TECHNICAL REPORT ON A FIXED WING AEROMAGNETIC SURVEY

DAWSON AREA, YUKON

For

Geological Survey of Canada

by

GOLDAK AIRBORNE SURVEYS

February to March, 2014

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1 INTRODUCTION

This report describes an aeromagnetic survey conducted in the Dawson area in Yukon. This high sensitivity aeromagnetic survey was carried out by Goldak Airborne Surveys (Goldak) on behalf of the Geological Survey of Canada (GSC) between February 14th and March 21st, 2014.

Aircraft equipment operated included three cesium vapour magnetometers, a GPS/GLONASS real-time and post-corrected differential positioning system, a flight path recovery camera, a digital video titling and recording system, as well as radar and barometric altimeters. All data were recorded digitally in GEDAS binary file format.

Reference ground equipment included two GEM Systems GSM-19W Overhauser magnetometers and a Novatel 12 channel GPS/GLONASS base station which was set up at the base of operations for differential post-flight corrections.

Fifty flights (including test and calibration sorties) were required to complete the survey block. A total of 33,182 line kilometres of high resolution magnetic data were collected, processed and plotted.

The traverse lines were flown at a spacing of 400 metres with control lines flown at a separation of 2400 metres. Nominal terrain clearance was specified at 125 metres above ground. Dawson City, Yukon was used as the base of operations throughout the entire survey.

All installations and equipment specifications are described in more detail in Section 4 of this report. Daily operational logs were kept and are included as Appendix B of this report.

2 SURVEY AREA LOCATION

The Dawson area block is centered approximately 50 kilometers northwest of Dawson City, YK with the midpoint roughly at 64° 15’ N, 140° 00’ W. This block contained 33,182 line kilometers of data (28,303 km of traverse lines and 4879 of control lines).

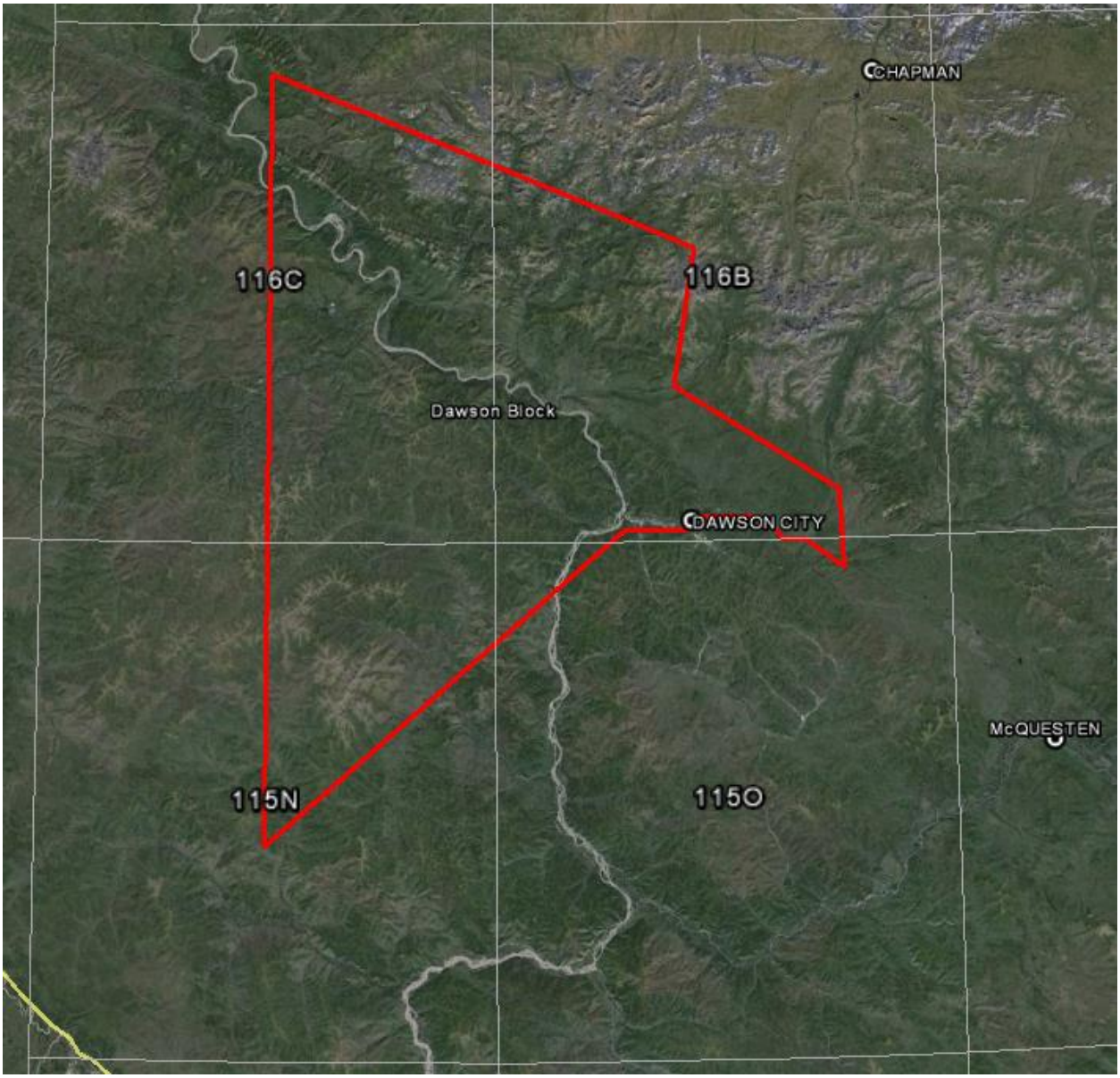

Figure 1 - Location of the Dawson Area Survey Block

The Dawson area was defined by the following NAD83, UTM zone 7N, coordinates:

Easting	Northing
500000	7197649
590981	7161046
586951	7131383
622669	7109919
624081	7093096
615174	7099294
610953	7098982
606369	7103626
593050	7103573
589883	7100719
576840	7100566
499956	7031906
500000	7197649

Table 1 - Dawson Area Coordinates

3 CONTRACT SPECIFICATIONS

3.1 Line Spacing

Traverse Lines: bearing - N 10°E UTM
spacing - 400 metres
allowed min separation - 300 metres
allowed max separation - 500 metres

Control Lines: bearing - N 100°E UTM
nominal spacing - 2400 metres

3.2 Altitude

Altitude control was accomplished via a smooth drape provided by the Geological Survey of Canada.

Nominal altitude: 125 m NTC (nominal terrain clearance)

Tolerance: a maximum 30m difference between traverse lines and control lines. To accomplish this, actual height deviations from the drape surface were not to exceed an envelope of +/- 15 metres at all times.

3.3 Diurnal

A maximum tolerance of 3 nT (peak to peak) deviation from a long chord equivalent to a period of 60 seconds was not to be exceeded. Additionally, the diurnal was not to exceed a 0.5 nT deviation over 15 seconds.

3.4 Magnetic Noise

The magnetic noise was not to exceed 0.1 nT in the 4^{th} digital difference.

All data was fully examined in the field and was deemed to have met the above specifications.

4 AIRCRAFT AND EQUIPMENT

4.1 Aircraft

Type	Piper PA-31 Navajo
Registration	C-GJBB & C-GJBG
Cruise Range	1800 km
Cruising Speed	330 km/h
Tyical Survey Speed	270 km/h
Survey Duration	6 hours plus reserve
Max Climb Gradient	13%
Max Descent Gradient	16%
Aviation Fuel	100 LL aviation gasoline
Fuel Consumption	150 litres per hour total
Oil Consumption	0.2 liters per hour total
Long Range Comm	Iridium satellite phone
Typical Figure of Merit	0.9
Tail Stinger	3 m composite
Wingtip Pods	1 m composite
Gradiometer Dimensions	14.783 m lateral / 9.754 m longitudinal

Two Piper PA-31 Navajos, registrations C-GJBB and C-GJBG, were used on this survey. Both aircraft are owned and operated by Goldak Airborne Surveys. Each aircraft is fitted with a 3-meter stinger attached to the rear fuselage on the centerline of the aircraft. The attitude sensing fluxgate magnetometer is positioned at the midpoint of the stinger. The Navajos also have magnetometers installed in composite pods on each wingtip. The pods mount the sensors 1.2 metres outboard of the aircraft wingtip. The three magnetometers form a two-axis gradiometer.

The aircraft have been extensively modified, both mechanically and electrically, to minimize the effects of maneuvering on the measured magnetic field. All aircraft have demonstrated a Figure of Merit of less than 0.7 nT as measured to Geological Survey of Canada (GSC) specification. Typical FOMs under less than ideal calibration environments are 0.9 nT for the tail magnetometer.

