



Global methodology for assessing and reporting runway surface conditions (GRF)

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Overview

- Background
- Development of GRF SARP's
- What is the GRF?
- Stakeholders responsibilities
- The GRF Implementation



Objective

- Increase awareness and knowledge
- Understand ICAO SARPS and other related provisions and training needs
- Awareness of implementation challenges
- Exchange of best practice



Background (22 June 2019)

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Averted Plane Crash: Nigeria Begins Investigation Into Air Peace Flight Incident At Port Harcourt Airport

"The aircraft skidded off the runway to the left about 1300m from the runway 21 threshold at the Port Harcourt International Airport."

The Air Peace Flight P47291 from Abuja to Port Harcourt overshot the runway while touching down at the airport during heavy rainfall.

Olajide said: "We confirm that Air Peace Flight P47291 Abuja-Port Harcourt had a runway excursion upon landing at the Port Harcourt International Airport on June 22 due to downpour."

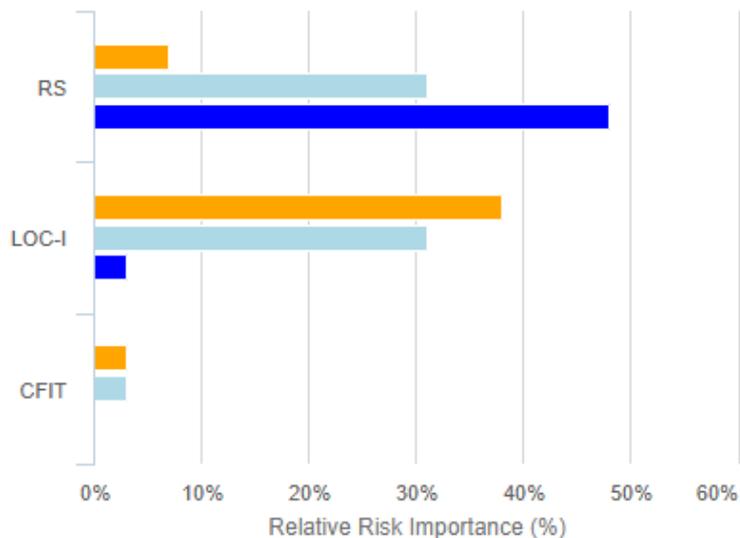




Background - World

Risk Distribution

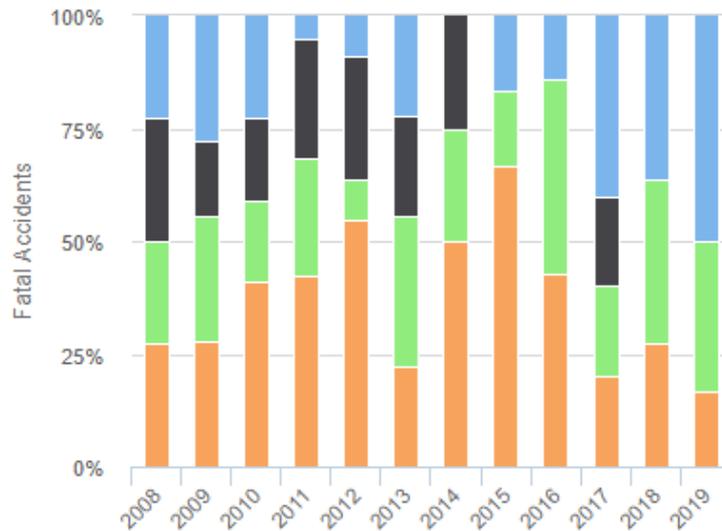
Scheduled Commercial flights on airplanes above 5.7t 2015-2019



