

ภาคผนวก ข.
ข้อมูลข้อกำหนดทางเทคนิค

**เอกสารอ้างอิง

ที่มา : ICAO DOC 9881

(Guidelines for Electronic Terrain, Obstacle and Aerodrome Mapping Information)

International Civil Aviation Organization (ICAO)

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ภาคผนวก ข. ข้อมูลประกอบข้อกำหนดทางเทคนิค

TABLE C.1 RECOMMENDED NUMBER OF CHECKPOINTS BASED ON AREA

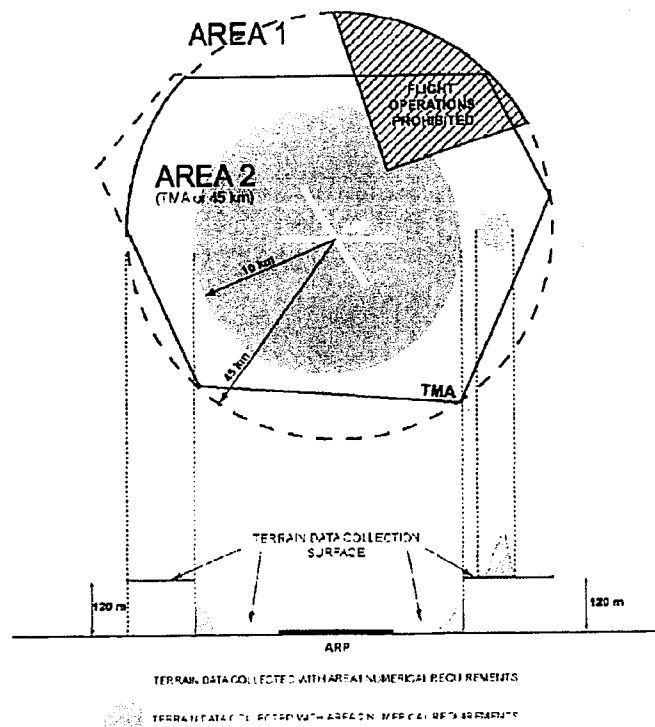
Project Area (Square Kilometers)	Horizontal Accuracy Testing of Orthoimagery and Planimetrics	Vertical and Horizontal Accuracy Testing of Elevation Data sets		
	Total Number of Static 2D/3D Checkpoints (clearly-defined points)	Number of Static 3D Checkpoints in NVA ¹	Number of Static 3D Checkpoints in VVA	Total Number of Static 3D Checkpoints
500	20	20	5	25
501-750	25	20	10	30
751-1000	30	25	15	40
1001-1250	35	30	20	50
1251-1500	40	35	25	60
1501-1750	45	40	30	70
1751-2000	50	45	35	80
2001-2250	55	50	40	90
2251-2500	60	55	45	100

¹Although vertical check points are normally not well defined, where feasible, the horizontal accuracy of lidar data sets should be tested by surveying approximately half of all NVA check points at the ends of point stripes or other point features that are visible and can be measured on lidar intensity returns.

ภาพที่ ข-1 จำนวนจุดตรวจสอบ

ที่มา: The American Society for Photogrammetry and Remote Sensing (ASPRS), 2014. ASPRS POSITIONAL STANDARDS FOR DIGITAL GEOSPATIAL DATA, *PE&RS Vol.81, No.3, March 2015, pp.*

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ภาพที่ ข-2 พื้นผิว Terrain collection surface

Handwritten signatures and initials are present in the bottom right corner of the page.

Quality attributes	Area 2 — Terminal Airspace
Horizontal Accuracy	5.0 m
Data Integrity	Essential (10^{-5})
Vertical Accuracy	3.0 m
Vertical Resolution	0.1 m
Confidence Level (1σ)	90%
Post Spacing	1.0 arc second (30 m)

ภาพที่ ข-3 ข้อกำหนดด้านคุณภาพแบบจำลองภูมิประเทศเชิงเลข สำหรับบริเวณ Area 2

Quality attributes	Area 3 — Aerodrome Mapping
Horizontal Accuracy	0.5 m
Data Integrity	Essential (10^{-5})
Vertical Accuracy	0.5 m
Vertical Resolution	0.01 m
Confidence Level (1σ)	90%
Post Spacing	0.6 arc second (20 m)

