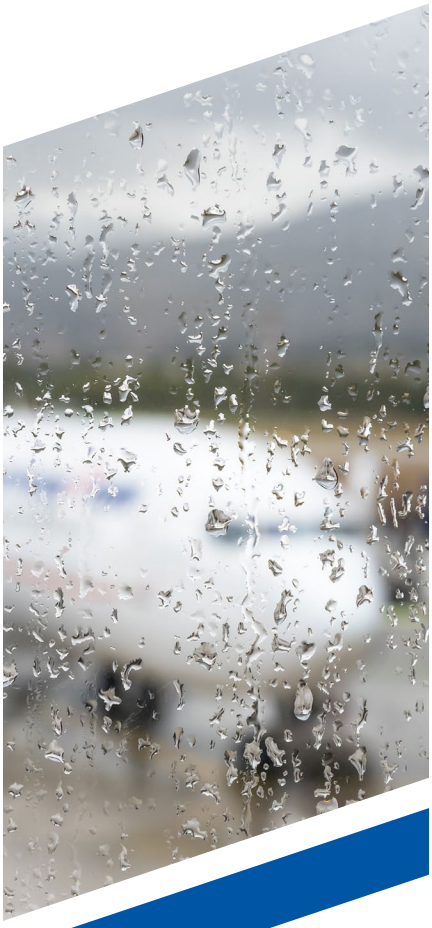
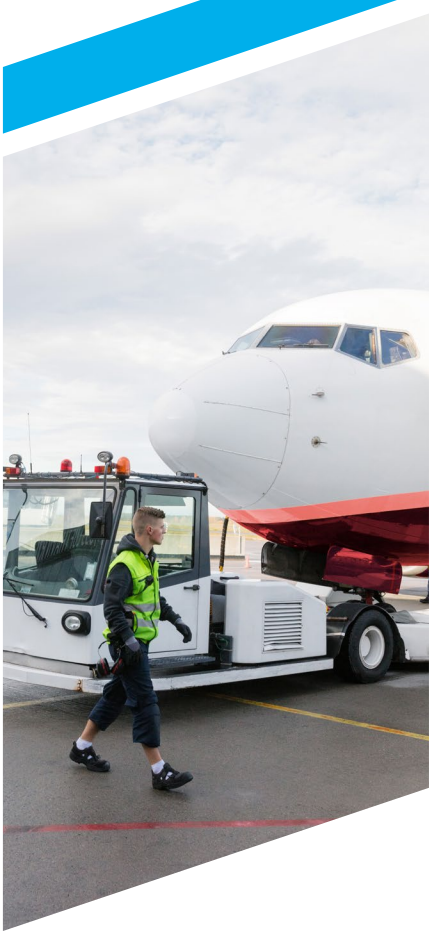
ICAO

Implementation of Global Reporting Format for Runway Surface Conditions (GRF)

Guidance based on management of change (MOC)





This document is intended to support States with the process for managing the change associated with implementing the Global Reporting Format for Runway Surface Conditions (GRF).
It was developed through a series of workshops involving State, industry and ICAO experts.

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INTRODUCTION

This document aims to provide States with guidance to apply a process to support the effective implementation of the *Global Reporting Format (GRF)*[1]. The guidance is based on the *Management of Change (MoC)* process as described by the Safety Management Manual (SMM, Doc 9859) and other ICAO references[2].

The GRF is a new ICAO methodology for assessing and reporting runway surface conditions, which intends to reduce the safety risks related to runway excursions, the most common form of runway safety related incident. The introduction of GRF represents a source of change to each State's aviation system. When change is introduced into a system, the baseline safety risk assessment of the aviation system will change. The MoC process provides a trigger for the State to assess and manage the associated risks since hazards may unintentionally be introduced in the system due to GRF implementation. Applying a MoC process before the change is implemented ensures that all direct and indirect consequences are fully understood and the desired outcomes are achieved without compromising safety performance.

The GRF aims to harmonize the assessment and reporting of runway surface conditions.

