

Bass Strait
Airborne Magnetic Survey
for
Geoscience Australia
Acquisition and Processing Report

Prepared by: Paul Rogerson

Survey flown: from 15 December 2007 - to 16 September 2008

by

Thomson Aviation

GA JOB# 1180



CONTENTS

1. INTRODUCTION.....	3
2. SURVEY DETAILS	3
3. PROJECT PERSONNEL.....	6
4. ACQUISITION.....	7
5. PROCESSING REPORT	21

INTRODUCTION

This report provides details of the Bass Strait airborne magnetic survey carried out in Flinders Island, Tasmania. The survey area consists of 69519 line kilometres flown in one block over 100 flights. The survey was flown for the Commonwealth of Australia through Geoscience Australia (GA), and was undertaken by Thomson Aviation.

SURVEY DETAILS

Project Identification

Area Name: Bass Strait
Contractor: Thomson Aviation
Geoscience Job No.: 1180

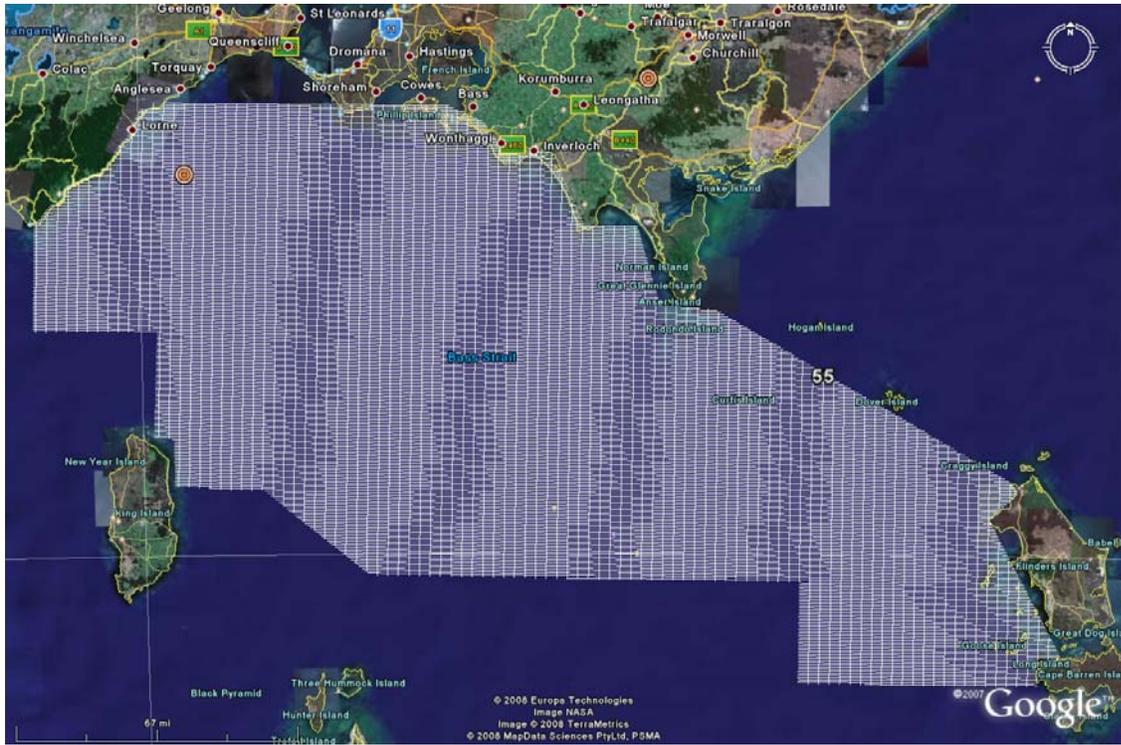
Survey Location

The survey location is shown in Figure 1.

Survey boundary co-ordinates for 800 m line spacing in GDA94 MGA Zone 55

	Easting	Northing		Easting	Northing		Easting	Northing
1	356119.0	5739100.7	17	208719.7	5700628.9	33	493213.3	5524022.1
2	241329.2	5739100.3	18	206623.9	5700390.8	34	583138.4	5523564.2
3	237125.8	5730422.7	19	203850.0	5696879.8	35	583249.1	5533554.2
4	237973.0	5728699.3	20	201996.2	5694380.5	36	591744.1	5533455.3
5	232501.0	5723615.0	21	200050.9	5693172.3	37	563276.9	5585299.5
6	230225.0	5719054.1	22	200050.5	5653265.9	38	563286.1	5586409.3
7	229970.3	5718153.4	23	248079.8	5654401.0	39	573644.9	5596306.5
8	227507.6	5715615.6	24	247500.3	5614237.3	40	574501.2	5596298.2
9	227594.7	5714791.4	25	255221.8	5613376.3	41	571106.7	5599660.4
10	225475.7	5713845.6	26	255786.1	5595614.8	42	457683.7	5663624.2
11	225466.4	5712566.0	27	271245.4	5594980.2	43	436948.1	5664594.5
12	223320.5	5712305.0	28	286699.8	5594314.5	44	428037.3	5694483.3
13	211740.1	5706780.4	29	289300.4	5594875.5	45	408095.5	5694276.7
14	210943.0	5705011.7	30	330252.2	5563196.0	46	395592.7	5721869.4
15	211743.5	5704378.6	31	333664.5	5563271.5	47	376433.4	5722705.7
16	210669.3	5702159.6	32	493178.2	5562870.3	48	369272.2	5733201.8

