



SUPPORTING
EUROPEAN
AVIATION

ISOBAR Compliance

FLY AI Forum
22nd-23rd April 2025

Benjamin CRAMET
Mihai OGICA
EUROCONTROL

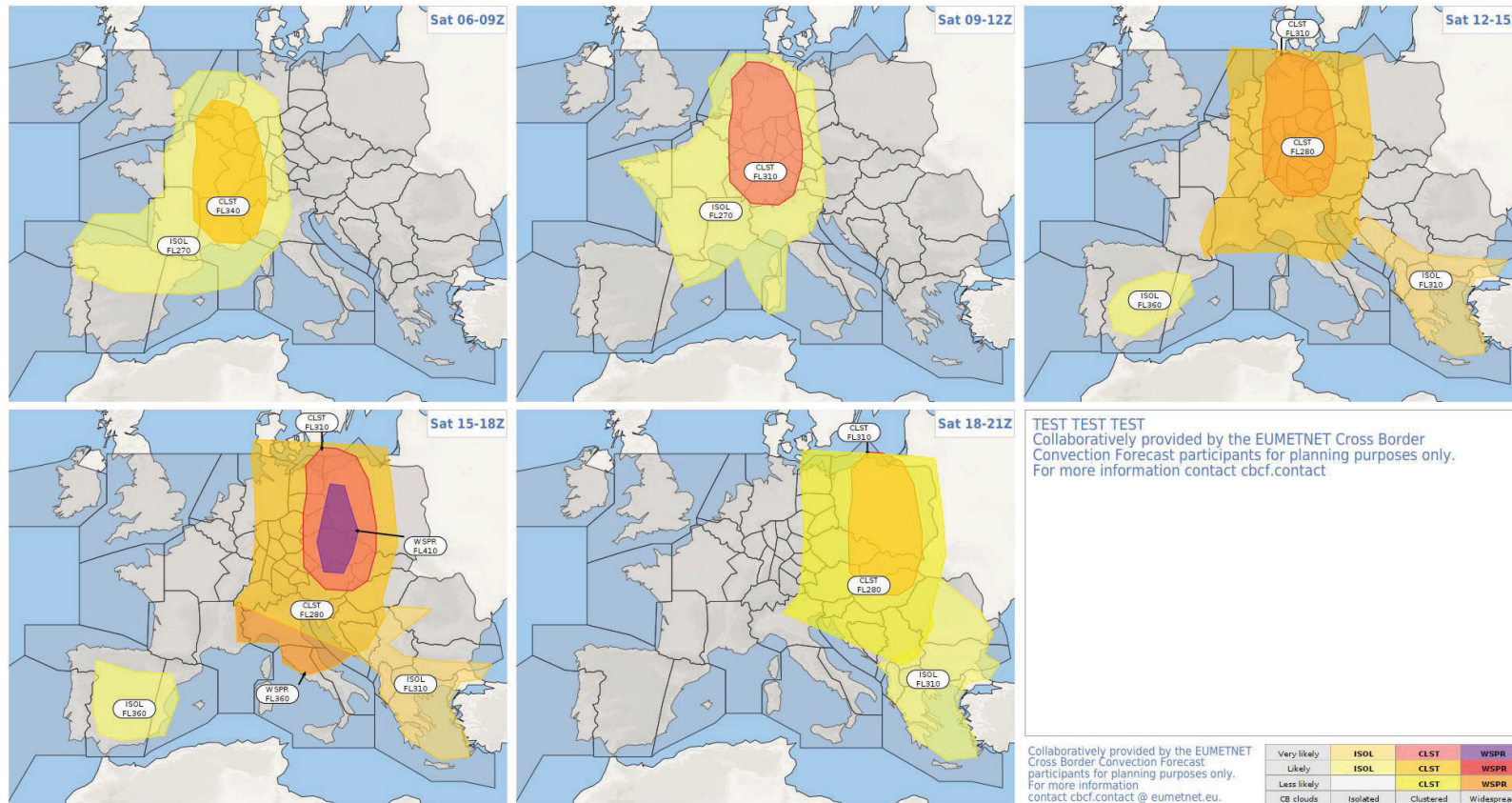


It all started from there...