The assessment is conducted by a trained observer (normally airport operations staff) who, using a globally recognized runway condition matrix, allocate a *Runway Condition Code (RWYCC)* to each third of a runway. This code is complemented by a description of the surface contaminant, including its type, depth and amount of coverage, again per third and using a globally recognized set of descriptors. The outcome of the evaluation is then incorporated into a standard *Runway Condition Report (RCR)*, which is then forwarded to the air traffic and aeronautical information services for transmission to pilots by SNOWTAM, by ATIS and, if necessary, also by radio broadcast. By correlating the RCR with aircraft performance data provided by the manufacturer the flight crew then is able to calculate their takeoff and landing performance. This matching of standardized observation and reporting with standardized Aircraft performance data is the key advantage of the GRF. Another important element of the GRF is the facility for flight crew to provide their own observations of runway surface conditions, used to confirm the RWYCC or provide an alert to changing conditions. It should also be noted that the GRF applies to all aerodromes including those with and without winter conditions.

[1] https://www.icao.int/safety/Pages/GRF.aspx

[2] https://www.icao.tv/latest-videos/videos/management-of-change

INTRODUCTION

The guidance is divided into 2 parts:

1. **Checklist for GRF implementation based on MoC:** A list of recommended activities that may be applied by the State in their GRF implementation efforts. It also aims to support the safety impact assessment and the required changes in the oversight system to allow the transition to the new methodology. The checklist should be applied with the GRF implementation action plan template *(GRF Milestones)*[3], already shared with the aviation community.

2. **GRF Bowtie:** A generic risk assessment, management and communication bowtie, developed to support the assessment of safety risks related to the implementation of GRF. The bowtie visualizes potential pathways a hazard may take to cause a consequence and the appropriate defences that can be put in place by service providers to prevent or reduce the severity of runway excursions. It is an initial assistance for States on the development of the safety risk management strategy (Step Execution in the MoC process) and the prioritization of defences and resource allocation for a successful GRF implementation.

   Tasks Hazards and Defences Matrix: in addition to the bowtie, a table outlining the tasks to be conducted by stakeholders, the potential hazards associated with each task and potential defences is provided. It allows States to better understand the GRF structure when implemented, facilitating the desired outcome of the implementation of this methodology.

This content provides guidance to support States and stakeholders with their implementation of the GRF. Its use is recommended, but not mandatory.
Any comments to this material should be forwarded to safetymanagement@icao.int.

[3] https://www.icao.int/safety/SiteAssets/Pages/GRF/GRF%20Implementation_Milestones_March%202021.pdf

CHECKLIST FOR GRF IMPLEMENTATION BASED ON MOC

Activities to be conducted by the State:
The examples given were identified by the expert group as guidance and are not intended to be exhaustive.

INITIATION

1 Description of the change

1.a Apply GRF Milestones 1 and 15

Example:

- *The GRF is a standardized and globally agreed methodology to improve flight safety through timely and accurate information to flight crew on the runway surface conditions. Applicability date on 4 November 2021.*

2 Description of the safety impact

2.a Describe the safety impact at airports in the State, considering different types of operation

Example:

- *Positively impacts flight safety (runway): fewer runway excursions, better fuel management, globally harmonized method, reinforcing local knowledge of runway (know your runway).*
- *Related challenges: time and resources needed for updating existing systems/software/ communications, implementation of a new change during a crisis (pandemic)/reduced operations, methodology based on human observations during a period of extended leave/ furlough presenting difficulties for training.*

PLANNING

3 Develop and agree an assurance plan for changes

3.a Apply GRF Milestones 2, 3, 4, 6, 7, 8, 12
3.b Define indicators and safety performance levels
3.c Identify training requirements via a training needs analysis
3.d Formalize and sign-off on the assurance plan

4 Develop a supporting communication plan

4.a Apply GRF Milestone 9
4.b State to promote awareness of GRF implementation using appropriate mechanisms e.g. seminars/webinars/workshops/training with relevant stakeholders
4.c State to encourage industry to ensure personnel are aware of and trained for GRF implementation, for example, that they 'know their runway' and are aware on how to apply the downgrade and upgrade procedures
4.d Assign roles and responsibilities to the Implementation Coordination Team
4.e Establish mechanisms for coordination and communication across internal and external stakeholders
4.f Develop and communicate an agreed safety assurance plan

Activities to be conducted by the State:
The examples given were identified by the expert group as guidance and are not intended to be exhaustive.

