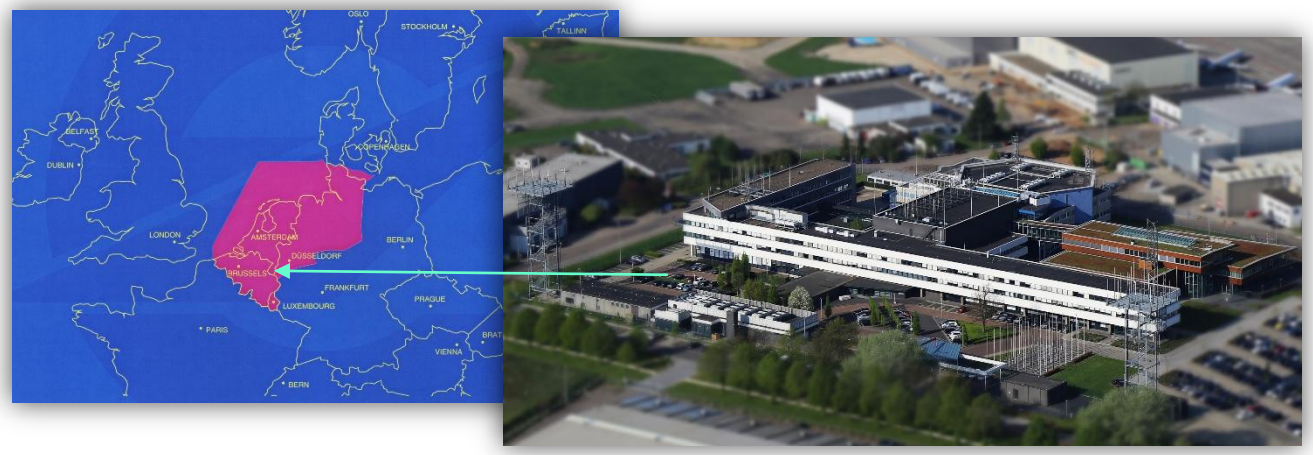
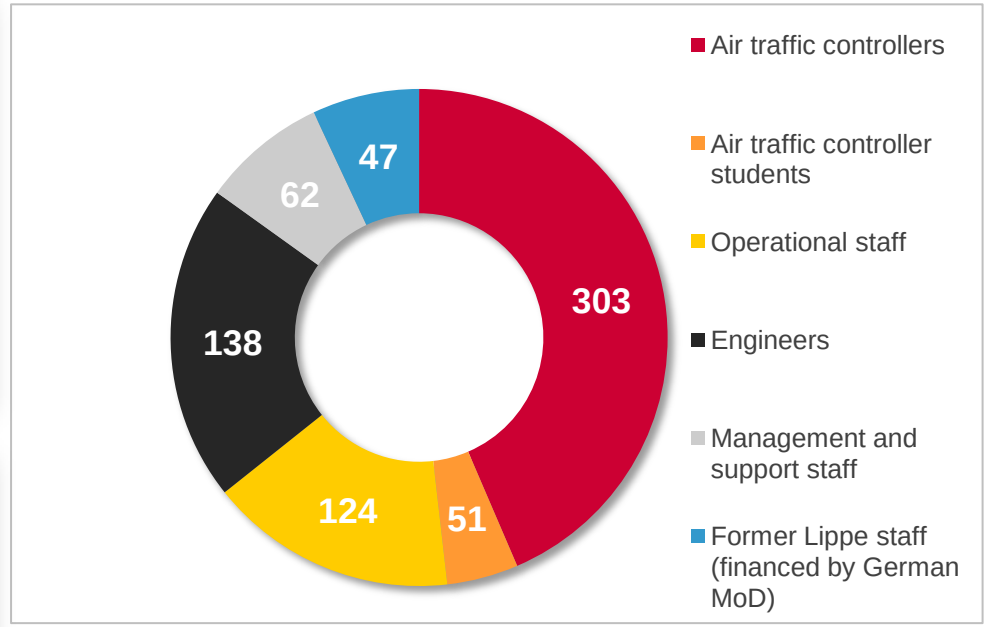
Maastricht Upper Area Control

