400–2500 nm

Leading UAV Hyperspectral Imaging Systems

Description

The NWH9000 UAV Hyperspectral Imaging System leverages cutting-edge spectral imaging technology. It combines the unique spectral fingerprints of various materials with high-resolution camera imagery to deliver comprehensive detection capabilities—encompassing qualitative, quantitative, temporal, and positional analysis. This integrated "spectrum + image" remote sensing device supports synchronized acquisition across the hyperspectral imager, high-resolution camera, and POS (Position and Orientation System). A compact ground station module paired with intelligent remote control enables real-time system status monitoring, control, and enhanced GPS accuracy via PPK processing. It also supports high-precision stitching of both hyperspectral imagery and visible-light orthophotos.

▣ **Application**

◎ **Water Quality & Environmental Monitoring**
Enables precise remote sensing of critical parameters such as total nitrogen, total phosphorus, ammonia, chlorophyll-a, turbidity, and permanganate index—essential for tracking water quality and ecosystem health.

◎ **Soil Health & Heavy Metal Assessment**
Facilitates rapid, non-invasive sensing of soil moisture content, fertility levels, and contamination by heavy metals (e.g., Zn, Pb, Cd), providing scalable insights across agricultural or restoration landscapes.

◎ **Geological Mapping & Mineral Exploration**
Leverages spectral signatures to accurately map mineral distributions, lithological structures, and alteration zones—critical in mining and resource evaluation.

◎ **Agriculture & Carbon Sequestration**
Supports advanced precision farming, crop disease and pest diagnosis, tree species classification, and carbon stock assessment in forests through high-resolution vegetation analysis.

◎ **Defense & Camouflage Countermeasures**
Enables detection of camouflage, concealed equipment, excavation, or altered vegetation—empowering military surveillance, reconnaissance, and anti-camouflage operations.
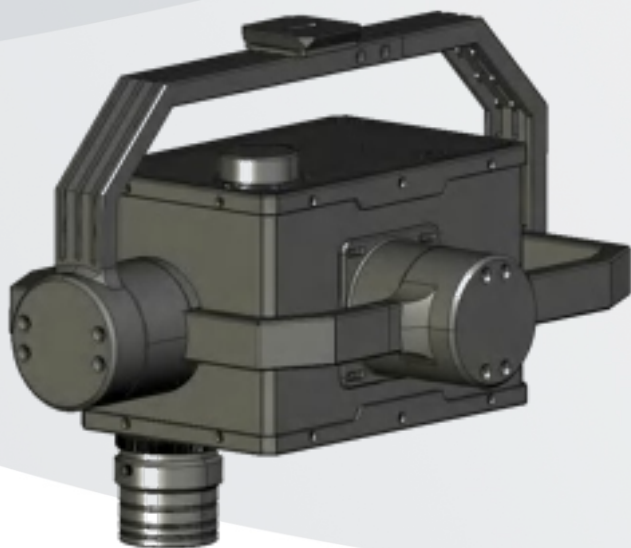
UAV Hyperspectral Water Quality Monitoring — Case Study (Shanghai River)

