Thomson Aviation
Geophysical Survey

Logistics Report

Project: Humpty Doo.

9063

Flown for

Acacia Minerals Ltd

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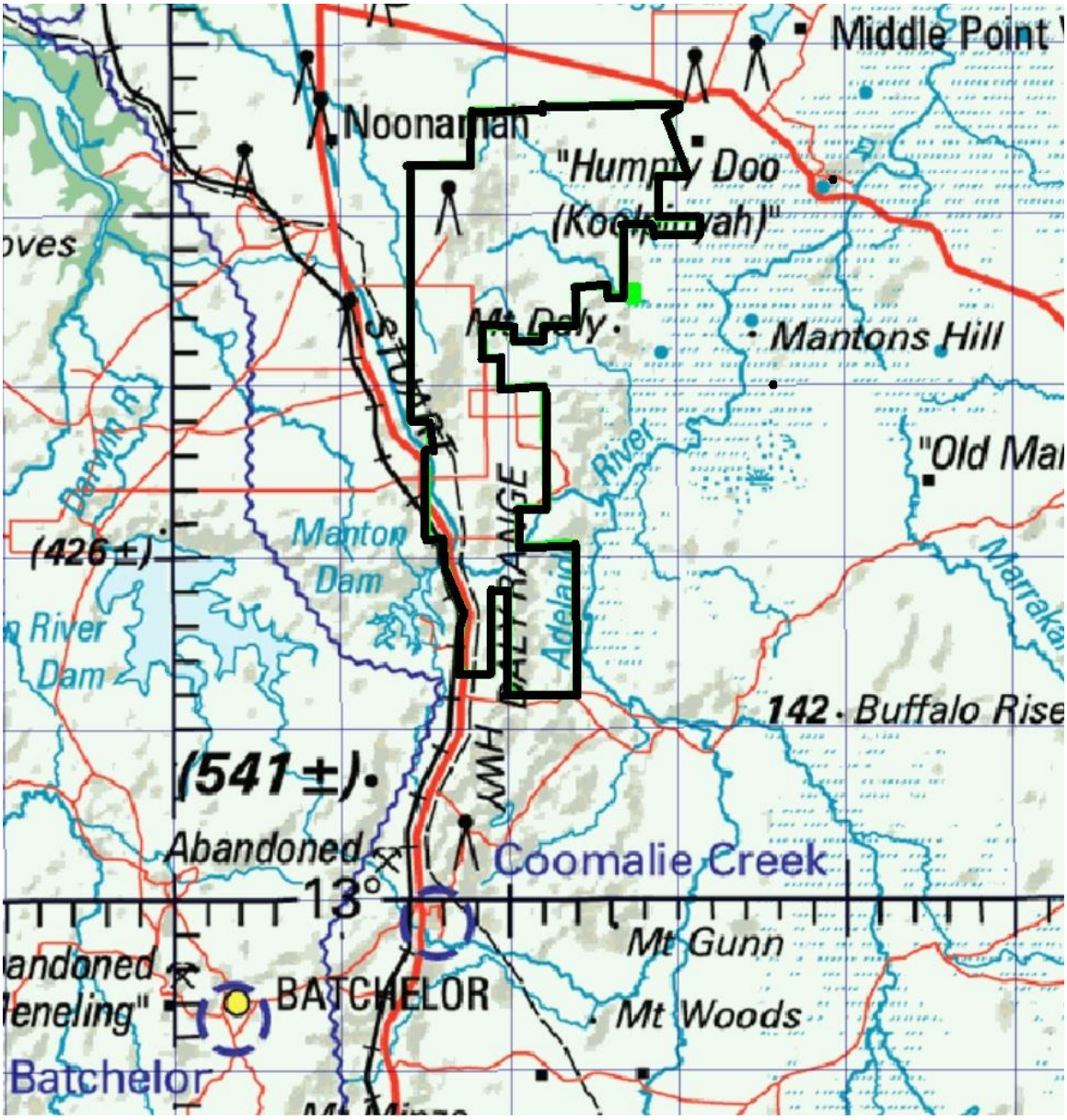
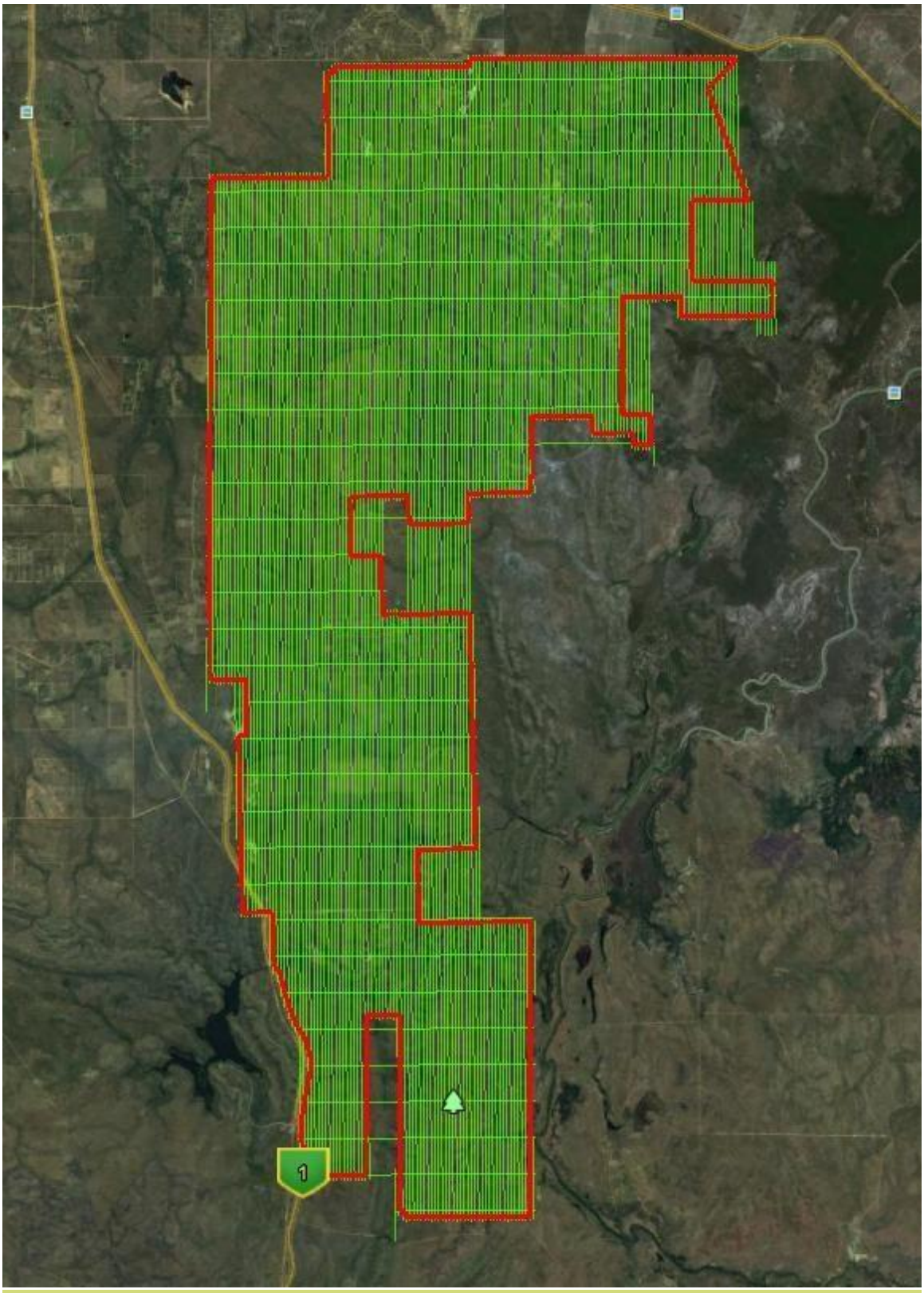
SPECIFICATIONS FOR AIRBORNE GEOPHYSICAL SURVEY

