

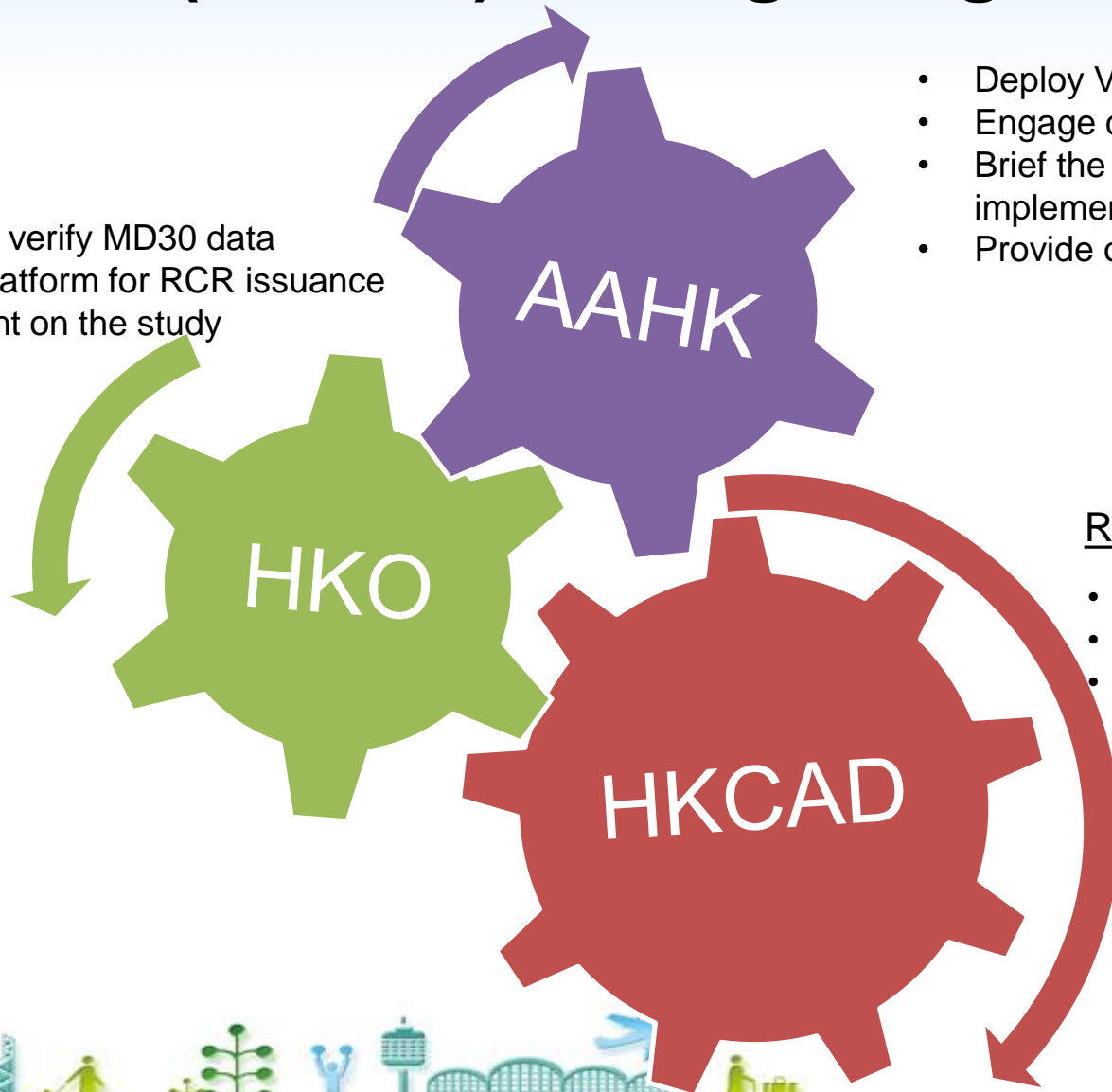
# HKIA - Embarkation on the GRF Journey

***29 September 2022***





# Working Concertedly with Hong Kong Civil Aviation Department (HKCAD) & Hong Kong Observatory (HKO)



- Provide rainfall data for verify MD30 data
- Develop the tripartite platform for RCR issuance
- Work with the consultant on the study

- Deploy Vaisala MD30 for water measurement
- Engage consultant on simulated runway model study
- Brief the pilots & airport community about GRF implementation in HKIA
- Provide on-the-job training to operation staff

## Regulatory Arm (Airport Standards Division)

- Review ICAO provisions and guidance on GRF
- Monitor implementation activities
- Set the requirements on GRF

## Air Navigation Service Provider (Air Traffic Management Division)

- Upon receiving changes on RCR from AAHK, notify pilots via various means including NOTAM / ATIS / VHF comms etc.