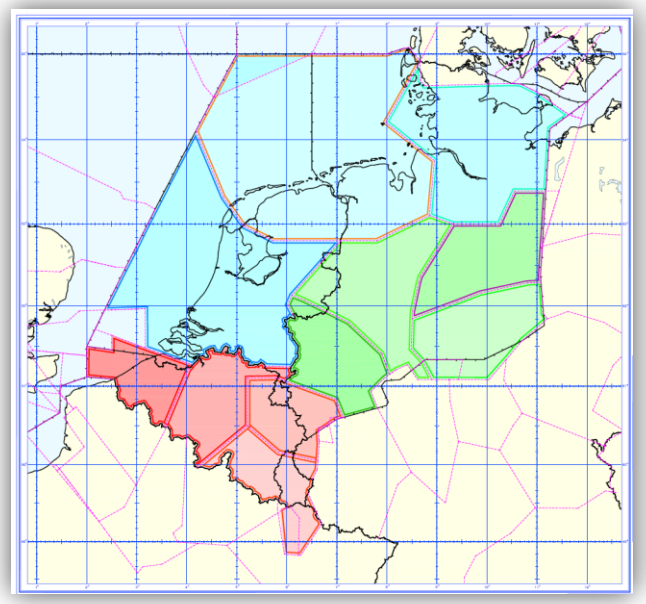
CONTRAIL PREVENTION

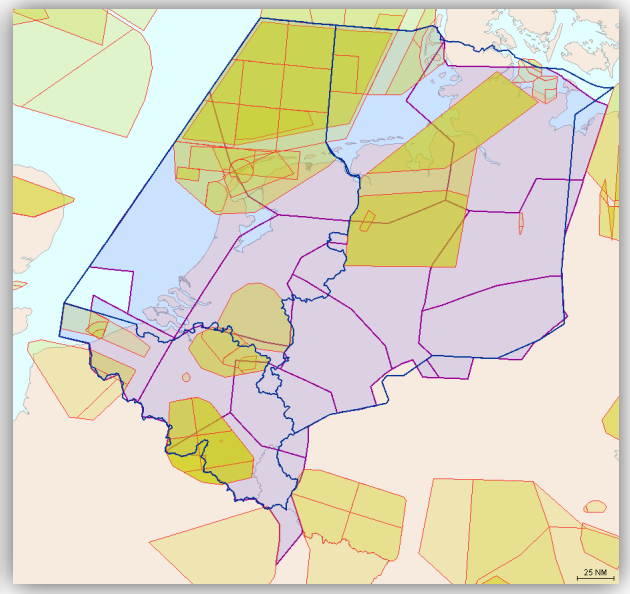
member of FABEC

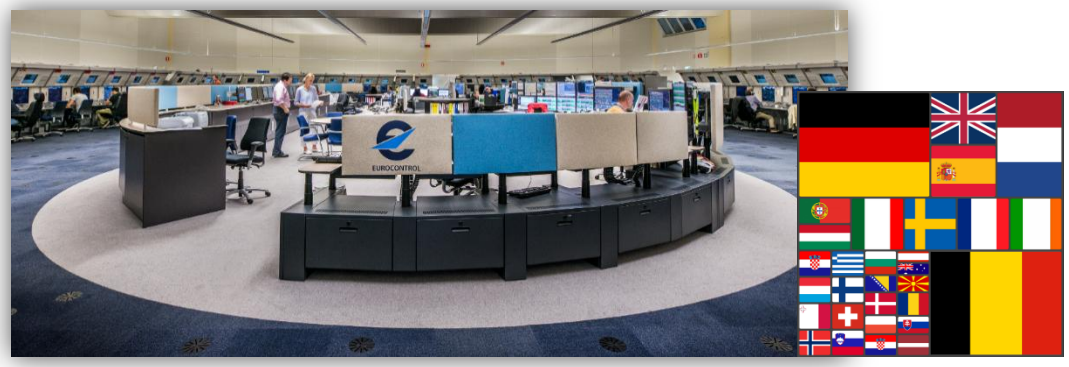
Maastricht Upper Area Control in Numbers



