



# EASA

European Aviation Safety Agency

# Flight at High Altitude in Adverse Conditions

## EU/EASA Research Activities

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**Your safety is our mission.**

An agency of the European Union





# Introduction

- Research on weather is a high priority in Aviation
- Vast domain
- Numerous EU initiatives, mostly through Clean Sky EU scheme



# Scope

- Wind (in particular mountain wave; mountain rotor), storms (typhoon, hurricane, cyclone, tornado), gusts, turbulence (including clear air turbulence), wind-shear, cross winds
- Wake turbulence



# Scope

- Humidity, precipitation such as rain, hail, snow, packed snow,
- Liquid precipitation: drizzle, rain,
- Freezing precipitation: freezing drizzle, freezing rain, rain and snow mixed
- Frozen precipitation: snow, snow grains, snow pellets/graupel, ice pellets, hail, ice crystals, high-altitude icing, clear ice, super-cooled droplets



# Scope

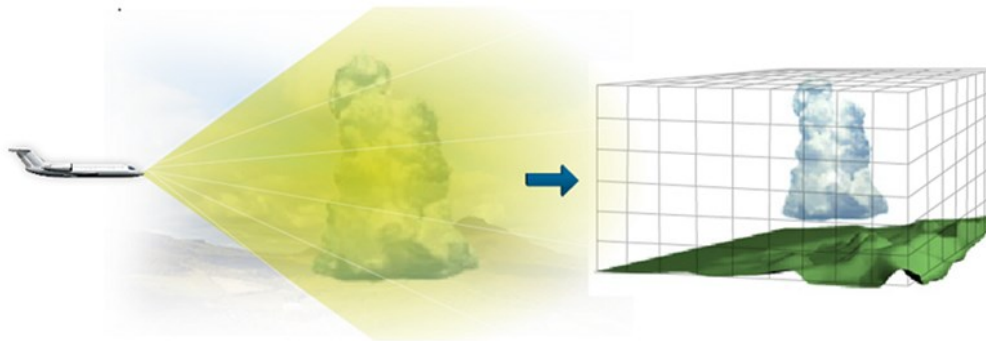
- Rime
- Static electricity, lightning
- Extreme high and low temperature
- Low visibility
- Volcanic Ash
- Bird Strike
- Ozone
- Cosmic radiation, space weather



# Today's technology

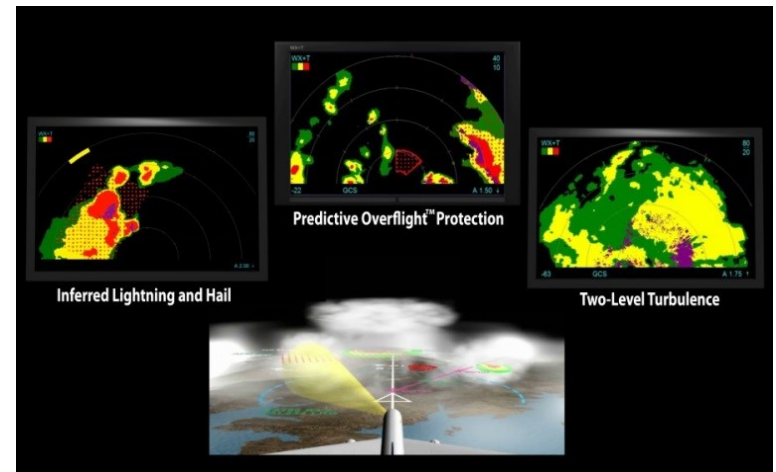
- Conventional weather radar technology
  - Advanced weather radar technology - Examples
    - Honeywell's IntuVue™ 3-D Weather Radar, RDR 4000
    - Rockwell Collins MultiScan ThreatTrack™ weather radar

*Captures All Weather in the Scanning Volume*



Display +/-90 degrees, 3-Dimensional (range, azimuth, altitude), Continuously Updated, Motion Compensated

Source: Honeywell presentation

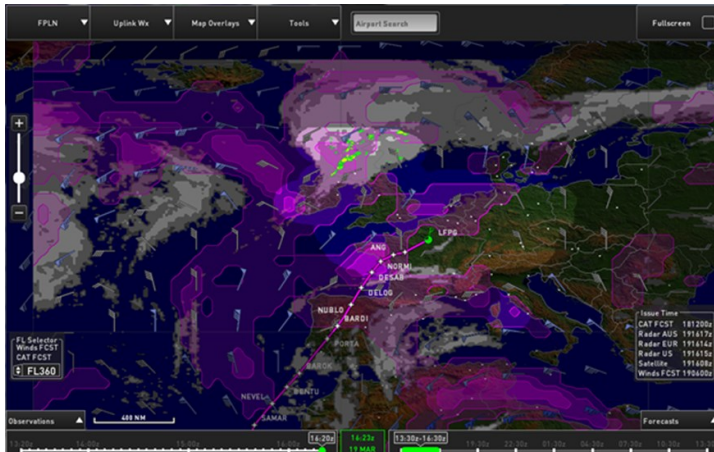


Source: Rockwell Collins website



# Today's technology

- Weather information system based on ground, in-situ, and satellite data - Examples
  - weather observation like from radar, satellite, PIREPS, METAR, and
  - weather forecast like CB tops, wind aloft, clear air turbulence, icing, TAF, SIGMET



•Source: Honeywell presentation



•Source: Honeywell website



## ➤ General projects on weather phenomena

### ➤ ***EWENT***

- Extreme Weather Impacts on European networks of Transport

### ➤ ***WEATHER***

- Weather extremes ; assessment of impacts on transport systems and hazards for EUROPEAN regions

### ➤ ***WEZARD***

- CSA-SA on Weather Hazards for Aeronautics





- On-board technology for detection of weather phenomena
  - Weather radar technology
    - **AHEAD** - Advanced design and testing of a polarimetric X-band antenna for avionic weather radar
    - **CLEOPATRA** - Cleaner operations attained through radars' advance
    - **KLEAN** - Knowledge-based EFB for green flight trajectory decision aid
    - **X-WALD** - Avionic X-band weather signal modelling and processing validation through real data acquisition and analysis



## ➤ Clear air turbulence Weather radar technology

- **AWIATOR**- Aircraft Wing with Advanced Technology Operation
- **DELICAT** - Demonstration of LIDAR-based Clear Air Turbulence detection

## ➤ Icing

- **EXTICE/ EXTICE II** - Extreme icing environment
- **ON-WINGS** - On Wing Ice Detection and Monitoring System
- **HAIC-HIWC-HighIWC** - High Altitude Ice Crystals
- **STORM** - Efficient ice protection systems and simulation techniques of ice release on propulsive systems



- Ground and Satellite based
  - **FLYSAFE** - Airborne integrated systems for safety improvement, flight hazard protection and all weather operations
  - **ALICIA** - All Condition Operations and Innovative Cockpit Infrastructure



## Other Information

- Workshop – Weather Information provided to Pilot
  - 28-29 October 2015
  - <http://easa.europa.eu/newsroom-and-events/events/workshop-%E2%80%9Cweather-information-provided-pilots%E2%80%9D>



EUROPEAN AVIATION SAFETY AGENCY  
AGENCE EUROPÉENNE DE LA SÉCURITÉ AÉRIENNE  
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# Questions?

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