UAV Gradiometer System

AirGRAD

NEW!

Since 1980

Leading the World of Magnetics

GEM Systems is the global leader in the manufacture and sale of high precision magnetometers.

GEM Systems is the only commercial manufacturer of Overhauser magnetometers, that are accepted and used at Magnetic Observatories over the world.

Our Potassium Magnetometers are the most precise magnetometers in the world.

Our Proton sensors are considered the most practical and robust magnetometers for general field use.

Proven reliability based on R+D since 1980.

We deliver fully integrated systems with GPS and additional survey capability with VLF-EM for convenience and high productivity.

Today we are creating the absolute best in airborne sensors and are leading the way with smaller and lighter sensors for practical UAV applications.

GEM Systems large potassium sensors offer the highest sensitivity (20-50 fT) for use in natural hazard research and global ionospheric studies.

Our Leadership and Success in the World of Magnetics is your key to success in applications from Archeology, Volcanology and UXO detection to Exploration and Magnetic Observations Globally.

The AirGRAD is a complete turnkey system for towing under a UAV platform.

The AirGRAD

The **AirGRAD** is the first and only vertical gradiometer currently available on the market, designed specifically for UAV applications. At a total net weight of 8.5 kg, the turnkey gradiometer solution includes two high sensitivity, ultra-lightweight magnetometers as well as all the components required for precise UAV aeromagnetic surveys.

At the core of the **AirGRAD** is GEM Systems modified, lightweight, high sensitivity magnetometer. GEM Systems popular optically pumped Potassium magnetometer offers the highest sensitivity, absolute accuracy and gradient tolerance in addition to the lowest heading error available in the industry.

A gradiometer is ideal for locating small, near surface anomalies, and it is therefore very useful in archeological, geotechnical and environmental mapping. One of the sensors used for the gradient measurement can be used to obtain total field data for analysis and interpretation.

Surveying with UAV's

UAVs can be used to perform airborne geophysical surveys, in particular aeromagnetic surveys where mapping the spatial variations in the Earth's magnetic field can be used to further the understanding of the geology in areas where the mineral potential is being explored.

UAV-borne magnetic surveys are less expensive than either airborne or ground surveys. They can be carried out in areas that are too dangerous, too remote, or too expensive to carry out with manned aircraft or walking on the ground. UAV borne magnetic surveys can deliver better data quality in environments where topography and safety standards prohibit manned aircrafts from acquiring data at optimum terrain clearances.

Practical applications of UAVs are limited by several factors. Aviation regulations and flight restrictions must be adhered to when operating most fixed wing UAVs. In addition limitations are also imposed around the use of rotory-wing UAVs in and around built up areas. From a logistical point of view, one of the largest limiting factors with respect to UAVs is that they have limited payload. In order for UAVs to make practical survey flights, the survey equipment must be light. GEM has developed light weight geophysical instrumentation for UAVs.

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Our World is **Magnetics.**

AirGRAD

Overall length of the AirGRAD is 4 meters with 1.5 m speration between the sensor pods.

Advantages of Potassium Optically Pumped Technology

- Highest sensitivity, absolute accuracy and gradient tolerance of all optically pumped magnetometers available on the market
- Potassium narrow, single spectral line minimizes heading and orientation errors
- Low maintenance cost of the sensors
- High quality results in areas of high gradients

The AirGRAD conveniently breaks down to smaller components and fits within a carrying case for easy shipping

The **AirGRAD** comes complete with 2 GSMP-35U Potassium Magnetometers, laser altimeter for altitude tracking / post processing, IMU for GRAD and sensor orientation, GPS navigation, RadioLink, tow cable and carrying case.

AirGRAD Specifications

A laser altimeter is located in the nose pod, along with a Li-Po battery for one hour system operation (operational time can be increased upon customer request). A 2.4 GHz dual antenna RadioLink and GPS antenna are mounted on the aerodynamic airframe with the two GSMP-35U sensors installed on gimbals inside the tail pods to allow for ± 45 degree rotation of each sensor. The system is towed by the UAV platform with a high strength / lightweight Dyneema tow cable. The housing shell weighs only 5.3 kg, and with all components added, including power, the bird weighs just under 9 kg.

The self contained, self powered stand alone system does not require any integration with the UAV's navigation or electrical systems.

Customer provided UAV's

Before deciding on a particular UAV aircraft with adequate range and payload for the geophysical instruments, it is recommended that the magnetic interference generated by the vehicle be assessed with a high sensitivity portable magnetic gradiometer, operated by an experienced geophysicist. The UAV vehicles should have a payload capacity of at least 10 kg for minimum requirements. But before purchasing a UAV, contact GEM to discuss your plans.

Gradiometer Specifications

Components

Two (2) GSMP-35U magnetometers, AirGRAD shell with 10m tow cable, laser altimeter, IMU, GPS (0.7m resolution), RadioLink (base station and remote), ground station computer and GEM Airborne logger software, GEMDAS Data acquisition Module, battery complete (1 hour system operation) with charger, carrying case, instruction manual, and GEMLink+ software for File Transfer, Diurnal Corrections, Profiling and Basic Mapping & Modeling

UAV Magnetometer Performance

Sensitivity: 0.0002 nT @ 1 Hz
Resolution: 0.0001 nT
Absolute Accuracy: ± 0.1 nT
Dynamic Range: 20,000nT to 120,000 nT
Low/High Field Options: 3000 to 350,000 nT
Gradient Tolerance: 50,000 nT/m
Sampling Rate: 1, 5, 10, 20 Hz

Magnetometer Orientation

Sensor Angle: optimum angle 35° between sensor head axis & field vector.
Proper Orientation: 10° to 80° & 100° to 170°
Heading Error: ± 0.05 nT between 10° to 80° and 360° full rotation about axis.

Environmental

Operating Temperature: -40°C to +55°C
Storage Temperature: -70°C to +55°C
Humidity: 0 to 100%, splashproof

Dimensions & Weights

Sensor: 161mm x 64mm (external dia) with 2m cabling ; 0.43 kg
Electronics Box: 236mm x 56mm x 39mm; 0.46 kg

Power

Power Supply: 22 to 32 V DC
Power Requirements: approx. 40 W at start up, dropping to 15 W after warm-up
Power Consumption: 15 W typical at 20°C
Warm-up Time: <10 minutes at 20°C

Outputs

Outputs X, Y, altitude, UTC time, magnetic field, lock indication, heater, field reversal, GPS position (latitude, longitude altitude, number of satellites)

GEM Systems provide an industry leading 3 year Warranty

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