

**JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
SURVEY OF BANGLADESH (SOB)**

**BANGLADESH DIGITAL MAPPING
ASSISTANCE PROJECT
(BDMAP)**

Project Management and Lecture

- 1) Outline and Essence of Project Management**
- 2) Explanation and Exercise of Earned Value Management**
- 3) Lecture for Pricking, Establishment of Air Photo Signals and Aerial Photography Planning**

March 2012

**Asia Air Survey Co., Ltd.
Aero Asahi Corporation**

Outline and Essence of Project Management

June 2010

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Bangladesh Digital Mapping Assistance Project

(BDMAP)

Outline and Essence of Project Management

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Project Management (No.1)

Success Rate of Project?

Project: The body or group organized to achieve the specific purpose is called as "Project".

Purpose of Project: The purpose of the Project is different from project by project.



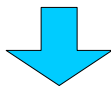
Therefore, the conditions of the judgement for success or failure of Project are different project by project.

In general, success or failure of Project will be judged by the following items.

Items for judgement of success or failure of project (Sample)

Items	Failure	Success
Cost	Over	Within budget
Period	Over	Within period
Quality/performance	Many claims, Many accident	No claim, No accident
Specifications	Not achieved	Achieved
Customer satisfaction	Low	High
Technical capability	Level down	Level up
Personnel	Unhappy	Happy

Note: The number of items concerning quality, performance and specifications will be different project by project.



In general, success or failure of Project is the results of combination of around 10 items.



The success rate of Project can be estimated as follows on the condition of the possibility of success of each items as 1/2.

Success rate of Project

Success rate of Project = Cost × Period × Quality/performance 1 × Quality/performance 2 ×
Customer satisfaction × Technical capability × Personnel.....

<In case of 10 items>

$$\text{Success rate of Project} = \left(\frac{1}{2}\right)^{10} = \frac{1}{1024}$$

In a probability theory, the success rate of Project is approximately 0.1 %.



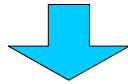
This success rate of Project means that the Project without proper project management will surely be failed.

At the end of Project, it is possible to know what items are succeeded or failed by the analysis of target values and actual values of each items.

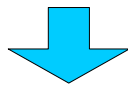
Project Management (No.2)

What is Project Management?

The success rate of Project is calculated as 0.1 % on the condition of the possibility of success of each items as 1/2.

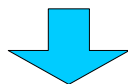


This percentage means that Project without proper plan, proper management will be surely failed from the view point of probability theory.

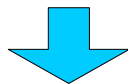


At the time of implementation of Project, it is necessary to consider how to improve the success rate of following two items.

- 1. Increase the success rate of total Project**
- 2. Increase the success rate of each items of Project**



In general, it is difficult to implement Project successfully (All components of Project will be completed as success).



Accordingly, in fact, success or failure of Project will be judged as what components of Project are succeeded and what components of Project are failed.

Therefore, it is necessary to make ranking of components of Project for evaluation.



Project Management is the method to increase the success rate of each component of Project.

There is no assured way for success of Project.

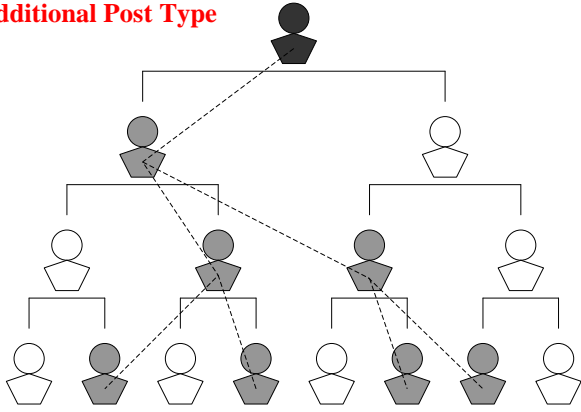
Project Management (No.3)

Organization of Project Team

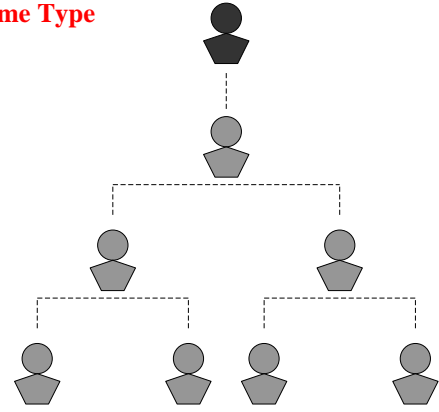
In general, Project team will be organized at the time of implementation of Project.

There are four (4) type of Project Team.

1. Additional Post Type

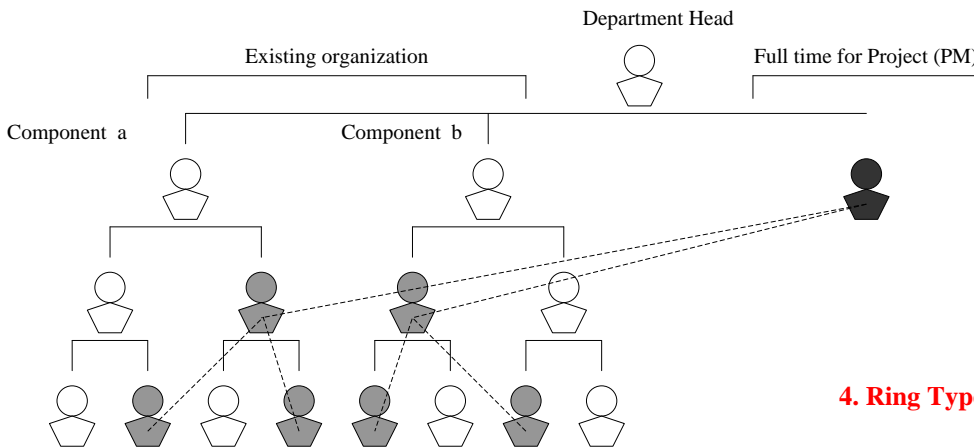


2. Full Time Type



----- : Chain of command

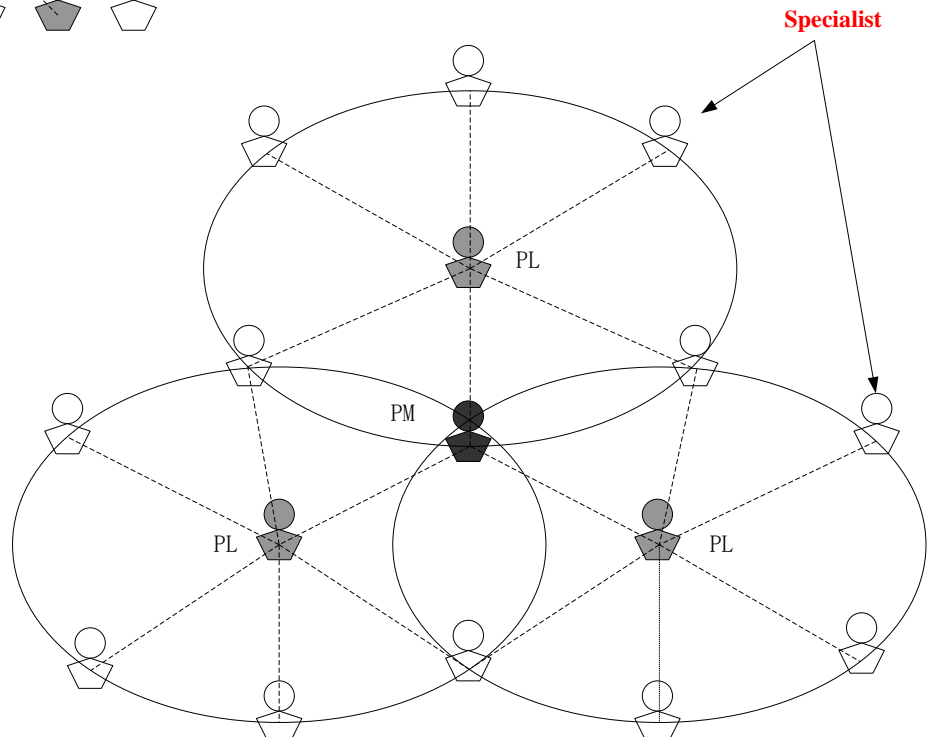
3. Cross Function Type



4. Ring Type

PM: Project Manager

PL: Project Leader



Project Management (No.4)

Characteristics of Project Team Type

The characteristics of each project team type are as follows:

1. Additional post type

- Most classical style organization
- Suitable for operational improvement Project
- In case the boss of project member has no relation with Project, it is difficult to keep the motivation of project members.

