



# ECA

European Cockpit Association

## **Aviation Weather: a critical safety pillar in flight operations**

Klaus Sievers, ECA

Safety Forum, Brussels 20.6.2024

# Issues to discuss

- 1: Weather information : the basics
  - during planning, including fuel decision
  - situation awareness in flight with available tools
- 2: safety critical issues in flight operations
  - weather forecast and actual weather : delivered
  - PBN QNH
  - turbulence
  - Alternate decision and diversion
- 3: pilot training including use of digital real time weather
- 4: European ATM and weather



# 1: Weather information: the basics

➤ during planning , including fuel decision

## Main kinds of weather info:

- aerodrome weather ( TAF / METAR )
- temp/wind charts - Significant Wx charts
- SIGMET, like for MOD/SEV Turbulence
- TC, VA and Space Weather advisories
- optional: Wx depictions, like radar / satellite



# 1: Weather information: the basics

➤ during planning , including fuel decision

Pilots considerations during briefing for a specific flight / airplane:

- are the planned airports useable ?
- is a detailed look at some needed ?
- choice of alternate, usability of destination ?
- enroute weather ?
- are any advisories relevant ?
- change of time/date of operation needed ?



# 1: Weather information: the basics

➤ during planning , including fuel decision

FUEL DECISION is taken , but uncertainties and unknowns remain:

- accuracy of TAF (different quality control methods in use globally)
- broad-brush Sigwx charts (improvements are coming soon - how good are they ?)

# 1: Weather information: the basics

## ➤ Situation awareness in flight with available tools

### Information from aircraft's own sources:

- aircraft sensed, like temperature & wind
- aircraft systems: Wx radar, lightning detection (rare)
- safety nets: windshear alerting
- looking out of the cockpit - window



# 1: Weather information: the basics

## ➤ Situation awareness in flight with available tools

### Information sources:

- basic: voice ATIS, voice VOLMET
- better: ACARS uplink of Wx,  
pilot selected or automated
- better yet : company support by dispatch
- safety relevant, and economic:  
satellite weather (Connectivity required)



# 2: Safety critical issues in flight operations

- weather forecast and actual weather : delivered

Wx forecast for aerodromes:

- Terminal Aerodrome Forecasts, TAF
- example:

Issued  
every  
6 hrs mostly-

**3 hrly issuance  
would yield  
improved  
forecasts.**

TAF EDDM 061100Z 0612/0718 34008KT CAVOK

TEMPO 0616/0621 RA

PROB40

TEMPO 0616/0618 30020G35KT 3000 TSRA FEW010 BKN030CB

BECMG 0618/0620 25006KT

PROB30

TEMPO 0620/0702 BKN012

BECMG 0708/0710 31005KT





# 2: Safety critical issues in flight operations

- weather forecast and actual weather : delivered

## Wx report for aerodromes:

- Meteorological Aerodrome Report, METAR
- Example – note the “’///’”:

```
EDDM 061620Z AUTO 26014KT 7000 +SHRA VCTS SCT008 BKN037 BKN047 FEW///CB 12/11 Q1010 RETS BECMG 26007KT NSW  
EDDM 061550Z AUTO 26026G38KT 9999 SHRA VCTS FEW014 BKN035 BKN049 FEW///CB 13/12 Q1009 RETS TEMPO 3000 TSRA  
EDDM 061520Z AUTO 33007KT 300V360 9999 -SHRA VCTS FEW///CB 18/12 Q1007 RESHRA TEMPO 33020G35KT 3000 TSRA FEW010 BKN030CB  
EDDM 061450Z AUTO 35008KT 9999 -SHRA FEW///CB 19/11 Q1006 TEMPO FM1600 30020G35KT 3000 TSRA FEW010 BKN030CB
```

- issue: AUTO reports can lack ceiling information that reports by humans have.

OK / not OK ? **Need improvements!**



# 2: Safety critical issues in flight operations

## ➤ PBN QNH

The local altimeter setting (QNH) is a crucial part for PBN approaches with barometric based vertical navigation.

> Safety risk through mis-communication !