EXECUTION

5 Develop a risk management strategy

5.a Build capacity in safety risk management (training, seminars, workshops, ICAO Implementation Packages)

5.b Conduct a safety risk assessment related to GRF implementation

Example:

- *For hazards/risks during GRF implementation:*
  - *COVID-19 effects on implementation (people being laid-off and the loss of their expertise and industry financial capability to carry out change);*
  - *unsynchronized implementation among States;*
  - *challenges arising from the implementation of the GRF where an airport is not certified;*
  - *reduced awareness of other movement area components (taxiways, apron);*
  - *increased and more frequent access to the runway for RCR (runway incursion);*
  - *increased workload while software/systems are not compatible with GRF.*
- *Hazards and safety risks related to GRF when implemented: consider the information already provided through the GRF Bowtie and corresponding matrix of this document.*

5.c Review and agree on residual safety risk with formal sign-off

5.d Collaborate with other States in advance of GRF implementation to identify challenges/hazards

5.e Review and update assurance plan, as needed

6 Develop, agree and implement the change

6.a Apply GRF Milestones 5, 10, 11, 14, 15

6.b Amend national regulation

6.c Ensure stakeholders are following the agreed assurance plan and the responsibilities are correctly allocated

MONITORING

7 Monitor and verify the performance of the system

7.a Review feedback and assess the need to update regulations and inspection/audit procedures

7.b Monitor indicators, risk controls and safety performance levels as described in the assurance plan

7.c Exchange experience related to GRF implementation (within the State and internationally)

7.d Coordinate with industry to establish mechanisms for sharing and exchanging data and information

7.e Conduct regular reviews about the implementation, e.g. after the first winter or rainy operations

7.f Monitor training plan roll-out and amend as necessary.

2. GRF BOWTIE

The bowtie methodology is used for risk assessment, risk management, and risk communication. It is designed to give an overview of the risk, clarifying the relationship between the hazards identified and barriers in place to address them.

As the GRF implementation aims at the management of runway excursions (top event, in the center of the bowtie), the traditional assessments of this risk are already known by the aviation community, for example, the existing hazards in the system and barriers available to address them. The focus of this work was to identify hazards and barriers directly related to GRF, allowing a comprehensive assessment of what can be done to reduce the likelihood of the Top Event. The right side of the bowtie, which would detail the recovery measures to reduce the severity of the event, was outside of the scope of this exercise.

Further information can be accessed through: www.bowtiexp.com, www4.icao.int/demo/SMI/Summary_SRM.pdf

Examples of bowtie applied to safety risk assessments related to runway excursions can be accessed through: www.caa.co.uk/safety-initiatives-and-resources/working-withindustry/bowtie

2.1 MATRIX: TASKS, HAZARDS, AND DEFENCES PER STAKEHOLDER

The aforementioned bowtie is an example that is intended to give States an overview of the GRF in the context of preventing runway excursions, as well as the associated hazards and barriers.

The following matrix further supports understanding of the hazards throughout the aviation system, affected by the GRF, enabling stakeholders to assess their roles in its implementation and hence in the prevention of runway excursions. Each hazard listed in this matrix is connected to the three primary hazards identified:

Purple	the inaccurate assessment and report of runway condition (RCR)
Green	issues in the communication flow of RCR among stakeholders
Orange	GRF information is not properly used for landing and take-off performance calculation

The matrix is organized according to the tasks to be conducted by each stakeholder. It also lists proposed defences to address individual hazards, which can contribute to the general barriers as displayed in the bowtie.