2. Full time type

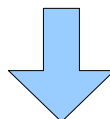
- Next type of Additional post type
- Most popular organization of project team
- Suitable for development of new products
- It is easy to keep the motivation of the member of project team, because the boss of project team is also the member of project team.
- It is difficult to recruit the necessary members who has enough experience and capabilities for project team.

3. Cross function type

- The organization to rectify a defect of Full Time Type
- Suitable for development of new products necessary many kind of technologies, and new products have to be developed continuously such as car and home electric appliances
- Real member of project team is Project manager and administrative department head (2 persons).
- Other members of project team belong to two (2) organizations. Therefore, it is difficult to manage the volume of works of each member of project team.
- Project manager can not use the members of project team freely.

4. Ring type

- Organization consisting of small members
- Suitable for research and development project and project necessary high technologies
- Every member has to be the specialist and has high technical capabilities.
- In general, there is no chain of command, the member of project team will work independently and the role of project manager and team leader is the coordination among the members.
- It is easy to keep the motivation of high level engineers.



The type of project team will be decided based on the characteristics of Project and necessary technical capabilities and so on.

Project Management (No. 5)

What is Project and Characteristics?

To understand the Project Management, it is necessary to understand the definition of Project and the characteristics of Project.

This is the first step to understand the Project Management.

Definition of Project :

"Temporary activities to achieve the purpose and/or requirements" is called as "Project".

Characteristics of Project :

Project has following three characteristics.

Characteristic -1 : Project has clear-cut purpose(s).

- Project has clear-cut purpose(s) to achieve.
- To achieve the purpose(s), Project Team will be organized and the Project will be implemented by Project Team.
- It is necessary to distinguish clearly between Purpose of Project and Outputs of Project.
- Outputs of Project mean the service and/or products which will be produced through the implementation of Project.

Characteristic-2 : One-time activity (Not routine work)

- Project is one-time activity (work) and not repeated activity (work) such as routine work.
- Preparation of monthly report, cyclic check (Patrol inspection), assembly production line such as car factory and so on are not called as Project.
- Project has start and end due to the reason of one-time activity. It is possible to define the starting time and ending time.
- In case the starting time and ending time is not clear, project cost may be increased.

Characteristic-3 : Project has restrictions such as period, cost, manpower and so on

- In general, Project has restrictions such as project period, budget, available and so on.
- Therefore, Project has to be implemented and achieved the project purpose within a limited time, budget, manpower and so on.
- Practically, there is no Project with limitless project budget, limitless manpower, limitless project period and so on.

Project Management (No. 6)

History of Project Management

Before establishment of the concept of Project Management, project was implemented based on the personnel experience and/or feeling (divination).

In the past, Project Management means the management actions for quality, cost and date of delivery. And it is not considered as independent and academic concept.

It is said that concept of Modern Project Management was established by the Ministry of Defense in USA under the period of cold war.

Due to the reason of launching of manned rocket by USSR prior to USA, the Ministry of Defense in USA systematized the process of military project for the purpose of speed up of project implementation.

In 1958, "Program Evaluation and Review Technique (PERT)" was developed at the time of Polaris Missile Development Project in USA.

At the same time, "Critical Path Method (CPM)" was developed by DuPont Company in USA.

After that, "Project Management Body of Knowledge (PMBOK) which was formulated by PMI (Project Management Institute: NPO in USA) became popular as Concept of Project Management.

At present, Modern Project Management is advocated. This naming is to distinguish between the traditional project management targeting cost and schedule control and new concept of project management.

Modern Project Management deals with not only cost and schedule control, but also project scope, communication, risk management, team building, quality control and so on.

Project Management (No.7)

Pitfall of PERT and CPM

PERT (Program Evaluation and Review Technique) and CPM (Critical Path Method)

In PERT, all necessary works will be itemized and Network Map showing the interdependent relation of each work items will be made.

This network map is called as "PERT Map". Based on this PERT Map, critical path, which is the most important and main working route, will be clarified.

Critical Path means the series of the most important and main works in Project. The delay of some of work in critical path means the delay of whole Project.

PERT was developed by Polaris Missile System Development by US Navy. PERT aims to reduce the Project Period by the stochastically estimation of necessary time.

Around the same time, "Critical Path Method (CPM)" is the process planning and management method to optimize the Project Cost, not Project Period.

Both PERT and CPM will execute schedule control using similar network map. Therefore, it is called as PERT/CPM.

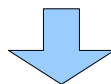
PERT/CPM contributed to many projects for reducing project period and project cost. However, in the latter half of the '90s, unexpected issue was found in PERT/CPM.

PERT/CPM was developed targeting for Military Project and Construction Project. Therefore, PERT/CPM was developed on the condition of:

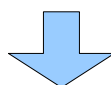
- 1) Project period is the first priority in Military Project and cost of project is not a factor into calculation to win the military competition.
- 2) It is easy to hire the Resources (Construction workers) incrementally in construction project.

However, followings became serious issues for software development project or new products development project.

- 1) Increase or decrease of volume of work and cost due to the reason of unclear specifications
- 2) Lacking of resources such as necessary technologies or engineers for the implementation of project



PERT/CPM has no idea of the scramble of resources at the time of implementation of Project.



The project, which cannot be able to secure the necessary resources, will not be implemented on schedule due to the reason of scramble of resources by other projects or other tasks in the same project.

Project Management (No.8)

Pitfall of Present Project Management

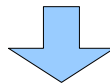
Dr. Eliyahu M. Goldratt (Physical scientist, Israeli) pointed out that the scramble of resource affects the schedule of Project or Task seriously.

Dr. Eliyahu M. Goldratt developed the new project management method based on his theoretical concept.

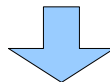
At first, the dependency of the process of operation will be made clear. Then, the critical chain (chain of operations) which will take longest working period will be defined considering the dependency of the process of operation due to the reason of the limited resources.

Then, working schedule will be made from the end of the project (delivery date of products) to be able to shorten the work schedule. This management method is called as "Critical Chain Project Management".

"Critical Chain Project Management" was developed in 1997 and the significant progress has been made in the field of schedule control of Project. However, some project could not be completed successfully.

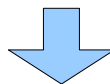


Because, the methodology of administrative engineering, factor of "Humanity" is not taken into consideration.



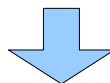
In the traditional project management, manpower is one of the factors of resources and considered as follows:

- 1) The productivity is always same even though the person is different.**
- 2) Therefore, the value of 1 Man/Day will not be changed by the person.**



Human is not like a machinery, the performance of human will be changed by the circumstances, feeling and so on.

The productivity is depend on not only the capability, but also the motivation to the work.



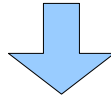
Therefore, productivity can be defined as follows:

Volume of 1 Man/Day $\hat{=}$ Capability \times Working Hours \times Motivation Factor

Project Management (No.9)

Definition of Project Management at Present

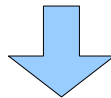
Success of Project means that the outputs of Project will be created within the limited conditions such as budget, period and so on, and the customers will satisfy the outputs of Project.



**It is easy to say, but it is difficult to execute.
However, "difficult" does not means "impossible".**

The word of "Absolutely" or "Definitely" does not exist in the field of human activities. It can be said that Project will be absolutely a success, or Project will be definitely a failure.

At the time of starting Project, every Project has a possibility of success or failure. However, when Project completed, success or failure of Project will become clear.

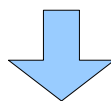


**It can be said that Project Management with clear-cut intention
will bring Project to a successful conclusion.**

Project Management Institute (PMI) in USA defines Project Management as follow:

**The application of knowledge, skill, tools, and techniques to project activities
to meet the project requirements.**

**Present Project Management is the method of management targeting not only for cost
and schedule control, but also with wide vision such as scope, communication,
risk, team building, quality and so on.**



**However, it is necessary to understand clearly that Project Management is
a tool for managing of Project.
The results of Project Management will be changed by the person who will use this tool .
Therefore, the most important is the capabilities of person who engaged in Project
Management.**

Project Management (No.10)

To Understand the Key Words

Followings are key words which are commonly used in Project Management.

Output

An Output means the service or products which will be created by the activities of Project.

An Output means not only the final products, but also intermediate products in Project Management. For example, operation plan at the time of planning stage also call as Output.

An Output which will be delivered to Customer is call as Final Output distinguish final products and intermediate products.

Stakeholder

Stakeholder means all peoples or organizations related with Project

Thus, Stakeholder means peoples or organizations which have an affect on Project, or peoples or organization which will be affected by Project.

For example, customer (organization and its staff), sponsor (organization and its staff), project manager, members of project team and so on are stakeholders of Project.

To define the range of stakeholders is one of the important key factor at the time of implementation of Project.

