

# 1<sup>st</sup> Asia Pacific Workshop on Flying at High Altitude under Adverse Weather Conditions



## Flight at High Altitude in Adverse Conditions Turbulence Avoidance - Weather Information To Pilot

Chabbi Chaouki, Deputy Head of Department, Aircrew Standards, EASA

### Organisers

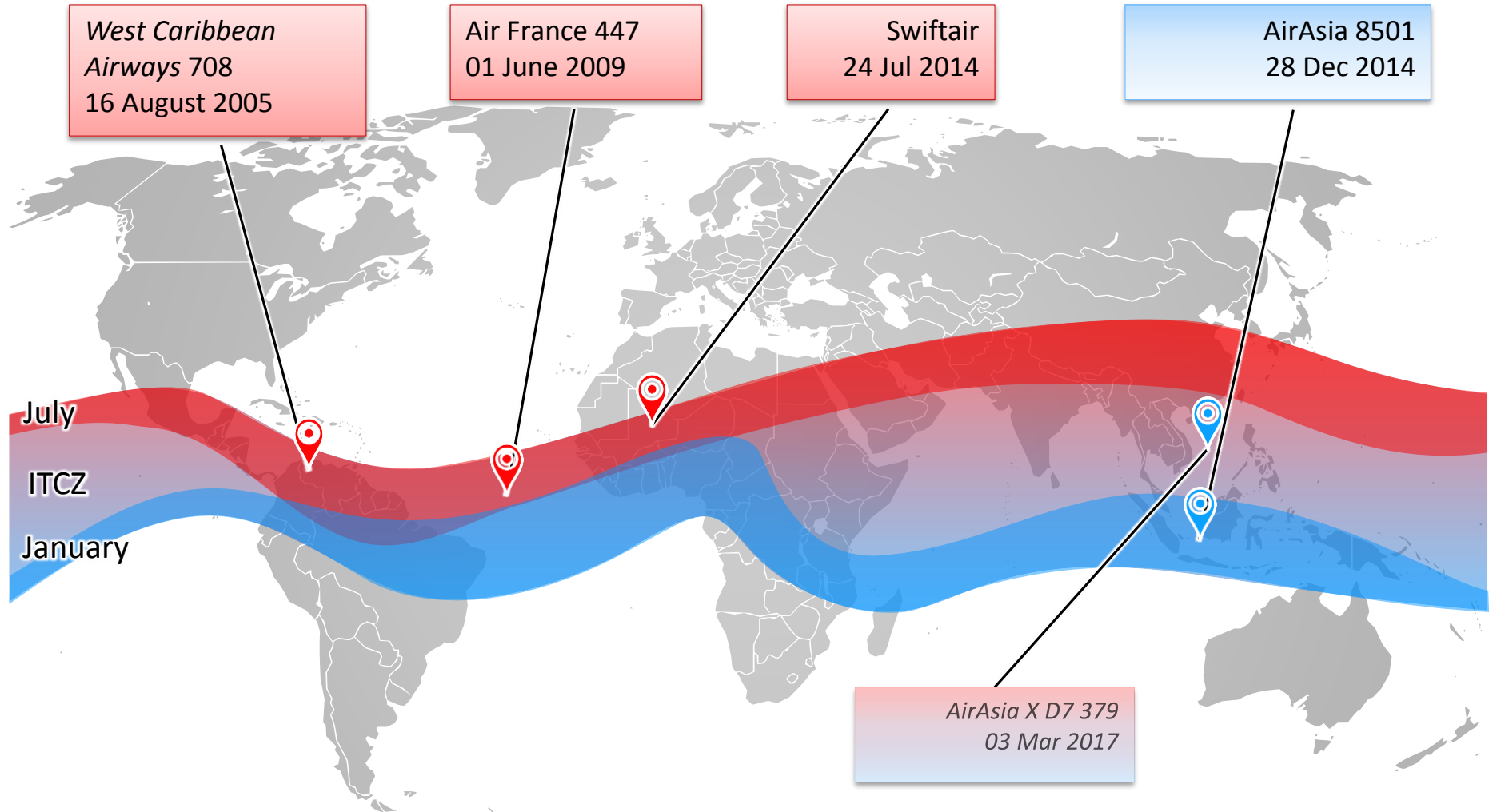


### Supporting Partners





# The starting point → the ITCZ

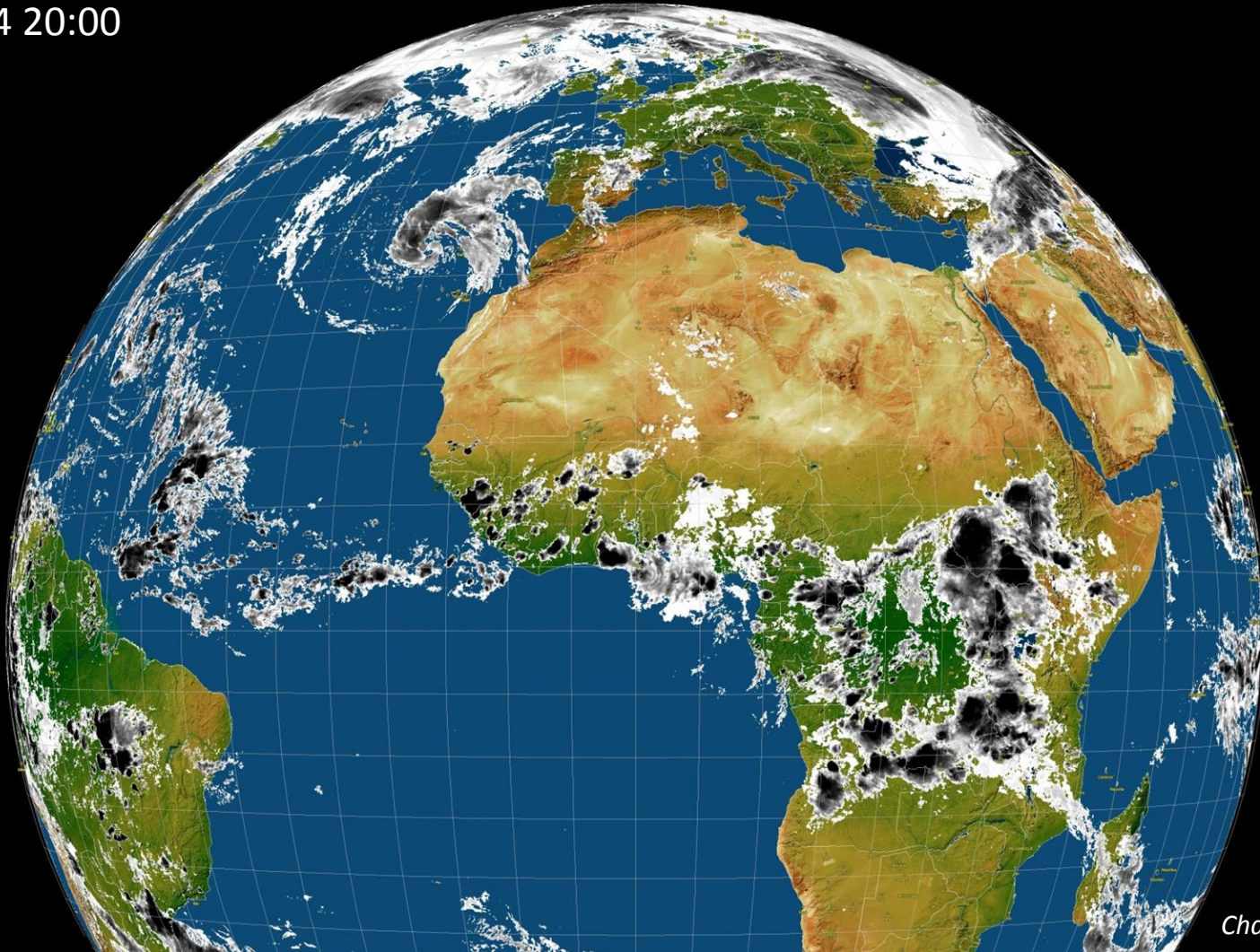






# ITCZ over Africa

19 Oct 2014 20:00

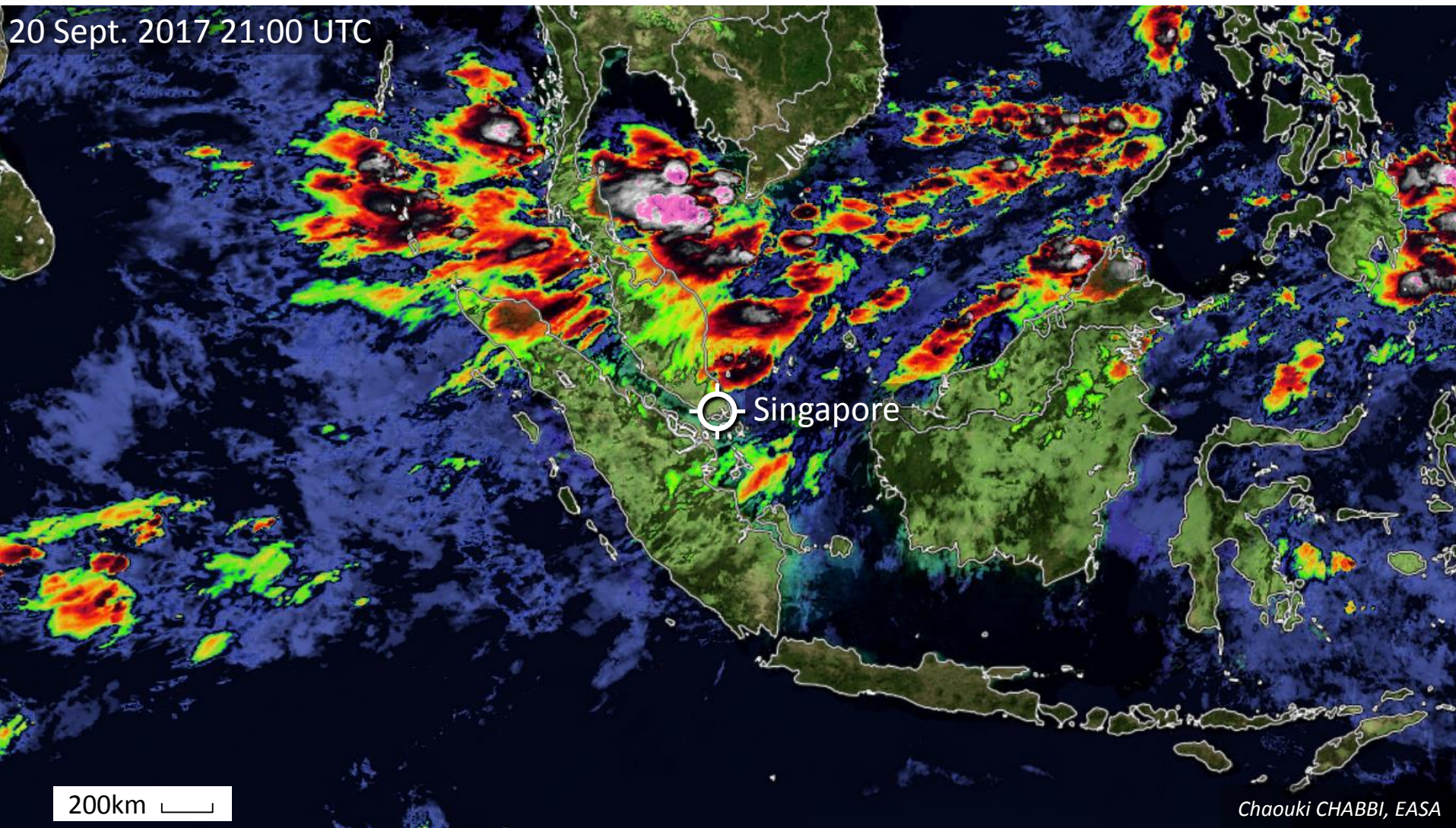


*Chaouki CHABBI, EASA*





# Tropical convective weather over Asia







# Convective cell

Image taken on 5 February 2008 while the International Space Station (ISS) was located over Western Africa near the Senegal-Mali border



**Credit:**

*Astronaut photograph ISS016-E-27426 was acquired on February 5, 2008 and is provided by the ISS Crew Earth Observations experiment. The images were taken by the Expedition 16 crew, and are provided by the Image Science & Analysis Laboratory, Johnson Space Center.*



# Multiple convective cells

**Credit:**

Astronaut photograph ISS040-E-90343. The image was taken by the Expedition 40 crew.



