



World Meteorological Organization

Working together in weather, climate and water

# Meteorological Services Supporting ATM

*...providing MET services to support a move from Air Traffic Control (ATC) to more integrated and collaborative Air Traffic Management (ATM)*



# Background

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- The WMO Expert Team on Meteorological Services To ATM (MSTA) and Meteorological Information Exchange (ET-M&M) is the WMO/ Commission for Aeronautical Meteorology (CAeM) response to the challenge laid out by ICAO on behalf of the ATM community.
  - The primary role of the group is to analyse user needs from an innovative and high-level scientific perspective and perform a gap analysis with current MET capabilities
  - ET-M&M is also assisting with carrying out of the work of the ICAO Meteorological Aeronautical Requirements and Information Exchange Project Team (MARIE-PT).
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# The challenge

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- ICAO Annex 3 stipulates meteorological data products
  - ...In support of aerodrome operations
    - Aerodrome Forecast (TAF)
    - Trende Landing Forecast (TREND)
    - Aerodrome Warnings
  - ...In support of FIR, regional, global operations
    - AIRMET/SIGMET
    - WAFC charts
  - Use highly-condensed, coded, textual format
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# The challenge

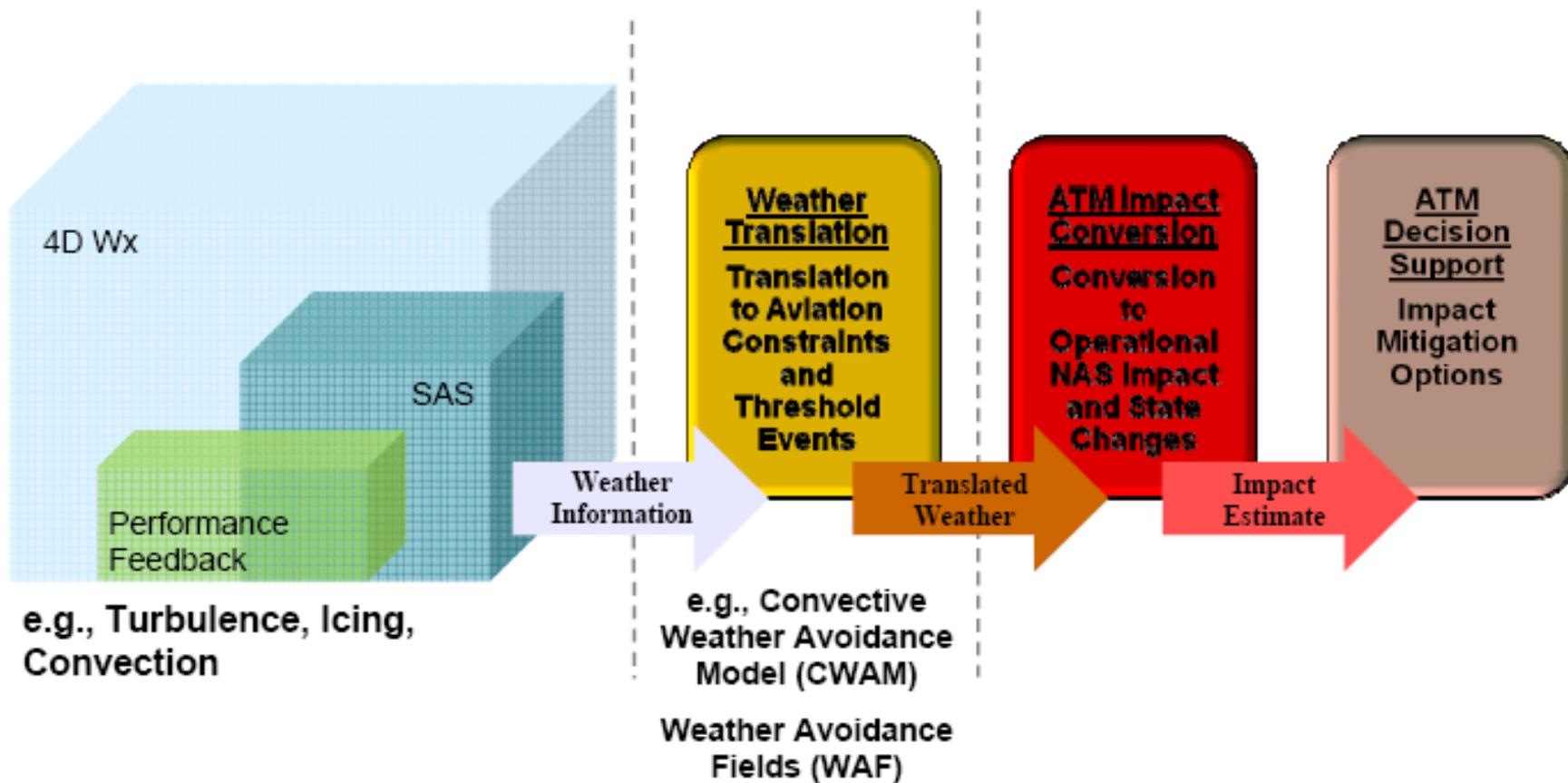
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- Services no longer meet the needs of modern aircraft operators and other users of the ANSPs
    - Not specific enough
    - Gap between aerodrome and FIR/global scale
    - No info on some important parameters (crosswind, headwind, winter conditions such as snow fall rate)
  - Various States developing MET services to address local needs
  - The problem has been recognized by ICAO
    - “MET services required by ATM to optimize traffic flow in the en-route and terminal areas”
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Example US development

