VISIONMAP
Digital mapping systems

A3 Edge for oblique and dense DSM – practical case study

Use of oblique images

- Emergency situations
  - Damage estimation – fire, flood, inundation, storm, landslide, big accidents, act of terror etc.
  - Management in emergency situation - EMERCOM (Emergency Control Ministry), fire-brigade, first aid, army
- Large industrial objects
  - Planning, management and documentation – sea ports, airports, railway stations, large construction cites, special destination objects etc
  - Planning, management and documentation of linear objects – roads, power lines, pipe lines etc.
- Town planning
  - Town planning, landscape design, architecture
  - City building fund documentation
  - Illegal housing

Use of oblique images

- Cultural heritage
  - Documentation and monitoring of historical buildings and installations
- Real estate assessment
  - Assessment, showing and inspection of real estate – insurance agencies, real estate agencies
- Miscellaneous
  - Municipal services, tax inspection (HM Revenue and Customs (HMRC), police, police patrol, fire brigade, ambulance etc
  - Mass media
  - Web-sites (Google, Bing, Yandex,…)
  - Tourism
  - 3D City models etc.

Use of 3D City models

- Town planning
- Military applications
- Emergency situations
- Security services
- Documentation of historical and cultural heritage objects
- GIS
- Earth work calculations – mines, quarries, roads etc.
- Forestry
- Infrastructures mapping – power lines, pipe lines etc
- Web-sites and search engines
- Tourism

VisionMap and oblique images

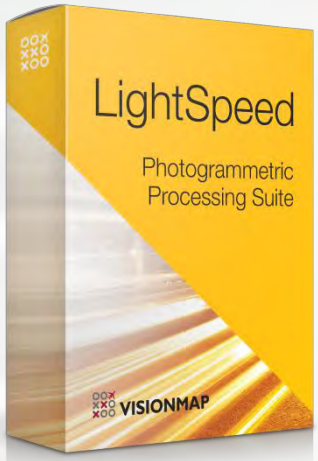
- **A3 Edge** - aerial camera (RGB+NIR) for vertical and oblique images
- **MIST-IR** – aerial camera (MWIR) for vertical and oblique images
- **LightSpeed** - processing system for simultaneous adjustment of hundreds of thousands of vertical and oblique images, DSM creation and orthophoto production
- **Oblivision** – 3rd party software to work with oblique images
- **Acute 3D** – 3rd party software to build 3D City models

A3 Edge & MIST-IR aerial camera

Camera	A3 Edge	MIST-IR
Focal length (mm)	300	300
GSD from 1,000 m	2.5 cm	5.0 cm
Max FOV (°)	110	80
CCD pixel size (µ)	7.4	15.0
CCD size (pix)	4,864 x 3,232	1,280 x 1,024
Maximal footprint (pix)	75,000 x 9,600	27,600 x 1,280
Max image size (Mpix)	700	34
Wave length	RGB / RGB+NIR	MWIR
Color Depth (bit)	12	12
Vertical & Oblique	Yes	Yes
Motion compensation	FMC, RMC, VC	FMC, RMC, VC
Weight (kg)	42	11
Camera dimensions (cm)	50*60*60	24*34*39
Operation temperature (°C)	-15° - +55°	-15° - +55°

