

Long-term plan for aeronautical meteorology

AvRDP Seminar

Pretoria, South Africa

19 to 22 August 2019



WMO OMM

World Meteorological Organization

Organisation météorologique mondiale

Presented by:
WMO Secretariat
and P/CAeM

Content

- Background and rationale
- Introducing the long-term plan
- Next steps

Background and rationale

A global business...



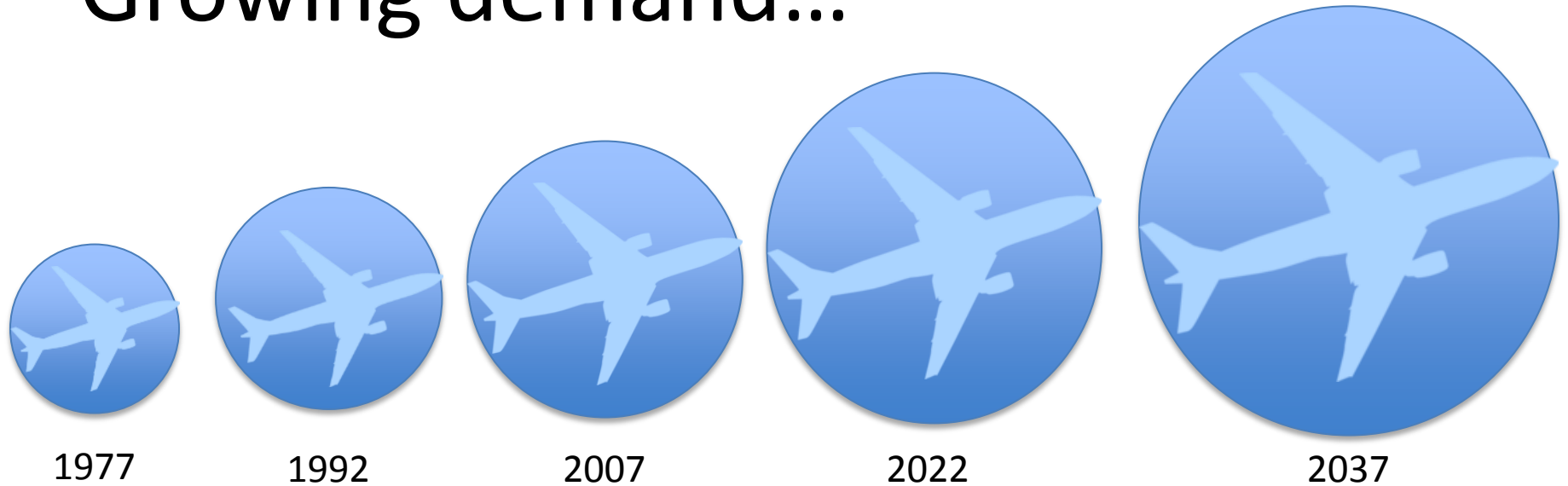
>100,000 commercial flights per day

...needs globally standardized, uniform weather information “gate-to-gate” or “enroute-to-enroute”



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Growing demand...



...to be met by growing supply

The facts:

- Global air traffic has doubled in size once every 15 years since 1977, despite broader recessionary cycles
- Over US\$ 2 trillion GDP contribution annually
- Over 3 billion passengers annually
- Over US\$ 6 trillion value of air cargo annually



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[Source: ICAO, ATAG, Airbus]

Why is weather important to aviation?



...because it's intrinsically linked with aviation **SAFETY**, **EFFICIENCY**,
ECONOMY and **ENVIRONMENTAL PROTECTION**

