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# Requirements for Regulators and Operators on GRF

ICAO *Eastern and Southern Africa*

Kigali Rwanda 23/24 Jan 2020





## Overview

- Components of the RCAM
- Using of the RCAM
- The Runway Condition Report

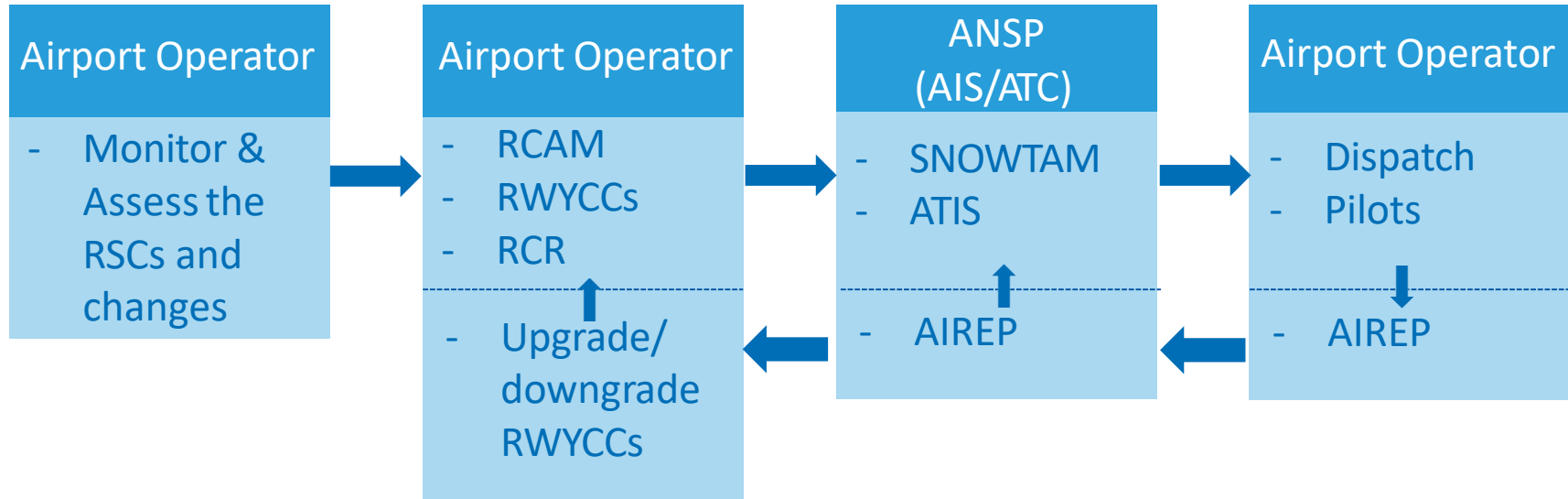


## Objective

- Describe key elements of the RCAM
- Explain how to generate, downgrade or upgrade a RWYCC
- Describe how to use the RCAM to assess and report on runway surface condition



# GRF Information Flow





# The runway condition assessment matrix (RCAM)

A matrix allowing the assessment of the runway condition code, using associated procedures, from a set of observed runway surface condition(s) and pilot report of braking action.

RUNWAY CONDITION ASSESSMENT MATRIX (RCAM)			
Assessment criteria		Downgrade assessment criteria	
Runway condition code	Runway surface description	Aeroplane deceleration or directional control observation	Pilot report of runway braking action
6	<ul style="list-style-type: none"> <li>• DRY</li> </ul>	---	---
5	<ul style="list-style-type: none"> <li>• FROST</li> <li>• WET (The runway surface is covered by any visible dampness or water up to and including 3 mm depth)</li> </ul> <p><i>Up to and including 3 mm depth:</i></p> <ul style="list-style-type: none"> <li>• SLUSH</li> <li>• DRY SNOW</li> <li>• WET SNOW</li> </ul>	Braking deceleration is normal for the wheel braking effort applied AND directional control is normal.	GOOD
4	<ul style="list-style-type: none"> <li>• <i>-15°C and lower outside air temperature:</i></li> <li>• COMPACTED SNOW</li> </ul>	Braking deceleration OR directional control is between Good and Medium	GOOD TO MEDIUM
3	<ul style="list-style-type: none"> <li>• WET ("slippery wet" runway)</li> <li>• DRY SNOW or WET SNOW (any depth) ON TOP OF COMPACTED SNOW</li> </ul> <p><i>More than 3 mm depth:</i></p> <ul style="list-style-type: none"> <li>• DRY SNOW</li> <li>• WET SNOW</li> </ul> <p><i>Higher than -15°C outside air temperature<sup>1</sup>:</i></p> <ul style="list-style-type: none"> <li>• COMPACTED SNOW</li> </ul>	Braking deceleration is noticeably reduced for the wheel braking effort applied OR directional control is noticeably reduced.	MEDIUM
2	<p><i>More than 3 mm depth of water or slush:</i></p> <ul style="list-style-type: none"> <li>• STANDING WATER</li> <li>• SLUSH</li> </ul>	Braking deceleration OR directional control is between Medium and Poor.	MEDIUM TO POOR
1	<ul style="list-style-type: none"> <li>• ICE <sup>2</sup></li> </ul>	Braking deceleration is significantly reduced for the wheel braking effort applied OR directional control is significantly reduced.	POOR
0	<ul style="list-style-type: none"> <li>• WET ICE <sup>2</sup></li> <li>• WATER ON TOP OF COMPACTED SNOW <sup>2</sup></li> <li>• DRY SNOW or WET SNOW ON TOP OF ICE <sup>2</sup></li> </ul>	Braking deceleration is minimal to non-existent for the wheel braking effort applied OR directional control is uncertain.	LESS THAN POOR



