Joint event of SWIM over CRV Demonstration and Surveillance data over SWIM Trial

(Hong Kong, China 28 to 29 May 2024)

Surveillance Data Sharing via SWIM

Operational Benefits and Demo Scenario

民航處 Civil Aviation Department

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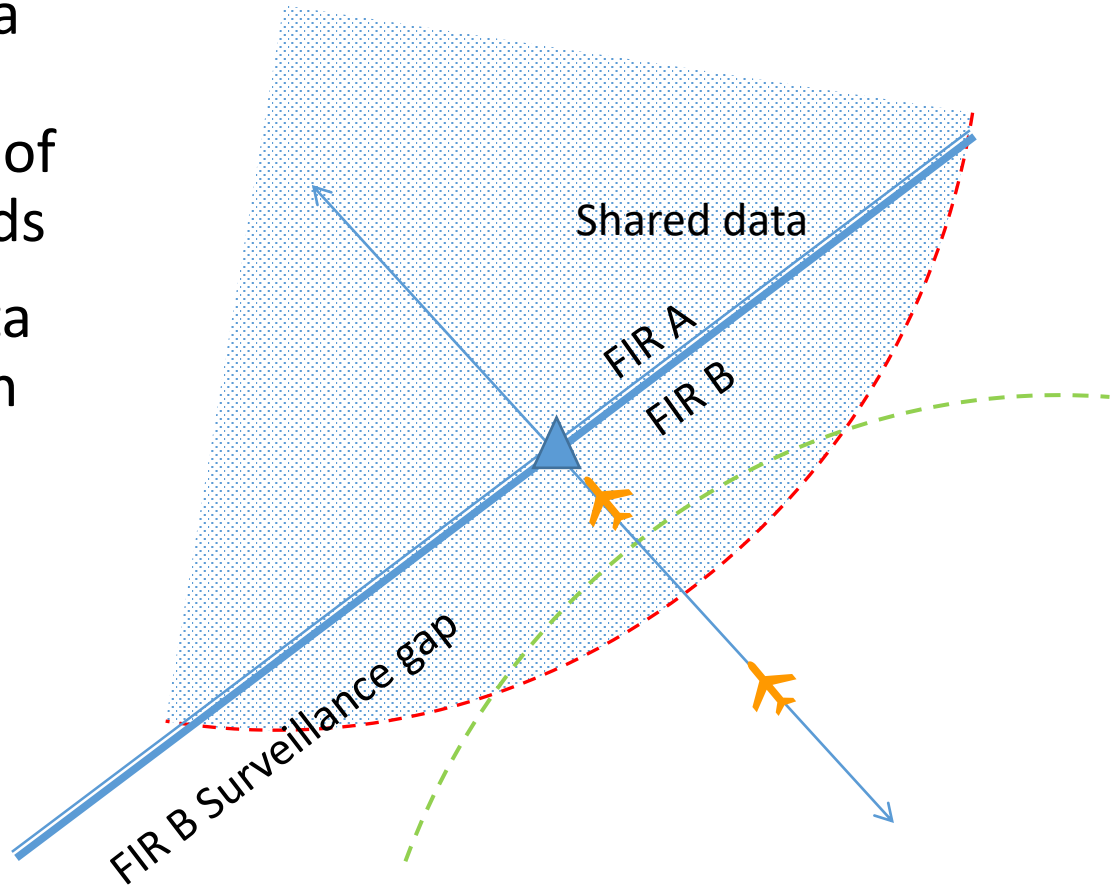
AEROTHAI Aeronautical Radio of Thailand Ltd. บริษัท วิทยุการบินแห่งประเทศไทย จำกัด

CAAS Civil Aviation Authority of Singapore

Enabling opportunities through aviation

Operational Use cases for Surveillance sharing

- Already common practice for some adjacent ANSPs to share overlapping surveillance data through fibre link etc to enable seamless application of reduced separation standards
- High quality/Low latency data is required if ICAO separation minima are to be applied

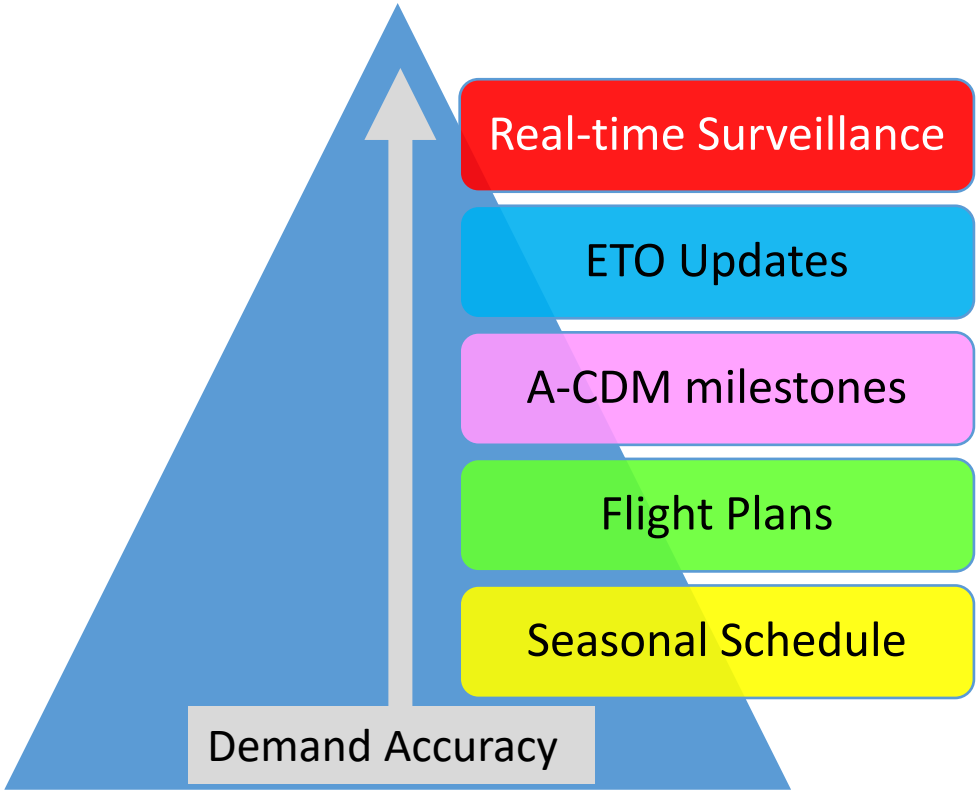


Operational Use cases for Surveillance sharing (2)

- For non-contiguous surveillance sources, what benefits could be gained sharing data via SWIM?
- For Air Traffic Flow Management purposes and airline situational awareness, data update rate/latency is less critical