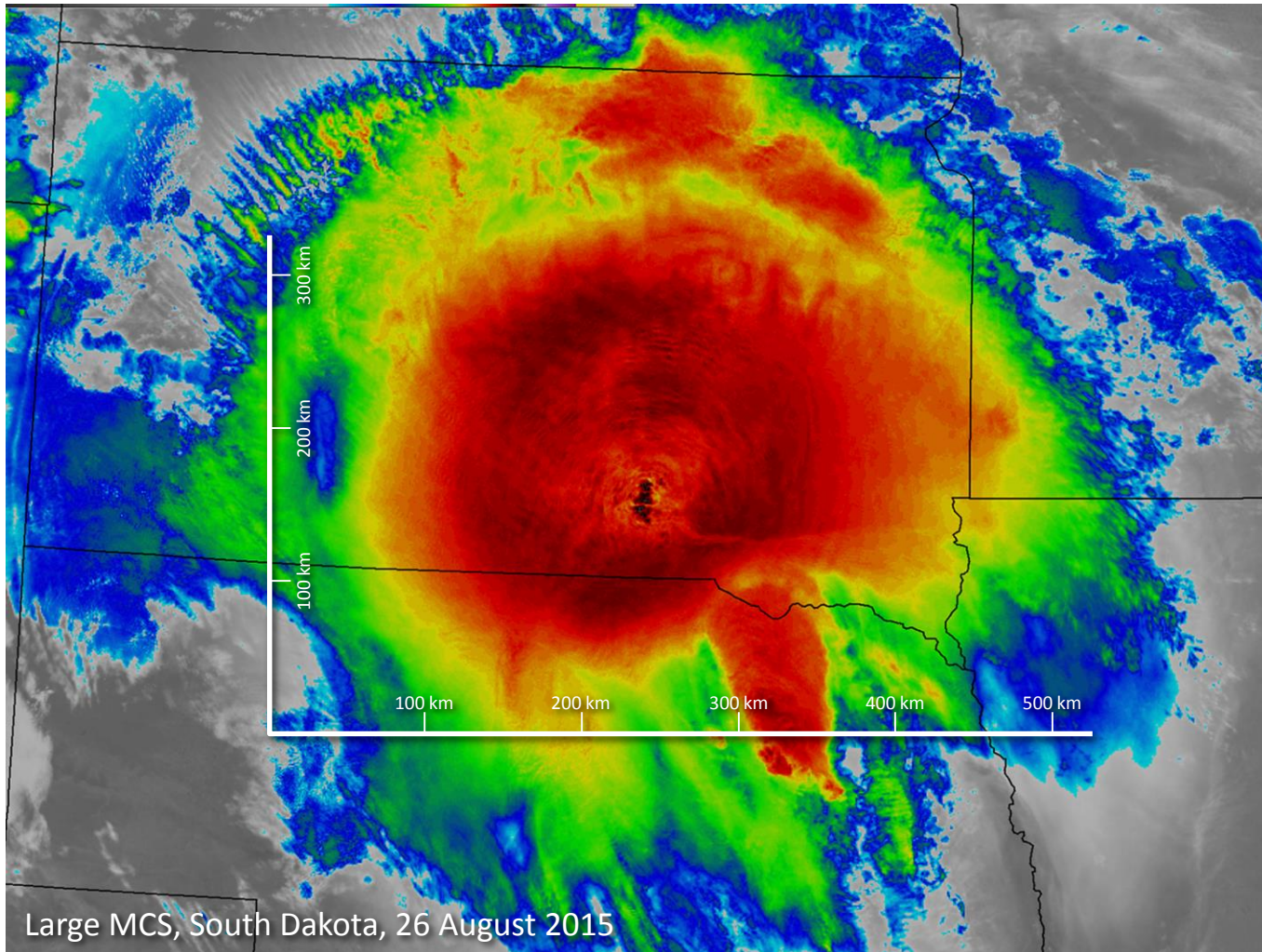
In early September 2014, this photograph was taken by astronaut Alex Gerst on 08 September 2014 from the International Space Station.

The ISS was over Libya at the time, and Gerst was looking south-southwest over a storm that stretched hundreds of kilometers across the sand seas of the Sahara.





