



## **Met Office User Forum / 13**

***Thursday 3<sup>rd</sup> November 2016***

**Venue: CAA House, London, Time 1100**

**Agenda Item 1: Welcome and Introductions**

**Agenda Item 2: Regulatory service provision (NG)**

- a. Review of MOUF/12 actions
- b. Review of Met Costs
- c. Volcanic Ash issues
- d. TAF verification proposal

**Agenda Item 3: National services (DH)**

- a. Review of Met Service performance
- b. Changes to UK regulated service provision

**Agenda Item 4: Regulated Aviation activities (PB)**

- a. Aviation R&D progress report
- b. Update on future R&D programme
- c. Update on HPC
- d. High Altitude Ice Crystals research

**Agenda Item 5: Specific Issues**

- Services to the LTMA (IC)
- Ice Crystal research (PC)
- Review of automatic METARs at Heathrow (PC)
- What are the impacts of on-site forecasters at Heathrow on TAFs? (PC)
- Met Office & CAA involvement in Space Weather (*ref CAA CAP1428*) (PC)
- NATS R&D areas of work (TK)

**Agenda Item 6: Any Other Business**

**Agenda Item 7: Date of next meeting**

**Attendees**

Ian Cameron	Met Office	IC
Nigel Gait	Met Office	NG
Darren Hardy	Met Office	DH
Piers Buchanan	Met Office	PB
Andy Wells	CAA	AW
Colin Hord	CAA	CH
David Gibbs	CAA	DG
James Carr	NATS	JC
Jane Gothard	NATS	JG

Tharaka Kothalawala	NATS	TK
Les Dunn	HIAL	LD
Dominic Haysom	Easyjet	DHay
Stewart Houston	Loganair	SH
Mike Thrower	BALPA	MT
Peter Cox	Hon Comp of Air Pilots	PC

**Apologies**

Graham Hill	Flybe	GH
Dai Whittingham	UKFSC	DW
Graham Easthope	NATS	GE
John Hamshare	LHR Airports Ltd/UKFSC	JH
Gareth Nicholas	HIAL	GN
James Vickery	Easyjet	JV
Peter Tysoe	Easyjet	PT
Tim Kinvig	Loganair	TK
Roger Koukkoulis	AOA	RK
Neal Weston	BATA	NW
Huw Murray	NATS	HM
Nigel Spence	Southampton Airport	NS
Steve Stebbings	BA (rep IATA)	SS
Steve Smith	Thomson Airways	SS
John Hanlon	ELFAA	JH
Steve Copeland	AOPA	SC
Rob Hunter	BALPA	RH
Zoe Reeves	BALPA	ZR

## Summary of Outstanding Actions & New Actions

### OUTSTANDING ACTIONS

<b>Reference:</b>	MOUF/11/2014/05
<b>Action:</b>	<p>Low temperature forecasts:</p> <p>Consider the provision of a 'cold weather correction information package' to support altimeter corrections for low temperatures.</p> <p>CH reported that this was discussed in Eurocontrol and ICAO, and a working paper was subsequently submitted by Eurocontrol to the ICAO Air Traffic Management Operations Panel (ATMOPSP). This paper is attached as an annex to this document for reference. CH confirmed that that such corrections are a pilot responsibility (using available briefing material) rather than an ATS one. The role of the CAA is to identify conditions during which a correction may be appropriate.</p> <p>CH also explained that any change to UK guidance in this regard would need to be co-ordinated with our European neighbours as part of a future harmonisation of Transition Altitude, but this would be several years away. However the CAA would continue to review these activities and would keep the group informed of any developments.</p>
<b>Action on:</b>	CH
<b>Status:</b>	OPEN

### NEW ACTIONS

<b>Reference:</b>	MOUF/13/2016/01
<b>Action:</b>	<p>TAF verification statistics for lower thresholds:</p> <p>Provide statistics summarising the performance of TAF against the current verification scheme against low cloud and visibility thresholds.</p>
<b>Action on:</b>	DH
<b>Status:</b>	OPEN

<b>Reference:</b>	MOUF/13/2016/02
<b>Action:</b>	<p>Missing OPMET data from States:</p> <p>Discuss with NATS the availability of any statistics on data missing from the OPMET databanks.</p>
<b>Action on:</b>	DH
<b>Status:</b>	OPEN

