JAPAN INTERNATIONAL COOPERATION AGENCY (JICA) SURVEY OF BANGLADESH (SOB)

BANGLADESH DIGITAL MAPPING ASSISTANCE PROJECT (BDMAP)

Operation Manuals

- 1) Operation Manual for Aerial Triangulation on Match-AT
- 2) Operation Manual for DTM/Orthophoto
- 3) Operation Manual for Digital Plotting
- 4) Activity Report and Operation Manual for GIS Data Management
- 5) Operation Manual for Digital Compilation

March 2012

Asia Air Survey Co., Ltd. Aero Asahi Corporation

Bangladesh Digital Mapping Assistance Project (BDMAP)

Operation Manual for Aerial Triangulation On MATCH-AT

Ver. 2

August 2011

Introduction

1. General

This Operation Manual is prepared by officers of Survey of Bangladesh who were trained in Bangkok in Thailand for Aerial Triangulation with MATCH-AT as the one of the programs of IDMS project of Bangladesh. They prepared the Operation Manuals during the Factory Training in there. BDMAP made some compilation to the Operation Manuals and made some amendment to make let anybody can understand and operate smoothly without troubles on actual job done.

BDMAP expects SOB that the operation manual should be revised time to time according to the improvement of aerial triangulation progress, developing of software and technology. It means this Manual is not the final one but just "Version 1" and has to be revised in future. Please note that this kind of manual should be positioned as REFERENCE only.

Followings are the name of trainees and officers who were trained on factory training program in Bangkok and participated for preparation of this Operation Manual.

- Mr. Shahadat Hossain
- Md. Abdullah Al Rakib
- Mr. Arifur Rahman
- Sheikh Motiur Rahman
- Sara Afroz
- Mahbuba Haque

2. MATCH-AT

2-1. Generals

MATCH-AT is the software for the Arial Triangulation and products of Trimble INPHO Photogrammetric System providing highly precise automatic digital aerial triangulation based on the advanced and unique image processing algorithms.

All the processing steps of "MATCH-AT" are fully automated for achieving highest productivity. The workflow is logical and easy from the project setup, the precise multi-ray tie point matching and integrated bundle adjustment, up to the block analyzing with graphical support.

There is a rigorous support for GPS and IMU data, including calibration of bore-sight missalignment, as well as shift and drift corrections.

An integrated multi-window stereo module is at hand for both, comfortable stereoscopic verification as well as measurement of control points and additional tie points.

With its advanced sub-block handling "MATCH-AT" is designed for processing the photogrammetric projects with block sizes of **20,000** images and even more.

Due to its flexible data exchange capability of "MATCH-AT" integrates into the workflow of any third-party photogrammetric system.

2-2. FEATURES of MATCH-AT

With frame images:

- Single, automated process for point selection, point transfer and measurement, along with an integrated bundle block adjustment requires minimum user interaction.
- Support of any film or digital frame sensors (nadir and oblique).
- No limitations for block size, shape or overlap. With sub-block handling (see below) projects with block sizes of 20,000 images and even more can be processed.
- Tie points are automatically collected in image areas best contributing to the strength and quality of the block. Von Gruber positions can be used, or other patterns in case of special image overlap situations.
- High precision tie point correlation (~0.1pixel) is achieved by an advanced combination of feature-based and least-squares matching, with multi-threading support.
- > Effective tie point matching also in poorly textured, as well as mountainous areas.
- Strong internal quality control of tie points by performing robust bundle block adjustment in each level of the image pyramid.
- Flexible weighting schemes for all types of observations
- Multi-camera support in one block, and camera-specific self-calibration parameter sets (12 or 44 parameters). The results of self-calibration are made available as a dense correction grid for camera re-calibration and for further use in any subsequent applications
- Fully automatic interior orientation:
 - Automatic detection of fiducial marks
 - User definable fiducial mark templates
- Project-wide photo display with correct topology, and auto image-selection for interactive, guided control point measurement
- Advanced sub-block handling:
 - Sub-blocks make it easy to administrate, visualize and analyze large blocks

- Free block adjustment, i.e. sub-blocks can be adjusted without control points
- Sub-blocks can be merged for final project-wide block adjustment
- GPS data handling with shift & drift determination
- IMU data handling:
 - Preprocessed GPS/IMU data from POS AV/POSEO by Applanix and AEROControl by IGI
 - Altitude data are used as constraints in the integrated block adjustment
 - Bore-sight misalignment calibration
- Optionally the triangulation can be made in a local space rectangular coordinate system for avoiding tensions caused by map projections
- Powerful graphical block analyzer:
 - Easy visual checking of large data sets
 - Visualization of image footprints, overlaps, ground control and tie points, and photo connections, residuals, error ellipses and more
- Smooth transfer of exterior orientation data to stereoplotters (e.g. Summit Evolution) and other photogrammetric applications, such as OrthoMaster or MATCH-T
- Export/import formats:
 - DAT/EM Summit Evolution, BAE SocetSet, Z/I project, Aviosoft Ori, ABC-PC, AP32, Phorex/Pex, PATB, Bluh, Bingo

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Appendix (Example of Trouble Shooting)

Chapter 1. Project Setup (Basic setup)

Chapter 1. Project Setup (Basic setup)



Basics	2 🔀 😒
Administrativ	8
Description:	new_project
Operator:	DPW09
Log File:	new_report.log
Units	
coordinate	🕑 Local 🔾 Other
system:	Local Space Rectangular (LSR)
Object units:	m 0000000000 = 💓 m
inage units:	ana S
Angular units	: deg 😽
Administra	OK Cancel Apply
Description Operator	: Project Name, Ex.: IDMS : ex: Rakib
Units	
Coordinate S	System : "Local "Should be "ON"
Object Units	: m (meter)

<Procedure>

*After completing project setting, save to any directory.

Ex: Click file --> Save --> Drive C --> Your name --> Project name --> Save

Chapter 2. Camera Setup

Chapter 2. Camera Setup



<Procedure>

* For camera setting, firstly double click "cameras/sensors"



Camera ID: Ultra	CampXp			
Serial number: UC	Xp-1-10712003			
Sensor type: CCD F	Frame	Brand:	UltraCamXp x-down	4
Platform				
	Offset X:	Offset Y:	Offset Z:	
GNSS antenna offset	: 0.000	0.000	0.000	[m]
Camera mount rotatio	on: 0.0000 - Zeiss de	efault		Market [deg
				Default
				Default
			OK Cancel	Default
			OK Cancel	Default
ocedure>			OK Cancel	Default

Platform:

GNSS ANTENNA OFFSET: Input antenna offset value from camera calibration certificate (Ultracam camera has no antenna offset value)

Edit Camera	22
Basic Calibration Distortion Comments	
Sensor System Focal length: 100.5000 Click [mm]	
Sensor size: Widtb: 17310 Height: 11310	[nix]
Pixel size:	[Pass]
Width: 6.0000 Height: 6.0000	[µm]
Principal Point	
Defined with respect to:	
 Sensor coordinate system. The reference is a pixel's renter point Image coordinate system. The orientation of the image coordinate system is set to Definitions are provided for PPA only Principal point of autocollimation (PPA); x; 0.0000 y; 0.0000 Select this direction according to image coordinate system x; renter point 	PPA C tx center
OK Cancel Click here	Apply.
Calibration: Input PBA value from Camera certificate	

Ex: X=0.000, Y=0.000 for Ultracam Xp Camera

Distortion Correction Type	Click	Ulsau
istortion Values	Click	VIEW
Linear	Distance step: 4.1	[mm]
Linear Distance [mm] Distort	ion Error [um	Add
		Remove
		Drocat
		FIGSOL
		Import
*This function	is for Analog Camera only	Import
*This function	is for Analog Camera only	Import
*This function	is for Analog Camera only	Import
*This function	is for Analog Camera only	Import
*This function	is for Analog Camera only	Import
*This function	is for Analog Camera only	Import

Distortion: UltraCamXp Camera is not required for Distortion

Edit Camera		? 🔀
Basic Calibration Distortic	on Comments	
Last change: Sun. 02.01.2011 01.	42 pm	
		、 、
	Click here)

<u>Comments</u>: If you have any comments, write in the box and then click "Apply" and "OK"

Now, the Camera setup is complete. After that if there need any corrections, you can Edit and correct it as shown in next procedure.

<Edit Camera>

Camera Editor	? 🔀	
Camera ID Status Date Sensor Type UltraCampXp 02.01.11 13.42 CCD Frame 1. Select	Add Copy Edit Remove Import Export	2. Click here
OK Cancel	Apply	

Edit camera setting:

<Procedure>

* If there is need any corrections for camera setting, then select the previous "Camera ID", click "Edit" and previous camera setting page will open.

* After edit something, click "Apply" and "OK", then Camera setting is complete.

Chapter 3. Image Import

Chapter 3. Image Import













<Procedure>

For Image Setup:

* Double click "Frame type"--> Click "import"--> Click "image Files"--> Click "add"--> select "Add Directory"-->Now go to folder where images are stored and select image and "OK".

Frame Pho	to Importer	? 🗙
ntification Ext	raction	
ID	Image File	
1_22536 1_22537	C:\Work\Boresight Calibration Project\Lvl03_RGB_Boresit C:\Work\Boresight Calibration Project\Lvl03_RGB_Boresit	e_50cm_55
(_22538 _22539	C:\Work\Boresight Calibration Proj <mark>C:\Work\Boresight Cal</mark> C:\Work\Boresight Calibration Project\Url03_PCB_Boresit	ibration Project\Lvl03_R
22539 I_22540 I_22541	C:\Work\Boresight Calibration Project\Lvl03_RGB_Boresit C:\Work\Boresight Calibration Project\Lvl03_RGB_Boresit C:\Work\Boresight Calibration Project\Lvl03_RGB_Boresit	e_50cm_55 e_50cm_55
22542 !_22543	C:\Work\Boresight Calibration Project\LvI03_RGB_Boresit C:\Work\Boresight Calibration Project\LvI03_RGB_Boresit C:\Work\Boresight Calibration Project\LvI02_RCB_Boresit	e_50cm_55 e_50cm_55
_22544 22545 .22546	C:\Work\Boresight Calibration Project\LvIU3_RGB_Boresit C:\Work\Boresight Calibration Project\LvI03_RGB_Boresit C:\Work\Boresight Calibration Project\LvI03_RGB_Boresit	e_50cm_55 e_50cm_55 e_50cm_55
22547	C:\Work\Boresight Calibration Project\Lvl03_RGB_Boresit	e_50cm_55
ID Extraction	Method	
Use digit	is only digit, starting from left until first non-digit character	
O Use any	digit, starting from right until first non-digit character	
💿 Use any	character	Click here again and
Deploy s r o lead Era	ection from position 1 📚 up to position 👔 🤤 ling zeros anks	again until the image is the same as the GN ID
This b	< Back Next >	Cancel
	Click here	

Frame Photo Importer	2
Merge Options	
Imported IDs:	
 ✓ 1_22537 ✓ 1_22538 ✓ 1_22539 ✓ 1_22540 ✓ 1_22541 ✓ 1_22542 ✓ 1_22543 ✓ 1_22543 ✓ 1_22544 ✓ 1_22545 ✓ 1_22546 ✓ 1_22547 ✓ 1_22548 ✓ 1_22549 ✓ 1_22549 ✓ 1_22549 	
 ✓ 1_22550 ✓ 1_22551 ✓ 2_22552 ✓ 2_22553 ✓ 2_22554 ✓ 2_22556 ✓ 2_22556 ✓ 2_22557 ✓ 2_22558 ✓ 2_22558 ✓ 2_22559 	Click here

Frame Photos	? 🔀
ID Camera East X North Y Height Z Omega Phi Kappa Terrain On Image File	Add
1_22536 @bUCXp_537994.476 2742588.358 8285.441 -0.2122 0.0249 -93.5079 20.000	1_22536_RGB.t
1_22537 MartiOCAP 557646.269 2740531.515 6285.763 -0.0539 0.4524 -95.8151 20.000 👳 C1(Workporesigni Calibration Project)(1/03_RGB_Boresite_50cm[55_20101216] 1_22538 MartiOCAP 537719.671 2738075.246 8286.436 0.2324 0.9871 -92.5858 20.000 🖵 C1(Work]Boresight Calibration Project)(1/03_RGB_Boresite_50cm_55_20101216)	(1_22537_RGB.t ■
1_22539 @bUCXp_537630.366 2735817.479_8286.7000.1939_0.3488_92.1300_20.000	1_22539_RGB.t
1_22540 @DUCXp 537550.938273559.154 8287.427 -0.3349-0.3174 -92.2280 20.000 👳 Ct(work(Boresight Calibration Project(Lv103_RGB_Boresite_50cm_55_20101218) 1_22541 @DUCXp 537437.436 2731302.198 8287.967 -0.1927 0.0403 -93.1015 20.000 🐙 Ct(Work(Boresight Calibration Project)Lv103_RGB_Boresite_50cm_55_20101218)	(1_22540_RGB.tImport ▼ \1_22541_RGB.t
1_22542 mm/UCXp_537306.250 2729045.378 8289.062 -0.1096 -0.0344 -93.3405 20.000 ♀ C:\\Work\Boresight Calibration Project\\v\03_RGB_Boresite_50cm_55_20101218\	1_22542_RGB.t Eliminate ▼
1_22543 @DUCXp 53/169/494 2/26/88.684 8288.2/6 -0.1615 0.3481 -93.40/0 20.000 👮 C:(work(boresight Calibration Project(Lvl03_RGB_Boresite_50cm_55_20101218) 1_22544 @DUCXp 537051.675 2724530.852 8289.634 0.0345 0.8843 -92.7545 20.000 👮 C:(Work(Boresight Calibration Project)(Lvl03_RGB_Boresite_50cm_55_20101218)	(1_22543_RGB.t \1_22544_RGB.t
1_22545 🏙 UCXp 536947.407 2722272.505 8291.557 0.0410 0.4887 -92.5861 20.000 🖵 C:\Work Boresight Calibration Project\Lvl03_RGB_Boresite_50cm_55_20101218	1_22545_RGB.t Rename
1_22546 Φ UCXp 536844.412 2720016.143 8290.481 -0.1410 0.1308 -92.6141 20.000 🛒 C1\Work Boresight Calibration Project Lvl03_RGB_Boresite_50cm_55_20101218\ 1_22547 Δ BUCXp 536725.635 2717758.985 8291.246 -0.2400 0.2444 -93.1658 20.000 🛒 C1\Work Boresight Calibration Project Lvl03_RGB_Boresite_50cm_55_20101218\	(1_22546_RGB.t \1_22547_RGB.t Columns
1_22548 🏙 UCxp 536600.610 2715502.550 8291.968 -0.1250 0.7414 -92.9274 20.000 🛒 C:\Work\Boresight Calibration Project\Lvl03_RGB_Boresite_50cm_55_20101218	1_22548_RGB.t Find
1_22549 mmUCXp 536494.660 2713243.776 8294.911 -0.1828 0.1528 -92.7364 20.000 🛒 C:\Work\Boresight Calibration Project\LvI03_RGB_Boresite_50cm_55_20101218\ 1 22550 mmUCXp 536395.006 2710986.140 8295.383 0.0186 0.4682 -92.4691 20.000 🗬 C:\Work\Boresight Calibration Project\LvI03_RGB_Boresite_50cm_55_20101218\	(1_22549_RGB.t
1_22551 m UCxp 536293.423 2708730.394 8295.527 -0.0037 0.5814 -92.6282 20.000 👤 C:\Work Boresight Calibration Project Lvl03_RGB_Boresite_50cm_55_20101218	1_22551_RGB.t
0/47	Units: m, deg
Click here	Cancel Apply

