

Eliza Creek, Monakoff & North Duchess,
Queensland
Airborne Magnetic and Radiometric
Geophysical Survey

Acquisition and Processing Report

for

Mount Isa Mines Limited

Prepared by : W. Tran
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Authorised for release by :
.....

Survey flown: June - July 2012

by



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FAS JOB # 2330

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1. SURVEY OPERATIONS AND LOGISTICS

1.1 Introduction

Between the 14th of June 2012 and the 31st of July 2012, Fugro Airborne Surveys Pty. Ltd. (FAS) undertook an airborne magnetic and radiometric survey for Mount Isa Mines Limited, over three areas in central western Queensland. The three survey areas called Eliza Creek, Monakoff and North Duchess were flown in 48 flights. Total coverage of the survey areas amounted to 15,846 line kilometres. The survey was flown using a Diamond DA42 aircraft, registration VH-FNV owned and operated by FAS. This report summarises the procedures and equipment used by FAS in the acquisition, verification and processing of the airborne geophysical data.

1.2 Survey Base

The survey was based out of Cloncurry and Mt Isa, Queensland. The survey aircraft was operated from Cloncurry and Mt Isa Airport with the aircraft fuel available on site. A temporary office was set up at each of the base locations, where all survey operations were run and the post-flight data verification was performed.

1.3 Survey Personnel

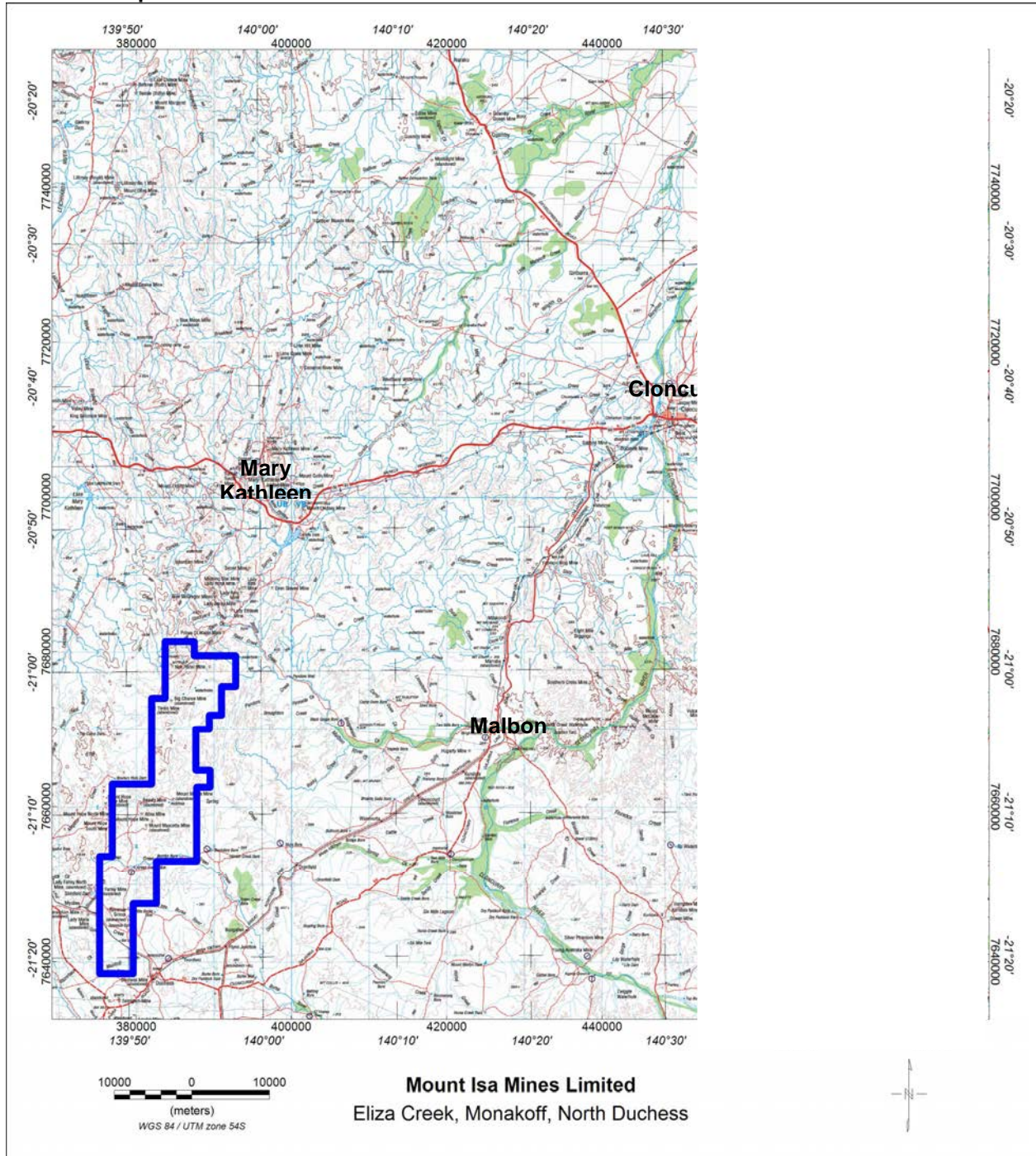
The following personnel were involved in this project:

Project Supervision - Acquisition	Richard Butterfield
- Processing	Denis Cowey
On-site Crew Leader	Mike Poole, Rob Doepel
Pilot/s	Genevieve Leith, Wayne Saunders, Barry Ralston, Dave Baker
System Operator/s	Mike Poole, Rob Doepel
Technician	Gary Kreider
Data Processing	William Tran

1.4 Survey Equipment

Survey Platform	- Diamond DA-42 VH-FNV
Data Acquisition System	- FAS digital acquisition system
Total Field Magnetometer	- Scintrex CS-3 Caesium vapour
Vector Magnetometer	- Billingsley TFM100-1E 3-axis
Magnetometer Compensator	- Fugro FASDAS Mag Decoupler Unit Aeromagnetic Digital
Gamma-ray Spectrometer	- Exploranium GR820 256 Channels
Gamma-ray Detector	- 8 NaI(Tl) crystals; 33.56 L down
Navigation System GPS	- Fugro Omnistar in VBS (Virtual Base Station) mode, Novatel OEM4 GPS receiver
Base Station Magnetometers	- 2 x Scintrex Envi Mag
Altimeter	- Collins ALT-55 radio altimeter
Barometer	- Vaisala PMB100 altimeter
Thermometer	- Honeywell HIH-3602-C temperature and humidity sensor

1.5 Area Map



- Eliza Creek Survey Area – AGD84 AMG54 (Red boundary)
- Monakoff Survey Area – AGD84 AMG54 (Green boundary)
- North Duchess Survey Area – AGD84 AMG54 (Blue boundary)

1.6 General Disclaimer

It is Fugro Airborne Survey's understanding that the data and report provided to the client is to be used for the purpose agreed between the parties. That purpose was a significant factor in determining the scope and level of the Services being offered to the Client. Should the purpose for which the data and report is used change, the data and report may no longer be valid or appropriate and any further use of, or reliance upon, the data and report in those circumstances by the Client without Fugro Airborne Survey's review and advice shall be at the Client's own or sole risk.

The Services were performed by Fugro Airborne Survey exclusively for the purposes of the Client. Should the data and report be made available in whole or part to any third party, and such party relies thereon, that party does so wholly at its own and sole risk and Fugro Airborne Survey disclaims any liability to such party.

Where the Services have involved Fugro Airborne Survey's use of any information provided by the Client or third parties, upon which Fugro Airborne Survey was reasonably entitled to rely, then the Services are limited by the accuracy of such information. Fugro Airborne Survey is not liable for any inaccuracies (including any incompleteness) in the said information, save as otherwise provided in the terms of the contract between the Client and Fugro Airborne Survey.

With regard to DIGITAL TERRAIN DATA, the accuracy of the elevation calculation is directly dependent on the accuracy of the two input parameters, radar altitude and GPS altitude. The radar altitude value may be erroneous in areas of heavy tree cover, where the altimeter reflects the distance to the tree canopy rather than the ground. The GPS altitude value is primarily dependent on the number of available satellites. Although post-processing of GPS data will yield X and Y accuracies in the order of 1-2 metres, the accuracy of the altitude value is usually much less, sometimes in the +/-5 metres range. Further inaccuracies may be introduced during the interpolation and gridding process. Because of the inherent inaccuracies of the method, no guarantee is made or implied that the information displayed is a true representation of the height above sea level. Although this product may be of some use as a general reference, THIS PRODUCT MUST NOT BE USED FOR NAVIGATION PURPOSES.

2. SURVEY SPECIFICATIONS AND PARAMETERS

2.1 Area Co-ordinates

The area was located within AGD84 AMG Zone 54, Central Meridian = 141
(Note - Co-ordinates in AGD84/AMG Zone 54)

North Duchess

Easting	Northing
383700	7681300
387500	7681300
387500	7679500
392800	7679500
392800	7675500
391000	7675500
391000	7671800
389400	7671800
389400	7670000
387700	7670000
387700	7664700
389500	7664700
389500	7662500
387800	7662500
387800	7653000
382600	7653000
382600	7647500
379600	7647500
379600	7638500
375300	7638500
375300	7653600
376900	7653600
376900	7662900
382000	7662900
382000	7674000
383700	7674000

2.2 Survey Area Parameters

Job Number	-	2330
Survey Company	-	Fugro Airborne Surveys Pty Ltd
Date Flown	-	14 th June 2012 – 31 st July 2012
Client	-	Mount Isa Mines Limited
Area Name	-	Eliza Creek, Monakoff, North Duchess, Qld
Nominal Terrain Clearance	-	30.5 m (Eliza Creek & Monakoff) 45 m (North Duchess)
Traverse Line Spacing	-	50 m
Traverse Line Direction	-	000 – 180 degrees (Monakoff) 090 – 270 degrees (Eliza Creek & North Duchess)
Tie Line Spacing	-	500 m
Tie Line Direction	-	090 – 270 degrees (Monakoff) 000 – 180 degrees (Eliza Creek & North Duchess)
Traverse Line Numbers	-	10001 – 10538 (Eliza Creek) 20001 – 20283 (Monakoff) 30001 – 30858 (North Duchess)
Tie Line Numbers	-	19001 – 19037 (Eliza Creek) 29001 – 29028 (Monakoff) 39001 – 39036 (North Duchess)
Line Kilometres	-	5752 km (Eliza Creek) 2647 km (Monakoff) 7447 km (North Duchess)
Total Line Kilometres	-	15846 km

2.3 Data Sample Intervals

Nominal data sample intervals.

Magnetometer	-	7 m (@10 Hz)
Radar Altimeter	-	7 m (@10 Hz)
Thermometer	-	70 m (@1 Hz)
Barometer	-	70 m (@1 Hz)
GPS	-	70 m (@1 Hz)
Spectrometer	-	70 m (@1 Hz)
Magnetic Base Station (ENVI Mag)	-	5 s

2.4 Survey Tolerances

As specified in the contract the following tolerances were used:

Traverse line deviation	-	+/- 50% of nominated line spacing over 1 km or more
Tie line deviation	-	+/- 50% of nominated tie line spacing over 1 km or more
Terrain clearance deviation	-	+/-10 m of nominal terrain clearance over 1 km or more, except where such lines breach air regulations, or in the opinion of the pilot, put aircraft and crew at risk.
Total magnetometer system noise	-	More than 0.1 nT continuously for more than 1 km
Magnetic diurnal variation	-	More than 10 nT in 10 minutes linear either on flight lines or tie lines.

3. AIRCRAFT EQUIPMENT AND SPECIFICATIONS

3.1 Aircraft

Manufacturer	-	Diamond Aircraft
Model	-	DA-42
Registration	-	VH-FNV
Ownership	-	Fugro Airborne Surveys Pty Ltd

3.2 Navigation System

The GPS receiver was integrated as part of the acquisition system. Navigation displays were generated by the acquisition system software that displayed to the pilot a graphical representation of the line being flown. A pre-defined flight plan, with area boundaries and the start and end of the line co-ordinates, was loaded into memory and used for real-time navigation information. Position co-ordinates and other relevant GPS information were output and recorded by the acquisition computer.

3.3 Aircraft Magnetometers

The survey was flown using a Scintrex CS-3 ultra-high sensitivity Caesium vapour magnetometer sensor with the sensor mounted in the tail stinger of the aircraft. The sensor provides a Larmor signal that is processed by high precision counters embedded within the FASDAS to provide an operating range of 20,000 to 100,000 nT.

Specifications

Nominal Sensitivity:	-	0.001 nT
Still Air RMS Noise:	-	0.05 nT
Digital Recording Resolution:	-	0.001 nT
Magnetic Gradient Tolerance	-	>20,000 nT/m

3.4 Automatic Compensator

The magnetometer data, together with data from the 3-axis fluxgate, was integrated in the acquisition system to produce real time compensation for the effects of the aircraft's motion, i.e. from changes in attitude and heading. The compensation coefficients were calculated from compensation flights carried out before the survey commenced. The compensated output data, with a resolution and sensitivity of 0.001 nT at a sampling rate of 10 times per second, were recorded digitally.

3.5 Gamma Ray Spectrometer System

The radiometric acquisition system consisted of a 256 channel gamma-ray spectrometer and detector system with the following specifications:

Manufacturer:	Exploranium Inc.
Model:	GR-820
Number of channels:	256
Crystal Volume:	33.56 L downward looking (thermally insulated)
Sampling interval:	1 s
Windows (keV):	Potassium: 1370 to 1570
	Uranium: 1660 to 1860
	Thorium: 2410 to 2810
	Total Count: 410 to 2810
	Cosmic: 4000 to >6000

Data checking in the survey system was carried out by the use of resolution procedures using known radiometric sources. To verify the system, real time display of individual crystal resolutions and system resolutions, real time display peak channel tracking information, real time display of the energy spectrum showing counts, cosmic level and system livetime were available. The survey system displayed to the operator any errors encountered in the spectrometer system.

3.6 Radar Altimeter

A Collins ALT-55 radio altimeter system was used to measure ground clearance. The radio altimeter indicator provides an absolute altitude display from 0 - 750 metres (0 - 2,500 feet) with a sensitivity of 4 mV/ft. Radar altimeter data were digitally recorded every 0.1 seconds.

Specifications

Range:	-	0 - 2500 ft
Accuracy:	-	1%
Resolution:	-	4 mV/ft

3.7 Barometric Altimeter

The output of the Paroscientific Digibaro Barometric Altimeter was used for calculating the barometric altitude of the aircraft. The atmospheric pressure was taken from a probe and fed to the transducer. The transducer uses a precise quartz crystal resonator whose frequency of oscillation varies with pressure induced stress. The temperature of the pressure sensor was also recorded. In conjunction with the area QNH pressure and ambient temperature, the barometric altitude was calculated.

Specifications

Range:	-	sea level to 10,000 ft
Accuracy:	-	5 ft
Resolution:	-	1 mV/ft

3.8 Flight Data Recording

All data recorded by the data acquisition system were stored in a digital format on the removable media drive located in the DAS. This data were then transferred to the field office computers for post-flight quality control examination.

3.9 Flight Following

An integral part of the Safety Management System provides for the installation of a Flight Following System that transmits a position via satellite at pre determined intervals. The Fugro OmniTRACK system is fitted to the aircraft and position information is transmitted every 4 minutes to the Omnistar Network control centre. This information can be monitored by accessing the Fugro web page where the updated flight path is displayed. The aircraft is also fitted with an emergency switch and activation of this by the pilot or crew will notify the Omnistar Network control centre immediately. They in turn will contact FAS personnel as per the Emergency Response Plan.

