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ICAO GRF & TALPA COMPLIANT

THE EFFICIENT AND COST-EFFECTIVE WAY TO QUICKLY ASSESS AND REPORT ON RUNWAY CONDITIONS

WHITE PAPER

OTT HydroMet

Every day, pilots, air traffic controllers and airport operators work hard to make air travel as safe and efficient as possible. Before COVID-19 took control over the world, 4.5 billion passengers entered a plane in 2019, more than ever before. These are about 12.5 million lives to protect each day.

However, flight security also depends on external factors we can hardly influence, especially referring to risky weather conditions: strong winds, freezing temperatures, or heavy precipitation can have serious consequences. Combined with increasing air transport, as shown in figure 1, the need for safety measures grows in parallel.

ICAO GRF – The New Global Reporting Format for Runway Surface

To provide the necessary information to ensure the required safety level, especially for takeoffs and landings, the International Civil Aviation Organization introduces a global and standardized reporting format for runway surface conditions, the Global Reporting Format (GRF). It has to be implemented by 4 November 2021. This provides effective means to anticipate the airplane braking performance for airport traffic managers [(2)].

One step of the TALPA is the socalled NOTAM (Notice to Airmen) - a crucial encoded report for airmen, which is determined by national authorities. The code is usually sufficiently self-evident allowing a fast recognition of hazards or obstacles [(3)].

