9. Field identification survey

The field identification techniques that the Survey Department are using in the UTM project were investigated, and on the basis of this investigation the work method for efficient implementation of the field identification was constructed. The Study Team carried out the survey efficiently and within a limited time by utilizing mobility and digital techniques.

9.1 The method of field identification

In Japan, field identification is generally carried out prior to the process of digital mapping, and is the task of preparing the materials used in the acquisition of the topographic features data in the digital mapping process.

For the Myanmar Survey Department, field identification is done after the digital processing and is a process to confirm that the digital mapping has been done correctly. Field identification is done only once in the topographical mapping.

The method adopted is to superimpose an existing topographic map over the acquired data carry out a light-penetration inspection and then verify conflicting items in the field. Of course, when the field survey reveals topographic features that are missing, the missing items are added.

After the digital compilation, the supplementary field survey is done in Japan to resolve and verify questionable points arising in the compilation. In other words, the field survey is carried out twice. Because this Study had the chance to do field studies twice, the Study Team decided n a compromise.

9.2 Use of digital technologies

In this Study, the following digital technologies were used in the execution of the field identification survey.

9.2.1 Use of handy GPS

Topographic features that cannot be obtained from aerial photographs, such as line features (power transmission lines, pipelines, etc.) and facilities (pagoda and government facilities), can be acquired in the field identification using handy GPS.

9.2.2 Preparation of annotated sheets

These data were plotted onto corresponding sheets and prepared as annotated sheets. These annotated sheets were brought out to the field. The confirmation of place names and correction of place name spellings was done easily and efficiently.

9.2.3 Preparation of field identification materials

At 50cm x 50cm, the map sheets were too big to bring to the field, and enter survey results. Original topographic data were stored in digital form, making it very easy to output small sections.

It was decided to prepare each map sheet into 9 parts.

When a new place name was acquired in the field, its position was acquired by handy GPS.

9.3 Experimental work in Yangon city

Experimental work for field identification was carried out in Yangon City to provide training in handy GPS and photo-interpretation. The attribute information acquired, such as buildings, was used to create GIS base data. Field identification was conducted for 6 days from October 28 to November 4, together with counterparts.

Field identification mainly gathers the names of structures and the position information of public buildings as point data, using handy GPS. The positioning data acquired were converted to the Myanmar 2000 system and saved to disc. This information will be prepared as a data file with a classification code and named as attribute information.

Point data was acquired for the following structures.

Church (3), Embassy (28), Government office (168), Hospital (16), Hotel (22), Museum (13), Pagoda (132), Police Station (44), Post Office (61), State High School (125), University / College (37)

*The numbers in parentheses show the number of structures for which data was acquired.

9.4 Preliminary Study

Prior to the commencement of the actual Field Identification, a Field Identification trial was carried out to standardize the work content.

The results of the trial work provide guidance to what problems are likely to occur.

Moreover, the volume of total work, standard man-hours, local conditions and problems are understood beforehand.

A more detailed plan for the actual Field Identification was drawn up.

The duration of the trial was four days from 28th October 2002 to 4th November 2002.

The trial covered 2 map sheets, 1764-09 and 1764-13.

2 parties were organized, and participation was by one member of the Study Team and five counterparts from the Survey Department.

Because existing maps were old and did not show the current state, use was made of orthophotos that had been made in this Study for reconnaissance of a road that had been newly constructed at this time.

1) Grasp of overview of Study area
-Current changes from existing topographical maps
-Investigation of access within the Study area, and the time required between main villages
-Accommodation and state of electric power supply in Study area
2) Main items investigated
-Position and type of Benchmarks
-Classification of bridge size
-Railway bridges and power transmission lines
- Names of rivers and direction of flow
3) Place name survey
-Place name and administrative classification
-Confirmation of place names by asking villagers
4) Collection of information
-Large-scale map of main towns (Pathein, Dedaye, Labutta, Bogalay, Moulmeingyun, Khayan)
Population statistics data

9.5 Actual field identification

9.5.1 Preparation of materials for field identification

1) The following materials were prepared before commencement of the survey:
2) Output of topographic map data
3) Orthophoto
4) Superimposed prints of orthophoto and topographic map data
5) Existing topographic maps, scale 1:63,360
6) Annotated sheets
7) Description of bench marks

9.5.2 Execution of field identification

The field identification was carried out by the Japanese Study Team, SD counterparts and locally-hired engineers.
The field identification was carried out over 68 days, from 9th December 2002 to 14th February 2003.

The field survey group was organized into 4 groups, each supervised by one chief counterpart. One group was composed of 2 engineers and one assistant.
Those engineers and assistants worked individually for the field identification.

9.6 Sorting of results

The items confirmed in the field were sorted and prepared as material for use in digital compilation.

9.6.1 Sorting of materials

The following materials were prepared after the field identification:

1) Field identification sheets
   Sorting used the following abbreviations:
   OK (No change), D (Delete), M (Correction or Modification), C (Check), A (Addition), G (Re-plotting or Data acquisition)
2) Administrative boundaries
   A classification table was drawn up for Districts, Townships and Towns
3) Index maps for road rank
   Road index maps were prepared classifying Highway, Main Road, Secondary Road and Other Road.
4) Field photos
   Photos of many facilities and views were taken during the field identification.
   These photographs were sorted into a photo album.

9.6.2 Method of field identification by SD

The SD does not carry out the field identification work using aerial photo prints prior to stereo restitution. When digital plotting is done, topographic features are acquired by photo interpretation using a stereo plotter. The field identification is carried out after digital plotting using the draft map output from a printer.

1) Photo interpretation
   Topographic features to be interpreted in stereoscopic view in the digital plotter are acquired as topographic data. These acquired topographic data are output as a draft map from a printer and inspected overlaid on the existing map using a light table. Dubious items are confirmed and corrected on a stereo-plotter.

2) Field identification

Obscurities in photo interpretation are confirmed in the field identification work. In the field identification, draft maps, existing maps, aerial photos and handy GPS (Magellan GPS 315) are brought into the field. Polyester bases were overlaid on aerial photo prints and items verified in the field were arranged on the overlay.

The method is very time-consuming, and a more efficient method of doing this should be considered.

3) Survey of place names

Place names were verified in the field survey. The names collected were arranged on an annotated confirmation sheet. The place names were written down in the Myanmar language first, and then transcribed into English. The collected place names were verified and arranged into a gazetteer, after the spelling of the names had been checked by Home Affairs.

9.6.3 Collection and sorting of materials and information

The materials collected were as follows:

- Map of Yangon (1996), Yangon City Development Committee
- Myanmar Facts and Figures (2002), Ministry of Information Union of Myanmar 2002
- Myanmar Yellow Pages 2002, IMEX (Myanmar) Co. LTD.
- Gazetteer of Burma, Director of Survey (India) 1944

Moreover, place names and the locations of Pagodas and monasteries were read using existing topographical maps and a database of annotations was prepared.

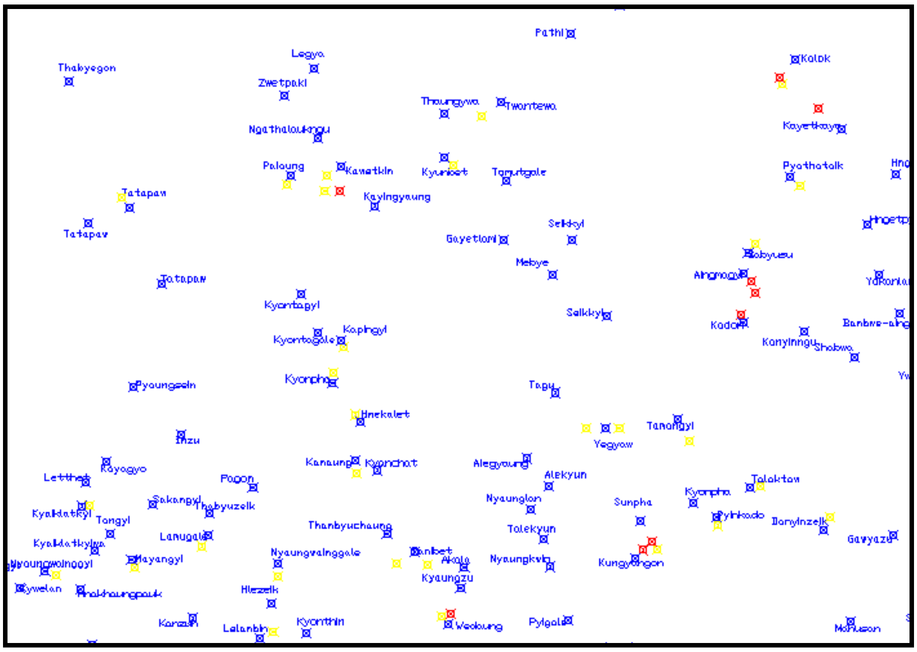


Figure 9.6.1 Results of importing place names from old maps

9.6.4 Determination of field identification items and preparation of photo-interpretation cards

The various field identification items were examined and classified into the following three groups.

- -Features that can be acquired with mapping instruments
- -Feature that can be acquired by field identification
- -Features to be acquired from information, materials

The interpretation criteria were standardized by preparing photo-interpretation cards for features with major interpretation mistakes

10. Digital compilation

In order to prepare the topographic data, the topographic data initially acquired by digital mapping were compiled digitally in accordance with the specifications. Three types of digital compilation system which are very popular and widely used were used for the digital compilation.

1) Autodesk Map System
2) Microstation system
3) TNTmips System

10.1 Preparation

The acquired topographic map data was checked for the duplication of points and the omission of lines, and modified. This is called cleaning.

