GM 64508

HELICOPTER-BORNE MAGNETIC, GAMMA-RAY SPECTROMETRY AND VLF GEOPHYSICAL SURVEY, DATA ACQUISITION REPORT, KANGIQ PROJECT

HELICOPTER-BORNE
MAGNETIC, GAMMA-RAY SPECTROMETRY AND VLF GEOPHYSICAL SURVEY
NTS MAP SHEETS 24J/09 24I/03 24I/04 24I/05 24I/06 24I/07 AND 24I/12

DATA ACQUISITION REPORT
KANGIQ PROJECT

Presented to:

AZIMUT EXPLORATION INC.
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Presented by:

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M-07395

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1. INTRODUCTION

During September 2007, **Geophysics GPR International Inc**. flew a helicopter-borne magnetic, gamma-ray spectrometry and VLF geophysical survey for **Azimut Exploration Inc.** The survey was composed of six (6) blocks with a minimum coverage of 4005 line-km, located east of kangiqsualujjuaq, (Québec) on the NTS sheets 24J/09, 24I/03, 24I/04, 24I/05, 24I/06, 24I/07 and 24I/12. A total of **1932 line-km** was flown from September 22nd to 30th, 2007. The difference between the minimum coverage and the line-km flown is due to the ending of the survey caused by important snow falls.

The Helimager™ system is a towed bird system configured with two caesium vapour magnetometers at the end of the lateral arms. The system also includes a Totem-2A VLF receiver, a GRS-10 gamma-ray spectrometer and two DGPS systems, one mounted into the helicopter and the other mounted directly on the Helimager™ system.

This report is intended to be read in association with the printed maps provided in Appendix C.

Data processing and quality control was carried out by Olivier Létourneau, Phys. and Josianne Morel, Jr. Eng. The report was written by Isabelle D'Amours, Eng. M.A.Sc. and Olivier Létourneau, Phys.

2. SURVEY DETAILS

2.1 Survey Area

The survey area is located east of Kangiqsualujjuaq, Québec, Canada (*Figure 1*). The survey consists of six (6) blocks on the NTS map sheets 24J/09 24I/03 24I/04 24I/05 24I/06 24I/07 and 24I/12.

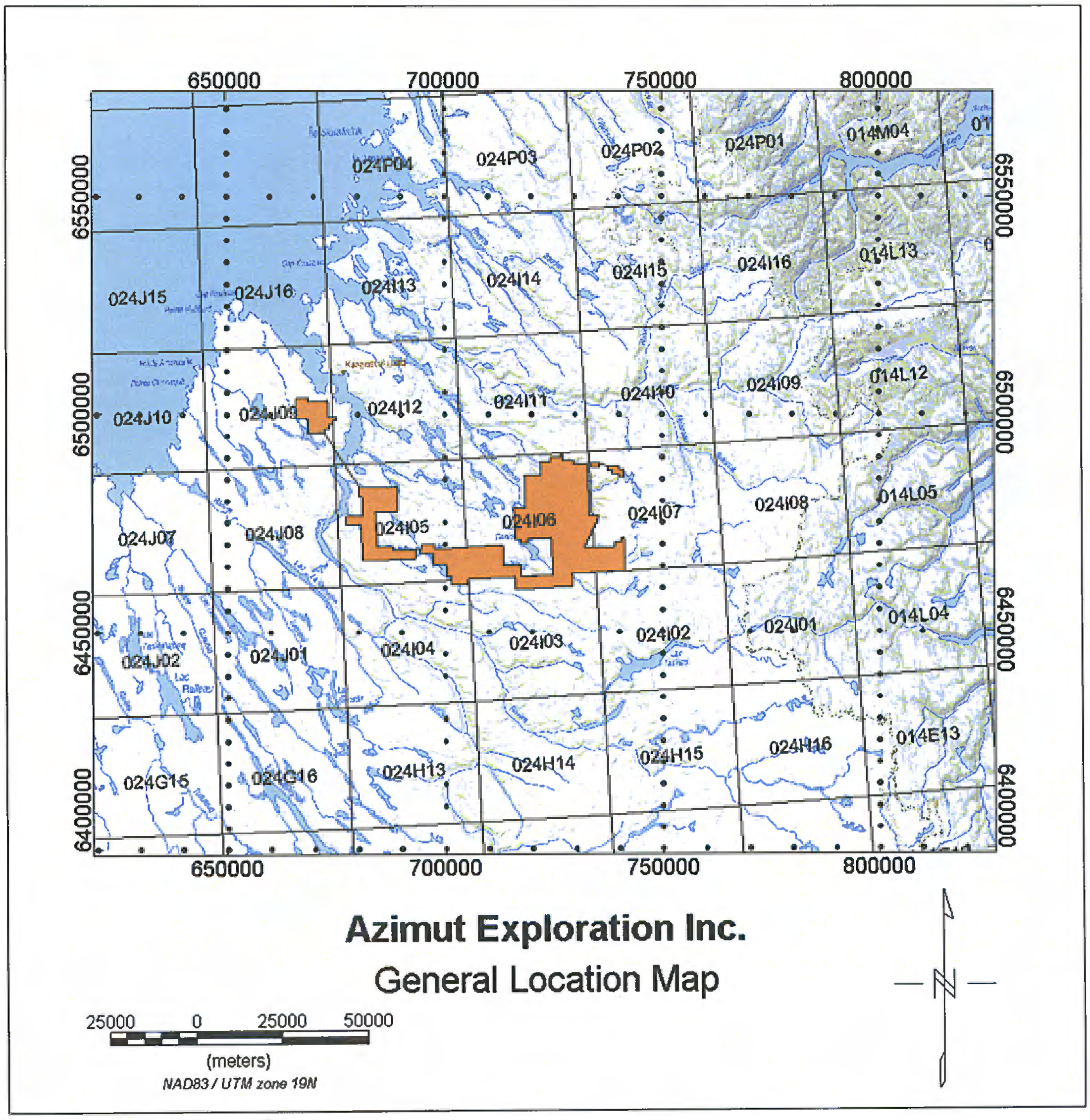

Figure 1 – General survey area

2.2 Survey block parameters

The direction of the flight lines is (N-S). The direction of the tie-lines is (E-W), with respect to UTM coordinates.

The coordinates given in *Table 1* represent the outline of the zone to be flown. **All coordinates are given in UTM zone 19N (NAD83).**

X (m)	Y (m)
716133	6462455
716285	6459674
729488	6460419
729326	6463199
741542	6463928
741088	6471342
740600	6471312
740657	6470385
705381	6461881
739194	6470296
739250	6469369
732419	6468960
732364	6469887
732852	6469916
732797	6470843
733285	6470872
733230	6471798
733718	6471827
733663	6472754
734150	6472783
734095	6473710
734582	6473739
734527	6474666
735014	6474695
734959	6475622
735446	6475651
735391	6476578
733443	6476461
732726	6488510
729813	6488338
729759	6489265
727332	6489123
727224	6490977
726739	6490948

Blocks A1-A2

X (m)	Y (m)
680408	6482961
680493	6481107
680980	6481129
681193	6476493
677299	6476315
677382	6474461
680792	6474616
681176	6466271
693378	6466851
693378	6466851
693287	6468765
688409	6468469
688364	6469396
684426	6469211
684071	6477556
689425	6477811
689157	6483374
680408	6482961

Block B

X (m)	Y (m)
665889	6503687
666087	6499050
668507	6499154
668667	6495445
672543	6495615
672502	6496542
673471	6496585
673430	6497512
674398	6497555
674357	6498483
675325	6498526
675283	6499453
673347	6499367
673182	6503076
668830	6502885
668790	6503812

Block C

X (m)	Y (m)
733697	6488568
735639	6488684
735695	6487758
733753	6487641

Block D

X (m)	Y (m)
737637	6487875
740065	6488023
740122	6487096
741094	6487156
741208	6485303
740236	6485243
740179	6486170
738722	6486081
738665	6487007
737694	6486948

Block E

Table 1: Survey block coordinates

Six (6) blocks were scheduled for surveying for a total of **4005 line kilometers**, based on 200 meters line spacing and 2000 meters tie-line spacing.

2.3 Survey geodetic parameters

Table 2 below presents the geodetic parameters that were used for data acquisition. The parameters were defined as NAD83 Zone 19 North in the navigation software. Subsequent coordinate transformation was necessary for drawing A1, A2, B, D and E maps which was drawn in NAD83 Zone 20 North.

