



Kákonyi Gábor | Trimble UAS Master

GISOPEN 2016

Jó minőségű ortofotó, pontfelhő, könnyen UAS képekből



Summary



- Photogrammetry is complicated?
- Photogrammetry everywhere
- Photogrammetry in Trimble
- Why using a UAS
- Why processing with UASMaster, Workflows

Photogrammetry was complicated!



Trimble Photogrammetry

- The application defines the best suited acquisition method and processing routines
 - Data availability, time for preparation, processing, scale, precision, area size



What can I expect?

Imagery with a ground sample distance of up to 1cm / 0.4"

UASMaster capabilities:

- Positional accuracy up to 1 pixel (~1cm/0.4")
- Vertical accuracy up to 1,5 pixel (~2cm/0.8")

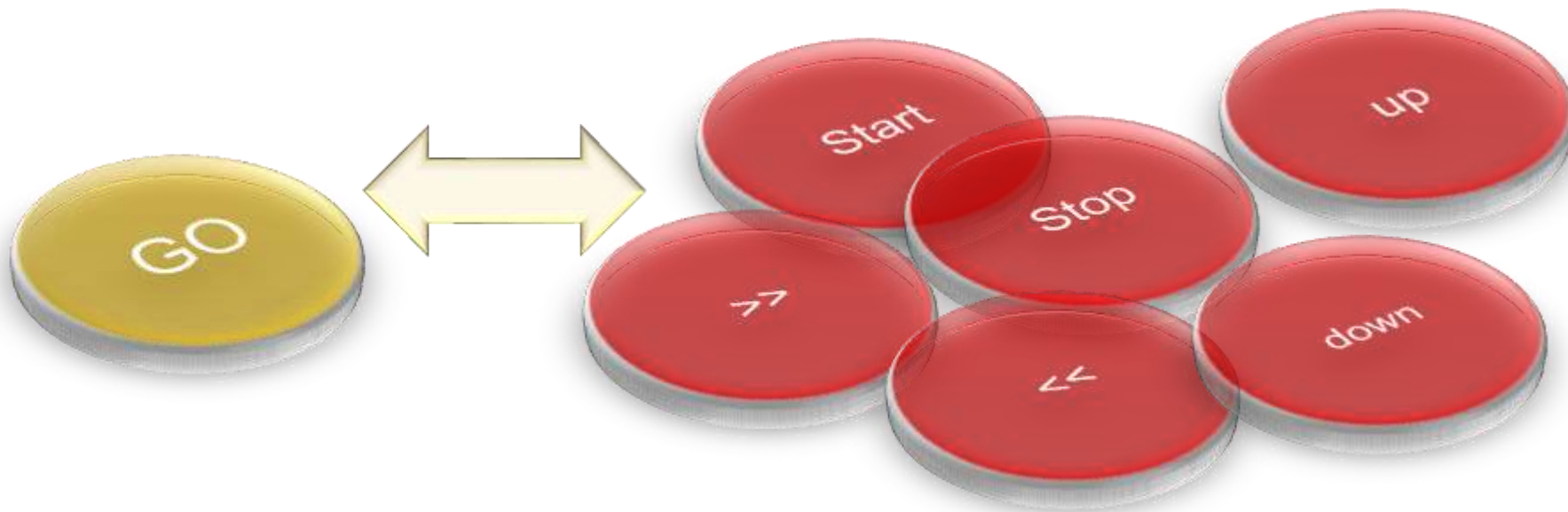


Why UASMaster?