A3 Edge aerial survey and mapping system

Aerial survey camera



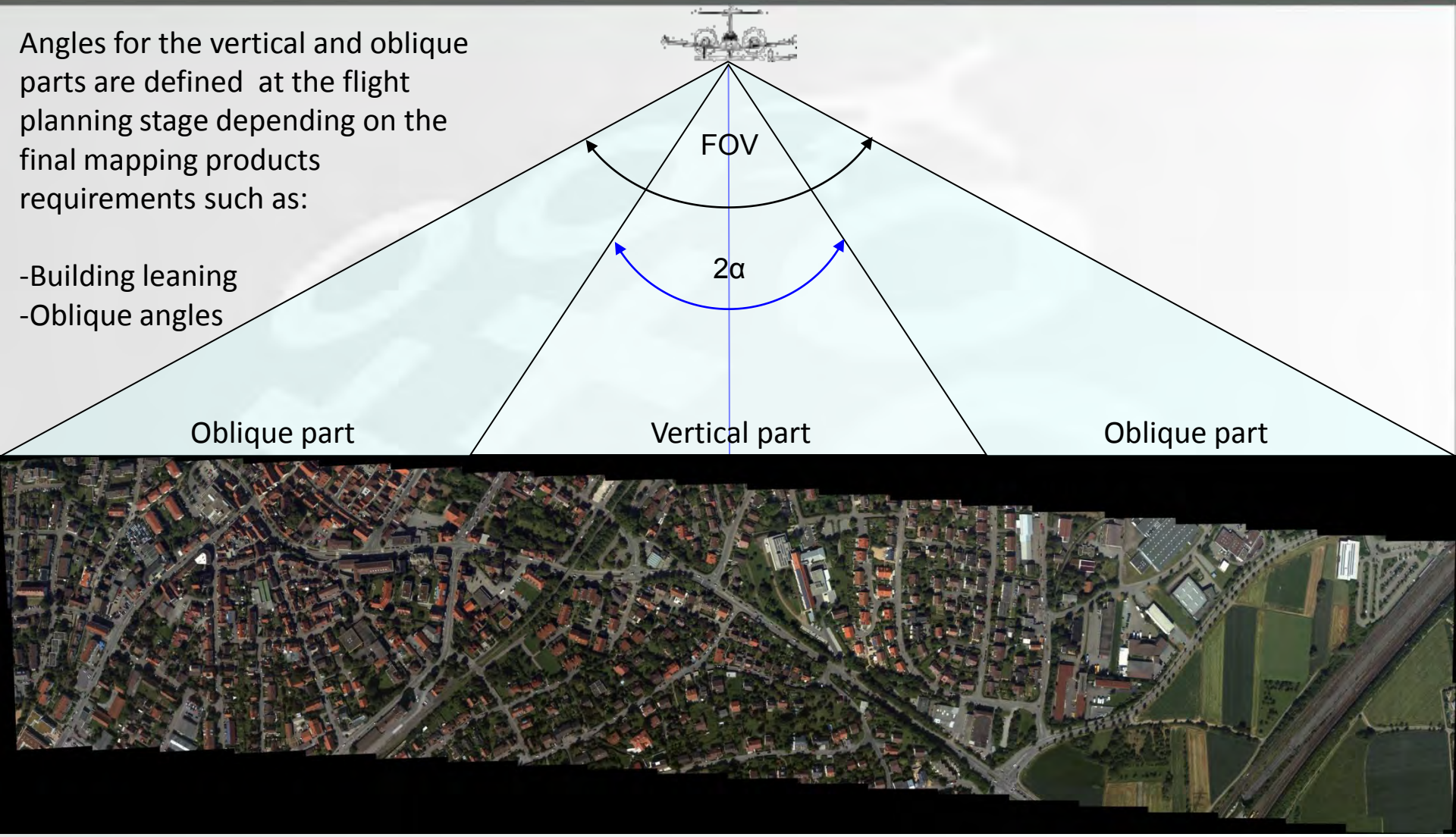
LightSpeed Photogrammetric Suite

Ground processing system

A3 Edge images

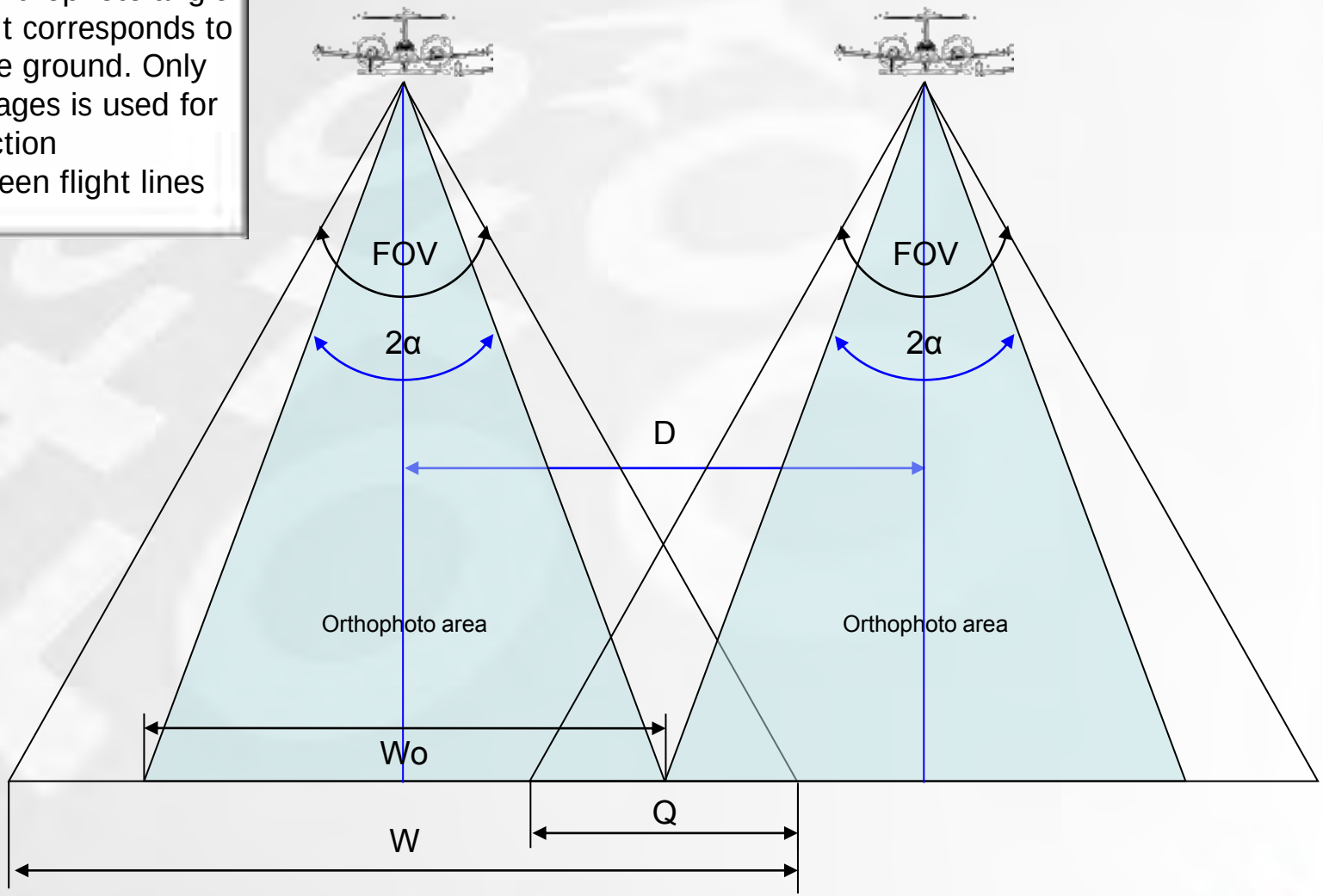
Angles for the vertical and oblique parts are defined at the flight planning stage depending on the final mapping products requirements such as:

-Building leaning
-Oblique angles



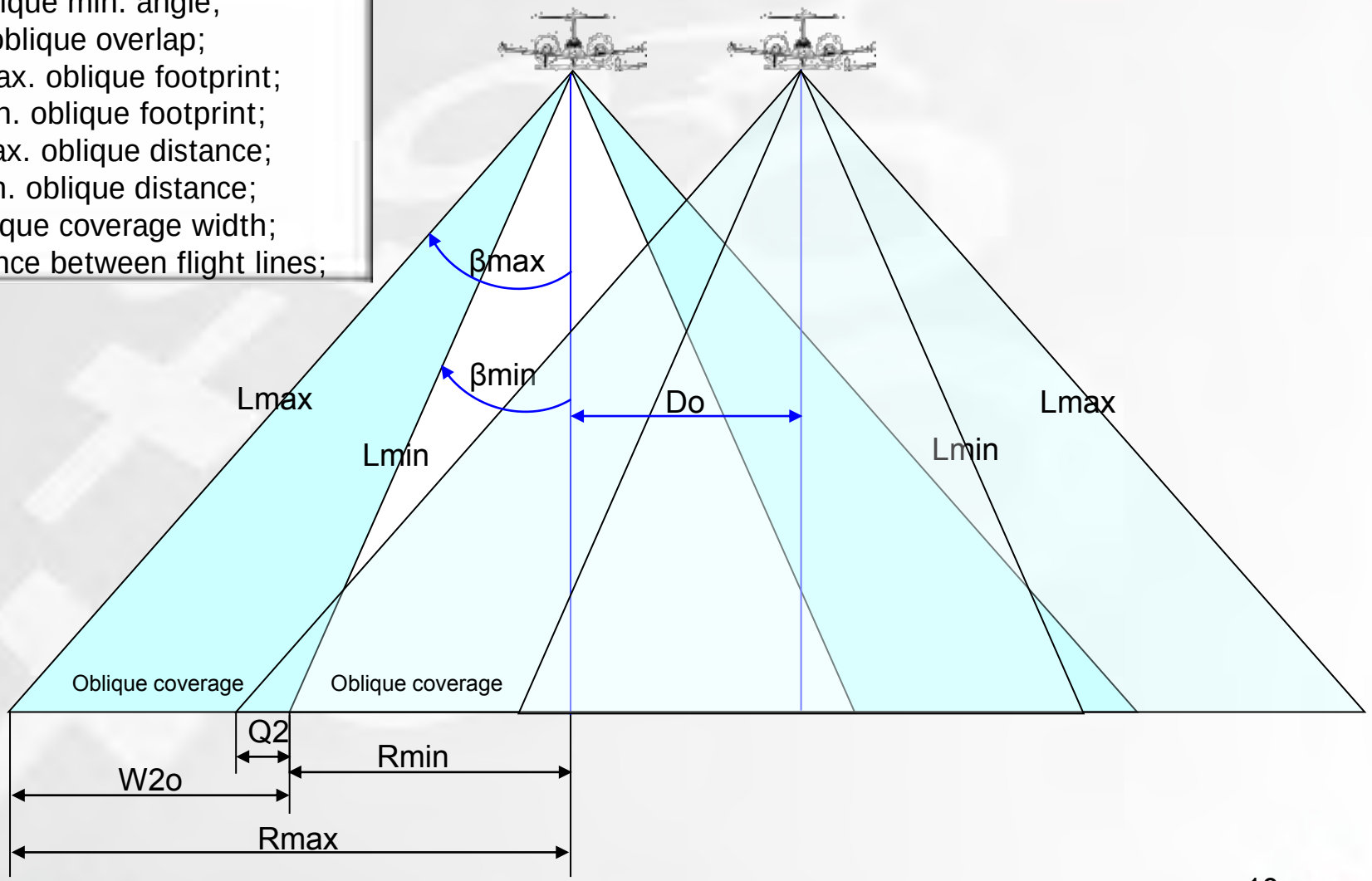
Vertical aerial survey scheme

FOV – field of view
2α – permissible orthophoto angle across flight line. It corresponds to Wo distance on the ground. Only this part of the images is used for orthophoto production
D – distance between flight lines
Q – side overlap



Two-side oblique aerial survey scheme

βmax - oblique max. angle;
βmin - oblique min. angle;
Q2 - side oblique overlap;
Rmax - max. oblique footprint;
Rmin - min. oblique footprint;
Lmax - max. oblique distance;
Lmin - min. oblique distance;
W2o - oblique coverage width;
Do – distance between flight lines;