Considering that the implementation of GRF is a global change, it is essential to provide training to staff, as well as monitoring during and post-implementation (Yellow actions in the matrix).

As a recommendation, when States conduct oversight of GRF implementation, they can establish new procedures, or adjust existing ones, to verify the performance of the defences listed in this matrix.

An example of how to apply the content is provided:

Task:	The aerodrome operator shall amend RCR by using upgrade or downgrade procedures.
Hazard:	One hazard identified is when a downgrade/upgrade does not take place when it should or is imprecise.
Defences:	As defences to address this hazard, it was listed the need to: define the correct upgrade/downgrade process; train the staff staff in the upgrade/downgrade process, guaranteeing the understanding of triggers and criteria to conduct it; and keep staff ready and available to make a new assessment when the problem is identified.
Color:	This hazard was signalized in purple, as it is related to the hazard of inaccurate assessment and report of runway condition (RCR).
Checklist:	States can verify if the aerodrome operator: had established procedures to amend RCR through upgrade/downgrade, listing the criteria and triggers to conduct it; keeps staff trained and available for conducting the assessments during operations.

Tasks	Hazards	Defences
A All Stakeholders		
Establish procedures and train staff on activities related to GRF	New methodology still being implemented and some level of doubt/uncertainty by people involved in its implementation	• *Keep track of guidance material, training, and other information available* • *Keep track of difficulties observed during and after implementation and share them with other operators/States/organizations* • *Take part in regional workshops/seminars* • *Seek assistance from ICAO / ACI / IATA / CANSO and other regional and international organizations* *Note: further information on the content of the training is provided in this matrix, based on the tasks to be performed and hazards identified.*
	Limited State training capacity available (compared to the number of seats required by the community), limited languages offered, limited number of instructors available	• *Make use of existing on-line training resources* • *Gather information available and provide it through initial training, adjusted to each operator/State/ organization* • *Train the trainers and adjust content according to the challenges observed on the implementation of GRF* • *Identify 'peers' and pioneers*
	COVID-19 pandemic affecting the possibility of in-person training for GRF procedures due to distancing measures (on-the-job training)	• *Prioritize staff to be trained* • *Make training available, as feasible* • *Take advantage of the periods of reduced operations to allow on-site training*
Monitor GRF through RST (SMS/SSP)	Failures of GRF processes and procedures are not identified or addressed in a timely manner	• *Monitor GRF implementation through Runway Safety Team (RST)* • *Assure coordination of interfaces between stakeholders' SMS (hazards and risks identified)* • *Adjust existing safety management processes to allow support to GRF implementation and monitoring* • *Ensure reporting of any non-conformities, events/ incidents, difficulties/challenges* • *Address problems identified and monitor actions taken to improve the process* • *Establish an effective runway safety team*

Tasks	Hazards	Defences
B Airport Operator		
Conduct the assessment of the runway condition and issue RCR	Absence of equipment to support assessment	• *Ensure airport staff have tools to do the job, vehicle, etc.* • *Keep equipment maintained and calibrated*
	Incorrect assessment resulting in a wrong report (e.g. runway becomes 'slippery wet' but is not identified)	• *Assure key personnel trained in runway contaminant inspection* • *Identify local challenges faced by staff (equipment, local conditions, local procedures etc.)* • *Train staff to improve practical assessment* • *Involve RST in the development of procedures*
	Assessment takes more time than expected or it starts later than needed	• *Ensure timely process by the definition of triggers and assure that staff is available* • *Define effective procedures and communications to enable assessor access to the runway* • *Arrange trial to gauge the time needed for inspections in different scenarios e.g. fair weather, rainy, snowy, etc.* • *Ensure adequate time windows to access runway for assessment* • *Keep number of inspections/accesses to the runway balanced with traffic flow* • *Arrange sufficient manpower for assessment especially at times when RCR change is anticipated, e.g. during heavy rain / snowfall* • *Ensure coordination between ATC and Airport operations*
Coordination with ATC/AIS for RCR transmission	Problems in the communication of the report, either from the issuance of the RCR or understanding by ATC	• *Assure precise communication and use of the standard terminology between airport operator and ATC* • *Make staff familiar with the usage of runway thirds* • *Reflect updated procedures in existing guidance*
	Lack of timely communication action of RCR to ATS/AIS	• *Establishing and applying a real-time communication flow between between the airport operator and ATS, AIS*
	Loss of communication	• *Agree on a dedicated communication means and a contingency e.g. VHF radio / specific phone number*
Amend RCR by using upgrade or downgrade	A downgrade/upgrade does not take place when it should or is imprecise	• *Define correct upgrade/downgrade process* • *Train staff in the upgrade/downgrade process, including triggers and criteria.* • *Be ready to make a new assessment.*