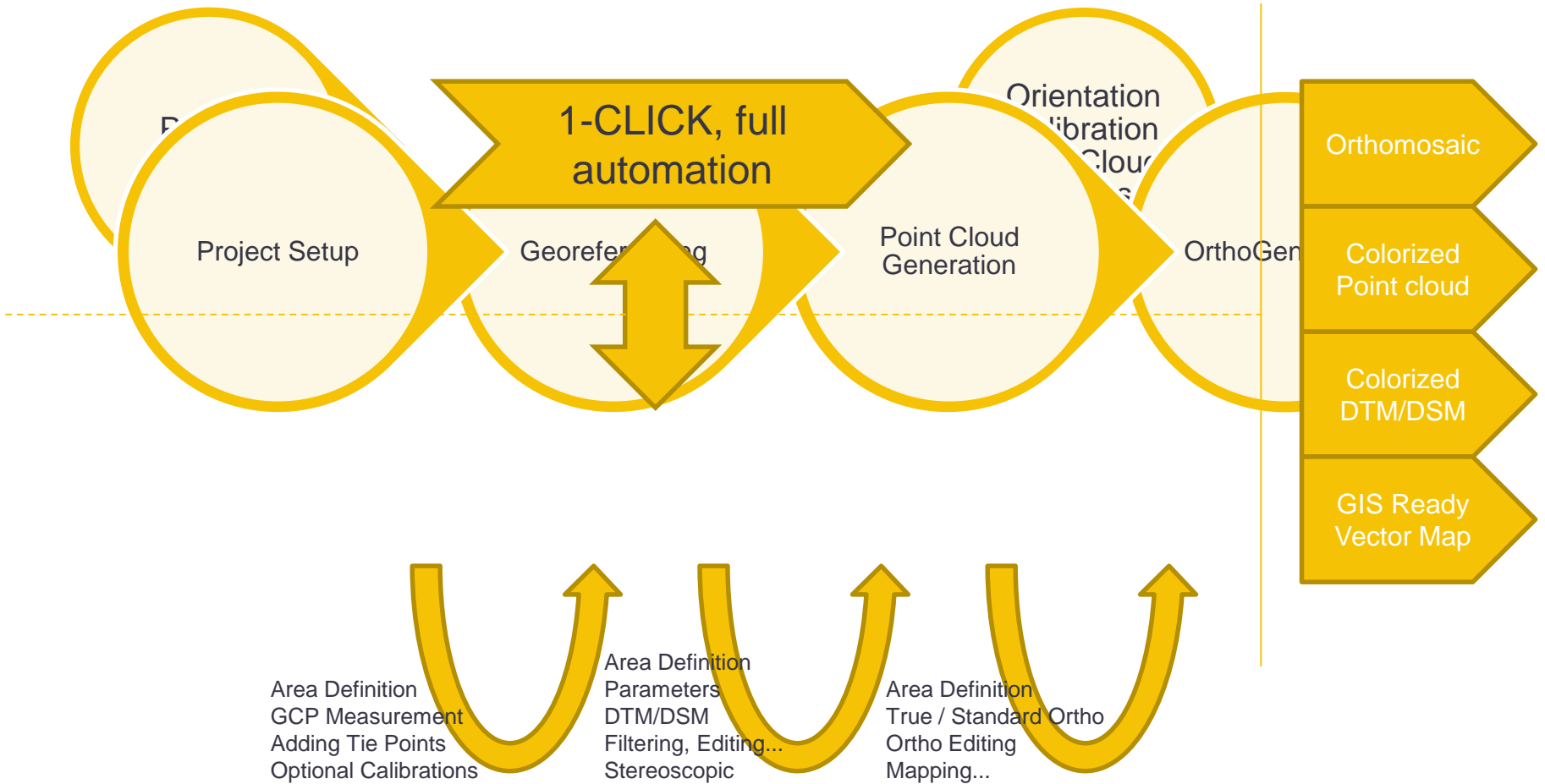
- UASMaster offers full flexibility AND ease of use