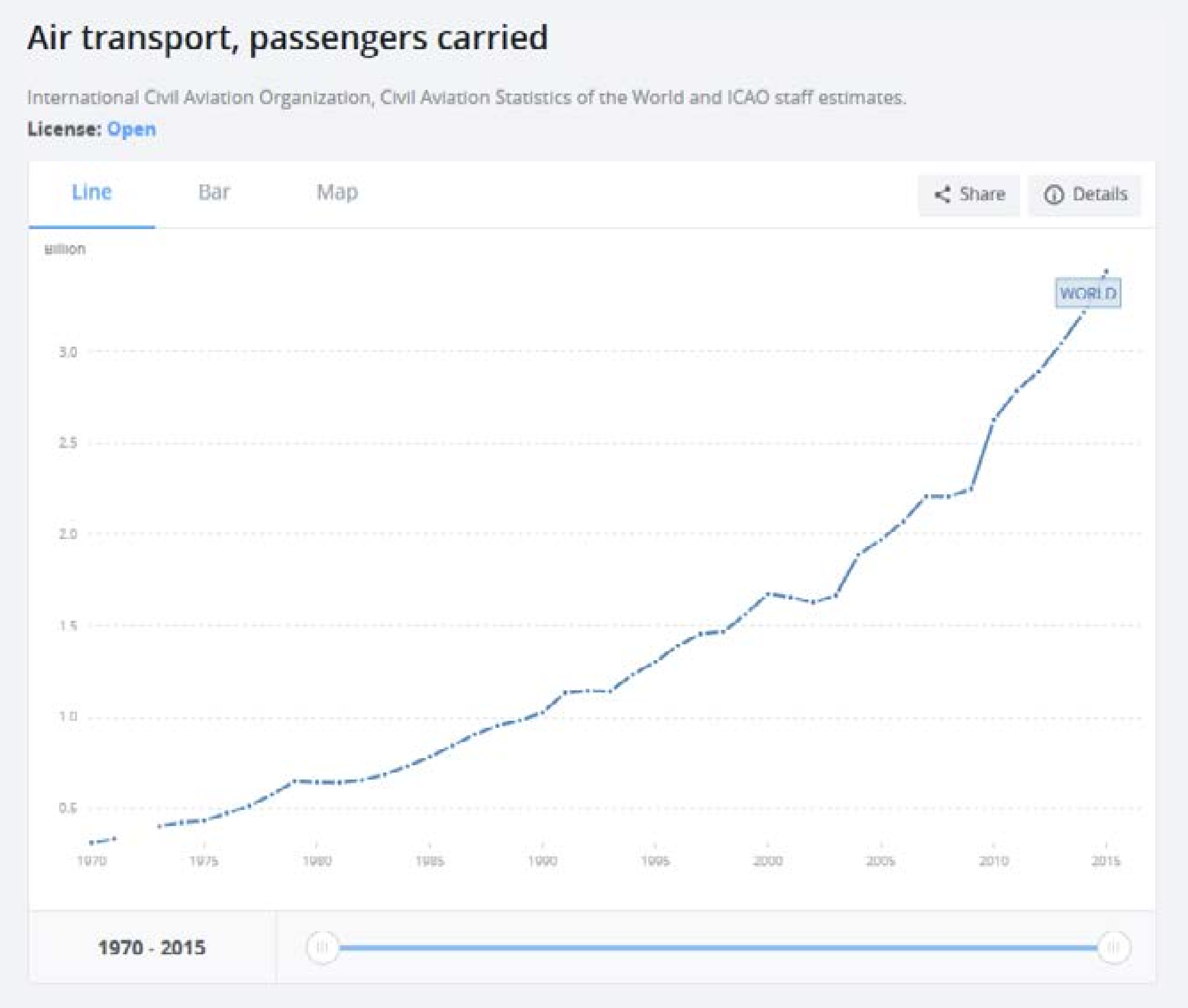

Figure 1: Air transport, passengers carried

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[(1)] © The World of Air Transport in 2019, ICAO, www.icao.int/annual-report-2019/pages/the-world-of-air-transport-in-2019.aspx

[(2)] © European Organisation for Safety of Air Navigation (EUROCONTROL) (2016), www.skybrary.aero/bookshelf/books/3593.pdf

[(3)] © European Organisation for Safety of Air Navigation (EUROCONTROL) (2016), www.skybrary.aero/index.php/NOTAM