<b>Reference:</b>	MOUF/13/2016/03
<b>Action:</b>	Pilot briefing guidance material:  Keep the MOUF informed of developments to increase and improve the material available to help pilots brief effectively.
<b>Action on:</b>	DH
<b>Status:</b>	OPEN

<b>Reference:</b>	MOUF/13/2016/04
<b>Action:</b>	To consider and provide NATS with a summary of available forecast weather information and/or models that could potentially be available to support the NATS activities described
<b>Action on:</b>	NG
<b>Status:</b>	OPEN

**Agenda Item 1: Welcome and Introductions**

NG opened the meeting, and thanked everyone for attending. Introductions were made and NG expressed his thanks to the CAA for their kind invitation to host this meeting.

**Agenda Item 2: Regulatory service provision**

NG provided a presentation on regulatory service provision. A presentation relating to each item is available and has been circulated.

**a. Review of MOUF/12 actions**

<b>Reference:</b>	MOUF/11/2014/05
<b>Action:</b>	<p>Low temperature forecasts:</p> <p>Consider the provision of a ‘cold weather correction information package’ to support altimeter corrections for low temperatures.</p> <p>CH reported that this was discussed in Eurocontrol and ICAO, and a working paper was subsequently submitted by Eurocontrol to the ICAO Air Traffic Management Operations Panel (ATMOPSP). This paper is attached as an annex to this document for reference. CH confirmed that that such corrections are a pilot responsibility (using available briefing material) rather than an ATS one. The role of the CAA is to identify conditions during which a correction may be appropriate.</p> <p>CH also explained that any change to UK guidance in this regard would need to be co-ordinated with our European neighbours as part of a future harmonisation of Transition Altitude, but this would be several years away. However the CAA would continue to review these activities and would keep the group informed of any developments.</p>
<b>Action on:</b>	CH
<b>Status:</b>	OPEN

<b>Reference:</b>	MOUF/12/2015/01
<b>Action:</b>	<p>TAF Verification:</p> <p>Present an analysis of TAF performance based on a range of cloud and visibility thresholds.</p> <p>NG presented a proposal for a new verification scheme. A more detailed explanation of this scheme is attached as an annex to this document.</p>
<b>Action on:</b>	NG
<b>Status:</b>	CLOSED

<b>Reference:</b>	MOUF/12/2015/02
<b>Action:</b>	Forecasting for potential airframe icing events:  NG and JH to discuss potential development activities to improve the forecasting of Hold Over Times on composite airframe surfaces.  This discussion is continuing directly between JH and the Met Office
<b>Action on:</b>	NG
<b>Status:</b>	CLOSED

**b. Review of Met Costs**

NG provided a summary of regulated aviation MET costs for the period 2014 to 2019. The main components contributing to these overall costs were detailed, and a number of changes made during 2016 and expected in 2017 were summarised. Regarding the potential changes arising from the introduction of EASA legislation in 2017, CH commented that these were unlikely to significantly change the regulated Met provision and that any changes were expected to be introduced towards the end of 2018-19. The meeting noted that the Unit Rate for 2017 is significantly lower compared to 2016, a trend which is expected to continue until 2019 (the remainder of Reporting Period 2).

**c. Volcanic Ash issues**

NG summarized activities relating to volcanic ash, including ICAO existing and planned requirements, volcanic ash forecast requirements established by the ICAO EUR/NAT Contingency Plan and the establishment of a LiDAR monitoring network.

The Met Office operates a Civil Contingency Aircraft (MOCCA). Consideration is being given to extending the use of the aircraft to the end of 2019. However the aircraft is an aging Cessna 421 and consideration is also being given to a potential replacement aircraft. In order to ensure value for money and access to the best possible aircraft, CH commented that the new aircraft may be operated on a shared asset basis with other users. PC enquired about the use of the FAAM BAe 146 aircraft. CH reported that this aircraft does not currently have an approved safety case for volcanic ash operations and is also very expensive to operate.