Easy to use 1-CLICK processing

Flexible parameters, full editing capability, detailed analysis



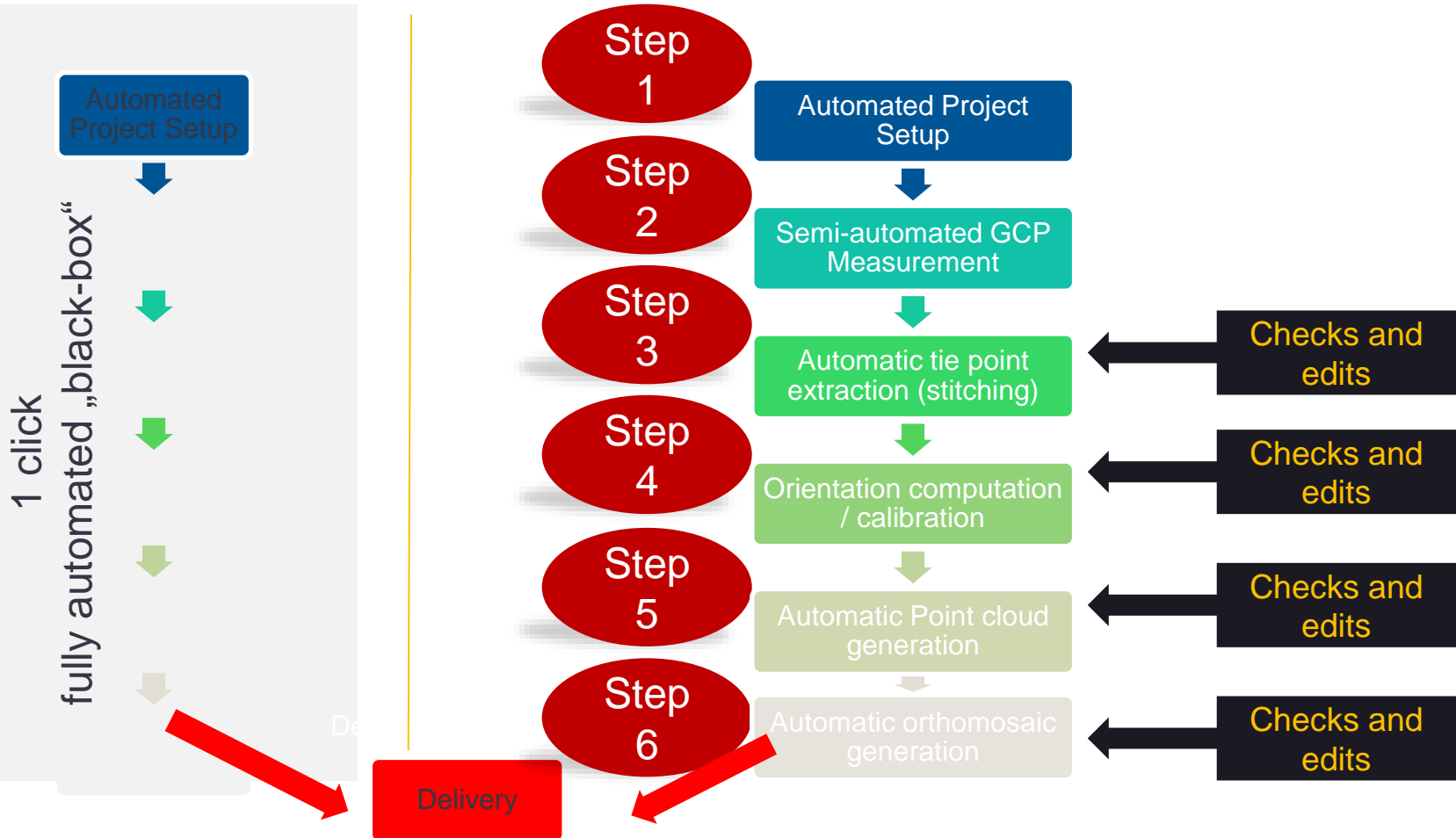
1-Click or Multi-Stop Process



Open hardware concept



A full process with **one click** OR interactive processing in just **6 Steps**



Guided Workflows

UAS

- **Project Preparation**
Create, open or edit a project. **Step 1**
- **Quick Processing (optional)**
Processing from georeferencing mosaic image generation. **1- Click**
- **Georeferencing**
Start UAS Measurement...
- **Surface and Ortho Generation**
Start UAS Edit...

UAS

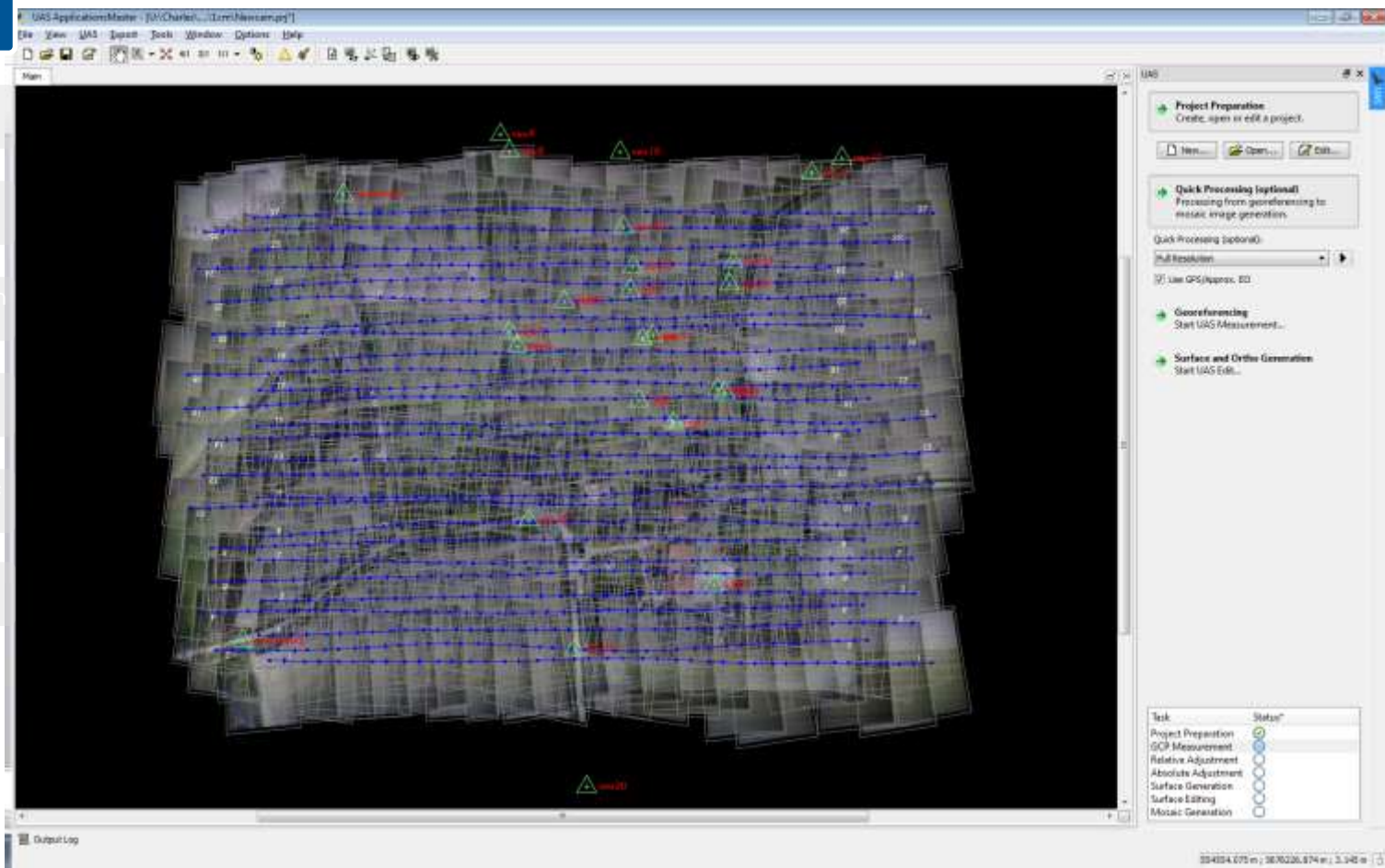
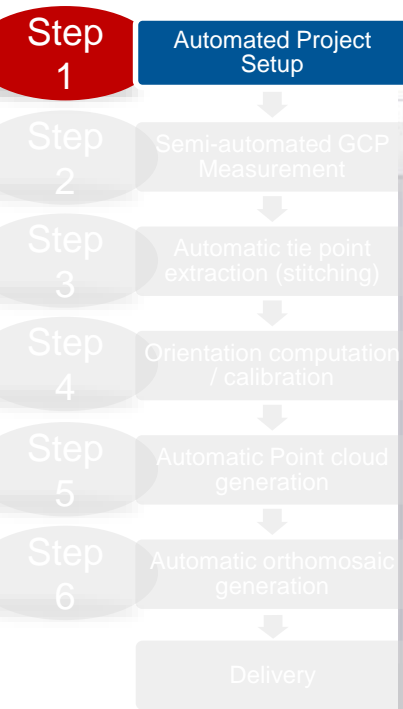
- **Extract**
Acquire tie points **Step 2**
- **Measure**
Digitize tie points or control points **Step 3**
- **Orientate**
Compute exterior orientations **Step 4**

