

# GM 64249

TECHNICAL REPORT ON HELIBORNE MAGNETIC AND RADIOMETRIC SURVEYS, RUPERT PROJECT

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Énergie et Ressources  
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Québec 

TECHNICAL REPORT  
ON  
HELIBORNE MAGNETIC  
AND RADIOMETRIC SURVEYS

**RUPERT PROJECT**

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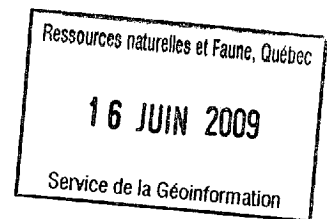
**PROSPECTAIR INC.**

for

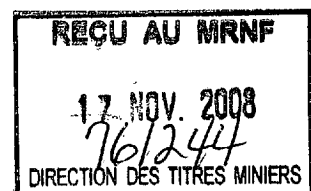
**LANDMARK MINERALS INC.**

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December 2006



GM 64249



## SUMMARY

A Heliborne magnetic / radiometric survey has been carried out between september 22 and October 10, 2006, by Prospectair inc., on behalf of LANDMARK MINERALS Inc., on the RUPERT project consisting of 4 blocks A,B,C & D, located in JAMES BAY, province of Québec.

A total of 4920 linear km were flown over the property covering an approximate area of 520 km<sup>2</sup> with 100 m line spacing of for A and B and 200 m line spacing for C and D, and a nominal altitude of 33m. The Total Magnetic Field measurements along survey lines (Az. 225°) and control lines were made with a Geometrics G-822A split-beam total-field magnetometer (resolution of 0.02 nT ). A GEM GSM-19 Magnetometer ( resolution of 0.1 nT ) was used as a Base Station. A GR-820 Airborne Spectrometer employing four downward looking crystals recorded the radiometric spectrum from 410 KeV to 3000KeV over 256 discrete energy windows from which the standard Total Count, Potassium, Uranium and Thorium channels are extracted

The survey produced a high-definition magnetic image of the underlying rock formations characterized by a weak to high magnetic relief,. The radiometric survey detected several interesting structural features.

Recommendations for further work consist of a more detailed study of the radiometric and magnetic surveys in the lights of all available geological and geochemical information..

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### FINAL MAPS(tif)

Total Magnetic Field Contours	1 : 10 000
Vertical Magnetic Gradient Contours	1 : 10 000
Uranium (U) Values Colour Map	1 : 10 000
Potassium (K) Values Colour Map	1 : 10 000
Uranium/Potassium (U/K) Ratio Colour Map	1 : 10 000
Uranium /Thorium (U/Th) Ratio Colour Map	1 : 10 000

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Total Magnetic Field Contours	1 : 50 000
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Uranium /Thorium (U/Th) Ratio Colour Map	1 : 50 000

## 1. INTRODUCTION

A Heliborne magnetic / radiometric survey has been carried out between september 22 and October 10, 2006 by Prospectair inc., on behalf of LANDMARK MINERALS Inc., on its RUPERT property, located about 240 km north of Chibougamau. Province of Québec.

The purpose of the survey was to present a high-definition magnetic image of the underlying rock formations and to try to outline structural elements for Uranium and possible alteration zones in the search for gold-bearing mineralization.

## 2. RUPERT PROJECT

The RUPERT project is located about about 240 km north of Chibougamau, Province of Québec.

**The access to the property is relatively easy from Chibougamau-Nemiscau road**

The project consists of **4 Blocks A, B, C and D**

Figure 2 shows the location of the area surveyed.

## 3. WORK EXECUTED ON THE PROJECT

A Heliborne magnetic and radiometric survey has been carried out on October 15, 2006 by Prospectair inc., on behalf of LANDMARK MINERALS Inc., on its RUPERT project, located about 240 km north of Chibougamau, Québec

A total of 4920 linear km were flown over the 4 Blocks A, B, C and D with the following specifications:

### Blocks A:

- Area sq. km : 231.6
- Line km : 2648
- Lines spacing: 100 m
- Lines direction : NW-SE, AZ=225 N
- Tie-lines Direction : SW-NE
- Nominal altitude : 33 m
- Real time GPS controlled.
- 

### Blocks B:

- Area sq. km : 139
- Line km : 1503
- Lines spacing: 100 m
- Lines direction : NW-SE, AZ=225 N
- Tie-lines Direction : SW-NE
- Nominal altitude : 33 m
- Real time GPS controlled.

Blocks C & D:

- Area sq. km : 149.5
- Line km : 875
- Lines spacing: 200 m
- Lines direction : NW-SE, AZ=225 N
- Tie-lines Direction : SW-NE
- Nominal altitude : 33 m
- Real time GPS controlled.