4. GROUND DATA ACQUISITION EQUIPMENT AND SPECIFICATIONS

4.1 Magnetic Base Station

Two Scintrex Envi Mag magnetometers were used to measure the daily variations of the Earth's magnetic field. The base stations were established in an area of low gradient, away from cultural influences. The base stations were run continuously throughout the survey flying period with a sampling interval of 5 seconds at a sensitivity of 0.01 nT. The base station data were closely examined after each day's production flying to determine if any data had been acquired during periods of out-of-specification diurnal variation. The base stations were located at Cloncurry Airport from the 14th June until the 13th July. The base stations were then relocated to Mt Isa airport where they remained until completion of survey on the 31st July 2012. The base station magnetometers were positioned approximately 80 m apart.



Base Station 1 – Cloncurry



Base Station 2 - MT ISA

4.2 GPS Base Station

A GPS base logging station was set up at each of the base locations as described below.

Cloncurry Base 1 - The GPS antenna was attached to the fence and veranda roof edge outside room 5 of the Wagon Wheel Motel from the 22nd June until the 24th June.

Cloncurry Base 2 – The GPS antenna was attached to the fence and veranda roof edge outside room 1 of the Cloncurry Motel from the 24th June until the 5th July.

Cloncurry Base 3 – The GPS antenna was attached to the fence post behind room 34 of the Gidgee Motel from the 5th July until the 13th July.

Mt Isa Base 4 – The GPS antenna was attached to the corner of the balcony room 32 of the Townview Motel from the 14th July until the 31st July.

The GPS base system was comprised of a GPS receiver, a logging computer, an antenna and a power supply. Data was logged and displayed in real time on the logging computer screen. The logged base data was processed with the airborne GPS data to calculate the differentially post-processed position of the aircraft.

The GPS base station position was calculated by logging data continuously at each of the base positions over a period of approximately 24 hours. These data were then statistically averaged to obtain the position of the base station.

The calculated GPS base position was (in WGS84):

Base 1 – Cloncurry	20° 42' 26.61544" S, 140° 30' 16.03027" E, 242.477 m.
Base 2 – Cloncurry	20° 42' 16.59377" S, 140° 30' 16.78947" E, 242.745 m.
Base 3 – Cloncurry	20° 42' 28.94191" S, 140° 30' 59.69840" E, 235.370 m.
Base 4 – Mt Isa	20° 43' 36.95018" S, 139° 30' 28.93843" E, 418.966 m.

5. EQUIPMENT CALIBRATIONS AND DATA ACQUISITION CHECKS

5.1 Survey Calibrations

A series of calibrations were performed as follows:

5.1.1 Dynamic Magnetometer Compensation

Carrying a magnetometer through a varying field in a non-uniform orientation produces manoeuvre noise. To compensate for this manoeuvre noise a standard compensation test flight called a “comp box” was flown. The compensation file produced also removed the majority of the heading error. Aircraft compensation tests were flown on the 4 survey line headings and also at +/- 7½ and 15° to the line headings (to accommodate for cross wind flying conditions). The data for each heading consists of a series of aircraft manoeuvres with large angular excursions: specifically pitches, rolls and yaws. This was done to artificially create the worst possible attitudes and rates of attitudinal change likely to be encountered while on line and compensate for any magnetic noise created by the aircraft’s motion within the earth’s magnetic field. The data was processed to obtain the real-time compensation terms. These coefficients were applied in real-time or later during post-processing if required. Note that this form of compensation will only remove those noise effects modelled in the manoeuvre test flight. Random motions of the stinger with respect to the aircraft airframe generally establish the noise floor for this type of installation. Details of the comp boxes flown for this survey are shown in the table below.

Flown	Flights covered
15/6/2012	Flights 1 – 3
16/6/2012	Flights 4 – 10
26/6/2012	Flights 11 – 31
21/7/2012	Flights 32 – 38
25/7/2012	Flights 39 - 48

Table 1: Magnetometer Compensation Details

5.1.2 Parallax

Parallax error is caused by the physical difference in distance between the various sensors, the electronic delay and software timing in the acquisition system. Hence all variables are subjected to a displacement from the GPS co-ordinates. If these variables are processed without a position offset a parallax error will usually occur. The most suitable way to treat this problem is to use the 1 second radiometric data as a base with a zero correction. This will prevent interpolation of important variables (a filtering process). The co-ordinates were moved by linear interpolation and other data variables were displaced onto the radiometric data, without change.

Data	Parallax
GPS	-0.5 second
Magnetics	0.1 second
Radar Altitude	0 second
Pressure	0 second
Temperature	0 second

Table 2: Parallax Values

5.1.3 Pad Calibrations

A series of tests were taken using a set of radiometric pads of known concentrations of Potassium, Uranium and Thorium. Each crystal pack was tested individually, with data accumulated for 15 minutes. The pad calibration data were processed to determine the radiometric stripping coefficients for each crystal pack. Where aircraft had more than one crystal pack installed, the average of the stripping coefficients were used in final data processing.

5.1.4 Background and Cosmic Calibration Stacks

High-level stacks were flown over the ocean away from the effects of any land based radon. Data were collected for ten minutes at altitudes starting at 1000 feet above sea level and

incrementing to 10000 feet above sea level. The high-level stack data were processed to determine the cosmic and aircraft background coefficients.

5.1.5 Height Attenuation Calibrations

Low-level stacks were flown over the Carnamah Dynamic Test Range, Western Australia. Data were collected at altitudes of 130 feet above sea level (asl), 200 ft asl, 260 ft asl, 330 ft asl, 400 ft asl and 650 ft asl. The neighbouring salt lake was flown at the same altitudes, and the data were used as a radon test. A ground survey was carried out on the same day using a calibrated gamma-ray spectrometer.

The airborne and ground data were processed to determine radioelement sensitivity and height attenuation coefficients.

5.1.6 Daily Calibrations

A set of calibrations were performed each survey day as follows:

- Magnetic base station time check
- Spectrometer resolution test
- Spectrometer button test

5.1.6.1 Magnetic Base Station Time Check

Prior to each day's survey all magnetic base stations were time checked and synchronised with the time on the aircraft survey system GPS receiver.

5.1.6.2 Spectrometer Resolution Test

Once the spectrometer had stabilised a Thorium source resolution check was carried out by placing the source in a cradle specially designed to ensure precisely repeatable locations.

5.1.6.3 Spectrometer Button Test

Thorium sample checks were performed on the spectrometer before and after each day's survey acquisition. Each sample was placed in a predetermined location and data recorded for 180 sec. Relative count rates above background were within +/- 5% of the average sample checks for the duration of the survey.

6. DATA VERIFICATION AND FIELD PROCESSING

All data verification was conducted at the field office at Cloncurry and Mt Isa for the duration of the survey. At the conclusion of each days survey all magnetic, radiometric, altimeter, flight path and diurnal data were downloaded onto the field office computer for preliminary verification. All raw aircraft data were backed up at the end of each day's survey. One copy was sent to the FAS office in Perth, the other copy remaining at the field office.

6.1 Magnetic Diurnal Data

Diurnal data recorded from the primary base station was downloaded onto the field office computer. The data was checked for spikes and erroneous readings. If invalid diurnal data occurred whilst survey data was being acquired the affected section was re-flown. The diurnal data was also checked to see that the change in diurnal readings during the course of the survey did not exceed the specified tolerances. When this occurred the affected part of the survey line was re-flown. The diurnal data was merged with the aircraft data and used in the verification of the magnetic data. Diurnal data recorded on the secondary base station was also downloaded onto the field office computer.

6.2 Height Data

Radar altimeter, barometric altimeter and GPS height data from the aircraft were transferred onto the field office computer.

6.2.1 Radar Altimeter Data

The radar altimeter data was verified to check that a reasonably constant height above the terrain was flown, readings during the course of the survey did not exceed the specified tolerances and for equipment reliability.

6.2.2 GPS Height Data

The aircraft's height above the WGS84 ellipsoid each second was determined by differentially post-processing the synchronised GPS data from the aircraft and GPS base station data. The GPS height of the aircraft was verified to check for data masking and for equipment reliability.

6.2.3 Barometric Altimeter Data

As a backup to the aircraft's GPS height, barometric height was also recorded. The barometric height of the aircraft was verified to check for equipment reliability. The barometric data were also used in the processing of the radiometric data.

6.2.4 Topographical Data

After verification parallax corrections were applied, the radar altitude was subtracted from the GPS height to give the elevation of the terrain above the WGS84 ellipsoid. It was not considered necessary to make any further corrections as this data was for verification purposes only.

6.2.5 Gridding and Inspection

The topographical data was gridded and grid image enhancements were computed and displayed on screen. These were inspected for inconsistencies and errors.

6.3 Flight Path Data

The flight path data from the aircraft and the GPS base station were transferred onto the field office computer. The aircraft's precise location each second was determined by differentially post-processing the synchronised GPS data from the aircraft and GPS base station data. The flight path was recovered and plotted daily to ensure it was within specification. Any data not within specification was re-flown. The flight path data was then merged with the rest of the aircraft and diurnal data. Both the aircraft and GPS base station recorded the data in the WGS84 datum.

6.4 Magnetic Data

The real-time compensated and uncompensated magnetic data from the aircraft recorded every 0.1 second were transferred onto the field office computer. The raw magnetic data was checked to identify noise and spikes. If the noise exceeded the specified tolerances the part of the line affected was re-flown. After the magnetic data were merged with the digital flight path the following sequence of operations were carried out to allow inspection and verification of the data:

6.4.1 Diurnal Correction

The synchronised digital diurnal data collected by the base station was first subtracted from the corresponding airborne magnetic readings to calculate a difference. The resultant difference was then subtracted from the base value to produce diurnally corrected magnetic data.

6.4.2 Parallax Correction

The diurnally corrected magnetic data was corrected for system parallax using the calculated value.

6.4.3 Preliminary Gridding and Inspection

The magnetic data were gridded and grid image enhancements were computed and displayed on screen. These were inspected for inconsistencies and errors.

6.5 Spectrometer Data

Spectrometer data from the aircraft were transferred onto the field office computer. The data was verified to check that readings during the course of the survey did not exceed the specified tolerances and for equipment reliability.

6.5.1 Parallax Correction

The raw window data were corrected for system parallax using the calculated value.

6.5.2 Preliminary Gridding and Inspection

The spectrometer data were gridded and grid image enhancements were computed and displayed on screen. These were inspected for inconsistencies and errors.

7. FINAL DATA PROCESSING

7.1 Aircraft Location

The aircraft's location each second was determined by differentially post-processing the synchronised GPS data recorded on both the aircraft and GPS base station. This data is recorded in the WGS84 datum.

7.2 Magnetic Data Processing

The processing procedures applied to the magnetic data are summarised below:

- a) Apply any spike corrections to the compensated magnetic variables.
- b) Interpolate undefined magnetic values.
- c) Co-ordinate the data with post-processed GPS data.
- d) Filter diurnal values and subtract them from individual compensated magnetic readings.

Base Mag	Flights covered	Base Value
Base Mag 1	1-10, 15-17	51418.0 nT
	31	51043.4 nT
	35	50624.5 nT
	38-48	50634.1 nT
Base Mag 2	11-14, 18-30	51153.8 nT
	32-34	50621.8 nT
	36-37	50627.7 nT

Table 3: Diurnal Base Values

- e) Apply parallax correction.
- f) Correct for regional effects of the earth's magnetic field by calculating the IGRF value at each fiducial using IGRF model 2010 and secular variation model. A base value was added back.

Area	IGRF Model	Base Value
All Areas	16/6/2012	50708.9 nT

Table 4: IGRF Base Values

- g) Height correction applied using Taylor Drape method to nominal flying height (30.5m for Eliza Creek, Monakoff and 45 m for North Duchess).
- h) Using the tie lines (flown at 90 degrees to the traverse lines) a set of miss-tie values were determined. These miss-tie values reflected the differences in the magnetic value between the tie lines and traverse lines over the same geographical point. Using a least squares fit algorithm, which also takes into account the statistical variation inherent in DGPS positioning, a series of corrections were applied to the traverse line data. These allowed the data to be levelled to the same base value.
- i) Following this, a Fugro proprietary micro-leveling process was applied in order to more subtly level the data.

7.2.1 Gridding

The final levelled magnetic data were gridded using a bi-directional spline algorithm. The data was gridded with a cell size of 10 m.

7.3 Radiometric Data Processing

The radiometric data was processed using the standard IAEA window processing technique as summarised below.

- a) Co-ordinate the data with post-processed GPS data.
- b) Apply spike corrections to the radar altimeter, temperature and pressure values.
- c) Apply parallax corrections to altimeter, temperature and pressure values.
- d) Apply NASVD filtering to the 256 channel radiometric data.
- e) Apply Energy Recalibration to the NASVD filtered 256 channel radiometric data.
- f) Correct for dead time.

- g) Calculate the equivalent terrain clearance at STP (standard temperature and pressure).
- h) Remove aircraft background.
- i) Remove cosmic background.
- j) Window the 256 channel data using the IAEA standard energy windows.
- k) Remove radon background.
- l) Apply stripping ratios.
- m) Apply height corrections.
- n) Using the tie lines (flown at 90 degrees to the traverse lines) a set of miss-tie values were determined. These miss-tie values reflected the differences in the value between the tie lines and traverse lines over the same geographical point. Using a least squares fit algorithm, which also takes into account the statistical variation inherent in DGPS positioning, a series of corrections were applied to the traverse line data. These allowed the data to be levelled to the same base value.
- o) Following this, a Fugro proprietary micro-leveling process was applied in order to more subtly level the data.

7.3.1 NASVD Filtering

The radiometrics were produced with NASVD smoothing. Using the NASVD technique, the raw spectra were first smoothed using 7 principal components. Eigenvectors and statistics on the NASVD processing results were used for analysis.

7.3.2 Energy Recalibration

The spectral drift was checked by monitoring the position of the Potassium, Uranium and Thorium peaks on average spectra along flight lines. The peak positions were determined by using a Gaussian fitting method. Energy recalibration was applied to the spectra using a linear regression (LSQ fit) to determine the slope and intercept.

7.3.3 Dead Time

Gamma-ray spectrometers require a finite time to process each pulse from the detectors. While one pulse is being processed, any other pulse that arrives will be rejected. Consequently the 'live time' of a spectrometer is reduced by the time taken to process all pulses reaching the spectrometer. The spectra are normalised to counts per second by dividing by the live time.

7.3.4 STP Altitude

The radar altimeter data was converted to effective height at standard temperature and pressure using the expression:

$$STPAIt = RAlt * (P/1013) * (273 / (T+273))$$

where:

RAlt = the observed radar altitude in m
T = the measured air temperature in deg C
P = the barometric pressure in hPa

7.3.5 Cosmic and Aircraft Background Removal

The 256 channel aircraft and cosmic spectra for the aircraft were calculated from the high-level test data with the aircraft and cosmic backgrounds derived using least squares fitting applied on a channel by channel basis.

The aircraft background was removed by subtracting the computed aircraft background spectra from the dead time corrected spectra. The 256 channel cosmic background spectrum that is removed is calculated by multiplying the 256 channel cosmic factor values by the cosmic counts recorded. The effect of cosmic radiation is removed from the spectra by subtracting the resultant cosmic spectrum.

Window	Aircraft Background	Cosmic Stripping Ratio
Total Count	62.0	0.9150
Potassium	8.45	0.0550
Uranium	1.50	0.0435
Thorium	2.36	0.0520

Table 5: Aircraft Background and Cosmic Stripping Ratios

7.3.6 Window Definitions

The 256 channel data were summed into the standard IAEA windows.

Window	Peak Energy (keV)	Energy Window (keV)		GR-820 Channel Window		
Total Count	-	410	- 2810	34	-	234
Potassium	1460	1370	- 1570	115	-	131
Uranium	1765	1660	- 1860	139	-	155
Thorium	2614	2410	- 2810	201	-	234
Cosmic	-	4000	- 6000		-	

Table 6: IAEA Window Definitions

7.3.7 Radon Correction

Radon corrections were applied using the spectral ratio method.

