Report #10004

HIGH RESOLUTION STINGER MOUNTED MAGNETIC SURVEY FOR GEOLOGICAL SURVEY OF CANADA

KLUANE, YUKON

Parts of NTS 115A /13 and 115 A/14;
Part of NTS 115 B/16;
Parts of NTS 115 G/1, 115 G/8;
NTS 115 H/4;
Parts of NTS 115 H/3, 115 H/5, 115 H/6, 115 H/11 and 115 H/12

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SUMMARY

This report describes the logistics, data acquisition and processing of results from a high resolution aeromagnetic geophysical survey flown in the Kluane region of Yukon on behalf of the Geological Survey of Canada. The survey was flown by two helicopters from February 4, 2010 to. March 15, 2010. A total of 11,740 line-kilometres were flown to cover one survey block.

The purpose of the survey was to record detailed magnetic data to assist in mapping the geology and structure of the survey area and highlight potential targets for follow-up. This was accomplished by using high sensitivity cesium magnetometers. The information from these sensors was processed to produce maps that display the magnetic properties of the survey area. A GPS electronic navigation system ensured accurate positioning of the geophysical data with respect to the base maps.

The survey data were processed and compiled in the Fugro Airborne Surveys Toronto office.

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APPENDICES

1. INTRODUCTION

A high resolution aeromagnetic survey was flown for Geological Survey of Canada between February 10, 2010 to March 15, 2010 over one survey block located in the Kluane region of Yukon. The survey was funded by the Geological Survey of Canada. The survey area is located west of Haines Junction, extending north to Aishinik Lake (Figure 2.1).

A total of 11,740 line-km of survey data were collected, consisting of 10,030.6 line-km of traverse lines and 1,709.7 line-km of tie-lines. Traverse flight lines were flown in an azimuthal direction of N 30°E / S 30°W with a line separation of 400 metres. Tie lines were flown orthogonal to the traverse lines with a line separation of 2,400 m. The nominal terrain clearance of the drape surface flown by the aircraft was 100 metres.

The survey employed the HM1 magnetic system. Ancillary equipment consisted of radar, laser and barometric altimeter, video camera, digital recorders, and an electronic navigation system and a dual-frequency GPS receiver. The instrumentation was installed in two AS350 type turbine helicopters with the registration C-FGSC and C-GAVO provided by Great Slave Helicopters (Figure 1.1).

Figure 1.1: Fugro Airborne Surveys HM1 with AS350 B2

2. SURVEY OPERATIONS

The two helicopters were equipped with the geophysical and ancilliary navigation instrumentation and tested in Athabasca, Alberta between January 25th to 27th, 2010. The two aircraft mobilized to the survey site based at Haines Junction, Yukon and conducted survey operations from January 31st to March 15th, 2010. The survey area is located on parts of NTS map sheets 115 A/13, 14; 115 B/16; 115G/1, 8; 115H/3, 5, 6, 11 ,12 and NTS 115 H/4 (Figure 2.1).

Table 2-1 lists the corner coordinates of the survey blocks in NAD83, UTM, Zone 8N, central meridian 135° W.

Table 2-1

Block	Corners	X-UTM (E)	Y-UTM (N)
10004-1	1	356534	6834022
Kluane	2	367045	6827954
Area	3	395515	6812036
	4	352040	6736735
	5	349165	6738395
	6	347965	6736317
	7	320599	6752117
	8	319399	6750038
	9	312817	6753838
	10	311617	6751760
	11	309668	6752885

The survey specifications for Kluane were as follows:

Parameter	Specifications
Traverse line direction	N30°E
Traverse line spacing	400 m
Tie line direction	N120°W
Tie line spacing	2400 m
Sample interval	10 Hz, 3.06 m @ 110km/h for mag;
Aircraft nominal terrain clearance (drape)	100 m
Mag sensor mean terrain clearance	±5 m, Real-time GPS
Average speed	±2 m, Differential GPS
Navigation (guidance)	
Post-survey flight path	

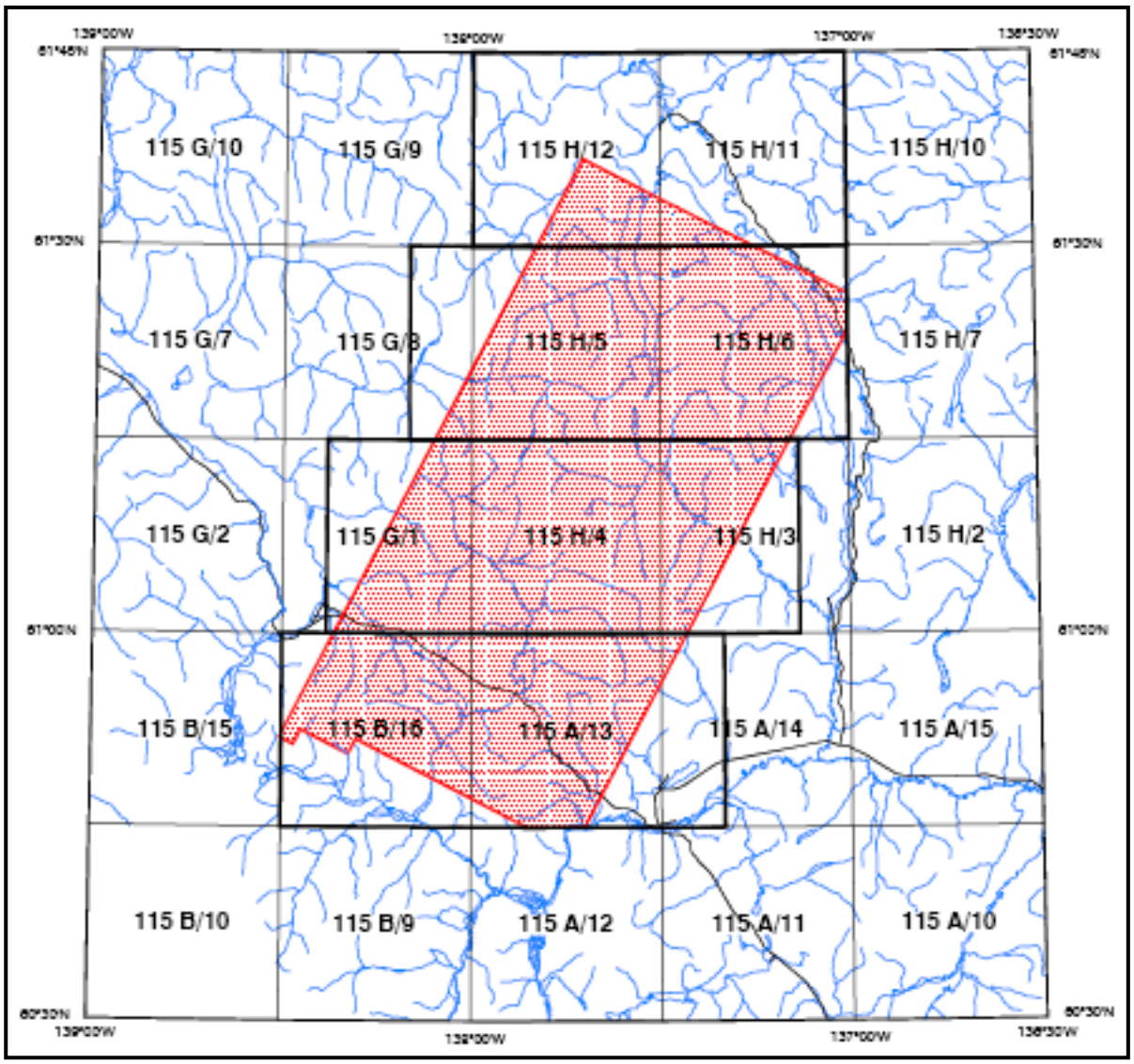

Figure 2.1: Location map and sheet layout of Kluane, Yukon
Job # 10004

3. SURVEY EQUIPMENT

This section provides a brief description of the geophysical instruments used to acquire the survey data and the calibration procedures employed. The geophysical equipment was installed in two AS350 type helicopters. This aircraft type provides a safe and efficient platform for surveys of this type.

Airborne Magnetometer

Model:	Fugro D1344 processor with Scintrex CS3 sensor
Type:	Optically pumped cesium vapour
Sensitivity:	0.01 nT
Sample rate:	10 per second

The magnetometer sensor is housed in a stinger mounted on the helicopter.

Magnetic Base Station

Two magnetic base stations were setup at for this project. The primary magnetic base station was set up for the survey approximately 600 meres south of the Haines Junction airstrip, in a wooded area just off the airport road. See coordinates below. A second magnetic base station was set up near Athabasca, Alberta for the purpose of monitoring the diurnal variation while the Meanook test was being flown. That base station was

located at the south end on the Athabasca airstrip. A digital recorder is operated in conjunction with the base station magnetometer to record the diurnal variations of the earth's magnetic field. The clock of the base station was synchronized with that of the airborne system to permit merging of the magnetic diurnal data with the airborne data accurately in time.

Primary Magnetic Base Station

Model:	Fugro CF1 base station with timing provided by integrated GPS	
Sensor type:	Scintrex CS-3	
Counter specifications:	Accuracy:	±0.1 nT
	Resolution:	0.01 nT
	Sample rate	1 Hz
GPS specifications:	Model:	Marconi Allstar with CMT-1200 antenna
	Type:	Code and carrier tracking of L1 band, 12-channel, C/A code at 1575.42 MHz
	Sensitivity:	-90 dBm, 1.0 second update
	Accuracy:	Manufacturer's stated accuracy for differential corrected GPS is 2 metres

Environmental Monitor specifications:

Temperature:

- Accuracy: ±1.5ºC max
- Resolution: 0.0305ºC
- Sample rate: 1 Hz
- Range: -40ºC to +75ºC

Barometric pressure:

- Model: Motorola MPXA4115A
- Accuracy: ±3.0º kPa max (-20ºC to 105ºC temp. ranges)
- Resolution: 0.013 kPa
- Sample rate: 1 Hz
- Range: 55 kPa to 108 kPa

The WGS84 geographic coordinates of the magnetic base stations were as follows:

Location	Date	Latitude	Longitude	Height
Athabasca	Jan 25-27, 2010	54º 44' 14.1514"N	113º 12' 7.6367"W	579.61 m
Haines Junction	Jan 31-Mar 15, 2010	60º 47' 21.4727"N	137º 32' 14.3049"W	666.74 m

Navigation (Global Positioning System)

Airborne Receiver for Flight Path Recovery and Navigational Guidance

Model: Novatel OEM4

Type: Code and carrier tracking of L1-C/A code at 1575.42 MHz and L2-P code at 1227.0 MHz. Dual frequency, 24-channel.

Sample rate: 10 Hz update. 2Hz recording

Accuracy: Manufacturer's stated accuracy for differential corrected GPS is better than 1 metre.

Antenna: Mounted on tail of aircraft.

Primary GPS Base Station

Model: Novatel OEM4

Type: Code and carrier tracking of L1-C/A code at 1575.42 MHz and L2-P code at 1227.0 MHz. Dual frequency, 24-channel.

Sample rate: 10 Hz update. 2Hz recording

Accuracy: Manufacturer's stated accuracy for differential corrected GPS is better than 1 metre.

The Novatel OEM4 captured the airborne positional data which were post processed using the base station GPS to provide differentially corrected positional data. The Novatel OEM4 was operated as the primary base station and utilized time-coded signals from at least four of the twenty-four NAVSTAR satellites. The base station raw XYZ data were recorded, thereby permitting post-survey processing for theoretical accuracy of better than 5 metres.

The Novatel OEM4 receiver was coupled with a PNAV navigation system for real-time guidance. Some difficulties were experienced with the real-time guidance system due to erratic reception of real-time guidance data in the mountainous terrain within the survey area. Procedures were established in the field to mitigate these navigation difficulties by avoiding the use of real-time guidance once the real-time satellite signal was blocked by terrain.

Although the base station receiver is able to calculate its own latitude and longitude, a higher degree of accuracy can be obtained if the reference unit is established on a known benchmark or triangulation point. For this survey, a primary and secondary GPS base station setup was established at each operational base. The GPS location for each of base stations, in WGS84 geographic coordinates, were as follows:

Location	Date	Latitude	Longitude	Height
Athabasca	Jan 25-27, 2010	54º 44' 14.1514”N	113º 12’ 7.6367”W	579.61 m
Haine’s Junction	Jan 31-Mar 15, 2010	60º 47' 21.4727”N	137º 32’ 14.3049”W	666.74 m

The GPS records data relative to the WGS84 ellipsoid, which is the basis of the revised North American Datum (NAD83). Conversion software is used to transform the WGS84 coordinates to the NAD83 UTM system displayed on the maps.

Radar Altimeter

Manufacturer:	Honeywell
Model:	RT300/AT220
Type:	Short pulse modulation, 4.3 GHz
Sensitivity:	0.3 m
Sample rate:	2 per second

The radar altimeter measures the vertical distance between the helicopter and the ground, except in areas of dense trees.