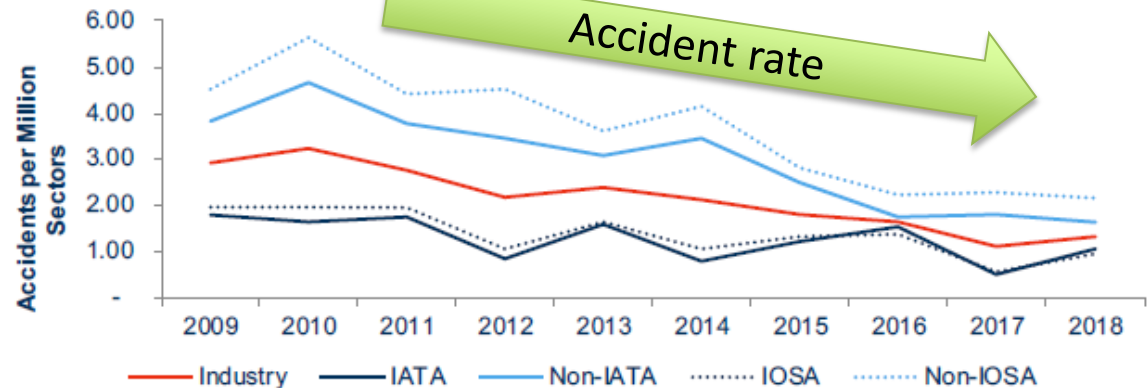
Safety performance in numbers...



ALL ACCIDENTS

'All Accidents' is the most inclusive rate, including all accident types and all severities in terms of loss of life and damage to aircraft.

Jet & Turboprop Aircraft



- Over the last ten years the world's commercial aviation system industry has **improved its overall safety performance**, with an **accident rate in 2018 of 1.35 accidents per million sectors**, compared to ~3 in 2009



The weather factor...

- Over the past 5 years, hazardous weather conditions has consistently been one of the **TOP THREATS** to aviation, including:
 - thunderstorms
 - poor visibility/IMC
 - gusty wind/wind shear
 - icing conditions
 - hail
- Primary aircraft 'end-states':
 - Loss of control in-flight (LOC-I)
 - Controlled flight into terrain (CFIT)
 - Runway/taxiway excursion

...in aviation incidents/accidents

Aviation's No. 1 Priority:



SAFETY

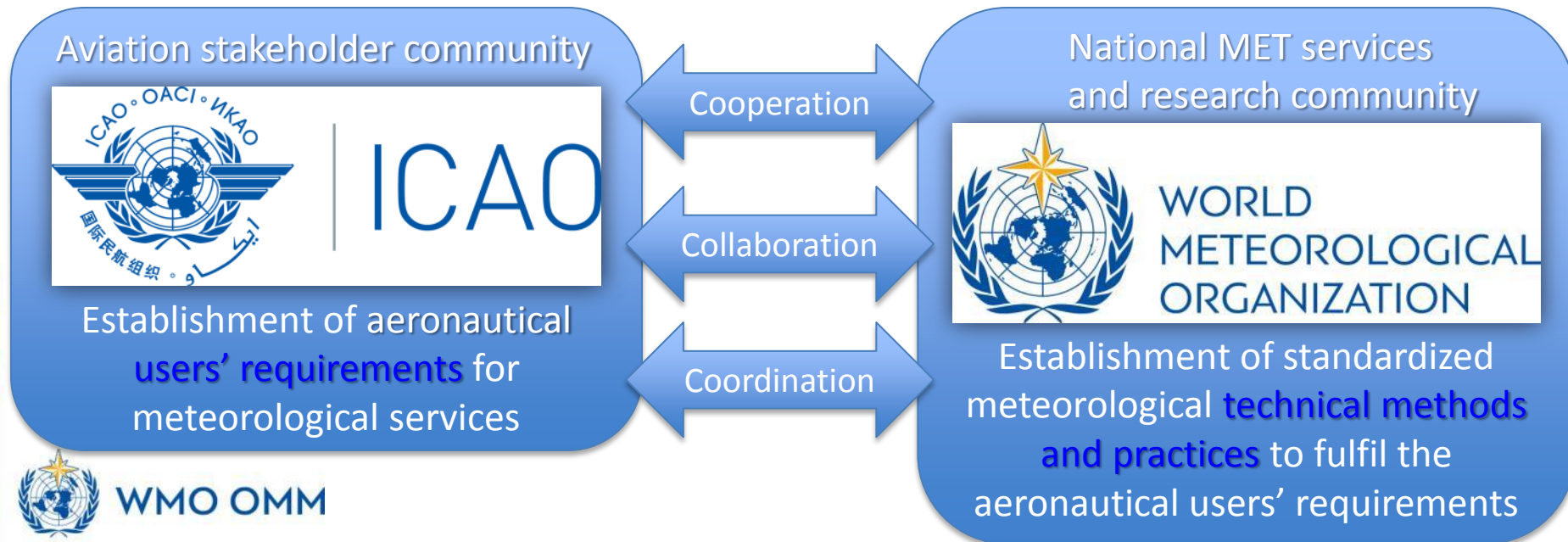
...on the ground and in the air...

