UAS Aeromagnetic Survey System

The advanced Geodrones Aeromagnetic Survey System utilizes Atomic Rubidium Magnetometer / Vector Fluxgate Magnetometer / Aeromagnetic technology, providing high-resolution and high-sensitivity magnetic data acquisition basing on drones platform.

Common Applications for Geodrones Aeromagnetic Survey system include:

- *Mining exploration (iron, gold, copper, tin, diamonds (kimberlites))*
- *Unexploded ordnance (UXO) detection*
- *Utility location*
- *Archaeology*
- *Regional geology*

➢ Magnetometer Sensors

Rubidium Optical Pump Magnetometer

200g

Specifications	
Field Sensitivity	<1 pT/√Hz in 0.1-100 Hz band
Deadzone	single equatorial plane, ± 7 deg
Heading error	below 3 nT (uncompensated)
Dynamic Range	1000 nT to 100000 nT
Power	5V , 2 W total (sensor+electronics), 3W during startup
Operating temperature range	-30C to +60C
Calibration	none required
Outputs	USB
Dimensions	19x19x47 mm (sensor),100mmx40mmx25mm(control unit)
Weight	30g(sensor)
Slew rate	10000 nT/s
Max gradient	1000 nT/cm
Max data rate	400 samples/s sensor output directly, 10 samples/s for surveying system
Atomic species	Rubidium

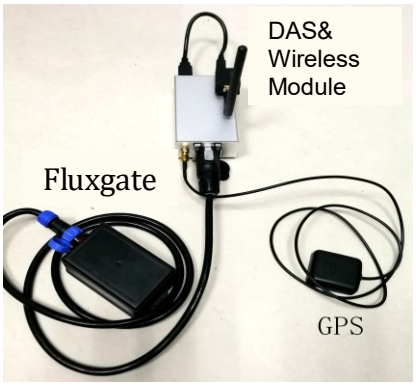
Software Calibrated Fluxgate Magnetometer

70g

Specifications	
Fluxgate axis	3 (Right hand XYZ coordinate)
measuring range	±100μT
Frequency domain noise:	≤10pTrms/√Hz at 1Hz
Preparing time	15 mins
Offset error	In the zero field ±100nT
Scale error	DC, ±0.5%
Temperature offset error	1nT/℃
Orthogonality error	Inter-axial error less than 1°
Weight	70g(sensor)
size	80mmx55mmx35mm

➢ Miniature High Sensitive Rubidium Optical Pump Magnetometer Aeromagnetic Survey System (Total system 700g)

Magnetometers Correction Technology for Fixed connection UAV Platform



Specifications	
Magnetometer Sensor	Optical Pump Magnetometer for magnetic total field Fluxgate Magnetometer for Vector magnetic field
Corrections for magnetometer	12 parameters correction algorithm of fluxgate magnetometer,18 parameters compensation for optical pump total field magnetometer
Correction Mode	Real-time or post-flight Aeromagnetic Correction as options
Evaluation Result	Improved ratio, FOM factors
Data output Rate	1,2,5,10Hz
Power Consumption	5V, 6 W working, 7W during start-up
Operating Temperature	0 to +60
Totally Weight	700g

Data Acquisition System Specifications	
CPU	4 ARM Cortex-A53, 1.2 GHz
ADC converter	24 bit
Digital output noise (static)	0.2nT/√Hz
Weight	285g
Size	110mmx65mmx40mm
GPS accuracy	2.5m/0.02m(RTK)
Interface	USB,ethernet
Ground Station SW	Windows rugged handheld tablets with digital wireless telemetry to display and record data, coefficient estimation

Wireless Telemetry Specifications	
Wireless Frequency	900 MHz (ISM)
Receive Sensitivity	-109 dBm
Range (LoS) with high gain antenna	Up to 9 miles
Transmit Power	250 mW (24 dBm)