Barometric Pressure and Temperature Sensors

Type:	Motorola MPX4115AP analog pressure sensor AD592AN high-impedance remote temperature sensors	
Sensitivity:	Pressure:	150 mV/kPa
	Temperature:	100 mV/°C or 10 mV/°C (selectable)
Sample rate:	10 per second	

The D1300 circuit is used in conjunction with one barometric sensor and up to three temperature sensors. Three sensors (baro, temp_int and temp_ext) are installed in the data acquisition system in the aircraft, to monitor pressure and internal and external operating temperatures. Data was not recorded and archived from the temperature sensors for this survey.

Laser Altimeter

Manufacturer:	Optech
Model:	ADMGPA100
Type:	Fixed pulse repetition rate of 2 kHz
Sensitivity:	±5 cm from 10ºC to 30ºC ±10 cm from -20ºC to +50ºC
Sample rate:	2 per second

The laser altimeter is mounted to the helicopter belly, and measures the distance from the helicopter to the ground.

Digital Data Acquisition System

Manufacturer: Fugro

Model: HeliDAS

Recorder: Compact Flash Card

The stored data are downloaded to the field workstation PC at the survey base, for verification, backup and preparation of in-field products.

Compensation System

Manufacturer: Fugro, Billingsley Aerospace & Defence

Model: HeliDAS, with triaxial fluxgate magnetometer (TFM 100G2-1E)

The presence of the helicopter in close proximity to the sensors causes considerable deviations on the readings. The orientation of the aircraft with respect to the sensors and the motion of the aircraft through the earth's magnetic field are contributing factors. A special calibration flight is flown to record the information necessary to remove these effects.

The manoeuvre consists of flying a series of calibration lines at high altitude to gain information in each of the required line directions. During this procedure, the pitch, roll and yaw of the aircraft are varied. Each variation is conducted in succession (first vary

pitch, then roll, then yaw). This provides a complete picture of the effects of the aircraft at designated headings in all orientations.

The HeliDAS compensation system derives a set of coefficients for each line direction and for each magnetometer sensor. The coefficients can be applied real-time or in a post-processing environment. These calibrations are presented in the Appendix D of this report.

Video Flight Path Recording System

Type:	Axis 2420 Digital Network Camera
Recorder:	Axis 241S Video Server and tablet computer
Format:	Blocked binary digital format with index to allow for extraction of individual JPEG images (.BDX, .BIN files)

Fiducial numbers are recorded continuously and are displayed on the margin of each digital image. This procedure ensures accurate correlation of data with respect to visible features on the ground. The fiducials appearing on the video frames and the corresponding fiducials in the digital profile database originate from the data acquisition system and are based on incremental time from start-up. Along with the acquisition system time, UTC time is also recorded in parallel and displayed (Figure 3.1).

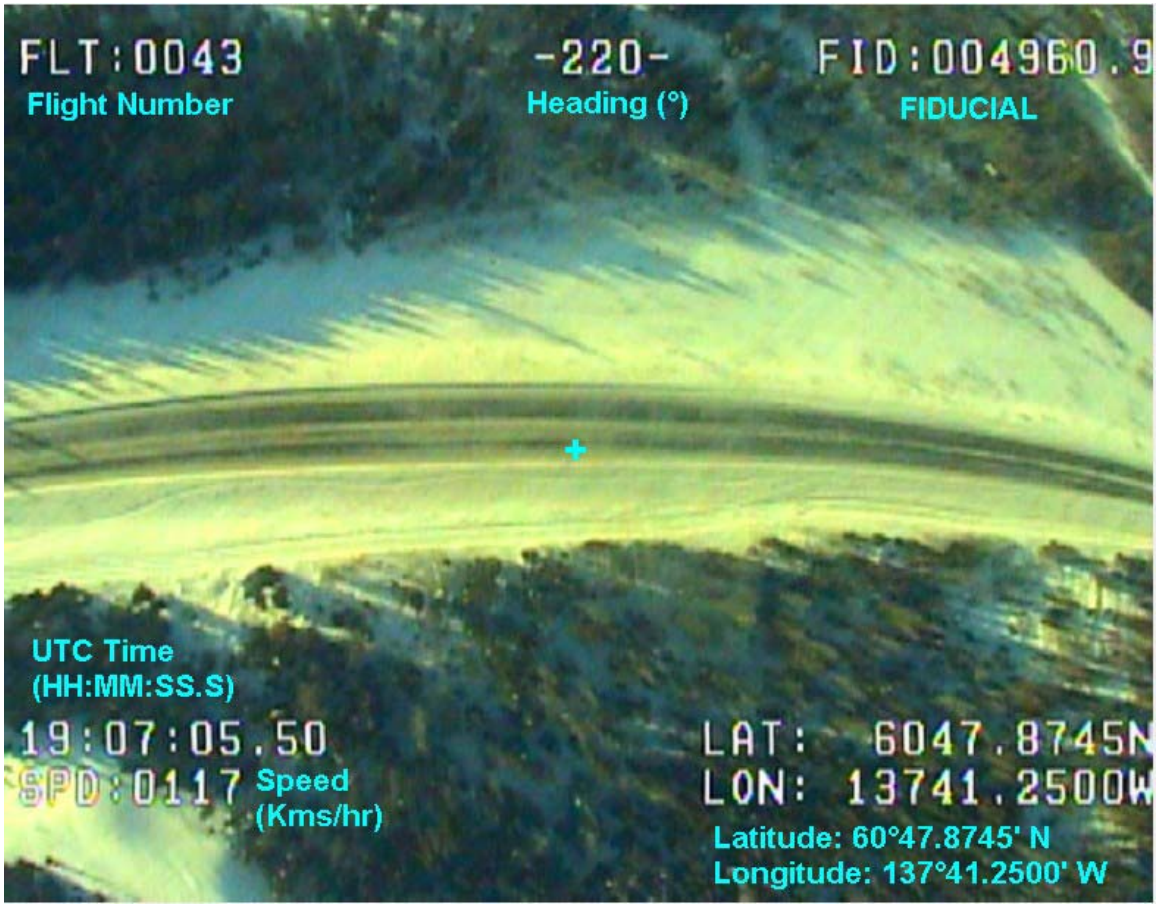

Figure 3.1: Sample flight path video

Flight numbers that are presented on the video are not unique and it is possible for the two helicopters systems to have the same flight. Hence, the digital videos have separately archived for each helicopter system used on this project. In the profile data archive, aircraft C-GAVO's flight numbers are incremented by 100, thereby avoiding duplication in the flight numbers from each aircraft.

4. QUALITY CONTROL AND IN-FIELD PROCESSING

Digital data for each flight were transferred to the field workstation, in order to verify data quality and completeness. A database was created and updated using Geosoft Oasis Montaj and proprietary Fugro Atlas software. This allowed the field personnel to calculate, display and verify both the positional (flight path) and geophysical data on a screen or printer. Records were examined as a preliminary assessment of the data acquired for each flight.

In-field processing of Fugro survey data consists of differential corrections to the airborne GPS data, spike rejection and filtering of all geophysical and ancillary data, verification of flight videos, diurnal correction, and preliminary levelling of magnetic data.

All data, including base station records, were checked on a daily basis, to ensure compliance with the survey contract specifications. Reflights were required if any of the following specifications were not met.

Navigation - Digital GPS positioning data coverage was incomplete, usually occurring when less than 4 satellites are available for GPS solution.

Flight Path - Maximum separation of lines is greater than 500 metres, except for reasons of safety.

Clearance - Traverse-line and tie-line altitudes are greater than the pre-planned drape surface by +/- 15 metres, except where flying is precluded by safety considerations, e.g., restricted or populated areas, severe topography, obstructions, tree canopy, aerodynamic limitations, etc., as decided by the pilot.

Airborne Mag - The typical Figure of Merit for the magnetometer will be no greater than 2.0 nT. Noise envelope for the magnetometer data is not to exceed +/- 0.25 nT.

Base Mag - Diurnal variations not to exceed 3 nT peak to peak over a straight line time chord of 1 minute and an additional limitation for micropulsations (ULF waves) which must not exceed 0.5 nT (peak to peak) deviation from a long chord equivalent to a period of 15 seconds.

5. DATA PROCESSING

Flight Path Recovery

The raw range data from at least four satellites are simultaneously recorded by both the base and mobile GPS units. The geographic positions of both units, relative to the model ellipsoid, are calculated from this information. Differential corrections, which are obtained from the base station, are applied to the mobile unit data to provide a post-flight track of the aircraft, accurate to within 2 metres. Speed checks of the flight path are also carried out to determine if there are any spikes or gaps in the data.

The corrected WGS84 latitude/longitude coordinates are also transformed to the coordinate system used on the final maps. Images or plots are then created to provide a visual check of the flight path.

Total Magnetic Field

The magnetic data were corrected to produce a final levelled total field product by the application of the following sequence of procedures:

- Performed data quality checks on the raw and compensated magnetic data and edited the diurnal data for shifts or spikes caused by cultural interference;

- System absolute value difference correction of 23.2 nT was added to all data from C_GAVO;
- Removal of systematic high-frequency(<2 seconds);
- Lag correction;
- Application of Taylor series expansion on selected lines in the south end of the survey;
- Levelling of total magnetic field data;
- Removal of the IGRF from the total magnetic field.

The data quality check was accomplished in the field by applying a fourth difference filter to all raw compensated magnetic data after it had been loaded into the Oasis montaj™ database. Plotting the raw and compensated data together permitted tracking the performance of the magnetometer sensor as well as monitoring of the noise levels that were superimposed on the data during survey activities. Magnetometer noise levels were maintained within stated specifications.

The aeromagnetic data from the magnetic sensor was inspected in both grid and profile format. Spikes were removed manually with the aid of a fourth difference calculation and a few small gaps (1 second or less) were interpolated using an Akima spline. A single gap of 6 seconds on TL19311 remains nulled due to potential erroneous interpolation over this gap.

The diurnal variations recorded by the base station were edited for any cultural contamination and filtered to remove high-frequency noise. In some special circumstances, subtraction of filtered diurnal from the airborne total field may be helpful in simplifying the levelling of the magnetic data. This was initially attempted but later abandoned as this added processing step was not contributing significantly to solve levelling problems in specific regions of the survey area. The diurnal magnetic data was therefore not subtracted from the despiked, lagged total magnetic field. However, it was useful as a guide in evaluating the magnitude of the levelling adjustments by correlating the applied adjustments to the diurnal activity of the day.

A system absolute value difference was noted in the Meanook, Alberta calibration. (See calibration in the appendix D). A constant of 23.2 nT was added to all data acquired by the system on aircraft C-GAVO to correct for this discrepancy;

In the office, any high frequency noise (less than 2 seconds) were isolated and removed from the compensated raw de-spiked magnetic data. The magnitude of this noise correlates proportionally to the severity of the air turbulence during flight;

A lag correction was applied to remove the effects of temporal delay inherent in the data acquisition system. A correction of 1.3 seconds was applied to the magnetic data for all flights.

Application of Taylor expansion series on the magnetic data on selected lines in the south end of the survey was necessary prior to levelling of the magnetic data. Large altitude differences between traverse lines occurred because the aircraft was unable to negotiate the given drape surface over the steep terrain in this area. The difference in altitude between the drape surface and the traverse line profile altitude was used as the continuation distance to apply to the magnetic data points. The Taylor expansion series algorithm used the first and second derivatives of the magnetic profile data. No limits were set for upward continuation of the surface. However, downward continuation was limited to a maximum of 30 metres.

Once the above corrections were applied, the results were then levelled using network (primarily 0 and 1st order trend) adjustments of tie and traverse line intercepts.

The International Geomagnetic Reference Field (IGRF) was removed from the leveled magnetic data at an average survey altitude of 1488 metres using the 2010 model year extrapolated to mid-February 2010 (2010.14).

Calculated Vertical Magnetic Gradient

The levelled residual magnetic field data were subjected to a processing algorithm that enhances the response of magnetic bodies in the upper 500 m and attenuates the response of deeper bodies. The resulting vertical gradient map provides better definition and resolution of near-surface magnetic units. It also identifies weak magnetic features

that may not be evident on the total field map. However, regional magnetic variations and changes in lithology may be better defined on the total magnetic map.

Digital Elevation

The radar altimeter values (RALT – aircraft to ground clearance) were subtracted from the differentially corrected and de-spiked GPS orthometric height (GPSALT) values to produce profiles of the height above the geoid along the survey lines. These values were gridded to produce contour maps showing approximate elevations within the survey area. A tie-line correction was carried out to remove any line to line variations between the survey lines.

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

It should be noted that there were a few instances were the maximum limit of the radar instrument's dynamic range was exceeded. This usually occurred when the helicopter

transitioned from flying over very high mountains to deep valleys. In these cases, altitude values derived from the alternate laser altimeter were used.

Because of the potential errors that may be created by these inherent inaccuracies, no guarantee is made or implied that the calculated digital evevation calculated by this method is accurate in all respects nor that is a true representation of the height above sea level. Although this product may be of some use as a general reference, THIS PRODUCT MUST NOT BE USED FOR NAVIGATION PURPOSES.

