

# Vaisala AVAPS

Drosonde Receiving System



The complete solution for accurate, targeted  
in-situ measurement of the atmosphere

# The Ultimate in In-Situ Measurement of the Atmosphere.

The Vaisala AVAPS MD11 and Vaisala Dropsonde RD93 represent the latest in dropsounding technology with an onboard dropsonde microprocessor and synthesized digital transmission. This combination offers the meteorological community a complete solution for accurate in-situ measurement of the atmosphere.

AVAPS stands for "Airborne Vertical Atmosphere Profiling System", a multi-channel GPS dropsounding 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 is a general-purpose dropsonde receiving system, versatile enough for use in many different kinds of aircraft. Employing the Vaisala Dropsonde RD93 for wind and PTU measurements, the AVAPS system architecture handles up to four dropsondes descending simultaneously.

## The Vaisala AVAPS

The Vaisala Dropsonde RD93 measures and transmits pressure, temperature, relative humidity and wind data to the AVAPS receiving system at a high data rate. The AVAPS processes the data, displays it and stores it to the hard disk.

The AVAPS system comprises:

- A dropsonde launcher and control unit
- UHF antenna for receiving dropsonde data and GPS antenna for receiving reference GPS data
- A dropsonde telemetry chassis
- A serial interface between the PC and the dropsonde telemetry chassis
- A fan panel for cooling the dropsonde telemetry chassis
- A PC with keyboard/mouse for processing and storing data

- Easy-to-use software for setting dropsonde parameters and receiving data
- A color monitor with screens for set-up, operation & data display

In the dropsonde telemetry chassis, each channel (up to 4) contains a GPS processor, a PTU buffer board and a 400 MHz receiver. A dropsonde interface card is used for checking the dropsondes and setting the telemetry transmitter frequency before launch. A launcher is provided for safe ejection from the cabin.

The Vaisala AVAPS system components can be installed in a standard 19" equipment rack with connections to mains power, the UHF antenna and the GPS antenna. External aircraft data systems can be interfaced through a serial link.

Installation frame (optional)

LCD flat panel display

Keyboard and trackball mouse

Fan panel

Vaisala AVAPS telemetry chassis

Rack-mounted PC

Printer (optional)

Vibration suppression system (optional)





### Vaisala Dropsonde RD93 GPS module

The RD93 GPS module detects the GPS signals and transmits them to the receiving system for wind calculation.

### PTU sensor module

The RD93 PTU sensor module measures pressure, temperature and relative humidity of the ambient air as the dropsonde descends through the atmosphere.

### Intellectual property rights and development

The Atmospheric Technology Division (ATD) of the National Center of Atmospheric Research (NCAR) owns the design of the RD93 Dropsonde, the AVAPS and the AVAPS Lite. Vaisala Inc. manufactures and markets the products under a licensing agreement.

NCAR/ATD and Vaisala are committed to the continuous development of the AVAPS and AVAPS Lite hardware and software in step with the evolving requirements of our customers. The AVAPS brings together GPS technology and PTU sensor technology, the results of Vaisala's 60+ years of expertise in atmospheric measurement.



### A precision tool

The RD93 Dropsonde and AVAPS were adopted in 1997 as part of the FASTEX project. Since then, they have been used operationally for hurricane observation and research, and in many other research projects including CAMEX, NORPEX, Winter Storms, SCATCAT, MAP, Lake-ICE, Snowband and INDOEX.

### References

Several thousand Vaisala dropsondes are launched annually for weather reconnaissance/research and hurricane hunting. Customers include NOAA (US), the US Air Force, NCAR (US), NASA, the MSC (Canada), DLR (Germany), MRF (UK) and NIPR (Japan).

### Aircraft installation

The Vaisala AVAPS has been installed in various types of aircraft including: P-3 Orion, Gulfstream II, Gulfstream G-IV-SP, Lockheed Hercules C-130, Convair 580, Falcon 20, Pilatus PC-6, Lockheed Electra, Canberra and DC-8.

### Main system features

Vaisala AVAPS main features:

- Operates to an altitude of 24 km
- Operates in both polar and tropical environments
- Operated by one person
- Four-channel data system allows dense horizontal dropsonde spacing

Vaisala Dropsonde RD93 main features:

- Can be deployed at indicated airspeeds up to 250 knots
- Descent time: approx. 15 min from 14 km, 8 min from 7.5 km
- 2 Hz sample rate for wind and thermodynamic data
- Preparation time <2 min

# Technical Information

## PC and monitor

Pentium	Min. 3.0 GHz
Operating system	Windows® XP Professional, SP2, no media, English.
Floppy disk drive	1.44 MB 3.5"
Hard disk drive	Min. 80 GB
CD-RW drive	
Interface	Two serial ports (COM1, COM2), USB, parallel port
Extra modules	2 x 8-port Serial I/O Expansion Cards
Typical chassis size (W x D x H)	465 x 520 x 175 mm
Typical chassis weight	16.3 kg
Typical power consumption	70 W, depends on make and model
Max. power consumption at start-up	350 W, depends on make and model
Power source	115/230 VAC, 50/60 Hz

## Telemetry chassis

Modules installed	Telemetry receiver, PTU buffers, GPS wind processors, power supply, dropsonde interface, loudspeaker	
Chassis	Weight	8.2 kg
	Size (W x D x H)	485 x 381 x 132 mm
	Typical power consumption	~50 W
Telemetry receiver	Telemetry input	400 to 406 MHz, -120 to -20 dBm
	Video output	FSK (PTU) / FSK (GPS)
PTU buffer	Analog input	0.5 Vpp to 1.0 Vpp
GPS wind processor	GPS channels	Tracks up to 12 satellites
	GPS input	1575 MHz (C/A)
	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	Input	115/230 VAC, 47-440 Hz
	Type	60 W switching

## Fan panel

Ventilation	Three fans, each 100 m3/h
Typical weight	~3.2 kg
Typical size (W x D x H)	483 x 381 x 43 mm
Typical power consumption	~50 W
Power source	115 VAC / 60 Hz or 230 VAC / 50 Hz

## Antennas

GPS antenna	Frequency	1575 MHz (L1)
	Type	Active
	Impedance	50 Ω
	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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