

# **NORTHERN TERRITORY DEPARTMENT OF MINES & ENERGY**



## **Operations and Processing Report**

### **Airborne Geophysical Survey STURT Northern Territory**

13<sup>th</sup> August – 28<sup>th</sup> September 2001

**FLOWN AND PROCESSED BY KEVRON GEOPHYSICS FOR AND ON BEHALF OF THE  
NORTHERN TERRITORY DEPARTMENT OF MINES & ENERGY**

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## **INTRODUCTION**

The STURT airborne geophysical survey lies on 1:250,000 maps Larrimah (SE53-13) and Daly Waters (SE53-01). A total of 33,476 line kilometres of magnetic, radiometric and digital elevation data were acquired and processed. It is intended that the acquired geophysical data will constitute a major addition to the fundamental geological database of the Northern Territory and will stimulate mineral exploration activity with a view to possible discovery and development of economic mineral deposits.

The project was managed by the Northern Territory Department of Mines & Energy under the supervision of the Chief Geophysicist Mr. Richard Brecianini. The data acquisition, quality control, data processing and mapping were carried out by Kevron Geophysics Pty Ltd of 10 Compass Road, Jandakot Airport, Western Australia.

Katherine (Tindal) was used as the base of operations for the duration of the Sturt survey. Mobilisation of crew commenced on Tuesday 13th August 2001 and all crew members were on site on Wednesday 14th August 2001. Production commenced on Tuesday 13th August and was completed on 28th September 2001. A total of 41 sorties were flown.

Acquisition was undertaken using a twin engine Aero Commander 'Shrike' 500s aircraft, registration VH KAC. Periodic maintenance was performed by Kevron Aviation staff in both Kununurra and Alice Springs.

The fixed wing traverse lines were flown at an interline spacing of 400 m, with a tie line spacing of 4000m. Traverse lines were oriented north-south and tie lines east-west respectively. An average ground clearance of 80m was specified for both magnetic and radiometric sensors.

In field data verification and quality control was undertaken on a post flight basis on-site using a combination of Kevron proprietary software and ChrisDBF. QC products produced in the field included magnetometer 4<sup>th</sup> difference noise plots, flight path deviation plots of cross-track and elevation and radiometric summed spectra plots. Diurnal plots of the Cs vapour base station magnetometer were plotted and assessed to ensure contract compliance. Some reflights were necessary due to excessive magnetic variation. Back-ups of all field data were written to compact disk and an additional copy sent to Kevron's data processing center in Perth where further QC products were produced and data processing undertaken.



## 1. SURVEY AREAS AND PARAMETERS

### 1.1 SURVEY AREA

Total line kilometres for the Sturt Area was calculated to be 33,476 inclusive of tie lines and boundary overlap. A breakdown of the survey follows:

|                       | Direction | Spacing | Shortest | Longest  | Lines | Total         |
|-----------------------|-----------|---------|----------|----------|-------|---------------|
| <b>Traverse Lines</b> | 0 – 180°  | 400 m   | 6.6 km   | 120.6 km | 548   | 30,472        |
| <b>Tie Lines</b>      | 90 – 270° | 4000m   | 9.1 km   | 112.2 km | 52    | 3,004         |
| Total Line Kilometres |           |         |          |          |       | <b>33,476</b> |

The Sturt survey is located South of Katherine between Longitude 132° and 133° and Latitude 15° S and 16° 30' S. The area is characterised by sand dunes, low scrub and spinifex with very little topographical relief. Mean daily maximum temperatures from July to September is 30.5°. Mean daily minimum temperatures for the same period is 12.6°.

The following geographic coordinates based on the GDA94 datum and spheroid define the survey boundary.

|    | Latitude      | Longitude      | Easting | Northing |
|----|---------------|----------------|---------|----------|
| 1  | 15° 13' 54" S | 131° 59' 32" E | 176855  | 8313811  |
| 2  | 15° 18' 16" S | 132° 05' 46" E | 188130  | 8305917  |
| 3  | 15° 18' 20" S | 132° 11' 23" E | 198203  | 8305917  |
| 4  | 15° 20' 07" S | 132° 11' 21" E | 198181  | 8302641  |
| 5  | 15° 26' 52" S | 132° 15' 07" E | 205099  | 8290264  |
| 6  | 15° 26' 47" S | 132° 16' 22" E | 207321  | 8290454  |
| 7  | 15° 29' 40" S | 132° 16' 24" E | 207448  | 8285123  |
| 8  | 15° 29' 46" S | 132° 29' 57" E | 231693  | 8285250  |
| 9  | 15° 27' 48" S | 132° 30' 03" E | 231820  | 8288868  |
| 10 | 15° 27' 47" S | 132° 31' 26" E | 234295  | 8288931  |
| 11 | 15° 20' 26" S | 132° 39' 46" E | 249084  | 8302641  |
| 12 | 15° 13' 33" S | 132° 39' 42" E | 248830  | 8315335  |
| 13 | 15° 02' 57" S | 132° 29' 40" E | 230614  | 8334693  |
| 14 | 14° 59' 17" S | 132° 29' 47" E | 230741  | 8341484  |
| 15 | 14° 59' 16" S | 132° 48' 30" E | 264316  | 8341865  |
| 16 | 15° 10' 53" S | 132° 48' 22" E | 264280  | 8320422  |
| 17 | 15° 11' 01" S | 133° 00' 57" E | 286848  | 8320412  |
| 18 | 15° 11' 01" S | 133° 01' 02" E | 286975  | 8174115  |
| 19 | 16° 30' 24" S | 132° 29' 07" E | 231566  | 8173353  |
| 20 | 16° 00' 50" S | 132° 29' 49" E | 232137  | 8227900  |

|    |               |                |        |         |
|----|---------------|----------------|--------|---------|
| 21 | 16° 00' 27" S | 131° 59' 21" E | 177744 | 8227900 |
| 22 | 15° 13' 54" S | 131° 59' 32" E | 176855 | 8313811 |

The survey areas cover portions of the following 1:250,000 map sheets.

1:250,000 Sheet Reference:

|             |          |
|-------------|----------|
| Larrimah    | SE 53-13 |
| Daly Waters | SE 53-01 |

Refer to **Appendix 1** for survey area location diagram.

## 1.2 SURVEY PARAMETERS

|                        |             |
|------------------------|-------------|
| Flight line direction  | 0° - 180°   |
| Flight line spacing    | 400 metres  |
| Tie line direction     | 90° - 270°  |
| Tie line spacing       | 4000 metres |
| Mean Terrain Clearance | 80 metres   |

Time Base and approximate sampling interval (in still air):

- Magnetics 0.1 second (7 metres approx.)
- Radar altimeter 0.1 second (7 metres approx.)
- Radiometrics 1.0 second (70 metres approx.)
- GPS system 1.0 second (70 metres approx.)



## 2. LOGISTICS

### 2.1 OPERATIONS BASE AND SURVEY DATES

| Base Airfield | Latitude    | Longitude    | Elevation |
|---------------|-------------|--------------|-----------|
| Tindal        | 14° 31.3' S | 132° 22.7' E | 443 ft    |

Tindal was selected as the preferred operating base as it provided all the facilities required for the safe operation of an airborne geophysical survey.

The township of Katherine offers comfortable accommodation and eating establishments, important for crew morale on large projects. A regular service by Commercial airlines allowed for the rapid dispatch of data to the DPC in Perth and the ability to rotate crews smoothly with little or no loss of production. Down time due to instrument failure was also minimised as replacement components could be despatched and delivered the following day.

Tindal airport is located 15km ESE of the township of Katherine and has a single bitumen runway (14/32) 2,744m in length. Navigation aids include a VOR (TN 112.3), NDB (TN 356) and ILS (ITN 110.7 for runway 14). AVGAS is readily available from Tindal Refuelling Services who stock both Shell and BP products.

Crew Accommodation:

Katherine Pine Tree Motor Inn  
Katherine, NT

Survey Dates and Production Summary

Refer to **APPENDIX 4** for detailed production summary.

|   |                                 |
|---|---------------------------------|
| Mobilisation                                | 13 <sup>th</sup> August 2001    |
| Production flying commenced                 | 14 <sup>th</sup> August 2001    |
| Production flying completed                 | 27 <sup>th</sup> September 2001 |
| Demobilisation                              | 28 <sup>th</sup> September 2001 |
| Total days on job                           | 47                              |
| Total number of flights                     | 41                              |
| Total production days                       | 40                              |
| Total days lost due to weather              | 0                               |
| Total days lost due to aircraft maintenance | 24.5                            |
| Total days lost due to Mag storms           | 0                               |
| Total days lost due to other causes         | 0                               |
| Total kilometres flown                      | 33,476 km                       |
| Average acquisition rate - km per flight    | 732 km                          |
| km per production day                       | 1,566 km                        |

### 2.2 SURVEY AIRCRAFT AND FIELD CREW



*Aircraft*

Two twin engine Rockwell Aero Commander 500S  
'Shrike': Registration VH KAC



*Field Crew*

Pilots

Rad Jamieson  
Dave Chappell  
Ivan Hussein  
Mark Rooney  
Max Eichorn

Operators

Ross Rackham  
Mark Devenish  
Leith Gardiner  
Brett Archer  
Kevin Cahill  
Rob Deopel

*Crew Leader & Field QC*

Ross Rackham



### **3. SURVEY EQUIPMENT, OPERATION AND QUALITY CONTROL**

#### **3.1 MAJOR EQUIPMENT SUMMARY**

|                           |   |
|---------------------------|---|
| Aircraft Magnetometer     | Geometrics G-822A Caesium vapour  |
| Magnetic Compensator      | RMS Instruments Automatic Aeromagnetic Digital Compensator (AADC)           |
| Base station magnetometer | Geometrics G856 proton precession   |
| Gamma-ray spectrometer    | Exploranium GR820D, 256 channels  |
| Gamma-ray detector        | NaI(Tl) crystals; 33.6L down;   |
| Altimeter                 | Sperry AA-210 radio altimeter   |
| Barometer                 | Rosemount 1241m   |
| Thermometer               | Rosemount Model 22000 temperature sensor                                    |
| Navigation system         | Fugro Omnistar in VBS (Virtual Base Station) mode, Ashtech G12 GPS receiver |
| Flight Track Recording    | VHS video tracking camera with wide-angle lens                              |
| Data acquisition system   | RMS Instruments DAS-8 digital acquisition system                            |

#### **3.2 MAGNETOMETER AND COMPENSATOR**

A Geometrics G-822A optically pumped caesium vapour magnetometer was used for the survey with the sensor mounted in a tail stinger of the aircraft. The magnetometer sensor was coupled to a RMS Instruments Automatic Aeromagnetic Digital Compensator (AADC) to produce real time compensation for the effects of the aircraft's motion, changes in attitude and heading. The AADC interference coefficients were calculated from compensation flights carried out before the survey commenced and after aircraft maintenance. The AADC output data, with a resolution and sensitivity of 0.001 nT at a sampling rate of ten (10) times per second, were recorded digitally. The noise envelope for compensated magnetometer readings was less than 0.1 nT

#### **3.3 BASE STATION MAGNETOMETER**

A GR823B caesium vapour base station magnetometer was used to measure the daily variations of the Earth's magnetic field. The base station was established in an area of low gradient, away from cultural influences. These data were displayed and recorded on a Libretto laptop computer. The base station was run continuously throughout the survey flying period with a sampling interval of 1 seconds and a sensitivity of 0.01 nT.

In addition to the caesium vapour base station, a Geometrics G856 proton precession magnetometer base station recording at 5 second intervals was established at Tindal airport primarily as a storm monitor.



The base station data were closely examined after each days production flying to determine if any data had been acquired during periods of out-of-specification diurnal variation.

### 3.4 SPECTROMETER

An Exploranium GR-820, 256-channel gamma ray spectrometer with automatic crystal gain was used to record 256 channels of data in addition to the data from pre-set spectral windows. Total downward crystal array volume was 33.6 litres. System sample time and live time were also recorded. The digital were recorded once per second.

The pre-set spectral window limits were:

| Window      | Spectrometer channel number    Equivalent energy levels (keV) |       |       |                     |
|-------------|---|-------|-------|---------------------|
|             | Lower   | Upper | Lower | Upper               |
| Total Count | 34  | 237   | 410   | 2.810               |
| K-40        | 116   | 132   | 1 370 | 1 570               |
| Bi-141      | 141   | 157   | 1 660 | 1 860               |
| Tl-208      | 204   | 237   | 2 410 | 2 810               |
| Cosmic      | 255   | 255   | 4 000 | $\infty \geq 4$ meV |

### 3.5 ALTIMETERS

A Sperry AA-210 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.

A Rosemount 1241m barometer, with an output sensitivity of 0.666 mV/ft, was used to measure barometric altitude of the aircraft.

The radar altimeter system was checked prior to commencement of production flying. This involved flying the aircraft at 30 metre height intervals, up to a height of 300 metres over the base of operations airstrip using the aircraft's barometric altimeter as the height reference. Radar altimeter and GPS height data were recorded for each flight interval flown. A comparison of these data with the aircraft's barometric altimeter verified that the system was operating satisfactorily.

Altimeter data (radar and barometric) were digitally recorded every 0.1 seconds.

### 3.6 NAVIGATION AND FLIGHT PATH RECOVERY

Aircraft navigation was controlled by real-time differential GPS using an Ashtech G12 receiver in the aircraft with pseudo range corrections obtained through the commercial FUGRO VBS system transmitting via the OPTUS B satellite.



The position of the aircraft was fixed and recorded once per second and the on-board pilot guidance steering signal updated once every half second.

The flight path data were inspected after each flight for any deviations of flight path from specifications and for any gaps caused by momentary loss of satellites. Flight path quality was confirmed at Kevron's processing centre by plotting flight path maps at an appropriate scale, highlighting any portions of lines which exceeded the specified horizontal and altitude tolerances.

### 3.7 FLIGHT TRACK RECORDING SYSTEM

The flight path of the aircraft was recorded with a National CCD colour video camera and a VHS video recorder. Line and fiducial numbers were recorded on the video image.

### 3.8 DATA ACQUISITION

A RMS Instruments DAS-8 Data Acquisition System was used to record all data in digital format onto a 10 gigabyte hard disk drive.

### 3.9 GENERAL QUALITY CONTROL

Rigorous in-field quality control was undertaken on-site and various QC products were produced in the field using a combination of Kevron proprietary software, ChrisDBF software and AGSO software. QC plots were produced for each flight and included:

- Flight path maps displaying cross track and height deviations.
- Magnetic 4<sup>th</sup> difference noise plots
- Radiometric Summed spectra plots
- Diurnal plots

Lines selected at random from each flight were subjected to further QC checks. Profiles were generated for all variables recorded and inspected for data quality. Any lines found to be outside the specified tolerances were identified and reflown.

A running log of each flight was maintained recording details of all lines flown. Transcribed flight logs and a complete flight line listing are included in **APPENDIX 3**. Equipment tests and calibrations are described in Section 4 and tabulations of the calibration and test flight data are in **APPENDIX 5**.

Field data were sent to Kevron's processing centre in Perth where they were further



inspected for data quality and conformance to specifications before commencing processing.

### 3.10 SAFETY MANAGEMENT

Kevron Geophysics Pty Ltd are an accredited active member of IAGSA and thus has a commitment, as far as practicable, to eliminate or control all risks and hazards to its staff that may arise in the work environment.

A revision of Kevron's Occupational Health, Safety and Environment was undertaken in January 2001 and a comprehensive Safety Management System was implemented in February 2001. The Safety Management System includes Risk Evaluation Processes and Procedures and Occupational Health Safety & Environment Policies for the entire Kevron Group of Companies.

Copies of Kevron's Occupational Health, Safety and Environment Policies are provided in *APPENDIX 7*.

All aircraft operations, including pilot flying hours and aircraft maintenance, complied with the requirements of the Federal Civil Aviation Safety Authority (CASA) and the CASA-approved procedures set out in Kevron's Aircraft Operations Manual.

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 EagleStar Flight Following System is fitted to all Kevron aircraft and for the Sturt survey, position information was transmitted every 4 minutes to FUGRO's premises in Perth. This information can be monitored by accessing the FUGRO web page where the updated flight path is displayed. In the event that positional information from the aircraft is lost for a period exceeding 12 minutes or three consecutive transmissions, an alarm is raised and a SMS text message sent to nominated contacts and the Emergency Response plan implemented.

## 4. CALIBRATIONS

### 4.1 MAGNETICS

Compensation coefficients for the AADC were established by flying a "compensation box" test (a series of pitch, roll and yaw manoeuvres in each of the four cardinal headings) before survey production commenced, and again after aircraft servicing where components were changed that may effect the magnetic field of the aircraft.

Compensation flights were flown in an area of low gradient near Katherine at an altitude of 8000 to 10000 feet above mean sea level.



The AADC calculates basic statistics, which reflect the degree of merit of the compensation. These include the standard deviation of the recorded data without corrections applied, the standard deviation with the correction applied, the improvement ratio (the ratio of the standard deviation of the data without and with corrections applied) and the vector norm (the degree of difficulty in calculating the corrections). The table below shows statistics recorded from compensation flights with the aircraft in survey configuration, ie Air conditioner on, Transponder off, DME off, HF on, ADF on, #1 COM on, #2 NAV/Com on .

| Comp Box Test Date           | Aircraft |
|------------------------------|----------|
| 21 <sup>st</sup> August 2001 | KAC      |

## 4.2 RADIOMETRICS

### 4.2.1. Background Correction Plots and Equations

The following procedure was used to determine the aircraft background radiation was determined following the procedures outlined in AGSO Record 1995/60. There were no changes to the system between the date of this test and the survey.