1) Duplicated points and lines should be detected and deleted.
2) Intersecting lines were detected and modified.
3) Lines should not be segmented at crossing points.
4) Redundant nodes should be deleted
5) Fragmented lines should be connected.
6) Overshot lines should be detected and modified.
7) Undershot lines should be detected and modified.
8) Dangles operation should be detected and modified.

10.2 Execution of Digital compilation

After data cleaning, the topographic maps were compiled as follows:

(1) Addition of field verification results

(2) Detection of leakage of topographic features and addition of their data

(3) Sorting of annotated data

Annotated data was sorted and inspected after digital compilation based on the field verification results.

1) Preparation of name list

A name list was made using the attribute management function of the digital compilation system.

2) Check of name data

Spellings were checked based on the name list.

3) Compilation of contour lines and spot heights

Contour lines in this Study were composed of index contour lines, main contour lines and supplementary contour lines. The correspondence between spot height and contour line height was checked. If there was any discrepancy between the spot height and the contour line, the contour line was modified.

Then, the contour line shape was edited to give a correct representation of the geographical features.

4) Connections

After checking the connections between adjoining sheets, discrepancies were corrected.

The Study area was divided into two blocks of the UTM, zone 46 and zone 47.

Where the map connection joins different zones, the coordinates of identical items were different.

Therefore, the figure data was imported into the computer, and editing was done to match the node point of the figure to the joint line.

5) Preparation and checking of closed polygon data

The closed polygon data was generated, and plane data was generated for the arrangement of patterns and coloring within the polygon

The plane data generated were as follows:

-Famous construction
-Dense and sparse forest
-Cultivated area
-Grass and bush
-Orchard and plantation
-Built up area
-River, Lake, Reservoir, Sea
-Mud area
-Swamp
-Mangrove
-Sand
-Golf field, Cemetery, Airfield
-Administrative zone

(4) Sorting of administrative data

Administrative boundaries are often used in GIS data. Therefore, accuracy is required in administrative boundary data.

1) Import the raster data of administrative boundaries

The administrative information maps collected were scanned by scanner and recorded as geo-referenced raster data.

The administrative data acquired was checked by super-imposing the geo-referenced raster data. Locations where any contradiction was found were checked again and the administrative boundary corrected.

2) Connection between map sheets

The connections of administrative boundaries between map sheets were checked and corrected.

3) Generation of administrative boundaries

Townships, divisions, districts and province boundaries were generated as closed polygon data.

10.3 Sorting of digital compilation

After digital compilation was finished, the map sheets were plotted and their content checked, and the completion of digital compilation was confirmed.

As three kinds of compilation system were used, the final topographic map data standardized and recorded to CD-ROM in the AutoCAD dwg format.

Problematic questions were recorded to be resolved in the supplementary field survey.

11. Map symbolization (Preparation of drawing data for topographic map)

In order to prepare the topographic maps, the compiled topographic data were represented as map symbols in accordance with the specifications for map symbols and the application rules.

11.1 Preparation

1) Preparation of symbols

The map symbols were prepared based the application rules

2) Preparation of marginal information

The marginal information was prepared based on the application rules

11.2 Compilation for map symbolization

1) The topographic map data shall be symbolized on every sheet

Items that are duplicated by the symbolization are transferred.

2) Preparation of marginal information that is variable for each map:

Division name or heading, sheet name, names of nearby townships, 1km mesh line, UTM zone number, True north, magnetic north, grid north, adjoining sheets, administrative index, location diagram

3) Addition of destination annotations

Roads that run onto an adjoining sheet must show the name of the destination town and the distance to it.

11.3 Digital compilation for printing

Annotation such as village names shall be described on the map in accordance with the annotation rules. As a general rule, annotation shall not be displayed over another topographic feature symbol.

A distinction shall be made between the header villages (bold type) and ordinary villages.

Regarding the annotation of rivers, upper-case lettering shall be displayed within the width of the river for double-line river. If to the lettering cannot be displayed within the width of the river, the annotation shall be shown above the line of the river.

For single-line rivers, the initial letter shall be in upper-case lettering and the rest in lower-case lettering.

11.4 Check

The position of the annotations shall be checked to ensure that the name is not illegible or unclear through overlapping with any other geographical feature.

12. Inspection of topographic data

The topographic map data for which the digital compilation process is complete have reached the final stage of the Study. At this stage the quality of the topographic map data was inspected and confirmed using prints output by plotter.

The inspection of the topographic map data was carried out in accordance with ISO/TC211.

12.1 Inspection

The topographical map data and the background image were displayed on the monitor screen of the computer at the same time and a supervisor inspected the data.

In addition, a visual inspection of the output map was carried out by experienced technicians.

Figure 12.1.1 Topographic map data superimposed on orthophoto

(1)Confirmation of completeness

It was confirmed that all the topographic features laid down in the specifications had been acquired.

1) No duplicated data

Duplicated data was dealt with at the data cleaning stage.

2) No missing data

In particular, it was checked that there was no omission of annotation for roads, water courses, ponds, public facilities, power transmission lines, pipelines, or protected forest areas, by superimposing the topographic map data on the orthophoto.

3) Township name, destination town names and the distance to them were correctly prepared along the periphery.

4) Marginal information was correctly prepared

(2) Confirmation of logical consistency

1) Coordinates of topographic features should be within the defined area

Data derived by GPS can sometimes have the wrong position because of faulty calculations.

2) Elevation of spot heights should be greater than 0 meters.

Elevations of less than 0 meters may exist because the study area is located in the delta area. These elevations should be checked and confirmed.

3) Contour lines should match spot heights

Check height values of contour lines

4) Administrative boundaries should not accurately input as plane data, with no omissions.

(3)Positional accuracy

1) The two-dimensional position of topographic features should coincide with a superimposed orthophoto image.

(4)Temporal accuracy

1) The latest materials and information should be used.

Topographic data should be acquired from aerial photos taken in 2002

Structures under construction should be confirmed at the time of the supplementary field survey.

(5)Attribute accuracy

Topographic features are distinguished carefully with reference to the “Map symbol and application rules”.

1) Distinguish between Build-up areas and residential areas
2) Distinguish between different categories of vegetation
3) Distinguish between different classes of road
4) Distinguish railway categories (single track or double track)
5) Distinguish width of river (single or double lines)
6) Use correct place names and river names

Various errors were detected on inspection. The errors are listed in descending order of frequency.
(See Table 12.1.1)

Table 12.1.1 Content and number of errors detected in UTM zone 47

(Numbers in parenthesis indicate number of errors)

1) Inconsistent interpretation of Vegetation	(369)
2) Spot height (shift, deletion, addition)	(329)
3) Inconsistency in feature code between adjacent sheets	(242)
4) Omission of water gate	(236)
5) Unnamed village	(192)
6) Omission of pond	(148)
7) Confusion between built up area and independent building	(138)
8) Omission of bridge	(113)
9) Missing of road	(79)
10) Missing contour line	(74)
11) River (Omission / alteration of type)	(68)
12) Addition of tide symbol	(60)
13) Omission of vacant land symbol	(32)
14) Harbor facilities	(20)
15) Railways (bridge, station)	(17)
16) Pipe line (Connection, symbol error)	(16)
17) Omission of tidal arrow symbol	(16)
18) Omission of swamp symbol	(14)
19) Omission of building symbol	(7)
20) Route of transmission line	(5)
21) Omission of pagoda	(2)

The Study Team confirmed during the supplementary field survey stage those matters that could not be determined in the process of this work.

13. Field completion

The field completion is carried out to check important items in the topographic map data prepared in the digital compilation process.

The following information and data should be confirmed during the field completion.

1) Dubious items or important representations found during the compilation process.
2) Items difficult to compile.
3) Items subject to temporal change.
4) Boundaries and annotations.
5) Mistakes or omissions in representation of features to be acquired.

13.1 Preparation

(1) Preparation of data

In order to carry out the field completion, the necessary materials were prepared.

1) Specifications for Map symbols and application rules

   Reference data for judging whether planimetric features indicated in the topographical map match the specifications.

2) Printout of topographic map data

   Output maps are used to confirm annotations such as the names of towns, villages and rivers, and land use.

3) Aerial photos

   For collecting information over a wide area, aerial photos are efficient.

4) Collected data

   The large-scale maps collected in the field verification were required as data for checking location of buildings such as schools, pagodas and hospitals.

(2)Preparation of equipment

The following equipment was used in the field completion.

1) Handy GPS

   Used to measure the position of subjects such as pagodas, schools and hospitals that have been incorrectly marked or omitted. The data observed by GPS are converted into the coordinates values on the Myanmar 2000 ellipsoid.

2) Camera

   During the field completion photographs are taken to record field conditions, and for use as reference data.

13.2 Field completion work

Since the period of the survey was limited and a field verification survey had already been conducted, the field completion work plan was drawn up to investigate a minimum of important matters.

13.2.1 Working procedures

The work was carried out according to the procedures shown below.

1) Preparation work

Unclear matters found during the digital plotting process are marked on printed maps. Problems found by the Survey Department and areas showing large temporal change compared with existing maps will also be checked and clarified in the field completion.

Meetings was held in order to identify of the items to be verified in the field completion.

2) Execution of field completion

Pre-marked questions were surveyed in the field.

The results of the field completion were compiled on printed maps and sorted.

The work period is shown in Table 13.2.1.

Table 13.2.1 Period of work

Target area	Period of work	**Number of maps**
Zone 46	Dec.8, 2003 – Jan.3, 2004	35 maps
Zone 47	Nov.27, 2003 –Dec.7, 2003	13 maps

3) Confirmation of location of field completions and content of survey

The field completion is conducted to clarify unclear matters that come to light during the digital compilation and to confirm annotations such as place names. In particular, unclear matters found during the digital compilation process will be listed as shown in Table 13.2.2 so that the field completions can be carried out efficiently.