Tasks	Hazards	Defences
Runway surface condition maintenance	Maintenance actions take more time than it should or does not take place when needed	• *Update existing maintenance procedures to adjust to GRF requirements, considering the time needed for assessments and new triggers* • *Plan regular runway maintenance inspections to identify surface irregularities on the runway, and correct them in a timely manner* • *Regular maintenance and checking of all airport equipment for winter operations* • *Planned engineering inspections tracking surface friction with continuous friction measuring equipment (CFME) thus avoiding or identifying slippery wet*
C Aircraft Operator		
Aircrew and flight dispatchers to assess landing and take-off performance based on the RCR	RCR does not correlate with existing aircraft performance data according to manufacturer (ad-hoc gap filling calculation)	• *Standardization of performance parameters (criteria to support recalculation while different sources are available, refer to the use of conservative parameters)* • *Ensure policies and SOPs for the use of existing aircraft performance data in the context of GRF implementation* • *GRF-compliant and complete aircraft systems, guidance for flight crew and dispatcher on how to deal with the transition*
	Incorrect application of RCR (e.g. pilots may interpret same RCR differently)	• *Train flight crew and dispatch on how to assess landing and take-off parameters/performance and the correct calculation of V1* • *Ensure that SOPs and manuals are amended to ensure that use of GRF supports the safe operation of the aircraft* • *Ensure that difficulties are monitored and processed by the operator's SMS*
	Aircraft braking performance is below the RCR	• *Train pilots on the need to make PIREP to ATC*
	Incorrect take-off calculation in the event of multiple contaminants	• *Provide SOP to manage multiple contaminants on runway* • *Standardization of landing and take-off performance parameters (criteria to support recalculation when runway presents multiple contaminants)*
	Reported contaminant does not match the actual surface condition observed by flight crew	• *Require pilots to report to ATC when RCR does not properly reflect the runway surface condition (using PIREP)* • *Establish procedures to assist pilots in identifying and assessing a mismatch between RCR and actual runway surface conditions*
	Inaccurate PIREP regarding RWYCC	• *Airline should train pilots to understand RCAM and give correct PIREPs* • *Train pilots to understand that RWYCC may be upgraded and downgraded.*

Tasks	Hazards	Defences
D Aircraft Manufacturer		
Provide performance parameters to aircraft operator	Unclear aircraft performance parameters related to GRF	• *Define set of performance parameters related to GRF* • *Provide guidance material related to aircraft performance theory* • *Sensors in the aircraft providing information on the performance (under development)*
Monitor effectiveness of performance data post-GRF implementation	Difficulties in the exchange of data/ information related to performance	• *Ensure performance data available to aircraft operators and flight crew* • *Establish data and information communications (workflow)*
Make performance data captured by aircraft available to aviation community	Lack of standardization of aircraft derived data related to actual take off and landing performance	• *Engage with industry bodies* • *Standardize report of data related to performance* • *Establish a GRF performance related database accessible to States (future activity)*
E Air Traffic Service (ATS)		
Monitor effectiveness of performance data post-GRF implementation	Delayed or incorrect transmission of RCR through ATIS or VHF radio when there is a significant change in the RWY condition	• *Train Controllers/ANSPs on the importance of timely transmission* • *Make systems and procedures available to support timely transmission (e.g. planned updates, identify improvement to ATIS to accommodate GRF implementation)* • *Establish monitoring and contingency procedures* • *Use of standard terminology and phraseology* • *Ensure that occurrences related to delayed or incorrect transmission are captured by the SMS*
	Misunderstanding of upgrade/downgrade of RWYCC	• *Establish procedures to provide awareness of upgrade and downgrade when applied and local criteria* • *Use standard terminology and phraseology*
	PIREP not transmitted by ATS to airport operator or other flight crew	• *Assess the need to inform the airport operator* • *Understand the need to relay to other aircraft and flight crew as essential information on airport conditions* • *Adjust PIREP to GRF terminology if provided incorrectly* • *Clear procedures and mechanisms to ensure transmission to the airport operator*