Solutions include:

- - use of D-ATIS > **Connectivity is Key !**
- clear communication via voice and ACARS
- cross-check with QNH received at briefing
- flying a 3-d approach when one is available, especially when ceiling and/or visibility are low



# 2: Safety critical issues in flight operations

## ➤ turbulence

➤ **Connectivity is key** to receiving inflight updates !

### Turbulence :

- Improved, high resolution forecasts are available
- Automated turbulence reports of some aircraft are online, and available (may cost, IATA turbulence aware)
- Many cases where **persons suffer injury** seem to be related to flight close to / in convection. : WHY ?
- Equipment ?? Training ? Using the equipment, like wx radar properly ? Proper use of eFB weather ??



➤ weather forecast and actual weather : delivered

## Example:



## 2: Safety critical issues in flight operations

- weather forecast and actual weather : delivered
- **Connectivity is key** to receiving inflight updates !

Enroute: improvements enabled this year:

Upgrades of the World Area Forecast System

> hazard objects, IWXXM, 3 hourly issuance, all parameters, including **turbulence**, all at improved granularity

Link >>>



# 2: Safety critical issues in flight operations

- weather forecast and actual weather : delivered

Question is, if the upgraded WAFS covers all of Europe's needs .

- What about the information in the cross border forecasts ?
- Lower level features, like an upcoming snow storm, or actual area and movement of thunderstorms for example, are not communicated to pilots. Such info should be available !
- Digital ATIS at more airports - a great enhancement.





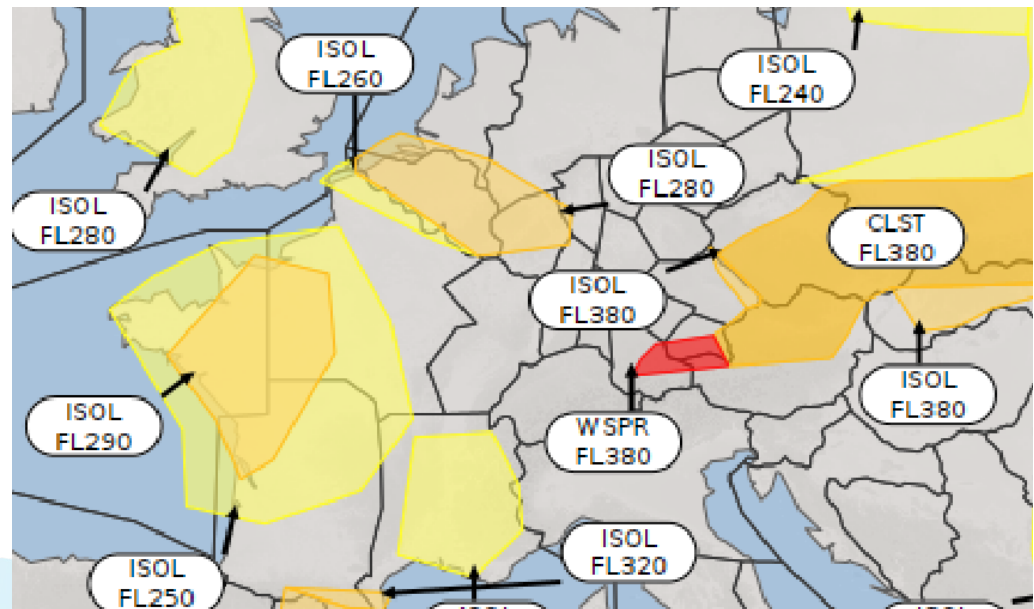
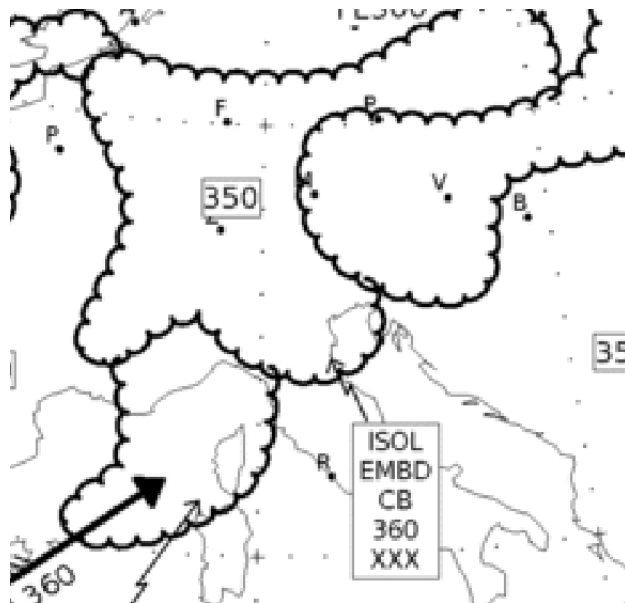
# 2: Safety critical issues in flight operations