Complimented by:

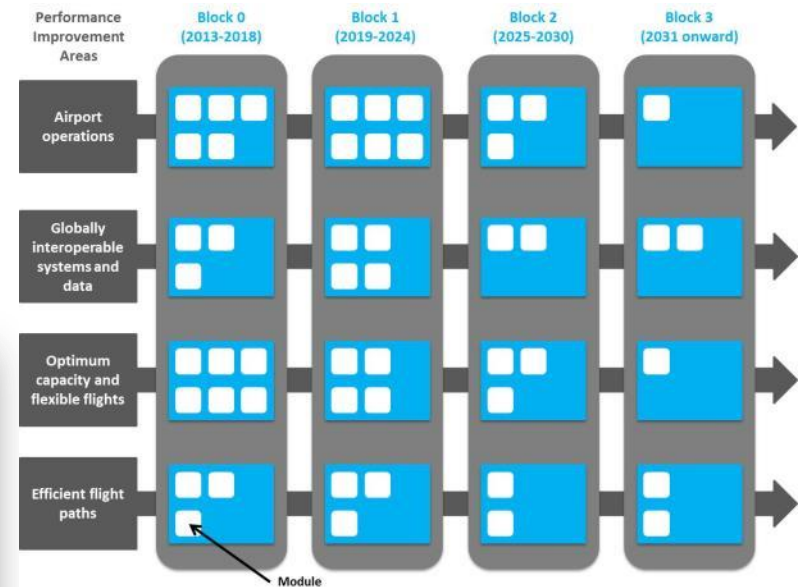
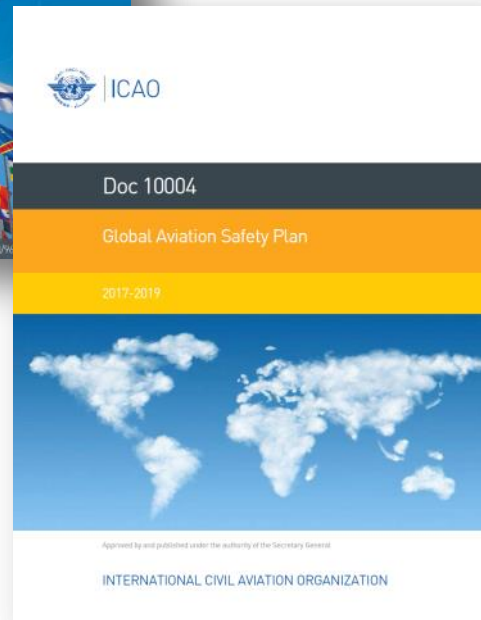
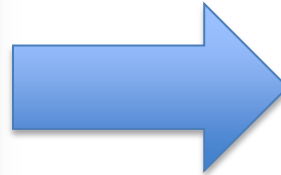
- Air Navigation Capacity and Efficiency
- Security and Facilitation
- Economic Development
- Environmental Protection

WMO partnership with ICAO

- Working arrangement for 70+ years
 - Broad principles of cooperation, collaboration and coordination
 - Currently under review and update



Global plans...