# Runway Condition Assessment Matrix

- Airport operators will base on the Assessment Matrix to report runway surface condition when water or contaminants are present
- Due to geographic location, HKIA never experience or report in snow and icy conditions
- Only RWYCC 6, 5, 3 and 2 will be generated for HKIA unless downgraded with pilot reports of runway braking action

RCAM — WET and DRY only (based on PANS-Aerodromes (Doc 9981))

RUNWAY CONDITION ASSESSMENT MATRIX (RCAM)			
Assessment criteria		Downgrade assessment criteria	
Runway condition code (RWYCC)	Runway surface description	Aeroplane deceleration or directional control observation	Pilot report of runway braking action
6	• DRY	---	---
5	• WET (The runway surface is covered by any visible dampness or water up to and including 3 mm depth)	Braking deceleration is normal for the wheel braking effort applied AND directional control is normal.	GOOD
4		Braking deceleration OR directional control is between Good and Medium.	GOOD TO MEDIUM
3	• WET ("slippery wet" runway)	Braking deceleration is noticeably reduced for the wheel braking effort applied OR directional control is noticeably reduced.	MEDIUM
2	<b>More than 3 mm depth of water:</b> • STANDING WATER	Braking deceleration OR directional control is between Medium and Poor.	MEDIUM TO POOR
1		Braking deceleration is significantly reduced for the wheel braking effort applied OR directional control is significantly reduced.	POOR
0		Braking deceleration is minimal to non-existent for the wheel braking effort applied OR directional control is uncertain.	LESS THAN POOR



Note. — An RWYCC 5,4,3 or 2 cannot be upgraded.





# Procurement and Setup of Vaisala MD30

- Purchase Vaisala MD30 and deploy for water measurement since 18 May 20
- Engage a vendor to add latitude/longitude information and RCR generating function

Install the MD30 at the front of the vehicle  
Calibrate MD30 with reference plate



Measurement Area:

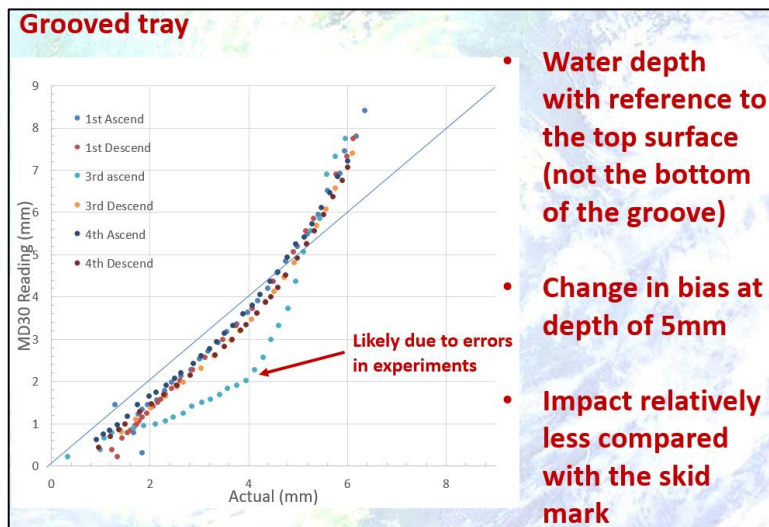
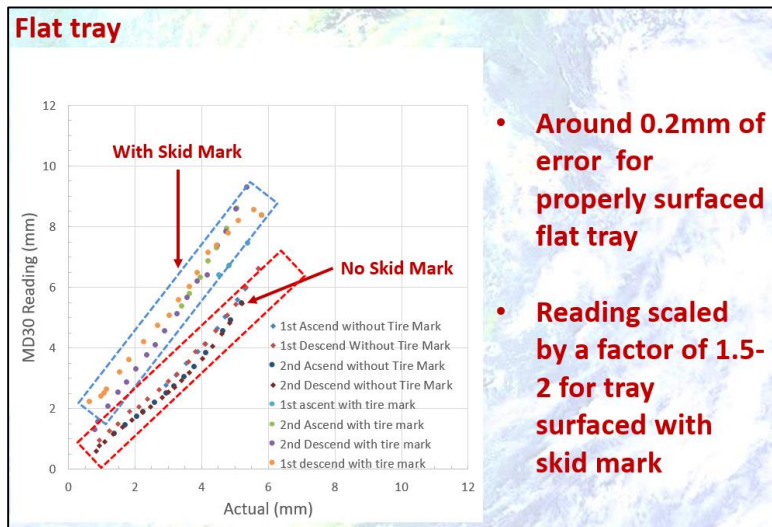


- ✓ Between two runway extremities
- ✓ +/- 5 meters away from the centerline
- ✓ Conduct on both North and South Runway
- ✓ Driving speed: 60km/hr

# MD30 Runway Measurement



- Conduct water depth measurement since May 2020
- Continuous enhancement with measured water depth data since Nov 2021