Contour and Colour Map Displays

The magnetic geophysical data and the digital terrain data are interpolated onto a regular grid using a modified Minimum Curvature technique. The resulting grid is suitable for image processing and generation of contour maps. The grid cell size is 25% of the line interval, equivalent to 100 metres ground distance, as required in the contract.

Colour maps are produced by interpolating the grid down to the pixel size. The parameter is then incremented with respect to specific amplitude ranges to provide colour "contour" maps.

6. PRODUCTS

This section lists the final maps and products that have been provided under the terms of the survey agreement.

Base Maps

Base maps of the survey area were produced from vector files originating from the Centre for Topographic Information (CTI) of Natural Resources Canada, published at a scale of 1:50,000. This base facilitates correlation of the navigation data to the map coordinate system. The topographic files have been combined with geophysical data for plotting the final maps. Maps have been created using the following parameters:

Projection Description:

Datum:	NAD83 Canada
Ellipsoid:	GRS80
Projection:	UTM, Zone; 8N and Zone 7N
Central Meridian:	-135° and -141°
False Northing:	0
False Easting:	500000
Scale Factor:	0.9996
WGS84 to Local Conversion:	Molodensky
Datum Shifts:	DX: 0 DY: 0 DZ: 0

All maps include flight lines, contours and topography, unless otherwise indicated. Final map products have been prepared at 1:50 000 scale and delivered in PDF/X and Postscript formats.

Final Products

1) ***Colour paper plots of maps at 1:50,000 scale (5 copies):***
   - residual total magnetic field
   - first vertical derivative of the magnetic field

Digital Data Archives

2) ***Digital archive on DVD media of all gridded data in Geosoft format at 100 m grid cell size (2 copies)***:
   - Residual total magnetic field
   - first vertical magnetic derivative of the magnetic field
   - second vertical magnetic derivative of the magnetic field
   - digital elevation model

3) ***Digital line data on DVD media in Geosoft GDB format of all navigation and magnetic data presented at 10 times per second (2 copies)***

4) ***Digital Maps on DVD media in PDF/X and Poscript format (2 copies):***
   - Map files of the resuidual total magnetic fiel
   - Map files of the first vertical derivative of the total filed

5) ***Project Report on DVD media in MS Word format (3 paper copies, 2 digital copies)***:
   - Final technical report describing field operations and data processing

7. CONCLUSIONS AND RECOMMENDATIONS

This report provides a very brief description of the survey results and describes the equipment, data processing procedures and logistics of the survey.

Respectfully submitted,

FUGRO AIRBORNE SURVEYS CORP.

APPENDIX A

LIST OF PERSONNEL

The following personnel were involved in the acquisition, processing, interpretation and presentation of data, relating to a high resolution magnetometer airborne geophysical survey carried out for Geological Survey of Canada.

Graham Konieczny	Manager Processing and Interpretation
Adriana Pagliero	Project Manager/Geophysicist
Duane Griffith	Operations Manager
Richardo White	Geophysicist (Office)
Nick Gavican	Geophysical Operator
Liliana Amicarella	Geophysical Operator
Amir Soltanzadeh	Field Geophysicist
Glen Charbonneau	Pilot (Great Slave Helicopters)
Blair Elliott	Pilot (Great Slave Helicopters)
Gary Martinson	Pilot (Great Slave Helicopters)
Carig Cable	AME (Great Slave Helicopters)
Lyn Vanderstarren	Drafting Supervisor
Susan Pothiah	Word Processing Operator
Albina Tonello	Secretary, Expeditor

The survey consisted of 11,740 km of coverage, flown from February 4th, 2010 to March 15th, 2010.

All personnel are employees of Fugro Airborne Surveys, except as indicated.

APPENDIX B

BACKGROUND INFORMATION

BACKGROUND INFORMATION

Magnetic Responses

The measured total magnetic field provides information on the magnetic properties of the earth materials in the survey area. The information can be used to locate magnetic bodies of direct interest for exploration, and for structural and lithological mapping.

The total magnetic field response reflects the abundance of magnetic material in the source. Magnetite is the most common magnetic mineral. Other minerals such as ilmenite, pyrrhotite, franklinite, chromite, hematite, arsenopyrite, limonite and pyrite are also magnetic, but to a lesser extent than magnetite on average.

In some geological environments, an EM anomaly with magnetic correlation has a greater likelihood of being produced by sulphides than one which is non-magnetic. However, sulphide ore bodies may be non-magnetic (e.g., the Kidd Creek deposit near Timmins, Canada) as well as magnetic (e.g., the Mattabi deposit near Sturgeon Lake, Canada).

Iron ore deposits will be anomalously magnetic in comparison to surrounding rock due to the concentration of iron minerals such as magnetite, ilmenite and hematite.

Changes in magnetic susceptibility often allow rock units to be differentiated based on the total field magnetic response. Geophysical classifications may differ from geological classifications if various magnetite levels exist within one general geological classification. Geometric considerations of the source such as shape, dip and depth, inclination of the earth's field and remanent magnetization will complicate such an analysis.

In general, mafic lithologies contain more magnetite and are therefore more magnetic than many sediments which tend to be weakly magnetic. Metamorphism and alteration can also increase or decrease the magnetization of a rock unit.

Textural differences on a total field magnetic contour, colour or shadow map due to the frequency of activity of the magnetic parameter resulting from inhomogeneities in the distribution of magnetite within the rock, may define certain lithologies. For example, near surface volcanics may display highly complex contour patterns with little line-to-line correlation.

Rock units may be differentiated based on the plan shapes of their total field magnetic responses. Mafic intrusive plugs can appear as isolated "bulls-eye" anomalies. Granitic intrusives appear as sub-circular zones, and may have contrasting rings due to contact metamorphism. Generally, granitic terrain will lack a pronounced strike direction, although granite gneiss may display strike.

Linear north-south units are theoretically not well-defined on total field magnetic maps in equatorial regions due to the low inclination of the earth's magnetic field. However, most

stratigraphic units will have variations in composition along strike that will cause the units to appear as a series of alternating magnetic highs and lows.

Faults and shear zones may be characterized by alteration that causes destruction of magnetite (e.g., weathering) that produces a contrast with surrounding rock. Structural breaks may be filled by magnetite-rich, fracture filling material as is the case with diabase dikes, or by non-magnetic felsic material.

Faulting can also be identified by patterns in the magnetic total field contours or colours. Faults and dikes tend to appear as lineaments and often have strike lengths of several kilometres. Offsets in narrow, magnetic, stratigraphic trends also delineate structure. Sharp contrasts in magnetic lithologies may arise due to large displacements along strike-slip or dip-slip faults.

APPENDIX C

DATA ARCHIVE DESCRIPTION

APPENDIX C

ARCHIVE DESCRIPTION

Reference: CDVD00
# of DVD's: 1
Archive Date: July 29, 2010

This archive contains final grids, maps and report of an aeromagnetic geophysical survey conducted by FUGRO AIRBORNE SURVEYS CORP. on behalf of Geological Survey of Canada over one block in Kluane, Yukon. The survey was flown from February 4, 2010 to March 15, 2010.

Job # 10004

******* Disc 1 of 1 *******

\Grids…….. Grids in Geosoft format

Kluane_DEM.GRD	- Digitial Elevation Model (m)
Kluane_FVD.GRD	- First Vertical Derivative of the Magnetic Field (nT/m)
Kluane_MAG.GRD	- Residual Total Magnetic Field (nT)
Kluane_SVD.GRD	- Second Vertical Derivative of the Magnetic Field (nT/m^2)

\Linedata

Kluane.GDB	- Data archive in Geosoft GDB format
Kluane.doc	- Data archive summary

\Maps\PDFS Final colour maps in PDF/X format (there are four map sheets per theme).

FVD*.PDF	- First Vertical Derivative of the Magnetic Field nT/m Sheet*
MAG*.PDF	- Residual Total Magnetic Field nT Sheet *

\Maps\Postscripts Final colour maps in postscript format (there are four map sheets per theme).

FVD*.ps	- First Vertical Derivative of the Magnetic Field nT/m Sheet*
MAG*.ps	- Residual Total Magnetic Field nT Sheet*

\Project Report

10004_Report.pdf	- Field operations and processing
10004_Report.doc	- Field operations and processing

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- Appendix C.2 -

KLUANE GEOSOFT ARCHIVE SUMMARY

GSC Channel Name	Description	Format	Units	Sample Rate
LINE	Line number	I10	-	0.1
TIME	GPS Time (seconds of the day, dbl prec.& rounded)	F10.2	sec	0.1
FIDUCIAL	Acquisition System Time (seconds, dbl prec., original)	F10.2	sec	0.1
LONG	Longitude [NAD83]	F13.6	deg	0.1
LAT	Latitude [NAD83]	F13.6	deg	0.1
EASTING	UTM Easting (NAD83, zone 8N)	F10.2	m	0.1
NORTHING	UTM Northing (NAD83, zone 8N)	F10.2	m	0.1
RALTRAW	Raw Radar Altimeter, lagged, unedited	F10.2	m	0.1
RALT	Edited Radar Altimeter, lagged, corrected, final	F10.2	m	0.1
BALT	Barometric altimeter corrected for drift and lag	F10.2	m	0.1
SURFACE	Ideal Surface altitude (drape)	F10.2	m	0.1
GPSALTR	Uncorrected GPS Altitude (orthometric)	F10.2	m	0.1
GPSALT	Differentially Corrected GPS Altitude (orthometric)	F10.2	m	0.1
DEMRAW	Uncorrected digital Topography [GPSALT - RALT]	F10.2	m	0.1
DEMLEV	Levelled corrected digital Topography	F10.2	m	0.1
MAGUNCOM	Raw uncompensated, unlagged total filed mag	F10.2	nT	0.1
MAGCOM	Raw compensated, unlagged total filed mag	F10.2	nT	0.1
MAGHFCOR	High frequency comp mag noise removal correction	F10.2	nT	0.1
ALTCOR	Taylor series correction factor for height variations	F10.2	nT	0.1
MAGRAW	Raw compensated, lagged, edited, corrected mag	F10.2	nT	0.1
MAGTLCOR	Tie-line levelling correction to the magnetic field	F10.2	nT	0.1
DIURNRAW	Raw unfiltered Basemag1	F10.2	nT	0.1
DIURNAL	Edited, filtered, Basemag 1	F10.2	nT	0.1
SRVMGLEV	Final tie-line levelled total field mag	F10.2	nT	0.1
IGRF	IGRF correction; Avg. alt (1488.0 m) , date 2010/02/22	F10.2	nT	0.1
SRVMGRES	Levelled residual magnetic field	F10.2	nT	0.1
FLUXLONG	Longitudinal Vector Mag (fluxgate)	F10.2	nT	0.1
FLUXTRAN	Transverse Vector Mag (fluxgate)	F10.2	nT	0.1
FLUXVERT	Vertical Vector Mag (fluxgate)	F10.2	nT	0.1
DATE	Local date **(YYYYMMDD)**	I10	-	0.1
FLIGHT	Flight number	I10	-	0.1

SRVMGLEV=MAGRAW+MAGHFCOR+ALTCOR+MAGTLCOR
SRVMGRES=MAGLEV-IGRF

Note:

66 dummy values in ALL airborne magnetic channels in T19311
63 dummy values in ALL airborne fluxgate mag channels in T19311

- Appendix C.3 -

The coordinate system for all grids and the data archive is projected as follows:

Datum	NAD83
Spheroid	GRS80
Central meridian	135 West (Z8N)
False easting	500000
False northing	0
Scale factor	0.9996
Northern parallel	N/A
Base parallel	N/A
WGS84 to local conversion method	Molodensky
Delta X shift	0
Delta Y shift	0
Delta Z shift	0