■ Fatalities ■ Fatal Accidents ■ Accidents

Share of Fatal Accidents by Risk Category

Scheduled Commercial flights on airplanes above 5.7t only



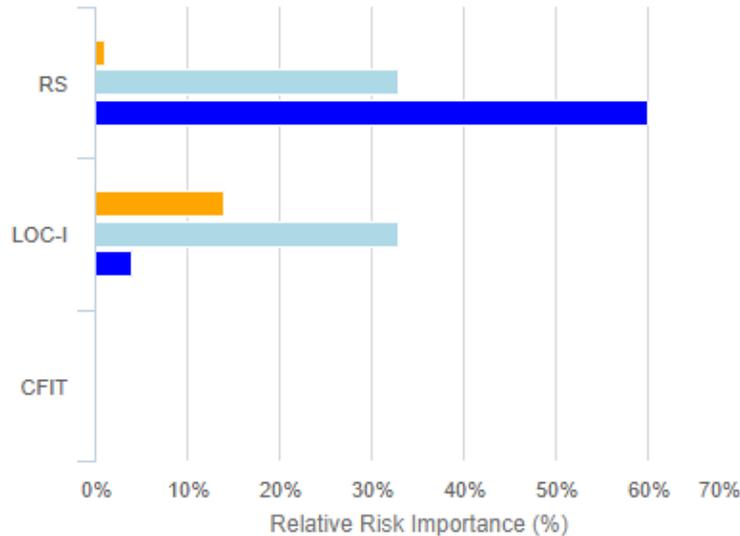
■ Runway Safety ■ CFIT ■ LOC-I ■ Other



Background - RASG-AFI

Risk Distribution

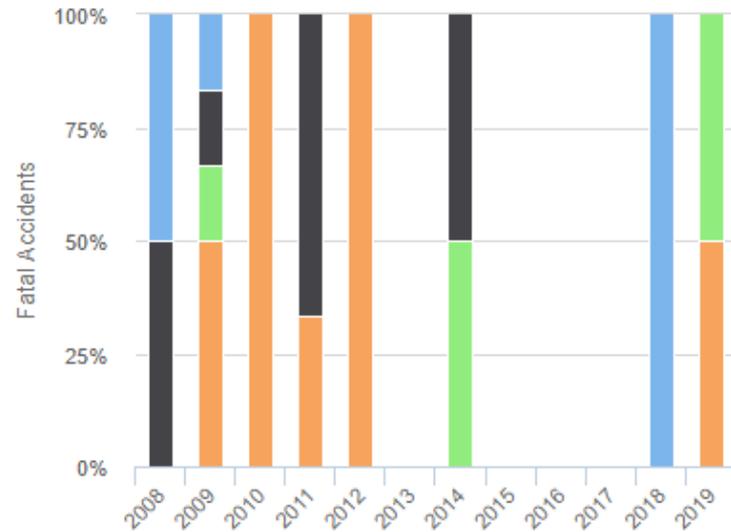
Scheduled Commercial flights on airplanes above 5.7t 2015-2019



Legend: Fatalities (orange), Fatal Accidents (light blue), Accidents (dark blue)

Share of Fatal Accidents by Risk Category

Scheduled Commercial flights on airplanes above 5.7t only



Legend: Runway Safety (light blue), CFIT (black), LOC-I (green), Other (orange)



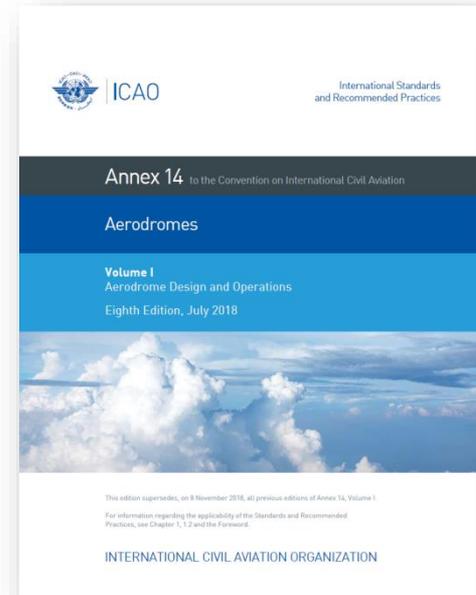
Background

- Runway Friction included in the ICAO Aerodromes Panel work programme in 2004;
- Questionnaire on Runway Surface Friction Characteristics sent to States (SL06/48) in 2006
- Friction task force (FTF) established in 2008
- Supported by ICAO panels: METP, FLTOPS, AIRP, AIM-AIS SG, ATMOPSP
- Developed a globally-harmonized methodology for runway surface condition assessment and reporting



Development of GRF SARPs

- Proposals for the amendment of Annexes 3; 6, Parts I and II; 8; 14, Volume I; 15; PANS-Aerodromes; PANS-ATM and PANS-AIM
- States and International organizations consultation from 29 May to 28 August 2015
- 59 States and 6 international organizations replied
- Adoption of amendment during the 207th Session of the Council (February 2016)
- Effective on 11 July 2016
- Applicable on 5 November 2020





ICAO Provisions on GRF

- **Annex 14, Volume 1 and PANS-Aerodromes:** fundamental provisions for assessing and reporting runway surface conditions
- **Annex 6, Parts I and II:** assessment by the pilot-in-command of the landing performance and report for commercial air transport operations
- **Annex 8:** nature of the information provided by the aircraft manufacturers;
- **Annex 3:** removal of the runway state group for METAR/SPECI
- **Annex 15 and PANS-AIM:** syntax and format used for dissemination;
- **PANS-ATM:** phraseology and communication of special air-reports concerning runway braking
- **Guidance materials**
 - *Aeroplane Performance Manual (Doc 10064)*
 - *Assessment, Measurement and Reporting of Runway Surface Conditions (Circular 355)*



What is the GRF?

