A slippery business

By Marcus Blomlöf, Supervisor Stockholm Arlanda TWR

It is well known that contamination on the runway may be a contributing factor to a runway excursion. In Sweden, known for warm and dry summers, the contamination mostly consists of snow and ice in the winter...

Stockholm Arlanda airport is situated in the far north of Europe where winters are crisp and cold. The airport normally has winter conditions at least 4 months a year. Snow clearing and de-icing procedures on runways and aircraft becomes a routine business - with some 2 metres of snow falling last season this is understandable. With the standard two runways open, the airport can still continue to function even during prolonged snowfall. How is this done? How do we maintain good braking actions? How do we prevent runway excursions?

The big difference in weather conditions during the year makes ATC work highly diverse, especially for the tower controllers. Mixing a group of large sweepers and aircraft makes an interesting challenge. During a standard winter day, the supervisor in the tower works very close with the person from the airport in charge for the airside snow clearing. This is vital to ensure the best appreciation of the runway status and assessment of breaking conditions and contamination.

The airport supervisor for the snow clearing is responsible for the condition of the runways, taxiways and aprons. He or she decides what to do, when to spread de-icing fluid, etc. The standard way to remove the snow is to use a group of sweepers for a circuit around the airport including two of the runways and associated taxiways. A typical circuit for the sweeper group at Arlanda takes 48 min. After 48 min, if it is still snowing, they start it all over again. Timing is everything; the sweeper group has to be ready to start clearing the runway when the final arrival touches down. No lingering allowed on the runway, the next arriving aircraft are exactly 12 min away.

To clear runway 01L/19R (3301m) with a group of 8-10 sweepers takes 10 min. Following the sweepers are 2 friction testers (Two SAAB 9-5, same as Chicago O'Hare) which measure the breaking action. It takes an additional 2 minutes to measure, calculate and publish the friction values, including the contamination.

This value is then given to the aircraft using the now snow-free runway. The breaking action value is accurate at the time of the measurement. No estimate of the future value is given, only the value and the time of the measurement. In heavy snow this means that the values may be worse than the latest published figures. However, pilot reports are also taken into consideration. After all, Scandinavian pilots are used to winter conditions. However, if you are the last aircraft using a runway before the sweepers starts clearing, the values that ATC gives you may be relatively old…

Of course, to measure the friction the two vehicles have to be on the runway. If you want to measure the number of landings more often, departures will consequently be reduced which may create delays. It's a thin line between keeping an adequate and up to date friction value, while trying to use the runway to accommodate as many air-

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craft as possible. Again, here is when the professionalism and experience of the supervisor for snow clearing is of highest importance and value. With their deep knowledge and experience, their judgment is one of the most important tool for keeping the runways and taxiways in a good condition; if needed they make the decision if and when to spread de-icing fluids on the runway. For this, a modern type of (environmentally friendly) fluid is used, which has the ability to reduce the freezing point. The Aviform product that is used at Arlanda can be spread down to -50C, it is mixed with water (!) to make it as efficient as possible. However, spreading de-icing fluids on the runways is no miracle cure against runway excursions; it has to be carefully evaluated. The fluid is always efficient but needs to be carefully monitored, e.g. followed by sweeping within a certain time period to avoid freezing.

The condition of the runways and taxiways is always the top priority. This may, as a spin-off effect, have an impact on the apron conditions. Sometimes, pushback trucks are unable to get a grip on the icy surface. The solution to this is to spread warm sand in front of the truck, an efficient but very time consuming way of dealing with poor friction! The breaking value on the apron can stay poor during extensive periods during the winter, but the snow is always removed (sooner or later!) allowing the aircraft to enter and exit the gates.

SOME FACTS

Surface Liquid de-icing	684.842 Litres
Sand	2.850.000 kg
Aircraft de-iced	9468
Number of days with snow clearing	110
Snow 2009/2010	190 cm
Largest amount of snow during one day	23 cm
Total area to clear of snow	2.946.043 m^2

The system using 2 runways even during a longer snowfall has proved very effective. Delays are kept to a minimum while being able to land and depart regularly and independently of each other. A few days each year however, the weather conditions become extremely severe, making it impossible to operate two runways. Typically this is often the case when snowfall is combined with strong winds that polish the surface of the runway. The polished surface has to be ground down using blow sweepers and this requires the sweepers to enter the runway more often. The circuit takes around 30 min; it may reduce the operational available runway time to 36 min per hour. This will normally build up delays but luckily this situation is rare, normally a light to moderate snowfall have a surprisingly low impact on the throughput.

The drivers of the trucks, ploughs, blow sweepers, snow blowers etc. are typically seasonal employees, making an extensive training program before each winter season necessary. It is important to ensure not only how to handle the vehicles, but also how to use the radio and how to navigate the airport including where clearance is needed and where it is not.

One challenge for the tower controllers during snowfall is to keep track of all the vehicles that are busy with the snow removal. Starting from the winter season 2010/2011 all vehicles will be equipped with a transponder making them securely identified via the multilateration system. To further ensure the integrity of the runway, the use of stop bars is mandatory.

To maintain high safety and throughput, the airport and ATC have developed good coordination procedures and also invested in training and equipment. The cost of keeping 12 sweepers, support vehicles and drivers available 24/7 is not to be underestimated. However, this investment is essential, as we often have winter in Sweden. Even with careful preparation and long experience, each winter season is a new challenge, snow has a strange habit of falling when it is least expected….

And we do not like runway excursions!

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