Chapter 4. Input GNSS/IMU Value

Chapter 4. Input GNSS/IMU Value

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Project	Value	
🖃 🚮 Workspace		
Elements		
Cameras/Sensors	4	
	91	
RPC Type	0	
🔚 🛃 3-Line Type	0	
CNSS/IMIL: 0 CONSY E	0 199	
A Points	Double Click	
TTMs	0	
🖃 🧰 Groupings		
dtp Strips	7	
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E W Corrections	Mator	
Atmospheric Refraction		
Earth's Curvature		
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*Select folder in which to save GNSS/IMU data.

	orter			? 🔀
Select import file				
Choose a file source to start from any line of t	o import data from. If neo the file.	ccessary, define a token s	equence to rule out comm	k mport. Import may
File:				
			Grouping separators	#
Import begins at row:	1 🗘		Ignore lines starting with	
-Import Data Preview	·			
Double c	lick "GNSS/IMU"· "	> Click "import"	'> Click, select "(Go to
Now go t	o folder where G	NSS/IMU data is	stored and select and "	OK"
		-		
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* Input the identify letter of comment low in the GPS file (In this case "#"). Then "Next"

le G	SS/IMU Importer	×
Sele	import file	
Choc start	a file source to import data from. If neccessary, define a token sequence to rule out commentary lines from import. Import ma om any line of the file.	Y
File:	:\training\MATCH-AT\Offingen\Input\offingen.gps	
Impo Imp	begins at row: 1 2 I Data Preview	
1	*	
2	#GPS File for Sample Block "OFFINGEN"	
3	#separated into strips with '#' (only a subset will be triangulated)	
4	#images marked with an '*' are not used in the adjustment	
5	#	
6	0736 539400.056 332885.154 1742.731	
7	0737 539881.982 332892.741 1741.349	

<Procedure>

* Input the identify letter for separation between ID, X, Y, etc in the GPS file (II. ...is case "blank"). Then "Next".

🚔 GNSS/II	WU Importer	i l			?	
Define field	delimiters					
Select any ni selection.	umber of delimi	ters to separat	e your import data into co	olumns. The data pre	view will show you the effects of your	
Delimiters	Comma	Other			Treat sequenced delimiters as	one
Blank	Semicolon				Text identifying mark: "	*
Group 1 Group 2 Group 3 Group 4						~
	539400.056 539881.982 540445.819	332885.154 332892.741 332899.344	1742.731 1741.349 1744.484			

* Choose each field and Click corresponding class (example, the left field corresponds "ID" button).



Then "Next". Then go "Next" until Finish.

G	NSS	/IMU													? 🛛
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001	V	3516986.8	56 5318014.348	3195.757	0.1000	0.1000	0.1000	✓	-0.5128	-0.0287	178.7917	0.00800	0.00800		
002	~	3516310.7	50 5318022.231	3194.599	0.1000	0.1000	0.1000	✓	0.3047	-0.2863	-179.2573	0.00800	0.00800		Edit
003	\checkmark	3515633.9	57 5318019.969	3192,503	0.1000	0.1000	0.1000	✓	0.3503	-0.2544	-179.2850	0.00800	0.00800		
004	V	3514951.1	78 5318016.607	3193.707	0.1000	0.1000	0.1000	✓	0.4337	-0.0820	-179.0098	0.00800	0.00800		Remove
005	~	3514275.9	26 5318008.898	3193.130	0.1000	0.1000	0.1000	✓	0.3421	0.0784	-178.8339	0.00800	0.00800		
006	V	3513592.6	42 5318007.356	3193.141	0.1000	0.1000	0.1000	✓	-0.0104	0.1931	-179.9043		00800		Import
007	✓	3512912.7	50 5318013.697	3193.011	0.1000	0.1000	0.1000	✓	0.0191	0.1581	179.9	Click	R		Std Dou
008	V	3512235.4	63 5318016.658	3194.587	0.1000	0.1000	0.1000	✓	0.3468	0.1532	-179.4	CHER	1		Studev
009	✓	3511557.7	01 5318014.396	3193.291	0.1000	0.1000	0.1000	✓	0.3574	-0.0174	-179.3467	0.00000	0.00800		Columns
010	V	3510880.0	10 5318010.462	3193.828	0.1000	0.1000	0.1000	✓	0.2293	0.0239	-179.4069	0.00800	0.00800		Coldminstri
011	✓	3510201.8	30 5318011.228	3193.507	0.1000	0.1000	0.1000	✓	0.1239	-0.0254	-179.8680	0.00800	0.00800		Find
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013	~	3508839.9	23 5318013.226	3195.690	0.1000	0.1000	0.1000	✓	0.5571	0.0715	-178.8170	0.00800	0.00800		- Sort ID
014		3508161.0	47 5318014 308	3103 212	0 1000	0 1000	0 1000		-0 0785	-0 1954	-170 0824	0.00800	0.00800		
5														2	
0/18	9												Units: r	n, deg	
												ОК	Ca	ncel	Apply

Value of standard deviation is depending on the method of GPS_IMU. However when click the default button following values comes automatically.



GN	ISS/	/IMU													?
ID	ş	East X	North Y	Height Z	StdDev X	StdDev Y	StdDev Z	§	Omega	Phi	Карра	StdDev O	StdDev P	St 🔼	Add
001	✓	3516986.856	5318014.348	3195.757	0.1000	0.1000	0.1000	V	-0.5128	-0.0287	178.7917	0.00800	0.00800		
002	✓	3516310.750	5318022.231	3194.599	0.1000	0.1000	0.1000	✓	0.3047	-0.2863	-179.2573	0.00800	0.00800		Edit
003	✓	3515633.957	5318019.969	3192.503	0.1000	0.1000	0.1000	✓	0.3503	-0.2544	-179.2850	0.00800	0.00800		
004	✓	3514951.178	5318016.607	3193.707	0.1000	0.1000	0.1000	✓	0.4337	-0.0820	-179.0098	0.00800	0.00800		Remove
005	✓	3514275.926	5318008.898	3193.130	0.1000	0.1000	0.1000	✓	0.3421	0.0784	-178.8339	0.00800	0.00800		True aut
006	✓	3513592.642	5318007.356	3193.141	0.1000	0.1000	0.1000	✓	-0.0104	0.1931	-179.9043	0.00800	0.00800		Imporc
007	✓	3512912.750	5318013.697	3193.011	0.1000	0.1000	0.1000	✓	0.0191	0.1581	179.9328	0.00800	0.00800		Std Dev
800	✓	3512235.463	5318016.658	3194.587	0.1000	0.1000	0.1000	✓	0.3468	0.1532	-179.4389	0.00800	0.00800		Bearbonn
009	✓	3511557.701	5318014.396	3193.291	0.1000	0.1000	0.1000	✓	0.3574	-0.0174	-179.3467	0.00800	0.00800		Columns
010	~	3510880.010	5318010.462	3193.828	0.1000	0.1000	0.1000	✓	0.2293	0.0239	-179.4069	0.00800	0.00800		
011	✓	3510201.830	5318011.228	3193.507	0.1000	0.1000	0.1000	✓	0.1239	-0.0254	-179.8680	0.00800	0.00800		Find
012	✓	3509521.534	5318013.902	3193.015	0.1000	0.1000	0.1000	✓	0.0953	0.0207	-179.8967	0.00800	0.00800		
013	✓	3508839.923	5318013.226	3195.690	0.1000	0.1000	0.1000	✓	0.5571	0.0715	-178.8170	0.00800	0.00800	~	- Sort ID
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0/189	I												Units:	n, deg	
									Click	<u> </u>		ОК		incel	Apply

<Procedure>

* Double Click "GNSS/IMU" Import--> Go to directory where GNSS/IMU data are stored--> select "GNSS/IMU data"--> "Open".

*ATTN: Sometime have to input "Standard deviation" in manually and "OK"

Chapter 5. GCP (Ground Control Point) Setup

Chapter 5. GCP (Ground Control Points) Setup



For GCP Setup: Double click "Points"--> Click "import"--> Click ______ --> Go to Directory-->Now go to folder where GCP is stored and select and "OK"

Points		?
§ ID Type East X North Y He	eight Z StdDev X,Y StdDev Z Description	Add
		Edit,
	Click	Remove
		Import
		Descriptions
		Std.Dev
		Columns
		Find
		Sort ID numerically
2 •/•	Units: m, deg	
	OK Cancel	Apply
elect import file hoose a file source to import data from ommentary lines from import. Import n	m. If neccessary, define a token sequence to r nay start from any line of the file.	ule out
ile:		
mport begins at row: 1	Grouping separators	5

Select Import F	ile				2
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My Network Places	File name: Files of type: ile	Ground Control (*.e	cn * txt *.dat)	<u> </u>	Open Cancel
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My Network. Places	File name: Files of type:	Ground Control (*.g	cp *.txt *.dat)		Open Cancel

Colort Import I						1
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My Network Places	File name: Files of type:	Ground Con	trol (*.gcp *.txt *.	dat)	•	Öpen Cancel