# NextGen Weather Integration Concept





# The Met view of ATM needs

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- Status quo:
    - Weather strongly affects ATM operations, causes delays and increased costs
    - Current weather info, as defined in Annex 3, is not sufficient to meet the future needs of the performance based ATM
    - National prototype services are uncoordinated, lack inter-operability, but address some specific solutions
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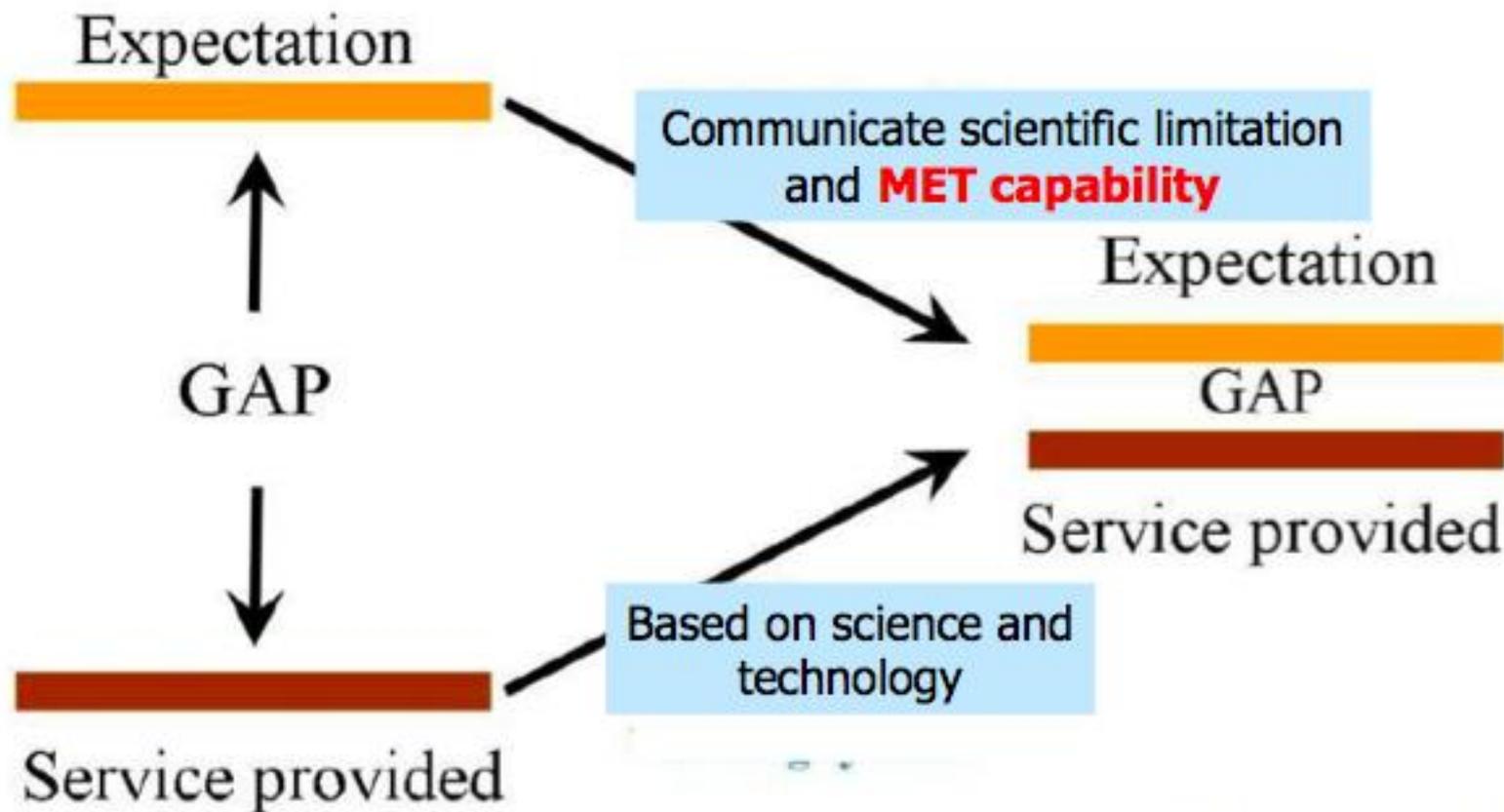


