

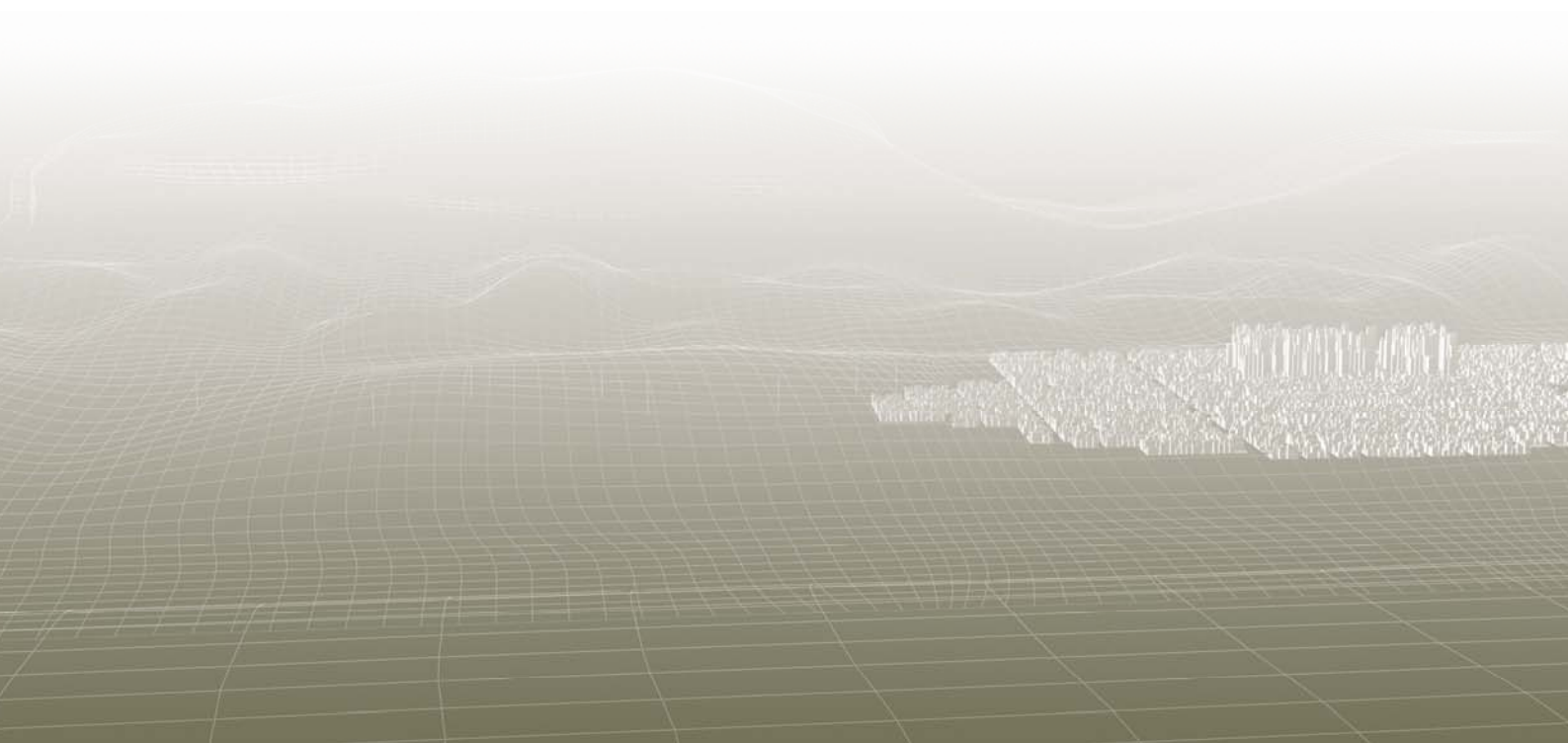


**BLOM**  
GEOMATICS AS

# **LIDAR Report**

**NO06735**

**R & D Project Juupajoki**



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- 3. Converter, **BinToAsc.exe***
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## 1. INTRODUCTION

This document summarizes the flights, decoding and processing of the “R & D Project Juupajoki” project. The Blom Geomatics internal reference number for this project is NO06735.

