High Resolution Airborne Magnetometer Surveys

High resolution airborne magnetometer surveys can play an important part in your exploration program. Improvements in magnetometer design have resulted in more accurate data, which combined with GPS, yield significantly better aeromagnetic maps. The overall improvement in accuracy often warrants resurveying areas which were flown using instrumentation and methods now considered obsolete.

High resolution aeromagnetic maps reflect the underlying geology regardless of the degree of exposure. They play such an important role in interpreting structures and rock type distribution that high resolution magnetometer surveying can truly be called a basic, universal exploration tool. Moreover with the relatively low cost of aerial magnetometer surveys they are particularly attractive in the early stage of an exploration project, when large areas need to be covered rapidly.

AIRBORNE MAGNETOMETER SURVEYS AT SGL

Sander Geophysics Limited (SGL) of Ottawa, Canada, specializes in flying high resolution magnetometer surveys worldwide. To maintain our position as a leader in the field, SGL's engineers and scientists are actively involved in developing better instruments and survey methods.

We use optically pumped cesium magnetometers with a sensitivity of 0.005 nT, and computer controlled real-time digital compensation, giving an overall system resolution of 0.01 nT. The magnetometer sensors in the aircraft and in the reference station are identical, ensuring that all magnetometer data sets are equivalent in terms of sensitivity and noise envelope. The sampling rate can be adjusted depending on survey requirements, with most surveys delivered at 10 Hz.

One of SGL's Cessna Grand Caravans

FIXED-WING MAGNETOMETER SURVEYS

All of our aircraft have been extensively modified to accommodate geophysical instruments and to reduce the aircraft's magnetic field. Typical Figures of Merit (FOM) for SGL's fixed-wing aircraft are less than 1 nT. Our standard configuration is to have a single magnetometer sensor mounted in a "stinger" rigidly attached to the tail of the aircraft. Alternatively, several magnetic sensors can be used simultaneously to directly measure the horizontal and/or vertical gradient of the magnetic field by separating the sensors horizontally on booms attached to each wing of the aircraft, and separated vertically on the tail stinger.

HELICOPTER MAGNETOMETER SURVEYS

C-FXPL with stinger

Magnetic data can be acquired using a “bird” towed beneath the helicopter, which incorporates two total field magnetic sensors that are separated horizontally. The bird maintains a constant separation of 4.9 m between the magnetic sensors, which allows recording of the measured horizontal gradient. A GNSS (dual frequency GPS) antenna mounted directly on the bird provides accurate sensor position data.

Alternatively, a single total field magnetometer can be mounted in a stinger rigidly attached to the front of the helicopter, eliminating the need for the towed bird. This option can be useful in built-up areas where towed loads may not be permitted. If there is no regulatory restriction, we usually prefer to use a towed bird because it is magnetically quieter and yields higher quality data.

SGL's aircraft are equipped with GNSS receivers (dual frequency GPS) integrated into a proprietary navigation and flight path recovery system. This system, called **SGNav**, allows for excellent navigation and provides an accuracy of better than 1 m in post-flight recovery. **SGNav** is used in conjunction with our pre-planned, computer-aided drape flying system, **SGDrape**. This system allows us to produce a drape flying surface which is optimal for safety and data quality. Using a drape surface ensures that adjacent flight lines and control lines are flown at comparable levels, resulting in better quality magnetic data.

SGL "bird" in Greenland

SGL's reference stations automatically record diurnal fluctuations of the earth's magnetic field. Both airborne and ground magnetometer data acquisition computers use a temperature compensated quartz crystal oscillator and a counting circuit to provide real-time clocks. These clocks are synchronized to the GPS time strobe, which has an absolute accuracy of 0.5×10^{-6} s.

The company's data centre in Ottawa is equipped for processing and interpretation of high resolution magnetic data. An array of products designed to represent the geology, as expressed through the magnetic data is available. SGL provides complete interpretational services by experienced geoscientists, enhancing the value of your high resolution airborne magnetic survey.

AIRBORNE INSTRUMENTS				
Magnetometer Sensor	**Geometrics** Strap-down, optically pumped, cesium split beam Sensitivity: 0.005 nT Sensor noise level: < 0.02 nT Sampling rate: 10 Hz			
Compensator	**Sander Geophysics – AIRComp** real-time digital compensation Range: 20,000 to 200,000 nT Resolution: 0.001 nT Sampling rate: 160 Hz			
Data Acquisition System	**Sander Geophysics – SGDAS** airborne computer Capable of recording unlimited number of channels at variable intervals, and digital scrolling chart display of the data. Data is recorded on a vibration tolerant removable drive. The system clock is a quartz time standard automatically synchronized to UTC by the GPS signal to an accuracy of 1 millisecond.			
Video Imaging System	**Sander Geophysics – SGDIS** digital video			
Radar Altimeter		**Resolution**	**Calibrated to**	**Range**
	TRT AHV8	0.5 m	1%	0 to 3,050 m (10,000 ft)
	King KRA-10	0.1 m	1%	0 to 760 m (2,500 ft)
	Freeflight	0.5 m	1%	0 to 760 m (2,500 ft)
Barometric Altimeter	**Sander Geophysics Digitally Recording Barometric Altimeter**	2.0 m	+/- 4 m	0 to 10,000 m (33,000 ft)
REFERENCE STATION INSTRUMENTS				
Magnetometer Sensor	Same as airborne			
Magnetometer Interface	**Sander Geophysics – SGRef** Range: 20,000 to 100,000 nT Resolution: 0.01 nT Sampling rate: 2 Hz			
Data Acquisition System	**Sander Geophysics – SGRef** This system runs SGL data acquisition software capable of recording unlimited number of channels at variable intervals, and digital scrolling chart display of the data. Data is recorded on a vibration tolerant removable drive. The system clock is a quartz time standard automatically synchronized to UTC by the GPS signal to an accuracy of 1 millisecond.			
Power Source	**12 VDC** can be wind or solar powered			
NAVIGATION INSTRUMENTS				
Global Positioning System	**NovAtel** – GNSS (Global Navigation Satellite System), reference and airborne Sampling rate: 20 Hz			
Real-Time Differential GPS	Satellite link to the aircraft for real-time in-flight differential GPS (RDGPS), if required			

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