ct Import F	ile				?
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ID Type E 1D Type E 11 HV 3 100 HV 3 111 HV 3 112 HV 3 113 HV 3 114 HV 3 115 HV 3 116 HV 3 117 CHV 3 118 HV 3 119 HV 3	Fast X North Y 499716.919 5317071.963 514682.851 5308404.013 514725.183 5308377.608 1514725.183 5308377.608 1514725.183 5308372.453 514482.582 5317129.114 514482.582 5317129.114 514482.582 5317129.114 514482.582 5317129.114 514482.582 5317129.114 514508.125 5317258.627 507004.096 5317170.135 506943.561 5317161.550 506870.195 5317158.557 506996.529 5313487.901	Height Z StdDev X,N 728.225 Standard 657.456 Standard 656.378 Standard 6653.694 Standard 643.301 Standard 644.2170 Standard 641.211 Standard 630.963 Standard 633.070 Standard 633.070 Standard 609.887 Standard	ck StdDev Z Standard Standard Standard Standard Standard Standard Standard Standard Standard Standard	Einish Description Undefined Undefined Undefined Undefined Undefined Undefined Undefined Undefined	Cancel Add Edit Pemove Import Descriptions Std.Dev Columns
ID Type E 1 HV 3 10 HV 3 11 HV 3 12 HV 3 13 HV 3 14 HV 3 15 HV 3 16 HV 3 18 HV 3 19 HV 3	Fast X North Y 499716.919 5317071.963 514682,851 5308404.013 514725.183 5308377.608 514777.915 5308352.453 514482.582 5317129.114 514494.789 5317192.463 514508.125 5317258.627 507004.096 5317170.135 506943.561 5317161.550 506870.195 5317158.557 506996.529 5313487.901 499748.241 5317047.724	Height Z StdDev X,N 728,225 Standard 657,456 Standard 656,378 Standard 6653,694 Standard 643,301 Standard 641,211 Standard 641,211 Standard 641,2179 Standard 630,963 Standard 633,070 Standard 609,887 Standard 726,684 Standard	ck StdDev Z Standard Standard Standard Standard Standard Standard Standard Standard Standard Standard Standard	Einish Description Undefined Undefined Undefined Undefined Undefined Undefined Undefined Undefined Undefined	Cancel Add Edile Remove Import Descriptions Std.Dev Columns.,
ID Type E 10 HV 3 10 HV 3 11 HV 3 12 HV 3 13 HV 3 14 HV 3 15 HV 3 16 HV 3 17 CHV 3 18 HV 3 19 HV 3 20 HV 3	Fast X North Y 499716.919 5317071.963 514682.851 5308404.013 514725.183 5308377.608 9514777.915 5308352.453 514482.582 5317129.114 514494.789 5317192.463 514508.125 5317258.627 507004.096 5317170.135 506943.561 5317161.550 506870.195 5317158.557 506996.529 5313487.901 499748.241 5317047.724 507023.868 5313530.182	Height Z StdDev X,V 728,225 Standard 657,456 Standard 656,378 Standard 665,3694 Standard 643,301 Standard 644,2770 Standard 641,211 Standard 641,211 Standard 633,070 Standard 633,070 Standard 609,887 Standard 609,689 Standard 609,689 Standard 609,689 Standard	ck StdDev Z Standard Standard Standard Standard Standard Standard Standard Standard Standard Standard Standard Standard	Einish Description Undefined Undefined Undefined Undefined Undefined Undefined Undefined Undefined Undefined	Cancel Add Edile Pemove Import Descriptions Std.Dev Columns Find
Points Type E 10 Type E 11 HV 3 10 HV 3 11 HV 3 12 HV 3 13 HV 3 14 HV 3 15 HV 3 16 HV 3 17 CHV 3 18 HV 3 20 HV 3 20 HV 3	East X North Y 499716.919 5317071.963 514682.851 5308404.013 514725.183 5308377.608 8514777.915 5308352.453 514482.582 5317129.114 514494.789 5317192.463 514508.125 5317258.627 507004.096 5317170.135 506943.561 5317161.550 506870.195 5317158.557 506996.529 5313487.901 499748.241 5317047.724 507023.868 5313530.182 507072.011 5313604.976	Height Z StdDev X,Y 728,225 Standard 657,456 Standard 656,378 Standard 6653,694 Standard 643,301 Standard 642,770 Standard 641,211 Standard 642,779 Standard 633,070 Standard 633,070 Standard 633,070 Standard 609,887 Standard 609,689 Standard 609,919 Standard 609,919 Standard	ck StdDev Z Standard Standard Standard Standard Standard Standard Standard Standard Standard Standard Standard Standard Standard	Einish Description Undefined	Cancel Add Edile Permove Import Descriptions Std.Dev Columns Find
ID Type E 1D Type E 11 HV 3 10 HV 3 11 HV 3 12 HV 3 13 HV 3 14 HV 3 15 HV 3 16 HV 3 19 HV 3 20 HV 3 21 CHV 3 3 CHV 3	East X North Y 499716.919 5317071.963 514682.851 5308404.013 514725.183 5308377.608 8514777.915 5308352.453 514482.582 5317129.114 514494.789 5317129.463 514508.125 5317258.627 507004.096 5317170.135 506943.561 5317161.550 506870.195 5317158.557 506996.529 5313487.901 499748.241 5317047.724 507023.868 5313530.182 507072.011 5313604.976	 Height Z StdDev X, V 728.225 Standard 657.456 Standard 653.694 Standard 643.301 Standard 643.301 Standard 642.770 Standard 643.070 Standard 630.963 Standard 633.070 Standard 633.070 Standard 609.887 Standard 	ck StdDev Z Standard Standard Standard Standard Standard Standard Standard Standard Standard Standard Standard Standard Standard	Einish Description Undefined Undefined Undefined Undefined Undefined Undefined Undefined Undefined Undefined Undefined Undefined Undefined	Cancel Add Edit Pemove Import Descriptions Std.Dev Columns., Find
ID Type E 1 HV 3 10 HV 3 11 HV 3 12 HV 3 13 HV 3 14 HV 3 15 HV 3 16 HV 3 19 HV 3 20 HV 3 21 CHV 3 3 CHV 3	East X North Y 499716.919 5317071.963 514682.851 5308404.013 514725.183 5308377.608 9514777.915 5308352.453 514482.582 5317129.114 514482.582 5317129.114 514508.125 5317258.627 507004.096 5317170.135 5069943.561 5317158.557 506996.529 5313487.901 499748.241 5317047.724 507002.368 5313530.182 507072.011 5313604.976 499745.325 5317036.449	 Keight Z StdDev X, V 728,225 Standard 657,456 Standard 653,694 Standard 643,301 Standard 642,770 Standard 642,770 Standard 630,963 Standard 630,963 Standard 633,070 Standard 609,887 Standard 609,689 Standard 609,689 Standard 609,919 Standard 725,804 Standard 	ck StdDev Z Standard Standard Standard Standard Standard Standard Standard Standard Standard Standard Standard Standard Standard Standard	Einish Description Undefined Undefined Undefined Undefined Undefined Undefined Undefined Undefined Undefined Undefined	Cancel Add Edile Permove Import Descriptions Std.Dev Columns Find Find



The standard deviation specified for observation groups determine the weighting of those observations. The smaller standard deviation values mean that the higher weight and more accurate observations are carrying out. If necessary, 5 different sets of standard deviations can be entered assigned to ground control points in order to work with different accuracy classes.

i	ID	Туре	East X	North Y	Height Z	StdDev X, Y	StdDev Z	Description	Add
-	1	HV	3499716.91	9 5317071.96	3 728.225	5 Standard	Standard	Undefined	
1	10	HV	3514682.85	1 5308404.01	3 657.456	6 Standard	Standard	Undefined	Edit
1	11	HV	3514725.18	3 5308377.60	8 656.378	8 Standard	Standard	Undefined	
1	12	HV	3514777.91	5 5308352.45	3 653,694	4 Standard	Standard	Undefined	Pemove
1	13	HV	3514482.58	2 5317129.11	4 643.30	1 Standard	Standard	Undefined	[
1	14	HV	3514494.78	9 5317192.46	3 642.770) Standard	Standard	Undefined	Import
1	15	HV	3514508.12	5 5317258.62	7 641.21	1 Standard	Standard	Undefined	-
1	16	HV	3507004.09	6 5317170.13	5 632.179	9 Standard	Standard	Undefined	Descriptions
1	17	CHV	3506943.56	1 5317161.55	0 630,963	3 Standard	Standard	Undefined	Std Dev
1	18	HV	3506870.19	5 5317158.55	7 633.070) Standard	Standard	Undefined	Junee
1	19	HV	3506996.52	9 5313487.90	1 609.883	7 Standard	Standard	Undefined	Columns
1	2	HV	3499748.24	1 5317047.72	4 726.684	4 Standard	Standard	Undefined	
/	20	HV	3507023.86	8 5313530.18	2 609,689	Standard	Standard	Undefined	Find
1	21	CHV	3507072.01	1 5313604.97	6 609.919	9 Standard	Standard	Undefined	
1	3	CHV	3499745.32	5 5317036.44	9 725.804	4 Standard	Standard	Undefined 🚤	- Sort ID
7	-		titutte a	Serences			- 1 1		- numerically
31] 0	1/21			Click			Units: m, deg	

* After click "magic box", "Standard Deviation" will be input automatically and Click "OK". After this procedure is completed on each "magic box" individually for all "magic box", then click "Apply" & "OK".

Chapter 6. Strip Setting (Automatic System)

Chapter 6. Strip Setting (Automatic System)



I				_	?		
	> Photo IDs	Num (Crab Angle	Azimuth	Add		
				-	Edition		
					Remove		
			Click		Generate		
					Columns		
					Find		
					Sort ID	,	
0/	0		i	Inits: m, deg			
			ок	Cancel	Apply		
Strip Gen	eration Wiz	zard	~				[7]
Method							
Select	method						
Method:	om photo ID in	formation				_	
Method.	om prioco 10 m	normación				-	
				Click			
				Click			
				Click			
				Click			
			(Click < Back	Next :	>	Cancel

Strip Generatio	n Wizard	2	\times
Settings Define paramet	ers.		
Azimuth tolerance:	5 deg		
Distance tolerance:	100.%		
		Next	
		< Back Next > Cancel	

D Extraction Extract IDs.			
ID	Candidate	~	
3_2240 3_2240	10 3_22400)1 3_22401		
3_2240)2 3_22402)3 3 22403		
5_2250	0 5_22500		
5_2250	12 5_22502		
2_2240)4 2_22404)3 5_22503		
2_2240)5 2_22405 14 5_22504		
2_2241	0 2_22410		
2_2240)6 2_22406 10 5_22510		
5_2250)5 5_22505 11 2 22411		
2_2240	17 2_22407	*	
ID Ext	raction Method		
ΟU	Ise digits only		
Qu	Ise any digit, starting from left until first non-digit Click		
00	lse any digit, starting from right under non-digit character		
() U	ise any character		
Do	eploy section from position 1 up to position 1		
5	kip leading zeros		
D B	rase blanks		
	< Back Next >	Cancel	

Click this BOX until the ID No. and candidate No. should be same.



31	oubs				
ID	Photo IDs	Num	Crab Angle	Azimuth	Add
1	1_22446,	16	0.0000	6.4404	-
2	2_22404,	29	0.0000	-173.5487	Edit
3	3_22375,	29	0.0000	6.3944	(An exclusion
4	4_22464,	28	0.0000	99.8157	Remove
5	5_22492,	29	0.0000	-80.2452	Generate
					Columns
					Find
	C	lick			Sort ID numerically
5/5		- 1	Ur	nits: m, deg	

Double click "Strip"--> "Generate"-->"Next"--> Select "Deploy section" from position box & click up to position arrow until the image & GNSS ID No. become the same-->"Next"

-->"Finish" --> "Apply" & "OK."(Strip setting completed.)

Chapter 7. Manual Strip Setting

Chapter 7. Manual Strip Setting

Project		Value
🖃 🚮 Work	space	
😑 🧿 E	lements	
	Cameras/Sensors	1
111	🖓 Frame Type	91
	RPC Type	0
	a 3-Line Type	0
	Orthos	0
	GNSS/IMU - Approx.E	O 189
2	Points	
	DTMs Do	uble click
e 🗋 G	roupings	
10	D Strips	7
10	Blocks	0
😑 🐼 S	ettings	
	Display Channels	0
E-	Administrative	
	Description	Match_M
	Log File	new_report.log
	Operator	Matiur
	Corrections	
	Atmospheric Refractio	
~ 5	Earth's Curvature	
. B. B	Suctors	Local Space Dectangular /(SD)
	Object	Ducal space Rectangular (LSR)
	Image	m
	Angular	deg
	- State - Contraction	



Chapter 8. Block Setting

Chapter 8. Block Setting

a Edit View Tools Help	
한 100k View 100ks Neip 가 10월 🔲 🔖 🍇 📾 🖽	
Project	Value
🖶 🚺 Workspace	
Photos	1
a Frame Type	91
RPC Type	0
🔄 🌆 3-Line Type	0
Orthos	0
GNSS/IMU - Approx.EC) 189
Points	21
Croupings	0
ditto Strips	7
Blocks	
🖃 🐼 Settings	
Display Channels	0
🖃 🌇 Administrative	ve hitten
Description	Match_M
Operator	Matiur
🖃 📆 Corrections	
Atmospheric Refraction	
Earth's Curvature	
	Local Space Bertangular (LSD)
Object	m
Image	mm
Angular	deg
eneration date: Sun Jan 2 13:40:16 20	11 Last channe: Tue Jan 04 13:02:28 2011



* The Basic Setup has completed

After completing **Project Setup**, you must save the project, otherwise it has possibility to miss all project data

Chapter 9. Image Pyramid Creation

Chapter 9. Image Pyramid Creation



From above table of image list, select desired images and then click "process overviews".
🐝 Generate Overviews	? 🔀
Options	
• Generate overviews	
Color depth:	8 bits per channel 🛛 👻
Adjust intensities to	use complete range
💽 Enforce tile rather t	han scanline organization
Save image pyramid	l in separate file
Use JPEG compressi	on: Quality Factor 85
O Delete overviews	
Schedule Task-	
Execution time: 1/25/20	011 12:46:19 PM
Login	
Domain/User: BDMAP-F	PC-09\DPW09
Password:	
Tasks	Start Cancel
Click!	

<Procedure> For image pyramid creation:

Ex: Click "Basics"-->Click "Image commander"-->Select all images-->Click "Process Overviews"-->Click "Start"

* This Process will continue and it takes several times. After completing pyramid, then "close".

After completed pyramid creation then



	/	/				
File	Overviews	External	Depth	Channels	Tilir 🔼	Add 🔻
C:\Work\Boresight Calibration Project\Lvl03_RGB_Boresite_50cm_55_20101218\3_22535_RGB.ti	f 10	yes	8	3	Tile	Densus
C:\Work\Boresight Calibration Project\Lvl03_RGB_Boresite_50cm_S5_20101218\3_22534_RGB.ti	f 10	yes	8	3	Tile	Remove
C:\Work\Boresight Calibration Project\Lvl03_RGB_Boresite_50cm_SS_20101218\3_22533_RGB.ti	f 10	yes	8	3	Tile 🗏	
C:\Work\Boresight Calibration Project\Lvl03_RGB_Boresite_50cm_55_20101218\3_22532_RGB.ti	f 10	yes	8	3	Tile	Process Overviews
C:\Work\Boresight Calibration Project\Lvl03_RGB_Boresite_50cm_55_20101218\3_22531_RGB.ti	f 10	yes	8	3	Tile	
C:\Work\Boresight Calibration Project\Lvl03_RGB_Boresite_50cm_SS_20101218\3_22530_RGB.ti	f 10	yes	8	3	Tile	Stop Processing
C:\Work\Boresight Calibration Project\Lvl03_RGB_Boresite_50cm_55_20101218\3_22529_RGB.ti	f 10	yes	8	3	Tile	Scheduled Tacks
C:\Work\Boresight Calibration Project\Lvl03_RGB_Boresite_50cm_55_20101218\3_22528_RGB.ti	f 10	yes	8	3	Tile	
C:\Work\Boresight Calibration Project\Lvl03_RGB_Boresite_50cm_55_20101218\3_22527_RGB.ti	f 10	yes	8	3	Tile	
C:\Work\Boresight Calibration Project\Lvl03_RGB_Boresite_50cm_55_20101218\3_22526_RGB.ti	f 10	yes	8	3	Tile	RGB Channel Assignment
C:\Work\Boresight Calibration Project\Lvl03_RGB_Boresite_50cm_55_20101218\3_22525_RGB.ti	f 10	yes	8	3	Tile	DadiaMatvix
C:\Work\Boresight Calibration Project\Lvl03_RGB_Boresite_50cm_55_20101218\3_22524_RGB.ti	f 10	yes	8	3	Tile	Rauiometrix
C:\Work\Boresight Calibration Project\Lvl03_RGB_Boresite_50cm_55_20101218\3_22523_RGB.ti	f 10	yes	8	3	Tile	View Image
C:\Work\Boresight Calibration Project\Lvl03_RGB_Boresite_50cm_55_20101218\3_22522_RGB.ti	f 10	yes	8	3	Tile	
C:\Work\Boresight Calibration Project\Lvl03_RGB_Boresite_50cm_55_20101218\3_22521_RGB.ti	f 10	yes	8	3	Tile	
C:\Work\Boresight Calibration Project\Lvl03_RGB_Boresite_50cm_55_20101218\2_22567_RGB.ti	f 10	yes	8	3	Tile	
C:\Work\Boresight Calibration Project\Lvl03_RGB_Boresite_50cm_55_20101218\2_22566_RGB.ti	f 10	yes	8	3	Tile ⊻	
K					>	Close

