

LOGISTICS REPORT

AIRBORNE GEOPHYSICAL SURVEY  
AYERS ROCK AREA NORTHERN TERRITORY

FOR

DEPARTMENT OF MINES AND ENERGY

BY

AUSTIREX INTERNATIONAL LIMITED

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1. SURVEY DETAILS

1.1 Areas

1.1.1 AYERS ROCK

Location Longitude 130 degrees 30 minutes to 131 degrees 10 minutes east, latitude 25 degrees 00 minutes to 26 degrees 00 minutes south within the Mt Olga (5047), Allana (5046) and western third of Ayers rock (5147) 1:100,000 map sheets.

Flight line direction	000 - 180 degrees
Flight line spacing	500 metres
Tie line direction	090 - 270 degrees
Tie line spacing	5000 metres
Mean terrain clearance	100 metres
Line distance	15,677 kilometres

1.2 Photography and Navigation

Navigation was visual with Doppler tracking from pre-planned flight lines on NT and NATMAP 1983-1985 aerial photography. The photo enlargements were 1:25,000 scale. Horizontal photogrammetric control were supplied by Peter Livings and Associates.

1.3 Flight Path Recovery

Flight path recovery was carried out using visual image recognition from tracking films on a duplicate set of photographs provided for navigation.

The average distance between recovered points was no greater than 4.5 kilometres along traverse lines and tie lines where sufficient photographic detail was present.

2. LOGISTICS AND OPERATIONAL STATISTICS

2.1 Operating Base

The operating base was Yulara, Northern Territory

2.2 Survey Field Crew

Pilots	I. Doncaster and N. Fuller
Navigator	P. McHugh
Data Technician	C. Barrett
Manager	K. Harrington

### 2.3 Aircraft

Survey aircraft    Aerocommander 500S  
Registration        VH-FGS

### 2.4 Flight Summary

Production flights    24  
Survey start            11 September 1988  
Survey finish          27 September 1988  
Duration                17 days

### 2.5 Climatic Conditions

Windy weather was recorded during the period 22-26/9/88. Clear weather was observed during the remaining of the survey period.

### 2.6 Geo-magnetic Conditions

The diurnal field was recorded as unstable on the 11,18/9/88. Data acquired during these periods were reflowed.

## 3. INSTRUMENT SPECIFICATIONS

### 3.1 Airborne Magnetometer

Type                    Scintrex, V2321 alkali vapour  
Resolution              0.01 nanoTeslas  
Operating range        17,000 - 95,000 nanoTeslas  
Mounting                Tail stinger  
Sampling rate           0.2 seconds

### 3.2 Ground Magnetometer

Type                    Geometrics G-856A  
Resolution              0.1 nanoTeslas  
Sampling rate          20 seconds  
Recorder                Hewlett Packard 85B computer  
Location                Sited at the rear of the Yulara Development complex.

### 3.3 Spectrometer

Channels                256  
Type                    Exploranium, GR-800D  
Sampling rate          0.8 seconds  
Crystal volume         33.56 litres (2048 cubic inches)

Spectral windows:

	Channel		Energy (MeV)	
	from	to	from	to
Total count	2	254	0.321	2.995
Potassium	101	120	1.368	1.579
Uranium	128	147	1.653	1.853
Thorium	198	236	2.393	2.805
Cosmic	255	255	2.995	6.000

3.4 Altimeter

Type                    Radar Sperry AA100  
Range                    0 - 610 metres  
Sampling rate            0.8 seconds

3.5 Tracking Camera

Type                    Scientific, Vinten MkII  
Format                  16mm, single frame  
Lens                     5.9mm

3.6 Acquisition System

3.6.1 Digital recording on magnetic tape

Flight number  
Line number  
Fiducial number  
Time  
Magnetic intensity  
Total count  
Potassium  
Uranium  
Thorium  
Cosmic  
Altitude

3.6.2 Analogue recording

Channel 1	Magnetic intensity	0 - 200 nanoTeslas
Channel 2	Magnetic intensity	0 - 2000 nanoTeslas
Channel 3	Altitude	0 - 1000 feet
Channel 5	Thorium	0 - 200 counts per second
Channel 6	Uranium	0 - 200 counts per second
Channel 7	Potassium	0 - 200 counts per second
Channel 8	Total count	0 - 2000 counts per second

#### 4. SYSTEM CALIBRATIONS AND CHECKS

##### 4.1 System Calibration

Magnetometer compensation differences:

	Heading	Roll	Pitch
North	-0.3	0.1	
South	+0.5	0.2	
East	+0.3		0.2
West	+0.7		0.1

System parallax calibration:

Magnetometer 1 fiducials

Spectrometer hand sample checks using Cs, U and Th sources were completed before and after each day's production flight. Digital and analogue data was recorded.

