

CDM@CDG

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Content

Paris-Charles de Gaulle airport

CDM@CDG origins, concept, benefits

The MET application cdm@cdg

Gains



Paris-Charles de Gaulle airport





ATC Infrastructure

1 approach room, 3 control towers,

2 apron control centers

Airport Infrastructure Information

 Surface : 3,200 ha
 2 pairs of runways – dedicated mode DEP/ARR (scheduled capacity: 120 mvts/h)

- 110 km Taxiways
 - 8 ILS CAT.III
- 9 passenger terminals
 - 2 cargo hubs

Statistics 2017

- 69.5 M passengers
- 475,000 movements
- 1,400 mvts per day
- RWY throughput: ARR 73 / DEP 76
 - 146 Airlines

Weather environment

Fog/low ceilings - Low Visibility Procedures

Snow
 Winter 17/18 : 19 d – 30 cm
 Winter 12/13 : 30 d – 59 cm
 Winter 10/11 : 23 d – 30 cm



Paris-Charles de Gaulle airport







About 1,400 flights per day 2 aircrafts per min at peak hours RWY throughput: 73 ARR/h – 76 DEP/h

AIRFRANCE J

Hub Structure for half of traffic



High peaks make the traffic structure decisive





Since 2003, airports became bottlenecks

Congestion Point between airport & en-route delays



European traffic is due to triple by 2025

 \rightarrow Triple the capacity

→ Reduce ATM costs by 50% per flight

 \rightarrow Increase safety by a factor 10

 \rightarrow Reduce the environmental impact per flight by 10%



These PI targets also apply to airport operations !







A CDM concept aiming at improving <u>airside operations</u> (nominal and adverse conditions), between :



This project is supported by Europe through Eurocontrol and SESAR project (Single European Sky ATM Research)









2003 Snow Event with

- ✓ 2 days non-stop
- ✓ Cancellations : 25%
- ✓ Delays : +2h per flight
- \checkmark Around 5,000 pax stucked inside terminals and 5,000 pax in the hotels

Every stakeholder used to work in silos, there was no coordination, no information sharing...

2004 DSNA, Aéroports De Paris and Air France launched CDM@CDG program in order to :

- ✓ deploy Airport Collaborative Decison Making (A-CDM) concept with Eurocontrol rules
- ✓ reduce delays, improve departures and arrivals predictability
- ✓ reduce taxi-time, kerosene consumption and polluting emissions (CO₂, NOҳ, HC …)
- \checkmark optimize airport capacities and resources usage







To be an A-CDM airport means to respect Operational and Technical concepts defined in Eurocontrol/EU Airport CDM concept and implementation manual e.g. create a PDS, optimize predictability, manage ARR/DEP with ECTL, etc.





CDM@CDG Working structure







CDM@CDG structure

Operational Pillar

To strengthen and optimise operational collaboration between stakeholders

Technical Pillar

To optimise departures flights sequencing, including

→ Enhance predictability to the Network Manager (prediction 3 hours before)

Benefits (as measured by an external audit company) Departure taxi-time : - 2.5 min/flight Kerosene : - 4,000 t/yr (~4 M€/yr for airlines) CO₂ : -12,000 t/yr







CDM Cell :

Three activation levels :

- **1** watching in a 'nominal situation'
- 2 monitoring a non nominal situation, that would induce delays, but was anticipated
- **3** monitoring a non nominal situation ; defining strategy to optimise airside ops

All stakeholders present in the CDM cell room incl. the Aerodrome Met Office Management





The Met partner in CDMCDG has a key role :

- Share information for pro activity
- Update on regular basis, or event-driven update
- Communicate for better understanding
- Back-up CDM community → manager on duty during winter period, physically participating to CDM cell
- Develop tools to meet customers needs and expectations \rightarrow dedicated working group
- > Dedicated website providing observations & forecast+ first steps in translation of MET information into impact



WWRP CAS/CAeM AvRDP workshop - CDM@CDG



First steps in translation of MET information into impact : the CDM@CDG WG for meteorology defined impact translation matrices

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VERGLAS	RAS	inutilisé	inutilisé	pluie ou bruine verglaçante
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TEMPERATURES CHAUDES	< 32°C	>= 32°C	>= 35°C	>= 40°C
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VENT TRAVERS MOYEN	< 25kt	>= 25kt	>= 30kt	>= 35kt
VENT TRAV FREQ/EXTR	< 25kt	>= 25kt	>= 38kt	>= 50kt





Wind is the 'every day-every time' parameter => special impact translation matrices for head/tail wind or for crosswind





METEO FRANCE

Nowcasting, short-term and medium-term detailed forecast

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Nowcasting, short-term and medium-term detailed forecast First steps in translation of MET information into impact

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Nowcasting, short-term and medium-term detailed forecast

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Nowcasting, short-term and medium-term detailed forecast First steps in translation of MET information into impact





Nowcasting, short-term and medium-term detailed forecast First steps in translation of MET information into impact

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Example of LVP forecast

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LOW VISI & CLGs





Real time observations

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	(i	ndications re	latives aux 6	dernières m	inutes écoulé	es)		
LOW	Visibilité (RVR)	Plafond	Vitesse Vent	Composante Vent Travers	Températures Chaudes	Températures Froides		
	>=1500m	> 500ft	<=20kt	<=20kt	< 32°C	> 3°C		
VISI &	< 1500m	<=500ft	> 20kt	> 20kt	>=32°C	<=3 °C		
	< 1000m	<=300ft	> 40kt	> 25kt	>=35°C	<=1°C		
CLGS	< 600m	<=200ft	> 55kt		>=40 °C	<=-7°C		
			Phénomène	es divers			_1	
	Forte Pluie	Orage G < 5km (ou pr	rain Trombe) Brouil givr oche	llard Pluie&N ant mêlée	eige SNeige	Pluie verglaçante		
			Inform	ations				





