

MODEM UPPER-AIR GPS RADIOSOUNDING SYSTEM

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Modem's new-generation upper-air sounding system consists in SR2K2 ground station associated with the M2K2 GPSonde. Last developments have brought some technical innovations to reinforce reliability , performances and easy operation and maintenance.

Ground station:

Beside the basic desktop station, Modem has developed a portable version. SR2K2-P is specially designed for temporary field operations on different sites. The receiving system is integrated in a very compact and robust suitcase including a laptop. During transport, antennas and cables are protected into their own smart foam bag.

Both desktop and portable systems have the same functionalities and performance level.

A built-in barometer board provides automatically launch area ground pressure to the software. There is no risk to forget updating the value just before the launch. Nevertheless, the software will accept manual entry from the operator.

New generation ground check looks like a plastics box with a transparent door and it can be set on a table or wall-mounted. The ground check system allows two simultaneous functions.

One is the calibration of temperature and humidity sensors prior launch. Sensor calibration is performed in ambient atmosphere without using any desiccant salt. Placing the sonde into the box doesn't need direct handling of sensor boom, reducing risk of damage and contamination of sensitive elements.

The second function consists in GPS initialization of the radiosonde. Thanks to the built-in GPS repeater antenna, indoor sonde initialization is performed while the sensor calibration is in progress. It is no longer necessary to place the sonde outdoor.

According to customers request, MODEM developed as an option, a dual antenna system particularly designed for shipboard station when deck superstructure doesn't allow ideal installation of a unique antenna. There is also another application for tropics areas where wind flow often brings back the sonde overhead the ground station at the end of the flight. In this case, we offer to combine a basic antenna and a turnstile antenna with a predominant vertical diagram. Both manual or automatic reception modes are available. Running the latest mode, the software will shift automatically to the antenna receiving the best signal.

Software

ICAR (Interface of Calculation and Analysis of Radiosounding) is the new software module developed by Modem's engineers for edition of WMO messages (Pilot, Temp, Climat Temp...) aerological reports (significant points, standard levels...) and sounding analysis

Radioonde

M2K2 GPSonde is registered under WMO code 56. M2K2 conception refers to the highest technology in this matter and is fully compliant with the recent ETSI standard for radiosonde transmitter.

The full coded GPS receiver board provides the position along Latitude, longitude and Altitude with a constant accuracy (10m) during the whole flight

Modem's GPS antenna is an original design for optimization of satellite signal reception in spite of unusual move due to strong pendulum.

M2K2 GPSonde offers three connectors for additional sensors. It is fully compatible with ozone sounding without using the costly interface board traditionally necessary

GPS wind finding is based on differential calculation providing position and speed components (V_x , V_y , V_z) as well. Therefore, we have two radically different methods to determine wind speed:

- Speed is derived from GPS positions (Geometric calculation)
- Doppler measurement is performed on instant speed

Our system combines both possibilities choosing for each data frame the more appropriate method to get the best quality.

Pressure is calculated from GPS altitude and temperature and humidity parameters accordingly to Laplace law. No pressure sensor is implemented in the radiosonde.

This operating mode ensure the same accuracy all along the flight and the benefit is clearly shown below:

At ground level

A sonde with a pressure sensor provides an accuracy around 1.5 hPa which is equivalent to 10 to 15m altitude.

M2K2 GPS accuracy is 10 m on altitude which is equivalent to 1.5 hPa.

At high altitude - 20 hPa level

Pressure sensor accuracy is now around 0.6 hPa which is equivalent to more than 250 m error on altitude.

Conversely, M2K2 GPS accuracy is still 10 m which is equivalent to 0.1 hPa error.

At ground level, both operating modes are similar, but progressively during the ascent, the error introduced by the pressure sensor can reach considerable values on altitude.

M2K2 radiosonde is powered by alkaline dry cells instead of traditional water activated battery:

- Simple and easy operation – Handling without any hazard for the operator
- Autonomy more than 3 hours
- Excellent resistance to extreme conditions up to -90°C outdoor temperature. (batteries and electronics are protected inside polystyrene box)
- No excessive heating production comparatively to water activated batteries. This issue is specially tricky for tiny sonde without any thermic protection, where temperature measurement may be contaminated by the heating of the batteries quite close to the sensor. Artificial software corrections should be applied on raw data
- 3 year shelf life
- On environmental point of view, dispersion of water activated batteries (electrolytic liquid) is finally worse than unleaded dry cells

A new generation dereeler with field-proven efficiency is delivered along M2K2 GPSondes