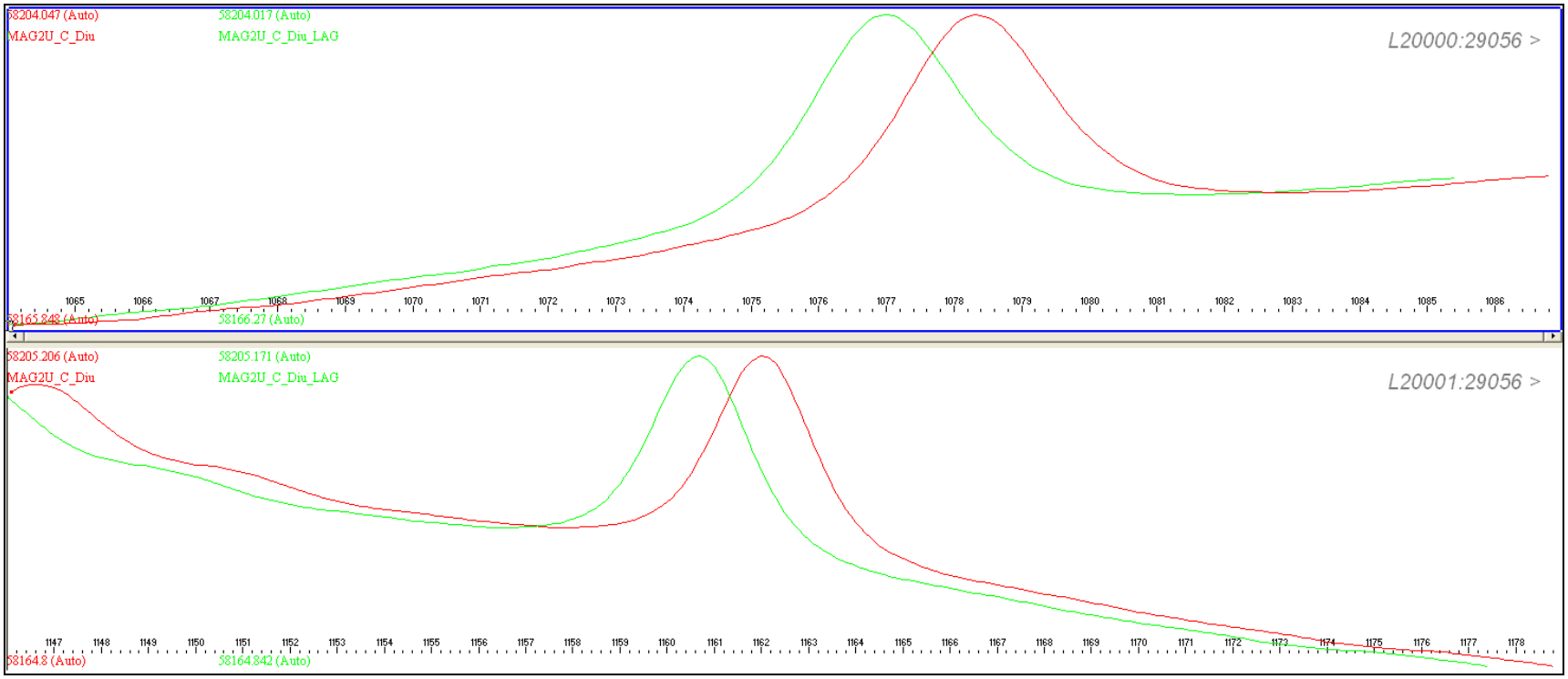
APPENDIX D

TESTS AND CALIBRATIONS

APPENDIX D
TESTS AND CALIBRATIONS
Aircraft Registration C- FGSC

LAG TEST

A magnetic lag test is flown to calculate the positional lag that develops between the time a reading is made and the time it is recorded in the data. A large metallic body such as railway tracks, a bridge, buildings or a distinct magnetic anomaly is flown over along a single line, at survey altitude, in opposite directions. This allows the time constant value that will line-up the magnetic anomaly peaks or troughs that are produced to be determined. This time shift constant is then applied to the data collected during the survey. Lag test for C-FGSC was flown on Janaury 25, 2010. The lag was determined to be 1.3 seconds.



ALTIMETER VERIFICATION

Immediately following a new helicopter installation or radar altimeter change, an altimeter test flight is necessary to ensure the indicated altitude is known and to have confidence in the instrumentation. A base level for the GPS and barometer is established by recording 30 seconds of data with the helicopter on the ground. Radar and barometric altitude is checked against the GPS Z for several target heights. The radar altimeter is graphed against the GPS Z in order to determine values that are used an adjustment equation to adjust the radar altimeter values.

ALTIMETER VERIFICATION

Job Number:	10004	**Survey Type:**	Stinger	**Radar Altimeter:**	Honeywell or Sperry RT300 / AT220
Date Flown:	25-Jan-10	**Helicopter Reg:**	C-FGSC	**Laser Altimeter:**	Optech ADMGPA100
Flight Number:	29056	**Geosoft Database:**	altitude-lag_athabasca_fgsc_jan25	**Barometric Pressure Sensor:**	Motorola MPX4115AP

TARGET RADAR (ft)	ZHG_HELI	ALTRAD_U	ALTBAR_M	HELI GPS Z MINUS GROUND GPS LEVEL (m)	UNCALIBRATED RADAR (m)	CALIBRATED RADAR (m)	BAROMETRIC MINUS GROUND GPS LEVEL (m)
0	587.3	0.00	212.7	0.0	0.0	-0.5	-375
200	646.4	210.24	235.5	59.1	64.1	61.8	-351.8
300	675.1	306.92	251.3	87.8	93.5	90.5	-335.9
400	705.5	405.24	267.7	118.2	123.5	119.6	-319.6
500	735.6	504.11	283.7	148.3	153.7	148.9	-303.6
600	764.4	599.78	299.0	177.1	182.8	177.3	-288.3

Summary of Radar Altimeter Calibration Test

Scale factor to apply = 0.97 (slope)

Offset factor to apply = -1.77 m = -5.82 ft (intercept)

The following equation should be used to calibrate the raw radar altimeter data (Note: ALTRAD_R is in feet and the offset applied, -5.82 is in feet):

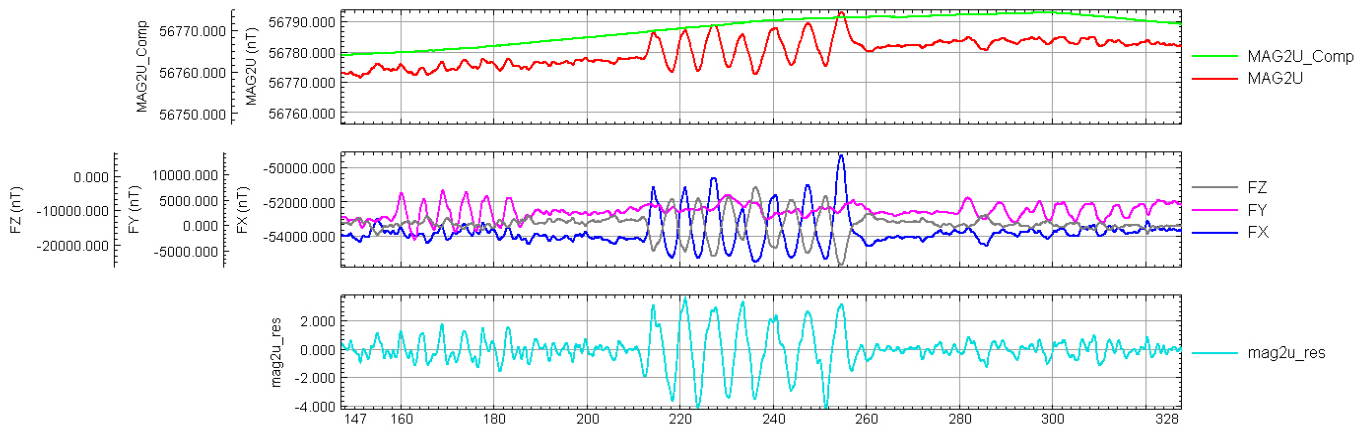
ALTRAD_C = 0.97 * ALTRAD_R - 5.82

FIGURE OF MERIT

Compensation of magnetic readings is required when the magnetometers are mounted on, or in close proximity to, the aircraft. The aircraft with its metallic parts and surfaces creates secondary magnetic fields while the aircraft moves through the earth's magnetic field. Therefore the compensation calibration test is flown to calculate the effects of the aircraft and its control surfaces on the magnetic field. The test is flown at high altitude, outside the effect of geology on the magnetic readings. The aircraft flies in each of the survey directions performing a series of manoeuvres that moves the aircraft along each of its three axis of rotation. The aircrafts affect on the magnetic data is calculated and then subtracted from the magnetic data collected during the survey. C-FGSC magnetic compensation test for 10004 was done on February 18, 2010.

Job Number:	10004		**Survey Type:**	Mag_stinger			
Date Flown:	**2/6/2010**		**Helicopter Registration:**	FSGC			
Flight Number:	**29050***		**Database Name:**	FOM_GSV_Feb18_FuelPump.			
BOX 2	**Sensor Position:**		**Pitch**	**Roll**	**Yaw**	**Total**	**Figure of Merit**
	Raw Mag Channel:	mag2u	**Residual Peak to Peak**	**Residual Peak to Peak**	**Residual Peak to Peak**		
	Line Number	**Heading**					
Direction 1:	100.00	300	0.11	0.11	0.08	0.30	**1.57**
Direction 2:	200.00	210	0.14	0.09	0.31	0.53	
Direction 3:	300.00	120	0.20	0.11	0.11	0.42	
Direction 4:	400.00	030	0.09	0.10	0.15	0.33	

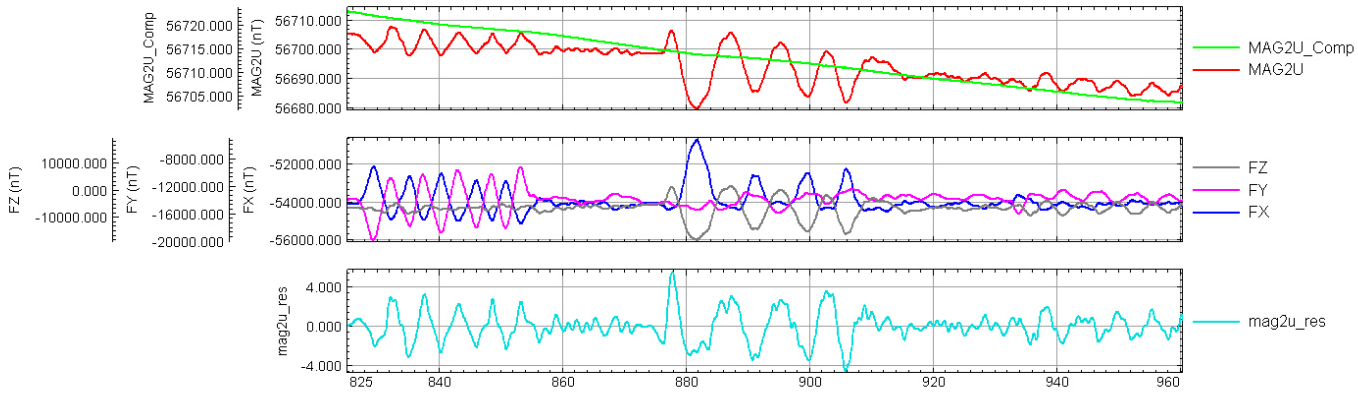
10004 FOM 18 FEB 2010 300NW



database: D:\Jobs\10004\Field\Test&Calibration\Haines_FOM\GSC_Feb18\FOM_GSV_Feb18_FuelPump.gdb line/group: L10

2010/05/10

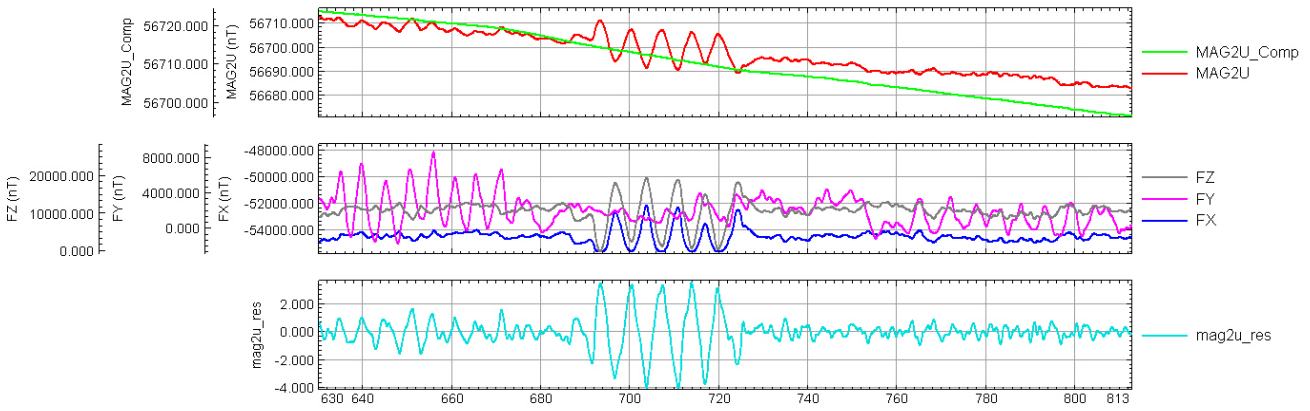
10004 FOM 16 MAR 2010 210SW



database: D:\Jobs\10004\Field\Test&Calibration\Haines_FOM\March 16 2010 FOM_GAVO\Helidas Data\MAR16_FOM_Gavo.gdb line/group: L20