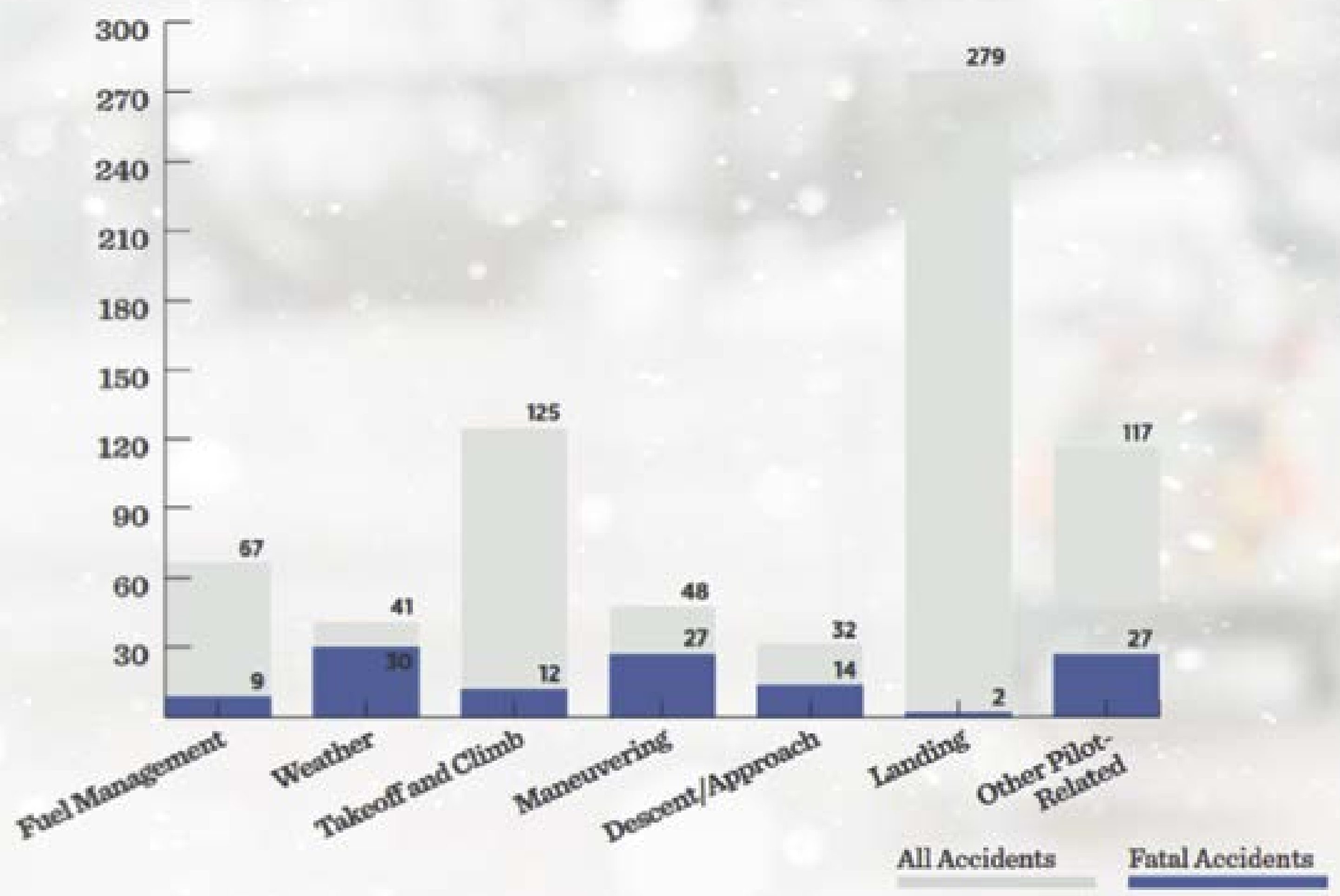


Figure 2: Types of pilot related accidents in 2013 – 41 of 709 accidents were weather-related, © AOPA

SNOWTAM is understood as a special form of the NOTAM notifying the presence, or removal, of hazardous conditions due to snow, ice, slush, or standing water in a specific format (4).

From November 2021 onwards, the ICAO GRF and SNOWTAM (as TALPA already is in North America) will become mandatory on airports, whereas until then the simpler RCC (Runway Condition Code) report, which is a part of the SNOWTAM, is sufficient. The trigger of this change was a Southwest Airline Boeing-737 overrunning the Chicago-Midway Airport runway in December 2005.

But what are the needed parameters and how are they delivered?

Landing safety depends, among other factors, on the runway grip or friction which needs to be included in the above mentioned reports. It is mainly influenced by different kinds of layers on the runway surface. Grip on dry surfaces can be measured by a grip tester, which has already been used on airports for many years. But most of the friction level estimations depend on experienced airport traffic managers who are responsible for informing airmen on the runway conditions via radio communication or via printed reports for pilot briefings. “Normally the first step of a runway assessment is done visually from a patrol car. In case of apparent frost, ice, or other dangerous conditions, runway technicians sometimes use a mechanic μ-meter, Skidometer, or a GripTester issuing the data on a protocol printout”, explains Michael Eberling, transport manager at Airport Saarbrücken, Germany.

(4) European Organization for Safety of Air Navigation (EUROCONTROL) (2016), www.skybrary.aero/index.php/SNOWTAM

Air traffic controllers record the runway weather message onto an ATIS (Automatic Terminal Information Service), which is an recorded tape retrieved by aircraft crews via a known radio frequency. The ATIS is updated for every significant change of (weather) conditions. The airport operators also feed the MOTNE (Meteorological Operational Telecommunication Network Europe).

The latter is an appendix of the METAR (Meteorological Aviation Routine Weather Report) distributed by the national aviation weather service, such as the DWD in Germany, informing on current data on the runway (RWY) designator (e.g. R27), type of deposit, extent of contamination, depth of deposit and estimated braking conditions. The MOTNE is part of a briefing package every airplane crew has to read before the start of a flight. In turn, the pilot gives his or her feedback on the landing conditions back to the tower (see workflow in figure 3).