NG reported that a recent volcanic ash exercise utilised new VA Column Mass Loading (CML) charts. The exercise involved the Met Office, Eurocontrol, Airlines, ANSPs, other European Met services and NATS. The difference between these charts and the historical concentration charts was described – the CML charts assess the amount of ash within a vertical column of air and best utilize satellite derived data. These are currently trial products, and their value will be considered further at a forthcoming exercise wash-up meeting. IC commented that the use of supplementary charts is driven by a European ICAO requirement, which, the Met Office provide in addition to the standard VAAC products. However, where it is possible to provide additional detail to airlines as part of their Safety case, the Met Office and Commercial providers (e.g. WSI) could provide this.

NG also commented that during the exercise no VA NOTAMs were issued defining the detail of ash areas. Instead, detail on the extent and track of ash is provided through the VA charts, SIGMETs and associated data held on the Met Office web site.

NG summarized the progress made on the installation of the UK LiDAR ash detection network. In total 9 fixed site LiDARs have been deployed across the UK and one mobile site is also being fitted. The objective of the LiDAR network is to increase the forecasters ability to detect and track ash through improvements to the vertical profile of ash concentration from assessment from the ground as well as from above (satellites). DHay enquired if the LiDAR data would feed into the Met Office numerical modeling. IC confirmed that the intention will be to feed this data into the Met Office dispersion model. There are also similar LiDAR networks established across Europe and their data is shared between the Met services to ensure the fullest possible information is available.

**d. TAF verification proposal**

NG presented a proposal to introduce a new TAF verification scheme. He explained that the existing scheme was based upon the provision of results based upon a single cloud and visibility threshold. As such the results more reflected a reliability score rather than a skill score. The proposed new scheme has considered elements of an alternative verification scheme used by the Met Alliance, a group of 6 European Met services. The Met Alliance scheme however only considers the performance against the worst forecast conditions. The new scheme proposed adopts the best elements of both schemes to assess performance for the entire range of forecast conditions in TAFs. NG then presented 2 examples of how the proposed scheme would assess TAFs. Finally, it was proposed that before any new scheme was introduced, a detailed reanalysis of historical TAFs would be undertaken to assess the behavior of the scheme and to establish a baseline TAF performance score. The meeting supported the approach proposed on the basis that a verification scheme that assessed against all cloud and visibility conditions would likely be superior to the current scheme which assessed only a single cloud and visibility threshold. A detailed description of the new verification scheme is attached at Annex B.

**Agenda Item 3: National services**

DH provided a presentation on regulatory service provision. A presentation relating to each item has been circulated.

**a. Review of Met Service performance**

A description of the service measures and performance against these were provided. It was explained that the performance measures existed to provide assurance on the

level of accuracy and compliance of regulated products, demonstrate the value of the products to users of the information and to identify areas for the Met Office to improve performance. Based on the existing verification scheme the meeting discussed the TAF performance for a number of airports. It was identified that TAFs for many of the south-east airports verified particularly well as did some Scottish airports. Some of the other Scottish airport TAFs verified less well, as did those for Leeds and Bristol airports. DH noted that a recent reorganization of the forecast positions had taken account of the particular forecasting challenges at Bristol and Leeds and these airports had been assigned to the more experience Team leader position. JC commented that forecaster visits to airports may also assist in identifying the localized conditions at particular locations. DH agreed, noting that meteorologists are encouraged to visit airports either alongside the Met Office airport audit team or independently.

DHay noted the value of the existing verification scheme and asked if the Met Office could verify TAFs for lower cloud and visibility thresholds. An action was taken to consider providing some statistics for these thresholds

<b>Reference:</b>	MOUF/13/2016/01
<b>Action:</b>	TAF verification statistics for lower thresholds:  Provide statistics summarising the performance of TAF against the current verification scheme against lower cloud and visibility thresholds.
<b>Action on:</b>	DH
<b>Status:</b>	OPEN

During the discussion on Trend timeliness performance, DH commented that the Met Office had recently begun to receive statistics relating to the time of receipt of the METARs from UK airports. One value of these statistics may be to identify if any of the airports for which Trends are appended have a propensity for issuing METARs outside routine times, and that this may be valuable in identifying opportunities to further improve trend timeliness. CH described the windows in which METARs should be issued and this led to a discussion around the wider ICAO deficiency reporting process and how this may help identify missing or erroneous OPMET data to airlines. The Met Office took an action to liaise with NATS regarding this.

