RWANDA

CIVIL AVIATION AUTHORITY

ADVISORY CIRCULAR
RCAA-AC-FOPS-021

REPORTING OF RUNWAY SURFACE CONDITIONS

PURPOSE

1) The purpose of this document is to introduce and explain the forthcoming Rwandan implementation of the International Civil Aviation Organization (ICAO) Global Reporting Format (GRF) for runway condition reporting. The Rwandan implementation of GRF is based on the Take-off and Landing Performance Assessment (TALPA) methodology which was developed by ICAO.

2) This document is also being made available to the aviation industry for the purpose of conveying flight safety information. All aerodrome personnel involved with runway condition assessment should be aware of the forthcoming implementation of the new GRF for runway condition reporting. These personnel are encouraged to utilize this AC to assist them in reviewing this topic and to determine the applicability to their specific operations. All Operators (Foreign and Rwandan AOC Holders) are also to be familiar with the contents in order to meet the requirements (pilots, flight dispatchers) for operations utilizing the new ICAO GRF.

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SECTION 1: GENERAL

1.1 INTRODUCTION

This Advisory Circular (AC) is provided for information and guidance purposes. It describes an example of an acceptable means, but not the only means, of demonstrating compliance with regulations and standards. This AC on its own does not change, create, amend or permit deviations from regulatory requirements, nor does it establish minimum standards.

1.2 APPLICABILITY

This document is applicable to:

a) Rwandan airport operators holding an Airport Certificate issued pursuant to Part 26 of the *Rwanda Civil Aviation Regulations* (RCARs);
b) Rwandan aerodrome operators;
c) Rwanda Civil Aviation inspectors with certification and safety oversight responsibilities; and
d) The aviation industry: Rwandan pilots, flight dispatchers, commercial and private operators as well as all foreign air operators flying in and out of Rwanda

1.3 RELATED REGULATIONS

The following regulations are directly applicable to this advisory circular—

a) Rwanda Civil Aviation Regulations, Parts 10, 14 and 17
b) RCATS as applicable

1.4 RELATED PUBLICATIONS

The following reference materials are to be used in conjunction with this document:

a) Rwanda Civil Aviation Regulations, Part 26
b) ICAO Annex 3 - Meteorological Service for International Air Navigation,
c) ICAO Annex 6 - Operation of Aircraft, Part I - International Commercial Air Transport - Aeroplanes and Part II - International General Aviation – Aeroplanes,
d) ICAO Annex 8 - Airworthiness of Aircraft,
e) ICAO Annex 14- Aerodromes – Volume I Aerodrome Design and Operations,
f) ICAO Annex 15 - Aeronautical Information Services,
g) ICAO Doc 9981- Aerodromes (PANS Aerodromes),
h) ICAO Doc 10066- Aeronautical Information Management (PANS-AIM),
i) ICAO Doc 4444- Air Traffic Management (PANS-ATM,),
j) ICAO Doc. 10064- Aeroplane Performance Manual,
k) ICAO Doc. 9137- Airport Services Manual

l) ICAO Circular 355 AN/211 – *Assessment, Measurement and Reporting of Runway Surface Conditions* (Advance edition (unedited)).

m) Federal Aviation Administration AC 150/5200-28F, 2016-12-30 — *Notices to Airmen (NOTAMs) for Airport Operators,*

n) FAA AC 150/5200-30D, 2018-03-08 — *Airport Field Condition Assessments and Winter Operations Safety,*

1.5 DEFINITIONS AND ABBREVIATIONS

1.5.1 Definitions:

a) **Aircraft Movement Surface Condition Report:** means a report that details the surface conditions of all movement areas at an airport, including runways and taxiways.

b) **Runway Friction Index:** means the average of the friction measurements taken on runway surfaces on which freezing or frozen contaminants are present.

c) **Compacted snow**: means snow that has been compacted into a solid mass such that aeroplane tires, at operating pressures and loadings, will run on the surface without significant further compaction or rutting of the surface.

d) **Contaminant**: means material that collects on a surface, including standing water, snow, slush, compacted snow, ice, frost, sand, and ice control chemicals.

e) **Contaminated runway**: A runway is contaminated when a significant portion of the runway surface area (whether in isolated areas or not) within the length and width being used is covered by one or more of the following substances: compacted snow, dry snow, frost, ice, slush, standing water, wet ice or wet snow.

f) **Dry**: means a surface condition that is free of visible moisture, and has no observed contaminants.

g) **Dry snow**: means snow that does not contain sufficient water to allow the crystals to stick together or bond to a surface. (Dry snow, when compressed, falls apart, and a snowball cannot readily be made from it.)

h) **Frost**: means ice crystals formed from airborne moisture on a surface whose temperature is below freezing. Frost differs from ice in that the frost crystals grow independently and therefore have a more granular texture.