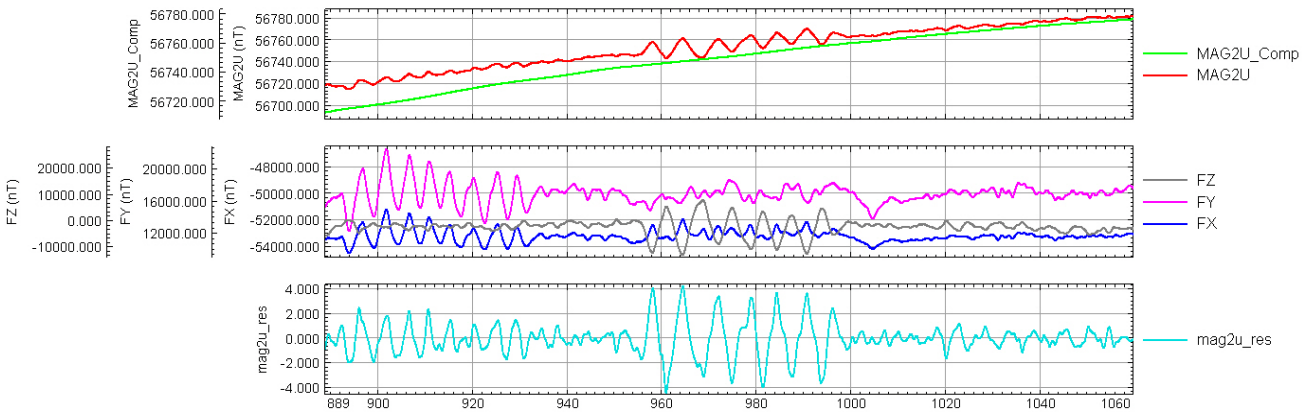
2010/05/10

10004 FOM 18 FEB 2010 120SE



database: D:\Jobs\10004\Field\Test&Calibration\Haines_FOM\GSC_Feb18\FOM_GSV_Feb18_FuelPump.gdb line/group: L30 2010/05/10

10004 FOM 18 FEB 2010 30NE



database: D:\Jobs\10004\Field\Test&Calibration\Haines_FOM\GSC_Feb18\FOM_GSV_Feb18_FuelPump.gdb line/group: L40 2010/05/10

AEROMAGNETIC SURVEY SYSTEM CALIBRATION TEST RANGES AT MEANOOK, ALBERTA

AIRCRAFT TYPE AND REGISTRATION: **C-FGSC**
ORGANIZATION (COMPANY): **FUGRO AIRBORNE SURVEYS TORONTO**
MAGNETOMETER TYPE: SCINTREX CS3
MAGNETOMETER SERIAL NUMBER:
COMPILED BY: AMIR SOLTANZADEH

DATE: JANUARY 25, 2010
HEIGHT FLOWN: 500 FEET
SAMPLING RATE: 10 / SECOND
DATA ACQUISITION SYSTEM: HELIDAS
GSC 4/95

Direction of flight across the Crossroads	Time that Survey Aircraft was over the Crossroads (HH/MM/SS) Greenwich Mean Time	Total Field Value (nT) Recorded in Survey Aircraft over Crossroads (T1)	Observatory Diurnal Reading at Previous Minute i.e. Hours + Minutes (T2) from Printout	Observatory Diurnal Reading at Subsequent Minute i.e. H hours + (M + 1) mins. (T3) from Printout	Interpolated Observatory Diurnal Reading at Time H hours + M mins + S sec T4 = T2 + S (T3 – T2) ----- 60	Calculated Observatory Value T5 = T4 - C*	Error Value T6 = T1 - T5
EXAMPLE	20:34:40 Z	56840.4 nT	57397.5 nT	57398.3 nT	57398.0 nT	56842.0 nT	-1.6 nT
NORTH	19:39:18.0	57998.5	58002.3	58002.3	58002.3	58002.3	-3.8
SOUTH	19:45:51.6	57999.3	58002.3	58002.7	58002.6	58002.6	-3.3
EAST	19:16:56.0	57997.7	58001.9	58001.8	58001.8	58001.8	-4.1
WEST	19:23:03.0	57998.6	58002.3	58002.2	58002.3	58002.3	-3.7
NORTH	19:52:03.4	57999.0	58002.9	58003.0	58002.9	58002.9	-3.9
SOUTH	19:58:42.1	57999.6	58002.8	58003.0	58002.9	58002.9	-3.3
EAST	19:28:52.8	57998.8	58002.9	58002.5	58002.5	58002.5	-3.7
WEST	19:23:03.1	57999.0	58002.3	58002.3	58002.3	58002.3	-3.3

*C is the difference in the total field between the Meanook Observatory value (O) and the value (B) at the point above the crossroads at a given height. Meanook Observatory: 1000 Feet, C = (O-B) = 0 nT; 500 Feet, C = 0 nT

Total = 29.2 nT

Average North-South Heading Error (T6 North - T6 South) = 0.5 nT
Average East-West Heading Error (T6 East - T6 West) = -0.4 nT

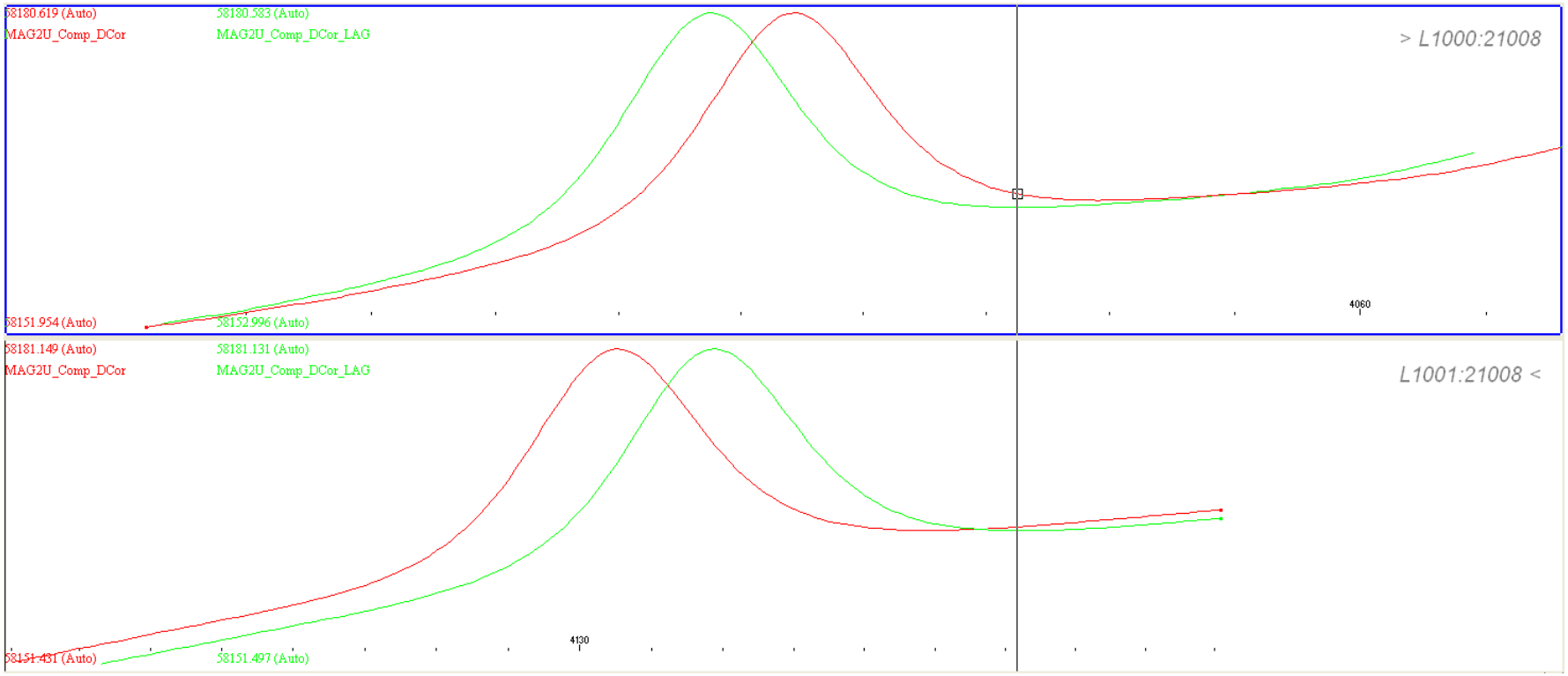
Number of Passes for Average = 8 **3.65 nT**

TESTS AND CALIBRATIONS

Aircraft Registration C- GAVO

LAG TEST

A magnetic lag test is flown to calculate the positional lag that develops between the time a reading is made and the time it is recorded in the data. A large metallic body such as railway tracks, a bridge, buildings or a distinct magnetic anomaly is flown over along a single line, at survey altitude, in opposite directions. This allows the time constant value that will line-up the magnetic anomaly peaks or troughs that are produced to be determined. This time shift constant is then applied to the data collected during the survey.
Lag test for C-GAVO was flown on January 25, 2010. The lag was determined to be 1.3 seconds.



ALTIMETER VERIFICATION

Immediately following a new helicopter installation or radar altimeter change, an altimeter test flight is necessary to ensure the indicated altitude is known and to have confidence in the instrumentation. A base level for the GPS and barometer is established by recording 30 seconds of data with the helicopter on the ground. Radar and barometric altitude is checked against the GPS Z for several target heights. The radar altimeter is graphed against the GPS Z in order to determine values that are used an adjustment equation to adjust the radar altimeter values.

ALTIMETER VERIFICATION

Job Number:	10004	**Survey Type:**	Stinger	**Radar Altimeter:**	Honeywell or Sperry RT300 / AT220
Date Flown:	25-Jan-10	**Helicopter Reg:**	C-GAVO	**Laser Altimeter:**	Optech ADMGPA100
Flight Number:	21008	**Geosoft Database:**	altitude-lag-thabasca_fgavo_jan25	**Barometric Pressure Sensor:**	Motorola MPX4115AP

TARGET RADAR (ft)	ZHG_ HELI	ALTRAD _U	ALTBAR _M	HELI GPS Z MINUS GROUND GPS LEVEL (m)	UNCALIBRATED RADAR (m)	CALIBRATED RADAR (m)	BAROMETRIC MINUS GROUND GPS LEVEL (m)
0	589.9	0.0	213.3	0.0	0.0	-0.6	-376.6
200	650.0	210.0	244.3	60.1	64.0	63.2	-345.7
300	679.7	305.5	260.7	89.8	93.1	92.2	-329.2
400	709.6	403.1	259.4	119.7	122.9	121.8	-330.5
500	739.7	499.2	274.8	149.8	152.1	151.0	-315.1
600	771.1	598.0	289.7	181.2	182.3	181.0	-300.3

Summary of Radar Altimeter Calibration Test

Scale factor to apply = 1.00
Offset factor to apply = -1.94 m = -6.37 ft

The following equation should be used to adjust the raw radar altimeter data (Note: ALTRAD_R is in feet and the offset applied, -6.37 is in feet):

ALTRAD_C = 1.00 * ALTRAD_R – 6.37

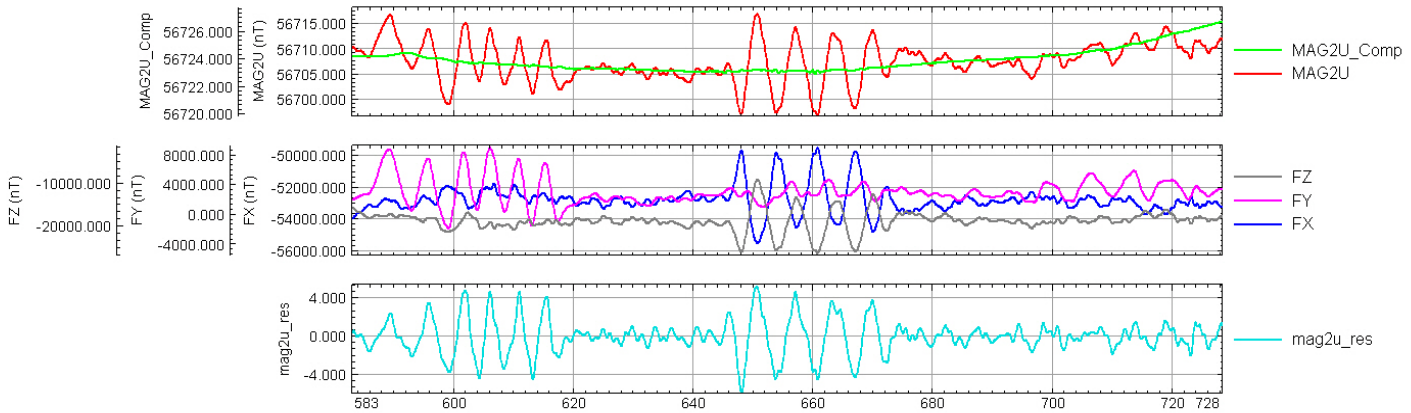
FIGURE OF MERIT

Compensation of magnetic readings is required when the magnetometers are mounted on, or in close proximity to, the aircraft. The aircraft with its metallic parts and surfaces creates secondary magnetic fields while the aircraft moves through the earth's magnetic field. Therefore the compensation calibration test is flown to calculate the effects of the aircraft and its control surfaces on the magnetic field. The test is flown at high altitude, outside the effect of geology on the magnetic readings. The aircraft flies in each of the survey directions performing a series of manoeuvres that moves the aircraft along each of its three axis of rotation. The aircrafts affect on the magnetic data is calculated and then subtracted from the magnetic data collected during the survey. C-GAVO magnetic compensation was done on March 16, 2010.

