



Bart van de Kerk, M.Sc.
Project Manager
Siemens Nederland N.V.
Den Haag
The Netherlands



The radiotheodolite antenna tracks the radiosonde automatically throughout the sounding. An operator shelter on the vehicle is used for data processing and telecommunications equipment.

Ballistic Meteo System for

At the beginning of 2000 the Dutch Army placed an order with Siemens Nederland to build seven new ballistic meteo shelters. The new systems will replace the present ones and allow expansion of the amount of operational systems in use. This new order also gave the Army the possibility to equip their meteo systems with the latest technology. Vaisala has been responsible for designing a system that meets the Army's requirements and Siemens Nederland has done the system integration in order to get a fully operational Ballistic Meteo System.



The launcher makes it easy to fill the balloon and launch the radiosonde.

Special requirements

The military application sets some special requirements for the meteo system. The most important is gaining reliable upper-air data, up to an altitude of 20 km, for tactical defense applications. The data contains the parameters of the wind speed and direction as well as the pressure, temperature and humidity (PTU).

From this data, meteo messages are made in real-time according to the STANAG format. The user transmits these messages with standard radio systems of the Dutch Army. The whole meteo system, excluding the radiosonde, must be passive during operation so as to avoid detection.

Old and new technology

The army's present meteo systems use radar technology to track radiosondes. This makes them very complex systems whose reliability may be wanting. As the army would also prefer to carry out maintenance on site, a less complex system is required. The new systems are

Latest meteo data is vital

According to the Dutch Army, artillery operations carried out in harsh weather conditions require the latest meteo data.

The purpose of the Ballistic Meteo System is to provide artillery units with the latest local meteo data. The data is used to calculate ballistic trajectories and correct them for the specific atmospheric circumstances. The Dutch Army has been involved in various UN missions in recent years. In these operations it is very important that the system is highly mobile and can be used in extreme conditions.



The sounding workstation and telecommunications equipment are operated inside the spacious EMI/EMC protected shelter.

the Dutch Army

equipped with two different methods of tracking radiosondes, both of which are less complicated than a radar system.

The easiest way is to use a radiosonde with a GPS receiver, which measures the phase data of the GPS signals. This data is transmitted to the base station using 403 MHz telemetry. The location of the base station is determined by another GPS receiver or by inputting manually. Wind speed is calculated by using GPS data from the radiosonde and the ground station location.

The other method implemented in the meteo system is the use of Vaisala's RT20 Radiotheodolite. The RT20 uses a radiosignal (1680 MHz band) from the radiosonde to determine the position of the sonde. As the antenna is kept pointing at the radiosonde, the azimuth and elevation angles can be measured. Using the antenna's angular pointing data and the radiosonde height information, based on measured atmospheric pressure, temperature and humidity, the software calculates the wind speed and direction. This appears to be a reliable and

accurate method and has the advantage of not being dependent on the availability of the GPS satellite system. The disadvantage of the RT20 is the fact that, during the sounding, the base station is not moveable. Whereas the advantage of GPS sounding is that the base station can move around in a limited area – which can be important for camouflaging. As the system is equipped with both wind finding functions, the user can always make his choice.

The receiving antennas, either GPS or RT20 can be positioned up to 30 m from the base station, which makes it possible to hide the base station and at the same time to give the antennas a clear view of the radiosonde. All the equipment is painted in colors for optimal camouflage.

Software processing

The radiosonde battery lasts at least 2 hours, which is enough for a sonde to reach a height of over 20 km. During flight the PTU measurements are transmitted in the UHF band to the base station. On the ground all

the necessary equipment, excluding the antennas (GPS and UHF) and the RT20, is installed in a standard shelter of the Dutch Army. In this shelter the signals from the antennas are processed by the DigiCORA III Data Processing System.

A network, in this case an ARCNEL, maintains the communication between the DigiCORA III and the antennas. The DigiCORA III software converts meteo data into useful graphs and meteo messages in real-time. The messages meet the STANAG requirements and are directly used for different military purposes. Siemens Nederland has equipped the shelters with standard army radio systems to transmit the meteo messages to the fire control system.

Extreme conditions

The shelter has enough room for up to three people to operate the meteo workstation and radios. It is also provided with an air-conditioning system for extreme weather conditions. The shelter and the outside meteo equipment are made to withstand temperatures from -40 to +70 °C. Thus, the Ballistic Meteo System is usable all over the world, an essential requirement in modern defense strategies.

Two vehicles are needed for field operation – one truck carrying an operator shelter with the base station and radio equipment, and another truck for transportation of the radiotheodolite, the balloon launcher, gas cylinders and the personal gear of the soldiers.

Training

Because the system contains totally new equipment and software, the Dutch Army contracted Siemens Nederland to arrange training. Markku Markkanen from Vaisala Helsinki gave operational and maintenance training for the meteo system.

One of the systems has been reserved for training purposes. In addition, Siemens has furnished a classroom with four workstations with DigiCORA III software for training and running sounding simulations. This facility helps operators to become familiar with the software. After a certain start-up period, the army will take over the training function. Siemens Nederland is responsible for operator and maintenance training for the operator shelter and the transportation shelter of another vehicle. All the systems will be delivered to the Dutch Army before summer 2001. ■



Training session in classroom – simulation software of DigiCORA III enables training for normal and special weather situations. From left: Mr. te Kulve (Army), Mr. Logman (Siemens), Mr. Meijer (standing, Army) and Mr. Dierckx (Army).