## 2. FLIGHT MISSIONS

### 2.1. General information

The project was flown in one flight. The LIDAR flights were flown with a Piper Navajo PA 31 airplane (LN-AEY). The LIDAR survey was executed with the following settings:

Flyhøyde	800 m
Repetisjonsfrekvens	100 000 Hz
Speil frekvens	70 Hz
Halvvinkel	14 deg
Hastighet	ca. 75 m/s

### 2.2. LIDAR flight -25<sup>th</sup> July 2006

Flight name:	20606b
Date:	25.07.2006
Period (UTC):	15:41 – 16:57
Weather conditions:	Clear

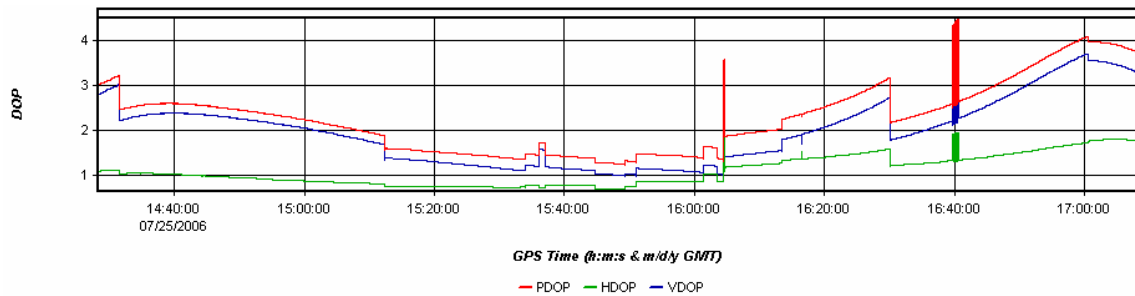
Besetning	Navn
Pilot	John Wiese
Operatør	Ingvild Brekke

## GPS stations

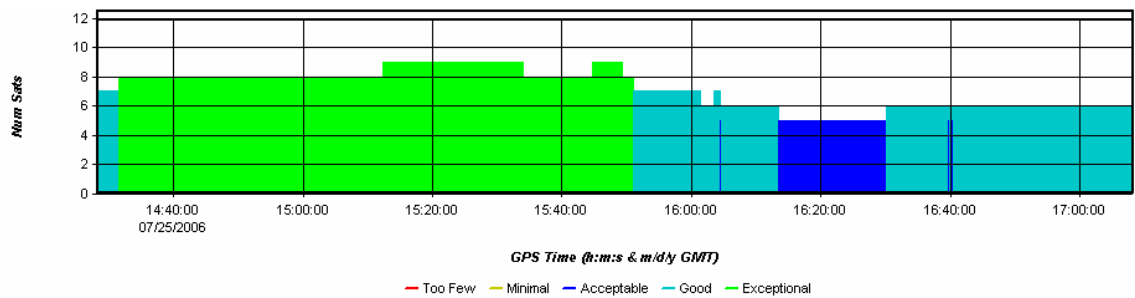
<b>Ground station:</b>	Orivesi	Coordinate	ETRF89
GPS antenna:	Trm41249	North	61 40 59.91870
<b>ARP- L1</b>	0.0714	East	24 21 40.05112
<b>ARP - L2</b>	0.0682	Height el.	168.455
<b>ARP height</b>	0		

<b>RemoteAntenna</b>	AERAT 2775_41
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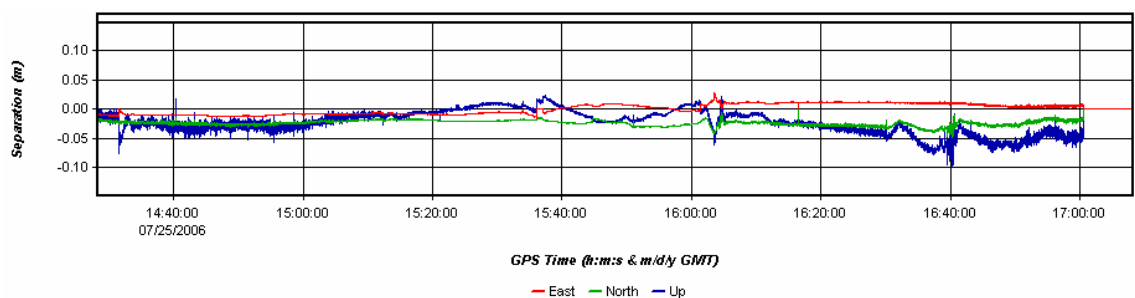
## DOP plot