The measured 256 channel spectra are each the sum of the aircraft component (constant) and the cosmic component. The measured spectra are used to calculate the aircraft gamma energy spectrum and the normalised cosmic gamma energy spectrum.

Aircraft and Cosmic background spectra are estimated as follows:

$$N_i = a_i + b_i N_{cos}$$

Where:

$N_i$  = aircraft + cosmic background count rate in the (*i*)th channel

$N_{cos}$  = cosmic window count rate

$a_i$  = aircraft background in the (*i*)th channel

$b_i$  = cosmic background in the (*i*)th channel normalized top unit counts in the cosmic window.

A linear regression of the cosmic window count rate on any channel gives the cosmic sensitivity (slope of regression line) and aircraft background (zero intercept) for that channel.

The aircraft and cosmic background spectra are subtracted from the dead-time corrected and energy calibrated observed spectra, The conventional radiometric windows are extracted from the 256 channel data.

#### 4.2.2 Pre and Post Flight Checks

Hand sample checks, using thorium, uranium and caesium-137 samples, were carried out before and after flights.

#### 4.2.3 Test Line

A test line approximately 8 kilometres long was chosen NE of Tennant Creek along a cleared line. The start and end co-ordinates are as follows;

|           | <b>Latitude (°S)</b> | <b>Longitude (°E)</b> |
|-----------|----------------------|-----------------------|
| South End | 15° 34.9043'         | 128° 49.9366'         |
| North End | 15° 40.3951'         | 128° 45.2548'         |

#### 4.2.4 Compton Stripping Coefficients

The following Compton stripping coefficients, derived from calibrations over test pads in Perth were used in subsequent processing:

|               |                            |          |
|---------------|----------------------------|----------|
| <b>VH KAC</b> | alpha (Tl-208 into Bi-214) | 0.265020 |
|               | beta (Tl-208 into K-40)    | 0.433140 |
|               | gamma (Bi-214 into K-40)   | 0.805216 |

#### 4.2.5 Spectrometer Countrate Sensitivities

Broad source sensitivities for each of the radio-element windows were obtained from a flight line flown at a height of 80 m over the Carnamah Test Range and a corresponding line on the ground surveyed with a calibrated hand-held spectrometer supplied by Tesla Geoscience. The Carnamah Test Range is located approximately 10 kilometres east of Carnamah, 200 kilometres north of Perth, on the Carnamah-Belvoir Road. The Test Range follows the power line south for eight kilometres crossing undulating wheat crops and rocky scrub covered hills.

The aircraft acquisition system was not changed between the date of the calibration flight and the survey dates. The following values were obtained:

VH KAC 26th May, 2001

| Element     | Corrected mean countrate (cps) | Average ground concentration     | Countrate sensitivity |
|-------------|--------------------------------|----------------------------------|-----------------------|
| Potassium   | 357.1473589                    | 2.71 %K                          | 131.847 cps/%K        |
| Uranium     | 36.86961332                    | 3.93 ppm eU                      | 9.375 cps/ppm eU      |
| Thorium     | 204.0701113                    | 32.39 ppm eTh                    | 6.301 cps/ppm eTh     |
| Total Count | 4422.491351                    | 143.95 nG/h (nGh <sup>-1</sup> ) | 30.72 cps/nGh         |

#### 4.3 PARALLAX

The parallax error was established immediately after completion of the survey by flying over a suitable anomaly in opposite directions. The parallax for each aircraft system was resolved to following:

**Magnetics** 7 fiducials (all flights)

**Radiometrics** No parallax correction was applied to the radiometrics

## **5. DATA PROCESSING**

### **5.1 DATA VERIFICATION AND EDITING**

The field data were sent regularly to Kevron's processing centre in Perth for verification and editing with in-house software installed on Sun Sparc 20 workstations.

The data were loaded into a database and a statistical report generated for each variable on a line by line basis. The data were then edited for scrubbed or duplicate lines and checked for spikes, steps or high noise levels. Lines with any out-of-specification data were flagged for reflight.

### **5.2 FLIGHT PATH RECOVERY**

The differentially corrected GPS data were converted to Universal Transverse Mercator coordinates using the Australian National Spheroid GDA94

The survey area is in grid UTM Zone 53 with a central meridian of 135° East.

Flight path maps were generated to verify the off-line tolerances and to ensure all necessary data had been loaded into the geophysical data base.

### **5.3 MAGNETIC PROCESSING**

After correcting the magnetic data for diurnal variations, the International Geomagnetic Reference Field (IGRF) was subtracted and the data were tie line levelled.

These processes are described more fully below.

#### **5.3.1 Diurnal Correction**

The diurnal data were edited to keep only those readings taken during flight time. The data were visually checked on the computer screen for spikes, noise and any apparent cultural magnetic events.

After editing, the data were low pass filtered using a twenty-term, spatial domain filter, which removed periods of less than thirty seconds. The data were again checked visually for integrity after the filtering process.

The filtered data were synchronised with the airborne data, interpolated and subtracted from the airborne data, one sample at a time. After subtraction, the mean diurnal value was added back to the airborne data for each line to produce diurnally corrected data.

#### **5.3.2 Subtraction of the IGRF**

The International Geomagnetic Reference Field (IGRF) was removed from the diurnally-corrected data by fitting a second order polynomial surface to thirteen coefficients computed from the IGRF model and then subtracting the IGRF values





on a sample by sample basis.

The IGRF 2000 model updated to the survey date was used with the following values:

|                      |          |
|----------------------|----------|
| IGRF updated to      | 2001.6   |
| Magnetic Declination | 4.25 °   |
| Magnetic Inclination | -46.3 °  |
| Total Field Strength | 47986 nT |

### 5.3.3 Tie Line Levelling

The diurnally corrected and IGRF-removed data were processed by a Kevron proprietary levelling program.

The program compares the magnetic differences at intersections of the flight lines and tie lines and calculates individual magnetic field biases for each flight line based on the tie line intersection. The miss-ties are minimised in a least-squares sense for all intersections. The biases are manually evaluated and selectively applied. Further reduction of the miss-ties can be removed by fitting a polynomial to produce levelled magnetic data.

The levelled data were then gridded on a 100 x 100 metre mesh using a minimum curvature algorithm based on Briggs (1974). The gridded data were displayed on an image processor to check data integrity and data levelling.

### 5.3.4 Micro Levelling

The data were microlevelled using Kevron in-house proprietary software. Kevron's micro-levelling process is line based rather than grid based. Pseudo lines are extracted perpendicular to the traverse line direction. These are low pass filtered and mis-tied to the traverse lines using the tie line levelling software.

The mis-tie values are bounded spatially by a series of polygons edited through ER Mapper.

## 5.4 RADIOMETRIC PROCESSING

### 5.4.1 System Deadtime and Energy Calibrations

Following correction for system deadtime, the 256 channel spectrometer data were energy calibrated using the following procedure:

For each line, the individual 256 channel data from each sample point were stacked to produce a single spectrum. The peak positions of the standard potassium and thorium windows were found by performing a gaussian fit to the spectral data for the energy range of each window after first removing the Compton continuum slope. If the measured peak positions were shifted by more than one channels for



the thorium peak or 0.5 channels for the potassium peak, an energy recalibration was performed to obtain the correct spectral channel positions for the lower and upper bounds of each of the required windows. Using these corrected channel limits, new window counts were then extracted from the 256 channel data for each 1 second data sample on the line.

#### 5.4.2 Noise Adjusted Singular Value Decomposition (NASVD)

The raw gamma-ray spectra was smoothed using the Noise Adjusted Singular Value Decomposition (NASVD – Hovgaard and Grasty, 1997) spectral smoothing technique. This technique is a spectral component analysis procedure for the removal of noise from gamma-ray spectra. The observed spectra were transformed into orthogonal spectral components in which lower order components represent the signal and higher order components represent noise. Noise was removed from the observed spectra by rejecting the noise components and reconstructing the spectra using the **first five** principal components.

#### 5.4.3 Aircraft and Cosmic Background Removal

Aircraft and cosmic background were removed from the data using the normalised 256 channel cosmic spectrum for the aircraft, and the aircraft 256 channel background spectrum.

| <b>Aircraft Background Coefficients</b> |       |
|---|-------|
| Total Count                             | 52.26 |
| Potassium                               | 7.4   |
| Uranium                                 | 1.2   |
| Thorium                                 | 0     |

| <b>Aircraft Cosmic Coefficients</b> |          |
|-------------------------------------|----------|
| Total Count                         | 0.718991 |
| Potassium                           | 0.039252 |
| Uranium                             | 0.033910 |
| Thorium                             | 0.035575 |

#### 5.4.4 Airborne radon removal

Data were corrected for airborne radon using Minty (1996 – Alt Method B) two component spectral ratio method. Calibration constants for Method B derived directly from observed radon and ground spectra at a height of 80m STP.  $C_1$ , and  $C_2$ , are the ratios between the 0.609 MeV peak count rate and the conventional U window count rate for a radon spectrum and a composite K, U and Th ground spectrum respectively.

| Calibration Constants for Method B |       |
|------------------------------------|-------|
| C1                                 | 1.944 |
| C2                                 | 0.859 |

#### 5.4.5 Effective Altitude Calculations and Compton Scattering Corrections

At this point, the conventional radiometric windows are extracted from the 256 channel data and all further gamma-ray corrections are performed using three-window radiometric data processing.

Following reduction of the altitude data to effective altitude at standard temperature and pressure as described in Grasty and Minty (1995), Compton scattering stripping was carried out on the background corrected count rates in the potassium, uranium and thorium channel data using the appropriate coefficients listed in Section 4.2.4.

#### 5.4.6 Height attenuation corrections

A height attenuation factor was applied to reduce the data for each channel to a nominal datum of 80 m above ground level. The program used limits corrections to data at terrain clearances between 30m and 250m. Data recorded at terrain clearances outside these limits are corrected assuming they are at these limits.

The attenuation factors used are listed below and were determined from tests carried out over the Carnamah Test Range. (*APPENDIX 5*).

| Total Count | Potassium | Uranium | Thorium |
|-------------|-----------|---------|---------|
| -0.0074     | -0.0094   | -0.0084 | -0.0074 |

#### 5.4.7 Conversion to Ground Element Concentrations

Data were converted to equivalent ground concentrations using the method described in Grasty and Minty (1995) using, for each window, the equation:

$$C_i = N_i / S_i$$

where  $C_i$  = ground concentration of radio-element "i"  
(%K, ppm eU or ppm eTh);

$N_i$  = corrected count rate for window "i"; and

$S_i$  = broad source sensitivity for window "i" as tabled in Section 4.2.5.

#### 5.4.8 Levelling

The corrected and reduced radiometric data were tie-line levelled and micro-levelled using the procedure described above for the magnetic data.

## 5.5 DIGITAL ELEVATION MODEL

A digital elevation model (DEM) was computed by subtracting the terrain clearance measured by the radar altimeter from the GPS measured aircraft altitude to obtain a nominal ground elevation. The nominal ground elevation data were tie-line levelled and micro-levelled using the same technique described for the levelling of the magnetic data.

Allowance was made for the constant 3.9 m elevation difference between the radar altimeter and the GPS antenna.

A set of geoid-ellipsoid separation values were obtained from AUSLIG, gridded and values interpolated for each point along the survey lines. The interpolated separation values were subtracted from the nominal ground elevation to produce the final located DEM.

The DEM data were tie line levelled and micro-levelled using the procedure described above for the magnetic and radiometric data.



## 5.6 DELIVERABLE ITEMS

The following survey data items were produced and delivered:

1. Survey location diagram (APPENDIX 1)
2. Magnetometer Base station location diagram. (APPENDIX 2)
3. Flight logs and flight summary - line listing (APPENDIX 3)
4. Production summaries week by week for each aircraft. (APPENDIX 4)
5. Tabulations of calibration and test flight data (APPENDIX 5)
6. Located digital records in the specified format (APPENDIX 6)
7. OHS and Environment Policies (APPENDIX 7)

## 5.7 FINAL PRODUCTS

The following files containing digital ASCII located data and grids were delivered on CD.

### Sturt

#### CD#1

README - Text file describing content of CD  
DATA:  
Sturt\_256.DAT - 1 sec 256 Channel Radiometric ASCII Located Data  
Sturt\_256.DES - Description file  
Sturt\_256.DFN - Definition file

#### CD#2

README - Text file describing content of CD  
DATA:  
Sturt\_Mag.DAT - Magnetics .1 second ASCII located data  
Sturt\_Mag.DES - Description file  
Sturt\_Mag.DFN - Definition file

GRIDS:  
Sturt\_1VD\_GDA94\_MGA53  
Sturt\_1VD\_GDA94\_MGA53.ers - First Vertical Derivative Erampper  
Sturt\_AGC\_1VD\_GDA94\_MGA53  
Sturt\_AGC\_1VD\_GDA94\_MGA53.ers - AGC of First Vertical Derivative Ermapper Grid  
Sturt\_DTM\_GDA94\_MGA53  
Sturt\_DTM\_GDA94\_MGA53.ers - DTM Ermapper Grid  
Sturt\_1VD\_RTP\_GDA94\_MGA53  
Sturt\_1VD\_RTP\_GDA94\_MGA53.ers - First Vertical Derivative of RTP Ermapper Grid  
Sturt\_RTP\_GDA94\_MGA53  
Sturt\_RTP\_GDA94\_MGA53.ers - Reduced to Pole Ermapper Grid  
Sturt\_TMI\_GDA94\_MGA53  
Sturt\_TMI\_GDA94\_MGA53.ers - TMI Ermapper Grid



### **CD#3**

|                                |   |
|--------------------------------|---|
| README                         | - Text file describing content of CD                      |
| DATA:                          |   |
| Sturt_Spec.DAT                 | - 1 second Radiometric ASCII Located                      |
| Sturt_Spec.DES                 | - Description file  |
| Sturt_Spec.DFN                 | - Definition file   |
| GRIDS:                         |   |
| Sturt_DTM_GDA94_MGA53          |   |
| Sturt_DTM_GDA94_MGA53.ers      | - DTM Ermapper Grid                                       |
| Sturt_K_GDA94_MGA53            |   |
| Sturt_K_GDA94_MGA53.ers        | - Potassium % Ermapper Grid                               |
| Sturt_TC_GDA94_MGA53           |   |
| Sturt_TC_GDA94_MGA53.ers       | - Total Count nGy/hr Ermapper Grid                        |
| Sturt_Th_GDA94_MGA53           |   |
| Sturt_Th_GDA94_MGA53.ers       | - Thorium ppm Ermapper Grid                               |
| Sturt_U_GDA94_MGA53            |   |
| Sturt_U_GDA94_MGA53.ers        | - Uranium ppm Ermapper Grid                               |
| Sturt_KThU_RGB_GDA94_MGA53     |   |
| Sturt_KThU_RGB_GDA94_MGA53.ers | - Potassium Thorium Uranium (RGB) composite Ermapper Grid |

Note : For each original CD delivered, 1 copy was also delivered.  
Total of 6 CDs were delivered for **Sturt** (3 originals + 3 copies)



## **REFERENCES**

Briggs, I.C., 1974. Machine Contouring Using Minimum Curvature. *Geophysics*, v.39: p. 39 - 48.

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R.L. Grasty and B.R.S Minty, 1995: A Guide To The Technical Specifications For a Airborne Gamma-Ray Survey. AGSO Record 1995/60.

Hovgaard, J., (1997). A new processing technique for airborne gamma-ray spectrometer data (Noise Adjusted Singular Value Decomposition). Danish Emergency Management Agency.

Hovgaard, J. and Grasty, R.L, (1997). Reducing noise in airborne gamma-ray data through spectral component analysis. Exploration 97, Ontario Geological Survey.

Minty, B.R.S., 1996. The analysis of multichannel airborne gamma-ray spectra. PhD Thesis, Australian National University.