Chapter 10. Automatic Tie Point Processing

Chapter 10. Automatic Tie point Processing

¶r ApplicationsMaster - [C:\Watch.prj]	\rightarrow	
File View Basics Products Export Tools Window Options Help		
1. Click MATCH-AT M Multi Photo Measurement		
MATCH DSM > 👶 Stereo-Comparator Measurement		
Master 🕨 🚸 Aerial Frame Triangulation		
2. Click Check Log File		
Pushbarona Turn		
3. Select		
Open aerial frame triangulation		

<Procedure>

* Click "product"--> "MATCH-AT"--> "Aerial Frame Triangulation"

MATCH-AT - [C:\Work_UCXP\	.Watch.prj] 🔁 🗖 🔀
Run	
Automatic tie point extraction with adjus	tment of block
Stop after TPC creation	Click
Do processing of sub block(s)	
Settings	
Adjustment GNSS GNSS drift parameter GNS drift drif	ON OFF ON OFF 12 0.100 0.100 0.100 0.008 0.008 0.008 0.002 0.002 0.002 0.002 0.002 0.002 0.002 0.002 0.003 0.112 5 0 FBM FBM LSM FBM LSM 1 10
Tools	Edit
Online monitor View statistic	View log file Delete log file
Run	Stop Close



<Procedure>

* Click "Arrow"--> "Select Automatic Tie point extraction with adjustment of block"--> "Edit"

Parameters I Use GNS5 Compute shift/drift parameters Apply shift/drift parameters Apply shift/drift for each strip separately Enable drift for: I I I I I I I I I I I I I I I I I I I	Adjustment 5tr	ategy Matching	Files Std. Dev. Image/Control	Standard Dev. GNSS/IMU	Refine Initial EO
Image: Wide GMSS (This BOX must be "ON") Compute shift/drift parameters Apply shift/drift for each strip separately Enable drift for: Enable drift for: X Y Image: Compute boresight misalignment angles Compute boresight misalignment angles 12 parameter 13 parameter 14 parameter 15 parameter 16 on tellminate any manual photo measurements	Parameters				
Compute shift/drift parameters Apply shift/drift for each strip separately Enable drift for: X Y Z Enable shifts only (This BOX must be "ON") Compute boresight misalignment angles Compute self-calibration parameters 12 parameter 12 parameter 12 parameter 12 po show more details of Adjustment in Applications Master main window Do show more details of Adjustment in Applications Master main window Do not eliminate any manual photo measurements	Use GNSS	(This BOX mus	t be "ON")		
Compute shift/drift for each strip separately Enable drift for: X Y Z Y Z Enable shifts only Chris BOX must be "ON") Compute boresight misalignment angles Compute self-calibration parameters 2 parameter 444 parameter 2 parameter 2 po show more details of Adjustment in Applications Master main window Do not eliminate any manual photo measurements		a da ante a como de como			
Apply shift/drift for each strip separately Enable drift for: X Y Z hable shifts only	Compute sh	ift/drift parameters			
Enable drift for: X Y Z Y Z Enable shifts only Use IMU (This BOX must be "ON") Compute boresight misalignment angles Compute self-calibration parameters 12 parameter 12 parameter 12 parameter 12 po show more details of Adjustment in Applications Master main window Do show more details of Adjustment in Applications Master main window Do not eliminate any manual photo measurements	Apply shift/di	ift for each strip separa	stelý		
Enable shifts only	Enable drift fo	n: EX ZV E	Z		
Vuse INU (This BOX must be "ON") Compute boresight misalignment angles Compute self-calibration parameters 12 parameter 13 parameter 14 parameter 12 parameter 12 parameter <td>Enable shifts o</td> <td>inly</td> <td></td> <td></td> <td></td>	Enable shifts o	inly			
Compute boresight misalignment angles Compute self-calibration parameters 12 parameter 12 parameter 4# parameter 0 create new calibrated camera(s) with correction grid Do show more details of Adjustment in Applications Master main window Do not eliminate any manual photo measurements	(Table Manuel)	(This BOX mus	t be "ON")		
Compute boresight misalignment angles Compute self-calibration parameters 12 parameter reate new calibrated camera(s) with correction grid Do show more details of Adjustment in Applications Master main window Do not eliminate any manual photo measurements		(1110 2011 1100			
Compute self-calibration parameters 12 parameter 12 parameter 12 parameter 44 parameter 12 parameter 13 parameter 14 par	Compute bo	resight misalignment ar	ngles		
 12 parameter dreate new calibrated camera(s) with correction grid Do show more details of Adjustment in Applications Master main window Do not eliminate any manual photo measurements 	Compute self-	calibration parameters			
 create new calibrated camera(s) with correction grid Do show more details of Adjustment in Applications Master main window Do not eliminate any manual photo measurements 	12 paramet	er	4# param	ieter	
 Do show more details of Adjustment in Applications Master main window Do not eliminate any manual photo measurements 	📃 create new	calibrated camera(s) w	ith correction grid		
Do not eliminate any manual photo measurements	Do show more	details of Adjustment	in Applications Master main window		
	🗹 Do not elimina	te any manual photo m	easurements		
					_
					-

<Procedure>

* "Use GNSS" and "Use IMU" Should be checked. After input all data, click "strategy"

Adjustment Strate	y Matching	Files Std. Dev. Ima	ge/Control	Standard Dev. GNS	5/IMU Ref	ine Initial EC
Parameters Point density defau TPC pattern: 4 × 4 Min. distance between	it vite and the second se	This value is Block terrai	s changea n conditio	ble according to		
Levels Start at overview le	vel (pixel size: 192	micron)		Į	5	**
Stop at overview le	vel (pixel size: 6 mi	cron)		1	D	*
Level 3 : Least Squ Level 3 : Least Squ Level 2 : Do not pro Level 1 : Feature b Level 0 : Least Squ	ased Matching - FB ares Matching - LSf ocess this level ased Matching - FB ares Matching - LSf	M pixel size: 96 micron - ci 1 pixel size: 48 micron - re M pixel size: 12 micron - ci 1 pixel size: 6 micron - refi	reate new po fine existing (reate new po ne existing pi	nts points nts pints		
				Set def	ault	=

Settings				?
Adjustment Strategy	Matching Files	Std. Dev. Image/Control	Standard Dev. GNSS/IMU	Refine Initial EO
Parameters Size of tie-point area:		Click		100 pixel 📚
FBM correlation coefficient:	This va Block	alue is changeable ac terrain condition	cording to	92 %
Apply epipolar line constr	aint in FBM			

Settings								?
Adjustment	Strategy	Matching	Files	Std. Dev. Ima	age/Control	Standard Dev. GN	ISS/IMU Ref	ine Initial EO
Files Save results	in project file				Click	>		
.\Match.pr	q							
DTM file for i	nitialization. Su	upported forma	its: ARCII	NFO(*.hdr(flt,b	il), Geotiff, MA	TCH-T raster (*.ras)	, SCOP DTM	
1)
							0	-
							L	Close

Settings	Antolian Antolian	Files Rtd Day 1	mage/Central	Click	. Chies Ithat I	Define tailed 50
Aujustment Strat	egy Macching	Files Std. Dev. I	mage/control	Standard De	A' OMICCERD 'N	Renne Inicial EQ
Image Points						
		imanuai [mm]		Aucom	iacic [mm]	
Standard		0.0020		0.002	20	
ObjectPoints					_	
			Planimet	ry [m]	Height	[m]
Standard			0.0304		0.1124	
Class 1						1
Class2			-			
Class 3						
Class 4						
						Close

Settings							?
Adjustment	Strategy	Matching	Files	Std. Dev. Image/Control	Standard Dev. G	NSS/IMU	Refine Initial EO
GNSS/IMU	-			GNSS positions	ſml	IMU rotat	ion [deg]
East X:				0.1000	Omega	0.0080	
North Y:				0.1000	Phi	0.0080	
Height Z:				0.1000	Карра	0.0080	
							Close

Settings						2
Adjustment	Strategy	Matching	Files	Std. Dev. Image/Control	Standard Dev. GNSS/IM	1U Refine Initial EO
Process in o Search dista Parallax thr Min number	werview level ance in baseler eshold in level of good match	ngth nes between 2	photos			₿ 4 20 10 20
					Click	Close



Log file (After processing)

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Elapsed time = 0 hour 0 min. 9 sec. End of Post Processing: The Ian 04 12:48:55 2011	
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*We can see the detail result from this "Log File"

After Tie Point extraction we can see the shape of Block, Point position, Number of strip, Photo position etc.

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	OrthoMaster	• _	Check Log File
		- Z	Pushbroom Triangulation

<Procedure>

* Click "product"--> "MATCH-AT"--> "Multi Photo Measurement"





Chapter 11. GCP Measurement

(Multi photo measurement)

Chapter 11. GCP Measurement (Multi photo measurement)

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	OrthoMaster	۲	Check Log File
			💱 Pushbroom Triangulation

<Procedure>

* Click "product"--> "MATCH-AT"--> "Multi Photo Measurement"







All GCP have to be measured following the same as above procedure and "close".

Measuring point;

- 1. Select measuring mode with view view Measure
- 2. Open the multi-stereo view, if you would like to measure the points stereoscopically (view display multi-stereo viewer)
- 3. Check the point measurement options and set the mode to manual
- 4. Use the Zoom function to get the good view on the designated point position
- 5. Measure the position in the multi-aerial or multi-stereo views

*Post Processing System:

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ostprocessing (adjustment only)		
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🥶 12 pá	rameter				44 paramet	er	
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Result of GCP measurement (Post Processing)

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Start Post Processing: Sun Feb 20 16:28:56 2011	<u>^</u>
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• <u>Tie Point Generator</u>	<u>,</u>
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<u>[deg/1000]</u>	
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 Sigma naught : 1.7 [micron] = 0.3 [pixel in level 0] 	
 Elapsed time = 0 hour 0 min. 8 sec. 	
 End of Post Processing: Sun Feb 20 16:29:03 2011 	
Start Post Processing: Wed Feb 23 10:55:08 2011	
Active Block : complete Block	

- <u>Standard deviations (a-priori) :</u>
 <u>Tie Point Generator</u>
 total of 12114 measurements in 47 photos are used for adjustment (total 47 photos).

Chapter 12. Graphical Analysis of Post Processing

Chapter 12. Graphical Analysis of Post Processing

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E Output Log 🔘 Statistics			
		PAN 1:73.5 1:24891	4.79 560150.321 m ; 2729512.024 m ; 20.000 m


The properties TAB allows defining different analysis settings. Further more, from here it is possible to active or de-active the display of elements such as Control Point, Tie Point etc.



We can see the Standard deviation of all points by graphically. Standard deviation show the quality of point measurements. A standard deviation represents the maximum error the determined coordinate might have. The residual, however, shows the true difference between the given position and the adjusted position. Points that are measured in only two photos or that are measured with bad intersections, will show a large ellipse, may be not round but more elliptic. The block geometry will affect the size of standard deviation ellipses and the shape (round or elliptic) of photo canters. Generally in the block centre only small round ellipses should exist. At the block edges, ellipses might be a little bit larger.











PAN 1 : 34.3 1:116122.86 552647.973 m ; 2724816.008 m





Check LOG File:

After completion of an AT RUN, you want to get some information about statistics and result for every processed pyramid level. This information is written to the report of LOG file during the RUN. You either can look at this ASCII file or you click on button labeled "Check log file" in the "MATCH-AT" Submenu of the main window "Application Master".

Statistics Viewer:

During the triangulation MATCH-AT, create binary statistics file. This file stores very detailed information about the adjustment computation. To have very detail analysis, this viewer can be used to read out the statistics file.

Chapter 13. View Statistic of Adjustment

Chapter 13. View Statistic of Adjustment

Step1: Open Application Master --> Product --> Match AT --> Aerial Triangulation. Then click View Statistic of Adjustment.