If not, necessary information will not be conveyed to the necessary persons and troubles will be arisen

Life cycle

Project is one-time activity and has the starting point and ending point. There are of several processes in Project (between the starting point and the ending point) like human life. Therefore, it is possible to say that there is a life cycle in Project.

To manage Project effectively, it is necessary to understand the temporal changes of Project according to the progress of Project.

Phase

An idea of life cycle is useful to grasp the temporal change in Project. Each phase is call as Phase in project management .

Consideration of life cycle of Project is:

- 1) To define the phases composing of Project
- 2) To define the operation order of phases

Project Management (No. 11)

Merit of Phase Classification

What is a merit of phase classification?

Following points have to be considered at the time of phase classification.

1) Project consists of what kind of Phases (Steps of Work) ?

2) What is the main items to be managed in each phases ?

3) What is the outputs of each phases ?

Phase classification has to be done flexibly considering the characteristics of Project and management method. Depend of the Project period and size of Project, phase classification is not necessary.

Merits of phase classification are as follows:

1) It is possible to manage Project phase by phase.

2) Check point can be set up at the end of each phase by deciding the outputs of each phases.

3) It is easy to understand the progress of Project by stakeholders.

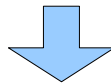
Project Management (No.12)

Characteristics of Project Team

Project Team will be consisted of One Project Manager who has the responsibility for the implementation of Project and project members. In case of big project, project leaders who have the responsibility for each section will be assigned

To achieve the targets of the Project effectively within the limited period, Project Team with high performance will be necessary.

The Project which are organized by the members who have high capabilities will be able to execute the Project successfully or not ?



Unfortunately, answer is No.

It is necessary to understand the characteristics of Project Team to get this answer.

In general, the organization will be made on the condition that the organization will be continued semi permanently.

However, Project Team will be organized to achieve the specific purpose and will be dissolved after completion of the Project. Temporary organization is one of the characteristics of Project Team.

Therefore, there is a flexibility for team building according to the project purpose and the circumstances surrounding Project

The member of Project Team have to get a approval of Project Manager only before making a decision. Therefore, the necessary period for the decision in Project Team is very short comparing with ordinary organization.

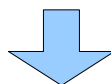
This means that Project Team can execute quick response for issues and/or change of circumstances surrounding the Project. This is a merit of Project Team.

However, there are difficult tasks in Project Team comparing with ordinary organization.

First, it is difficult to manage or organize the members of Project Team. Because, Project Team will be organized by multiple members which have a skills and capabilities necessary for the achievement of project purposes. Furthermore, it is necessary to recruit the persons from the other organization(s) in many project. Therefore, it is difficult to make a communication between the members of Project Team.

Second, high ability of leadership, and personnel magnetism and influence is required to Project Manager. personnel magnetism and influence is some feeling to work with this Project Manager.

In general, Project Manager does not have authority over the personnel of Project Team. However, in ordinary organization, department head has the power for the decision of promotion and salary of the staff belonging to the department. Therefore, more high ability of leadership, personnel magnetism and influence is required for Project Manager comparing with department head of ordinary organization.



**Well organized Project Team and high ability of leadership of Project Manager are essential for the success of Project.
The Project can not be success only by recruiting the members with high capability and performance.**

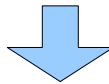
Project Management (No.13)

Good Project Team and Bad Project Team

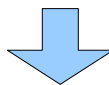
What is Good Project Team and What is Bad Project Team?

Good Project Team	Bad Project Team
Reliable with each other	No relationship of mutual trust among members
Team activities is available by members.	Team activities is not available by members.
Activities of members of project team are in accordance with project purpose	Members of project team do not understand the project purpose.
Good communication among the project members	No multiple effect, just a gathering of individuals
High capability of work implementation as a team	Low capability of work implementation as a team

To expect the good team condition from the beginning of the Project is in fault.



**Good Project Team must be created by the Project Manger.
Good Project Team will not be created without any effort.**



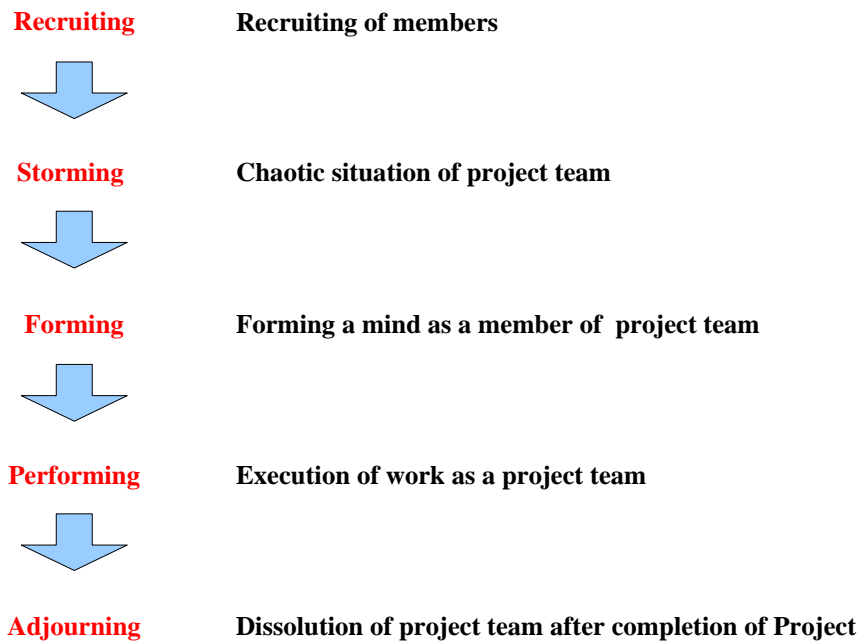
To create Good Project Team is one of the important task of Project Manager.

Project Management (No.14)

Evolution of Project Team

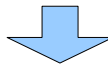
Change of the condition of Project Team

In general, the condition of project team will be changed as follows:



To create Good Project Team is fully depend on how to get through "Storming".

At a same time, it is necessary to consider that problems always exist in Project and it is a natural situation of Project.



**There is no project without problems.
The important point is how to solve the problems, and not to expect no problems in Project.**

Note: Project team without change of condition means a bad project team.

Project Management (No.15)

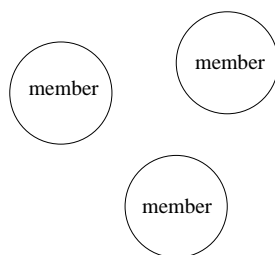
How to Create Good Project Team.

Good communication is essential in project team.

Lively exchange of opinions among the members of project team are essential for the creation of good project team.

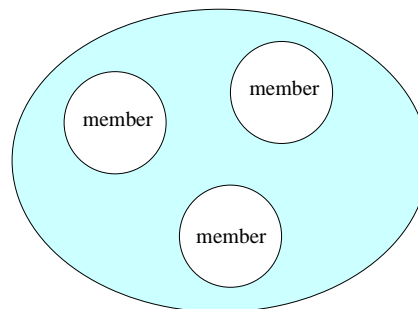
During the implementation of project, change of circumstances surrounding the project and may issues will be arisen. To get through these matters, mutual effects among the members of project team is necessary.

In case bad communication



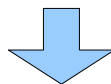
1+1+1 is only 3

In case good communication

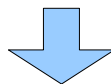


**1+1+1 become more than 3
(Mutual effects)**

Information, opinions, idea and so on will be exchanged by the lively communication within project team is essential for mutual effects.



**Confidential relationship between project manager and project members,
and also among the project members is essential.**



**In case no confidential relationship, most energy will be used for protection of itself
and effective communication become impossible.**

Following points are important for good communication.

- 1) Latest information have to be always delivered to the member of project team promptly.
- 2) No favouritism
- 3) To make understand the importance of communication to the members of project team.
- 4) If necessary, training for improving communication capability will be executed.

Project Management (No. 16)

Role of Project Manager

What is the role of project manager?

It is considered that the main roles of the project manager are as follows:

1) Setting up a good project team

- ⇒ To make a good communication among the project members.
- ⇒ To establish the confidential relationship among the project members.

2) Preparation of project plan

- ⇒ To make clear the works to be executed.
- ⇒ To make clear the role and duties of each members of the project team.
- ⇒ To make understand the project plan to the all members of the project team.
- ⇒ To make clear the scope of work of each sections of the project team.

3) Leadership

- ⇒ To make a decision immediately when the issues occurred.
In case the decision was found as not so good, just correct it.
- ⇒ The postpone of the decision may be the worst choice.

4) Periodical monitoring

- ⇒ To check the progress and cost and compare with the original plan.
- ⇒ To analyze the discrepancy and take a necessary countermeasures.
- ⇒ To revise the project plan such as schedule and budget.
- ⇒ To make understand the issues to all members of the project team.