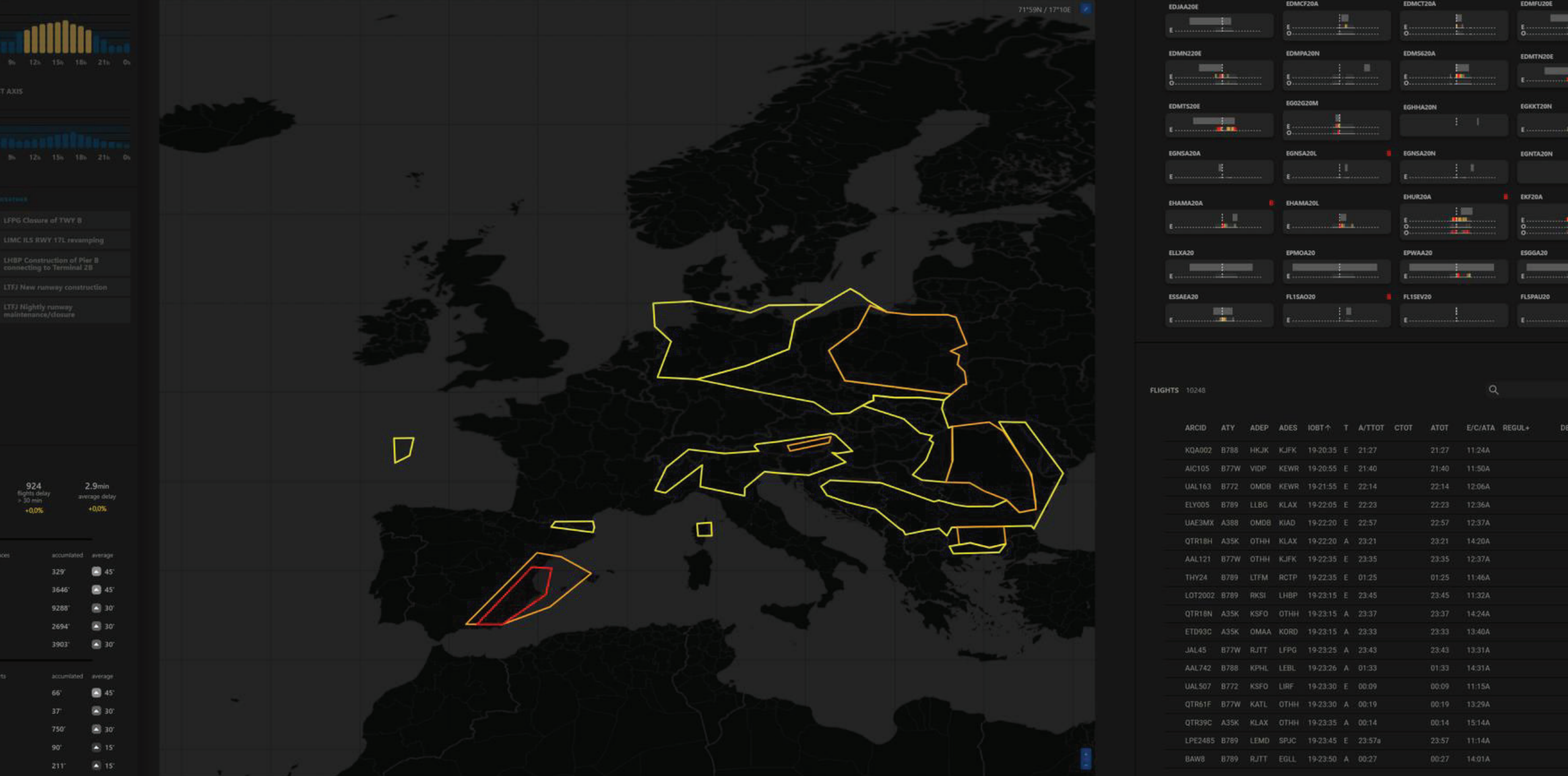
D-1 Cross Border Convection Forecast issued 01/03/2024 07:00 UTC, valid 02/03/2024