Note 1: Below freezing refers to air temperature equal to or less than the freezing point of water (0°C).

Note 2: Heavy frost that has noticeable depth may have friction qualities similar to ice and downgrading the runway condition code accordingly should be considered. If driving a vehicle over the frost does not result in tire tracks down to bare pavement, the frost may be of sufficient depth to consider a downgrade of the runway condition code.

i) **Ice**: means water that has frozen on a surface and includes the condition commonly known as black ice and the condition in which compacted snow has turned into a polished ice surface.

j) **Ice control chemicals**: means chemicals used to prevent ice formation, to prevent ice from bonding to a surface, or to break up or melt ice on a surface.

k) **Paved surface**: means a surface of asphaltic concrete (flexible) or Portland cement concrete (rigid).

l) **Percent coverage of contaminant**: means the estimated amount of contaminant present on the surface of the runway and reported as percentage of the assessed surface.

m) **Runway Condition Assessment Matrix:** means a matrix allowing for the assessment of runway condition code, using associated procedures, from a set of observed runway surface condition(s).

n) **Runway Condition Code:** means a number describing the runway surface condition.

o) **Runway Surface Condition:** means the portion of the AMSCR which reports the surface condition of the runway.

p) **Significant change:** means, with respect to runway surface condition includes, but is not limited to: changes in type of contaminant, such as from dry snow to wet snow, measurable changes in depth of contaminant, following the application or removal of sand or chemicals, following snow removal or sweeping; changes in conditions caused by rapid increases or decreases in temperature.

q) **Slippery (when) wet runway:** means a wet runway where the surface friction characteristics of the runway have been determined to be degraded.

r) **Slush:** means partially melted snow or ice, with a high water content, from which water readily flows. (Slush will spatter if stepped on forcefully, and water will drain from slush when a handful is picked up.)

s) **Snow bank:** means a heap or mound of snow created mechanically that is higher than the surrounding snow cover, and is located next to or on the edge of a runway or taxiway.

Note: Snow banks are assumed to be at the edge of a runway, taxiway or apron, or, when a plough/sweeper is used, at the edge of the cleared (ploughed/swept) area.

t) **Snow drift**: A heap or mound of snow created by action of the wind.

u) **Standing water:** means water of depth greater than 1/8 inch (3 mm).

v) **Take-off and Landing Performance Assessment:** means a method of reporting runway conditions (which relates to aeroplane performance), developed by the US FAA, which is intended to reduce the risk of runway excursions.

w) **Wet:** means a surface condition where there is any visible dampness or water up to and including 1/8 inch (3 mm) deep.

x) **Wet ice:** means ice with water on top of it or ice that is melting.

y) **Wet snow:** means snow that will stick together when compressed but will not readily allow water to flow from it if squeezed. (Wet snow contains enough water to be able to make a well-compacted, solid snowball, but water will not squeeze out.)

z) **Windrow:** means a ridge of material, such as snow or gravel, created by airside maintenance equipment. (Windrows can exist within the cleared (ploughed/swept) portion of a runway).