Figure 2 - Aircraft C-GJBG

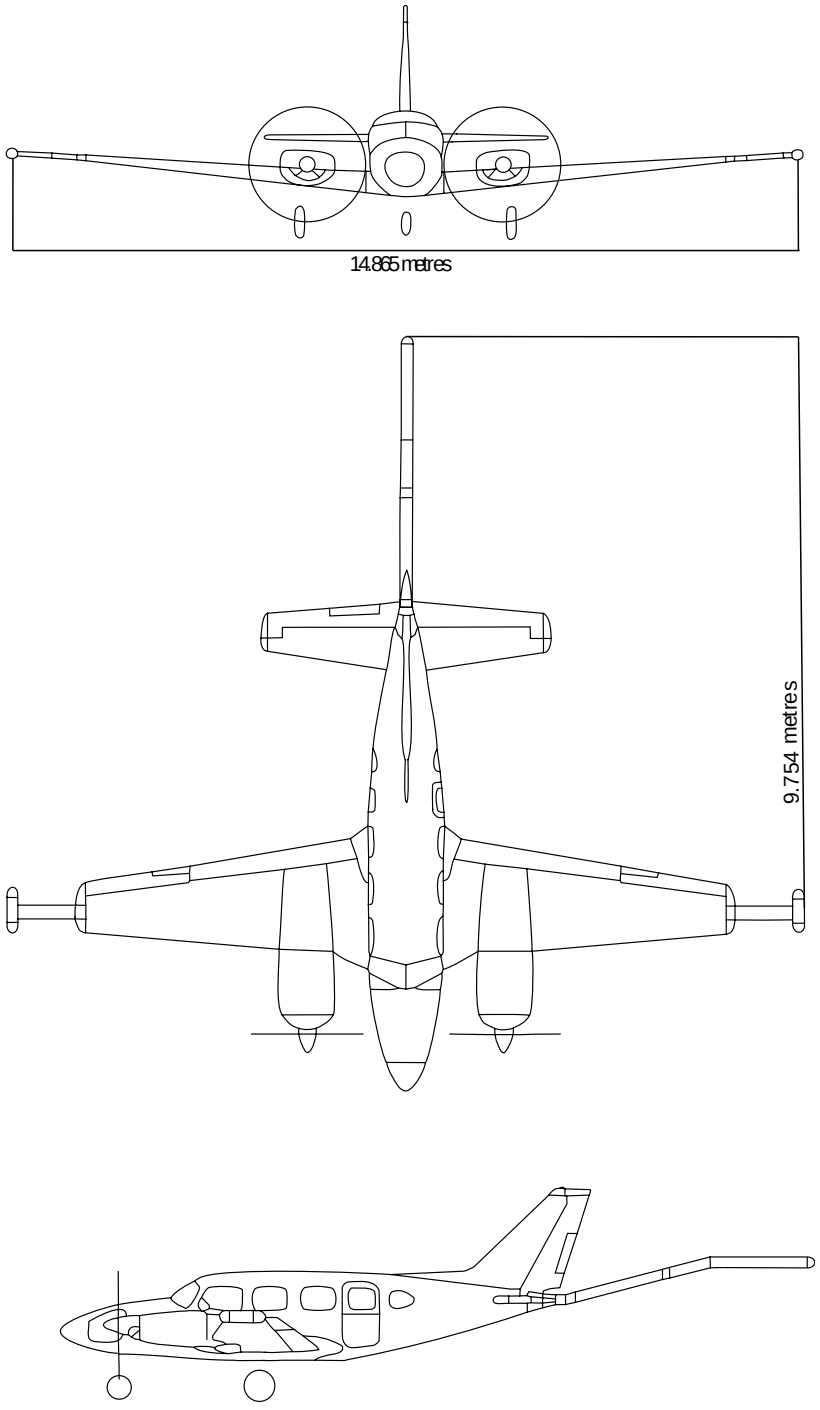

Figure 3 - Piper PA-31 Navajo

4.2 Airborne Systems

4.2.1 Data Acquisition System

Manufacturer:	Goldak Exploration Technology
Type and Model Number:	GEDAS
Sampling Rate:	10 Hz
Data Format:	GEDAS binary

All magnetic and positioning data are processed and recorded digitally by our GEDAS system. The GEDAS is an industrial rack-mount Intel Pentium based PC computer with multiple hard-drives, IO ports and ADAC devices.

The GEDAS system records GNSS navigation records at 1Hz. Magnetic, radar altimeter and barometric altimeter data are recorded at 10 Hz. All data is tightly synchronized to GPS time with an accuracy of ± 1 millisecond. Each data packet, on arrival to the data system is stamped with a system time with a resolution of 1 millisecond. Data files are organized on a flight-by-flight basis in a proprietary binary format. The data can then imported directly into Geosoft® via a custom GX.

4.2.2 Magnetometers and Compensation

Aircraft Magnetometers:

Manufacturer:	Geometrics
Type and Model Number:	Cesium G-822A
Range in nT:	20,000 to 90,000
Sensitivity in nT:	0.005
Sampling Rate:	10 Hz

Real-time Magnetic Compensator:

Manufacturer:	RMS Instruments
Type and Model Number:	AADCII or AARC
Range in nT:	20,000 to 100,000
Resolution in nT:	0.001
Sampling Rate:	20Hz

The airborne magnetometers used are a matched set of Geometrics G-822A optically pumped cesium vapour types with sensitivity of 0.005 nT. The magnetometer's Larmor signal is decoupled and counted by a RMS Instruments AADCII compensator, and data are produced at a rate of 10 Hz with a resolution of 0.001 nT. The data bandwidth is from 0 to 0.9 Hz with an internal noise level of less than 0.002 nT.

Compensation mathematically "corrects" the magnetic data for noise due to aircraft motion and heading. Prior to the survey, the aircraft is taken to an area of low magnetic gradient at a high altitude (7000' AGL +) and put through a series of rolls, pitches and yaws on each of the survey's cardinal headings. The data collected from these maneuvers can then be used to form a model of the aircraft's magnetic characteristics without the near influence of the local geology.

In most cases this model is calculated using the onboard magnetic compensator with the resultant corrections applied in real time. However, it was discovered that due to high terrain and local magnetic gradients, obtaining a compensation solution that was free of signal from the local geology with the RMS real-time compensator was problematic. Instead, an offline compensation algorithm that better resolved the magnetic reactions due solely to aircraft maneuver was used to form the compensation model and apply the appropriate corrections.

The remaining magnetic distortion is quantified by a term known as the Figure of Merit, or FOM. The Geological Survey of Canada uses a figure of merit of 1.5 or less as standard survey criteria.

Three compensation flights were completed over the course of the survey. The results of these flights are posted in Appendix A.

4.2.3 GNSS Positioning and Navigation

Navigation System:

Manufacturer	Goldak Exploration Technology Ltd.
Type and Model Number	GENAV
Displays	10” Color LCD data display 3D Autodrape LCD pilot display

GNSS Receivers:

Manufacturer	Novatel
Type and Model Number:	OEMV dual-frequency ProPakV3 (x1)
System Resolution:	<1 meter
Overall accuracy:	3 m in real-time, <1m post-corrected
Number Channels:	120
Signal Tracking:	GPS L1, L2, L2C, L5 GLONASS L1, L2 Galileo E1, E5

Manufacturer	Novatel
Type and Model Number:	OEM4 dual-frequency ProPak (x2)
System Resolution:	<1 meter
Overall accuracy:	3 m in real-time, <1m post-corrected
Number Channels:	72
Signal Tracking:	GPS L1, L2

The GNSS receiver in the survey aircraft was a GPS and GLONASS capable Novatel OEMV ProPakV3 12 channel dual-frequency differential unit that communicates directly with the GEDAS system. This unit is used for navigation purposes and also logs data for post-flight differential corrections.

GNSS signals can be affected by atmospheric and ionospheric effects which typically reduce the accuracy of the non-differential positioning to approximately 10 metres RMS. If a suitable stationary GPS receiver, on a known or assumed position, is used to record the apparent errors in the satellite range data, those errors can be used to correct the moving receiver in the aircraft to an accuracy of 1 meter RMS. This compensation process is called differential correction and can be applied to the moving receiver in real time for higher dynamic accuracy, or applied later to find out where the aircraft *was* with high accuracy. These are called real-time and post-corrected differential positioning respectively.

4.2.4 Radar Altimeters

Radar Altimeter 1:

Manufacturer	Thompson
Type and Model Number:	CFS 530A
Range:	0-8000 feet
Resolution:	1 meter
Accuracy:	2%

Radar Altimeter 2:

Manufacturer	Terra
Type and Model Number:	TRA3000 – TRI40
Range:	40-2500 feet
Resolution:	3 metres
Accuracy:	5-7%

4.2.5 Barometric Altimeter

Manufacturer:	Setra
Type and Model Number:	270
Range:	-1000 to 10,000 feet
Resolution:	1 meter

4.2.6 Visual Flight Path Recovery

Camera:

Manufacturer:	Panasonic
Model:	GPKR402 HRSV
Lens:	WV-LR4R5 4.5mm
Field of view at 300m AGL	317 x 396m

Video Titler:

Manufacturer:	Horita
Model:	SCT-50
Type:	video overlay with 10Hz clock

Digital Video Recorder:

Manufacturer:	Toronto Micro-Electronics
Model:	MDVR301
Type:	digital MPEG

The flight path was captured by a Panasonic GP-KR402 HRSV hi-resolution color video camera located in the lower rear fuselage of each aircraft. The video was recorded to a removable hard drive by a Toronto Micro Systems MDVR digital recorder, and then burned to dual layer DVD post flight.