ภาพที่ ข-4 ข้อกำหนดด้านคุณภาพแบบจำลองภูมิประเทศเชิงเลข สำหรับบริเวณ Area 3

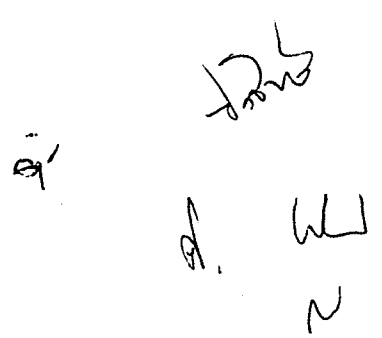
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Attribute	Mandatory Optional
Area of Coverage	Mandatory
Data Source Identifier	Mandatory
Acquisition Method	Mandatory
Post spacing	Mandatory
Horizontal Reference System	Mandatory
Horizontal Resolution	Mandatory
Horizontal Accuracy	Mandatory
Horizontal Confidence Level	Mandatory
Horizontal Position Data	Mandatory
Elevation	Mandatory
Database Units	Mandatory
Elevation Reference	Mandatory
Vertical Reference System	Mandatory
Vertical Resolution	Mandatory
Vertical Accuracy	Mandatory
Vertical Confidence Level	Mandatory
Surface Type	Mandatory
Recorded Surface	Mandatory
Penetration level	Optional
Known Variations	Optional
Integrity	Mandatory
Date and Time Stamp	Mandatory

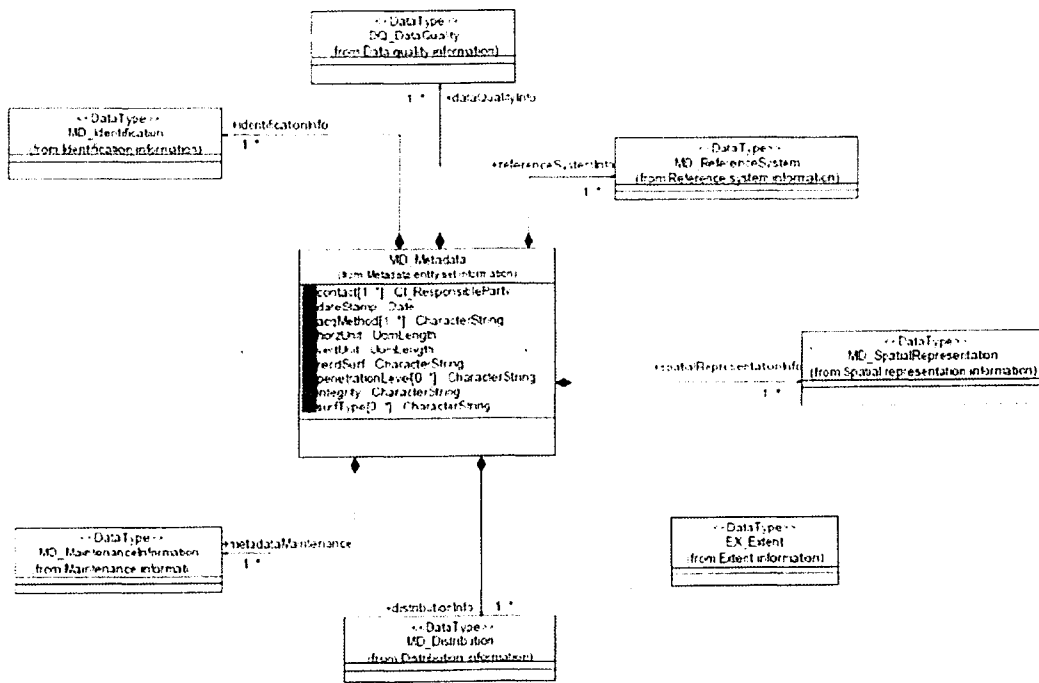
ภาพที่ ข-5 ข้อกำหนดส่วนข้อมูลคุณลักษณะ (Attribute) ของแบบจำลองภูมิประเทศเชิงเลข