Figure 1 Bass Strait



Specifications and Tolerances

Project Number	8005
Approx. line kilometres (including ties)	69519km
Traverse direction	090°-270°
Traverse spacing	800 m
Traverse line numbers	10010 – 12730
Tie-line direction	000°-180°
Tie-line spacing	4,000 m
Tie line numbers	190010 – 191000
Nominal Terrain Clearance	90 m

Sample Intervals:

Magnetics (aircraft)	10 Hz (approx. 7.0 m)
GPS positions	1 Hz
Radar altimeter	10 Hz
Temperature & pressure	1 Hz
Magnetics (base stations)	2 s

Contracted tolerances:

Flight or tie lines	must not exceed 20 m off course for 1 km or more
Position accuracy	5 m horizontal; 10 m height
Radar altimeter accuracy	0.3 m
Temperature accuracy	1°C
Pressure accuracy	0.1%

Magnetic base stations:

Noise envelope	0.1 nT
Variation	5 nT in 5 minutes and less than 1 nT from any chord 1 minute long across the diurnal record

Aircraft magnetometer:

Non-geological noise envelope	0.1 nT
Variation with heading	+/- 1 nT
Total noise on unfiltered profiles	0.2 nT

Terrain clearance envelope	90 - 120 m
----------------------------	------------



PROJECT PERSONNEL

PROJECT SUPERVISION:- PAUL ROGERSON: 02 6968 1484 HOME
0427 681 484 MOBILE
ED DOWLING: 0427 649 487 MOBILE

SURVEY PILOTS:- Adam King 0417949896
Ruben Martin 0427534872
John Herrman 0427 606 858
Chris Holden 0408 914507
Rod Landini 0428 402 502
Lindsey Bartell 0428 135 737
Kevin Patchett 0427 403 055

John Zampieri (02) 6962-5097

SURVEY OPERATORS Sat Phone: 0147 143 143
VH-AQS Operator 0408 470 404
Thane Pringle: 0418 681 568
Chris Dickson: 427 143 083
Rod Martin 0400 547 537
Aaron McCarthy 0432 293 415

TECHNICIAN/ENGINEER **GEOZ PTY LTD:** 08 9250 2530 HOME
ZOLAN BELDI: 0417 215 773 Mobile

DATA PROCESSING:- MARK BAIGENT 08) 9397-1691



ACQUISITION

Aircraft and Equipment

VH-AQS

Aircraft Model	CESSNA -210
Aircraft Registration	VH-AQS
Aircraft Magnetometer	Geometrics 823 Caesium vapour
Magnetic Compensator	Pico
Base station magnetometer	1 x Geometrics 823 Caesium vapour 1 x Geometrics 856 Mag
Altimeter	King KR405B

VH-IDM

Aircraft Model	CESSNA -210
Aircraft Registration	VH-IDM
Aircraft Magnetometer	Geometrics 823 Caesium vapour
Magnetic Compensator	Pico
Base station magnetometer	2 x Geometrics 856 Mag
Altimeter	King KR405B



GPS RECIEVER

The GPS receiver is an NovAtel OEMV-1VBS 12 channel parallel tracking receiver capable of providing sub-metre resolution at five times per second. The GPS receiver is integrated within the GeOZ_DAS acquisition unit.

BASE STATION MAGNETOMETER

One Geometrics 823 and two Geometrics 856 base station 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. These data were displayed and recorded on a laptop computer. The base stations were run continuously throughout the survey flying period with a sensitivity of 0.1 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. Below is a summary of base station locations.

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 provides the magnetic field to a nominal accuracy of 0.01nT at 20 times per second both in analogue and digital forms.

The sensor and pre-amp will be mounted in a "stinger" which will be attached to the aircraft.

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

RADAR ALTIMETER

A King KR405B Radar Altimeter or similar type system being a high resolution, short pulse radio altitude system designed for automatic continuous operation over a wide variation of terrain, target reflectivity, weather and aircraft altitude. The radar altimeter indicator provides a terrain clearance display from 0 - 650 metres (0 - 2,000 feet) above ground.

BAROMETRIC ALTIMETER

Barometric pressure is recorded using a Vaisala pressure transducer with a range of 600 to 1600 Hpa and a resolution of 0.04 Hpa (equivalent to 0.4 metres).

The sensor is calibrated to the height given by the GPS.

DATA ACQUISITION SYSTEM

The GeOZ_DAS digital data acquisition system records all system parameters to removable "Flash Cards" and provides both pilot guidance and error reporting diagnostics for the pilot or operator.