Coordinated by:
EuFoCS Devel



MEASURES 257 + NEW MEASURE Warnings (39) Sort by N

TIME 14:13 FLIGHT LEVEL 999 MAP SETTINGS



- LFPG Closure of TWY B
- LIMC ILS RWY 17L revamping
- LHBP Construction of Pier B connecting to Terminal 2B
- LTFJ New runway construction
- LTFJ Highly runway maintenance/closure

924 flights delay > 30 min +0.0%

2.9min average delay +0.0%

Accumulated	Average
329'	45'
3646'	45'
9288'	30'
2694'	30'
3903'	30'

Grid of measure proposals:

- BDSIV20A, EBWSC20A, EDDFA20A, EDG4H20A
- EDJAA20E, EDMCF20A, EDMCT20A, EDMFU20E
- EDMN220E, EDMPA20N, EDMSE20A, EDMTN20E
- EDMTS20E, EG02G20M, EGHHA20N, EGKKT20N
- EGNSA20A, EGNSA20L, EGNSA20N, EGNTA20N
- EHAMA20A, EHAMA20L, EHUR20A, EKF20A
- ELLXA20, EPMOA20, EPWAA20, ESGGA20
- ESSAEA20, FL1SAO20, FL1SEV20, FLSPA20

FLIGHTS 10248

ARCID	ATY	ADEP	ADES	IOBT↑	T	A/TTOT	CTOT	ATOT	E/C/ATA	REGUL+	DE
KQA002	B788	HKJK	KJFK	19-20:35	E	21:27		21:27	11:24A		
AIC105	B77W	VIDP	KEWR	19-20:55	E	21:40		21:40	11:50A		
UAL163	B772	OMDB	KEWR	19-21:55	E	22:14		22:14	12:06A		
ELY005	B789	LLBG	KLAX	19-22:05	E	22:23		22:23	12:36A		
UAE3MX	A388	OMDB	KIAD	19-22:20	E	22:57		22:57	12:37A		
QTR1BH	A35K	OTHH	KLAX	19-22:20	A	23:21		23:21	14:20A		
AAL121	B77W	OTHH	KJFK	19-22:35	E	23:35		23:35	12:37A		
THY24	B789	LTFM	RCTP	19-22:35	E	01:25		01:25	11:46A		
LOT2002	B789	RKSI	LHBP	19-23:15	E	23:45		23:45	11:32A		
QTR1BN	A35K	KSFO	OTHH	19-23:15	A	23:37		23:37	14:24A		
ETD93C	A35K	OMAA	KORD	19-23:15	A	23:33		23:33	13:40A		
JAL45	B77W	RJTT	LFPG	19-23:25	A	23:43		23:43	13:31A		
AAL742	B788	KPHL	LEBL	19-23:26	A	01:33		01:33	14:31A		
UAL507	B772	KSFO	LIRF	19-23:30	E	00:09		00:09	11:15A		
QTR61F	B77W	KATL	OTHH	19-23:30	A	00:19		00:19	13:29A		
QTR39C	A35K	KLAX	OTHH	19-23:35	A	00:14		00:14	15:14A		
LPE2485	B789	LEMD	SPJC	19-23:45	E	23:57a		23:57	11:14A		
BAW8	B789	RJTT	EGLL	19-23:50	A	00:27		00:27	14:01A		

TIME 14:13 FLIGHT LEVEL 0 999 MAP SETTINGS



Convection Information

Risk Level

MEDIUM

FL0 > FL380 09:00-12:00

ALL: 114 TV

- TV:EDG2BL07
- TV:EDG2BL25
- TV:EDG5PFA
- TV:EDMAMAS
- TV:EDMCA5
- TV:EDMCS2

Show details (graph)

Add to selection

Add to custom section

MEASURES 257 + NEW MEASURE

BDSIV20A	EBWSC20A	EDDFA20A	EDG4I20A
EDJAA20E	EDMCF20A	EDMCT20A	EDMFU20E
EDMN220E	EDMPA20N	EDMSE20A	EDMTN20E
EDMTS20E	EG02G20M	EGHHA20N	EGIXT20N
EGNSA20A	EGNSA20L	EGNSA20N	EGNTA20N
EHAMA20A	EHAMA20L	EHUR20A	EKF20A
ELLXA20	EPMOA20	EPWAA20	ESGGA20
ESSAE20	FL1SA020	FL1SEV20	FLSPA020