UAS

- **Surface**
Generate DTMs and DSMs **Step 5**
- **Orthos and Mosaic**
Generate orthos and mosaic **Step 6**

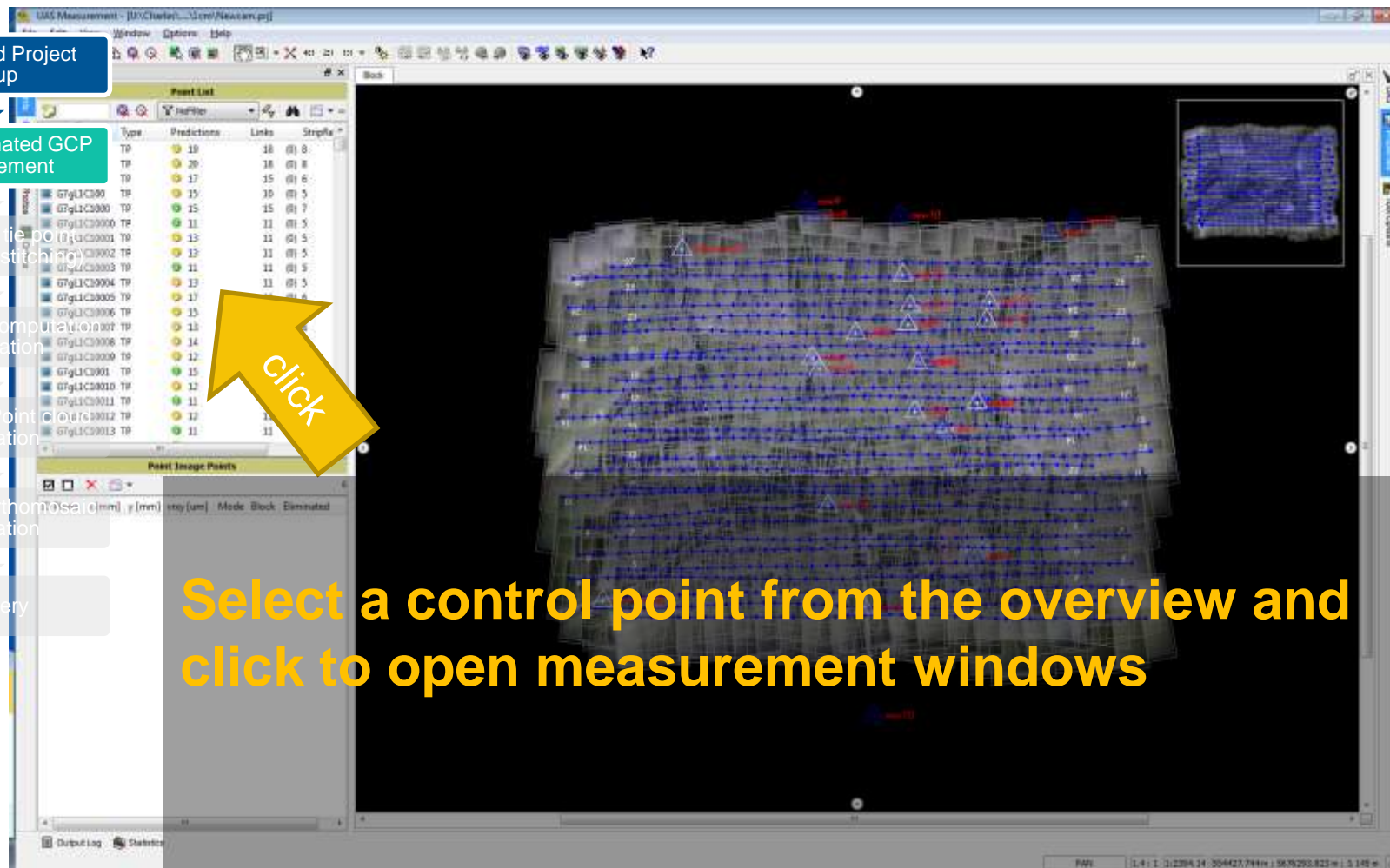
Task	Status*
Project Preparation	✓
GCP Measurement	✓
Relative Adjustment	✓
Absolute Adjustment	✓
Surface Generation	✓
Surface Editing	⋮
Mosaic Generation	○