- weather forecast and actual weather : delivered

Enroute: high level significant wx chart.

**Issues:** improved info is not shown to pilots

Example: Cross Border Convection Forecast



# 2: Safety critical issues in flight operations

➤ weather forecast and actual weather : delivered

...or hidden behind passwords...

.....in plain sight, in the NOP Portal. ??

The screenshot displays the 'Weather Dashboard' interface. On the left is a dark sidebar with navigation links: 'Home', 'Map', and 'Select Date' (set to 2024-05-11). Below these are filter sections: 'Likelihood' with checkboxes for 'likely', 'very likely', and 'less likely'; 'Validity window' with checkboxes for '06-09', '09-12', '12-15', '15-18', and '18-21'; 'Convection' with checkboxes for 'ISOL', 'CLST', and 'WSPR'; and a 'TOP' slider ranging from 0 to 450. The main content area has a blue header with the 'Weather Dashboard' title and a menu icon. The 'Background' section contains text about severe weather impacts and a link to the 'Network Cross-Border Weather Procedure Portal'. The 'Harmonised forecast of adverse weather' section describes EUROCONTROL's support for new MET services and provides a link to the 'Network Cross-Border Weather App'.

Weather Dashboard

Home

Map

Select Date

2024-05-11

Likelihood

☒ likely ☒ very likely

☒ less likely

Validity window

☐ 06-09 ☐ 09-12 ☐ 12-15

☒ 15-18 ☐ 18-21

Convection

☒ ISOL ☒ CLST ☒ WSPR

TOP

0 50 400

0 45 90 135 180 270 360 450

## Background

Severe weather remains the main reason for air traffic flow management delay at European airports – and they have been increasing across the Network over the past few years. High-intensity weather events cause delay and unnecessary fuel burn – a major obstacle to efficient, safe and sustainable air traffic. By working closely with Météo-France, Deutscher Wetterdienst - DWD (Germany), Met Office (UK), skyes (Belgium), Austro Control (Austria) and Croatia Control - CCL (Croatia), coordinated by the European MET Services (EUMETNET), NM is aiming to improve its ability to detect when weather conditions could deteriorate and rapidly develop into severe storms capable of impacting airspace capacity.

## Harmonised forecast of adverse weather

EUROCONTROL is supporting the deployment of new high resolution MET services by the European MET Services (EUMETNET), which will provide resilient, single source and harmonized adverse weather forecast products within Europe, including convection, icing, turbulence and winter conditions.

A set of new MET services will provide resilient, single source and harmonized adverse weather forecast products within Europe, including convection, icing, turbulence and winter conditions.

The link below allows participants to access all weather forecasts used in this procedure:

[Network Cross-Border Weather Procedure Portal](#)

The link will be active between 1 May and 16 October 2024. Information from the direct calls and conferences will be daily provided on the INP and at the dedicated:

[Network Cross-Border Weather App](#)

[https://nmcooperationsanalysis.shinyapps.io/weather\\_app/](https://nmcooperationsanalysis.shinyapps.io/weather_app/)