- Common language between all actors of the system that is based on the impact on aeroplane performance of the runway surface condition.
- The runway condition report (RCR) is based on
 - Airport assessment and reporting of runway surface conditions enabling a description of the runway surface conditions enabling;
 - Flight crew determination of performance
- Global and harmonized implementation required



The Benefits of the GRF

- Improved safety
 - Better understanding of runway conditions
 - Fewer runway excursions
- Improved efficiency
 - Better situational awareness
 - Better decision making
 - Fewer runway closures
- Reduced ENV impact
 - Fewer runway excursions
 - Better traffic management
 - Better management of de-icing products





The GRF - five fundamental elements

- Definition of the runway surface conditions
- Definition of the runway surface condition descriptors.
- The runway condition assessment matrix (RCAM)
- The runway condition code (RWYCC)
- The runway condition report (RCR)



The runway surface conditions

Description of the condition(s) of the runway surface used in the runway condition report which establishes the basis for the determination of the runway condition code for aeroplane performance purposes:

- Dry runway;
- Wet runway;
- Slippery wet; and
- Contaminated runway.



The runway surface condition descriptors

- Compacted snow;
- Dry snow;
- Frost;
- Ice;
- Slush;
- **Standing water;**
- Wet ice; and
- Wet snow.



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"> • DRY 	---	---
5	<ul style="list-style-type: none"> • FROST • WET (The runway surface is covered by any visible dampness or water up to and including 3 mm depth) <p><i>Up to and including 3 mm depth:</i></p> <ul style="list-style-type: none"> • SLUSH • DRY SNOW • WET SNOW 	Braking deceleration is normal for the wheel braking effort applied AND directional control is normal.	GOOD
4	<ul style="list-style-type: none"> • <i>-15°C and lower outside air temperature:</i> • COMPACTED SNOW 	Braking deceleration OR directional control is between Good and Medium.	GOOD TO MEDIUM
3	<ul style="list-style-type: none"> • WET ("slippery wet" runway) • DRY SNOW or WET SNOW (any depth) ON TOP OF COMPACTED SNOW <p><i>More than 3 mm depth:</i></p> <ul style="list-style-type: none"> • DRY SNOW • WET SNOW <p><i>Higher than -15°C outside air temperature¹:</i></p> <ul style="list-style-type: none"> • COMPACTED SNOW 	Braking deceleration is noticeably reduced for the wheel braking effort applied OR directional control is noticeably reduced.	MEDIUM
2	<ul style="list-style-type: none"> • <i>More than 3 mm depth of water or slush:</i> • STANDING WATER • SLUSH 	Braking deceleration OR directional control is between Medium and Poor.	MEDIUM TO POOR
1	<ul style="list-style-type: none"> • ICE ² 	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"> • WET ICE ² • WATER ON TOP OF COMPACTED SNOW ² • DRY SNOW or WET SNOW ON TOP OF ICE ² 	Braking deceleration is minimal to non-existent for the wheel braking effort applied OR directional control is uncertain.	LESS THAN POOR



The runway condition code (RWYCC)

The RWYCC is a number describing the runway surface condition to be used in the runway condition report.

The purpose of the runway condition code is to permit an operational aeroplane performance calculation by the flight crew.

RUNWAY CONDITION ASSESSMENT MATRIX (RCAM)			
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4	<ul style="list-style-type: none"> • COMPACTED SNOW <p>-15°C and lower outside air temperature:</p> <ul style="list-style-type: none"> • WET ("slippery wet" runway) • DRY SNOW or WET SNOW (any depth) ON TOP OF COMPACTED SNOW 	Braking deceleration OR directional control is between Good and Medium.	GOOD TO MEDIUM
3	<p>More than 3 mm depth:</p> <ul style="list-style-type: none"> • DRY SNOW • WET SNOW <p>Higher than -15°C outside air temperature¹:</p> <ul style="list-style-type: none"> • COMPACTED SNOW 	Braking deceleration is noticeably reduced for the wheel braking effort applied OR directional control is noticeably reduced.	MEDIUM
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Runway Condition Report (RCR)

- a) **an agreed set of criteria** used in a consistent manner for runway surface condition assessment, aeroplane (performance) certification and operational performance calculation;
- b) **a unique runway condition code (RWYCC)** linking the agreed set of criteria with the aircraft landing and take-off performance table, and related to the braking action experienced and eventually reported by flight crews;
- c) **reporting of contaminant type and depth** that is relevant to take-off performance;
- d) **a standardized common terminology and phraseology** for the description of runway surface conditions that can be used by aerodrome operator inspection personnel, air traffic controllers, aircraft operators and flight crew; and
- e) **globally-harmonized procedures** for the establishment of the RWYCC with a built-in flexibility to allow for local variations to match the specific weather, infrastructure and other particular conditions.