MAGNETIC COMPENSATION CALIBRATION			
Job Number:	10004	**Survey Type:**	Mag_stinger
Date Flown:	**3/16/2010**	**Helicopter Registration:**	FGAVO
Flight Number:	**21060**	**Database Name:**	MAR16_FOM_Gavo.gdb

BOX 2	**Sensor Position:**		**Pitch**	**Roll**	**Yaw**	**Total**	**Figure of Merit**
	Raw Mag Channel:	mag2u	**Residual Peak to Peak**	**Residual Peak to Peak**	**Residual Peak to Peak**		
	Line Number	**Heading**					
Direction 1:	100.00	300	0.09	0.13	0.10	0.32	**1.26**
Direction 2:	200.00	210	0.11	0.10	0.10	0.31	
Direction 3:	300.00	120	0.09	0.12	0.09	0.30	
Direction 4:	400.00	030	0.13	0.14	0.07	0.34	

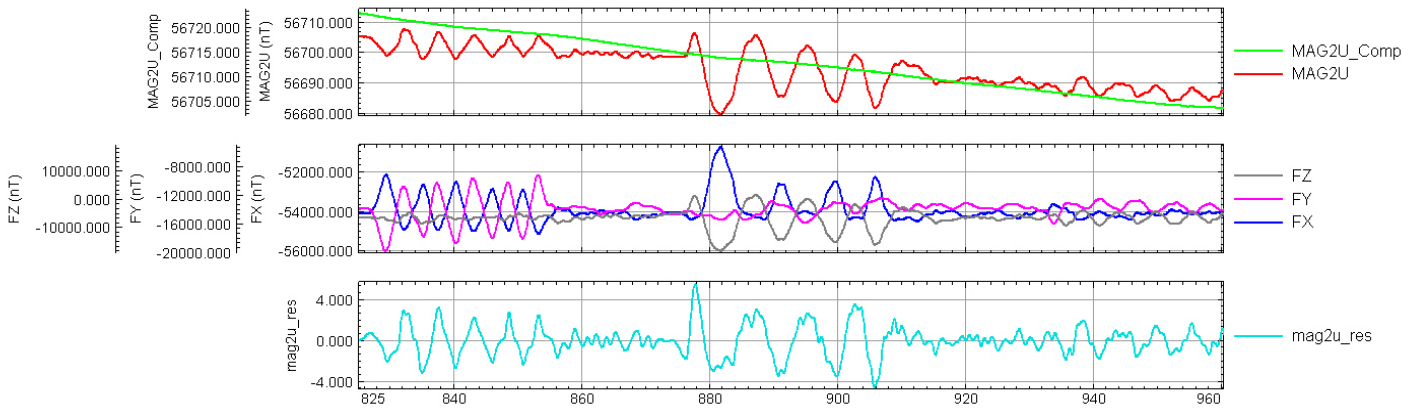
10004 FOM 16 MAR 2010 300NW



database: D:\Jobs\10004\Field\Test&Calibration\Haines_FOM\March 16 2010 FOM_GAVO\Helidas Data\MAR16_FOM_Gavo.gdb line/group: L10

2010/05/10

10004 FOM 16 MAR 2010 210SW



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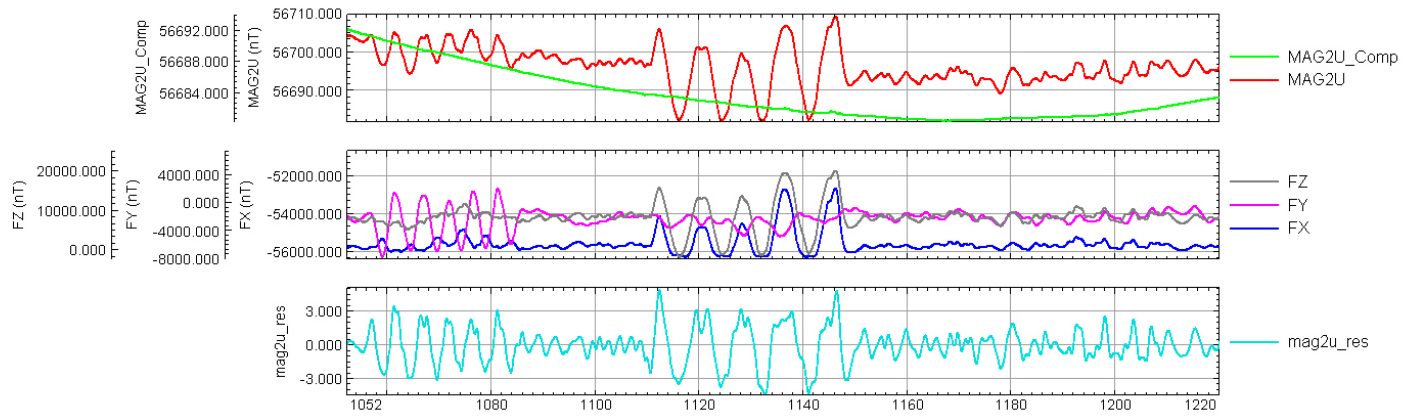
2010/05/10

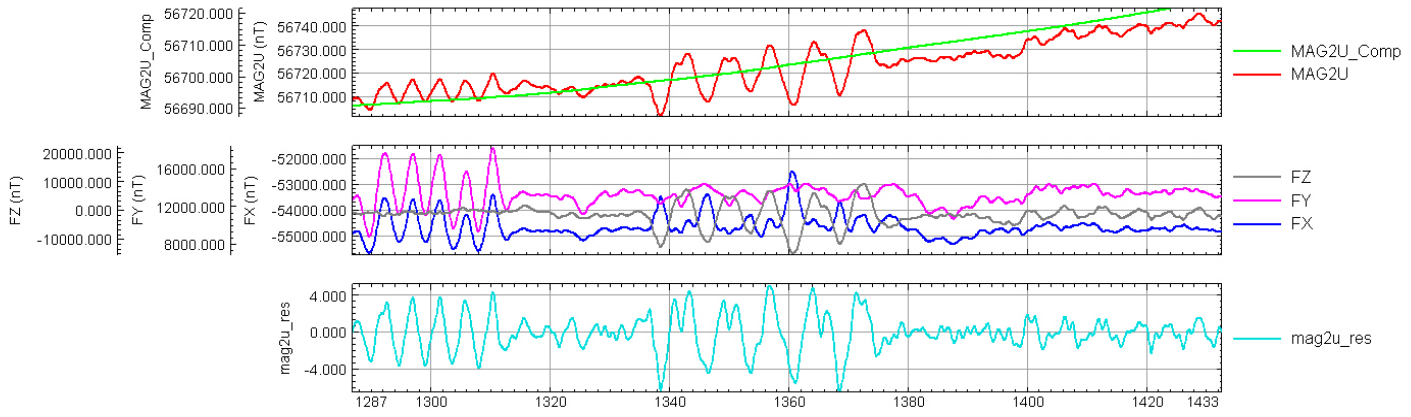
10004 FOM 16 MAR 2010 120SE



database: D:\Jobs\10004\Field\Test&Calibration\Haines_FOM\March 16 2010 FOM_GAVO\Helidas Data\MAR16_FOM_Gavo.gdb line/group: L30

2010/05/10

10004 FOM 16 MAR 2010 30NE



database: D:\Jobs\10004\Field\Test&Calibration\Haines_FOM\March 16 2010 FOM_GAVO\Helidas Data\MAR16_FOM_Gavo.gdb line/group: L40

2010/05/10

AEROMAGNETIC SURVEY SYSTEM CALIBRATION TEST RANGES AT BOURGET, ONTARIO AND MEANOOK, ALBERTA

AIRCRAFT TYPE AND REGISTRATION: **C-GAVO**
ORGANIZATION (COMPANY): **FUGRO AIRBORNE SURVEYS TORONTO**
MAGNETOMETER
MAGNETOMETER SERIAL NUMBER:
COMPILED BY: AMIR SOLTANZADEH

DATE: JANUARY 27, 2010
HEIGHT FLOWN: 500 FEET
SAMPLING RATE: 10 / SECOND
DATA ACQUISITION SYSTEM: HELIDAS
GSC 4/95

Direction of flight across the Crossroads	Time that Survey Aircraft was over the Crossroads (HH/MM/SS) Greenwich Mean Time	Total Field Value (nT) Recorded in Survey Aircraft over Crossroads (T1)	Observatory Diurnal Reading at Previous Minute i.e. Hours + Minutes (T2) from Printout	Observatory Diurnal Reading at Subsequent Minute i.e. H hours + (M + 1) mins. (T3) from Printout	Interpolated Observatory Diurnal Reading at Time H hours + M mins + S sec T4 = T2 + S (T3 – T2) ----- 60	Calculated Observatory Value T5 = T4 - C*	Error Value T6 = T1 - T5
EXAMPLE	20:34:40 Z	56840.4 nT	57397.5 nT	57398.3 nT	57398.0 nT	56842.0 nT	-1.6 nT
NORTH	18:45:05.7	57977.3	57999.5	57999.5	57999.5	57398.0	-22.2
SOUTH	18:40:27.7	57976.8	57999.7	57999.7	57999.7	57999.5	-22.9
EAST	19:03:15.5	57975.9	57999.7	57999.6	57999.7	57999.7	-23.8
WEST	18:59:34.5	57976.5	57999.6	57999.9	57999.8	57999.7	-23.3
NORTH	18:53:17.6	57977.0	57999.8	57999.8	57999.8	57999.8	-22.8
SOUTH	18:49:29.8	57975.7	57999.4	57999.6	57999.5	57999.8	-23.8
EAST	19:07:01.8	57976.4	57999.6	57999.7	57999.6	57999.5	-23.2
WEST	19:10:31.8	57976.7	58000.3	58000.1	58000.2	57999.6	-23.5

*C is the difference in the total field between the Meanook Observatory value (O) and the value (B) at the point above the crossroads at a given height. Meanook Observatory: 1000 Feet, C = (O-B) = 0 nT; 500 Feet, C = 0 nT

Total = -185.5 nT

Average North-South Heading Error (T6 North - T6 South) = 0.9 nT

Average East-West Heading Error (T6 East - T6 West) = -0.1 nT

Number of Passes for Average = 8 **23.19 nT**

APPENDIX E

WEEKLY PROGRESS REPORTS

JOB #:	**10004**
CLIENT:	**NRC/GSC**
OPERATING BASE(S):	**Haines Junction, Yukon**
LINE KILOMETRES:	**11740.3**
MOB DATE:	**15-Jan-10**
AIRCRAFT:	**AS350 B2 and B3**

PRODUCTION KM				
Flown	**Accepted**	**Remaining**	**% Comp**	**System Days**
3990.9	**3985.0**	**7218.2**	**38.5%**	**7.00**

Crew Leader(s):	**Amir H. Soltanzadeh**
Processor(s):	**Amir H. Soltanzadeh**
Operator(s):	**Nick Gacican, Liliana Amicarella**
Pilot(s):	**Blair Eliott, Garry Martinson, Glenn Charbonneau**
AME(s):	**Craig Cable**
Other(s):	

DATE	**FLT**	**AREA FLOWN**	**CREW**	**PRODUCTION**		**STANDBY DAY**	**COMMENTS** *(Rep: Problems, Down Time, Safety, Unusual Circumstances, Crew Moves, Etc.)*
				Flown km	**Accepted km**		
05-Feb-10-Fri	21022	1	NG,LA, AHS,GC,DR,GM	256.7	256.7		AVO: Ops normal Flew part lines on the s.w corner of block due to weather
05-Feb-10-Fri	21023	1	NG,LA, AHS,GC,DR,GM	203.1	203.1		AVO: Ops Normal. Contine part lines
05-Feb-10-Fri	29016	1	NG,LA, AHS,GC,DR,GM	179.0	179.0		GSC: Ops Normal
05-Feb-10-Fri	29017	1	NG,LA, AHS,GC,DR,GM	102.0	96.1		GSC Partial tie lines due to weather
06-Feb-10-Sat	21024	1	NG,LA, AHS,GC,DR,GM	308.3	308.3		AVO: Partial lines due to clouds
06-Feb-10-Sat	21025	1	NG,LA, AHS,GC,DR,GM	134.1	134.1		AVO: Partial lines due to clouds
06-Feb-10-Sat	29018	1	NG,LA, AHS,GC,DR,GM	188.4	188.4		
06-Feb-10-Sat	29021	1	NG,LA, AHS,GC,DR,GM	26.1	26.1		GSC: FOM flown prior to this flight
07-Feb-10-Sun	21026	1	NG,LA, AHS,GC,DR,GM	48.4	48.4		GAVO: Flying south end, called due to wind
07-Feb-10-Sun	29024	1	NG,LA, AHS,GC,DR,GM	258.1	258.1		GSC: Flying North end. completed flight, called due to winds
08-Feb-10-Mon		1	NG,LA,	0.0	0.0		GAVO: Winds all day, no flying

