Ramp to runway

A year on from the introduction of ICAO's Global Reporting Format for Runway Surface Conditions, Paul Sillers reports on how this safety requirement, and the implementation of supporting new monitoring and lighting technologies, are impacting the airfield landscape.

Runway excursions, often caused by erroneous data on surface conditions being relayed to pilots, has driven the instigation of the Global Reporting Format for Runway Surface Conditions (GRF), which became globally applicable in November 2021.

GRF rules require airport operators to implement a mix of detection technologies around the airfield – especially around runways.

The data then has to be processed and relayed via aeronautical information services channels to ATC, pilots, and airport ground crew, flagging critical issues in cases of adverse weather.

Crew can then take appropriate actions. For example, pilots apply the appropriate level of braking when landing, and ground crew can be deployed to de-ice wings at the stands.

THE RIGHT TOOL FOR THE JOB

A good example of how this is all playing out is at Torino Airport in Italy, which has implemented AirportGRF, a GRF-compliant runway monitoring platform designed for airports to enable them to evaluate runway conditions and share real-time information.

The platform has been developed by the airport's managing company, SAGAT. Twenty-three Italian international and regional airports, plus London Heathrow, Ljubljana, Zagreb, Tirana and Kukës and Amman, are currently using the platform.

Andrea Andorno, CEO of Torino Airport, says: "Initiatives such as AirportGRF allow Torino Airport to meet the needs of air transport quickly and effectively, spreading the benefits of digitalisation and creating shared value with a collaborative approach."

Effective sharing of information through the platform significantly reduces data processing times and minimises errors while exchanging information, the airport's operators say.

TEMPERATURE SENSITIVE

Of course, different locales tend to focus on different parameters. For example, Finnish airport operator Finavia says that the GRF rules affect the flow of traffic at Nordic airports operating in extreme winter conditions.

Runway surface conditions such as snow, ice, water and friction level affect the flow of air traffic. Snow poses challenges in Lapland, while ice is a challenge at Helsinki Airport.

Henri Hansson, Finavia's Technical Director, says: "In terms of airport winter maintenance, this is the most significant change in 50 years. To implement the new methods, Finavia has taken part in extensive international cooperation and has been investing in planning and training our employees for several years. For our runway maintenance operations, this means the adoption of a completely new operating model."

By contrast in Singapore, Changi Airport's tropical climate necessitates continuous monitoring of the level of running or standing water on the runway

OTT Hydromet's Lufft MARWIS mobile weather detection sensors are in use at Hamburg Airport (right).

surface; measurements of runway surface friction levels; and checking of individual airfield light photometric output using specially equipped vehicles. Passing showers, common in Singapore, sometimes wet only one part of the four kilometre-long runways.

To tackle this, Changi has deployed Differential Scanning Calorimetry sensors (using direct lasers to measure levels of water on the runway surface to an accuracy of +/-0.2mm). Sensors placed at every one third of the runway measure and report the rainfall intensity in real time to the airport's GRF-compliant runway condition reporting system.

"This new capability enhances the safety of aircraft operations against the backdrop of higher frequencies and intensities of local rainfall brought about by climate change," says Calvin Yeung, Manager, Innovation and Process Enhancement, at Changi.

NON-INVASIVE MONITORING

For regional airports with modest budgets, what this means in terms of physical upgrades and refurbs across the airfield environment is that rather than rip up runways and embed new sensor devices and lighting systems, operators are turning to non-invasive monitoring equipment to keep costs low and mitigate disruption to airport operations.

Martin Maly, Senior Marketing Content Specialist at OTT HydroMet, says: "Smaller airports are asking how to implement GRF without changing the runway infrastructure, because with traditional sensors you have to tear up the tarmac – and you lose a lot of time as you cannot fly during that operation. That's why customers are looking at non-invasive optical sensors."

OTT HydroMet's Lufft MARWIS mobile weather detection sensors work in conjunction with the company's GRF-compliant ViewMondo software to detect runway conditions and enable it to interface the data with airport reporting systems. The technology is already active at Hamburg, Frankfurt, Lübeck, Paderborn, Cologne/Bonn and Milan Bergamo airports.

The MARWIS module attaches to the back of runway patrol vehicles and can detect temperature, relative humidity, dew point and runway surface conditions (dry, moist, wet, ice/snow, chemical wet). It then determines ice percentages and calculates the runway surface friction, before transferring the data continuously in real time via Bluetooth to a tablet in the driver cab. This data is subsequently relayed via the cloud to the airport's operations centre where it can be viewed using ViewMondo software.

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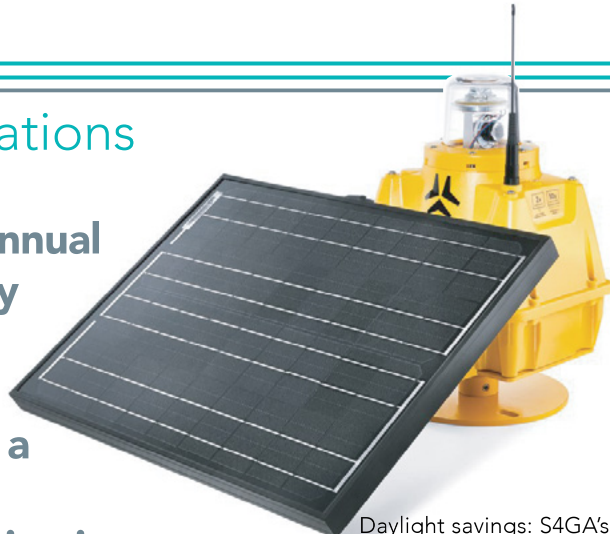
>
> **Andrea Andorno, CEO, Torino Airport**

USING AIRCRAFT AS A SENSOR

Another approach to monitoring runway conditions is through RunwaySense, developed by Airbus subsidiary NAVBLUE. The GRF-compliant system is installed on Airbus A320 and A330 aircraft equipped with Braking Action Computation Function software which reports the condition of the runway during landing.