● **Deployment Location & Target:** A river segment within a district of Shanghai.
● **Objective:** To remotely assess water quality parameters using UAV-mounted hyperspectral imaging.
● **Outcome:** Derived concentration distributions of key indicators—permanganate-index (COD_{mn}), total phosphorus (TP), ammonia nitrogen (NH_3-N), and dissolved oxygen (DO)—with predictive accuracy exceeding 80%.
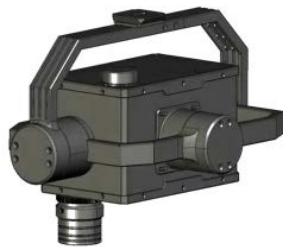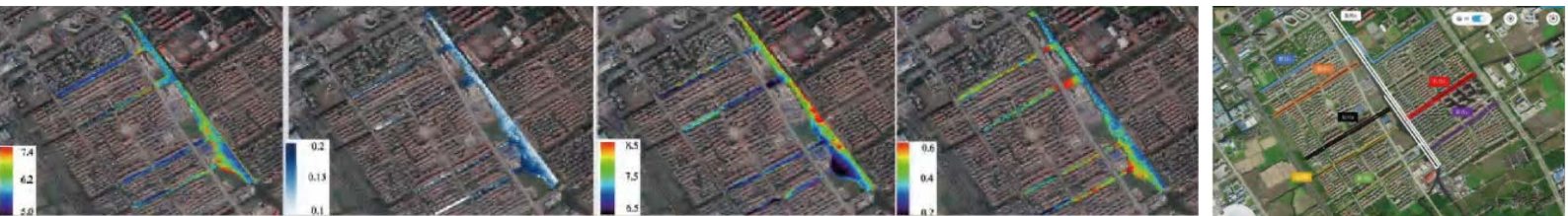
400–1000nm
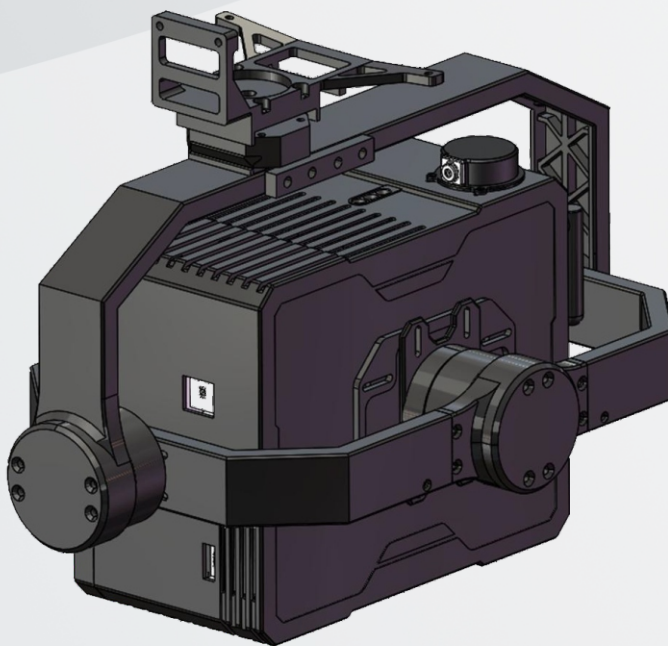
VNIR Hyperspectral Cameras

■ Product Advantages

◎ **Outstanding Spectroscopic Capability:** Features a spectral resolution of 2.8nm @ 650nm, ensuring precise spectroscopic analysis.

◎ **Geometric Calibration:** Supports accurate position calibration with GPS/INS.

◎ **Long-Range Detection:** Capable of impressive range performance.

◎ **High-Definition Imaging:** Offers stunning, clear images.

◎ **Multidimensional Data Analysis:** Facilitates comprehensive data analysis.

◎ **Reference Data Cloud:** Compatible with TN/TP/COD/NH4/Chla/CDOD/OSSI parameters.

◎ **Internal Calibration Coefficient:** Enhances accuracy with WDN/WDPN/RDN/RDPN indexing.

◎ **Real-Time Monitoring:** Provides immediate insights into collected data.

◎ **High-Dimensional Data Storage:** Supports significant capacity for data storage.

◎ **Thin and Lightweight Design:** Promotes ease of use and maneuverability.

◎ **Wide-Area Observation:** Enables extensive geographical coverage.

◎ **Advanced Imaging Algorithms:** Employs efficient onboard algorithms.

◎ **Auto Detection Navigation Systems:** Ensures autonomous operation via GPS/INS.

◎ **Ultra-High Spectral Resolution:** Delivers superior imaging performance.

◎ **Efficient Operation:** Simplifies tasks with an intuitive control interface.

■ Description

NWH9000L-VNIR UAV Hyperspectral Imaging System integrates advanced Hyperspectral sensing with high-definition RGB imaging to deliver an all-in-one "spectrum plus image" remote sensing solution. This powerful system simultaneously captures qualitative, quantitative, temporal, and geospatial data, unlocking full-spectrum insights in a single, seamless operation.