Data are transferred to a field computer for both verification and archiving prior to being shipped to the processing centre.

Survey Operations

A copy of the daily operational reports can be found below.

Reports For Bass Strait Survey .28TH Jan – 10TH MaRCH 2008

Date	Flight Number	Km flown	Aircraft	Comments
28th Jan	01, 02	931	AQS	Flight 1 was a comp box
29th Jan	03, 04, 05	1390	AQS	Flight 3 was a comp box
30th Jan	06, 07	1618	AQS	Good weather
31st Jan	08, 09	1982	AQS	Good weather
1st Feb	10, 11	1968	AQS	Good weather
2nd Feb	12, 13	2067	AQS	Good weather
3rd Feb	14, 15	2054	AQS	Oil tanker was passed on line 19860
4th Feb	16, 17	1695	AQS	
5th Feb		0	AQS	100 hourly Maintenance
6th Feb	18	537	AQS	Bad weather 1/2 day standby
7th Feb	19, 20	1512	AQS	
8th Feb	21, 22	1538	AQS	
9th Feb	23, 24	1499	AQS	Bad weather near King Island
10th feb	25, 26	1919	AQS	
11th Feb	27, 28	1292	AQS	
12th Feb	29, 30, 31	1915	AQS	
13th Feb	2, 3, 4	280	IDM	Comp Box and calcs
13th Feb	32, 33	1799	AQS	
14th Feb	5, 6	1570	IDM	
14th Feb	35, 36	1567	AQS	
15th Feb	7, 8, 9	1658	IDM	
15th Feb	21, 22	1538	AQS	
16th Feb	10, 11	2080	IDM	
16th Feb	39, 40	1486	AQS	
17th feb	12, 13	1856	IDM	
17th feb	41, 42	1161	AQS	

18th Feb	15, 16	1839	IDM	
18th Feb		0	AQS	100 Hourly Maintenance
19th Feb	17, 18	1349	IDM	
19th Feb		0	AQS	Stand By Due Weather
20th Feb	19	0	IDM	Stand By Due Weather
20th Feb	50, 51	1166	AQS	Rain Periods, conditions rough
21th Feb		0	IDM	Stand By Due Weather
21th Feb	52, 53	1402	AQS	
22th Feb	20	436	IDM	Afternoon FL cancelled due low cloud
22th Feb	54, 55	1109	AQS	
23th Feb	21	931	IDM	Afternoon FL only
23th Feb	59	525	AQS	Low Cloud, Afternoon FI cancelled
24th feb	22, 23	1874	IDM	Good Visibility
24th feb	60, 61	1060	AQS	Good Visibility
25th Feb	24,25	1702.99	IDM	
25th Feb	62,63	1092.76	AQS	
26th Feb	26,27	1896.86	IDM	
26th Feb	64,65	1517.02	AQS	
27th Feb	28	954.61	IDM	No Afternoon flt. IDM in 100hrly
27th Feb	66,67	1565.19	AQS	
28th Feb			IDM	IDM flown to Griffith
28th Feb	68,69	1414.17	AQS	Afternoon flt frm Flinders - Leongatha
29th Feb			IDM	IDM in Griffith
29th Feb	70,71	1367.29	AQS	
1st March			IDM	IDM in Griffith
1st March	72,73	1643.58	AQS	
2nd March			IDM	IDM in Griffith
2nd March	74,75	1490.92	AQS	
3rd March	76	355.2	AQS	
3rd March			AQS	FF to La Trobe - 100hrly
4th March			AQS	



6th March			AQS	Power failure on board equip
6th MArch			AQS	FF to La Trobe – Maintenance check
7th March	78	962.24	AQS	
7th March	79	1228.11	AQS	
8th March	80	779.3	AQS	
8th March	81	504.09	AQS	
9th March	82	1067.38	AQS	
9th March	83	997.48	AQS	
10th March	84	533	AQS	

Parameters

All acquired data were recorded digitally.

The following parameters are recorded at 20 Hz:

<i>Parameter</i>	<i>Resolution</i>	<i>units</i>
Uncompensated Total Magnetic Intensity (TMI)	0.001	nT
Fluxgates X, Y & Z	0.01	nT
Radar Altimeter	1	mV

The following parameters are recorded at 1 Hz:

<i>Parameter</i>	<i>Resolution</i>	<i>units</i>
Fiducial	1.0	
GPS Time	1	s
Latitude	0.0000001	°
Longitude	0.0000001	°
GPS height	0.01	m
Outside air temperature	1	mV
Barometric pressure	1	mV
Number of satellites	1.0	
Position dilution of precision (PDOP)	0.1	
HDOP	0.1	

Calibrations and System Checks

Magnetic Compensation

Magnetic compensation sequences were flown before acquisition commenced and after routine maintenance was performed, as required. The resulting coefficients were used for post flight magnetic compensation:

Aircraft	Date	Flight	StDev (UnC)	StDev (Cmp)	IR
VH-AQS	28/01/08	1	0.312	0.056	5.55
	19/02/08	47	0.229	0.044	5.26
VH-IDM	29/01/08	203	0.312	0.056	5,55
	17/02/08	214	0.260	0.047	5.50