9 DOF IMU Attitude Sensors Specifications	
Resolution	Acceleration: 6.1e-5g, Angular velocity: 7.6e-3 ° / s.
Stability	Acceleration: 0.01g, angular speed 0.05° / s
Attitude measurement stability	0.01 °
Angle accuracy	0.1° (dynamic), 0.05° (static)
Weight	14g
Size	51.3mm x 36mm x 15mm

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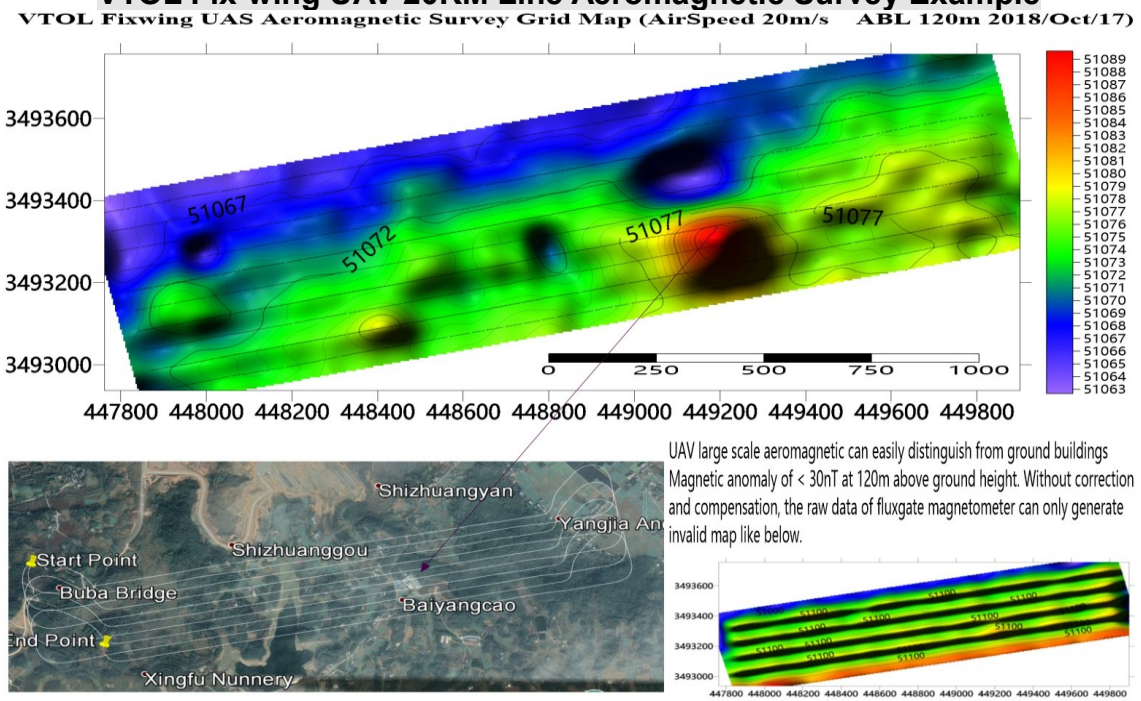
➢ UAV Platform Options

Option 1: VTOL Fix-wing UAV (1~2kg payload)

- Light and small fluxgate aeromagnetic system, total weight only 485g, vertical takeoff and landing fix-wing UAV, suitable for single person operation, quickly assembly with fast lock connection structure, all electrical and mechanical connections can be packed into 1080*550*550mm boxes.
- Long flight time, high efficiency, low cost, high precision, no ground interference, adaptative to multi terrain conditions, fully automatic flight UAS system.
- Wireless real-time aeromagnetic measurement data transmission and ground station real-time display, or data USB storage for post-flight processing
- Magnetometer system integrated in the convenient dis-assembly UAV task pod, the real-time aeromagnetic correction greatly improves the precision of the three-axis vector high-precision magnetometer and reduces the system noise.