# RCAM

- The method to be used by airport operators to report runway surface conditions when contaminated
- Clearly identifies factors that influence aircrafts takeoff and landing performance, particularly braking performance
- It relates these factors to RWYCC that can be used by flight crews to interpret the runway conditions and support their pre-landing and pre-departure assessments

RUNWAY CONDITION ASSESSMENT MATRIX (RCAM)			
Assessment criteria		Downgrade assessment criteria	
Runway condition code	Runway surface description	Aeroplane deceleration or directional control observation	Pilot report of runway braking action
6	<ul style="list-style-type: none"> <li>• DRY</li> </ul>	---	---
5	<ul style="list-style-type: none"> <li>• WET (The runway surface is covered by any visible dampness or water up to and including 3 mm depth)</li> </ul>	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	<ul style="list-style-type: none"> <li>• WET ("slippery wet" runway)</li> </ul>	Braking deceleration is noticeably reduced for the wheel braking effort applied OR directional control is noticeably reduced.	MEDIUM
2	<p><b>More than 3 mm depth of water:</b></p> <ul style="list-style-type: none"> <li>• STANDING WATER</li> </ul>	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



# Downgrade assessment criteria

Downgrade assessment criteria	
Aeroplane deceleration or directional control observation	Pilot report of runway braking action
---	---
Braking deceleration is normal for the wheel braking effort applied AND directional control is normal.	GOOD
Braking deceleration OR directional control is between Good and Medium.	GOOD TO MEDIUM
Braking deceleration is noticeably reduced for the wheel braking effort applied OR directional control is noticeably reduced.	MEDIUM
Braking deceleration OR directional control is between Medium and Poor.	MEDIUM TO POOR
Braking deceleration is significantly reduced for the wheel braking effort applied OR directional control is significantly reduced.	POOR
Braking deceleration is minimal to non-existent for the wheel braking effort applied OR directional control is uncertain.	LESS THAN POOR

Provides the assessment criteria allowing the airport operator to further assess the runway and validate the RWYCC. It includes:

- *The column to be used by the pilot to rate the estimated aeroplane braking performance on a given contaminant and estimate a runway braking action category based on six descriptions*
- *A report of braking action on the runway by a pilot, providing other pilots with an indication of the degree/quality of expected braking*

The use of any available means of assessing runway slipperiness should be considered to support the decision for downgrading or upgrading RWYCC



# Assessment criteria

Assessment criteria	
Runway condition code	Runway surface description
6	<ul style="list-style-type: none"><li>• DRY</li></ul>
5	<ul style="list-style-type: none"><li>• WET (The runway surface is covered by any visible dampness or water up to and including 3 mm depth)</li></ul>
4	
3	<ul style="list-style-type: none"><li>• WET ("slippery wet" runway)</li></ul>
2	<b>More than 3 mm depth of water:</b> <ul style="list-style-type: none"><li>• STANDING WATER</li></ul>
1	
0	

The two columns are used to determine the correct RWYCC

- *This column describes runway surface conditions and contaminants (least to most slippery) that are directly correlated to aeroplane takeoff and landing performance. Contaminants have different effects depending on their depth and outside air temperature.*
- *This column represents the RWYCC that is associated with the relevant runway surface description based on the type of contaminant on the runway, its depth and the outside air temperature.*