A total of 4920 linear km were flown over the properties covering an approximate area of 520 km<sup>2</sup> with a nominal altitude of 33 m a line spacing of 100 m for A and B and a line spacing of 200 m for C and D . The Total Magnetic Field measurements along survey lines (Az. 225°) were made with a Geometrics G-822A split-beam total-field magnetometer (resolution of 0.02 nT ). A GEM GSM-19 Magnetometer (resolution of 0.1 nT ) was used as a Base Station. A GR-820 Airborne Spectrometer employing four downward looking crystals recorded the radiometric spectrum from 410 KeV to 3000KeV over 256 discrete energy windows from which the standard Total Count, Potassium, Uranium and Thorium channels were extracted

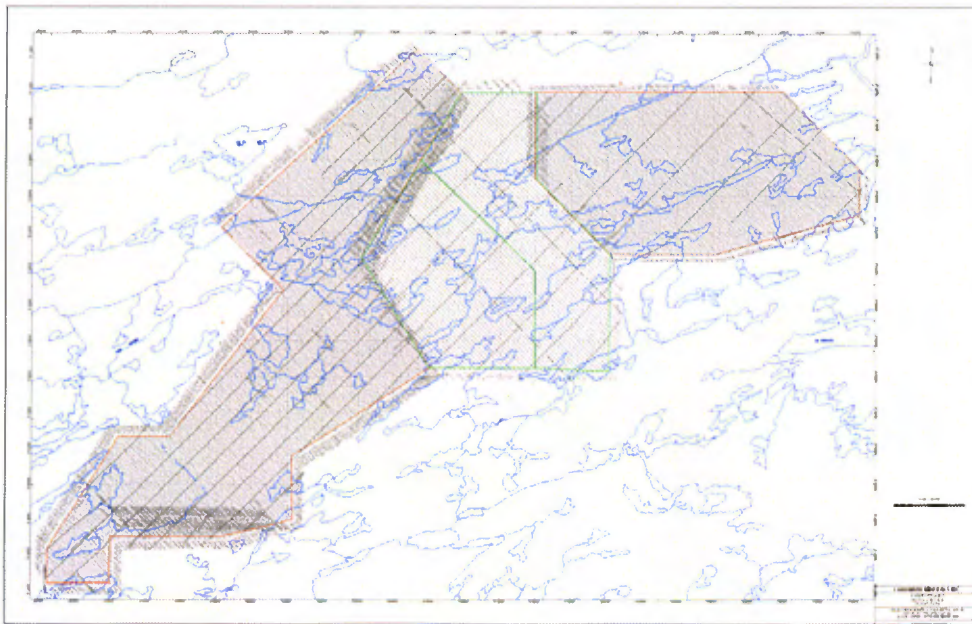


Figure 1 : survey area location and flight path

## 4. SURVEY METHODS AND INSTRUMENTS

### INSTRUMENTS

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#### Airborne High Sensitivity Magnetometer

A Geometrics G-822A split-beam total-field magnetometer sensor, installed in an airfoil 35 m under the helicopter, with a sampling rate of ten times per second and an in-flight sensitivity of 0.02 nT, was utilized. The magnetometer performs continuously in areas of high magnetic gradient with the ambient range of the sensor approximately 20k-100k nT. Aerodynamic magnetometer noise should not exceed 0.5 nT.

#### Airborne spectrometer GR-820

256 Multichannel, Potassium stabilized  
1 integrated sample/sec.  
Maximum counts: 100 000 counts/sec  
Spectrometer Manufacturer: Exploranium  
Accuracy: 1 count/sec.  
Dead time less 5 microseconds/count

The GR-820 Airborne Spectrometer employs four downward looking crystals (1024cu.in.) The downward crystal records the radiometric spectrum from 410 KeV to 3000KeV over 256 discrete energy windows, as well as a cosmic ray channel which detects photons with energy levels above 3000 KeV. From these 256 channels, the standard Total Count, Potassium, Uranium and Thorium channels are extracted following their width in KeV:

Potassium	1370 to 1570
Uranium	1660 to 1860
Thorium	2410 to 2810
Total Count	400 to 2810
Cosmic	3000 > 6000

The shock-protected Sodium Iodide (Thallium) crystal package is unheated, and is automatically stabilized with respect to the Potassium peak. The GR-820 provides raw or Compton stripped data which has been automatically corrected for gain, base level, ADC offset and dead time. The system is calibrated before and after each flight using three accurately positioned handheld sources. Additionally, fixed-site hover tests or repeat test lines are flown to determine if there are any differences in background. This procedure allows corrections to be applied to each survey flight, to eliminate any differences that might result from changes in temperature or humidity

#### PC-based Data Acquisition System

Survey data was digitally recorded on a PC-based data acquisition system (DAS), which is an integral part of the HeliMag system. The DAS is not only a powerful data

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acquisition system; it is also a fully PC-compatible microcomputer, built around a PENTIUM CPU board. All data collection routines, checking, buffering, recording and verification are software controlled for maximum flexibility. A modular concept has been used for both the software and the hardware to allow for future expandability. The five main functions fulfilled by the DAS are: 1) system control and monitoring, 2) data acquisition, 3) real-time data processing, 4) navigation, and 5) data playback and analysis. The DAS may be controlled and operated by a standard keyboard (not required during flight as the units has a touch sensitive screen), and is supplied with a number of expansion slots, into which may be installed various processor modules.