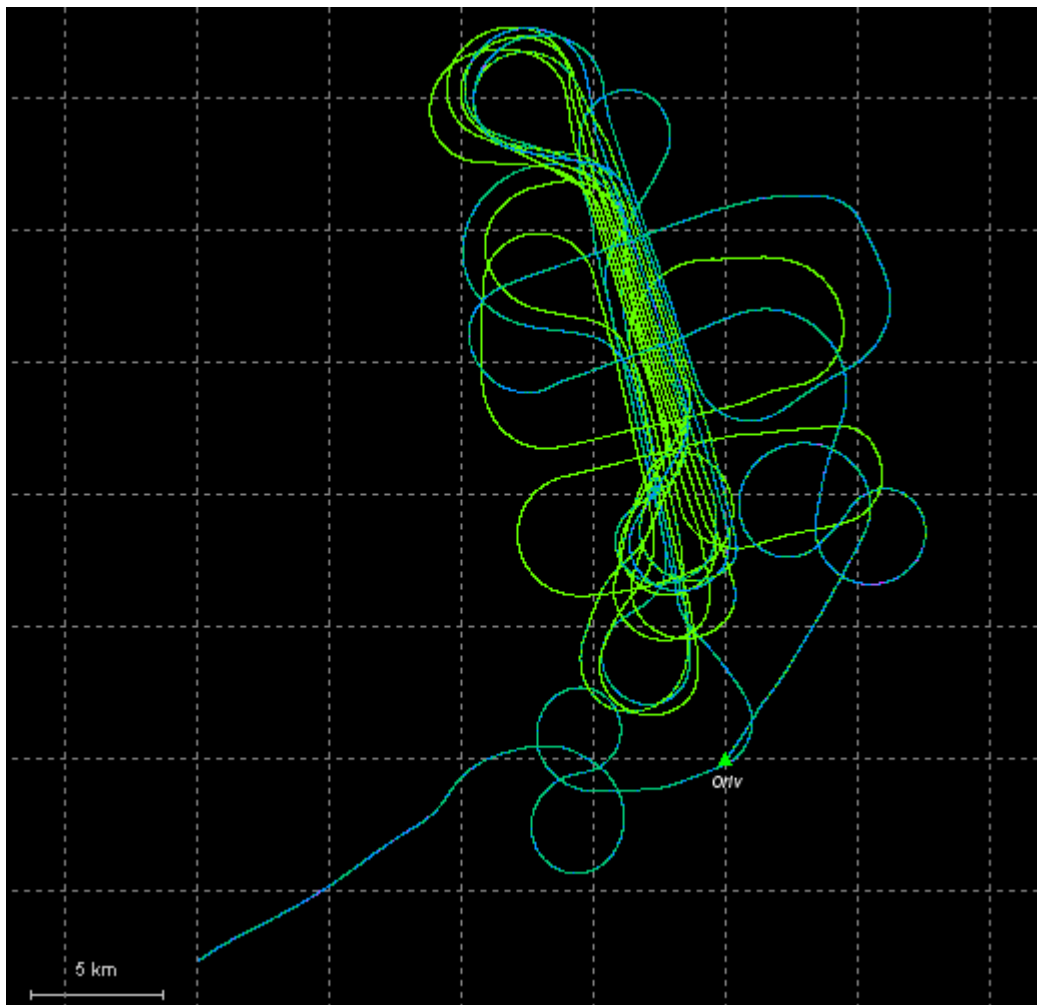
## Number of satellites



## Separation plot between forward and reverse solution



## Flight map



*Aircraft trajectory and location of ground GPS stations for flight 20606b.*

## Conclusion

The solutions are calculated with Applanix PosGPS. Two separate solutions with different kinematic ambiguity resolution were calculated. The “separation plot” shows the difference between the solutions.

The solutions are combined weighted on standard deviation.

The separation plot combined with the P<sub>dop</sub> plot indicates that the GPS solution is very good.

## GPS/INS Calculation

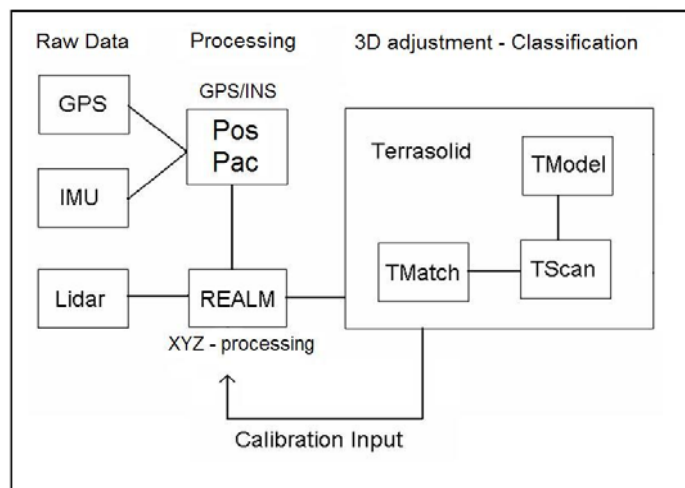
The calculation was done with Applanix PosProc.

IMU report	Start	End
Time interval	15:41	16:57
Nr. of interpolation	0	
Nr. of gaps	0	
Correct time types	Yes	

The result is within the specification of the instrument.