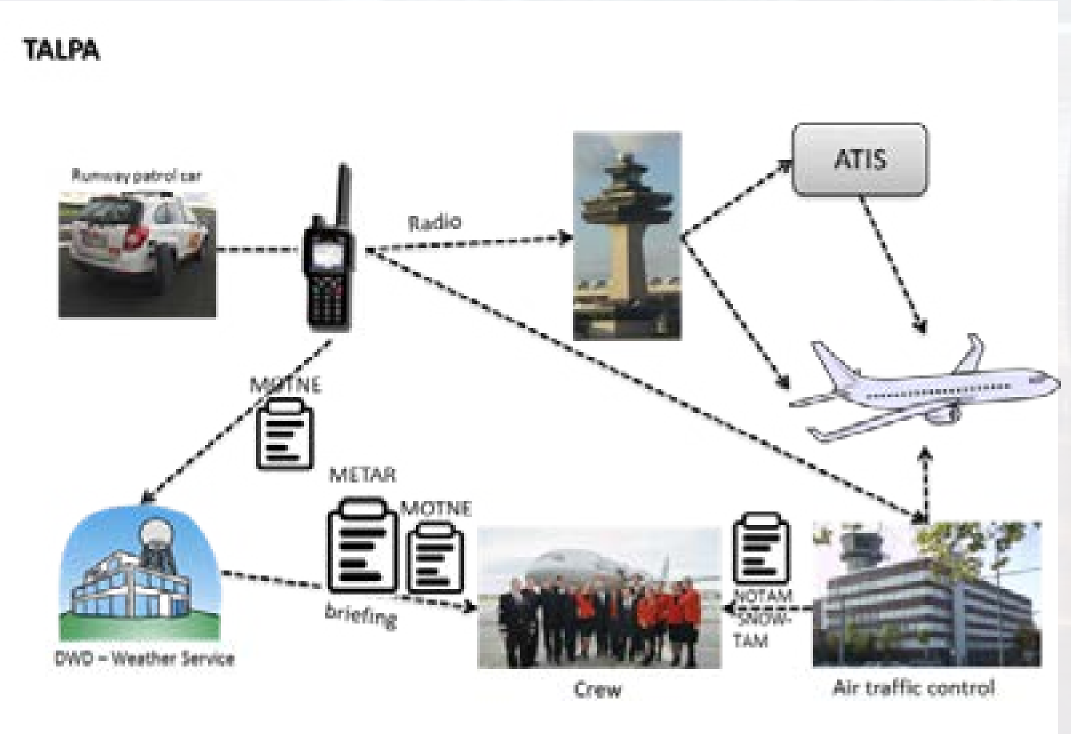


Figure 3: TALPA Workflow

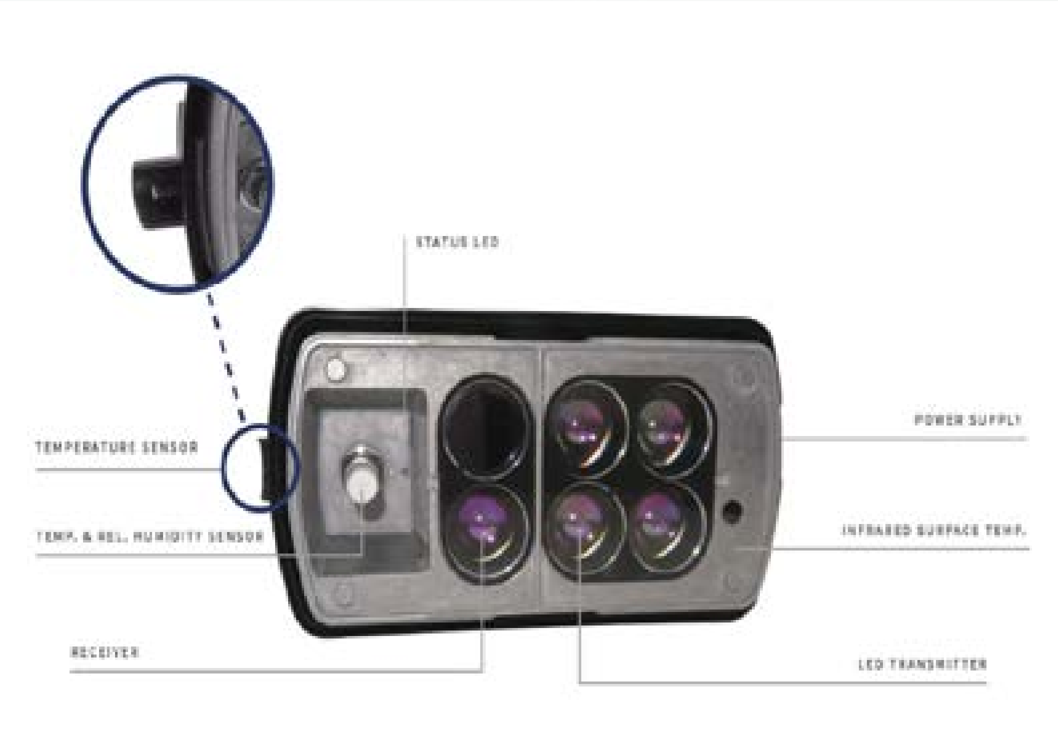
Is the visual estimation of the runway conditions sufficient for the high safety requirements on airports? The figures speak against it: On average, 14.4% (see figure 2) of all aircraft accidents in 2013 [5] (Source: AOPA, see figure 2) and 63.1% of aviation system delays in the US between 2003 and 2017 (source: FAA [6]) were weather-related. But, how can this be prevented?