Runway Condition Report (RCR)

- Designed to report runway surface condition in a standardized manner
- Common language between all actors of the system: aircraft manufacturers, aerodrome operators, aircraft operators, ANSPs, AIM, MET and other stakeholders.
- Allow flight crew to accurately determine aeroplane take-off and landing performance
- Based on the impact on aeroplane performance of the runway surface condition
- To be customized based on States needs (full or reduced format depending on weather conditions)



Runway Condition Report

The RCR consists of two sections:

- **Aeroplane performance calculation section (for each runway third)**
- **Situational awareness section**

RUNWAY CONDITION REPORT (RCR)	
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



Stakeholder responsibilities

- **Aerodrome operators:** assess the runway surface conditions, including contaminants, for each third of the runway length, and report them by means of a uniform runway condition report (RCR)
- **Air traffic services (ATS):** convey the information received via the RCR and/or special air-reports (AIREP) to end users (voice communications, ATIS, CPDLC)
- **Aeronautical information services (AIS):** provide the information received in the RCR to end users (SNOWTAM)
- **Aircraft operators:** utilize the information in conjunction with the performance data provided by the aircraft manufacturers to determine if landing or take-off operations can be conducted safely and provide runway braking action special air-reports (AIREP)
- **Aircraft Manufacturers** provide the necessary performance data in the aeroplane flight manual



Assessing the runway surface conditions

- The aerodrome operator assesses the runway surface conditions whenever water, snow, slush, ice or frost are present on an operational runway, using runway condition assessment matrix (RCAM)
- A runway condition code (RWYCC) will be assigned based on the assessment, along with a description of the runway surface condition, which can be used by the flight crew for aeroplane performance calculations
- This report, based on the type, depth and coverage of contaminants, is the best assessment of the runway surface condition by the aerodrome operator
- All other pertinent information may be taken into consideration
- Upgrading or downgrading RWYCC using procedures in PANS-Aerodromes, including RCAM



Reporting the runway surface conditions

- The RCR shall be established when a significant change in runway surface condition occurs due to water, snow, slush, ice or frost (and should continue to reflect **significant changes** until the runway is no longer contaminated).
- Significant change:
 - any change in the runway condition code associated with type and depth of contaminant or in reportable contaminant coverage; and
 - any other information (e.g. a pilot report of runway braking action).



Dissemination of information

- **Through the AIS and ATS services:** when the runway is wholly or partly contaminated by standing water, snow, slush, ice or frost, or is wet associated with the clearing or treatment of snow, slush, ice or frost.
- **Through the ATS only:** when the runway is wet, not associated with the presence of standing water, snow, slush, ice or frost.





In-Flight procedures for International Commercial Air Transport / General Aviation

- The pilot-in-command shall / should **report the runway braking action special air-report (AIREP)** when the runway braking action encountered is not as good as reported.
- **An approach to land shall / should not be continued below 300 m** above aerodrome elevation unless the pilot-in-command is satisfied that, with the runway surface condition information available, the aeroplane performance information indicates that a safe landing can be made.





Performance data

- Performance data shall be determined and furnished in the flight manual.
- For aeroplanes for which application for certification was submitted on or after 2 March 2019
- The take-off performance data and the at time of landing performance data **shall include the effect of the gradient and conditions (dry, wet, or contaminated) of the take-off or landing surface as appropriate for landplanes**, and water surface conditions, density of water, and strength of current for seaplanes.





The Challenges

- Implementation by airports all around the world
 - Complex set of stakeholders
 - Language, culture, 'distance'
- Impacts most States (a new topic for some)
- Lessons learnt from some States confirm challenges

How do we ensure global understanding, implementation, harmonisation?



Implementation

- **ICAO:** SARPS, PANS, guidance material (including training guidance), support to States
- **States:** Ensure awareness, training and deployment
- **International Organisations:** Provide training, support awareness efforts, support deployment
- **Airports:** Local deployment, training
- **Airlines:** Support deployment, training
- **Industry:** Provide training support, tools



Implementation

Importance of training!!!

- Aerodrome personnel
- Air traffic controller
- AIS personnel
- Dispatcher
- Pilots





Follow-up

- Implementation complex...lesson learnt!
- Follow-up by:
 - States
 - International organisations
 - Peer support
 - Industry
- Proactive ICAO



ICAO DAKAR UNITING AVIATION

Thank You