1.5.2 Abbreviations:

a) **AC**: Advisory Circular
b) **AMSCR**: Aircraft Movement Surface Condition Report
c) **RCARs**: Rwanda Civil Aviation Regulations
d) **CL**: Centreline
e) **RFI**: Runway Friction Index
f) **FAA**: Federal Aviation Administration
g) **GRF**: Global Reporting Format
h) **ICAO**: International Civil Aviation Organization
i) **RCAM**: Runway Condition Assessment Matrix
j) **RSC**: Runway Surface Condition
k) **RWY**: Runway
l) **RWYCC**: Runway Condition Code
m) **TALPA**: Takeoff and Landing Performance Assessment
n) **RCAA**: Rwanda Civil Aviation Authority
o) **TWY**: Taxiway

1.6 BACKGROUND

a) The International Civil Aviation Organization (ICAO) has developed a new globally harmonized methodology for runway condition assessment and reporting. The methodology is called the Global Reporting Format (GRF) and the implementation date required by ICAO is November 5th, 2021.

b) The ICAO Aerodrome SARPs is in Annex 14 with additional guidance found in the PANS Aerodromes Doc 9981 and Circular 355. The GRF is a major step forward in cross functional (Aerodromes, ATM and Flight operations) harmonisation that enables runway surface conditions to be reported in a standardized manner, such that flight

crew can accurately determine aircraft take-off and landing performance. The GRF also incorporates the potential to communicate actual runway surface conditions to flight crew in real time and in terms that directly relate to aircraft performance data.

c) The GRF can be used in all climates and provides a means for aerodrome operators to correctly assess runway surface conditions including rapidly changing conditions such as those experienced during winter or in tropical climates.

d) The philosophy of the GRF is that the airport operator assesses the runway surface conditions whenever water, snow, slush, ice or frost are present on an operational runway. From this assessment, a runway condition code (RWYCC) and a description of the runway surface are reported which can be used by the flight crew for aeroplane performance calculations. This format, based on the type, depth and coverage of contaminants is the best assessment of the runway surface condition by the airport operator. All other pertinent information should also be taken into consideration. When changes in conditions occur, they should be reported without delay.

e) The RWYCC reflects the expected braking capability as a function of the surface conditions. With this information, the flight crews can derive, from the performance information provided by the aeroplane manufacturer, the landing distance of an aeroplane under the existing conditions. When a RWYCC is not provided, pilots reference the reported runway surface conditions to determine expected landing performance.

f) Flight crews utilize runway surface condition descriptors (type and depth of contamination) when determining their aeroplane's expected take-off performance.

g) In preparation for the November 5, 2021 target date for GRF implementation, Rwanda Civil Aviation Authority (RCAA) has developed the new runway condition reporting methods which are described in this AC. Although by virtue of her geographical position, Rwanda does not experience precipitation other than Rain, this AC basically includes other types of precipitation. For training and other purposes, operators are advised to review the referenced documents.

h) Rwandan implementation will meet the intent and important safety elements of the GRF.

i) RCAA may require RAC to conduct trials at the Kigali International Airport (KIA) and will publish the planned times in due course. This will be in preparation for full implementation.

SECTION 2: IMPLEMENTATION OF THE GLOBAL REPORTING FORMAT (GRF) IN RWANDA

2.1 GENERAL

The Global Reporting Format (GRF) is an internationally accepted concept which utilizes a consistent method to produce an aircraft movement surface condition report (AMSCR). The GRF consists of five fundamental elements:

a) Aircraft movement surface condition report (AMSCR);

b) Runway condition assessment matrix (RCAM);

c) Runway condition code (RWYCC);

d) Runway surface conditions; and

e) Runway surface descriptors.

2.3 AIRCRAFT MOVEMENT SURFACE CONDITION REPORT (AMSCR)

This AMSCR has been specially designed to align with the aeroplane performance information based on TALPA used by pilots.

2.4 RUNWAY CONDITION ASSESSMENT MATRIX (RCAM)

The RCAM is a matrix used to determine a runway condition code, from a set of observed runway surface condition(s) and associated procedures.

2.5 RUNWAY CONDITION CODE (RWYCC)

a) The Assessment Criteria consist of Runway Surface Descriptions which are used to determine the Runway Condition Code (RWYCC).

b) Flight crews use the RWYCC for determining the landing performance of their aeroplane.

c) The information and Matrix for determining the RWYCC is provided respectively in Sections 3 and 4 of this AC.