Resolution of the gamma ray spectrometer was checked from spectral plots using a Cs137 source. The average resolution of the crystal pack was better than 9 per cent full width half measurement of the photopeak at 0.662 MeV.

Test lines were flown prior to and after each day's production flight over a 2 kilometre length line in a constant direction at survey altitude. The line location was within AMG coordinates 680,000mE and 7,205,000mN. Photographic identification is referenced on photograph number 031, film NTC 842. Digital and analogue data was recorded. Refer to Appendix 1 for a statistical summary.

Spectrometer qualification tests were conducted on 10/9/88 at Townsville, Queensland. Refer to Appendix 1 for a statistical summary.

Altimeter calibrations were conducted on 15/9/88 by flying over the level airstrip at Yulara. Terrain clearances were at approximately 30,60,80,100,120,150,200, and 300 metres. Refer to Appendix 1 for a statistical summary.

##### 4.2 Data Acquisition Checks

The checks performed on the data acquisition system involved a read after write check on the tape.

On receipt of data from the field, statistics of each variable are computed, as well as each production line is profiled and the results checked for data integrity.

### 4.3 Radiometric Correction Coefficients

#### 4.3.1 Analogue Coefficients

The following stripping coefficients are applied to the data prior to presentation on the analogue:

Thorium/Uranium	0.3
Thorium/Potassium	0.5
Uranium/Potassium	0.7

#### 4.3.2 Digital Coefficients

The following coefficients are to be used for stripping the digital data:

Thorium/Uranium	alpha	0.251
Thorium/Potassium	beta	0.335
Uranium/Potassium	gamma	0.871
Uranium/Thorium	a	0.022

#### 4.3.3 Aircraft Background and Cosmic Correction

These coefficients were determined from high altitude flights. The aircraft background is to be removed before stripping.

	Aircraft Background	Cosmic Correction
Total Count	266.2	2.343
Potassium	19.6	0.118
Uranium	12.1	0.091
Thorium	5.5	0.117

#### 4.3.4 Altitude Attenuation

Total Count	.006168
Potassium	.007177
Uranium	.003728
Thorium	.008411

## 5. GEOPHYSICAL DATA

### 5.1 Processing

The field tapes are decoded and corrected for errors. All lines voided in the field are removed. The data is then automatically edited to remove any major spikes. Any errors not detected in the automatic edit are manually corrected.

On receipt of flight path recovery the photos with control are

digitized and transformed to grid coordinates. The flight path is then plotted and checked for any errors which are then corrected.

Diurnal values are read off cassettes and edited to remove high frequency noise. Profiles of diurnal are plotted and any errors remaining are corrected. The diurnal is then interpolated to produce a diurnal value for every fiducial and removed from the magnetic data along with the IGRF value. The data is corrected for system parallex and a new set of coordinates are computed. Tie line levelling is then applied, if necessary, to remove any linear variations between traverse lines. The data is then gridded and contoured.

## 5.2 Line Numbering Series

Pre calibration	5010 - 5040
Post calibration	6010 - 6040
Pre low level test line	5080
Pre high level test line	5090
Post low level test line	6080
Post high level test line	6090
Traverse lines	1010 - 1241
Tie lines	7010 - 7230
Heading checks	8010 - 8039
Equipment tests	9000 - 9999

## 5.3 Processed Data

### 5.3.1 Flight Path Maps

1:100,000 scale

### 5.3.2 Contour Maps

1:100,000 Total magnetic intensity

### 5.3.3 Stacked Profiles

1:100,000 Total magnetic intensity and altitude terrain clearance.

### 5.3.4 Data Tapes



Three copies in ASCII code, ASEG format.

Located edited raw data on a line by line basis.

Located corrected data on a line by line basis.

Pre and post flight calibrations and test line data.