4.3 Ground Systems

4.3.1 Magnetic Base Stations

Base Station Magnetometers:

Manufacturer:	GEM Systems
Type and Model Number:	Overhauser GSM-19W
Range in nT:	20,000 to 120,000
Sensitivity in nT:	0.01
Sampling Rate:	1 Hz (5 Hz maximum)

Base Station Data Loggers:

Manufacturer:	Acumen
Type and Model Number:	Data Bridge SDR-CF Serial Data Recorder
Media Type:	Compact Flash

Figure 4 - Base Magnetometer Installation

For this survey two magnetic base stations were installed. Multiple stations are useful both as a hardware back up and to discern any cultural effects from either unit. In both installations the base station employed was a GEM Systems GSM19W Overhauser type proton precession magnetometer with GPS time base. Each setup was configured to log data both internally and externally to a compact flash card using an Acumen DataBridge SDR serial data recorder. The station closest to the base of operations was also equipped with a VHF radio link to the processing office so that diurnal conditions could be monitored in real time. Station BaseMag1 was installed on the hillside approximately 1 km east of Dawson City, station BaseMag2 was installed in a wooded area outside the Dawson City airport. The installation details are as follows:

Station	Easting	Northing	Elevation	Reference Value
BaseMag1	576848	7104130	413	57800 nT
BaseMag2	592082	7104106	370	57425 nT

Table 2 - Base Magnetometer Stations

4.3.2 GNSS Base Station

Base GNSS Reciever:

Manufacturer	Novatel
Type and Model Number:	OEMV dual-frequency ProPakV3 (x1)
System Resolution:	<1 meter
Overall accuracy:	3 m in real-time, <1m post-corrected
Number Channels:	120
Signal Tracking:	GPS L1, L2, L2C, L5 GLONASS L1, L2 Galileo E1, E5

The base station receiver unit, like the airborne units, was a GPS and GLONASS capable Novatel OEMV ProPakV3 whose data were logged by a battery-powered, industrial portable computer. A survey-grade

GNSS base antenna designed to minimize multi-path errors was set up on the roof of the Triple J Hotel in Dawson City. The precise position of the antenna was determined by collecting 9 hours of data then submitting the data to the NRCan's online Precise Point Positioning (PPP) service. The following WGS84 coordinate was delivered:

Latitude	64° 03' 38.7967" N
Longitude	139° 25 41.7181" W
Ellipsoidal height	341.570 m

Table 3 - Base GNSS Position

4.4 Field Office Systems

4.4.1 Field Data Verification, Logging and Plotting

Processing Computer:

Manufacturer: Lenovo
Type and Model Number: ThinkCentre / Intel i5 3.4 GHz

Data Logging Computers:

Manufacturer: Lenovo
Type and Model Number: ThinkPad / Intel i5 3.4 GHz

Plotters and Printers:

Manufacturer: Canon
Type and Model Number: Inkjet

Data backup:

Manufacturer: Sony
Type and Model Number: DVD+-R / CDRW
Manufacturer: Western Digital
Type and Model Number: 1.5 TB external HDD

4.4.2 Software

Manufacturer: Geosoft®
Function: Geophysical data processing
Type and Model Number: Oasis Montaj v 7.2

Manufacturer: Waypoint Consulting
Function: GPS post-processing
Type and Model Number: GrafNav v 8.50

Manufacturer: Scott Hogg & Associates
Function: Offline Magnetic Compensation
Type and Model Number: CompCal v 1.1

5 PERSONNEL

The following Goldak personnel were involved in the Dawson Area project:

Project Manager	Ben Goldak
Techical Manager	Glen Carson
Field Manager	Bill Heath
Field Data Proccessor	Drew Rotheram
Pilots	Jay Mathieson
	Denys Lebrun
	Brian Langevin
Co-pilots	Lawrence Ando
	Daryll Saldanha
Aircraft engineer	Chris Martell

Table 4 - Project Personnel

6 DATA PROCESSING AND QUALITY CONTROL

6.1 Positioning Data

All raw GNSS position data were post processed in the field using the corresponding base GNSS data and Waypoint's Grafnav software. This step, depending on baseline distance and ionospheric activity, improves the accuracy of the data to the sub meter level.

The corrected GNSS NAD83 longitude, latitude and altitude are then merged into a Geosoft® database with aircraft flight data and reprojected to the local UTM NAD83 datum. The corrected GNSS data are inspected for gaps and positioning error as indicated by anomalous velocity changes or horizontal offsets. The real-time positions are compared to the post-corrected positions for integrity check. Flight path is examined to detect horizontal deviations that exceed tolerances. Velocity is then calculated from the corrected positions. Following survey completion, final trimming of the flight path is performed and the original position data recorded at 1 Hz were linearly interpolated to 10 Hz.

During survey operations it was discovered that the on-board satellite tracking system was interfering with the each aircraft's primary GNSS antenna, resulting in loss of reception at set 10 minute intervals for approximately 10 seconds each interval. To rectify this, the satellite trackers were disabled after flight 23 and any resultant gaps in post-processed positions for the affected flights were splined using data acquired from one of the aircraft's secondary GPS antennas.

6.2 Magnetic Data

6.2.1 Quality Control

Goldak Airborne Surveys' data acquisition system is designed to allow the second pilot to monitor data quality at all times. Both pilots have been trained to operate the equipment and recognize data problems. Automated systems are also in place to draw their attention to anomalous conditions. In addition, the field processor is continually monitoring the magnetic base station via radio link to be on the alert for poor diurnal conditions. The field processor maintains scheduled communication with the aircraft for flight following purposes and to update the flight crew on weather and diurnal conditions.

After a survey flight, the GEDAS data are loaded into a Geosoft® database and the magnetic data are inspected on a line basis for gaps, spikes and other anomalous conditions. Magnetic noise levels are monitored using the fourth digital difference and visually. The magnetic base station data are examined for deviations that exceed the contract stated peak-to-peak magnitude and chord lengths. Reflights were assigned where necessary.

A frequency domain plot of the uncompensated and compensated magnetic data is generated through FFT transform on a line basis and inspected. Through this, the general ongoing performance of the magnetic compensation can be evaluated and any aircraft system induced magnetic noise can be easily discerned.

Preliminary grids of the total field data, along with flight path plots are examined daily to visually compare the correlation of data between lines and across flights.

6.2.2 Initial Field Processing

Processing of the magnetic data begins in the field where the raw magnetic, positioning and altitude data from the aircraft acquisition systems is first imported into a Geosoft® Oasis Montaj database on a line basis.

The magnetic base station data logged during the corresponding flight time were then merged with the flight data for display and quality control checks. The diurnal data, originally recorded at 1 Hz is then interpolated to 10 Hz using a minimum curvature interpolation method. In addition the full diurnal datasets

from both magnetic base stations is compiled and archived in a separate Geosoft® database on a day basis.

6.2.3 Final Processing

Final processing of the magnetic data consisted of the following:

System Lag Correction

While the pre-survey Lag test which ascertains the time difference between the magnetometer readings and the positional devices was completed and recorded as 0.36 and 0.39 seconds for each aircraft and documented in section A.4, a refinement of this lag was made possible from Traverse and Tie-line intersection data statistics and reduced to 0.30 seconds and applied to the edited magnetic data prior to leveling.

High Frequency Noise Correction

High frequency noise that was induced by aircraft movement and not removed though the magnetic compensation process, generally less than 3 seconds in wavelength and 0.2 nT in amplitude, was removed by generating a correction profile from a combination of high-pass and low-pass filters of the total field data. Minimum and maximum limits constrained the correction profile to no more than +/- 0.3 nT, smoothed, and finally the result was then in-turn subtracted from the total field data.

Altitude Correction

An altitude correction to account for line-to-line deviations from the pre-planned flight surface was generated by first subtracting the corrected GNSS altitude from the flight surface. A 5 second low-pass filter was applied the resulting difference which was then multiplied by the calculated first derivative of a set of preliminary levelled magnetic data. This product was then added to the lagged, high-frequency corrected magnetic data.

Tieline Levelling

The intention of tie line leveling is to apply a smoothly varying function to the measured data which results in near identical values at the intersections of traverse and control lines. The most significant component of the correction is to accommodate the diurnal variation of the magnetic field. Other sources of error are altitude errors, GNSS positioning errors, and system drift.