5) Transmission of information (Communication)

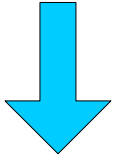
- ⇒ Necessary information have to be transmitted to all members of the project team without delay.
- ⇒ Many issues during the implementation of the project will be caused by the lack or insufficient communication.

Project Management (No. 17)

Steps of the Project

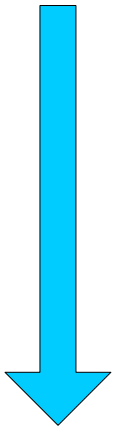
The project will proceed according to the following 4 steps.

Definition : The step to decide the project purpose and final products



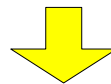
- 1) Outline of the project
- 2) Purpose of the project
- 3) Final output of the project

Preparation of plan : The step to prepare the project plan



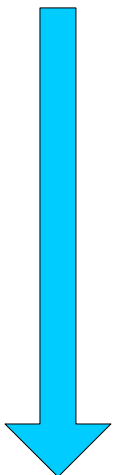
- 1) How to produce the output.
- 2) Realistic project plan must be made.
- 3) Detailed plan is not always a good plan.

Project plan is a tool, not a target.



Project plan must be modified according to the situation.

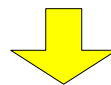
Implementation : The step to execute the project according to the project plan



This step is the period to consume the almost all of the resources.
The main tasks of project management in this step are :

- 1) Check the progress and cost
- 2) Comparison of the progress and cost with original plan
- 3) Countermeasures to issues

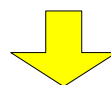
Almost all of the projects can not be implemented according to the schedule.



**In case of the long period project and/or complicated project,
the discrepancy between the progress and plan may become large.**

Completion : The step to complete the project

**Completion of the project is not same as the completion of production
of final products.**



**It is necessary to make clear the condition of project completion
on the step of "Definition".**

Project Management (No. 18)

Definition of the Project (1)

The first work of the project is "Definition of the Project".

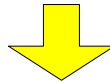
The definition of the project means ;

- 1) To inform the project to stakeholders
- 2) To make clear the final goal of the project

Generally, at the beginning of the project, the document including the following items will be prepared. This document is called as "**Project Charter**".

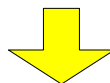
- 1) Background of the project
- 2) Purpose of the project
- 3) Final products
- 4) Budget
- 5) Project period
- 6) Condition of completion
- 7) Power and responsibility of project manager
- 8) Organization of project team
- 9) Communication
- 10) Etc.

It is recommended that the project should be started after the contents of the project make clear as much as possible. The project will be able to execute efficiently.

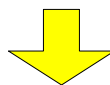


How it ends depends on how it begins.

From when the project exists?



The project will exist as officially after the definition of the project.
It is necessary to make clear the starting date of the project.



To make clear the contents of the project and to inform to stakeholders

Project Management (No. 19)

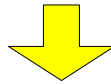
Definition of the Project (2)

To make clear the final goal

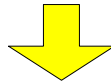
At the beginning of the project, it is necessary to make clear the following items.

- 1) For what purpose the project will be executed.
- 2) What have to be executed by the project.
- 3) What is the priority items of the project.
- 4) Order of the works of the project

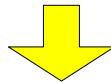
It is necessary to understand that the purpose of the project and the final output of the project are different.



In case the communication between the ordering party and the project team is not enough, the discrepancy between the project purpose and the final output will be occurred.



Therefore, project manager have to make clear the background and the purpose of the project before starting the project.



In case the ordering party or upper authority can not make clear the project purpose, project manager have to make clear the project purpose and have to get an approval from the concerned parties and make an official document .

Project Management (No. 20)

Preparation of Project Charter

PMI, USA defines that project charter will be prepared at the beginning of the project.

The contents of project charter will depend on the size and type of project. Generally, following items will be included in project charter.

1) Background of the project

The necessity of the project, process of formation of the project and so on will be described briefly.

2) Purpose of the project

The target to be achieved by the implementation of the project will be described briefly.
The purpose of the project is not same as the final products of the project.

3) Final products of the project

The outputs which will be produced by the project will be described.

4) Budget of the project

The amount of money which can be used by the project will be described.

5) Project period

The date to be produced the final products will be described.

6) Condition of completion

The condition of completion of the project will be described.

7) Power and responsibility of project manager

The power and responsibility of project manager during the implementation of the project will be described. Responsibility with no power is meaningless.

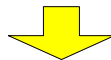
8) Organization

Organization of the project team, chain of command, name of members and so on will be described.

9) Communication

How to exchange the information among the members of the project team, and between the project team and stakeholder and so on will be described.

In a normal situation, project charter have to be prepared by the top management.
However, in actually, "No."



Therefore, project manager has to prepare the project charter and to get the approval from the concerned parties

The power of project manager does not mean the unlimited power.



The power of project manager is the power to be able to execute the project effectively and smoothly and will be limited within this extent.

Project Management (No. 21)

Preparation of Project Plan

At the time of preparation of project plan, it is necessary to list up all works for the implementation of the project after confirmation of the project purpose and final products.

Frankly speaking, project will not be implemented according to the project plan. However, project plan is essential for the implementation of the project.

It is recommended that project plan will be made by the project manager with the cooperation of the members of the project team.



Project members can understand the contents of the project and also how to execute the project.



**The project plan must be made in an easy-to-understand manner.
(Preparation of project plan is just a method , not a target.)**



An information and its accuracy are important factors for the preparation of project plan.



**It case it is difficult to obtain the necessary information, it is not necessary to make a precise project plan.
According to the volume and accuracy of information, project plan will be modified.**



Project plan have to be modified according to the progress and the necessity of the project.

A capable person in the organization is the person who can make a good plan.

Project Management (No. 22)

Breakdown of the Project

1) Definition of project purpose and final products

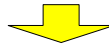
The first work of the preparation of project plan is to define the project purpose and final products.

Based on the under-mentioned items, project purpose and final products will be clearly defined.

- 1) Project charter
- 2) Specifications of contract document
- 3) Meeting with ordering party and stakeholders

At this step, it is necessary to share the common perceptions not only by project manager and project members, but also ordering party and stakeholders.

An arbitrary perceived notion is the most dangerous factor at this step.



It is a delayed bomb.

2) Breakdown of the project by WBS

Work Breakdown Structure (WBS)

All works necessary for the production of final products are shown in Work Breakdown Structure (WBS).

The purpose of WBS is to understand the project visually by the all members of the project team.

According to PMBOK, it is defined that all works necessary for the implementation of the project must be shown on WBS.



Therefore, the work not mentioned on WBS is out of activities of the project.



**The contents of WBS must be made accurately and precisely.
However, if the mistake is found, it is just to correct it.**



An exceeding segmentalization of work makes difficult to manage the project.

**It seems to be difficult to make WBS by the person who has
no experience of actual works.**

Project Management (No. 23)

Preparation of Project Schedule (1)

1) Preparation of project schedule, budget plan and risk management plan

Following three items must be considered at the time of preparation of project plan..

- 1) Project schedule
- 2) Budget
- 3) Risk

For the preparation of project schedule, following three types of schedule will be used.

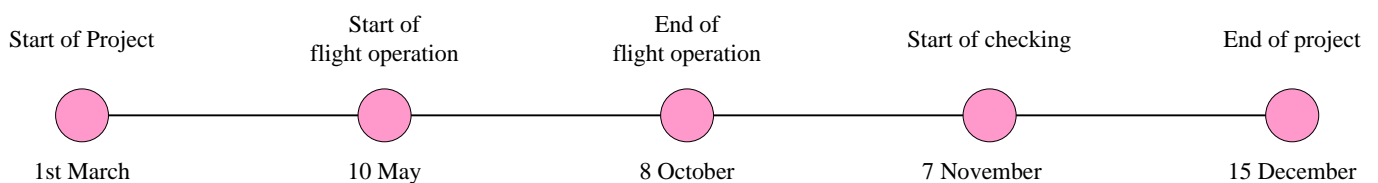
- 1) Milestone schedule
- 2) Project summary schedule
- 3) Project master schedule

Milestone Schedule

Milestone : Main checking points of project

milestone schedule shows the milestones on time axis as follows:

Sample of Mile Stone Schedule (Aerial Photography)



The progress of project can be checked based on the checking point.

Project Management (No. 24)

Preparation of Project Schedule (2)

Project summary schedule

Project summary schedule shows the main work items of the project are shown on time axis. It is easy to grasp the following information by project summary schedule.

- 1) Main works of the project
- 2) When work have to be started and to be ended.

However, it is difficult to understand the relationship among the work items.



Generally, project summary schedule will be used for the explanation to the stakeholders and to check the overall progress of the project.