ATFM Traffic Demand Accuracy

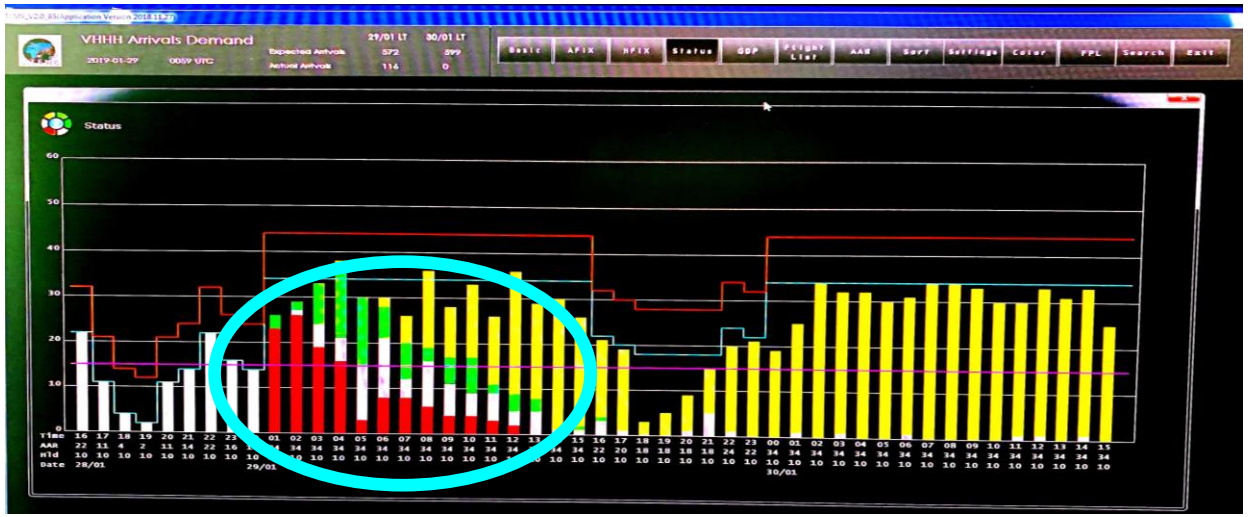
- Key aspect of determining efficient ATFM measures is accurate forecast of traffic demand
- Real-time update of aircraft trajectories can provide the most accurate picture prior to pre-tactical ATFM cut-off time



Long-range Surveillance in ATFM

- Simply displaying targets on a screen for human monitoring can realistically only provide broad situational awareness

- Processing SWIM data automatically via SDP/FDP trajectory capability in ATFM systems can provide real-time updates to traffic demand profile and increase accuracy several hours ahead



Objectives of this demonstration

- Support a Ground Delay Program (GDP) with Calculated Take-Off Time (CTOT) distribution at Hong Kong International Airport (HKIA) due to the impact of a severe trough
- To demonstrate operational benefits of sharing of surveillance data via SWIM to enhance ATFM through real-time trajectory updates
- Focus on 2 flights which are affected in this scenario; CPA690 from Singapore to Hong Kong and CPA770 from Bangkok to Hong Kong and show that operational efficiency can be improved through real-time updates to trajectory and projected traffic demand at destination
- We will observe the visualization from Hong Kong ATC, Hong Kong Observatory (HKO), Thailand and Singapore and Airspace User perspectives.

