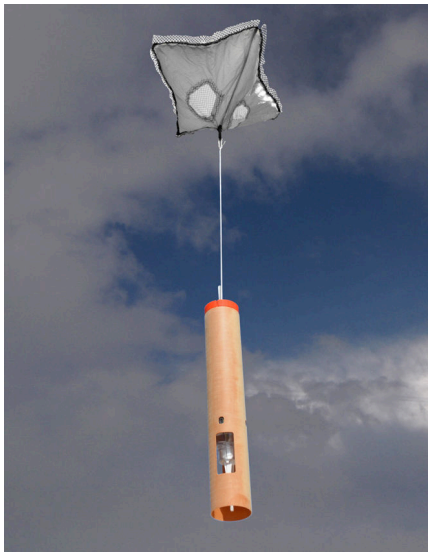
NCAR Dropsonde NRD41



NRD41 is a meteorological measurement device for use in atmospheric profiling from aircraft flight level to surface. Descending through the atmosphere by a parachute, it measures the profiles of pressure (P), temperature (T), and relative humidity (U), and reads wind direction and speed data from the point of launch to the surface.

Features

- Designed for atmospheric profilings from aircraft flight level to surface
- Used for tropical cyclone reconnaissance and research, data acquisition over oceans as input for Numerical Weather Prediction (NWP) models, and in various field campaigns to acquire data for meteorological research and for validation of other airborne instrumentation
- Measures pressure, temperature, and humidity values, and reads wind direction and speed data from the point of launch to the surface
- Airborne Vertical Atmospheric Profiling System (AVAPS®) onboard the aircraft receives, displays, stores, and distributes dropsonde data for further use

NRD41 is used for tropical cyclone reconnaissance and research, data acquisition over oceans as input for Numerical Weather Prediction (NWP) models, and in various field campaigns to acquire data for meteorological research and for validation of other airborne instruments. RD41 transmits data to the Airborne Vertical Atmospheric Profiling System (AVAPS) onboard the aircraft using narrow bandwidth Frequency Shift Key (FSK) modulation in the 403 MHz meteorological band.

Proven measurement performance

NRD41 is based on the same Vaisala sensors and unique measurement technology as the RS41 radiosonde family. The temperature sensor uses linear resistive platinum technology and it is very stable. The humidity sensor integrates humidity and temperature sensing elements. The pressure sensor is the same high-quality, shock-resistant capacitive silicon sensor as the one in Vaisala Radiosonde RS41 and Dropsonde RD41, but with revised electronics and calibration. All sensors are calibrated against references that are traceable to international standards. The sensors are effectively protected from freezing, wet bulb, and solar radiation errors. Winds are measured using a commercial GPS receiver. Wind profiles from multiple simultaneous dropsoundings show good consistency.

Designed for aircraft use

NRD41 is designed for aircraft use, and it is launched through the body of an aircraft. Specially designed launchers are used for both pressurized and unpressurized cabin aircrafts. The delayed deployment mechanism ensures proper clearance from the aircraft and allows the parachute to open safely. The specially designed parachute stabilizes NRD41 by aligning it properly for measurements, and its small gliding factor ensures proper measurement of wind speed and direction. The descent speed of the NRD41 is approximately 11 m/s (25 mph) at the sea level and about 21 m/s (47 mph) in 12-km (7.5-mi) altitude. In strong convective circumstances, the descent rate can vary, and even negative descent rates are measured.

NRD41 measures PTU values twice, and wind speed and direction readings 4 times a second. This means that the last measured pressure level is about 5-6 m (16 ft 5 in-19 ft 8 in) above the surface at maximum. The robust design of NRD41 ensures safe use of the legacy launchers and high speed deployment of the parachute.