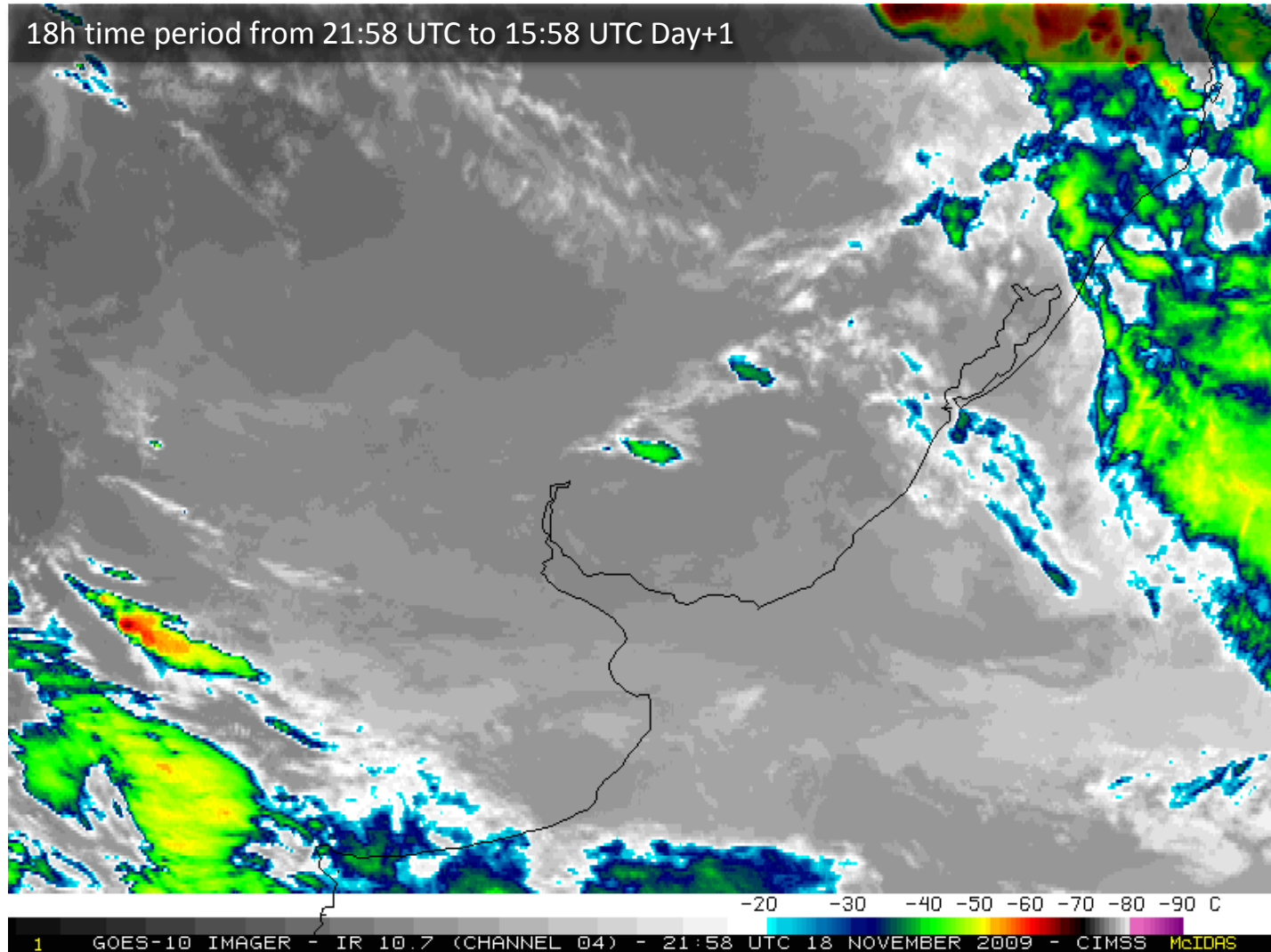
# Mesoscale convective system (MSC)