TABLE 3 – MAGNETIC COMPENSATION STATISTICS

UNC: Standard deviation of uncompensated TMI (nT)

CMP: Standard deviation of compensated TMI (nT)

IR: Improvement ratio (UNC/CMP)

Radar Altimeter Stacks

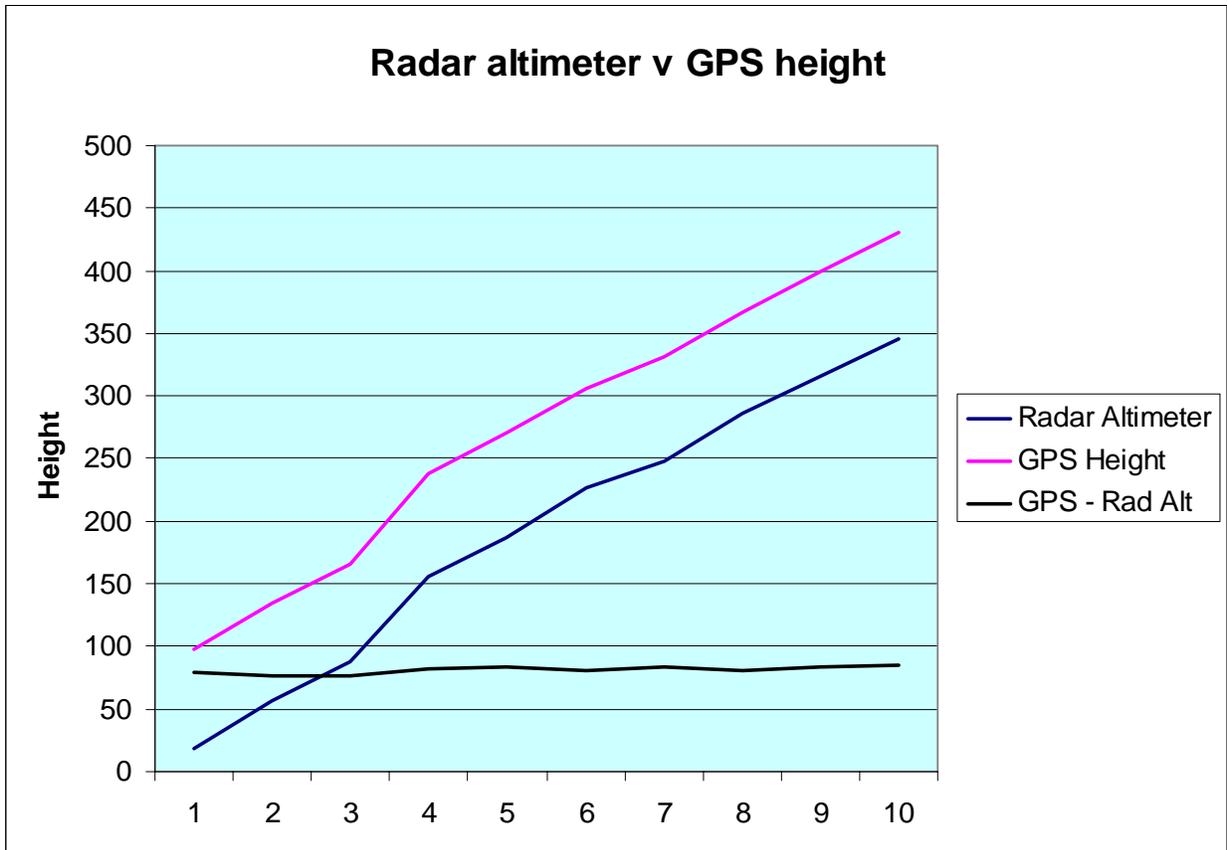
Prior to commencement of acquisition, radar altimeter stacks were flown as accurately as possible with reference to the radar altimeter indicator, which was set at a pre-determined height.



**RADAR ALTIMETER/BAROMETRIC ALTIMETER CHECK
VH-AQS**

Flown 11th March, 2008

Radar Altimeter (metres)	Barometric Height (hPa)	GPS Height (metres)	$H_{GPS} - H_{radalt}$ (metres)
18.53	1040.66	97.55	79.02
57.23	1028.5	134.13	76.9
88.01	1017.39	165.12	77.11
155.38	991.89	239.25	82.7
187.04	992.01	238.08	83.1
225.97	981.41	270.14	80.41
248.56	966.85	306.38	83.29
285.73	958.04	331.85	80.97
315.87	947.13	366.7	84
345.15	934.55	399.87	84.77
18.53	920.37	429.92	79.02



