



VAISALA

**Make weather
your ally**

**WEATHER MEASUREMENT SYSTEMS
FOR BALLISTIC PREPARATION**

Your ballistic weapons systems are only as accurate as your weather information



Reliable weather information

In field operations, a superior knowledge of weather conditions has always been advantageous. While modern numerical weather models enhance weather forecasting capabilities, immediate, local weather observations are essential to create accurate weather data reports in support of operational safety and efficiency.

Asserting operational superiority

Accurate weather measurements lead to improved operational efficiency, both in terms of troop readiness for adverse weather conditions and in terms of the performance of complex systems. Vaisala's weather observation solutions are a key contributor to your tactical superiority.

Improved safety

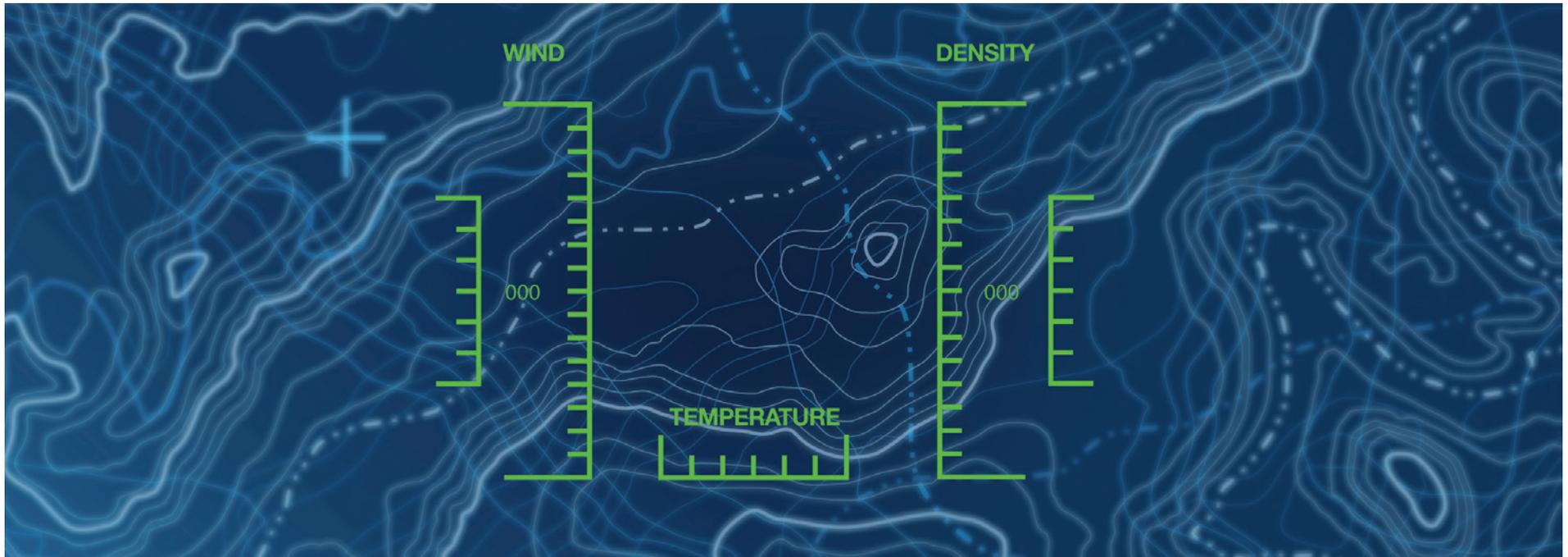
Military operations and disaster response missions often take place over complex terrain or in urban areas. Knowing the present weather conditions lowers the risk for both personnel and equipment losses. This has created a need for new, often mobile, approaches to measuring weather phenomena – a need which Vaisala foresaw and has moved quickly to fulfill.

The greater the tactical complexity – the greater its vulnerability when bad weather strikes

Atmospheric conditions affect firing accuracy of tube artillery, MLRS and mortar fires, and understanding the weather effect can be paramount in achieving accurate first round fire and resulting mission success.

