



FUGRO EARTHDATA, INC.

Turning Spatial Data Into Knowledge

ADS40-52

ORTHOPHOTOGRAPHY MAPPING

Gulf Spill Oil

Aerotriangulation Report

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Prepared for

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AEROTRIANGULATION REPORT

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OVERVIEW

Fugro EarthData, Inc. completed all phases of aerotriangulation (AT) for the 17 flight lines covering the Gulf Spill Oil ADS52 Orthophotography Mapping Project. All final ADS52 data and related products will be delivered to the client in the projection(s) and datum(s) of UTM16, NAD83(NSRS2007), GRS80, Meters. All coordinates and measurements in this report will be presented in UTM 16, NAD83(NSRS2007), GRS80, Meters, unless otherwise stated.

1 GENERAL PROJECT INFORMATION

Collections: 1

Collection Dates: May 9th, 2010

Ground Sample Distance (GSD): 1 pixel is equal 1 ft

Flight Level(s): 9494 ft above mean terrain (AMT)

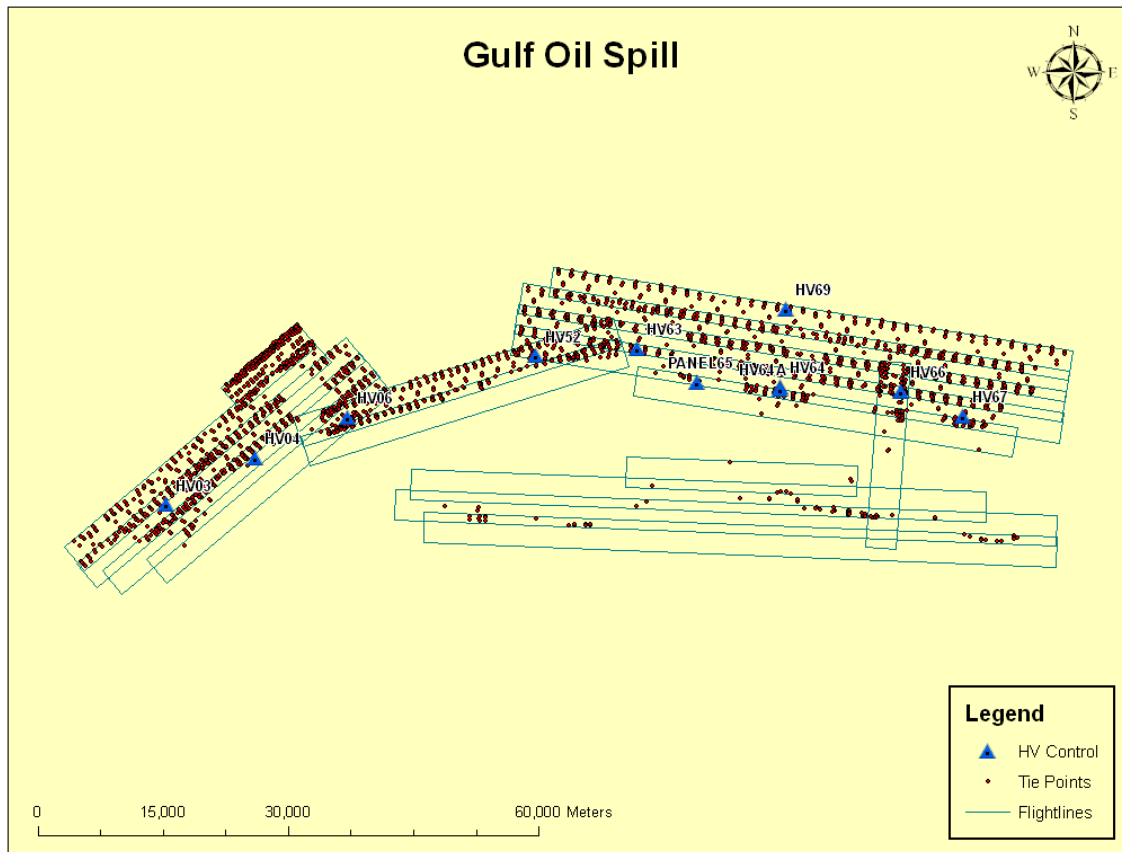
Camera Type: Leica ADS40-52

Camera Serial Number(s): SH-30024

All imagery was acquired on the date of May 9th, 2010, from an altitude of 9494 ft above mean terrain (AMT). The resulting Ground Sample Distance (GSD) of 1 pixel is equal to 1 ft of ground coverage. Fugro EarthData, Inc. acquired all photography using the Leica ADS40-52 digital airborne sensor, serial number(s) SH-30024, each with a calibrated focal length of 62.77 mm. The entire project collection was completed with a total of 1 lift(s).

