

# AIRCRAFT DE - ICING

Ján Ferenc – Peter Koščák – Jana Ferencová

The article discusses the necessity and the need for de-icing of aircraft. It refers to the experience from abroad how to de-ice aircrafts. It describes the environmental aspects of de-icing and also highlights several promising devices, simulators and aircraft de-icing fluids that are used abroad. Their application under the conditions of international airports in the Slovak Republic is considered too.

**K e y w o r d s :** aircraft de-icing, de-icing environmental aspects, de-icing fluid, simulators

## 1 INTRODUCTION

At present, new technologies have begun in the field of aircraft de-icing, which place emphasis on environmental policy but also the world community to accelerate and streamline the process.

In the USA the winter of 2009/2010 will be remembered as a time of record snowfalls and record low temperatures. De-icing processes at the airport have been challenged by the severe winter and with the spotlight firmly focused on efficiency, safety and the environment, attention is required.

There has already been a change instigated by the US Federal Aviation Administration (FAA) on safety grounds.

## 2 CHANGES IN AIRCRAFT DEFROSTING

On December 1, 2009 the FAA announced that it was banning take-offs with "polished frost" which is the practice of buffing frost on wings, stabilisers and control surfaces to make them smooth, instead, from January 30, 2010 operators, aside from regional and major carriers, which already cannot fly with "polished frost" will have four alternatives, using wing covers to prevent frost accumulation on wings, waiting for the frost to melt, storing the aircraft in a heated hangar or de-icing the wing surface.

## 3 ECOLOGICAL ASPECTS OF AIRCRAFT DE-ICING

A major change in de-icing is likely due to the US Environmental Protection Agency (EPA) proposing Effluent Limitation Guidelines and New

Source Performance Standards for storm water runoff produced from de-icing activities. De-icing fluid at least at the moment, is not that environmentally friendly and unintended run offs can cause damage. A recent inspection of a creek at the Nashville international Airport turned up what seemed to be a case of severe pollution caused by aircraft de-icing fluid that could have killed some endangered crayfish. New EPA guidelines, which will quite likely be emulated by other authorities, will have an effect on airport de-icing activities.

„Airports that conduct aircraft de-icing operations, have 1,000 or more annual jet departures, and 10,000 or more total annual departures, would be required to collect spent aircraft de-icing fluid and treat the waste water. They may either treat the waste water on site or send it to an off site treatment contractor or publicly owned treatment works," says the EPA; some airports will be required to reduce the amount of ammonia discharged from pavement de-icing, too.

The US National Air Transportation Association (NATA) is concerned. The EPA's one-size-fits-all approach to dealing with de-icing runoff does not adequately account for the unique operations at our nation's commercial service airports. The specialized operations of individual airports and the effect their efficient operation has on the national airspace system do not lend themselves to this type of standardized approach to environmental regulation.

As the focus switches from emissions reduction to glycol recovery, JBT Aero Tech is in the mix for a solution. "One system that has been proven to reduce aircraft de-icing fluid (ADF) by over 60% is Air First forced air offered on our Tempest de-icer. De-icer Engineering Manager at JBT AeroTech, "AirFirst uses a

powerful 82 kW (110 hp) compressor and a nozzle with a patented tip to direct air to the aircraft surface at Mach 0.9“ The operator can chose from several forced air and fluid combinations that best meet the demands of the current weather conditions.

The AirFirst is very good on dry snow and that savings can be made during de-frosting operations. "A small amount of heated ADF is injected into the air stream and applied to the aircraft surface in a wide fast moving swath. Not only less glycol is required, but the operation is done more quickly than with conventional methods, thus reducing the aircraft's ground time.

#### **4 PROSPECTIVE FACILITIES FOR AIRCRAFT DEICING**

There is a range of innovative de-icing equipment available now. Global Ground Support's latest offering is the Orion de-icer, a self propelled unit that is specifically designed for small to medium sized aircraft up to a 767/A330. At the sharp end of de-icing, Task Force Tips has a range of anti-icing/de-icing nozzles with flow fixed gallonage settings and high-flow automatic pressure control settings. Based in Wisconsin, Premier Engineering & Manufacturing Inc, established in 1991, has a range of de-icing equipment and offers service and support, too.