Sample of Project Summary Schedule

Work item/Month	May	June	July	August	September	November
Work item A	████████████████████					
Work item B		██				
Work item C			████████████████████			
Work item D				██		

Project master schedule


Project master schedule is the overall schedule showing how to execute the project (starting and ending date of each work and the relationship among works of the project).

Generally, project master schedule will be used to control and manage the project.



It is necessary to modify the contents of project master schedule periodically during the implementation of the project.

Sample of Project Master Schedule

Work item/Month	May	June	July
Work item A	████████████████████		Completion date of Project 
Work item B		████████████████████	
Work item C		████████████████████	
Work item D			████████████████████
Work item F		████████████████████	

Project Management (No. 25)

Preparation of Budget Plan

Preparation of total project budget

Project budget means an all necessary cost for the implementation of the project.

Following is the basic concept for the preparation of project budget.

- 1) Calculation of necessary cost of each work item of WBS.
- 2) Total cost will be calculated by the accumulation of cost of each work.
- 3) Comparison of calculated total cost and the amount of original budget for the project.
- 4) Adjustment of calculated cost and original budget of the project.
- 5) To decide the total amount of project cost.
- 6) Total budget will be breakdown and allocated to each work.

Generally, Cost calculated based on WBS > Original budget of the project



It is not recommended to decrease the total cost without careful consideration.



To decrease the cost, it is necessary to make clear the reasons such as change of the scope of work, volume of work, methodology and so on.



The cost cut without clear reasons may have a risk.



It is necessary to increase the total budget of the project, in case cost cut is not available.



After determination of the total cost of the project, budget will be break down and allocated to each work.

Project Management (No. 26)

Preparation of Risk Management Plan

Risk Management Plan

There are no project without risk.



Therefore, risk management is an essential factor for the success of the project.



The contents of risk will be different project by project.

The basic procedure of the risk management is as follows:

Identification of risk

- 1) To list up the risk which will be considered during the implementation of the project.
- 2) It is not necessary to evaluate the level of risk at this stage.
- 3) It is recommended that the persons who have similar project experience will join in this work.

Quantification of risk

- 1) The risk listed up will be quantified.
- 2) The impact of the risk will be made clear.
- 3) Generally, quantification will be done by 5 ranks or 3 ranks.

Countermeasures to risk

- 1) Countermeasures to each risk will be defined.
- 2) Typical countermeasures to the risk are as follows:
- 3) Project team and project manager must decide countermeasure to be applied case by case.

Avoidance ⇒ To avoid the risk by using other methodology and so on.

Alleviation ⇒ To make the risk level and impact of risk become low.

Shifting ⇒ To effect an insurance policy. The risk will be shifted to third party by contract.

Watching ⇒ Do nothing, just watching the situation, in case the risk seems to be judged as low level.

Review of risk and countermeasures

- 1) Evaluation of the effects of countermeasures to the risk.
- 2) To define the new risk.

Project Management (No. 27)

Implementation of the Project

Implementation of the project means that the project will be executed according to the project plan.



Therefore, it is necessary to make clear the methodology, time schedule and so on before starting the actual work of the project.



That is "Project Plan".

All members of the project team have to know what should be done, how to execute the work and when the works have to be completed.

Especially, it is necessary to pay special attention in case new members joined to the project after starting the project.

Project manager has a responsibility for the intelligibility for the contents of the project by all members of the project team.



Finally, this is the key factor to reduce the burden of project manager.

Project Management (No. 28)

To Understand the Work of Other Sections or Members

The members of the project team will execute their duties during the implementation of the project.

However, to execute their duties efficiently and smoothly, following must be understood by all members of the project team.

- 1) The relationship between own duties and other members duties
(or, duties on own section and other sections)**
- 2) What kind of effect to the other member's duty will be made by the the progress of own work.
(or, effect between own section and other sections)**
- 3) What kind of effect to own work will be made by the works of other members.
(or effect between own section and other sections)**

Project manager must prepare the opportunities to be able to understand the work relationship among the members of the project team and sections of the project.

Project Management (No. 29)

Check of the Progress of the Project

When the project plan was made, implementation of the project will be started.

During the implementation of the project, the major works of the project management are as follows:

- 1) Check of the progress of each work
- 2) Comparison of the progress of each work and original schedule
- 3) Necessary countermeasures for the issues

Check of the progress of works

To grasp the present situation of the project, necessary information have to be collectetd.



Accuracies of the information are important key factor at the time of this stage.



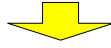
It is recommended that the presentation method of the progress (percentage of the progress) should be standardized by the project team.

Often, the underlying issues will not be shown on the schedule and/or cost.

Project Management (No. 30)

Comparison of the Progress and Original Schedule

Comparison of the progress of work and original schedule will be executed after getting the necessary information.



In case there is a discrepancy (both plus and minus) between the progress of work and original schedule, it is necessary to identify the reason of the discrepancy.

In case the progress of the work is beyond the original schedule, it is necessary to pay attention to the contents of work already executed.



For example, in case of field survey, the actual work was started from the area of good accessibility. So, the progress of work is beyond the schedule. However, the accessibility of the remaining area is not so good.

This can be applied to the cost of each work (in case of "Cost < Budget").



- 1) The planned work is not yet completed. So, the cost is below the budget.**
- 2) The mistake of accounting processing.**

To grasp the progress of the project objectively, "Earned Value Analysis" will be used, recently.



The progress of the project will convert into the amount of money by Earned Value Analysis.



For example : 10 days delay ⇒ 100,000 US\$ delay

Project Management (No. 31)

Countermeasures to Issues

After determination of the reasons of discrepancy between the progress and original schedule, it is necessary to decide the countermeasure to the issues.



It is not necessary to device a countermeasures against all issues.



The decision will be done by the project team and project manager.



If the project team want to make a decision efficiently, it is recommended to make some rule beforehand.

For example :

- 1) In case the discrepancy is less than 5 percent ⇒ No action
- 2) In case the discrepancy is more than 5 percent ⇒ Take action

Generally, the actions at the time of delay of the progress are following two method.

1) Crashing :

Increase the resources such as staff, equipment and so on.
The cost will also increase.

2) Fast Tracking :

Some work will be executed ahead of the schedule.
The risk of confusion and/or re-work will become increase.



**It is necessary to decide the countermeasures carefully
due to the reason of increase of the risk.**

Project Management (No. 32)

Periodical Risk Control

Unexpected issues will be occurred during the implementation of the project.

The situation around the project will also change during the implementation of the project.



Therefore, periodical check for risk management plan is essential.



Based on the risk management plan, periodical check will be executed.

- 1) Risk was occurred according to the estimation, or not.**
- 2) Cause of risk is same as the estimation, or not.**
- 3) Countermeasures to risk was effective, or not.**



If necessary, new risk and its countermeasure will be added to the risk management plan.

In case the organization already has the experience of same project, and new technology is not applied for the project, the manpower necessary for risk control will decrease.

Project Management (No. 33)

Troubleshooting

The basic concept of project management is "There is no project without issues".

Therefore, project manager and project members have to execute troubleshooting always during the implementation of the project.



Sometime, we find the project which has no issues at first glance. However, it is possible to say that in case of such project, project manager and/or project team solve the issues at the earlier stage of troubles.



No issues or having the good fortune.



Project manager and project members have to take necessary countermeasures for solving the issues which were already occurred or will be occurred in near future.



**Issues must be solved at the early stage of troubles.
The cost and time necessary for the troubleshooting will increase drastically
as time advances.**

From the point of views of troubleshooting, followings items should be executed during the implementation of the project.

- 1) Team meeting
- 2) Meeting with ordering party
- 3) Action for alteration of scope of work and/or specifications
- 4) Evaluation of team members

Project Management (No. 34)

Team Meeting

Team Meeting means the meeting which will be held by the members of the project team.

At the time of the implementation of the project, every members of the project team are always busy due to their own works. Therefore, the meeting held by all members of the project team is important for the good communication within the project team.

At the time of team meeting, following points should be considered.

- 1) It is necessary to make clear the frequency of team meeting, time of meeting and so on beforehand.
- 2) It is necessary to make clear the contents of meeting beforehand (**Agenda will be made.**)
- 3) The method of explanation such as the comparison of project plan and actual progress and so on will be unified beforehand.
- 4) Material to be delivered on the team meeting must be prepared beforehand.
- 5) Present situation, issues and **countermeasures** must be reported on the meeting.
- 6) Situation around the project also will be reported.

The purpose of team meeting is to provide the members of project team with a chance of communication among the members, team leader and project manager. This is one of the role of team leader and project manager.

Project manager also has to observe the air of project members such as physical condition and so on through the team meeting.