2 CONTROL

With the use of Airborne GPS (ABGPS) and an integrated Inertial Measurement Unit (IMU), the necessary amount of ground control is reduced significantly. Together, the ABGPS and IMU provide very accurate measurements in X, Y, and Z and rotation (Omega, Phi, and Kappa.) For the previous Gulf Coast Mapping project in March 2007, TerraSurv established 11 survey points; of which 10 were successfully located and used as ground control in the final block adjustments. Explanations for any ground control not used in this AT will be posted under chapter 7.2.1 of this report. If, for any reason, the explanations do not meet your expectations, a more detailed account can be delivered at your request.



3 AEROTRIANGULATION PROCEDURE

The standard AT procedure includes the optimization of the following 7 parameters for an entire flight:

- 3 angles representing the relative orientation of the IMU and the focal plane. These angles account for the mechanical distortions over a thermal cycle of use of the camera. Typical angle changes are less than 100 micro radians.
- 3 translation parameters accounting for the inaccuracy of the absolute position given by the GPS. Typically less than 50cm in each direction.
- To correct the effects of IMU drift for flight lines with a flying duration of over 10 minutes, the value of the Kappa drift angle will be calculated and an offset correction factor will then be applied.

3.1 Methodology

A Photogrammetric Technician performed the following 9 steps in accordance with established ISO procedures:

Step 1: First QA/QC - Upon receipt of all aerial photography and ground control, technicians confirm ground coverage (overlap) and completeness, ground control spacing, and overall image quality.

Step 2: POS processing - Through the processing of the GPS/IMU data, we are able to generate the Smoothed Best Estimate Trajectory (SBET) of the aircraft's path and therefore the orientation of each scan line.

Step 3: ISTAR Import - All raw ADS52 data is uncompressed and converted to ISTAR format.

Step 4: GCP import - Upon receipt of ground control, coordinates are converted to ISTAR processing-format.

Step 5: Relative Orientation - Through manual tie point selection or ISTAR's "Automatic Point Matching", a series of tie points are generated to link adjacent flight lines.

Step 6: Absolute Orientation - Ground control and GPS/IMU are introduced to imagery and coordinates are applied to individual pixels.

Step 7: Combined Adjustment - After combining ground control, tie points, and the GPS/IMU the final block adjustments are made.

Step 8: Final QA/QC - Measurement residuals undergo evaluation and are refined to within project specifications. In addition, a set of ortho images surrounding each ground control point along with ortho image strips between flight lines are generated to calculate the final product accuracy.

Step 9: An aerotriangulation report outlining the adjustment results is prepared.

4 AEROTRIANGULATION RESULTS

Block adjustment results:

Control points coordinates residuals:

XYZ bias: -0.036766 -0.012233 0.144389 (meters)

XYZ std : 0.170025 0.182956 0.116513 (meters)

XYZ max : 0.338733 0.465643 0.389748 (meters)

Image coordinates residuals:

xy bias : 0.000808 0.006132 (pixels)

xy std : 0.309231 0.320511 (pixels)

xy max : 1.809773 1.949290 (pixels)

5 AEROTRIANGULATION APPROVAL

Accuracy Statement:

This data has been produced to be fully compliant with the American Society for Photogrammetry and Remote Sensing Accuracy Standards for Class 1 mapping requirements at a scale of 1 to 1,200 with a 0.15 meter pixel resolution.

AT Performed by: FugroEarthData Inc **Date:** 05/19/2010

AT Approved by: Qassim Abdullah **Date:** 05/19/2010

6 CONTACT INFORMATION

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7 ADDITIONAL INFORMATION

7.1 Ground Control Residuals

HV04 DX 0.042 DY -0.013 DZ 0.081
HV06 DX 0.109 DY -0.022 DZ 0.204
HV52 DX 0.142 DY 0.170 DZ 0.015
HV63 DX -0.049 DY 0.199 DZ 0.022
HV64 DX -0.339 DY -0.466 DZ 0.313
HV64A DX -0.134 DY 0.110 DZ 0.090
HV66 DX -0.269 DY 0.004 DZ 0.390
HV67 DX -0.010 DY -0.054 DZ 0.140
HV69 DX 0.176 DY -0.038 DZ 0.099

HV03 X n/a Y n/a DZ 0.091

7.2 Ground Control Coordinates

HV04 X 271635.141000 Y 3351881.184000 Z -23.263000
HV06 X 282698.489000 Y 3356732.921000 Z -23.893000
HV52 X 305239.367000 Y 3364073.813000 Z -20.046000
HV63 X 317389.493000 Y 3364943.678000 Z -26.054000
HV64 X 334524.786000 Y 3360370.324000 Z -23.912000
HV64A X 334581.921000 Y 3360087.447000 Z -23.118000
HV66 X 348967.079000 Y 3359850.460000 Z -25.357000
HV67 X 356391.963000 Y 3356885.396000 Z -25.957000
HV69 X 335156.318000 Y 3369675.377000 Z -22.562000
HV03 X 260970.520000 Y 3346283.912000 Z -25.500000

7.3 Ground Control Notes

HV03 used as V only, the sign is gone
PANEL65 is not used, the panel is gone