A new airport has been built during the past ten years on the Argentine side of the Tierra del Fuego archipelago. The airport serves the growing number of tourists visiting the area. To efficiently maintain an open runway in rapidly changing weather conditions, the local airport authority, Aeroporto International del Ushuaia, selected a Vaisala IceCast ice prediction system. Through continuous monitoring, the IceCast system helps with runway maintenance in extreme weather conditions, while reducing the costs of de-icing materials and labor.
the Andes mountains that curl down from the Chilean coast, and then drop onto an airstrip that borders the Beagle Channel. The airport is on a flat stretch of tundra-like grassland. Airport operations in extreme and quickly changing weather conditions are an added challenge. Landings and take-offs have to go safely and smoothly.

The weather can change extremely quickly and, because there is so little land mass below 50° latitude, fierce winds can occur during storms.

The site of the airport is a former island that was changed into a peninsula by transporting one million cubic meters of soil and rock, smoothing off the previously hilly terrain to about 50 meters above sea level. The runway, designed for landings of large aircraft, runs roughly east to west, to match the almost ubiquitous westerly winds. The local air force is already using the airport for delivery flights to the Antarctica, and three Argentinean airlines have daily connections to other mainland destinations.

The airport will be opened to international carriers in 1998, when other charter airlines are planning flights to Ushuaia. By next year, the volume of operations is expected to grow considerably.

The airport’s opening ceremony was held on 12 June 1997. Of special note is the terminal building, which is the largest wooden building in Argentina. Both its design and materials blend into the scenery and natural setting of this fascinating place.

IceCast system cuts costs

The Ushuaia system is the first IceCast installation in Argentina, and in fact all of South America. It is also the southernmost installation in the world.

The airport system consists of three ROSA automatic weather stations (Road Surface Analyzer), each with DRD11A precipitation sensors, HMP35D humidity and air temperature probes and two DRS50 road and runway sensors. Using this set-up, the three stations monitor local weather and surface conditions on the runway and at the taxiway entrances.

The runway, sloping from the center point in each direction, is designed for the fastest possible run-off of water. For this reason, six DRSS0 sensors were placed at critical points of the runway to achieve the best coverage for the surface readings. Because of the prevailing westerly winds, the center and touchdown area are the most critical in icy conditions.

The data collected and analyzed by the ROSA station is processed every 15 minutes by the central IceCast Server, where it is sent every 15 minutes via a radio link. The radio modems of the ROSA system transmit at a rate of 9600 bits/second over a distance of up to 2 km. The transmission takes place very quickly and is very secure.

The new-generation ROSA road weather station is highly modular and allows various configurations. With its robust and compact structure, it can be used in very harsh environments. The stations can be linked together in small networks to reduce cable length, speed up installation, and increase reliability and accuracy.

Accurate readings of runway surface conditions

The state of the runway surface is measured with a patented passive technique for recording the polarization and conductivity of the surface. This technique has been utilized with the latest ROSA station, so a determination of water film thickness and depression of the freezing point can be made. This ensures that both the surface of the sensor and the surrounding road surface are measured and taken into account in the resulting readings.

The runway states to be determined are as follows:

- **Dry** – surface is dry
- **Moist** – surface is moist
- **Wet** – surface is wet
- **Trace** – residual chemicals on the surface
- **Wet and Trace** – surface wet and de-icing chemicals present
- **Frost** – hoarfrost present on the surface
- **Snow** – it is snowing, or has snowed recently
- **Ice** – mono-crystalline (black) ice on the surface

Comprehensive ROSA weather stations

Thanks to its modular compact design, the ROSA station is quick and easy to install. It is also sufficiently robust to withstand even the most extreme weather conditions.
weather conditions. Because of its integrated system operation and unique detection principle for determining amount of the de-icing chemicals and the freezing point, the station performs all required measurements, compiles the results and provides the interpretation of its input in a user-friendly format.

The data is displayed in various ways in the IceCast Server, in tabular or graphical form, or in data blocks overlaying the airport map for a quick overview. The various runway surface conditions, warnings and ice alarms are displayed in a user-friendly format. Because the weather can change extremely quickly in Ushuaia, it is important for users to make quick decisions. So they have to understand the effect and combinations of various air, surface, ground, depth and dew point temperatures, as well as the freezing point. All this data is provided by the ice detection system, which helps users determine how conditions will develop.

The ice detection system only makes predictions for the next several hours, by following slopes and correlating them with pre-defined thresholds for user alarms. For 24-hour and longer forecasts, the forecasting office uses FORECAST software to produce highly accurate predictions of surface temperatures and conditions, cloud amount and height, and precipitation.

Additionally, an alarm box is connected to the computer to give audible and visual alarms in case of critical runway conditions. This box is currently in the meteorologists’ office, but when the airport building is ready, it will be moved to the winter maintenance facilities. Although it will be located next to the workstation, the alarm box is directly controlled by the IceCast Server. As the workstation is not necessarily updated as often as the data collected by the weather stations, this allows for the fastest possible alarms in case of hazardous conditions.

In the future, the workstation will be located at the winter maintenance facilities. Local companies will be responsible for winter maintenance, and will use the workstations to monitor weather conditions at the airport.

An Uninterruptable Power Supply (UPS) secures the safety of the system operation, as breaks in the power supply are quite common in Ushuaia, and the backup power system at the airport is already serving all other installations.