VH-IDM

Flown 5th January, 2007

Radar Altimeter (metres)	Barometric Height (hPa)	GPS Height (metres)	$H_{\text{gps}} - H_{\text{radalt}}$ (metres)
18.53	1040.66	97.55	79.02
57.23	1028.5	134.13	76.9
88.01	1017.39	165.12	77.11
155.38	992.01	238.08	82.7
187.04	981.41	270.14	83.1
225.97	966.85	306.38	80.41
248.56	958.04	331.85	83.29
285.73	947.13	366.7	80.97
315.87	934.55	399.87	84
345.15	920.37	429.92	84.77

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, Diurnal was not collected on the day and was not removed. As the lines were on several minutes long and not separated by a large time difference then we can assume that the diurnal was near constant. 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 number	Valid crossings	Heading correction
-------------	-----------------	--------------------

10010	2	0.45
10040	2	-0.64
20020	2	0.79
20030	2	-0.59

The full listing results are shown on the next page:

The listing gives the flight line, the crossing line, the fiducial at the intersection point, the magnetic value, the raw difference, the altitude and the intersections as well as the computed magnetic gradient.



Fiducial number	C r o s s i n g l i n e		Raw	Tied	Difference		Value	F l i g h t		L i n e	I n t e r s e c t i o n		
	Alt value	Corr Gradient			Gradient	Corr		Alt Number	Fiducial			No	
926.	420.	18.4	0.4	-0.023	0.3	0.0	0.027	0.8	18.1	419.	20020	278.	1
2155.	427.	19.2	-0.6	0.014	1.4	0.0	0.029	0.8	17.8	420.	20020	275.	2
925.	421.	18.4	0.4	-0.021	-1.0	0.0	-0.025	-0.6	19.5	425.	20030	1558.	3
2155.	428.	19.2	-0.6	0.014	0.0	0.0	-0.025	-0.6	19.2	425.	20030	1561.	4
278.	419.	18.1	0.8	0.027	0.3	0.0	-0.023	0.4	18.4	420.	10010	926.	1
1558.	425.	19.5	-0.6	-0.025	-1.0	0.0	-0.021	0.4	18.4	421.	10010	925.	3
275.	420.	17.8	0.8	0.029	1.4	0.0	0.014	-0.6	19.2	427.	10040	2155.	2
1561.	425.	19.2	-0.6	-0.025	0.0	0.0	0.014	-0.6	19.2	428.	10040	2155.	4

NAVIGATION REPEATABILITY CHECKS

AQS	Morning GPS		Afternoon GPS		Min. Difference Accepted (m)	
	Date	East	North	East	North	Difference (m)
2/8/2008	585596.6	5561641.0	585596.3	5561641.2	0.4	Pass
2/9/2008	585594.8	5561641.0	585595.5	5561640.5	0.9	Pass
2/10/2008	585595.7	5561639.7	585596.5	5561640.6	1.2	Pass
2/11/2008	585597.0	5561640.5	585597.3	5561641.2	0.8	Pass
2/12/2008	585596.7	5561641.4	585597.0	5561641.6	0.4	Pass
2/13/2008	585596.8	5561641.8	585596.9	5561642.3	0.5	Pass
2/14/2008	585596.9	5561641.8	585596.6	5561642.1	0.4	Pass
2/15/2008	585596.2	5561642.1	585596.3	5561641.8	0.3	Pass
2/16/2008	585596.7	5561640.8	585596.6	5561641.8	1.0	Pass
2/17/2008	585596.8	5561641.6	585596.6	5561641.6	0.2	Pass
2/18/2008	585595.8	5561640.6	585596.0	5561640.9	0.4	Pass
2/19/2008	585596.5	5561641.4	585596.9	5561641.2	0.4	Pass
2/20/2008	585596.7	5561641.4	585596.6	5561641.6	0.2	Pass
2/21/2008	585596.5	5561641.0	585595.6	5561641.0	0.9	Pass
2/22/2008	585596.6	5561640.1	585596.2	5561640.3	0.4	Pass
2/23/2008	585596.0	5561640.8	585596.9	5561640.8	0.9	Pass
2/24/2008	585596.0	5561641.6	585596.3	5561640.5	1.1	Pass
2/25/2008	585596.3	5561639.5	585596.9	5561641.2	1.8	Pass
2/26/2008	585596.6	5561642	585596.8	5561641.6	0.4	Pass
2/27/2008	585596.3	5561641	585596.5	5561642	1.0	Pass
2/28/2008	585596.0	5561639.4	585596.7	5561641.2	1.9	Pass
2/29/2008	400587.9	5738794.1	400587.7	5738793.7	0.4	Pass
3/1/2008	400587.3	5738794.4	400586.3	5738793.7	1.2	Pass
3/2/2008	400588.3	5738793.5	400587.4	5738794.8	1.6	Pass
3/3/2008	400587.9	5738794.1	400587.2	5738793.8	0.8	Pass

