(W O R L D M E T E O R O L O G I C A L O R G A N I Z A T I O N

WORLD WEATHER RESEARCH PROGRAMME (WWRP)

STANDING COMMITTEE ON SERVICES FOR AVIATION (SC-AVI)

A subsidiary body of WMO's Commission for Weather, Climate, Water and Related Environmental Services and Applications (SERCOM)

ONLINE MEETING OF THE AVIATION RESEARCH AND DEVELOPMENT PROJECT – PHASE 2 (AvRDP2) SCIENTIFIC STEERING COMMITTEE

20 February 2024

Meeting minutes

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1. OPENING OF THE MEETING

Chris and Piers opened the meeting by welcoming the participants and presenting the agenda. The agenda covered updates on two airport pairs (London to Johannesburg and Hong Kong to Singapore), the verification plan, the project mid-term report, and Jacob's presentation on the London-Johannesburg route. Chris mentioned 2024 would be a transitional year as the research moves towards application and user evaluation.

The agenda for the meeting included:

1. Verification plan for evaluating the blended products.
2. Updates of the blending datasets on the two airport routes (**LHR-JNB and HKG-SIN**)
3. AvRDP2 Mid-term report
4. Update on optimum routing work for the LHR-JNB route
5. Next steps

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1. Verification plan for evaluating the blended products.

    - Ramon presented a paper which described the verification plan/suggestions.
    - He discussed conceptualising verification in the context of maximising user benefits and the mission to develop, demonstrate and quantify benefits.
    - He emphasised understanding user needs and limitations, as well as weather science limitations, to provide meaningful improvements rather than just replicating forecasts.
    - Ramon presented a diagram showing nonlinear relationships between forecast quality/skill and user benefits, highlighting the need to focus on areas with the greatest potential benefit.
    - He also discussed challenges like the slow pace of forecast improvement, unpredictability issues, and small sample sizes that limit robust demonstrations.
    - He further suggested that case studies may be needed to understand the sample sizes required for robust results.
    - Ramon emphasised the importance of adopting new verification techniques, such as using artificial intelligence to ensure accuracy and reliability.
    - He mentioned that quantifying benefits is very important, but verification is a complex step, and understanding business models is also key for the project.

2. Update on LHR-JNB pair (includes Jacob's work on ensemble products, Morne's investigation of turbulence products, and user engagement update)

    - Jacob presented results from trajectory prediction modelling, analysing potential flight delays and route shifts due to avoidance of forecast convective areas. The results showed an average delay of around 1% of flight time and up to 10% in extreme cases, suggesting benefits to strategic planning over reactive deviations.
    - Piers discussed challenges in getting airlines or air traffic control to change routes based on provided forecasts during the trial period due to system limitations and other pressures.
    - It was noted that there is a need to continue working on blending new data like satellite nowcasts and precipitation products into the existing probabilistic convection forecast product for this route.
    - The group discussed the potential value of analysing integrated convection chances along multiple potential routes to help decision-making.
    - Piers planned to have further conversations with airlines/controllers to explore options for real-time forecast demonstrations and route guidance over the busy summertime.

3. Update on HKG-SIN pair (Ping)

    - Ping mentioned that an agreement had been signed with Singapore to start real-time weather data exchange. Under this agreement, Hong Kong will share one year of blended data, while Singapore will provide radar observations for verification purposes. The implementation of the real-time data exchange is scheduled to commence in April. The exchange aims to analyse the impacts such as when the flights will encounter convection, the required deviation distances etc.
    - He noted that, originally, the plan was to have static images of forecasts sent to pilots. However, it was agreed to display forecast polygons in their in-house "My Flight Weather" iPad app. The app already has cloud height and nowcast data that could be used to display the convection polygons and vertical cross-sections along the flight route.
    - In March, there will be a meeting with airlines like Cathay Pacific to gather feedback on the display of probabilistic forecasts from the ensemble in the app, uncertainty ranges, etc.
    - He further noted that efforts were underway to incorporate new data sources like satellite nowcasts and precipitation products into this route's existing blended forecast product.

4. AvRDP2 Mid-term report

    - Piers and Chris have produced a report summarizing project progress over the past two years and proposing plans for the next phase.
    - The report has been shared with the group, and they were encouraged to read through it carefully and provide any feedback or questions.
    - Chris noted that the report:
        - ✓ Contains an executive summary that can be shared externally to explain the project goals and achievements.
        - ✓ Elaborates what has been accomplished so far regarding research and development of weather forecasting techniques.
        - ✓ Outlines the proposed focus on testing, evaluation, and quantifying benefits as the project transitions into an operational demonstration phase.
    - Chris encouraged the experts to provide feedback to help develop a consensus on priorities and direction for the remainder of the project.

5. Next steps

    - Conducting intermediate small group meetings and conversations to advance specific workstreams like blending products and verification approaches.
    - Ping to discuss trajectory prediction analysis for the HKG-SIN route offline with Piers.
    - Continuing to refine blended forecast products for both main routes ahead of pilot demonstrations.
    - Gathering feedback from airlines on displaying probabilistic forecasts in iPad apps during trials starting in April.
    - Piers to explore options for real-time forecast demonstrations with air traffic controllers over the busy northern summer period.
    - Piers and the WMO secretariat to finalise plans for the in-person 3rd SSC meeting at the Met Office in September (16-18).
    - The experts to provide feedback on verification methodologies in line with Ramon's discussions on understanding impacts and benefits.
    - Experts to provide feedback on the mid-term report to help guide the next project phase.

6. Request for a joint face-to-face meeting with the PDEF working group.

Hellen relayed that the Working Group on Predictability, Dynamics and Ensemble Forecasting (PDEF) is interested in having a joint face-to-face meeting with various user groups, such as Aviation and Weather Modification experts. Their idea is to have a joint meeting in the UK with the Aviation Project group. Although the experts were receptive to the idea, it was decided that Hellen would speak directly with PDEF to discuss plans. Engaging with other relevant forecast user communities, such as PDEF, could lead to valuable collaboration opportunities and advancements in forecast applications.

2. **NEXT ONLINE MEETING:** on 30th April 1200UTC 2024

AvRDP2-SSC-actions	Who/Due date
○ Conducting intermediate small group meetings	April 2024
○ Offline discussion on the trajectory prediction analysis for the HKG-SIN route.	Piers and Ping
○ LHR-JNB and HKG-SIN to refine blended forecast products ahead of pilot demonstrations.	April 2024
○ Gathering feedback from airlines	Ping
○ Options for real-time forecast demonstrations with air traffic controllers over the busy northern summer period.	Piers
○ Finalise plans for the in-person 3rd SSC meeting at the Met Office in September (16-18).	Piers and the WMO secretariat
○ Feedback on verification methodologies in line with Ramon's discussions on understanding impacts and benefits.	Ramon and All
○ Feedback on the mid-term report to help guide the next project phase	All
○ Follow up with PDEF group	WMO secretariat (Hellen)

LIST OF ATTENDEES

1. SSC members

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[1] Co-chair of AvRDP-SSC

2. WMO Secretariat

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MSEMO, Hellen	Scientific Officer, World Weather Research Division, Science and Innovation Department	hmsemo@wmo.int
BROCK, Greg	Head, Services for Aviation Division, Services Department	GBrock@wmo.int

3. List of apologies/absentees

NAME	POSITION	E-MAIL	WMO AFFILIATION
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4. Invitees

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