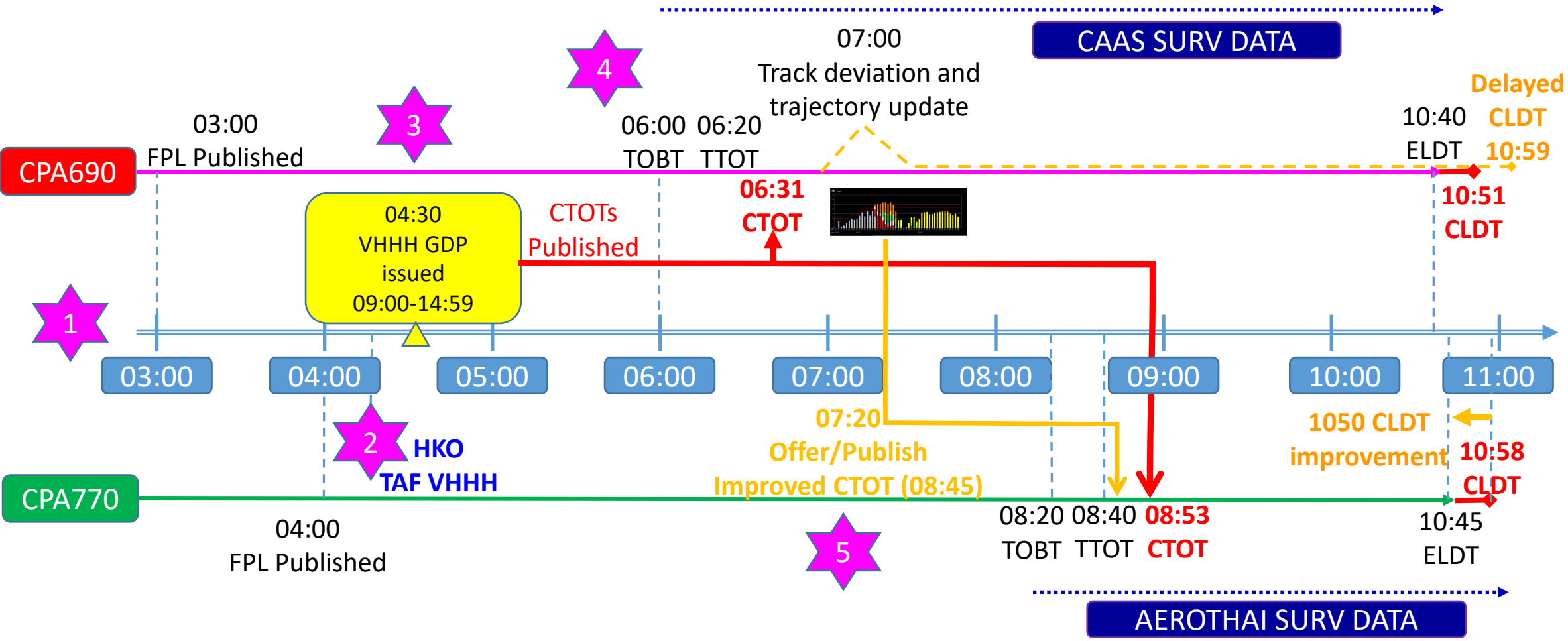
The Background Scenario

2 Cathay Pacific flights destined for Hong Kong

#2: CPA770 (Cathay Pacific): Bangkok – Hong Kong

#1: CPA690 (Cathay Pacific): Singapore – Hong Kong

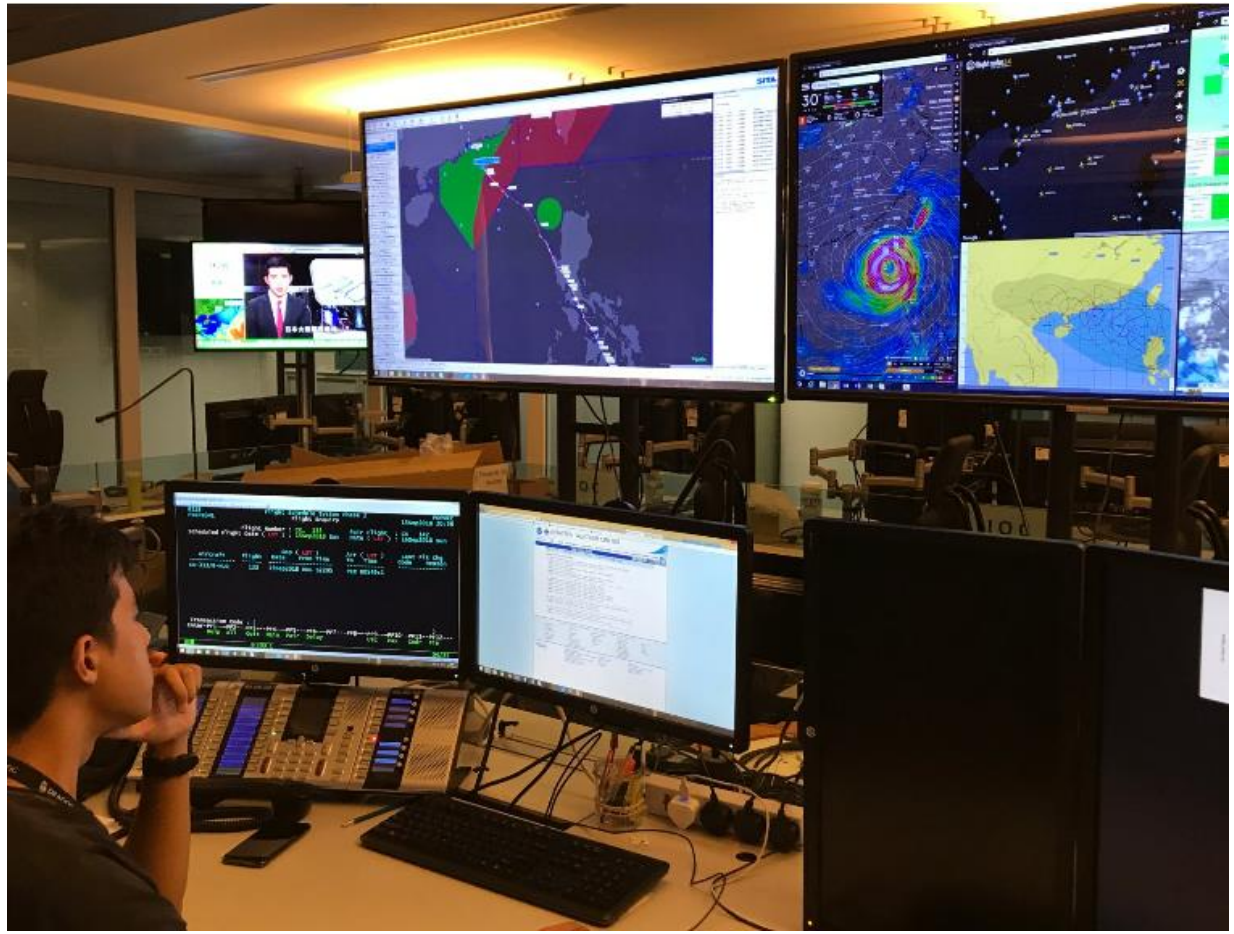
Timeline for CPA690 and CPA770



1

Cathay Pacific Flight Dispatch

- Subscribe to HKO, MSS and TMD for Airport and enroute MET services via Local SWIM Services
- Assess initial impact to operations/flight planning requirements, noting weather is currently good in VHHH but CB activity forecast en-route in north of Singapore FIR
- 0300: Publish FPL for CPA690 WSSS-VHHH (EOBT 0600/ELDT 1040) in FIXM
  - (Observe HKCAD receives FPL CPA690)
- 0400: Publish FPL for CPA770 VTBS-VHHH (EOBT 0820/ELDT 1045) in FIXM
  - (Observe HKCAD receives FPL CPA770)



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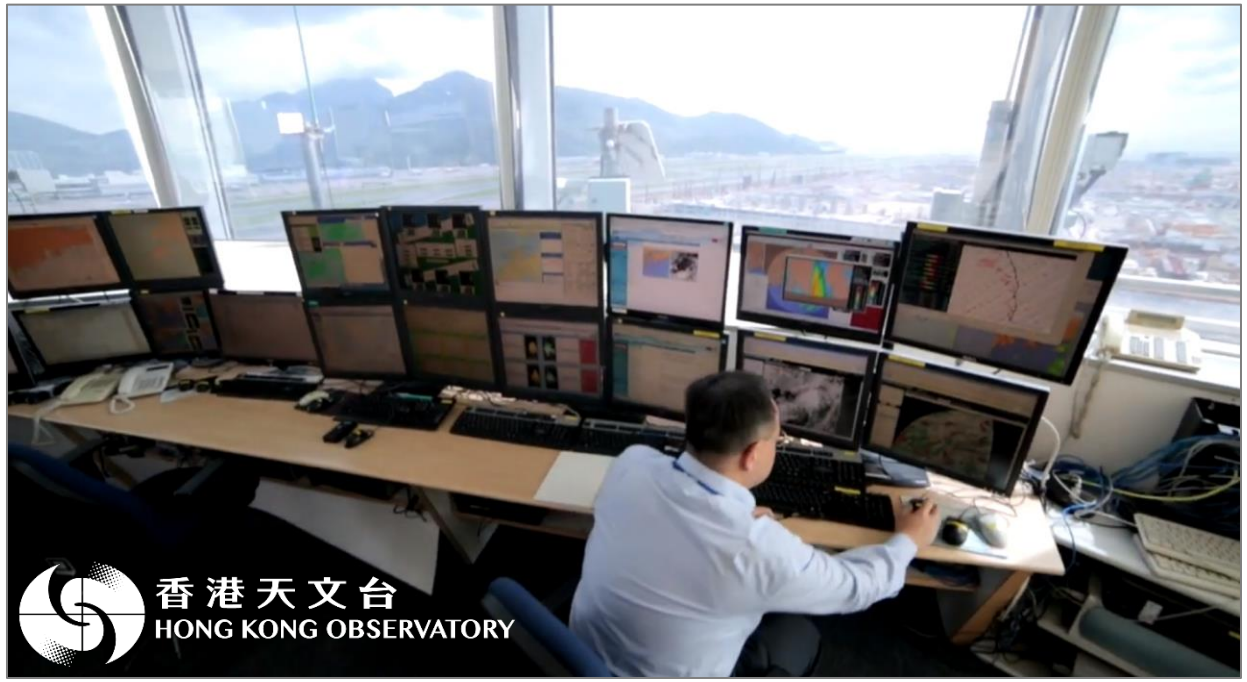
2