Select processing sten		
server proceeding areprin		100
Settings		
D. Adjustment		
- Adjustment	ON	
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	ON	
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object x/v z [m]	0.098 0.150	
-Matching Strategy		
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stop in level	1	
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13.1 Photo Observation:

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00000001 1	126_05546	9	-10.7	-1.6	10.9 man	ual -	31.549	-5.666	items visible to :	/.J			(w)
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50000625	124 05604	5	-2.4	4,6	5.2		10.055	-45,573	RMS		1.0	0.9	
70001487	27 01228	5	5.1	0.3	5.1		30.573	45.283	max		12.0	10.3	
A-16 1	124_24222	4	-5.0	0.7	5.1 man	ual	-17.726	5.052	min		0.0	0.0	
B4_1_1	20_21518	4	4.3	2.8	5.1 man	ual	12.687	-5.300 -					
te: The nu	mber of vis	ble items is limited to	the first 5000000	(follow	ing the requested	sorted sequence)							
show elin	ninated aut	omatic points											

13.2 Control/ Check Point Observation:



13.3 GNSS Observations:

oto Observations	Control / Check Point	Observations	GNSS Observations	IMU Observatio	ns Adjusted	Terrain Points	Adjusted Photo Orient	ation		
noto ID Strip ID	Camera ID	eliminated in adi.	X [terrain units]	Y [terrain units] 2	[terrain units]	r X [terrain units]	r Y [terrain units]	r Z [terrain units]		1
10 00970	191 IltraCamXn 20415191		616627,119	2710114.159	8289,188	0.04	6 0.011	-0.121		
90,00969	19 UltraCamVin 20415191		614365 416	2710075 719	8288 743	-0.10	1 0.038	0.138		1
30 00968	19 UltraCamVn 20415191		612104 639	2710035 684	8288.799	0.02	3 -0.078	0.032		
80 00967	19 UltraCamVn 20415191		609843 311	2709993.070	8286 186	-0.02	5 -0.001	0.004		
30 00966	19 UltraCamXn 20415191		607582 947	2709946 594	8283 354	0.00	8 0.030	-0.054		
30 00677	181 IltraCamXp 20415191		707092.972	2712076.707	8308.341	0.07	2 0.052	-0.111		
0 00676	181 IltraCamXn 20415191		704830.654	2712039,968	8307.060	0.07	0 0.109	0.039		
0 00675	181 litraCamXn 20415191		702568,819	2711977.381	8307.957	0.05	2 -0.007	0, 189		
0 00674	181 litraCamXn 20415191		700307.267	2711891.004	8309.964	0.17	0 -0.105	0.209		
0.00673	18 illtraCamVn 20415191		698045 043	2711812 342	8309 704	0.05	7 0.078	-0.067		
0 00672	18 illtraCamXp_20 (15191		695782 752	2711754 023	8309 650	0.14	8 0.118	-0.349		
0.00671	18 illtraCamXp_20415191		693520.844	2711725 807	8307.452	-0.02	3 -0.106	-0.359		
0.00670	18 UltraCamXn 20415191		691256,934	2711713.675	8309.146	-0.24	2 -0.003	-0.321		
0.00669	181 lltraCamXn 20415191		688994,906	2711681.754	8310,172	-0.19	4 -0.019	-0.275		
0 00668	181 lltraCamXn 20415191		686733,113	2711621.428	8307.679	-0.13	7 0.252	-0.131		
0 00667	181 litraCamXn 20415191		684471,531	2711554.925	8307.640	-0.09	0 -0.091	-0.034		
0.00666	181 litraCamXn 20415191		682209, 164	2711492.777	8306.053	0.00	3 0.115	-0.027		
00665	181 IltraCamXn 20415191		679947.684	2711439.702	8307,188	-0.00	5 0.023	0.008		
00664	18 UltraCamXn 20415191		677685,344	2711400.161	8308,401	0,11	0 -0.003	0.077		
00663	181 lltraCamXn 20415191		675423,767	2711374.235	8307 753	0.09	3 -0.137	0.201		
0 00662	18 UltraCamXp 20415191		673160,986	2711343.914	8306,919	-0.03	3 -0.184	0.263		
0 00661	18 UltraCamXp 20415191		670898.845	2711304.615	8306,762	-0.10	8 -0.091	0,157		
0 00660	18 IlltraCamXn 20415191		668637.312	2711252,451	8306.079	-0.09	2 -0.046	0.225		
0.00659	181 litraCamXn 20415191		666375,459	2711180,442	8306,955	-0.15	5 -0.018	0.083		
0 00658	181 IltraCamXn 20415191		664114,252	2711104.957	8308,127	0.06	0 0.001	0.154		
00657	18 UltraCamXp 20415191		661852,852	2711042.225	8308,123	0.00	6 0.024	0.036		
0 00656	18 UltraCamXp 20415191		659591,201	2710999.879	8306.098	-0.02	0 -0.010	0.057		
0 00655	18 UltraCamXp 20415191		657330,121	2710970.608	8306.085	0.06	7 -0.024	0.060		
0 00654	18 UltraCamXp 20415191		655067.761	2710939.681	8306,931	0.03	0 0.059	0.082		
0 00653	18 UltraCamXp 20415191		652805,962	2710903.677	8307.090	0.04	-0.041	0.056		
00652	18 UltraCamXp 20415191		650544.552	2710857.867	8306,314	0.13	6 0.012	0.042		
0 00651	18 UltraCamXp 20415191		648283.292	2710808.969	8305,316	-0.04	2 -0.098	0,177		
	INTEL CONTRACTOR		C.40004.000	0340353.000	AND SAFE	0.00		0.000		
esiduais										
					x		Ϋ́,		z	
MS					0.128		0.097		0,196	
ax					0.742		0.485		1.179	
in					0.000		0.000		0.000	
GNSS:		560								

13.4 IMU Observations:

oto Observations	Control / Check Point	Observations	GNSS Ob	servations	IMU Observations	Adjusted T	errain Points	Adjusted P	hoto Orientation		
noto ID Strip ID	Camera ID	omega [deg]	phi [dea]	kappa [deg]	r omega [mdeg]	r phi [mdea]	r kappa [mdec	1			
24 05598	1 UltraCamXp 20415191	-0.302	0,184	-88.84	0 -27.9	2.5		0.7			6
24 05599	1 UltraCamXp 20415191	0.170	0.071	-88.44	8 -31.0	7.4		5.6			12
24 05600	1 UltraCamXp 20415191	-0.005	0.229	-88.63	-24.4	5.1		17.0			
4 05601	1 UltraCamXp 20415191	0.130	0.577	-88.29	-32.2	15.1	-1	9.2			
4 05602	1 UltraCamXp 20415191	-0.221	-0.294	-88.63	6 -22.0	9,1		9.9			
4 05603	1 UltraCamXp 20415191	-0.202	0.092	-89.21	9 -23.8	10.2	-	27.8			
4 05604	1 UltraCamXp_20415191	0.020	0.424	-89.54	-22.8	6.8		17.3			
4 05605	1 UltraCamXp 20415191	0.039	0.404	-89.21	.0 -19.1	8.3		9.4			
4 05606	1 UltraCamXp 20415191	0.149	0.385	-89.31	.0 -22.1	15.5	-1	6.3			
4 05607	1 UltraCamXp_20415191	0.058	0.375	-88.67	-21.4	13.2		0.7			
4_05608	1 UltraCamXp_20415191	0.036	0.297	-88.91	2 -25.2	15.5	-62	0.4			
4 24221	2 UltraCamXp 10712003	-1.131	-2.952	-90,86	0 -11.3	2,1		17.7			
4 24222	2 UltraCamXp_10712003	1.017	1.017	-89.98	4 -13.2	0.4	-1	3.1			
4 24223	2 UltraCamXp 10712003	0.040	0.352	-89.12	-11.9	4.3	-1	4.7			
4 24224	2 UltraCamXp 10712003	-0.148	0,163	-88.92	-12.9	7.3	-1	0.0			
4 24225	2 UltraCamXp_10712003	-0.043	0.126	-88.93	4 -12.9	8.4		3.2			
4_24226	2 UltraCamXp_10712003	0.065	0.265	-88.92	-10.9	5.3	-1	15.3			
4 24227	2 UltraCamXp 10712003	-0.076	0.359	-89.11	9 -16.2	2.8		9.1			
4 24228	2 UltraCamXp 10712003	0.045	0.021	-88.86	-15.5	7.2		12.0			
4 24229	2 UltraCamXp_10712003	-0.191	0.212	-88.74	-14.4	2, 1	-1	6.9			
4 24230	2 UltraCamXp 10712003	-0.067	0.037	-88.87	3 -8.5	12.6	-1	6.5			
4 24231	2 UltraCamXp 10712003	-0.149	0.011	-88.73	-14.8	3.0	-1	9.0			
4 24232	2 UltraCamXp 10712003	0.081	-0.102	-88.78	8 -12.1	3.2	-7	1.2			
4 24233	2 UltraCamXp 10712003	0.026	0.244	-88.90	-11.6	8.9	1	6.3			
4 24234	2 UltraCamXp 10712003	-0.130	0.292	-88.89	-17.1	6.4		1.9			
4_24235	2 UltraCamXp_10712003	0.069	0.112	-88.65	-15.5	4.2	-2	1.4			
4 24236	2 UltraCamXp 10712003	0.053	0.378	-88.70	5 -12.4	5.9	-2	23.1			
4 24237	2 UltraCamXp 10712003	-0.024	0.299	-88.79	-15.9	7.7	-2	1.7			
4 24238	2 UltraCamXp 10712003	-0.074	0,181	-89.14	-13.7	5.5	-2	22.0			
4_24239	2 UltraCamXp_10712003	0.182	0.441	-88.61	2 -17.8	0.6	-5	26.1			
4 24240	2 UltraCamXp 10712003	0.015	-0.159	-88.69	-17.1	2.6	-2	1.2			
4 24241	2 UltraCamXp 10712003	0.001	0.019	-88.87	-13.9	5.1	-2	3.9			
eiduale		0.074									
-300003											
						mega			phi	kappa	
MS						13.0			7,1	14.4	
ax						35.5			30.6	113.0	
in)						0.0			0.0	0.0	
IMU:		560									

13.5 Adjusted Terrain points:

After completion of AT, We can easily compare what is the difference between input and output value. After completion of AT, we can easily compare what is the difference between input and output value.

ioto Observations	Control / Check	Point Observation	GNSS Observations	IMU Observatio	ne Aujusted Terrain Points	Adjusted Photo Orientation	0		
oint ID eliminated	din adi, #rays	X [terrain units]	Y [terrain units] Z [terr	rain units] std. d	lev. X [terrain units] std. dev. '	([terrain units] std. dev. Z [[terrain units]		
Z-6		3 682055.358	2770667.065	10.843	0.081	0.078	0.092		
Z-5		2 682356.837	2770420.284	9.646	0.092	0.088	0.095		
Z-4		5 685300.942	2767164.533	11.296	0.060	0.062	0.078		
Z-2		2 684316.497	2749075.996	10.411	0.078	0.080	0.095		
Z-16-1		5 611122.205	2740185.088	6,182	0.064	0.065	0.088		
Z-16		6 611157.051	2740067.624	7.355	0.061	0.062	0.083		
Z-15		3 617497.603	2750683.514	4.834	0.070	0.074	0.092		
Z-1		5 682077.049	2746177.665	10.819	0.052	0.052	0.076		
TBM		3 714571.037	2739146.182	11.073	0.076	0.079	0.092		
SK-6		3 706486.589	2714234,982	11.014	23011	0.088	0.086		
SK_6_1	3	3 706582.146	2713931.402	12.939	0.090	0.089	0.086		
5_9		2 690943.841	2757280.677	19.573	0.079	0.079	0.095		
5_8		2 690441.483	2763410.172	11,080	0.081	0.081	0.095		
S_7		2 686373.651	2762989.712	7.489	0.081	0.081	0.095		
S_6		4 682197.531	2759696.169	9.316	0.059	0.059	0.079		
5_5		3 681129.675	2749878.390	9,192	0.065	0.065	0.091		
5_4	3	2 695063.253	2749745.567	9,114	0.079	0.080	0.095		
5_12		3 687023.591	2750997.848	11.053	0.065	0.066	0.091		
S_11		4 689445,585	2761133.380	14.868	0.060	0.061	0.080		
S_10	-	2 681659.004	2755032.838	8.321	0.078	0.082	0.095		
E-9		5 656964.549	2740311.067	7.516	0.053	0.053	0.076		
E-8	3	2 649900.361	2747536.877	7.861	0.078	0.083	0.095		
E-7	-	2 640560.981	2763817.828	8.586	0.084	0.084	0.095		
E-6		3 651165,649	2757596.424	8,651	0.067	0.069	0.091		
E-5		2 645995.945	2757858.212	8,461	0.080	0.083	0.095		
E-4		4 641218.234	2759630.280	8.352	0.061	0.062	0.080		
E-2		4 661003.864	2760259.010	8.030	0.058	0.059	0.079		
E-11		3 635427.865	2754113.169	8,151	0.067	0.071	0.091		
E-10		2 636390.359	2742180.389	7.045	0.079	0.080	0.095		
E-1		6 665371.317	2759404.018	9,478	0.050	0.050	0.072		
84_9		2 65/555.822	2/61049.62/	8,481	0.030	0.030	0.063		
84_8		5 6655/4.8/4 • concept and	2/68547.129	0.039	0.030	0.030	0.063		
tandard deviations									
_					x	Y.		7	
ean									
					0.070	0.081		0.236	
ax					0.302	0.309		0.859	
rin -					0.028	0.028		0.057	
points:		38674							