**A RWYCC is reported to each third of the runway assessed. The direction for listing the runway thirds shall be in the direction as seen from the lower runway designation number**





## Using of RCAM

### **Airports operator need to assess and collect data on:**

- The percentage of each runway third that is covered by contaminants
- The runway surface condition and type of contaminants
- The depth of the contaminants



# Using of RCAM

## The percentage of runway covered by contaminants

<i>Assessed per cent</i>	<i>Reported per cent</i>
10 – 25	25
26 – 50	50
51 – 75	75
76 – 100	100

- If 25 per cent or less area of a runway third is wet or covered by contaminant, a RWYCC 6 shall be reported.
- If the distribution of the contaminant is not uniform, the location of the area that is wet or covered by the contaminant is described in the plain language remarks part of the situational awareness section of the runway condition report.



# Using of RCAM

## Runway surface conditions

– There are four runway surface conditions in the RCAM:

- Dry
- Wet
- Slippery wet
- Contaminated runway



# Using of RCAM

## Runway surface conditions

- Dry

- A runway is considered dry if its surface is free from visible moisture and not contaminated within the area intended to be used.
- The RWYCC for a Dry Runway is 6**
- A dry surface must be reported only when there is a need to report conditions on one or more of the other thirds
- A dry surface will be report where the report is the last, final report that closes a period in which the runway was contaminated



# Using of RCAM

## Runway surface conditions

- Wet

- A runway is considered wet when it is covered by any visible dampness or water that is 3 mm or less in depth.
- The RWYCC for a Wet Runway is 5**
- Wet runway assessments do not necessary require direct observation of all affected pavements surfaces
- Credible evidence of wet conditions such as receiving reports of rain at the airport , can be used as a rationale for assigning wet RWYCCs.



# Using of RCAM

## Runway surface conditions

- Slippery wet

- A wet runway may be slippery where the surface friction characteristics of a significant portion of the runway have been determined to be degraded.
- Some contributing factors that can create such conditions include rubber buildup, groove failures/wear or pavement micro/macro textures.
- The RWYCC for a Slippery Wet Runway is 3**
- Methods to determine that a runway is slippery wet may include *a functional friction measurements, observation by aerodrome maintenance personnel, repeated reports by pilots and analysis of aeroplane stopping performance that indicates a substandard surface.*



# Using of RCAM

## Runway surface conditions

- Contaminated Runway

- Compacted snow

- Dry snow

- Frost

- Ice

- Slush

- **Standing water**

- Wet ice

- Wet snow



# Using of RCAM

## Runway surface conditions

- Contaminated Runway

- Mud, ash, sand and oil are also examples or reportable contaminants. However there is insufficient of varying data on their impact on aircraft performance
- Therefore, RCC are not reported for these contaminants – rather, they are reported in the plain language remark session of the RCR
- Ash, oil, sand and rubber contaminants should be reported without a measured depth, while the measured depth should be reported for mud.
- An exception is rubber contamination, for which in service data indicates that an assumption of RWYCC 3 restores usual performance margins





# Using of RCAM

## Runway surface conditions

- Contaminated Runway – Standing Water
  - ❑ Water of a depth **more than 3 mm** is defined as standing water
  - ❑ **The RWYCC for Slippery Water is 2**



# Using of RCAM

## Contaminant depth

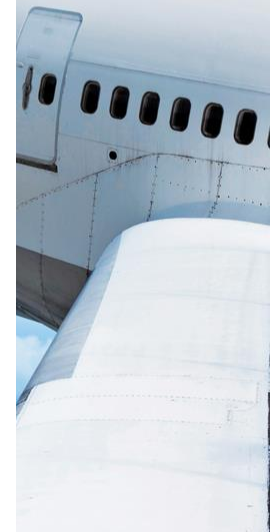
- ❑ Contamination depth significantly affects aircraft takeoff and landing performance, including stopping capability
- ❑ Specifics contaminants with more that 3 mm have been found to significantly degrade aircraft takeoff and landing performance
- ❑ The airport operator shall report the distribution of contaminant on the total maintained portion of the runway for the following contaminant types only:
  - **Standing Water more that 3 mm**
  - Slush
  - Dry Snow
  - Wet Snow
  - Wet Snow or Dry Snow on top of Compacted Snow