Hong Kong Observatory

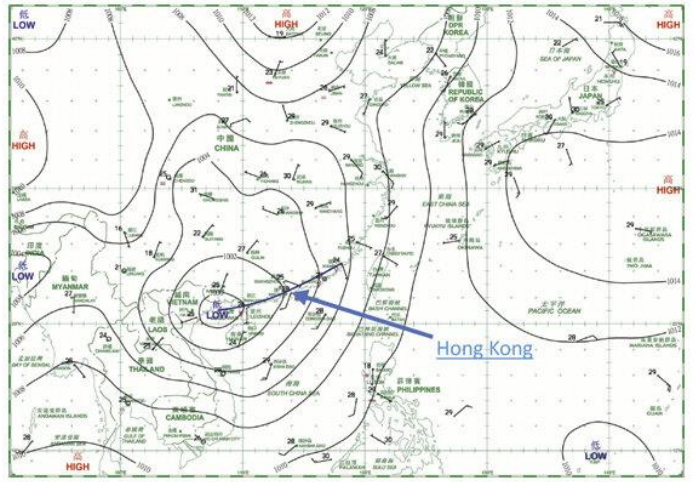
0415: HKO publish TAF AMD VHHH forecasting severe trough to impact VHHH from 0800 to 1200.

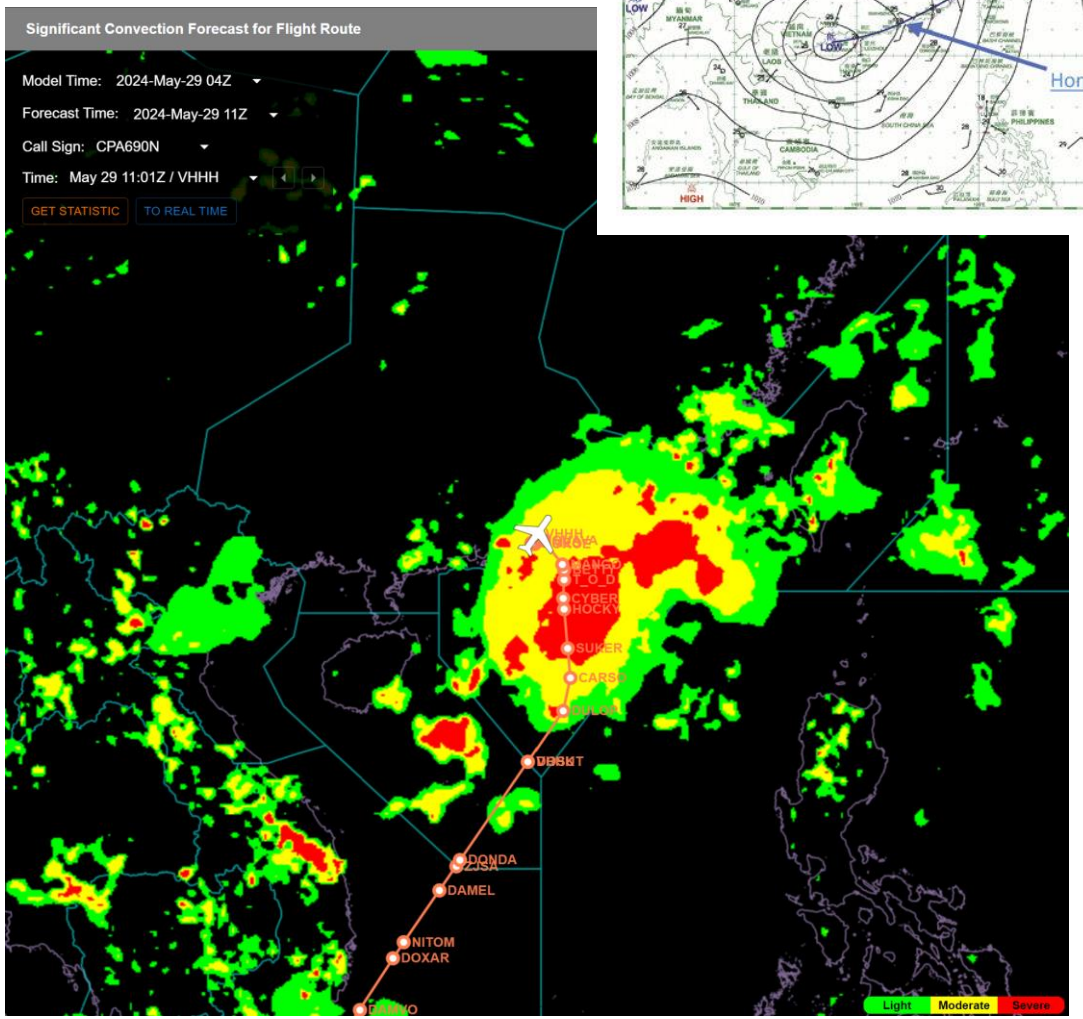


TAF AMD VHHH 290415Z 2904/3009 13018KT 9000 BKN020 TX30/2906Z TN26/2922Z BECMG 2906/2908 SCT015CB BKN020 TEMPO 2908/2912 17025G40KT 1000 TSRA SCT010CB BKN020 FM291200 15015KT 9999 NSW BKN020 BKN100=