Mission Overview after Project Setup



Step 2: GCP Measurement

- Step 1 Automated Project Setup
- Step 2 Semi-automated GCP Measurement
- Step 3 Automatic tie point extraction (stitching)
- Step 4 Orientation computation / calibration
- Step 5 Automatic Point Cloud generation
- Step 6 Automatic orthomosaic generation
- Delivery



Select a control point from the overview and click to open measurement windows

Step 2: GCP Measurement



Type	Predictions	Links	Strip
new1	14	0 (0) 0	0
new2	14	0 (0) 0	0
new3	14	12 (0) 6	6
new4	15	16 (0) 7	7
new5	15	0 (0) 0	0
new6	15	16 (0) 8	8
new7	12	11 (0) 6	6
new8	1	0 (0) 0	0
new9	0	0 (0) 0	0
newcentral1	3	0 (0) 3	3
newcentral2	0	0 (0) 0	0
newcentral3	0	0 (0) 0	0
newcentral4	0	0 (0) 0	0
newcentral5	0	0 (0) 0	0
old4	13	12 (0) 7	7
old2	10	0 (0) 0	0
old1	14	14 (0) 7	7
old5	14	14 (0) 7	7
old6	0	0 (0) 0	0
tp1	13	12 (0) 6	6
tp4	13	12 (0) 6	6

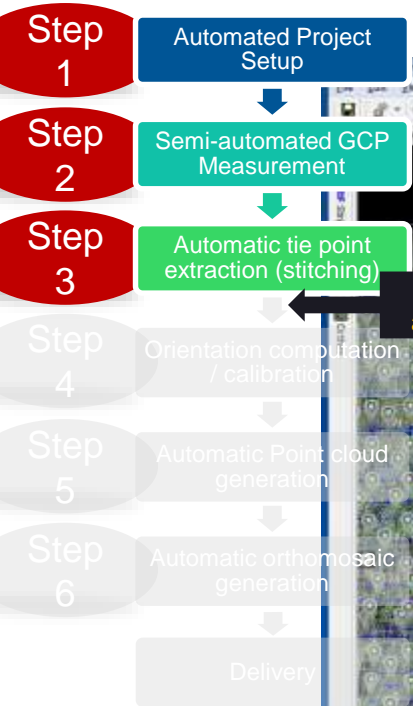
Photo	x [mm]	y [mm]	xy [mm]	Mode	Block	Element
DSC01581	3.70051	17.49462	15.59608	MAN	0	0
DSC01615	11.82281	-10.35234	8.52525	MAN	0	0
DSC01616	1.62687	-10.26672	8.90001	MAN	0	0
DSC01617	-10.30785	-12.80537	14.92881	MAN	0	0
DSC01624	3.63461	8.56675	21.17286	MAN	0	0
DSC01625	-8.00500	7.10981	18.50004	MAN	0	0

GCP are prepositioned

Automatic Point Transfer

One click measurement

Step 3: Auto-Extract Tie Points



UAS

- Extract: Acquire tie points
- TP Extraction With Adjustment: Full Resolution
- Use GPS/Approx. EO

Measure

Measure	<input checked="" type="checkbox"/>
Vectors	<input checked="" type="checkbox"/>
Markers	<input checked="" type="checkbox"/>
Blocks	<input checked="" type="checkbox"/>
Strips	<input checked="" type="checkbox"/>
Strip/Photo	<input checked="" type="checkbox"/>
Point Statistics	
StdDev XY	<input type="checkbox"/>
StdDev Z	<input type="checkbox"/>
Residual XY	<input type="checkbox"/>
Residual Z	<input type="checkbox"/>
ID Test	<input type="checkbox"/>
Symbol Size	100
Photo Statistics	
StdDev XY	<input type="checkbox"/>
StdDev Z	<input type="checkbox"/>
Residual XY	<input type="checkbox"/>
Residual Z	<input type="checkbox"/>
ID Test	<input type="checkbox"/>
Symbol Size	100
Joint	
Joint Lines	<input type="checkbox"/>
Joint Sect1	<input type="checkbox"/>
Joint Analy	<input type="checkbox"/>
Joint Lines R	<input type="checkbox"/>
Joint Sect2	<input type="checkbox"/>
Stereo Cuts	
Show Brn	<input type="checkbox"/>

Select

Click on the left mouse button to start the polygon. Add more vertices to the polygon lines by clicking. A double-click will close the polygon.

