LSI LASTEM

Environmental Monitoring Solutions

AIRPORTS Monitoring Systems

System for runway's conditions monitoring

The **International Civil Aviation Organization (ICAO)** has introduced the **Global Reporting Format (GRF)** from November 4, 2021. The GRF aspires to be a globally harmonized method for reporting runway conditions, replacing and simplifying the different existing methods.
The GRF reports the following parameters:

- Runway Condition Code RWYCC
- Contaminant type
- Contaminant depth
- Contaminant cover

The **RWYCC** is a number between 0 and 6 that indicates runway conditions, based on the type and depth of the contaminant. The possible conditions are summarized in the Runway Condition Assessment Matrix (RCAM).
Contaminant types are standardized descriptions of the type of runway contamination, taken from a list of 15 climate contamination descriptors.
GRF requires a **contaminant depth** rating greater than 3mm only for the following contaminant types: Stagnant water> 3mm, Hail> 3mm, Dry snow, Wet snow, Wet snow, or dry snow over hard snow.
Contaminant coverage represents the percentage of runway covered by contaminants. It must be reported within predefined intervals: 25%, 50%, 75% or 100% of the indicated runway third.
On page 3 the tables for the definition of the parameters are shown.

Global Reporting Format

System for runway's conditions monitoring

ATLAS (Automated Take-off and Landing Assessment System) is a complete solution to provide the parameters of the new ICAO global method for assessing runway conditions, the Global Reporting Format (GRF). The system is composed of several hardware and software elements to automatically detect and measure the required parameters: RWYCC track status code, type of contaminant, depth of contaminant, contaminant coverage.

The Global Reporting Format (GRF) defined by ICAO entered into force on November 4, 2021

Assessment Criteria		Control / Braking Assessment Criteria	
Runway Condition Description	**RWYCC**	**Deceleration or Directional Control Observation**	**Pilot Reported Braking Action**
→ Dry	6	-	-
→ Frost → Wet (includes damp and ⅛ inch depth or less of water) **3mm (⅛ inch) depth or less of:** → Slush → Dry Snow → Wet snow	5	Braking deceleration is normal for the wheel braking effort applied AND directional control is normal	Good
-15°C and colder outside air temperature → Compacted Snow	4	Braking deceleration OR directional control is between Good and Medium	Good to Medium
→ Slippery When Wet (wet runways) → Dry Snow or Wet Snow (any depth) over Compacted Snow **Greater than 3mm (⅛ inch) depth of:** → Dry Snow → Wet Snow **Warmer than -15°C outside air temperature** → Compacted Snow	3	Braking deceleration is noticeably reduced for the wheel braking effort applied OR directional control is noticeably reduced	Medium
Greater than 3mm (⅛ inch) depth of: → Water → Slush	2	Braking deceleration OR direction control is between Medium and Poor	Medium to Poor
→ Ice	1	Braking deceleration is significantly reduced for the wheel braking effort applied OR directional control is significantly reduced	Poor
→ Wet Ice → Slush over Ice → Water over Compacted Snow → Dry Snow or Wet Snow over Ice	0	Braking deceleration is minimal to non-existent for the wheel braking effort applied OR direction control is uncertain	Nil

- Compacted snow
- Dry snow
- Dry snow on top of compacted snow
- Dry snow on top of ice
- Frost
- Ice
- Slush
- 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
- Dry (only reported when there is no contaminant)

RWYCC runway condition code table from 0 to 6 (left) and type of contaminants (right)

Contaminant	*Valid values to be reported*	*Significant change*
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

Note 1.— For STANDING WATER, 04 (4 mm) is the minimum depth value at and above which the depth is reported. (From 3 mm and below, the runway third is considered WET).

Note 2.— For SLUSH, WET SNOW and DRY SNOW, 03 (3 mm) is the minimum depth value at and above which the depth is reported.

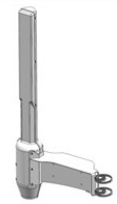
Note 3.— Above 4 mm for STANDING WATER and 3 mm for SLUSH, WET SNOW and DRY SNOW an assessed value is reported and a significant change relates to observed change from this assessed value.

Assessed per cent	*Reported per cent*
10 – 25	25
26 – 50	50
51 – 75	75
76 – 100	100

Table of the depth of the type of contaminants (left) and of the contaminant coverage (above)

System for runway's conditions monitoring



Sensors

- Turnkey solution to provide the parameters for the GRF
- Measurements: RWYCC runway condition code, contaminant type, contaminant depth, contaminant coverage
- Possibility to include more sensors recommended by ICAO (additional pavement sensors, meteorological sensors)
- Software for parameters' processing as defined by the GRF
- Cloud platform for visualization
- Decision support for those responsible for runway conditions

Global Reporting Format

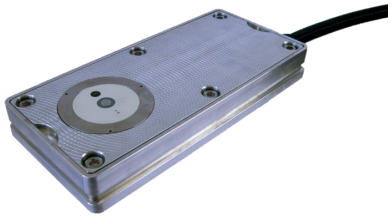
ICAO

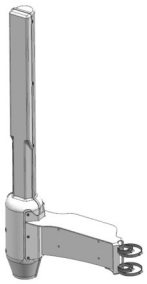
RWYCC
Contaminant type
Contaminant depth
Contaminant coverage

Visualization

ATLAS (Automated Take-off and Landing Assessment System) is a complete solution to provide the parameters of the new ICAO global method for assessing runway conditions, the Global Reporting Format (GRF).
The system consists of various hardware and software elements to automatically detect and measure parameters required: RWYCC runway status code, type of contaminant, depth of contaminant, coverage of contaminant.