Stripping	Area 1	Area 2	Area 3
Total Count	13.15386	13.15386	13.15386
Potassium	0.78264	0.78264	0.78264
Thorium	0.06105	0.06105	0.06105
Radon	2.1000	1.8754	1.8754
Ground (1)	0.8525	0.7398	0.6076

Table 7: Radon Stripping Values

7.3.8 Spectral Stripping

Spectral stripping was applied to the Potassium, Uranium and Thorium windows. The stripping coefficients were corrected for STP altitude.

Stripping	Value	STP adjustment (/m)
Alpha	0.2650	0.00049
Beta	0.4082	0.00065
Gamma	0.7693	0.00069
A	0.0595	0
B	0.0007	0
G	-0.0150	0

Table 8: Spectral Stripping Ratios

7.3.9 Height Correction

The background corrected and stripped window data were corrected for variations in the density altitude of the detector.

Window	Attenuation coefficient (m^{-1})
Total Count	-0.0075
Potassium	-0.0100
Uranium	-0.0072
Thorium	-0.0077

Table 9: STP Altitude Coefficients

7.3.10 Gridding

The final radiometric data were gridded using a minimum curvature algorithm. The data was gridded with a cell size of 10 m.

7.4 Digital Terrain Model

The processing procedures applied to the terrain data are summarised below:

- a) Apply any spike corrections to the raw radar altimeter data. The radar altimeter was extensively de-spiked due to trees in the survey area.
- b) Interpolate undefined values.
- c) Co-ordinate the data with post-processed GPS data.
- d) Apply parallax corrections.
- e) Subtract the aircraft's height above ground from the aircraft's height above the WGS84 ellipsoid and correct for radar altimeter/GPS sensor separation.
- f) Derive surface topography values with respect to mean sea level (referenced to the geoid) by correcting the WGS84 ellipsoid values with geoid-ellipsoid separation values.
- g) Using the tie lines (flown at 90 degrees to the traverse lines) a set of miss-tie values were determined. These miss-tie values reflected the differences in the value between the tie lines and traverse lines over the same geographical point. Using a least squares fit algorithm, which also takes into account the statistical variation inherent in DGPS positioning, a series of corrections were applied to the traverse line data. These allowed the data to be levelled to the same base value.
- h) Following this, a FAS proprietary micro-levelling process was applied in order to more subtly level the data.

7.4.1 Gridding

The final levelled digital terrain data were gridded using a bi-directional spline algorithm. The data was gridded with a cell size of 10 m.

The accuracy of the elevation calculation is directly dependent on the accuracy of the two input parameters, radar altitude and GPS altitude. The radar altitude value may be erroneous in areas of heavy tree cover, where the altimeter reflects the distance to the tree canopy rather than the ground. The GPS altitude value is primarily dependent on the number of available satellites. Although post-processing of GPS data will yield X and Y accuracies in the order of 1-2 metres, the accuracy of the altitude value is usually much less, sometimes in the ± 5 metre range. Further inaccuracies may be introduced during the interpolation and gridding process.

Because of the inherent inaccuracies of this method, no guarantee is made or implied that the information displayed is a true representation of the height above sea level. Although this product may be of some use as a general reference, THIS PRODUCT MUST NOT BE USED FOR NAVIGATION PURPOSES.

APPENDIX I – Weekly Operations Report

System: **FASDAS**
 Aircraft: **VH-FNV**

2322.4 Hrs - Progressive M/R Hrs at the start of job, prior to mobilisation

Job Number: **2330**
 Contract Number: **1100XXXX**
 Job Name: **Xstrata - Cloncurry**
 Area Names: **Eliza Creek, North Duchess, Monakoff.**
 Client: **Xstrata**

Total Job kms: **15906.317** Kms

2371.3 Hrs - The hours the Periodic Inspection is actually due at start of the job

Plan Kms Remain: **14884.682** Kms
 % Complete: **6.423** %

Date	Flt	Pilot initials	On board Oper initials	Production inc. Reflights Exc. Scrubs	FAS Scrub	Time		Engine Hours on M/R	Hours to Periodic Inspectio	Job Hrs to Date	Prod. to Date	FAS Scrubs to Date	Stdby Days	Activity Contribution	Activity	COMMENTS <u>Weather, Data delivery Aircraft movement, etc</u>
						Start	End									
11-June-2012														1.00	MO	Mike Poole mobilises Perth to Brisbane.
Julian Day 163																
Monday									48.9							
Date 12-Jun														1.00	MO	Mike Poole mobilises Brisbane to Cloncurry.
Julian Day 164																
Tuesday									48.9							
Date 13-Jun														0.20	SETUP	Setting up.
Julian Day 165														0.40	MO	Gary Kreider arrives from Goulburn
Wednesday														0.40	MO	Barry Ralston flies FNV Goulburn to Charlville.
Date 14-Jun																
Julian Day 166														0.20	SETUP	Setting up.
Thursday														0.40	MO	Barry Ralston flies FNV Charlville to Cloncurry.
	1	BR												0.20	SAF	Recce flight over area 1.
														0.20	SAF	Completing post-recce flight paperwork.
Date 15-Jun																
Julian Day 167														0.30	TF	3 x comp-boxes.
Friday														0.20	SAF	Recce flight over area 2.
	2	BR												0.30	SAF	Completing paperwork post-recce flight.
	3	BR												0.20	TF	Testing Radalt over runway at 0', 100', 200'.
Date 16-Jun																
Julian Day 168														0.50	PDO	PDO for Barry Ralston. Wayne Saunders
Saturday														0.20	TF	3 x Comp-boxes.
	4	WS												0.30	P	
	4	WS		421.841												
Date 17-Jun																
Julian Day 169																
Sunday														0.50	P & S	Late start, waiting for refueller. Diurnal activity.
	5	BR		164.394	102.000									0.50	P & S	Late start, waiting for refueller. Diurnal activity.
	6	WS		435.400	10.800											
									26.2	22.7	1021.635	112.800				
Totals This Week:				1021.635	112.800	Week Hours:				22.6	▲: A/C Hrs to Next Service			7.00		

System: **FASDAS**
 Aircraft: **VH-FNV**

2322.4 Hrs - Progressive M/R Hrs at the start of job, prior to mobilisation

Total Job kms: **15906.317** Kms

2371.3 Hrs - The hours the Periodic Inspection is actually due at start of the job

Job Number: **2330**
 Contract Number: **1100XXXX**
 Job Name: **Xstrata - Cloncurry**
 Area Names: **Eliza Creek, North Duchess, Monakoff.**
 Client: **Xstrata**

Plan Kms Remain: **13157.009** Kms
 % Complete: **17.284** %

Date	Flt	Pilot initials	On board Oper initials	Production inc. Reflights Exc. Scrubs	FAS Scrub	Time		Engine Hours on M/R	Hours to Periodic Inspectio	Job Hrs to Date	Prod. to Date	FAS Scrubs to Date	Stdby Days	Activity Contribution	Activity	COMMENTS <u>Weather, Data delivery</u> <u>Aircraft movement, etc</u>
						Start	End									
18-June-2012														1.00	D	Possible diurnal activity all day.
Julian Day 170																
Monday									26.2	22.7	1021.635	112.800				
Date 19-Jun	7	BR		335.718		7:36:00	11:40:00	4.1						0.50	P	
Julian Day 171	8	WS		502.743		13:09:00	17:21:00	4.2						0.50	P	
Tuesday									17.9	31.0	1860.096	112.800				
Date 20-Jun	9	WS		555.812		7:19:00	11:23:00	4.1						0.50	P	
Julian Day 172	10	BR		333.400		13:44:00	17:28:00	3.7						0.50	P	
Wednesday									10.1	38.8	2749.308	112.800				
Date 21-Jun		BR				8:50:00	9:20:00	0.5						1.00	MA	FNV goes to Mt Isa for maintenance.
Julian Day 173																
Thursday									9.6	39.3	2749.308	112.800				
Date 22-Jun														1.00	MA	FNV in Mt Isa for maintenance.
Julian Day 174																
Friday									9.6	39.3	2749.308	112.800				
Date 23-Jun														1.00	MA	FNV in Mt Isa for maintenance.
Julian Day 175																
Saturday									9.6	39.3	2749.308	112.800				
Date 24-Jun														1.00	MA	FNV in Mt Isa for maintenance.
Julian Day 176																
Sunday									9.6	39.3	2749.308	112.800				
Totals This Week:				1727.673		Week Hours:				16.6	▲: A/C Hrs to Next Service			7.00		

System: FASDAS
Aircraft: VH-FNV

2322.4 Hrs - Progressive M/R Hrs at the start of job, prior to mobilisation

Job Number: 2330
Contract Number: 1100XXXX
Job Name: Xstrata - Cloncurry
Area Names: Eliza Creek, North Duchess, Monakoff.
Client: Xstrata

Total Job kms: 15906.317 Kms

2371.3 Hrs - The hours the Periodic Inspection is actually due at start of the job

Plan Kms Remain: 7831.153 Kms
% Complete: 50.767 %

Date	Flt	Pilot initials	On board Oper initials	Production inc. Reflights Exc. Scrubs	FAS Scrub	Time		Engine Hours on M/R	Hours to Periodic Inspectio	Job Hrs to Date	Prod. to Date	FAS Scrubs to Date	Stdby Days	Activity Contribution	Activity	COMMENTS Weather, Data delivery Aircraft movement, etc
						Start	End									
25-June-2012														0.50	MA	FNV released from maintenance.
Julian Day 177														0.20	SAF	Recce flight over area 3.
Monday	11	WS	BR											0.10	MA	Return flight from Mt Isa.
									101.4	39.3	2749.308	112.800		0.20	TF	Comp-box.
Date 26-Jun														0.70	MO	Rob Doepel mobed to Cloncurry
Julian Day 178	11	WS	BR			15:30:00	17:00:00	1.5						0.30	TF	COMP BOX
Tuesday																
									99.9	40.8	2749.308	112.800				
Date 27-Jun	12	WS		645.935		7:00:00	11:11:00	4.2						0.40	P	Production OK. Lines over Mine site completed.
Julian Day 179	13	BR		533.300		11:50:00	15:50:00	4.0						0.40	P	Production OK
Wednesday	14	WS		271.510		16:12:00	18:00:00	1.8						0.20	P	Production OK
									89.9	50.8	4200.053	112.800				
Date 28-Jun	15	BR		488.611	9.800	7:17:00	11:10:00	3.9						0.40	P & S	Line 10446 Scrubbed due to Xtrack
Julian Day 180	16	WS		627.200		11:36:00	15:42:00	4.1						0.40	P & R	Production OK. Line 10446 reflown
Thursday	17	BR		186.200		16:10:00	18:00:00	1.8						0.20	P	Production OK.
									80.1	60.6	5502.064	122.600				
Date 29-Jun	18	WS		578.600		6:55:00	11:00:00	4.1						0.40	P	Production OK. Area 1 complete Area 2 commenced.
Julian Day 181		WS	BR			11:30:00	12:36:00	1.1						0.20	SAF	Recce Flight of Duchess Area 3
Friday	19	BR		562.200		13:16:00	17:16:00	4.0						0.40	P	Production OK
									70.9	69.8	6642.864	122.600				
Date 30-Jun	20	BR		554.200		7:17:00	11:30:00	4.2						0.50	P	Production OK
Julian Day 182	21	WS		520.800		11:52:00	16:06:00	4.2						0.50	P	Production OK
Saturday															Comment	No Third flight possible due to refueller delay
									62.5	78.2	7717.864	122.600				
Date 1-Jul	22	WS		357.300		7:17:00	10:17:00	3.0						0.50	P	Production OK. Flight aborted due to High Wind in
Julian Day 183													0.50	W	No PM Flight due to Wx	
Sunday														0.00	PDO	B. Ralston RDO
									59.5	81.2	8075.164	122.600				
Totals This Week: ▶				5325.856	9.800	Week Hours: ▶		41.9	▲ : A/C Hrs to Next Service				0.50	7.00		

System: FASDAS
Aircraft: VH-FNV

2322.4 Hrs - Progressive M/R Hrs at the start of job, prior to mobilisation

Total Job kms: 15906.317 Kms

2371.3 Hrs - The hours the Periodic Inspection is actually due at start of the job

Job Number: 2330
Contract Number: 1100XXXX
Job Name: Xstrata - Cloncurry
Area Names: Eliza Creek, North Duchess, Monakoff.
Client: Xstrata

Plan Kms Remain: 5176.402 Kms
% Complete: 67.457%

Date	Flt	Pilot initials	On board Oper initials	Production inc. Reflights Exc. Scrubs	FAS Scrub	Time		Engine Hours on M/R	Hours to Periodic Inspectio	Job Hrs to Date	Prod. to Date	FAS Scrubs to Date	Stdby Days	Activity Contribution	Activity	COMMENTS Weather, Data delivery Aircraft movement, etc	
						Start	End										
02-July-2012	23	BR		18.600		8:00:00	8:36:00	0.6						0.20	P	Flight aborted due to High wind in Area.	
Julian Day 184													1.00	0.80	W	No Flight possible due to strong wind in area	
Monday								58.9	81.8	8093.764	122.600						
Date 3-Jul													0.50	0.50	W	No AM Flight possible due to high wind in Area	
Julian Day 185	24	WS		378.206		14:55:00	18:12:00	3.3						0.50	P	Production OK. Area 2 Complete	
Tuesday								55.6	85.1	8471.970	122.600						
Date 4-Jul	25	WS		365.130	7.600	7:00:00	10:56:00	3.9						0.50	P & S	Production OK. Flight aborted due High winds	
Julian Day 186	26	BR		217.482	105.000	14:30:00	17:42:00	3.2						0.50	P & S	Takeoff delayed due to strong wind in area.	
Wednesday								48.5	92.2	9054.582	235.200						
Date 5-Jul													1.00	1.00	W	No Flights. Strong wind in area all day.	
Julian Day 187																	
Thursday								48.5	92.2	9054.582	235.200						
Date 6-Jul													1.00	1.00	W	No Flights. Strong wind in area all day.	
Julian Day 188																	
Friday								48.5	92.2	9054.582	235.200						
Date 7-Jul	27	WS		455.403	16.800	7:55:00	12:00:00	4.1						0.50	P & S	2 Lines scrubbed due to Diurnal Bust	
Julian Day 189	28	BR		345.000		13:20:00	17:26:00	4.1						0.50	P	Production OK	
Saturday								40.3	100.4	9854.985	252.000						
Date 8-Jul	29	BR		360.000		7:55:00	11:55:00	4.0						0.50	P	Production OK	
Julian Day 190	30	WS		514.930		12:15:00	16:20:00	4.1						0.50	P	Production OK	
Sunday																	
				Totals This Week:	2654.751	129.400	Week Hours:		27.3	▲: A/C Hrs to Next Service			3.50	7.00			

System: FASDAS
 Aircraft: VH-FNV

2322.4 Hrs - Progressive M/R Hrs at the start of job, prior to mobilisation

Total Job kms: 15906.317 Kms

2371.3 Hrs - The hours the Periodic Inspection is actually due at start of the job

Plan Kms Remain: 4742.793 Kms

% Complete: 70.183%

Job Number: 2330
 Contract Number: 1100XXXX
 Job Name: Xstrata - Cloncurry
 Area Names: Eliza Creek, North Duchess, Monakoff.
 Client: Xstrata