Block	C	A1,A2,B,D and E
Datum:	NAD83	NAD83
Geoid:	GRS-80	GRS-80
Projection:	UTM	UTM
Zone:	19N	20N
Central meridian:	-69°	-63°
False Easting:	500 000	500 000
False Northing:	0	0
Scale factor:	0.9996	0.9996

Table 2 – Geodetic parameters

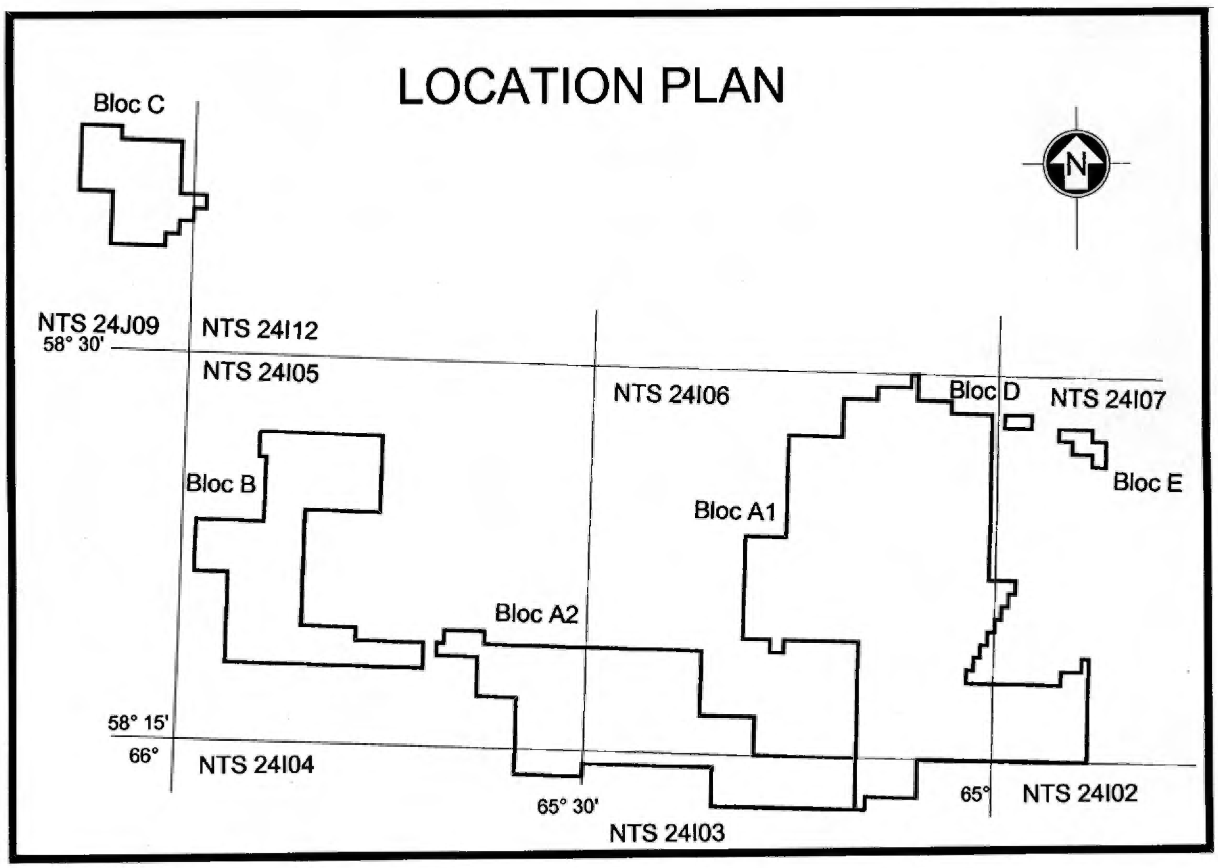

Figure 2 – Survey area and map sheets location for Kangiq project

3. LOGISTICS

3.1 Survey helicopter

- Type : Bell 206-L Jet Ranger
- Call sign : **C-GMHT**
- Operated by: **Canadian Helicopters Ltd,** based in Sept-îles, Québec

3.2 Survey personnel

The survey crew consisted of the following personnel (*Table 3)*:

Operator	*Christian Chatel, tech.*	*Valérie Guay, tech.*
Data QC and Processing	*Olivier Létourneau, Phys.*	*Josianne Morel, Jr. Eng.*
Map QC and Report	*Olivier Létourneau, Phys.*	*Isabelle D'Amours, Eng., M.A.Sc.*
Drafting	*André Beaudoin, tech.*	
Project Manager	*Réjean Paul, Eng.*	
Mechanic	*Jean-Philippe David*	
Pilot	*Jean-Yves Lacasse*	

Table 3 – Survey personnel

3.3 Preparation

The helicopter's installation was carried out at the base of Canadian Helicopters Ltd. located in Sept-îles, Québec. The Helimager™ system was assembled and a test flight was carried out.

3.4 Operating base & fuel cache

The crew was based at Barnouin Camp, Québec. A nearby field was used for take-off and landing operations with the bird attached.

3.5 Flight dates

The crew mobilized on September 21st. Production flying was carried out from September 22nd to 30th. The crew demobilized on October 2nd. Two (2) days were lost due to bad weather conditions, and one (1) day was lost because the VLF station was not available (no signal on Mondays).

4. DATA ACQUISITION

4.1 Planned survey parameters

Table 4 below shows the planned survey parameters for the project.

Parameters	Specifications
Mag. Sampling Interval	2.5 m (0.1s)
VLF Sampling Interval	5.0 m (0.2s)
Spectro. Sampling Interval	25 m (1.0s)
Flight-line Spacing	200 m
Flight-line Direction	N-S
Control-line Spacing	2000 m
Control-line Direction	E-W
Aircraft MTC	60m +/- 6m
Mag. Sensor MTC	30m +/- 6m
Ground speed	80 km/h +/- 20 km/h

Table 4 – Planned survey parameters

4.2 Quality control

During data acquisition, quality control was carried out on data on a daily basis by GPR's data processor to ensure that quality remained within specifications. At the end of the planned survey, data were reviewed by GPR's team leader and re-flight lines were identified. Profiles were checked after each production day to ensure correct flight path recovery and instrument noise was verified using Geosoft Oasis Montaj Software.

5. SURVEY EQUIPMENT

5.1 The HELIMAGER™ Gradiometer system

The **HELIMAGER™** system consists of a tri-axial magnetic gradiometer, developed by **Geophysics GPR International Inc.** The gradiometer was installed on a stable helicopter-borne vector platform capable of accepting a range of different sensors / instruments, particularly useful for the mapping and exploration of mountainous regions. The platform allows the arrangement of the sensors in three orthogonal directions. A photograph of the platform is presented below (*Figure 3*).

Advantages of measuring the lateral gradients include the production of bi-directional total magnetic field gridding using measured transversal magnetic gradient. It may also be used for the gridding of the Laplace Enhanced Vertical Gradient, as well as allowing Laplace Enhanced Total Field gridding that are both free of all diurnal variations, if data quality permits it.

Figure 3 – Helimager™ in flight with a Bell 206-L

5.2 Helicopter-borne magnetometers

Two (2) Geometrics G-823A (optically pumped caesium vapour) total magnetic field sensors with a sampling interval of 0.1 second were mounted on the gradiometer, below a 30 meters cable. The sensors were installed at the end of the horizontal boom (6m), in order to measure the lateral. The magnetometers send the measured magnetic field intensity as nanoTesla (nT) units to the data acquisition system via a RS-232 port.

5.3 Base-station magnetometer

A Geometrics G-856 Ax (proton precession) total magnetic field sensor, with a sampling interval of 4 seconds was used to record the diurnal variation of the magnetic field at the base-station's location. The base-station was set up at a location away from power lines and main roads to avoid interference from traffic. It was located a few kilometers from the local airport in a nearby wooden area.

5.4 Airborne Gamma-ray Spectrometer

The PICO GRS-10 system is an intelligent, self calibrating gamma-ray spectrometer using NaI (Tl) large volume detector arrays. All dedicated electronics modules are housed within the detector's container. The GRS-10 series of gamma-ray spectrometers are widely used in geological and geophysical exploration and mapping as well as in environmental and nuclear surveillance.

Individual, independent, detector processing provides real time gain and linearity correction. The system's stabilization algorithm makes these spectrometer systems fully automated and self-stabilizing on natural radioactive elements. This eliminates the requirement for regular, time consuming, and frequent system checking and re-calibration. Furthermore, it provides excellent accuracy and reliability of the gamma-ray measurements.

Individual crystal detector signal processing provides an accurate control over each contributing sensor providing the user with the best possible spectrum alignment for the complete system. New design techniques for the peak detection electronics almost completely eliminate 'pulse pile up' and 'Dead Time' effects.

The technique used for radon removal is the spectral ratio method (Minty, B.R.S., 1992: *Airborne gamma ray spectrometric background estimation using full spectrum analysis*. Geophysics, 57, 279-287) and does not require the use of an upward looking detector.