Safety Forum, Brussels, 20 June 2024



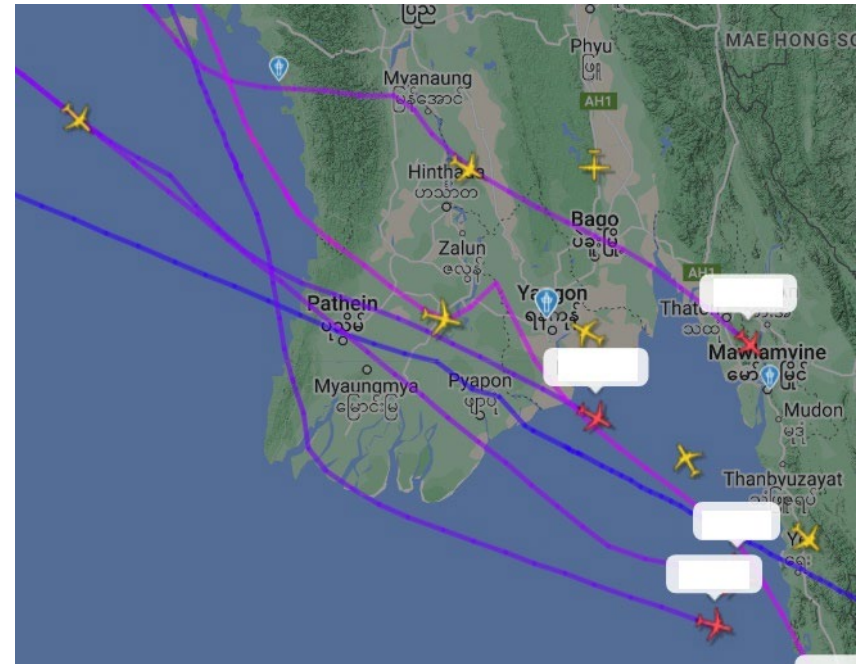
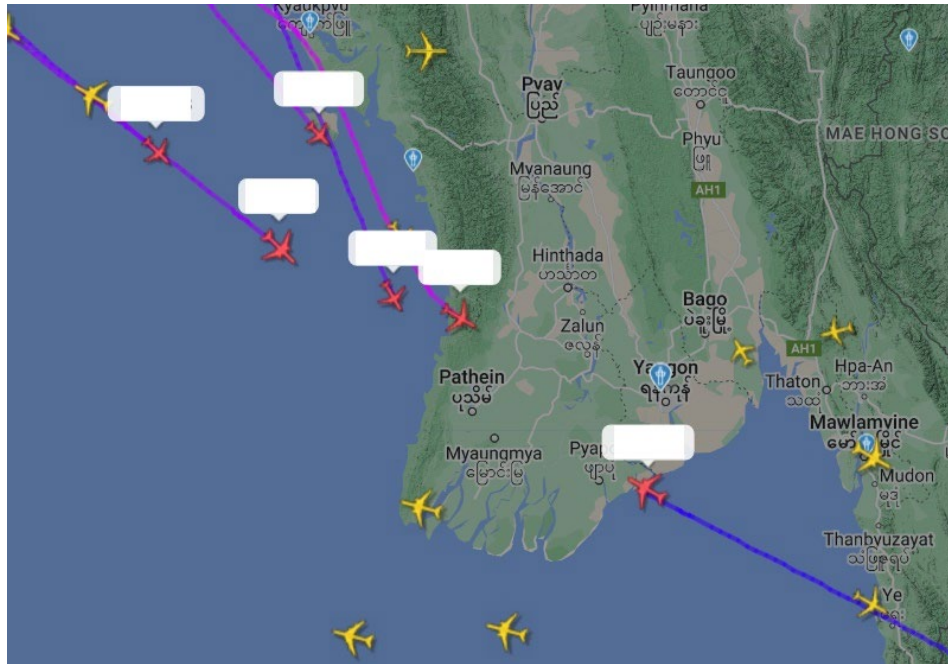
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# 2: Safety critical issues in flight operations