- LB: Polygon Select
- Ctrl + RB: Pan
- WB: Zoom

Task Status

Task	Status
Project Preparation	<input checked="" type="checkbox"/>
GCP Measurement	<input checked="" type="checkbox"/>
Relative Adjustment	<input checked="" type="checkbox"/>
Absolute Adjustment	<input type="checkbox"/>
Surface Generation	<input type="checkbox"/>
Surface Editing	<input type="checkbox"/>
Mosaic Generation	<input type="checkbox"/>

Step 4: Orientation and Calibration

The screenshot displays the UAS Measurement software interface. The main window shows a 3D point cloud of a city street with numerous tie points marked in yellow, green, and blue. A sidebar on the left lists the workflow steps:

- Step 1: Automated Project Setup
- Step 2: Semi-automated GCP Measurement
- Step 3: Automatic tie point extraction (stitching)
- Step 4: Orientation computation / calibration
- Step 5: Automatic Point cloud generation
- Step 6: Automatic orthomosaic generation
- Delivery

A yellow box labeled "Checks and edits" is positioned over the point cloud, with an arrow pointing to Step 4. A monitor icon in the foreground shows a 3D surface plot and a point cloud. On the right, the UAS Properties panel is visible, showing the current step and a task status table.

UAS Properties Panel:

- Extract**: Acquire tie points
- Measure**: Digitize tie points or control points
- Orientate**: Compute exterior orientations

Adjustment With Calibration: Extensive

Adjustment (optional): Default

Use GPS/Approx. EO

Restore EO Backup EO

Purge and Compress: Clean up the project.

Task	Status*
Project Preparation	✓
GCP Measurement	✓
Relative Adjustment	✓
Absolute Adjustment	...
Surface Generation	○
Surface Editing	○
Mosaic Generation	○

Step 5: Point Cloud Generation



UAS

Surface
Generate DTMs and DSMs

Define Area

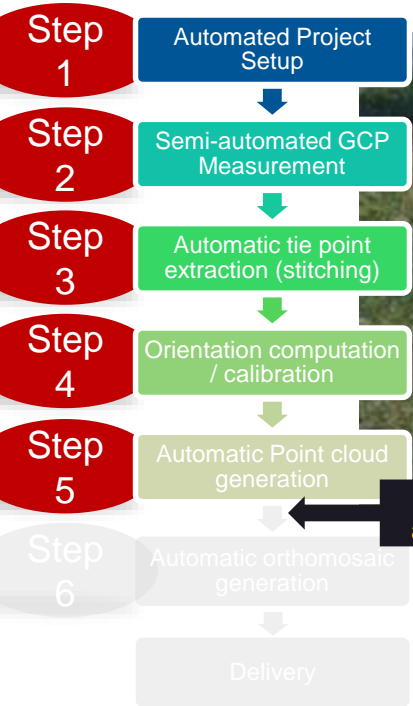
DTM Extraction:
Detailed

DSM Extraction:
Dense

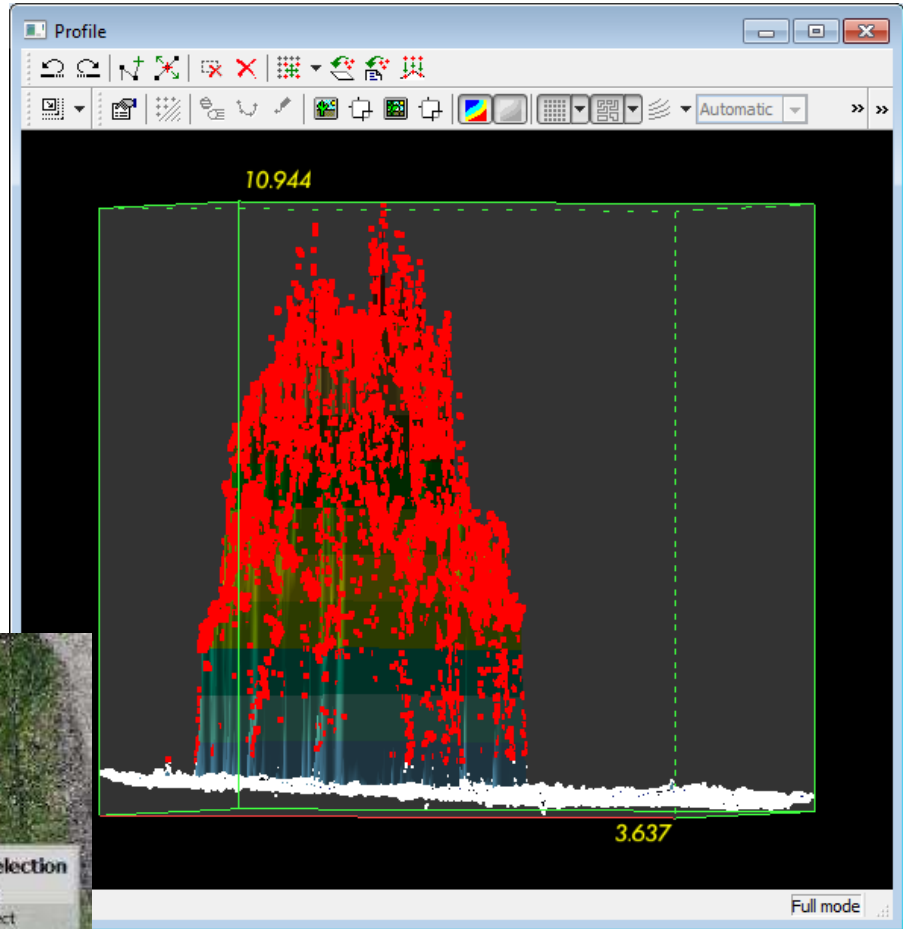
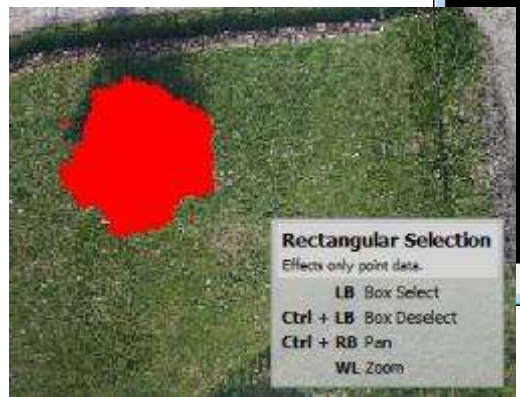
Orthos and Mosaic
Generate orthos and mosaic