13.6 Adjusted Photo Orientation:

hoto ID Strip ID	Camera ID	Eliminated Points	X	[terrain units]	Y [terrain units]	Z [terrain uni	ts]	omega [deg]	phi [deg]	kappa [deg]	std. dev. X [terrain units]	std. dev. Y [terrain unit
24_05598	1 UltraCamXp_20415191		0	611233.914	2726111.360	8280	.743	-0.275	0.182	-88.810	0.130	0
24_05599	1 UltraCamXp_20415191		0	611305.002	2723851.415	8283	.535	0.201	0.064	-88.432	0.121	0.
24_05600	1 UltraCamXp_20415191		0	611370.231	2721592.040	8279	.756	0.019	0.224	-88.617	0.126	0.
24_05601	1 UltraCamXp_20415191		0	611439.669	2719331.964	8282	157	0.162	0.562	-88.276	0.125	0
24_05602	1 UltraCamXp_20415191		0	611517.038	2717071.638	8282	.525	-0.199	-0.303	-88,606	0,130	0
24_05603	1 UltraCamXp_20415191		0	611561.228	2714811,171	8281	.559	-0.179	0.082	-89,191	0.142	0.
24_05604	1 UltraCamXp_20415191		0	611580.675	2712549.663	8281	.501	0.043	0.417	-89.528	0.156	0.
24_05605	1 UltraCamXp_20415191		0	611608.427	2710287.863	8282	.652	0.058	0.396	-89,200	0.171	0.
24_05606	1 UltraCamXp_20415191		0	611646.010	2708026.473	8283	.433	0.171	0.369	-89.294	0.197	0.
24_05607	1 UltraCamXp_20415191		0	611693.964	2705765.932	8283	.872	0.079	0.362	-88.654	0.220	0.
24_05608	1 UltraCamXp_20415191		0	611747.194	2703504.478	8281	.535	0.062	0.282	-88.891	0.242	0.
24_24221	2 UltraCamXp_10712003		0	610319.567	2775858.647	8304	.219	-1.120	-2.955	-90.842	0.119	0.
4_24222	2 UltraCamXp_10712003		0	610287.286	2773595.110	8304	.539	1.030	1.017	-89.971	0.113	0.
24_24223	2 UltraCamXp_10712003		0	610311.160	2771332.510	8302	.023	0.051	0.348	-89,110	0.109	0.
4_24224	2 UltraCamXp_10712003		0	610357.530	2769071.451	8302	. 502	-0.135	0.156	-88,910	0.103	0.
4_24225	2 UltraCamXp_10712003		0	610404.766	2766810.367	8302	.477	-0.030	0.117	-88.921	0.098	0.
24_24226	2 UltraCamXp_10712003		0	610446.358	2764550.063	8302	.620	0.076	0.259	-88,910	0.097	0.
4 24227	2 UltraCamXp 10712003		0	610488.098	2762288.835	8302	.808	-0.060	0.356	-89,110	0.092	0.
4 24228	2 UltraCamXp 10712003		0	610537.879	2760027.802	8304	.564	0.061	0.014	-88,855	0.090	0.
4 24229	2 UltraCamXp 10712003		0	610591.138	2757767.786	8305	.063	-0.176	0.210	-88,723	0.089	0.
4 24230	2 UltraCamXp 10712003		0	610643.474	2755506,110	8305	. 102	-0.058	0.025	-88,857	0.088	0.
4 24231	2 UltraCamXp 10712003		0	610696.890	2753245.282	8305	. 103	-0.134	0.008	-88,719	0.083	0.
4 24232	2 UltraCamXp 10712003		0	610747.925	2750985,452	8306	.848	0.093	-0,106	-88,767	0.083	0
4 24233	2 UltraCamXp 10712003		0	610792.647	2748723.553	8306	.637	0.037	0.235	-88,891	0.080	0
4 24234	2 UltraCamXp 10712003		0	610838.387	2746463,154	8306	.073	-0.113	0.286	-88,874	0.082	0
4 24235	2 UltraCamXp 10712003		0	610890.964	2744202.512	8308	.642	0.084	0,108	-88,634	0.083	0
4 24236	2 UltraCamXp 10712003		0	610943.936	2741941.342	8307	.803	0.065	0.372	-88,682	0.083	0
4 24237	21 litraCamXn 10712003		n	610994.576	2739680.527	8308	.531	-0.008	0.291	-88,770	0.084	n
24 24238	2 UltraCamXp 10712003		0	611042,438	2737420.073	8311	.794	-0.060	0,175	-89,118	0.084	0
4 24239	21/ltraCamXn 10712003		0	611095.072	2735159,448	8309	.048	0.200	0.440	-88,586	0.096	0
4 24240	21/ltraCamXp 10712003		0	611154.531	2732898.011	8311	363	0.032	-0.161	-88,677	0,101	0
			<u>.</u>		0	2.27		2.222			2752	
tandard deviation			_	400			_					
				x	Y			Z	3	omega	phi	kappa
nean				0.086	0.105			0.067		0.7	0.6	0.3
nax				0.273	0.251			0.177		2.1	1.9	2.0
nin				0.071	0.078			0.044		0.5	0.5	0.1
# photos:	560											

Chapter 14. Export MATCH A.T. Project to Summit EV

Chapter 14. Export MATCH A.T project to Summit EV

Step 1 : Open "ApplicationsMaster" → File → Open or Recent File → A.T Project (Ex.-Block4_Matiur)







Export DAT/EM	SummitEV			23	
Select Project	C:ProjectWattor_R	ahman\8LDCK4_	WATTLER FEINAL	BUCKER -	
elect Directory	Nam/BLOCK 4_MATTU	R FINAL BLOCK4	MATIUE/SUmm	HEV_sha	
		Export	Can	cel	
Convert project	ile and leave the win	dow			
		_			
Select how mod	els are created from	image Ids		00	
0					
				4.5	
Select < decsen	Yes> to generate mo ling order	dels along strip	s în ascending	and	
Select < decsend Select <	Yes> to generate mo ling order No> to generate mo	idels along strip: dels in acsendin	s in ascending g order only	and	Click "N
Select < decsent Select <	Yes> to generate mo ling order No> to generate mo	dels along strip: dels in acsendin	s in ascending g order only	and	Click "M
Select < decsend Select <	Yes> to generate mo ling order No> to generate mo	idels along strip: dels in acsendin Yes	s in ascending g order only	and No	Click "N
Select < decsent Select <	Yes> to generate mo ling order No> to generate mo	dels along strip: dels in acsendin Yes	s in ascending g order only	and No	Click "I
Select < decsent	Yes> to generate mo ling order No> to generate mo	dels along strip: dels in acsendin Yes	s in ascending g order only	and No	Click "N
Select < Select <	Yes> to generate mo ling order No> to generate mo	edels along strip: dels in acsendin Yes	s in ascending g order only	and	Click "I
Select < Select < Select <	Yes> to generate mo ling order No> to generate mo MIT Evolution should use	e per defualt for mo	s in ascending g order only	and	Click "f
Select < decsend Select < Select < Define what EO SUM	Yes> to generate mo ling order No> to generate mo MIT Evolution should use to use directly MATCH-4 todel setup in SUMMIT Ev	edels along strip: dels in acsendin Yes Per defualt for mo AT's computed EO p /OLUTION	s in ascending g order only del setup	and	Click "I
Select < Select < Select < Select < Define what EO SUM O you wan default for r and NOT SUMMIT EV	Yes> to generate mo ling order No> to generate mo MIT Evolution should use to use directly MATCH-4 odel setup in SUMMIT Ev OLUTION's recomputatio	edels along strip: dels in acsendin Yes per defualt for mo AT's computed EO p /OLUTION	s in ascending g order only del setup arameters by Tie Point	and	Click "I
Select < Select < Select < Select < Do you wan default for r and NOT SUMMIT EV Measureme	Ves> to generate mo ling order No> to generate mo MIT Evolution should use to use directly MATCH-4 todel setup in SUMMIT Ev OLUTION's recomputatio tts?	e dels along strip: dels in acsendin Yes e per defualt for mo AT's computed EO p VOLUTION	s in ascending g order only del setup arameters by Tie Point	and No	Click "f

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gram prj2sumev started	
ormation: Coordinate system definition of INPHO project;	
OCAL_CS["Local Space Rectangular (LSR)",UNIT["m",1.0000000000]]	
is not exported/translated to SUMMIT. Use Summit Evolution to specify the correct system.	
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Appendix

(Example of Trouble Shooting)

Example of Trouble Shooting for The result of Aerial Triangulation on IDMS project

This Appendix shows the examples of trouble shooting done during the generation of the result of Aerial Triangulation. Actually the AT group completed BLOCK4 right now and adjusted the result solution of troubles met during the works done. The trouble shooting, may happen to individual BLOCK, must be added here in this chapter as APPENDICES for further trouble shooting.

July 2011

Aerial Triangulation Group

Survey of Bangladesh

BLOCK 4

When the Aerial Triangulation is implemented on Block 4, the height error more than tolerated encountered. Following are the one of solution to eliminate errors and make this method guideline for further actual Aerial Triangulation works to be carried out.

Active Block Number of photos Number of strips Photo scale Mean terrain height [m] Automatic blunder detection Use all adjusted points in project file	: complete Block : 560 : 19 : 1:82348 : 15 : OFF
as control (absolute mode)	: OFF (Start Post Processing: Sup Jup 10 12:52:44 2011)
Control parameter for block adjustment.	(Start Post Processing, Sun Jun 19 12.52.44 2011)
Self-calibration GNSS-Mode Drift-Mode IMU-Mode Earth's curvature correction Atmospheric correction Do not eliminate manual points Standard deviations (a-priori) :	: OFF : OFF : OFF : OFF : ON : ON : OFF
Ground control (planimetry) [m] Set 0 (=default) Ground control (height) [m] Set	: 0.098
0 (=default)	: 0.364
O (=default) 0 (=default) Image points of ground control and manual measure	: 0.002 ments [mm] : 0.002
1	

1. Generation status of troubles (discrepancy)

Following table shows the discrepancy of height error more than tolerance on GCP. (Red color)

Residuals, vertical control points in [ineter]IDrzIDrzIDrz ID rz ID rz ID rz ID rz ID rz $A-1$ -0.319 Z-5 -0.069 $AN-2$ -0.179 $AH-14$ 0.080 $A-2$ -0.008 Z-6 0.334 $AN-5$ -0.253 $AH-16$ -0.172 $A-3$ -0.040 $A-12$ -0.496 $AN-6$ 0.262 $AH-18$ -0.072 $A-4$ 0.017 $A-13$ 0.059 $AS-1$ -0.173 $AH-19$ -0.776 $A-5$ 0.018 $A-14$ -0.170 $AS-2$ -0.849 $AH-20$ -0.250 $A-6$ -0.235 $A-15$ 0.114 $AS-3$ -0.221 $AH-21$ -0.083 $A-7$ -0.077 $A-16$ 0.335 $AS-4$ -0.102 $AH-22$ -0.143 $A-8$ -0.012 $A-18$ 0.744 $AS-5$ -0.073 $AN-13$ 0.503 $A-9$ 0.299 $A-20$ -0.149 $AS-6$ -0.212 $AN-14$ 0.881 $F=1$ 0.205 $A-21$ 0.055 $AS-0$ 0.272 $AN-14$ 0.881	Decidual	a vertical control noi	ate in [mod	horl				
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		s, vertical control poin			П	r7	ю	*7
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		0.210		0.060		0.170		0.020
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		-0.519	Z-5 7 6	-0.009		-0.179	AD-14 AU 16	0.060
A-5 -0.040 A-12 -0.496 AN-6 0.262 AN-16 -0.072 A-4 0.017 A-13 0.059 AS-1 -0.173 AH-19 -0.776 A-5 0.018 A-14 -0.170 AS-2 -0.849 AH-20 -0.250 A-6 -0.235 A-15 0.114 AS-3 -0.221 AH-21 -0.083 A-7 -0.077 A-16 0.335 AS-4 -0.102 AH-22 -0.143 A-8 -0.012 A-18 0.744 AS-5 -0.073 AN-13 0.503 A-9 0.299 A-20 -0.149 AS-6 -0.212 AN-14 0.861		-0.008	Z-0 A 1 2	0.334		-0.235		-0.172
A-4 0.017 A-13 0.039 A5-1 -0.175 AA-19 -0.776 A-5 0.018 A-14 -0.170 AS-2 -0.849 AH-20 -0.250 A-6 -0.235 A-15 0.114 AS-3 -0.221 AH-21 -0.083 A-7 -0.077 A-16 0.335 AS-4 -0.102 AH-22 -0.143 A-8 -0.012 A-18 0.744 AS-5 -0.073 AN-13 0.503 A-9 0.299 A-20 -0.149 AS-6 -0.212 AN-14 0.861		-0.040	A-12	-0.490		0.202	AU 10	-0.072
A-5 0.018 A-14 -0.170 A5-2 -0.849 An-20 -0.230 A-6 -0.235 A-15 0.114 AS-3 -0.221 AH-21 -0.083 A-7 -0.077 A-16 0.335 AS-4 -0.102 AH-22 -0.143 A-8 -0.012 A-18 0.744 AS-5 -0.073 AN-13 0.503 A-9 0.299 A-20 -0.149 AS-6 -0.212 AN-14 0.861		0.017	A-15	0.059	AS-1	-0.175	AH-19	-0.770
A-6 -0.253 A-15 0.114 A5-5 -0.221 An-21 -0.085 A-7 -0.077 A-16 0.335 AS-4 -0.102 AH-22 -0.143 A-8 -0.012 A-18 0.744 AS-5 -0.073 AN-13 0.503 A-9 0.299 A-20 -0.149 AS-6 -0.212 AN-14 0.881		0.010	A-14 A 15	-0.170	AS-2	-0.649	AH-20	-0.250
A-7 -0.077 A-16 0.555 A5-4 -0.102 An-22 -0.145 A-8 -0.012 A-18 0.744 AS-5 -0.073 AN-13 0.503 A-9 0.299 A-20 -0.149 AS-6 -0.212 AN-14 0.881 F-1 0.205 A.21 0.055 AS-0 0.284 AN-14 0.861		-0.255	A-15 A 16	0.114	AS-5	-0.221	AU 22	-0.065
A-8 -0.012 A-16 0.744 A5-5 -0.075 AN-15 0.505 A-9 0.299 A-20 -0.149 A5-6 -0.212 AN-14 0.881 E-1 0.205 A.21 0.065 AS-0 0.294 AN-14 0.881		-0.077	A-10 A 10	0.555	AS-4	-0.102		-0.145
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		0.012	A-10 A-20	-0 1/9	A3-3 AS-6	-0.073	AN-13 AN-14	0.303
		0.235	A-20	-0.149		-0.212		0.001
$E_{-2} = 0.60$ $A_{-22} = 0.073$ $B_{-1} = 0.264$ $A_{11} = 0.102$		-0.203	A-21 A-22	-0.033	A3-9 B/ 1	0.264	AN-31 AS_10	-0.108
$E_{-4} = 0.040$ $A_{-22} = 0.073$ $B_{-1} = 0.003$ $A_{-10} = 0.024$		0.000	A-22	-0.718	B4_1 B4_2	-0.032	AS-10 AS-22	0.224
$E_{-5} = 0.050$ $A_{-24} = 0.716$ $B_{-2} = 0.052$ $A_{-22} = 0.039$	E-4	-0.050	A-23 A-24	-0.718	B4_2	0.604	AS-22 AS-35	-0 3/9
$E_{-5} = -0.050$ $A_{-25} = 0.151$ $B_{-3} = 0.054$ $A_{-35} = -0.54$	E-5	-0.050	Δ-25	-0.131	B4_3 B4_4	-0 384	AS-36	0.151
$E_{-7} = 0.044$ $A_{-26} = 0.070$ $B_{-5} = 0.003$ $A_{5-37} = 0.514$	F-7	0.044	Δ-26	-0.070	B4 5	0 903	Δ5-37	0.131
E-8 0.053 A-27 -0.113 B4_6 -0.116 A5-38 0.308	F-8	0.053	Δ-27	-0 113	B4_6	-0.116	AS-38	0.308
E-9 0.275 A-28 0.178 B4 7 -0.594 AS-40 0.354	F-9	0 275	A-28	0 178	B4_0 B4_7	-0 594	AS-40	0.354
S 1 0 186 A-29 -0 226 B4 8 0 164 B4 9 0 437		0.186	A-29	-0.226	B4_8	0 164	B4 9	0.437
S 2 -1.473 check point A-30 -0.116 E-10 -0.135 B4 10 -0.291	5 2	-1.473 check point	A-30	-0 116	F-10	-0 135	$B4_{10}$	-0 291
S 3 -1.224 check point A-31 0.028 F-11 -0.520 B4 11 0.099	<u>\$</u> 3	-1.224 check point	A-31	0.028	F-11	-0.520	B4_11	0.099
S 4 -0.193 A-32 -0.026 SK-6 1.144 B4 12 0.188	S 4	-0.193	A-32	-0.026	SK-6	1.144	B4 12	0.188
S 5 -0.060 A-34 -0.275 S 10 -0.223 B4 14 -0.532	S_5	-0.060	A-34	-0.275	S 10	-0.223	B4 14	-0.532
S ⁻ 6 -0.041 AH-4 -0.404 S ⁻ 11 -0.147 B4 ⁻ 15 0.129	S_6	-0.041	AH-4	-0.404	S_11	-0.147	B4 15	0.129
S 7 -0.120 AH-5 1.018 check point S 12 -0.387 B4 17 0.670	S 7	-0.120	AH-5	1.018 check point	S_12	-0.387	B4_17	0.670
S ⁻ 8 0.048 AH-6 -0.193 Z ⁻ 15 -0.131 B4 ⁻ 19 0.688	<u>\$</u> 8	0.048	AH-6	-0.193	Z-15	-0.131	B4 ⁻ 19	0.688
S ⁻ 9 -0.323 AH-7 0.041 Z-16 4.945 check point B4 ⁻ 20 0.912	S_9	-0.323	AH-7	0.041	Z-16	4.945 check point	B4 20	0.912
Z-1 0.542 AH-8 -0.303 AH-11 -0.199 B4 ⁻ 21 -0.437	Z-1	0.542	AH-8	-0.303	AH-11	-0.199	B4 ²¹	-0.437
Z-2 0.007 AH-9 -0.084 AH-12 0.484 check point B4 ⁻ 22 -0.332	Z-2	0.007	AH-9	-0.084	AH-12	0.484 check point	B4_22	-0.332
Z-4 0.443 AN-1 -0.163	Z-4	0.443	AN-1	-0.163			-	