FLIGHTS 10248

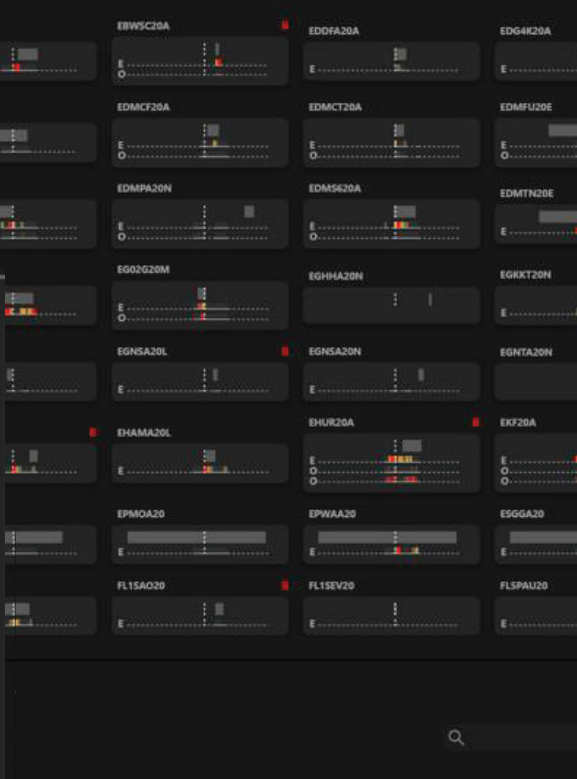
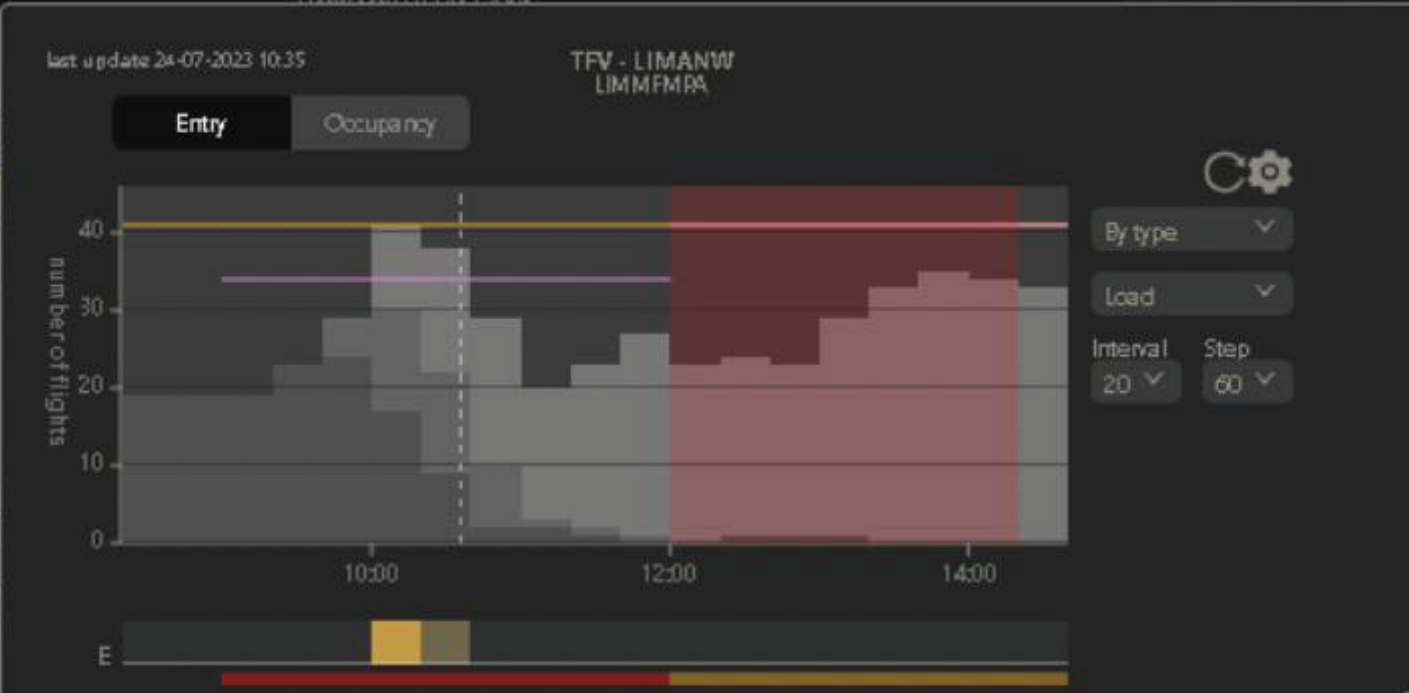
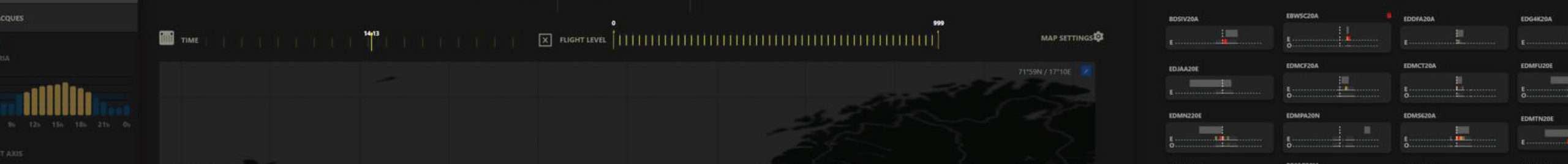
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times	accumulated	average
329'	45'	
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9288'	30'	
2694'	30'	
3903'	30'	