Project Management (No. 35)

Meeting with Ordering Party

Meeting with an ordering party will be held during the implementation of the project.

Project manager can grasp the concept and opinions of an ordering party through this meeting.

An ordering party can get the information of the progress of the project, and also has a chance to express the dissatisfied points to the project manager through this meeting.

Followings are the important points for the meeting with an ordering party.

- 1) Setting of frequency of meeting
- 2) Present situation of the project
- 3) Comparison of original schedule and actual progress
- 4) Situation around the project is changed, or not
- 5) Explanation of issues and countermeasures
- 6) Opinion and/or comment of an ordering party for the project implementation
- 7) Dissatisfied points of an ordering party for the project and/or project team

Project Management (No. 36)

Alteration of Scope of Work and/or Specifications

Sometimes, the scope of work and/or specifications will be changed during the implementation of the project.

In case of alteration of scope of work and/or specifications, immediately, it is necessary to judge that the contents of alteration are within the original scope of work and/or specifications of the project, or not.

In general, an additional cost will be necessary for the implementation of the work caused by the alteration of scope of work and/or specifications.



However, in case of minor change of scope of work and/or specifications, it is difficult to receive the additional cost from the ordering party.



Especially, in case of the scope of work and/or specifications of the project are ambiguous, this issue will be happened.

At the time of alteration of scope of work and/or specifications, following points have to be considered.

- 1) Amount of additional cost caused by the alteration of scope of work and/or specifications.
- 2) The change of scope of work and/or specification will be adversely affected, or not.
- 3) It is possible to implement the project within the project period, or not.
- 4) Risk of the project will increase, or not .

Project Management (No.37)

Evaluation of the Project Members

It is necessary to execute the evaluation of the project members by project manager during the implementation of the project.



This evaluation does not mean the evaluation for bonus or promotion of the position. The evaluation will be executed for the potential ability of each members of the project team.



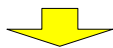
The purpose of this evaluation is to check that the project team is organized by the members having necessary skill or experience for the implementation of the project or not.



Also, it is necessary to check the capability as the project team is enough for the implementation of the project or not.



During the implementation of the project, situation around the project and the scope of the project will be changed and the necessary skill or knowledge of the project team will be changed. Therefore, evaluation for the members of the project team is essential.



Project manager must take a necessary actions such as recruiting the new members who have the necessary skill and/or experience, or execution of training for improving the capabilities of members of project team during the implementation of the project.

Project Management (No.38)

Completion of the Project

Completion of the final products according to the schedule does not mean the end of the project.



The completion of the project is the acceptance of the final products by the ordering party.



**It is necessary to make clear the conditions of completion of the project.
The official written documents have to be made before starting the project.**

Generally, the date of completion of the project is set in advance.



There are no issues on the final products does not mean that the project will be completed according to the schedule.



Generally, the date of completion of the project is the date of letter of completion issued by the ordering party.

The procedure of completion of the project are as follows:

- 1) To make clear the condition of completion.**
- 2) Official written document concerning the condition of completion will be made.**
- 3) To check the disincentives for the completion of project.**
- 4) To lead the project team to the end of project.**
- 5) To check the condition of completion by check list.**

Project Management (No.39)

Necessary Capability of Project Manager

The capabilities necessary for the project manager are considered as follows:

- 1) Leadership**
- 2) Proper judgement ability**
- 3) Flexibility**
- 4) Communication ability**
- 5) Negotiation ability**
- 6) Trouble Shooting ability**
- 7) Knowledge of project management method**
- 8) Clear-cut faith for success of the project**
- 9) Ability for good human relation**
- 10) Unprejudiced attitude**
- 11) Knowledge of contract**



However, from a practical point of view, it is possible to say that there are no person who has all abilities mentioned above.



It is not sure that the project will be completed successfully by recruiting the talented project manager from other organization.

It is possible to say that the talented project manager will not be cultivated automatically in the organization.



Therefore, project manager has to be cultivated by design. Frankly speaking, the cultivation of project manager is one of the most difficult task of organization.

Project Management (No. 40)

Essence of Project Management

Up to now, I explained the outline of project management. However, the essence of project management are undermentioned 4 items.

1) Leadership

- 1) A leader(s) who has unbending determination is essential for project team.
- 2) The project without leader will surely fail.
- 3) Quick analysis, decision and instruction are essential for a leader(s).
- 4) In case the decision and instruction are not suitable, it is just make change it immediately when we find that it is not a suitable decision and instruction.

2) Communication

- 1) Project is activities by group of human. Therefore, communication is one of the important key factor for the implementation of Project.
- 2) Many issues during the implementation of project will be caused by the lack or insufficient communication.
- 3) The project without the communication in the project team will surely fail.

3) Quick Action

- 1) There are no project without issues.
- 2) It is necessary to solve the issues at early stage or before the issues are found as much as possible.
- 3) If the necessary actions for issues are delayed, the time and cost for solving the issues will become huge drastically.
- 4) Therefore, quick decision and action are essential at the time of issue.
- 5) Generally, postpone of decision and action are the worst measure at the time of issues.

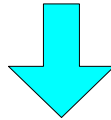
4) Cycle of Plan⇒Do⇒Check⇒Action

- 1) The basic element of project management during the implementation of project is to execute properly and effectively this cycle.
- 2) This cycle must be executed periodically.
- 3) In case of issues, after execution of necessary actions to issues, it is necessary to execute this cycle additionally.

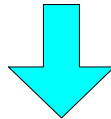
Project Management (No. 41)

At the End of Explanation of Project Management

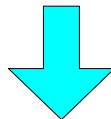
**Human is not God.
Therefore, mistakes are unavoidable in human activities.**



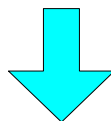
If we afraid of mistakes, it is impossible to implement the Project.



However, repeat of same mistake is a behaviour of fools.



An analysis for causes of mistake is essential.



Capabilities of personnel and organization will be improved by this analysis.

Explanation and Exercise of Earned Value Management

(EVM)

- No.1 What is EVM?
- No.2 Explanation of Word used on EVM
- No.3 What have to be checked on EVM?
- No.4 EAC and Estimated Completion Time of Project
- No.5 EVM Tools
- No.6 Flow of EVM
- No.7 Sample of EVM

June 2010

**By Toru Watanabe
Bangladesh Digital Mapping Assistance Project
(BDMAP)**

What is EVM? (No. 1)

EVM : Earned Value Management

Earned Value Management (EVM) helps project managers to measure project performance. It is systematic project management process used to find variances in project based on the comparison of work performed and work plan.

The progress of work and performance of each work will be converted to the value of work (Generally, convert to the amount of money) on EVM.

WBS is the basis for the planning and utilizing of EVM.

To utilize EVM, it is necessary to decide the cost, starting date and ending date of each work at the time of planning stage.

At a time of monitoring of project, actual values of each works will be counted.

Also, based on the situation of each work (start of work, completion of work , etc), earned value and actual cost will be counted.

EV (Earned Value) means the value of work performed. At the completion of the project the value of EV must be same as the value of Project cost (BAC: Budget at Completion).

AC (Actual Cost) means the amount of cost necessary for the execution of each work.

Based on the values of PV, AC and EV, analysis of present situation and future prospects of the project will be executed.

To analyze the present situation of project, following indexes will be used.

SV:	Schedule Variance
CV:	Cost Variance
SPI:	Schedule Performance Index
CPI:	Cost Performance Index

To estimate the future prospects of project, following indexes will be used.

EAC:	Estimate At Completion
ETC:	Estimate To Completion
VAC:	Variance At Completion

Explanation of Word used on EVM (No. 2)

Following the Key Works used on EVM.

BAC Budget At Completion

Amount of budget of estimated cost of the project

PV Planned Value

The amount of cost allocated to each work at the time of planning.

EV Earned Value

$$EV = PV \times \text{Progress of work (\%)}$$

The amount of cost allocated at the time of planning corresponding to the volume of work performed at the time of monitoring.

For example;

The cost of work allocated at the time of planning	: 10
The cost used for the work at completion	: 15
Earned Value	: 10

AC Actual Cost

The cost used for the implementation of each work.

SV Schedule Variance

$$SV = EV - PV$$

The discrepancy of schedule between the plan and actual.

CV Cost Variance

$$CV = EV - AC$$

The discrepancy of cost between the plan and actual.

SPI Schedule Performance Index

$$SPI = EV / PV$$

The efficiency of each work from the view point of schedule.

CPI Cost Performance Index

$$CPI = EV / AC$$

The efficiency of each work from the view point of cost.

EAC Estimate At Completion

$$EAC = AC + (BAC - EV) / CPI$$
$$EAC = AC + (BAC - EV) / (CPI * SPI)$$

The total project cost estimated at the time of monitoring.