Failing to properly adjust for meteorological conditions accounts for up to two thirds of long-range fire error. Using up-to-date, accurate local weather data, an operator can increase first-round-on-target probability by more precisely compensating for wind and air density.

Upper-air meteorological conditions affecting the trajectory of artillery shells



Wind

The effects of wind on a projectile is easy to understand. Wind along the firing direction impacts the firing range and crosswind causes a deflection error.

Temperature

Variations in temperature affect the flight path in two separate ways: the affect of increasing air density with decreasing temperature and the more complicated affect of temperature-dependent compression waves surrounding the projectile.

Air density

Higher air density increases friction between the projectile and the air and impacts the firing range. Higher air density leads to shorter achieved ranges.

Take the right trajectory



Up-to date atmospheric data is vital

Depending on the mission and other available meteorological data tools, the upper air observation provides valid atmospheric data for a radius of 20 km to 60 km around the release location. As the weather is constantly changing, upper-air measurements are only valid for a limited time, typically from 1 to 12 hours depending on the weather conditions.

Optimized operational capability

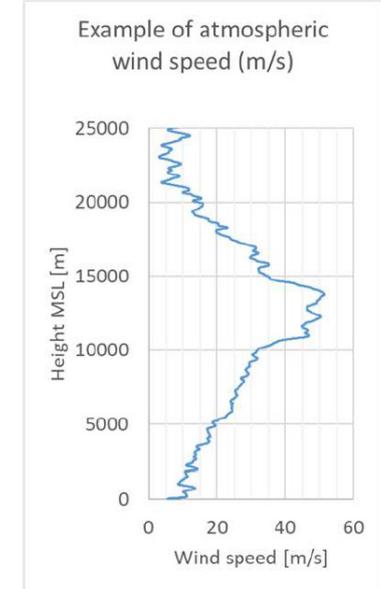
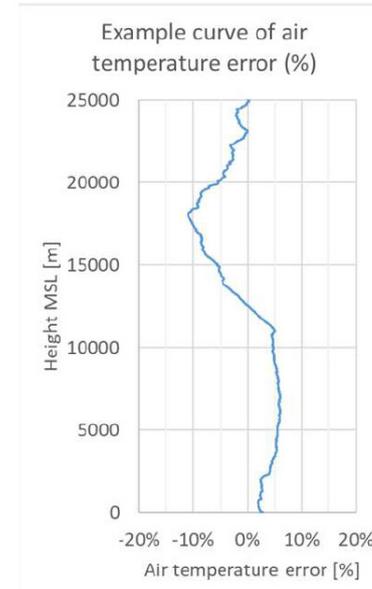
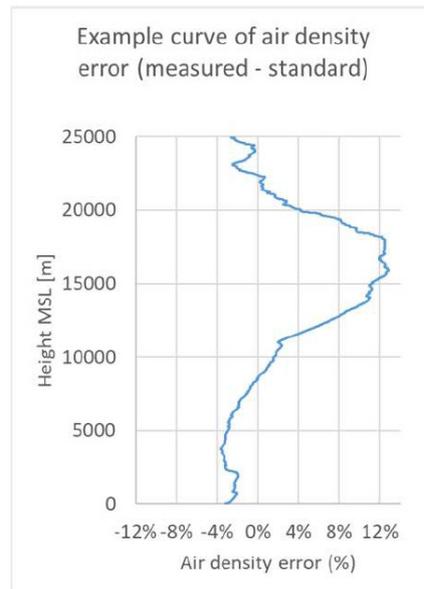
With appropriate infrastructure in place, numerical weather prediction (NWP) provides valid general information over an operational area. However, high-precision accuracy can only be achieved by combining NWP with in-situ meteorological information provided by an operational MET unit equipped with advanced balloon-borne radiosonde systems. MET teams with vehicle-integrated measurement systems are essential to maintain operational capability in all conditions.