ICAO Doc 9750 (GANP)
ICAO Doc 10004 (GASP)

...for evolving a global business



ASBUs on MET

- **AMET-B0 (from 2013):** Global, regional and local meteorological information to support flexible airspace management, improved situational awareness, collaborative decision-making and dynamically optimized flight trajectory planning.
- **AMET-B1 (from 2019):** Meteorological information supporting automated decision process or aids, involving meteorological information, meteorological information translation, ATM impact conversion and ATM decision support.
- **AMET-B2 (from 2025):** Integrated meteorological information in support of enhanced operational ground and air decision-making processes, particularly in the **planning phase and near-term**.
- **AMET-B3 (from 2031):** Integrated meteorological information in support of enhanced operational ground and air decision-making processes, for **all flight phases** and corresponding air traffic management operations.
- **AMET-B4 (from 2037):** Integrated meteorological information supporting both **air and ground** decision making for **all phases of flight** and ATM operation, especially for implementing immediate weather mitigation strategies



Aviation as a customer-oriented major application area of WMO

Observations – surface, upper air and satellite-based Earth observations

Data-processing, modelling and forecasting – immediate-term (minutes), short-term (hours), longer term (days+)

Standardization – technical regulations and guidance

Seamless service delivery – right time, right place, right format (locally, nationally, regionally, globally)

Technical assistance and capacity development – education and training, competencies and qualifications, QMS, cost recovery, etc.

Telecommunications, infrastructure and data exchange – point-to-point, point-to-many, many-to-one, push/pull, METCE ↔ IWXXM interoperability

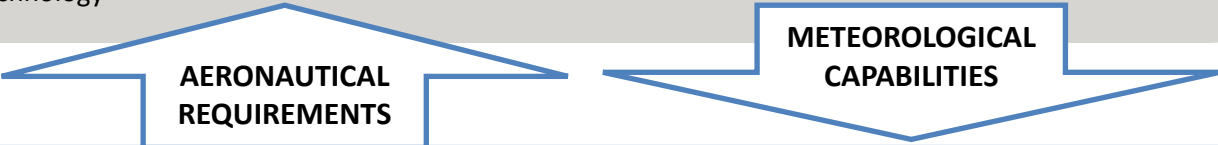
WMO/ICAO

TCs/RAs Support

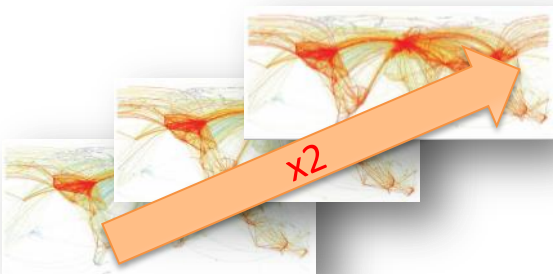
Research and development, science and technology

From product centric to data centric

Coordination and partnerships – ICAO, IAEA, IATA, IFALPA, IFATCA, ICCAIA, CANSO, IBAC, IAOPA, WHO, ...



DRIVERS (for change)



Air traffic growth (doubling) 2015-2030

Enhance safety, improve air navigation capacity, efficiency and economy, reduce impact on the environment



ICAO's Global Air Navigation Plan (GANP) and aviation system block upgrade (ASBU) methodology



WMO Member responsibilities


- World area forecast centres (WAFC)
- Volcanic ash advisory centres (VAAC)
- Tropical cyclone advisory centres (TCAC)
- Meteorological watch offices (MWO)
- Aerodrome meteorological offices (AMO)
- Aeronautical meteorological stations (AMS)

GLOBAL

REGIONAL

SUB-REGIONAL

NATIONAL



All operated by National Meteorological and Hydrological Services (NMHSs) or other Aeronautical Meteorological Service Providers (AMSPs) of WMO Members

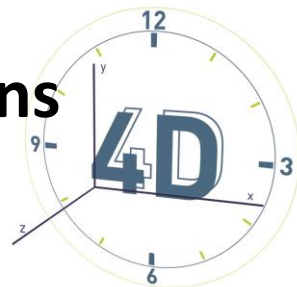
Within the next decade...

- Enhanced World Area Forecast System (**WAFS**)
 - Improved temporal and spatial resolution
 - Use of ensembles
- Enhanced International Airways Volcano Watch (**IAVW**)
 - Improved parameterization, detection, notification, observation and atmospheric transport dispersion modelling
 - SO₂ and other volcanic gases
 - Quantitative forecast information
- Enhanced **OPMET** information
 - Decommissioning of METAR/SPECI, TAF, SIGMET, AIRMET, VA Advisory, TC advisory, etc.
 - Transition to IWXXM schema (XML/GML) and meteorological information services



Within the next decade...

