STANDARD SYMBOLS FOR PHOTOGRAMMETRY*

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Committee on Nomenclature

IN 1943 the American Society of Photogrammetry adopted a set of standard definitions of terms. As something in the nature of a sequel, the Committee on Nomenclature now presents a set of symbols for use in discussing mathematical topics in photogrammetry. The work is still incomplete, however, and the definitions and symbols will require changes and additions as the need arises.

It is not strange that a young branch of science should find itself using a veritable hodge-podge of symbols in its writings and discussions. In fact, it is evidence of a rapid and healthy growth. But it is somewhat unusual that the members of such a group should frequently express an urgent desire for a standard system, and should cooperate so well in conceding some of their personal likes in order to make such a standard possible. This again, I feel, is evidence of healthy development.

The symbols presented here may serve as a nucleus for a more nearly complete set. The list includes only thirty-one terms which are in frequent usage and for which there is general agreement. It is felt that the set is not complete with regard to the discussion of oblique photographs, rectification, and plotting instruments. Undoubtedly there are also other groups of symbols which have been omitted. To add such other terms now would seem to require a considerable amount of time and more arbitrary decisions by the committee without sufficient precedent. Nevertheless, a more nearly complete set should not be delayed long. And your reaction, dear reader, is requested to expedite and formulate further developments.

The set of symbols which was selected is somewhat of a compromise between existing textbooks, recent magazine articles, and present practice in some of the offices engaged in photogrammetric mapping. A number of individuals outstanding in the field of theoretical and practical photogrammetry were consulted in the assembly of the list. They are

R. E. Altenhofen	O. M. Miller
R. E. Ask	R. H. Moore
H. C. Davey	J. T. Pennington
B. G. Jones	O. S. Reading
David Landen	E. J. Schlatter
J. G. Lewis	R. M. Wilson
P. G. McCurdy	L. A. Woodward

Although each term received the approval of a large majority of the group, it did not necessarily receive a unanimous approval.

An attempt was made to observe the following general principles in selecting the set:

1. All characters are presumed to appear in italics in texts.

2. English characters are used exclusively insofar as possible. Greek letters are used for representing angles where the use of English letters leads to confusion.

3. Lower case letters are used to designate points, lines, or angles pertaining to the photograph.

4. Upper case letters are used to designate points, lines, or angles pertaining to the ground, or with reference to a ground system of measurement.

5. The symbols are suggestive of the elements which they represent, and are usually the initial letters.

6. The terms are general rather than specific. For example, the letter f is used to represent focal length, but also may be used to mean any of several values such as calibrated focal length, equivalent focal length, or even principal distance, and may be specified by subscript if desired.

A list of the adopted standard terms and their definitions follows, after which a comparison table illustrates the differences in symbols used in recent writings. A key to the numbered columns of the table identifies the works in which the symbols appear.