Generate report in RCR format:

```

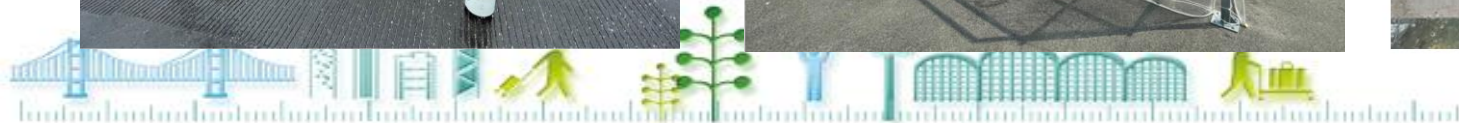
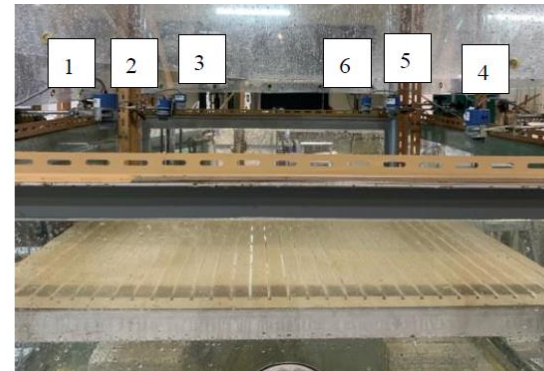
RCR_Runway_North_2020-09-22_104004_ - Notepad
File Edit Format View Help
RCR  VHHH  09220240  07  5/5/5  100/100/100  NR/NR/NR
WET/WET/WET
100% of 1st runway third is covered by <=3mm water and 0% of 1st runway third is covered by >3mm water.
100% of 2nd runway third is covered by <=3mm water and 0% of 2nd runway third is covered by >3mm water.
100% of 3rd runway third is covered by <=3mm water (2% of DRY) and 0% of 3rd runway third is covered by >3mm water.
    
```



# Quantitative Modelling for Rain Intensity Correlation

- Engaged **University of Hong Kong** for below quantitative consultancy:
  - Built runway model prototype (6m x 4m) to test different rain and wind conditions
  - Set up a 2D numerical model calibrated with the experimental data
    - *Along runway & cross runway*
    - *Wind: No wind, 10, 20, 30, 50, 75, 100km/hr*
    - *Rainfall: 100, 150, 200, 250, 300, 350, 400, 450 mm/hr*
    - *Surface: Touch down zone /non touch down zone*
    - *Rubber filled into grooved surface*

**DONE**





Video Clip: Simulate different rainfall intensity for the physical model



# Model Data Analysis by Hong Kong Observatory

- **Hong Kong Observatory** based on the model data and past 20 years' rainfall data to simulate the water depths on the runway

- Summarize HKO analysis:

- Below conditions triggered 4mm water depth with > 10% coverage on respective 1/3 runway:

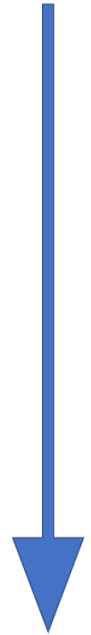
- Use new Runway meteorological equipment

- LT31 (RVR transmissometer) provides rainfall data
- Update data frequency from every 6 mins → every 1 min

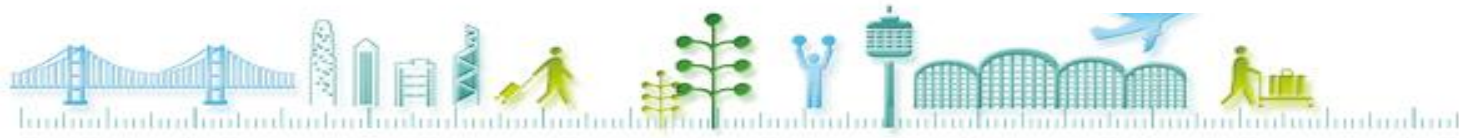
RWYCC 2 (10mm)	<b>thr<sub>7mm,2min</sub></b>	<b>Suggest % coverage</b>
• 2-min rule	350 mm/h	25
RWYCC 2 (7mm)	<b>thr<sub>7mm,1min</sub></b>	<b>Suggest % coverage</b>
• 1-min rule	403 mm/h	25
• 2-min rule	<b>thr<sub>7mm,2min</sub></b>	<b>Suggest % coverage</b>
	197 mm/h	25
RWYCC 2 (4mm)	<b>thr<sub>4mm,1min</sub></b>	<b>Suggest % coverage</b>
• 1-min rule	211 mm/h	25
• 2-min rule	<b>thr<sub>4mm,2min</sub></b>	<b>Suggest % coverage</b>
	105 mm/h	25