Dropsonde receiving system

Onboard the aircraft, the AVAPS system receives, displays, stores, and distributes dropsonde data for further use. AVAPS is compatible with dropsondes. It is not compatible with conventional Vaisala radiosondes. AVAPS can be configured to track up to 8 dropsondes at the same time. This is an essential ability in operations carried out with a high-speed, high-altitude aircraft when dense horizontal resolution of data is required. AVAPS can be set to provide the data automatically for the aircraft data system for further use. Dropsonde technology developer NCAR/EOL provides ASPEN data post-descent processing software for dropsonde users.

Technical data

Dropsonde NRD41

Weight	216 g (7.61 oz)
Size	Diameter 45 mm (1.77 in), length 310 mm (12.20 in)
Maximum deployment airspeed	325 KIAS (indicated airspeed)
Shelf life	2 years from delivery

Transmitter

Tuning range	400.16 ... 405.99 MHz
Frequency stability	< ±10 kHz
RF power output	< 200 mW
Channel spacing	200 kHz
Modulation	FSK
Harmonic and spurious output	According to EN 302054
Telemetry range with recommended receiving antenna	325 km (201 mi)

Battery

Type	Three lithium cells in series
Voltage	6 V nominal
Life	2 hours (operating), 3 years (shelf)

Pressure sensor

Type	Silicon capacitor
Observation range	From surface pressure to 3 hPa
Resolution	0.01 hPa
Repeatability [1)]	0.4 hPa

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

Temperature sensor

Type	Platinum resistor
Observation range	-90 ... +60 °C (-130 ... +160 °F)
Resolution	0.01 °C
Repeatability [1)]	0.1 °C
Response time (when used and measured in Vaisala Radiosonde RS41):	
6 m/s (13 mph), 1000 hPa	0.5 s

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

Relative humidity sensors

Type	Thin-film capacitor
Observation range	0 ... 100 %RH
Resolution	0.1 %RH
Repeatability [1)]	2 %RH
Response time (when used and measured in Vaisala Radiosonde RS41):	
at 6 m/s (13 mph), 1000 hPa, +20 °C (68 °F)	< 0.3 s
at 6 m/s (13 mph), 1000 hPa, -40 °C (-40 °F)	< 10 s

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

Wind (horizontal)

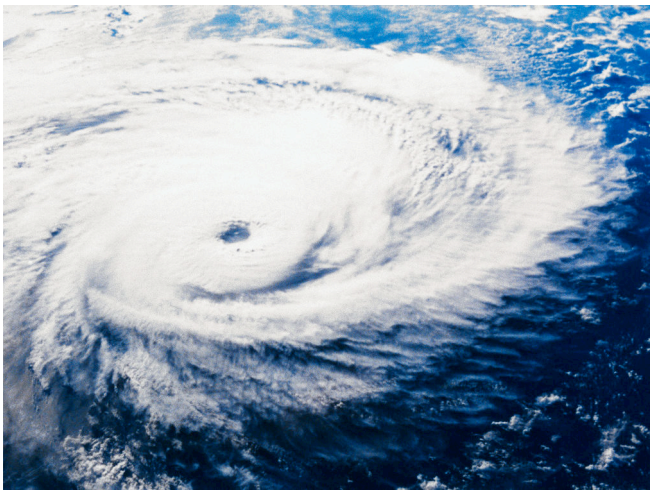
Commercial GPS receiver

Data rates

PTU update rate	2 Hz
Wind update rate	4 Hz

Descent

Descent speed	Approx. 11 m/s (25 mph) at sea level
Descent time	
From 14 km (8.7 mi)	Approx. 15 min
From 7.5 km (4.7 mi)	Approx. 8 min



Intellectual property rights and development

Vaisala Inc., USA, manufactures and markets the Dropsonde NRD41 under license to University Corporation for Atmospheric Research Foundation (UCARF). The dropsonde and receiving system hardware and software have been developed at the Earth Observing Laboratory (EOL) of the National Center of Atmospheric Research (NCAR), in Boulder, Colorado, USA. AVAPS® is a registered trademark of the University Corporation for Atmospheric Research.

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