Large MCS, South Dakota, 26 August 2015



# Mesoscale convective activity

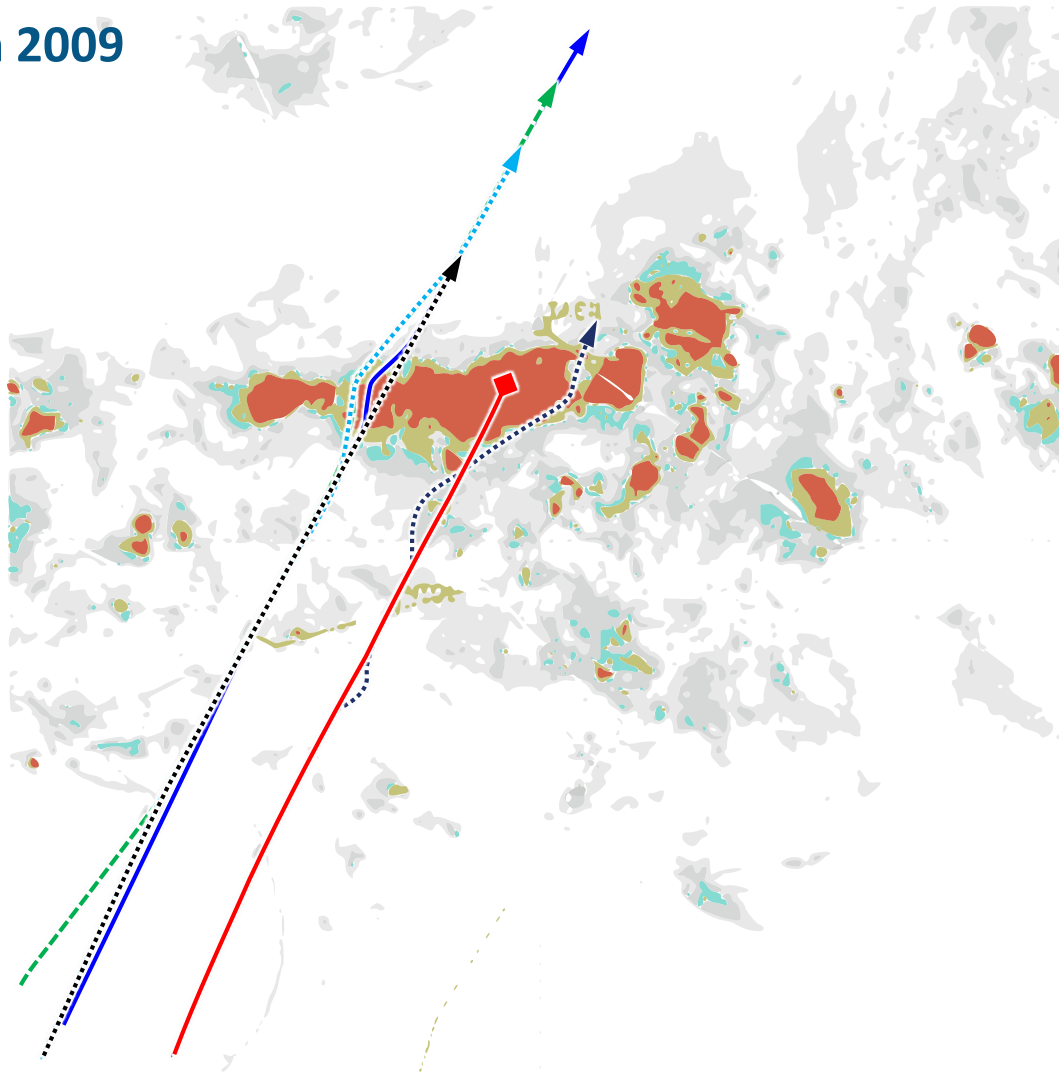






# Flight crew perspective

1<sup>st</sup> juin 2009



AF459 - A330-200  
.....→

AF415 - B777  
————→

AF401 - B777  
-----→

KLM792 - B777  
.....→

ELY010 - B777  
.....→

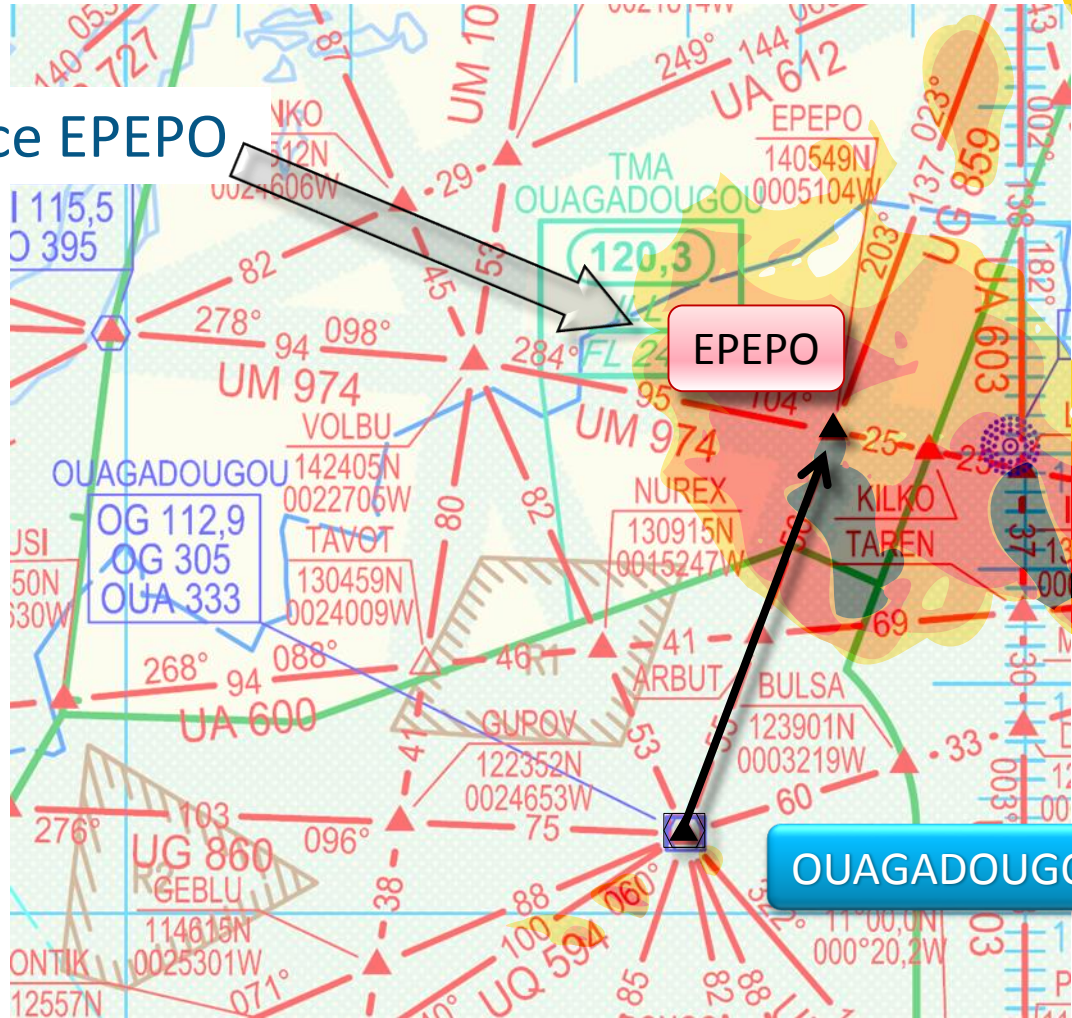
AF447 - A330-200  
————→



# Decision making considering weather

Mali July 2014

ATC clearance EPEPO



Weather cell 01:38  
→ 23' after TOFF  
→ 09' before crash





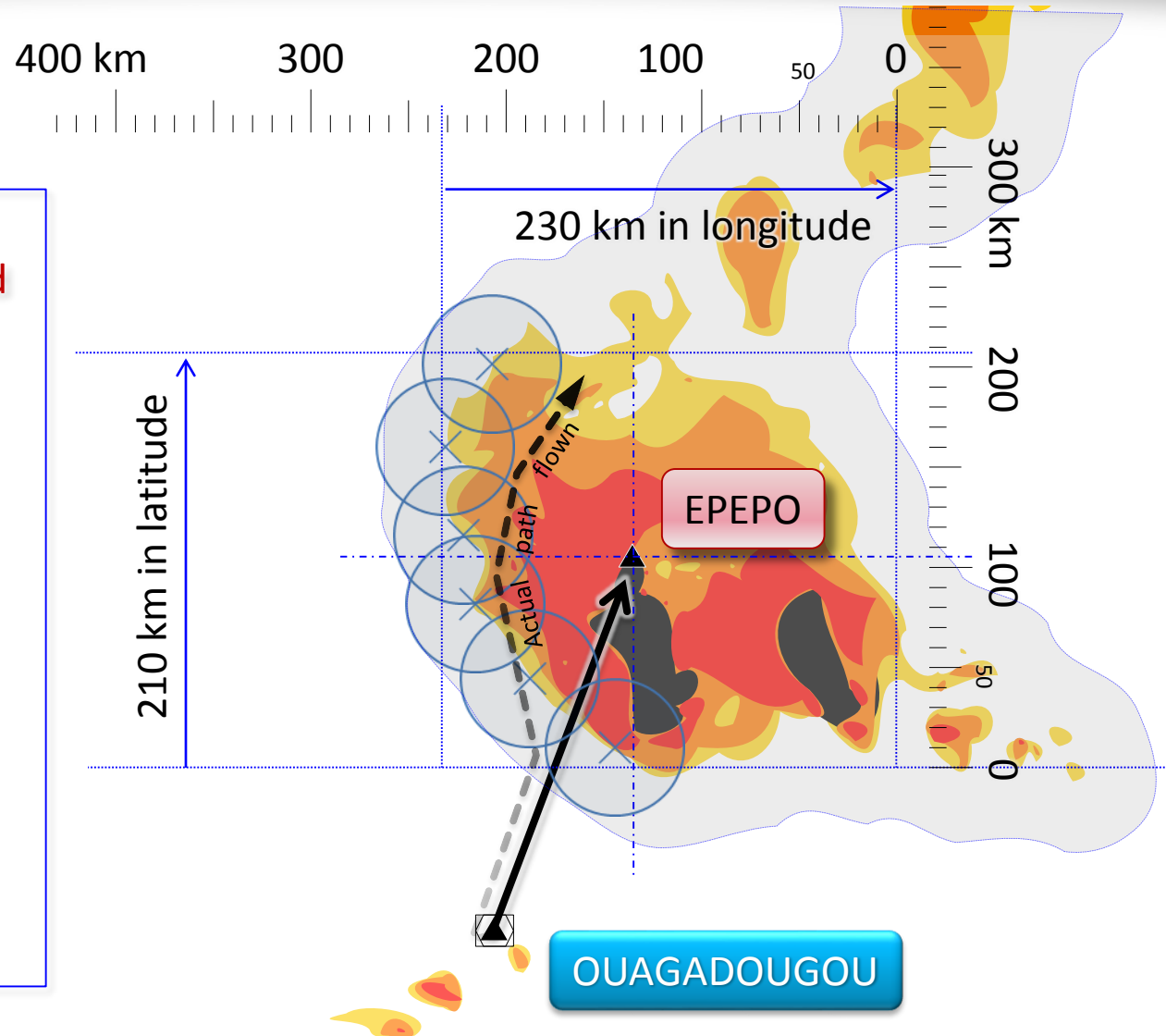
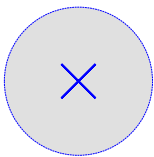
# Considerations for avoidance

Mali July 2014