			AHS,GC,DR,GM				
08-Feb-10-Mon		1	NG,LA, AHS,GC,DR,GM	0.0	0.0		GSC: Winds all day, no flying
09-Feb-10-Tue	21027	1	NG,LA, AHS,GC,DR,GM	151.4	151.4		GAVO. Flying the rough south end.
09-Feb-10-Tue	21028	1	NG,LA, AHS,GC,DR,GM	87.3	87.3		GAVO: Flying the rough south end.
09-Feb-10-Tue	21029	1	NG,LA, AHS,GC,DR,GM	208.9	208.9		GAVO: Flying the rough south end.
09-Feb-10-Tue	29025	1	NG,LA, AHS,GC,DR,GM	124.8	124.8		GSC: Completing the north tie lines
09-Feb-10-Tue	29026	1	NG,LA, AHS,GC,DR,GM	25.7	25.7		GSC: Completing the north tie lines
09-Feb-10-Tue	29027	1	NG,LA, AHS,GC,DR,GM	18.6	18.6		GSC: Completing the north tie lines
09-Feb-10-Tue	29028	1	NG,LA, AHS,GC,DR,GM	9.0	9.0		GSC: Completing the north tie lines
09-Feb-10-Tue	29029	1	NG,LA, AHS,GC,DR,GM	133.3	133.3		GAVO: Flying rough area in south
10-Feb-10-Wed	21030	1	NG,LA, AHS,GC,DR,GM	118.5	118.5		GAVO: Flying rough area in south
10-Feb-10-Wed	21031	1	NG,LA, AHS,GC,DR,GM	274.3	274.3		GAVO: Flying rough area in south
10-Feb-10-Wed	29030	1	NG,LA, AHS,GC,DR,GM	8.3	8.3		FGSC: Flying North East.
10-Feb-10-Wed	29031	1	NG,LA, AHS,GC,DR,GM	59.5	59.5		FGSC: Flying North East.
10-Feb-10-Wed	29032	1	NG,LA, AHS,GC,DR,GM	92.1	92.1		FGSC: Flying North East.
10-Feb-10-Wed	29033	1	NG,LA, AHS,GC,DR,GM	233.0	233.0		FGSC: Flying North East.
11-Feb-10-Thu	21034	1	NG,LA, AHS,GC,DR,GM	280.6	280.6		GAVO Flying rough area in the south
11-Feb-10-Thu	21035	1	NG,LA, AHS,GC,DR,GM	0.0	0.0		GAVO Flying rough area in the south
11-Feb-10-Thu	29035	1	NG,LA, AHS,GC,DR,GM	24.6	24.6		FGSC: Flying North East.
11-Feb-10-Thu	29037	1	NG,LA, AHS,GC,DR,GM	161.5	161.5		FGSC: Flying North East.
11-Feb-10-Thu	29038	1	NG,LA, AHS,GC,DR,GM	275.5	275.5		FGSC: Flying North East.
				3990.9	**3985.0**		

JOB #:	10004
CLIENT:	NRC/GSC
OPERATING BASE(S):	Haines Junction, Yukon
LINE KILOMETRES:	11740.3
MOB DATE:	15-Jan-10
AIRCRAFT:	AS350 B2 and B3

PRODUCTION KM				
Flown	Accepted	Remaining	% Comp	System Days
3542.8	3536.7	3618.5	69.2%	7.00

Crew Leader(s):	Amir H. Soltanzadeh
Processor(s):	Amir H. Soltanzadeh
Operator(s):	Nick Gacican, Liliana Amicarella
Pilot(s):	Blair Eliott, Garry Martinson, Glenn Charbonneau
AME(s):	Craig Cable
Other(s):	

DATE	FLT	AREA FLOWN	CREW	PRODUCTION		STANDBY DAY	COMMENTS *(Rep: Problems, Down Time, Safety, Unusual Circumstances, Crew Moves, Etc.)*
				Flown km	Accepted km		
12-Feb-10-Fri	21035	1	NG,LA, AHS,CC,DR,GM	359.6	359.6		GAVO: OPS NORMAL
12-Feb-10-Fri	21036	1	NG,LA, AHS,CC,DR,GM	303.0	303.0		GAVO: OPS NORMAL
12-Feb-10-Fri	21037	1	NG,LA, AHS,CC,DR,GM	92.1	92.1		GAVO: OPS NORMAL
12-Feb-10-Fri	29039	1	NG,LA, AHS,CC,DR,GM	221.5	221.5		FGSC: Flying North East.
12-Feb-10-Fri	29041	1	NG,LA, AHS,CC,DR,GM	15.2	15.2		FGSC: Flying North East.
12-Feb-10-Fri	29042	1	NG,LA, AHS,CC,DR,GM	273.4	273.4		FGSC: Flying North East.
13-Feb-10-Sat	21038	1	NG,LA, AHS,CC,DR,GM	200.5	200.5		Gavo: contunuing lines to the North West
13-Feb-10-Sat	21039	1	NG,LA, AHS,CC,DR,GM	335.9	335.9		Gavo: contunuing lines to the North West
13-Feb-10-Sat	29043	1	NG,LA, AHS,CC,DR,GM	263.3	263.3		FGSC: Flying South East
13-Feb-10-Sat	29044	1	NG,LA, AHS,CC,DR,GM	83.8	77.8		FGSC Flying south east, going around a settlement for two lines
13-Feb-10-Sat	29046	1	NG,LA,	186.1	186.1		FGSC: ops normal

			AHS,CC,DR,GM				
14-Feb-10-Sun	21040	1	NG,LA, AHS,CC,DR,GM	326.0	326.0		GAVO:
14-Feb-10-Sun	21041	1	NG,LA, AHS,CC,DR,GM	156.9	156.9		GAVO
14-Feb-10-Sun	21042	1	NG,LA, AHS,CC,DR,GM	137.0	137.0		GAVO:
14-Feb-10-Sun	29047	1	NG,LA, AHS,CC,DR,GM	0.0	0.0		FGSC: Repeat lines flown
14-Feb-10-Sun	29048	1	NG,LA, AHS,CC,DR,GM	223.0	223.0		FGSC Ops Normal
14-Feb-10-Sun	29049	1	NG,LA, AHS,CC,DR,GM	276.2	276.2		FGSC:Ops Normal
15-Feb-10-Mon		1	NG,LA, AHS,CC,DR,GM	0.0	0.0		GAVO: Client concern with drape flying. Both machines grounded until drape surface rengenerated to allow for better drape flying.
15-Feb-10-Mon		1	NG,LA, AHS,CC,DR,GM	0.0	0.0		GSC down for maintanence
16-Feb-10-Tue	21043	1	NG,LA, AHS,CC,DR,GM	89.2	89.2		GAVO: 1 reflight line from (11060 from 29024). Called due to winds
16-Feb-10-Tue		1	NG,LA, AHS,CC,DR,GM	0.0	0.0		FGSC: Maintenance complete, no flying due to winds, awaiting clearence from office regarding drape
17-Feb-10-Wed		1	NG,LA, AHS,CC,DR,GM	0.0	0.0		Windy, no flying
17-Feb-10-Wed		1	NG,LA, AHS,CC,DR,GM	0.0	0.0		Windy, no flying
18-Feb-10-Thu	29050	1	NG,LA, AHS,CC,DR,GM	0.0	0.0		FGSC: FOM for new fuel pump. Aborted due to strong winds
18-Feb-10-Thu		1	NG,LA, AHS,CC,DR,GM	0.0	0.0		GAVO: Aborted due to strong winds
				3542.8	**3536.7**		

JOB #:	**10004**
CLIENT:	**NRC/GSC**
OPERATING BASE(S):	**Haines Junction, Yukon**
LINE KILOMETRES:	**11740.3**
MOB DATE:	**15-Jan-10**
AIRCRAFT:	**AS350 B2 and B3**

Crew Leader(s):	**Amir H. Soltanzadeh**
Processor(s):	**Amir H. Soltanzadeh**

PRODUCTION KM				
Flown	Accepted	Remaining	% Comp	System Days
3317.7	3260.0	421.5	96.4%	6.00

Operator(s):	Nick Gacican, Liliana Amicarella
Pilot(s):	Blair Eliott, Garry Martinson, Glenn Charbonneau
AME(s):	Craig Cable
Other(s):	

DATE	FLT	AREA FLOWN	CREW	PRODUCTION		STANDBY DAY	COMMENTS *(Rep: Problems, Down Time, Safety, Unusual Circumstances, Crew Moves, Etc.)*
				Flown km	Accepted km		
19-Feb-10-Fri	29051	1	NG,LA, AHS,CC,DR,GM	244.0	232.6		FGSC: Flying valleys, peaks too windy. Part line rejected due to attemp at mountains out of drape spec
19-Feb-10-Fri	29052	1	NG,LA, AHS,CC,DR,GM	309.8	309.8		FGSC Flying valleys, peaks too windy
19-Feb-10-Fri		1	NG,LA, AHS,CC,DR,GM	0.0	0.0		flight aborted due to winds.
20-Feb-10-Sat	21046	1	NG,LA, AHS,CC,DR,GM	229.1	229.1		GAVO: Light Breeze
20-Feb-10-Sat	21047	1	NG,LA, AHS,CC,DR,GM	213.4	213.4		GAVO: OPS NORMAL
20-Feb-10-Sat	21048	1	NG,LA, AHS,CC,DR,GM	106.6	106.6		GAVO:OPS normal
20-Feb-10-Sat	29053	1	NG,LA, AHS,CC,DR,GM	141.3	107.1		FGSC: ops normal
20-Feb-10-Sat	29054	1	NG,LA, AHS,CC,DR,GM	241.6	241.6		FGSC:Ops Normal
20-Feb-10-Sat	29055	1	NG,LA, AHS,CC,DR,GM	126.4	126.4		FGSC:Ops Normal
21-Feb-10-Sun	21049	1	NG,LA, AHS,CC,DR,GM	105.6	105.6		GAVO: Cut short due to equipment problems
21-Feb-10-Sun	21050	1	NG,LA, AHS,CC,DR,GM	211.2	211.2		GAVO: Some breeze, ops normal
21-Feb-10-Sun	21051	1	NG,LA, AHS,CC,DR,GM	197.7	197.7		GAVO: Mountains in the northwest
21-Feb-10-Sun	29056	1	NG,LA, AHS,CC,DR,GM	269.0	260.4		FGSC: Lots of short lines
21-Feb-10-Sun	29057	1	NG,LA, AHS,CC,DR,GM	244.8	244.8		FGSC Lots of short lines
21-Feb-10-Sun		1	NG,LA, AHS,CC,DR,GM	0.0	0.0		

22-Feb-10-Mon	21051	1	NG,LA, AHS,CC,DR,GM	197.7	197.7		GAVO: Ops normal
22-Feb-10-Mon	21052	1	NG,LA, AHS,CC,DR,GM	61.4	61.4		GAVO: Ops normal
22-Feb-10-Mon	21053	1	NG,LA, AHS,CC,DR,GM	54.5	50.9		GAVO: Ops normal
22-Feb-10-Mon	29058	1	NG,LA, AHS,CC,DR,GM	137.8	137.8		FGSC: called due to winds in that area
23-Feb-10-Tue	21055	1	NG, AHS,CC,GM	36.1	36.1		GAVO: Completed mountains in the south
23-Feb-10-Tue	29060	1	NG, AHS,CC,GM	134.4	134.4		FGSC: Completed mountains in the south
23-Feb-10-Tue	29061	1	NG, AHS,CC,GM	55.5	55.5		FGSC Completed mountains in the south
24-Feb-10-Wed	29062	1	NG, AHS,CC,GM	0.0	0.0		FGSC: Lag test, incomplete
25-Feb-10-Thu		1	NG, AHS,CC,GM	0.0	0.0		Awaiting for new drape from office regarding reflights. Weather windy
				3317.7	**3260.0**		

JOB #:	**10004**
CLIENT:	**NRC/GSC**
OPERATING BASE(S):	**Haines Junction, Yukon**
LINE KILOMETRES:	**11740.3**
MOB DATE:	**15-Jan-10**
AIRCRAFT:	**AS350 B2 and B3**

PRODUCTION KM				
Flown	**Accepted**	**Remaining**	**% Comp**	**System Days**
29.8	**29.8**	**391.7**	**96.7%**	**7.00**

Crew Leader(s):	**Amir H. Soltanzadeh**
Processor(s):	**Amir H. Soltanzadeh**
Operator(s):	**Nick Gacican, Liliana Amicarella**
Pilot(s):	**Blair Eliott, Garry Martinson, Glenn Charbonneau**
AME(s):	**Craig Cable**
Other(s):	

DATE	**FLT**	**AREA FLOWN**	**CREW**	**PRODUCTION**		**STANDBY DAY**	**COMMENTS** *(Rep: Problems, Down Time, Safety, Unusual Circumstances, Crew Moves, Etc.)*
				Flown km	**Accepted km**		
26-Feb-10-Fri		1	NG, AHS,CC,GM	0.0	0.0		Awaiting for new drape from office regarding reflights
27-Feb-10-Sat	21056	1	NG, AHS,CC,GM	20.2	20.2		Attempted some reflights on old drape, but too windy