IDM	Morning GPS		Afternoon GPS		Min. Difference Accepted (m)		
	Date	East	North	East	North	Difference (m)	Within Spec?
	14/01/08	400594.16	5738734.12	400594.62	5738733.83	0.5	Pass
	15/01/08	400593.54	5738735.36	400595.06	5738734.23	1.9	Pass
	16/01/08	400593.18	5738735.65	400594.05	5738735.79	0.9	Pass
	17/01/08	400594.09	5738735.13	400594.82	5738734.03	1.3	Pass
	18/01/08	400593.67	5738735.99	400593.19	5738734.84	1.2	Pass
	19/01/08	400594.76	5738735.73	400594.02	5738735.91	0.8	Pass
	22/01/08	400593.56	5738735.22	400593.82	5738734.72	0.6	Pass
	23/01/08	400594.82	5738735.83	400594.82	5738735.06	0.8	Pass
	24/01/08	400594.12	5738734.29	400594.79	5738734.77	0.8	Pass
	25/01/08	400593.02	5738735.52	400594.91	5738735.11	1.9	Pass
	26/01/08	400593.96	5738734.25	400593.21	5738734.82	0.9	Pass
	27/01/08	400594.55	5738734.73	400594.82	5738735.83	1.1	Pass

Processing Report

BAIGENT GEOSCIENCES



Geoscience Australia 1180 - Bass Strait Geophysical Survey Processing Report

April 2008

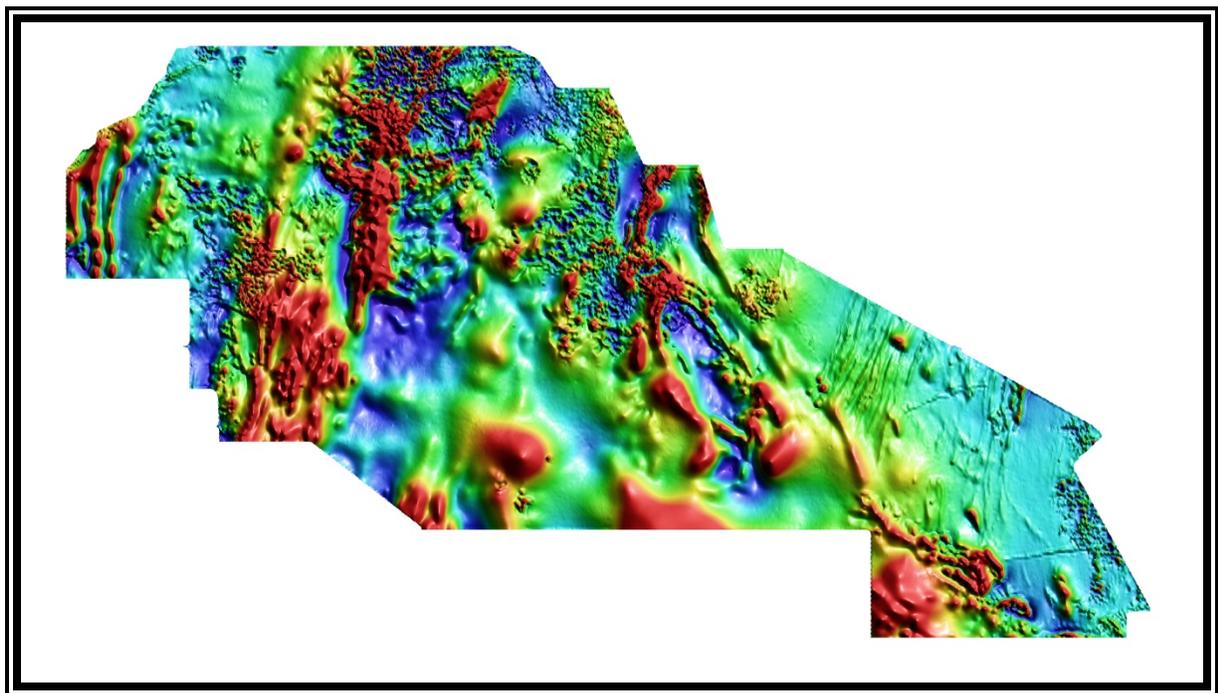




Table of Contents

Survey Specifications.....	23
Magnetic processing	24
Processing Flow.....	24
Compensation.....	24
Magnetic Model.....	25
Diurnal Base Value	25
Tie Line levelling Method	25
Least Squares Levelling	25
Polynomial Levelling.....	26
Micro-levelling Method	26
Deliverable Items	26
Raw Magnetic Located Data format.....	27
Final Magnetic Located Data Format.....	29
Magnetic Data Processing Flow Chart.....	31



SURVEY SPECIFICATIONS

The survey was conducted over the central part of Bass Strait.

The output survey coordinates are based on the Geocentric Datum of Australia 1994 (GDA94)

It has the following parameters:

Projection name:	Map Grid of Australia
Datum:	Geocentric Datum of Australia (GDA94)
Reference Frame:	ITRF92 (International Terrestrial Reference 1992)
Epoch:	1994.0
Ellipsoid:	GRS80
Semi-major axis:	6,378,137.0 metres
Inverse flattening:	298,257,222,101
False Northing:	10,000,000 m N
False Easting:	500,000 m E
Scale Factor:	0.9996

The data was projected to the MGA Zone 55 datum.