Leveling of the total field magnetic data consists of the following steps:

1. Iterative application of best fit, zero, first and second order trends (with outliers removed) on traverse and control lines, recursively, until resulting correction approaches zero.
2. The final levelling step involves manual inspection of the remaining intersection mismatches and reducing it to zero where appropriate by applying the necessary amounts to either the survey or tie lines. Special attention is paid to ensuring that the overall correction profiles are as smooth as possible and that there is no line to line correlation in the correction profiles, which implies a misapplied correction. The correction channel (when applied to the unleveled raw magnetic total field magnetic channel (produces the final levelled total field magnetic channel).
3. The second vertical derivative of the total field grid is analyzed to ensure that the corrections are sufficient and appropriate. Features which appear along the survey lines in the second vertical derivative may be the result of overcorrection or undercorrection. In either case the solution is to revise the correction profile at those intersections.

IGRF Removal

The International Geomagnetic Reference Field (IGRF) was calculated using the 2005 model year with a constant date of March 3, 2014 (roughly the mid-point of the survey) as the reference date. A constant altitude of 1192.3 m, the mean altitude over the course of the survey, was specified as the elevation. This value was subtracted from the tie-line levelled data to obtain the residual magnetic field data.

6.3 Altitude Data

Part of the GNSS positioning processing involves calculation of the aircraft height above sea level. This component of the position is the least reliable, however with suitable care should be accurate to within 2-3 metres.

The barometric altimeter is calibrated for the air pressure at the beginning of each flight. Barometric drift, which is very similar to the magnetic diurnal in that it varies both in time and in space, is corrected for by periodically synchronizing the barometric altimeter with GPS altitude.

The radar altimeter and barometric altimeter data are inspected for anomalous conditions. Vertical navigation is checked for deviations from the pre-determined flight surface that exceed tolerances.

The original corrected GNSS alititude data recorded at 1 Hz was interpolated to 10 Hz using a minimum curvature interpolation method.

The computed digital topography was generated by subtracting the radar altitude from the post-processed GNSS altitude less 3.5 metres (to account for antenna to radar altimeter separation) gridding the result and comparing it with the known topography. Any striations in the gridded data are then removed in the profile data by subtracting the known topography data from the derived topography data, applying a 31 second median filter and 15 second low-pass filter to the difference and adding the result back to the derived topography.

6.4 Gridded Data

The residual total field and digital elevation grids were created using the minimum curvature method. Grid cell size for all grids is 100 m. The first vertical derivative grid was calculated directly from the residual total field grid.

7 FINAL PRODUCTS

7.1 Digital Data Files

Digital data has been provided on DVD-ROM in Geosoft® .GDB format. The fields included are as follows:

Channel Name	Description	Format	Units	Sample Rate
LINE	Line number	I10	-	0.1
TIME	UTC Time, as on flt. path on maps(seconds of the day, dbl prec.& rounded)	F10.2	sec	0.1
FIDUCIAL	Acquisition System time increment	F10.2	sec	0.1
LONG	Longitude [WGS84]	F13.6	deg	0.1
LAT	Latitude [WGS84]	F13.6	deg	0.1
EASTING	UTM Easting (NAD83, zone **7N**)	F10.2	m	0.1
NORTHING	UTM Northing (NAD83, zone **7N**)	F10.2	m	0.1
RALTRAW	Raw Primary Radar Altimeter; before corrections	F10.2	m	0.1
RALT	Lagged Radar Altimeter – final; with corrections	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 (real-time)	F10.2	m	0.1
GPSALT	Differentially Corrected GPS Altitude	F10.2	m	0.1
DEMRAW	Raw digital Topography [GPSALT - RALT]	F10.2	m	0.1
DEMLEV	Levelled digital Topography [GPSALT - RALT]	F10.2	m	0.1
MAGUNCOM	Raw uncompensated, unlagged Lower Tail Mag	F10.2	nT	0.1
MAGCOM	Raw compensated, unlagged Lower Tail Mag	F10.2	nT	0.1
MAGRAW	Raw compensated, lagged Lower Tail Mag	F10.2	nT	0.1
ALTCOR	Taylor series correction factor for height variations	F10.2	nT	0.1
MAGHFCOR	HF_ noise removal corr. applied L.Tail	F10.2	nT	0.1
DIURNRAW	Raw Basemag1	F10.2	nT	0.1
DIUR2RAW	Raw Basemag2	F10.2	nT	0.1
DIURNAL	Basemag1	F10.2	nT	0.1
DIURNAL2	Basemag2	F10.2	nT	0.1
MAGTLCOR	Tie-line levelling corrections to mag	F10.2	nT	0.1
SRVMGLEV	Final tie-line levelled mag	F10.2	nT	0.1
IGRF	IGRF correction calculated at altitude of **1192.3** m, date: **2014.17**	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
AIRCRAFT	Aircraft registration number where multiple aircraft are used	A10	-	0.1
DATE	Local date **(YYYYMMDD)**	I10	-	0.1
FLIGHT	Flight number	I10	-	0.1
LINENAME	Line name (Line type + Line number	A7	-	0.1
LINETYPE	Line type (L=traverse Line, T=Tie)	A2	-	0.1

Table 5 - Final Database Channels

SRVMGLEV = MAGRAW – MAGHFCOR + ALTCOR - MAGTLCOR

7.2 Map Files

1:100 000 scale, UTM Zone 7N, NAD83 datum maps were delivered digitally in both Geosoft® .Map and .PDFX format. For each sheet residual total magnetic field (RTF) and first vertical derivative (VDR1) of the magnetic field maps were produced. The products delivered are as follows:

No.	NTS	Theme	GSC-OF	YGS-OF
1	NTS 115-N/15 and parts of 115-N/7, 115-N/9, 115-N/10, 115-N/16 and 115-O/13	RTF	7634	2014-2
2	NTS 115-N/15 and parts of 115-N/7, 115-N/9, 115-N/10, 115-N/16 and 115-O/13	VDR1	7635	2014-3
3	NTS parts of 115-O/14, 115-O/15, 115-O/16, 116-B/1, 116-B/2, 116-B/3, 116-B/6 and 116-B/7	RTF	7636	2014-4
4	NTS parts of 115-O/14, 115-O/15, 115-O/16, 116-B/1, 116-B/2, 116-B/3, 116-B/6 and 116-B/7	VDR1	7637	2014-5
5	NTS 116-B/4, 116-B/5, 116-C/1, 116-C/2, 116-C/7 and 116-C/8	RTF	7638	2014-6
6	NTS 116-B/4, 116-B/5, 116-C/1, 116-C/2, 116-C/7 and 116-C/8	VDR1	7639	2014-7
7	NTS 116-C/9, 116-C/10 and parts of 116-B/11, 116-B/12, 116-C/15 and 116-C/16	RTF	7640	2014-8
8	NTS 116-C/9, 116-C/10 and parts of 116-B/11, 116-B/12, 116-C/15 and 116-C/16	VDR1	7641	2014-9

Table 6 - Final Maps

7.3 Grid Files

Grids in Geosoft® .GRD format gridded from coordinates in UTM Zone 7N, NAD83 datum, of the following data we delivered:

Data	Grid Name	Cell Size
Residual Total Field	Dawson_SRVMGRES	100 m
Total Magnetic Field	Dawson_SRVMGLEV	100 m
First Vertical Derivative of the Total Magnetic Field	Dawson_VDR1	100 m
Second Vertical Derivative of the Total Magnetic Field	Dawson_VDR2	100 m
Levelled Digital Topography	Dawson_DEMLEV	100 m

Table 7 - Final Grids

7.4 Flight Path Video

Flight path video for this survey is supplied on dual layered DVD, one per flight in a proprietary format. Software required to view the video is included on each disk. Times, positions, direction and speed are overlain on the tape for detailed flight path recovery if required.

APPENDIX A – TEST AND CALIBRATION RESULTS

A.1 Compensation Figure of Merits

Compensation figure of merit tests were performed by both aircraft after their initial arrival on site and before survey operations commenced. In addition, the calibration and test was repeated after any significant change to the aircraft or its systems which may have altered its magnetic properties.