Tasks	Hazards	Defences
Monitor effectiveness of performance data post-GRF implementation	Additional workload resulting from the transition to GRF affecting the service provided	• *Ensure that implementation of GRF is promulgated (e.g. via AIP)* • *Ensure that workload is reviewed to accommodate GRF implementation (planning and rostering)* • *Provide training according to local operation environment (e.g. peak hours)* • *Procedures to assure awareness of all elements of the movement area (e.g. taxiways and apron)*
	Unsynchronized ATIS and SNOWTAM data	• *Implement GRF-compliant ATIS and ensure adequate ATIS capability* • *Apply standard terminology* • *Ensure correct ATIS parcing from SNOWTAM*
Create SNOWTAM/ ATIS using suitable software	New SNOWTAM and/ or ATIS software is not ready	• *Establish transition processes for existing software/ without the use of software*
	Software systems not compatible with GRF requirements	• *Verify existing software for compatibility with GRF* • *Update system functions and test it before implementation* • *If using software to publish RCR/SNOWTAM allocate time for integration*
	Failures in the software	• *Establish redundancies and make a backup procedure available* • *Train staff on how to recover from system failures*
	Staff unfamiliar with the software	• *Ensure software provides the service needed* • *Train staff for the proper use of the software/ SNOWTAM* • *Train staff in SNOWTAM compilation*
Inform rapid changes in runway condition observed from TWR (unofficial information)	RCR is not issued when there is a rapid change in runway condition	• *Ensure ATCOs are trained to identify a rapid changes (e.g. weather) which could adversely affect RCR and inform airport operator* • *Develop policy and procedures for ATCOs to inform flight crew of tower observations of runway surface conditions (e.g. use of phraseology plain language remarks)* • *Use standard terminology and phraseology*
Coordinate access to RWY for assessment of surface condition	Runway incursions resulting from GRF assessments (vehicles and pedestrians)	• *Ensure coordination between ATC and airport operator for the safe assessment of the runway surface condition* • *Coordination between airport and approach control to manage traffic, as needed*

Tasks	Hazards	Defences
F Aeronautical Information Service (AIS) / Meterogology Service (MET)		
Publish SNOWTAM into aeronautical fixed telecommunication network (AFTN)	SNOWTAM publishing fails due to incorrect AFTN format	• *Develop and implement SNOWTAM publication procedures* • *Ensure effective procedures to translate RCR to SNOWTAM* • *Provide SNOWTAM message AFTN-compliant (Syntax limitations) and provide training for awareness* • *Apply standard terminology*
Ensure that systems are GRF-compliant	RCR provided is incorrect or incomplete	• *Establish quality procedures to ensure that information is complete and in the correct format* • *Allow the provision of upgrade and downgrade through the system* • *Adequate technical system specification and adaptation (allow time)*
	Delays or inadequate transmission of RCR	• *Train AIS Staff on the importance of timely transmission, including communications* • *Make systems and procedures available to support timely transmission (identify improvement to accommodate GRF implementation)* • *Establish monitoring and contingency procedures* • *Use of standard terminology and phraseology*