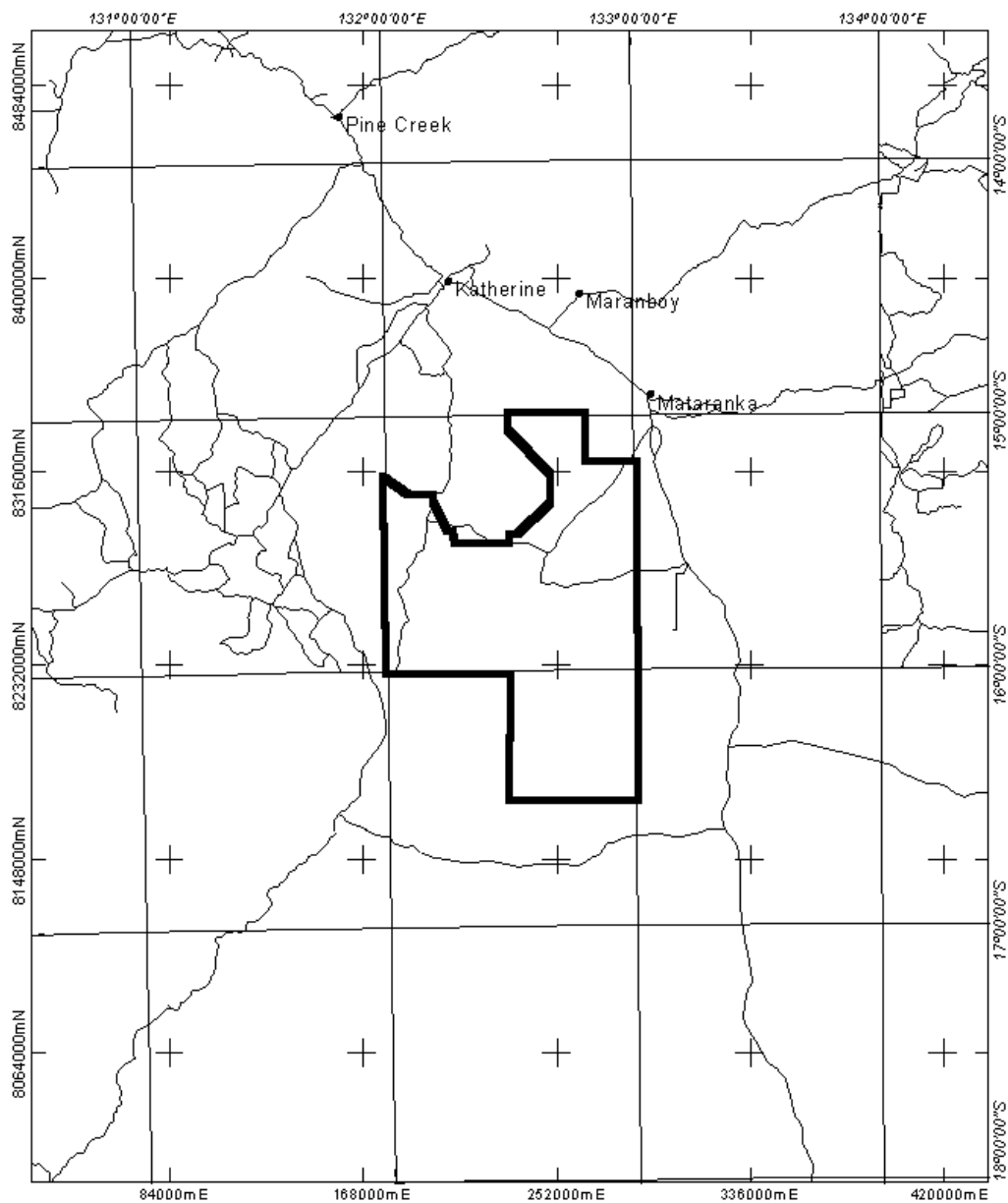


# APPENDIX 1

## Survey Area



# Sturt Survey Area Location Diagram



Sturt Magnetic and Radiometric Survey

0 30 60 90 120 Kilometers

|                                  |                                       |
|----------------------------------|---------------------------------------|
| Projection : Transverse Mercator | Flight Line Heading : 0               |
| Spheroid : WGS 84                | Flight Line Spacing : 10000 1:2500000 |
| False Easing : 500000            | Cross Line Heading : 90               |
| False Northing : 10000000        | Cross Line Spacing : 10000            |
| Central Meridian : 135           | Total Line Km : 2378                  |

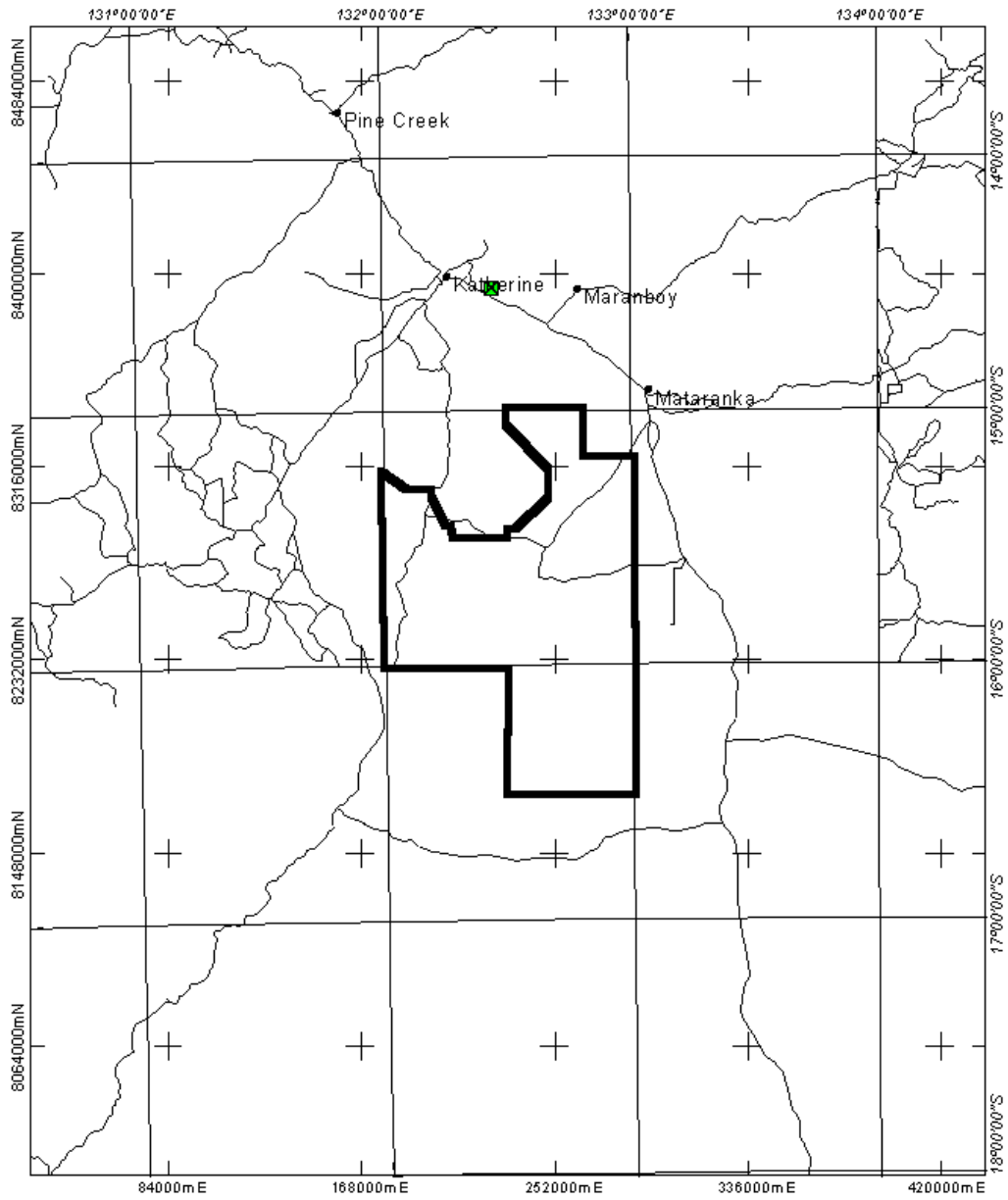


# APPENDIX 2

## Magnetometer Base Position



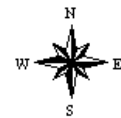
# Base Magnetometer Location Diagram



Sturt Magnetic and Radiometric Survey  
Basestation Locations



|                                  |                             |
|----------------------------------|-----------------------------|
| Projection : Transverse Mercator | Flight Line Heading : 0     |
| Spheroid : WGS 84                | Flight Line Spacing : 10000 |
| False Easting : 500000           | Scale : 1:2500000           |
| False Northing : 10000000        | Cross Line Heading : 90     |
| Central Meridian : 135           | Cross Line Spacing : 10000  |
|                                  | Total Line Km : 2378        |



# APPENDIX 3

## Operators Flight Reports And Line Listing

### Flight Line Listing Summary

| Line  | Flight | Date     | Start Fid | End Fid | Line  | Flight | Date     | Start Fid | End Fid |
|-------|--------|----------|-----------|---------|-------|--------|----------|-----------|---------|
| 10010 | 4      | 20010818 | 1710      | 9700    | 20190 | 33     | 20010922 | 94260     | 98040   |
| 10020 | 4      | 20010818 | 17590     | 25520   | 20200 | 33     | 20010922 | 101770    | 105560  |
| 10030 | 4      | 20010818 | 33360     | 41250   | 20210 | 33     | 20010922 | 109300    | 112950  |
| 10040 | 4      | 20010818 | 9710      | 17580   | 20220 | 33     | 20010922 | 116380    | 120170  |
| 10050 | 4      | 20010818 | 25540     | 33350   | 20230 | 33     | 20010922 | 123650    | 127160  |
| 10060 | 4      | 20010818 | 41260     | 49170   | 20240 | 33     | 20010922 | 112960    | 116370  |
| 10070 | 4      | 20010818 | 57240     | 65190   | 20250 | 33     | 20010922 | 120180    | 123630  |
| 10080 | 4      | 20010818 | 73120     | 81130   | 20260 | 33     | 20010922 | 127170    | 130580  |
| 10090 | 4      | 20010818 | 49180     | 57230   | 20270 | 34     | 20010922 | 10        | 3330    |
| 10100 | 4      | 20010818 | 65200     | 73110   | 20280 | 34     | 20010922 | 6600      | 9850    |
| 10110 | 4      | 20010818 | 81150     | 89040   | 20290 | 33     | 20010922 | 130600    | 133990  |
| 10120 | 4      | 20010818 | 96970     | 104800  | 20300 | 34     | 20010922 | 3340      | 6590    |
| 10130 | 4      | 20010818 | 112680    | 120490  | 20310 | 34     | 20010922 | 9870      | 13120   |
| 10140 | 4      | 20010818 | 89060     | 96950   | 20320 | 34     | 20010922 | 16370     | 19600   |
| 10150 | 4      | 20010818 | 104820    | 112670  | 20330 | 34     | 20010922 | 22870     | 26080   |
| 10160 | 4      | 20010818 | 120500    | 128310  | 20340 | 34     | 20010922 | 13140     | 16350   |
| 10170 | 4      | 20010818 | 136160    | 143990  | 20350 | 34     | 20010922 | 19620     | 22850   |
| 10180 | 7      | 20010822 | 9630      | 17440   | 20360 | 34     | 20010922 | 26090     | 29300   |
| 10190 | 4      | 20010818 | 128330    | 136140  | 20370 | 34     | 20010922 | 32530     | 35740   |
| 10200 | 7      | 20010822 | 1670      | 9620    | 20380 | 34     | 20010922 | 38950     | 42160   |
| 10210 | 7      | 20010822 | 17460     | 25390   | 20390 | 34     | 20010922 | 29310     | 32520   |
| 10220 | 7      | 20010822 | 33210     | 41080   | 20400 | 34     | 20010922 | 35750     | 38940   |
| 10230 | 7      | 20010822 | 48990     | 56840   | 20410 | 34     | 20010922 | 42170     | 45380   |
| 10240 | 7      | 20010822 | 25400     | 33190   | 20420 | 34     | 20010922 | 48660     | 51890   |
| 10250 | 7      | 20010822 | 41090     | 48980   | 20430 | 34     | 20010922 | 55190     | 58400   |
| 10260 | 7      | 20010822 | 56850     | 64720   | 20440 | 34     | 20010922 | 45400     | 48650   |
| 10270 | 7      | 20010822 | 10        | 7950    | 20450 | 34     | 20010922 | 51900     | 55170   |
| 10280 | 7      | 20010822 | 15840     | 23610   | 20460 | 34     | 20010922 | 58410     | 61580   |
| 10290 | 7      | 20010822 | 64740     | 72590   | 20470 | 34     | 20010922 | 64780     | 67990   |
| 10300 | 7      | 20010822 | 7970      | 15820   | 20480 | 34     | 20010922 | 71240     | 74430   |
| 10310 | 7      | 20010822 | 23620     | 31510   | 20490 | 34     | 20010922 | 61600     | 64770   |
| 10320 | 7      | 20010822 | 39360     | 47350   | 20500 | 34     | 20010922 | 68010     | 71220   |
| 10330 | 7      | 20010822 | 55160     | 63110   | 20510 | 34     | 20010922 | 74450     | 77680   |
| 10340 | 7      | 20010822 | 31530     | 39340   | 20520 | 34     | 20010922 | 80930     | 84140   |
| 10350 | 7      | 20010822 | 47360     | 55150   | 20530 | 34     | 20010922 | 77700     | 80910   |
| 10360 | 7      | 20010822 | 63120     | 70910   | 20540 | 34     | 20010922 | 84150     | 87340   |
| 10370 | 8      | 20010823 | 1690      | 9780    | 20550 | 34     | 20010922 | 89820     | 92410   |
| 10380 | 8      | 20010823 | 17660     | 26030   | 20560 | 34     | 20010922 | 94800     | 97310   |
| 10390 | 8      | 20010823 | 34030     | 41940   | 20570 | 34     | 20010922 | 87360     | 89810   |
| 10400 | 8      | 20010823 | 9800      | 17650   | 20580 | 34     | 20010922 | 92420     | 94790   |
| 10410 | 8      | 20010823 | 26040     | 34010   | 20590 | 34     | 20010922 | 97320     | 99550   |
| 10420 | 8      | 20010823 | 41960     | 49810   | 20600 | 34     | 20010922 | 101540    | 103730  |
| 10430 | 8      | 20010823 | 57800     | 65610   | 20610 | 34     | 20010922 | 105630    | 107760  |
| 10440 | 8      | 20010823 | 73630     | 81440   | 20620 | 34     | 20010922 | 99560     | 101530  |
| 10450 | 8      | 20010823 | 49820     | 57790   | 20630 | 34     | 20010922 | 103750    | 105620  |
| 10460 | 8      | 20010823 | 65620     | 73610   | 20640 | 34     | 20010922 | 107770    | 109560  |
| 10470 | 8      | 20010823 | 81450     | 89700   | 20650 | 34     | 20010922 | 111130    | 112840  |
| 10480 | 8      | 20010823 | 97620     | 105470  | 20660 | 34     | 20010922 | 114280    | 116350  |
| 10490 | 8      | 20010823 | 89720     | 97610   | 20670 | 34     | 20010922 | 109570    | 111120  |
| 10500 | 1      | 20010814 | 46790     | 54760   | 20680 | 34     | 20010922 | 112860    | 114270  |
| 10510 | 1      | 20010814 | 62580     | 70490   | 20690 | 34     | 20010922 | 116370    | 117720  |
| 10520 | 1      | 20010814 | 78250     | 86340   | 20700 | 34     | 20010922 | 118820    | 120090  |
| 10530 | 1      | 20010814 | 54780     | 62570   | 20710 | 34     | 20010922 | 121100    | 122250  |