MAGNETIC PROCESSING

Processing Flow

The diurnal base station data was checked for spikes and steps, and suitably filtered prior to the removal of diurnal variations from the aircraft magnetic data.

The diurnal data was filtered with an 11 point moving average filter to reduce noise levels, followed by second difference filter was to identify and remove spikes of less than 0.05 nT.

The filtered diurnal measurements were subtracted from the diurnal base field and the residual corrections applied to the survey data by synchronising the diurnal data time and the aircraft survey time. The average diurnal base station value was added to the survey data.

An eighth difference filter was run on the raw magnetic survey data in order to identify any remaining spikes in the data, which were manually edited from the data.

The X and Y positioning of the data was then checked for spikes before applying the IGRF correction. Any spikes in the positions were manually edited.

The IGRF 2005 (updated to 2008.14) correction was calculated at each data point taking into account the height above sea level using the gps altitude.

This regional magnetic gradient was subtracted from the survey data points.

The data was then tie-line levelled and micro-levelled.

Compensation

The data was compensated post flight using a 16 term model based on the work done by C.D. Hardwick.

Magnetic Model

IGRF was removed using the gps altitude scaled to kilometres above sea level.

The magnetic model applied was as detailed below:

Model	IGRF 2005 updated to 2008.14
Declination	12.6556 degrees
Inclination	-70.0345 degrees
Field strength	60707.56 nT
Grid zone	55
Grid central meridian	147.00000 degrees
Input latitude	-39.38447 degrees
Input longitude	145.84447 degrees
Grid convergence	-0.73321 degrees
Grid magnetic angle	11.92235 degrees
Secular variation	0.01115 degrees

IGRF Magnetic Model

Diurnal Base Value

The average diurnal base value was : 61228.55 nT

Tie Line levelling Method

Least Squares Levelling

Tie line levelling was applied to the data by least squares minimisation, using a polynomial fit of order 0, of the differences in magnetic values at the crossover points of the survey traverse and tie line data.

The least squares tie line levelling process employs a two pass Gauss-Seidel iterative scheme. The essential steps in this process are:

In the first pass the tie lines were first adjusted to minimise, in the least squares sense, the crossover values with the traverse line values being held constant.

The second pass held the levelled tied line values constant, and minimised in the least squares sense, the crossover values with traverses.

The DC correction values to be applied to the traverse lines and tie lines were then applied to the magnetic data.

To reduce the effects of terrain induced variations the recorded magnetic field at the crossover points, points having a radar altimeter difference of 30 metres in a radius of 400 metres or a magnetic gradient of 5nT/metre on the traverse or tie lines were excluded from the tying process.

Polynomial Levelling

A polynomial least squares fit was applied to the line data subsequent to the least squares crossover minimization. A polynomial of order 3 was applied to the tie lines and order 5 was applied to the traverse lines.

This process reduced the remaining residual variation in crossover values.

Micro-levelling Method

Micro-levelling techniques were then selectively applied to the tie line levelled data to remove minor residual variations in profile intensity. Selective micro-levelling was applied in order to leave unaffected any data having no residual levelling artifacts. Selective micro-levelling proceeds using the following steps:

Areas of interest that required micro-levelling were identified through the use of image processing visualisation.

Polygons were used to define areas requiring micro-levelling.

“Pseudo-ties” were constructed from the gridded data by extracting traverses from the grid normal to the flight direction.

Line dependent artefacts were removed from the pseudo lines using a custom filter.

Crossover values were calculated between traverse lines and pseudo tie lines.

The traverse lines were adjusted in the pre-defined sections to minimise the crossover values.

This process was repeated in order to remove various wavelength line dependent artefacts from the pseudo-ties. The object of each micro-levelling iteration was to produce a smooth control surface to which the traverse lines are levelled. This control surface was provided through the use of “pseudo-ties”.

DELIVERABLE ITEMS

The deliverable items included all digital data. The located data conformed to ASEG-GDF format and the gridded data was supplied in ER Mapper format.

The description of the data is as follows:

Raw ASEG-GDF Located Data

1180_RawMagnetics.DAT

1180_RawMagnetics.DES

1180_RawMagnetics.DFN

Final ASEG-GDF Located Data

1180_Magnetics.DAT

1180_Magnetics.DES

1180_Magnetics.DFN



Final ER Mapper Gridded Data
1180_Magnetics.ers

Raw Magnetic Located Data format

The located raw magnetic data is described below.

```
COMM
COMM Baigent Geosciences Pty. Ltd.
COMM -----
COMM Date: 8 April 2008
COMM
COMM LOCATED DATA
COMM -----
COMM Area           : Bass Strait - Project Code 1180.
COMM Company Flown by : Thomson Geophysical Survey Pty. Ltd.
COMM Company Flown for: Geoscience Australia.
COMM Company Processed: Baigent Geosciences Pty. Ltd.
COMM
COMM AIRBORNE SURVEY EQUIPMENT:
COMM -----
COMM Aircraft           : Cessna 210 VH-AQS
COMM Magnetometer       : Geometrics G822 Cesium Vapour
COMM Magnetometer Resolution : 0.001 nT
COMM Magnetometer Compensation : Post Flight
COMM Magnetometer Sample Interval : 20 Hz, Approx 3.75 metres
COMM Data Acquisition    : GeoOZ Model 2007
COMM GPS Navigation System : Novatel 951R GPS Receiver
COMM
COMM
COMM
COMM AIRBORNE SURVEY SPECIFICATIONS
COMM
COMM Flight Line Direction : 090 - 270 degrees
COMM Flight Line Separation : 800 metres
COMM Tie Line Direction : 000 - 180 degrees
COMM Tie Line Separation : 4000 metres
COMM Terrain Clearance : 90 metres (MTC)
```

