

## Meeting Minutes of the Aviation Research and Development Project (AvRDP)

Kick off Meeting (24-25 Jun 2015)

(Shanghai, China)

### *Agenda*

#### Day 1 : 24 Jun 2015 (Wednesday)

<b>Time</b>	<b>Event</b>	<b>Representative</b>	<b>Video-Conference</b>
09:30-10:00	Opening Ceremony and Speeches	WMO – Paolo RUTI CAeM – CMA – Cuiying TIAN CAAC – Zhongfeng ZHANG SMS – Zhenlin CHEN	CM SHUN
10:00-10:10	Group Photo	All	
10:10-10:15	Adoption of Agenda and Working Arrangements	Peter LI	
10:15 – 10:45	Overview of WWRP (including FDPs/RDPs and WG Nowcasting & Mesoscale Weather Forecasting Research)	Paolo RUTI	
10:45-11:00	Morning Break		
11:00-11:30	Overview of next generation global aviation navigation plan and MET requirement	Sharon LAU	
11:30-12:00	Introduction to AvRDP	Peter LI	
12:00- 13:30	Lunch		
13:30-14:00	NextGen (TBD)	Matt STRAHAN	Cecilia MINER
14:00-14:45	Introduction about HKIA and its plan in AvRDP <sup>1</sup>	Sharon LAU	
14:45-15:30	Introduction about CDG and European airports and its plan in AvRDP	Stephanie DESBIOS	Jean-Louis BRENGUIER
15:45-16:40	Verification for aviation applications		Marion MITTERMAIER
16:40-17:16	Introduction about SHA and its plan in AvRDP		Fengyun WANG and Baode CHEN
	End of Day 1		

**Day 2: 25 June SSC Meeting (Thursday)**

<b>Time</b>	<b>Event</b>	<b>Representative</b>	<b>Video-Conference</b>
8:30-9:15	Introduction about JNB and its plan in AvRDP	Estella de CONING	
9:15-10:00	Introduction about YYZ & YYB and their plan in AvRDP <sup>1</sup>	Janti REID	
10:00 – 10:45	Air Traffic Management Expectation – requirement, verification and validation		Peter CHADWICK
10:45 - 11:00	Morning Break		
11:00–12:30	SSC Meeting Review of the Science Plan	All	P CHADWICK C MINER P JOE
12:30 – 14:00	Lunch		
14:00 – 14:45	SESAR		Jean-Louis BRENGUIER
14:45–17:30	SSC Meeting (continue) Adoption of the Science Plan (may carry over to 26 Jun if not finished)	All	JL BRENGUIER P CHADWICK C MINER M MITTERMAIER P JOE
	End of Meeting		

## ***Meeting Participants***

### **Scientific Steering Committee (SSC)**

**Chair:** Peter LI (HKO)

### **Members:**

#### **Representing the 5 Participating Airports**

Estelle de CONING (SAWS/JNB)  
Janti REID (EC/YYZ (summer) & YFB (winter))  
Jean-Louis BRENGUIER (MF/CDG) – VideoConf; represented by Stephanie DESBIOS in the meeting  
Fengyun WANG (CAAC/SHA)  
Sharon LAU (HKO/HKG)

#### **Other Experts**

Peter M. CHADWICK (CAD, HK) – VideoConf  
Baode CHEN (CMA)  
Cecilia MINER (NOAA) – VideoConf; represented by Matt STRAHAN in the meeting  
Stefane BELAIR (EC/WGMNR) – *will not be able to attend*  
Paul JOE (EC/WGMNR) – VideoConf – represented by  
Yong WANG in the meeting  
Marion MITTERMAIER (UKMO/JWGFVR) – VideoConf

#### **Will participate in Phase II**

Dennis HART (EuroControl)

#### **WMO Secretariat Staff:**

Xu TANG (CBS/WDS)  
Paolo RUTI (CAS/WWRP)  
Abdoulaye HAROU (CBS/WDS/GDPFS)