SURVEY AREA

Thomson Aviation carried out a Fixed Wing Geophysical Survey of a total of 3,101 line km near Humpty Doo, NT. For the survey our Air Tractor 502B – Data Boss aircraft was based out of the Batchelor Airfield. The survey was planned and delivered in GDA94 (Zone 52), a map of the survey areas, flight plan and specifications can be found below.

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FLYING SPECIFICATIONS

Flight line direction	North - South
Flight line spacing	100 m
Tie line direction	East - West
Tie line spacing	1000 m
Sensor mean terrain clearance	35 metres
Time base - for magnetics	0.05 sec. (< 3m)
Time base - for radiometrics	.5 sec
Total Line Kilometers	3,101 Km

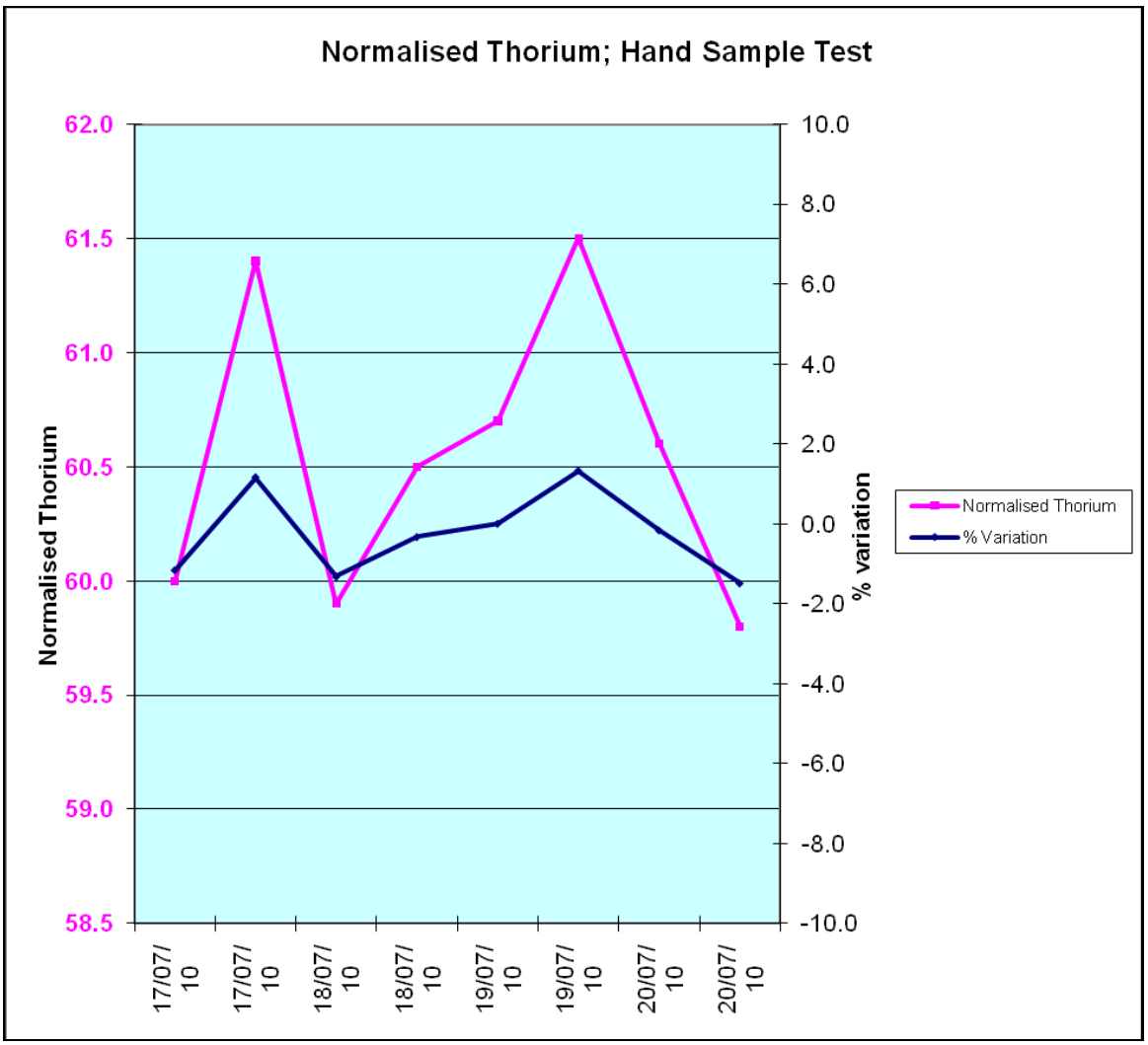
Boundary Lines Used
GDA94 Zone 52

#	Easting	Northing	#	Easting	Northing	#	Easting	Northing	#	Easting	Northing
1	730045	8593260	23	742234	8594849	45	735239	8589427	67	732441	8575726
2	730148	8601455	24	742218	8594026	46	737161	8589462	68	732497	8576096
3	733370	8601436	25	741734	8594028	47	737173	8589451	69	732617	8576639
4	733406	8602788	26	741734	8594365	48	737211	8587859	70	732660	8576834
5	733357	8602995	27	740612	8594366	49	737290	8583008	71	732689	8577044
6	733365	8604299	28	740615	8594842	50	735680	8582982	72	732685	8577264
7	733551	8604297	29	738954	8594850	51	735710	8580970	73	732648	8577481
8	733552	8604457	30	738948	8593186	52	738788	8580992	74	732512	8577880
9	737307	8604426	31	738892	8593186	53	738719	8572899	75	732262	8578279
10	737308	8604641	32	738888	8592765	54	735232	8572929	76	731994	8579052
11	744675	8604579	33	737146	8592734	55	735233	8573089	77	731910	8579427
12	743875	8603771	34	737160	8591929	56	735102	8573090	78	731842	8579679
13	744974	8600707	35	735530	8591900	57	735147	8578462	79	731784	8579678