One-side oblique aerial survey scheme

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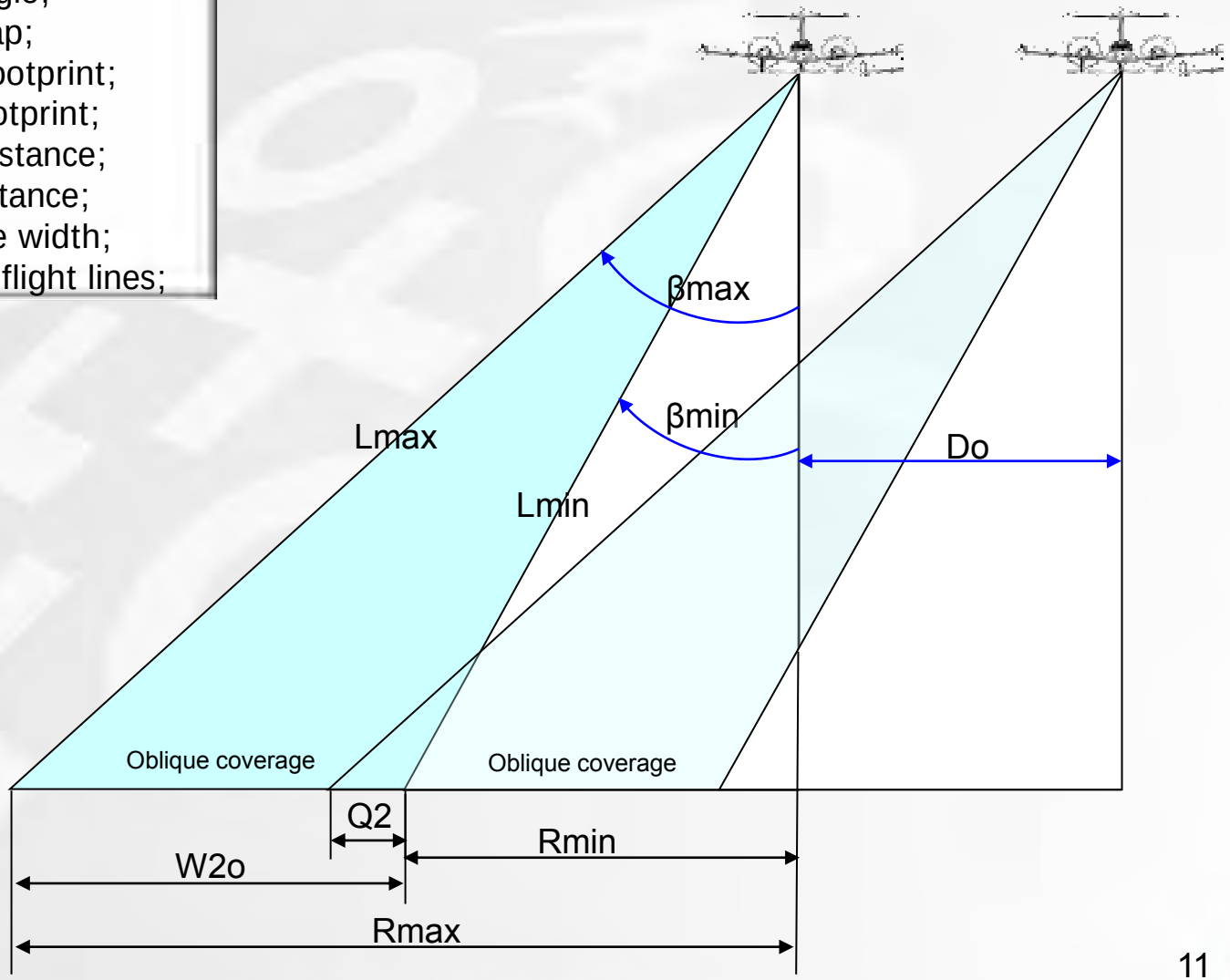
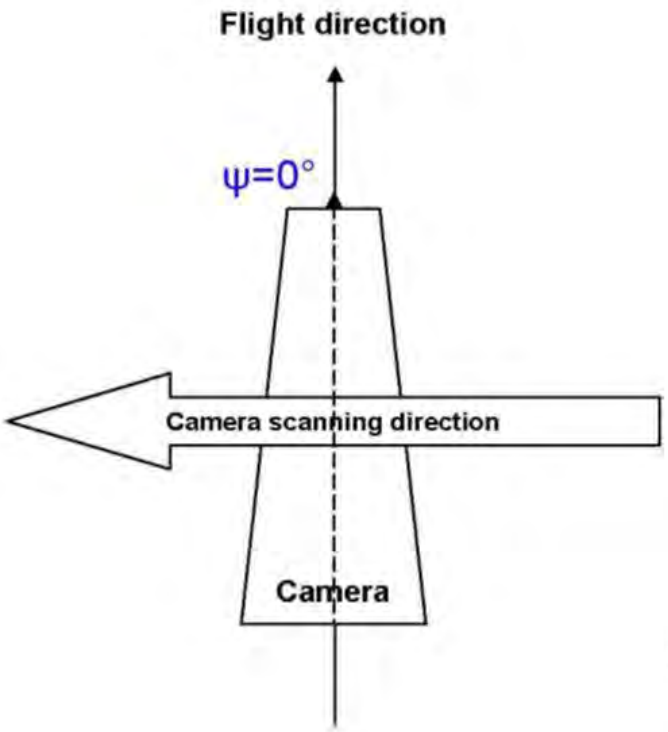
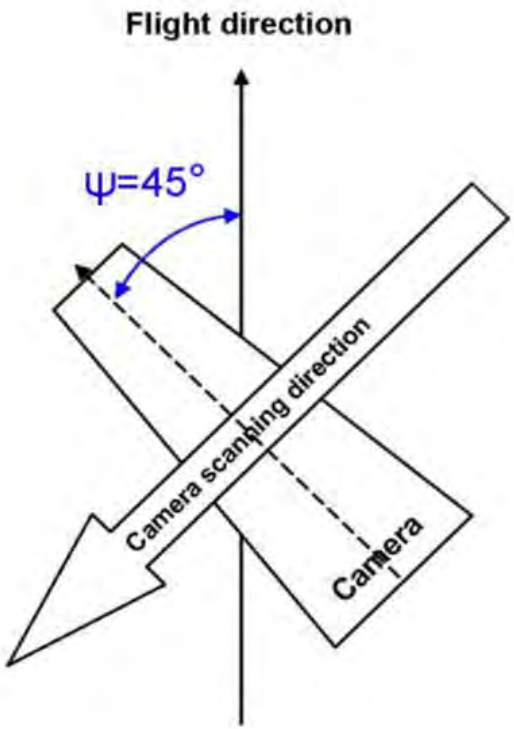
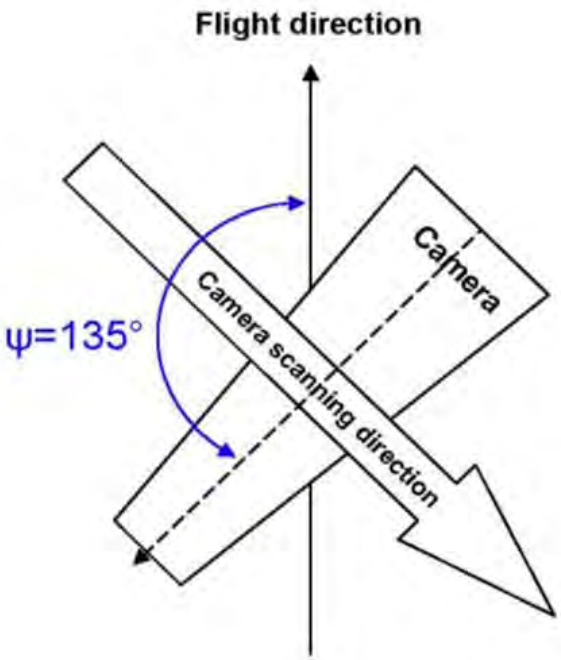