Task	Status*
Project Preparation	✔
GCP Measurement	✔
Relative Adjustment	✔
Absolute Adjustment	✔
Surface Generation	✔
Surface Editing	☹
Mosaic Generation	○

Partial editing



Checks and edits



Step 6: Ortho & Digitizing

Data Checking:

- Lines/polygons
- Point-offset / stereo-parallax evaluation
- Personal stereoscopic height correction value

Step 1

Automated Project Setup

Step 2

Semi-automated GCP Measurement

Step 3

Automatic tie point extraction (stitching)

Step 4

Orientation computation / calibration

Step 5

Automatic Point cloud generation

Step 6

Automatic orthomosaic generation

Delivery

Automated tools /

WORKFLOWS

Correlation/interpolation-based train-following for 3D measurements

Checks and edits

for UAS

Checks and edits

UAS

→ **Surface**
Generate DTMs and DSMs

→ **Orthos and Mosaic**
Generate orthos and mosaic

Ortho Mosaicking:
Pixel size: [m]
Classic Ortho

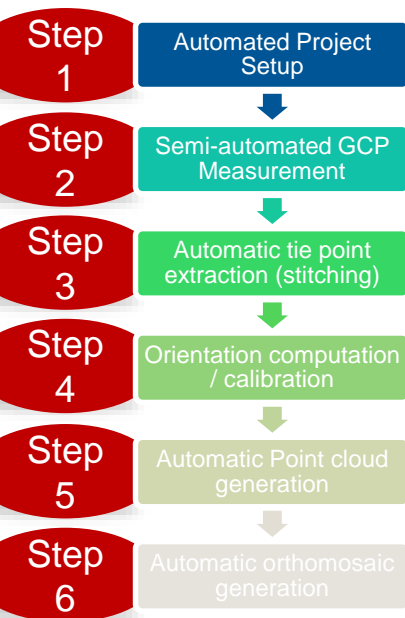
Ortho Patch Generation:
Define Patch Area

Ortho Patch Merging:
Default

Task	Status*
Project Preparation	✓
GCP Measurement	✓
Relative Adjustment	✓
Absolute Adjustment	✓
Surface Generation	✓
Surface Editing	✓
Mosaic Generation	⋮