14	743419	8600720	36	735512	8592706	58	734234	8578470	80	731684	8579944
15	743399	8598500	37	733909	8592678	59	734195	8574063	81	731682	8580087
16	745671	8598480	38	733933	8591383	60	733300	8574071	82	731662	8581306
17	745609	8598357	39	733908	8591384	61	732495	8574079	83	730838	8581295
18	745603	8597552	40	733914	8591068	62	732522	8574178	84	730786	8584531
19	743081	8597572	41	733935	8591047	63	732456	8574796	85	730761	8586139
20	743086	8598090	42	734740	8591061	64	732437	8574966	86	730991	8586143
21	741453	8598082	43	734768	8589450	65	732421	8575123	87	730973	8587683
22	741427	8594856	44	735239	8589457	66	732416	8575426	88	730003	8587692
									89	730045	8593260

CALIBRATION

The radiometric system was calibrated using Geoscience Australia's calibration range in Carnamah, WA, within 12 months of the commencement of this survey. The following calibrations were carried out before and after each days flying:

a) Verification of the gamma ray spectrometer system response using hand sample checks. System was exposed to a Thorium sample for a minimum period required to accumulate 10,000 counts in the Thorium window. All background corrected counts fell within a 10% envelope (+/- 5% from the mean over the survey period).



b) A Test Line was flown at the same height as the survey specified height to verify magnetometer, spectrometer and barometric altimeter baselines. The test line was flown over a repeatable line of five kilometers and was flown in either direction. The test line Thorium window counts fell within a 10% envelope (+/- 5% of the mean over the survey period).

Prior to the commencement of the survey, a parallax check was flown to verify the correct parallax values for all of the recorded parameters.