Date	Flt	Pilot initials	On board Oper initials	Production inc. Refflights Exc. Scrubs	FAS Scrub	Time		Engine Hours on M/R	Hours to Periodic Inspectio	Job Hrs to Date	Prod. to Date	FAS Scrubs to Date	Stdb Days	Activity Contribution	Activity	COMMENTS Weather, Data delivery Aircraft movement, etc
						Start	End									
09-July-2012	31	WS		433.609	36.500	7:20:00	11:26:00	4.1						0.50	P & S	3 Lines scrubbed due to Diurnal
Julian Day 191													0.50	0.50	W	No Flight due to Strong Wind in Area.
Monday									28.1	112.6	11163.524	288.500				
Date 10-Jul													1.00	1.00	W	No Flights due to low cloud and rain
Julian Day 192																
Tuesday									28.1	112.6	11163.524	288.500				
Date 11-Jul													0.50	0.50	W	No AM Flight due to Fog
Julian Day 193														0.50	MA	Aircraft in Mt Isa for maintenance
Wednesday									28.1	112.6	11163.524	288.500				
Date 12-Jul														1.00	MA	Aircraft in Mt Isa for maintenance
Julian Day 194																
Thursday									28.1	112.6	11163.524	288.500				
Date 13-Jul														1.00	MA	Aircraft in Mt Isa for maintenance
Julian Day 195															Comment	Base Moved to Mt Isa
Friday									28.1	112.6	11163.524	288.500				
Date 14-Jul														1.00	MA	Aircraft in Mt Isa for maintenance
Julian Day 196																
Saturday									28.1	112.6	11163.524	288.500				
Date 15-Jul														1.00	MA	Aircraft in Mt Isa for maintenance
Julian Day 197															Comment	Genevive Leith arrived Mt Isa
Sunday																
Totals This Week: ▶				433.609	36.500	Week Hours: ▶		4.1	▲: A/C Hrs to Next Service				2.00	7.00		

System: FASDAS
 Aircraft: VH-FNV

2322.4 Hrs - Progressive M/R Hrs at the start of job, prior to mobilisation

Job Number: 2330
 Contract Number: 1100XXXX
 Job Name: Xstrata - Cloncurry
 Area Names: Eliza Creek, North Duchess, Monakoff.
 Client: Xstrata

Total Job kms: 15906.317 Kms

2371.3 Hrs - The hours the Periodic Inspection is actually due at start of the job

Plan Kms Remain: 4272.793 Kms
 % Complete: 73.138%

Date	Flt	Pilot initials	On board Oper initials	Production inc. Reflights Exc. Scrubs	FAS Scrub	Time		Engine Hours on M/R	Hours to Periodic Inspectio	Job Hrs to Date	Prod. to Date	FAS Scrubs to Date	Stdby Days	Activity Contribution	Activity	COMMENTS Weather, Data delivery, Aircraft movement, etc
						Start	End									
16-July-2012														0.90	MA	Aircraft in Mt Isa for maintenance
Julian Day 198		BR				16:40:00	17:22:00	0.7						0.10	Comment	Test Flight
Monday									100.0	113.3	11163.524	288.500				
Date 17-Jul		GL	BR			11:08:00	12:20:00	1.2						0.50	TR	Training/Check flight for G Leith
Julian Day 199														0.50	A	Aircraft awaiting AH.
Tuesday									98.8	114.5	11163.524	288.500				
Date 18-Jul														1.00	A	Aircraft grounded Altimeter reading incorrectly
Julian Day 200									98.8	114.5	11163.524	288.500				
Wednesday																
Date 19-Jul														1.00	A	Aircraft grounded Altimeter reading incorrectly
Julian Day 201									98.8	114.5	11163.524	288.500				
Thursday																
Date 20-Jul														1.00	A	Aircraft grounded Altimeter reading incorrectly
Julian Day 202									98.8	114.5	11163.524	288.500				
Friday																
Date 21-Jul		GL				11:00:00	11:12:00	0.2						0.50	A	Aircraft Altimeter repaired Test flight conducted.
Julian Day 203	32	GL				12:50:00	14:12:00	1.4						0.30	TF	COMP Flight conducted.
Saturday														0.20	SETUP	Checking Data
									97.2	116.1	11163.524	288.500				
Date 22-Jul	33	GL		330.000		8:20:00	12:26:00	4.1						0.50	P	Production OK
Julian Day 204	34	GL		140.000		14:45:00	16:51:00	2.1						0.50	P	Production OK
Sunday																
									91.0	122.3	11633.524	288.500				
Totals This Week:				470.000		Week Hours:		9.7	▲: A/C Hrs to Next Service					7.00		

System: FASDAS
Aircraft: VH-FNV

2322.4 Hrs - Progressive M/R Hrs at the start of job, prior to mobilisation

Job Number: 2330
Contract Number: 1100XXXX
Job Name: Xstrata - Cloncurry
Area Names: Eliza Creek, North Duchess, Monakoff.
Client: Xstrata

Total Job kms: 15906.317 Kms

2371.3 Hrs - The hours the Periodic Inspection is actually due at start of the job

Plan Kms Remain: 429.294 Kms
% Complete: 97.301%

Date	Fit	Pilot initials	On board Oper initials	Production inc. Reflights Exc. Scrubs	FAS Scrub	Time		Engine Hours on M/R	Hours to Periodic Inspectio	Job Hrs to Date	Prod. to Date	FAS Scrubs to Date	Stdby Days	Activity Contribution	Activity	COMMENTS Weather, Data delivery Aircraft movement, etc
						Start	End									
23-July-2012	35	GL		325.000		7:55:00	11:55:00	4.0						0.50	P & R	Production and reflights from FLT0026 done.
Monday	205	DB				14:10:00	14:55:00	0.8						0.50	SAF	Recce flight for Dave Baker.
								86.2	127.1	11958.524	288.500					
Date 24-Jul	36	DB		588.300		7:50:00	12:02:00	4.2						0.50	P	Production OK
Julian Day 206	37	GL		543.827		13:12:00	17:42:00	4.5						0.50	P	Production OK
Tuesday																
								77.5	135.8	13090.651	288.500					
Date 25-Jul	38	GL		659.714	24.600	7:45:00	12:45:00	5.0						0.50	P & S	Production OK. 1 Line scrubbed due to fuel pump on.
Julian Day 207	39	DB				13:07:00	14:43:00	1.6						0.20	TF	COMP Box
Wednesday				348.900	11.100	15:00:00	17:48:00	2.8						0.30	P & S	Production OK. Line scrubbed due to already flown.
									68.1	145.2	14099.265	324.200				
Date 26-Jul	41	DB		327.258		7:45:00	10:25:00	2.7						0.50	P	Production OK. Flight aborted due to severe turbulence.
Julian Day 208	42	DB		333.774		13:10:00	16:21:00	3.2						0.50	P	Production OK. Flight aborted due to severe turbulence.
Thursday																Comment: G. Leith PDO
									62.2	151.1	14760.297	324.200				
Date 27-Jul	43	GL		107.892		7:48:00	9:20:00	1.5						0.50	P	Production OK. Flight aborted due to severe turbulence
Julian Day 209													0.50	W		No PM Flight due to severe turbulence
Friday																
								60.7	152.6	14868.189	324.200					
Date 28-Jul	44	DB		137.862		7:50:00	9:36:00	1.8						0.50	P	Production OK. Flight aborted due to severe turbulence
Julian Day 210													0.50	W		No PM Flight due to severe turbulence
Saturday																
								58.9	154.4	15006.051	324.200					
Date 29-Jul	45	GL		334.172		7:45:00	11:00:00	3.3						0.50	P	Production OK. Flight aborted due to severe turbulence
Julian Day 211	46	DB		136.800		14:15:00	16:06:00	1.9						0.50	P & R	Production and reflights OK. Severe turbulence
Sunday																
									53.7	159.6	15477.023	324.200				
Totals This Week: ▶				3843.499	35.700	Week Hours: ▶		37.1	▲: A/C Hrs to Next Service				1.00	7.00		

System: FASDAS
Aircraft: VH-FNV

2322.4 Hrs - Progressive M/R Hrs at the start of job, prior to mobilisation

Total Job kms: 15906.317 Kms

2371.3 Hrs - The hours the Periodic Inspection is actually due at start of the job

Plan Kms Remain: 0.000 Kms
% Complete: 100.000 %

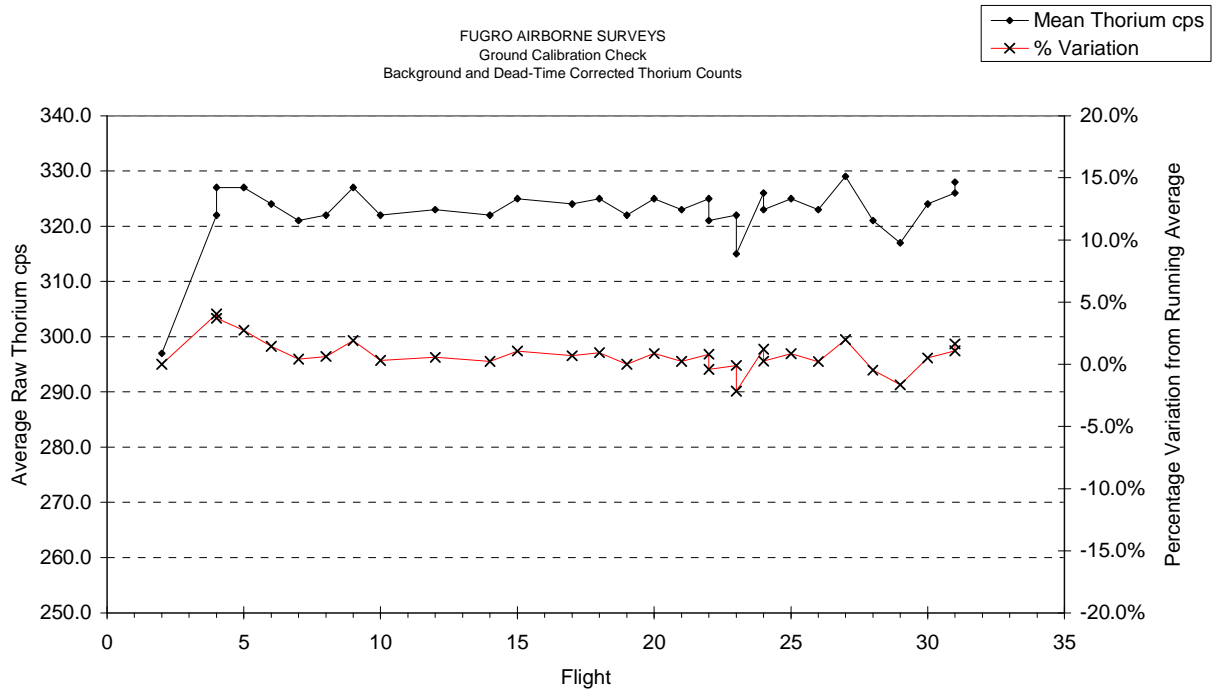
Job Number: 2330
Contract Number: 1100XXXX
Job Name: Xstrata - Cloncurry
Area Names: Eliza Creek, North Duchess, Monakoff.
Client: Xstrata

Date	Flt	Pilot initials	On board Oper initials	Production inc. Reflights Exc. Scrubs	FAS Scrub	Time		Engine Hours on M/R	Hours to Periodic Inspectio	Job Hrs to Date	Prod. to Date	FAS Scrubs to Date	Stdb Days	Activity Contribution	Activity	COMMENTS <u>Weather, Data delivery</u> <u>Aircraft movement, etc</u>	
						Start	End										
30-July-2012	47	DB		381.300		7:50:00	11:08:00	3.3						0.50	P	Production OK. Flight aborted due to severe turbulence	
Julian Day 212													0.50	0.50	W	No PM Flight due to severe turbulence	
Monday																	
Date 31-Jul	48	GL		152.994		7:46:00	9:33:00	1.8		50.4	162.9	15858.323					
Julian Day 213														0.50	P	Production OK. Duchess Block Complete.	
Tuesday																	
Date 1-Aug									48.6	164.7	16011.317	324.200					
Julian Day 214														0.50	MO	Preparing for Demob.	
Wednesday																	
Date 2-Aug									48.6	164.7	16011.317	324.200					
Julian Day 215																	
Thursday																	
Date 3-Aug									48.6	164.7	16011.317	324.200					
Julian Day 216																	
Friday																	
Date 4-Aug									48.6	164.7	16011.317	324.200					
Julian Day 217																	
Saturday																	
Date 5-Aug									48.6	164.7	16011.317	324.200					
Julian Day 218																	
Sunday																	
Totals This Week: ▶				534.294		Week Hours: ▶				5.1	▲: A/C Hrs to Next Service		0.50	2.00			

APPENDIX II – Thorium Button Test
--

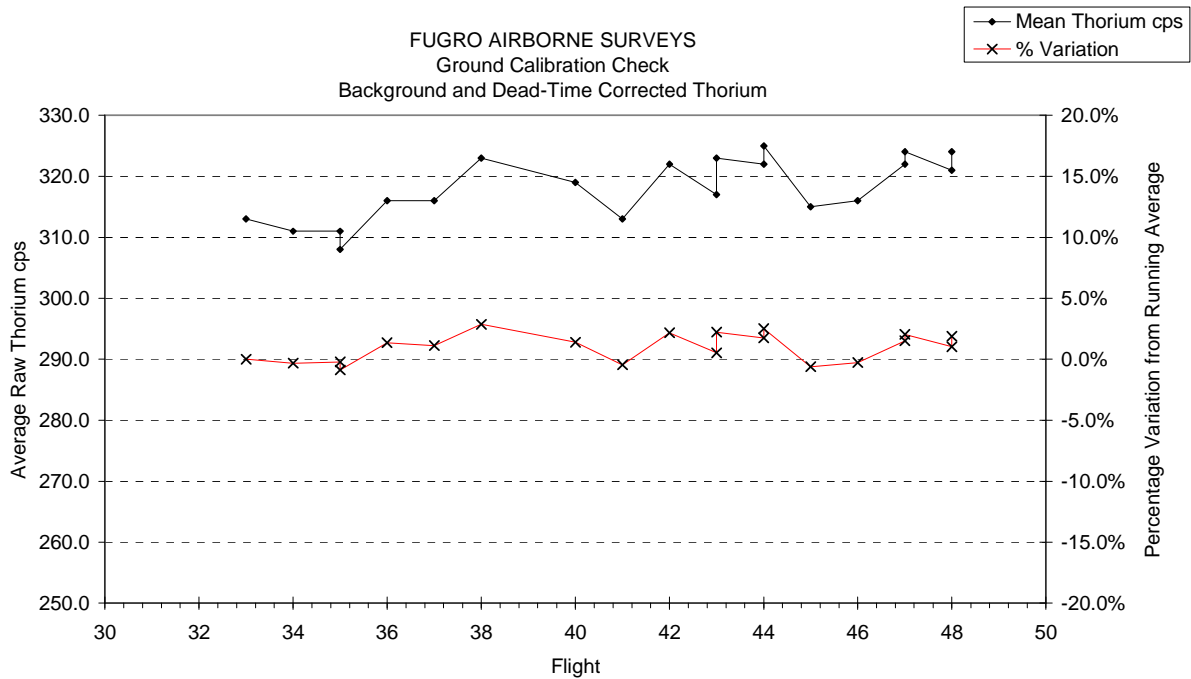
AIRCRAFT VH-FNV – CLONCURRENCY, QLD

Flt#	Th in 501/601	Th in 502/602	Th Counts Actual	Th Counts Used	Running Average	Allowed Minimum	Allowed Maximum	% Change
2	121.0	418.0	297.0	297.0	297.0	288.1	305.9	0.0%
4	118.0	440.0	322.0	322.0	309.5	300.2	318.8	4.0%
4	127.0	454.0	327.0	327.0	315.3	305.9	324.8	3.7%
5	127.0	454.0	327.0	327.0	318.3	308.7	327.8	2.7%
6	124.0	448.0	324.0	324.0	319.4	309.8	329.0	1.4%
7	123.0	444.0	321.0	321.0	319.7	310.1	329.3	0.4%
8	130.0	452.0	322.0	322.0	320.0	310.4	329.6	0.6%
9	127.0	454.0	327.0	327.0	320.9	311.2	330.5	1.9%
10	125.0	447.0	322.0	322.0	321.0	311.4	330.6	0.3%
12	127.0	450.0	323.0	323.0	321.2	311.6	330.8	0.6%
14	124.0	446.0	322.0	322.0	321.3	311.6	330.9	0.2%
15	132.0	457.0	325.0	325.0	321.6	311.9	331.2	1.1%
17	120.9	444.9	324.0	324.0	321.8	312.1	331.4	0.7%
18	124.0	449.0	325.0	325.0	322.0	312.3	331.7	0.9%
19	124.0	446.0	322.0	322.0	322.0	312.3	331.7	0.0%
20	123.0	448.0	325.0	325.0	322.2	312.5	331.9	0.9%
21	124.0	447.0	323.0	323.0	322.2	312.6	331.9	0.2%
22	122.0	447.0	325.0	325.0	322.4	312.7	332.1	0.8%
22	130.0	451.0	321.0	321.0	322.3	312.6	332.0	-0.4%
23	132.0	454.0	322.0	322.0	322.3	312.6	332.0	-0.1%
23	135.0	450.0	315.0	315.0	322.0	312.3	331.6	-2.2%
24	132.0	458.0	326.0	326.0	322.1	312.5	331.8	1.2%
24	127.0	450.0	323.0	323.0	322.2	312.5	331.8	0.3%
25	126.0	451.0	325.0	325.0	322.3	312.6	332.0	0.8%
26	124.0	447.0	323.0	323.0	322.3	312.7	332.0	0.2%
27	122.0	451.0	329.0	329.0	322.6	312.9	332.3	2.0%
28	122.0	443.0	321.0	321.0	322.5	312.8	332.2	-0.5%
29	124.0	441.0	317.0	317.0	322.3	312.7	332.0	-1.7%
30	131.0	455.0	324.0	324.0	322.4	312.7	332.1	0.5%
31	131.0	457.0	326.0	326.0	322.5	312.8	332.2	1.1%
31	129.0	457.0	328.0	328.0	322.7	313.0	332.4	1.6%



