

# Vaisala AVAPS Lite

## Dropsonde Receiving System



The small, portable, economical  
dropsonding system

# The Lighter Dropsonde Receiving System.

The Vaisala AVAPS Lite MD12 is a dropsonde receiving system for applications that require targeted, detailed, accurate and real-time atmospheric profiles of pressure, temperature, humidity (PTU) and wind.

AVAPS stands for "Airborne Vertical Atmosphere Profiling System", a GPS dropsonding system that was developed by NCAR and introduced in 1997 for hurricane research and reconnaissance. The Vaisala Dropsonde RD93 is used with the Vaisala AVAPS Dropsonde Receiving System. Both products are licensed by NCAR and have been used on many missions in support of operational weather forecasting and atmospheric research.

The Vaisala AVAPS Lite Dropsonde Receiving System is a smaller and more portable version of the Vaisala AVAPS Dropsonde Receiving System. It receives data from a single dropsonde at a time and can be operated with a laptop PC.

The sounding software receives and displays the raw dropsonde data on the PC in real-time, an important aid to in-flight decision-making. The data is stored in ASCII format on the hard drive, where it can be post-processed and displayed with programs supplied by the user or with dedicated data processing software. The Vaisala AVAPS Lite uses the same sounding software and data processing hardware as the full Vaisala AVAPS: the data outputs and post-processing programs are compatible.

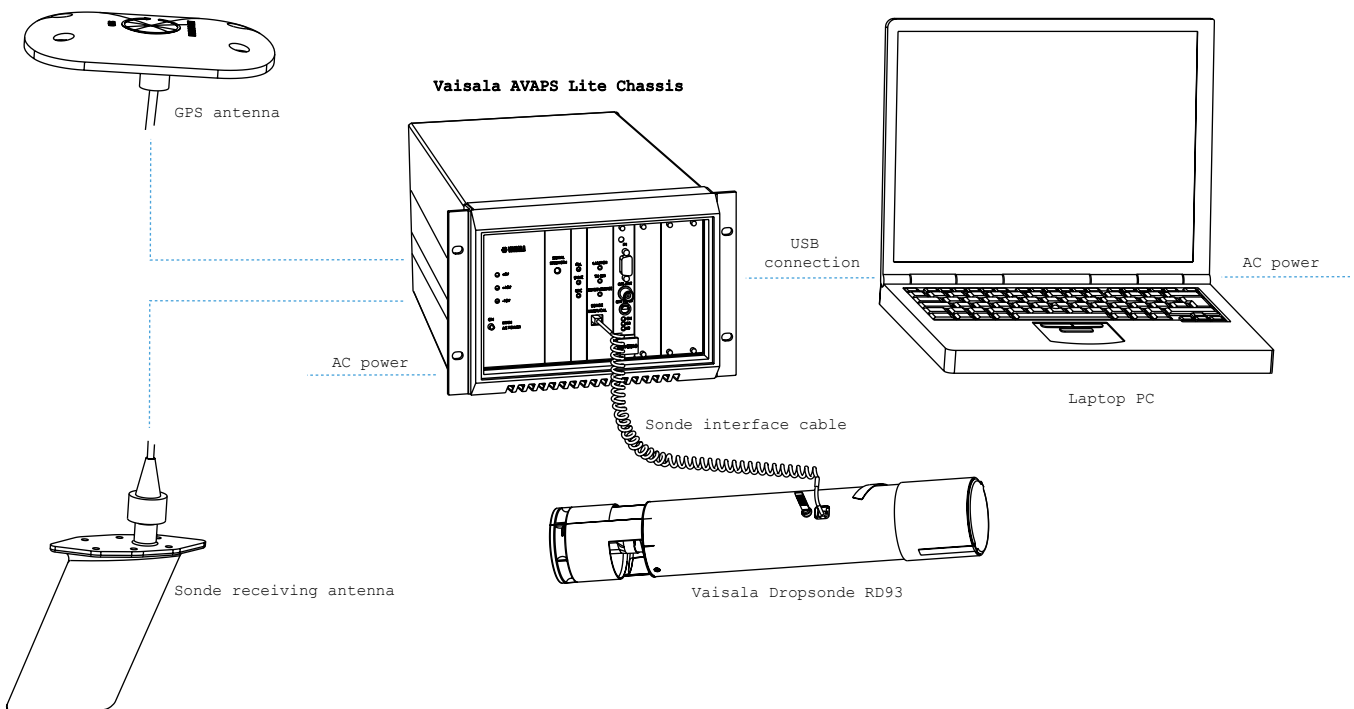
## What is a dropsonde?

The Vaisala Dropsonde RD93 is a meteorological measurement device that is launched from an aircraft or other manned flying platform. Descending through the atmosphere by parachute it measures the atmospheric profiles of pressure, temperature,

relative humidity and wind from the point of launch to the ground. The Vaisala Dropsonde RD93 is used with the Vaisala AVAPS Lite. It transmits data via a 400 MHz telemetry link to the receiving AVAPS Lite system onboard the aircraft. The onboard GPS receiver tracks the dropsonde's horizontal movement as it is borne by the wind. Several thousand RD93s are launched annually to measure atmospheric conditions to a level of detail that is without precedent in history.