*Operations & Processing Report*  
**STURT.**

|              |    |          |        |        |              |    |          |        |        |
|--------------|----|----------|--------|--------|--------------|----|----------|--------|--------|
| <b>10540</b> | 1  | 20010814 | 70510  | 78240  | <b>20720</b> | 34 | 20010922 | 117730 | 118800 |
| <b>10550</b> | 1  | 20010814 | 86360  | 94170  | <b>20730</b> | 34 | 20010922 | 120100 | 121090 |
| <b>10560</b> | 1  | 20010814 | 102100 | 109930 | <b>20740</b> | 34 | 20010922 | 122270 | 123260 |
| <b>10570</b> | 1  | 20010814 | 117840 | 125650 | <b>20750</b> | 34 | 20010922 | 124330 | 125340 |
| <b>10580</b> | 1  | 20010814 | 94180  | 102090 | <b>20760</b> | 34 | 20010922 | 125350 | 126410 |
| <b>10590</b> | 1  | 20010814 | 109940 | 117830 | <b>20770</b> | 34 | 20010922 | 123270 | 124320 |
| <b>10600</b> | 2  | 20010815 | 59000  | 66930  | <b>30020</b> | 34 | 20010922 | 127720 | 128910 |
| <b>10610</b> | 2  | 20010815 | 74880  | 82950  | <b>30030</b> | 34 | 20010922 | 128930 | 130100 |
| <b>10620</b> | 2  | 20010815 | 90790  | 98800  | <b>30040</b> | 37 | 20010924 | 144240 | 145210 |
| <b>10630</b> | 2  | 20010815 | 66940  | 74870  | <b>30051</b> | 34 | 20010922 | 130120 | 131450 |
| <b>10640</b> | 2  | 20010815 | 82960  | 90770  | <b>30060</b> | 37 | 20010924 | 146140 | 147110 |
| <b>10650</b> | 2  | 20010815 | 98810  | 106760 | <b>30070</b> | 34 | 20010922 | 131470 | 132820 |
| <b>10660</b> | 2  | 20010815 | 114660 | 122630 | <b>30080</b> | 37 | 20010924 | 145220 | 146130 |
| <b>10670</b> | 8  | 20010823 | 105490 | 113360 | <b>30090</b> | 34 | 20010922 | 132830 | 134220 |
| <b>10680</b> | 2  | 20010815 | 106780 | 114650 | <b>30100</b> | 37 | 20010924 | 143290 | 144220 |
| <b>10690</b> | 2  | 20010815 | 122650 | 130460 | <b>30110</b> | 34 | 20010922 | 134240 | 135670 |
| <b>10700</b> | 8  | 20010823 | 113370 | 121240 | <b>30121</b> | 37 | 20010924 | 141330 | 142260 |
| <b>10710</b> | 8  | 20010823 | 129080 | 137010 | <b>30130</b> | 34 | 20010922 | 135690 | 137220 |
| <b>10720</b> | 9  | 20010824 | 1670   | 9540   | <b>30140</b> | 37 | 20010924 | 138590 | 139500 |
| <b>10730</b> | 8  | 20010823 | 121250 | 129060 | <b>30150</b> | 34 | 20010922 | 137240 | 138810 |
| <b>10740</b> | 8  | 20010823 | 137020 | 144930 | <b>30160</b> | 37 | 20010924 | 142280 | 143270 |
| <b>10750</b> | 9  | 20010824 | 9550   | 17360  | <b>30171</b> | 35 | 20010923 | 1840   | 3470   |
| <b>10760</b> | 9  | 20010824 | 25190  | 33120  | <b>30180</b> | 37 | 20010924 | 139510 | 140480 |
| <b>10770</b> | 9  | 20010824 | 40900  | 48750  | <b>30190</b> | 35 | 20010923 | 5370   | 7040   |
| <b>10780</b> | 9  | 20010824 | 17370  | 25180  | <b>30200</b> | 37 | 20010924 | 137520 | 138570 |
| <b>10790</b> | 9  | 20010824 | 33140  | 40890  | <b>30210</b> | 35 | 20010923 | 8930   | 10680  |
| <b>10800</b> | 9  | 20010824 | 48760  | 56550  | <b>30220</b> | 37 | 20010924 | 135170 | 136300 |
| <b>10810</b> | 9  | 20010824 | 64480  | 72270  | <b>30230</b> | 35 | 20010923 | 3480   | 5350   |
| <b>10820</b> | 9  | 20010824 | 80090  | 87940  | <b>30240</b> | 37 | 20010924 | 132670 | 133880 |
| <b>10830</b> | 9  | 20010824 | 56560  | 64470  | <b>30250</b> | 35 | 20010923 | 7060   | 8910   |
| <b>10840</b> | 9  | 20010824 | 72280  | 80070  | <b>30260</b> | 37 | 20010924 | 136320 | 137510 |
| <b>10850</b> | 9  | 20010824 | 87960  | 95830  | <b>30270</b> | 35 | 20010923 | 10700  | 12590  |
| <b>10860</b> | 9  | 20010824 | 103700 | 111590 | <b>30280</b> | 37 | 20010924 | 133900 | 135150 |
| <b>10870</b> | 9  | 20010824 | 119370 | 127400 | <b>30290</b> | 35 | 20010923 | 14690  | 16640  |
| <b>10880</b> | 9  | 20010824 | 95850  | 103680 | <b>30300</b> | 37 | 20010924 | 131350 | 132660 |
| <b>10890</b> | 9  | 20010824 | 111610 | 119360 | <b>30310</b> | 35 | 20010923 | 18820  | 20850  |
| <b>10901</b> | 30 | 20010912 | 1600   | 9350   | <b>30320</b> | 37 | 20010924 | 128370 | 129760 |
| <b>10911</b> | 30 | 20010912 | 17250  | 25060  | <b>30330</b> | 35 | 20010923 | 12600  | 14670  |
| <b>10921</b> | 30 | 20010912 | 33020  | 40790  | <b>30340</b> | 37 | 20010924 | 125190 | 126720 |
| <b>10931</b> | 30 | 20010912 | 9370   | 17240  | <b>30350</b> | 35 | 20010923 | 16650  | 18800  |
| <b>10941</b> | 30 | 20010912 | 25080  | 33010  | <b>30360</b> | 37 | 20010924 | 129780 | 131330 |
| <b>10951</b> | 30 | 20010912 | 40800  | 48710  | <b>30370</b> | 35 | 20010923 | 20870  | 23040  |
| <b>10961</b> | 30 | 20010912 | 56540  | 64410  | <b>30380</b> | 37 | 20010924 | 126740 | 128350 |
| <b>10971</b> | 30 | 20010912 | 72280  | 80190  | <b>30390</b> | 35 | 20010923 | 25390  | 27640  |
| <b>10981</b> | 30 | 20010912 | 48730  | 56520  | <b>30400</b> | 37 | 20010924 | 123480 | 125170 |
| <b>10991</b> | 30 | 20010912 | 64420  | 72270  | <b>30411</b> | 35 | 20010923 | 30060  | 32330  |
| <b>11001</b> | 30 | 20010912 | 80210  | 88000  | <b>30420</b> | 37 | 20010924 | 119930 | 121640 |
| <b>11011</b> | 30 | 20010912 | 95860  | 103710 | <b>30430</b> | 35 | 20010923 | 23050  | 25380  |
| <b>11021</b> | 30 | 20010912 | 111540 | 119390 | <b>30441</b> | 39 | 20010925 | 33840  | 35570  |
| <b>11031</b> | 30 | 20010912 | 88010  | 95840  | <b>30450</b> | 35 | 20010923 | 27660  | 30050  |
| <b>11041</b> | 30 | 20010912 | 103720 | 111530 | <b>30460</b> | 37 | 20010924 | 121660 | 123470 |
| <b>11052</b> | 30 | 20010912 | 137760 | 145650 | <b>30470</b> | 35 | 20010923 | 32350  | 34800  |
| <b>11061</b> | 30 | 20010912 | 129860 | 137750 | <b>30480</b> | 37 | 20010924 | 118170 | 119920 |
| <b>11070</b> | 11 | 20010831 | 10     | 8390   | <b>30490</b> | 35 | 20010923 | 37440  | 39930  |
| <b>11081</b> | 30 | 20010912 | 120570 | 128220 | <b>30501</b> | 39 | 20010925 | 32060  | 33830  |
| <b>11082</b> | 30 | 20010912 | 128230 | 129840 | <b>30511</b> | 35 | 20010923 | 42610  | 45260  |
| <b>11090</b> | 11 | 20010831 | 25460  | 34010  | <b>30520</b> | 37 | 20010924 | 110670 | 112500 |
| <b>11100</b> | 11 | 20010831 | 8410   | 17040  | <b>30530</b> | 35 | 20010923 | 34810  | 37420  |



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|       |    |          |        |        |              |    |          |        |        |
|-------|----|----------|--------|--------|--------------|----|----------|--------|--------|
| 11110 | 11 | 20010831 | 42460  | 50970  | <b>30540</b> | 37 | 20010924 | 106770 | 108600 |
| 11120 | 11 | 20010831 | 59440  | 67990  | <b>30541</b> | 39 | 20010925 | 30240  | 32050  |
| 11130 | 11 | 20010831 | 17060  | 25450  | <b>30550</b> | 35 | 20010923 | 39950  | 42600  |
| 11140 | 11 | 20010831 | 34030  | 42440  | <b>30560</b> | 37 | 20010924 | 112510 | 114460 |
| 11150 | 11 | 20010831 | 50990  | 59420  | <b>30570</b> | 37 | 20010924 | 1750   | 4620   |
| 11160 | 11 | 20010831 | 68010  | 76480  | <b>30581</b> | 39 | 20010925 | 26380  | 28290  |
| 11170 | 11 | 20010831 | 85000  | 93450  | <b>30590</b> | 37 | 20010924 | 7730   | 10640  |
| 11180 | 11 | 20010831 | 101950 | 110440 | <b>30601</b> | 39 | 20010925 | 28310  | 30220  |
| 11190 | 11 | 20010831 | 76490  | 84980  | <b>30610</b> | 37 | 20010924 | 13850  | 16780  |
| 11200 | 11 | 20010831 | 93470  | 101940 | <b>30620</b> | 37 | 20010924 | 100430 | 102600 |
| 11210 | 11 | 20010831 | 110460 | 118890 | <b>30621</b> | 39 | 20010925 | 24370  | 26360  |
| 11220 | 11 | 20010831 | 126940 | 135050 | <b>30630</b> | 37 | 20010924 | 4630   | 7720   |
| 11230 | 12 | 20010901 | 1790   | 10440  | <b>30640</b> | 37 | 20010924 | 96010  | 98220  |
| 11240 | 11 | 20010831 | 118910 | 126920 | <b>30650</b> | 37 | 20010924 | 10700  | 13830  |
| 11250 | 12 | 20010901 | 10460  | 18290  | <b>30661</b> | 39 | 20010925 | 19960  | 22090  |
| 11260 | 12 | 20010901 | 26870  | 34820  | <b>30670</b> | 37 | 20010924 | 16800  | 19970  |
| 11270 | 12 | 20010901 | 43360  | 51350  | <b>30680</b> | 37 | 20010924 | 98230  | 100420 |
| 11280 | 12 | 20010901 | 18310  | 26860  | <b>30681</b> | 39 | 20010925 | 22100  | 24350  |
| 11290 | 12 | 20010901 | 34840  | 43350  | <b>30690</b> | 37 | 20010924 | 23310  | 26580  |
| 11300 | 12 | 20010901 | 51360  | 59950  | <b>30700</b> | 37 | 20010924 | 93750  | 96000  |
| 11310 | 12 | 20010901 | 67970  | 76580  | <b>30701</b> | 39 | 20010925 | 17680  | 19950  |
| 11320 | 12 | 20010901 | 84520  | 93070  | <b>30710</b> | 37 | 20010924 | 29960  | 33270  |
| 11330 | 12 | 20010901 | 59970  | 67960  | <b>30720</b> | 37 | 20010924 | 88910  | 91220  |
| 11340 | 12 | 20010901 | 76590  | 84500  | <b>30721</b> | 39 | 20010925 | 12920  | 15290  |
| 11350 | 12 | 20010901 | 93090  | 100920 | <b>30730</b> | 37 | 20010924 | 19980  | 23290  |
| 11360 | 12 | 20010901 | 100930 | 109320 | <b>30740</b> | 37 | 20010924 | 83880  | 86250  |
| 11370 | 12 | 20010901 | 109340 | 125430 | <b>30750</b> | 37 | 20010924 | 26600  | 29950  |
| 11380 | 12 | 20010901 | 125450 | 140680 | <b>30761</b> | 39 | 20010925 | 15300  | 17670  |
| 11390 | 13 | 20010901 | 10     | 15490  | <b>30770</b> | 37 | 20010924 | 33290  | 36680  |
| 11400 | 13 | 20010901 | 15510  | 30800  | <b>30780</b> | 37 | 20010924 | 86270  | 88900  |
| 11410 | 13 | 20010901 | 46690  | 61900  | <b>30781</b> | 39 | 20010925 | 10500  | 12910  |
| 11420 | 13 | 20010901 | 77460  | 92710  | <b>30790</b> | 37 | 20010924 | 40350  | 43780  |
| 11430 | 13 | 20010901 | 30810  | 46680  | <b>30800</b> | 37 | 20010924 | 81050  | 83860  |
| 11440 | 13 | 20010901 | 61920  | 77450  | <b>30810</b> | 37 | 20010924 | 47520  | 50990  |
| 11450 | 13 | 20010901 | 92730  | 107880 | <b>30821</b> | 39 | 20010925 | 7830   | 10480  |
| 11460 | 13 | 20010901 | 123120 | 138230 | <b>30830</b> | 37 | 20010924 | 36700  | 40330  |
| 11470 | 15 | 20010902 | 10     | 15670  | <b>30840</b> | 37 | 20010924 | 70270  | 73000  |
| 11480 | 15 | 20010902 | 31220  | 46710  | <b>30850</b> | 37 | 20010924 | 43790  | 47500  |
| 11490 | 15 | 20010902 | 62130  | 77420  | <b>30861</b> | 39 | 20010925 | 5220   | 7810   |
| 11500 | 15 | 20010902 | 15690  | 31200  | <b>30870</b> | 37 | 20010924 | 51000  | 54730  |
| 11510 | 15 | 20010902 | 46730  | 62120  | <b>30880</b> | 37 | 20010924 | 73010  | 75740  |
| 11520 | 15 | 20010902 | 77440  | 92570  | <b>30891</b> | 37 | 20010924 | 58520  | 62330  |
| 11530 | 15 | 20010902 | 107850 | 122980 | <b>30910</b> | 37 | 20010924 | 54750  | 58500  |
| 11540 | 15 | 20010902 | 131600 | 139970 | <b>30920</b> | 38 | 20010924 | 10     | 7850   |
| 11541 | 19 | 20010904 | 15440  | 24030  | <b>30930</b> | 38 | 20010924 | 15720  | 23530  |
| 11550 | 15 | 20010902 | 92580  | 107830 | <b>30940</b> | 38 | 20010924 | 31340  | 39170  |
| 11560 | 15 | 20010902 | 122990 | 131580 | <b>30950</b> | 38 | 20010924 | 7870   | 15700  |
| 11561 | 19 | 20010904 | 24050  | 32520  | <b>30960</b> | 38 | 20010924 | 23540  | 31330  |
| 11570 | 19 | 20010904 | 10     | 15420  | <b>30970</b> | 38 | 20010924 | 39180  | 47010  |
| 11580 | 19 | 20010904 | 32540  | 48450  | <b>30980</b> | 38 | 20010924 | 54850  | 62680  |
| 11590 | 19 | 20010904 | 48460  | 63770  | <b>30990</b> | 38 | 20010924 | 70540  | 78250  |
| 11600 | 17 | 20010903 | 10     | 15320  | <b>31000</b> | 38 | 20010924 | 47030  | 54840  |
| 11610 | 17 | 20010903 | 77300  | 92710  | <b>31010</b> | 38 | 20010924 | 62690  | 70520  |
| 11620 | 17 | 20010903 | 92730  | 108040 | <b>31020</b> | 38 | 20010924 | 78270  | 86000  |
| 11630 | 18 | 20010904 | 1670   | 16820  | <b>31030</b> | 38 | 20010924 | 93740  | 101610 |
| 11640 | 17 | 20010903 | 108050 | 123260 | <b>31040</b> | 38 | 20010924 | 109400 | 117190 |
| 11650 | 18 | 20010904 | 16830  | 32620  | <b>31050</b> | 38 | 20010924 | 86010  | 93720  |
| 11660 | 18 | 20010904 | 48080  | 63210  | <b>31060</b> | 38 | 20010924 | 101630 | 109380 |