In Sweden, Safeaero says that the German and the Norwegian air force chose the new Safeaero 220EH with extended height for military operations. Safeaerols mission is to offer airlines, airports and private ground support handling enterprises the most efficient de-icing vehicle. The one man operated de-icer range includes the Safeaero 220, 220EH and the 223IXL. The Safeaero 223XXL is a completely new design with a maximum nozzle height of 22m, a tank capacity of up to 14000 litres and a maximum operator's eye height of 17m. The all new boom system with horizontal reach of 16m allows for de-icing the A380 wing at the wing route from the front. The one or two man operated de-icers include the

Safeaero Typhoon and the new Safeaero 210XX5. The company also offers a proportional mixing system and a management/co-ordination system which has been developed for full control of the de-icing/anti-icing procedure.

In Mississippi, Ground Support Specialist LLC manufactures and re-manufactures ground support equipment including de-icers, such as the GS 700 and the GS 1400. The company specializes in aircraft main deck loaders, heavy pushback tractors, and new custom built chassis and de-icers.

In the UK, Kilfrost is a leading de-icing and anti-icing fluid manufacturer. Kilfrost's Head of Operations, Tim Peyton, reflected recently on the latest winter season. When it comes to predicting winter weather a crystal ball would be great but we've got the next best thing which is a lead-in to the very latest meteorological data and satellite imagery. We can see what the MET Office sees. Talking about volumes of de-icing fluids needed for 2009-2010, you only have to look over the delivery schedules to see just how much demand has increased. As an example, British Airways ordered 25% of previous year's volume in just one 24 hour period this year, and Italy took its usual full year's stock in a 10 day period in December.

The Met Office Aircraft de-icing service helped leading airlines such as BMI to optimize their aircraft de-icing operations. Forecasters issued an unprecedented number of alerts and accurately predicted airframe king on 97.5% of occasions, over three hours in advance. This not only reduced delays and costs, but also lowered the environmental impact through wasted fluid." According to Flight on Time, in turn based on Civil Aviation Authority (CAA) statistics, BMI is rated the most punctual scheduled airline at UK airports for the fourth year in a row.

#### **5 SIMULATORS, AIRCRAFT DE-ICING**

Training with a de-icing simulator can be a cost effective method, especially when mistakes affect computer pixels not real aircraft. Working

with Global Ground Support, ForgeFX simulations has developed an interactive 3D simulation for the operator's of Global's Extended Reach De-icers. Forge7X. The company recently delivered Version 4.0 of the Global Ground Support De-icing Simulator. This version is updated to include two military aircraft for the US Air Force to train on, an open bucket model of de-icer, and a number of other supervisor setting controls, which allow the administrators to fine tune the simulator on a session by session basis. The simulator also includes an ER 2875 extended reach de-icer used to de-ice large aircraft such as the A380. The next version of the simulator will include, "Gobars Orion De-icer plus a new real time physics based wind system that will allow simulated fluids to react to the virtual wind more realistically".

Servisair provides ground services at 128 locations worldwide, delivered by around 15,000 staff to 700 customers, handling 1,1 million aircraft movements. The company operates the Servisair Toronto Central De-icing Facility (STCDF) it was one of the first companies to use de-icing equipment simulators as part of its de/anti-icing training programme. "Currently, Servisair operates two MPRI (a division of L-3 Communications) Elephant Beta Trainers, STCDF To provide the most realistic experience for the students, the simulators are networked together to give operators the feel that they are de/anti-icing the aircraft. To really get the feel of the job "exactly", replica scenery of the Central De-icing Facility (CDF) pads and terminal aircraft gates is implemented into the software. Students have the flexibility to select the variant of equipment they would like to operate, the pad in which they wish to be positioned, as well as the aircraft type they would like to spray.

Each aircraft is slightly different by adjustments to vehicle positioning and the spray techniques required. "The type and amount of aircraft snow/ice contamination can be adjusted. A major advantage of simulator training is that it can take place any time, all year round. Those additional features are the ones that could include additional aircraft types and forms of contamination, active precipitation (with varying

types of weather), temperature /wind/ visibility adjustment, day/night de-icing scenarios and emergency scenarios.

"We have noticed an increased level of proficiency and skill compared to operators who did not have this technology available to complete their training on in years past," says Schock. "As a trainer, this reduces the amount of time required in the jump seat during operator checkouts to ensure the new operators are de-icing safely and efficiently."

In 2005, Servisair began to prepare for de-icing the A380." The standard de-icing equipment utilised at the CDF was not fully capable of de/anti-icing the entire aircraft. The existing equipment could not reach the fur height of this aircraft's vertical stabilizer. As a result, four Vestergaard Elephant Beta-15s were acquired to accomplish this task. These units are only one of a few in the world that are capable of reaching up to the top of the 24.1m A380 vertical stabilizer.