Compensation / Figure of Merit

Project	GSC - Dawson
Flight	13
Aircraft	C-GJBG
Date	2014-02-22
Julian Day	

Pilot	Mathieson
Copilot	Saldanha
Processor	Rotheram

Test Summary

MB FOM	0.86

Test Location	Near Dawson City, YK
Reason for Comp / FOM	Initial Comp

Air Time	1
Test Time	0.4
Ferry Time	0.6

RMS AADCII Compensator Statistics

	Uncomp Std Dev	Comp Std Dev	IR	Solution Norm
Left Wing M1	6.46E-01	3.11E-02	20.8	72.2
Right Wing M2	5.05E-01	3.68E-02	13.7	64.7
Tail Top M3				
Tail Lower M4	1.02E-01	2.40E-02	4.2	24.3
Lateral Grad G1	2.70E+00	1.23E-01	21.9	28.3
Long Grad G2	2.55E+00	3.20E-02	79.7	87.7
Vert Grad G3				
Memory Slot	6			

FOM Analysis

Bottom Tail Magnetometer (MBc)					
	North	East	South	West	Sum
Pitch	0.12	0.08	0.13	0.08	0.41
Roll	0.02	0.03	0.03	0.04	0.12
Yaw	0.06	0.11	0.06	0.1	0.33
Sum	0.20	0.22	0.22	0.22	0.86

Notes

Alternator	Right
Heater	On
Altitude	12,000 ft
Temperature	-20
Altimeter	30.7
Comp Line	40
FOM Line	50

Table 8 - C-GJBG Compensation Figure of Merit, February 22

Compensation / Figure of Merit

Project	GSC Dawson
Flight	14
Aircraft	C-GJBB
Date	2014-02-22
Julian Day	

Pilot	Langevin
Copilot	Ando
Processor	Rotheram

Test Summary

MB FOM	1.02

Test Location	Near Dawson City, YK
Reason for Comp / FOM	Intial Comp

Air Time	1
Test Time	0.4
Ferry Time	0.6

RMS AADCII Compensator Statistics

	Uncomp Std Dev	Comp Std Dev	IR	Solution Norm
Left Wing M1	7.75E-01	3.67E-02	21.1	72.7
Right Wing M2	8.91E-01	3.56E-02	25	69.2
Tail Top M3				
Tail Lower M4	1.38E-01	2.55E-02	5.4	24
Lateral Grad G1	7.50E-01	7.21E-02	11.2	26.9
Long Grad G2	3.07E+00	6.39E-02	48.1	88
Vert Grad G3				
Memory Slot				

FOM Analysis

Bottom Tail Magnetometer (MBc)					
	North	East	South	West	Sum
Pitch	0.12	0.17	0.12	0.13	0.54
Roll	0.03	0.05	0.04	0.05	0.17
Yaw	0.08	0.09	0.05	0.09	0.31
Sum	0.23	0.31	0.21	0.27	1.02

Notes

Alternator	Left
Heater	On
Altitude	12,000 ft
Temperature	-17
Altimeter	30.7
Comp Line	24
FOM Line	25

Table 9 - C-GJBB Compensation Figure of Merit, February 22

Compensation / Figure of Merit

Project	GSC Dawson
Flight	26
Aircraft	C-GJBG
Date	2014-03-02
Julian Day	

Pilot	Mathieson
Copilot	Saldanha
Processor	Rotheram

Test Summary

MB FOM	1.04

Test Location	Near Dawson City, YK
Reason for Comp / FOM	VLF assy removed

Air Time	0.8
Test Time	0.4
Ferry Time	0.4

RMS AADCII Compensator Statistics

	Uncomp Std Dev	Comp Std Dev	IR	Solution Norm
Left Wing M1	6.50E-01	3.60E-02	18	71.6
Right Wing M2	5.65E-01	4.04E-02	14	65
Tail Top M3				
Tail Lower M4	1.24E-01	2.62E-02	4.7	25.5
Lateral Grad G1	2.41E+00	1.26E-01	19.2	28.5
Long Grad G2	2.35E+00	3.26E-02	72.3	90.2
Vert Grad G3				
Memory Slot				

FOM Analysis

Bottom Tail Magnetometer (MBc)					
	North	East	South	West	Sum
Pitch	0.1	0.11	0.13	0.11	0.45
Roll	0.03	0.06	0.05	0.05	0.19
Yaw	0.08	0.14	0.06	0.12	0.40
Sum	0.21	0.31	0.24	0.28	1.04

Notes

Alternator	Right
Heater	On
Altitude	12,000
Temperature	-12
Altimeter	30.15
Comp Line	20
FOM Line	30

Table 10 - C-GJBG Compensation Figure of Merit, March 2

A.2 Radar Altimeter Calibrations

The radar altimeter calibrations and verifications were performed by acquiring altitude data from several passes of increasing altitude over the runway at the Saskatoon airport.

Radar Altimeter Calibration

Project	GSC Dawson
Flight	5
Aircraft	C-GJBB
Date	2014-02-07
Julian Day	37

Pilot	Mathieson
Copilot	Langevin
Processor	Rotheram

Radar Stack Summary

Runway Height	510.8
Tail Height	3.5

Test Location	Saskatoon Airport
Radar 1 Type	Thompson-CFS ERT160
Radar 2 Type	Terra TRA-30

Radar 1 Scale Factor	0.987
Radar 2 Scale Factor	1.032

Radar Stack Analysis

PASS (ft)	GPSAlt	RAlt 1	RAlt 2	Hgt AGL	RAlt 1 Scale	RAlt 2 Scale
650	697.1	185.6	178.2	**182.8**	**0.985**	**1.026**
1300	880.2	370.9	355.5	**365.9**	**0.987**	**1.029**
1950	1062.6	559	533.2	**548.3**	**0.981**	**1.028**
2600	1236.4	728.7	692.3	**722.1**	**0.991**	**1.043**
3250	1415.7	914		**901.4**	**0.986**	
3900	1601.8	1095.7		**1087.5**	**0.993**	

Table 11 - C-GJBB Radar Altimeter Calibration, February 7

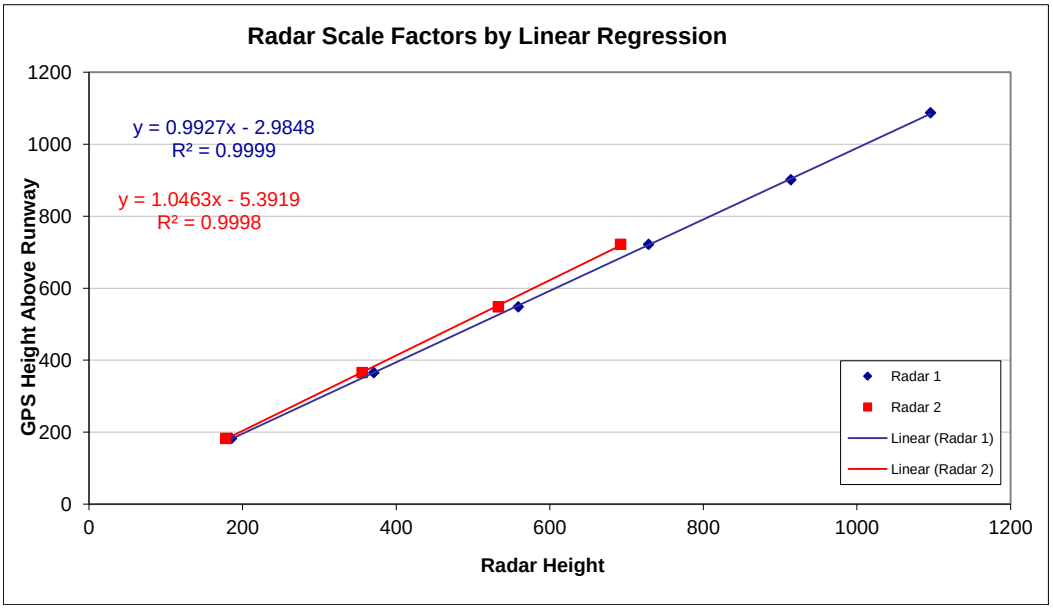

Figure 5 - C-GJBB Radar Altimeter Calibration, February 7

Radar Altimeter Calibration

Project	GSC Dawson
Flight	4
Aircraft	C-GJBG
Date	2014-02-06
Julian Day	37

Pilot	Mathieson
Copilot	Langevin
Processor	Rotheram

Radar Stack Summary

Runway Height	510.8
Tail Height	3.5

Test Location	Saskatoon Airport
Radar 1 Type	Thompson-CFS ERT160
Radar 2 Type	Terra TRA-30

Radar 1 Scale Factor	0.993
Radar 2 Scale Factor	1.018

Radar Stack Analysis

PASS (ft)	GPSAlt	RAlt 1	RAlt 2	Hgt AGL	RAlt 1 Scale	RAlt 2 Scale
650	694.5	181.5	176.5	180.2	0.993	1.021
1300	872.3	360.1	350.8	358	0.994	1.021
1950	1052.6	545.8	530.4	538.3	0.986	1.015
2600	1234	723.6	707.3	719.7	0.995	1.018
3250	1416.4	907.3		902.1	0.994	
3900	1602.3	1095.5		1088	0.993	