[5] Types of pilot related accidents, AOPA (2015), www.aopa.org/-/media/files/aopa/home/pilot-resources/safety-and-proficiency/accident-analysis/nall-report/15-fn-0022-1-24th-nall-v6.pdf

[6] Airline On-Time Statistics and Delay Causes, United States Department of Transportation (2017), www.transtats.bts.gov/OT_Delay/ot_delaycause1.asp?type=4&pn=1

New technology for runway weather assessment

One answer to improve aircraft takeoff and landing safety is new technology in form of the mobile runway weather sensor MARWIS (see figure 4). As an addition to the usual AWOS (Automatic Weather Observation System) equipment such as embedded runway surface sensors and stationary weather sensors, it improves the determination of runway (RWY) conditions and digitalizes the handling of runway condition codes of traffic managers, pilots and towers. It thus offers a new toolbox to digitalize airport workflows for processing and transferring the runway conditions in the right future-proof coding such as the SNOWTAM or MOTNE. How exactly does this change the landing preparation?



Fast and digital

The compact MARWIS can be mounted on all kinds of airport patrol vehicles and directly delivers the runway conditions dry, moist, wet, snow, slush, ice, chemically and critically wet. It issues this data both on mobile devices, such as a tablet, and stationary output devices, such as in a control center (TWR). Therefore, it supports the traffic manager in the patrol car during the runway assessment without detours. Moreover, MARWIS issues a weather-related friction value between 0.1 and 0.82 (low to high) which is similar to the CRFI (Canadian Runway Friction Index). This means, that the smart sensor detects the friction for the different runway contamination levels from dry to water, ice or snow covered and feeds them directly into the MDSS (Maintenance Decision Support System) software ViewMondo in the right format of SNOWTAM – and this with a notably large number of local high-resolved measuring points along the runway thanks to the high data transfer rapidity of 1.0 Hz.

Using MARWIS for the assessment is linked with two decisive advantages: Airmen get considerably more information for their decision-making, and the workflow takes less time, because by retrieving the data automatically the runway is blocked for a shorter period. This frees precious time for the TALPA workflow, which must not exceed 10 minutes. However, airport traffic managers still hold the reigns of the data, as the ViewMondo software allows any modification of the issued runway condition codes directly on the mobile output device in the patrol car, in case the observations require it, or the feedback of the pilots calls for a level downgrade. The SNOWTAM and RCC/ RCAM reports can be printed, or sent by e-mail, e.g. directly from the patrol vehicle to the tower (see data flow process in image 5).

In order to provide accurate location data, individual spots of the runway can be stored in the route's master data and tracked by the output devices, such as a tablet, or a GPS module. This is

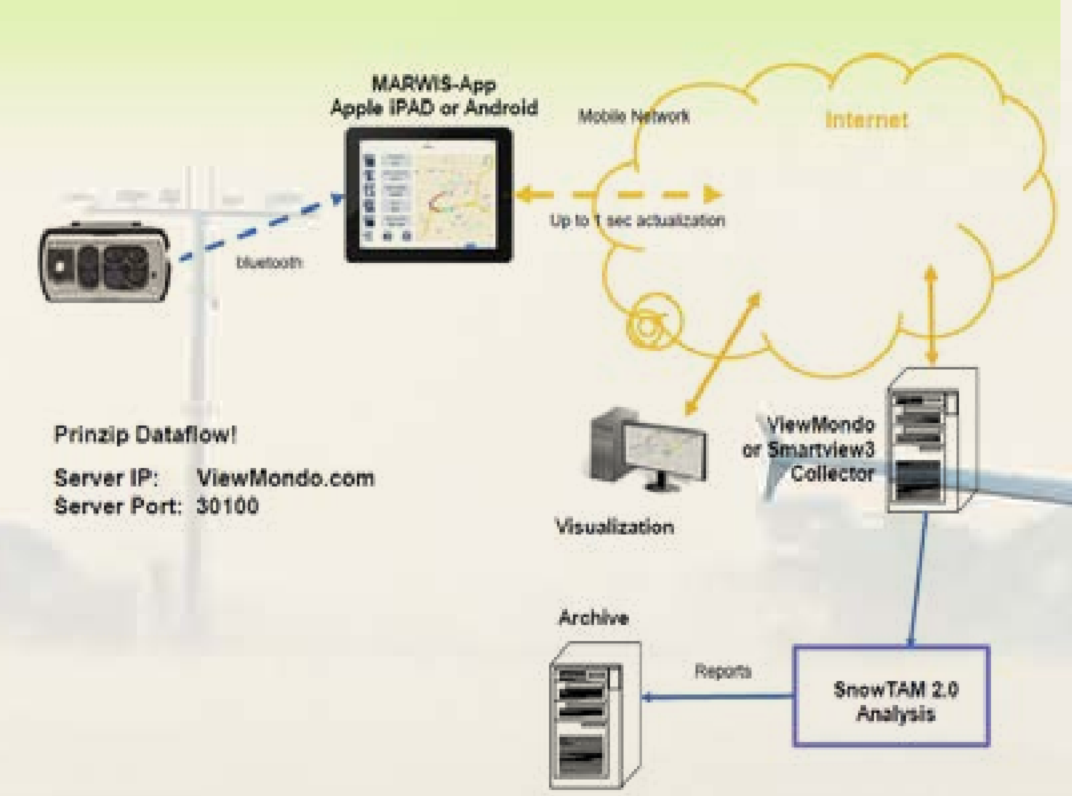


Figure 5: Principle data flow: runway condition monitoring

especially important for the TALPA, where the runway states need to be reported for each of the three sections (see figure 6).