#### **Other Experts to participate in the Kick-off Meeting:**

CM SHUN (CAeM/HKO) VideoConf (Welcome Remarks)  
Zhongfeng ZHANG (CAAC)  
Qingliang ZHOU (CMA)  
Yong WANG (ZMG)  
Alan SEED (BoM)  
Alpha Mamadou Malaado DIALLO (ANCIM)  
Larisa NIKITINA (ROSHYDROMET)  
Nikolai BOCHARNIKOV (IRAM)  
Tatiana BAZLOVA (IRAM)  
Yinming YANG (SMS)  
Jianhua DAI (SMS)  
Zhikai ZHANG (CAAC)

## **1. Welcome Remarks (see Appendix I)**

**1.1 WWR/D chief and WWRP presentation – Paolo Ruti**

**1.2 President, Commission for Aeronautical Meteorology – CM Shun (Video Conference)**

**1.3 Chinese Meteorological Administration - Cuiying Tian**

**1.4 Civil Aviation Administration of China – Zhongfeng Zhang**

**1.5 Director-General, Shanghai Meteorological Service, CMA – Zhenlin Chen**

## **2. Overview of previous projects and airport's activities.**

### **2.1 NextGEN (Matt Straham).**

Transform aviation weather services to create state of the science weather information for impact based decision making.

Goals: Digitalize weather information. High spatial and temporal resolution guidance. Standardized open access and discoverability of weather information.

Focus areas:

- web services (NextGen It web services, implementing open geospatial consortium compliant data services and standardized formats),
- verification,
- modeling and data assimilation (multi radar and multi sensor system),
  - localized aviation products
- aviation weather elements (ceilometer operating range extension),
- forecast applications (Integrated Support for Impacted air Traffic Environment),
  - provide decision assistance tool for NWS forecasters to aid in the prediction of convective weather events that affect aviation
- Single authoritative source.

### **2.2 Hong Kong International Airport (Sharon Lau)**

One of the busiest airports in the World – 1,034 flights per day, 66 flights per hour at peak hours (2014).

Key weather elements:

- Significant convection - lightning and thunderstorms, mainly from March to October.
- Low level wind shear and turbulence: first peak during northeast monsoon, second peak in Typhoon season.

Priority areas:

- Best use of Doppler weather radars (some with dual pol capability), including LIDAR.
- Best use of Satellite data for nowcasting
- Experimenting fine scale aviation model: 600m to 200m.
- AvRDP website and data exchange server setup for use

ATM data:

- Airport capacity - Airport Acceptance Rate
- Air traffic data

Intense Observation Period:

- 1<sup>st</sup> IOP has already started in mid May 2015 and would end in Aug 2015
- MET observation, nowcasting and mesoscale modelling data, and ATM data being collected
- Opened for AvRDP participants to download and carrying research

### **2.3 Charles de Gaulle Airport (Stephanie Desbios)**

Max capacity per hour 66 flights/hr.

Key weather elements:

- Convection in summer is one of the most serious elements.

What should be advanced in research?

- Forecasting fusion techniques between nowcasting and forecasting methods.

### **2.4 An overview of aviation verification (Marion Mittermaier)**

Marion pointed out the key elements and questions to organize and plan a verification methodology.

- How to verify?
  - One is more modeling oriented approach
  - Another approach is more user-oriented
- What are the customers sensitive to?
- Develop verification questions they are interested in
- Identify observations that represent the event
- Identify multiple verification attributes that can provide answers
- Select measures and graphs
- Matching forecasts and observation, towards a fuzzy matching
- Forecast goodness depends on what angle are you taking and forecast quality is only one aspect

### **2.5 Shanghai airport (Fengyun Wand and Baode Chen)**

Key hazards:

- Convective weather
- Low visibility & ceiling
- Lightning
- Low level windshear
- In-flight icing

Available observations and derived products:

- Doppler Weather Radar
- Satellite
- Lightning detection network
- Ground observations – Radiosonde, AWOS, METAR/SPECI etc.
- AMDAR (600 reports per day per hr), PIREP

NWP:

- AMEFS
- SMS-WARMS
- Simulated reflectivity
- WARR – WRF ARPS Rapid Refresh (3km, 1-12hr)
- WARMR2 – WRF ARPS Rapid Refresh Real Time model (9km, 1-12hr)
- CMLPX – Cloud Analysis for hydrometeors
- SMS-WRP + SMS-ADAS (9km)

ATM Data:

- Static ATM data
- Flight track
- Capacity
- CDM Tools – MET Support tool

### **2.6 Johannesburg International Airport (Estelle de Coning)**

Key hazards

- Radiation fog or advection from SE, mostly early am (2-3 days per month). Risks for cloud below 200 ft
- Precipitation: thunderstorms, summer, pm, early evening
- Hail 5 days per year, Oct-Dec

Available observations and derived products:

- Doppler Weather Radar, S-band (10.5 cm wavelength). It operates at 200 km distance. Radar derived products for hail, different types of rainfall.
- MSG satellite data:
  - Derived products for fog, 12 channels, 3 km resolution (1km for HRV), updates every 15 min.
  - For precipitation (using channel 9 IR 108) brightness temperature with input from NWP to estimate precipitation, useful in areas where there are very few (or no) rain gages.
  - For instability indices where limited upper air soundings over Africa, updates every 15 min.
- Lightning data network consisting of 24 Vaisala ground based sensors, 0.5 resolution products.
- Radiosondes and surface observation data.

- AMDAR data are available, but the SA weather service has to pay the airlines for the data
- PIREP data, very little is available in SA
- Real-time air traffic data not easily available

NWP:

- 12 km, 38 levels, hourly output to 48 hours once a day, half continent
- 4 km southern Africa and 1.45 or 2.2 km for SA only, operationalized in 2015/16, twice daily
- currently no DA

Satellite products represent an important tool to complement weather forecasts. EUMETSAT developed new Satellite Application Facilities (SAF) products, specifically the v2013 software developed by the nowcasting SAF (Nowcasting products → Rapidly Development Thunderstorm products → Convective Rainfall Rate) has recently been implemented in South African Weather Service.

Local team for AvRDP will consist of 6-7 people, including mostly aviation forecasters, contacts with ATM have been initiated.

Key priorities: What are the most relevant product gaps which can be filled by research ?

- Radar data
- Fusion between NWP and satellite products.

## **2.7 Environment Canada (Janti Reid)**

Toronto Pearson Airport YYZ and Iquluit airport.

Nowcasting products:

- 3 hours card used for Beijing 2008 and FORST2014.
- Radar, lightning mapping.
- NWP down to 250 mt for experiments.

AvRDP contribution:

- High time resolution surface obs in near real time
- Specialized remote sensing products
- High resolution NWP (GEM 2.5 km, perhaps 1km and 250 m)
- GOES-E imager products in near real time
- Archived IPO data and products
- ATM component needs to be further investigated because managed by a private company

## **2.8 Air Traffic Management Experience and Expectation (Peter Chadwick, senior operations officer, Civil Aviation Department, Hong Kong)**

Rapid and sustained growth of traffic within the Asia/Pacific (APAC) region.

ICAO Air Traffic Flow Management steering group established to develop a common regional framework.

Critical airspace areas: development of capacity determination tool and capacity notification scheme.

What does ATM need?

- Intuitive, graphical based products
- Forecasts briefings targeting operationally critical triggers thresholds which relate to airport capacity
- What will cause us to have to change our airport operating model type usage
- Not only airport centric, Meteorological Services in the Terminal Area (MSTA) a priority
- Final approach spacing: distance based separation depending on wake vortex requirements
- Visibility and ceiling: > 1000m, no impact on operations; 600-1000m operations coordinated mode; <600mt, low visibility operations capacity reduced by 33-50%.
- Crosswind component: reduces tracking ability for departures and possible missed approaches. < 30 kts, simultaneous mode (no/minor impact on ops); 30-35 kts, coordinated mode (moderate impact on ops, capacity reduced by 15-20 %); > 35 kts coordinated mode, many limitations
- Headwind component. While not affecting the mode of operations, has a related impact on landing rate. Simultaneous mode maintained. < 20 kts, equivalent to coordinated mode (capacity reduced 15-20 %); > 40 kts capacity reduced > 33 %.