times	accumulated	average
66'	45'	
37'	30'	
750'	30'	
90'	15'	
211'	15'	



924 flights delay > 30 min +0.0%

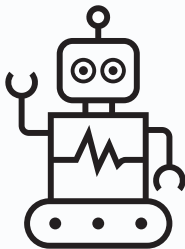
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B772	KSFO	LIRF	19-23:30	E	00:09		00:09	11-15A		
B77W	KATL	OTHH	19-23:30	A	00:19		00:19	13-29A		
A35K	KLAX	OTHH	19-23:35	A	00:14		00:14	15-14A		
B789	LEMD	SPJC	19-23:45	E	23:57a		23:57	11-14A		
B789	RJTT	EGLL	19-23:50	A	00:27		00:27	14-01A		

ISOBAR



Weather



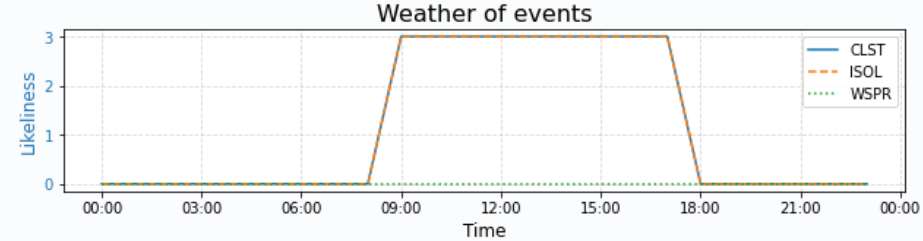
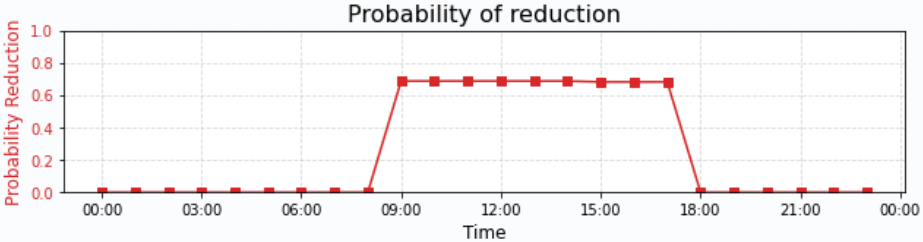
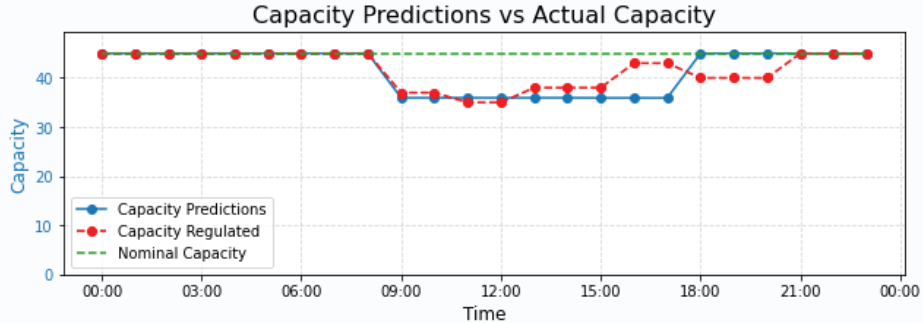
Demand