Specification

Model	Specification	NWH9000L-VNIR UAV Hyperspectral Imager
Hyperspectral Camera	Spectral Range	400-1000nm
	Spectral Resolution	≤3.5nm
	Sampling Interval	2.8nm (4X)
	F-number	F/2.4
	Detector	CMOS
	Detector Interface	USB3.0
	Power Supply for Detector	External power (12-24 VDC),3W
	Detector Sensor Size	1/1.2", 11.3mm x 7.1mm
	Original Detector Resolution	1920 x 1200
	Original Pixel Size	5.86 µm x 5.86 µm
	Effective Pixel Bit Depth	12bits
	Slit Widt	25µm
	Recommended Pixel Merging Mode	4x4
	Spatial Effective Pixel Count	≥1450 (1X) ,≥360 (4X)
	Spectral Bands	≥920 (1X),≥230 (4X)
	Field of View (FOV)	29° @f=16mm
	Instantaneous Field of View (IFOV)	1.6mrad @f=16mm
	Maximum Frame Rate	≤120fps
	Hyperspectral Lens	Standard 16mm
High-Definition Camera	HD Camera	500MP
Self-Stabilizing Gimbal	Self-Stabilizing Gimbal	2-axis high-stability gimbal
POS System	GPS Positioning Accuracy	10cm
Acquisition and Control System	Onboard Control and Acquisition System	CPU: i7,Memory: 16GB,Storage: 1TB
	Remote Intelligent Control	UAV Remote Controller with Remote Intelligent Control
	Real-Time Monitoring	Real-time spectral data display
Overall Parameters	Working Current	Peak Current: 3A
	Input Voltage	13.6V
	Weight	Less than 990g (Main Uni,tLens,and Gimbal)
	Operating Temperature	0-40°C, 20% ~ 80% RH (non-condensing)

900-1700nm

## NIR Hyperspectral Camera

🔷 Product Overview

The NWH9000 UAV Hyperspectral Imaging System leverages cutting-edge spectral imaging technology. It combines the unique spectral fingerprints of various materials with high-resolution camera imagery to deliver comprehensive detection capabilities—encompassing qualitative, quantitative, temporal, and positional analysis. This integrated "spectrum + image" remote sensing device supports synchronized acquisition across the hyperspectral imager, high-resolution camera, and POS (Position and Orientation System). A compact ground station module paired with intelligent remote control enables real-time system status monitoring, control, and enhanced GPS accuracy via PPK processing. It also supports high-precision stitching of both hyperspectral imagery and visible-light orthophotos.NWH9000L NIR UAV Payload Hyperspectral Imaging System features a lightweight, self-developed 900-1700nm near-infrared hyperspectral imaging module by HuiPu Technologies. It is compact, lightweight, and offers high spectral resolution, making it compatible with small UAVs such as DJI M350 RTK. This system is suitable for a wide range of applications including precision agriculture, forestry fire prevention, fog penetration observation, and camouflage detection.

Specification

Functional Configuration	Parameter	NWH9000L-NIR (Compatible with DJI M350 RTK)
Hyperspectral Camera	Spectral Range	900-1700nm
	Spectral Resolution	≤6nm
	Sampling Interval	1.7nm
	F-number	F/2.0
	Detector	InGaAs (TE Cooled)
	Detector Interface	USB 3.0
	Detector Power Supply	12V DC,<2.1W (TEC OFF) / <25W (TEC ON)
	Detector Sensor Size	6.4mm x 5.12mm
	Original Detector Resolution	1280 x 1024
	Original Pixel Size	5 µm x 5 µm
	Effective Pixel Bit Depth	12bit
	Slit Width	20µm
	Recommended Pixel Merging Mode	2x2
	Spatial Effective Pixel Count	640
	Spectral Bands	400
	Field of View (FOV)	14.6°@f=25mm
	Instantaneous Field of View (IFOV)	0.8mrad@f=25mm
	Maximum Frame Rate	125fps
	Hyperspectral Lens	Standard 16mm
High-Definition Camera	HD Camera	1500W
Self-Stabilizing Gimbal	Self-Stabilizing Gimbal	2-axis high-stability gimbal
POS System	GPS Positioning Accuracy	10cm
Acquisition and Control System	Onboard Control and Acquisition System	CPU: i7,Memory: 16GB, Storage: 1TB
	Remote Intelligent Control	UAV Remote Controller with Remote Intelligent Control
	Real-Time Monitoring	Real-time spectral data display
Overall Parameters	Working Current	Peak Current: 3A
	Input Voltage	17V
	Weight	≤2.7kg (Main Unit, Lens, and Gimbal)
	Operating Temperature	0-40°C,20% ~ 80% RH (non-condensing)