HKO Forecast impacting VHHH and TMA

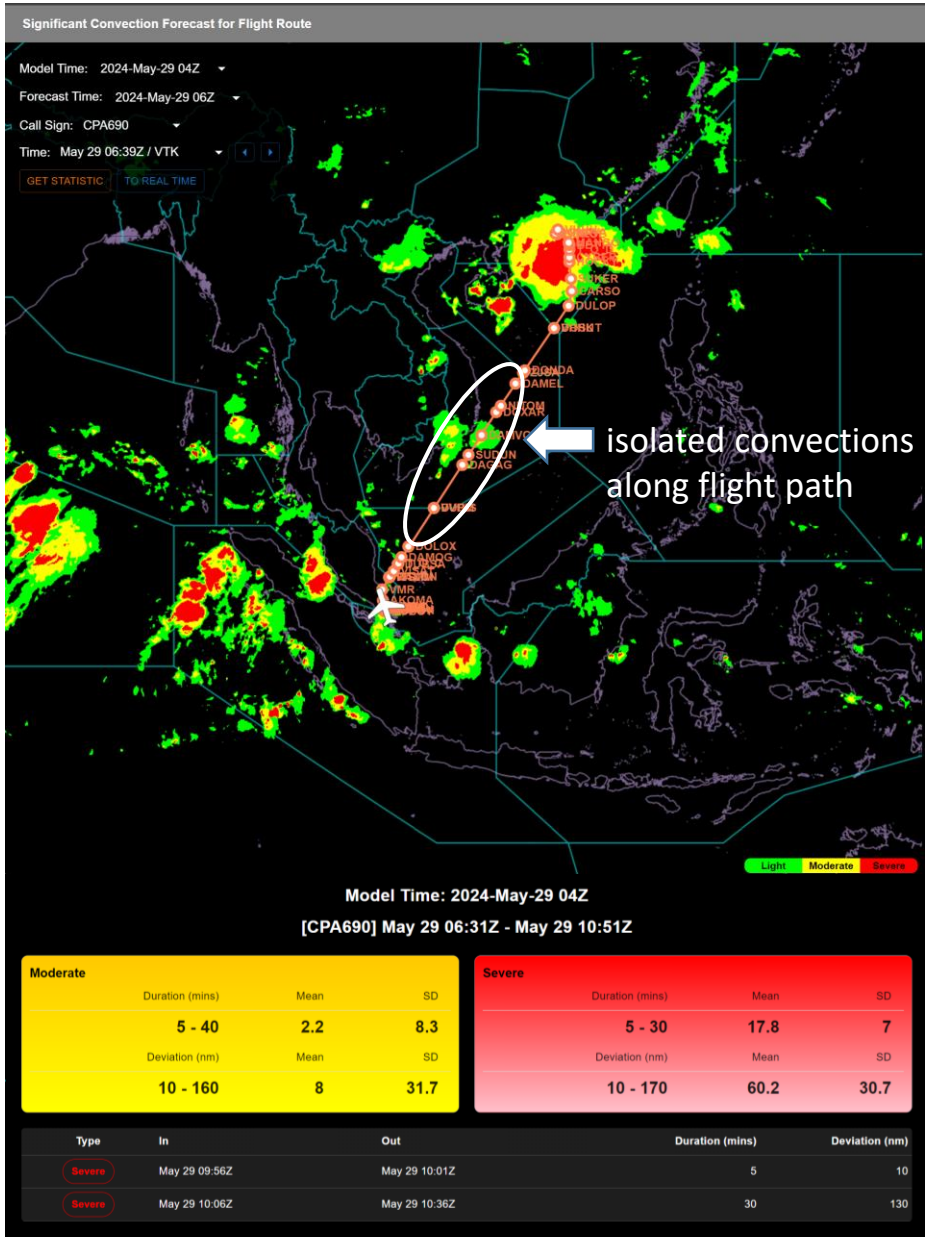
- In addition to TAF, HKO also provide the gridded information of hourly significant convection forecast over South China Sea with forecast lead time up to 8 hours, and the associated visualisation on HKO's SWIM-enabled MET application
- Due to a trough of low pressure, major convective activities would be over the northern part of the South China Sea, including the Terminal Area in Hong Kong FIR





SWIM-enabled MET application for increasing pilot's awareness

- SWIM-enabled MET application has the capability to ingest and process the flight plan published in FIXM format.
- By integrating FIXM-formatted flight plan and forecast MET information, the application could provide a rough estimate on cross-route deviation
- Through the SWIM-enabled application, pilots of CPA690 would also be aware of possible isolated convections along flight path before reaching Hong Kong FIR during the flight planning stage
- The pilots decide to load an extra fuel of 15 minutes.



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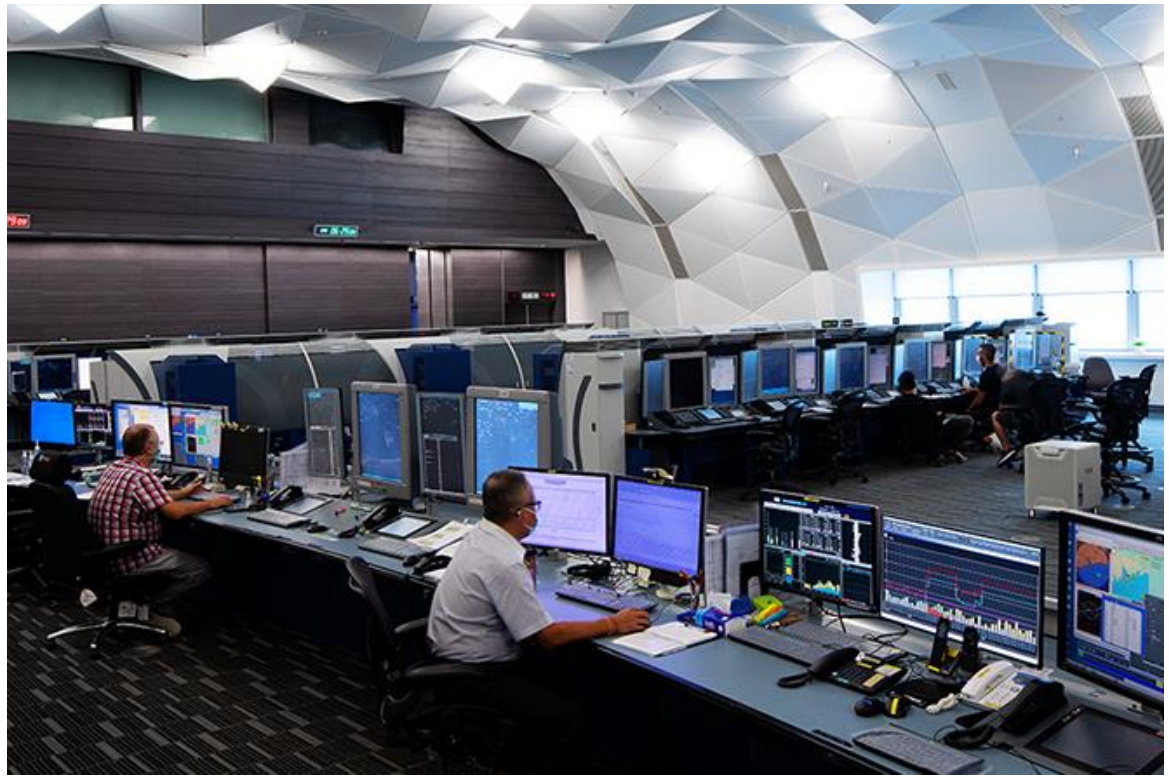
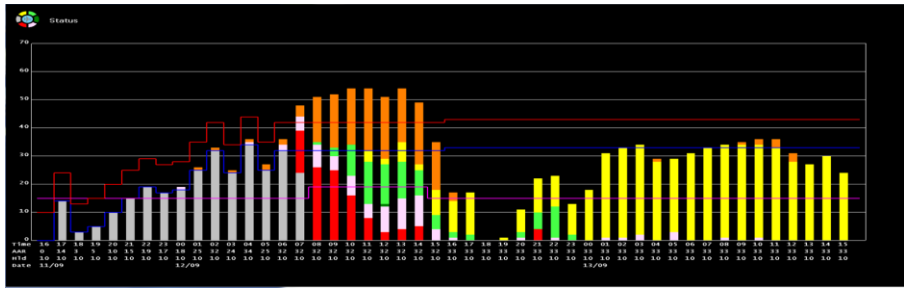
Hong Kong Air Traffic Flow Management Unit