Table 12 - C-GJBG Radar Altimeter Calibration, February

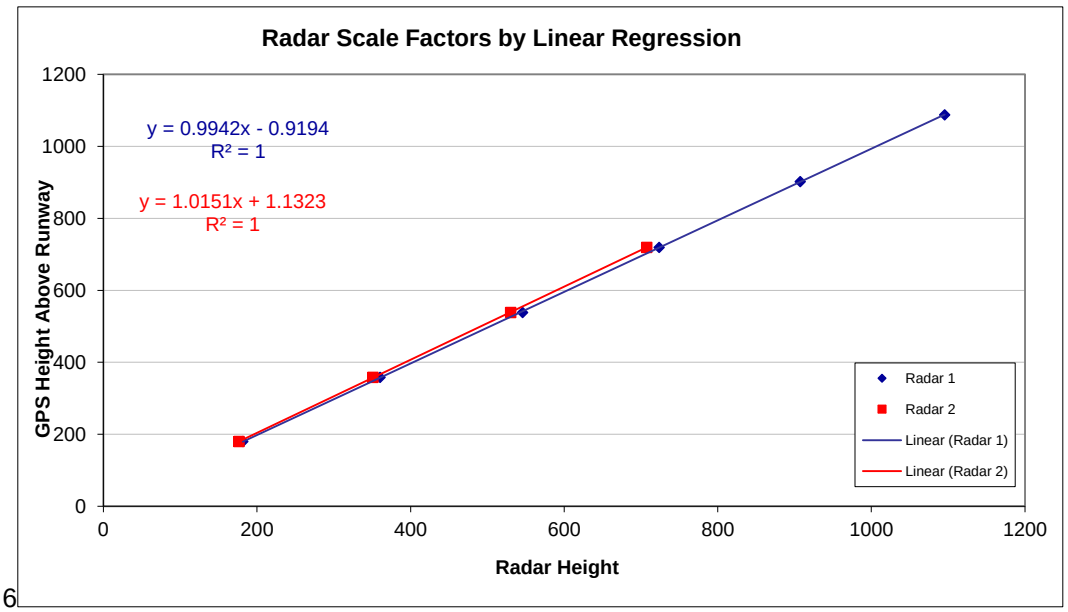

Figure 6 - C-GJBG Radar Altimeter Calibration, February 6

A.3 Heading Tests

To verify system accuracy and acceptable heading error, heading tests were performed by C-GJBB over the magnetic observatory at Bourget, ON and by C-GJBG over the magnetic observatory at Meanook, AB prior to commencement of the survey. Both aircraft repeated the test at the Meanook observatory after survey completion. The aircraft performed 3 passes in each cardinal direction directly over the observatory and the aircraft measured total field was compared against the observatory data

Heading Test

Project	GSC Dawson
Flight	1
Aircraft	C-GJBB
Date	2013-12-06
Julian Day	

Pilot	Mathieson
Copilot	Ando
Processor	Carson

Heading Test Summary

MB Mean Offset	8.89
MB Mean N/S Error	0.45
MB Mean E/W Error	0.14
MB Mean Error	0.30

Test Location	Bourget, ON
Station Offset	550.00

Air Time	1.1
Test Time	0.4
Ferry Time	0.07

Heading Test Analysis

Bottom Tail Magnetometer (MB)							
Pass	Direction	Time	Meas TF	Base TF	Offset (nT)	Heading Error (nT)	Heading
1	E	69032.5	54092.79	54634.00	8.79	0.19	E-W
2	W	69170.5	54092.02	54633.42	8.60		
3	E	69339.4	54092.17	54633.51	8.66	0.01	E-W
4	W	69492.9	54092.48	54633.83	8.65		
5	E	69667.0	54093.30	54634.56	8.74	0.21	E-W
6	W	69831.7	54094.15	54635.62	8.53		
7	S	67977.4	54093.02	54634.08	8.94	0.34	N-S
8	N	68161.3	54093.83	54634.55	9.28		
9	S	68330.2	54094.02	54635.04	8.98	0.25	N-S
10	N	68491.5	54092.00	54632.77	9.23		
11	S	68651.4	54091.23	54632.46	8.77	0.77	N-S
12	N	68813.9	54092.78	54633.24	9.54		

Table 13 - C-GJBB Heading Test, December 6

Heading Test

Project	GSC Dawson
Flight	7
Aircraft	C-GJBG
Date	2014-02-08
Julian Day	

Pilot	Mathieson
Copilot	Ando
Processor	Rotheram

Heading Test Summary

MB Mean Offset	-3.88
MB Mean N/S Error	0.65
MB Mean E/W Error	0.20
MB Mean Error	0.42

Test Location	Meanook, AB
Station Offset	

Air Time	1.1
Test Time	0.2
Ferry Time	0.9

Heading Test Analysis

Bottom Tail Magnetometer (MB)							
Pass	Direction	Time	Meas TF	Base TF	Offset (nT)	Heading Error (nT)	Heading
1	N	19:10:56	57550.28	57554.25	-3.97	0.78	N-S
2	S	19:13:06	57550.54	57555.29	-4.75		
3	N	19:15:33	57554.51	57557.88	-3.36	0.92	N-S
4	S	19:17:34	57553.36	57557.65	-4.29		
5	N	19:19:30	57553.72	57557.69	-3.96	0.25	N-S
6	S	19:21:21	57555.27	57558.99	-3.72		
7	W	19:23:50	57551.69	57555.43	-3.74	0.22	E-W
8	E	19:25:58	57552.27	57556.22	-3.95		
9	W	19:28:05	57554.94	57558.71	-3.76	0.12	E-W
10	E	19:29:57	57555.01	57558.90	-3.89		
11	W	19:32:23	57552.38	57555.86	-3.48	0.26	E-W
12	E	19:34:25	57550.72	57554.46	-3.74		

Table 14 - C-GJBG Heading Test, February 8

Heading Test

Project	GSC Dawson
Flight	62
Aircraft	C-GJBB
Date	2014-03-24
Julian Day	

Pilot	Lebruen
Copilot	Mathieson
Processor	Rotheram

Heading Test Summary

MB Mean Offset	-4.23
MB Mean N/S Error	0.43
MB Mean E/W Error	0.08
MB Mean Error	0.26

Test Location	Meanook, AB
Station Offset	

Air Time	1
Test Time	0.3
Ferry Time	0.7

Heading Test Analysis

Bottom Tail Magnetometer (MB)							
Pass	Direction	Time	Meas TF	Base TF	Offset (nT)	Heading Error (nT)	Heading
1	N	16:50:09.0	57542.45	57546.35	-3.90	0.55	N-S
2	S	16:52:16.6	57541.06	57545.51	-4.45		
3	N	16:54:26.5	57540.81	57545.45	-4.64	0.12	N-S
4	S	16:56:09.4	57540.55	57545.07	-4.52		
5	N	16:58:20.6	57541.02	57544.94	-3.92	0.63	N-S
6	S	17:00:00.0	57540.64	57545.19	-4.55		
7	W	17:03:03.0	57541.14	57545.13	-3.99	0.10	E-W
8	E	17:04:44.1	57541.37	57545.46	-4.09		
9	W	17:06:33.7	57540.68	57544.79	-4.11	0.02	E-W
10	E	17:08:12.2	57539.27	57543.40	-4.13		
11	W	17:10:02.7	57542.83	57547.10	-4.27	0.13	E-W
12	E	17:11:34.5	57539.47	57543.61	-4.14		

Table 15 - C-GJBB Heading Test, March 24

Heading Test

Project	GSC Dawson
Flight	64
Aircraft	C-GJBG
Date	2014-03-24
Julian Day	86

Pilot	Mathieson
Copilot	Rotheram
Processor	Rotheram

Heading Test Summary

MB Mean Offset	-5.57
MB Mean N/S Error	0.39
MB Mean E/W Error	0.06
MB Mean Error	0.22

Test Location	Meanook, AB
Station Offset	

Air Time	1
Test Time	0.3
Ferry Time	0.7

Heading Test Analysis

Bottom Tail Magnetometer (MB)							
Pass	Direction	Time	Meas TF	Base TF	Offset (nT)	Heading Error (nT)	Heading
1	N	16:51:18.7	57517.30	57522.51	-5.21	0.52	N-S
2	S	16:53:32.2	57516.92	57522.65	-5.73		
3	N	16:55:56.3	57518.07	57523.42	-5.35	0.24	N-S
4	S	16:57:47.6	57516.90	57522.49	-5.59		
5	N	17:00:14.2	57517.95	57523.29	-5.34	0.41	N-S
6	S	17:02:14.5	57517.20	57522.95	-5.75		
7	W	17:05:57.9	57516.07	57521.60	-5.53	0.15	E-W
8	E	17:07:59.9	57514.78	57520.46	-5.68		
9	W	17:10:06.2	57513.76	57519.44	-5.68	0.01	E-W
10	E	17:12:11.6	57513.41	57519.08	-5.67		
11	W	17:14:21.5	57513.55	57519.22	-5.67	0.02	E-W
12	E	17:16:40.3	57514.26	57519.95	-5.69		

Table 16 - C-GJBG Heading Test, March 24

A.4 Lag Tests

A test to verify the system lag on the survey aircraft was conducted on over a radio tower located 22 km southwest of Saskatoon. This test involved flying two passes in each of the four cardinal headings over the tower and comparing the position of the observed magnetic peaks with the know position of the target.