## 6 NORWEGIAN ICE

Norway has the same latitude as Alaska, Greenland and Siberia and, although it has pleasant spring and summer seasons, winters can be very cold, Roros Flyservice is a Norwegian handling company whose task is to bathe the ice and, to that extent, it has invested in new equipment from Vestergaard.

The company provides ground handling services at nine Norwegian cities: Oslo, Trondheim, Tromsø, Bodo, Kristiansand, Bardufoss, Alesund, Molde and Roros. These locations all have one thing in common: cold winters. But these are regional airports and often investment in large ground support equipment is unwarranted.

That is why Roros Flyservice has invested in the Vestergaard Elephant Sigma de-icer - a more compact piece of equipment than others it has operated over the years. Arve Engen, Managing Director of Roros Flyservice comments they are very satisfied with this new product. In Norway, they have 55 airports and many of them

are quite small. To invest in big de-icing vehicles is very expensive for all of those small airports.

He is extremely pleased with the results of the Sigma in operation, "The economics of operating this equipment are very good. It is cheaper to warm up - after all, the liquid we use has to be warmed up to 90°C and to warm up large quantities in big tanks is very expensive. Given its location at small regional airports, Roros Flyservice usually de-ices smaller regional and commuter aircraft for which the Sigma is perfectly suited. But it is still able to de-ice bigger aircraft like the 737.

Happily, there has been no great need for extensive training on this product as the equipment operators were perfectly familiar with larger versions of the de-icer. Sigma will be cheaper for the company to maintain and easy to store during warmer weather.

## 7 ICING UP IN TALLINN

Tallinn Airport, in Estonia, experiences those cold wet days we associate with the Baltics. For example, on January 1, 2010 the temperature was down as low as -26°C. The winter season 2009-10 kept all its de-icers extremely busy, including its Vestergaard Elephant Sigma the baby of the bunch. The airport operator is present at six stations where it delivers handling and de-icing services. Actually, they started with Vestergaard in 2001 and the first equipment that they bought was the toilet truck which is still in operation in Tallinn. In total they have four de-icers, of which three are brand new. The smaller one was at Tallinn for three months in order for their staff to become familiar with the product.

Last year, Tallinn Airport was even de-icing aircraft during May and starting again at the end of September. This means that the Vestergaard de-icers are in use for around half of the year.

## 8 CONCLUSION

In September 2009, Servisair and Emirates commenced simulated de-icing of the A380 at the company's Toronto facility and from there onto the real thing. To date, this aircraft has been de-iced 20 plus times in Toronto. The average de-icing time for the aircraft being contaminated with frost or light snow is three to five minutes (de-icing only), for moderate to heavy contamination 15-20 minutes (de-icing and anti-icing).

What weather challenges lie in store for de-icing suppliers, service providers and service procurers for the future are unknown but in terms of operations, innovation, training and regulations there looks to be plenty of opportunities and enforcement for them all to continue to adopt and adapt.

Defrosting of aircraft played and in the period ahead will play a crucial role in the winter operation of the airport. At the forefront it received new technologies such as portal or specific deicing using infrared rays. Furthermore, using new types of de-icing fluids is not only less harmful to the environment but also economically more advantageous especially to both the airliner and airport operator. It is also possible that they are developing completely new methods, which will show up in the near future.

**Resume:** Článok pojednáva o nutnosti a potrebe odmrazovania lietadiel. Poukazuje na skúsenosti v zahraničí s odmrazovaním lietadiel. Popisuje ekologické aspekty odmrazovania lietadiel. V článku sú taktiež vytypované niektoré perspektívne zariadenia a kvapaliny na odmrazovanie lietadiel.

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## AUTHORS' ADDRESSES

Ján Ferenc, Ing., PhD.  
Technical university of Košice  
Faculty of Aeronautics  
Rampová 7, 04021 Košice

e-mail: Jan.Ferenc@tuke.sk

Peter Koščák, Ing., PhD.  
Technical university of Košice  
Faculty of Aeronautics  
Rampová 7, 04021 Košice  
e-mail: Peter.Kocsak@tuke.sk

Jana Ferencová, Ing.  
Technical university of Košice  
Faculty of Aeronautics  
Rampová 7, 04021 Košice  
e-mail: Jana.Ferencova.2@tuke.sk