System specifications:

- Resolution: 256 channels
- Four NaI crystal detectors, each with individual electronics, for a total of 16.8 litres (1025in^3) of crystals "downward looking"
- Individual detector tracking and linearity correction
- Energy spectra from 36 keV to 3 MeV with adjustable threshold
- Data sampling rate: 1 Hz
- Signal sampling: 25 MHz by internal 12 bit ADC for each detector
- Pulse rate per detector : > 60000 pulses per second with negligible dead time
- Channel capacity : 65500 counts/sampling period
- Operating temperature range: -10° to +55° Celsius

5.5 DGPS positioning

A DGPS Novatel ProPak L-Band signal receiver system which provides various types of correction data for increased accuracy was used for in-flight navigation, with a sampling interval of 1 second. The antenna was mounted directly on the bird, and allowed an accurate positioning of the bird.

The DGPS system provides an accurate positioning as well as the height above the WGS-84 ellipsoid. A LED-type track bar (from AG-NAV Inc.) was used by the pilot for efficient line tracking in any lighting conditions. A second DGPS comprising the same elements was mounted on the helicopter.

5.6 Radar altimeter

A FreeFlight TRA3000 radar altimeter, combined with a TRI30 Indicator unit mounted on the helicopter provides the pilot with highly accurate altitude-above-ground-level (AGL) information. A second radar altimeter comprising the same elements was mounted on the bird, along with the GPS and magnetic sensors.

5.7 Herz TOTEM-2A multi-channel airborne VLF system

VLF electromagnetic survey uses powerful VLF transmitters located around the world for navigation and submarine communications. For this survey, the transmitting station in Cutler, Maine (NAA, 24.0 kHz) was used.

This radio transmitter emits powerful radio-waves (around 2 Megawatts) at 24 kHz that induce electrical currents in conductive bodies which intensity depends on different factors such as the distance of the emitting source and the conductivity and volume of the bodies. The induced currents produce a secondary magnetic field at the same frequency which is detected at the near surface through alteration of the original primary field. This secondary field, which is called quadrature, is tilted up on the near side of the conductor and down to the other. The total field is composed of both primary and secondary fields.

The VLF electromagnetic system used for this survey is the TOTEM-2A which employs state-of-the-art, unique digital and linear integrated circuits to implement the functions of crystal-controlled phase-locked loop frequency synthesizers, dual frequency heterodyne conversion and proprietary time domain sampling vector computation techniques, with a sampling interval of 0.2 second. The VLF receiver measures the vertical, transversal and longitudinal quadrature components and total field as a ratio of the total primary field.

For this survey, only the VLF total field was recorded.

System specifications:

- Capability of simultaneous measurement of two VLF stations
- Accurate frequency selection: from 15 kHz to 25 kHz; selectable for each channel in 100 Hz steps
- Sensitivity range: from 130 μV m to 100 mV m at 20 kHz; 3dB down at 14 kHz and 24 kHz
- VLF signal bandpass: -3dB at ± 80 Hz; < 4% variation at ± 50 Hz
- Internal Noise: 1.3 μV m RMS

5.8 Helicopter Data Acquisition and Recording System

The Helicopter data acquisition and recording system is composed of proprietary hardware developed by **Geophysics GPR International Inc.** and an industry standard navigation / recording software package (Hypack Max 6.2). Data were recorded on hard disk and backed up after each flight.

5.9 Field computer workstation

A dedicated laptop computer was used on-site for the purpose of displaying geophysical data for quality control, calculating and displaying the navigation, producing preliminary magnetic, gamma-ray spectrometry and VLF maps, and backing up digital data.

6. DATA PROCESSING

6.1 Magnetic data

1) Data checking, editing, reformatting and flight path recovery

Data recorded on the helicopter were transferred after each flight to the processing computer for verification and quality control. Raw GPS data (longitude, latitude and height) were recorded in the WGS-84 geodetic system. These coordinates were transformed into the NAD83 datum, UTM projection, Zone 19 North and 20 North by the navigation software and compared in real-time to the theoretical coordinates of the flight paths to provide a correction to the pilot.

The DGPS data (1.0 s interval) were interpolated at the same rate as the magnetic data (0.1 s interval) and exported for flight path recovery and quality control.

Raw line data was transformed into Oasis Montaj .XYZ format by a proprietary software program.

2) Diurnal corrections

The magnetic data recorded at the base-station were synchronized, using the GPS time and merged with the helicopter-borne data. Subsequently, the diurnal corrections obtained by subtracting the mean value of the base-station readings were applied to the data after low-pass filtering.

3) Lag corrections

A lag correction of 0.1 second was applied to the magnetic data based on the results of the lag test that can be found in Appendix A.

4) Heading corrections

A heading correction was not applied to the magnetic data since the original data was of sufficient quality. The results of the heading calibration can be found in Appendix A.

5) Tie-line levelling

Classical tie-line levelling was performed on the Total Magnetic Intensity data for the block C and was not performed for the other data due to the lack of Tie-line for the those block. The LevTieLine processing module in Oasis Montaj was used to carry out these operations.

6) Micro-levelling

The final step was to remove any minor line to line effects (most probably caused by different flight altitudes between the lines). This is most effectively done by microlevelling the grid in the frequency domain. The MAGMAP processing module in Oasis Montaj was used to carry out these operations. A standard combination of a Butterworth high-pass filter followed by a directional cosine filter was used to obtain the residual error grid, which was imported in the Oasis Montaj data base, filtered and subtracted from the original to remove errors striking parallel to the line direction.

7) First Vertical Derivative (FVD)

The first vertical derivative was obtained with the help of the 2D-FFT first vertical derivative calculated from the total magnetic field.

Figure 4 presents a summary of the processing sequence used to obtain the final magnetic grid.

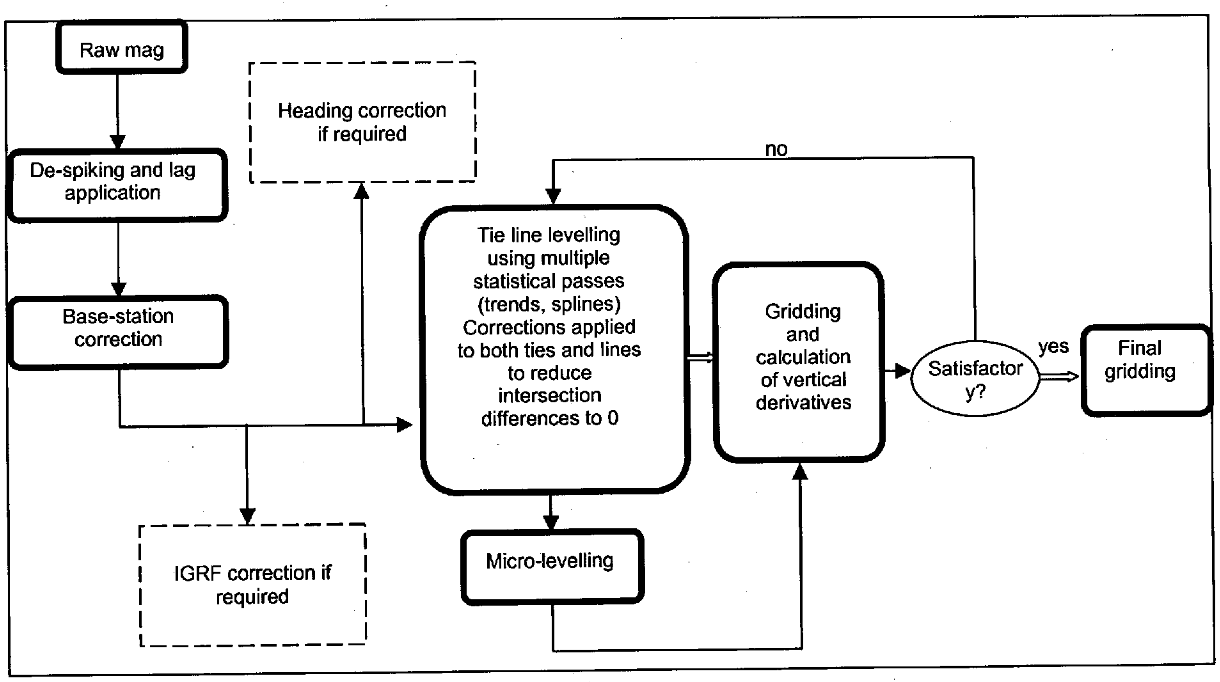

Figure 4 – Standard Magnetic data processing flow

6.2 Digital Terrain Model (DTM) data processing

The Digital Terrain Model was obtained by subtracting the radar altimeter readings from the DGPS' height. The radar altimeter was corrected for an estimated lag of 2 seconds.

A standard combination of a Butterworth high-pass filter followed by a directional cosine filter was used to obtain the residual error grid, which was imported in the Oasis Montaj database, filtered and subtracted from the original to obtain the de-corrugated DTM data.

6.3 Gamma-ray Spectrometry

The preliminary data processing and quality control of airborne gamma-ray spectrometry was performed using the Geosoft Oasis Montaj RPS suite.