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|       |    |          |        |        |       |    |          |        |        |
|-------|----|----------|--------|--------|-------|----|----------|--------|--------|
| 11670 | 18 | 20010904 | 78370  | 93600  | 31070 | 38 | 20010924 | 117200 | 124930 |
| 11680 | 18 | 20010904 | 32640  | 48070  | 31080 | 38 | 20010924 | 132760 | 140530 |
| 11690 | 18 | 20010904 | 63220  | 78350  | 31090 | 39 | 20010925 | 43380  | 51210  |
| 11700 | 18 | 20010904 | 93620  | 97390  | 31100 | 38 | 20010924 | 124950 | 132740 |
| 11701 | 18 | 20010904 | 97400  | 110310 | 31110 | 39 | 20010925 | 51230  | 59200  |
| 11710 | 18 | 20010904 | 125530 | 133600 | 31120 | 35 | 20010923 | 135930 | 143740 |
| 11711 | 19 | 20010904 | 72160  | 80470  | 31130 | 35 | 20010923 | 143750 | 151580 |
| 11720 | 18 | 20010904 | 133620 | 141750 | 31140 | 35 | 20010923 | 128050 | 135920 |
| 11721 | 19 | 20010904 | 63780  | 72150  | 31150 | 31 | 20010921 | 1530   | 9300   |
| 11730 | 18 | 20010904 | 110320 | 125510 | 31160 | 31 | 20010921 | 54720  | 62510  |
| 11740 | 19 | 20010904 | 80490  | 96180  | 31170 | 32 | 20010921 | 10     | 7850   |
| 11750 | 19 | 20010904 | 111690 | 127280 | 31180 | 32 | 20010921 | 15820  | 23670  |
| 11760 | 19 | 20010904 | 142800 | 158530 | 31194 | 42 | 20010928 | 11450  | 19520  |
| 11770 | 19 | 20010904 | 96190  | 111680 | 31200 | 32 | 20010921 | 7870   | 15800  |
| 11780 | 19 | 20010904 | 127300 | 142790 | 31210 | 32 | 20010921 | 23690  | 31620  |
| 11790 | 24 | 20010908 | 1640   | 17250  | 31220 | 36 | 20010923 | 10     | 8100   |
| 11800 | 24 | 20010908 | 33030  | 48480  | 31230 | 36 | 20010923 | 16290  | 24460  |
| 11810 | 24 | 20010908 | 64230  | 79800  | 31240 | 36 | 20010923 | 32550  | 40760  |
| 11820 | 24 | 20010908 | 17260  | 33010  | 31250 | 36 | 20010923 | 8110   | 16280  |
| 11830 | 24 | 20010908 | 48500  | 64210  | 31260 | 36 | 20010923 | 24480  | 32530  |
| 11840 | 24 | 20010908 | 79810  | 95320  | 31270 | 36 | 20010923 | 40770  | 48700  |
| 11850 | 24 | 20010908 | 110760 | 126310 | 31280 | 36 | 20010923 | 48720  | 56970  |
| 11860 | 24 | 20010908 | 141690 | 157200 | 31290 | 36 | 20010923 | 56990  | 64960  |
| 11870 | 24 | 20010908 | 95340  | 110750 | 31300 | 36 | 20010923 | 64980  | 70190  |
| 11880 | 24 | 20010908 | 126320 | 141670 | 31310 | 36 | 20010923 | 75210  | 80500  |
| 11890 | 25 | 20010909 | 1580   | 4950   | 31320 | 36 | 20010923 | 85520  | 90770  |
| 11891 | 25 | 20010909 | 4960   | 20890  | 31330 | 36 | 20010923 | 70200  | 75190  |
| 11900 | 25 | 20010909 | 37010  | 52580  | 31340 | 36 | 20010923 | 80510  | 85500  |
| 11910 | 25 | 20010909 | 69010  | 84600  | 31350 | 36 | 20010923 | 90780  | 95710  |
| 11920 | 25 | 20010909 | 20910  | 37000  | 31360 | 36 | 20010923 | 100990 | 105940 |
| 11930 | 25 | 20010909 | 52590  | 69000  | 31370 | 36 | 20010923 | 111210 | 116300 |
| 11940 | 23 | 20010907 | 122850 | 138020 | 31380 | 36 | 20010923 | 95720  | 100970 |
| 11950 | 23 | 20010907 | 92350  | 107580 | 31390 | 36 | 20010923 | 105950 | 111200 |
| 11960 | 23 | 20010907 | 138030 | 153240 | 31400 | 36 | 20010923 | 116320 | 121550 |
| 11970 | 23 | 20010907 | 107600 | 122830 | 31410 | 36 | 20010923 | 126520 | 131630 |
| 11980 | 23 | 20010907 | 77170  | 92340  | 31420 | 39 | 20010923 | 59220  | 64150  |
| 11990 | 23 | 20010907 | 46650  | 61900  | 31430 | 36 | 20010923 | 121560 | 126510 |
| 12000 | 23 | 20010907 | 16190  | 31420  | 31440 | 36 | 20010923 | 131650 | 136620 |
| 12010 | 23 | 20010907 | 61910  | 77160  | 31450 | 39 | 20010925 | 64170  | 69120  |
| 12020 | 23 | 20010907 | 31430  | 46640  | 31460 | 39 | 20010925 | 74120  | 79130  |
| 12030 | 23 | 20010907 | 10     | 16170  | 31470 | 39 | 20010925 | 84130  | 89160  |
| 12040 | 22 | 20010907 | 127920 | 143230 | 31480 | 39 | 20010925 | 69140  | 74110  |
| 12050 | 22 | 20010907 | 96610  | 112080 | 31490 | 39 | 20010925 | 79150  | 84120  |
| 12060 | 22 | 20010907 | 143250 | 158720 | 31500 | 39 | 20010925 | 89180  | 94130  |
| 12070 | 22 | 20010907 | 112090 | 127900 | 31510 | 39 | 20010925 | 99190  | 104160 |
| 12080 | 22 | 20010907 | 80730  | 96600  | 31520 | 39 | 20010925 | 109220 | 114150 |
| 12090 | 22 | 20010907 | 49040  | 65070  | 31530 | 39 | 20010925 | 94140  | 99170  |
| 12100 | 22 | 20010907 | 17000  | 33170  | 31540 | 39 | 20010925 | 104180 | 109210 |
| 12111 | 22 | 20010907 | 65090  | 80720  | 31550 | 39 | 20010925 | 114160 | 119170 |
| 12120 | 22 | 20010907 | 33190  | 49020  | 31560 | 39 | 20010925 | 124160 | 129190 |
| 12130 | 21 | 20010906 | 1610   | 16980  | 31570 | 39 | 20010925 | 134150 | 139120 |
| 12140 | 21 | 20010906 | 46480  | 62430  | 31580 | 39 | 20010925 | 119180 | 124150 |
| 12150 | 21 | 20010906 | 15380  | 31330  | 31590 | 39 | 20010925 | 129200 | 134130 |
| 12160 | 21 | 20010906 | 16880  | 32810  | 31600 | 40 | 20010925 | 10     | 5270   |
| 12170 | 21 | 20010906 | 31350  | 46460  | 31610 | 40 | 20010925 | 10410  | 15680  |
| 12180 | 21 | 20010906 | 10     | 15370  | 31620 | 40 | 20010925 | 20800  | 26090  |
| 12190 | 21 | 20010906 | 1640   | 16870  | 31630 | 40 | 20010925 | 5280   | 10390  |
| 12200 | 20 | 20010905 | 1600   | 17010  | 31650 | 40 | 20010925 | 26110  | 31200  |





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|              |    |          |        |        |              |    |          |        |        |
|--------------|----|----------|--------|--------|--------------|----|----------|--------|--------|
| <b>12210</b> | 20 | 20010905 | 32440  | 47750  | <b>31660</b> | 40 | 20010925 | 36630  | 41740  |
| <b>12220</b> | 20 | 20010905 | 63200  | 78550  | <b>31670</b> | 40 | 20010925 | 47180  | 52270  |
| <b>12230</b> | 20 | 20010905 | 17020  | 32430  | <b>31680</b> | 40 | 20010925 | 15690  | 20780  |
| <b>12240</b> | 20 | 20010905 | 47770  | 63180  | <b>31681</b> | 40 | 20010925 | 31220  | 36610  |
| <b>12250</b> | 20 | 20010905 | 78570  | 94020  | <b>31690</b> | 40 | 20010925 | 41750  | 47160  |
| <b>12260</b> | 20 | 20010905 | 109210 | 124540 | <b>31701</b> | 40 | 20010925 | 1770   | 6800   |
| <b>12270</b> | 20 | 20010905 | 139700 | 154890 | <b>31710</b> | 41 | 20010925 | 11790  | 16760  |
| <b>12280</b> | 20 | 20010905 | 94030  | 109200 | <b>31720</b> | 41 | 20010927 | 21740  | 26750  |
| <b>12290</b> | 20 | 20010905 | 124550 | 139680 | <b>31730</b> | 40 | 20010925 | 6810   | 11780  |
| <b>12300</b> | 25 | 20010909 | 84620  | 101070 | <b>31740</b> | 41 | 20010927 | 16770  | 21720  |
| <b>12310</b> | 26 | 20010909 | 10     | 15030  | <b>31750</b> | 41 | 20010927 | 26770  | 31680  |
| <b>12320</b> | 26 | 20010909 | 30660  | 45950  | <b>31760</b> | 41 | 20010927 | 36720  | 41670  |
| <b>12330</b> | 25 | 20010909 | 101080 | 114730 | <b>31770</b> | 41 | 20010927 | 46640  | 51610  |
| <b>12332</b> | 25 | 20010909 | 10     | 15950  | <b>31780</b> | 41 | 20010927 | 31700  | 36710  |
| <b>12340</b> | 26 | 20010909 | 15050  | 30640  | <b>31790</b> | 41 | 20010927 | 41680  | 46630  |
| <b>12350</b> | 26 | 20010909 | 45960  | 61330  | <b>31800</b> | 41 | 20010927 | 51630  | 56560  |
| <b>12360</b> | 26 | 20010909 | 76510  | 91700  | <b>31810</b> | 41 | 20010927 | 61860  | 66870  |
| <b>12370</b> | 26 | 20010909 | 106810 | 122020 | <b>31820</b> | 41 | 20010927 | 71840  | 76710  |
| <b>12380</b> | 26 | 20010909 | 61350  | 76500  | <b>31830</b> | 41 | 20010927 | 56570  | 61840  |
| <b>12390</b> | 26 | 20010909 | 91710  | 106800 | <b>31840</b> | 41 | 20010927 | 66890  | 71820  |
| <b>12400</b> | 26 | 20010909 | 122030 | 137160 | <b>31900</b> | 39 | 20010925 | 35590  | 43360  |
| <b>12410</b> | 27 | 20010910 | 1580   | 16630  | <b>90010</b> | 1  | 20010814 | 1780   | 16570  |
| <b>12420</b> | 27 | 20010910 | 31960  | 46950  | <b>90020</b> | 1  | 20010814 | 16590  | 31560  |
| <b>12430</b> | 26 | 20010909 | 137180 | 156450 | <b>90030</b> | 1  | 20010814 | 31580  | 46770  |
| <b>12440</b> | 27 | 20010910 | 16640  | 31950  | <b>90040</b> | 2  | 20010815 | 10     | 15090  |
| <b>12450</b> | 27 | 20010910 | 46970  | 62300  | <b>90050</b> | 2  | 20010815 | 15100  | 29770  |
| <b>12460</b> | 27 | 20010910 | 77290  | 92780  | <b>90060</b> | 2  | 20010815 | 29780  | 44430  |
| <b>12470</b> | 27 | 20010910 | 107770 | 123180 | <b>90070</b> | 2  | 20010815 | 44440  | 58990  |
| <b>12480</b> | 27 | 20010910 | 62310  | 77280  | <b>90080</b> | 3  | 20010816 | 2040   | 16790  |
| <b>12490</b> | 27 | 20010910 | 92790  | 107760 | <b>90090</b> | 3  | 20010816 | 16800  | 31670  |
| <b>12500</b> | 27 | 20010910 | 123200 | 138190 | <b>90100</b> | 3  | 20010816 | 31680  | 46390  |
| <b>12510</b> | 28 | 20010910 | 10     | 15340  | <b>90110</b> | 3  | 20010816 | 46400  | 61470  |
| <b>12520</b> | 28 | 20010910 | 31440  | 46970  | <b>90120</b> | 3  | 20010816 | 61490  | 76180  |
| <b>12530</b> | 27 | 20010910 | 138200 | 153490 | <b>90130</b> | 3  | 20010816 | 76190  | 91220  |
| <b>12540</b> | 28 | 20010910 | 15350  | 31420  | <b>90140</b> | 3  | 20010816 | 91230  | 105760 |
| <b>12550</b> | 28 | 20010910 | 46980  | 62930  | <b>90150</b> | 3  | 20010816 | 105770 | 113740 |
| <b>12560</b> | 28 | 20010910 | 78390  | 94360  | <b>90160</b> | 3  | 20010816 | 113750 | 121700 |
| <b>12570</b> | 28 | 20010910 | 109830 | 125800 | <b>90170</b> | 3  | 20010816 | 121710 | 129480 |
| <b>12580</b> | 28 | 20010910 | 62950  | 78380  | <b>90180</b> | 3  | 20010816 | 129500 | 137450 |
| <b>12590</b> | 28 | 20010910 | 94380  | 109810 | <b>90190</b> | 14 | 20010902 | 1650   | 9300   |
| <b>12600</b> | 29 | 20010911 | 1710   | 17260  | <b>90200</b> | 17 | 20010903 | 69570  | 77280  |
| <b>12610</b> | 29 | 20010911 | 33940  | 49870  | <b>90210</b> | 17 | 20010903 | 62010  | 69560  |
| <b>12620</b> | 29 | 20010911 | 66240  | 81990  | <b>90220</b> | 17 | 20010903 | 54340  | 61990  |
| <b>12630</b> | 29 | 20010911 | 17280  | 33930  | <b>90230</b> | 17 | 20010903 | 46360  | 54330  |
| <b>12640</b> | 29 | 20010911 | 49890  | 66220  | <b>90240</b> | 17 | 20010903 | 38650  | 46340  |
| <b>12650</b> | 29 | 20010911 | 82010  | 97860  | <b>90250</b> | 17 | 20010903 | 30790  | 38640  |
| <b>12660</b> | 29 | 20010911 | 113710 | 129540 | <b>90260</b> | 17 | 20010903 | 23070  | 30780  |
| <b>12670</b> | 29 | 20010911 | 145380 | 161330 | <b>90270</b> | 17 | 20010903 | 15340  | 23050  |
| <b>12680</b> | 29 | 20010911 | 97870  | 113700 | <b>90280</b> | 13 | 20010901 | 115530 | 123100 |
| <b>12690</b> | 29 | 20010911 | 129560 | 145370 | <b>90290</b> | 13 | 20010901 | 107900 | 115510 |
| <b>12700</b> | 29 | 20010911 | 161340 | 177050 | <b>92010</b> | 35 | 20010923 | 45270  | 50080  |
| <b>12710</b> | 31 | 20010921 | 9320   | 24390  | <b>92020</b> | 33 | 20010922 | 2310   | 3600   |
| <b>12720</b> | 31 | 20010921 | 39650  | 54700  | <b>92021</b> | 35 | 20010923 | 50090  | 54960  |
| <b>12730</b> | 29 | 20010911 | 177070 | 192620 | <b>92030</b> | 33 | 20010922 | 3610   | 6880   |
| <b>12740</b> | 31 | 20010921 | 24410  | 39640  | <b>92031</b> | 35 | 20010923 | 54970  | 59520  |
| <b>20010</b> | 33 | 20010922 | 26890  | 31460  | <b>92040</b> | 33 | 20010922 | 6900   | 10250  |
| <b>20020</b> | 33 | 20010922 | 35830  | 40320  | <b>92041</b> | 35 | 20010923 | 59530  | 63460  |
| <b>20030</b> | 33 | 20010922 | 44640  | 49090  | <b>92050</b> | 33 | 20010922 | 10260  | 13970  |



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|              |    |          |        |        |              |    |          |        |        |
|--------------|----|----------|--------|--------|--------------|----|----------|--------|--------|
| <b>20040</b> | 33 | 20010922 | 31470  | 35820  | <b>92051</b> | 35 | 20010923 | 63470  | 66900  |
| <b>20050</b> | 33 | 20010922 | 40340  | 44630  | <b>92060</b> | 33 | 20010922 | 13980  | 17850  |
| <b>20060</b> | 33 | 20010922 | 49100  | 53390  | <b>92061</b> | 35 | 20010923 | 66910  | 69800  |
| <b>20070</b> | 33 | 20010922 | 57600  | 61710  | <b>92070</b> | 33 | 20010922 | 17870  | 22440  |
| <b>20080</b> | 33 | 20010922 | 65890  | 69960  | <b>92071</b> | 35 | 20010923 | 69810  | 73160  |
| <b>20090</b> | 33 | 20010922 | 53410  | 57580  | <b>92080</b> | 33 | 20010922 | 22450  | 26880  |
| <b>20100</b> | 33 | 20010922 | 61720  | 65870  | <b>92081</b> | 35 | 20010923 | 73170  | 78380  |
| <b>20110</b> | 33 | 20010922 | 69970  | 74500  | <b>92091</b> | 35 | 20010923 | 78400  | 83630  |
| <b>20120</b> | 33 | 20010922 | 78410  | 82520  | <b>92101</b> | 35 | 20010923 | 83650  | 88900  |
| <b>20130</b> | 33 | 20010922 | 86380  | 90450  | <b>92110</b> | 35 | 20010923 | 88910  | 94140  |
| <b>20140</b> | 33 | 20010922 | 74510  | 78400  | <b>92120</b> | 35 | 20010923 | 94150  | 99920  |
| <b>20150</b> | 33 | 20010922 | 82540  | 86370  | <b>92130</b> | 35 | 20010923 | 99940  | 105990 |
| <b>20160</b> | 33 | 20010922 | 90470  | 94240  | <b>92140</b> | 35 | 20010923 | 106010 | 112860 |
| <b>20170</b> | 33 | 20010922 | 98050  | 101760 | <b>92150</b> | 35 | 20010923 | 112870 | 120540 |
| <b>20180</b> | 33 | 20010922 | 105570 | 109280 | <b>92160</b> | 35 | 20010923 | 120550 | 128040 |



# APPENDIX 4

## Weekly Production Reports

# KEVRON GEOPHYSICS PTY LTD: Production Summary

**Job No: 1592B**

**Company Name: NT DEPARTMENT OF MINES AND ENERGY**

**Company Address: CENTREPOINT TOWER BUILDING**

Contact Name RICHARD BRESCIANINI

**SMITH STREET MALL**

**DARWIN NT 0828**

Project Name: STURT RIVER SURVEY

(08) 8999 5511

**Date Awarded: Demobilisation Date: 28/09/01**

**DIRECT PHONE: (08) 8999 5389**

**Total Estimated Value: \$0 Budgeted Line Kms: 25,710.0**

**Mobilisation Date: 13/08/01 Budgeted Flying Hours: 0**

**Date Completed: 28/09/01**

| Aircraft      | On Line Hours | Other Flying Hours | Total Flying Hours | Total Line Kms  | Total Reflown Km | Total Kms Flown | Total Fuel   | Start Date      | Last Date       | Last Flt No | Tot. Standby Time | Total Lost Days |
|---------------|---------------|--------------------|--------------------|-----------------|------------------|-----------------|--------------|-----------------|-----------------|-------------|-------------------|-----------------|
| KAC           | 151.4         | 74.3               | 225.7              | 33,669.9        | 1,353.9          | 35,023.8        | 20939        | 13/08/01        | 28/09/01        | 41          | 0                 | 24.5            |
| <b>Total:</b> | <b>151.4</b>  | <b>74.3</b>        | <b>225.7</b>       | <b>33,669.9</b> | <b>1,353.9</b>   | <b>35,023.8</b> | <b>20939</b> | <b>13/08/01</b> | <b>28/09/01</b> | <b>41</b>   | <b>0</b>          | <b>24.5</b>     |

|  |       |  |         |                              |      |
|--|-------|--|---------|------------------------------|------|
| <b>Average Production Rate Kms/On Line Hours</b>   | 222.4 | <b>Average Daily Production (production days only)</b> | 1,566.0 | <b>Litres per Hour</b>       | 92.1 |
| <b>Average Production Rate (Kms/Total Hours)</b>   | 149.2 | <b>OFFLINE Hours as % of Total Hours</b>               | 32.9%   | <b>Total Days On Job</b>     | 46.5 |
| <b>Average Daily Production over survey period</b> | 732.0 | <b>Reflight as % of Km Flown</b>                       | 3.9%    | <b>Total Production Days</b> | 21.0 |