- Improved **aerodrome forecasts and warnings**
 - Development of advanced forecast information services for the aerodrome and terminal area
 - Uplink direct to the cockpit
- **En-route** hazards enhanced provision
 - moving towards a holistic, phenomenon-based approach
- Other new and improved services
 - Space weather
 - Releases of radioactive material and toxic chemical clouds
- All to support the transformation of **global ATM performance** through **trajectory-based operations**



Integration of MET

- Aerodrome, terminal area and enroute phases
- In-cockpit and other on-board capabilities
- Collaborative decision-making
 - Airport, ATFM, AOC, MET, etc.
- ATFM and network management
- Trajectory-based operations and user-preferred routing

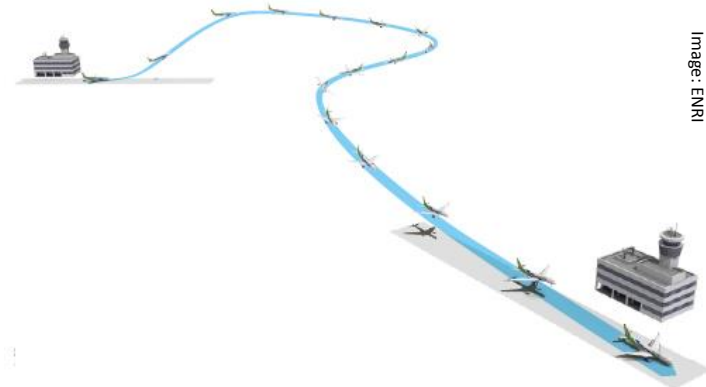
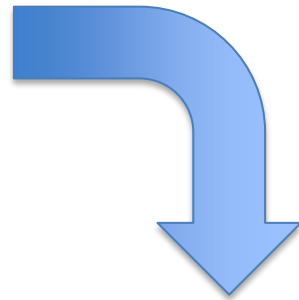
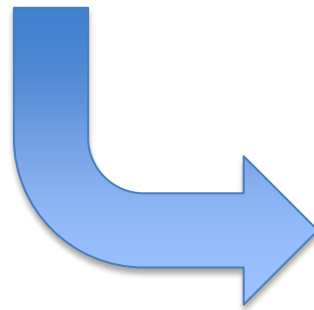


Image: ENRI



Evolving service provision

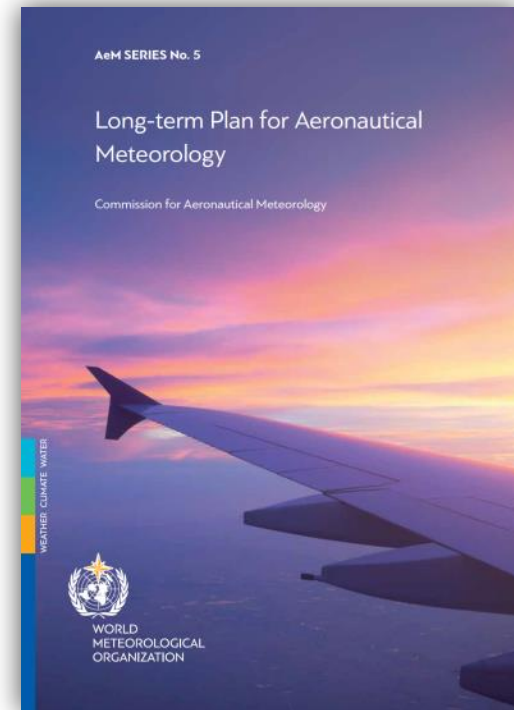


Introducing the long-term plan

Long-term plan

- Published July 2019 ✓
- Framework to plan the progressive transformation from a conventional “product-centric” approach to a modern “information-centric” approach to meteorological service provision for aviation through to 2030 and beyond

WMO AeM SERIES No. 5 (English only)



<https://www.wmo.int/aemp/LTP-AeM>



Long-term plan

Content

- Drivers for change ✓
- Science and technology ✓
- Performance improvement ✓
- Strategic guidance for Members ✓