- 0420 ATFMU receives TAF AMD VHHH and automatically determines impact of forecast on VHHH Airport Acceptance Rate (AAR)
  - In addition to the aerodrome forecast, also taking into account the forecast spatial distribution of severe convective cells over the Terminal Area (TMA) in Hong Kong FIR
  - HK ATFMU determines reduction in AAR by ~33% from 0900-1200 and ATFM Daily Plan published





IWXXM TAF Data feeds directly to AAR Calculator

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IWXXM TAF

Capacity Notification

Expected Runway	07				
FACILITIES					
Runway Availability	(•) Dual ( ) Single (Rwy Maint) ( ) Single (Day)				
Approach	(•) ILS/RNAV ( ) VOR				
WEATHER					
	DIR	SPD	X/W	H/W	Note:if SFC wind > 20kts, Enter 1000' wind
WIND	070	5	0	5	
VIS/RVR(m)	5000				
CLOUD CEILING (BKN+)	3000				
TS/CB in 20NM?	(•) Nil/Green ( ) Yellow ( ) Red (•) Isolated ( ) Broken ( ) Extended TS				
Available Arrival Feeds	(•) 3 ( ) 2 ( ) 1 ( ) 0				
OTHER FACTORS					
Additional Spacing (WX/AWK?)	0				
Mode of Operation					
Final Spacing		NM			
Final Speed		kts			
Airport Acceptance Rate					
Capacity Level					
Expected Delay					
Critical Factors					
Remarks					

Calculate

AAR Calculator

ADP published in PDF format using Web Services GDP Implemented 0900-1459

ATFM Daily Plan (ADP)

ATFM DAILY PLAN	HONG KONG
DATE / TIME OF ISSUE	29 MAY 2024, 0400 UTC
STATUS / REFERENCE	EFFECTIVE - 29 MAY 2024 HK 02

CONSTRAINTS AND IMPACT

LOCATION	PERIOD (UTC)			DETAILS	REMARK
VHHH	29 MAY 2024	0800	0859	VHHH affected by passage of trough from 0900 to 1159 with extensive CB	AAR=34
		0900	1159		AAR=24
		1200	1459		AAR=28
		1500	1559	Single RWY OPS	AAR=18

ATFM MEASURE

LOCATION	ATFM MEASURE PERIOD (UTC)			ATFM MEASURE
VHHH	29 MAY 2024	0900	1459	GDP

POSSIBLE / DEVELOPING ISSUES

LOCATION	PERIOD (UTC)			REMARK

WEATHER BRIEFING

Expect severe low level windshear and turbulence on approach during passage of trough.

AIRSPACE STATUS BRIEFING

OTHER INFORMATION

Declared Dual Rwy AAR=34
Hong Kong International Airport Runway Closure Programme (AIP SUP 16/22)

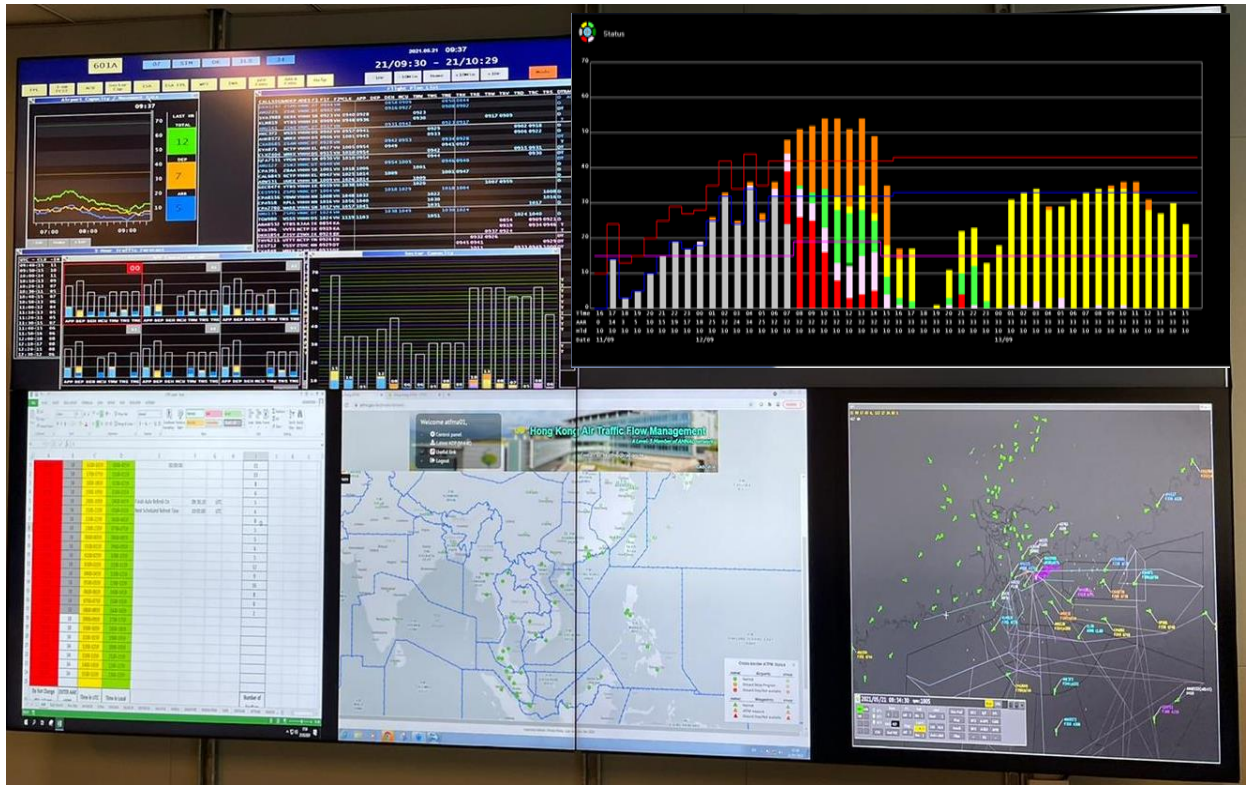
Ground Delay Programme (GDP) for aerodome - CTOT compliance window -5/+10 minutes.
Airspace FLow Programme (AFP) for waypoint/airspace - CTOT compliance window -5/+5 minutes.