In this system, survey data is digitally recorded directly onto the DAS's internal removable hard disk. On completion of the days flying, the survey data hard disk is removed from the DAS, and is then backed-up /copied to the FWS. Survey data is monitored in real-time by the system operator on the DAS's display.

#### Altimeter

A Terra TRA3000/TRI-40 radar altimeter system records the ground clearance to an accuracy of about 1 ft (30 cm), over a range of 40 ft to 2,500 ft.

The radar altimeter was interfaced to the data acquisition system with an output repetition rate of 1.0 second, and digitally recorded.

#### DGPS Navigation System

A real-time OMNISTAR/GPS navigation system and a navigation computer and pilot steering indicator (PSI) provides in-flight navigation control (UTM NAD 83). This navigation system operated on 12-channels. A pilot steering indicator (PSI) provides steering and cross-track guidance to the pilot. The system worked with a predetermined "grid-flight-path" or "record-as-you-go" flight path.

This navigation system, in any event, yields a real-time positional accuracy of better than  $\pm 2$  m.

#### Magnetometer Base Station

The Magnetometer Base Station was a GSM-19 overhauser magnetometer. The base-station magnetometer, with digital recording, was operated continuously throughout the airborne data acquisition work with a sensitivity of 0.01 nT, sampling once every 2 seconds. The ground and airborne system clocks were synchronised using GPS time, to an accuracy better than 1 second. At the end of the day's work, the digital data was transferred from the base station's data-logger to the FWS.

This base station was located in reasonable proximity to the survey area, in a region of low magnetic gradient (less than 2nT/m), but away from moving steel objects, vehicles or power transmission lines to ensure minimum interference and noise levels.



## DATA CORRECTIONS AND PROCESSING

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### Magnetic Survey

#### Data corrections

##### Flight Path

The flight paths of the survey were corrected for data continuity and erroneous values, and plotted with UTM coordinates (NAD-83 – Zone 17).

##### Data Editing

Each magnetic data profile of the survey has been edited on the screen with a specialised software and corrected interactively for erroneous values and spikes.

##### Lag Corrections

The raw magnetic data were gridded and plotted as a color map. The lag amount was defined on different sectors of the survey area. After several essays the lag amount was found to be 17 measures. This lag amount has been applied to the whole data.

##### Diurnal Corrections

The data from the base station show that diurnal variations of the magnetic field were very weak.

##### Quality Check

After edition and corrections, the magnetic data were gridded and plotted as raw colour maps with the flight path. The obtained maps were analysed and checked if the corrections were properly applied and if other corrections were needed.

##### Data Levelling and processing

After appropriate corrections, the magnetic data are ready to be levelled. The magnetic data were levelled with the help of the intersection control lines (tie lines) and flight lines (traverses lines) when the tie lines values are viable and well positioned. Intersection of total field values, altitudes and gradients were determined for both traverse and control line. The differences at intersections were tabulated and carefully analysed and distributed proportionally along the control lines and the traverse lines, in order to yield and identical final total field value for both lines at the given intersections.

Final values were then assigned to the traverse profiles and the appropriate intersections, and used corrections to the digital values along the traverse lines. In areas of steep magnetic gradient and/or rugged topography, the intersection adjustment is not used. An appropriate adjustment is assigned to the traverse line.

After having done that, the levelled magnetic data was gridded and plotted as a colour maps. A quality check was performed and the levelling process was repeated until satisfactory. Vertical gradient was computed to verify the levelling quality.

## Radiometric Survey

### Spectrometer Calibration Checks

The Gamma Ray spectrometric system is calibrated before and after each flight using three accurately positioned handheld sources. Additionally, fixed-site hover tests or repeat test lines are flown to determine if there are any differences in background. This procedure allows corrections to be applied to each survey flight, to eliminate any differences that might result from changes in temperature or humidity.

### Spectrometric data processing

All radiometric data reductions were performed following the procedures described in the IAEA Technical Report No. 323, 1991.