Outside the cloud, shear turbulence is encountered several thousand feet above and up to 20 miles laterally from a severe storm.

FAA AC No: 00-24C

20 NM  
radius  
clearance





# Cues for avoidance

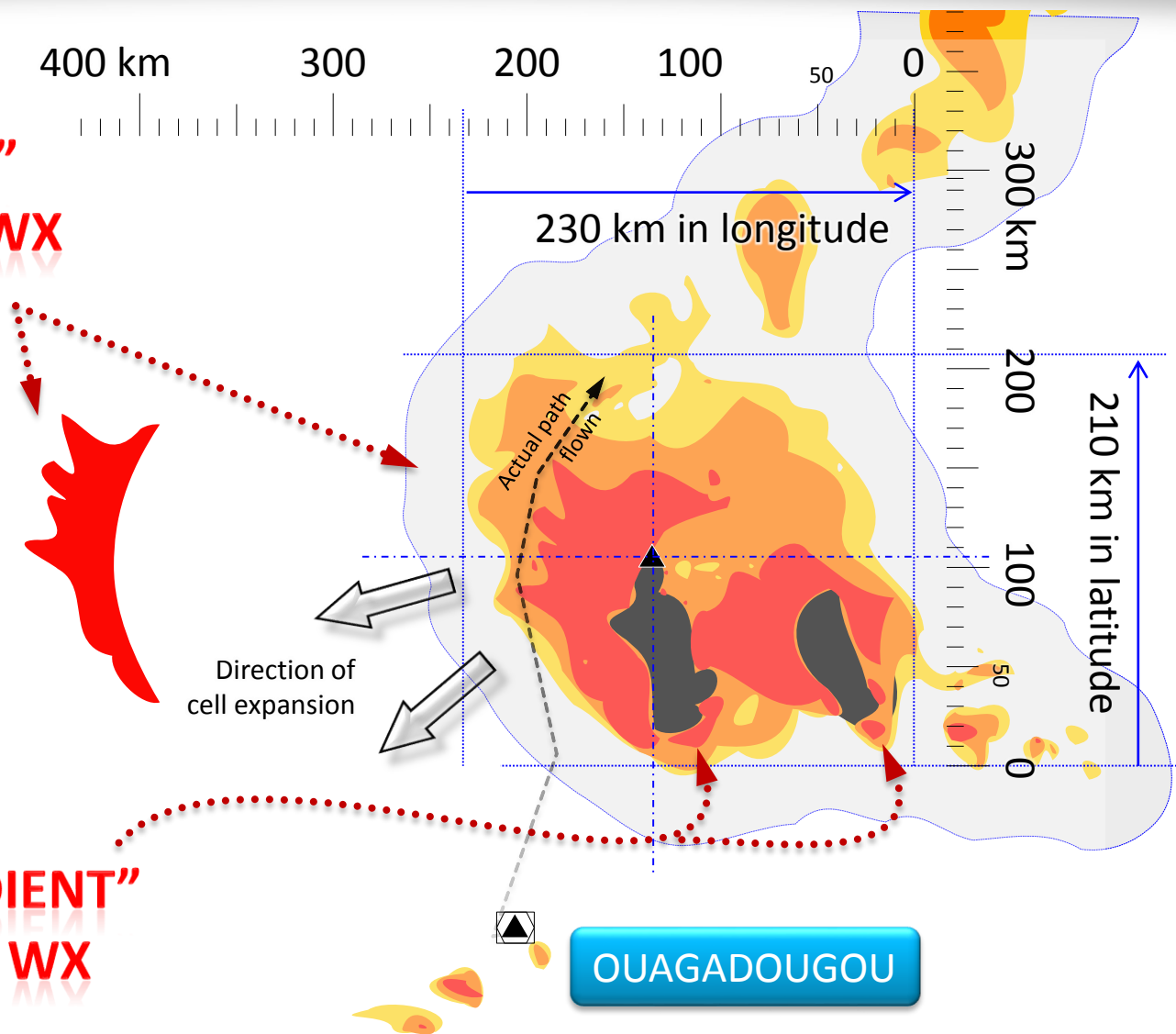


**“FINGERS”  
→ SEVERE WX**

**Airbus Briefing:  
Adverse Weather  
Operations  
Optimum Use of  
the Weather Radar**




**“HIGH GRADIENT”  
→ SEVERE WX**







# Prevention is key → EASA SIB

**EASA**  
European Aviation Safety Agency

You are **not** logged in





Safety Publications Tool


MCAI | SIB | CZIB | Advanced search | AD Biweekly reports | Export list as... | User guide | Related information **NEW!** | Register | Login