FOR CHANGES TO FLIGHTS, PLEASE CONTACT:
Primary: Hong Kong Flow Manager Phone Line: +852 2910 6859 (Operational) Email: atmdflm@cad.gov.hk
Secondary: Hong Kong ATFMU Phone Line: +852 2910 6275 Email: hkatfmu@cad.gov.hk

Hong Kong Air Traffic Flow Management Unit

- 0425 HK ATFMU runs GDP 0900-1459
- 0430 HK ATFMU publishes CPA690 CTOT 0631 based on CLDT 1051
  - (Observe CAAS receives CPA690 CTOT)
- 0500 HK ATFMU publishes CPA770 CTOT 0853 based on CLDT 1058
  - (Observe AeroThai receives CPA770 CTOT)

Note: HK ATFMU ConOps is to continually calculate Demand/Capacity balance with latest data and issue CTOTs once within 120-90 minutes window prior to FPL EOBT.



Back

Ground situation in Singapore: CPA690

- 0510 Cathay ground coordinator inputs CPA690 TOBT 0600 to Changi A-CDM, indicating flight will board on time and absorb delay at the gate
  - Changi A-CDM calculates and publishes TTOT 0620
  - HK CAD subscribes to TTOTs from all regional A-CDM airports and receives, ensuring traffic demand picture is accurate

Ground situation in Singapore: CPA690

- 0610 CPA690 cleared to pushback and start and shortly after, begins taxi to the holding point
- 0634 CPA690 is cleared for take-off. CAAS surveillance system detects CPA690 airborne at 0635 (within CTOT tolerance) and a Departure message is published
- HK CAD receives departure message and also begins receiving CAAS surveillance data via SWIM

Surveillance Display: First Surveillance fix CPA690

25 mins after departure: CPA690 at cruise level

- 0700 Approaching waypoint DOLOX on Airway M771, CPA690 observes a long line of active CB's across track ahead on weather radar and requests a large deviation off course to avoid with a safe margin
- Singapore ATC approve the deviation and their surveillance shows CPA690 deviating almost 50NM east of M771
- Once clear, ATC clears CPA690 to rejoin M771 at waypoint DUDIS, on the Singapore/Ho Chi Minh FIR boundary.

CAAS Surveillance Data via SWIM

SIT1

10 25 19.28 N, 111 26 34.27 E

1539 NM

2023/09/14 08:54:02 QNH:1006

Main CFG

MST ASMG CPS LRNG

SIT1 SIT2 SIT3

Zoom + - RNG 1538 CEN Gnd TRK

PTL Off Rings Off

Trail 1m CAPPI L M H 10km

Label Normal SSR QLK Auto Label

Alt Filter 999 ^ 0

User Pref Map Search Filter

SIT1 R/T FPL SIT2 A-APS CAM SIT3 A-ESU APM --- ISS ---

CPA690 360 B77WH

CXA852 350 B738M

SIN

Flight Plan

ACID	CPA690	SSR		FRUL	I	FTYP	S	ACTYP	B77W / H
EQUIP	SWRIGDHXYJ / SD			ADEP	WSSS	ADES	VHHH	ATD	0735
ROUTE	N0488F360 M771 DOSUT M771 DULOP Q1 CARSO V551 SUKER V551 HOCKY V551 BETTY								
ETD	[illegible]	SEI	0227	REGN	BKQD	RFL	360	TAS	N0488
ETA	1101	EET		ALTN	ZGSZ			DATE	230914
SID		STAR						TYP	