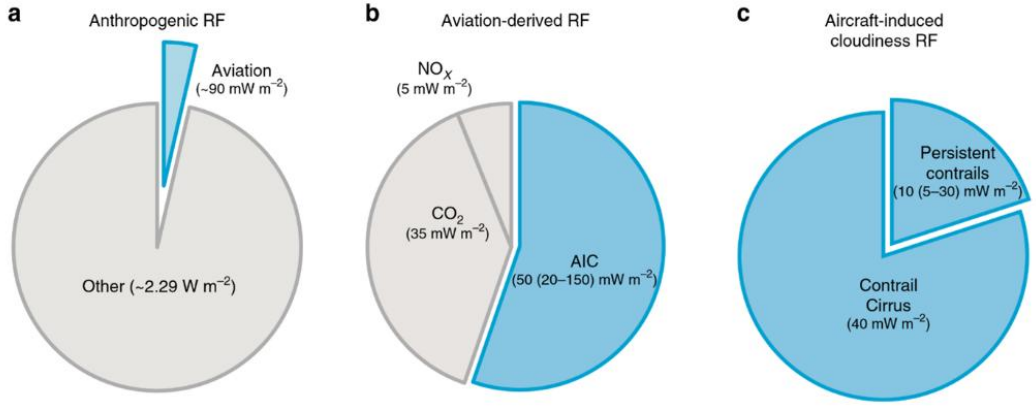








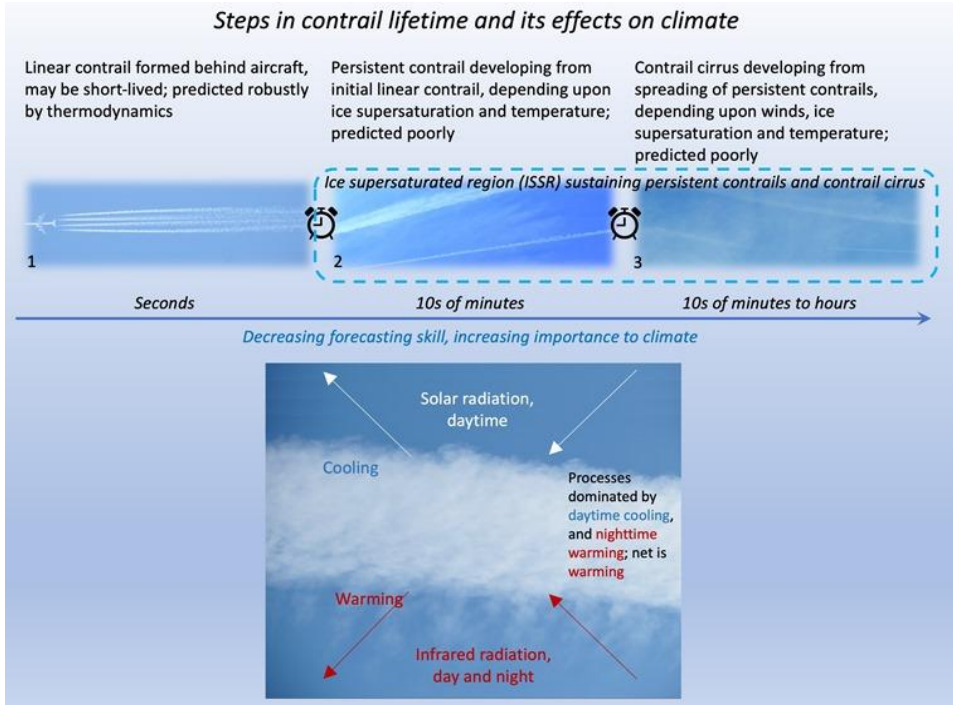
Climate Change, Non-CO2, ISSR and Contrail Cirrus