ATLAS is the first fully automatic system in the world that does not require the closure of the runway for the measurement of the quantities and the determination of the parameters according to the GRF.
The key features of the GRF are its relative simplicity, its global applicability, as well as its applicability to all climatic conditions.
ATLAS records measured values and historical data, which makes the work and decisions of runway managers safer.
The system is easily scalable according to the size of the airport and can be modified by adding additional sensors to provide additional parameters as a decision support. The system can be used in hot and cold climates with the modification of some components.





Meteorological sensor

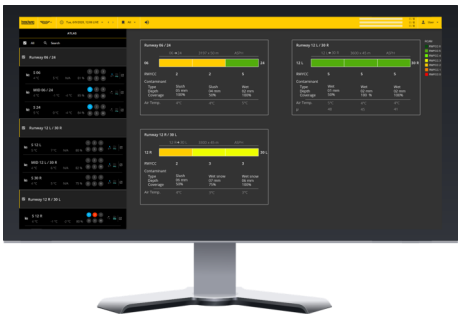
Compact meteorological sensor: allows the measurement of air temperature, relative humidity, type, intensity and quantity of precipitation, visibility, barometric pressure, wind speed and direction. It calculates the dew point. It allows to discriminate the types of contaminants and the transitions between different pavement conditions.

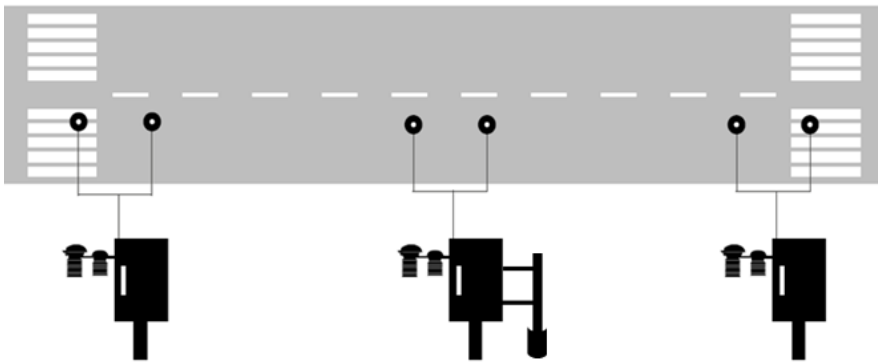
Pavement sensor

Pavement sensor for detecting certain contaminants and conditions: dry, water (wet), frost, ice, snow, slush. Allows the depth measurement of contaminants. Used in conjunction with other components for sensing the transition between different pavement conditions. 2 to 4 sensors are required for every third of the runway.

Snow level sensor

Sensor for identification of snow presence and for measuring the depth of the snowpack. It allows to identify some runway contaminants linked to snowfall and to recognize the transition between different contaminants. The sensor is designed to be installed in airports. A sensor is required for the entire runway in cold climates.