The following checks were performed in the field:

1) Careful verification of each profile (and spectra) to spot spikes, jumps or interruptions in the readings.
2) Statistical calculation of the mean spectra at each line to ensure peak stability.
3) Gridding windowed elements (K, U, Th) and total count to evaluate data coherence and consistence.
4) A background over lakes flight was flown in the morning and at the end of the flying to check daily variations in the radon content.

The final processing of the gamma-ray spectrometry data was performed with the Praga3 software. This program is specially designed to process Pico Envirotec spectrometer acquired data and interfaces directly with Geosoft Oasis Montaj. The Praga3 program uses the spectral ratio method to calculate the radon component, which eliminates the necessity to use an upward looking detector in a survey. The following diagram summarizes the processing of the airborne gamma-ray spectrometry data including conversion to equivalent concentration units using the calibration pads and range results which can be found in Appendix A. Micro amplitude levelling was executed to remove the apparent effect of the snow.

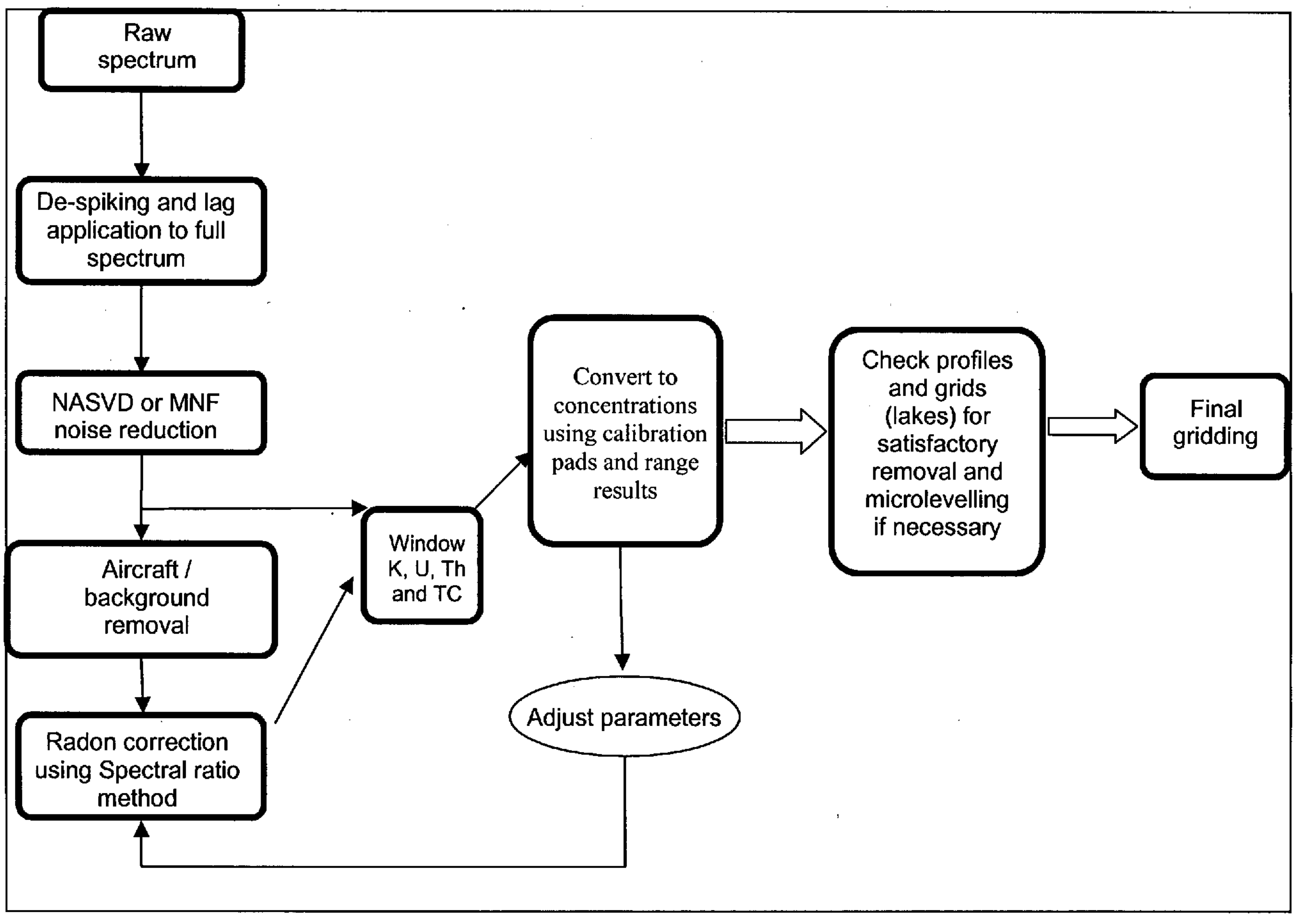

Figure 5 – Gamma-ray spectrometry processing flow

6.4 VLF

The VLF transmission antenna used was the NAA in Cutler, Maine (24.0 kHz).

The VLF total field data was zero-levelled and a lag correction of 0.85 second was applied to the data.

The final step was to remove any minor line to line effects (most probably caused by different flight altitudes between the lines). This is most effectively done by applying a filter on the grid in the frequency domain. The MAGMAP processing module in Oasis Montaj was used to carry out these operations. A standard combination of a Butterworth high-pass filter followed by a directional cosine filter was used to obtain the residual error grid, which was imported in the Oasis Montaj data base, filtered and subtracted from the original to obtain the de-corrugated VLF data.

6.5 Presentation

The Total Magnetic Field, First Vertical Derivative, DTM, equivalent Potassium, Uranium and Thorium concentration, air absorbed dose rate, VLF total field components were gridded using the Minimum Curvature algorithm of Oasis Montaj using a 50 meters size cell.

7. FINAL PRODUCTS

7.1 Paper products

A standard set of geophysical maps was produced at a scale of **1: 50 000**. The flight path is presented on a separate map. The claims boundaries and numbers are displayed on this map. The name and direction of the lines are indicated at the beginning and end of each line.

Block C maps were drawn in the UTM projection Zone 19 North, NAD83 datum and the block A1, A2, B, D and E maps were drawn in the UTM projection Zone 20 North, NAD 83 datum. Coordinate units are in meters, unless indicated otherwise.

The final paper products consist of twenty-seven (27) maps.

The final maps produced for each map sheet are as follows:

1) Flight path recovery and property limits map
2) Colour contour map of the Total Magnetic Intensity
3) Colour contour map of the First Vertical Derivative
4) Colour contour map of the VLF Total Field component
5) Colour contour map of the Digital Terrain Model
6) Colour contour map of the equivalent Potassium concentration
7) Colour contour map of the equivalent Uranium concentration
8) Colour contour map of the equivalent Thorium concentration
9) Colour contour map of the total air absorbed dose rate derived from the total counts.

The digital data are included on a CD-ROM along with the printed maps.

Table 5 on the following page lists each map type and its associated drawing number.

Drawing title	Blocks drawing numbers		
Block	C	B-A2	A1-A2-D-E
Flight path Recovery and Property limits	07-12-720-00	07-12-730-00	07-12-740-00
Total Magnetic Field, (nT)	07-12-721-00	07-12-731-00	07-12-741-00
First Vertical Derivative (nT/m)	07-12-722-00	07-12-732-00	07-12-742-00
Equivalent Potassium concentration (%)	07-12-723-00	07-12-733-00	07-12-743-00
Equivalent Uranium concentration (ppm)	07-12-724-00	07-12-734-00	07-12-744-00
Equivalent Thorium concentration (ppm)	07-12-725-00	07-12-735-00	07-12-745-00
Total air absorbed dose rate (nGy/h)	07-12-726-00	07-12-736-00	07-12-746-00
VLF total field, (ppm)	07-12-728-00	07-12-738-00	07-12-748-00
Digital Terrain Model, (m)	07-12-729-00	07-12-739-00	07-12-749-00

Table 5 – Drawing titles and numbers

7.2 Digital products

Below is a list of the products delivered on CD-ROM (More detailed in Appendix C).

There are two (2) main directories:

Data

Contains for Mag. and VLF:

• Databases	(Oasis Montaj™ .GDB and ASCII.XYZ)
• Grids	(Montaj™ .GRD binary grid format)
• Projection information files	(MapInfo and other .GI)
• Maps	(Oasis Montaj™ .MAP)
• Files used in the MapInfo software to distinguish a Geosoft map file from a MapInfo file	(MapInfo and other .GM)
• Geo referenced image map	(Montaj™ .TIFF)

Report

Contains:

• Copy of the report	(Adobe Acrobat .PDF)
• Report on the lag test for mag.	(Adobe Acrobat .PDF)
• Report on the heading test for mag	(Adobe Acrobat .PDF)
• Daily flight log	(Adobe Acrobat .PDF)
• Description of the database's Channel	(Adobe Acrobat .PDF)

8. CONCLUSION

A helicopter-borne magnetic, gamma-ray spectrometry and VLF geophysical survey was flown for **Azimut Exploration Inc.** The survey was composed of six (6) blocks, east of Kangiqsualujjuaq, (Québec). A total linear distance of **1932 km** was flown from September 22nd to 30th, 2007.