## Contaminant depth

**Table II-1-2. Depth assessment for contaminants**

<i>Contaminant</i>	<i>Valid values to be reported</i>	<i>Significant change</i>
STANDING WATER	04, then assessed value	3 mm up to and including 15 mm
SLUSH	03, then assessed value	3 mm up to and including 15 mm
WET SNOW	03, then assessed value	5 mm
DRY SNOW	03, then assessed value	20 mm





# Using of RCAM

## Contaminant depth

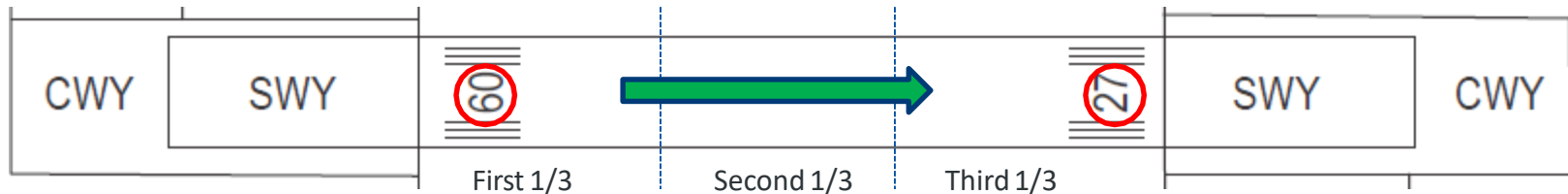
- ❑ The depth is reported as a two or three-digit number representing the assessed depth in millimeters (mm) of the contaminant for each runway third
- ❑ The assessment is based upon an even distribution within the runway thirds as assessed by trained personnel
- ❑ If measurements are included as part of the assessment process, the reported values are still reported as assessed depths, as the trained personnel have placed their judgment upon the measured depths to be representative for the runway third
- ❑ Where contaminant depth is not being reported, operator should indicate that no information exists by entering NR



# Runway Condition Report

## Reporting

- ❑ A RWYCC is reported for each runway third in the format of n/n/n
- ❑ The percentage of the runway covered by contaminants, contaminant depth and contaminant type should also be reported for each runway third
- ❑ Runway thirds should reflect the entire usable pavement length of the runway, inclusive of displaced threshold
- ❑ The direction for listing the runway thirds should be in the direction as seen from the lower runway designation number





# Runway Condition Report

- The RCR consists of two sections:
  - aeroplane take-off and landing performance calculations; and
  - situational awareness of the surface conditions on the runway, taxiways and aprons.

Aeroplane performance calculation section	
Information	Source
Aerodrome location indicator	ICAO Doc 7910, <i>Location Indicators</i>
Date and time of assessment	UTC time
Lower runway designation number	Actual runway (RWY)
RWYCC for each runway third	Assessment based upon RCAM and associated procedures
Per cent coverage contaminant for each runway third	Visual observation for each runway third
Depth of loose contaminant for each runway third	Visual observation assessed for each runway third, confirmed by measurements when appropriate
Condition description (contaminant type) for each runway third	Visual observation for each runway third
Width of runway to which the RWYCCs apply if less than published width	Visual observations while at the RWY and information from local procedures/snow plan

Situational awareness section	
Reduced runway length	NOTAM
Drifting snow on the runway	Visual observation while at RWY
Loose sand on the runway	Visual observation while at RWY
Chemical treatment on the runway	Known treatment application. Visual observation of residual chemicals on the runway
Snowbanks on the runway	Visual observations while at the RWY
Snowbanks on taxiway	Visual observations while at the taxiway (TWY)
Snowbanks adjacent to the runway penetrating level/profile set in the aerodrome snow plan	Visual observations while at the RWY confirmed by measurements when appropriate
Taxiway conditions	Visual observation, AIREP, reported by other aerodrome personnel, etc
Apron conditions	Visual observation, AIREP, reported by other aerodrome personnel, etc
State approved and published use of measured friction coefficient	Dependent upon the State set or agreed standard
Plain language remarks using only allowable characters in capital letters	Any additional operational significant information to be reported



# Runway Condition Report

## Aeroplane performance calculation section

- ❑ **Aerodrome location indicator** (*mandatory*): four-letter ICAO location indicator in accordance with Doc 7910, *Location Indicators*.
  - Format: nnnn
  - Example: GOBD
- ❑ **Date and time of assessment** (*mandatory*): date and time (UTC) when the assessment was performed by the trained personnel.
  - Format: MMDDhhmm
  - Example: 09111357
- ❑ **Lower runway designation number** (*mandatory*): a two- or three-character number identifying the runway for which the assessment is carried out and reported.
  - Format: nn[L] or nn[C] or nn[R]
  - Example: 09L