Headlines

- Seamless regional/global models of service delivery
- Driven by user requirements
- It's all about the (best) data
- Integration and interoperability
- WMO key roles in science, technology, data and observations, including aircraft-based observations
- Roles of AMSPs – public and private sector



LONG-TERM

SHORT-TERM



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Target audience

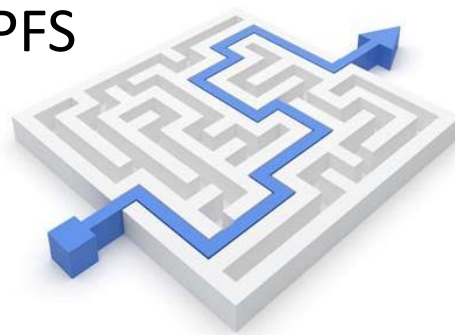
- First and foremost:
 - WMO Members, in particular their aeronautical meteorological service providers
 - Public and private sectors, as appropriate
- Other interested stakeholders (non-exhaustive):
 - Aviation partner organizations such as ICAO, IATA, IFALPA and others
 - CAAs, airline operators, pilots, ATC/ANSPs, etc.
 - Development partners such as World Bank
 - Academia



Complementary strategies and concepts

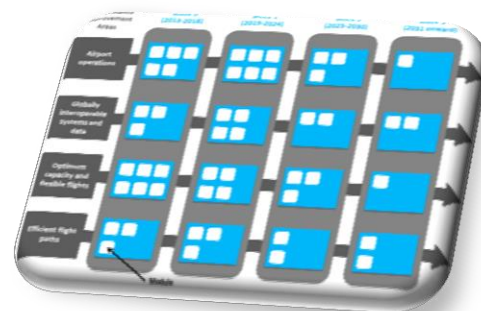
WMO side

- Strategic Plan (2020-2023)
- Service Delivery Strategy
- Rolling Review of Requirements (RRR)
- WIGOS Vision 2040
- GBON Concept
- WIS 2.0 evolution
- Seamless GDPFS
- Etc.



ICAO side

- Global Air Navigation Plan (2019-2033)
- METP 'White Paper on Future Aeronautical Meteorological Information Service Delivery' (2018)
- 'MET in SWIM' plan and roadmap
- ConOps and Roadmaps (various)
- Etc.



Next steps

Next steps



- Resolution 28 (Cg-18) requested ...
 - Living document, regular review, periodic update
 - P/CAeM then P/APPCOM to establish mechanisms for its future maintenance and development
- Second edition of long-term plan
 - 2020 to 2022: Drafting
 - 2023: Endorsement by Cg-19 and publication
- Outreach (continuous)
 - PTCs and PRAs
 - (C)AeM Newsletters, etc.
 - Working groups of WMO, ICAO and others concerned



More information ...



The screenshot shows the WMO Aeronautical Meteorology Programme (AeMP) website. At the top is the WMO logo and the text 'WORLD METEOROLOGICAL ORGANIZATION'. Below this is the title 'Aeronautical Meteorology Programme'. A large banner image shows a view from an airplane window looking out over a sunset or sunrise over a sea of clouds. Below the banner are four columns of text and images:

- About AeMP >**

One of the purposes of WMO is to further the application of meteorology to aviation. The Aeronautical Meteorology Programme (AeMP) has the main long-term objective of ensuring worldwide, reliable provision of high quality, timely and cost-effective meteorological service to aviation users.

[CLICK HERE](#) to learn more about the programme.

[CLICK HERE](#) to learn about the long-term plan ****NEW****
- Commission for Aeronautical Meteorology (CAeM) >**

CAeM is the driving force behind the Aeronautical Meteorology Programme and provides guidance and coordination through expert working groups.
- Implementation Areas >**

Implementation of the ICAO and WMO regulations related to QMS and competency of aeronautical meteorological personnel are high priority for WMO and for CAeM. WMO is providing assistance to its Members through training, development of guiding materials and other capacity development actions.
- Volcanic Ash >**

The provision of advisories and warnings of volcanic eruptions and volcanic ash clouds to aviation users necessitates close coordination between the international aviation community, aviation meteorologists and volcanologists.

<https://www.wmo.int/aemp/>



...on the web



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— END —