Table 13.2.2 List of questions and method of checking（Main items）

Item	By supplementary survey	By asking Counterpart	By referring to existing material	Remarks
Town / village name				Check the name of town / villages in new residential areas
Lighthouse / Beacon		x		Check Location
Pipelines				Check for continuity.
Transmission lines				Check for continuity.
Railway	x			Check Station and track type (single or multiple)
Roads				Check type
Benchmarks		x		Check location
Name of dam / lake				Check name
Information on Yangon City	x			Selection of information is important

: use as major information   x: use as supplementary data

4) Planning of Field completion

Before starting the field completion, an implementation plan is prepared. The following items should be included in the plan.

-Purpose of the field completion

-List of survey team members (leader, sub leaders)

-Schedule and volume of work

- Accommodation

- Work content of the field completion

-Necessary equipment and material

5) Procedure for fieldwork

-Application for permission for domestic travel.

-Arrangements for vehicles and drivers.

13.2.2 Field completion

1) Survey items

Unclear points found during digital compilation are to be checked carefully.

-Confirmation of town and village names（Especially the names of new residential areas.）

-Lighthouses and Beacons（Major ones only）

-Transmission stations, Pipe lines, Transmission lines（Confirmation of location）

-Roads（Confirmation of road type）

-Bench marks（Confirmation of location）

2) Arrangement

The results of the field completion are compiled on printed maps.

In addition, some Myanmar-language materials are to be translated into English (Figure 13.3.1).

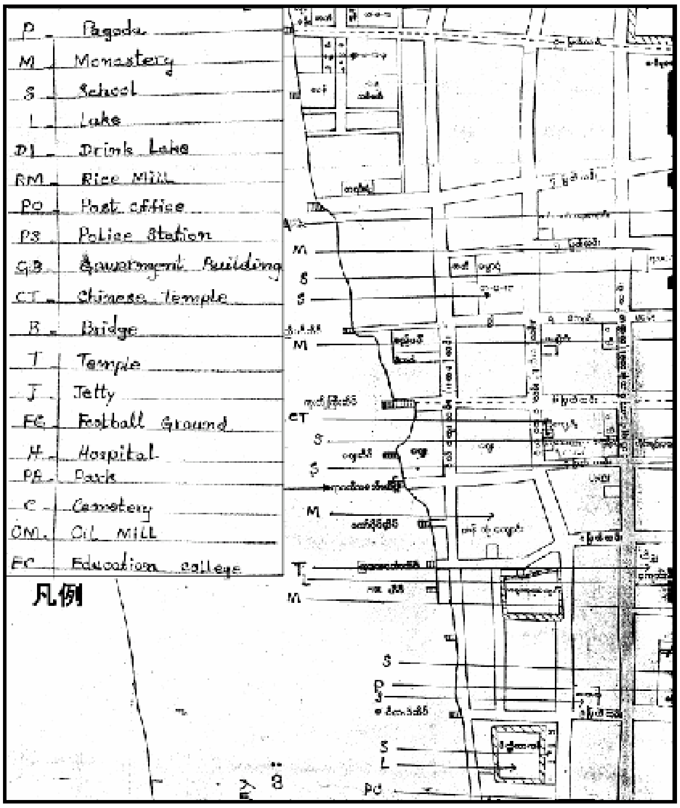


Figure 13.3.1 Rearrangement of reference material

14. Digital compilation for the results of field completion

Digital compilation for the results of field completion is the final process before map printing, in which it is necessary to confirm that the topographic map data verified in the field completion has been corrected. The completed topographical map data is saved to CD-ROM as a backup to be stored.

The work procedure for the digital compilation for the results of field completion is shown below.

14.1 Preparation

1) Preparation of data

-Field completion results

-Existing topographic maps

-Specification for Map symbols and application rules

-Collected data

2) Work plan

-A work plan including staff, time needed, etc.

3) Preparation of materials

-Polyester sheets

-CD-ROMs

14.2 Implementation of digital compilation for the results of field completion

1) Compilation of the field completion results

The topographical maps are edited based on the results of the field completion.

Using digital compilation system, the addition, deletion and correction of data done on the display screen. However, since this process is the final stage before printing, the edited results are output to polyester sheets and overlaid with the field completion data for checking. Any items still not corrected are marked in red pencil on mylar paper indicating the need for re-compilation by a compilation worker to complete the topographical map.

2) Compilation of other items

Confirmation and compilation of the following items is also carried out.

-Annotation: Name of destination, and distance

-Marginal information: Title of map sheet、coordinate values, district boundaries, map index

-Connections to adjacent maps: Continuity of roads, rivers, land use etc.

3) Creating CD-ROMs

After the digital compilation for the results of field completion has been completed, the topographic map data for the 48 sheets are recorded onto CD-ROMs and labeled for ease of storage and management.

The field completion results were sorted onto output sheets and scanned, then recorded onto CD-ROMs labeled for ease of management.

15. Structuralized compilation (Preparation of GIS basic data)

GIS basic data that can be used in all kinds of planning and Study is prepared in order to build the GIS. Two files were made, for zone 46 and zone 47, because in the UTM projection the Study Area was split by these two zones.

The GIS base data was created through the following steps.

15.1 Creation of assembled files

The 48 sheets of topographical map data were divided into data belonging in zone 46 and in zone 47, and each set of data was assembled into a single seamless file.

15.2 Making GIS basic data

The assembled data file was sorted into point data, line data, polygon data and text data based on the specifications. Text data was input as attribute data when it belonged to a planimetric feature.

15.3 Creation of metadata

Metadata were created. The specification are in the GIS guidelines.

15.4 Making CD-ROMs

A backup was created for management of the GIS base data, and recorded to CD-ROM for storage.

16. Construction of GIS database

The data collected in this study was sorted and a GIS base data was created. Then attribute data was added to this data to create the geographic information database.

16.1 Collected data

The data collected in this study are as follows.

1）The name and location of facilities in the Yangon city region

The location, name and photos of the following facilities were collected in the field survey.

Church, Embassy, Government Office, Hospital, Hotel, Museum, Pagoda, Police Station, Post Office, State High School, University/College

2）Changes in population

"Yangon 2002" was used.

（Source: Statistical "Yearbook 2000" Central Statistical Organization Yangon, Myanmar2000）

3）Location and data of medical institutions

4）Geologic maps

5）Township Maps and Data of Yangon City

6）Pictures of facilities taken during the field survey

16.2 Making attribute data

1) Location of facilities

The facilities data acquired using GPS during the field investigation survey were converted into the coordinates of Myanmar Datum 2000 and the name was added as an attribute of point data.

2) Population data

A population data table was created for every township of Yangon.

3) Medical facilities

Data on the names and equipment of medical facilities were created.

16.3 Creation of a geographic information database

The collected data was input into the TNTmips system introduced in this study, and built onto the GIS base data to construct a geographic information system.

When more accurate data is collected in the future, a more highly complete GIS system will be created.

17. Map printing by Survey Department of Myanmar

Drawing data files for 48 topographic maps which were prepared by the Study team were printed by the Survey Department.

17.1 Printing skills of the Survey Department

Initially, it was scheduled to print the maps in Japan. However, at the request of the Survey Department, the maps will be printed by the Survey Department in Myanmar. The Survey Department has brought in several pieces of equipment in order to modernize its surveying technology. The Image Setter was also brought in for this purpose. Skills in the technology used to operate this equipment are needed. Therefore, in order to master operation and become able to use the equipment effectively, the Survey Department wanted to do the topographical map printing by themselves.

In order to comply with this request, the Study Team investigated the technical skills of the Survey Department, and the headquarters of JICA agreed that the Survey Department has the knowledge to print the maps by themselves.

The Survey Department sells topographical maps. Topographical maps from the UTM project, which started in 1999, are also in print and on sale.

Figure 17.1.1 The SD Image Setter

Figure 17.1.2 The SD Plate-making machine

Figure 17.1.3 The SD Offset Printing machine

17.2 Preparation

The equipment needed for printing was checked. Consequently, it became clear that it is possible to print using the equipment owned by the Survey Department and the compilation system introduced in this study. However, there is no budget for the Survey Department to buy materials Moreover, many of the printing material must be imported, and so is not immediately available. Therefore, it was decided that the Study Team would prepare most of the materials and the Survey Department would prepare the smaller expendables.

As for the printing paper, from the point of view of quality Japan-made paper was requested. After discussions with the Survey Department, it was decided to use paper produced in Indonesia paper in order to maintain a point in common with other projects. After obtaining the approval of the headquarters of JICA, the materials shown in Table 17.2.1 were ordered.

Table17.2.1 Materials required for printing

Item of material	Quantity	Remarks
Large-format film	4 Rolls	Agfa Roll Film
Film Developer	10 Tanks	G 101C(Agfa)
Film Fixer	10 Tanks	G 333C(Agfa)
PS Plate	10 Pkg	Negative Plate
Print Paper	125PKts	Made in Indonesia
Ink (6 colors)	192 Tins	24 tins of each color

17.3 Printing of topographical maps

Printing of the topographical maps was carried out in the following steps.

1) Inspection of the print manuscript

The Printing Division of the Survey Department carried out a final inspection to check the manuscript supplied by the Study Team. The counterparts used the compilation system to correct errors in the topographical map data and a map symbolization file, to create the final version.

Figure 17.3.1 Inspection of a print manuscript by the SD

2) Color separation

Six-color printing of topographical maps is laid down in the printing specification. Based on the final version of the map symbolization file, the sheets were separated into six colored plates. The digital compilation system was used for this task.