AIRCRAFT VH-FNV – MT ISA, QLD

Flt#	Th in 501/601	Th in 502/602	Th Counts Actual	Th Counts Used	Running Average	Allowed Minimum	Allowed Maximum	% Change
33	134.0	447.0	313.0	313.0	313.0	303.6	322.4	0.0%
34	127.0	438.0	311.0	311.0	312.0	302.6	321.4	-0.3%
35	130.0	441.0	311.0	311.0	311.7	302.3	321.0	-0.2%
35	127.0	435.0	308.0	308.0	310.8	301.4	320.1	-0.9%
36	127.0	443.0	316.0	316.0	311.8	302.4	321.2	1.3%
37	127.0	443.0	316.0	316.0	312.5	303.1	321.9	1.1%
38	129.0	452.0	323.0	323.0	314.0	304.6	323.4	2.9%
40	135.0	454.0	319.0	319.0	314.6	305.2	324.1	1.4%
41	134.0	447.0	313.0	313.0	314.4	305.0	323.9	-0.5%
42	136.0	458.0	322.0	322.0	315.2	305.7	324.7	2.2%
43	130.0	447.0	317.0	317.0	315.4	305.9	324.8	0.5%
43	137.0	460.0	323.0	323.0	316.0	306.5	325.5	2.2%
44	135.0	457.0	322.0	322.0	316.5	307.0	326.0	1.8%
44	132.0	457.0	325.0	325.0	317.1	307.6	326.6	2.5%
45	131.0	446.0	315.0	315.0	316.9	307.4	326.4	-0.6%
46	134.0	450.0	316.0	316.0	316.9	307.4	326.4	-0.3%
47	132.0	454.0	322.0	322.0	317.2	307.7	326.7	1.5%
47	135.0	459.0	324.0	324.0	317.6	308.0	327.1	2.0%
48	134.0	455.0	321.0	321.0	317.7	308.2	327.3	1.0%
48	133.0	457.0	324.0	324.0	318.1	308.5	327.6	1.9%



APPENDIX III – Final Located Data Formats

Headers for final data files

Area 1 – Eliza Creek

Description File for 0.1 sec Magnetics Data

```

COMM JOB NUMBER:                2330
COMM AREA NUMBER:                1
COMM SURVEY COMPANY:            Fugro Airborne Surveys
COMM CLIENT:                    Mount Isa Mines Limited
COMM SURVEY TYPE:               Magnetic and Radiometric
COMM AREA NAME:                 Eliza Creek
COMM STATE:                     QLD
COMM COUNTRY:                   Australia
COMM SURVEY FLOWN:              June 2012 - July 2012
COMM LOCATED DATA CREATED:     July 2012
COMM
COMM DATUM:                     AGD84
COMM PROJECTION:                 AMG
COMM ZONE:                       54
COMM
COMM SURVEY SPECIFICATIONS
COMM
COMM TRAVERSE LINE SPACING:     50 m
COMM TRAVERSE LINE DIRECTION:   90 - 270 deg
COMM TIE LINE SPACING:         500 m
COMM TIE LINE DIRECTION:       0 - 180 deg
COMM NOMINAL TERRAIN CLEARANCE: 30.5 m
COMM FINAL LINE KILOMETRES (in the 10 Hz dataset): 5812
COMM
COMM LINE NUMBERING
COMM
COMM TRAVERSE LINE NUMBERS:     10001 - 10538
COMM TIE LINE NUMBERS:         19001 - 19037
COMM
COMM AREA BOUNDARY
COMM
COMM EASTING      NORTHING
COMM 477400      7751600
COMM 480900      7751600
COMM 480900      7746100
COMM 482600      7746100
COMM 482600      7742400
COMM 483800      7742400
COMM 483800      7738700
COMM 482600      7738700
COMM 482600      7724800
COMM 473000      7724800
COMM 473000      7731000
COMM 465300      7731000
COMM 465300      7733000
COMM 467000      7733000
COMM 467000      7735000
COMM 470500      7735000
COMM 470500      7736800
COMM 472300      7736800
COMM 472300      7738700
COMM 473900      7738700
COMM 473900      7742400
COMM 475700      7742400

```


COMM 475700 7749800
 COMM 477400 7749800
 COMM
 COMM SURVEY EQUIPMENT
 COMM
 COMM AIRCRAFT: VH-FNV DIAMOND DA42
 COMM
 COMM MAGNETOMETER: Scintrex CS-3 CV Magnetometer
 COMM INSTALLATION: Nose stinger
 COMM RESOLUTION: 0.001 nT
 COMM RECORDING INTERVAL: 0.1 s
 COMM
 COMM BASE MAGNETOMETER: Scintrex Envi Mag
 COMM RECORDING INTERVAL: 5 s
 COMM LOCATION: Cloncurry Airport
 COMM
 COMM RADAR ALTIMETER: Collins Alt-55
 COMM RECORDING INTERVAL: 0.1 s
 COMM
 COMM NAVIGATION: real-time differential GPS
 COMM RECORDING INTERVAL: 1.0 s
 COMM
 COMM ACQUISITION SYSTEM: Fugro DAS
 COMM
 COMM DATA PROCESSING
 COMM
 COMM CO-ORDINATES
 COMM PARALLAX CORRECTION APPLIED -0.5 s
 COMM
 COMM MAGNETIC DATA
 COMM MAGNETIC PARALLAX CORRECTION APPLIED -0.1 s
 COMM DIURNAL CORRECTION APPLIED
 COMM Diurnal 1 D166-172, 180 base value 51418.0 nT
 COMM Diurnal 2 D179, 181 base value 51153.8 nT
 COMM
 COMM
 COMM IGRF CORRECTION APPLIED base value 50708.9 nT
 COMM IGRF MODEL 2010 extrapolated to 2012/06/16
 COMM HEIGHT CORRECTED USING Taylor Drape TO 30.5 m AGL
 COMM DATA HAVE BEEN TIE LINE LEVELLED
 COMM DATA HAVE BEEN MICROLEVELLED
 COMM
 COMM RADAR ALTITUDE DATA
 COMM PARALLAX CORRECTION APPLIED 0 s
 COMM
 COMM GPS ALTITUDE DATA
 COMM PARALLAX CORRECTION APPLIED -0.5 s
 COMM
 COMM DIGITAL TERRAIN DATA
 COMM DTM CALCULATED [DTM = GPS ALTITUDE - (RADAR ALT + SENSOR SEPARATION)]
 COMM DATA CORRECTED TO AUSTRALIAN HEIGHT DATUM
 COMM DATA HAVE BEEN TIE LINE LEVELLED
 COMM DATA HAVE BEEN MICROLEVELLED
 COMM
 COMM -----
 COMM DISCLAIMER
 COMM -----
 COMM It is Fugro Airborne Survey's understanding that the data provided to
 COMM the client is to be used for the purpose agreed between the parties.
 COMM That purpose was a significant factor in determining the scope and
 COMM level of the Services being offered to the Client. Should the purpose
 COMM for which the data is used change, the data may no longer be valid or
 COMM appropriate and any further use of, or reliance upon, the data in
 COMM those circumstances by the Client without Fugro Airborne Survey's

COMM review and advice shall be at the Client's own or sole risk.

COMM

COMM The Services were performed by Fugro Airborne Survey exclusively for
 COMM the purposes of the Client. Should the data be made available in whole
 COMM or part to any third party, and such party relies thereon, that party
 COMM does so wholly at its own and sole risk and Fugro Airborne Survey
 COMM disclaims any liability to such party.

COMM

COMM Where the Services have involved Fugro Airborne Survey's use of any
 COMM information provided by the Client or third parties, upon which
 COMM Fugro Airborne Survey was reasonably entitled to rely, then the
 COMM Services are limited by the accuracy of such information. Fugro
 COMM Airborne Survey is not liable for any inaccuracies (including any
 COMM incompleteness) in the said information, save as otherwise provided
 COMM in the terms of the contract between the Client and Fugro Airborne
 COMM Survey.

COMM

COMM With regard to DIGITAL TERRAIN DATA, the accuracy of the elevation
 COMM calculation is directly dependent on the accuracy of the two input
 COMM parameters, radar altitude and GPS altitude. The radar altitude value
 COMM may be erroneous in areas of heavy tree cover, where the altimeter
 COMM reflects the distance to the tree canopy rather than the ground. The
 COMM GPS altitude value is primarily dependent on the number of available
 COMM satellites. Although post-processing of GPS data will yield X and Y
 COMM accuracies in the order of 1-2 metres, the accuracy of the altitude
 COMM value is usually much less, sometimes in the ±5 metre range. Further
 COMM inaccuracies may be introduced during the interpolation and gridding
 COMM process. Because of the inherent inaccuracies of this method, no
 COMM guarantee is made or implied that the information displayed is a true
 COMM representation of the height above sea level. Although this product
 COMM may be of some use as a general reference,
 COMM THIS PRODUCT MUST NOT BE USED FOR NAVIGATION PURPOSES.

COMM -----

COMM

COMM LINE DATA FORMAT

COMM A space is left between fixed fields so that a field of, for example,
 COMM A8 should only ever have a maximum of 7 characters in it, even when it
 COMM is a null, thus:

COMM

COMM FIELD	COMM UNITS	COMM NULL	COMM FORMAT
COMM Line Number		-99999	I7
COMM Flight Number		-99	I4
COMM Date (yyyymmdd)		-9999999	I9
COMM Fiducial Number	s	-9999.9	F8.1
COMM Time (local)	s	-9999.9	F8.1
COMM Easting	m	-99999.99	F10.2
COMM Northing	m	-999999.99	F11.2
COMM Longitude	deg	-999.9999999	F13.7
COMM Latitude	deg	-99.9999999	F12.7
COMM GPS Altitude	m	-999.99	F8.2
COMM Radar Altitude	m	-999.99	F8.2
COMM Compensated TMI	nT	-99999.999	F11.3
COMM Diurnal	nT	-9999.99	F9.2
COMM Final TMI	nT	-99999.999	F11.3
COMM Digital Terrain Model	m	-999.99	F8.2

Description File for 1.0 sec Windowed Radiometrics Data

COMM JOB NUMBER: 2330
 COMM AREA NUMBER: 1
 COMM SURVEY COMPANY: Fugro Airborne Surveys
 COMM CLIENT: Mount Isa Mines Limited
 COMM SURVEY TYPE: Magnetic and Radiometric
 COMM AREA NAME: Eliza Creek

COMM STATE: QLD
 COMM COUNTRY: Australia
 COMM SURVEY FLOWN: June 2012 - July 2012
 COMM LOCATED DATA CREATED: July 2012
 COMM
 COMM DATUM: AGD84
 COMM PROJECTION: AMG
 COMM ZONE: 54
 COMM
 COMM SURVEY SPECIFICATIONS
 COMM
 COMM TRAVERSE LINE SPACING: 50 m
 COMM TRAVERSE LINE DIRECTION: 90 - 270 deg
 COMM TIE LINE SPACING: 500 m
 COMM TIE LINE DIRECTION: 0 - 180 deg
 COMM NOMINAL TERRAIN CLEARANCE: 30.5 m
 COMM FINAL LINE KILOMETRES (in the 1 Hz dataset): 5751
 COMM
 COMM LINE NUMBERING
 COMM
 COMM TRAVERSE LINE NUMBERS: 10001 - 10538
 COMM TIE LINE NUMBERS: 19001 - 19037
 COMM
 COMM AREA BOUNDARY
 COMM

COMM	EASTING	NORTHING
COMM	477400	7751600
COMM	480900	7751600
COMM	480900	7746100
COMM	482600	7746100
COMM	482600	7742400
COMM	483800	7742400
COMM	483800	7738700
COMM	482600	7738700
COMM	482600	7724800
COMM	473000	7724800
COMM	473000	7731000
COMM	465300	7731000
COMM	465300	7733000
COMM	467000	7733000
COMM	467000	7735000
COMM	470500	7735000
COMM	470500	7736800
COMM	472300	7736800
COMM	472300	7738700
COMM	473900	7738700
COMM	473900	7742400
COMM	475700	7742400
COMM	475700	7749800
COMM	477400	7749800

 COMM
 COMM SURVEY EQUIPMENT
 COMM
 COMM AIRCRAFT: VH-FNV DIAMOND DA42
 COMM
 COMM SPECTROMETER: 256 Channel Exploranium GR820
 COMM CRYSTAL VOLUME: 33.56 L
 COMM RECORDING INTERVAL: 1.0 s
 COMM
 COMM RADAR ALTIMETER: Collins Alt-55
 COMM RECORDING INTERVAL: 0.1 s
 COMM
 COMM NAVIGATION: real-time differential GPS

COMM RECORDING INTERVAL: 1.0 s
 COMM
 COMM ACQUISITION SYSTEM: Fugro DAS
 COMM
 COMM DATA PROCESSING
 COMM
 COMM CO-ORDINATES
 COMM PARALLAX CORRECTION APPLIED -0.5 s
 COMM
 COMM RADAR ALTITUDE DATA
 COMM PARALLAX CORRECTION APPLIED 0 s
 COMM
 COMM GPS ALTITUDE DATA
 COMM PARALLAX CORRECTION APPLIED -0.5 s
 COMM
 COMM RADIOMETRIC DATA
 COMM NASVD FILTERING APPLIED TO 256 CHANNEL DATA
 COMM WINDOW DATA EXTRACTED USING IAEA STANDARD WINDOWS
 COMM PARALLAX CORRECTION APPLIED 0 s
 COMM COSMIC, AIRCRAFT AND RADON BACKGROUNDS REMOVED
 COMM STRIPPING CORRECTIONS APPLIED
 COMM HEIGHT CORRECTED TO: 30.5 m AGL
 COMM DATA HAVE BEEN TIE LINE LEVELLED
 COMM
 COMM AIRCRAFT BACKGROUND COEFFICIENTS
 COMM TOTAL COUNT 62.00
 COMM POTASSIUM 8.450
 COMM URANIUM 1.500
 COMM THORIUM 2.360
 COMM COSMIC COEFFICIENTS
 COMM TOTAL COUNT 0.9150
 COMM POTASSIUM 0.0550
 COMM URANIUM 0.0435
 COMM THORIUM 0.0520
 COMM STRIPPING COEFFICIENTS
 COMM ALPHA 0.2650
 COMM BETA 0.4082
 COMM GAMMA 0.7693
 COMM a 0.0595
 COMM b 0.0007
 COMM c -0.0150
 COMM RADON STRIPPING COEFFICIENTS
 COMM TOTAL COUNT 13.15386
 COMM POTASSIUM 0.78264
 COMM THORIUM 0.06105
 COMM SPECTRAL RATIOS
 COMM RADON (C1) 2.0000
 COMM GROUND (C2) 0.4949
 COMM ALTITUDE COEFFICIENTS
 COMM TOTAL COUNT -0.0075
 COMM POTASSIUM -0.0100
 COMM URANIUM -0.0072
 COMM THORIUM -0.0077
 COMM SENSITIVITY COEFFICIENTS AT 30 m
 COMM TOTAL COUNT 36.3 (cps/(nGy/h))
 COMM POTASSIUM 146.5 (cps/%)
 COMM URANIUM 9.5 (cps/ppm)
 COMM THORIUM 8.1 (cps/ppm)

COMM

COMM -----
 COMM DISCLAIMER

COMM

COMM -----
 COMM It is Fugro Airborne Survey's understanding that the data provided to
 COMM the client is to be used for the purpose agreed between the parties.