Categorisation
(Random Forest)

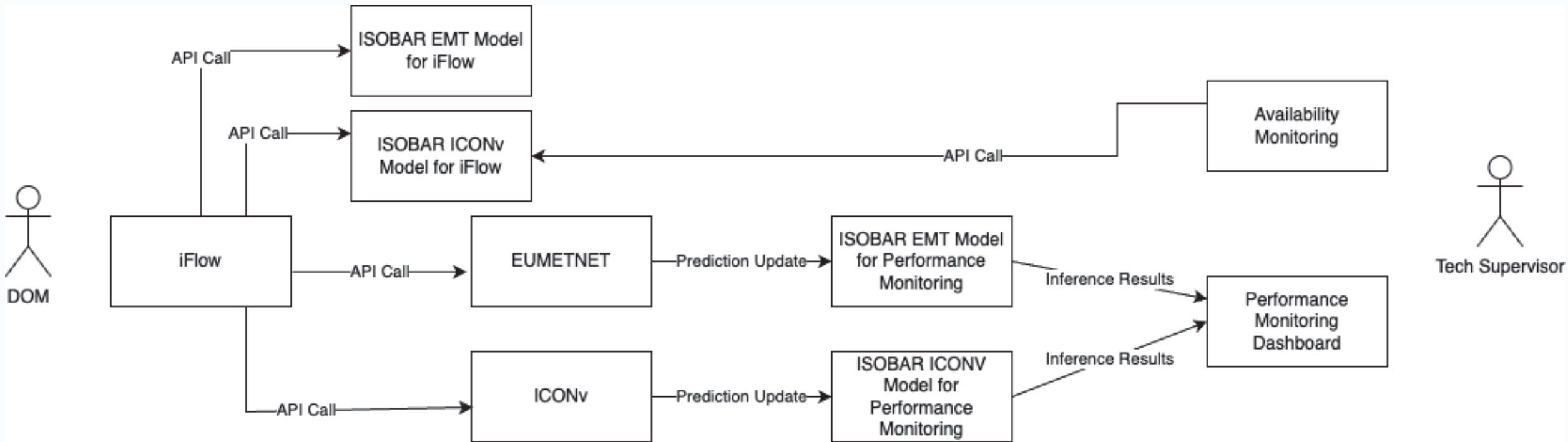
Regressor
(XGBoost)

Airspace





Architecture



Concept of Operation



- **High Level Tasks and AI based definition**

- The end-users of the ISOBAR project are the Deputy Operation Managers (DOMs), who are responsible for monitoring and managing the European Network.
- The end-users can use the predictions from the ISOBAR models, the EUMETNET and ICONv weather prediction to enhance their understanding about capacity in engaging with FMPs.
- The end-users can also provide feedback and suggestions to improve the ISOBAR project.



Operational Environment and Scenarios

- The operational environment of the ISOBAR project is the European airspace, where weather events can cause disruptions and delays in air traffic flow and capacity.
- The ISOBAR project is integrated into the existing Cross Border Weather procedure, which aims to reduce weather-related air traffic flow and capacity management (ATFCM) delays.
- Scenario 1: DOM in action
- Scenario 2: Monitoring / Digital Twin

Testing and monitoring



- Weather does not occur where we think it will
- Regulation can be placed at other places than the weather to protect flows
- Metrics are computed at ACC level for:
 - Classifier
 - Confusion matrix, recal, F1
 - Regressor
 - RMSE, MAE



Feedback

- It is an enabler to engage into constructive discussion with end-users
- Learning Assurance objectives very useful for the design and usage of data pipeline
- Several objectives appear as not in correlation of the safety impact of the AI model
- Information to be provided is very into data-science and requires a deep knowledge of AI which appears as different for conventional software
 - whereby less knowledge of computer science is required.