HEADING CHECKS.

A series of lines were flown to check the magnetic heading of the aircraft at the end of the survey

Two lines were flown North- South and two lines flown East- West

To review this data, intersections were calculated at of each of the cross over points, the lines did not cross over the same point, which is nearly impossible, and Diurnal was not collected on the day and was not removed. As the lines were only several minutes long and not separated by a large time difference then we can assume that the diurnal was near constant during the time period. The IGRF was removed with the appropriate filed and using the gps height as the height control

Lines 10010 was flown East, line 2020 flown North, line 20030 flown South and line 10040 flown West

From the analysis we computed the following results:

Line	Valid number	Heading crossings correction
10010	2	1.28
10040	2	-0.69
20020	2	1.75
20030	2	-0.73

RADAR ALTIMETER/BAROMETRIC ALTIMETER CHECK

VH- AVN

Radar Altimeter (metres)	Barometric Height (hPa)	GPS Height (metres)	H_{gps} - H_{radalt} (metres)
96.25	1375	95.35	-0.9
139.5	1364	140.25	0.75
188.36	1357	189.96	1.6
231.62	1352	234.2	2.58
276.45	1346	274.35	-2.1
326.79	1344	328.69	1.9
373.36	1337	369.89	-3.47
442.58	1333	440.36	-2.22
489.25	1326	487.36	-1.89
520.56	1322	518.65	-1.91

IN-FIELD VERIFICATION AND PROCESSING

Stringent real time data validity checks were employed. Thomson Aviation conducted a daily post-flight verification of all acquired data. The following products were generated on site by a mixture of ChrisDBF and Thomson Aviation proprietary software:

Flight path plots, to demonstrate quality of navigation
Magnetic stacked profiles, to demonstrate character of magnetic data
Statistical summary of line data
Magnetometer base station plots
Progressive image presentation of magnetic and topographic data
Plots of daily parking site of the aircraft to verify GPS position.

NAVIGATION AND POSITIONING

Navigation was by electronic means using a mobile Novatel OEMV-1 VBS receiver to provide flight guidance to the pilot as well as recording the flight path for subsequent processing. Differential GPS data was obtained in real time using static GPS data obtained from the "Omnistar" wide area GPS service. Position relative to the survey line was displayed to the pilot by a system proprietary to Thomson Aviation which has proven highly effective.

Under normal circumstances differential GPS is expected to yield positional accuracies in the order of 5 metres RMS or better.

DIURNAL MONITOR

The base station magnetometer was positioned at Batchelor, NT for the block. It recorded to a sensitivity of 0.1 nT every 5 seconds. Noise levels on the base station magnetometer did not exceed +/- 1.0 nT and the non-linear variations of the diurnal field did not exceed 10 nT in 5 minutes.

DAILY REPORTS OF AIRCRAFT VH-AVN

Line Kms flown: 3,101 line kms

Date	Block	Aircraft	Flight	Operator	Comments
16/07/10	Acacia	VH-AVN	01CB	Aaron McCarthy	Good Weather
17/07/10	Acacia	VH-AVN	2	Aaron McCarthy	Good Weather
17/07/10	Acacia	VH-AVN	3	Aaron McCarthy	Good Weather
18/07/10	Acacia	VH-AVN	4	Aaron McCarthy	Good Weather
19/07/10	Acacia	VH-AVN	5	Aaron McCarthy	Good Weather
20/07/10	Acacia	VH-AVN	6	Aaron McCarthy	Good Weather
21/07/10	Acacia	VH-AVN	7	Aaron McCarthy	Good Weather
22/07/10	Acacia	VH-AVN	8	Aaron McCarthy	Good Weather

AIRCRAFT AND SURVEY INSTRUMENTATION

AIRCRAFT

Our Air Tractor 502B – Data Boss, VH-AVN was used as the survey platform. This aircraft combines good maneuverability with the benefits of a magnetically clean base for minimal interference with the magnetic performance of the sensor.