400-2500nm

VIS and SWIR Hyperspectral Camera
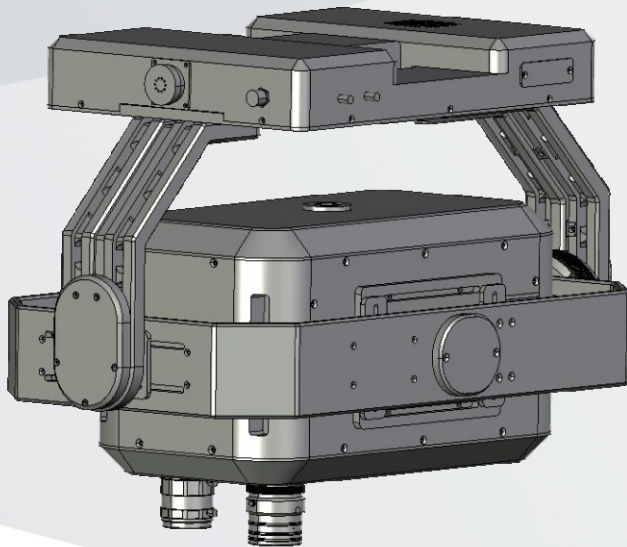
▣ Description

NWH9000U 400-2500nm full-spectrum UAV Hyperspectral Imaging System utilizes cutting-edge hyperspectral imaging technology to fully capture and analyze the unique spectral information of various materials. Combining high-definition imaging with precise spectral data, it enables comprehensive qualitative, quantitative, timing, and positional analysis of substances. This versatile "spectral map integration" platform serves as a comprehensive remote sensing solution, widely applicable in water environment monitoring, precision agriculture, mineral resource surveys, target recognition, and camouflage detection. It effectively meets the diverse needs of various industries.

▣ Features

- ◉ **Exceptional Spectral Performance:** Offers spectral resolution of 2.8nm/8nm within the 2,8nm/8nm range, covering 460 spectral bands and 21 viewing angles.
- ◉ **Multidimensional Data Fusion:** Supports integrated analysis of spectral, image, and GPS data for comprehensive insights.
- ◉ **High-Definition Imaging:** Built-in algorithms enable precise and clear images.
- ◉ **Geospatial Coordinate Calibration:** Equipped with advanced calibration modules for accurate positioning.
- ◉ **Extended Sunlight Variability Resistance:** Features environmental calibration modules to handle sunlight changes.
- ◉ **Real-Time Parameter Feedback:** Capable of live data upload and parameter monitoring (e.g., TN/TP/NH3N/CHLA).
- ◉ **Remote Intelligent Control:** Allows remote management and parameter adjustment via UAV integration.
- ◉ **Consistent and Stable Cloud Platform:** Ensures stable and accurate data processing and storage.
- ◉ **Deep UAV Integration:** Designed for seamless UAV compatibility, sharing image and GPS data.
- ◉ **High-Efficiency Image Stitching:** Supports large-area image, enabling broad scene coverage.
- ◉ **Fast Operation & Deployment:** Complete system setup within 10 minutes for efficient field deployment.
- ◉ **High-Quality Data Storage:** Built-in 1TB SSD supports continuous operation for up to 8 hours.
- ◉ **Autonomous and Efficient Collection:** UAV flight planning and automatic data acquisition capabilities.
- ◉ **User-Friendly Interface:** Simplifies operation and data processing workflows.

