

# Out in the field

– Finnish Defense Forces put new RS92-D radiosondes to test

Finnish Defense Forces organized a large-scale training event for national artillery and mortar units in Rovajärvi, Northern Finland in May. The two-week event brought together some 3,000 conscripts, several hundreds of reservists in refresher training and a few hundred members of the army personnel to test equipment out in the field.

“Training events are extremely important in terms of testing new equipment. Experiences from the field are needed to ensure the equipment meets our requirements - a radiosonde that works splendidly at a Vaisala testing facility doesn't necessarily work out in the field, in the middle of nowhere,” says Senior Lieutenant Reijo Miettinen, leader of the meteorological section respon-



Senior Lieutenant Reijo Miettinen heads the ballistic weather service for Niinisalo Artillery Brigade in Finland.

sible for the ballistic weather service for Niinisalo Artillery Brigade in Finland.

Vaisala's new radiosonde RS92-D, however, passed the test. “The Rovajärvi event was the first time we tested the new radiosonde in the field, and we found it to be fully operational. The reservists in my group had no problems performing soundings using the RS92-D, they mastered its use with little instruction”, Miettinen says.

## Soundings help determine the impact of weather

Atmospheric conditions directly affect the accuracy of artillery fire. A few years back NATO working groups on meteorological services came to the conclusion that 67% of errors in artillery fire are caused by weather.

Upper-air soundings are used to gather information on pressure, temperature, relative humidity, and wind speed and direction. This basic weather information is used to define horizontal wind conditions, air density and elasticity/sonic speed, all factors affecting a trajectory.

“Soundings are a central tool in determining the impact of weather

*The RS92-D replaces the earlier RS80-67 model of Vaisala radiosondes for radiotheodolite use. Finnish Defense Forces tested the new sonde during a two-week training camp in Finland's Lapland.*

on our operation,” Senior Lieutenant Miettinen points out.

“The firing distances of modern artillery fire can be tens of kilometers, during which time the ammunition goes extremely high into the upper atmosphere. Therefore it is self-evident that we need detailed weather information to calculate ballistic trajectories.”

## RS92-D: independent from GPS

The RS92-D is a digital radiosonde designed for use with Vaisala's radiotheodolite RT20 systems. The main difference to the earlier models in Vaisala's RS92 radiosonde family, in use since 2004, is that the D model does not rely on GPS for wind data calculation.

The radiotheodolite antenna tracks the radiosonde automatically throughout the sounding using the principle of radio direction finding (RDF). The antenna gives bearing and elevation angle, whereas the altitude is computed from the radiosonde sensor data. This information is used to calculate wind speed and direction.

The RS92-D is based on the same platform as the other RS92 series radiosondes. It has the same trans-

ducer unit and the same demonstrably excellent capability in terms of PTU performance.

The RS92-D uses capacitive wire to take temperature measurements, which reduces time lag and lowers solar radiation error. Humidity measurement is based on two sensors with alternative heating, which eliminates the freezing and contamination issues of the previous generation. In addition, the humidity sensors can be reconditioned to remove any chemical contaminants to ensure measurement accuracy.

The silicon-based pressure sensor is smaller and more reliable than the earlier version, which at times suffered from being mechanically sensitive and temperature dependent. Battery activation is no longer needed as the sonde is equipped with a drycell battery, ready for use immediately.

## Easy to operate

In practice, the operation of the RS92-D follows the same procedure as the previous generation and is very straightforward and simple. Frequency can now be set with software via cable instead of using a manual tuning screw, and calibration coefficients are read directly from the radiosonde memory via cable or telemetry link.

“This is a very concrete improvement and definitely a step forward in terms of usability,” says Senior Lieutenant Miettinen. “Previously the calibration coefficients were read optically from a paper tape, and it was not unheard of that out in the field the paper sometimes got wet, after which it couldn’t be used anymore. Another improvement is that it is no longer possible to read the same tape twice.”

## Fully digital data transmission

The digital data transmission of the RS92-D offers important advantages over analog data transmission. Data



*Training events are good opportunities to test new equipment out in the field. The reservists on a refresher course at Rovajärvi mastered the use of RS92-D with little instruction.*

availability during a sounding is excellent and telemetry errors are always detected. The digital transmitter also consumes less power than an analog transmitter and more channels are available in the meteorological frequency band.

The RS92-D is fully compliant with the European ETSI standard, which aims to regulate usage of the 1680 MHz meteorological band in order to universally improve meteo-

rological data availability. The data messages are coded into ballistic weather data (e.g. NATO STANAGS) and general WMO formats, and can be distributed using either dedicated serial communication lines or a TCP/IP FTP server.

### Further information:

[www.vaisala.com/weather/applications/ballisticweather.html](http://www.vaisala.com/weather/applications/ballisticweather.html)