3) Creation of the film for printing

The Image Setter owned by the Survey Department was used to print the film and to create the negative film for printing.

4) Creation of the printing plate

The printing plate was made using the print film. The plate-making machine owned by the Survey Department was used to create the plate.

5) Printing

The proof sheet was made using the six-color printing plates. The 2-color printing machine owned by the Survey Department was used to print the proofs and for the final printing.

17.4 Work period for printing and work management

The Survey Department organized themselves to carry out the printing of 6 sheets in one week, and set up a printing work program. Since the Survey Department already had the printing technology, the study team decided to provide instruction and supervision only for the technology to correct the image data for printing.

17.5 Inspection of Printed maps

Five hundred copies of each of the 48 sheets of topographic map were printed. The printing time coincided with the rainy season, and the Indonesian paper used became extremely elastic. Therefore printing disparities, blurring, uneven coloring, etc. were checked severely and only those maps that passed inspection were accepted.

Figure 17.5.1 Inspection for printing

18. Creation of land use maps

In the working out of a national land development plan, topographical maps provide the most basic information. Furthermore, in order to set up development projects of all kinds, it is necessary to make thematic maps based on topographical maps. One of the most frequently made thematic maps is the land-use map.

In this survey, because of restrictions of time, we decided to create a land-use map limited to the area of Yangon City and its environs. This area is a region most expected to see development in the future.

Looking at a land-use map makes it easy to grasp the present circumstances, such as the situation regarding residential area development and the present condition of industrial areas.

18.1 Purpose of creating land use maps

There are two purposes to creating a land-use map, as follows:

(1) To contribute to the reconstruction and development of the Yangon area

(2)Technology transfer in the creation of land-use maps as one form of thematic map

18.2 Survey area

11 sheets of land-use map on a scale of 1 / 50,000 were created (see Figure 18.2.1).

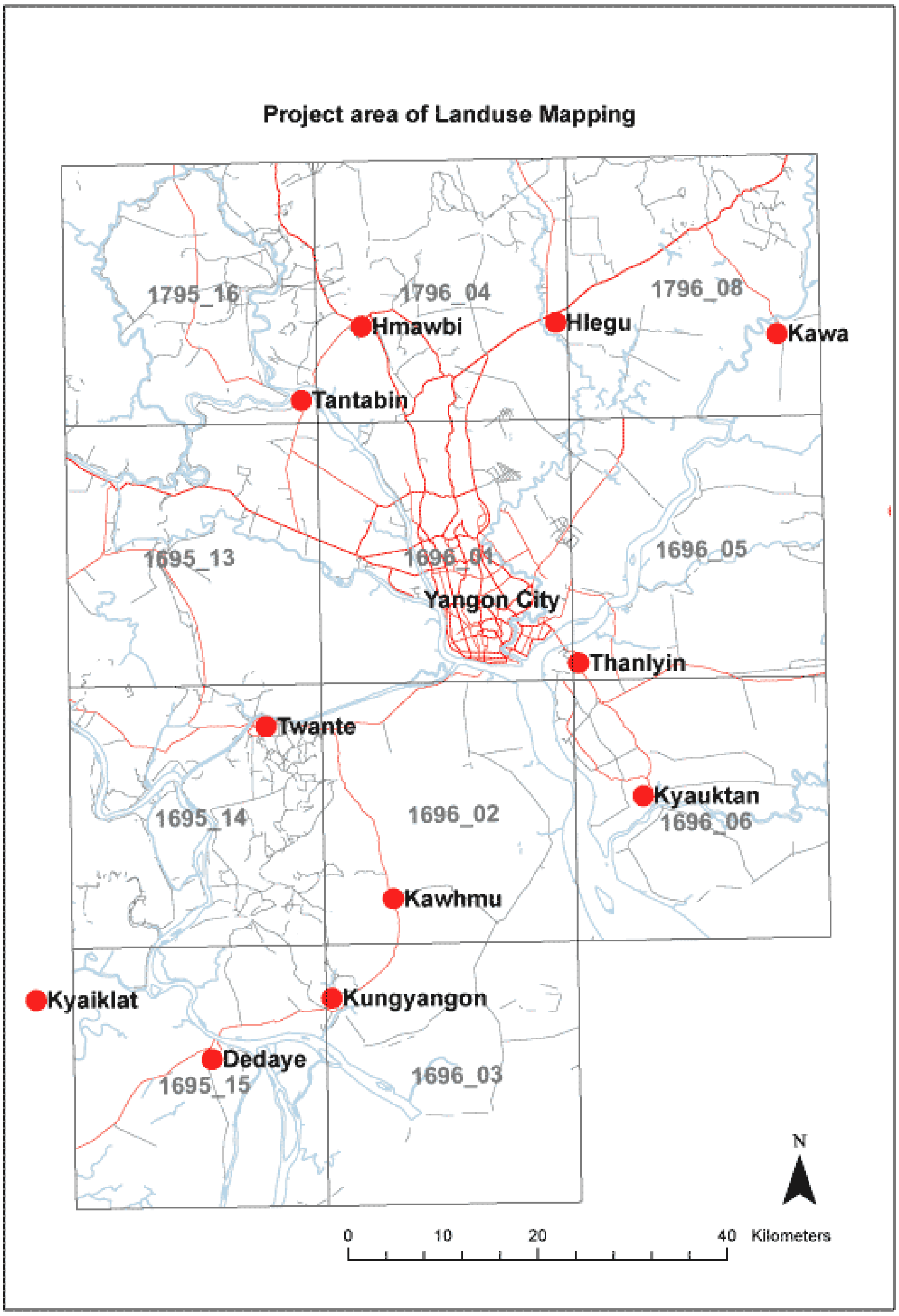


Fig. 18.2.1 Created land use map

18.3 Land Use Classification

The land-use map with 23 categories shown in Table 18.7.1 was created.

18.4 Procedure for the creation of the land-use map

The procedure for the creation of a land-use map is as follows.

(1) Creation of land-use map legend

The colors and patterns for displaying land use classified into 22 categories are decided.

(2) Classification of topographical map data

Based on the topographical map data, a land-use manuscript map was created by converting to land use categories those planimetric features related to land-use classification, and by converting those planimetric features not related to land-use classification to an unclassified category. In addition, planimetric features (line data), such as serviceable roads and railways were created as background data to orientate positions on the map.

(3) Creation of the manuscript map

The land-use data and background data that were created in the preceding step were integrated and output as a 1 / 50,000 manuscript map. A legend was also added (See Fig... 18.4.1).

(4) Editing of land-use classifications

The classification of non-classified land was classified by the following methods.

1) Classification using collected data

Classification using collected data (Township Map and Data of Yangon City etc.), topographical maps and aerial photos.

2) Classification by field survey

A field survey is carried out to clarify the land-use classification. The results of classification based on collected data are also checked in the field.

3) Inspection of the manuscript map

All non-classified land divisions are classified using collected data and the field survey results. Land use classifications as a whole are checked after the whole area has been classified.

18.5 Field Survey for Land Use Classification

For areas that could not be classified from the interpretation of materials, a field survey was carried out to determine land use categories.

The field survey was carried out from April 19to May 7, 2004.

The work was done by two parties under two leaders, as shown in Table 18.5.1.

Table18.5.1 The assigned technical experts

Name	Position
U Ko Latt	Geodetic Department/Surveyor
U Than Khaing	Geodetic Department/Surveyor

Fig. 18.5.1 Working on land use interpretation

18.6 Creation of land-use maps and land use data

The land use maps were completed in Japan, based on the field survey data,
The results were summarized as land use data.

1) Land use data

Polygon data showing land use classification.

2) Background data

Line data representing roads and other planimetric features were displayed as a background.

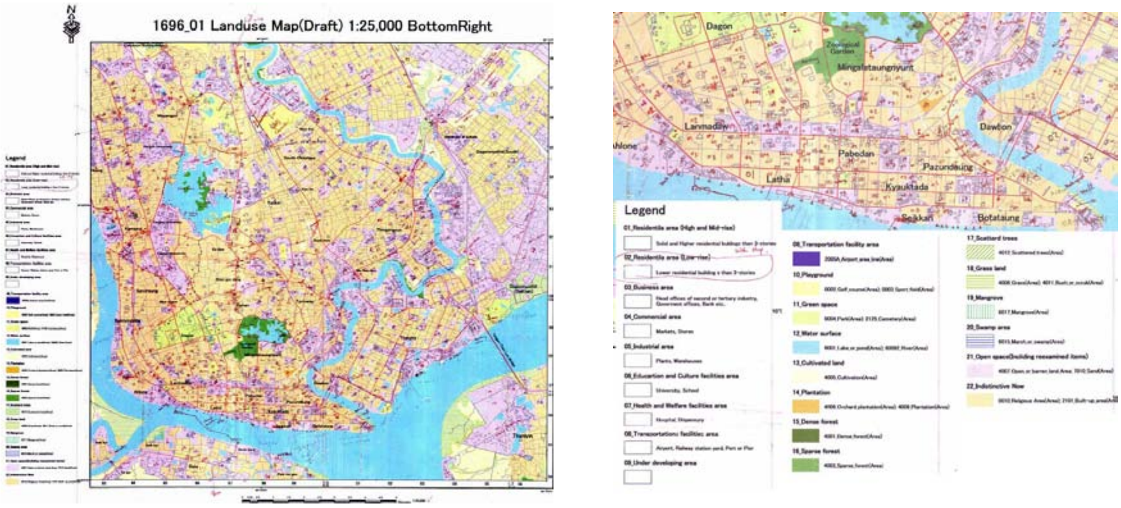
18.7 Products

The following products were prepared.