- turbulence
- Successfully dealing with CB takes airspace & coordination



# 2: Safety critical issues in flight operations

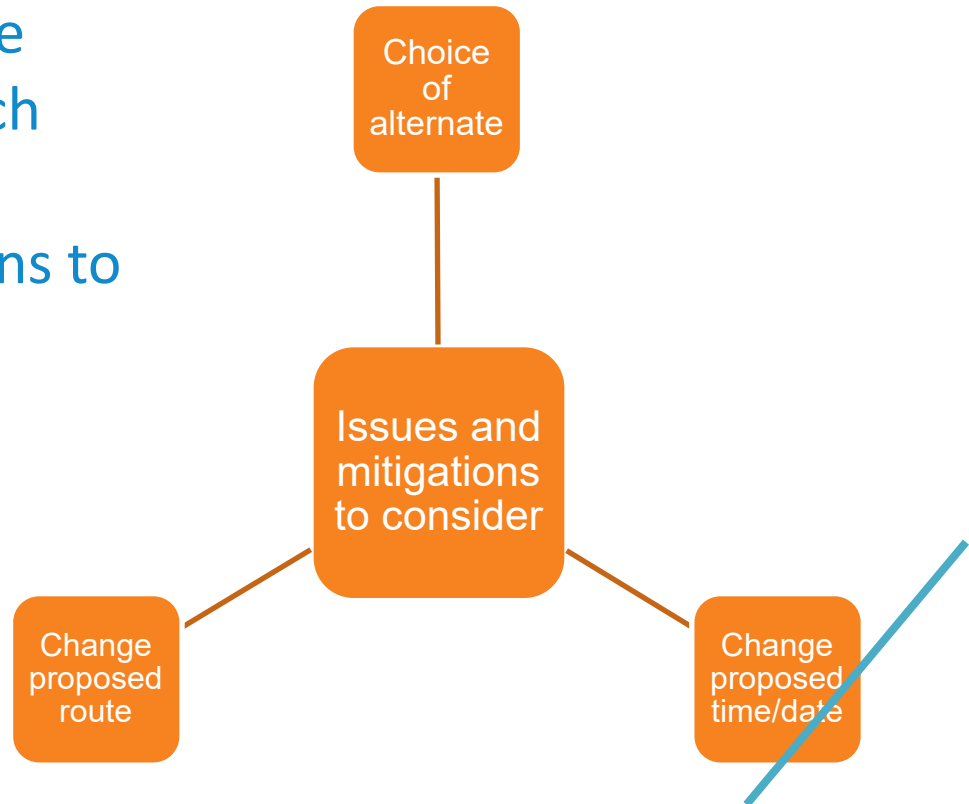
## ➤ Alternate decision and diversion

- > Decision making as per airline operations manual at Dispatch

Enroute: similar considerations to planning,

- > but with time pressure !

- > No 'hold position' button in the cockpit !



# 2: Safety critical issues in flight operations

## ➤ Alternate decision and diversion

### ➤ Connectivity is Key !

Fast provision of complete and accurate information is safety relevant. Needs to encompass the latest available

- actual and forecast weather at the alternate airport
- weather enroute
- operational information on actual usability and handling support



# 2: Safety critical issues in flight operations

➤ Alternate decision and diversion

➤ **Connectivity is Key !**

Ideally, all that info is uplinked in timely manner.

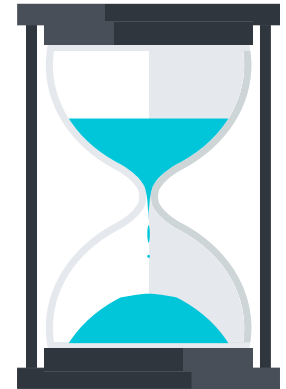
- only possible for aircraft having at ACARS or another form of connectivity
- without connectivity, **workload** on pilots increases substantially as listening to ATIS, VOLMET or asking ATC essentially **takes one pilot away** from flying.
- Support by company dispatch can be valuable



# 2: Safety critical issues in flight operations

## ➤ Alternate decision and diversion

- To be noted: flying to the alternate uses up substantial fuel reserves aircraft carry !
- - margins are getting thin
- - consequently, declaration of MINIMUM FUEL may well be required
- - any unforeseen delay / fuel usage will lead to the MAYDAY FUEL declaration



# 3: Pilot training including use of digital real time weather

## Learning Objectives of EASA

- unchanged since 2016
- do not include specifics on the use of digital, real time, weather
- Open question: is adequate training being provided ?