"By transforming the aircraft into a sensor we're maximising the airports' knowledge of their runway performance and increasing safety for aircraft and airports," says NAVBLUE VP, Thomas Lagaillarde.

NAVBLUE recently inked a deal with Finavia, under which it will access RunwaySense data via SoftAvia's Global Runway Reporter Alert software. Six of Finavia's airports (Helsinki, Oulu, Kittilä , Kuusamo, Ivalo, and Rovaniemi) have implemented RunwaySense. They will use the GRF-formatted data sent back from the aircraft's actual braking action to inform runway clearing activities, particularly relevant for runways subject to snowy conditions.



Daylight savings: S4GA's solar-powered airfield lighting solutions offer low running costs.

> **"The typical annual cost of runway electricity is around £50-60,000 in a conventional system. Sunshine is more economical."**
>
> **Dmytro Kuczeruk, Business Development Director, S4GA**

BRIGHT IDEAS

Of course, with all this runway and ramp condition detection activity, it helps to have some light on the subject. But with escalating energy prices, keeping check on operating costs is key, especially for smaller airports working to tight margins.

Warsaw-based airfield lighting company S4GA supplies a variety of solar-powered lights for runway approach, threshold, taxiways, and illuminated airport guidance lighting, which are for implementation at regional and larger scale airports.

"Running costs for solar lighting systems are minimal," Dmytro Kuczeruk, Business Development Director of S4GA, told *Regional Gateway*. "The typical annual cost of runway electricity is around £50-60,000 in a conventional system. Sunshine is more economical."

Maintenance costs for traditional wired systems are around 10% of system CapEx annually, whereas solar maintenance is usually under 1% of system CapEx yearly, due to solar being low voltage and maintainable by regular airport staff.

S4GA's implementations at regional airports include Ethiopia's Jijiga (Wilwal) Airport, where electrical power supply is intermittent due to an unstable electrical grid. S4GA, together with its partner Alpha Airport, provided a solar LED airfield lighting system equipped with five-level protection against system failure.

In another scenario at Lithuania's Aleksotas Airport, when municipal authorities decided to renovate the airport for business and GA use, a hard-wired runway lighting system was beyond the airport's budget.

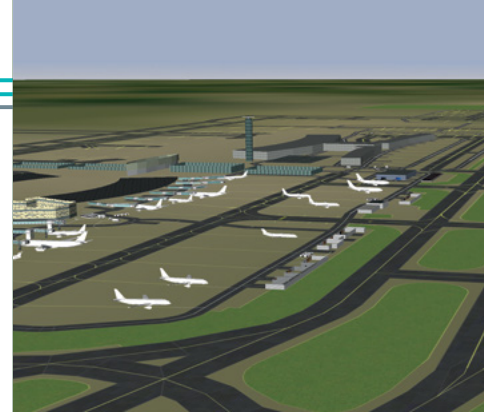
S4GA, in collaboration with airfield system integrators FIMA, implemented a permanent ICAO-compliant solar runway lighting system incorporating a specially designed mounting assembly that could be installed without disrupting operations and without drilling into the runway.

It is often assumed that solar lighting is only feasible in sunny regions. However, as Kuczeruk explains: "Airports such as Scotland's Campbelltown, where we installed solar lighting, generate enough power during the winter to provide around three hours of lighting per day. For them that's enough for the low frequency of flights during low light conditions."

In situations where a single runway airport needs to be closed for several months for refurbishment, a parallel taxiway can sometimes be activated as a temporary runway during the construction.

"These airports don't want to abort operations while they refurb the main runway," says Kuczeruk. "But they can continue to operate using solar lights, and so this is how our system is also used."

S4GA is currently offering a free trial of the system to interested airports." ■



AirTOP can be used to simulate scenarios and configurations on the runway.

Improving runway design and capacity and minimising congestion

With air traffic on the rise, understanding movements on the airfield and planning enhancements to improve infrastructure is integral to optimising efficiency and futureproofing airports. Transoft Solutions' AirTOP offers a gate-to-gate fast-time airport and air traffic modelling simulation tool that can be used to monitor, assess, and improve runway, taxiway, and apron operations by replicating an airport's physical and procedural characteristics. If an airport wants to improve its runway capacity or carry out runway maintenance for instance, AirTOP can be used to simulate different scenarios and configurations to test performance or determine when the optimal time would be to close a runway for refurbishment. In a recent project, AirTOP was used to estimate the capacity of the runway system at Olbia Costa Smeralda Airport, in northern Sardinia, to demonstrate that rapid exit taxiways were a valid way of increasing traffic volumes by reducing runway occupancy time for arrival flights. AirTOP can be used in conjunction with AviPLAN, which is used for airside design and planning and allows for a more geometric level of detail in terms of the spatial requirements that aircraft and vehicles require when manoeuvring around the runway, taxiways, and apron, or parking at the stand.

AviPLAN offers a geometric level of detail in terms of spatial requirements.