The standard atmosphere

By default, modern fire control systems utilize the ICAO standard atmospheric profiles for temperature and air density for calculating the ballistic trajectory.

However, the standard atmosphere is very rarely, if ever, close enough to the prevailing conditions for accurate ballistic corrections. For example, tests in Southwest Asia have shown MET corrections up to 4,700 meters off original target

Source: Tactics, Techniques, and Procedures for Field Artillery Meteorology, FM3-09.15, PCN 144 000266 00 (2007)



Performance built on the principle of passive reception and proven, independent windfinding techniques

Defense forces need weather observation systems that perform accurately and reliably in every field operation, whatever the tactical objective. Reliable operation under all meteorological and climatic conditions is absolutely essential. The system must be very robust and entirely dependable. It must also be easy to use: ease of transport and deployment are no less important requirements.

Upper-air meteorological data is used in fire control systems to correct firing parameters and improve the accuracy of modern artillery. It is also vital in deploying smart weapons that are susceptible to bad weather over target areas. In most cases, upper-air soundings are performed by two operators.

As the balloonborne Vaisala radiosonde ascends through the atmosphere, it measures atmospheric pressure, temperature, and humidity. It tracks the navigation signals and sends the measurement data to ground equipment. Here, wind speed and direction are automatically calculated using global or local navigation networks or independent wind finding methods. The basic set of measurement data can be coded into several message formats – radio transmissions are kept to a minimum.



Safeguard your ballistic investment

Ballistic weapons systems are major long-term investments, and only the ability to deliver true accuracy in real action validates the cost.

The integrated Vaisala meteorological system consists of versatile, high performance upper air sounding systems and a family of specialized precision radiosondes – with choice depending on operational needs and budget.

The system supports all the latest WMO specified and relevant STANAG message formats for ballistic and other defense applications, with over 30 calculated meteorological parameters available in tabular form.

With an optional radiotheodolite, the Vaisala system can be operated independently of GPS.

All this gives you a secure access to rich and accurate meteorological information from the surface to an altitude of up to 30 kilometers or higher while offering the widest telemetry range of up to 200 kilometers with omnidirectional antenna.



MARWIN® Sounding System MW32 No need to handle with care

- Fully ruggedized, modular and light sounding solution with no moving parts.
- Works even in the most extreme weather conditions.
- Provides an atmospheric profile of wind, pressure, temperature and humidity from the surface up to the altitudes to be used in the ballistic weather computation. Data is provided in relevant STANAG and WMO formats.
- Highly reliable with no breakable wires, and wireless connection to the radiosonde
- Radiosonde can be prepared inside its cardboard package, which protects sensors until balloon launch site

Radiosonde RS41-SGM Invisible for security

- Radio silence up to 5 km height or 20 minutes.
- Radiosonde transmission does not reveal the balloon launch location as the transmitter is not switched on until a specified height or time from launch.
- Data is recorded also during the radio silence and, when the radio silence ends, transmitted to the ground equipment. Data encryption ensures maximum safety for the whole sounding.
- Designed for mobile use in the field, and tested to comply with relevant MIL-STD-810G specifications for environmental testing and MIL-STD-461F for electromagnetic compliance.

A soldier in camouflage gear is seen from behind, looking through a scope. The soldier is positioned on a hillside, looking out over a vast, open landscape. The image is split diagonally, with the top-left portion being a solid teal color and the bottom-right portion showing the soldier and the landscape. The soldier is wearing a cap and has a backpack on. The landscape is a mix of green grass and brown earth, with a clear sky in the distance.

VAISALA

Uncertainties are inevitable. Being caught unprepared is not.

Vaisala weather observation systems meet the most stringent performance requirements in the areas of mobility, durability, passivity, independent navigation, automation and size.

We have been working for decades with leading defense specialists, investing considerable resources in R&D devoted to defense customers. The results have made Vaisala the world's most trusted supplier of weather observation systems for tactical operations.

www.vaisala.com/meteorology

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