

Aeronautical Meteorology Statement of Guidance for the EUCOS region

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In 2018, WMO completed a [rolling requirement review](#) (RRR) process for Aeronautical Meteorology application area which delivered: 1) an updated record of user requirements listed in the WMO's Observing Systems Capability Analysis and Review database ([OSCAR database](#)); 2) a critical analysis to assess the gaps by comparing capabilities versus requirements, 3) and finally an analysis (led by Jitze van de Meulen, KNMI) to produce a gap analysis and a [Statements of Guidance](#) (SoG) for WMO for the Aeronautical Meteorology Application Area. This SoG was developed to guide the evolution of networks (both ground-based and space-based) on a global scale and therefore does not necessarily represent the priorities for EUMETNET members for the EUCOS region. Following on from this WMO RRR process, the EUMETNET Observations Programme led a similar exercise in collaboration with the EUMETNET AVIMET WG to develop a SoG for Aeronautical Meteorology for the EUCOS region.

The SoG captures the most important observation gaps that users wish to be addressed in order to help tackle some high priority challenges in NMHS's service delivery. The SoG does not provide a record of all user requirements; these are documented in the WMO OSCAR database which has been used to inform the SoG. The consensus view from the EUMETNET Aeronautical Meteorology community is that the EUCOS and NMHS observing networks are not currently fulfilling their requirements, with some significant key weaknesses. The starting assumption for this SoG is that existing networks should be maintained, forming the basis on which enhanced capabilities are introduced in an optimal manner to enhance the overall performance of composite network over the EUCOS region.

EUMETNET Aeronautical Meteorology community is comprised of a wide range of aeronautical stakeholders, authorized and certified Aeronautical Meteorological Service Providers which may be either a EUMETNET Member or another agency in that country. Their main areas of responsibility include:

- aerodrome and terminal area forecasts and warnings based on rapid updating nowcasting products and short-range NWP products;
- en-route forecasts based on short-range NWP products and on World Area Forecast System (WAFS) products provided by WAFC centres, including provision of SIGMET and AIRMET (warnings of weather conditions which could threaten the safety of the flight);
- WAFC responsibilities (UK Met Office and NOAA via WAFC London and Washington respectively) providing T+24 to T+128 global forecasts of upper winds and temperatures (down to 5000 feet) throughout the globe.
- VAAC responsibilities (Meteo-France and UK Met Office via VAAC Toulouse and London respectively) providing specialist volcanic ash forecasters and guidance products within their area of responsibilities (extending throughout Europe, Iceland, Russia, Africa, large parts of the North and South Atlantic Oceans, Indian Ocean, Antarctica and Arctic circle).
- specialist forecasts for helicopter operators (e.g. offshore, search and rescue, police, ambulance) and General Aviation (GA)

AVIMET WG Members identified the prevailing Aeronautical Meteorology challenges within the EUCOS region, relating in part to gaps in observations; these currently are:

Challenges common to all Aeronautical Meteorology services:

- Forecast and real-time observation of convection and associated hazards (e.g. thunderstorm, lightning, turbulence, wind shear, icing).
- Forecast and real-time observation of precipitation types products (e.g. freezing precipitation, hail, super cooled large cloud droplets).
- Real-time monitoring of significant weather (e.g. Lightning used to track storms, mountain waves). This is particularly relevant for services provided to offshore industries but also for aerodromes located in coastal areas or in mountainous areas.
- Forecasting and real-time monitoring of other aviation hazards (e.g. volcanic ash cloud, ash concentration) particularly over data sparse areas.

Challenges specific to services provided for managing Aerodromes' operation:

- Forecast of wind shear and turbulence around the runway.
- Timing of Fog formation and dispersion, as well as low visibility at runway level.
- Forecast and observation of snowfall and black ice on the runway.