-Land use map	11 sheets
-Land use map data	1 set
-Work manual	1 set

Table 18.7.1 Classifications for land-use map

	Category of land use	Definition
1	Residential area (High)	Buildings 3 stories or higher. Including buildings with ground floor used as commercial space.
2	Residential area (Low)	Buildings less than 3_stories high
3	Business area	Head offices of second or tertiary industries Government offices, Banks etc.
4	Commercial area	Markets, Stores
5	Industrial area	Plants, factories
6	Education and Cultural facility area	University, School
7	Health and welfare facility area	Hospital, Dispensary
8	Transportation facility area	Airport, Station yard, Port or Pier, warehouse or shipping storage.
9	Developing area	Area under development or under construction
10	Sports ground	Golf course, Stadium, Playing field
11	Green space	Park, Green space or Cemetery
12	Water surface	Sea, River, Lake, Pond
13	Cultivated land	Rice paddy, Upland farm
132	Cattle farm	Cattle farm, Pig farm, Chicken farm
14	Plantation	Large scale farmland
15	Dense forest	Dense forest
16	Sparse forest	Sparse forest
17	Scattered trees	Scattered trees
18	Grass land	Grass, Bush, or Scrub
19	Mangrove area	Mangrove trees
20	Swamp area	Swamp
21	Open space	Unused land. (Barren land, Sand, Waste land, Mud land)
22	Other	Unclassified area



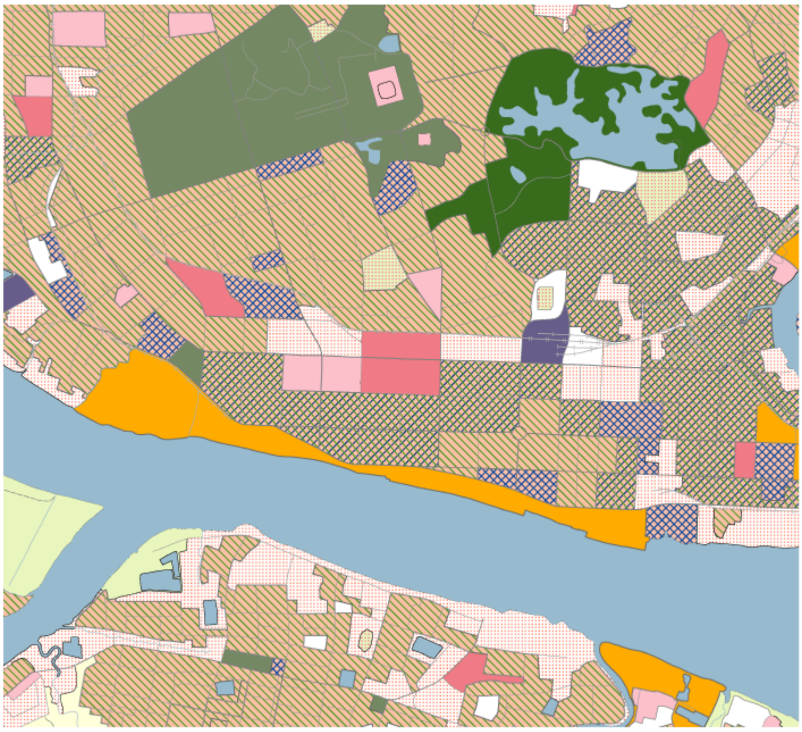


Fig. 18.6.1 Land-use manuscript map (upper Fig.) and final print (lower Fig.)

19. Technology transfer

The technology transfer that is one of the purposes of this Study was carried out.

It is clear from the fact that the Survey Department was carrying out the UTM project that the Department has the technical skills necessary for topographical map production. Therefore, before making plans for technology transfer, the actual capacity of the Department, such as the exact method and procedure employed by the Department, was investigated and analyzed.

Previously, the Survey Department technicians used to spend most of the time on field surveys, and only a limited number of technicians were using computers to process observation results. The total number of computers being used in the Department was limited.

In order to deal with the shortage in computers, five personal computers were brought in by the Study Team; and with this introduction of additional computers, it became possible for many technicians to have access to a personal computer.

At the technology-transfer seminars, of which two were held, the technicians who had actually participated in the work explained the content of the work. The Study Team checked the level of understanding of the counterpart personnel by observing and evaluating the content of their presentation. The content of the slides was good enough to be used at future technical training sessions.

Since many technicians asked questions during the slide presentation, indicating that they are eager to learn new technology, we decided to purchase textbooks on GPS, photogrammetry, and GIS CDs that can be used for education were also put together.

19.1 Technology transfer items

The technology transfer covered the following work items.

First, a work manual was created in which the work procedure was explained. The content of the manual was corrected during the course of actual work.

1) Control point survey
2) Aerial Triangulation
3) Digital mapping
4) Field identification
5) Digital compilation
6) Field completion
7) Digital compilation of field completion results
8) Compilation of map symbolization

9) Compilation of structurization
10) Construction of geographic data base
11) Preparation of Land-use maps

19.2 Control point survey

Technology for the control point survey was transferred to the Survey Department technicians through on-the-job training. The control point survey included the installation of aerial photo signals, GPS surveys, simple leveling and pricking.

Since the Survey Department has the equipment for GPS and leveling surveys, methods of controlling the quality of observation results and sorting the results were explained.

19.2.1 Installation of aerial photo signal

Aerial photo signals are essential tools for co-relating aerial photos with the surface of the mapping area. However, the color and shape of signals need to be considered carefully so that they can be clearly seen on the photos.

In order to determine the size, color and shape of signals most suited to the situation in Myanmar, several types of aerial signal were set up in the yard of the Survey Department. After comparison, it was found that three-blade and four-blade aerial signals were clearly identifiable on photos.

19.2.2 GPS survey

Initially, it was planned to use GPS receivers procured by JICA for the GPS survey training. However, the procured receivers did not arrive in Myanmar by the start of the on-the-job training, and so the same type of GPS receiver owned by the Survey Department was used. The content of the training was as follows.

1) Arrangement of control points to acquire the best adjustment in aerial triangulation

   Control points used for aerial triangulation should be placed at each corner of the block.

2) Survey plan based on accuracy verification

   The following two points need to be considered when survey plans are made:

   a. The number of new survey points for each observation should be maximized.

   b. The plan should be prepared in such a way that accuracy can be verified.

3) Method of calculating observed result

   Analysis was done using baseline analysis software bundled with the equipment.

4) Methods for examining results

Examination using duplicated sides

Examination of discrepancies using closed polygon

5) Method of creating the final results table

Method of creating point descriptions and the final result table

Table 19.2.1 Counterparts and survey workers engaged in the GPS work

Role	Member	Position
CP1	U Than Hlaing	Leader/Deputy director of Geodetic department
CP2	U Ko Latt	Surveyor
Group 1	U Khin Mg Aye	Surveyor
Group 2	U Teot Oo	Surveyor
Group 3	U Win Myint Oo	Assistant Surveyor
Group 4	U Than Aye	Assistant Surveyor
Group 5	U Nuein Zay Aung	Assistant Surveyor

19.2.3 RTK-GPS

RTK-GPS (Real Time Kinematic GPS) is one of the GPS observation methods. Coordinates of objective point are surveyed by roving receiver in real time. RTK-GPS method consists of a base station receiver on the known point (Master) and a roving receiver on the unknown point (Remote). Correction signal is transmitted by radio from the base station and the rover station receives the signal to get the corrected coordinates.

The receivers procured by JICA in this study have both Static and RTK functions. The static method was used for this study.

Generally RTK-GPS is used for applied surveying as one of the useful methods. As a part of technology transfer, practice observation of RTK-GPS was carried out.

Figure 19.2.1 RTK Survey System (Master)

Figure 19.2.2 RTK Survey System (Remote)

19.3 Simple Leveling

Simple leveling was carried out using the equipment supplied by JICA. With regard to height adjustment, for some points direct leveling was used, while for other points the GPS survey results were used with added Geoid compensation. The UTM project also uses this method.

1) Selection of points for which GPS surveys to find Geoid height and leveling surveys are carried out
2) Selection of height control points
3) Selection of observation routes
4) Observation and calculation method
5) Method of creating the final results table

Table 19.3.1 Counterpart engaged in leveling

Role	Member	Position
Counterpart	U Maung Maung Soe	Manager, SD
Surveyor (Group1)	U Than Tun Kyaing	SD
Surveyor (Group2)	U Tin Winn	SD
Surveyor (Group3)	U Than Khine	SD
Assistant surveyor (Group1)	U Banyar	SD
Assistant surveyor (Group1)	U Ko Ko Htwe	SD
Assistant surveyor (Group2)	U Tun Aung	SD
Assistant surveyor (Group2)	U Aung Kyaw Moe	SD
Assistant surveyor (Group3)	U Thein Kyi	SD
Assistant surveyor (Group3)	U Saw L Htoo	SD

19.4 Pricking

In order to take aerial photos as soon as possible, the aerial photo signals were not set up prior to the photographic flights. Instead control points were marked on the aerial photos by the pricking method.

The methods and procedures for selecting pricking positions and sorting the results were explained

Table 19.4.1 Counterparts engaged in pricking

Role	Member	Position
Counterpart	U Nyan Tun	Manager, ST
Counterpart	U Khin Maung Aye	SD
Assistant Surveyor	U Thet Oo	SD
Assistant Surveyor	U Win Myint Oo	ST
Assistant Surveyor	U Than Aye	ST

19.5 Aerial Triangulation

Technology related to aerial triangulation was transferred.