◼ Specification

NWH9000U-VNIR/SWIR			
Model	**Parameter**	**VNIR**	**SWIR**
Main Unit	Spectral Dispersion Mode	Transmission Grating	Transmission Grating
Main Unit	Spectral Range	400-1000nm	1000-2500nm
	Combined Spectral Range	400-2500nm	
	Spectral Bands	300	≥250
	Combined Spectral Bands	≥450	
	Spectral Resolution	≤2.8nm	≤10nm
	F-number	F/2.6	F/2.0
	Detector	CMOS	HgCdTe (Stirling Cooling)
	Detector Interface	USB 3.0	GigE
	Detector Sensor Size	11.3mm x 7.1mm	9.6mm x 7.68mm
	Original Pixel Size	5.86 μm x 5.86 μm	15 μm x 15 μm
	Effective Pixel Bit Depth	12bits	14bits
	Effective Slit Length	11.3mm	9.6mm
	Slit Width	25μm	25μm
	Recommended Pixel Merging Mode	1x1	1x1
	Spatial Effective Pixel Count	1920	640
	Combined Spatial Pixel Count	640	
	Field of View (FOV)	21° @f=25mm	21° @f=25mm
	Combined Field of View (FOV)	21° @f=25mm	
	Instantaneous Field of View (IFOV)	1mrad @f=25mm	1mrad @f=25mm
	Combined Instantaneous Field of View (IFOV)	1mrad @f=25mm	
	Max Frame Rate	128fps	100fps
	Detector Power Supply	12V DC,4.3W	24V DC,30W
	Operating Temperature	0-40°C	
	Storage Temperature	0-50°C	

400-1000nm

UAV Hyperspectral Imaging System

🖥 Product Overview

The WingNest UAV-mounted Hyperspectral Automated Monitoring System is built around proprietary hyperspectral imaging technology. It integrates industry-leading drone flight platforms and ground stations to address key challenges such as flight control, video transmission, safety monitoring, automated data processing, intelligent early warning, and remote system updates. This innovative approach significantly reduces operational complexity, enabling truly autonomous hyperspectral remote sensing missions—a first worldwide achievement. The system supports multi-dimensional data synchronization, allowing a single flight to capture hyperspectral data across 300 spectral bands along with high-definition visible-light imagery.

Advantages

⊙ **Autonomous Operation:**

Designed with lightweight high-performance load systems, integrated with industry-leading autonomous drones and automated data collection platforms. The system realizes automated task planning and execution, enabling autonomous flight and monitoring. It supports intelligent routing and dynamic obstacle avoidance, significantly enhancing operational flexibility and safety in real-world applications.

⊙ **Remote Monitoring and Management:**

Provides real-time data feedback from ground station, enabling remote oversight of device status, mission progress, and data flow. During operations, users can monitor system status and manually intervene if necessary, ensuring smooth mission execution.

⊙ **Intelligent Computing:**

Equipped with multiple deep learning algorithms, allowing users to input different application requirements and train or upgrade models autonomously. This continuous learning enhances monitoring accuracy and adaptability across various scenarios.

⊙ **Real-time Data Processing:**

Uses high-precision sensors to acquire real-time data, capable of completing initial data processing and analysis during flight. Performance results can be uploaded instantly to cloud platforms, providing immediate support for quick decision-making.

⊙ **Multi-scenario Compatibility:**

Supports a variety of data processing algorithms such as water quality monitoring, vegetation indices, and more, enabling applications in agriculture, forestry, water bodies, urban environments, and beyond. It maximizes low-altitude sensing efficiency for diverse environmental monitoring needs.

⊙ **Third-party Data Support:**

Compatible with external laboratories or online monitoring stations for high-precision data calibration and validation. This integration enhances data accuracy and system reliability.

Applications

The UAV Hyperspectral Imaging system possesses multi-dimensional data collection capabilities. A single flight can acquire hyperspectral data across 300 spectral bands, along with high-resolution visible-light photographs. By utilizing complementary software for NDVI, NDWI, and other common index calculations, as well as numerous spectral water quality indices such as chlorophyll, total nitrogen, and high-temperature salt index, the system generates clear and visually interpretable spectral distribution maps. This enables precise source identification and detailed analysis of various water quality parameters.