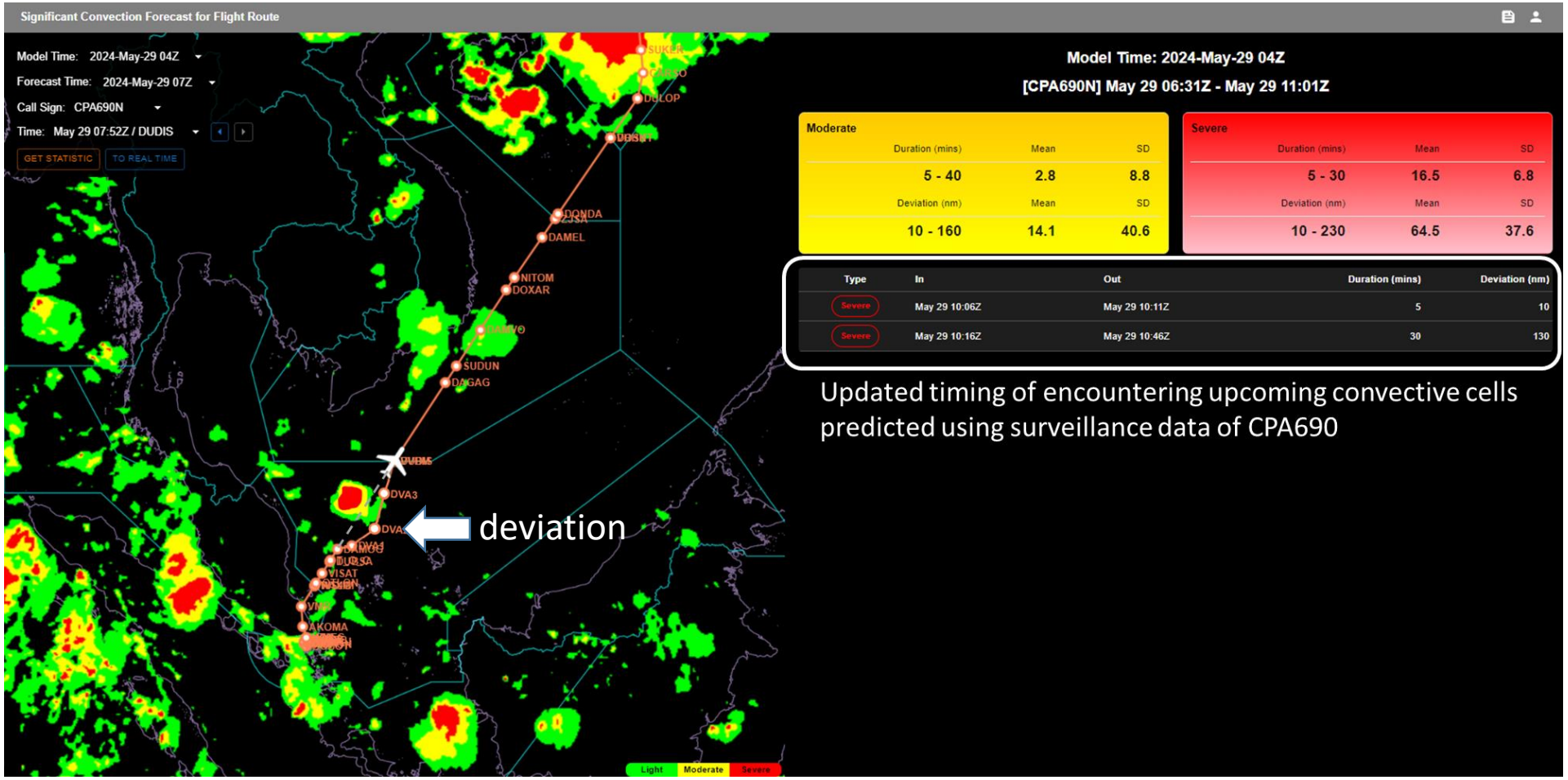
Type here to search

ENG 4:54 pm 14/9/2023

Surveillance Display: Sequence of CPA690 deviation around CBs

Benefits of surveillance data feeding to HKO's SWIM-enabled MET application

- The timing of encountering upcoming convective cells predicted by the application could be reassessed and updated for pilots' situation awareness via uplink.
  - predicted based on the surveillance data of CPA690



Updated Trajectory CPA690

- 0715-0735 Hong Kong ATFMU has been receiving continuous surveillance data from CAAS since CPA690's departure and the Flight Data Processor in the ATFM System has calculated a trajectory update based on the aircraft's position and FPL held in the system. Once tracking to DUDIS, a revised estimate to enter the HK FIR and updated landing time is determined. It is found that the deviation has added over 8 minutes to the estimated elapsed flight time and the original CLDT based on FPL time interval can now no longer be met. The updated landing time for CPA690 is now 1101.
- HK ATFM System Demand chart continues to be automatically updated with the most up to date data, including the trajectory update from CAAS surveillance feed

Back

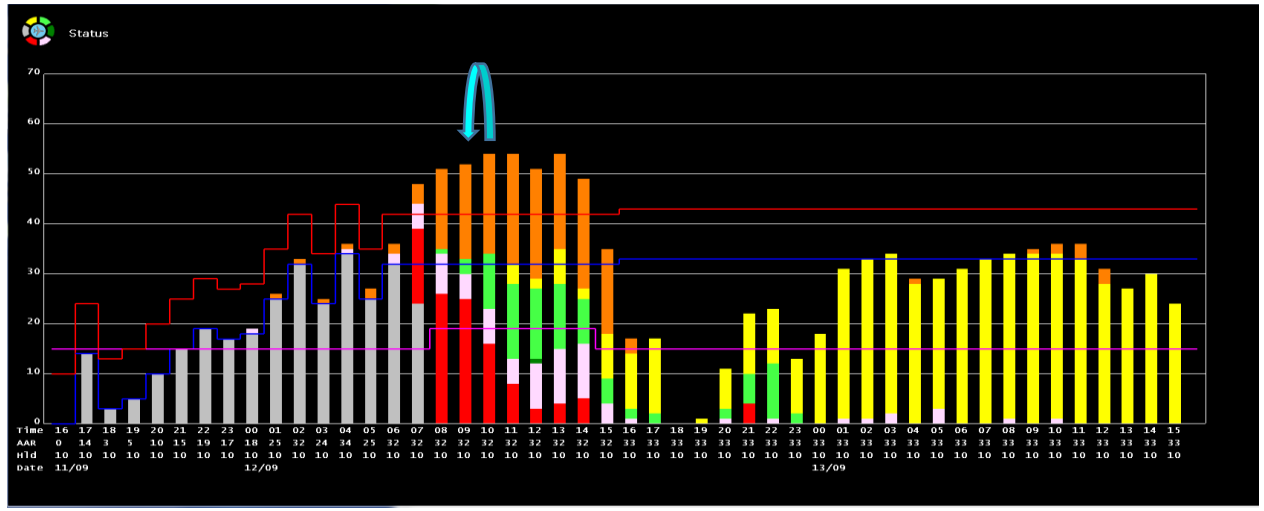
Meanwhile in Bangkok: CPA770

- 0740 Cathay ground coordinator inputs CPA770 TOBT 0820 to VTBS A-CDM, indicating the flight will board on time and absorb its 13 minute delay at the gate with passengers on board
    - VTBS A-CDM calculates and publishes TTOT 0840
    - HK receives TTOT CPA770, ensuring traffic demand picture is accurate

Meanwhile in Bangkok: CPA770

- Although CPA770's CTOT has been issued and now locked within the AMNAC agreed advance notification window, the ATFMS indicates that a CTOT improvement could be offered based on the now delayed landing time of CPA690.

- Based on the availability of revised CLDT of 1050, a Slot Revision Message of 0845 is offered and published for CPA770 and accepted by Airline ground staff and BKK ATFMU/ATC as the flight is still able to make the revised time based on their TOBT



Bangkok: CPA770

0745 With only a 5 minute delay now, CPA770 begins boarding on schedule

0820 CPA770 reports ready and after only a short delay due apron congestion, is cleared to pushback and start. The aircraft is already within the agreed CTOT compliance window and is cleared to taxi to the holding point.

0842 CPA770 reports ready for departure and is cleared for take-off.

CPA770 Departure VTBS

0843 AeroThai surveillance detects CPA770 airborne and a Departure message is published which is subsequently received by the HK ATFMU

0845 HK ATFM System also receives Aerothai Surveillance Data and begins trajectory calculation of CPA770 based on FPL Route.

Surveillance Display: Sequence of CPA770

CPA770 Departure VTBS

- 0910 CPA770 has reached cruise altitude and surveillance data confirms ELDT is 1048, just 3 min behind schedule

1049 CPA770 lands VHHH

1059 CPA690 lands VHHH

END