- Kärcher 2018: Aviation Radiative Forcing
- Sum from last 100 years (GWP100)
- Actual proportion could be higher

- Keith Shine and David Lee 2021
- Call to be cautious when doing contrail prevention because of scientific uncertainty

- MUAC video: (https://youtu.be/oz4OyEFrD4Q)



Objectives of MUAC Live Trial 2021

Project will contribute to the mitigation of the non-CO_2 effects of aviation

- To establish and test the procedure that prevents persistent contrails in the MUAC area of responsibility

Requires answering the following questions

- Can we organise air traffic such, that areas, which allow the formation of persistent contrails, can be avoided?
- Can we predict contrails with reasonable skill?
- Can we **predict** persistent contrails with sufficient skill for deviating air traffic?
- Can we **detect** ice super-saturated regions and avoid them in real-time?

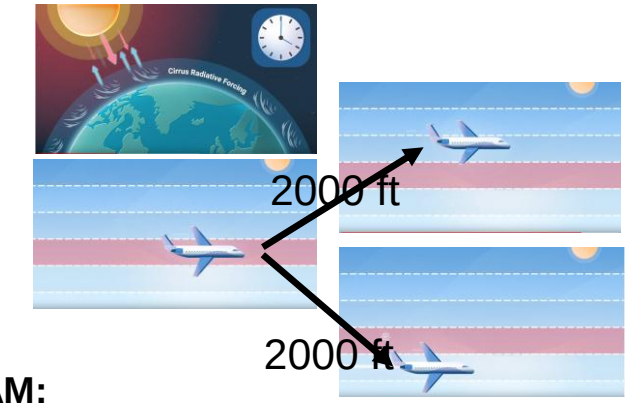
Partnering with DLR, Prof. Robert Sausen and team

- Satellite image recognition
- Statistics

Operational Concept - Options

1. Pre-tactical planning
   - Global plannability, environmental optimisation possible
   - Assumes very high skill on weather forecast for ISSR
   - Difficult for high density airspace
   - Possibly high margins, unnecessary CO_2
2. Tactical pilot trigger
   - Aircraft as sensor for relative humidity, temperature, engine
   - Global and precise, minimises additional CO_2
   - Global, independent on ATC capabilities
   - Assumes high quality of measurement of relative humidity in avionics
   - Cost of equipment
   - Procedures not existing
3. Tactical ATC decision
   - More accurate, minimises additional CO_2
   - Weather forecast good enough for capacity planning
   - Works in high-density airspace
   - Local, difficult for environmental optimisation functions