<b>Reference:</b>	MOUF/13/2016/02
<b>Action:</b>	Missing OPMET data from States:  Discuss with NATS the availability of any statistics on data missing from the OPMET databanks.
<b>Action on:</b>	DH
<b>Status:</b>	OPEN

**b. Changes to UK regulated service provision**



DH presented a summary of changes and activities concerning national aviation services. These included the introduction of the new briefing portals for the aviation community, offshore helicopter operators and helicopter emergency services such as Search & Rescue, Police and Air Ambulance. All of these portals are available to users free at the point of use and have been designed to address evolving user requirements for access via mobile devices and smartphones. These briefing portals have been developed in close coordination with the CAA and the users of the websites. The Met Office continues to engage closely with users through specific user group meetings with a view to implementing lifecycle enhancements where appropriate.

DH also reported that web analytics had provided some useful information on how pilots tend to brief on the weather, and that there was evidence suggesting that certain products were used more than others. Other feedback suggests that TAFs may not always be interpreted in the correct way, for example the specific values of forecast wind, cloud and visibility represent a range of potential values). As a result a planned activity designed to assist pilots to make best use and fully understand the regulated products provided was underway. This will initially result in a repository of guidance available on the Met Office web pages and in future also via periodical e-newsletters. It was agreed that the MOUF would be kept informed of these developments and offer any feedback on other specific guidance that that could also be created to assist pilots.

<b>Reference:</b>	MOUF/13/2016/03
<b>Action:</b>	Pilot briefing guidance material:  Keep the MOUF informed of developments to increase and improve the material available to help pilots brief effectively.
<b>Action on:</b>	DH
<b>Status:</b>	OPEN

The commencement of aerodrome weather warnings verification was also discussed. This verification is considering 3 weather parameters with results being generated on correctly forecast events (hits), events forecast that did not materialize (false alarms) and events that occurred which were not forecast (misses). An overall ‘threat score’ based on the ratio of correct forecasts to all assessed events is also provided. Whilst the sample size is currently small, early indications show that the warnings are providing good information, albeit with a tendency to often ‘over-forecast’ events (i.e. the warnings are quite pessimistic). These statistics will continue to be developed and the Met Office will use these to identify trends and areas to improve the warnings. IC commented on the value of threat scores more widely in the context of an aid to decision making.

Finally, DH described a new forecast product for helicopters operating in the London CTA and summarized the results of a recent audit undertaken by the CAA on elements of Met Office regulated service provision.

#### **Agenda Item 4: Regulated Aviation activities (PB)**

PB provided a presentation on regulatory service provision. A presentation relating to each item has been circulated.

##### **a. Aviation R&D progress report**

PB summarised the activities undertaken over the past 12 months in respect of developing forecasts of en-route hazards and to improve forecasting of weather over the UK airspace. With regards the latter the meeting discussed the value of work undertaken to identify areas of forecast rapidly developing thunderstorm (RDT) activity. IC explained that such a forecast tool will become invaluable to help plan aircraft routing to avoid expected areas of thunderstorm development much further ahead compared to currently, thereby improving airspace flow efficiency. MT asked if such information could become available in cockpits as well as in ATS. IC confirmed that it this would be desirable to ensure consistent decision making.

##### **b. Update on future R&D programme**

PB then summarised the work plan for the coming year. This plan would continue to build upon the activities of the past year but would also introduce an new activity to assess the value of 'first guess' TAFs based upon model data, which could lead to increasing efficiency and accuracy of TAFs in the future.

In terms of planned work to improve CB forecasting, DHay asked how this activity would manifest itself operationally. IC commented that in due course the Met Office would seek early adopters to trial the product once developed.

The meeting also considered the ongoing RDT work and IC reported that the model will also be used to increase availability and access of this information over areas much wider than can currently be forecast by the limited number of available meteorologists. The enabler for this increased accessibility is the additional computing power from the new HPC supercomputer.