Lag Test

Project	GSC Dawson
Flight	2
Aircraft	C-GJBB
Date	2013-12-09
Julian Day	36

Pilot	Mathieson
Copilot	Lebrun
Processor	Shaikh

Lag Test Summary

MB Average Lag	0.39

Test Location	Near Saskatoon, SK
Feature Easting	370601
Feature Northing	5767234

Air Time	1.1
Test Time	0.4
Ferry Time	0.7

Lag Test Analysis

Bottom Tail Magnetometer (MB)						
Pass	Direction	Peak X	Peak Y	Velocity	From Tower	Lag
1	S	370596	5767207	83.88	27.97	0.33
2	N	370605	5767260	67.27	26.26	0.39
3	S	370591	5767208	79.92	28.35	0.35
4	N	370605	5767258	65.29	24.18	0.37
5	W	370571	5767241	67.71	30.30	0.45
6	E	370630	5767228	79.49	30.23	0.38
7	W	370573	5767243	66.41	29.10	0.44
8	E	370635	5767229	80.43	34.68	0.43

Table 17- C-GJBB Lag Test, December 19

Lag Test

Project	GSC Dawson
Flight	3
Aircraft	C-GJBG
Date	2014-02-05
Julian Day	36

Pilot	Mathieson
Copilot	Langevin
Processor	Rotheram

Lag Test Summary

MB Average Lag	0.36

Test Location	Near Saskatoon, SK
Feature Easting	370602
Feature Northing	5767237

Air Time	1
Test Time	0.4
Ferry Time	0.6

Lag Test Analysis

Bottom Tail Magnetometer (MB)						
Pass	Direction	Peak X	Peak Y	Velocity	From Tower	Lag
1	N	370604	5767260	73.36	23.75	0.32
2	S	370595	5767209	81.49	28.20	0.35
3	N	370605	5767262	74.91	25.33	0.34
4	S	370593	5767215	78.39	23.94	0.31
5	W	370574	5767245	67.26	28.43	0.42
6	E	370629	5767231	87.35	28.10	0.32
7	W	370576	5767245	67.1	26.54	0.40
8	E	370636	5767228	87.22	35.90	0.41

Table 18 - C-GJBG Lag Test, February 5

APPENDIX B – OPERATIONS REPORTS

Goldak Airborne Surveys

WEEK BEGINNING
February 2, 2014

Aircraft: C-GJBG/C-GJBB
Pilot: Mathison/Langevin
Co Pilot: Ando/Saldanha
Data Processor: Rotheram
Project total 33033

WEEKLY OPERATIONS REPORT

GSC - Dawson

Project #: **2014 - 01**

Base: Triple J Hotel, Dawson City YK
Phone:

			Flight Times				Kilometers			Unservicability				
Date	**Flt**	**Aircraf**	**Ferry**	**Test**	**Prod**	**Total**	**Flown**	**Accept**	**Remain**	**A/C**	**Eqt**	**Diur**	**Wx**	**Comments**
Sun									33033					
Feb 02														
DOY :33														
Mon														
Feb 03														
DOY :34														
Tues														
Feb 04														
DOY :35														
Wed	1	GJBG		1.3		1.8								Lag Test
Feb 05	2	GJBG												Comp YXE (Flight times in FL1)
DOY :36														
Thurs	3	GJBG		1.6		1.8								Radar Stack YXE
Feb 06														
DOY :37														
Fri	4	GJBB	0.5	0.5		1								Comp YXE
Feb 07	5	GJBB	0.1	0.9		1								Radar Stack
DOY :38														
Sat		GJBG	1.9			1.9								Ferry CYXE to CYWM
Feb 08		GJBB	1.9			1.9								Ferry CYXE to CYWM
DOY :39	6/7	GJBG	1.5			1.5								Comp/FOM/Meanook
TOTAL FOR WEEK			5.9	4.3	0	10.9	0	0						
CARRIED OVER			0	0	0	0	0	0	33033					
TOTAL FOR JOB			5.9	4.3	0	10.9	0	0	33033					

Goldak Airborne Surveys

WEEK BEGINNING
February 9, 2014

WEEKLY OPERATIONS REPORT

Aircraft: C-GJBG/C-GJBB
Pilot: Mathison/Langevin
Co Pilot: Ando/Saldanha
Data Processor: Rotheram
Project total 33033

GSC - Dawson

Project #: **2014 - 01**

Base: Triple J Hotel, Dawson City YK
Phone: 867-993-5323 (Room 301)

			Flight Times				Kilometers			Unservicability				
Date	**Flt**	**Aircraft**	**Ferry**	**Test**	**Prod**	**Total**	**Flown**	**Accept**	**Remain**	**A/C**	**Eqt**	**Diur**	**Wx**	**Comments**
Sun		GJBG	5.7			5.7			33033					Ferry CYWM - CYDA
Feb 09		GJBB	5.7			5.7								Ferry CYWM - CYDA
DOY :40														
Mon		GJBG												Truck/Trailer and crew arrive on site
Feb 10		GJBB												
DOY :41														
Tues		GJBG											100	Temps -40 or below all day
Feb 11		GJBB												
DOY :42														
Wed		GJBG											100	Temps -40 or below all day
Feb 12		GJBB												
DOY :43														
Thurs		GJBG											100	Low temps and ceilings
Feb 13		GJBB												
DOY :44														
Fri	8	GJBG	0.5	0.5		1								Innitial on site comp
Feb 14		GJBB								100				Concerns over Fuel System
DOY :45														
Sat		GJBG											100	Severe low level turbulence
Feb 15		GJBB								100				
DOY :46														
TOTAL FOR WEEK			11.9	0.5	0	12.4	0	0						
CARRIED OVER			5.9	4.3	0	10.9	0	0	33033					
TOTAL FOR JOB			17.8	4.8	0	23.3	0	0	33033					

Goldak Airborne Surveys

WEEK BEGINNING
February 16, 2014

WEEKLY OPERATIONS REPORT

Aircraft: C-GJBG/C-GJBB
Pilot: Mathison/Langevin
Co Pilot: Ando/Saldanha
Data Processor: Rotheram
Project total 33033

GSC - Dawson

Project #: **2014 - 01**

Base: Triple J Hotel, Dawson City YK
Phone: 867-993-5323 (Room 301)

			Flight Times				Kilometers			Unservicability				
Date	**Flt**	**Aircraft**	**Ferry**	**Test**	**Prod**	**Total**	**Flown**	**Accept**	**Remain**	**A/C**	**Eqt**	**Diur**	**Wx**	**Comments**
Sun		GJBG							33033			40	60	
Feb 16		GJBB								100				
DOY :47														
Mon	9	GJBG	0.3		4.6	4.9	946	878	32155					
Feb 17		GJBB								100				Aircraft Maintenance
DOY :48														
Tues	10	GJBB	1	0.4		1.4							80	Comp/FOM
Feb 18		GJBG											100	Low Cloud Ceilings
DOY :49														
Wed		GJBB										50	100	Low Cloud Ceilings
Feb 19		GJBG										50	100	
DOY :50														
Thurs		GJBG									100	50	100	Fluxgate magnetometers rotated
Feb 20		GJBB									100	50	100	in both aircraft
DOY :51														ceilings too low for re-comp
Fri		GJBG										20	100	Low Ceilings/Snow
Feb 21		GJBB										20	100	
DOY :52														
Sat	11/13	GJBG	0.6	1.8		2.4								Comp/FOM & Test lines
Feb 22	12/14	GJBB	0.6	2.7		3.3								Comp/FOM & Test lines
DOY :53														
TOTAL FOR WEEK			2.5	4.9	4.6	12	946	878						
CARRIED OVER			17.8	4.8	0	23.3	0	0	33033					
TOTAL FOR JOB			20.3	9.7	4.6	35.3	946	878	32155					

Goldak Airborne Surveys

WEEK BEGINNING
February 23, 2014

WEEKLY OPERATIONS REPORT

Aircraft: C-GJBG/C-GJBB
Pilot: Mathison/Langevin
Co Pilot: Ando/Saldanha
Data Processor: Rotheram
Project total 33033

GSC - Dawson

Project #: **2014 - 01**

Base: Triple J Hotel, Dawson City YK
Phone: 867-993-5323 (Room 301)