**Keyword:**   [advanced search](#)

**AD Workshop**  
The 5th EASA Airworthiness Directives (AD) Workshop will be held on 28 November 2017 in Cologne. The event is addressed to all interested stakeholders such as operators, CAMO, maintenance organisations, design approval holders, who want to have a better understanding of EASA processes related to safety publications. More information and online registration are available [here](#).

**List of Mandatory Continuing Airworthiness Information**  
Displaying 1 record in total.

Number	Issued by	Issue date	Subject	Approval Holder / Type Designation	Effective date	Attachment
<a href="#">2015-13</a>		2015-07-29	 <b>SIB</b> Safety Management of Flight Operations in Adverse Convective Weather and the Inter-Tropical Convergence Zone	 Safety Information Bulletin Operations		 <a href="#">144 kb</a>



**EASA Safety Information Bulletin**  
  
**SIB No.:** 2015-13  
**Issued:** 29 July 2015  
  
**Subject:** Safety Management of Flight Operations in Adverse Convective Weather and the Inter-Tropical Convergence Zone

EASA SIB No: 2015-13

For help on using this tool, please refer to [the help section](#)  
For any inquiry regarding ADs, please contact [the EASA AD team](#)  
To report any bug, broken link or problem with this application, please contact [the EASA IT team](#)



# SIB: core topics

- Crew knowledge and training, such as:
  - Effect on Altimeters;
  - Engine Water Ingestion;
  - Mesoscale Convective System;
  - Supercool Liquid Water;
  - Airborne Weather Radar ...
  
- Hazard identification for safety management, such as:
  - Turbulence;
  - Icing;
  - Hail ...
  
- Practical mitigation measures, such as:
  - Stay clear of radar echoes by 20 NM and 40 NM between 2 cells;
  - Don't land or takeoff in the face of an approaching thunderstorm;
  - Don't attempt to fly under a thunderstorm;
  - Don't attempt to fly under the anvil of a thunderstorm;
  - Caution when using weather satellite imagery for tactical navigation avoidance;
  - Circumnavigate the entire area if it has 6/10 thunderstorm coverage (clusters)
  - Consider as extremely hazardous any thunderstorm with tops 35,000 feet or higher ...





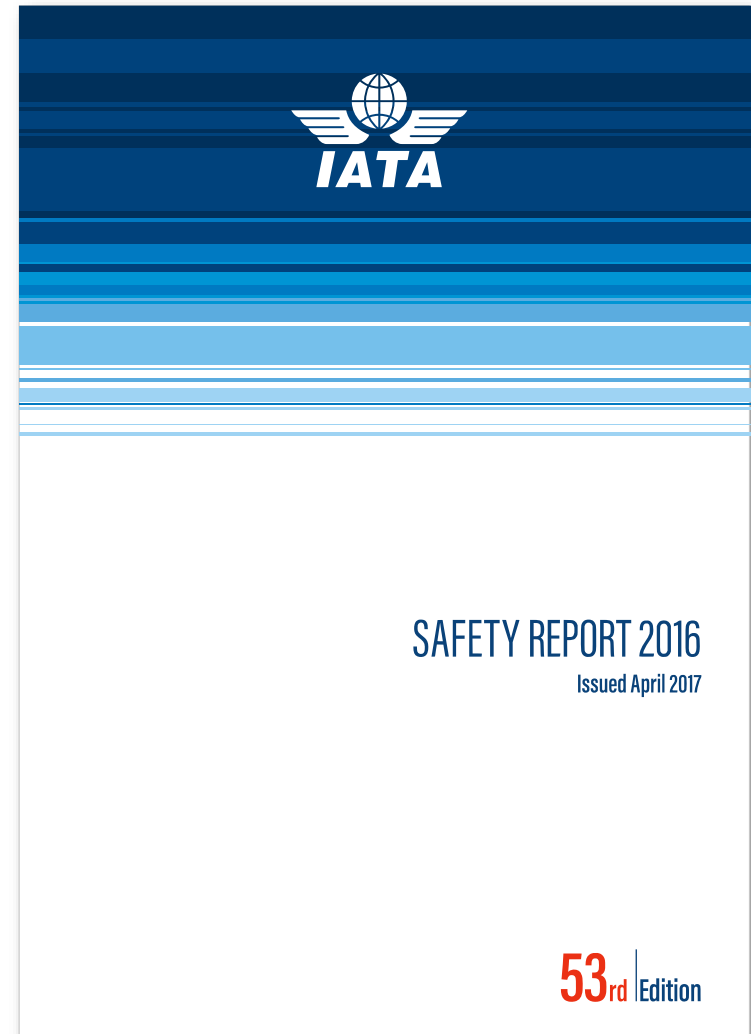
# SIB: safety management related to XX-WX

- Safety data collection, such as :
  - Is turbulent air penetration recorded? Is it reported by pilots? How are the reports used?
  - Are FDM-based indicators targeting adverse convective weather and ITCZ related events?
  - Are autopilot disconnection due to turbulence monitored?
  - Are lightning strikes and hail damages recorded?
  - ...
- Safety data analysis, such as:
  - Are trends of unnecessary WX penetrations analysed?
  - Are dispatch rates with inoperative anti-icing systems or WX radar analysed in relation to risks associated with WX conditions?
  - ...
- Risk mitigation aspects, such as:
  - How is pilot competence assessed to ensure proper use of WX radar?
  - How is training, progress and checking recorded when it comes to decision making related to WX?
  - Are there clear instructions for pilots on vertical and lateral WX avoidance in flight?
  - Is there a specific fuel policy for inclement WX operations?
  - Is in flight operational support providing pilots with regular WX updates adapted to tactical decision making?
  - ...