2(7mm or 4mm)  
Fraction rule

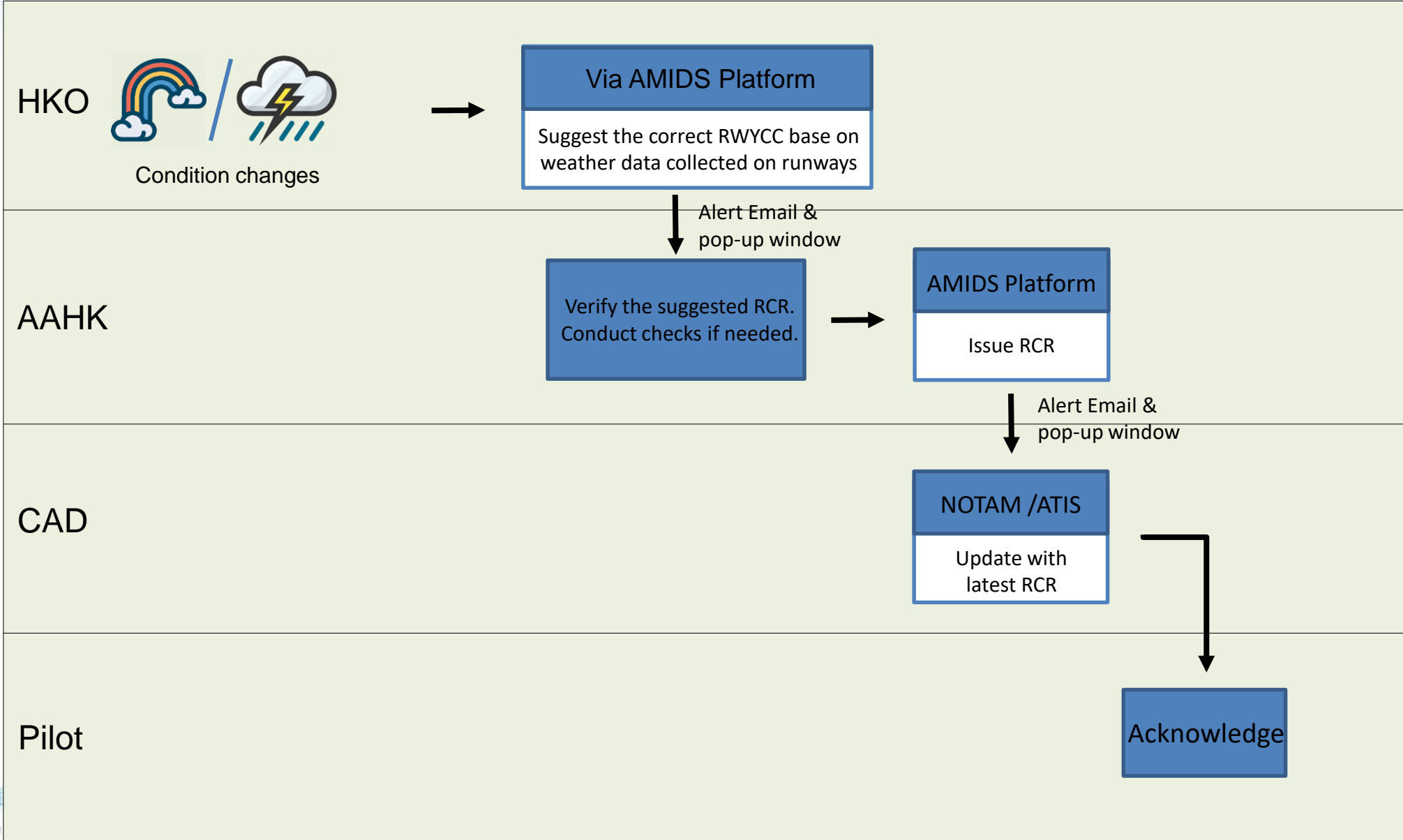
2(4mm) or 5  
Fraction rule



Check  
by  
priority



# Workflow for RCR Issuance



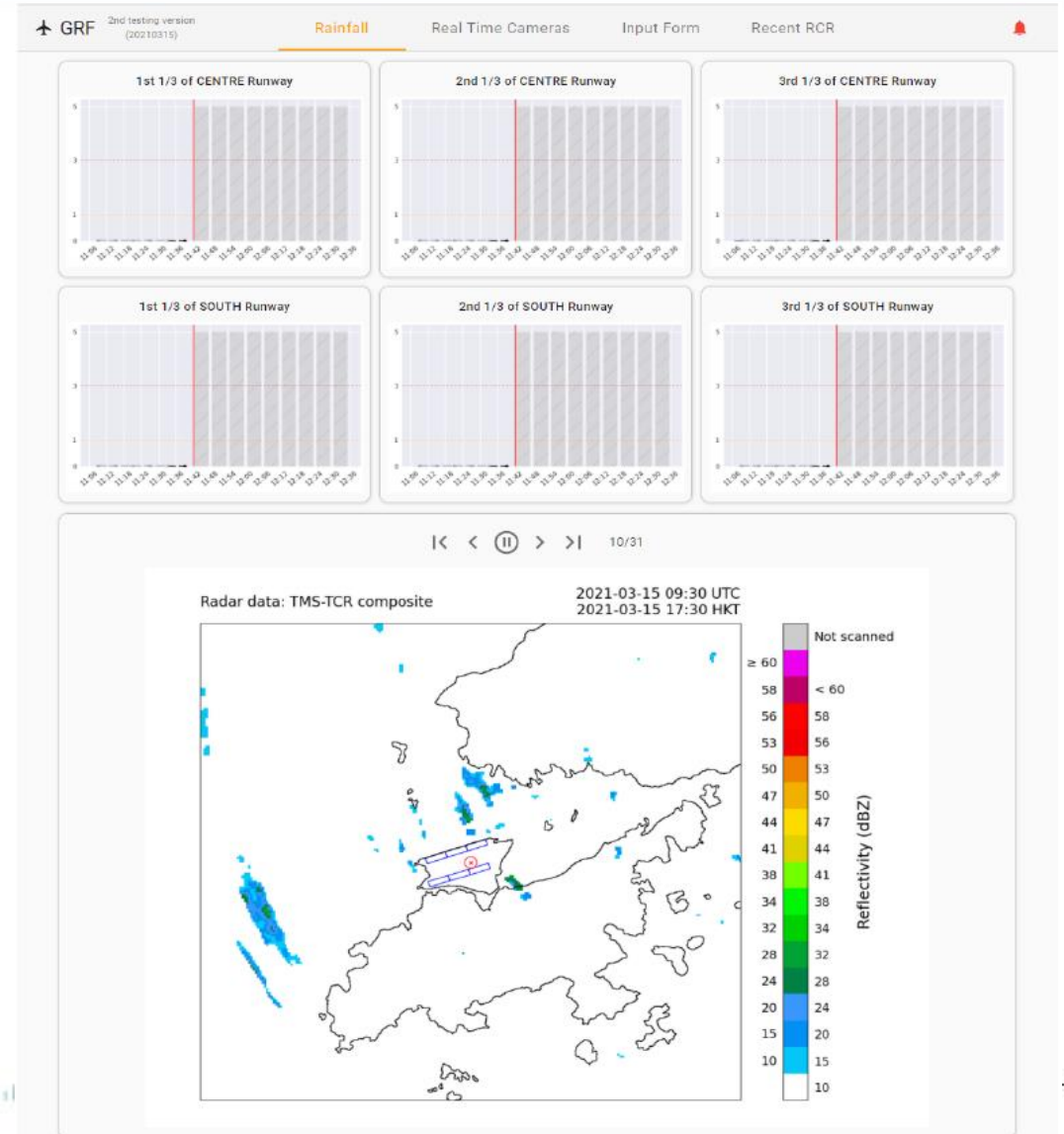
# Tripartite Platform between HKO/AA/CAD

## 1) Tripartite Platform via AMIDS

The screenshot shows the AMIDS website with various information categories:

- Warnings:** Airport Thunderstorms and Lightning Alerting System (ATLAS), HKIA Aerodrome Warnings, HKO Warnings.
- Space Weather:** Space Weather Advisory, Geomagnetic Storm Alert, Solar Radiation Storm Alert, Radio Blackout Alert.
- Volcanic Ash:** Information on Volcanic Eruption / Ash Cloud, Volcanic Ash Advisory (Graphical).
- HKIA Weather:** Significant Convection Monitoring and Forecast, Weather Summary for HKIA, Aviation Thunderstorm Nowcasting System, Latest AMOS Data, Winds Around HKIA, Lightning Around HKIA, Global Reporting Format (GRF), Runway Winds (more...).
- En-route & Destination Weather:** Standard Flight Document Package, Brief Flight Information Package, Full Flight Information Package, Customized Information, Select / Print Flight Document, Wind / Temp Chart, Concatenated Wind / Temp Chart, Customize Landing Minima, Space weather, Destination Weather Report & Forecast, Latest Visibility Reports, Latest Cloud Base Reports, Latest Significant Weather Reports, METAR/SPECI/TAF/SIGMET/AIREP (more...).