**Operations & Processing Report  
STURT.**

---

WEEK COMMENCING MONDAY 06/08/2001

AIRCRAFT: **VH-KAC**

**CREW: PILOTS:** Rod Jamieson, Dave Chappell

**OPERATORS:** Mark Devenish, Leith Gardiner

| DAY/<br>DATE  | FLIGHT<br>No. | JOB<br>No. | TAKE<br>OFF<br>TIME | "ON LINE"<br>FLIGHT<br>HOURS | ALL OTHER<br>FLIGHT<br>HOURS | FUEL | OIL |   | KM<br>FLOWN | KM<br>REFLOWN | CREW |    | COMMENTS<br>(Routes Flown, Wx, Equipment &<br>A/C Servicing etc) |
|---------------|---------------|------------|---------------------|------------------------------|------------------------------|------|-----|---|-------------|---------------|------|----|--|
|               |               |            |                     |                              |                              |      | L   | R |             |               | PLT  | OR |  |
| MON.<br>06/08 |               |            |                     |                              |                              |      |     |   |             |               |      |    |  |
| TUES<br>07/08 |               |            |                     |                              |                              |      |     |   |             |               |      |    |  |
| WEDS<br>08/08 |               |            |                     |                              |                              |      |     |   |             |               |      |    |  |
| THU.<br>09/08 |               |            |                     |                              |                              |      |     |   |             |               |      |    |  |
| FRI.<br>10/08 |               |            |                     |                              |                              |      |     |   |             |               |      |    |  |
| SAT<br>11/08  | -             | 1592B      | -                   | -                            | -                            | -    |     |   | -           | -             |      |    | IN KUNUNURRA   |
| SUN.<br>12/08 | -             | 1592B      | -                   | -                            | -                            | -    |     |   | -           | -             |      |    | IN KUNUNURRA   |
| <b>TOTALS</b> |               |            |                     |                              |                              |      |     |   |             |               |      |    |  |

**SUMMARY**

|                 |  |         |
|-----------------|--|---------|
| FUEL USAGE      |  | Ltrs/Hr |
| OIL USAGE L:    |  | Ltrs/Hr |
| R:              |  | Ltrs/Hr |
| PRODUCTION RATE |  | Km/Hr   |

**PILOT SUMMARY:**

| NAME                | 'ON LINE' | OTHER<br>HRS | TOTALS |         |
|---------------------|-----------|--------------|--------|---------|
|                     |           |              | HOURS  | LINE KM |
|                     |           |              |        |         |
|                     |           |              |        |         |
|                     |           |              |        |         |
| <b>GRAND TOTALS</b> |           |              |        |         |

HOURS TO 120 HOURLY:

TOTAL A/C HOURS:



**Kevron**  
Geophysics Pty Ltd

Flown and Processed for  
Northern Territory Department Of Mines & Energy

Job No. 1592B  
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**Operations & Processing Report  
STURT.**

WEEK COMMENCING MONDAY 13/08/2001

AIRCRAFT: **VH-KAC**

**CREW: PILOTS:** Dave Chappell

**OPERATORS:** Mark Devenish, Leith Gardiner

| DAY/<br>DATE  | FLIGHT<br>No. | JOB<br>No. | TAKE<br>OFF<br>TIME | "ON LINE"<br>FLIGHT<br>HOURS | ALL OTHER<br>FLIGHT<br>HOURS | FUEL | OIL |   | KM<br>FLOWN | KM<br>REFLOWN | CREW |    | COMMENTS<br>(Routes Flown, Wx, Equipment &<br>A/C Servicing etc) |
|---------------|---------------|------------|---------------------|------------------------------|------------------------------|------|-----|---|-------------|---------------|------|----|--|
|               |               |            |                     |                              |                              |      | L   | R |             |               | PLT  | OR |  |
| MON.          | -             | 1592B      | 10.00               | -                            | 2.3                          | -    | -   | - | -           | -             | DC   | -  | FERRY KUNUNURRA – TINDALL  |
| 13/08         | -             | 1592B      | -                   | -                            | -                            | -    | -   | - | -           | -             | -    | -  | NO FLIGHT DUE ONLY 1 PILOT                                       |
| TUES          | 1             | 1592B      | 14.00               | -                            | 2.5                          | 192  | 1   | 2 | -           | -             | DC   | LG | FLIGHT OK  |
| 14/08         | -             | 1592B      | -                   | -                            | -                            | -    | -   | - | -           | -             | -    | -  | NO FLIGHT DUE ONLY 1 PILOT                                       |
| WEDS          | 2             | 1592B      | 7.02                | 3.9                          | 1.3                          | 530  | -   | 1 | 902.7       | -             | DC   | MD | FLIGHT OK  |
| 15/08         | -             | 1592B      | -                   | -                            | -                            | -    | -   | - | -           | -             | -    | -  | NO FLIGHT DUE ONLY 1 PILOT                                       |
| THU.          | 3             | 1592B      | 6.55                | 1.1                          | 1.4                          | 567  | 1   | 1 | 953.8       | -             | DC   | LG | FLIGHT OK  |
| 16/08         | -             | 1592B      | -                   | -                            | -                            | -    | -   | - | -           | -             | -    | -  | NO FLIGHT DUE ONLY 1 PILOT                                       |
| FRI.          | -             | 1592B      | -                   | -                            | -                            | -    | -   | - | -           | -             | -    | -  |  |
| 17/08         | -             | 1592B      | -                   | -                            | -                            | -    | -   | - | -           | -             | -    | -  |  |
| SAT           | 4             | 1592B      | 9.50                | 4.1                          | 1.5                          | 606  | 2   | 2 | 982.8       | -             | DC   | MD | FLIGHT OK  |
| 18/08         | -             | 1592B      | -                   | -                            | -                            | -    | -   | - | -           | -             | -    | -  | NO FLIGHT DUE ONLY 1 PILOT                                       |
| SUN.          | 5             | 1592B      | 7.03                | 4.2                          | 1.2                          | 584  | 1   | 2 | 1036.3      | -             | DC   | MD | FLIGHT OK  |
| 19/08         | -             | 1592B      | -                   | -                            | -                            | -    | -   | - | -           | -             | -    | -  | NO FLIGHT DUE ONLY 1 PILOT                                       |
| <b>TOTALS</b> |               |            |                     | 16.3                         | 10.2                         | 2479 | 5   | 8 | 3875.6      | -             | -    | -  |  |

**SUMMARY**

|                 |       |         |
|-----------------|-------|---------|
| FUEL USAGE      | 93.55 | Ltrs/Hr |
| OIL USAGE L:    | 0.19  | Ltrs/Hr |
| R:              | 0.31  | Ltrs/Hr |
| PRODUCTION RATE | 146.2 | Km/Hr   |

**PILOT SUMMARY:**

| NAME                | 'ON LINE' | OTHER<br>HRS | HOURS | LINE KM |
|---------------------|-----------|--------------|-------|---------|
| Dave Chappell       | 16.3      | 10.2         | 26.5  | 3875.6  |
| <b>GRAND TOTALS</b> |           |              | 26.5  | 3875.6  |

HOURS TO 120 HOURLY:

TOTAL A/C HOURS:



**Kevron**  
Geophysics Pty Ltd

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Job No. 1592B  
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**Operations & Processing Report**  
**STURT.**

WEEK COMMENCING MONDAY 20/ 08/ 2001

AIRCRAFT: **VH-KAC**

**CREW: PILOTS:** Dave Chappell

**OPERATORS:** Mark Devenish

| DAY/<br>DATE  | FLIGHT<br>No. | JOB<br>No. | TAKE<br>OFF<br>TIME | "ON LINE"<br>FLIGHT<br>HOURS | ALL OTHER<br>FLIGHT<br>HOURS | FUEL | OIL |   | KM<br>FLOWN | KM<br>REFLOWN | CREW |    | COMMENTS<br>(Routes Flown, Wx, Equipment &<br>A/C Servicability etc) |
|---------------|---------------|------------|---------------------|------------------------------|------------------------------|------|-----|---|-------------|---------------|------|----|--|
|               |               |            |                     |                              |                              |      | L   | R |             |               | PLT  | OR |  |
| MON.<br>20/08 | -             | 1592B      | 06.35               | -                            | 1.4                          | 150  | 1   | 2 | -           | -             | DC   | MD | AADC U/S   |
|               | -             | 1592B      | -                   | -                            | -                            | -    | -   | - | -           | -             | -    | -  |  |
| TUES<br>21/08 | 6             | 1592B      | 15.00               | -                            | 2.0                          | 285  | -   | - | -           | -             | DC   | MD | COMP BOX U/S   |
|               | -             | 1592B      | -                   | -                            | -                            | -    | -   | - | -           | -             | -    | -  | -  |
| WEDS<br>22/08 | 7             | 1592B      | 06.58               | 4.8                          | 1.0                          | 578  | 1   | 1 | 1036.1      | -             | DC   | MD | FLIGHT OK  |
|               | -             | 1592B      | -                   | -                            | -                            | -    | -   | - | -           | -             | -    | -  | NO PM FLIGHT DUE 1 PILOT   |
| THU.<br>23/08 | 8             | 1592B      | 07.22               | 4.3                          | 1.1                          | 588  | 1   | 1 | 1036.0      | -             | DC   | MD | FLIGHT OK  |
|               | -             | 1592B      | -                   | -                            | -                            | -    | -   | - | -           | -             | -    | -  | NO PM FLIGHT DUE 1 PILOT   |
| FRI.<br>24/08 | 9             | 1592B      | 07.00               | 3.7                          | 1.0                          | -    | 2   | 2 | 920.7       | -             | DC   | MD | FLIGHT OK  |
|               | -             | 1592B      | -                   | -                            | -                            | -    | -   | - | -           | -             | -    | -  | NO PM FLIGHT DUE 1 PILOT   |
| SAT<br>25/08  | -             | 1593       | 06.50               | -                            | 1.5                          | 378  | -   | 1 | -           | -             | DC   | -  | FERRY TO KUNUNURRA   |
|               | -             | 1593       | -                   | -                            | -                            | -    | -   | - | -           | -             | -    | -  | 100 HOURLY   |
| SUN.<br>26/08 | -             | 1593       | -                   | -                            | -                            | -    | -   | - | -           | -             | -    | -  | 100 HOURLY   |
|               | -             | 1593       | -                   | -                            | -                            | -    | -   | - | -           | -             | -    | -  | 100 HOURLY   |
| <b>TOTALS</b> |               |            |                     | 12.8                         | 8                            | 1979 | 5   | 7 | 2992.8      | -             | -    | -  |  |

**SUMMARY**

|                 |       |         |
|-----------------|-------|---------|
| FUEL USAGE      | 95.1  | Ltrs/Hr |
| OIL USAGE L:    | 0.24  | Ltrs/Hr |
| R:              | 0..33 | Ltrs/Hr |
| PRODUCTION RATE | 143.8 | Km/Hr   |

**PILOT SUMMARY:**

| NAME                | 'ON LINE' | OTHER<br>HRS | TOTALS |         |
|---------------------|-----------|--------------|--------|---------|
|                     |           |              | HOURS  | LINE KM |
| Dave Chappell       | 12.8      | 8            | 20.8   | 2992.8  |
| <b>GRAND TOTALS</b> |           |              | 20.8   | 2992.8  |

HOURS TO 120 HOURLY:

TOTAL A/C HOURS:



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Job No. 1592B  
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**Operations & Processing Report  
STURT.**

WEEK COMMENCING MONDAY 27/ 08/ 2001

AIRCRAFT: **VH-KAC**

**CREW: PILOTS:** Dave Chappell, Ivan Hussein

**OPERATORS:** Mark Devenish, Leith Gardiner

| DAY/<br>DATE  | FLIGHT<br>No. | JOB<br>No. | TAKE<br>OFF<br>TIME | "ON LINE"<br>FLIGHT<br>HOURS | ALL OTHER<br>FLIGHT<br>HOURS | FUEL   | OIL |   | KM<br>FLOWN | KM<br>REFLOWN | CREW |    | COMMENTS<br><br>(Routes Flown, Wx, Equipment &<br>A/C Servicability etc) |
|---------------|---------------|------------|---------------------|------------------------------|------------------------------|--------|-----|---|-------------|---------------|------|----|--|
|               |               |            |                     |                              |                              |        | L   | R |             |               | PLT  | OR |  |
| MON.<br>27/08 | -             | 1592B      | -                   | -                            | -                            | -      | -   | - | -           | -             | -    | -  | NO FLIGHTS DUE 100 HOURLY  |
|               | -             | 1592B      | -                   | -                            | -                            | -      | -   | - | -           | -             | -    | -  | 100 HOURLY   |
| TUES<br>28/08 | -             | 1592B      | -                   | -                            | -                            | -      | -   | - | -           | -             | -    | -  | 100 HOURLY   |
|               | -             | 1592B      | 16.30               | -                            | 0.8                          | 204    | -   | - | -           | -             | IH   | RH | TEST FLIGHT  |
| WEDS<br>29/08 | 1             | 1592B      | 12.00               | 2.3                          | 1.7                          | 341    | 1   | 2 | 472.4       | -             | DC   | IH | OKAY   |
|               | -             | 1592B      |                     | -                            | -                            |        | -   | - |             | -             | -    | -  | NO PM FLIGHT   |
| THU.<br>30/08 | -             | 1592B      | 10.30               | -                            | 1.5                          | 379    | -   | - |             | -             | IH   | DC | FERRY KUNUNURRA – Kath   |
|               | -             | 1592B      |                     | -                            | -                            |        | -   | - |             | -             | -    | -  |  |
| FRI.<br>31/08 | 10            | 1592B      | 6.46                | 4.3                          | 0.9                          | 560    | -   | 1 | 1035.6      | -             | DC   | MD | OK   |
|               | 11            | 1592B      | 13.00               | 3.9                          | 1.0                          | 493    | 2   | 1 | 920.4       | -             | IH   | LG | OK   |
| SAT<br>01/09  | 12            | 1592B      | 6.35                | 4.3                          | 0.9                          | 575    | 1   | 1 | 973.7       | -             | IH   | LG | OK   |
|               | 13            | 1592B      | 12.46               | 4.0                          | 1.0                          | 539    | 1   | 1 | 1015.1      | -             | DC   | MD | OK   |
| SUN.<br>02/09 | 14            | 1592B      | 6.33                | 0.3                          | 1.5                          | 213    | -   | - | 55.4        | -             | DC   | MD | THICK SMOKE  |
|               | 15            | 1592B      | 12.44               | 4.0                          | 1.0                          | 553    | 1   | 1 | 1031.0      | -             | IH   | LG | OK – SMOKE IN AREA   |
| <b>TOTALS</b> |               |            |                     | 23.1                         | 10.3                         | 3857.0 | 6   | 7 | 5503.6      | 0             | -    | -  |  |

| SUMMARY | FUEL USAGE          |         |         | Ltrs/Hr | PILOT SUMMARY: | NAME | 'ON LINE' | OTHER<br>HRS | TOTALS  |        |
|---------|---------------------|---------|---------|---------|----------------|------|-----------|--------------|---------|--------|
|         | HOURS               | LINE KM | HOURS   |         |                |      |           |              | LINE KM |        |
|         | OIL USAGE L:        | 0.18    | Ltrs/Hr |         | Dave Chappell  | 10.9 | 5.1       | 16.0         | 2578.5  |        |
|         | R:                  | 0.21    | Ltrs/Hr |         | Ivan Hussein   | 12.2 | 5.2       | 17.4         | 2925.1  |        |
|         | PRODUCTION RATE     | 164.8   | Km/Hr   |         |                |      |           |              |         |        |
|         | <b>GRAND TOTALS</b> |         |         |         |                |      |           |              | 33.4    | 5503.6 |

HOURS TO 120 HOURLY: **86.6**

TOTAL A/C HOURS: **25,712.0**



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Job No. 1592B  
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**Operations & Processing Report  
STURT.**