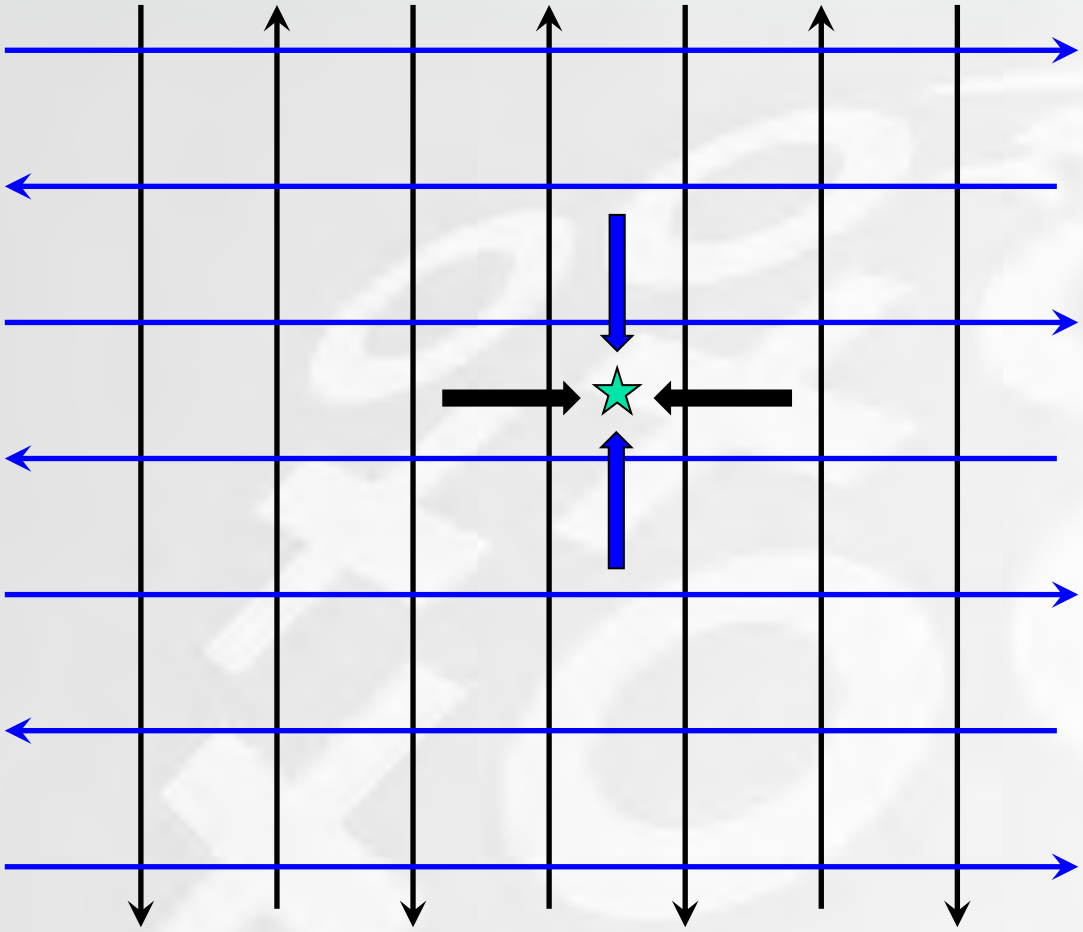
A3 Edge installation

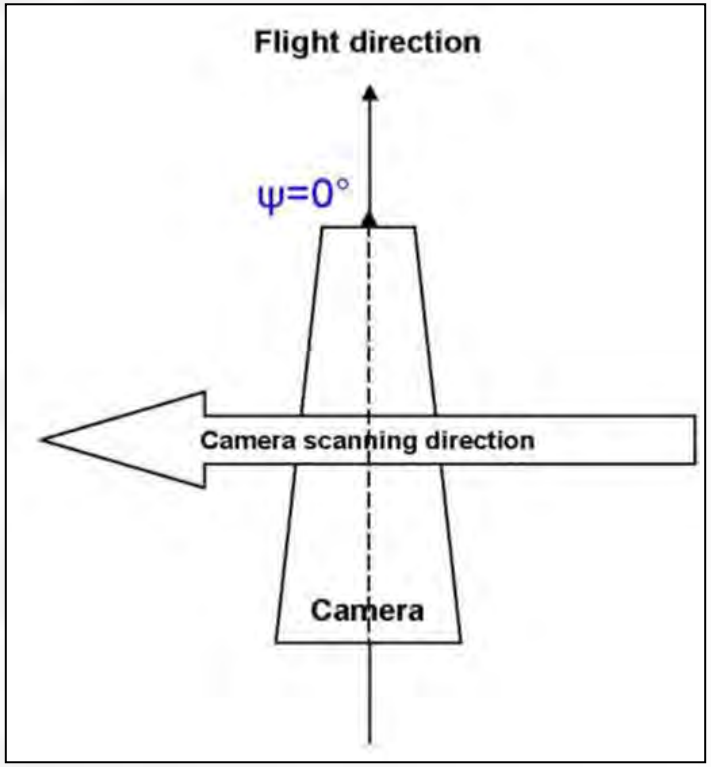




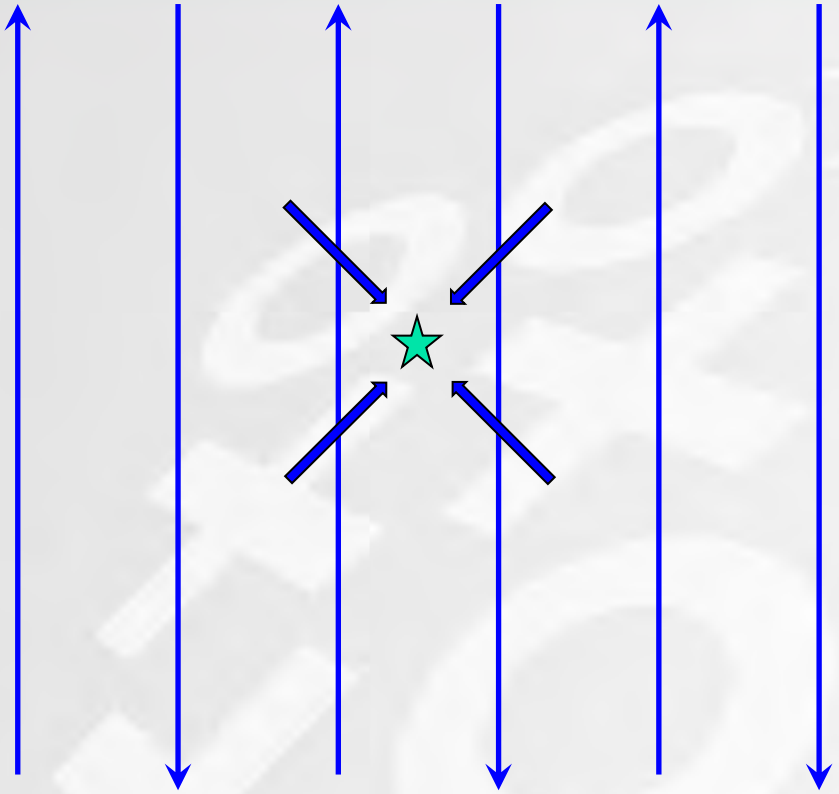


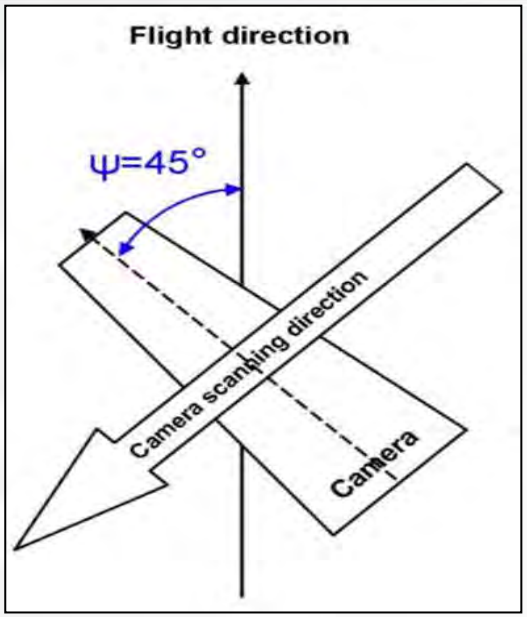
One A3 Edge for oblique imagery (criss-cross flight)

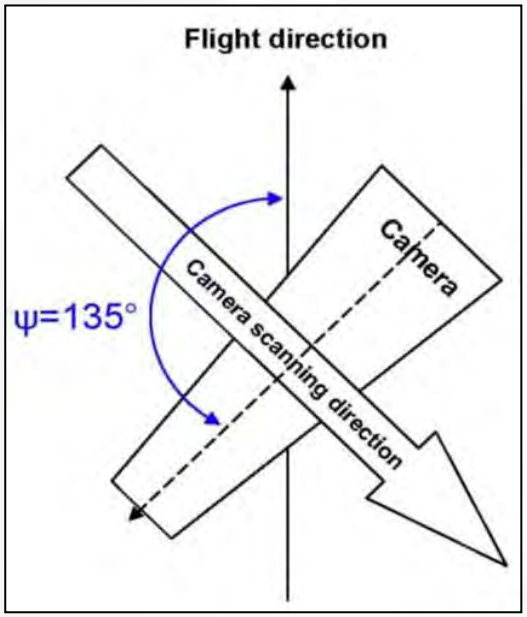




Two A3 Edge for oblique imagery (parallel flight)