# Risk awareness: specific to weather

- **36% of loss of control** accidents occurred in degraded meteorological conditions, in most of the cases involving thunderstorms and icing. (Pg. 118)
- The number and combination of **MEL** items, **combined** with other factors (e.g., **weather**) can lead to degraded safety levels. (Pg. 123)
- **31% of accidents** were related to meteorological threats. This **remains unchanged** since 2012. (Pg. 123)
- **Unnecessary weather penetration** was a factor in 7% of the accidents in 2016. (Pg. 123)
- **Real-time weather information available in the cockpit should be improved.** This recommendation was issued in 2014 (Pg. 79). It is still in the 2016 report. (Pg. 123)
- **Continuous improvement** of the **real-time downlink** of weather data obtained by aircraft and **uplink of weather information required in the cockpit** is needed. (Pg. 123)

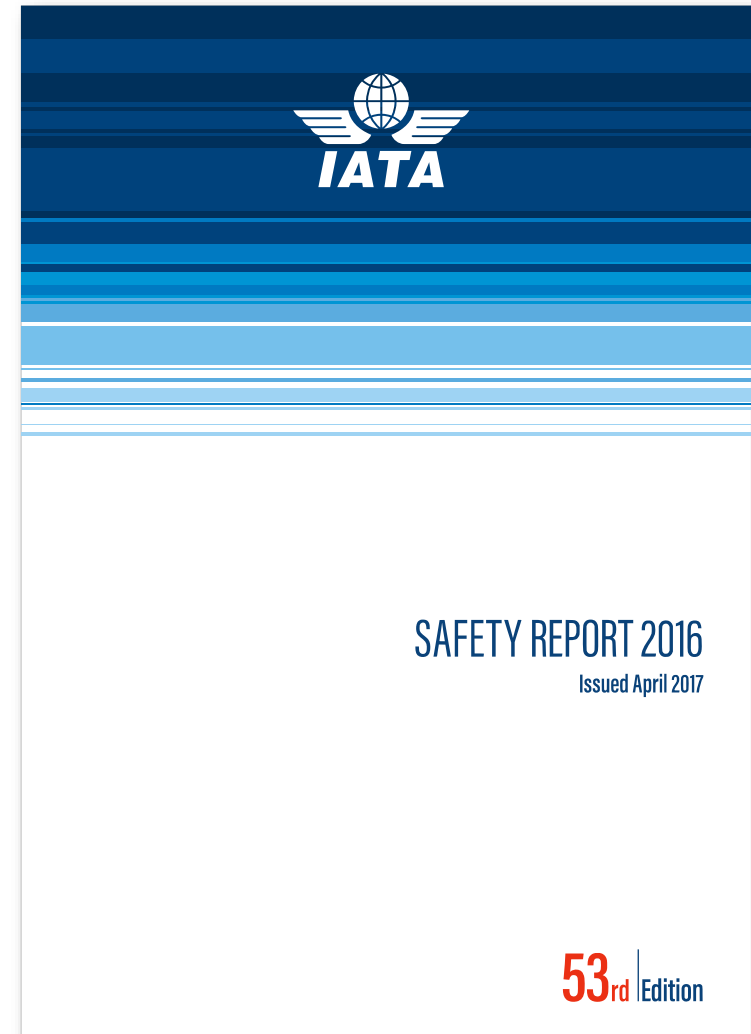
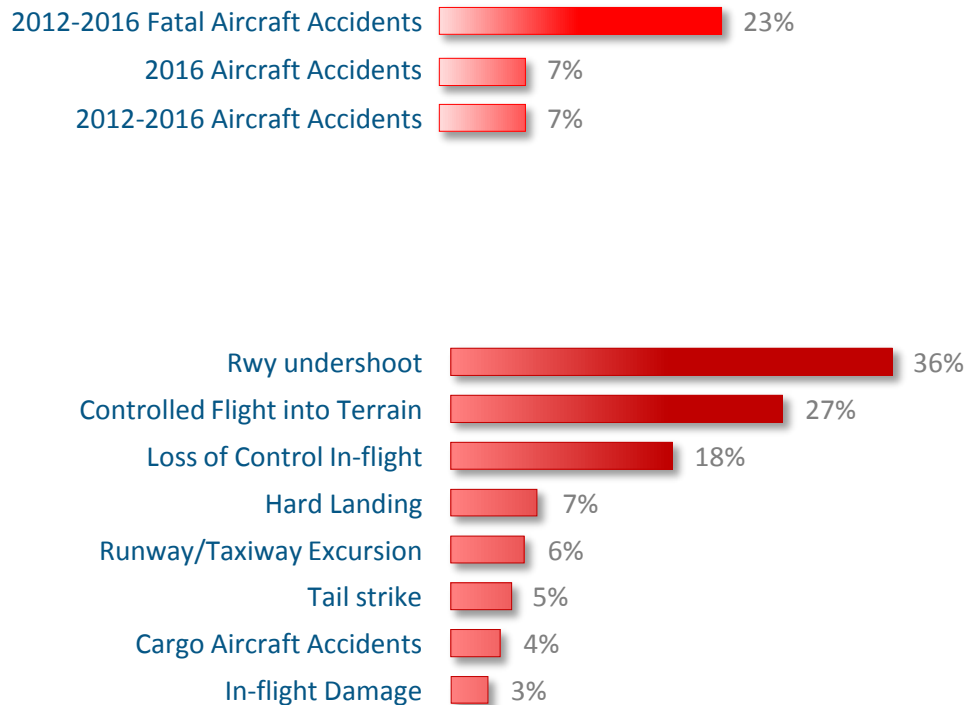






# Risk awareness: weather penetration

## Data on unnecessary weather penetration





# EASA

European Aviation Safety Agency

## Thank you for your attention



## Your safety is our mission.

An agency of the European Union