STANDARD PHOTOGRAMMETRIC SYMBOLS

α, β, γ etc.	Any angles.
α	Azimuth angle.
B	Base length; physical distance between camera stations.
b	Base length at the scale of the photograph; the precise or approximate distance on the photograph corresponding to the actual physical Base Length.
dh, dP	Difference in height or elevation, difference in parallax. "d" is used here to imply difference, and not differential.
Dip	Dip angle (use all three letters); the angle between the true and apparent horizons due to flying height, curvature and refraction.
d	Displacement of a photographic image due to any cause.
f	Focal length of the air camera.
G_1, G_2, etc.	Ground stations or objects.
g_1, g_2, etc.	Photograph image points corresponding to the respective ground stations.
H	Height or elevation of the camera stations above sea level datum, unless specified otherwise.
h	Height or elevation of a ground station or object above sea level datum, unless specified otherwise.
I	Apparent ground position of the isocenter.
i	Isocenter on the photograph.
m	Magnification; a factor which denotes the ratio of a dimension on a photographic enlargement to the corresponding dimension on the negative.
N	Nadir point, apparent ground positions; ground plumb point.
n	Nadir point on the photograph.
O	Origin point of perspective, lens point, camera station; origin of a system of space coordinates relative to a photograph.
p	Principal point.
P	Parallax.
P_x	x—parallax corresponding to elevation difference.
P_y	y—parallax, lack of correspondence.
r	Radial distance from any specified photograph center to an image.
S	Scale; in any one of several forms such as a common fraction, representative fraction, decimal fraction.
s	Swing angle.
T	Tilt of the camera axis from the horizontal as of an oblique photograph; depression angle. $T+t=90°$.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
α			A		α												
α,β,γ		α,β,γ	α,β,γ		α,β,γ	α,β,γ	α,β,γ	α,β,γ	α,β,γ								
B	p				B	b		B		B		B	B		B		
b													b				
dh, dP			d					dh, dp		dh, dp		ΔD					
Dip				Dip	D			δ		D'							
d		m, e	d		d					Z		$\Delta D, d$	d	d	r_d		
f	F, f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f
G_1, G_2	B	A, B			A, B	P						A, B	X				
g_1, g_2	b	a, b	A, B, C		a, b	P'						a, b	x				
H	H, x	H	Z	h	H	h	h, Z	H	H	H	Z_c	H	H	H	H	Z'	
h	χ	h	h		h			h		h	Z_g	h	h	h	h		
I					I												
i		i	M		i		J	I	i		j	m	i	i	i		
m							M					m			r		
N					V		N'	V		V	N	N	V	N'		N	
n		v	V		v	N		v	v	V'	n	n	v		n		
O	T	L	S	O	L	O	S	S	S	L	C	L	L	S	O	C	O
p	P	o	C	P	o		O		p	P	p	c	P	O	p		
P	y		p		p	p	p			p		p	P		$x - x'$		
P_x																	
P_y																	
r					r	r								r	l		
S	S	S			S	m					S_c		S	S	S		
s					s	χ	κ										
T		α	α	D	i			α		θ	T					i	
t		t	i	θ	t	ν, ω	Υ	θ	θ	t		ϕ	δ	ν	t		θ
t_x																	
t_y																	
X, Y, Z					X, Y, Z	X, Y, Z	X, Y, Z				X, Y, Z						
x, y, z					x, y, z	x, y, z	x, y, z				x, y, z						

t Tilt of the camera axis from the vertical as of a near vertical photograph; resultant tilt, not a component.

t_x x—tilt; angular component of the resultant tilt measured about the x-axis.

t_y y—tilt; angular component of the resultant tilt measured about the y-axis.

X, Y, Z Axes for a ground system of Cartesian coordinates.

x, y, z Axes for a photograph system of Cartesian coordinates.

KEY TO TABLE

1. The Standard Photogrammetric Symbols presented in this article.

2. Abrams, Talbert; *Essentials of Aerial Surveying and Photo Interpretations*, 1944.

3. Anderson, Ralph O.; *Applied Photogrammetry*, 1941.

4. Bagley, James W.; *Aerophotography and Aerosurveying*, 1941.

5. Topographical Survey Bulletin No. 62, Department of Interior, Canada, *The Use of Aerial Photographs for Mapping*.

6. Church, Earl; *Elements of Aerial Photogrammetry*, 1944.

7. Committee for Standardized Terminology, Germany; *Definitions and Formulas in Photogrammetry*, 1937.

8. von Gruber, O.; *Photogrammetry*, 1932.

9. Hart, C. A.; *Air Photography Applied to Surveying*, 1940.

10. Hotine, M.; *Surveying from Air Photographs*, 1931.

11. McCurdy, P. G.; *Manual of Aerial Photogrammetry*, 1940.

12. Miller, O. M.; Topographic Mapping from High Oblique Air Photographs in *Manual of Photogrammetry*, 1940.

13. Sharp, H. O.; *Photogrammetry*, 1943.

14. Smith, H. T. U.; *Aerial Photographs and their Applications*, 1943.

15. Talley, B. B.; *Engineering Applications of Aerial and Terrestrial Photogrammetry*, 1938.

16. Whitmore, G. D.; *Elements of Photogrammetry*, 1941.

17. Wilson, R. M.; Oblique Photographs for the Surveyor in *Manual of Photogrammetry*, 1944.

18. Reconnaissance Mapping with Trimetrogon Photography, prepared by U. S. Army Air Forces, in *Manual of Photogrammetry*, 1944.

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