WEEK COMMENCING MONDAY 3/09/2001

AIRCRAFT: **VH-KAC**

CREW: PILOTS: Dave Chappell, Ivan Hussein

OPERATORS: Mark Devenish, Leith Gardiner

| DAY/<br>DATE  | FLIGHT<br>No. | JOB<br>No. | TAKE<br>OFF<br>TIME | "ON LINE"<br>FLIGHT<br>HOURS | ALL OTHER<br>FLIGHT<br>HOURS | FUEL | OIL |   | KM<br>FLOWN | KM<br>REFLOWN | CREW |    | COMMENTS<br><br>(Routes Flown, Wx, Equipment &<br>A/C Servicability etc) |
|---------------|---------------|------------|---------------------|------------------------------|------------------------------|------|-----|---|-------------|---------------|------|----|--|
|               |               |            |                     |                              |                              |      | L   | R |             |               | PLT  | OR |  |
| MON.<br>3/09  | -             | 1592B      | 6.30                | -                            | 1.2                          | -    | -   | - | -           | -             | IH   | LG | FLIGHT ABORTED DUE NO VIS  |
|               | 17            | 1592B      | 12.40               | 3.9                          | 0.9                          | 514  | 1   | 1 | 882.4       | -             | DC   | MD | OK, THICK SMOKE  |
| TUES<br>4/09  | 18            | 1592B      | 6.28                | 4.1                          | 0.9                          | 567  | -   | - | 1012.7      | -             | DC   | MD | OK   |
|               | 19            | 1592B      | 12.15               | 4.6                          | 0.9                          | 593  | 2   | 1 | 1104.8      | -             | IH   | LG | OK   |
| WEDS<br>5/09  | 20            | 1592B      | 9.56                | 4.4                          | 1.0                          | 583  | -   | - | 1131.1      | -             | DC   | MD | OK   |
|               | -             | 1592B      | -                   | -                            | -                            | -    | -   | - | -           | -             | -    | -  | A/C MAINT (OIL CHANGE ETC)   |
| THU.<br>6/09  | 21            | 1592B      | 6.30                | 2.9                          | 2.0                          | 528  | -   | - | 678.6       | -             | IH   | LG | EARLY RETURN DUE GPS   |
|               | -             | 1592B      | 13.30               | -                            | 2.2                          | 289  | 1   | 1 | -           | -             | IH   | MD | SPAR INSPECTION IN DARWIN  |
| FRI.<br>7/09  | 22            | 1592B      | 7.10                | 4.5                          | 0.9                          | 568  | 1   | 1 | 1131.0      | -             | IH   | LG | OK   |
|               | 23            | 1592B      | 13.20               | 4.5                          | 0.8                          | -    | -   | - | 1131.1      | -             | DC   | MD | OK   |
| SAT<br>8/09   | -             | 1592B      | -                   | -                            | -                            | -    | -   | - | -           | -             | -    | -  | NO AM FLIGHT RH FUEL PROBS   |
|               | 24            | 1592B      | 12.36               | 4.3                          | 1.2                          | 534  | 1   | 1 | 1131.0      | -             | IH   | LG | OK   |
| SUN.<br>9/09  | 25            | 1592B      | 6.7                 | 4.2                          | 0.9                          | 590  | 1   | 1 | 904.8       | -             | IH   | LG | OK   |
|               | 26            | 1592B      | 13.16               | 4.4                          | 0.9                          | -    | -   | - | 1131.2      | -             | DC   | MD | OK   |
| <b>TOTALS</b> |               |            |                     | 41.8                         | 13.8                         | 4766 | 7   | 6 | 10,237.8    | -             | -    | -  |  |

**SUMMARY**

|                 |       |         |
|-----------------|-------|---------|
| FUEL USAGE      | 85.72 | Ltrs/Hr |
| OIL USAGE L:    | 0.13  | Ltrs/Hr |
| R:              | 0.11  | Ltrs/Hr |
| PRODUCTION RATE | 184.1 | Km/Hr   |

**PILOT SUMMARY:**

| NAME                | 'ON LINE' | OTHER<br>HRS | TOTALS |          |
|---------------------|-----------|--------------|--------|----------|
|                     |           |              | HOURS  | LINE KM  |
| Dave Chappell       | 21.3      | 4.5          | 25.8   | 5,288.5  |
| Ivan Hussein        | 20.5      | 9.3          | 29.8   | 4,950.2  |
| <b>GRAND TOTALS</b> |           |              | 55.6   | 10,238.7 |

HOURS TO 120 HOURLY:

TOTAL A/C HOURS:

**Operations & Processing Report  
STURT.**

WEEK COMMENCING MONDAY 10/ 09/ 2001

AIRCRAFT: **VH-KAC**

**CREW: PILOTS:** Dave Chappell, Ivan Hussein

**OPERATORS:** Mark Devenish, Leith Gardiner

| DAY/<br>DATE  | FLIGHT<br>No. | JOB<br>No. | TAKE<br>OFF<br>TIME | "ON LINE"<br>FLIGHT<br>HOURS | ALL OTHER<br>FLIGHT<br>HOURS | FUEL | OIL |   | KM<br>FLOWN | KM<br>REFLOWN | CREW |    | COMMENTS<br>(Routes Flown, Wx, Equipment &<br>A/C Servicing etc) |
|---------------|---------------|------------|---------------------|------------------------------|------------------------------|------|-----|---|-------------|---------------|------|----|--|
|               |               |            |                     |                              |                              |      | L   | R |             |               | PLT  | OR |  |
| MON.<br>10/09 | 27            | 1592B      | 6.25                | 4.3                          | 1.0                          | 537  | 1   | 1 | 1131.3      | -             | DC   | MD | OK   |
|               | 28            | 1592B      | 13.20               | 3.7                          | 0.9                          | 516  | 1   | 1 | 904.8       | -             | IH   | LG | OK   |
| TUES<br>11/09 | 29            | 1592B      | 10.10               | 5.5                          | 1.0                          | 74   | 1   | 1 | 1357.2      | -             | IH   | LG | OK   |
|               | -             | 1592B      | -                   | -                            | -                            | 592  | -   | - | -           | -             | -    | -  | -  |
| WEDS<br>12/09 | 30            | 1592B      | 9.18                | 4.4                          | 1.3                          | 587  | 2   | 1 | -           | 1035.6        | DC   | LG | OK   |
|               | -             | 1592B      | -                   | -                            | -                            | -    | -   | - | -           | -             | -    | -  | -  |
| THU.<br>13/09 | -             | 1592B      | 9.30                | -                            | 0.2                          | -    | -   | - | -           | -             | IH   | LG | AM FLIGHT CANCELLED, NAV   |
|               | -             | 1592B      | 13.00               | -                            | 4.7                          | -    | -   | - | -           | -             | IH   | -  | KATH – ALICE 100 HOURLY  |
| FRI.<br>14/09 | -             | 1592B      | -                   | -                            | -                            | -    | -   | - | -           | -             | -    | -  | 100 HOURLY   |
|               | -             | 1592B      | -                   | -                            | -                            | -    | -   | - | -           | -             | -    | -  | 100 HOURLY   |
| SAT<br>15/09  | -             | 1592B      | -                   | -                            | -                            | -    | -   | - | -           | -             | -    | -  | 100 HOURLY   |
|               | -             | 1592B      | -                   | -                            | -                            | -    | -   | - | -           | -             | -    | -  | 100 HOURLY   |
| SUN.<br>16/09 | -             | 1592B      | -                   | -                            | -                            | -    | -   | - | -           | -             | -    | -  | 100 HOURLY   |
|               | -             | 1592B      | -                   | -                            | -                            | -    | -   | - | -           | -             | -    | -  | 100 HOURLY   |
| <b>TOTALS</b> |               |            |                     | 17.9                         | 9.1                          | 2306 | 5   | 4 | 3393.3      | 1035.6        | -    | -  |  |

**SUMMARY**

|                 |       |         |
|-----------------|-------|---------|
| FUEL USAGE      | 85.4  | Ltrs/Hr |
| OIL USAGE L:    | 0.18  | Ltrs/Hr |
| R:              | 0.15  | Ltrs/Hr |
| PRODUCTION RATE | 164.0 | Km/Hr   |

**PILOT SUMMARY:**

| NAME                | 'ON LINE' | OTHER<br>HRS | HOURS | LINE KM |
|---------------------|-----------|--------------|-------|---------|
| Dave Chappell       | 8.7       | 2.3          | 11.0  | 2166.9  |
| Ivan Hussein        | 9.2       | 6.8          | 16.0  | 2262.0  |
| <b>GRAND TOTALS</b> |           |              | 27.0  | 4428.9  |

HOURS TO 120 HOURLY:

TOTAL A/C HOURS:



**Kevron**  
Geophysics Pty Ltd

Flown and Processed for  
Northern Territory Department Of Mines & Energy

Job No. 1592B  
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**Operations & Processing Report  
STURT.**

WEEK COMMENCING MONDAY 17/ 09/ 2001

AIRCRAFT: **VH-KAC**

**CREW: PILOTS:** Dave Chappell, Ivan Hussein

**OPERATORS:** Brett Archer, Leith Gardiner

| DAY/<br>DATE  | FLIGHT<br>No. | JOB<br>No. | TAKE<br>OFF<br>TIME | "ON LINE"<br>FLIGHT<br>HOURS | ALL OTHER<br>FLIGHT<br>HOURS | FUEL | OIL |   | KM<br>FLOWN | KM<br>REFLOWN | CREW |    | COMMENTS<br><br>(Routes Flown, Wx, Equipment &<br>A/C Servicing etc) |
|---------------|---------------|------------|---------------------|------------------------------|------------------------------|------|-----|---|-------------|---------------|------|----|--|
|               |               |            |                     |                              |                              |      | L   | R |             |               | PLT  | OR |  |
| MON.<br>17/09 | -             | 1592B      | -                   | -                            | -                            |      |     |   | -           | -             | -    | -  | 100 Hourly in Alice  |
|               | -             | 1592B      | -                   | -                            | -                            |      |     |   | -           | -             | -    | -  | 100 Hourly in Alice  |
| TUES<br>18/09 | -             | 1592B      | -                   | -                            | -                            |      |     |   | -           | -             | -    | -  | 100 Hourly in Alice  |
|               | -             | 1592B      | -                   | -                            | -                            |      |     |   | -           | -             | -    | -  | 100 Hourly in Alice  |
| WEDS<br>19/09 | -             | 1592B      | -                   | -                            | -                            |      |     |   | -           | -             | -    | -  | 100 Hourly in Alice  |
|               | -             | 1592B      | -                   | -                            | -                            |      |     |   | -           | -             | -    | -  | 100 Hourly in Alice  |
| THU.<br>20/09 | -             | 1592B      | -                   | -                            | -                            |      |     |   | -           | -             | -    | -  | 100 Hourly in Alice  |
|               | -             | 1592B      | 14.15               | -                            | 3.5                          | 546  | -   | - | -           | -             | IH   | BA | Ferry Alice – Katherine  |
| FRI.<br>21/09 | 31            | 1592B      | 8.00                | 2.6                          | 0.5                          | 336  | -   | - | 454.1       | -             | DC   | LG | Early return, Nav Computer Problem                                   |
|               | 32            | 1592B      | 14.06               | 1.0                          | 0.4                          | 181  | 1   |   | 230         | -             | DC   | LG | Early return, Nav Computer Problem                                   |
| SAT<br>22/09  | 33            | 1592B      | 6.35                | 4.3                          | 1.0                          | 522  | 1   | 1 | 8918        | -             | IH   | BA | Flight OK  |
|               | 34            | 1592B      | 12.38               | 4.8                          | 0.6                          | 575  | 1   | 1 | 918.6       | -             | DC   | LG | Flight OK  |
| SUN.<br>23/09 | 35            | 1592B      | 6.33                | 4.9                          | 0.7                          | 591  | -   | - | 1052.6      | -             | DC   | LG | Flight OK  |
|               | 36            | 1592B      | 13.10               | 4.2                          | 0.7                          | -    | 1   | 1 | 963.4       | -             | IH   | BA | Flight OK  |
| <b>TOTALS</b> |               |            |                     | 21.8                         | 7.4                          | 2751 | 4   | 3 | 4510.5      | 0             | -    | -  |  |

**SUMMARY**

|                 |       |         |
|-----------------|-------|---------|
| FUEL USAGE      | 94.2  | Ltrs/Hr |
| OIL USAGE L:    | 0.14  | Ltrs/Hr |
| R:              | 0.10  | Ltrs/Hr |
| PRODUCTION RATE | 154.5 | Km/Hr   |

**PILOT SUMMARY:**

| NAME                | 'ON LINE' | OTHER<br>HRS | TOTALS |         |
|---------------------|-----------|--------------|--------|---------|
|                     |           |              | HOURS  | LINE KM |
| Dave Chappell       | 13.3      | 2.2          | 15.5   | 2655.3  |
| Ivan Hussein        | 8.5       | 5.2          | 13.7   | 1855.2  |
| <b>GRAND TOTALS</b> |           |              | 29.2   | 4510.5  |

HOURS TO 120 HOURLY: **90.8**

TOTAL A/C HOURS: **25,823.8**



**Kevron**  
Geophysics Pty Ltd

Flown and Processed for  
Northern Territory Department Of Mines & Energy

Job No. 1592B  
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**Operations & Processing Report  
STURT.**

WEEK COMMENCING MONDAY 24 / 09 / 2001 AIRCRAFT: VH-KAC CREW: PILOTS: Max Eichorn, Mark Rooney, Ivan Hussein, Dave Chappell

OPERATORS: Kevin Cahill, Rob Deopel

| DAY/<br>DATE  | FLIGHT<br>No. | JOB<br>No. | TAKE<br>OFF<br>TIME | "ON LINE"<br>FLIGHT<br>HOURS | ALL OTHER<br>FLIGHT<br>HOURS | FUEL | OIL |   | KM<br>FLOWN | KM<br>REFLOWN | CREW |    | COMMENTS<br><br>(Routes Flown, Wx, Equipment &<br>A/C Servicability etc) |
|---------------|---------------|------------|---------------------|------------------------------|------------------------------|------|-----|---|-------------|---------------|------|----|--|
|               |               |            |                     |                              |                              |      | L   | R |             |               | PLT  | OR |  |
| MON.<br>24/09 | 37            | 1592B      | 6.35                | 4.9                          | 0.7                          | 577  | -   | 1 | 929.7       | -             | IH   | LG | OK   |
|               | 38            | 1592B      | 12.40               | 4.1                          | 0.7                          | 476  | 2   | 1 | 1035        | -             | DC   | LG | OK   |
| TUES<br>25/09 | 39            | 1592B      | 6.35                | 4.5                          | 0.5                          | 551  | 1   | 1 | 687.8       | 282.4         | DC   | LG | OK   |
|               | 40            | 1592B      | 12.40               | 1.9                          | 0.6                          | 348  | -   | - | -           | -             | IH   | LG | Early return due Nav comp Problem  |
| WEDS<br>26/09 | -             | 1592B      | 9.40                | -                            | 0.9                          | -    | -   | - | -           | -             | IH   | LG | Ferry Katherine - Darwin   |
|               | -             | 1592B      | 15.00               | -                            | 1.1                          | 95   | -   | - | -           | -             | IH   | LG | Ferry Darwin to Katherine  |
| THU.<br>27/09 | 41            | 1592B      | 8.38                | 2.3                          | 0.8                          | 413  | 1   | 1 | 502.6       | 35.9          | DC   | IH | OK, Job Completed  |
|               | -             | 1592B      | 5.15                | -                            | 3.6                          | 351  | -   | - | -           | -             | IH   | DC | Ferry Katherine - Alice  |
| FRI.<br>28/09 | -             | 1592B      | -                   | -                            | 1.4                          |      | -   | - | -           | -             | ME   | MR | Ferry Alice - Marqua   |
|               |               |            |                     |                              |                              |      |     |   |             |               |      |    |  |
| SAT<br>29/09  |               |            |                     |                              |                              |      |     |   |             |               |      |    |  |
|               |               |            |                     |                              |                              |      |     |   |             |               |      |    |  |
| SUN.<br>30/09 |               |            |                     |                              |                              |      |     |   |             |               |      |    |  |
|               |               |            |                     |                              |                              |      |     |   |             |               |      |    |  |
| <b>TOTALS</b> |               |            |                     |                              |                              |      |     |   |             |               |      |    |  |

| SUMMARY             | FUEL USAGE      |         | Ltrs/Hr | PILOT SUMMARY: | NAME | 'ON LINE' | OTHER<br>HRS | TOTALS |  |
|---------------------|-----------------|---------|---------|----------------|------|-----------|--------------|--------|--|
|                     | HOURS           | LINE KM |         |                |      |           |              |        |  |
|                     |                 |         |         |                |      |           |              |        |  |
|                     | OIL USAGE L:    |         | Ltrs/Hr |                |      |           |              |        |  |
|                     | R:              |         | Ltrs/Hr |                |      |           |              |        |  |
|                     |                 |         |         |                |      |           |              |        |  |
|                     | PRODUCTION RATE |         | Km/Hr   |                |      |           |              |        |  |
| <b>GRAND TOTALS</b> |                 |         |         |                |      |           |              |        |  |

HOURS TO 120 HOURLY: **47.5**

TOTAL A/C HOURS: **25,867.9**



Flown and Processed for  
Northern Territory Department Of Mines & Energy

Job No. 1592B  
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# APPENDIX 5

## Radiometric Calibrations and Test Results

# APPENDIX 6

## Digital Data Formats

**STURT MAGNETICS DATA DESCRIPTION FILE**

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Survey Name: Sturt  
Survey Date: August 2001  
Airborne Contractor: Kevron Geophysics  
Contractor Job Number: 1592B  
Processing Contractor: Kevron Geophysics  
Client: Department of Mines and Energy Northern Territory

1:250 000 sheets flown in Located Data File:

Larrimah SE53-13  
Daly Waters SE53-01

1:100 000 sheets flown in Located Data File:

Dry River 5367  
Elsey 5467  
Birimba 5366  
Western Creek 5466  
Middle Creek 5465

Flight Line Number Range of Located Data File: 10010 - 31900

Tie Line Number Range of Located Data File: 90010 - 92160

**SURVEY SPECIFICATIONS:**

Flight Line Direction: North-South  
Flight Line Separation (m): 400 metres  
Tie Line Direction: East-West  
Tie Line Separation (m): 4000 metres  
Nominal Terrain Clearance (m AGL): 80 metres  
Average Terrain Clearance (m ASL): 80 metres  
Total Line km: 33,476  
Projection: MGA  
Datum: GDA94  
Zone: 53

**SURVEY EQUIPMENT:**

Aircraft: Rockwell Aerocommander 500S VH-KAC  
Magnetometer: Geometrics G-822A Cesium Vapour  
Magnetometer Resolution (nT): 0.001  
Magnetometer Compensation: RMS AADCII operating in real time  
Magnetometer Sample Rate (s): 0.1  
Magnetometer Sample Interval (m): approx 7.0 metres  
Base Station Magnetometer: Geometrics G856  
Base Station Magnetometer Resolution (nT): .1  
Base Station Magnetometer Sample Rate (s): 5  
Base Station Magnetometer Location(s): Katherine (Tindal) Airport Aprox: -140 31.3 132 26.7

Data Acquisition System: RMS DAS8  
Flight Path Navigation System: GPS  
Navigation Equipment: Fugro Omnistar and Ashtech G12 GPS  
GPS Base Station Location(s): Differential corrections via Fugro Omnistar VBS (Virtual Base Station)  
Radar Altimeter: Sperry AA200



**DATA PROCESSING:**

**MAGNETIC DATA:**

Data are corrected for diurnal variation, and International Geometric Reference Field IGRF 2000 updated to 2001.66 secular variation removed. Tie line and micro levelling has been performed.