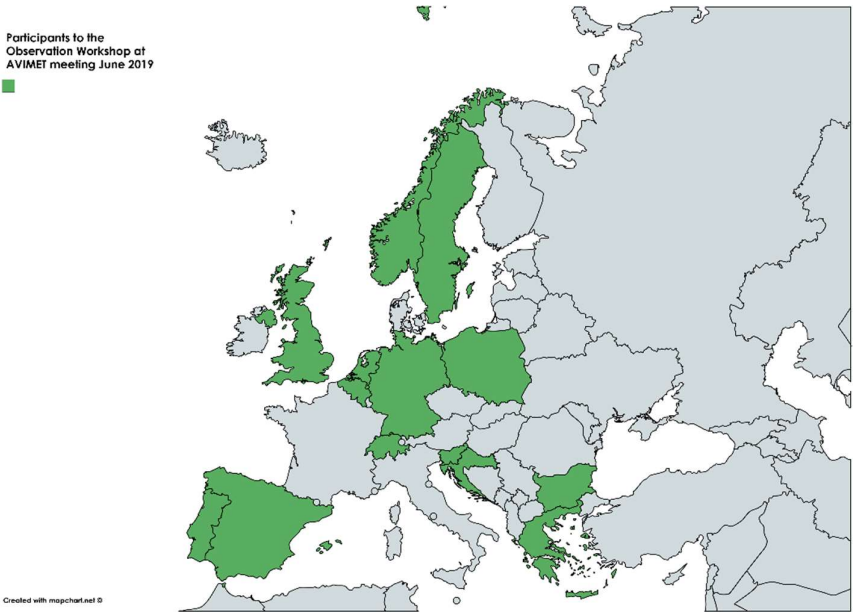
In addition, there is a newly emerging service area linked with the expanding use of drones by commercial business (e.g. for parcel delivery). This new business will bring its own set of challenges in urban areas e.g. in providing street level services in densely built areas.

Based on these Aeronautical Meteorology challenges, the AVIMET WG selected and prioritised the following statements to guide the evolution of the EUCOS and national networks; Aeronautical Meteorology Service Providers would benefit from increased:

- temperature, humidity and wind, both at the surface and as profile observations, at the spatial and temporal resolution required for improving all forecasting range from T0 to T+128 (i.e. Medium range/Global NWP, short-range NWP/Limited Area Model, very-short range NWP and Nowcasting) and in particular relating to the forecast of convection and associated hazards such as thunderstorms, turbulence, wind shear, icing, and ice crystals. For that reason, AVIMET WG supports all the guidance addressing those challenges already provided by the Global NWP, short-range NWP, and Nowcasting and VSRF application areas. Moreover, AVIMET WG strongly encourage gaining access to turbulence and pilot reports to provide real-time assessment of the model performance.
- high resolution observations around aerodromes (e.g. humidity, soil moisture, vertical cloud and aerosols backscatter, wind speed and direction, wind shear, wake vortices, snowfall, electric fields around the runway, etc...) to improve model output for forecasting range T0 to T+40 of fog formation and dispersion, low cloud/low visibility, wind shear/turbulence and snowfall/black ice on the runway, the local presence of electrified storm, and generally support the forecast of runway allocation and associated airport capacity. Studies focusing on increasing the lead-time on the forecast of these hazards should be strongly encouraged and supported, particularly focusing on improving forecast of fog formation/dispersion 2 to 3

hours ahead. Furthermore, AVIMET WG would welcome efforts in the development of a processing system capable of extracting in real-time visibility information from web cams. And finally, AVIMET WG would also welcome the creation of a forum to share experiences and studies on the use and optimisation of Doppler Lidar and X-band radar as a solution currently implemented by several organisations to optimise airport capacity management during wind shear/turbulence episodes around the runways.

- effort focusing on delivering real-time hydrometeor classification products (e.g. hail, snow, freezing precipitation, super cooled large cloud droplets). This should involve the development of new products to combine information from a variety of observing systems e.g. weather radars, visibility/present weather sensors, ground and space-based lightning detections systems, as well as other satellite products.
- the availability of various types of observations from data sparse areas to support services to offshore industry, search and rescue services, and services delivered through VAAC.
- engagement with commercial business currently planning to use drones as part of their service. EUMETNET should investigate accessing meteorological data from drones in order to support Aeronautical Meteorology community meet the demands of this new market.

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