19.5.1 Analysis of the techniques used by the Survey Department

The techniques employed in the UTM project are almost the same as the techniques used in Japan. However, there was no Aerial Triangulation software before the UTM project was started and the Survey Department did not have experience in block adjustment. Therefore, for each model, 4 to 6 control points were required for plotting. In the UTM project, the hardware and software for carrying out aerial triangulation were introduced in the Survey Department, but the main operator belonged to SUNTAC Corporation. The aim of this technology transfer was to improve the technical capabilities of the technicians of the Survey Department. In the UTM project, software named MATCH-AT was used to observe pass points and tie points and to carry out inner and relative orientations. However, the Study Team brought in PAT-B program software for the aerial triangulation, because automatic processing was effective only in a limited number of places and the SD already had the three programs mentioned above.

Table 19.5.1 Counterparts assigned to aerial triangulation

Name	Position	Years of experience
U Thant Sin Oo	Aerial Survey Division	7
Daw The Nu Htwe	Aerial Photo Division	3
Daw Aye Thet Wai	Aerial Photo Division	3
Daw War War The	Aerial Photo Division	3

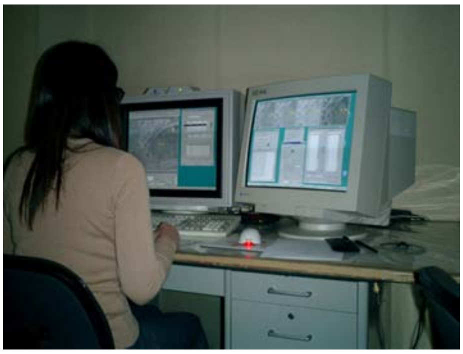


Figure 19.5.1 Execution of aerial triangulation

19.5.2 The content of technology transfer

The following technology was transferred.

(1) Creation of a work plan

When performing aerial triangulation, a work plan is required. Photography points are provided from the aerial GPS survey. However, GPS observations were made in WGS-84 ellipse, which is often used for GPS. The data need to be converted into Myanmar 2000 Datum and then converted again into UTM plane coordinates. In addition, these data were imported into AutoCAD, which is a CAD software application, and the method of creating index map was taught.

(2) Scanning of image data

The accuracy of subsequent work is determined by the accuracy of the image data. Therefore, in order to perform high precision scanning, a check was made of the location of the scanner, color tones when converting to a graphic image, etc., and procedures.

(3) Training in aerial triangulation

Part of the survey area in Zone47 was used, and the process of aerial triangulation was experienced in the following procedures.

1) Import image data
2) Import photograph principal point coordinates by GPS
3) Import control point file
4) Create camera data files
5) Inner and relative orientation calculation processing
6) Calculation of absolute orientation

(4) Block adjustment

Technology transfer of the block adjusting method was done in Japan because the introduction of the adjustment program was delayed and it was decided that the counterpart U Sein Min would undergo training in Japan.

(5) Method of quality control

Technology regarding the evaluation of calculation results was transferred based on the adjustment calculation.

(6) Creation of the final results table

The filing of calculation results was practiced.

19.5.3 The principles of GPS Aerial Triangulation

There was a request for an explanation of the principles of aerial triangulation. Therefore, slides were made and an explanation was given of the principles of aerial triangulation and the methods for verification of accuracy.

19.6 Digital mapping

Prior to the commencement of digital mapping, the Study Team investigated the present state of mapping work.

19.6.1 The present state of mapping work in the Survey Department

The Survey Department is also doing the updating of old maps.

In this photogrammetry work, A7, A8 and B8 analogue plotters are used. Persons with experience of map editing were chosen as mapping operators after three months of attending a training program. The Survey Department is modernizing the mapping process by adopting the Digital Plotter to carry out the UTM project. In order to process large amounts of work in the UTM project, the Digital Plotter DVP was brought and an operator was also trained with a short period of training.

In order to simplify digital mapping, all measurable items were acquired and then redundant items were eliminated in the subsequent editing process.

19.6.2 Technical instruction in digital mapping

4 sheets covering the area near northwestern Pathein were chosen to give instruction in digital plotting. The four sheets cover almost 10% of the whole survey area. The four sheets were selected because the area includes hills, rivers, cities and cultivated land. The following four persons were assigned to technology transfer.

Table 19.6.1 Assigned SD counterparts

Name	Position	Years of experience
U Thant Sin Oo	Aerial Survey Division	7
Daw The Nu Htwe	Aerial Survey Division	3
Daw Aye Thet Wai	Aerial Photo Division	3
Daw War War The	Aerial Photo Division	3

19.6.3 Implementation of digital mapping

Training in aerial triangulation was carried out using digital plotter software named Summit Evolution, which is the same as the plotters to be procured by JICA.

Automatic aerial triangulation software was introduced in the UTM project of the Survey Department in Myanmar. However, in the JICA project a semi-automatic processing program was procured. Automatic processing contributes to increased work efficiency, but it is said that the volume of work suited to automatic processing is limited, and it is difficult to use it for large-scale mapping. It was confirmed that aerial triangulation systems ware to be procured.

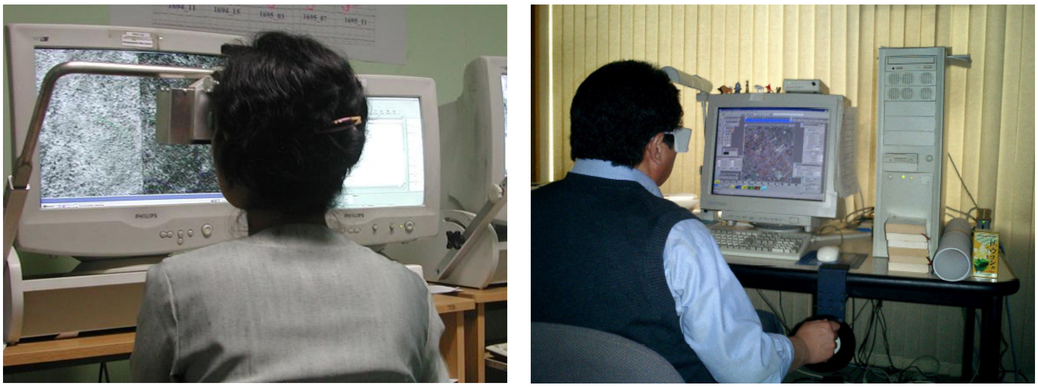


Figure 19.6.1 Digital mapping and digital compilation

19.6.4 Mapping area

Digital plotting was carried out for 33,000 square kilometers covered by 48 sheets of 1:50,000 scale maps.

19.6.5 Work procedure

Topographic features were acquired to prepare the topographic map data according to the work procedure flowchart (Figure 19.6.2).

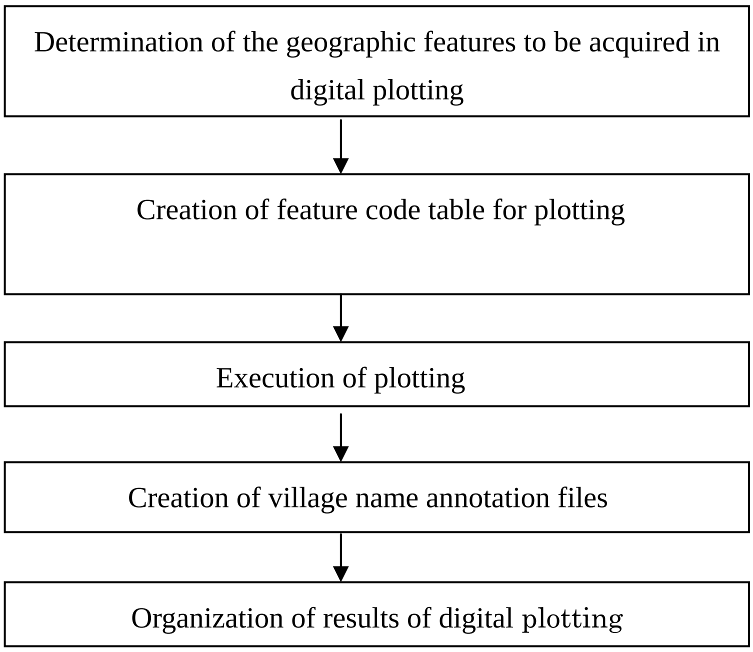


Figure 19.6.2 Flowchart of digital mapping

1) Determination of the geographic features to be acquired in digital plotting
Items are selected from geographic features defined by the map symbols and application rules of this project.

2) Creation of feature code table for plotting
Before execution of the plotting, a feature code table for plotting work was prepared.

3) Execution of plotting
Digital plotting was carried out using the digital plotting system.

4) Creation of village name annotation files
Village names were collected from the scanned 1/63,360 (1 inch to 1 mile) scale maps (which were converted to Myanmar 2000 Datum) and compiled as annotation files.

5) Organization of results of digital plotting

The results of digital plotting were divided into files corresponding to the map sheet arrangement. The files were stored as topographic map data files and formatted in AutoCAD .dwg file format.

19.6.6 Quality Control

Acquired data were plotted out on paper using a plotter. The plotted data were evaluated and the quality was found to be satisfactory. The evaluation criteria were as follows.

1) Completeness
Redundant or duplicated features were checked.
2) Logical consistency
The data structure of topographic features was checked and confirmed.
3) Positional accuracy
The positional accuracy of the acquired data was checked and confirmed.
4) Temporal accuracy
The survey date, observation date and date of data creation were checked and confirmed.
5) Attribute accuracy
Categories of roads, land use and public facilities were checked and confirmed.

19.7 Field identification

Photograph interpretation and field identification were carried out to create the topographical map data. This work was carried out together with the counterparts and the necessary technology was transferred to them.