2.6 RUNWAY SURFACE CONDITIONS

Three runway surface **conditions are considered here**:

a) Dry runway;

b) Wet runway;

c) Contaminated runway

2.7 RUNWAY SURFACE CONDITION DESCRIPTORS

1) There are eight contaminated runway surface condition **descriptors**:
   a) Compacted snow;
   b) Dry snow;
   c) Frost;
   d) Ice;
   e) Slush;
   f) Standing water;
   g) Wet ice; and
   h) Wet snow.
2) These runway surface condition descriptors, together with contaminant depth and temperature, are used to determine the RWYCC.
3) These runway surface condition descriptors are used singly or in combination (e.g. “dry snow on top of ice”) when describing the runway surface condition.

SECTION 3: REPORTING CRITERIA FOR AIRCRAFT MOVEMENT SURFACE CONDITION REPORT (AMSCR)

3.1 GENERAL

The following sections describe the data for the runway condition information to be included in the new Aircraft Movement Surface Condition Report (AMSCR) format.

3.2 DIRECTION OF REPORT

1) When runway condition information is reported for each third of the runway, the report should be based on the active runway in use (active runway for landing and/or take-off), or the anticipated runway to be used (e.g. Kigali Runway 28).
2) Reporting conditions in the direction of the runway in use provides a standard reference for pilots, which is oriented in the direction of flight.

   Note: The airport operator's assessment of runway conditions can be conducted in any direction.

3) When runway condition information is not reported for each third of the runway, the report is not based on a specific runway direction and is presented for both the runway in use and the reciprocal runway, as normally practiced (e.g. Runway 10/28).

3.3 REPORTING BY RUNWAY THIRDS

The runway condition information will normally be entered for each third of the runway. Reporting the runway condition information in thirds provides useful information for pilots. This format allows pilots to identify where contaminants are located on a runway and where the biggest impact on aeroplane performance may exist.

3.4 SURFACE CONDITION DESCRIPTIONS

The following terms will be used to describe the runway surface condition for each runway third

COMPACTED SNOW
DRY
DRY SNOW
DRY SNOW ON TOP OF COMPACTED SNOW
DRY SNOW ON TOP OF ICE
FROST
ICE
SLIPPERY (WHEN) WET
SLUSH
SLUSH ON TOP OF ICE
STANDING WATER
WATER ON TOP OF COMPACTED SNOW

WET
WET ICE
WET SNOW
WET SNOW ON TOP OF COMPACTED SNOW
WET SNOW ON TOP OF ICE

3.5 Percent Coverage of Surface Condition Descriptors

1) The data input process will report the percentage coverage of surface condition
2) Where some sections of the runway, or sections of a runway third, are not contaminated, the reported runway contaminants are not required to add up to 100%.

3.6 Number of Conditions that May be Reported

The number of contaminant types that may be reported for each runway third is limited to two. Similarly, when the runway condition is not reported by thirds, the number of contaminant types reported for the entire runway is also limited to two. This is a significant change, since observers had previously reported every type of contaminant that was observed on a runway.

Note: For a given runway third, the "DRY" condition is not reported unless there are contaminants in other runway third(s) and the runway third is 100% DRY.

3.7 Wet Runways

1) As per the previous practice, airport and aerodrome operators are to report "WET" conditions associated with other and/or winter contaminants, and the associated Runway Condition Code (RWYCC).
2) Due to the dynamic nature of rainfall conditions, the timely and accurate reporting of conditions when water or moisture is present on the runway, is recognized to be challenging. For example, during an active thunderstorm a runway may rapidly transition from dry, to wet (water 1/8 inch or less) to contaminated with standing water (water greater than 1/8 of an inch), in a very short period of time. In addition, variations in the drainage capabilities of a runway and/or portions of a runway further complicate accurate reporting. Therefore, airport or aerodrome operators may not be able to report these conditions accurately.
3) When an airport or aerodrome operator reports water or moisture on a runway, the following should be considered:
    a) A surface condition where there is any visible dampness or water up to and including 1/8 inch (3 mm) is reported as "WET" with an associated RWYCC of 5 (if more than 25% of the surface is affected by this condition);

    Note: A damp runway that meets this definition is considered wet, regardless of whether or not the surface appears reflective. This is a change from past practices, where a distinction was made for runways which were not dry, but were not reflective.

b) A surface condition where there is water of depth greater than 1/8 inch (3 mm) is reported as “STANDING WATER” with an associated RWYCC of 2 (if more than 25% of the surface is covered).