The total magnetic intensity was measured by the horizontal gradiometer system. Also the gamma-ray spectrum and VLF total field were measured. DGPS positioning data were collected and the Digital Terrain Model was obtained by subtracting the radar altimeter height from the GPS elevation.

The final paper products consist of maps at a scale of 1:50 000. A total of twenty-seven (27) maps was produced. The digital products consist of final databases, maps, metadata files and final grid files. Digital data are included on the CD-ROM and the content is described in Appendix C.

It is hoped that the information presented in this report and on the accompanying maps will be useful both in planning subsequent exploration efforts and interpretation of related exploration data.

This report was written by Isabelle D'Amours, Eng., M.A.Sc. and Olivier Létourneau, Phys., and was approved by Réjean Paul, Eng., Geoph.

Isabelle D'Amours, Eng., M.A.Sc.

Réjean Paul, Eng., Geoph.
President

REFERENCES

Grasty, R.L. Minty, B.R.S., 1995, A Guide to The Technical Specifications for Airborne Gamma-Ray Surveys, Australian Geological Survey Organisation

McNeill, J.D. Labson, V.F.,1992, Geological Mapping Using VLF radio Fields in Electromagnetic Methods in Applied Geophysics, ed. Misac Nabighian, vol. 2., Society of Exploration Geophysicists, Tulsa.

Minty, B.R.S., 1992, Airborne gamma ray spectrometric background estimation using full spectrum analysis, Geophysics, 57(2), 279-287

CERTIFICATE OF QUALIFICATION

1. I, the undersigned, Isabelle D'Amours, residing at 6875 Corelli, Brossard, Québec graduated with a B. Eng. in geological Engineering from École Polytechnique de Montréal in 1996 and I obtained a M.A.Sc. in Applied geophysics in 1998 also from École Polytechnique de Montréal and I have worked in airborne geophysics since the year 2000.
2. I am a member of the Québec Order of Engineers (number 118513) and of the Society of Exploration Geophysicists.
3. I have no direct or indirect interests in the mining claims owned by **Azimut Exploration Inc.**, nor in the securities of this company and have no interest in receiving such interest.
4. My company, I.D. Geophysics Inc. is hired by Geophysics GPR International Inc. for consulting and training purposes.

Signed in Longueuil, on the 18th of December, 2007

Respectfully submitted,

Isabelle D'Amours

Ingénieure · Engineer
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Isabelle D'Amours, Eng. M.A.Sc. (# 118513)

APPENDIX A

Equipment Calibration and Tests

AEROMAGNETIC SYSTEM CALIBRATION (HEADING TEST)

Project #: M07395

Aircraft:	C-GMHT	Date:	September 19th 2007
Company:	Azimut Exploration Inc.	Height Flown:	60m
Magnetometer:	Geometrics G-823A	Sampling rate:	10Hz
Data Acquisition system:	Helimager	Compiled by:	Olivier Létourneau, Phys.

EXEMPLE	TIME h	RMF (nT)	Correction (nT)
0	22:12:7	1.77517645	1.09
90	22:7:49	-2.141517707	-0.52
180	22:19:6	3.528687402	-1.09
270	22:29:13	-1.887345099	0.52
0	22:25:52	2.314465087	
90	22:22:49	0.383213087	
180	22:46:33	4.908219694	
270	22:42:22	-1.958840387	

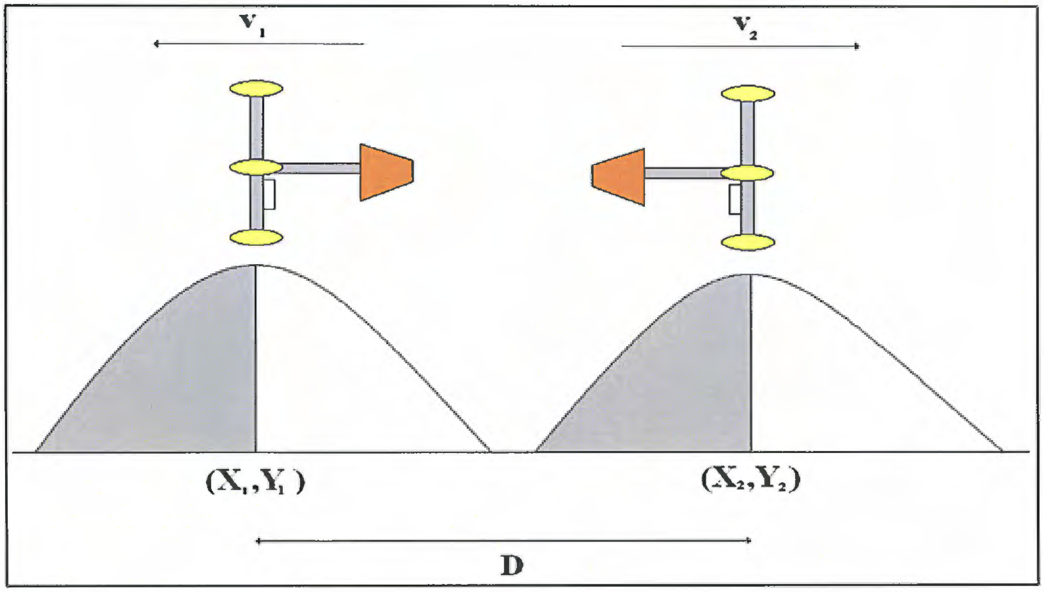
.TBL to be use for heading correction in geosoft.

```
/   Geosoft Heading Correction Table
/=  Direction:real:i
/=  Correction:real
/   Direction   Correction          (degrees)        (nT)
                                            0        1.09
                                           90       -0.52
                                          180       -1.09
                                          270        0.52
```

AIRBORNE GEOPHYSICAL SURVEY

MAG LAG TEST

PROJECT:	M07395	PILOT:	Philippe Tajan
LOCATION:	Havre Saint-Pierre, QC	OPERATOR:	Valérie Guay
CLIENT:	Azimut Exploration Inc.	COMPILED:	Olivier Létourneau, Phys
DATE:	August 27th, 2007	AIRCRAFT:	Bell 206L - C-GMHT



LINE (#)	HEADING (°)	FIDUCIAL (#)	X (m)	Y (m)	SPEED (m/s)	Magnetic Field (nT)
L1	330	301	455752.6	5573116.0	22.8	55247.21
L2	150	737	455747.6	5573117.4	28.0	55355.33
L3	330	1240	455751.6	5573117.9	26.1	55298.42
L4	150	1665	455739.8	5573114.2	22.3	55367.07

MEAN SPEED = (V1 + V2 + V3 + V4) / 4
DISTANCE = {(X330 – X150)2 + (Y330 – Y150)2 }1/2
LAG = (DISTANCE / 2) / MEAN SPEED

MEAN SPEED	24.8 m/s			
DISTANCE	8.4 m			
LAG	0.1701 s	rounded to	0.1	s

RAPPORT JOURNALIER

GÉOPHYSIQUE GPR INTERNATIONAL
M07395 2007-10-04 V.Guay

Projet		Équipe GPR		Helicoptère		Station de base	
Client:	Exploration Azimut	*Responsable terrain:*	Christian Chatel	*Pilote:*	Jean-Yves Lacasse	*Latitude :*	65°27'34.3"
		Opérateur:	Valérie Guay	*Mécano :*	Jean-Philippe David	*Longitude :*	58°33'24.6"
Site :	Baie d'Ungava, camp Barnoin	*Camion :*		*Modèle :*	Bell 206L long Ranger		
Levés :	Spectro, mag et VLF	*Bird :*	Helimager 1	*Immatriculation:*	C-GMHT		

Jour	Date	Opérateur	Activités et commentaires	Levé (km)		Attente (Journées)	
1	Ven. 21 sept.		Mobilisation de Schefferville au camp Barnouin.				
2	Sam. 22 sept.	CC	1/2 vol de production Bloc B, arrêt à cause du vent, 50-70km/h.	27.4		1.0	
3	Dim. 23 sept.	VG	1.5 vols de production Bloc B, mauvaise météo.	209.8			
4	Lun. 24 sept.		Météo: vents 80km/h, pluie.	0.0		1.0	
5	Mar. 25 sept.	CC	Mauvaise météo, 1 vol de production Bloc B en fin de journée.	183.7		0.0	
6	Mer. 26 sept.	VG	3 vols de production, terminé lignes reg. Bloc B, commencé Bloc A2.	351.7		0.0	
7	Jeu. 27 sept.	VG	3 vols de production sur le Bloc A2.	395.0		0.0	
8	Ven. 28 sept.	CC	2 vols de production	242.1		0.0	
9	Sam. 29 sept.	VG	2 vols de production	246.3		0.0	
10	Dim. 30 sept.	CC	3 vols de production	193.6		0.0	
11	Lun. 1 oct.		Météo: vents 70km/h, pluie.	0.0		1.0	
12	Mar. 2 oct.		Démobilisation vers Sept-Iles	0.0		1.0	
13	Mer. 3 Oct		Attente de l'arrivé de l'hélico, Préparation matériel pour démob en camion	0.0		1.0	
14	Jeu. 4 Oct		Démobilisation Sept-Iles vers Montreal	0.0		1.0	
			Total :	1849.6	0.0	6.0	0.0