ETC Estimate To Completion

$$ETC = EAC - AC$$

The estimated cost of the remaining works from the monitoring point up to the completion of project.

VAC Variance At Completion

$$VAC = BAC - EAC$$

The discrepancy of cost at the time of completion of the project between plan and estimation at the time of monitoring.

What have to be checked on EVM? (No. 3)

Following will be checked by EVM using data and EVM curve.

① **Progress (ahead or behind) of each work**

To check the progress (ahead or behind) of each work by the values showing in table.

② **Value and tendency of EV and AC**

To check the value of EV and AC (Difference between plan and actual).

To check the tendency of discrepancy between plan and actual (The discrepancy become large or small).

③ **Value and tendency of SPI and CPI**

To check value of SPI and CPI (Difference between plan and actual).

To check the tendency of discrepancy between plan and actual (The discrepancy become large or small).

In case of the values are bad, it is necessary to judge the issues is temporary issues or chronic issues.

④ **Value of EAC**

To check the cost at the completion of the project.

In case the following case, special attention is necessary.

PV > EV

The progress of work is behind schedule.

The tendency of the difference between PV and EV is large, it is estimated that the issues are not yet solved or become more serious.

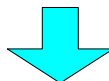
PV < AC

The cost of work is over budget.

In case the value of AC is over PV and the value of EV is under PV, it is estimated that the numbers of staff engaged in work are over from the appropriate number of staff ,or there are some issues on work.

PV = EV

In case PV = EV, it is estimated that the plan is not suitable or the accuracy of data acquisition for EVM is not so appropriate.



In general, in case the difference between PV and AC, and between EV and AC is more than 10 %, it is recommended to check the reason of difference and take a necessary countermeasures.

SPI < 1.0

The schedule performance is under plan.

In case the tendency of value of SPI become more low values, it is recommended to check the work method.

CPI < 1.0

The cost performance is under plan.

In case the tendency of value of CPI become more low values, it is recommended to check the work method and input of cost

EAC > BAC

The necessary cost for the implementation of project will become more than plan or the schedule will be delayed from the plan.

In case the difference between EAC and BAC is big, it is recommended to take a necessary countermeasure at a early stage.

EAC and Estimated Completion Time of Project (No. 4)

The typical formulas used for estimation of EAC are as follows.

What formula will be used for estimation of EAC is depend on the judgement of SV and CV at the time of monitoring.

1) $EAC = AC + ETC$

This formula will be used that the original budget (BAC) is judged as not effective or suitable due to the reason of situation change surrounding the project.

The cost of remaining work will be estimated and the actual cost up to the monitoring time will be added.

2) $EAC = AC + (BAC - EV)$

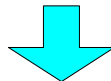
This formula will be used that the present difference of CV is judged as a special case and will not occurred during the implementation of the remaining work.

3) $EAC = AC + (BAC - EV) / CPI$

This formula will be used that the present difference of CV is judged to continued.

4) $EAC = AC + (BAC - EV) / (CPI * SPI)$

Same as 3), this formula will be used that the present difference of CV is judged to continued.



In general, formula 3) or 4) are used for estimation of EAC.

Estimation of completion time of project will be calculated by the following formula.

Completion time of project = Original project period / SPI

EVM Tools (No. 5)

There are many tools available on the market to measure earned value.

The most common are::

1. Microsoft Office Project
2. Primavera Cost Manager
3. Plan View MPM
4. iPursuit
5. Deltak Cobra

We can measure earned value by using Excel.

Flow of EVM (No.6)

To show the works based on WBS.



To decide persons or group who will engage in each work.



To estimate the PV of each work.



To decide the starting date and ending date of each work.



To draw the bar of each work based on the starting and ending date.



To set up the checking points (work period).



To make a calculation sheet of EV and AC of each period.



To allocate PV to each working period.



To calculate PV of each period and draw PV Curve.



To calculate the progress of each work at each period.



To calculate AC of each work at each period.



To calculate EV based on PV and Progress.



To draw EV and AC curves.



To calculate CV, SV, CPI and SPI.



To calculate EAC, ETC and VAC.



To calculate TOC.



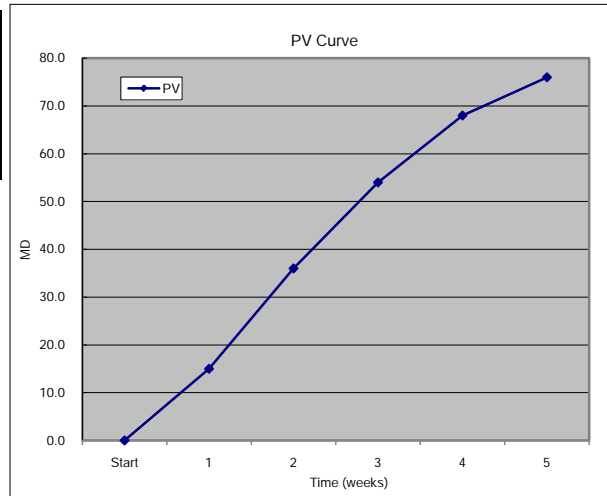
Evaluation of progress and cost will be done based on the above values.

Basic information is necessary.

No.7 Sample of EVM

Sample of EVM (Step-2) 2/2

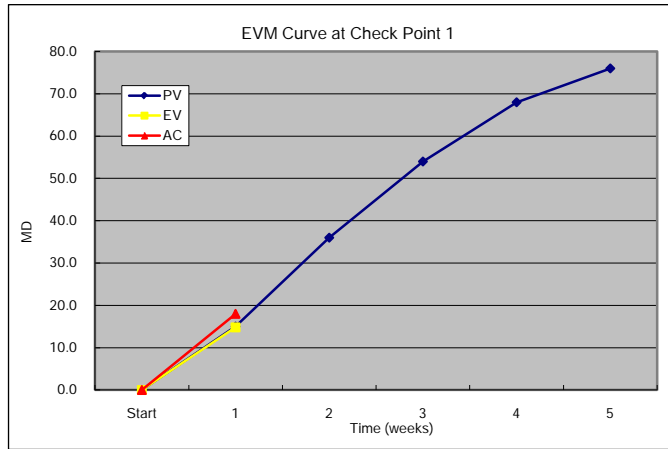
Check Point	PV
Start	0.0
CP1 (1st Week)	15.0
CP2 (2nd Week)	36.0
CP3 (3rd Week)	54.0
CP4 (4th Week)	68.0
CP5 (5th Week)	76.0



Sample of EVM (Step-3) 2/2

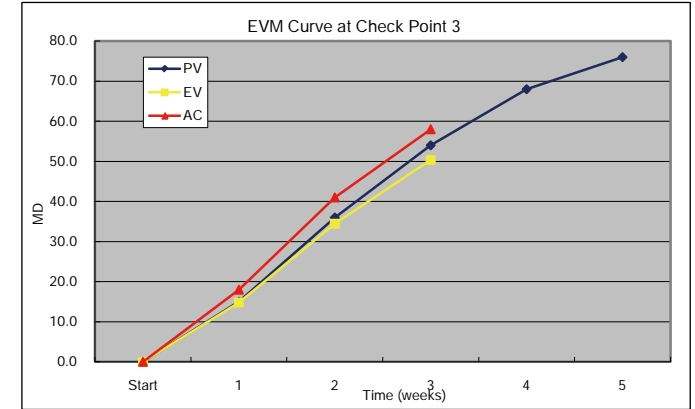
Check Point 1

CP	PV	EV	AC
Start	0.0	0.0	0.0
1 (1st W)	15.0	14.8	18.0
2 (2nd W)	36.0		
3 (3rd W)	54.0		
4 (4th W)	68.0		
5 (5th W)	76.0		



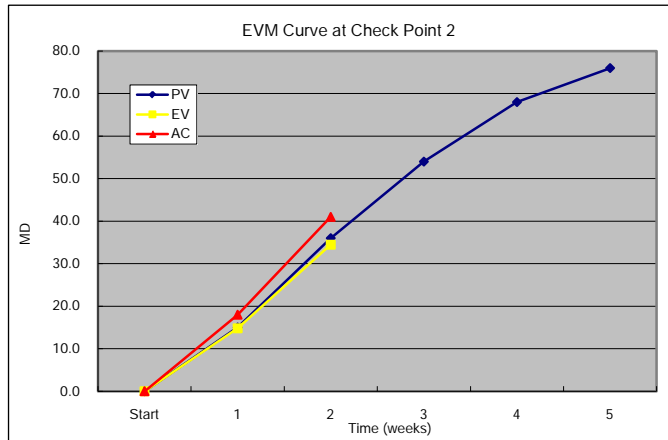
Check Point 3

CP	PV	EV	AC
Start	0.0	0.0	0.0
1 (1st W)	15.0	14.8	18.0
2 (2nd W)	36.0	34.5	41.0
3 (3rd W)	54.0	50.4	58.0
4 (4th W)	68.0		
5 (5th W)	76.0		