## Installing the Vaisala AVAPS Lite

When the flight mission calls for



	Vaisala AVAPS Lite (one-channel)	Vaisala AVAPS (multi-channel)
Size	Half of 3U slot in a 19" rack + laptop PC + launcher	Approx. 12 U in a 19" rack + launcher
Equipment weight	6.2 kg + weight of antennas, launcher and laptop	Approx. 50 kg + weight of antennas and launcher
Average sounding interval and profile separation	18 minutes, 210 km from 14 km altitude at jet aircraft speed	4-5 minutes, 45-60 km from 14 km altitude at jet aircraft speed
Size and space requirement for equipment	Low due to simpler design	Higher due to multi-channel equipment and connections
Installation	Easy due to few components, small size and weight	More complex due to more components and connections

dropsounding the Vaisala AVAPS Lite telemetry rack, laptop PC and dropsonde launcher are easily carried in and mounted in the aircraft cabin. The dropsonde launcher is installed on the aircraft and can be removed when no longer needed. The GPS and 400 MHz UHF antennas and their cables occupy little space and cause minimal drag on the aircraft exterior.

### Configuration

The Vaisala AVAPS Lite includes a telemetry chassis, aircraft GPS and UHF receiver antennas, a laptop PC

running the application software, and a dropsonde launcher modified either for unpressurized or pressurized aircraft. The AVAPS Lite telemetry chassis contains:

- Power supply (85-264 VAC, 47-440 Hz 10-36 VDC optional)
- 400 MHz receiver card that receives data from the Vaisala Dropsonde RD93
- A GPS processor card that computes wind direction and speed from the dropsonde GPS data
- A PTU buffer card that handles the pressure, temperature and relative humidity readings
- A dropsonde interface card for communication between the AVAPS Lite and the dropsonde

### Intellectual property rights and development

The Atmospheric Technology Division (ATD) of the National Center of Atmospheric Research (NCAR) developed the hardware and software for the Vaisala AVAPS Lite and Vaisala AVAPS. The hardware and software are licensed to Vaisala Inc., USA. NCAR/ATD and Vaisala are committed to the continuous development of the AVAPS Lite and AVAPS hardware and software in step with the evolving requirements of our customers. The

Vaisala AVAPS Lite brings together world-leading GPS technology and PTU sensor technology, the results of Vaisala's 60+ years of expertise in atmospheric measurement.

### Vaisala AVAPS and Dropsonde RD93 references

The Vaisala AVAPS and Vaisala Dropsonde RD93 are used by a number of prominent scientific organizations:

- NOAA (USA)
- US Air Force
- NASA (USA)
- MRF (UK)
- MSC (CANADA)
- NCAR (USA)
- DLR (Germany)
- NIPR (Japan)

The Vaisala AVAPS and Vaisala Dropsonde RD93 have been used in many scientific projects including FASTEX, MAP, PACJET and CAMEX. Further information on scientific projects can be found on the project web pages.

### Applications

- Supporting the precision air dropping of supplies
- Supporting paratroop deployment
- Air chemistry research
- Airborne validation of remote sensing data
- Atmospheric refraction studies
- Research on cloud physics
- Polar and marine environment/meteorological research
- Other research requiring detailed information on atmospheric conditions

# Technical Information

## Minimum requirements for laptop PC

Base Unit:	Intel® Pentium® M Processor 735 (1.6 GHz), 14.1" XGA English
Memory:	512MB, 1 DIMM, DDR SDRAM
Hard Drive:	30GB internal hard drive
Floppy Disk Drive:	Floppy Drive internal/external.
Operating System:	Microsoft® Windows® XP Professional, SP2 no media, for Latitude English.
CD-ROM:	24x CDRW/DVD
Interface:	Two serial ports (COM1, COM2), USB
Wireless:	Intel PRO wireless 2200 WLAN (802.11 b/g)
Power source:	Depends on laptop model
Typical power:	~20 W

## Telemetry chassis

Modules installed	
Telemetry receiver, PTU buffer, GPS wind processor, power supply, sonde interface	
Telemetry receiver	
Telemetry input	400 to 406 MHz, -120 to -20 dBm
Video output	FSK (PTH) / AFSK (GPS)
PTU buffer	
Analog input	0.5 Vpp to 1.0 Vpp
GPS receiver	
GPS channels	Tracks up to 12 satellites
GPS input	1575 MHz (C/A)
Sonde FM input	FSK, 50 mVpp to 20 Vpp
Dropsonde interface	
Launcher control	Open collector, +5 VDC to +30 VDC
Launcher sense	+28 VDC
Sonde interface	TTL level
Power supply	45 W switching
Ventilation	Passive convection
Power source	85-264 VAC, 47-440 Hz 10-36 VDC optional
Power consumption	~20 W
Chassis weight	6.2 kg
Chassis size (W x D x H)	235 x 361 x 177 mm

## Antennas

Aircraft GPS antenna	
Frequency	1575 MHz (L1)
Type	Active
Impedance	50
Gain	>36 dB
Connector	TNC (female)
Aircraft UHF antenna	
Frequency	400-406 MHz
Polarity	Vertical
Connector	N (female)

## Dropsonde launcher

Type	Pneumatic for pressurized, spring-loaded for un-pressurized aircraft
Material	Aluminum
Weight	Approx. 10 kg
Valve	Whittaker Fuel Shutoff Valve
Control mechanism	Electronic or manual
Power source	28 VDC, 3 A
Power connector	10SL3P
Launcher control unit	EMH122

## Vaisala Dropsonde RD93 (See RD93 brochure for details)

Weight	< 420 g
Size	7 cm in diameter, 41 cm in length
Maximum deployment airspeed	250 kt IAS (= 125 m/s IAS)
Frequency range	400 MHz to 406 MHz
RF Power output	100 mW
Telemetry range with recommended antenna	325 km

## Sensors

	Range	Resolution	Accuracy
Pressure	3 - 1080 hPa	0.1 hPa	0.4 hPa*
Temperature	-90 - +60°C	0.1 °C	0.2 °C*
Relative humidity	0 - 100 % RH	1 % RH	2 % RH*
Horizontal wind	0 - 200 m/s	0.1 m/s	0.5 m/s RMS

\*) Standard deviation of differences between two successive repeated calibrations, k = 2 confidence level



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