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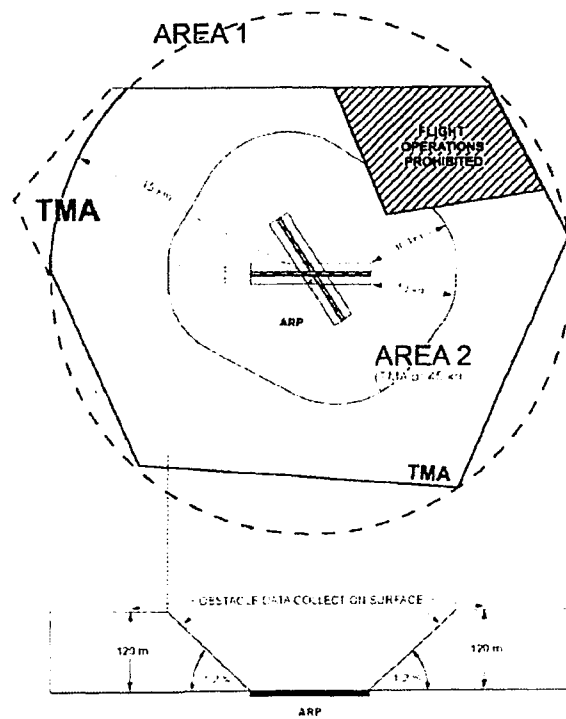
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ภาพที่ ข-6 แสดงภาพรวมของรายการข้อมูล Metadata สำหรับแบบจำลองภูมิประเทศเชิงเลขในรูปแบบ UML

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ภาพที่ ข-7 Obstacle collection surface

Quality Attributes	Area 2 — Terminal Control Area
Horizontal Accuracy	5.0 m
Data Classification and Integrity Level	Essential (10^{-7})
Vertical Accuracy	3.0 m
Vertical Resolution	0.1 m
Confidence Level (1σ)	90%
Maintenance period	As required

ภาพที่ ข-8 ข้อกำหนดด้านคุณภาพสิ่งกีดขวาง สำหรับบริเวณ Area 2

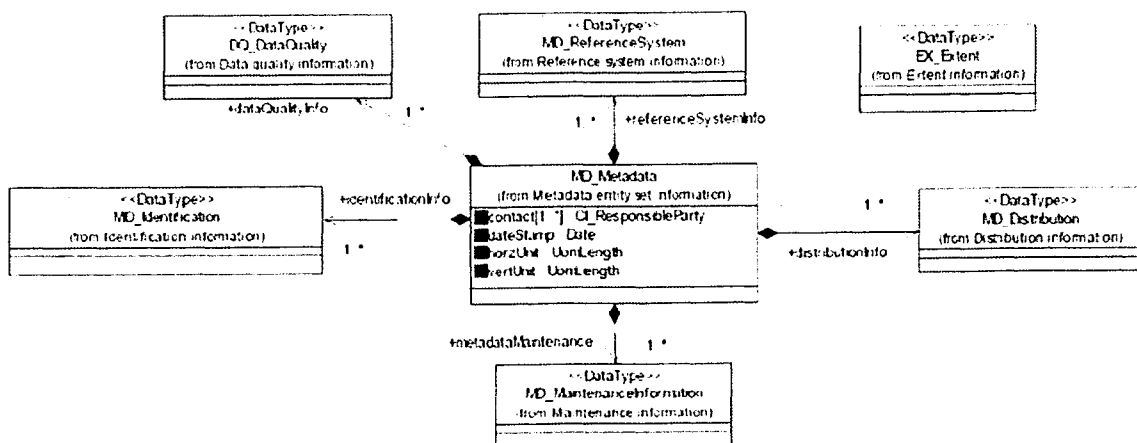
Quality Attributes	Area 3 — Aerodrome/Heliport Area
Horizontal Accuracy	0.5 m
Data Classification and Integrity Level	Essential (10^{-5})
Vertical Accuracy	0.5 m
Vertical Resolution	0.01 m
Confidence Level (1σ)	90%
Maintenance period	As required

ภาพที่ ข-9 ข้อกำหนดด้านคุณภาพสิ่งกีดขวาง สำหรับบริเวณ Area 3

Handwritten notes and signatures in the bottom right corner, including a signature and the letters 'A', 'W', and 'M'.