Wingspan / fuselage length	2.6 / 1.6m	**Duration of flight**	90min
Maximum take-off weight	12kg	**Cruising / maximum speed**	72 / 108 km/h
Working Payload	1~2kg	**Wind resistance**	6 level
Max High ABL	5500m	**Altitude accuracy**	3cm
Maximum take-off altitude	4300m	**GPS Horizontal accuracy**	1cm+1ppm
Take-off and landing mode	VTOL (vertical takeoff and landing)	**Working temperature**	-20℃~50℃

VTOL Fix-wing UAV 20KM Line Aeromagnetic Survey Example



UAV large scale aeromagnetic can easily distinguish from ground buildings Magnetic anomaly of < 30nT at 120m above ground height. Without correction and compensation, the raw data of fluxgate magnetometer can only generate invalid map like below.

Option 2: Quadcopter UAV (1kg payload)

*DJI multicopter integration support also

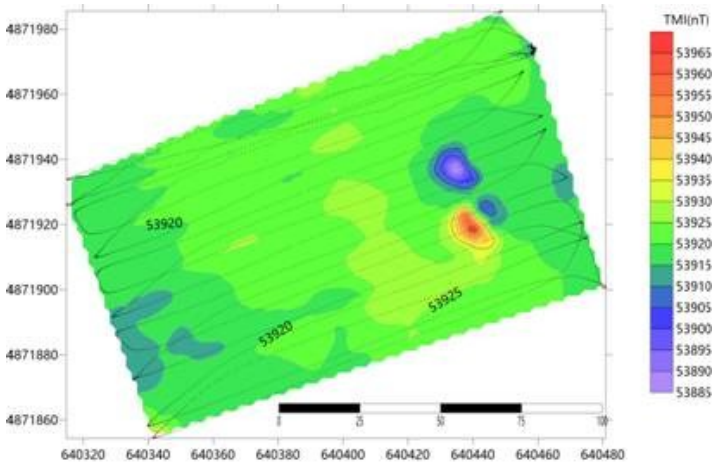
- Foldable and light weight system, can be packed into a solid carry-on equipment case. (battery shipping depends on local rules).
- Fully automatic flight, high precision, no ground interference, adaptative to multi terrain conditions. High precision laser altimeter for terrain fallowing function optional.
- FPV system for remote transmission of flight video optional.
- The unfolded UAV easily and quickly deployed, no massive installation, no concerning system failure and error.
- Survey data real time transmission to the ground station, and displayed in rugged windows ground station.
- Sling Mode or Extensible carbon fiber rod as fixed connection between magnetometer and UAV.
- 12 parameters compensation algorithm for fluxgate magnetometer, reducing the system noise effectively.

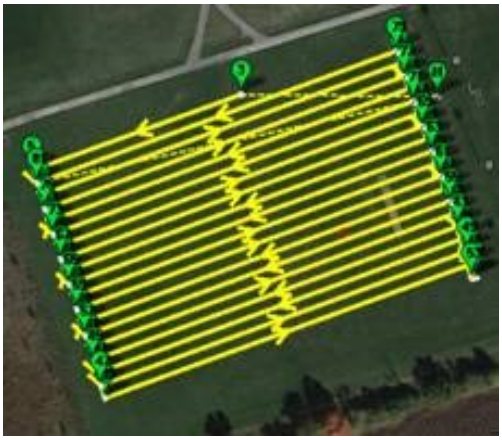
Material	High quality 3K carbon fiber	**Duration of flight**	25min
Maximum take-off weight	4kg	**Cruising speed / maximum speed**	28 / 54 km/h
Working Payload	1kg	**GPS Horizontal accuracy**	2m/2cm (RTK)
Wheelbase	X shape with 680mm	**Working temperature**	0℃~50℃

Sling connection mode

Fixed connection mode

Quad Copter UXO (Unexploded ordnance) Detection TMI Example





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