The Reduced To Pole (RTP) grid was calculated using a magnetic inclination of -46.3 deg and magnetic declination of 4.25 deg. These values correspond to the following location: latitude -15.76923 deg S, longitude 132.50334 deg E, elevation 500 metres.

**ELEVATION DATA:**

Elevation was calculated by subtraction of the radar altimetre from the gps height. Tie line and micro levelling has been performed.

AUSGEOID 98 nval geoid ellipsoid separation values subtracted to achieve AHD.

**LOCATED DATA FORMAT:**

| Variable        | Units  | Col number | Width | Format  | Null         |
|-----------------|--------|------------|-------|---------|--------------|
| LineName        |        | [ 1]       | 12    | %12.12s | '-'          |
| LineDate        |        | [ 2]       | 8     | %8.8s   | '-'          |
| Flight number   |        | [ 3]       | 4     | %3.0f   | '-99'        |
| Time (CST)      | hours  | [ 4]       | 9     | %8.5f   | '-9999999'   |
| Fiducial        |        | [ 5]       | 10    | %9.0f   | '-9999999'   |
| Easting         | metres | [ 6]       | 11    | %10.2f  | '-9999999.0' |
| Northing        | metres | [ 7]       | 11    | %10.2f  | '-9999999.0' |
| Raw Magnetics   | nT     | [ 8]       | 10    | %9.2f   | '-9999999.'  |
| Diurnal         | nT     | [ 9]       | 10    | %9.2f   | '-9999999.'  |
| Final Magnetics | nT     | [ 10]      | 10    | %9.2f   | '-9999999.'  |
| 1VD             | nT     | [ 11]      | 11    | %10.6f  | '-9999999.0' |
| Radio Alt       | meters | [ 12]      | 7     | %6.1f   | '-99999'     |
| Baro Alt        | metres | [ 13]      | 7     | %6.1f   | '-99999'     |
| Gps Height      | metres | [ 14]      | 7     | %6.1f   | '-99999'     |
| Elevation       | metres | [ 15]      | 7     | %6.1f   | '-99999'     |



**STURT RADIOMETRICS DATA DESCRIPTION FILE**

COPYRIGHT RESERVED NORTHERN TERRITORY GOVERNMENT

Survey Name: Sturt  
Survey Date: August 2001  
Airborne Contractor: Kevron Geophysics  
Contractor Job Number: 1592B  
Processing Contractor: Kevron Geophysics  
Client: Department of Mines and Energy Northern Territory

1:250 000 sheets flown in Located Data File:

Larrimah SE53-13  
Daly Waters SE53-01

1:100 000 sheets flown in Located Data File:

Dry River 5367  
Elsey 5467  
Birimba 5366  
Western Creek 5466  
Middle Creek 5465

Flight Line Number Range of Located Data File: 10010 - 31900

Tie Line Number Range of Located Data File: 90010 - 92160

**SURVEY SPECIFICATIONS:**

Flight Line Direction: North-South  
Flight Line Separation (m): 400 metres  
Tie Line Direction: East-West  
Tie Line Separation (m): 4000 metres  
Nominal Terrain Clearance (m AGL): 80 metres  
Average Terrain Clearance (m ASL): 80 metres  
Total Line km: 33,476  
Projection: MGA  
Datum: GDA94  
Zone: 53

**SURVEY EQUIPMENT:**

Aircraft: Rockwell Aerocommander 500S VH-KAC  
Magnetometer: Geometrics G-822A Cesium Vapour  
Magnetometer Resolution (nT): 0.001  
Magnetometer Compensation: RMS AADCII operating in real time  
Magnetometer Sample Rate (s): 0.1  
Magnetometer Sample Interval (m): approx 7.0 metres  
Base Station Magnetometer: Geometrics G856  
Base Station Magnetometer Resolution (nT): .1  
Base Station Magnetometer Sample Rate (s): 5  
Base Station Magnetometer Location(s): Katherine (Tindal) Airport Aprox: -140 31.3 132 26.7  
Spectrometer: Exploranium GR820  
Crystal Size: 33lt downward array  
Spectrometer Sample Rate (s): .5  
Spectrometer Sample Interval (m): 70



**Operations & Processing Report  
STURT.**

---

Spectral Windows: Potassium 1370 - 1570 keV  
Uranium 1660 - 1860 keV  
Thorium 2410 - 2810 keV  
Cosmic 4000 keV

Date aircraft last calibrated: March 2001  
Calibration range: Carnamah  
Data Acquisition System: RMS DAS8

Flight Path Navigation System: GPS  
Navigation Equipment: Fugro Omnistar and Ashtech G12 GPS  
GPS Base Station Location(s): Differential corrections via Fugro Omnistar VBS  
(Virtual Base Station)  
Radar Altimeter: Sperry AA200

**RADIOMETRICS DATA PROCESSING:**

Data has been corrected for aircraft and cosmic backgrounds.  
Height corrected to a constant datum of 80 metres,  
minimum height of 30 and a maximum of 300 metres.  
Data has also been corrected for radon using  
Minty (1996 - Alt Method B) and corrected for channel interaction.

Noise Adjusted Singular Value Deconvolution (NASVD) has been applied.  
Five components used to reconstruct spectra.

**ELEVATION DATA:**

Elevation was calculated by subtraction of the radar altimeter from the gps height.  
Tie line and micro levelling has been performed.  
AUSGEOID 98 nval geoid ellipsoid separation values subtracted to achieve AHD.

**LOCATED DATA FORMAT:**

| Variable              | Units  | Col number | Width | Format  | Null         |
|-----------------------|--------|------------|-------|---------|--------------|
| LineName              |        | [ 1]       | 12    | %12.12s | '-'          |
| LineDate              |        | [ 2]       | 8     | %8.8s   | '-'          |
| Flight number         |        | [ 3]       | 4     | %3.0f   | '-99'        |
| Time (CST)            | hours  | [ 4]       | 9     | %8.5f   | '-9999999'   |
| Fiducial              |        | [ 5]       | 10    | %9.0f   | '-9999999'   |
| Easting               | metres | [ 6]       | 11    | %10.2f  | '-9999999.0' |
| Northing              | metres | [ 7]       | 11    | %10.2f  | '-9999999.0' |
| Raw Potassium         | cps    | [ 8]       | 9     | %8.2f   | '-9999999'   |
| Raw Uranium           | cps    | [ 9]       | 9     | %8.2f   | '-9999999'   |
| Raw Thorium           | cps    | [ 10]      | 9     | %8.2f   | '-9999999'   |
| Raw Total Count       | cps    | [ 11]      | 9     | %8.2f   | '-9999999'   |
| Corrected Potassium   | cps    | [ 12]      | 9     | %8.2f   | '-9999999'   |
| Corrected Uranium     | cps    | [ 13]      | 9     | %8.2f   | '-9999999'   |
| Corrected Thorium     | cps    | [ 14]      | 9     | %8.2f   | '-9999999'   |
| Corrected Total Count | cps    | [ 15]      | 9     | %8.2f   | '-9999999'   |
| Corrected Potassium   | %      | [ 16]      | 9     | %8.3f   | '-9999999'   |
| Corrected Uranium     | ppm    | [ 17]      | 9     | %8.3f   | '-9999999'   |
| Corrected Thorium     | ppm    | [ 18]      | 9     | %8.3f   | '-9999999'   |
| Corrected Total Count | nGy/hr | [ 19]      | 9     | %8.3f   | '-9999999'   |
| Radio Alt             | meters | [ 20]      | 7     | %6.1f   | '-99999'     |
| Baro Alt              | metres | [ 21]      | 7     | %6.1f   | '-99999'     |
| Gps Height            | metres | [ 22]      | 7     | %6.1f   | '-99999'     |
| Elevation             | metres | [ 23]      | 7     | %6.1f   | '-99999'     |



```
#####  
# Stripping Coefficients  
#####  
StrippingCoeffStart  
ALPHA 0.265020  
BETA 0.433140  
GAMMA 0.805216  
A 0.081903  
StrippingCoeffEnd  
#####  
# Height Attenuation Coefficients  
#####  
HeightAttenuationStart  
TOTAL_COUNT -0.0074  
POTASSIUM -0.0094  
URANIUM -0.0084  
THORIUM -0.0074  
HeightAttenuationEnd  
#####  
# Cosmic & Aircraft background  
#####  
Cosmic  
TOTAL_COUNT 0.718991  
POTASSIUM 0.039252  
URANIUM 0.033910  
THORIUM 0.035575  
Background  
TOTAL_COUNT 52.26  
POTASSIUM 7.4  
URANIUM 1.2  
THORIUM 0.0  
  
#####  
# Sensitivity Coefficients  
#####  
Potassium 98.60  
Uranium 7.9  
Thorium 6.1  
Total Count 27.5
```



**STURT 256 CHANNEL RADIOMETRIC DATA DESCRIPTION FILE**

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Survey Name: Sturt  
Survey Date: August 2001  
Airborne Contractor: Kevron Geophysics  
Contractor Job Number: 1592B  
Processing Contractor: Kevron Geophysics  
Client: Department of Mines and Energy Northern Territory

1:250 000 sheets flown in Located Data File:

Larrimah SE53-13

Daly Waters SE53-01

1:100 000 sheets flown in Located Data File:

Dry River 5367

Elsey 5467

Birrimba 5366

Western Creek 5466

Middle Creek 5465

Flight Line Number Range of Located Data File: 10010 - 31900

Tie Line Number Range of Located Data File: 90010 - 92160

**SURVEY SPECIFICATIONS:**

Flight Line Direction: North-South  
Flight Line Separation (m): 400 metres  
Tie Line Direction: East-West  
Tie Line Separation (m): 4000 metres  
Nominal Terrain Clearance (m AGL): 80 metres  
Average Terrain Clearance (m ASL): 80 metres  
Total Line km: 33,476  
Projection: MGA  
Datum: GDA94  
Zone: 53

**SURVEY EQUIPMENT:**

Aircraft: Rockwell Aerocommander 500S VH-KAC  
Magnetometer: Geometrics G-822A Cesium Vapour  
Magnetometer Resolution (nT): 0.001  
Magnetometer Compensation: RMS AADCII operating in real time  
Magnetometer Sample Rate (s): 0.1  
Magnetometer Sample Interval (m): approx 7.0 metres  
Base Station Magnetometer: Geometrics G856  
Base Station Magnetometer Resolution (nT): .1  
Base Station Magnetometer Sample Rate (s): 5  
Base Station Magnetometer Location(s): Katherine (Tindal) Airport Aprox: -140 31.3 132 26.7  
Spectrometer: Exploranium GR820  
Crystal Size: 33lt downward array  
Spectrometer Sample Rate (s): .5  
Spectrometer Sample Interval (m): 70



**Operations & Processing Report**  
**STURT.**

---

Spectral Windows: Potassium 1370 - 1570 keV  
Uranium 1660 - 1860 keV  
Thorium 2410 - 2810 keV  
Cosmic 4000 keV

Date aircraft last calibrated: March 2001  
Calibration range: Carnamah

Data Acquisition System: RMS DAS8

Flight Path Navigation System: GPS  
Navigation Equipment: Fugro Omnistar and Ashtech G12 GPS  
GPS Base Station Location(s): Differential corrections via Fugro Omnistar VBS  
(Virtual Base Station)

Radar Altimeter: Sperry AA200

**RADIOMETRICS DATA PROCESSING:**

Data has been corrected for aircraft and cosmic backgrounds.  
Height corrected to a constant datum of 80 metres,  
minimum height of 30 and a maximum of 300 metres.  
Data has also been corrected for radon using  
Minty (1996 - Alt Method B) and corrected for channel interaction.

Noise Adjusted Singular Value Deconvolution (NASVD) has been applied.  
Five components used to reconstruct spectra.

**LOCATED DATA FORMAT:**

| Variable              | Units  | Col number | Width | Format  | Null          |
|-----------------------|--------|------------|-------|---------|---------------|
| LineName              |        | [ 1]       | 12    | %12.12s | ' '           |
| LineDate              |        | [ 2]       | 8     | %8.8s   | ' '           |
| Flight number         |        | [ 3]       | 4     | %3.0f   | ' -99'        |
| Time (CST)            | hours  | [ 4]       | 9     | %8.5f   | ' -9999999'   |
| Fiducial              |        | [ 5]       | 10    | %9.0f   | ' -9999999'   |
| Easting               | metres | [ 6]       | 11    | %10.2f  | ' -9999999.0' |
| Northing              | metres | [ 7]       | 11    | %10.2f  | ' -9999999.0' |
| Raw Potassium         | cps    | [ 8]       | 9     | %8.2f   | ' -9999999'   |
| Raw Uranium           | cps    | [ 9]       | 9     | %8.2f   | ' -9999999'   |
| Raw Thorium           | cps    | [ 10]      | 9     | %8.2f   | ' -9999999'   |
| Raw Total Count       | cps    | [ 11]      | 9     | %8.2f   | ' -9999999'   |
| Corrected Potassium   | cps    | [ 12]      | 9     | %8.2f   | ' -9999999'   |
| Corrected Uranium     | cps    | [ 13]      | 9     | %8.2f   | ' -9999999'   |
| Corrected Thorium     | cps    | [ 14]      | 9     | %8.2f   | ' -9999999'   |
| Corrected Total Count | cps    | [ 15]      | 9     | %8.2f   | ' -9999999'   |
| Corrected Potassium   | %      | [ 16]      | 9     | %8.3f   | ' -9999999'   |
| Corrected Uranium     | ppm    | [ 17]      | 9     | %8.3f   | ' -9999999'   |
| Corrected Thorium     | ppm    | [ 18]      | 9     | %8.3f   | ' -9999999'   |
| Corrected Total Count | nGy/hr | [ 19]      | 9     | %8.3f   | ' -9999999'   |
| Temperature           | deg    | [ 20]      | 9     | %8.3f   | ' -9999999'   |
| Humidity              | %      | [ 21]      | 9     | %8.3f   | ' -9999999'   |
| Air Pressure          | hPa    | [ 22]      | 9     | %8.3f   | ' -9999999'   |
| Radio Alt             | meters | [ 23]      | 7     | %6.1f   | ' -99999'     |
| Gps Height            | metres | [ 24]      | 7     | %6.1f   | ' -99999'     |
| Live Time             | msec   | [ 25]      | 5     | %5d     | ' '           |
| 256 channel counts    | cps    | [ 26-279]  | 5     | %5d     | ' '           |
| Cosmic                | cps    | [ 280]     | 5     | %5d     | ' '           |



```
#####  
# Stripping Coefficients  
#####  
StrippingCoeffStart  
ALPHA 0.265020  
BETA 0.433140  
GAMMA 0.805216  
A 0.081903  
StrippingCoeffEnd  
#####  
# Height Attenuation Coefficients  
#####  
HeightAttenuationStart  
TOTAL_COUNT -0.0074  
POTASSIUM -0.0094  
URANIUM -0.0084  
THORIUM -0.0074  
HeightAttenuationEnd  
#####  
# Cosmic & Aircraft background  
#####  
Cosmic  
TOTAL_COUNT 0.718991  
POTASSIUM 0.039252  
URANIUM 0.033910  
THORIUM 0.035575  
Background  
TOTAL_COUNT 52.26  
POTASSIUM 7.4  
URANIUM 1.2  
THORIUM 0.0  
  
#####  
# Sensitivity Coefficients  
#####  
Potassium 98.60  
Uranium 7.89  
Thorium 6.06  
Total Count 27.46
```



# APPENDIX 7

## Occupational Health and Safety and Environment Policies