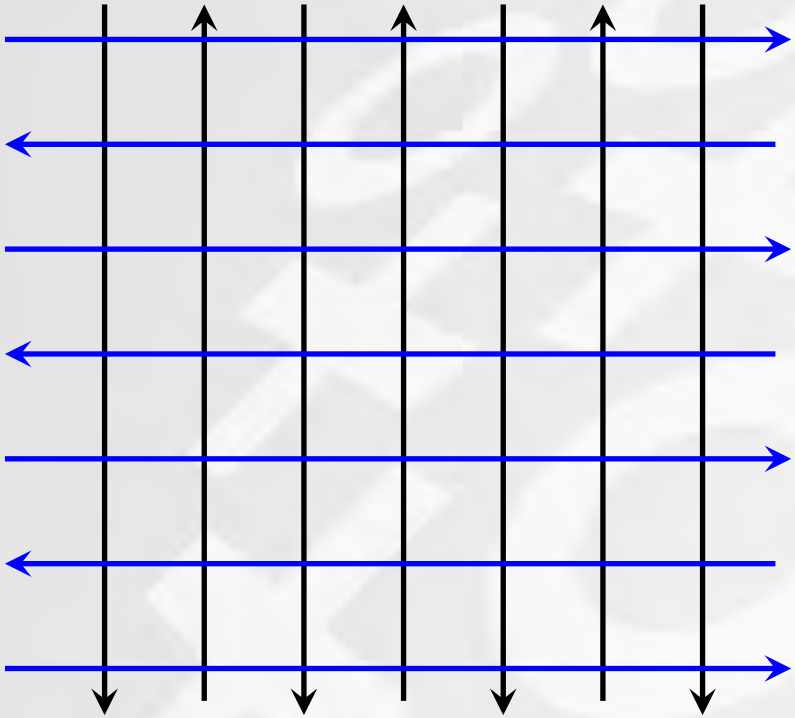




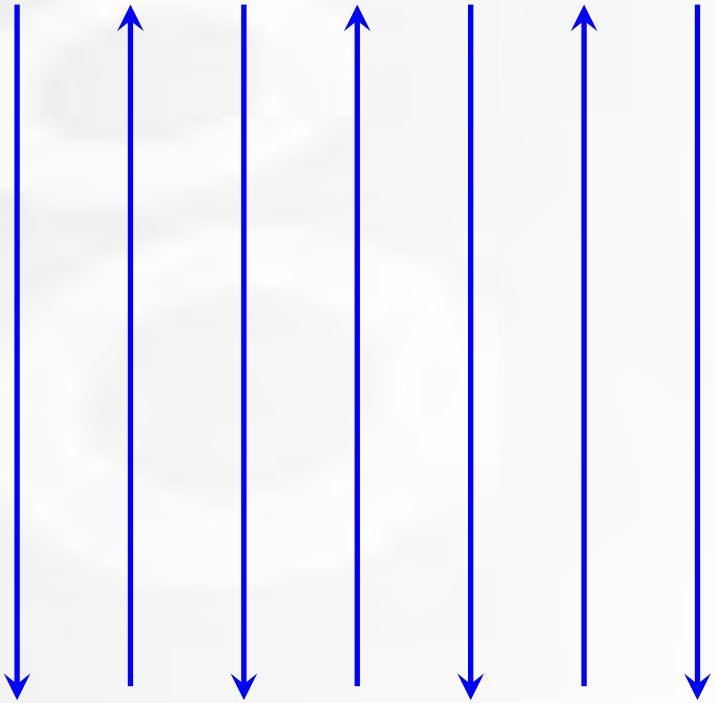


DSM flight scenarios with one A3 Edge

DSM with façades for 3D City

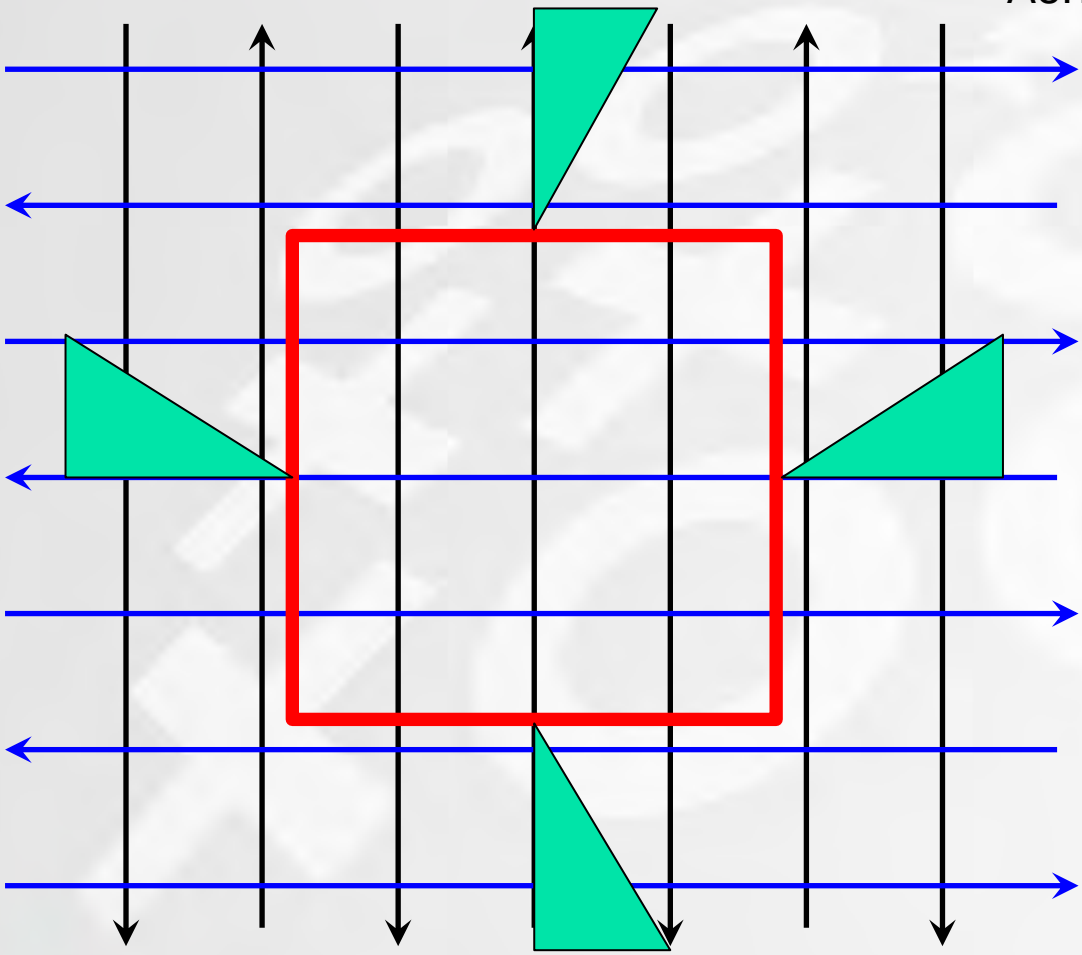


DSM for DSM/DTM/Ortho or
DSM based TrueOrtho



Aerial survey area for oblique

Mapping area – 5 km x 5 km
Aerial survey area – 7.5 km x 7.5 km



Oblique or 3D City projects with one A3 Edge

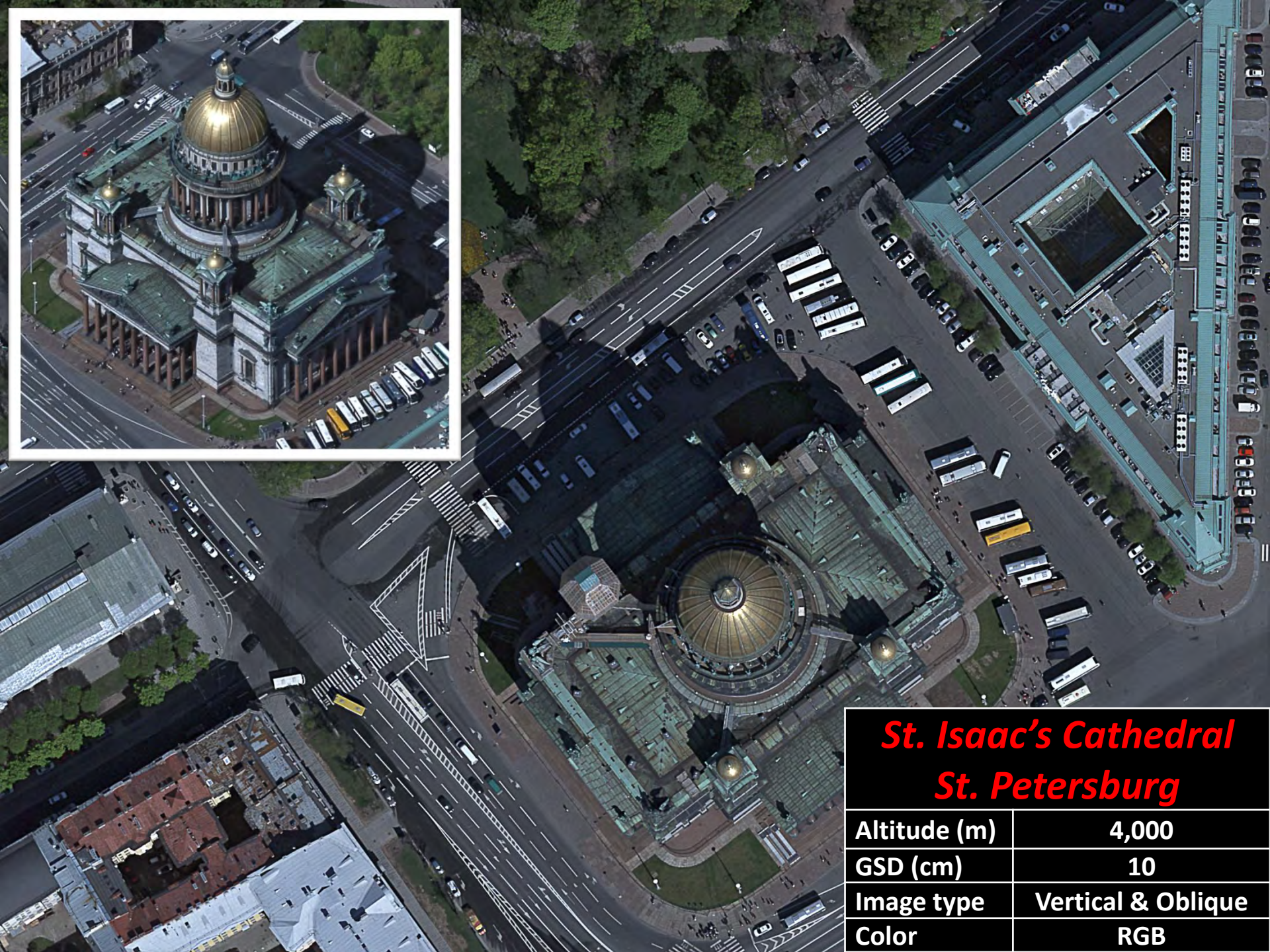
GSD (cm)	5	7.5	10
Altitude (feet, AGL)	6,650	8,300	11,000
Ground speed (knot)	120	180	240
Forward overlap (%)	30%	30%	30%
Side overlap (%)	82%	82%	82%
Side oblique overlap (%)	30%	30%	30%
Maximal oblique angle (deg)	54°	54°	54°
Minimal oblique angle (deg)	34°	34°	34°
Flight lines distance (m)	1,000	1,300	1,700
Aerial survey productivity (oblique coverage, sq. km/hour)	463	869	1,544
Survey area (10km x 10km)	**100**	**100**	**100**
Number of flight lines (criss-cross)	22	18	14
Flight time (criss-cross flight, including turns, hour)	**2.66**	**1.87**	**1.31**