Details:

Engine	Turbine PT6
Fuel Type	Jet A1
Fuel Burn	220lt per hour
Cruise Speed	115 Knots
Survey Speed	115 Knots
Stall Speed	65 Knots
Total Time Airframe	7,707 Hours

SURVEY INSTRUMENTATION

MAGNETOMETER AND COMPENSATOR

The Geometrics G822A Magnetometer is a highly sensitive unit incorporating an optically pumped sensor. The constant harmonic frequency from the sensor is proportional to the surrounding scalar magnetic field. This frequency is resolved by the Counter / Processor which provided the magnetic field to a nominal accuracy of 0.01nT at 20 times per second both in analog and digital forms.

The sensor and pre-amp are stinger mounted, attached to the rear of the aircraft.

A Pico Envirotec MMS-4 processor was used to correct, in real time, for the magnetic interference caused by the aircraft itself and the effects of it maneuvering in the earth's magnetic field. The signal from the magnetometer is preserved without aliasing or phase distortion. The raw uncompensated data was also recorded.

RADAR ALTIMETER

A King KR 495B Radar Altimeter was used, this unit is a high resolution, short pulse ratio altitude system designed for automatic continuous operation over a wide variation of terrain, target reflectivity, weather and aircraft altitude. The radar altimeter indicator provided a terrain clearance display from 0 – 650 metres (0 – 2,000 feet) above ground.

BAROMETRIC ALTIMETER

Barometric pressure was recorded using a Vaisela pressure transducer with a range of 600 to 1600 Hpa and a resolution of 0.04 Hpa (equivalent to 0.4 metres). The sensor was calibrated to the height given by the GPS.

DATA ACQUISITION SYSTEM

The GeOZ_DAS digital data acquisition system recorded all system parameters to removable Flash Cards and provided both pilot guidance and error reporting diagnostics for the pilot or operator. Data was transferred to a field computer for both verification and archiving prior to being shipped to the processing centre.

NAVIGATION EQUIPMENT

The GPS receiver was a Novatel OEMV-1VBS 12 channel parallel tracking receiver capable of providing sub-metre resolution at five times per second. The GPS receiver was integrated within the GeOZ-DAS acquisition unit.

BASE STATION MAGNETOMETER

Two Geometrics G-856 magnetometers with analog and digital recording were used as diurnal monitors and run continuously during the survey periods.

GAMMA RAY SPECROMETER SYSTEM

Two Radiations Solutions Inc. RSX-4 Gamma detector systems delivered high-resolution spectral information from 0.33 MeV to 3.0 MeV. In addition, the five primary regions of interest; Total Count, Potassium, Uranium, Thorium and Cosmic were provided. The Gamma Ray Spectrometer was interfaced to a NaI (Tl) crystal detector pack with a total volume of 33 litres (2048 cubic inches). The detector packs embody the latest techniques whereby the elimination of dead time in the counting process yields up to 30% more counts over competing systems.

Superior calibration facilities included the visual real time monitoring of full spectrum data and in flight monitoring of gain drift relative to the selected isotope window, to ensure that long-term data quality was maintained.

Enhancement of the spectrometer data was achieved by noise reduction techniques (NASVD or MNF), followed by dead time correction, energy calibration, cosmic/aircraft background correction and atmospheric radon removal all applied to the 256 channel data. Spectral stripping, height correction and conversion to radio-element concentrations were then applied prior to gridding and microlevelling.

Contact Information

Paul Rogerson, Director

Thomson Aviation
Geophysical Survey

Thomson Aviation Pty Limited

ABN 88 125 552 132

Main Office:	Hanger 14, Griffith Airport, 2680, Australia.
Phone:	02 6964 9487
Fax:	02 6962 2992
Mobile:	0427 681484 (Paul Rogerson)
Email:	paul@thomsonaviation.com.au
Postal address:	PO Box 1845 Griffith NSW, 2680