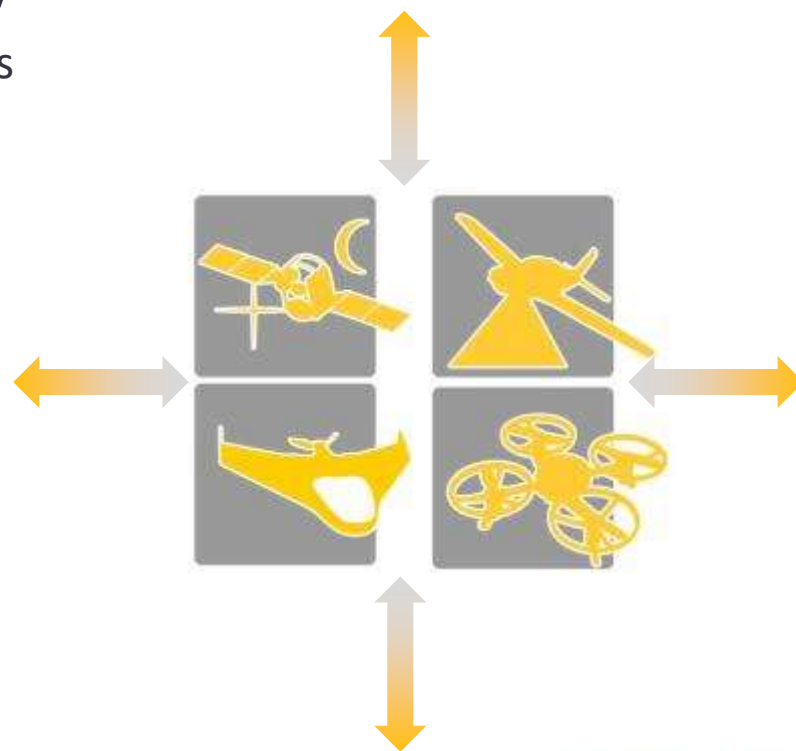
Trimble Inpho v7.0

Interoperability

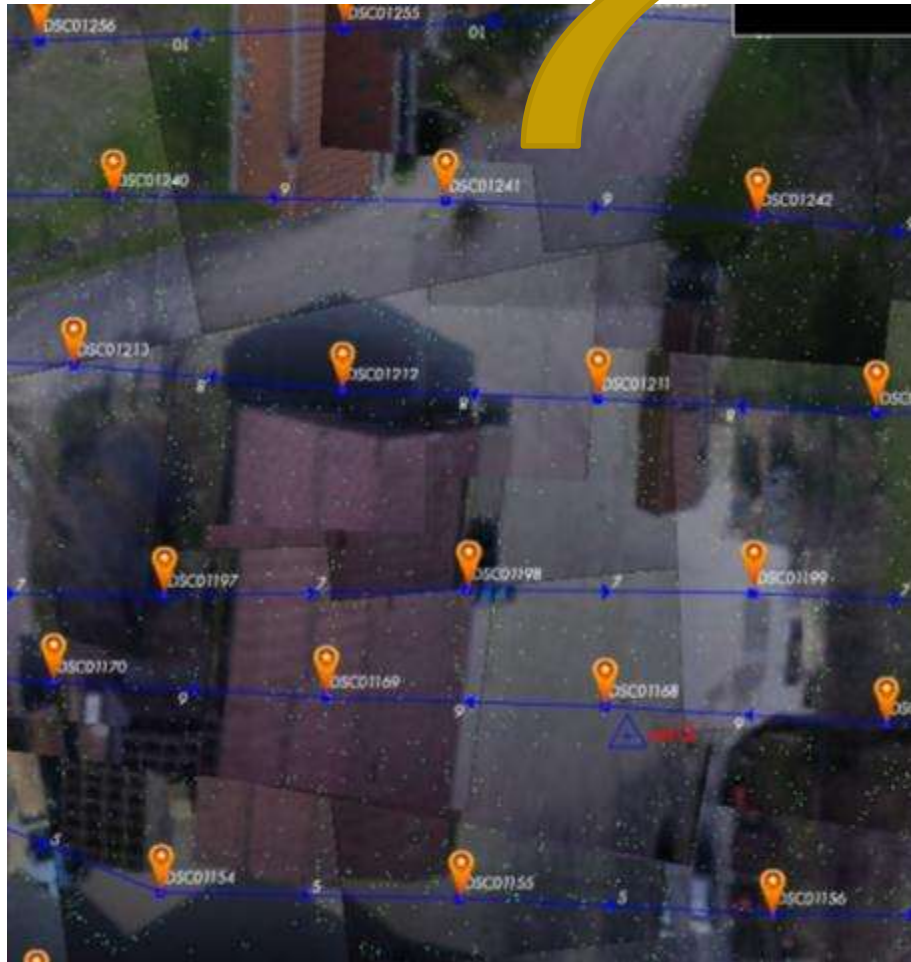


Integration into Trimble and 3rd party software
seamless integration of data and efficient project delivery

- Trimble Geoids
- Jpeg2000
- LAS 1.4
- LasZip
- EXIF-Reader



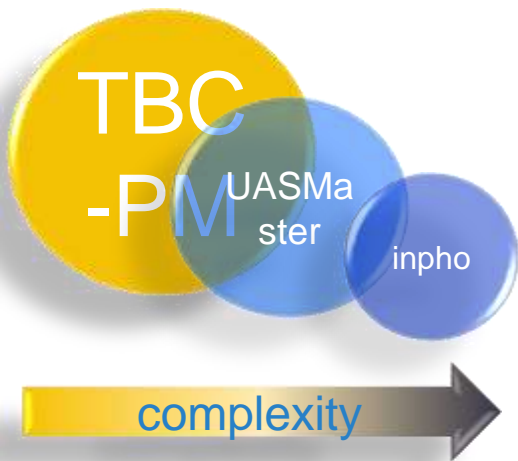
From A to Z in 2.5 hrs



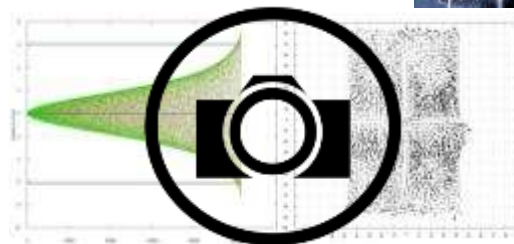
*
Customer project:
729 images (Sony Nex/alpha 6000)
Area-spread 1.4km /0.87mi
5 strips at 70%/80% overlap
Orthomosaic & Pointcloud
Laptop 2012 (i7, 2.8GHz)

UASMaster is different

- 1-Click processing option (black-box) (AT/georeferencing, cameracalibration, DTM/DSM, trueortho or traditional orthomosaic)
- Optional 6-step interactive process with parametrization
- Reliable QA/QC
- Full stereo visualization for better manual/automated editing and mapping
- Complete INPHO technology in one tool, limited to UAS data



Task	Status
Project Preparation	✓
GCP Measurement	✓
Relative Adjustment	✓
Absolute Adjustment	✓
Surface Generation	✓
Surface Editing	✓
Mosaic Generation	...



Why UASMaster?

- Reliably deliver highest quality GIS ready data
- Why hassle with missing functionality if you can have one-click processing and full photogrammetric flexibility in one tool
- UASMaster is the right product for any experience level