Oblique or 3D City projects with two A3 Edge

GSD (cm)	5	7.5	10
Altitude (feet, AGL)	6,650	8,300	11,000
Ground speed (knot)	210	260	350
Forward overlap (%)	30%	30%	30%
Side overlap (%)	82%	82%	82%
Side oblique overlap (%)	30%	30%	30%
Maximal oblique angle (deg)	54°	54°	54°
Minimal oblique angle (deg)	34°	34°	34°
Flight lines distance (m)	750	920	1,200
Aerial survey productivity (oblique coverage, sq. km/hour)	573	887	1,592
Survey area (10km x 10km)	**100**	**100**	**100**
Number of flight lines (criss-cross)	15	12	9
Flight time (parallel flight, including turns, hour)	**1.55**	**1.17**	**0.81**

DSM/DSM based TrueOrtho with one A3 Edge

GSD (cm)	5	7.5	10
Altitude (feet, AGL)	6,650	8,300	11,000
Ground speed (knot)	140	180	240
Forward overlap (%)	30%	30%	30%
Side overlap (%)	83%	83%	83%
Orthophoto angle (°)	30°	30°	30°
FOV (deg)	109°	109°	109°
Flight lines distance (m)	978	1,222	1,629
Aerial survey productivity (ortho coverage, sq. km/hour)	253	407	724
Survey area (10km x 10km)	**100**	**100**	**100**
Number of flight lines (parallel flight)	11	9	7
Flight time (parallel flight, including turns, hour)	**1.26**	**0.94**	**0.66**