- Tropical Cyclone Information:** HKO TC Information, TC Warnings from Other Centres, General Information on TC, WHO CAAM Aviation-weather Disaster Risk Reduction (ADRR) website, Probabilistic forecasts for HKIA [Beta Version].
- General and Local Aviation Weather:** Local Aviation Forecast, Local Weather Forecast, 9-day Weather Forecast, Winds around Hong Kong, Visibility Readings in Hong Kong Waters, Hong Kong Tephigram, Hong Kong Weather Photos, Upper wind and temperature information over South China Sea, Significant Weather for Neighbouring Aerodromes, QNH over Hong Kong.
- Satellite and Radar Images:** METEOSAT - 9, METEOSAT - 8, Kalpana-1, FY-2C, METSAT-2, EOS, GOES - 11, GOES - 16, Lightning Events with Satellite Image, Hong Kong Weather Radar, China Composite Radar.

## 2) Rainfall from HKO Radar Data & LT 31



## 3) Runways Real time monitoring

The interface shows two live camera feeds for runway monitoring:

- RWY07C:** On North Lidar (facing west). The camera feed shows the runway and surrounding area. The timestamp is 2021-03-16 01:20:28 UTC / 2021-03-16 09:20:28 HKT.
- RWY07C:** On North Lidar (facing northeast). The camera feed shows the runway from a different angle. The timestamp is 2021-03-16 01:20:29 UTC / 2021-03-16 09:20:29 HKT.