Filters:

TCSWAV="4.0"  
KSWAV="5.0"  
USWAV="7.0"  
THSWAV="7.0"  
RALTSWAV="5.0"

BACKGROUND CORRECTIONS:

TCAIRBACK="85"  
KAIRBACK="10"  
UAIRBACK="2.2"  
THAIRBACK="1.5"  
UPUAIRBACK="0.60"  
TCCOSSTRIP="0.600"  
KCOSSTRIP="0.032"  
UCOSSTRIP="0.026"  
THCOSSTRIP="0.030"

Stripping Factors :

UPUCOSSTRIP="0.0070"  
ALPHA="0.24"  
BETA="0.37"  
GAMMA="0.70"  
ASTRIP="0.05"  
BSTRIP="0.0"  
GSTRIP="0.0"  
NOMALT="40.0"  
TCATTEN="-0.0070"  
KATTEN="-0.0088"  
UATTEN="-0.0082"  
THATTEN="-0.0070"  
TCSENS="23"  
KSENS="75"

Uranium (ppm):	Min=-0.17	Max= 3.50	Mean=0.42	Std=0.21
Thorium (ppm):	Min=-0.73	Max= 15.35	Mean=2.16	Std=1.29

**Blocks B:**

Total Count ( $\mu$ Roentgens/hr):	Min=-3.8	Max= 59.5	Mean=12.9	Std=7.5
Potassium (%):	Min=0.8	Max= 8.30	Mean=2.70	Std=0.8
Uranium (ppm):	Min=-0.6	Max= 8.43	Mean=0.53	Std=0.20
Thorium (ppm):	Min=-0.7	Max= 26.5	Mean=3.20	Std=2.22

**Blocks C & D:**

Total Count ( $\mu$ Roentgens/hr):	Min=-3.1	Max= 42.2	Mean=8.9	Std=5.7
Potassium (%):	Min=0.7	Max= 5.5	Mean=1.90	Std=0.6
Uranium (ppm):	Min=-0.2	Max= 2.5	Mean=0.4	Std=0.2
Thorium (ppm):	Min=-0.6	Max= 12.1	Mean=2.0	Std=1.40

**1. CONCLUSION**

The heliborne magnetic and radiometric survey carried out by LANDMARK MINERALS Inc. on the RUPERT Project produced a high-definition magnetic image of the underlying rock formations which present a weak to high magnetic relief.

The radiometric survey detected interesting structural features.

A more advance study of the magnetic and radiometric surveys, is recommended in order to try to pinpoint precise exploration targets.

*J. Ghanem*

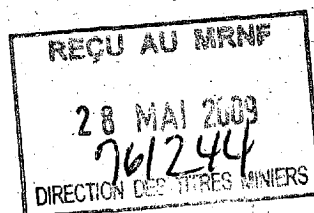
Yucef Ghanem, M.Sc.A., Pro. Geo. OGQ # 431  
Consulting Geophysicist



## 7. CERTIFICATE OF QUALIFICATION

I, YUCEF GHANEM of the City of Val-d'Or, Abitibi, Québec, do certify that:

1. I am a graduate of MGRI Moscow Geological Research Institute (Eng. Geophysicist, M.Sc., 1976) and of *École Polytechnique de Montréal* (M.Sc.A in Geophysics, 1988).
2. I have practiced my profession continuously for 32 years since my graduation
3. I am a member of *l'Ordre des Géologues du Québec* (#431)
4. I have no beneficial interest in the property discussed in this report nor do I expect to receive any in the future



USENS="7.5"  
THSENS="4.5"

After all corrections, the radio elements concentration for Potassium ( K %), Uranium (U ppm) and Thorium (Th ppm) were computed:

TCSENS="23"  
KSENS="75"  
USENS="7.5"  
THSENS="4.5"

eK / 75 cps = % K  
eU / 7.5 cps = U ppm  
eTh / 4.5 cps = Th ppm  
Total count (TC) /23 cps= in  $\mu$ Roentgens/hr.

## 5. RESULTS

### Magnetic Survey

The results of the survey are presented on the Total Field Contour and Vertical Gradient Contour maps.

The Total Magnetic Field intensities recorded by the present survey are as follows:

#### Blocks A:

Total MAG (nT): Min=56475 Max= 62350 Mean=57250 Std=211.94

#### Blocks B:

Total MAG (nT): Min=56263 Max= 59438 Mean=57250 Std=125.23

#### Blocks C & D:

Total MAG (nT): Min=57028 Max= 61282 Mean=57262 Std=151.157

### Radiometric Survey

The results of the survey are shown on the individual colour maps of the Potassium (K), Thorium (Th), Uranium (U) and RATIOS U/TH and U/K .

The radio-elements concentrations detected by the present survey are as follows:

#### Blocks A:

Total Count ( $\mu$ Roentgens/hr): Min=-3.26 Max= 47.22 Mean=9.56 Std=5.52  
Potassium (%): Min=-0.75 Max= 5.91 Mean=2.05 Std=0.56