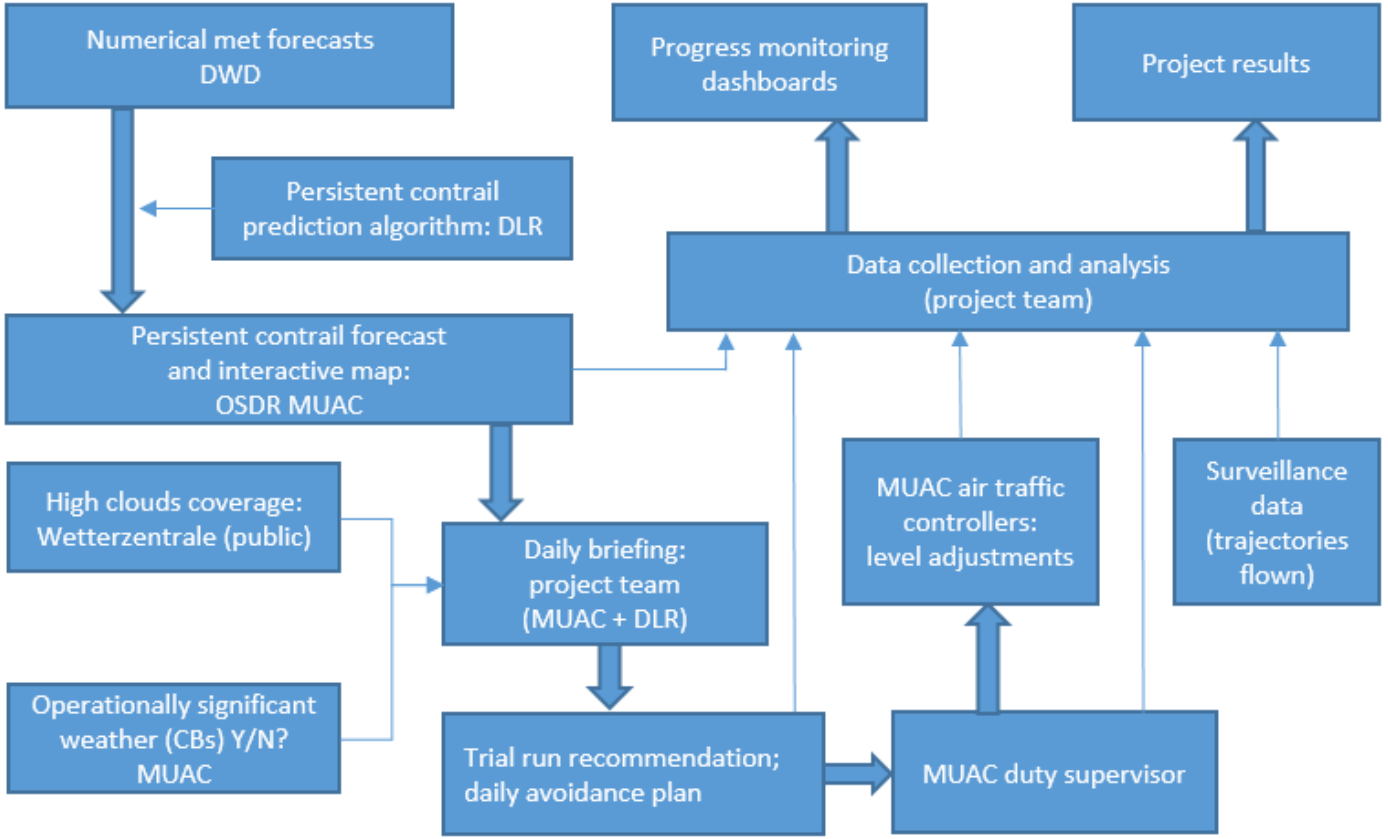
Detailed Operational Concept



NOTAM:

IN AN EFFORT TO MINIMISE THE IMPACT OF AVIATION ON THE ENVIROMNENT, MUAC WILL BE RUNNING A CONTRAIL PREVENTION TRIAL FROM 18 TH JANUARY 2021 UNTIL 31ST DECEMBER 2021 BETWEEN 1500-0500UTC WINTER (1400-0400UTC SUMMER). FLIGHTS MAY BE TACTICALLY REQUESTED TO DEVIATE FROM THE PLANNED/REQUESTED FLIGHT LEVEL BY THE SECTOR CONTROLLER.

ANY FLIGHT FLYING VIA MAASTRICHT UAC SECTORS BETWEEN THESE TIMES MAY BE CHOSEN. THE TRIAL WILL GO AHEAD DEPENDENT ON THE WEATHER CONDITIONS.