Based on the above mentioned matters, data checking and following trouble shooting 1 were implemented.

2. Causes of troubles and its trouble shooting (Elimination of errors No.1)

For the trouble shooting, resurvey of GCP (Ground Control Point) with errors exceed tolerance was conducted in the field and also checking of existence of parallax at each GCP in the spatial models was carried out. Results of each checking item are following.

> Cause 1: Automatic processing of each GCP observation

Observation of GCP had been implemented automatically. As a result, point measurement wasn't carried our identically, information error exists in GCP (including post pointing point) description and etc were found as causes.

As a trouble shooting;

- Reconfirmation of the position of post pointing points in the point description by field surveying team
- Reconfirmation of the position of reconfirmed post pointing points in the spatial models
- Implementation of manual re-observation of GCP for re-confirmation of observation position

> Cause 2: Existence of duplicate aerial photograph in flight line

AS there are several duplicate spatial models in each flight line such as L22, L24, L30, L125, L126, it became clear that result of automatic observation of Tie-points was not suitable. It seems that the cause of such result is from the different photography timing.

As a trouble shooting;

- Implementation of post processing excluding the duplicate photograph data of L22, L24, L30, L125, L126
- Implementation of re-observation of tie-point of target photographs

Result of resurvey of GCP was inserted and re-computation the post-processing (Without EO data) was carried out. The result is following table as below.

$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	Residual	s, vertical control poir	nts in [met	er]						
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	ID	rz	-	lD rz				ID	rz	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	A-1	-0.318	Z-4	0.460		AH-9	-0.075		AH-12	0.504
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	A-2	-0.008	Z-5	-0.066		AN-1	-0.190		AH-11	-0.180
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	A-3	-0.037	Z-6	0.342		AN-2	-0.180		AH-14	0.088
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	A-4	0.026	A-12	-0.469		AN-5	-0.289		AH-16	-0.181
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	A-5	0.027	A-13	0.050		AN-6	0.239		AH-18	-0.064
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	A-6	-0.224	A-14	-0.113		AS-1	-0.172		AH-19	-0.732
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	A-7	-0.070	A-16	0.283		AS-2	-0.845		AH-20	-0.162
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	A-8	-0.006	A-18	0.658		AS-3	-0.217		AH-21	-0.096
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	A-9	0.318	A-20	-0.155		AS-4	-0.101		AH-22	-0.164
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	E-1	-0.198	A-21	-0.084		AS-5	-0.071		AN-13	0.496
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	E-2	0.072	A-22	-0.076		AS-6	-0.208		AN-14	0.881
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	E-4	0.079	A-23	-0.729		AS-9	0.286		AN-31	0.173
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	E-5	-0.045	A-24	-0.138		B4_1	0.313		AS-10	-0.217
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	E-6	-0.101	A-25	-0.086		B4_2	-0.403		AS-22	0.677
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	E-7	0.051	A-26	-0.069		B4_3	0.269		AS-35	-0.326
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	E-8	0.044	A-27	-0.112		B4_4	-0.350		AS-36	0.223
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	E-9	0.197	A-28	0.145		B4_6	-0.227		AS-37	0.525
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	S_1	0.201	A-29	-0.240		B4_7	-0.562		AS-38	0.219
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	S_2	-1.482 check point	A-30	-0.119		B4_8	0.168		AS-40	0.084
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	S_3	-1.223 check point	A-31	0.047		B4_9	0.441		B4_10	-0.285
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	S_4	-0.199	A-32	-0.006		E-10	-0.179		B4_11	0.101
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	S_5	-0.065	A-34	-0.328		E-11	-0.541		B4_12	0.205
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	S_6	-0.032	AH-4	-0.380		SK-6	1.095		B4_14	-0.524
S_8 0.052 AH-6 -0.198 S_11 -0.131 B4_19 0.592 S_9 -0.321 AH-7 0.056 S_12 -0.391 B4_20 0.709 TBM 0.433 AH-8 -0.311 Z-15 -0.440 B4_21 -0.431 Z-1 0.522 Z-16 1.207 check point B4_22 -0.324 -0.324	S_7	-0.117	AH-5	1.041 check p	ooint	S_10	-0.223		B4_15	0.128
S_9 -0.321 AH-7 0.056 S_12 -0.391 B4_20 0.709 TBM 0.433 AH-8 -0.311 Z-15 -0.440 B4_21 -0.431 Z-1 0.522 Z-16 1.207 check point B4_22 -0.324 Z-2 0.004 2-16 1.207 check point B4_22 -0.324	S_8	0.052	AH-6	-0.198		S_11	-0.131		B4_19	0.592
TBM 0.433 AH-8 -0.311 Z-15 -0.440 B4_21 -0.431 Z-1 0.522 Z-16 1.207 check point B4_22 -0.324 Z-2 0.004 0.004 0.004 0.004 0.0004	S_9	-0.321	AH-7	0.056		S_12	-0.391		B4_20	0.709
Z-1 0.522 Z-16 1.207 check point B4_22 -0.324 Z-2 0.004	TBM	0.433	AH-8	-0.311		Z-15	-0.440	B4_21	-0.431	
Z-2 0.004	Z-1	0.522	Z-16	1.207 check p	ooint	B4_22	-0.324			
	Z-2	0.004				-				

Based on the above mentioned result, checking of GCP and Post-Pointing point were checked in the actual spatial models of SAMIT Evolution (Digital plotting software) was carried out and it became clear the computed value had discrepancy of 2m comparing with rz of computation result of aerial triangulation.

As a trouble shooting;

- Change the standard deviation of GCP for post-processing
- Reviewing the post processing with "with EO file" and "without EO file"

• The case of Without EO file

Control parameter for block adjustment:	Start Post Processing: Tue Jun 28 14:09:36 2011
	Start + OSt + Poccssing. Fac San 20 11.05.50 2011
Ground control (planimetry) [m] Set	
0 (=default)	: 0.098
1	: 0.050
Ground control (height) [m] Set	
0 (=default)	: 0.150
1	: 0.100
Automatic image points [mm] Set	
0 (=default)	: 0.002
Image points of ground control and manual measu	urements [mm] : 0.002
Max standard deviations of terrain points	20000077
x 0.291 [meter] at point	30000077
y 0.308 [meter] at point	30000248
Z U.818 [meter] at point Mean standard deviations of terrain points	90000337
X 0.072	
y 0.001	
2 0.202	

Control point ID	r7					
ID rz	ID	r7	ID	r7	ID	r7
A-1 -0.014	Z-6	0.060	AS-1	-0.021	AH-18	-0.006
A-2 -0.016	A-12	-0.088	AS-2	-0.210	AH-19	-0.179
A-3 -0.005	A-13	0.036	AS-3	-0.044	AH-20	-0.006
A-4 0.005	A-15	0.019	AS-4	-0.019	AH-21	-0.013
A-5 0.005	A-16	0.075	AS-5	-0.018	AH-22	-0.023
A-6 -0.020	A-18	0.062	AS-6	-0.066	AN-13	0.133
A-7 -0.011	A-20	-0.033	AS-9	0.049	AN-14	0.202
A-8 -0.003	A-21	-0.064	B4 2	-0.057	AN-31	0.023
A-9 0.070	A-23	-0.231	B4 ⁻ 3	0.028	AS-10	-0.067
E-1 -0.086	A-24	-0.017	B4_4	-0.052	AS-22	0.139
E-2 0.034	A-25	0.010	B4_5	0.075	AS-35	-0.058
E-4 0.054	A-26	-0.010	B4_6	-0.022	AS-36	0.150
E-5 -0.009	A-27	0.010	B4_7	-0.069	AS-37	0.036
E-6 -0.031	A-28	0.120	B4_8	0.025	AS-38	0.002
E-7 0.010	A-29	-0.040	B4_9	0.060	AS-40	-0.004
E-8 0.007	A-30	-0.012	E-10	-0.031	B4_10	-0.034
E-9 0.055	A-32	0.056	E-11	-0.116	B4_11	0.017
S_4 -0.030	A-34	-0.148	SK-6	0.207	B4_12	0.026
S_5 -0.027	AH-4	-0.131	S_10	-0.042	B4_14	-0.142
S_6 0.001	AH-6	-0.033	S_11	0.018	B4_15	0.022
S_7 -0.022	AH-7	0.050	<u>S_12</u>	-0.090	B4_19	0.066
S_8 0.015	AH-8	-0.066	Z-15	-0.120	B4_20	0.061
$S_9 - 0.054$	AH-9	-0.010	Z-16	0.194	B4_21	-0.051
IBM 0.049	AN-1	-0.030	AH-11	-0.200	B4_22	-0.041
2-1 0.204	AN-2	-0.030	AH-12	0.166	B4_1_1	0.088
	AN-5	-0.061	AH-14	0.012	SK_6_1	0.193
	AN-6	0.031	AH-16	-0.049	Z-16-1	0.125
2-5 -0.020						

• The case of With EO file

The computation result of with EO file is shown in following table.

Residuals, vertical control p	oints in [met	er]	Start Post Processing: Tue Jun 28 15:09:37 2011					
$\begin{array}{cccccccc} \text{ID} & \text{rz} \\ \text{A-1} & 0.047 \\ \text{A-2} & 0.000 \\ \text{A-3} & 0.022 \\ \text{A-4} & 0.023 \\ \text{A-5} & 0.027 \\ \text{A-6} & 0.012 \\ \text{A-7} & 0.030 \\ \text{A-8} & 0.037 \\ \text{A-9} & 0.157 \\ \text{E-1} & 0.201 \\ \text{E-2} & 0.286 \\ \text{E-4} & 0.196 \\ \text{E-5} & 0.002 \\ \text{E-6} & 0.042 \\ \text{E-7} & 0.029 \\ \text{E-8} & 0.016 \\ \text{E-9} & -0.018 \\ \text{S}_4 & -0.013 \\ \text{S}_5 & -0.005 \\ \text{S}_6 & 0.183 \\ \text{S}_7 & -0.005 \\ \text{S}_8 & 0.029 \\ \text{S}_9 & -0.032 \\ \text{TBM} & -0.036 \\ \text{TM} & -0.036 \\ \text{TM} & -0.029 \end{array}$	ID Z-5 Z-6 A-12 A-13 A-15 A-16 A-18 A-20 A-21 A-23 A-24 A-23 A-24 A-25 A-26 A-27 A-28 A-27 A-28 A-29 A-30 A-32 A-30 A-32 A-34 AH-4 AH-6 AH-7 AH-8 AH-9 AH-1	rz -0.016 0.079 -0.016 0.281 0.293 0.099 0.006 -0.044 -0.135 -0.305 -0.013 -0.027 -0.013 -0.027 -0.017 -0.128 -0.004 -0.022 -0.005 -0.231 -0.106 0.005 -0.058 0.151 0.003 -0.005 -0.005	ID Z-16-1 AN-5 AN-6 AS-1 AS-2 AS-3 AS-4 AS-5 AS-6 AS-9 B4_2 B4_3 B4_4 B4_5 B4_6 B4_7 B4_8 B4_9 E-10 E-11 SK-6 S_10 S_11 S_12 S_12	rz -0.035 0.052 0.002 0.009 0.134 0.027 -0.001 -0.005 -0.004 0.064 -0.068 -0.068 -0.075 0.003 0.026 -0.063 0.026 -0.063 0.026 -0.063 0.099 -0.009 0.018 -0.024 -0.022 0.209 -0.044 0.024	ID AH-12 AH-14 AH-16 AH-18 AH-19 AH-20 AH-21 AH-22 AN-13 AN-14 AN-31 AS-10 AS-22 AS-35 AS-36 AS-37 AS-38 AS-37 AS-38 AS-40 B4_10 B4_11 B4_12 B4_14 B4_15 B4_19 B4_19 B4_10	rz 0.193 -0.033 -0.056 0.011 0.008 -0.156 0.019 0.005 0.175 0.045 -0.043 0.014 -0.143 -0.064 -0.089 -0.102 -0.518 -0.152 -0.020 0.015 0.060 -0.357 0.014 0.074		
Z-1 0.089 Z-2 0.003 Z-4 0.421	AN-1 AN-2 B4_1_1 SK_6_1	-0.007 -0.011 0.051 -0.047	Z-15 <mark>Z-16</mark> AH-11	-0.088 - 0.036 -0.290	B4_20 B4_21 B4_22	0.019 -0.015 -0.005		

Based on the above mentioned result, the residuals of computation result with EO file become so small comparing with previous result. But it seems that the EO file accuracy is not suitable for the tolerable due to the fact that the z value of "mean standard deviations of terrain points" become worse.