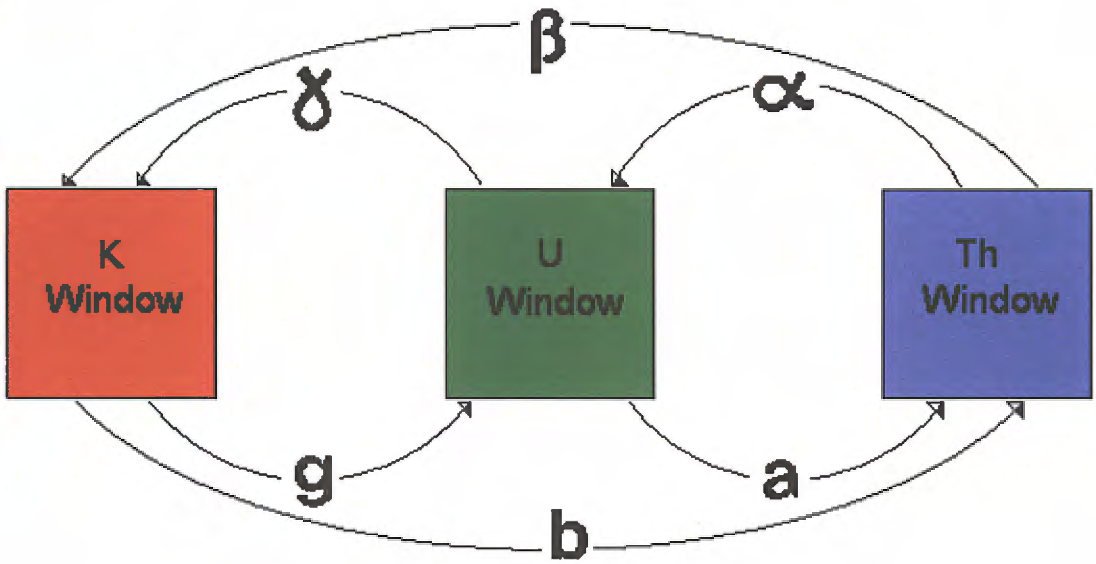
STATISTIQUES

14	jours, levés, attente et mobilisation
2.0	jours d'attente météo
1.0	jours d'attante, VLF
0.0	jours d'attente , bris d'hélicoptère
0.0	jours d'attente , bris d'équipement
4.0	jours de préparation et mobilisation
3.0	Total des jours d'attente
7.0	Jours de levé, sans attente

CALIBRATION RESULTS OF K-U-TH AND TC WINDOW COUNTS FROM PAD MEASUREMENTS

Spectrometer: GRS-10 from Pico Envirotec

Stripping Ratios

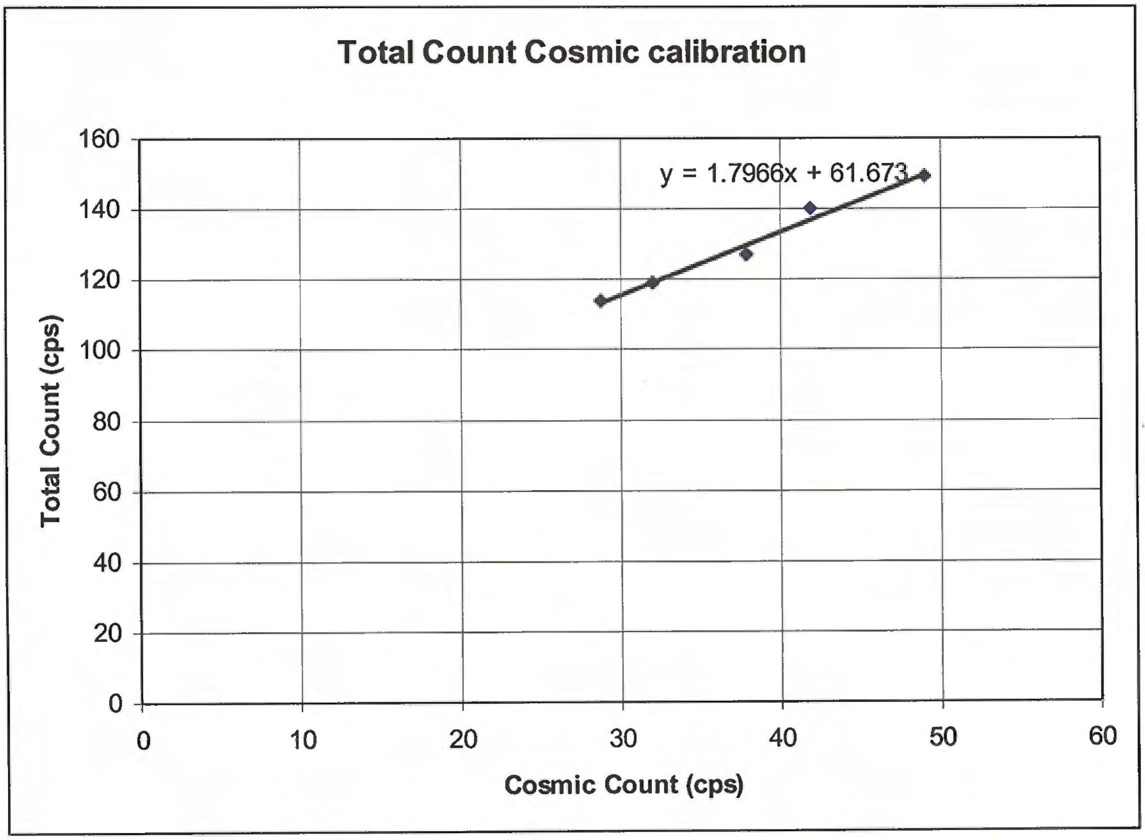


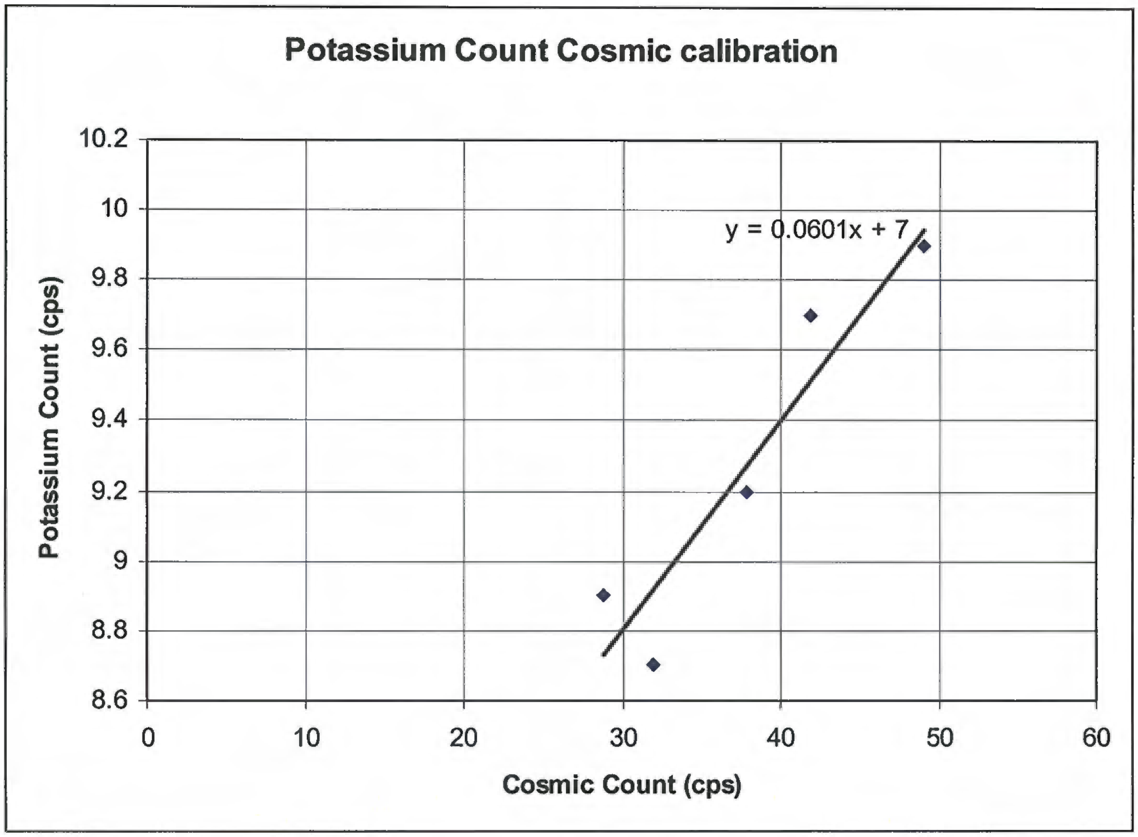
Th into U	α (alpha)	0.2401
Th into K	β (beta)	0.4144
U into K	γ (gamma)	0.7092
U into Th	a	0.0263
K into Th	b	0.0000
K into U	g	0.0000