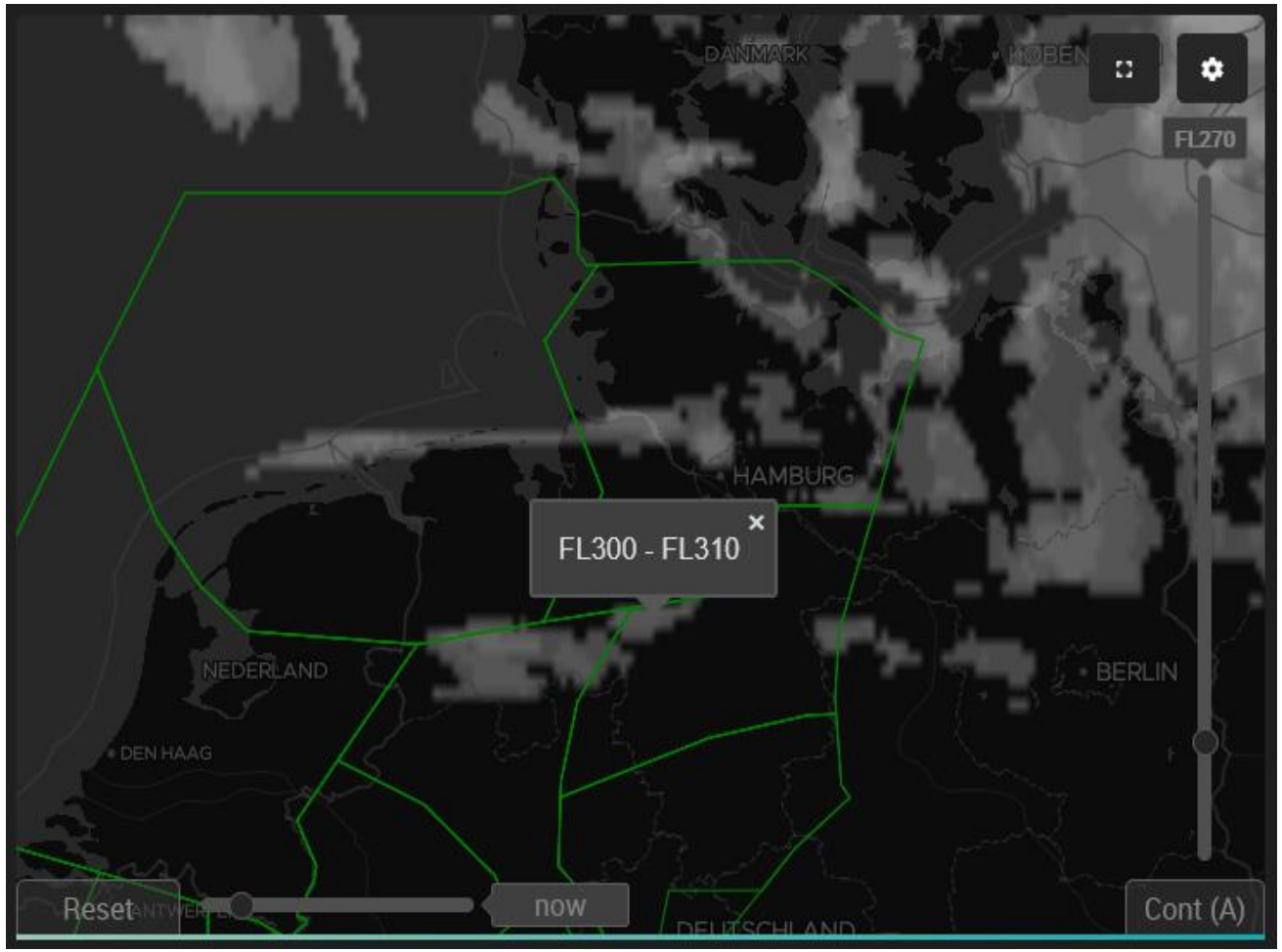


Detailed Technical Setup

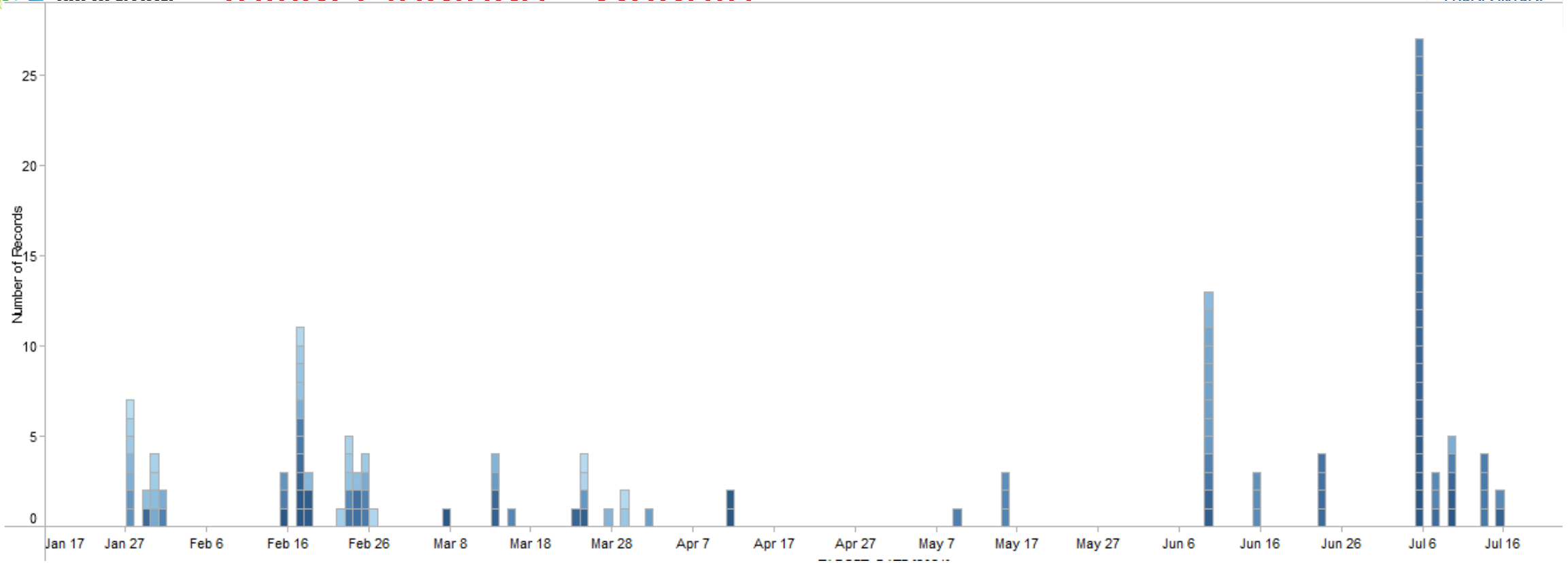
- T and RH from Deutscher Wetterdienst
- Local ISSR algorithm
- One constant for engine parameter
- Graphical presentation in four dimensions

On-the-job verification

- PIREPs feedback on visual contrails



Initial Findings - Counts



- Unusual bad weather in 2021 + low COVID traffic = low occurances

Findings - Stakeholders

- Airlines: Overall VERY co-operative, even under difficult COVID circumstances

Thank you!!!

- Proposals for co-operation from some airlines
- Proposals for co-operation from other companies
- Interested states
- Interested community

Outlook - Requirements for Improvements

- ISSR prediction needs improvement
- Persistent contrail and aviation induced cloudiness: need to evaluate usefulness of the contrail prevention in the specific weather context regarding other clouds or natural cirrus or the stability of the weather system, etc.
- ISSR detection with Relative Humidity (RH) sensors with data link: If the sensors for RH prove to work well, then high equipage rates should be targeted in combination with datalink. This could be the main enabler for world-wide ISSR detection and contrail prevention.
- Real-time contrail detection with satellite: instantaneous feedback loop.
- Real-time contrail detection with ground-based cameras

- Operational process improvements:
  - Automatic Day-2 pre-tactical capacity planning
  - ATCO position with automated advisory for ISSR prevention
  - Environmental optimal profile

Summary

- World-wide first operational live-trial for contrail prevention
- Simple operational concept, with 2000 feet vertical deviations based on Wx prediction
- Trial ongoing:
  - Bad weather + COVID traffic = low stastics
  - No solid ISSR verification
  - Positive psycological operational feedback
  - Very high stakeholder interest
- Wx forecast and ISSR prediction are issue
  - Better forecast
  - Real-time contrail detection systems
- Embed in wider picture
  - Contrail one contributor, contrail prevention one solution
  - From local to global