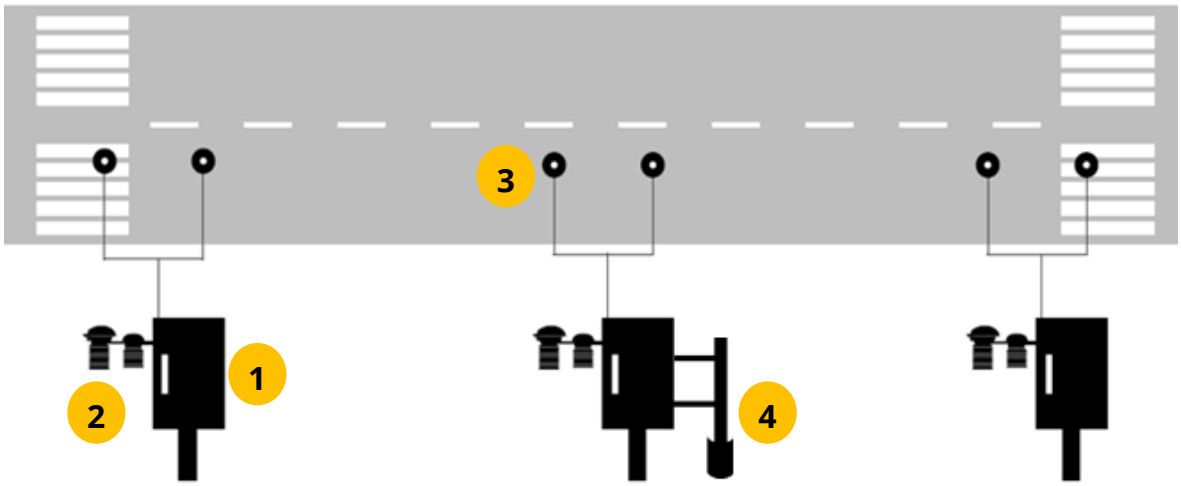
Cloud software

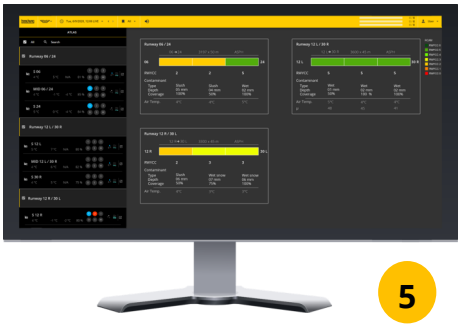
Visualization on RWIS (Runway Weather Information System) cloud software. It is possible to visualize: operational information of ice warning systems on the runway, GRF parameters, additional information (air temperature, coeff. of friction). Information is displayed for each third of the runway.

ATLAS system

The ATLAS system (Automated Take-off and Landing Assessment System), in its basic composition, consists of 2 pavement sensors and of a compact weather sensor for each third of the runway, a snow level sensor for the entire runway and the RWIS cloud software for visualizing the GRF and additional parameters. To comply with ICAO recommendations, an additional 2 pavement sensors and a snow level sensor can be added for every third of the runway.
The ATLAS system can be integrated with pre-existing pavement and weather monitoring systems and can be scaled for airports of all sizes.

ATLAS system





NOTES	
A	Scalable solution according to the size of the airport. A system necessary for every third of the runway.
B	A necessary sensor for every runway in cold climates.

Ref. Fig.	PN	Description	Kit	Ref. Note
		Acquisition station		A
1	**ISEWA0201**	Weather station - ice early warning system	3	
	TXCRA2400	Router 4G/LTE/UMTS/GSM, 2 ethernet ports; includes external antenna cable L=3 m, power cables	3	
	MAPOA1201	Pole h=2 m Ø 100 mm, breakaway in accordance with airport safety standards; includes zinc-coated foot including mechanical swiveling and flanges for mounting the electronic box	3	
		Multi-parametric meteorological sensor		
2	**PRMPA1201**	Multi-parametric sensor: visibility, precipitation type, precipitation intensity and quantity, air temperature, relative humidity, dew point, freezing point, barometric pressure; output ASCII on RS-232/RS-485; rating 12...24 Vdc < 80 mA (<550 mA with heater); includes cable L=7 m + connectors, mounting set for tube Ø 40...60 mm	3	
	MAARA1002	Fixing kit for sensor PRMPA1201, compatible with Ø 100 mm pole	3	
		Snow level sensor		B
3	**PRLVA0001**	Snow level sensor 0...1000 mm, out RS-485, rating 24 Vdc max 17 W, 44 W with heater active	1	

Ref. Fig.	PN	Description	Kit	Ref. Note
		Pavement sensors (see catalogue MW9065-ENG-01-02-03)		
4	**DQA357**	Pavement sensor for airports: runway Contaminant Depth (RCD), runway contaminant type; output RS-485; rating 12...24 Vdc	6	C
	DQA352.0	Pavement sensor: pavement status, surface temperature, water film thickness, salt concentration, freezing point temperature; output RS-485; rating 12...24 Vdc	Optional	D
	DQA353.0	TCS pavement sensor (Traffic Control Support): pavement status, surface temperature, water film thickness, salt concentration, freezing point temperature; output RS-485; rating 12...24 Vdc	Optional	D
	DQA354	Active pavement sensor: freezing point temperature; output RS-485; rating 12...24 Vdc	Optional	D
	DYA350	Case for pavament sensors	6	E
	CCCFA2990	Cable for pavement sensors. L = 90 m	6	E, F
	MW3032	Resin for installation of the sensors housing inside the pavement.	9	G
5		**Visualization software of GRF and additional parameters**		
	SWCLA5100	BORRMA-WEB: RWIS station configuration (una tantum)	3	H
	SWCLA5200	ATLAS: runway configuration (una tantum)	1	H
	SWCLA5300	RWIS: single station hosting, annual license, minimum bundle: 3 years	3	I
	SWCLA5400	ATLAS: single runway hosting, annual license, minimum bundle: 3 years	1	I

NOTES	
C	2 sensors required for every third of the runway, 4 recommended for every third of the runway.
D	Not required for the GRF but recommended by ICAO to obtain additional runway parameters.
E	One for each pavement sensor.
F	Different lengths available.
G	We recommend 3 cans of resin for every 2 pavement sensors to be installed.
H	One off.
I	Minimum: 3 years.

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