Attribute	Mandatory/ Optional	Type of attribute
Area of Coverage	Mandatory	Metadata
Data Originator Identifier	Mandatory	Feature Attribute
Horizontal Position Data	Mandatory	Feature Attribute
Horizontal Reference System	Mandatory	Metadata
Horizontal Resolution	Mandatory	Metadata
Horizontal Extent	Mandatory	Feature Attribute
Horizontal Accuracy	Mandatory	Feature Attribute
Horizontal Confidence Level	Mandatory	Feature Attribute
Elevation	Mandatory	Feature Attribute
Height	Mandatory	Feature Attribute
Database Units	Mandatory	Metadata
Vertical Reference System	Mandatory	Metadata
Vertical Resolution	Mandatory	Metadata
Vertical Accuracy	Mandatory	Feature Attribute
Vertical Confidence Level	Mandatory	Feature Attribute
Obstacle Type	Mandatory	Feature Attribute
Integrity	Mandatory	Feature Attribute
Date and Time Stamps	Mandatory	Feature Attribute
Effectivity	Optional	Feature Attribute
Status	Mandatory	Feature Attribute
Lighting	Mandatory	Feature Attribute
Marking	Mandatory	Feature Attribute
Geometry	Mandatory	Feature Attribute

ภาพที่ ข-10 ข้อมูลคุณลักษณะ (Attribute) ของสิ่งกีดขวาง



ภาพที่ ข-11 แสดงภาพรวมของรายละเอียดความเป็นมาของข้อมูล (Metadata)

สำหรับข้อมูลสิ่งกีดขวางในรูปแบบ UML

Handwritten notes and signatures in the bottom right corner, including a signature and the letters 'AP', 'WU', and 'W'.

Table 4-5. Horizontal data quality requirements
(All values in meters. NS denotes not specified)

Data Element	Data Derivation	Fine			Medium			Coarse			Max Error
		A	R	I	A	R	I	A	R	I	
Runway elevation	S	1	0.1	C	5	0.1	-	30	1	-	-
Runway intersection	S	1	0.1	C	5	0.1	-	30	1	-	-
Runway threshold	S	1	0.1	C	5	0.1	-	NS	NS	-	1
Painted centerline	S	0.5	0.01	C	5	0.1	-	NS	NS	-	2
LAIISD	S	1	0.1	R	5	0.1	-	NS	NS	-	1
Advertising gear location	S	1	0.1	-	5	0.1	-	30	1	-	-
Runway shoulder	S	1	0.1	-	5	0.1	-	30	1	-	-
Stopway	S	1	0.1	-	5	0.1	-	30	1	-	-
Runway displaced area	S	1	0.1	C	5	0.1	-	30	1	-	-
Runway markers	as charted	NS	NS	-	NS	NS	-	NS	NS	-	-
FATO	S	1	0.1	C	5	0.1	-	5	0.1	-	-
ILUF	S	1	0.1	C	5	0.1	-	5	0.1	-	-
Helipad threshold	S	1	0.1	C	5	0.1	-	NS	NS	-	-
Taxiway element	S	1	0.1	-	5	0.1	-	5	0.1	-	-
Taxiway shoulder	S	1	0.1	-	5	0.1	-	5	0.1	-	-
Taxiway guidance line	S	0.5	0.01	C	5	0.1	-	NS	NS	-	2
Taxiway intersection marking	S	0.5	0.01	C	5	0.1	-	NS	NS	-	-
Taxiway holding position	S	1	0.1	-	5	0.1	-	NS	NS	-	1
Runway end line	S	0.5	0.01	C	5	0.1	-	NS	NS	-	2
Frequency area	C	NS	NS	-	NS	NS	-	NS	NS	-	-
Apron	S	1	0.1	-	5	0.1	-	30	1	-	-
Stand guidance line	S	0.5	0.01	E	5	0.1	-	NS	NS	-	2
Parking stand location	S	0.5	0.01	E	5	0.1	-	30	1	-	2
Parking stand area	C	1	0.1	-	5	0.1	-	30	1	-	-
Design area	S	1	0.1	-	5	0.1	-	30	1	-	-
Vertical polygonal objects	S	0.5	0.1	E	5	0.1	-	30	1	-	-
Vertical point objects	S	0.5	0.1	E	5	0.1	-	30	1	-	-
Vertical line objects	S	0.5	0.1	E	5	0.1	-	30	1	-	-
Construction area	S	1	0.1	-	5	0.1	-	5	0.1	-	-
Aeronautical reference point	C	30	1	R	30	1	R	30	1	R	-
Survey control point	S	0.5	0.01	E	0.5	0.01	E	NS	NS	-	-
Service road	S	1	0.1	-	5	0.1	-	30	1	-	-
Airframe boundary	C	NS	NS	-	NS	NS	-	NS	NS	-	-