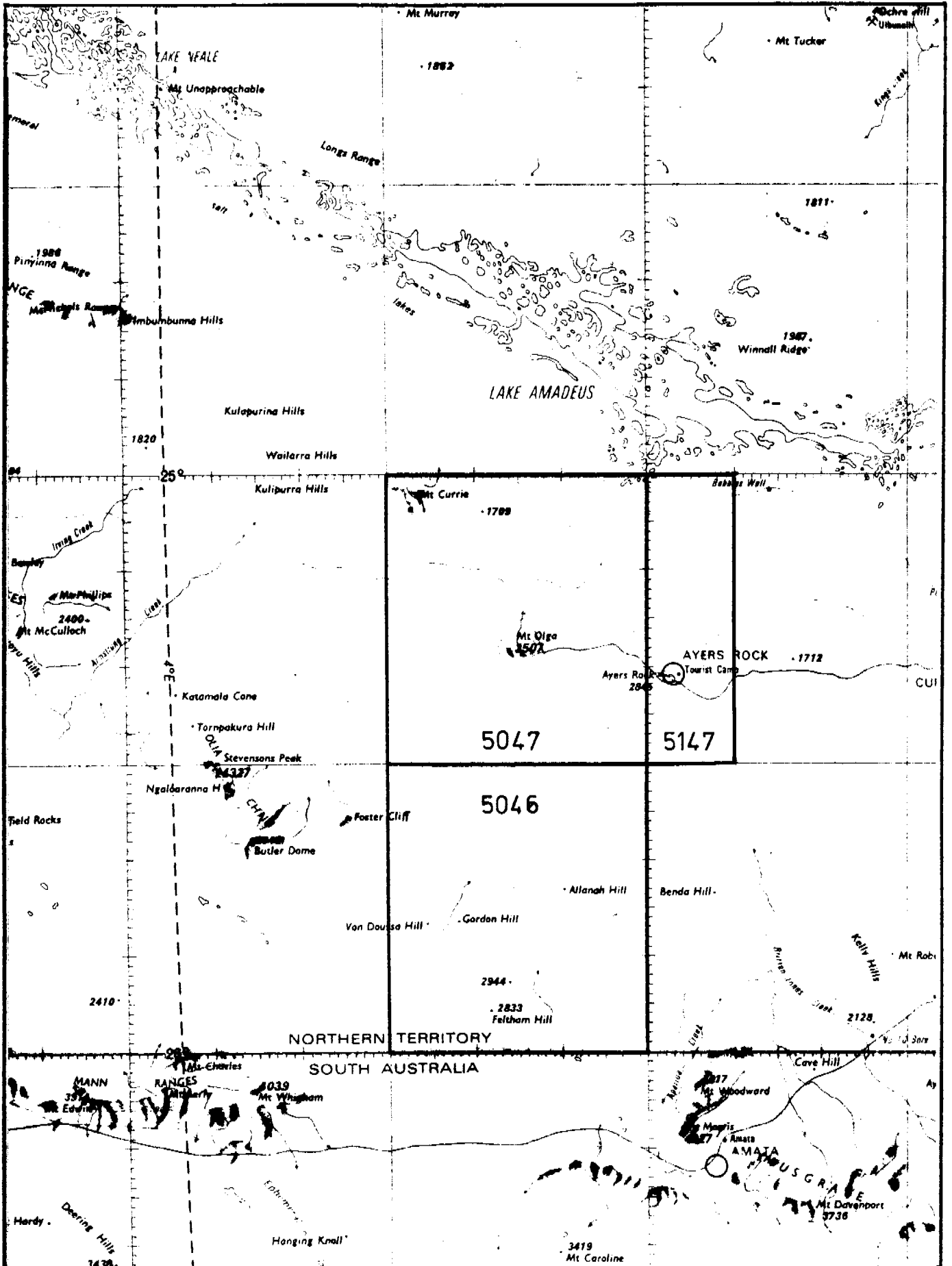
#### 5.3.5 Image Processing


Image processing of Total magnetic intensity data to one gray scale, one pseudo colour, one along line gradient, one cross line gradient and two sun angles. Presentation format on 35 mm slides.

#### 5.3.6 Multiplots

Raw data multiplot profiles of altitude, Doppler, magnetic intensity, total count, potassium, uranium, thorium, and cosmic channels.

6. SURVEY AREA LOCALITY PLAN



<b>AUSTIREX INTERNATIONAL LTD.</b>  <b>JOB No. 2073</b>	<b>LOCALITY</b>	MT. OLGA, N.T.	
	<b>AREA</b>	AYERS ROCK	
	<b>PLAN SHOWS</b>	SURVEY AREAS	
		<b>DATE</b>	9/88

7. CALIBRATION AND TEST LINE STATISTICS



Table with 7 columns: Parameter, Mean, Stand dev, Minimum, Maximum, Range, Und. Includes flight parameters (Line 18760) and observation statistics.

Table with 7 columns: Parameter, Mean, Stand dev, Minimum, Maximum, Range, Und. Includes flight parameters (Line 18710) and observation statistics.

Table with 7 columns: Parameter, Mean, Stand dev, Minimum, Maximum, Range, Und. Includes flight parameters (Line 18721) and observation statistics.