COMM
 COMM
 COMM Survey flown : January-March 2008
 COMM
 COMM
 COMM Flight path calculated from differentially
 COMM corrected GPS Data using a Novatel 951R GPS Receiver.
 COMM
 COMM
 COMM Grid notation refers to GDA/MGA Zone 55
 COMM
 COMM
 COMM MAGNETIC DATA CORRECTIONS:
 COMM -----
 COMM Diurnal variations removed
 COMM IGRF(2005) updated to 2008.14 removed
 COMM Average survey base station value added to datum
 COMM
 COMM

Field Name	Format	Units	Null Value
project Code	i4		
Flight number	i4		
Line number	i7		
fiducial	i9		-999999
Flight date	i9		
bearing	i4	DEGREES	-99
GDA94 longitude	f12.6	degrees	-999.00000
GDA94 latitude	f12.6	degrees	-99.000000
MGA(55) easting	f10.1	METRES	-99999.0
MGA(55) northing	f11.1	METRES	-99999.0
radar altimeter	f8.2	METRES	-999.00
barometric altimeter	f7.1	hPa	-999.0
temperature (deg C)	f5.1	DEG	-9.0
X flux	f11.3	nT	-99999.000
Y flux	f11.3	nT	-99999.000
Z flux	f11.3	nT	-99999.000
Raw magnetics	f10.3	nT	-9999.000
Compensated Magnetics	f10.3	nT	-9999.000
Diurnal	f10.3	nT	-9999.000



Final Magnetic Located Data Format

COMM
COMM Baigent Geosciences Pty. Ltd.
COMM -----
COMM Date: 8 April 2008
COMM
COMM LOCATED DATA
COMM -----
COMM Area : Bass Strait - Project Code 1180.
COMM Company Flown by : Thomson Geophysical Survey Pty. Ltd.
COMM Company Flown for: Geoscience Australia.
COMM Company Processed: Baigent Geosciences Pty. Ltd.
COMM
COMM AIRBORNE SURVEY EQUIPMENT:
COMM -----
COMM
COMM Aircraft : Cessna 210 VH-AQS
COMM Magnetometer : Geometrics G822 Cesium Vapour
COMM Magnetometer Resolution : 0.001 nT
COMM Magnetometer Compensation : Post Flight
COMM Magnetometer Sample Interval : 20 Hz, Approx 3.75 metres
COMM Data Acquisition : GeoOZ Model 2007
COMM GPS Navigation System : Novatel 951R GPS Receiver
COMM
COMM
COMM
COMM
COMM AIRBORNE SURVEY SPECIFICATIONS
COMM
COMM Flight Line Direction : 090 - 270 degrees
COMM Flight Line Separation : 800 metres
COMM Tie Line Direction : 000 - 180 degrees
COMM Tie Line Separation : 4000 metres
COMM Terrain Clearance : 90 metres (MTC)
COMM
COMM
COMM Survey flown : January-March 2008
COMM
COMM
COMM Flight path calculated from differentially
COMM corrected GPS Data using a Novatel 951R GPS Receiver.



```

COMM
COMM
COMM Grid notation refers to GDA/MGA Zone 55
COMM
COMM
COMM MAGNETIC DATA CORRECTIONS:
COMM -----
COMM Diurnal variations removed
COMM IGRF(2005) updated to 2008.1 removed
COMM Average survey base station value added to datum
COMM
COMM
COMM Field Name           Format           Units           Null Value
COMM
COMM project Code         i4
COMM Flight number        i4
COMM Line number          i7
COMM fiducial              i9              -999999
COMM Flight date          i9
COMM bearing              i4              DEGREES         -99
COMM GDA94 longitude       f12.6           degrees         -999.00000
COMM GDA94 latitude        f12.6           degrees         -99.000000
COMM MGA(55) easting       f10.1           METRES          -99999.0
COMM MGA(55) northing      f11.1           METRES          -99999.0
COMM radar altimeter       f8.2            METRES          -999.00
COMM barometric altimeter  f7.1            hPa             -999.0
COMM temperature (deg C)   f5.1            DEG             -9.0
COMM Tieline leveled Magnetics f10.3           nT              -9999.000
COMM Microleveled Magnetics f10.3           nT              -9999.000
COMM

```

MAGNETIC DATA PROCESSING FLOW CHART

