WHEN
ELEPHANTS MELT ICE
AERODYNAMICALLY CLEAN TAKEOFF

The formation of ice on the wings and fuselage can dangerously alter the aerodynamics of an aircraft. This is why those futuristic vehicles spray a mixture of glycol and hot water shortly before takeoff on the aircraft. These vehicles are called “Elephants” because of their trunk-like spray boom. Depending on the type of aircraft, they spray between three and six liters of fluid to de-ice the aircraft and to prevent ice from re-forming before takeoff. The water/glycol mixture sticks to the aircraft like a jelly-like mass. When the aircraft starts, the fluid loses its adhesion and runs off so that the aircraft takes off aerodynamically clean and free of ice. However, the anti-icing agent only protects the plane for a certain amount of time, referred to as the “hold over time”. If this time is exceeded before the plane starts, the de-icing process must be repeated. This is just one of many parameters that must be taken into account when planning aircraft de-icing.

STICKING TO THE FLIGHT SCHEDULE

As the last link in the chain of aircraft ground handling services, de-icing must be organized in such a way that the flight schedule can be maintained even in winter. De-icing extends the aircraft ground handling time by 15 minutes on average and so it is especially important that staff and resources are planned efficiently. This is a highly complex matter. At Frankfurt Airport, at peak times up to 340 services employees work in three shifts around the clock from October to April to de-ice 500 aircrafts a day by using 57 Elephants.
COMPLEX PARAMETERS

De-icing logistics are not only affected by an extremely large number of variables, but by parameters that are sometimes also hard to predict, like the weather. It is therefore difficult to estimate how many aircrafts actually need to be de-iced every day. At the end of the day, it’s down to the individual pilot to make that decision. He has up to 40 minutes before the departure time to decide whether or not to request de-icing. If he does, the start of de-icing must be coordinated in relation to the scheduled time of departure and the type of aircraft. After all, it takes longer to de-ice a big Airbus than a smaller aircraft. The aircraft type also determines the number of de-icing vehicles to be used. For example, up to six Elephant vehicles are needed at the same time to de-ice an Airbus A380. As soon as the time has been set, the staff and vehicles have to be organized so that the right employees always arrive at the aircraft with the right equipment at the right time. Even the question of where to de-ice the machines plays an important role. Frankfurt Airport has assigned special areas for this near the runways called de-icing pads. On particularly hectic days, however, the machines are also de-iced at their parking positions. In this case, the de-icing Elephants have to take into account longer routes via a defined road network.

PLANNING WITH INTELLIGENT SOFTWARE

Such complex and time-critical planning is scarcely possible at all without the assistance of intelligent control software. A system like the GroundStar software offered by INFORM is also connected to the airport’s A-CDM system (Airport Collaborative Decision Making) and the weather service. The system therefore knows the flight schedule and the expected weather conditions. The software uses this information to predict the number of scheduled departures likely to require de-icing and plans the expected de-icing orders in advance. This allows the airport to also calculate in advance whether there will be a greater than average number of de-icing operations on extremely cold winter days and what effects that will have on the flight schedule. Thus, passengers can be informed of any possible delays or flight cancellations. As soon as a pilot issues a de-icing request, this is reported to the A-CDM system first. In coordination with the A-CDM system, the start time for de-icing is automatically generated, taking also into account the available de-icing resources. The GroundStar software then automatically assigns the de-icing order directly to the on-board computer system of an available Elephant.

Using GroundStar, aircraft de-icing logistics can be integrated into the entire aircraft ground handling process so efficiently that the flight schedule can almost be maintained, even in winter. This is little consolation for John Smith for he has missed his plane. However, he is prepared for next time: He keeps a close eye on the weather report and always keeps his ice scraper handy in the glove box.

THESE VEHICLES ARE CALLED ELEPHANTS BECAUSE OF THEIR TRUNK-LIKE SPRAY BOOM.