# Runway Condition Report

## Aeroplane performance calculation section

- ❑ **Runway condition code for each runway third** (*mandatory*): a one-digit number identifying the RWYCC assessed for each runway third. The codes are reported in a three-character group separated by a “/” for each third. The direction for listing the runway thirds shall be in the direction as seen from the lower designation number.
  - **Format:** n/n/n
  - **Example:** 5/5/2

**Note:** When transmitting information on runway surface conditions by ATS to flight crews, the sections are, however, referred to as the first, second or third part of the runway. *The first part always means the first third of the runway as seen in the direction of landing or take-off*





# Runway Condition Report

## Aeroplane performance calculation section

❑ **Per cent coverage contaminant for each runway third** (*conditional. not reported for one runway third if it is dry or covered with less than 10 per cent*): a number identifying the percentage coverage. The percentages are to be reported in an up-to-nine character group separated by a “/” for each runway third.

➤ **Format:** [n]nn/[n]nn/[n]nn

➤ **Example:** 25/50/100

**NR/50/100 if contaminant coverage is less than 10% in the first third**

With uneven distribution of the contaminants, additional information is to be given in the plain language remark part of the situational awareness section of the runway condition report. Where possible, a standardized text should be used.

**Note.—** *When no information is to be reported, insert “NR” at its relevant position in the message to indicate to the user that no information exists (/NR/).*



# Runway Condition Report

## Aeroplane performance calculation section

- ❑ **Depth of loose contaminant:** dry snow, wet snow, slush or **standing water for each runway third** (*Conditional, reported for STANDING WATER*): a two- or three-digit number representing the assessed depth (mm) of the contaminant for each runway third.
  - **Format:** [n]nn/[n]nn/[n]nn
  - **Examples:** 04/06/12 [STANDING WATER]

When the depth of the contaminants varies significantly within a runway third, additional information is to be given in the plain language remark part of the situational awareness section of the runway condition report.



# Runway Condition Report

## Aeroplane performance calculation section

- ❑ **Condition description for each runway third** (*mandatory*): to be reported in capital letters using terms specified in 2.9.5 of Annex 14, Volume I. The condition type is reported by any of the following condition type descriptions for each runway third and separated by an oblique stroke “/”. (DRY, STANDING WATER, WET, ...)
  - Format: nnnn/nnnn/nnnn
  - Example: WET/WET/WET
  
- ❑ **Width of runway to which the RWYCCs apply if less than published width** (*optional*): a the two-digit number representing the width of cleared runway in metres.
  - Format: nn
  - Example: 30

If the cleared runway width is not symmetrical along the centre line, additional information is to be given in the plain language remark part of the situational awareness section of the runway condition report



# Runway Condition Report

## Situational awareness section

All individual messages in the situational awareness section end with a full stop sign. This is to distinguish the message from subsequent message(s).

- ❑ **Reduced runway length:** This information is conditional when a NOTAM has been published with a new set of declared distances affecting the LDA.
  - Format: Standardized fixed text
  - RWY nn [L] or nn [C] or nn [R] LDA REDUCED TO[n]nnn
  - Example: RWY 22L LDA REDUCED TO 1450.
- ❑ **Loose sand on the runway** *(optional)*:
  - Format: RWY nn[L] or nn[C] or nn[R] LOOSE SAND
  - Example: RWY 02R LOOSE SAND.
- ❑ **Chemical treatment on the runway** *(mandatory)*:
  - Format: RWY nn[L] or nn[C] or nn[R] CHEMICALLY TREATED
  - Example: RWY 06 CHEMICALLY TREATED.



# Runway Condition Report

## Situational awareness section

### ❑ **Taxiway conditions** *(optional)*:

- Format: TWY [nn]n POOR
- Example: TWY B POOR.

### ❑ **Apron conditions** *(optional)*:

- Format: APRON [nnnn] POOR
- Example: APRON NORTH POOR.

### ❑ **State-approved and published use of measured friction coefficient** *(optional)*:

- Format: [State set format and associated procedures]
- Example: [Function of State set format and associated procedures].



# Runway Condition Report

- **Situational awareness section**

- **Plain language remarks using only allowable characters in capital letters**

- *(optional):*

- Format: Combination of allowable characters where use of full stop « . » marks the end of the message.

- Allowable characters:

- A B C D E F G H I J K L M N O P Q R S T U V W X Y

- Z 0 1 2 3 4 5 6 7 8 9

- / [oblique stroke] “ . ” [period] “ ” [space]



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