Table with 7 columns: Parameter, Mean, Stand dev, Minimum, Maximum, Range, Und. Includes flight parameters (Line 18730) and observation statistics.

Table with 7 columns: Parameter, Mean, Stand dev, Minimum, Maximum, Range, Und. Includes flight parameters (Line 18740) and observation statistics.

Table with 7 columns: Parameter, Mean, Stand dev, Minimum, Maximum, Range, Und. Includes flight parameters (Line 18750) and observation statistics.

Table with 7 columns: Parameter, Mean, Stand dev, Minimum, Maximum, Range, Und. Includes flight parameters (Line 18760) and observation statistics.

Table with 7 columns: Parameter, Mean, Stand dev, Minimum, Maximum, Range, Und. Includes flight parameters (Line 18770) and observation statistics.

Table with 7 columns: Parameter, Mean, Stand dev, Minimum, Maximum, Range, Und. Includes flight parameters (Line 18780) and observation statistics.

Table with 7 columns: Parameter, Mean, Stand dev, Minimum, Maximum, Range, Und. Includes flight parameters (Line 18791) and observation statistics.

Table with 7 columns: Parameter, Mean, Stand dev, Minimum, Maximum, Range, Und. Includes flight parameters (Line 18800) and observation statistics.

Table with 7 columns: Parameter, Mean, Stand dev, Minimum, Maximum, Range, Und. Includes flight parameters (Line 18810) and observation statistics.

Table with 7 columns: Parameter, Mean, Stand dev, Minimum, Maximum, Range, Und. Includes flight parameters (Line 18810) and observation statistics.

Line 18500  
Flight 2  
Direction -40  
Date 880914  
No. of observations 192

	Mean	Stand dev	Minimum	Maximum	Range	Und
2 fid	96.5	55.5698	1	192	191	0
3 time	79213.3008	0.2242	79213	79213.6016	0.6016	0
4 alt	29.4583	4.6309	21	38	17	144
5 mag	54949.8644	24.1486	54914.1094	55018.0313	103.9219	0
6 tot	3851.375	412.8685	2513	4906	2393	144
7 pot	268.1667	22.5117	208	327	119	144
8 ura	99.2083	16.0146	60	134	74	144
9 tho	161.3542	29.7339	82	227	145	144
10 cos	43.5833	7.0555	30	56	26	144
11 heading	127.3062	0.7063	126	128.8	2.8	144
12 dx	-35.7604	1.4534	-39.7	-33	6.7	144
13 dy	46.825	1.6556	43.8	50.3	6.5	144

Line 18510

Flight 2  
Direction -20  
Date 880914  
No. of observations 156

	Mean	Stand dev	Minimum	Maximum	Range	Und
2 fid	270.5	45.1774	193	348	155	0
3 time	79371.3008	0.2243	79371	79371.6016	0.6016	0
4 alt	71.7692	2.842	67	77	10	117
5 mag	54948.5575	20.7954	54917.9297	55008.1719	90.2422	0
6 tot	2550.1026	79.3977	2423	2737	314	117
7 pot	190.8718	17.0559	159	226	67	117
8 ura	66.5128	11.2574	43	90	47	117
9 tho	90.9231	11.7415	72	123	51	117
10 cos	45.5128	7.8132	24	58	34	117
11 heading	310.141	0.612	309.3	311.2	1.9	117
12 dx	39.9615	0.7936	38.5	41.7	3.2	117
13 dy	-55.2821	0.876	-57	-53.7	3.3	117

Line 18520  
Flight 2  
Direction -40  
Date 880914  
No. of observations 176

	Mean	Stand dev	Minimum	Maximum	Range	Und
2 fid	436.5	50.951	349	524	175	0
3 time	79530.3008	0.2242	79530	79530.6016	0.6016	0
4 alt	93.25	3.307	88	102	14	132
5 mag	54951.5934	23.3288	54919.5781	55007.4414	87.8633	0
6 tot	2229.7727	109.9888	1922	2599	677	132
7 pot	168.5909	15.5089	139	206	67	132
8 ura	61.6364	8.0351	44	76	32	132
9 tho	71.4318	11.0462	55	91	36	132
10 cos	45.2727	8.2359	27	64	37	132
11 heading	120.8773	0.6723	120	122.1	2.1	132
12 dx	-38.8455	0.6571	-40	-37.4	2.6	132
13 dy	53.7432	0.9884	51.7	56.2	4.5	132