			Flight Times				Kilometers			Unservicability				
Date	**Flt**	**Aircraf**	**Ferry**	**Test**	**Prod**	**Total**	**Flown**	**Accept**	**Remain**	**A/C**	**Eqt**	**Diur**	**Wx**	**Comments**
Sun		GJBG							32155		100			
Feb 23	15	GJBB	0.3		2.5	2.8	493	493	31662			60		
DOY :54														
Mon		GJBG									100			Real Time compensation unsatisfactory
Feb 24		GJBB								100				Exhaust Manifold cracked
DOY :55														
Tues	16	GJBG	0.3		5.5	5.8	1180	1020	30642					
Feb 25	17	GJBB	0.3		3.7	4.0	673	673	29969	30				Exhaust Manifold replaced
DOY :56														
Wed	18	GJBG	0.3		5.2	5.5	1164	1152	28817					
Feb 26	19	GJBB	0.3		5.1	5.4	1138	1035	27782					
DOY :57														
Thurs		GJBG										100		VLF Assembly removed from JBG
Feb 27		GJBB												
DOY :58														
Fri	20	GJBG	0.3		3.9	4.2	815	790	26992					
Feb 28	21	GJBB	0.4		3.9	4.3	958	942	26050					
DOY :59	22	GJBG	0.4		3.4	3.8	819	819	25231					
	23	GJBB	0.3		2.1	2.4	513	513	24718					
Sat	24	GJBG	0.3		4.2	4.5	949	949	23769					
Mar 01		GJBB								100				
DOY :60														
TOTAL FOR WEEK			3.2	0	39.5	38.7	8702	8386						
CARRIED OVER			20.3	9.7	4.6	35.3	946	878	32155					
TOTAL FOR JOB			23.5	9.7	44.1	74	9648	9264	23769					

Goldak Airborne Surveys

WEEK BEGINNING
March 2, 2014

WEEKLY OPERATIONS REPORT

Aircraft: C-GJBG/C-GJBB
Pilot: Mathison
Co Pilot: Ando/Saldanha
Data Processor: Rotheram
Project total 33033

GSC - Dawson

Project #: **2014 - 01**

Base: Triple J Hotel, Dawson City YK
Phone: 867-993-5323 (Room 301)

			Flight Times				Kilometers			Unservicability				
Date	**Flt**	**Aircraf**	**Ferry**	**Test**	**Prod**	**Total**	**Flown**	**Accept**	**Remain**	**A/C**	**Eqt**	**Diur**	**Wx**	**Comments**
Sun	25	GJBG	0.4		3.6	4	949	949	22820					
Mar 02	26	GJBG	0.5	0.5		1								Comp
DOY :61	27													Flight Number Skipped
Mon	28	GJBG	0.2		4.6	4.8	977	977	21843					
Mar 03	29	GJBG	0.5		3.2	3.7	778	778	21065					
DOY :62														
Tues	30	GJBG	0.3		3.9	4.2	688	621	20444					
Mar 04	31	GJBG	0.3		3.8	4.1	804	804	19640					
DOY :63														
Wed	32	GJBG	0.5		5	5.5	1252	1252	18388					
Mar 05														
DOY :64														
Thurs	33	GJBB	0.3		1.9	2.2	415	415	17973					
Mar 06	34	GJBB	0.3		3.7	4	853	853	17120					
DOY :65														
Fri	35	GJBB	0.3		4.4	4.7	988	988	16132					
Mar 07	36	GJBB	0.4		3.9	4.3	883	883	15249					
DOY :66														
Sat	37	GJBB	0.4		5.4	5.8	1228	1228	14021					
Mar 08														
DOY :67														
TOTAL FOR WEEK			4.4	0.5	43.4	48.3	9815	9748						
CARRIED OVER			23.5	9.7	44.1	74	9648	9264	23769					
TOTAL FOR JOB			27.9	10.2	87.5	122.3	19463	19012	14021					

Goldak Airborne Surveys

WEEK BEGINNING
March 9, 2014

WEEKLY OPERATIONS REPORT

Aircraft: C-GJBG/C-GJBB
Pilot: Mathison/LeBrun
Co Pilot: Ando/Saldanha
Data Processor: Rotheram
Project total 33033

GSC - Dawson

Project #: **2014 - 01**

Base: Triple J Hotel, Dawson City YK
Phone: 867-993-5323 (Room 301)

			Flight Times				Kilometers			Unservicability				
Date	**Flt**	**Aircraf**	**Ferry**	**Test**	**Prod**	**Total**	**Flown**	**Accept**	**Remain**	**A/C**	**Eqt**	**Diur**	**Wx**	**Comments**
Sun									14021				100	Low clouds in survey block
Mar 09														
DOY :68														
Mon	38	GJBG	0.3		4.9	5.2	1076	1076	12945					
Mar 10														
DOY :69														
Tues	39	GJBB	0.2		1	1.2	234	234	12711				50	Strong turbulence
Mar 11	40	GJBB	0.3		2.2	2.5	517	517	12194					
DOY :70														
Wed	41	GJBB	0.6		4.7	5.3	1100	1100	11094					
Mar 12	42	GJBG	0.3		5.3	5.6	1173	1173	9921					
DOY :71														
Thurs		GJBG											100	Conditions too turbulent for survey
Mar 13	43	GJBB	0.5			0.5								
DOY :72														
Fri		GJBG	0.2			0.2							100	Conditions too turbulent for survey
Mar 14	45	GJBB	0.6			0.6								
DOY :73														
Sat	44	GJBG	0.5		4.5	5	1020	1000	8921					
Mar 15	47	GJBB	0.8		5	5.8	1311	1311	7610					
DOY :74														
TOTAL FOR WEEK			4.3	0	27.6	31.9	6431	6411						
CARRIED OVER			27.9	10.2	87.5	122.3	19463	19012	14021					
TOTAL FOR JOB			32.2	10.2	115.1	154.2	25894	25423	7610					

Goldak Airborne Surveys

WEEK BEGINNING
March 16, 2014

WEEKLY OPERATIONS REPORT

Aircraft: C-GJBG/C-GJBB
Pilot: Mathison/LeBrun
Co Pilot: Ando/Saldanha
Data Processor: Rotheram
Project total 33033

GSC - Dawson

Project #: **2014 - 01**

Base: Triple J Hotel, Dawson City YK
Phone: 867-993-5323 (Room 301)

			Flight Times				Kilometers			Unservicability				
Date	**Flt**	**Aircraf**	**Ferry**	**Test**	**Prod**	**Total**	**Flown**	**Accept**	**Remain**	**A/C**	**Eqt**	**Diur**	**Wx**	**Comments**
Sun	48	GJBB	0.7		5.1	5.8	1343	1343	6267					
Mar 16	49	GJBG	0.9		3.3	4.2	810	807	5460					
DOY :75														
Mon	50	JBB	0.4		5.8	6.2	1339	1334	4126					
Mar 17		JBG								100				Maintenance inspection due
DOY :76														
Tues	51	GJBB	0.7		5.2	5.9	1296	1296	2830					
Mar 18		GJBB								100				Maintenance Inspection
DOY :77														
Wed	52	GJBG											95	Low cloud layers
Mar 19	53	GJBB	0.6		0.8	1.4	108	108	2722					
DOY :78														
Thurs	54	GJBB	0.7		4.3	5	1080	1080	1642				20	Low clouds in south end of block
Mar 20	55	GJBG												Comp/FOM & test lines
DOY :79	56	GJBG	1	1	3.1	5.1	315	315	1327					
Fri	57	JBB	0.6		0.3	0.9								Aborted due to diurnal magnetic activity
Mar 21	58	JBG	0.6		4.5	5.1	1125	1125	202					
DOY :80	59	JBB	0.4		2.4	2.8	602	602	-400					
	60	JBB	0.6	1.1		1.7								Comp/Fom & Test lines
Sat														
Mar 22														
DOY :81														
TOTAL FOR WEEK			7.2	2.1	34.8	44.1	8018	8010						
CARRIED OVER			32.2	10.2	115.1	154.2	25894	25423	7610					
TOTAL FOR JOB			39.4	12.3	149.9	198.3	33912	33433	-400					

Goldak Airborne Surveys

WEEK BEGINNING
March 23, 2014

WEEKLY OPERATIONS REPORT

Aircraft: C-GJBG/C-GJBB
Pilot: Mathison/LeBrun
Co Pilot: Ando/Saldanha
Data Processor: Rotheram
Project total 33033

GSC - Dawson

Project #: **2014 - 01**

Base: Triple J Hotel, Dawson City YK
Phone: 867-993-5323 (Room 301)

			Flight Times				Kilometers			Unservicability				
Date	**Flt**	**Aircraf**	**Ferry**	**Test**	**Prod**	**Total**	**Flown**	**Accept**	**Remain**	**A/C**	**Eqt**	**Diur**	**Wx**	**Comments**
Sun		GJBG												Ferry to Athabasca for Meanook test
Mar 23		GJBB												
DOY :82														
Mon	61/62	GJBB	0.2	1.2		1.4								Comp/Meanook Test
Mar 24		GJBB												Ferry to YXE
DOY :83		GJBG								100				Flat main tire
Tues													100	
Mar 25														
DOY :84														
Wed													100	
Mar 26														
DOY :85														
Thurs	63/64	GJBG	0.3	1.2		1.5								Comp/Meanook Test
Mar 27		GJBG												Ferry to YXE
DOY :86														
Fri														
Mar 28														
DOY :87														
Sat														
Mar 29														
DOY :88														
TOTAL FOR WEEK			0.5	2.4	0	2.9	0	0						
CARRIED OVER			32.2	10.2	115.1	154.2	25894	25423	7610					
TOTAL FOR JOB			32.7	12.6	115.1	157.1	25894	25423	7610					