# System Alert When Rains

If it rains at the Runways, alert emails will be received from HKO

## 1) Alert by emails to change RCR

## 2) Alert by System to change RCR

[EXTERNAL] \*\* ALERT: Change of Suggested RCR issued at 2022-09-01 08:03 (UTC) \*\* - Message (Plain Text)

Thu 01/09/2022 4:03 PM  
rcr\_alert@hko.gov.hk  
[EXTERNAL] \*\* ALERT: Change of Suggested RCR issued at 2022-09-01 08:03 (UTC) \*\*

Note: This is an automatically-generated system message. Please do not reply to this message.

Datetime of Alert : 2022-09-01 08:03 (UTC)

===== !!! ALERT !!! ALERT !!! ALERT !!! ALERT !!! ALERT !!! =====

Section	Latest RWYCC	Suggested RWYCC
1st 1/3 of NORTH runway	6	5
2nd 1/3 of NORTH runway	6	5
3rd 1/3 of NORTH runway	6	5
1st 1/3 of CENTRE runway	-	5
2nd 1/3 of CENTRE runway	-	5
3rd 1/3 of CENTRE runway	-	5
1st 1/3 of SOUTH runway	5	5
2nd 1/3 of SOUTH runway	5	5
3rd 1/3 of SOUTH runway	5	5

===== !!! ALERT !!! ALERT !!! ALERT !!! ALERT !!! ALERT !!! =====

**!! Alert !!**

Section	Latest RWYCC 2022-09-01 11:10 (UTC)	Suggested RWYCC 2022-09-13 09:28 (UTC)	Source
1st 1/3 of NORTH Runway	6 (NR NR)	6 (NR NR)	LT31
2nd 1/3 of NORTH Runway	6 (NR NR)	6 (NR NR)	LT31
3rd 1/3 of NORTH Runway	6 (NR NR)	6 (NR NR)	LT31
1st 1/3 of CENTRE Runway	-	6 (NR NR)	LT31
2nd 1/3 of CENTRE Runway	-	6 (NR NR)	LT31
3rd 1/3 of CENTRE Runway	-	6 (NR NR)	LT31
1st 1/3 of SOUTH Runway	6 (NR NR)	6 (NR NR)	LT31
2nd 1/3 of SOUTH Runway	6 (NR NR)	6 (NR NR)	LT31
3rd 1/3 of SOUTH Runway	6 (NR NR)	6 (NR NR)	LT31

**Suggested RCR**

<input type="checkbox"/>	RWY07L	6/6/6 NR/NR/NR NR/NR/NR DRY/DRY/DRY
<input checked="" type="checkbox"/>	RWY07C	6/6/6 NR/NR/NR NR/NR/NR DRY/DRY/DRY
<input checked="" type="checkbox"/>	RWY07R	6/6/6 NR/NR/NR NR/NR/NR DRY/DRY/DRY

[SEND SUGGESTED RCR](#)



\*Note: Centre Runway is closed for reconfiguration

# AA to Issue RCR

- RCR input format:

The screenshot shows the 'Input Form' for a Runway Condition Report (RCR) on the website weather.hkairport.com. The form is for the '1st 1/3 of NORTH Runway'. It contains a table with the following data:

	Latest RCR	Suggested RCR
Date Time MMDDhhmm (UTC)	09011110	09130939
Runway Condition Code	6	6
Description of Runway Condition	DRY	DRY
Percentage Coverage	NR	NR
Depth of Contaminant (in mm)	NR	NR

Below the table is the 'AAHK Input' section, which is highlighted with a red box. It contains two buttons: 'LATEST' and 'SUGGESTED'. Below these are three dropdown menus, each with the text 'Please enter RWYCC'. A red arrow points from the text 'Input RWYCC, type of contaminant, coverage % and depth for each one-third' to the first dropdown menu.

At the bottom of the form, there is a 'CALL TIME' button, which is also highlighted with a red box. A red arrow points from the text 'Enter assessment time and send to CAD' to this button. The 'CALL TIME' button is located next to a 'Datetime of assessment (UTC)' field with the format 'YYYYMMDDhhmm'.

Input RWYCC, type of contaminant, coverage % and depth for each one-third

Enter assessment time and send to CAD



# CAD Received the issued RCR

○ ○

RWY07L	RWY25R
RWY07C	RWY25C
RWY07R	RWY25L

Issue datetime (UTC)  
2022-09-01 11:10 (Latest)

VHHH 09011110 07L 6/6/6 NR/NR/NR NR/NR/NR DRY / DRY / DRY

Search RCR

Start Date (UTC) 2022-09-01

End Date (UTC) 2022-09-05

[SEARCH](#)

Found 3 RCRs from 2022-09-01 to 2022-09-05: [Download as JSON](#) [Download as Excel](#)

Issue datetime (UTC)

- 2022-09-01 11:10 ● VHHH 09011110 07L 6/6/6 NR/NR/NR NR/NR/NR DRY / DRY / DRY
- 2022-09-01 08:03 ● VHHH 09010803 07L 5/5/5 100/100/100 NR/NR/NR WET / WET / WET
- 2022-09-01 07:12 ● VHHH 09010712 07L 6/6/6 NR/NR/NR NR/NR/NR DRY / DRY / DRY