AI Safety Support Assurance

- ISOBAR running on iFLOW tool on a non-ops computer
- Only B2B READ access to the ops system
- Allows NMOC FM staff to understand (by looking at the past regulations applied in similar weather situations) which ACC regulations could potentially be implemented with more time in advance →
 - coordination process can start with more time in advance

!!! The decision to implement remains with the local FMP !!!

!!! No change to the coordination procedure (NMOC staff-FMP) !!!



AI Safety Support Assurance

- Based on the EASA Concept Guidance Paper for Level 1 & 2 Machine Learning applications:
 - ISOBAR: Level 1A application

AI level	Function allocated to the system to contribute to the high-level task	Authority of the end user
Level 1A Human augmentation	Automation support to information acquisition	Full
	Automation support to information analysis	Full
Level 1B Human assistance	Automation support to decision-making	Full
Level 2A Human-AI cooperation	Overseen and overridable automatic decision	Full
	Overseen and overridable automatic action implementation	Full
Level 2B Human-AI collaboration	Overseen and overridable automatic decision	Partial
	Overseen and overridable automatic action implementation	Partial
Level 3A Supervised advanced automation	Supervised automatic decision	Upon alerting
	Supervised automatic action implementation	Upon alerting
Level 3B Autonomous AI	Non-supervised automatic decision	Not applicable
	Non-supervised automatic action implementation	Not applicable



AI Safety Support Assurance

- Objectives corresponding to SWAL 4 were selected

Applicability by Assurance Level	
●	The objective should be satisfied with independence.
○	The objective should be satisfied.
	The satisfaction of the objective is at the applicant's discretion.

Applicability by AI Level	
	The objective should be satisfied for AI level 1A, 1B, 2A and 2B.
	<i>The objective should be satisfied for AI level 1B, 2A and 2B.</i>
	The objective should be satisfied for AI level 2A and 2B.
	The objective should be satisfied for AI level 2B.

Building block	Objectives	Assurance Level				
		AL 1 DAL A SWAL1	AL 2 DAL B -	AL 3 DAL C SWAL2	AL 4 - SWAL3	AL 5 DAL D SWAL4
	CO-01: The applicant should identify the list of end users that are intended to interact with the AI-based system, together with end-user roles, responsibilities (including indication of the level of teaming with the AI-based system, i.e. none, cooperation, collaboration) and expected expertise (including assumptions made on the level of training, qualification and skills).	○	○	○	○	○
	CO-02: For each end user, the applicant should identify which goals and associated high-level task(s) are intended to be performed in interaction with the AI-based system.	○	○	○	○	○
	CO-03: The applicant should determine the AI-based system taking into account domain-specific definitions of 'system'.	○	○	○	○	○
	CO-04: The applicant should define and document the ConOps for the AI-based system, including the task allocation pattern between the end user(s) and the AI-based system. A focus should be put on the definition of the OD and on the capture of specific operational limitations and assumptions.	○	○	○	○	○



AI Safety Support Assurance

- For SA-01 – Safety Support Assessment
- Followed 2017/373 ATM/ANS.OR.C.005

Building block	Objectives	Assurance Level				
		AL 1 DAL A SWAL1	AL 2 DAL B -	AL 3 DAL C SWAL2	AL 4 - SWAL3	AL 5 DAL D SWAL4
	SA-01: The applicant should perform a safety (support) assessment for all AI-based (sub)systems, identifying and addressing specificities introduced by AI/ML usage.	●	●	○	○	○

- FMEA showed no impact on operations



AI Safety Support Assurance

- Nevertheless, EASA Concept Paper only focuses on High-Risk applications and does not allow to select a sub-set of Objectives for lower risk applications →
 - this resulted in time-consuming and high-effort activity for AI assurance for a low-risk applications
- Proposal to simplify could be:
 - Select only a subset of SWAL 4 AI Assurance Objectives (out of the 80) for minimal risk applications
- ***It is expected that Part-AI will solve this***



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Thank you!

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NETWORK
MANAGER