# 3: Pilot training including use of digital real time weather

Training needs to include benefits and pitfalls of digital weather interpretation and also

- checking that what is displayed is current
- knowing what 'current' means. The aircraft wx radar will offer up-to-the second information, whereas up-linked satellite or ground wx radar pictures could be 10, 20 or even 30 minutes old.





# 4: European ATM and Weather

- Real world operation capability in European ATM is hampered by
  - lack of timely adjustments in ATM to account for coming weather situations
  - apparent lack of weather information on display @ the air traffic controllers stations
  - lack of availability of pre-planned, coordinated measures like those shown in the 'playbook' in the USA.





# 4: European ATM and weather

- Real world operation capability in European ATM is enhanced by tools in the SWIM catalogue.
  - the question is: are they applied / used ?!?



## De-Icing Need/ area

De-Icing Need/ area -service is a nowcast-type forecast of aircraft de-icing needs before takeoff. I...



## De-Icing Need/ Point

De-Icing Need/ point - service is a nowcast-type forecast of aircraft de-icing need before takeoff. I...



## European Contrail...

European Contrails forecast product using a multimodel approach and delivered as a WFS (GeoJSON...



## European Convection...

Convection forecast product using a multimodel approach and delivered as a WFS (GeoJSON) SWIM w...

<https://eur-registry.swim.aero/services>




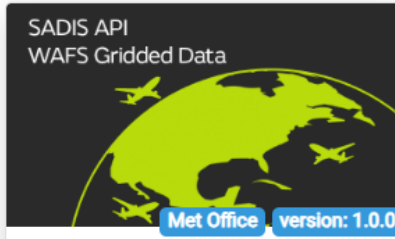


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# 4: European ATM and weather

- Real world operation capability in European ATM
  - are they in widespread, coordinated use ??
  - can pilots make use of them ?

 <p>Icing Intensity HARMONIZED VIA AMQP</p> <p>DWD version: 1.0</p>	 <p>4D-Trajectory</p> <p>Met Office version: 1.0.0</p>	 <p>OPAS EARLY WARNING SYSTEM</p> <p>BIRA version: 1.0</p>	 <p>SADIS API WAFS Gridded Data</p> <p>Met Office version: 1.0.0</p>
<h3>Icing Intensity v...</h3> <p>The Icing Intensity AMQP Service delivers icing intensity forecast information for air traffic for a...</p>	<h3>Met Office 4D-Tra...</h3> <p>The Met Office 4D Trajectory API service supplies global meteorological data for tailored flight tra...</p>	<h3>OpasSo2lhDatasetN...</h3> <p>OPAS service coordinates the OPAS SO2LH notification service which allows subscribed users to receiv...</p>	<h3>SADIS WAFS Gridde...</h3> <p>The SADIS World Area Forecast Service (WAFS) Gridded Data service (the Service) supplies tiles of me...</p>

<https://eur-registry.swim.aero/services>

Safety Forum, Brussels, 20 June 2024



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# 4: European ATM and weather

- Improved real world operating capability in European ATM needs a coordinated plan on severe weather mitigation.
- the Cross Border Convection forecast seems to be the only tool in use to communicate and highlight severe weather.
- Is it effective ?
- what about other kinds of weather disturbances, like snow storms, unusual jetstream patterns ?



# Conclusion: **Connectivity is key !**

- ECA perspective on weather
  - Steps to take: **Mandate Connectivity and do ATM with a focus on weather.**
    - Cross Border Forecasts for Pilots
    - 3-hourly TAF updates
    - get appropriate weather information into the cockpit
    - train pilots to use of modern, digital weather



# Conclusion: **Connectivity is key !**

- Weather information affecting safety
  - Risk assessment and mitigation lies in the hands of experienced crews- they depend on weather information
- Safety critical issues in flight operations
  - diversion due to weather, disruption management is one of the tasks of pilots - they need timely support.
- pilot training including use of digital real time weather
  - needs to come about, so full use is made of what's available.
- ATM and weather
  - modern tools are needed - and a PLAN !



**Thank you very much  
for your attention !**

Klaus Sievers  
Klaus.Sievers@VCockpit.de