The counterparts who took charge of this work were as listed below

Table 19.7.1 Assigned counterpart of SD

Member	Position	Years of experience
U Ko Latt	Geodetic Survey Section	5 years
U Mg. Mg. Latt	Boundary Section	5 years
U Aung Kyaw Oo	Boundary Section	5 years

19.7.1 Confirmation of the field identification techniques used by the Survey Department

Survey Department is not carrying out any field identification to check the planimetric features shown on aerial photos before digital mapping. Photograph interpretation is carried out when drawing the map using a Digital Plotter. Field identification is carried out on the basis of the output map.

(1) Photograph interpretation

Photograph interpretation is carried out by stereoscopic measurement using a Digital Plotter. Acquired planimetric feature data were output and checked by overlaying them on the existing topographic maps. If problems are found, they are checked by digital plotter again if necessary. Items which cannot be clearly identified on photos are checked in the field identification survey.

(2) Field identification

Unknown items were checked by field identification survey. For field identification, output drawings, old maps, aerial photos and Handy GPS were used. Single aerial photographs (not stereo pairs) were used in the field identification survey. A polyester base is overlaid on the aerial photo and corrections, descriptions and reference information are written or drawn on the sheet. This work was very time-consuming.

Figure 19.7.1 Field identification

(3) Investigation of place names

Place names were confirmed on field survey output. Names in the Myanmar language were checked first and listed on a questionnaire sheet if any problem was found. Where it was difficult to carry out a field check due to poor accessibility, place names were confirmed at district public offices. The pronunciation of place names was also checked. The spelling of English names were determined or confirmed by Home Affairs.

Figure 19.7.2 Observation by Handy GPS at a school

19.7.2 Collection of materials and information

Collected materials are as follows.

- The Map of Yangon (1996), Yangon City Development Committee
- Myanmar Facts and Figures (2002), Ministry of Information, Union of Myanmar 2002
- Myanmar Yellow Pages 2002, IMEX (Myanmar) Co., LTD.
- Gazetteer of Burma, Director of Survey (India) 1944

The positions of place names, pagodas and monasteries were read from existing topographical maps to create a database. Place names and locations were acquired and recorded by displaying old maps on a personal computer screen,

19.8 Digital compilation and map symbolization

Although the Survey Department is undertaking digital compilation for the UTM project, their purpose is the production of digital maps, not GIS data. In the Study, digital map data must be compiled so that they can be used in GIS – the same method that is employed in Japan. For this reason, technology was transferred following the steps shown in Chapter 10.

1) Cleaning of data

2) Geo-reference of raster images

   Using orthophotos or existing topographic maps as a backdrop, the planimetric locations of ground features are corrected or new ground features are added.

3) Compilation

   -Compilation of the results of field identification surveys

   -Check for missing items, additional acquisition

-Arrangement of annotation data
-Editing of contour lines
-Adjustment between sheets
-Generation of polygon data from line data

4) Map symbolization editing

-Generation and design of map symbols
-Map symbolization processing
-Creation of marginal information

The counterparts listed on Table19.8.1 received technical training. They carried out approximately 10% of the entire work.

Since the counterparts who were in charge of digital plotting were also included in the team for this digital compilation and map symbolization process, the work was completed smoothly.

Table19.8.1 Assigned technicians specializing in digital compilation

Member	Organization	Position	Experienced year of in SD	Experienced year of digital mapping
U Nyi Nyi Khin	Map Reproduction Div. Map Drawing Sub-Division	Staff Officer	31	2.5
U Aung Myint Kyi	Map Reproduction Div. Map Printing Sub-Division	Staff Officer	6	2
U Kyaw Kyaw Aung	Map Reproduction Div. Map Printing Sub-Division	Deputy Staff Officer	11	2
Daw Mi Mi Thet	Map Reproduction Div. Map Printing Sub-Division	Deputy Staff Officer	3	7
U Myat Hla Aung	Map Reproduction Div. Map Printing Sub-Division	Grade (1)	20	2


Figure 19.8.1 Meeting for digital compilation training

19.9 Field completion

Field completion was carried out in collaboration with the Study Team members. Since field identification had already been conducted, no technical problems were encountered. However, a problem arose in different arena. That is, the Survey Department technicians tried to acquire very detailed planimetric features despite the fact that the mapping scale was 1/50,000; it is important to understand that only necessary items should be verified in the field.

19.10 Digital compilation of field completion results

Field completion results were digitally compiled by the same work method as the digital mapping process. Special attention was given to not mixing remarks for items to be corrected with simple memos for reference purposes.

19.11 Structurization and symbolization for GIS data base

In order to make a Geographic Information Database from the digitally compiled supplementary field identification results, various topographic features were structuralized as point, line, or polygon data. In particular, structurization was carried out for items that had been newly added.

19.12 Comments about Technology Transfer

(1) Capability of the Survey Department

The Survey Department has a sound organization and is undertaking national topographical map maintenance, which is not common in developing countries. Many new digital techniques were introduced in anticipation of the Survey Department's need to modernize its survey and mapping methods. When this Study was started, the UTM project had also just started and the Survey Department had not yet familiarized themselves with digital techniques. But after experience in using new techniques during the course of this Study, the Survey Department has already started to use some of the techniques in their UTM project.

(2) Period of technology transfer

Since the members of the Study Team changed and the counterparts also changed, the period of about one month for the training was too short. The most confused and time-consuming part of this Study was the determination of administration boundaries and town and village names.

(3) Problems

Initial data was acquired from existing maps, and they were checked in the field. As the result of the field survey, data were added or corrected. However, there was some confusion in the correction process. For example, some place names were changed more than one time.

19.13 Training for counterparts in Japan

19.13.1 Content and purpose of the training

Counterpart training was given to U Sein Min and U Min Min Lwin, as outlined on the table below.

Table 19.13.1 Training in Japan

Member	Period	Content	Position in SD
U Sein Min	18 Nov.-20 Dec. 2002	Survey environment in Japan Role of private companies in Japan Aerial triangulation Digital Mapping GIS	Staff Officer
U Myo Min Min Lwin	24 Feb.- 24 Mar. 2004	Role of Japan Map Center Digital mapping Mobile mapping Aircraft laser measurement GIS Management system	Staff Officer

(1) Understanding of the role of the Survey and Mapping Agency in Japan

Both trainees fully understood the current situation regarding surveying and mapping in Japan, and the sales and management of maps, through visits to the Geographic Survey Institute of Japan, the Japan Mapping Center and the Infrastructure Developing Institute of

Japan.

(2) Understanding of the role of private companies in Japan

Both trainees also understood the current situation with regard to Japanese survey companies after visiting the two technical centers of the Asia Air Survey Company and Aero Asahi Corporation.

At Asia Air Survey, procedures and facilities for aerial photo processing, aerial triangulation and digital plotting were observed; the digital plotting process was also observed at Aero Asahi Corporation.

(3) Technology transfer of aerial triangulation and digital mapping

Both trainees practiced and understood various new technologies such as the aerial triangulation adjustment software PAT-B, the Leica Socet System Digital plotter, Mobile mapping and Radar measurement.

(4) Training in GIS operation

Many public organizations in Myanmar are interested in GIS, and agencies such as the Ministry of Forestry and the Survey Department are already using the system.

The TNTmips software is most popular in Myanmar; and the counterparts were interested in learning about the different types of software used in other countries. For this reason Arc/View was used for training in GIS operation. Exercises were carried out in geographic information analysis, such as data acquisition, information retrieval and result representation.

Figure 19.13.1 Training in Japan

20. Holding of Technology Transfer Seminar

Seminars were held to evaluate the results of the technology transfer.
The first seminar was held in February 2003 at the interim point, and the second seminar was held in July 2004, at the final stage.

Another objective of the seminars was to disseminate GIS through the use of the prepared GIS base data. At the first seminar examples from Japan were described, and at the second seminar, examples from Myanmar.

20.1 Seminar 1

The first seminar was held jointly with the Survey Department on February 14, 2003 at Sedona Hotel, near the Survey Department, with the participation of about 50 people.

Those invited to participate were the staff involved in GIS at the Ministry of Forestry and staff involved in GIS at other Ministries or Universities, as well as JICA experts.
Presentations were made of the results of the technology transfer of tasks carried out so far.
English was used in the seminar. This was the first time the Survey Department had held a conference in English, and full discussions were held with the study team in preparation

Mr. Irisawa, a Director of Asia Air Survey Co., Ltd., was invited as a special speaker, and he presented examples of the use of GIS in Japan. The program for the day was as follows and participants from both Japan and Myanmar made presentations in English.

A total of 60 people participated in the seminar.

Table 20.1.1 Program of Technology Transfer Seminar 1

Time	Content	Presenter
10:00-10:10	Opening address	U Maung Maung Tin: Director General of the Survey Department
10:10-10:50	Outline of JICA Project	U Kan Sint: Director of the Survey Department
10:50-11:00	Tea break	
11:00-11:30	Final results and Interoperability	Mr. Koseki: Team Leader of JICA Study Team
11:30-12:15	Applications of GIS in Japan	Mr. Irisawa: JICA Special speaker
12:15-13:00	Buffet	
	Presentation of Survey Manual	
13:00-13:20	Ground control survey	U Than Hlaing: Survey Department
13:20-13:40	Aerial triangulation	U Sein Min: Survey Department
13:40-14:00	Digital plotting	U Thant Sin Oo: Survey Department
14:00-14:20	Field verification	U Ko Latt: Survey Department
14:20-14:40	Tea break	Tea break
14:40-14:55	Questions	U Kan Sint
14:55-15:00	Closing address	Mr. Sato: JICA Myanmar office

20.2 Seminar 2

The second seminar on technology transfer was held on July 16, 2004, jointly with the Survey Department, at IBC (International Business Center), a conference hall of the Ministry of Forestry to which the Survey Department belongs. There were about 100 participants.
As this was the final event of the study, the Minster and Vice-minister of Forestry also attended; the Minister gave a special speech and expressed his gratitude to JICA and the Study Team.