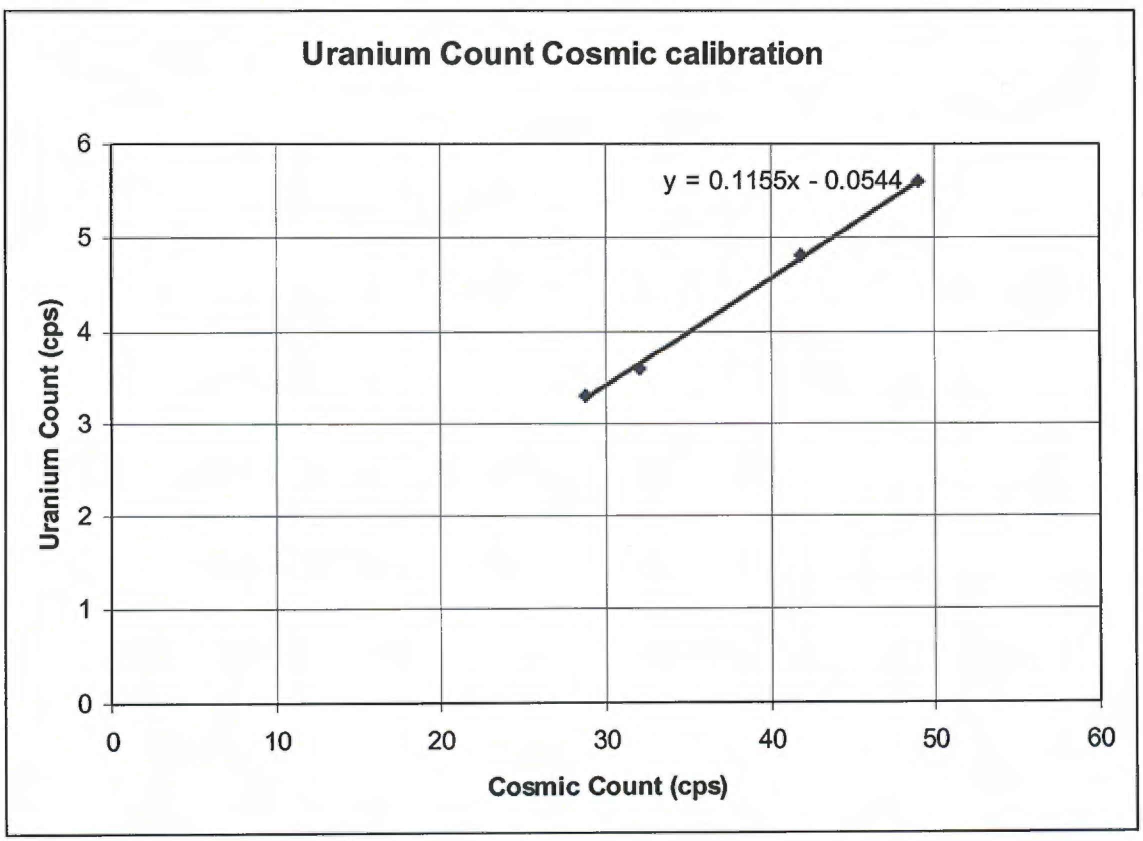
System Sensitivities (60 m ground clearance)

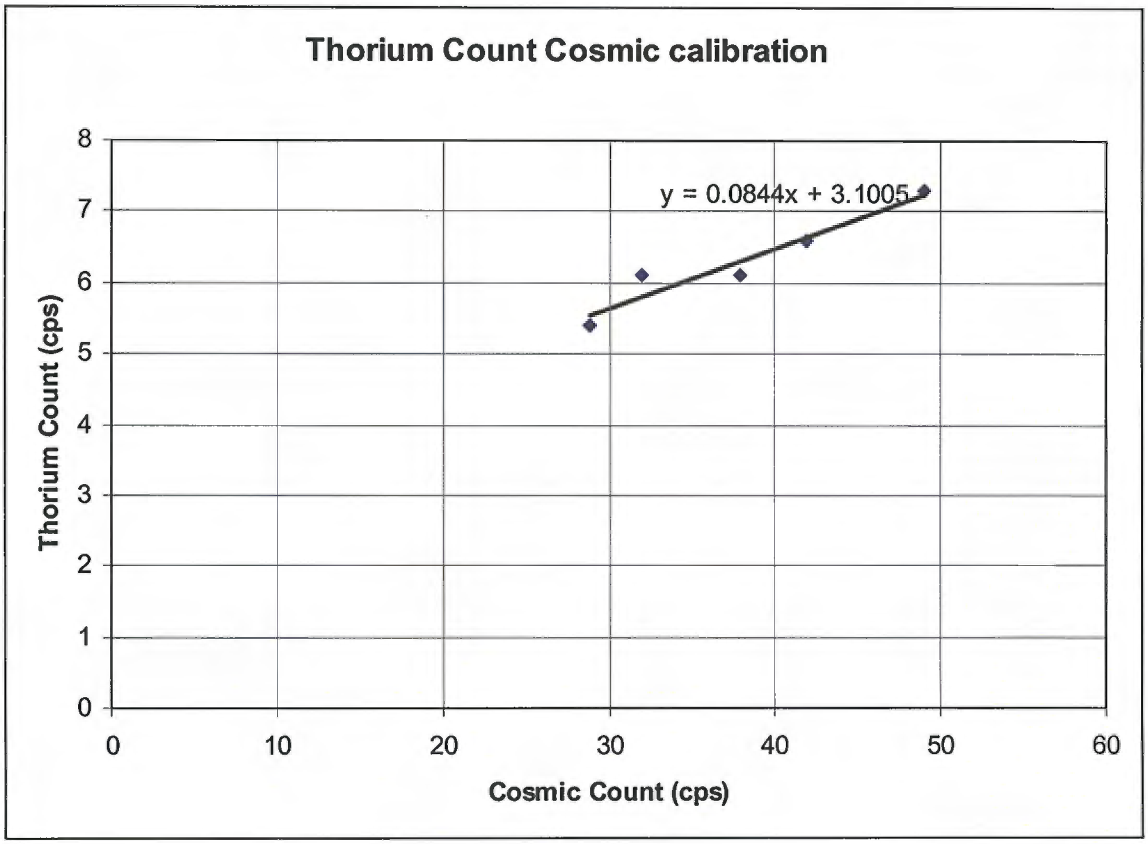
Window	Sensitivity	Attenuation
TC	20.95 cps/nGy/h	-0.0076 m^{-1}
K	47.22 cps/%K	-0.0104 m^{-1}
U	5.87 cps/ppm eU	-0.0090 m^{-1}
Th	3.01cps/ppm eTh	-0.0073 m^{-1}

Pico system calibration for cosmic rays above Saint Lawrence River (Havre-St-Pierre, August 27th 2007, Bell 206 Long Ranger, Canadian, C-GMHT)




Potassium Count Cosmic calibration
y = 0.0601x + 7
Potassium Count (cps)
10.2
10
9.8
9.6
9.4
9.2
9
8.8
8.6
0
10
20
30
40
50
60
Cosmic Count (cps)


Uranium Count Cosmic calibration
y = 0.1155x - 0.0544
Uranium Count (cps)
6
5
4
3
2
1
0
0
10
20
30
40
50
60
Cosmic Count (cps)



SUMMARY

WINDOW	AIRCRAFT (CPS)	COSMIC (CPS)
TC	61.60	1.80
K	7.00	0.06
U	0.00	0.11
TH	3.10	0.08

APPENDIX B

Miniature map samples

APPENDIX C
Maps

VOLUME II
Drawing number : 07-12-739-00 to 07-12-749-00

NUMÉRIQUE

PAGE(S) DE DIMENSION HORS STANDARD NUMÉRISÉE ET POSITIONNÉE À LA SUITE DES PRÉSENTES PAGES STANDARDS.