# Continued...

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- New solutions need to be standardized
  - Need to bridge the gap between high-level, abstract concepts (ASBUs) and existing developments
  - Consider moving target (effects of climate change)
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# User Engagement: Expectation in weather forecast



**Based on current state-of-art and projection**



# MET Information gaps

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- Need to understand ATM decision-making process, including critical decision points and parameter thresholds
  - Quantified impacts of weather on ATM operations in terms of e.g. arrival rate, airspace capacity
  - Understand clearly where and when which MET information is needed (Decision points)
  - Agreed performance metrics
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# Leading to...

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- Ability to factor users' needs into R&D planning and prioritization
  - Clear understanding where effort is most likely to result in most needed improvements
  - Allowing for the necessary budgeting, resource allocation and deployment, typically 5-year (+) timeframe
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# Cooperation is key as...

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- Need to develop common understanding
    - Of fundamental limitations of the science to model weather processes
    - How to handle uncertainty; e.g. use/interpret probabilistic information
    - E.g. as part of safety and project risk management
    - ATM feedback essential in validation process, including operationally relevant metrics
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# Looking out of the box

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- Role of new products and services in support of ATM and airport operations
  - Acceptance and departure capacity key factor in network operations, e.g.
    - Aircraft de-icing, runway clearance, engine icing in freezing fog
    - Lightning strike affecting ground ops...
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# Black boxes communicating only?

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- Some current concepts favour machine – machine communications only
    - MET data entering Flight Planning programmes directly without visualization
    - Common situational awareness – how?
    - Collaborative Decision Making needs “human-oriented” information and presentation
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# Guiding principles

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- Not just consider weather parameters separately, but group them into “scenarios”
    - wind (type [crosswind, wind], height, threshold)
    - convection forecast
    - winter weather (on-ground icing)... liquid/ freezing/ frozen precipitation and accumulation, temp
    - low visibility : low cloud ceiling, visibility, RVR
    - storms (sandstorm, snowstorm, tropical cyclone)
    - Turbulence and wind shear
    - in-flight aircraft icing... temp, humidity, cloud droplets
  - Goal is to provide advance notice of scenarios that require action as defined by Standard Operating Procedures (SOPs)
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# Regulated user involvement

- **Intensify efforts in user engagement**
  - *Established new **ICAO Project Team (MARIE-PT)***
- **Addressing key stakeholders in ATM:**
  - *Establish working relationship with ATMRPP–nominated experts*
- *Iterative approach in close cooperation with these experienced ATS/ATM practitioners*
- *Document weather effect on operations planning*
- *Holistic view of sub-regions rather than single aerodromes? (Alternates also affected?)*