27-Feb-10-Sat	29064	1	NG, AHS,CC,GM	9.6	9.6		Part tie line reflown, lag test
28-Feb-10-Sun		1	NG, AHS,CC,GM	0.0	0.0		No flying, weather low ceiling all day.
01-Mar-10-Mon		1	NG, AHS,CC,GM	0.0	0.0		No flying, weather low ceiling all day. Obtain permission to relase FGSC since work remaining can be completed with one machine. Client gave permission in the afternoon.
02-Mar-10-Tue		1	NG, AHS,CC,GM	0.0	0.0		No flying, weather low ceiling all day. FGSC released, equipment deinstalled. DR and LA offsite, overnighted in Whitehorse
03-Mar-10-Wed		1	NG, AHS,CC,GM	0.0	0.0		No flying, weather low ceiling all day.
04-Mar-10-Thu		1	NG, AHS,CC,GM	0.0	0.0		No flying, weather low ceiling all day.
				29.8	**29.8**		

JOB #:	**10004**
CLIENT:	**NRC/GSC**
OPERATING BASE(S):	**Haines Junction, Yukon**
LINE KILOMETRES:	**11740.3**
MOB DATE:	**15-Jan-10**
AIRCRAFT:	**AS350 B2 and B3**

PRODUCTION KM				
Flown	**Accepted**	**Remaining**	**% Comp**	**System Days**
0.0	**0.0**	**11740.3**	**0.0%**	**0.00**

Crew Leader(s):	**Amir H. Soltanzadeh**
Processor(s):	**Amir H. Soltanzadeh**
Operator(s):	**Nick Gacican, Liliana Amicarella**
Pilot(s):	**Blair Eliott, Garry Martinson, Glenn Charbonneau**
AME(s):	**Craig Cable**
Other(s):	

DATE	**FLT**	**AREA FLOWN**	**CREW**	**PRODUCTION**		**STANDBY DAY**	**COMMENTS** *(Rep: Problems, Down Time, Safety, Unusual Circumstances, Crew Moves, Etc.)*
				Flown km	**Accepted km**		
15-Jan-10-Fri		1	NG,LA	0.0	0.0		Crew begins mob for Edmonton
16-Jan-10-Sat		1	NG,LA	0.0	0.0		Crew mobing to Edmonton
17-Jan-10-Sun		1	NG,LA	0.0	0.0		Crew arrived at Yorkton
18-Jan-10-Mon		1	NG,LA	0.0	0.0		Crew arrives in Edmonton in the Evening. Aircraft not available yet
19-Jan-10-Tue		1	NG,LA	0.0	0.0		Crew on standby, aircraft still in High Level

20-Jan-10-Wed		1	NG,LA, AHS,GC	0.0	0.0		Freezing rain in High Level, aircrafts still in. Amir S and Glenn C arrive in Edmonton.
21-Jan-10-Thu		1	NG,LA, AHS,GC,BE,GM	0.0	0.0		Both aircraft arrive in Edmonton late in the afternoon, commence instalation
				0.0	**0.0**		

JOB #:	**10004**
CLIENT:	**NRC/GSC**
OPERATING BASE(S):	**Haines Junction, Yukon**
LINE KILOMETRES:	**11740.3**
MOB DATE:	**15-Jan-10**
AIRCRAFT:	**AS350 B2 and B3**

PRODUCTION KM				
Flown	**Accepted**	**Remaining**	**% Comp**	**System Days**
0.0	**0.0**	**11740.3**	**0.0%**	**0.00**

Crew Leader(s):	**Amir H. Soltanzadeh**
Processor(s):	**Amir H. Soltanzadeh**
Operator(s):	**Nick Gacican, Liliana Amicarella**
Pilot(s):	**Blair Eliott, Garry Martinson, Glenn Charbonneau**
AME(s):	**Craig Cable**
Other(s):	

DATE	**FLT**	**AREA FLOWN**	**CREW**	**PRODUCTION**		**STANDBY DAY**	**COMMENTS** *(Rep: Problems, Down Time, Safety, Unusual Circumstances, Crew Moves, Etc.)*
				Flown km	**Accepted km**		
22-Jan-10-Fri		1	NG,LA, AHS,GC,BE,GM	0.0	0.0		instalation continues
23-Jan-10-Sat		1	NG,LA, AHS,GC,BE,GM	0.0	0.0		AVO instalation complete by mid-day, Test flights local in Edmonton. Aircraft remain in Edmonton, truck arrives in Athabasca
23-Jan-10-Sat		1	NG,LA, AHS,GC,BE,GM	0.0	0.0		GSC:instalation complete by mid-day, Test flights local in Edmonton. Aircraft remain in Edmonton, truck arrives in Athabasca
24-Jan-10-Sun		1	NG,LA, AHS,GC,BE,GM	0.0	0.0		Gavo: Helicopters arrive, but too snowy for survey work. Base station setup and tests.
24-Jan-10-Sun		1	NG,LA, AHS,GC,DR,GM	0.0	0.0		GSC:Helicopters arrive, but too snowy for survey work. Base station setup and tests.
25-Jan-10-Mon	290056	1	NG,LA, AHS,GC,DR,GM	0.0	0.0		GSC: Flew heading and altimeer, lag tests. No FOM due to low ceiling

25-Jan-10-Mon	21002	1	NG,LA, AHS,GC,DR,GM	0.0	0.0		GAVO: Flew heading and altimeer, lag tests. No FOM due to low ceiling
26-Jan-10-Tue		1	NG,LA, AHS,GC,DR,GM	0.0	0.0		GSC: FOM flown.
26-Jan-10-Tue		1	NG,LA, AHS,GC,DR,GM				AVO: FOM flown twice due to noise because of anticolision lights
27-Jan-10-Wed		1	NG,LA, AHS,GC,DR,GM	0.0	0.0		GSC: Awaitng client approval
27-Jan-10-Wed		1	NG,LA, AHS,GC,DR,GM				OVA: New FOM and Lag/heating, changed sensors
28-Jan-10-Thu		1	NG,LA, AHS,GC,DR,GM	0.0	0.0		GSC: Ferrying to Fort Nelson
28-Jan-10-Thu		1	NG,LA, AHS,GC,DR,GM				OVA: Athabasca to Fort Nelson
				0.0	**0.0**		

JOB #:	**10004**
CLIENT:	**NRC/GSC**
OPERATING BASE(S):	**Haines Junction, Yukon**
LINE KILOMETRES:	**11740.3**
MOB DATE:	**15-Jan-10**
AIRCRAFT:	**AS350 B2 and B3**

PRODUCTION KM				
Flown	**Accepted**	**Remaining**	**% Comp**	**System Days**
537.1	**537.1**	**11203.2**	**4.6%**	**2.00**

Crew Leader(s):	**Amir H. Soltanzadeh**
Processor(s):	**Amir H. Soltanzadeh**
Operator(s):	**Nick Gacican, Liliana Amicarella**
Pilot(s):	**Blair Eliott, Garry Martinson, Glenn Charbonneau**
AME(s):	**Craig Cable**
Other(s):	

DATE	**FLT**	**AREA FLOWN**	**CREW**	**PRODUCTION**		**STANDBY DAY**	**COMMENTS** *(Rep: Problems, Down Time, Safety, Unusual Circumstances, Crew Moves, Etc.)*
				Flown km	**Accepted km**		
29-Jan-10-Fri		1	NG,LA, AHS,GC,DR,GM	0.0	0.0		GSC: arrive in Haines
29-Jan-10-Fri		1	NG,LA, AHS,GC,DR,GM	0.0	0.0		OVA: Arrive in Haines

30-Jan-10-Sat		1	NG,LA, AHS,GC,DR,GM	0.0	0.0		GSC: Awaiting ground crew
30-Jan-10-Sat		1	NG,LA, AHS,GC,DR,GM	0.0	0.0		OCA: Awaiting ground crew
31-Jan-10-Sun		1	NG,LA, AHS,GC,DR,GM	0.0	0.0		GSC Recon, FOM
31-Jan-10-Sun		1	NG,LA, AHS,GC,DR,GM	0.0	0.0		OVA: Recon, FOM
01-Feb-10-Mon		1	NG,LA, AHS,GC,DR,GM	0.0	0.0		
01-Feb-10-Mon		1	NG,LA, AHS,GC,DR,GM	0.0	0.0		
02-Feb-10-Tue		1	NG,LA, AHS,GC,DR,GM	0.0	0.0		OVA: Weather
02-Feb-10-Tue		1	NG,LA, AHS,GC,DR,GM	0.0	0.0		GSC:WX
03-Feb-10-Wed	21010	1	NG,LA, AHS,GC,DR,GM	0.0	0.0		AVO: Problem reading the DTM grid
03-Feb-10-Wed		1	NG,LA, AHS,GC,DR,GM	0.0	0.0		GSC: same as above
04-Feb-10-Thu	21020	1	NG,LA, AHS,GC,DR,GM	223.8	223.8		AVO: ops normal.
04-Feb-10-Thu	21021	1	NG,LA, AHS,GC,DR,GM	134.3	134.3		
04-Feb-10-Thu	29013	1	NG,LA, AHS,GC,DR,GM	134.3	134.3		GSC: FOM attempt, FOM failed, but problem discovered. Survey lines flown
04-Feb-10-Thu	29015	1	NG,LA, AHS,GC,DR,GM	44.8	44.8		GSC: Tablet froze, syste, reboot
				537.1	**537.1**		

JOB #:	**10004**
CLIENT:	**NRC/GSC**
OPERATING BASE(S):	**Haines Junction, Yukon**
LINE KILOMETRES:	**11740.3**
MOB DATE:	**15-Jan-10**
AIRCRAFT:	**AS350 B2 and B3**

PRODUCTION KM

Crew Leader(s):	**Amir H. Soltanzadeh**
Processor(s):	**Amir H. Soltanzadeh**
Operator(s):	**Nick Gacican, Liliana Amicarella**

Flown	Accepted	Remaining	% Comp	System Days
0.0	0.0	391.7	96.7%	7.00

Pilot(s):	Blair Eliott, Garry Martinson, Glenn Charbonneau
AME(s):	Craig Cable
Other(s):	

DATE	FLT	AREA FLOWN	CREW	PRODUCTION		STANDBY DAY	COMMENTS (Rep: Problems, Down Time, Safety, Unusual Circumstances, Crew Moves, Etc.)
				Flown km	Accepted km		
05-Mar-10-Fri		1	NG, AHS,CC,GM	0.0	0.0		No flying, Snow
06-Mar-10-Sat		1	NG, AHS,CC,GM	0.0	0.0		No flying, weather low ceiling all day.
07-Mar-10-Sun		1	NG, AHS,CC,GM	0.0	0.0		No flying, windy in the morning, low ceiling in the afternoon
08-Mar-10-Mon		1	NG, AHS,CC,GM	0.0	0.0		No flying, weather low ceiling all day.
09-Mar-10-Tue		1	NG, AHS,CC,GM	0.0	0.0		No flying, Snow. Amir flying home today
10-Mar-10-Wed		1	NG,CC,GM	0.0	0.0		Attempted to survey aborted because of winds.
11-Mar-10-Thu		1	NG,CC,GM	0.0	0.0		No Flying, weather low ceiling all day.
				0.0	**0.0**		

JOB #:	10004
CLIENT:	NRC/GSC
OPERATING BASE(S):	Haines Junction, Yukon
LINE KILOMETRES:	11740.3
MOB DATE:	15-Jan-10
AIRCRAFT:	AS350 B2 and B3

PRODUCTION KM				
Flown	Accepted	Remaining	% Comp	System Days
160.5	160.5	0.0	100.0%	5.00

Crew Leader(s):	Amir H. Soltanzadeh
Processor(s):	Amir H. Soltanzadeh
Operator(s):	Nick Gacican, Liliana Amicarella
Pilot(s):	Blair Eliott, Garry Martinson, Glenn Charbonneau
AME(s):	Craig Cable
Other(s):	

DATE	FLT	AREA FLOWN	CREW	PRODUCTION		STANDBY DAY	COMMENTS (Rep: Problems, Down Time, Safety, Unusual Circumstances, Crew
				Flown	Accepted		

				km	km		*Moves, Etc.)*
12-Mar-10-Fri		1	NG,CC,GM	0.0	0.0		No Flying, snow and low ceiling all day.
13-Mar-10-Sat		1	NG,CC,GM	0.0	0.0		No Flying, weather low ceiling all day.
14-Mar-10-Sun		1	NG,CC,GM	0.0	0.0		No Flying, weather low ceiling all day.
15-Mar-10-Mon	21058	1	NG,CC,GM	149.1	149.1		windy, ops normal
15-Mar-10-Mon	21059	1	NG,CC,GM	11.4	11.4		completed survey. Data sent for review at office.
				160.5	**160.5**		