3.8 STANDING WATER

1) Water on a runway at a depth greater than 1/8 of an inch (3 mm) is reported as “STANDING WATER.”

2) To facilitate the accurate reporting of standing water, airport and aerodrome operators should also be aware of the conditions which would lead to the accumulation of standing water including:

   a) the drainage characteristics of their runways, and

   b) the rate and amount of precipitation.

SECTION 4: RUNWAY CONDITION ASSESMENT MATRIX

4.1 ASSESSMENT CRITERIA

This section of the RCAM consists of a Runway Surface Description and a Runway Condition Code. The Runway Surface Descriptions in each category are linked to the corresponding Runway Condition Code based on their effect on aeroplane braking performance.

4.2 RUNWAY CONDITION DESCRIPTION

The Runway Surface Description column of the RCAM lists contaminants that are directly correlated to aeroplane landing performance. The description sections, ranging in terms of slipperiness, are categorized based on type and depth of contaminant and outside air temperature. When available, the runway surface temperature should be used.

4.3 RUNWAY CONDITION CODE (RWYCC)

1) Runway Condition Codes (Format: X/X/X) represent the runway condition description based on defined terms and increments. Use of these codes harmonizes with ICAO Annex 14, providing a standardized “shorthand” format for reporting runway condition, which can be used by pilots to determine landing performance parameters.
2) A RWYCC is determined using the RCAM based on type and depth of contaminant and outside air temperature. When available, the runway surface temperature should be used.

Table 1 – Runway Condition Assessment Matrix (RCAM)

Assessment Criteria		**Downgrade Assessment Criteria (Control/Braking Assessment Criteria)**		
Runway Surface Description	RWYCC	CRFI Range	Vehicle Deceleration or Directional Control Observation	Pilot Braking Action
DRY	6			
• FROST • WET (The runway surface is covered by any visible dampness or water up to and including 1/8 **inch** (3 mm) depth) **Up to and including 1/8 inch (3 mm) depth:** • SLUSH • DRY SNOW • WET SNOW	5	0.40 or higher	Braking deceleration is normal for the wheel braking applied AND directional control is normal	GOOD
-15°C and Colder outside air temperature: • COMPACTED SNOW	4	0.39 to 0.35	Braking deceleration OR directional control is between Good and Medium	GOOD TO MEDIUM
• SLIPPERY (WHEN) WET (wet runway) • DRY SNOW or WET SNOW (Any depth) ON TOP OF COMPACTED SNOW **Greater than 1/8 inch (3 mm) depth:** • DRY SNOW • WET SNOW **Warmer than -15°C outside air temperature:** • COMPACTED SNOW	3	0.34 to 0.30	Braking deceleration is noticeably reduced for the wheel braking effort applied OR directional control is noticeably reduced	MEDIUM
Greater than 1/8 inch (3 mm) depth: • STANDING WATER • SLUSH	2	0.29 to 0.20	Braking deceleration OR directional control is between Medium and Poor	MEDIUM TO POOR
ICE	1	0.19 or lower	Braking deceleration is significantly reduced for the wheel braking effort applied OR directional control is significantly reduced	POOR
• WET ICE • SLUSH ON TOP OF ICE • WATER ON TOP OF COMPACTED SNOW • DRY SNOW or WET SNOW ON TOP OF ICE	0		Braking deceleration is minimal to non-existent for the wheel braking effort applied OR directional control is uncertain	LESS THAN POOR / NIL

4.4 PILOT REPORTED BRAKING ACTION

1) This is a report of braking action on the runway by a pilot which provides other pilots with a degree/quality of expected braking. The braking action experienced is dependent on the type of aircraft, aircraft weight, touchdown point, and other factors.
2) Where available, pilot reports of braking action should be taken into consideration as part of the ongoing monitoring process.

SECTION 5: TRAINING

Operators are under obligations to comply with the regulations and conditions of their landing destinations and alternates. Implementation of the GRF is expected to be effective by the 5th of November 2021. By this time, operators are therefore expected to be familiar with the GRF parameters as in force in these destinations. Necessary training curricula and information are available in the referenced documents. Operators are advised to develop training programs compliant with the ICAO GRF standards.

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