APPENDIX C
Maps

VOLUME I
Drawing number: 07-12-720-00 to 07-12-738-00

APPENDIX D

Digital Data on CD-ROM

CD contents

REPORT\		
File Name	Description	Format
M07395_Report.pdf	Data acquisition report	Acrobat
M07395_Production.pdf	Production information	Acrobat
M07395_Mag_heading_calibration.pdf	Heading Calibration test	Acrobat
M07395_Mag_lag_calibration.pdf	Lag Calibration test	Acrobat
Database_Channel_Description.pdf	List of database channels of magnetic, spectrometric and VLF databases and corresponding units	Acrobat

DATA\MAG\		
File Name	Description	Format
M07395_MAG.xyz M07395_MAG.gdb	Magnetic database	Geosoft .XYZ and .GDB
TMI_C.grd	Bi-Directional Total Magnetic Field grid	Geosoft .GRD
TMI_ABDE.grd	Bi-Directional Total Magnetic Field grid	Geosoft .GRD
FVD_C.grd	First Vertical Derivative	Geosoft .GRD
FVD_ABDE.grd	First Vertical Derivative	Geosoft .GRD
DTM_C.grd	Digital Terrain Model	Geosoft .GRD
DTM_ABDE.grd	Digital Terrain Model	Geosoft .GRD
GIs	Including all projection information files	MapInfo and other .GI
M07395_TMI_C-(07-12-721-00).map	Bi-Directional Total Magnetic Field map, (nT)	Geosoft .MAP
M07395_TMI_AB-(07-12-731-00).map	Bi-Directional Total Magnetic Field map, (nT)	Geosoft .MAP
M07395_TMI_ADE-(07-12-741-00).map	Bi-Directional Total Magnetic Field map, (nT)	Geosoft .MAP
M07395_FVD_C-(07-12-722-00).map	First Vertical Derivative Field map, (nT/m)	
M07395_FVD_AB-(07-12-732-00).map	First Vertical Derivative Field map, (nT/m)	
M07395_FVD_ADE-(07-12-742-00).map	First Vertical Derivative Field map, (nT/m)	
M07395_BASE_C-(07-12-720-00).map	Flight path Recovery and Property limits	Geosoft .MAP
M07395_BASE_AB-(07-12-730-00).map	Flight path Recovery and Property limits	Geosoft .MAP
M07395_BASE_ADE-(07-12-740-00).map	Flight path Recovery and Property limits	Geosoft .MAP
TIFFs	Geo referenced images	.TIFF
GMs	Including all GM files used in the MapInfo software to distinguish a Geosoft map file from a MapInfo file	Geosoft .GM

DATA\VLF\		
File Name	Description	Format
M07395_VLF.XYZ M07395_VLF.gdb	Final VLF database	Geosoft .XYZ and .GDB
VLF_Tot_C.grd	VLF total field grid	Geosoft .GRD
VLF_Tot_ABDE.grd	VLF total field grid	Geosoft .GRD
GIs	Including all projection information files	MapInfo and other .GI
M07395_VLF_Tot_C-(07-12-728-00).map	VLF Total field map, (ppm)	Geosoft .MAP
M07395_VLF_Tot_AB-(07-12-738-00).map	VLF Total field map, (ppm)	Geosoft .MAP
M07395_VLF_Tot_ADE-(07-12-748-00).map	VLF Total field map, (ppm)	Geosoft .MAP
TIFFs	Geo referenced images	.TIFF
GMs	Including all GM files used in the MapInfo software to distinguish a Geosoft map file from a MapInfo file	Geosoft .GM

DATA\Spectro\		
M07395_RAD.xyz M07395_RAD.gdb	Spectrometric database	Geosoft .XYZ and .GDB
U_C.grd	Processed equivalent uranium concentration grid	Geosoft GRD
U_ABDE.grd	Processed equivalent uranium concentration grid	Geosoft GRD
TH_C.grd	Processed equivalent thorium concentration grid	Geosoft GRD
TH_ABDE.grd	Processed equivalent thorium concentration grid	Geosoft GRD
K_C.grd	Processed equivalent potassium concentration grid	Geosoft GRD
K_ABDE.grd	Processed equivalent potassium concentration grid	Geosoft GRD
TC_C.grd	Processed air absorbed dose rate derived from total count grid	Geosoft GRD
TC_ABDE.grd	Processed air absorbed dose rate derived from total count grid	Geosoft GRD
GIs	Including all projection information files	MapInfo and other .GI
M07395_U_C-(07-12-724-00).map	Equivalent Uranium concentration map, (ppm)	Geosoft MAP
M07395_U_AB-(07-12-734-00).map	Equivalent Uranium concentration map, (ppm)	Geosoft MAP
M07395_U_ADE-(07-12-744-00).map	Equivalent Uranium concentration map, (ppm)	Geosoft MAP
M07395_TH_C-(07-12-725-00).map	Equivalent Thorium concentration map, (ppm)	Geosoft MAP
M07395_TH_AB-(07-12-735-00).map	Equivalent Thorium concentration map, (ppm)	Geosoft MAP
M07395_TH_ADE-(07-12-745-00).map	Equivalent Thorium concentration map, (ppm)	Geosoft MAP
M07395_K_C-(07-12-723-00).map	Equivalent Potassium concentration map, (%)	Geosoft MAP
M07395_K_AB-(07-12-733-00).map	Equivalent Potassium concentration map, (%)	Geosoft MAP
M07395_K_ADE-(07-12-743-00).map	Equivalent Potassium concentration map, (%)	Geosoft MAP
M07395_TC_C-(07-12-726-00).map	Air absorbed dose rate derived from total count map (nGy/h)	Geosoft MAP
M07395_TC_AB-(07-12-736-00).map	Air absorbed dose rate derived from total count map (nGy/h)	Geosoft MAP
M07395_TC_ADE-(07-12-746-00).map	Air absorbed dose rate derived from total count map (nGy/h)	Geosoft MAP
M07395_DTM_C-(07-12-729-00).map	Digital Terrain Model map, (m)	Geosoft MAP
M07395_DTM_AB-(07-12-739-00).map	Digital Terrain Model map, (m)	Geosoft MAP
M07395_DTM_ADE-(07-12-749-00).map	Digital Terrain Model map, (m)	Geosoft MAP
TIFFs	Geo referenced images	.TIFF
GMs	Including all GM files used in the MapInfo software to distinguish a Geosoft map file from a MapInfo file	Geosoft .GM

MAGNETIC DATABASE CHANNEL DESCRIPTION

Channel name	Unit	Description
Fiducial		Fiducial increments
X_19N	meters	UTM Northing (NAD 83 zone 19N)
Y_19N	meters	UTM Northing (NAD 83 zone 19N)
X_20N	meters	UTM Northing (NAD 83 zone 20N)
Y_20N	meters	UTM Northing (NAD 83 zone 20N)
Z	meters	GPS height (in bird)
Lat	Dec. degrees	Latitude WGS84
Lon	Dec. degrees	Longitude WGS84
Time_PC	HH:MM:SS.SS	Computer time
Time_GPS	HH:MM:SS.SS	GPS time
Right	nT	Despiked right mag sensor
Left	nT	Despiked left mag sensor
Basemag	nT	base station magnetic readings
TMI	nT	Total Magnetic Intensity
FVD	nT/m	First Vertical Derivative
DTM	meters	Digital Terrain Model

VLF DATABASE CHANNEL DESCRIPTION

Channel name	Unit	Description
Fiducial		Fiducial increments
X_19N	meters	UTM Northing (NAD 83 zone 19N)
Y_19N	meters	UTM Northing (NAD 83 zone 19N)
X_20N	meters	UTM Northing (NAD 83 zone 20N)
Y_20N	meters	UTM Northing (NAD 83 zone 20N)
Lat	Dec. degrees	Latitude WGS84
Lon	Dec. degrees	Longitude WGS84
Time_PC	HH:MM:SS.SS	PC time
Time_GPS	HH:MM:SS.SS	GPS time
Tot1	ppm	Raw VLF total field data (1)
Tot2	ppm	Raw VLF total field data (2)
Total_Final	ppm	VLF total field data

SPECTROMETRY DATABASE CHANNEL DESCRIPTION

Channel name	Unit	Description
Fiducial		Fiducial increments
X_19N	meters	UTM Easting (NAD 83 zone 19N)
Y_19N	meters	UTM Northing (NAD 83 zone 19N)
X_20N	meters	UTM Easting (NAD 83 zone 20N)
Y_20N	meters	UTM Northing (NAD 83 zone 20N)
Z	meters	GPS height (in helicopter)
Lat	Dec. degrees	Latitude WGS84
Lon	Dec. degrees	Longitude WGS84
Time_PC	HH:MM:SS.SS	Computer time
Time_GPS	HH:MM:SS.SS	GPS time
Temperature	celsius	Temperature converted to Celsius
Altitude	meters	Radar Altimeter (in helicopter)
Pressure	mBar	Pressure
Humidity	%	Humidity
Spectro	256 channel	Measured spectrum raw but despiked (database only) in 256 channel vector array format
SVDspec	256 channel	Processed spectrum using NASVD (database only) in 256 channel vector array format
TC	nGy/h	Absorbed Dose rate derived from total count readings
K	% eK	Potassium concentration reading
U	ppm eU	Uranium concentration reading
Th	ppm eTH	Thorium concentration reading