##### **c. Update on HPC**

PB summarised the progress made on the delivery of the HPC programme. This new supercomputer will deliver a 15 fold increase in computing power compared to the currently supercomputer from Spring 2017. This will allow an increased global model resolution, improved probabilistic forecasting and hourly model updates over the UK. It will also enable the implementation of much of the Aviation R&D activities previously described.

**d. High Altitude Ice Crystals research**

PB then summarised work undertaken to identify and forecast areas of high altitude ice crystals. These have been responsible for a number of aircraft incidents and case studies were described by PB. Future development activities were also described to the group.

**Agenda Item 5: Specific Issues**

- **Services to the LTMA (IC)**

IC provided a summary of Met Office activities designed to support NATS' management of the LTMA. A main driver has been to work with airlines, airports and NATS to improve flow rates and operate safely, especially during periods of thunderstorm risk. The Met Office has trialled an embedded meteorologist at Swanwick, recently this has become a fully support operational activity covering 12 hours per day. From January the embedded support will exist on a 24/7 basis. Since the service supports the safety on en-route activities, funding of the embedded meteorologist has been met jointly by NATS and CAA.

IC commented that Met Office are committed to providing and communicating consistently and widely, to support to NATS flow rate planning. This will be achieved through a consolidated approach utilising the forecast support at Swanwick, the airport meteorologists and Heathrow and Gatwick, and the Ops Centre at Exeter.

- **Ice Crystal research (PC)**

PC confirmed this item had been addressed in the presentation given by PB.

- **Review of automatic METARs at Heathrow (PC)**

JC provided an overview on NATS consultation activities during the NATS AUTO METAR trial. Over the previous 3 years, 7 responses had been received by NATS. DG also described CAA industry consultation and the reported little feedback had been received. DG commented that whilst the METARs were annotated as AUTO, there were qualified observers available to intervene when necessary during operational hours – details are more fully described in the UK AIP (GEN 3.5).

- **What are the impacts of on-site forecasters at Heathrow on TAFs? (PC)**

IC confirmed that, based upon the existing TAF verification scheme, Heathrow TAF quality had demonstrably improved since the introduction of on-site meteorologists. However, the most important value of an on-site presence is through the collaborative decision making process that this allows, especially in marginal weather conditions.

Overall, there is strong evidence to support increased operational efficiency at Heathrow, which would also be recognised at other airports where a business case supports it.

- **Met Office & CAA involvement in Space Weather (ref CAA CAP1428) (PC)**

AW confirmed that Space Weather was on the Government Risk Register. Government attention is now focussed on the affects of space weather on aviation. CAA activities have focussed on ensuring awareness by airlines to consider space weather impacts in their risk plans. CAP1428 seeks to ensure airlines establish appropriate contingency plans to cope with the impacts of significant space weather events. To assist the process, the CAA are arranging workshops to help airlines consider how best to achieve this.

NG reported on recent discussions had by the ICAO Met Panel, where work has commenced on defining a concept of operations for space weather centres. ICAO have agreed to move towards a 'global system' utilising one or more space weather centres.

- **NATS R&D areas of work (TK)**

TK provided the group with a summary of NATS R&D activities where weather was an important consideration. These activities include:

- Airspace Management between military and civilian air traffic
- Airspace flow rate activities, which are impacted by weather
- Optimising landings (linked to time based separation) which require high resolution and timely weather data
- Drones (weather for low level flights)
- High altitude platform systems – particularly above FL600

NG took an action to consider what forecast information could potentially be available to support NATS activities.

<b>Reference:</b>	MOUF/13/2016/04
<b>Action:</b>	To consider and provide NATS with a summary of available forecast weather information and/or models that could potentially be available to support the NATS activities described
<b>Action on:</b>	NG
<b>Status:</b>	OPEN

**Agenda Item 6: Any Other Business**

There was no other business raised.



**Agenda Item 7: Date of next meeting**

This will be agreed by correspondence, but most likely in October/November 2017.

There being no other business the meeting closed at 1500.

**MOUF/11/2014/05 – Low temperature Forecasts**



WP007 Cold temperature.pdf

**Annex B**

**Proposed new TAF verification scheme**



CAA\_TAF\_verification\_proposal\_051016.pdf