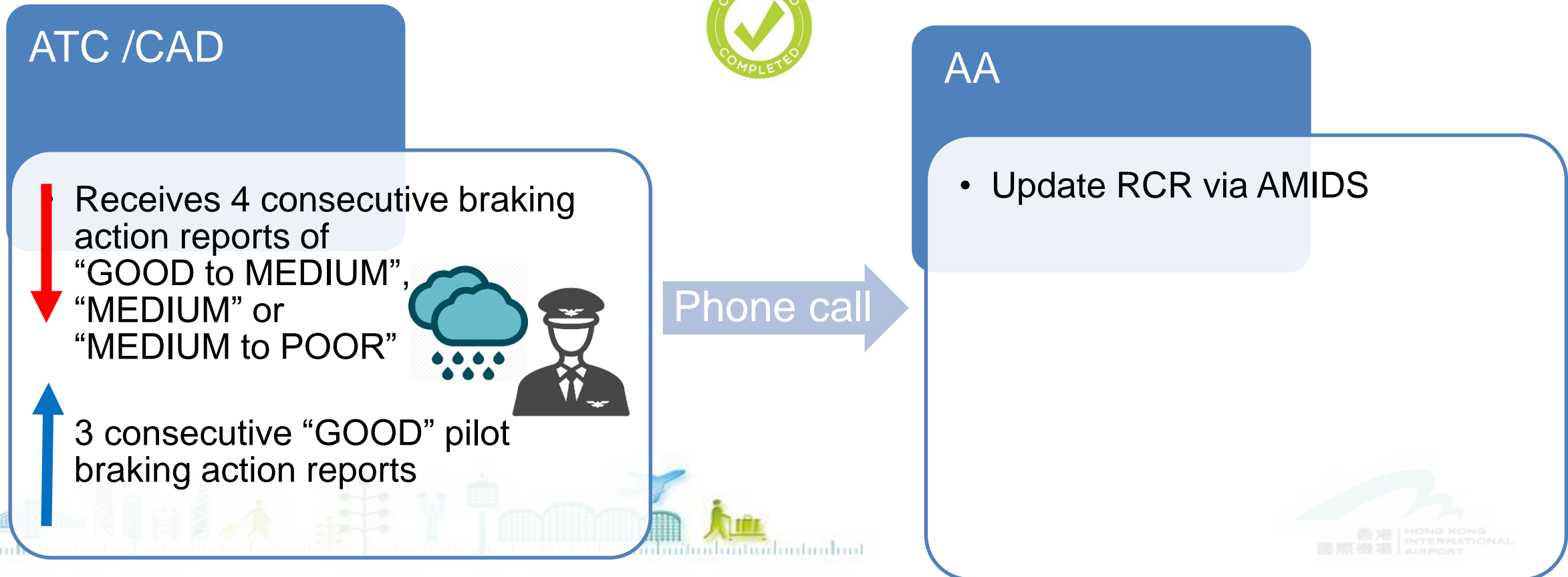
→ ATC onward update pilots via Notam/ATIS





# Pilots & Airlines Engagement

- Well engaged Hong Kong Airline Pilots Association (HKALPA) and Local airlines via different forums, i.e. AOC, RST, AOSC meetings
- Agreed on braking action report to ATC