COMM That purpose was a significant factor in determining the scope and
 COMM level of the Services being offered to the Client. Should the purpose
 COMM for which the data is used change, the data may no longer be valid or
 COMM appropriate and any further use of, or reliance upon, the data in
 COMM those circumstances by the Client without Fugro Airborne Survey's
 COMM review and advice shall be at the Client's own or sole risk.

COMM
 COMM The Services were performed by Fugro Airborne Survey exclusively for
 COMM the purposes of the Client. Should the data be made available in whole
 COMM or part to any third party, and such party relies thereon, that party
 COMM does so wholly at its own and sole risk and Fugro Airborne Survey
 COMM disclaims any liability to such party.

COMM
 COMM Where the Services have involved Fugro Airborne Survey's use of any
 COMM information provided by the Client or third parties, upon which
 COMM Fugro Airborne Survey was reasonably entitled to rely, then the
 COMM Services are limited by the accuracy of such information. Fugro
 COMM Airborne Survey is not liable for any inaccuracies (including any
 COMM incompleteness) in the said information, save as otherwise provided
 COMM in the terms of the contract between the Client and Fugro Airborne
 COMM Survey.

COMM -----
 COMM

COMM LINE DATA FORMAT

COMM A space is left between fixed fields so that a field of, for example,
 COMM A8 should only ever have a maximum of 7 characters in it, even when it
 COMM is a null, thus:

COMM

COMM FIELD	COMM UNITS	COMM NULL	COMM FORMAT
COMM Line Number		-99999	I7
COMM Flight Number		-99	I4
COMM Date (yyyymmdd)		-99999999	I9
COMM Fiducial Number	s	-9999.9	F8.1
COMM Time (local)	s	-9999.9	F8.1
COMM Easting	m	-99999.99	F10.2
COMM Northing	m	-999999.99	F11.2
COMM Longitude	deg	-999.9999999	F13.7
COMM Latitude	deg	-99.9999999	F12.7
COMM GPS Altitude	m	-999.99	F8.2
COMM Radar Altitude	m	-999.99	F8.2
COMM Uncorrected Total Count	cps	-9999.9	F8.1
COMM Uncorrected Potassium	cps	-999.9	F7.1
COMM Uncorrected Uranium	cps	-999.9	F7.1
COMM Uncorrected Thorium	cps	-999.9	F7.1
COMM Raw Cosmic	cps	-99	I4
COMM Final Total Count	cps	-9999.9	F8.1
COMM Final Potassium	cps	-999.9	F7.1
COMM Final Uranium	cps	-999.9	F7.1
COMM Final Thorium	cps	-999.9	F7.1

Description File for 1.0 sec Raw 256 Channel Radiometrics Data

COMM JOB NUMBER: 2330
 COMM AREA NUMBER: 1
 COMM SURVEY COMPANY: Fugro Airborne Surveys
 COMM CLIENT: Mount Isa Mines Limited
 COMM SURVEY TYPE: Magnetic and Radiometric
 COMM AREA NAME: Eliza Creek
 COMM STATE: QLD
 COMM COUNTRY: Australia
 COMM SURVEY FLOWN: June 2012 - July 2012
 COMM LOCATED DATA CREATED: July 2012
 COMM
 COMM DATUM: AGD84

COMM PROJECTION: AMG
 COMM ZONE: 54
 COMM
 COMM SURVEY SPECIFICATIONS
 COMM
 COMM TRAVERSE LINE SPACING: 50 m
 COMM TRAVERSE LINE DIRECTION: 90 - 270 deg
 COMM TIE LINE SPACING: 500 m
 COMM TIE LINE DIRECTION: 0 - 180 deg
 COMM NOMINAL TERRAIN CLEARANCE: 30.5 m
 COMM FINAL LINE KILOMETRES (in the 1 Hz dataset): 5751
 COMM
 COMM LINE NUMBERING
 COMM
 COMM TRAVERSE LINE NUMBERS: 10001 - 10538
 COMM TIE LINE NUMBERS: 19001 - 19037
 COMM
 COMM AREA BOUNDARY
 COMM

COMM	EASTING	NORTHING
COMM	477400	7751600
COMM	480900	7751600
COMM	480900	7746100
COMM	482600	7746100
COMM	482600	7742400
COMM	483800	7742400
COMM	483800	7738700
COMM	482600	7738700
COMM	482600	7724800
COMM	473000	7724800
COMM	473000	7731000
COMM	465300	7731000
COMM	465300	7733000
COMM	467000	7733000
COMM	467000	7735000
COMM	470500	7735000
COMM	470500	7736800
COMM	472300	7736800
COMM	472300	7738700
COMM	473900	7738700
COMM	473900	7742400
COMM	475700	7742400
COMM	475700	7749800
COMM	477400	7749800

 COMM
 COMM SURVEY EQUIPMENT
 COMM
 COMM AIRCRAFT: VH-FNV DIAMOND DA42
 COMM
 COMM SPECTROMETER: 256 Channel Exploranium GR820
 COMM CRYSTAL VOLUME: 33.56 L
 COMM RECORDING INTERVAL: 1.0 s
 COMM
 COMM RADAR ALTIMETER: Collins Alt-55
 COMM RECORDING INTERVAL: 0.1 s
 COMM
 COMM NAVIGATION: real-time differential GPS
 COMM RECORDING INTERVAL: 1.0 s
 COMM
 COMM ACQUISITION SYSTEM: Fugro DAS
 COMM
 COMM DATA PROCESSING
 COMM

COMM CO-ORDINATES	
COMM PARALLAX CORRECTION APPLIED	-0.5 s
COMM	
COMM RADAR ALTITUDE DATA	
COMM PARALLAX CORRECTION APPLIED	0 s
COMM	
COMM GPS ALTITUDE DATA	
COMM PARALLAX CORRECTION APPLIED	-0.5 s
COMM	
COMM BAROMETRIC DATA	
COMM PARALLAX CORRECTION APPLIED	0 s
COMM	
COMM TEMPERATURE DATA	
COMM PARALLAX CORRECTION APPLIED	0 s
COMM	
COMM RADIOMETRIC DATA	
COMM NO PROCESSING APPLIED TO RAW 256 CHANNEL RADIOMETRIC DATA	
COMM	
COMM AIRCRAFT BACKGROUND COEFFICIENTS	
COMM TOTAL COUNT	62.00
COMM POTASSIUM	8.450
COMM URANIUM	1.500
COMM THORIUM	2.360
COMM COSMIC COEFFICIENTS	
COMM TOTAL COUNT	0.9150
COMM POTASSIUM	0.0550
COMM URANIUM	0.0435
COMM THORIUM	0.0520
COMM STRIPPING COEFFICIENTS	
COMM ALPHA	0.2650
COMM BETA	0.4082
COMM GAMMA	0.7693
COMM a	0.0595
COMM b	0.0007
COMM c	-0.0150
COMM RADON STRIPPING COEFFICIENTS	
COMM TOTAL COUNT	13.15386
COMM POTASSIUM	0.78264
COMM THORIUM	0.06105
COMM SPECTRAL RATIOS	
COMM RADON (C1)	2.0000
COMM GROUND (C2)	0.4949
COMM ALTITUDE COEFFICIENTS	
COMM TOTAL COUNT	-0.0075
COMM POTASSIUM	-0.0100
COMM URANIUM	-0.0072
COMM THORIUM	-0.0077
COMM SENSITIVITY COEFFICIENTS AT 30 m	
COMM TOTAL COUNT	36.3 (cps/(nGy/h))
COMM POTASSIUM	146.5 (cps/%)
COMM URANIUM	9.5 (cps/ppm)
COMM THORIUM	8.1 (cps/ppm)

COMM

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 COMM the client is to be used for the purpose agreed between the parties.
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 COMM level of the Services being offered to the Client. Should the purpose
 COMM for which the data is used change, the data may no longer be valid or
 COMM appropriate and any further use of, or reliance upon, the data in
 COMM those circumstances by the Client without Fugro Airborne Survey's
 COMM review and advice shall be at the Client's own or sole risk.

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 COMM incompleteness) in the said information, save as otherwise provided
 COMM in the terms of the contract between the Client and Fugro Airborne
 COMM Survey.

COMM -----

COMM
 COMM LINE DATA FORMAT

COMM A space is left between fixed fields so that a field of, for example,
 COMM A8 should only ever have a maximum of 7 characters in it, even when it
 COMM is a null, thus:

COMM FIELD	UNITS	NULL	FORMAT
COMM Line Number		-99999	I7
COMM Flight Number		-99	I4
COMM Date (yyyymmdd)		-99999999	I9
COMM Fiducial Number	s	-9999.9	F8.1
COMM Time (local)	s	-9999.9	F8.1
COMM Easting	m	-99999.99	F10.2
COMM Northing	m	-999999.99	F11.2
COMM Longitude	deg	-999.9999999	F13.7
COMM Latitude	deg	-99.9999999	F12.7
COMM GPS Altitude	m	-999.99	F8.2
COMM Radar Altitude	m	-999.99	F8.2
COMM Raw Cosmic	cps	-99	I4
COMM Barometric Pressure	hPa	-999.99	F8.2
COMM Temperature	deg C	-9.9	F5.1
COMM Livetime	s	-9.999	F7.3
COMM Raw 256 Channel Radiometrics counts		-999	256I5

Area 2 – Monakoff

Description File for 0.1 sec Magnetics Data

COMM JOB NUMBER: 2330
 COMM AREA NUMBER: 2
 COMM SURVEY COMPANY: Fugro Airborne Surveys
 COMM CLIENT: Mount Isa Mines Limited
 COMM SURVEY TYPE: Magnetic and Radiometric
 COMM AREA NAME: Monakoff
 COMM STATE: QLD
 COMM COUNTRY: Australia
 COMM SURVEY FLOWN: June 2012 - July 2012
 COMM LOCATED DATA CREATED: August 2012
 COMM
 COMM DATUM: AGD84
 COMM PROJECTION: AMG
 COMM ZONE: 54
 COMM
 COMM SURVEY SPECIFICATIONS
 COMM
 COMM TRAVERSE LINE SPACING: 50 m
 COMM TRAVERSE LINE DIRECTION: 0 - 180 deg
 COMM TIE LINE SPACING: 500 m
 COMM TIE LINE DIRECTION: 90 - 270 deg

COMM NOMINAL TERRAIN CLEARANCE: 30.5 m
 COMM FINAL LINE KILOMETRES (in the 10 Hz dataset): 2667
 COMM
 COMM LINE NUMBERING
 COMM
 COMM TRAVERSE LINE NUMBERS: 20002 - 20282
 COMM TIE LINE NUMBERS: 29001 - 29028
 COMM
 COMM AREA BOUNDARY
 COMM
 COMM EASTING NORTHING
 COMM
 COMM 460000 7722500
 COMM 474000 7722500
 COMM 474000 7716500
 COMM 464000 7716500
 COMM 464000 7709000
 COMM 460000 7709000
 COMM
 COMM SURVEY EQUIPMENT
 COMM
 COMM AIRCRAFT: VH-FNV DIAMOND DA42
 COMM
 COMM MAGNETOMETER: Scintrex CS-3 CV Magnetometer
 COMM INSTALLATION: Nose stinger
 COMM RESOLUTION: 0.001 nT
 COMM RECORDING INTERVAL: 0.1 s
 COMM
 COMM BASE MAGNETOMETER: Scintrex Envi Mag
 COMM RECORDING INTERVAL: 5 s
 COMM LOCATION: Cloncurry Airport
 COMM
 COMM RADAR ALTIMETER: Collins Alt-55
 COMM RECORDING INTERVAL: 0.1 s
 COMM
 COMM NAVIGATION: real-time differential GPS
 COMM RECORDING INTERVAL: 1.0 s
 COMM
 COMM ACQUISITION SYSTEM: Fugro DAS
 COMM
 COMM DATA PROCESSING
 COMM
 COMM CO-ORDINATES
 COMM PARALLAX CORRECTION APPLIED -0.5 s
 COMM
 COMM MAGNETIC DATA
 COMM MAGNETIC PARALLAX CORRECTION APPLIED -0.1 s
 COMM DIURNAL CORRECTION APPLIED
 COMM Diurnal 2 D181-185 base value 51153.8 nT
 COMM
 COMM
 COMM IGRF CORRECTION APPLIED base value 50708.9 nT
 COMM IGRF MODEL 2010 extrapolated to 2012/06/16
 COMM HEIGHT CORRECTED USING Taylor Drape TO 30.5 m AGL
 COMM DATA HAVE BEEN TIE LINE LEVELLED
 COMM DATA HAVE BEEN MICROLEVELLED
 COMM
 COMM RADAR ALTITUDE DATA
 COMM PARALLAX CORRECTION APPLIED 0 s
 COMM
 COMM GPS ALTITUDE DATA
 COMM PARALLAX CORRECTION APPLIED -0.5 s
 COMM
 COMM DIGITAL TERRAIN DATA

COMM DTM CALCULATED [DTM = GPS ALTITUDE - (RADAR ALT + SENSOR SEPARATION)]
 COMM DATA CORRECTED TO AUSTRALIAN HEIGHT DATUM
 COMM DATA HAVE BEEN TIE LINE LEVELLED
 COMM DATA HAVE BEEN MICROLEVELLED

COMM

COMM

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 COMM in the terms of the contract between the Client and Fugro Airborne
 COMM Survey.

COMM

COMM With regard to DIGITAL TERRAIN DATA, the accuracy of the elevation
 COMM calculation is directly dependent on the accuracy of the two input
 COMM parameters, radar altitude and GPS altitude. The radar altitude value
 COMM may be erroneous in areas of heavy tree cover, where the altimeter
 COMM reflects the distance to the tree canopy rather than the ground. The
 COMM GPS altitude value is primarily dependent on the number of available
 COMM satellites. Although post-processing of GPS data will yield X and Y
 COMM accuracies in the order of 1-2 metres, the accuracy of the altitude
 COMM value is usually much less, sometimes in the ±5 metre range. Further
 COMM inaccuracies may be introduced during the interpolation and gridding
 COMM process. Because of the inherent inaccuracies of this method, no
 COMM guarantee is made or implied that the information displayed is a true
 COMM representation of the height above sea level. Although this product
 COMM may be of some use as a general reference,
 COMM THIS PRODUCT MUST NOT BE USED FOR NAVIGATION PURPOSES.