Key points of the discussion:

1. In view of probabilistic forecasts how to consider in ATM management. Usually the consensus is reached during the briefing and it is an option, say 70 % threshold rule used.
2. What needed more from Met Services perspective? An extension of 1 hour nowcasting.

### 3. SSC Discussion

#### 3.1 Review the scope of the science plan

- What now we call scientific questions could be defined as research issues or research questions.
- Convection, visibility, cross-wind/head-wind should be the three main issues to be addressed.
- The priority is on MSTA, Meteorological Services for Terminal Area.
- Airport's involvement: Shanghai, Hong Kong and S Africa, this summer; Toronto this winter
- The Objectives of the AvRDP Science Plan was been fine-tuned accordingly

#### 3.2 New nowcasting technologies, including blending, satellite nowcasting, etc.

- Key elements: Satellite nowcasting for airports; merging nowcasting with high resolution models; high resolution models; better DA; ensemble and probabilistic nowcasting forecast.
- Nowcasting ensemble system: first ensemble analyses and then blending using radar and convective permitting simulations. Observation uncertainties and then using statistics generating very large ensemble (30 members) of radar reflectivity for instance.

#### 3.3 Impact data and rights issues.

- Need to confine the scope of ATM data which include traffic volume, capacity forecast etc. rather than exactly where the aircraft location is.
- ATM requirement analysis: SESAR already have a long list of requirements from ATM, should start interacting with ATM, to know how to develop the impact perspective. Depending on which kind of ATM product they require, the Project needs to develop the methodology using the IOP data. It is thus important to set up a clear plan how the Project needs to move forward.
- Try explore the possibility to do simulation, at least for some specific case studies (e.g. Honk Hong).
- Define a matrix for impact modeling in order to guide the post-processing phase of the IOPs.

#### 3.4 Implementation Plan: next steps and actions.

- Revise the implementation plan and circulate to members (before end August 2015).
- Will the data be made available to the research community before WSN16 (WMO symposium on Nowcasting – Honk Hong)?
- Define interaction with ATM on impact models.
- Involvement of additional partners: Eumetnet Consortium is involved in SESAR and it will be useful with their involvement.
- Need to involve the chairs of the Working Group DAOS and PDEF then discuss how to involve the scientific community in order to exploit all data gathered by the Project. WMO to set up a teleconference with DAOS & PDEF chairs.
- The need for a funding plan to be discussed during the next WWRP SSC.
- Next SSC meeting back-to-back with WSN16.
- Peter Li has been named as chair of the Aviation RDP SSC. It has been suggested that we keep at the moment current set-up of one chair until the next SSC meeting. We might decide on a co-chair in Phase II when CBS joins the project.

#### 3.5 Aviation verification technologies and uncertainty estimation.

- What kind of ATM verification matrix would be appropriate for the project?  
ACTION → Peter Li to contact MM on this.
- How to estimate the uncertainty/confidence information for ATM risk assessment. The best strategy is looking to the scores in terms of impacts. While performance is a MET parameter and should be evaluated based on MET observations, when we move to performance predictability we should consider ATM.

#### 3.6 Training workshop

- An AvRDP training workshop will be organized back-to-back with the next WWRP

International Symposium on Nowcasting and Very-short-range Forecast to be held in Hong Kong in July 2016 (WSN16). Tentatively, it would be a 3 days workshop, containing lectures and hand-on exercise. Target trainees are WMO Members who would need to enhance aviation weather services to meet the ASBU requirements.

- Details to be announced in due course.

3.7 The website, including data issues (see above discussion on ATM data)

- Data base and use of the data.
- Data upload strategy: which format, free format or netcdf?
- WMO ACTIONS → Draft a disclaimer for data sharing. This is particularly relevant for ATM data as the ATM would not welcome making the data widely available even for research purposes.

There being no other matters, the meeting adjourned at 16:49 (Shanghai) 10:49 (Geneva).



## List of Participants

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