# Training & Procedure Completion

## CAD/ATC

- AIC issued
- Controllers training
- ATIS upgrade

**COMPLETED**

## AA

- Airfield Duty Team training
- Operation procedures and materials



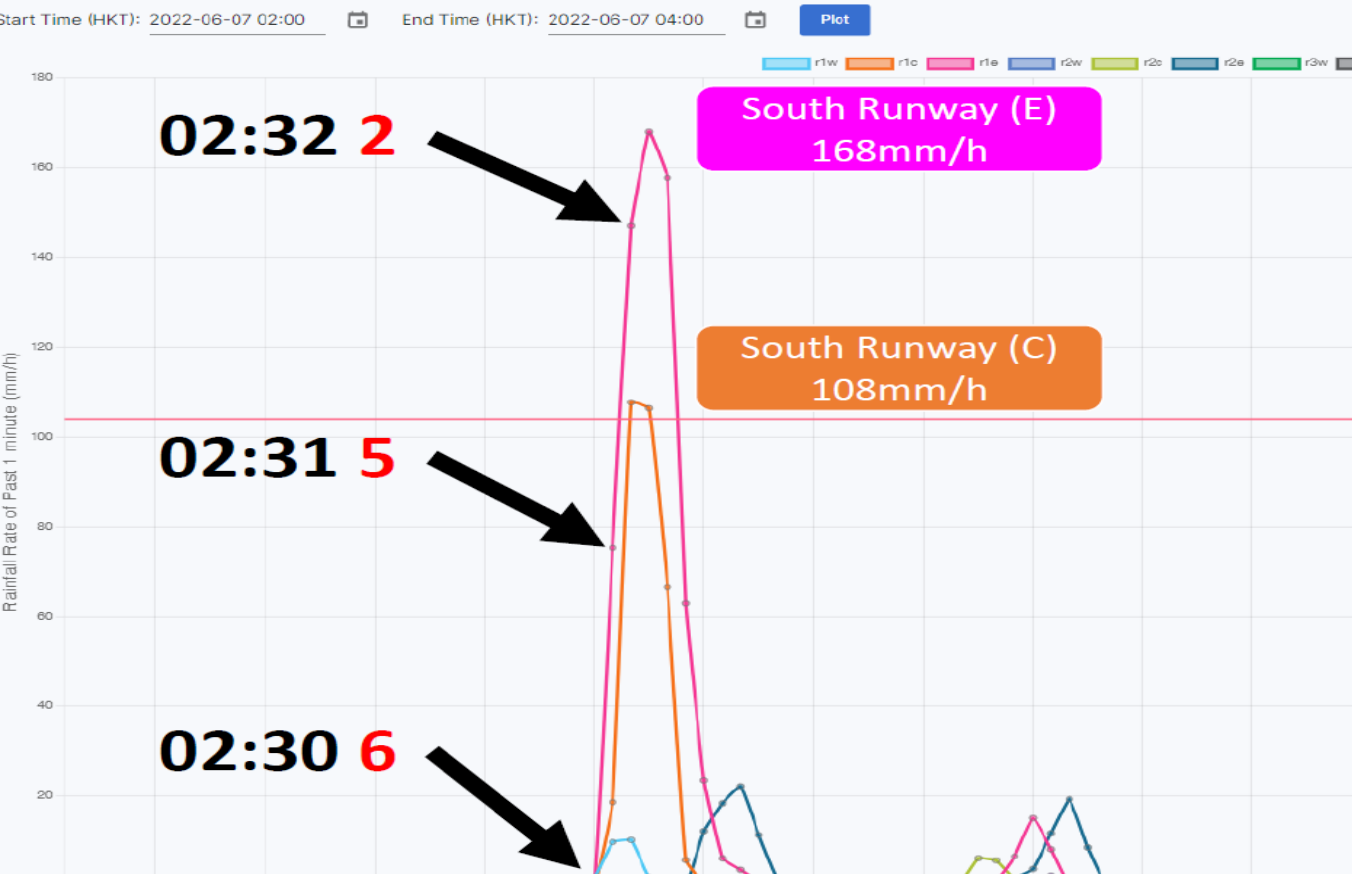
# 1<sup>st</sup> Rainy Season in 2022

- Example: RCR 2 issued on 6 June 18:33 UTC

2022-06-06 18:33

VHHH 06061832 07R 2/2/2 25/25/25 04/04/04 STANDING WATER / STANDING WATER / STANDING WATER

2022-6-7 02:00-04:00 HKT



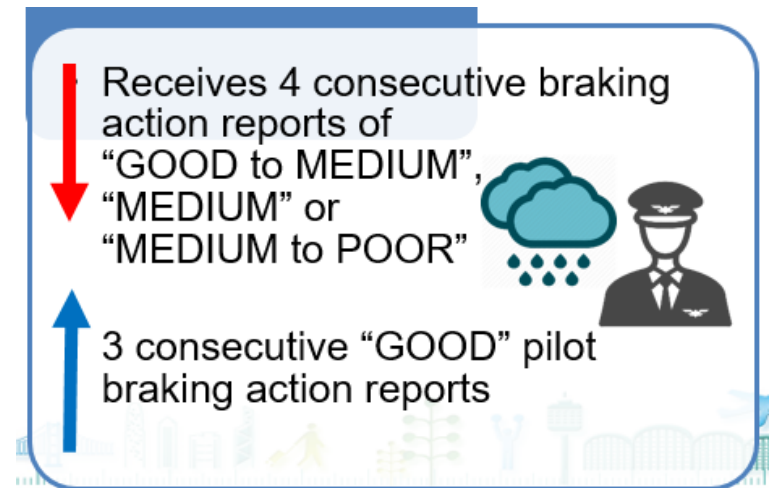
→ *Work with HKO to fine-tuning the decision algorithm*

→ *Continue to use MD30 for data verification*



# The Regulatory Roles

- Airport operator's preparation and implementation of GRF was assessed in the aerodrome licensing renewal exercise
- Continuous review of the implementation through existing and dedicated platforms
  - Regular meetings of HKIA Runway Safety Team
  - Dedicated focus meetings on specific GRF matters, e.g. the RWYCC downgrade and resumption mechanism



# Conclusion

- HKIA is in the early stage of GRF implementation and more to learn and refine
- Hong Kong Observatory has offered enormous support in GRF implementation
- HKCAD has offered unfailing support and guidance to AAHK during the course of GRF development
- AAHK pledge to ensure reporting the accurate runway condition to the airmen and working closely with stakeholders including but not limited to HKALPA and HKCAD to refine the GRF process in a continuous manner



# Thank You