* Reference data 1

- In case the only result GCP and BM are used.

Table A

Quality Control Sheet

BLOCK4	GCP&LEVEL 20-Ji													
1 m m	1. 1	Average			Max								· · · · · · · · · · · · · · · · · · ·	
Line	EASTING	NORTHING	HEIGHT	MAX de(m)	MAX dn(m)	MAX dh(m)	d-OMEGA	d-PHI	d-KAPPA	De(m)	Dr(m)	Dz(m)	Ds	
124	5.0	-0.1	3.2	6.3	4.5	7.0	-0.052	0.037	-0.032	5.0	2.0	3.4	6.4	
125	0.4	-0.6	3.7	1.2	4.0	4.6	-0.030	-0.015	0.012	0.6	1.7	3.7	4.1	
126	-0.6	-2.7	3.9	-1.9	-4.7	5.5	-0.062	-0.026	0.032	0.7	2.1	3.8	4.4	
20	-1.4	0.0	0.0	-5.7	-1.3	-4.2	-0.035	0.043	-0.012	2.8	0.6	1.9	3.4	
21	0.4	2.4	-0.1	1.1	4.6	-5.7	-0.040	-0.048	-0.043	1.8	2.9	1.5	3.7	
22	0.6	2.0	2,0	7.8	2.8	3.7	-0.032	-0.058	-0.046	2.1	2.0	2.3	3.7	
22-1	-2.4	1.3	-0.6	-5.8	2.2	-6,3	-0.020	0.035	0.113	3.0	1.4	2.4	4.1	
23	-0.6	1.4	0.6	5.7	2.5	-7.1	-0.013	0.048	-0.023	1.7	1.5	2.1	3.1	
24	0.2	0.2	1.1	3.1	2.5	2.8	-0.037	-0.027	-0.032	0.9	0.7	1.4	1.8	
24-1	-4.1	1.8	-1.2	-7.7	2.4	-4.4	-0.018	0.057	-0.025	4.7	1.9	2.2	5.5	
25	-0.2	-0.2	0.7	6.6	0.9	3.2	-0.030	0.047	-0.042	1.8	0.4	1.4	2.3	
26	-0.7	1.0	0.6	-7.0	1.9	-4.6	-0.023	0.057	-0.030	1.9	1.2	1.4	2,6	
27	0.1	0.3	0.1	-6.9	-1.0	-6.1	-0.031	0.048	-0.038	1.6	0.5	1.5	2.3	
28	-1.2	-0.3	2,0	-7.9	-1.5	-4.3	-0.024	0.053	-0.028	2.2	0.5	2,4	3.3	
29	-0.1	-0.8	0.5	-8.0	-1.5	-7.9	-0.036	0.057	-0.046	1.9	0.9	2.1	3.0	
30	-0.8	-3.6	-0.5	2.6	-4.5	-2,2	-0.042	-0.025	-0.035	1.3	3.6	0.8	3.9	
30-1	-5.6	-2.7	-5.3	-7.4	-2.8	-8.7	-0.040	0.057	-0.013	5.5	2.7	5.7	8,4	

Average = ((MATCH-AT Value) - (POS-EO Value))/Photos

RMS = Standerd Deviation

Table **B**

Quality Control Sheet

BLOCK4	With GNS	S-IMU											20-Jun-1	t	
	1	Average	_		Max							RMS			
Line	EASTING	NORTHING	HEIGHT	MAX de(m)	MAX dn(m)	MAX dh(m)	d-OMEGA	d-PHI	d-KAPPA	De(m)	Dri(m)	Dz(m)	Ds		
124	0.5	-1.4	0.3	0.8	-2.7	2.0	-0.027	-0.012	-0.031	0.6	1.6	0.9	2.0	1	
125	-0.6	-0.6	3.1	-0.8	-1.3	3.7	-0.020	-0.006	0.012	0.6	0.8	3.1	3.3		
126	8.0-	0.4	5,8	-1.1	0.6	6.1	-0.027	-0.032	0.032	0.7	0.7	4.1	4.2	1	
20	0.3	2.3	-1.1	0.5	2.6	-1.9	-0.018	0.006	-0.014	0.4	2.3	1.2	2.6		
21	0.4	2.6	-0.3	0.6	2.9	-2.0	-0.024	-0.009	-0.042	0.5	2.6	1.1	2.8		
22	0.1	1.8	1,5	0.4	2.0	2.8	-0.028	-0.007	-0,046	0,2	1.8	- 1.7	2.5		
22-1	-1.1	1.8	0.0	-1.4	2.0	-0.8	-0.016	0.006	0.113	1.1	1.8	0,5	2.2	1	
23	-0.2	1.0	0.2	-0.9	1.3	1.7	-0.017	0.015	-0.023	0.4	1.0	0.9	1.4	J DS	
24	0.1	1.4	0.4	0.4	1.8	1.9	-0.029	-0.010	-0.031	0.2	1.4	0.9	1.7		
24-1	-0.4	1.1	0.7	-1.6	1.4	1.0	-0.023	0.015	-0,024	0.9	1.2	0,7	1,6		
25	-0.2	0.2	0.8	0.9	1.2	2.2	-0.027	0.018	-0.042	0.5	0.3	1.2	1.3		
26	-0.5	0.5	0.6	-0.9	0.7	1.9	-0.020	0.016	-0.030	0.6	0.5	0.9	1.2	1b	
27	0,5	0.7	-0.1	0.9	1.1	-1.4	-0.026	-0.018	-0,038	0.5	0.7	0.8	1.2	Ĩ	
28	-0.9	-0.1	1.9	-1.1	-0.5	3.2	-0.021	0.013	-0.028	0.9	0.2	2.1	2.3	1.	
29	0.2	0.7	0,9	0.6	1.1	2.6	-0.024	0.007	-0.046	0.3	0.7	1.4	1.6	10	
30	-1.1	-0.1	1.4	-1.4	-0.5	2.6	-0.018	0.011	-0.036	1.1	0.3	1.6	1.9		
30-1	-0.7	0.8	-0.1	-1.0	0.9	-0.3	-0.018	0.007	-0.010	0.6	0.8	0.2	1.0		

Average = ((MATCH-AT Value) - (POS-EO Value))/Photos

RMS = Standerd Deviation

<u>Table **C**</u>

Quality Control Sheet

BLOCK4	Mod EQ fi	e		-										
		Average		Max							RMS			
Line	EASTING	NORTHING	HEIGHT	MAX de(m)	MAX dn(m)	MAX dh(m)	d-OMEGA	J-PH	d-KAPPA	De(m)	Dn(m)	Dz(m)	Ds	
124	2.0	-1.0	1.3	3.5	-2.6	2.2	-0.032	0.016	-0.031	2.1	1.5	1.4	3.0	
125	-0.4	-0.6	3.2	-0.7	-1.4	3.7	-0.020	-0.007	0.012	0.4	0,8	3.2	3,3	
126	-0.7	-1.0	5.1	-2.0	-2.4	5.7	-0.047	-0.030	0.033	0.6	0.9	3.8	4.0	
20	-0.9	2.6	-0.4	-1,2	3.2	-2.7	-0.015	0.013	-0.016	1.0	2.6	1,3	3.1	
21	0.5	2.1	0.1	6.4	3.1	-3.6	-0.032	-0.045	-0.042	1.6	2.2	1.0	2.9	
22	0,2	1,6	1.6	0.6	2.5	2.5	-0.036	-0.008	-0.046	0.2	1.7	1.7	2.4	
22-1	-1.4	1.2	0.0	-2.0	2.2	-1.6	-0.026	0.009	0.008	1.4	1.4	0.9	2,2	
23	-0,3	0.9	0.1	-0.8	1.2	-2.2	-0.016	0.017	-0.023	0.4	0.9	1.1	1.5	
24	0.1	1.5	0.5	-0.4	2.1	2.0	-0.028	-0.010	-0.032	0.2	1.6	1.0	1.9	
24-1	-1.0	1.0	0.3	-2.4	1.5	1.0	-0.023	0.020	-0.025	1.4	1.1	0.6	1.8	
25	-0.3	0.3	1.0	-0.9	1.1	2.4	-0.027	0.018	-0.042	0.5	0.4	1.2	1.4	
26	-0.6	0.8	0.9	-0.9	1.2	2.1	-0.018	0.016	-0.030	0.6	0.8	11	15	
27	0.3	0.1	0.1	-5.5	-0.9	-3.9	-0.032	0.039	-0.038	1.2	0.4	1.1	1.7	
28	-1.0	0.1	2.1	-1.7	0.4	3.1	-0.020	0.016	-0.028	1.0	0.1	2.2	2.4	
29	0.1	-0.1	0,8	-7.0	1.7	-6.0	-0.033	0.050	0.046	1.6	0.4	1.8	2.4	
30	-1.0	-0.8	0.9	-1.5	-1.5	1.9	-0.025	0.010	-0.036	1.0	0.9	11	1.7	
30-1	-3,6	1.0	-2,4	-4.0	1.3	-4.4	-0.018	0.031	-0.010	3.6	1.0	2.8	4.6	

Average = ((MATCH-AT Value) - (POS-EO Value))/Photos

RMS = Standerd Deviation

: Improvement value

- Positional data of principal point of photographs of the final result in 21, 27, 29, 126 of each flight line acquired in table A were replaced with existing EO file value and re-computed.
- The final result is shown as following table

Active Block	Start Post Processing: Thu Jun 30 12:26:30 2011
Number of photos	
Number of photos	. 500
Number of strips	: 19
Photo scale	: 1:82347
Mean terrain height [m]	: 15
Automatic blunder detection	: OFF
Use all adjusted points in project file	
as control (absolute mode)	· OFF
Control parameter for block adjustment ·	. 611
Self-calibration	: OFF
GNSS-Mode	: ON
Drift-Mode	: ON
drift ner strin	· ON
drift for XV7	
anable chifte anly	: ON,ON,ON
	. OFF
INIU-Mode	: UN
IMU-Bore-sight	: OFF
Earth's curvature correction	: ON
Atmospheric correction	: ON
Do not eliminate manual points	: OFF
Standard deviations (a-priori) :	
Ground control (planimetry) [m] Set	
0 (=default)	: 0.098
1	• 0.050
Ground control (height) [m] Set	. 0.050
$0 \left(-\text{default}\right)$	• 0.150
	. 0.100
L Automatic image points [mm] Cat	. 0.100
Automatic image points [mm] Set	0.003
o (=default)	: 0.002

Residuals vertical control points in [meter]										
ID rz	ID rz	ID rz	ID rz							
A-1 0.044	7-6 0.055	AS-1 0.008	AH-18 -0.005							
A-2 -0.000	A-12 -0.066	AS-2 0.124	AH-19 -0.206							
A-3 0.023	A-13 0.014	AS-3 0.026	AH-20 -0.154							
A-4 -0.002	A-14 0.117	AS-4 -0.002	AH-21 -0.010							
A-5 0.002	A-15 0.190	AS-5 -0.028	AH-22 -0.014							
A-6 -0.017	A-16 0.124	AS-6 -0.063	AN-13 0.102							
A-7 -0.011	A-18 0.054	AS-9 0.037	AN-14 0.075							
A-8 -0.007	A-20 -0.053	B4 2 -0.039	AN-31 -0.001							
A-9 0.074	A-21 -0.158	B4 ⁻ 3 -0.029	AS-10 -0.060							
E-1 0.202	A-23 -0.201	B4_4 -0.089	AS-22 -0.026							
E-2 0.281	A-24 -0.012	B4_5 0.048	AS-35 -0.091							
E-4 0.209	A-25 -0.010	B4_6 0.010	AS-36 -0.141							
E-5 0.004	A-26 -0.016	B4_7 -0.094	AS-37 -0.000							
E-6 0.046	A-27 -0.007	B4_8 0.032	AS-38 -0.262							
E-7 0.011	A-28 0.097	B4_9 0.089	AS-40 -0.069							
E-8 0.013	A-29 -0.021	E-10 -0.019	B4_10 -0.013							
E-9 -0.193	A-30 -0.007	E-11 0.033	B4_11 0.010							
S_4 -0.015	A-32 -0.040	SK-6 0.105	B4_12 0.049							
S_5 -0.011	A-34 -0.168	S_10 -0.023	B4_14 -0.254							
$S_6 0.1/9$	AH-4 -0.203	S_11 0.213	B4_15 0.020							
S_{-} -0.006	AH-6 -0.013	$S_{12} - 0.049$	B4_19 0.067							
S_8 0.029	AH-7 -0.022	2-15 -0.081	B4_20 0.016							
<u>5_9</u> -0.033	AH-8 -0.078	2-16 0.052	B4_21 -0.021							
	AH-9 -0.015	AH-11 -0.269	B4_22 -0.005							
	AN-1 -0.019		$B4_1_1 0.054$							
			3N_0_1 0.085 7 16 1 0.016							
2^{-4} 0.339 7_{-5} 0.020	AN-5 0.044 AN-6 0.001	AU-10 -0.002	2-10-1 0.010							
	AN-0 0.001									