Line 18530  
Flight 2  
Direction -20  
Date 880914  
No. of observations 168

	Mean	Stand dev	Minimum	Maximum	Range	Und
2 fid	608.5	48.6415	525	692	167	0
3 time	79683.3008	0.2242	79683	79683.6016	0.6016	0
4 alt	117.5952	2.2313	113	123	10	126
5 mag	54949.6916	19.9202	54921.4297	55000.8906	79.4609	0
6 tot	1924.7619	60.9913	1813	2041	228	126
7 pot	143.8333	12.9217	109	168	59	126
8 ura	55.119	7.8684	38	72	34	126
9 tho	60.5	9.4978	36	78	42	126

10 cos	45.119	8.3468	29	60	31	126
11 heading	310.9619	0.9066	309.7	312.6	2.9	126
12 dx	39.6476	0.8934	37.4	41.4	4	126
13 dy	-57.6167	1.0039	-60.4	-55.9	4.5	126

Line 18540  
Flight 2  
Direction -40  
Date 880914  
No. of observations 184

	Mean	Stand dev	Minimum	Maximum	Range	Und
2 fid	784.5	53.2604	693	876	183	0
3 time	79845.3008	0.2242	79845	79845.6016	0.6016	0
4 alt	139.9783	3.3565	133	146	13	138
5 mag	54950.4757	20.1861	54922.5508	54997.5781	75.0273	0
6 tot	1727.8913	72.6612	1539	1861	322	138
7 pot	128.4783	12.7797	102	158	56	138
8 ura	51.8913	7.5018	41	72	31	138
9 tho	52.9565	9.2663	36	82	46	138
10 cos	46.3478	7.7092	31	65	34	138
11 heading	118.5109	0.5267	117.2	119.4	2.2	138
12 dx	-38.0717	0.6953	-39.9	-36.8	3.1	138
13 dy	54.7696	0.8834	51.9	56.1	4.2	138

Line 18550  
Flight 2  
Direction -20  
Date 880914  
No. of observations 188

	Mean	Stand dev	Minimum	Maximum	Range	Und
2 fid	970.5	54.4151	877	1064	187	0
3 time	80026.3008	0.2242	80026	80026.6016	0.6016	0
4 alt	168.5745	4.4709	160	179	19	141
5 mag	54946.6387	14.4424	54924.5898	54985.9414	61.3516	0
6 tot	1473.4043	71.2582	1293	1610	317	141
7 pot	110.8511	11.4512	80	141	61	141
8 ura	48.234	8.2705	27	62	35	141
9 tho	43.4468	7.7902	26	60	34	141
10 cos	46.4255	8.4744	29	65	36	141
11 heading	311.8787	1.4781	309.7	314.6	4.9	141
12 dx	38.0702	1.1386	35.9	40.2	4.3	141
13 dy	-54.9447	1.3071	-57.7	-52.5	5.2	141

Line 18560  
Flight 2  
Direction -40  
Date 880914  
No. of observations 176

2 fid	1152.5	50.951	1065	1240	175	0
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3 time	80184.3008	0.2242	80184	80184.6016	0.6016	0
4 alt	213.9091	4.1642	207	223	16	132
5 mag	54946.9713	14.6265	54926.5117	54980.2617	53.75	0
6 tot	1260.2273	40.7658	1169	1366	197	132
7 pot	89.3409	8.9129	69	112	43	132
8 ura	38.0455	6.5449	27	56	29	132
9 tho	35.3182	7.526	25	55	30	132
10 cos	43.8636	8.3571	30	66	36	132
11 heading	120.4091	0.628	118.1	120.9	2.8	132
12 dx	-41.375	0.956	-43.2	-38.3	4.9	132
13 dy	58.9023	1.0355	56.5	60.9	4.4	132

Line 18570  
Flight 2  
Direction -20  
Date 880914  
No. of observations 208

	Mean	Stand dev	Minimum	Maximum	Range	Und
2 fid	1344.5	60.1886	1241	1448	207	0
3 time	80359.3008	0.2241	80359	80359.6016	0.6016	0
4 alt	311.9038	4.3623	303	320	17	156
5 mag	54943.6946	10.4827	54929.2109	54965.1914	35.9805	0
6 tot	950.1346	37.4805	846	1046	200	156
7 pot	62.4231	8.4653	41	80	39	156
8 ura	35.2885	6.9658	23	50	27	156
9 tho	23.8846	5.4545	12	39	27	156
10 cos	49.4231	6.8179	36	62	26	156
11 heading	310.1788	2.299	308.2	315.4	7.2	156
12 dx	35.0885	1.9662	32.6	40.5	7.9	156
13 dy	-51.8865	1.3962	-54.8	-47.7	7.1	156