COMM

COMM

COMM LINE DATA FORMAT

COMM A space is left between fixed fields so that a field of, for example,
 COMM A8 should only ever have a maximum of 7 characters in it, even when it
 COMM is a null, thus:

COMM

COMM FIELD	COMM UNITS	COMM NULL	COMM FORMAT
COMM Line Number		-99999	I7
COMM Flight Number		-99	I4
COMM Date (yyyymmdd)		-9999999	I9
COMM Fiducial Number	s	-9999.9	F8.1
COMM Time (local)	s	-9999.9	F8.1
COMM Easting	m	-99999.99	F10.2
COMM Northing	m	-999999.99	F11.2
COMM Longitude	deg	-999.9999999	F13.7
COMM Latitude	deg	-99.9999999	F12.7

COMM GPS Altitude	m	-999.99	F8.2
COMM Radar Altitude	m	-999.99	F8.2
COMM Compensated TMI	nT	-99999.999	F11.3
COMM Diurnal	nT	-9999.99	F9.2
COMM Final TMI	nT	-99999.999	F11.3
COMM Digital Terrain Model	m	-999.99	F8.2

Description File for 1.0 sec Windowed Radiometrics Data

COMM JOB NUMBER: 2330
 COMM AREA NUMBER: 2
 COMM SURVEY COMPANY: Fugro Airborne Surveys
 COMM CLIENT: Mount Isa Mines Limited
 COMM SURVEY TYPE: Magnetic and Radiometric
 COMM AREA NAME: Monakoff
 COMM STATE: QLD
 COMM COUNTRY: Australia
 COMM SURVEY FLOWN: June 2012 - July 2012
 COMM LOCATED DATA CREATED: August 2012
 COMM
 COMM DATUM: AGD84
 COMM PROJECTION: AMG
 COMM ZONE: 54
 COMM
 COMM SURVEY SPECIFICATIONS
 COMM
 COMM TRAVERSE LINE SPACING: 50 m
 COMM TRAVERSE LINE DIRECTION: 0 - 180 deg
 COMM TIE LINE SPACING: 500 m
 COMM TIE LINE DIRECTION: 90 - 270 deg
 COMM NOMINAL TERRAIN CLEARANCE: 30.5 m
 COMM FINAL LINE KILOMETRES (in the 1 Hz dataset): 2647
 COMM
 COMM LINE NUMBERING
 COMM
 COMM TRAVERSE LINE NUMBERS: 20002 - 20282
 COMM TIE LINE NUMBERS: 29001 - 29028
 COMM
 COMM AREA BOUNDARY
 COMM

COMM	EASTING	NORTHING
COMM	460000	7722500
COMM	474000	7722500
COMM	474000	7716500
COMM	464000	7716500
COMM	464000	7709000
COMM	460000	7709000

 COMM
 COMM SURVEY EQUIPMENT
 COMM
 COMM AIRCRAFT: VH-FNV DIAMOND DA42
 COMM
 COMM SPECTROMETER: 256 Channel Exploranium GR820
 COMM CRYSTAL VOLUME: 33.56 L
 COMM RECORDING INTERVAL: 1.0 s
 COMM
 COMM RADAR ALTIMETER: Collins Alt-55
 COMM RECORDING INTERVAL: 0.1 s
 COMM
 COMM NAVIGATION: real-time differential GPS
 COMM RECORDING INTERVAL: 1.0 s
 COMM
 COMM ACQUISITION SYSTEM: Fugro DAS

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COMM
COMM DATA PROCESSING
COMM
COMM CO-ORDINATES
COMM PARALLAX CORRECTION APPLIED                -0.5 s
COMM
COMM RADAR ALTITUDE DATA
COMM PARALLAX CORRECTION APPLIED                0 s
COMM
COMM GPS ALTITUDE DATA
COMM PARALLAX CORRECTION APPLIED                -0.5 s
COMM
COMM RADIOMETRIC DATA
COMM NASVD FILTERING APPLIED TO 256 CHANNEL DATA
COMM WINDOW DATA EXTRACTED USING IAEA STANDARD WINDOWS
COMM PARALLAX CORRECTION APPLIED                0 s
COMM COSMIC, AIRCRAFT AND RADON BACKGROUNDS REMOVED
COMM STRIPPING CORRECTIONS APPLIED
COMM HEIGHT CORRECTED TO:                        30.5 m AGL
COMM DATA HAVE BEEN TIE LINE LEVELLED
COMM
COMM AIRCRAFT BACKGROUND COEFFICIENTS
COMM TOTAL COUNT                                62.00
COMM POTASSIUM                                  8.450
COMM URANIUM                                    1.500
COMM THORIUM                                    2.360
COMM COSMIC COEFFICIENTS
COMM TOTAL COUNT                                0.9150
COMM POTASSIUM                                  0.0550
COMM URANIUM                                    0.0435
COMM THORIUM                                    0.0520
COMM STRIPPING COEFFICIENTS
COMM ALPHA                                      0.2650
COMM BETA                                       0.4082
COMM GAMMA                                      0.7693
COMM a                                          0.0595
COMM b                                          0.0007
COMM c                                          -0.0150
COMM RADON STRIPPING COEFFICIENTS
COMM TOTAL COUNT                                13.15386
COMM POTASSIUM                                  0.78264
COMM THORIUM                                    0.06105
COMM SPECTRAL RATIOS
COMM RADON (C1)                                2.0000
COMM GROUND (C2)                               0.4949
COMM ALTITUDE COEFFICIENTS
COMM TOTAL COUNT                                -0.0075
COMM POTASSIUM                                  -0.0100
COMM URANIUM                                    -0.0072
COMM THORIUM                                    -0.0077
COMM SENSITIVITY COEFFICIENTS AT 30 m
COMM TOTAL COUNT                                36.3 (cps/(nGy/h))
COMM POTASSIUM                                  146.5 (cps/%)
COMM URANIUM                                    9.3 (cps/ppm)
COMM THORIUM                                    8.1 (cps/ppm)

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COMM LINE DATA FORMAT

COMM A space is left between fixed fields so that a field of, for example,
 COMM A8 should only ever have a maximum of 7 characters in it, even when it
 COMM is a null, thus:

COMM

COMM FIELD	COMM UNITS	COMM NULL	COMM FORMAT
COMM Line Number		-99999	I7
COMM Flight Number		-99	I4
COMM Date (yyyymmdd)		-99999999	I9
COMM Fiducial Number	s	-9999.9	F8.1
COMM Time (local)	s	-9999.9	F8.1
COMM Easting	m	-99999.99	F10.2
COMM Northing	m	-999999.99	F11.2
COMM Longitude	deg	-999.9999999	F13.7
COMM Latitude	deg	-99.9999999	F12.7
COMM GPS Altitude	m	-999.99	F8.2
COMM Radar Altitude	m	-999.99	F8.2
COMM Uncorrected Total Count	cps	-9999.9	F8.1
COMM Uncorrected Potassium	cps	-999.9	F7.1
COMM Uncorrected Uranium	cps	-999.9	F7.1
COMM Uncorrected Thorium	cps	-999.9	F7.1
COMM Raw Cosmic	cps	-99	I4
COMM Final Total Count	cps	-9999.9	F8.1
COMM Final Potassium	cps	-999.9	F7.1
COMM Final Uranium	cps	-999.9	F7.1
COMM Final Thorium	cps	-999.9	F7.1

Description File for 1.0 sec Raw 256 Channel Radiometrics Data

COMM JOB NUMBER: 2330
 COMM AREA NUMBER: 2
 COMM SURVEY COMPANY: Fugro Airborne Surveys
 COMM CLIENT: Mount Isa Mines Limited
 COMM SURVEY TYPE: Magnetic and Radiometric
 COMM AREA NAME: Monakoff
 COMM STATE: QLD
 COMM COUNTRY: Australia
 COMM SURVEY FLOWN: June 2012 - July 2012
 COMM LOCATED DATA CREATED: August 2012
 COMM
 COMM DATUM: AGD84
 COMM PROJECTION: AMG
 COMM ZONE: 54
 COMM

COMM SURVEY SPECIFICATIONS
 COMM
 COMM TRAVERSE LINE SPACING: 50 m
 COMM TRAVERSE LINE DIRECTION: 0 - 180 deg
 COMM TIE LINE SPACING: 500 m
 COMM TIE LINE DIRECTION: 90 - 270 deg
 COMM NOMINAL TERRAIN CLEARANCE: 30.5 m
 COMM FINAL LINE KILOMETRES (in the 1 Hz dataset): 2647
 COMM
 COMM LINE NUMBERING
 COMM
 COMM TRAVERSE LINE NUMBERS: 20002 - 20282
 COMM TIE LINE NUMBERS: 29001 - 29028
 COMM
 COMM AREA BOUNDARY
 COMM
 COMM EASTING NORTHING
 COMM
 COMM 460000 7722500
 COMM 474000 7722500
 COMM 474000 7716500
 COMM 464000 7716500
 COMM 464000 7709000
 COMM 460000 7709000
 COMM
 COMM SURVEY EQUIPMENT
 COMM
 COMM AIRCRAFT: VH-FNV DIAMOND DA42
 COMM
 COMM SPECTROMETER: 256 Channel Exploranium GR820
 COMM CRYSTAL VOLUME: 33.56 L
 COMM RECORDING INTERVAL: 1.0 s
 COMM
 COMM RADAR ALTIMETER: Collins Alt-55
 COMM RECORDING INTERVAL: 0.1 s
 COMM
 COMM NAVIGATION: real-time differential GPS
 COMM RECORDING INTERVAL: 1.0 s
 COMM
 COMM ACQUISITION SYSTEM: Fugro DAS
 COMM
 COMM DATA PROCESSING
 COMM
 COMM CO-ORDINATES
 COMM PARALLAX CORRECTION APPLIED -0.5 s
 COMM
 COMM RADAR ALTITUDE DATA
 COMM PARALLAX CORRECTION APPLIED 0 s
 COMM
 COMM GPS ALTITUDE DATA
 COMM PARALLAX CORRECTION APPLIED -0.5 s
 COMM
 COMM BAROMETRIC DATA
 COMM PARALLAX CORRECTION APPLIED 0 s
 COMM
 COMM TEMPERATURE DATA
 COMM PARALLAX CORRECTION APPLIED 0 s
 COMM
 COMM RADIOMETRIC DATA
 COMM NO PROCESSING APPLIED TO RAW 256 CHANNEL RADIOMETRIC DATA
 COMM
 COMM AIRCRAFT BACKGROUND COEFFICIENTS
 COMM TOTAL COUNT 62.00
 COMM POTASSIUM 8.450

COMM URANIUM	1.500
COMM THORIUM	2.360
COMM COSMIC COEFFICIENTS	
COMM TOTAL COUNT	0.9150
COMM POTASSIUM	0.0550
COMM URANIUM	0.0435
COMM THORIUM	0.0520
COMM STRIPPING COEFFICIENTS	
COMM ALPHA	0.2650
COMM BETA	0.4082
COMM GAMMA	0.7693
COMM a	0.0595
COMM b	0.0007
COMM c	-0.0150
COMM RADON STRIPPING COEFFICIENTS	
COMM TOTAL COUNT	13.15386
COMM POTASSIUM	0.78264
COMM THORIUM	0.06105
COMM SPECTRAL RATIOS	
COMM RADON (C1)	2.0000
COMM GROUND (C2)	0.4949
COMM ALTITUDE COEFFICIENTS	
COMM TOTAL COUNT	-0.0075
COMM POTASSIUM	-0.0100
COMM URANIUM	-0.0072
COMM THORIUM	-0.0077
COMM SENSITIVITY COEFFICIENTS AT 30 m	
COMM TOTAL COUNT	36.3 (cps/(nGy/h))
COMM POTASSIUM	146.5 (cps/%)
COMM URANIUM	9.3 (cps/ppm)
COMM THORIUM	8.1 (cps/ppm)

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COMM LINE DATA FORMAT

COMM A space is left between fixed fields so that a field of, for example,
COMM A8 should only ever have a maximum of 7 characters in it, even when it
COMM is a null, thus:

COMM	FIELD	UNITS	NULL	FORMAT
COMM	Line Number		-99999	I7
COMM	Flight Number		-99	I4
COMM	Date (yyyymmdd)		-99999999	I9
COMM	Fiducial Number	s	-9999.9	F8.1
COMM	Time (local)	s	-9999.9	F8.1
COMM	Easting	m	-99999.99	F10.2
COMM	Northing	m	-999999.99	F11.2
COMM	Longitude	deg	-999.9999999	F13.7
COMM	Latitude	deg	-99.9999999	F12.7
COMM	GPS Altitude	m	-999.99	F8.2
COMM	Radar Altitude	m	-999.99	F8.2
COMM	Raw Cosmic	cps	-99	I4
COMM	Barometric Pressure	hPa	-999.99	F8.2
COMM	Temperature	deg C	-9.9	F5.1
COMM	Livetime	s	-9.999	F7.3
COMM	Raw 256 Channel Radiometrics counts		-999	256I5

Area 3 – North Duchess

Description File for 0.1 sec Magnetics Data

COMM	JOB NUMBER:	2330
COMM	AREA NUMBER:	3
COMM	SURVEY COMPANY:	Fugro Airborne Surveys
COMM	CLIENT:	Mount Isa Mines Limited
COMM	SURVEY TYPE:	Magnetic and Radiometric
COMM	AREA NAME:	North Duchess
COMM	STATE:	QLD
COMM	COUNTRY:	Australia
COMM	SURVEY FLOWN:	June 2012 - July 2012
COMM	LOCATED DATA CREATED:	August 2012
COMM	DATUM:	AGD84
COMM	PROJECTION:	AMG
COMM	ZONE:	54
COMM	SURVEY SPECIFICATIONS	
COMM	TRAVERSE LINE SPACING:	50 m
COMM	TRAVERSE LINE DIRECTION:	90 - 270 deg
COMM	TIE LINE SPACING:	500 m
COMM	TIE LINE DIRECTION:	0 - 180 deg
COMM	NOMINAL TERRAIN CLEARANCE:	45 m
COMM	FINAL LINE KILOMETRES (in the 10 Hz dataset):	7504
COMM	LINE NUMBERING	
COMM	TRAVERSE LINE NUMBERS:	30001 - 30858
COMM	TIE LINE NUMBERS:	39001 - 39036
COMM	AREA BOUNDARY	
COMM	EASTING	NORTHING
COMM	383700	7681300
COMM	387500	7681300
COMM	387500	7679500
COMM	392800	7679500
COMM	392800	7675500
COMM	391000	7675500
COMM	391000	7671800
COMM	389400	7671800
COMM	389400	7670000