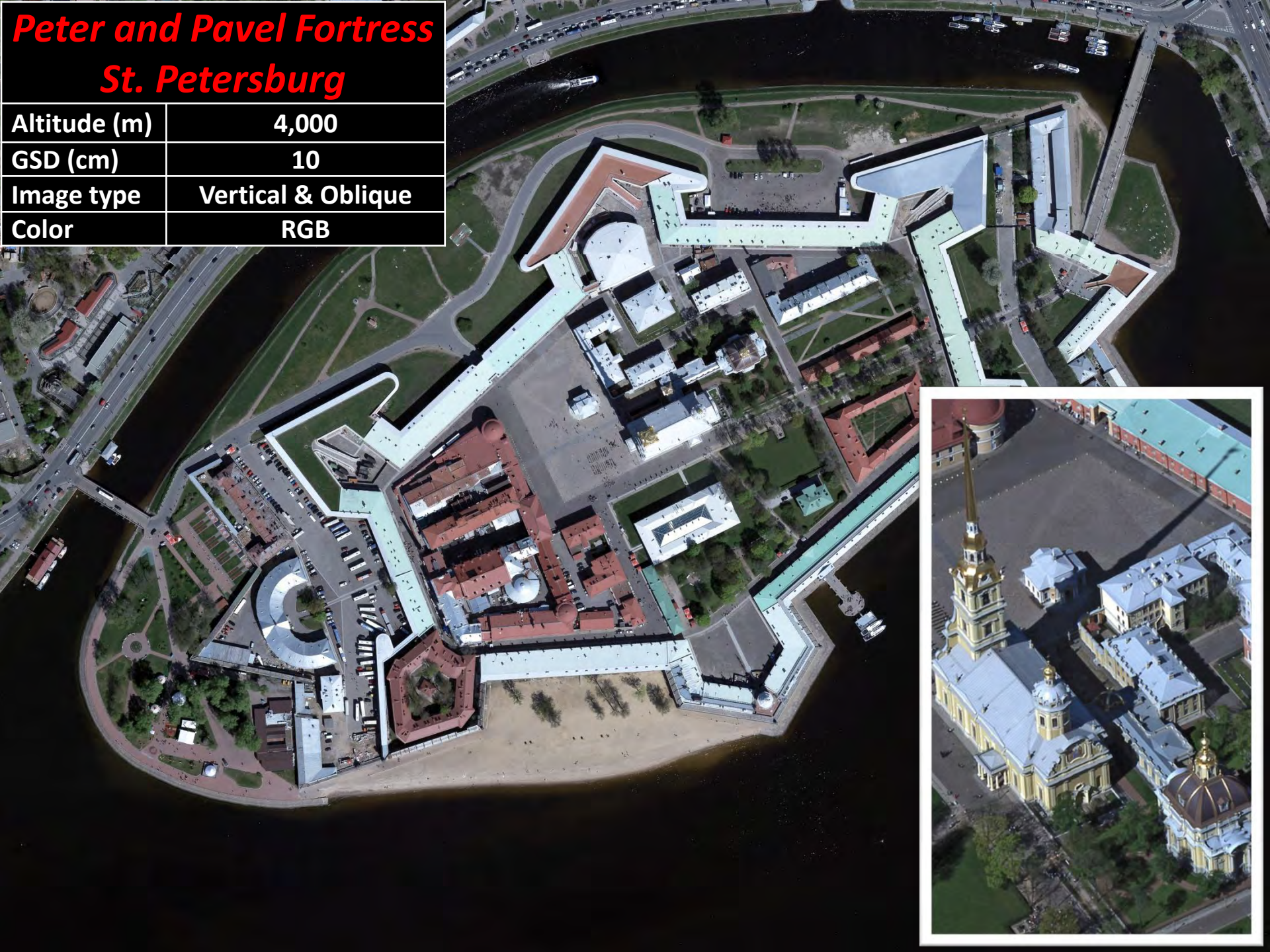


St. Isaac's Cathedral
St. Petersburg

Altitude (m)	4,000
GSD (cm)	10
Image type	Vertical & Oblique
Color	RGB

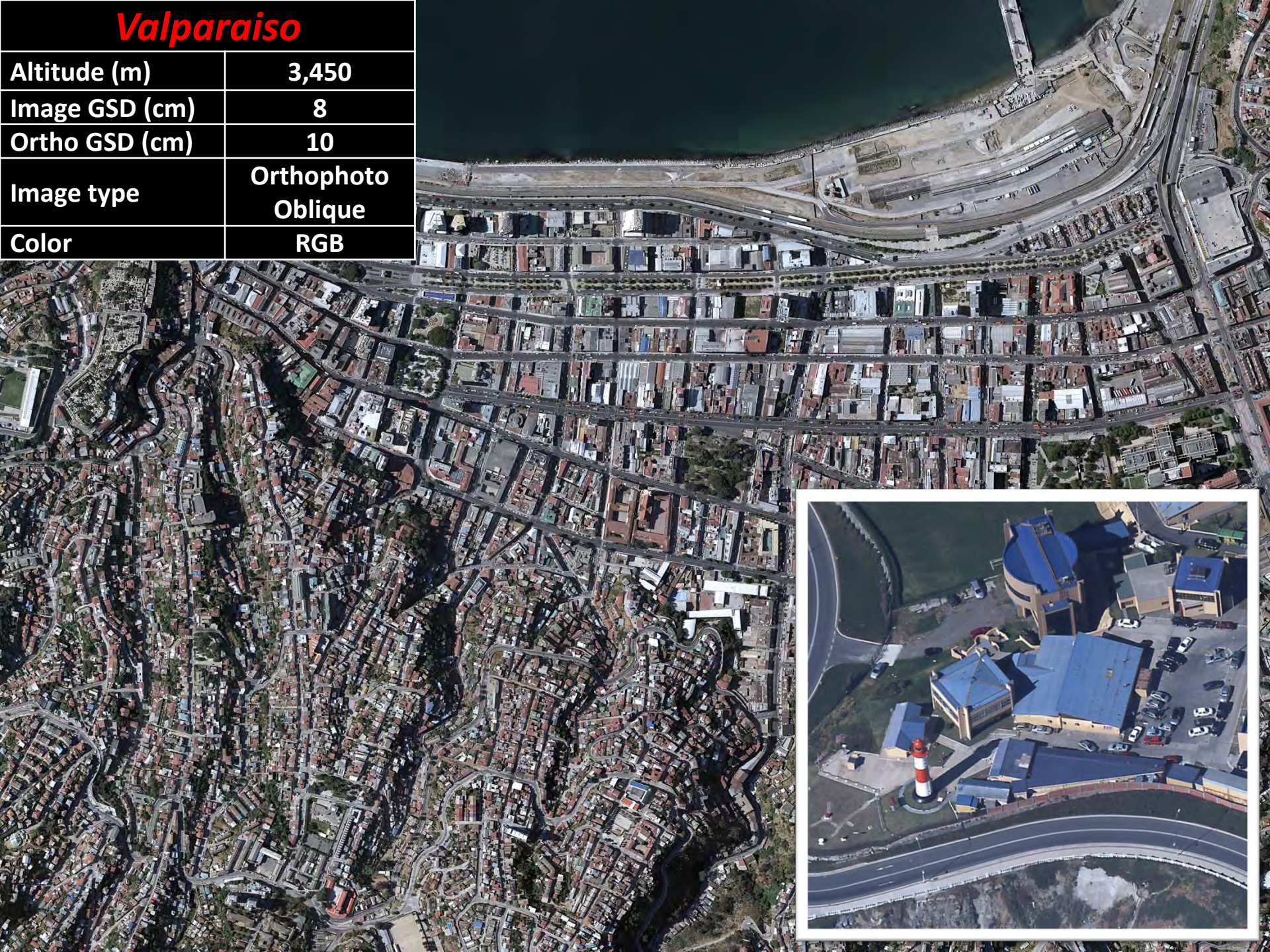
Peter and Pavel Fortress St. Petersburg

Altitude (m)	4,000
GSD (cm)	10
Image type	Vertical & Oblique
Color	RGB



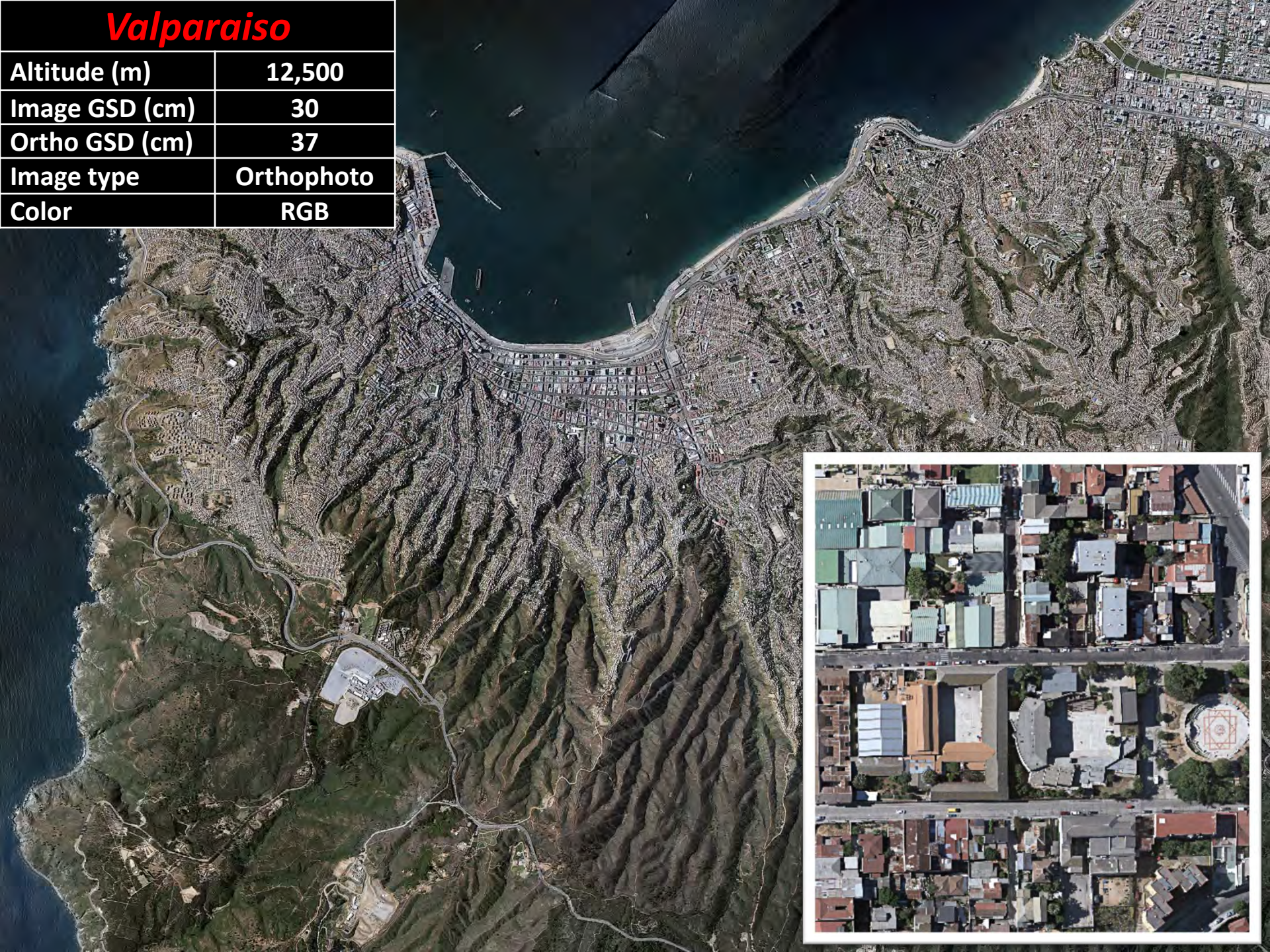
Valparaiso

Altitude (m)	3,450
Image GSD (cm)	8
Ortho GSD (cm)	10
Image type	Orthophoto Oblique
Color	RGB