Table 4-6. Vertical data quality requirements
(All values in meters. NS denotes not specified)

Data Element	Data Derivation	Fine			Medium			Coarse			Max Error
		A	R	I	A	R	I	A	R	I	
Runway threshold (non-precision)	S	0.5	0.1	E	NS	NS	-	NS	NS	-	1
Runway threshold (precision)	S	0.25	0.01	C	NS	NS	-	NS	NS	-	-
Painted centerline	S	1	0.1	-	NS	NS	-	NS	NS	-	0
Helipad threshold	S	0.5	0.1	C	NS	NS	-	NS	NS	-	-
Survey control point	S	0.25	0.01	E	NS	NS	-	NS	NS	-	-
Threshold elevation (non-precision)	S	0.5	0.1	E	NS	NS	-	NS	NS	-	1
Threshold elevation (precision)	S	0.25	0.01	C	NS	NS	-	NS	NS	-	-
Max height of vertical object	C	1	0.1	E	1	0.1	-	NS	NS	-	-
Max elevation of vertical object	S	1	0.1	E	1	0.1	-	NS	NS	-	-
Touchdown zone elevation	S	1	0.1	-	1	0.1	-	NS	NS	-	-

Table 4-7. Angular data quality requirements

Data Element	Data Derivation	Fine			Medium			Coarse			Max Error
		A	R	I	A	R	I	A	R	I	
True runway bearing	C	0.01'	0.01'	R	0.5'	0.01'	-	15'	0.1'	-	-
Magnetic runway bearing	S	0.01'	0.01'	R	0.5'	0.01'	-	15'	0.1'	-	-

Table 4-8. Dimensional data quality requirements
(All values in meters unless otherwise stated. NS denotes not specified)

Data Element	Data Derivation	Fine			Medium			Coarse			Max Error
		A	R	I	A	R	I	A	R	I	
Width of runway	C	0.5	0.01	R	1	0.1	-	5	0.1	-	-
Length of runway	C	1	0.1	C	5	0.1	-	30	1	-	-
Touchdown zone longitudinal slope	C	0.1%	0.01%	-	NS	NS	-	NS	NS	-	-
Runway slope	C	0.1%	0.01%	-	NS	NS	-	NS	NS	-	-
Take-off run available	C	1	0.1	E	5	0.1	-	30	1	-	-
Take-off distance available	C	1	0.1	E	5	0.1	-	30	1	-	-
Accelerating-stop distance avail	C	1	0.1	E	5	0.1	-	30	1	-	-
Landing distance available	C	1	0.1	C	5	0.1	-	30	1	-	-
Radius about center of obstacle	S	1	0.1	-	5	0.1	-	30	1	-	-
Max height of point structure	C	1	0.1	-	5	0.1	-	30	1	-	-

ภาพที่ ข-12 ข้อกำหนดเชิงตัวเลข (Numerical requirements) สำหรับการจัดทำข้อมูล AMDB

Handwritten signatures and initials:
 1. A signature that appears to be "จันทน์" (Chantana).
 2. Initials "H. W."
 3. Initials "W"
 4. A small mark resembling "๑" (one).