COMM 387700 7670000
 COMM 387700 7664700
 COMM 389500 7664700
 COMM 389500 7662500
 COMM 387800 7662500
 COMM 387800 7653000
 COMM 382600 7653000
 COMM 382600 7647500
 COMM 379600 7647500
 COMM 379600 7638500
 COMM 375300 7638500
 COMM 375300 7653600
 COMM 376900 7653600
 COMM 376900 7662900
 COMM 382000 7662900
 COMM 382000 7674000
 COMM 383700 7674000
 COMM
 COMM SURVEY EQUIPMENT
 COMM
 COMM AIRCRAFT: VH-FNV DIAMOND DA42
 COMM
 COMM MAGNETOMETER: Scintrex CS-3 CV Magnetometer
 COMM INSTALLATION: Nose stinger
 COMM RESOLUTION: 0.001 nT
 COMM RECORDING INTERVAL: 0.1 s
 COMM
 COMM BASE MAGNETOMETER: Scintrex Envi Mag
 COMM RECORDING INTERVAL: 5 s
 COMM LOCATION: Cloncurry Airport D186-191
 Mt Isa Airport D203-213
 COMM
 COMM RADAR ALTIMETER: Collins Alt-55
 COMM RECORDING INTERVAL: 0.1 s
 COMM
 COMM NAVIGATION: real-time differential GPS
 COMM RECORDING INTERVAL: 1.0 s
 COMM
 COMM ACQUISITION SYSTEM: Fugro DAS
 COMM
 COMM DATA PROCESSING
 COMM
 COMM CO-ORDINATES
 COMM PARALLAX CORRECTION APPLIED -0.5 s
 COMM
 COMM MAGNETIC DATA
 COMM MAGNETIC PARALLAX CORRECTION APPLIED -0.1 s
 COMM DIURNAL CORRECTION APPLIED
 COMM Diurnal 1 D191 base value 51043.4 nT
 COMM D205 base value 50624.5 nT
 COMM D207-213 base value 50634.1 nT
 COMM Diurnal 2 D186-190 base value 51153.8 nT
 COMM D203-204 base value 50621.8 nT
 COMM D206 base value 50627.7 nT
 COMM
 COMM IGRF CORRECTION APPLIED base value 50708.9 nT
 COMM IGRF MODEL 2010 extrapolated to 2012/06/16
 COMM HEIGHT CORRECTED USING Taylor Drape TO 45 m AGL
 COMM DATA HAVE BEEN TIE LINE LEVELLED
 COMM DATA HAVE BEEN MICROLEVELLED
 COMM
 COMM RADAR ALTITUDE DATA
 COMM PARALLAX CORRECTION APPLIED 0 s
 COMM

COMM GPS ALTITUDE DATA
 COMM PARALLAX CORRECTION APPLIED -0.5 s
 COMM
 COMM DIGITAL TERRAIN DATA
 COMM DTM CALCULATED [DTM = GPS ALTITUDE - (RADAR ALT + SENSOR SEPARATION)]
 COMM DATA CORRECTED TO AUSTRALIAN HEIGHT DATUM
 COMM DATA HAVE BEEN TIE LINE LEVELLED
 COMM DATA HAVE BEEN MICROLEVELLED
 COMM
 COMM -----
 COMM DISCLAIMER
 COMM -----
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 COMM for which the data is used change, the data may no longer be valid or
 COMM appropriate and any further use of, or reliance upon, the data in
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 COMM or part to any third party, and such party relies thereon, that party
 COMM does so wholly at its own and sole risk and Fugro Airborne Survey
 COMM disclaims any liability to such party.
 COMM
 COMM Where the Services have involved Fugro Airborne Survey's use of any
 COMM information provided by the Client or third parties, upon which
 COMM Fugro Airborne Survey was reasonably entitled to rely, then the
 COMM Services are limited by the accuracy of such information. Fugro
 COMM Airborne Survey is not liable for any inaccuracies (including any
 COMM incompleteness) in the said information, save as otherwise provided
 COMM in the terms of the contract between the Client and Fugro Airborne
 COMM Survey.
 COMM
 COMM With regard to DIGITAL TERRAIN DATA, the accuracy of the elevation
 COMM calculation is directly dependent on the accuracy of the two input
 COMM parameters, radar altitude and GPS altitude. The radar altitude value
 COMM may be erroneous in areas of heavy tree cover, where the altimeter
 COMM reflects the distance to the tree canopy rather than the ground. The
 COMM GPS altitude value is primarily dependent on the number of available
 COMM satellites. Although post-processing of GPS data will yield X and Y
 COMM accuracies in the order of 1-2 metres, the accuracy of the altitude
 COMM value is usually much less, sometimes in the ±5 metre range. Further
 COMM inaccuracies may be introduced during the interpolation and gridding
 COMM process. Because of the inherent inaccuracies of this method, no
 COMM guarantee is made or implied that the information displayed is a true
 COMM representation of the height above sea level. Although this product
 COMM may be of some use as a general reference,
 COMM THIS PRODUCT MUST NOT BE USED FOR NAVIGATION PURPOSES.
 COMM -----
 COMM
 COMM LINE DATA FORMAT
 COMM A space is left between fixed fields so that a field of, for example,
 COMM A8 should only ever have a maximum of 7 characters in it, even when it
 COMM is a null, thus:
 COMM

COMM FIELD	COMM UNITS	COMM NULL	COMM FORMAT
COMM Line Number		-99999	I7
COMM Flight Number		-99	I4
COMM Date (yyyymmdd)		-99999999	I9
COMM Fiducial Number	s	-9999.9	F8.1
COMM Time (local)	s	-9999.9	F8.1

COMM Easting	m	-99999.99	F10.2
COMM Northing	m	-999999.99	F11.2
COMM Longitude	deg	-999.9999999	F13.7
COMM Latitude	deg	-99.9999999	F12.7
COMM GPS Altitude	m	-999.99	F8.2
COMM Radar Altitude	m	-999.99	F8.2
COMM Compensated TMI	nT	-99999.999	F11.3
COMM Diurnal	nT	-9999.99	F9.2
COMM Final TMI	nT	-99999.999	F11.3
COMM Digital Terrain Model	m	-999.99	F8.2

Description File for 1.0 sec Windowed Radiometrics Data

COMM JOB NUMBER: 2330
 COMM AREA NUMBER: 3
 COMM SURVEY COMPANY: Fugro Airborne Surveys
 COMM CLIENT: Mount Isa Mines Limited
 COMM SURVEY TYPE: Magnetic and Radiometric
 COMM AREA NAME: North Duchess
 COMM STATE: QLD
 COMM COUNTRY: Australia
 COMM SURVEY FLOWN: June 2012 - July 2012
 COMM LOCATED DATA CREATED: August 2012
 COMM
 COMM DATUM: AGD84
 COMM PROJECTION: AMG
 COMM ZONE: 54
 COMM
 COMM SURVEY SPECIFICATIONS
 COMM
 COMM TRAVERSE LINE SPACING: 50 m
 COMM TRAVERSE LINE DIRECTION: 90 - 270 deg
 COMM TIE LINE SPACING: 500 m
 COMM TIE LINE DIRECTION: 0 - 180 deg
 COMM NOMINAL TERRAIN CLEARANCE: 45 m
 COMM FINAL LINE KILOMETRES (in the 1 Hz dataset): 7447
 COMM
 COMM LINE NUMBERING
 COMM
 COMM TRAVERSE LINE NUMBERS: 30001 - 30858
 COMM TIE LINE NUMBERS: 39001 - 39036
 COMM
 COMM AREA BOUNDARY
 COMM

COMM	EASTING	NORTHING
COMM		
COMM	383700	7681300
COMM	387500	7681300
COMM	387500	7679500
COMM	392800	7679500
COMM	392800	7675500
COMM	391000	7675500
COMM	391000	7671800
COMM	389400	7671800
COMM	389400	7670000
COMM	387700	7670000
COMM	387700	7664700
COMM	389500	7664700
COMM	389500	7662500
COMM	387800	7662500
COMM	387800	7653000
COMM	382600	7653000
COMM	382600	7647500
COMM	379600	7647500

COMM	379600	7638500	
COMM	375300	7638500	
COMM	375300	7653600	
COMM	376900	7653600	
COMM	376900	7662900	
COMM	382000	7662900	
COMM	382000	7674000	
COMM	383700	7674000	
COMM			
COMM	SURVEY EQUIPMENT		
COMM			
COMM	AIRCRAFT:		VH-FNV DIAMOND DA42
COMM			
COMM	SPECTROMETER:	256 Channel Exploranium	GR820
COMM	CRYSTAL VOLUME:		33.56 L
COMM	RECORDING INTERVAL:		1.0 s
COMM			
COMM	RADAR ALTIMETER:	Collins Alt-55	
COMM	RECORDING INTERVAL:		0.1 s
COMM			
COMM	NAVIGATION:	real-time differential	GPS
COMM	RECORDING INTERVAL:		1.0 s
COMM			
COMM	ACQUISITION SYSTEM:		Fugro DAS
COMM			
COMM	DATA PROCESSING		
COMM			
COMM	CO-ORDINATES		
COMM	PARALLAX CORRECTION APPLIED		-0.5 s
COMM			
COMM	RADAR ALTITUDE DATA		
COMM	PARALLAX CORRECTION APPLIED		0 s
COMM			
COMM	GPS ALTITUDE DATA		
COMM	PARALLAX CORRECTION APPLIED		-0.5 s
COMM			
COMM	RADIOMETRIC DATA		
COMM	NASVD FILTERING APPLIED TO 256 CHANNEL DATA		
COMM	WINDOW DATA EXTRACTED USING IAEA STANDARD WINDOWS		
COMM	PARALLAX CORRECTION APPLIED		0 s
COMM	COSMIC, AIRCRAFT AND RADON BACKGROUNDS REMOVED		
COMM	STRIPPING CORRECTIONS APPLIED		
COMM	HEIGHT CORRECTED TO:		45 m AGL
COMM	DATA HAVE BEEN TIE LINE LEVELLED		
COMM			
COMM	AIRCRAFT BACKGROUND COEFFICIENTS		
COMM	TOTAL COUNT		62.00
COMM	POTASSIUM		8.450
COMM	URANIUM		1.500
COMM	THORIUM		2.360
COMM	COSMIC COEFFICIENTS		
COMM	TOTAL COUNT		0.9150
COMM	POTASSIUM		0.0550
COMM	URANIUM		0.0435
COMM	THORIUM		0.0520
COMM	STRIPPING COEFFICIENTS		
COMM	ALPHA		0.2650
COMM	BETA		0.4082
COMM	GAMMA		0.7693
COMM	a		0.0595
COMM	b		0.0007
COMM	c		-0.0150
COMM	RADON STRIPPING COEFFICIENTS		
COMM	TOTAL COUNT		13.15386

COMM POTASSIUM 0.78264
 COMM THORIUM 0.06105
 COMM SPECTRAL RATIOS
 COMM RADON (C1) 2.0000
 COMM GROUND (C2) 0.4949
 COMM ALTITUDE COEFFICIENTS
 COMM TOTAL COUNT -0.0075
 COMM POTASSIUM -0.0100
 COMM URANIUM -0.0072
 COMM THORIUM -0.0077
 COMM SENSITIVITY COEFFICIENTS AT 45 m
 COMM TOTAL COUNT 32.4 (cps/(nGy/h))
 COMM POTASSIUM 126.2 (cps/%)
 COMM URANIUM 8.3 (cps/ppm)
 COMM THORIUM 7.2 (cps/ppm)

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 COMM -----
 COMM DISCLAIMER
 COMM -----

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COMM FIELD	UNITS	NULL	FORMAT
COMM Line Number		-99999	I7
COMM Flight Number		-99	I4
COMM Date (yyyymmdd)		-99999999	I9
COMM Fiducial Number	s	-9999.9	F8.1
COMM Time (local)	s	-9999.9	F8.1
COMM Easting	m	-99999.99	F10.2
COMM Northing	m	-999999.99	F11.2
COMM Longitude	deg	-999.99999999	F13.7
COMM Latitude	deg	-99.99999999	F12.7
COMM GPS Altitude	m	-999.99	F8.2
COMM Radar Altitude	m	-999.99	F8.2
COMM Uncorrected Total Count	cps	-9999.9	F8.1
COMM Uncorrected Potassium	cps	-999.9	F7.1
COMM Uncorrected Uranium	cps	-999.9	F7.1

COMM Uncorrected Thorium	cps	-999.9	F7.1
COMM Raw Cosmic	cps	-99	I4
COMM Final Total Count	cps	-9999.9	F8.1
COMM Final Potassium	cps	-999.9	F7.1
COMM Final Uranium	cps	-999.9	F7.1
COMM Final Thorium	cps	-999.9	F7.1

Description File for 1.0 sec Raw 256 Channel Radiometrics Data

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 COMM AREA NUMBER: 3
 COMM SURVEY COMPANY: Fugro Airborne Surveys
 COMM CLIENT: Mount Isa Mines Limited
 COMM SURVEY TYPE: Magnetic and Radiometric
 COMM AREA NAME: North Duchess
 COMM STATE: QLD
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 COMM SURVEY FLOWN: June 2012 - July 2012
 COMM LOCATED DATA CREATED: August 2012
 COMM
 COMM DATUM: AGD84
 COMM PROJECTION: AMG
 COMM ZONE: 54
 COMM
 COMM SURVEY SPECIFICATIONS
 COMM
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 COMM TRAVERSE LINE DIRECTION: 90 - 270 deg
 COMM TIE LINE SPACING: 500 m
 COMM TIE LINE DIRECTION: 0 - 180 deg
 COMM NOMINAL TERRAIN CLEARANCE: 45 m
 COMM FINAL LINE KILOMETRES (in the 1 Hz dataset): 7447
 COMM
 COMM LINE NUMBERING
 COMM
 COMM TRAVERSE LINE NUMBERS: 30001 - 30858
 COMM TIE LINE NUMBERS: 39001 - 39036
 COMM
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 COMM
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COMM	379600	7638500
COMM	375300	7638500

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COMM	RECORDING INTERVAL:		0.1 s
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COMM	NAVIGATION:	real-time differential	GPS
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COMM			
COMM	ACQUISITION SYSTEM:		Fugro DAS
COMM			
COMM	DATA PROCESSING		
COMM			
COMM	CO-ORDINATES		
COMM	PARALLAX CORRECTION APPLIED		-0.5 s
COMM			
COMM	RADAR ALTITUDE DATA		
COMM	PARALLAX CORRECTION APPLIED		0 s
COMM			
COMM	GPS ALTITUDE DATA		
COMM	PARALLAX CORRECTION APPLIED		-0.5 s
COMM			
COMM	BAROMETRIC DATA		
COMM	PARALLAX CORRECTION APPLIED		0 s
COMM			
COMM	TEMPERATURE DATA		
COMM	PARALLAX CORRECTION APPLIED		0 s
COMM			
COMM	RADIOMETRIC DATA		
COMM	NO PROCESSING APPLIED TO RAW 256 CHANNEL RADIOMETRIC DATA		
COMM			
COMM	AIRCRAFT BACKGROUND COEFFICIENTS		
COMM	TOTAL COUNT		62.00
COMM	POTASSIUM		8.450
COMM	URANIUM		1.500
COMM	THORIUM		2.360
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COMM Flight Number		-99	I4
COMM Date (yyyymmdd)		-9999999	I9
COMM Fiducial Number	s	-9999.9	F8.1
COMM Time (local)	s	-9999.9	F8.1
COMM Easting	m	-99999.99	F10.2
COMM Northing	m	-999999.99	F11.2
COMM Longitude	deg	-999.9999999	F13.7
COMM Latitude	deg	-99.9999999	F12.7
COMM GPS Altitude	m	-999.99	F8.2
COMM Radar Altitude	m	-999.99	F8.2
COMM Raw Cosmic	cps	-99	I4
COMM Barometric Pressure	hPa	-999.99	F8.2
COMM Temperature	deg C	-9.9	F5.1
COMM Livetime	s	-9.999	F7.3
COMM Raw 256 Channel Radiometrics counts		-999	256I5

APPENDIX IV – List Of All Supplied Data

Final Located Data

- 0.1 second magnetics and digital terrain data
- 1.0 second windowed radiometrics data
- 1.0 second raw 256 channel radiometric data

Final located data is in ASEG-GDFII format. Contents of each are shown in Appendix III.

Raw Gridded Data

Raw gridded data was produced in ERMapper format

- Total magnetic intensity (nT)
- Total Count (cps)
- Potassium (cps)
- Uranium (cps)
- Thorium (cps)
- Digital terrain model (m AHD)

Final Gridded Data

Final gridded data was produced in ERMapper format.

- Total magnetic intensity (nT)
- Total Count (cps)
- Potassium (cps)
- Uranium (cps)
- Thorium (cps)
- Digital terrain model (m AHD)

Additional Products

A logistics and processing report