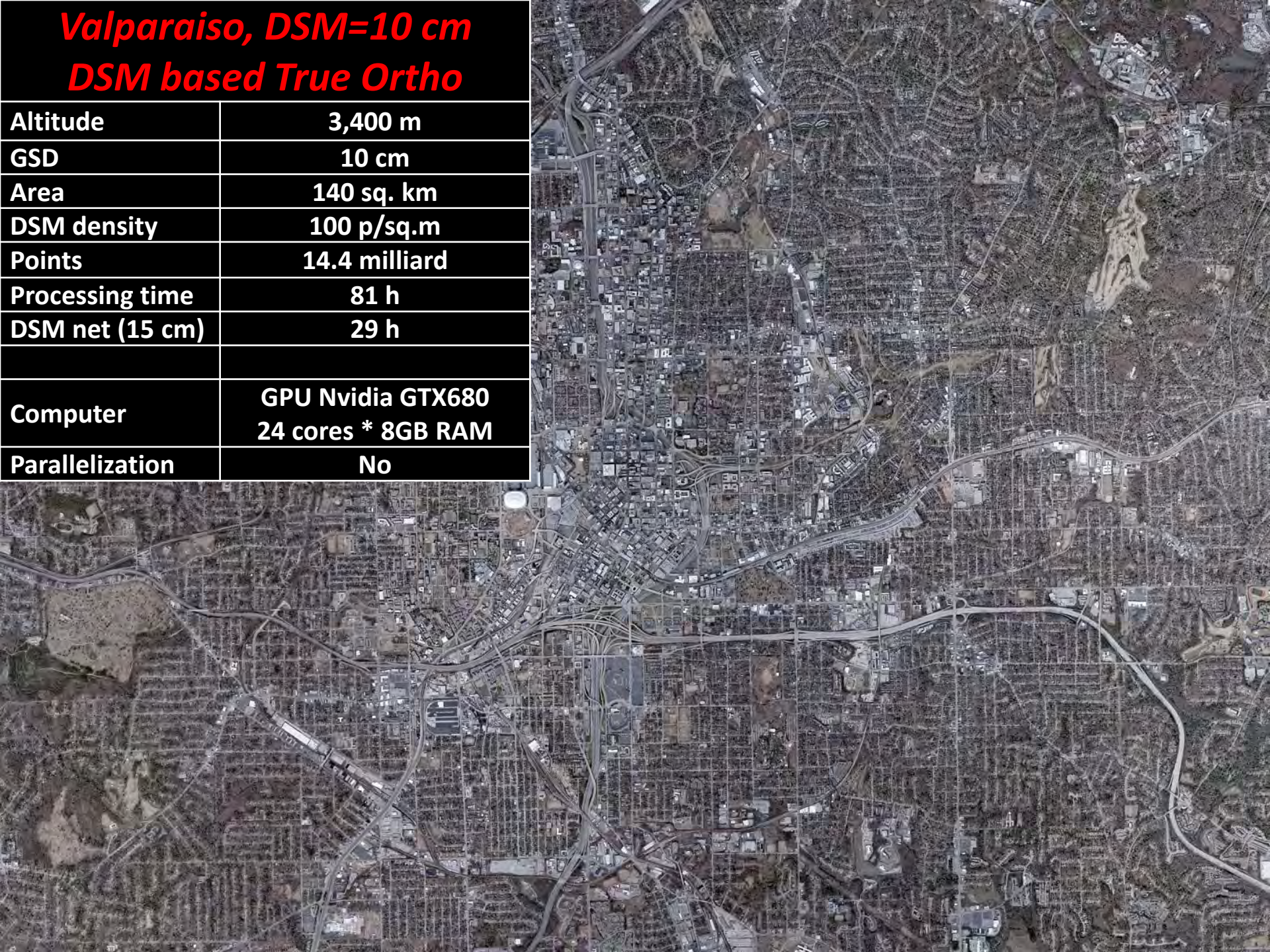
Valparaiso

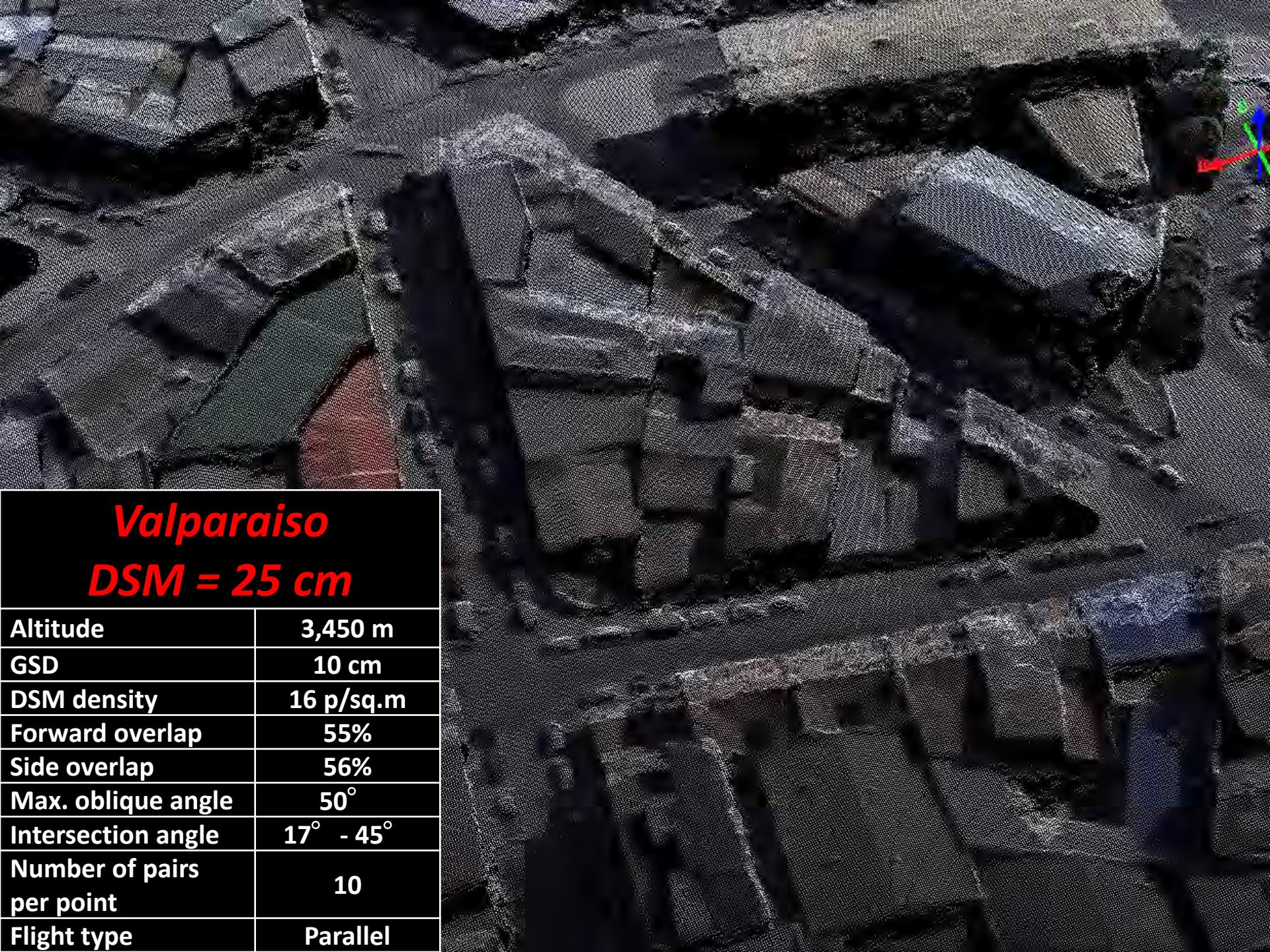
Altitude (m)	12,500
Image GSD (cm)	30
Ortho GSD (cm)	37
Image type	Orthophoto
Color	RGB



Valparaiso, DSM=10 cm
DSM based True Ortho

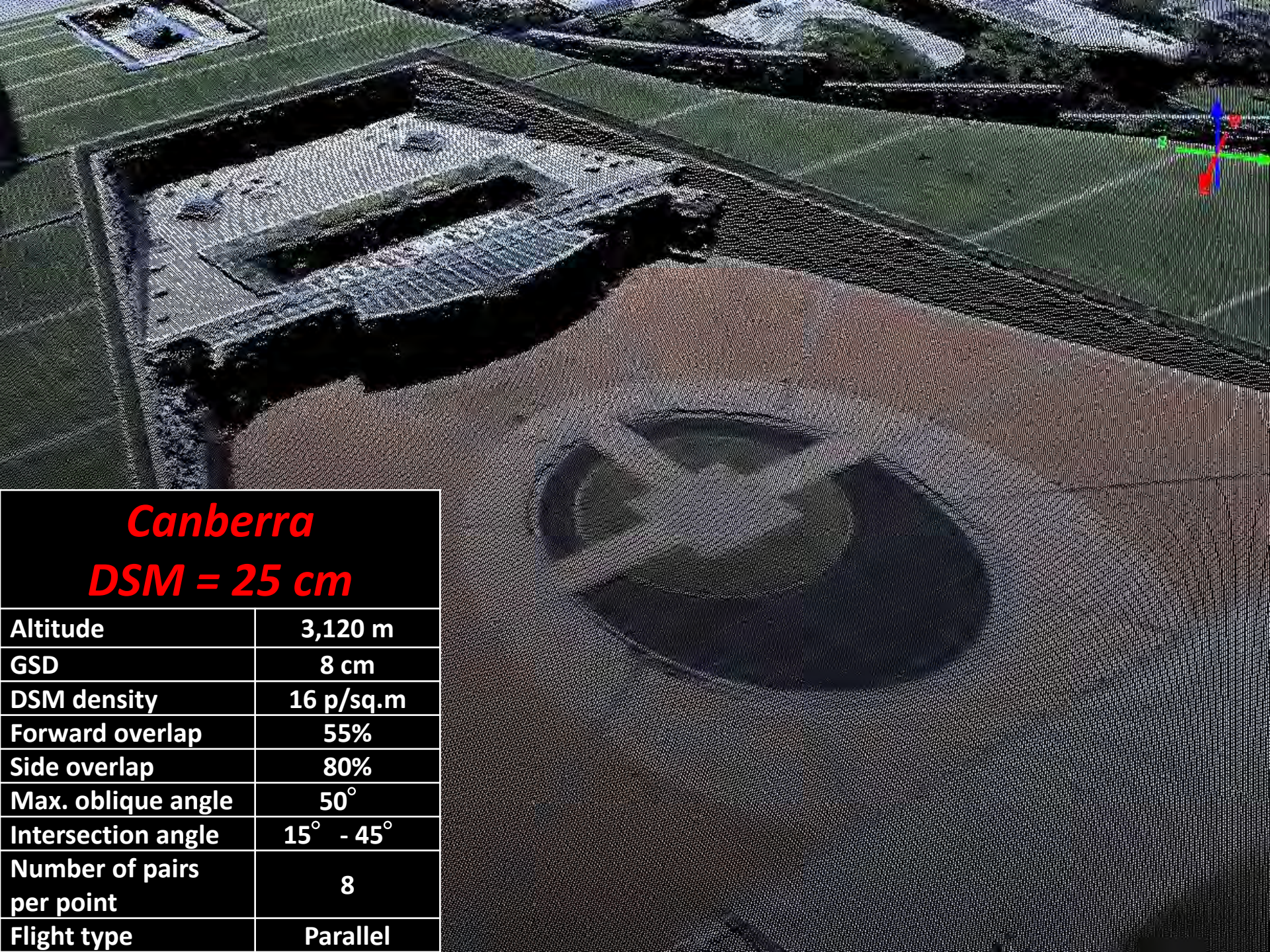
Altitude	3,400 m
GSD	10 cm
Area	140 sq. km
DSM density	100 p/sq.m
Points	14.4 milliard
Processing time	81 h
DSM net (15 cm)	29 h
Computer	GPU Nvidia GTX680 24 cores * 8GB RAM
Parallelization	No





Valparaiso DSM = 25 cm	
Altitude	3,450 m
GSD	10 cm
DSM density	16 p/sq.m
Forward overlap	55%
Side overlap	56%
Max. oblique angle	50°
Intersection angle	17° - 45°
Number of pairs per point	10
Flight type	Parallel

Valparaiso, DSM=25 cm
DSM based True Ortho



Canberra DSM = 25 cm	
Altitude	3,120 m
GSD	8 cm
DSM density	16 p/sq.m
Forward overlap	55%
Side overlap	80%
Max. oblique angle	50°
Intersection angle	15° - 45°
Number of pairs per point	8
Flight type	Parallel


Canberra, DSM=25 cm
DSM based True Ortho

A3 Edge oblique images with Oblivision

3D model with A3 Edge and Acute3D

Shateau Lapallise, France

Thank You

VISIONMAP

Digital mapping systems

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