More efficient de-icing

Within one week, one of the first airport users in Europe was able to save more than 10,000 Euro with the help of MARWIS, achieved by a more efficient output of de-icing chemicals. By using the new mobile sensor, the traffic managers were able to recognize chemically wet runway spots, where de-icing chemicals were still active and needed less, whereas especially critical spots needed more treatment. Moreover, under certain conditions, the residual de-icing chemical density can be estimated quantitatively. This is not only decreasing costs but also increasing the landing safety even more.

Outlook on future aviation tasks

As shown above, many different ways to assess and maintain runways are prevailing in the airport business, meaning that there are no officially valid international standards yet. The introduction of the TALPA will be one step forward to a global settlement. For the estimation or measurement of runway conditions there is also no standard available, forcing airport technicians to choose the best method to go with individually.

The mobile sensor MARWIS from Lufft, issuing weather-related friction values, water film heights, runway conditions, ice percentages, and dew points as well as surface and air temperatures at once, is the most versatile and future-proof equipment for a successful TALPA performance according to ICAO specifications.

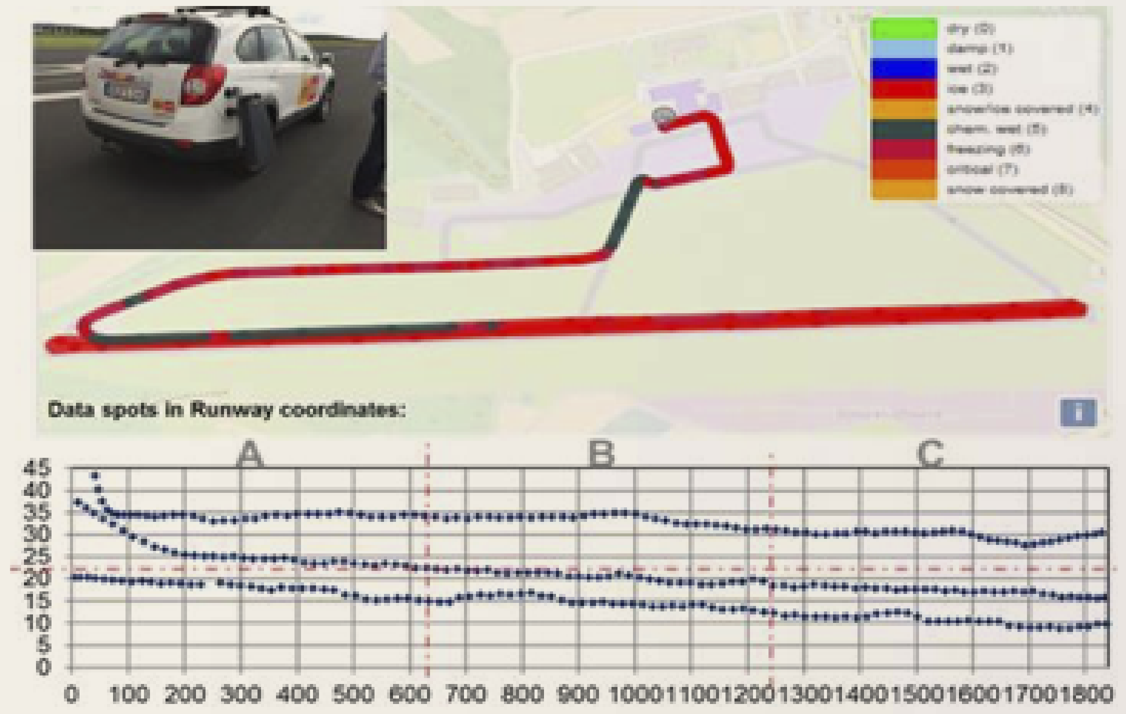


Figure 6: Runway division and assessment according to SNOWTAM
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Insights for Experts

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