Aerial Photo Scale, Ground Coverage and GSD

Scale of a vertical aerial photograph from focal length and flying height above terrain, ground coverage of the frame and ground sample distance for a pixel size.

Method: Scale of a vertical photograph

Input parameters

Unit system: SI

Parameter	Value	Unit
Camera focal length	152.40	mm
Flying height above datum	1,800.0	m
Average terrain elevation	280.00	m
Frame (format) width	230.00	mm
Pixel size	9.0000	µm

Calculated results

Parameter	Value	Unit
Scale (1 : ...)	9,973.8	
Ground width covered by the frame	2,294.0	m
Ground area of one photo	5.2623	km²
Ground sample distance	89.764	mm
Height above terrain	1,520.0	m

Notes for this case

• For a vertical photograph the scale at elevation h is S = f/(H − h), quoted as 1 : (H − h)/f. Scale varies with terrain height, so an average elevation gives an average scale. Ground coverage = frame width × scale denominator; ground sample distance = pixel size × scale denominator. Tilt and lens distortion are corrected in photogrammetric processing.

Formula and method

$$S = \frac{f}{H-h}, \quad G = \frac{w(H-h)}{f}, \quad GSD = p\frac{H-h}{f}$$

Variables

f	Camera focal length	m
H	Flying height above datum	m
h	Average terrain elevation	m
w	Frame (format) width	m
p	Pixel size	m
S	Scale (1 : ...)	-
G	Ground width covered by the frame	m
A	Ground area of one photo	m²
GSD	Ground sample distance	m
$H-h$	Height above terrain	m

Method and standards

Photo scale.

Assumptions and limits

- Vertical photograph; average terrain.

References

Scale of a vertical photograph

Report details

Report reference	FCC-63TY-YSCM (the same inputs always give the same reference)
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Calculator	Aerial Photo Scale, Ground Coverage and GSD
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Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/civil/surveying/photo-scale-flying-height

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.