Real time observations (values ; 1-min update)

Paris-CDG (108m) - Observation du	vendredi 06 juil.	2018 - 10:112 (12:11	LT)						
Temps présent		Nuages en f	ormation ou en train de se	développer						
État du sol n	aturel	Sol sec								
VISIBILITÉ et CIE	EL									
Visibilité		Nébulosité	Couches Nuageuses							
	>10km	1/8	1,	'8 CI 25000ft						
TEMPÉRATURE,	HUMIDITÉ et PLUIE									
T. sous abri	Td (Pt. rosée)	Humidité	T	+10cm	T sol	T -10cm		Pluie 6'	
24.8 °C 13.4 °C 49 % 33.9 °C 45.9 °C 2									0 mm	
VENT										
M	Moyenne sur 10 minutes			Moyenne sur 2 minutes			Rafale maximale			
09		020°/3kt (5km/h)			280°/2kt (4km/h)		4kt	(8km/h)		
		010°/4kt (8km/h)			020°/3kt (6km/h)		3kt	(5km/h)		27
08		030°/5kt (9km/h)			040°/8kt (14km/h)		9kt (17km/h)		
		040°/4kt (7km/h)			010°/4kt (8km/h)		6kt (11km/h)		26
PRESSION								POM		
Pression nive	au mer		1021.4 hPa		QNH		1021 hPa		> 20000m	
HBN		RVR						HBN		
		09L	> 2000m	MED	> 2000m	27R	> 2000m	07		
09	> 2600010	> 26000ft 09R >			> 2000m	27L	> 2000m	21	> 2600010	
0.0	200005	08L	> 2000m	MED	> 2000m	26R	> 2000m	06	2000055	
00	> 2600010	08R	> 2000m	MED	> 2000m	26L	> 2000m	20	> 26000It	

RWY temperature and contaminant forecast



Radar imagery



+satellite imagery, OPMET data, historical data, etc.





Wind & Crosswind forecast for decision support

		AVENS Mis	e à jour :06	/07/2017 à 08	h33 UTC												
ME	TEO-FR	ANCE		AID	E DE	CISIO e de la d	NNE ernière	LLE V e observ	ENT ation :	TRAVE 06 juillet	ERS - t 2017 0	PAF 8:30	RIS-C utc	DG			
		OPS		TION	///	DI	DEVISI	ON							MAX E	XTREM	E
		OBa		HON	///	FI		ON						Ν	/IAX FF	REQUEN	IT
	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21
	80					Rappo	rt (For	ce max	freq)/(F	orce mo	yenne)=	- 1.6					
	75																- 75
	65																
	55																- 55
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Tailored for users' needs in terms of wind/crosswind forecast over operational thresholds





Operations or procedures at CDG in case of strong winds

Wind-related operational phases (airport manager) and limiting thresholds



e.g. max wind > 54kt => no usage of gangways

e.g. max wind > 37kt => stop usage of de-icing pads or vehicles



erthi so soon

Antibus Antibus Antibus Antibus Antibus



Regional forecast

$ \downarrow $	
	METEO FRANCE
-+	
>	Bulletin Régional
	Edité le : 06/07/18 à 05:52 lég.
	Situation météorologique jusqu'en fin de nuit du 06/07/2018 au 07/07/2018 :
	Les hautes pressions se mettent en place sur la région avec un flux très relâché en altitude comme au sol.
	Incertitude du scénario :
1	Accord des modèles numériques : bon. Medèle surprésione chaisi : ABREGE
-	Commentaire : Pas d'enjeu sécurité.
	Prévision sur l'Ile-de-France :
٩.	Temps :
B	Calme sous le ciel dégagé, légère fraîcheur agréable de l'aube avant une journée estivale, chaude et ensol (Cu).
e.c	Sorree et nuit clementes.
anc	Températures maximales : de 28 à 30 °C
eofi	Températures minimales : de 13 à 17°C localement jusqu'à 20 °C dans la capitale.
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1	Tél. : / Fax : Mél. : support.iledefrance-centre@meteo.fr < <u>mailto:support.iledefrance-centre@meteo.fr</u> >

Wind forecast along approach paths



Tailwind/head wind along approach axis over pre-defined thresholds





Pre-tactical work in winter conditions

Weather forecast



Global traffic forecast



And other information or partners constraints that can impact traffic flow

Share and analyze

- Characterize the CDM Cell operational collaboration's level
- Adaptate de-icing & snow clearing means
- Suggest cancellations flights



Tactical work in winter conditions



- Decisions focused on infrastructure usage optimization
- Runways and Taxiways snow clearing strategy



Source GROUPE ADP

The MET application concept has been applied at other maj French airports incl. Lyon Saint-Exupéry airport. Similar information and products + local ones

e.g. convection probability over stack areas around LFLL





Gains from CDM@CDG



Improvements on :

- Safety
- Punctuality
- Forecasting
- Confidence
- Performance and capacity
- Quality standards
- Risk assessment
- Crisis management
- Taxi time
- Airport image





Gains from CDM@CDG



- Aircraft queueing (-40%)
- ATC delays
- Taxi time (up to -20%)



Fuel consumption









CDM@CDG

Also presented at WMO Aeronautical Meteorology Scientific Conference, in Toulouse, France in November 2017:

- AeM Series, 02. Proceedings of the 2017 WMO Aeronautical Meteorology Scientific Conference
- https://library.wmo.int/doc_num.php?explnum_id=4554





Thank you !

Merci !



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