a watershed in Anhui Province

a lake area in Jiangsu Province

a river in Shanghai City
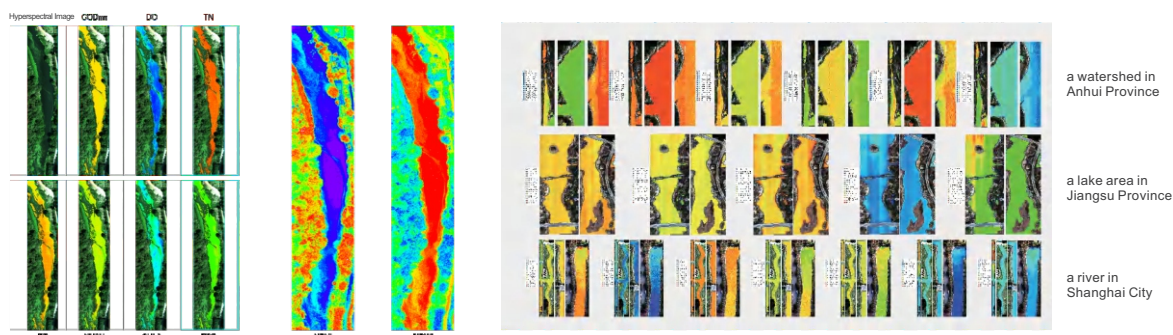
System Configuration

The system primarily consists of a hyperspectral load system, a high-precision airborne camera, unmanned aircraft, and an automatic flight and landing system. Equipped with autonomous flight capabilities, the UAV can take off, land, and perform data collection automatically. Additionally, the system includes a ground data server and network infrastructure. After missions, the UAV automatically uploads and processes data, which is then transmitted to the user's server for storage and analysis. Real-time data is relayed via UAV signal links directly to the aircraft control unit and subsequently sent to the user's data platform.

The system employs embedded software algorithms to perform various calculations, such as NDVI, NDWI, and other common indices. It also supports multiple spectral water quality indices, including chlorophyll, total nitrogen, high-temperature salt index, leaf greenness, and floating objects. These enable the generation of clear, intuitive spectral distribution maps for accurate source identification and comprehensive analysis.

Specification

NWH9000E UAV Hyperspectral Imager			
Module	Item	Specification	Value
Hyperspectral Payload	Hyperspectral Camera	Spectral Range	400–1000 nm
		Spectral Resolution	Better than 3.5 nm
		Spatial Resolution	1.6 mrad @ f = 16 mm
		Field of View (FOV)	29° @ f = 16 mm
		Spatial Channels	1450 (1 × 1)
		Spectral Channels	921 (1 × 1)
		Detector Type	CMOS
		Detector Interface	USB 3.0

▣ Specification

NWH9000E UAV Hyperspectral Imager			
Module	**Item**	**Specification**	**Value**
Hyperspectral Payload	Hyperspectral Camera	Pixel Bit Depth	12 bits
		Frame Rate	≤120 fps
		Lens Focal Length	16 mm
	Visible Camera	Resolution	5 MP
		Field of View (FOV)	> 45°
	Control & Acquisition Module	Hardware Configuration	CPU: i7 RAM: 16 GB SSD: 1 TB
	GPS Positioning	Supports RTK mode (requires network service)	Positioning accuracy: <10 cm
	Other Parameters	Operating Current	Peak: 3 A
		Input Voltage	13.6 V
		Weight	< 990 g (main unit, lens, gimbal)
		Operating Temperature	10–50 °C 20%–80% RH (non-condensing)
	Zenith Light Module	Interface	Serial / USB 2.0, supports real-time sync with hyperspectral acquisition
		Spectral Resolution	2.8 nm
UAV Ground Station	Dimensions & Weight	Size (L × W × H)	1.4 × 1.4 × 1.4 m (Closed)
			2.9 × 1.4 × 1.4 m (Deployed)
		Weight	< 400 kg
	Communication	Max Communication Range	NCC/FCC: 15 km (No interference or obstruction)
			CE/MIC: 8 km
			SRRC: 8 km
		Video Transmission Latency	0.3 s
	Power	Air Conditioning Power	300 W
		Standby Power	100 W
		Maximum Power Consumption	2100 W
		Max Charging Power	1000 W
	Other	Single Battery Charging Time	20% → 90%: approx. 30 min
			0% → 100%: approx. 70 min
		Operating Temperature	-20 °C to 50 °C
		Emergency Operation Time	30 min