In this seminar, not only were presentations made of the results of technology transfer; there were also demonstrations of the digital plotting system, the digital compilation system, GIS covering the Yangon metropolitan area, the ground control point management system and the aerial photo management system, with the equipment provided in the survey brought into the conference room.

In addition to explanations using slides, the technology was explained using the actual computer system, and this was very well received for being interesting and easy to understand.

In addition there was also an exhibition of the products of the Study, including prepared

topographic maps, land-use maps, orthophotos, aerial photos, field photographs, topographic maps of Japan (1:50,000, 1: 10,000) and thematic maps (land-use maps, land condition maps).
A total of 91 people participated in the seminar.

Table 20.2.1 Program of Technology Transfer Seminar 2

Time	Content	Presenter
10:00-10:10	Opening address	Brig-General Thein Aung: Minister, Ministry of Forestry
10:10-10:20	Outline of Project	U Kan Sint: Director of the Survey Department
10:20-10:40	Final results	Mr. Koseki :Team Leader of the JICA Study Team
10:40-10:45	Presentation of Survey Department's Logo Medal	U Maung Maung Tin: Director General of the Survey Department
10:45-11:00	Demonstration of Equipment	Officer of the Survey Department
11:00-11:20	Tea break	
11:20-11:40	Application of GIS in Myanmar	U Win Tint: Department of Geography, Yangon University
11:40-12:00	Digital Compilation	U Min Zaw: Survey Department
12:00-13:00	Lunch	
13:00-13:20	Map Printing	U Nyi Nyi Khin: Survey Department
13:20-13:40	Land Use Mapping	U Ko Latt: Survey Department
13:40-14:00	Demonstration of GIS Database	U Ze Ya Htwe: Survey Department
14:20-14:40	Tea break	
14:40-15:00	Questions	U Kan Sint
15:00-15:10	Closing address	Mr. Yamashita, JICA Myanmar Office

At the venue, many organizations using GIS requested the provision of data.
These data are all stored on CD-ROMs and we told them to ask the Survey Department directly, as these will be delivered to the Survey Department.
We asked Mr. U Win Tint, Associate Professor of Yangon University, Faculty of Geography, to give a special talk. The study team provided prepared data of the topographic map of Yangon, orthophotos, etc. The Faculty analyzed report on the layout of public facilities in the Okkalapa region in the northeastern part of Yangon City.
At Yangon University, a diploma course is offered for two hours at night for nine months, to teach GIS, remote sensing, photogrammetry, cartology and statistics to young government employees and university students, and awards diplomas in order to contribute to the dissemination of GIS.

While the previous lecture had used examples from foreign countries, this time the data of Myanmar were provided for the first time, and students said they were happy to be able to analyze data they felt was real, conducting field studies or adding new data.
We believe these results will be widely used by every ministry and agency via the students taking courses at the Faculty of Geography.
Sides used in the presentations in the seminar explained in outline the technology used in each process, and we hear that the Survey Department uses the slides for technical presentations.

20.3 Participants

Many people from the following organizations participated.

Invited organizations (in no special order)

Minister, Ministry of Forestry
Planning and Statistics Department, Ministry of Forestry
Settlement Land Record Department
Forest Department, Ministry of Forestry
Geography Department, Ministry of Education
Ministry of Science and Technology
Dry Zone Greening Department
Myanmar Timber Enterprise
Department of Water Resources and River System Improvement
Forest Joint Venture Corporation
Forestry Science, Ministry of Forestry
Department of Archaeology, Ministry of Culture
Yangon City Development Committee
Yangon University, Department of Geology
Myanmar Economic Corporation
Naval Hydrographic Survey Department
Department of Archaeology
Irrigation Department, Ministry of Irrigation and Agriculture
Mines Department, Ministry of Mines
Suntac Technology
Myanmar Intergraph
Embassy of Japan

Attached data

Attached 1	**List of reference books collected in the Study**
Attached 2	**List of the education CD collected in the Study**

Attached 1 List of the reference books collected in the Study

Bibliography	Name of books	Author	Publisher	Published	ISBN Code
GIS	ARC Macro Language：Developing ARC/INFO Menus and Macro with AML	ESRI	ESRI	1997	1-879102-18-8
GIS	Connecting Our World, GIS :Web Services	ESRI	ESRI	2003	1-58948-075-9
GIS	Enterprise GIS for Energy Companies	Christian Harder	ESRI	1999	1-879102-48-X
GIS	Extending ARCVIEW GIS	Tim Ormsby et al	ESRI	1999	1-879102-05-6
GIS	Getting to know ArcView GIS	Pat Breslin et al	ESRI	1999	1-879102-46-3
GIS	GIS means Business	Christian Harder	ESRI	1997	1-879102-51-X
GIS	GIS for Everyone:Exploring your neighborhood and your world with a GIS	David E.Davis	ESRI	2003	1-879102-91-9
GIS	GIS for Landscape Architects:GIS FROM LANDSCAPE ARCHITECTS	Karen C.Hanna	ESRI	1999	1-879102-64-1
GIS	Managing Natural Resources with GIS	Laura Laug	ESRI	1998	1-879102-53-6
GIS	The ESRI Guide to GIS Analysis: Vol1 Geographic Patterns & Relationship	Andy Mitchell	ESRI	1999	1-879102-06-4
GIS	Transportation GIS	ESRI	ESRI	1999	1-879102-47-1
GIS	Understanding GIS :The ARC/INFO Method	ESRI	ESRI	1997	1-879102-01-3
GIS	The Global Positioning System and GIS:An Introduction	Michael Kennedy	TAYLOR & FRANCIS		0-415-28608-5
GIS	A System for Survival:GIS and Sustinable Development	ESRI	ESRI	2002	1-58948-052-X
GIS	Modeling our World:The ESRI Guide to Geodatabase Design	Michael Zeiler	ESRI	1999	1-879102-62-5
GIS	Interoperating Geographic Information Systems	Andrej Vokovski et al	Springer	1999	3-540-65725-8
GIS	Geographic Information and Geographic Information System Standards	CCTA	HMSO	1994	0-11-330628-8
GIS	Web Cartography : Developments and Prospects	Menno-Jan KRAAK et al	TAYLOR & FRANCIS	2001	0-7484-0869-X
Photo-grammetry	Digital Photogrammerty	Michel Kasser et al	TAYLOR & FRANCIS	2002	0-748-40944-0
Photo-grammetry	Digital Photogrammerty	Michel Kasser et al	TAYLOR & FRANCIS	2002	0-748-40945-9
Photo-grammetry	Digital Photogrammetry: Theory and Application				
Photo-grammetry	Geoinformation: Remote Sensing, Photogrammetry and GIS	GOTTFRIED KONECNY	TAYLOR & FRANCIS	2003	0-415-23795-5
Photo-grammetry	Introduction to Modern Photogrammetry				
GIS	MANUAL OF GEOSPATIAL SCIENCE AND TECNOLOGY	John D.Bossler et al	TAYLOR & FRANCIS	2002	0-7484-0924-6
Photo-grammetry	INTRODUCTION TO MODERN PHOTOGRAMMETRY	Edward M.Mikhail et al	JOHN WILLY & SONS,INC	2001	0-471-30924-9
GIS	Statistics and Data Analysis	John C. Davis	John Wily & SON, Inc.	1973	
Surveying	Geodesy	Wolfgang Torge	Walter de Gruyter	1980	
Surveying	Plane and geodetic surveying for engineers	J.E. Jackson	Constable	1973	
Surveying	Science of the Earth		Harper & RowA. J. Eardley	1972	
Surveying	Surveying with GPS	R. W. King et al	The university of new South Wales	1985	
GIS	Intrductoriey readings in Geographic Information Systems	Donna J. Peuquet and Duane F. Marble	TAYLOR & FRANCIS	1990	0-85066-857-3
Surveying	Surveying with GPS	Bouchard and Moffitt	International Textbook	1961	
Photo-grammetry	AERO-PHOTO SURVEY AND MAPPING OF THE FOREST OF THE IRRAWADDY DELTA	R. C. KEMP et al	MAYMYO	1925	
Photo-grammetry	Photogrammetry (a part)	Francis H. Moffitt	International Textbook Company		

Attached 2 List of the education CD collected in the Study

	Title	Author	Organization
CD-1	Principles of Remote Sensing and Geographic Information Systems		ITC
CD-2	Introduction to Visualization of spatial data	Koert Sijmons	ITC
CD-3	How to create an orthophote	Koert Sijmons	ITC
CD-4	Multimedia Tutorial on Multispectral Image Processing		ITC
CD-5	Application of Satellite and Airborne Image Data to Coastal Management		ITC
CD-6	Multimedia tutorial R/S Image and data Fusion	Prof. John van	ITC
CD-7	Map makng from Space		ITC
CD-8	Guidline of Technical Transfer on Geographic Information System		ITC
CD-9	Drafts of the standard for Geographic information / Geomatics	ISO/TC211	GSI
CD-10	GIS Application		IDI
CD-11	Global Mapping Forum in Okinawa 2003		GSI
CD-12	Global Map "play it now!" kit		GSI
CD-13	CEOS SAR Workshop 2001 Proceeding		NASDA
CD-14	Global Rain Forest Mapping Project 1996. JERS-1 SAR Amazon Basin		NASDA
CD-15	Global Rain Forest Mapping Project 1996-7. JERS-1 SAR West Africa		NASDA
CD-16	Global Navigation Satellite System		GNSS
CD-17	Distance Education GIS		JICA
CD-18	Distance Education Remote Sensing		JICA