### 2.3. LIDAR XYZ calculation and control

#### Overview Workflow



*Simplified workflow diagram*

The following software has been used:

Name	Product by	Tasks
REALM	Optech	Tape decoding, XYZ processing
POSPAC	Applanix	GPS/INS processing
TerraScan	TerraSolid	Point data management, QC Classification Model offset
TerraModel	TerraSolid	Terrain Modelling, QC
TerraMatch	TerraSolid	System calibration, QC

### Calibration

Systematic errors were found using TerraSolid utilities, such as Roll, Pitch and mirror scale factors. According to the simplified workflow diagram above, the result was reset to the final XYZ process in Realm. These are the result from the calibration:

Parameter	Estimated value
dRoll	0.006°
dPitch	-0.019°
dHeading	0.000°
Scale	0.0000

### Strip adjustment

Terramatch was used to estimate for random errors in delta height, pitch and roll for all stripes. The following corrections were performed:

Stripe	dZ(m)	dRoll(°)	dPitch(°)
1	0.010	0.0057	0.0009
2	0.000	-0.0017	0.0003
3	0.014	0.0029	0.0010
4	-0.022	-0.0006	-0.0017
5	-0.037	-0.0035	-0.0026
6	0.010	0.0002	0.0000
7	-0.021	-0.0007	-0.0010
8	0.035	0.0023	-0.0005
9	-0.028	-0.0038	-0.0014
10	0.010	0.0061	-0.0013
11	-0.037	-0.0158	-0.0003
12	-0.021	0.0114	-0.0009
13	0.036	0.0001	-0.0014
14	0.049	0.0000	-0.0005

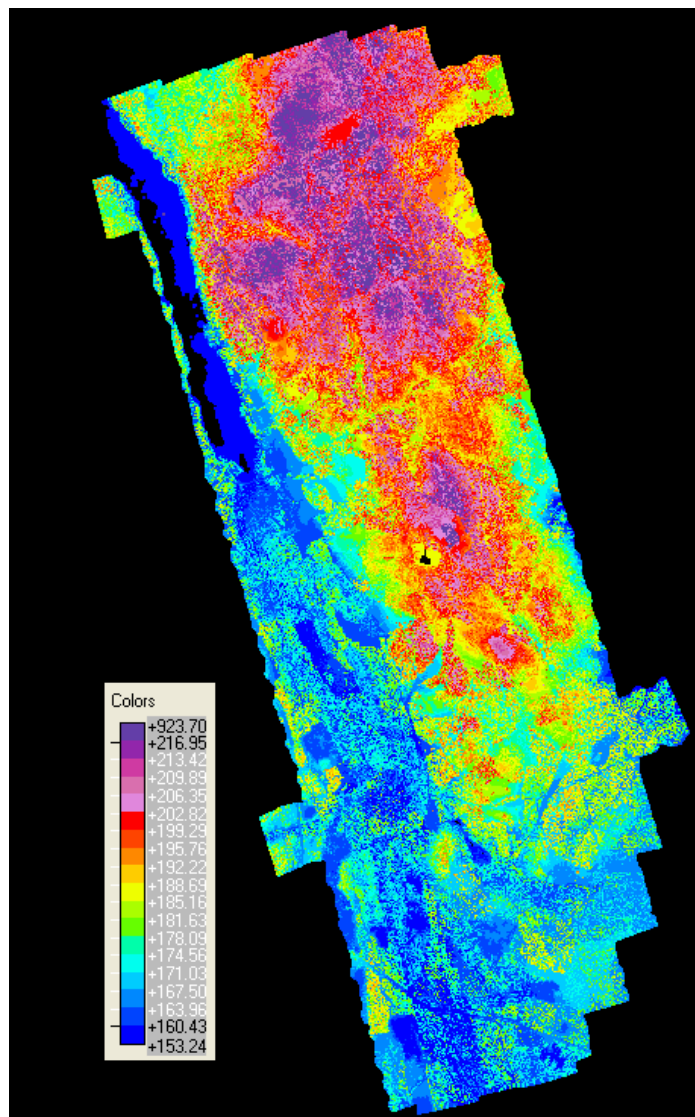
### Model offset

From previous calibrations we have experienced that there can be a small height offset between laser points and “true ground”. The offset is expected to be less than 10 cm. This is caused by different weather conditions or GPS base station coordinates.

No height analyses were performed.

### Density and coverage

The point density in the project is inbetween 6 to 9 points. The coverage is compared graphically with the limits to the area of interest. Black holes in the plot are caused by water, where the laser beam is scattered. The coverage is complete.



*Coverage displayed within area of interest.*



### **3. PRODUCTS**

The data set was delivered 10<sup>th</sup> August, 2006.

#### **3.1. Comprehensive format**

The delivery is done with the binary format called “Comprehensive”. For a complete description of the format please find the: “Appendix\_2\_description\_comprehensive\_format.pdf”

It is delivered a program to convert the binary files to ASCII format. Please find the “BinToAsc.exe” with the belonging “README.txt” file.

There are totally 14 comprehensive files. All files are compressed with “Gzip”.

#### **3.2. Coordinate system**

- All coordinates are exported in ETRF89, TM35 with ellipsoidal heights.