Check Point 2

CP	PV	EV	AC
Start	0.0	0.0	0.0
1 (1st W)	15.0	14.8	18.0
2 (2nd W)	36.0	34.5	41.0
3 (3rd W)	54.0		
4 (4th W)	68.0		
5 (5th W)	76.0		



Sample of EVM (Step-4) 2/3

Check Point	PV	EV	AC
Start	0.0	0.0	0.0
1 (1st W)	15.0	14.8	18.0
2 (2nd W)	36.0	34.5	41.0
3 (3rd W)	54.0	50.4	58.0
4 (4th W)	68.0		
5 (5th W)	76.0		
6 (6th W)			

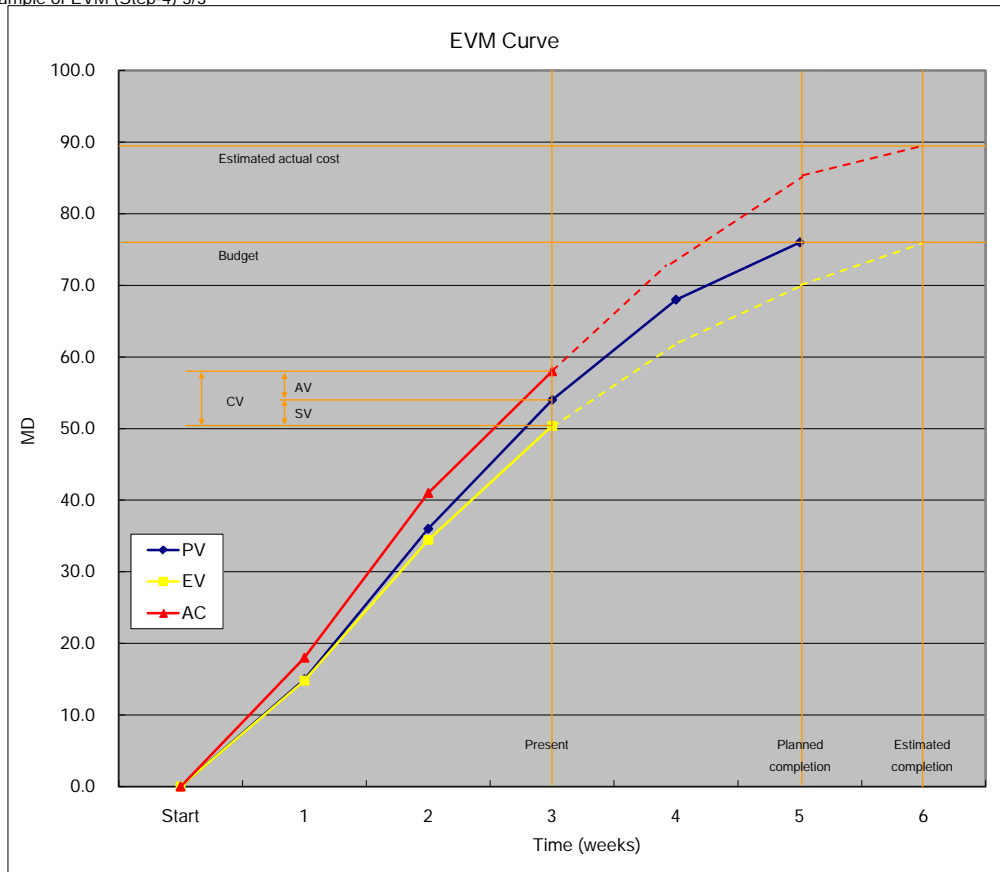
Check Point	CPI	SPI
Start		
1 (1st W)	0.82	0.99
2 (2nd W)	0.84	0.96
3 (3rd W)	0.87	0.93
4 (4th W)		
5 (5th W)		

	Name	Evaluation Time			Formula
		1st W	2nd W	3rd W	
PV	Planned Value	15.0	36.0	54.0	
EV	Earned Value	14.8	34.5	50.4	
AC	Actual Cost	18.0	41.0	58.0	
BAC	Budget at Completion	76.0	76.0	76.0	
CV	Cost Variance	-3.2	-6.5	-7.6	=EV-AC
SV	Schedule Variance	-0.2	-1.5	-3.6	=EV-PV
CPI	Cost Performance Index	0.82	0.84	0.87	=EV/AC
SPI	Schedule Performance Index	0.99	0.96	0.93	=EV/PV
EAC*	Estimate at Completion	93.4	92.7	89.7	=AC+(BAC-EV)/(CPI*SPI)
ETC	Estimate to Completion	75.4	51.7	31.7	=EAC-AC
VAC	Variance at Completion	-17.4	-16.7	-13.7	=BAC - EAC

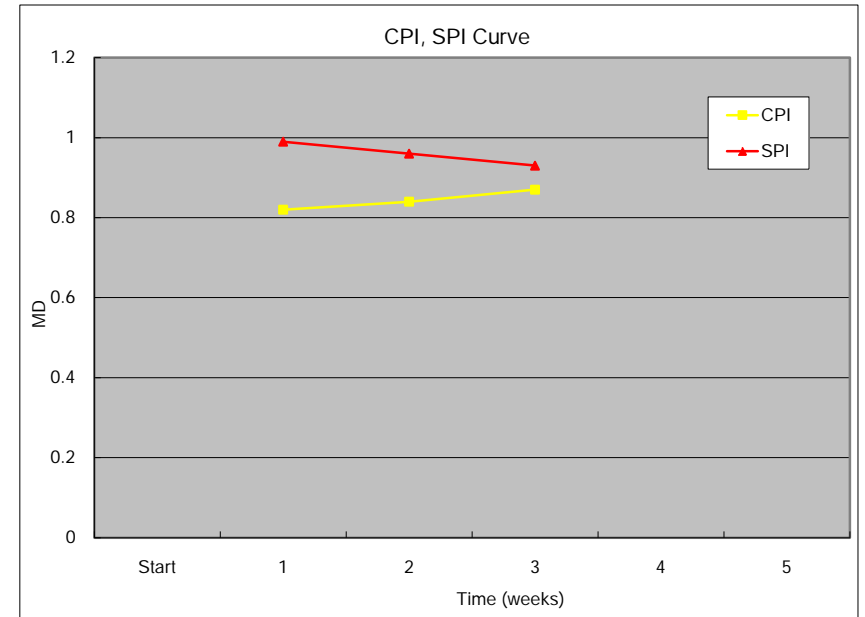
*	Formula	1st W	2nd W	3rd W
EAC (1)	=AC+(BAC-EV)/CPI	92.4	90.4	87.5
EAC (2)	=AC+(BAC-EV)/(CPI*SPI)	93.4	92.7	89.7
EAC (3)	=AC+ETC	93.4	92.7	89.7
EAC (4)	=AC+(BAC-EV)	79.2	82.5	83.6

Time to Completion
 =Planned period/SPI
 38 days

Sample of EVM (Step-4) 3/3



Check Point	PV	EV	AC
Start	0.0	0.0	0.0
1 (1st W)	15.0	14.8	18.0
2 (2nd W)	36.0	34.5	41.0
3 (3rd W)	54.0	50.4	58.0
4 (4th W)	68.0		
5 (5th W)	76.0		
6 (6th W)			



Check Point	CPI	SPI
Start		
1 (1st W)	0.82	0.99
2 (2nd W)	0.84	0.96
3 (3rd W)	0.87	0.93
4 (4th W)		
5 (5th W)		

Lecture for Pricking, Establishment of Air Photo Signal and Aerial Photography Planning

1. Pricking of Horizontal Point
2. Pricking of Height Point
3. Establishment of Air Photo Signal (1)
4. Establishment of Air Photo Signal (2)
5. Lesson of Aerial Photography Planning
6. Aerial Photography Planning at Mountain Area (1)
7. Aerial Photography Planning at Mountain Area (2)
8. Aerial Photography by Digital Camera

February 2010

**By Toru Watanabe
Bangladesh Digital Mapping Assistance Project
(BDMAP)**

Pricking of Horizontal Point

Purpose of pricking of horizontal point:

To execute the aerial triangulation, the existing GPS and new GCP points will be used for horizontal control of aerial triangulation. However, in case the existing GPS point can not be shown clearly on the aerial photos due to the reason of trees, building and so on, pricking of horizontal point and eccentric survey will be necessary.

Site selection for pricking of horizontal point:

Following points must be taken into consideration at the time of selection of site for pricking of horizontal point.

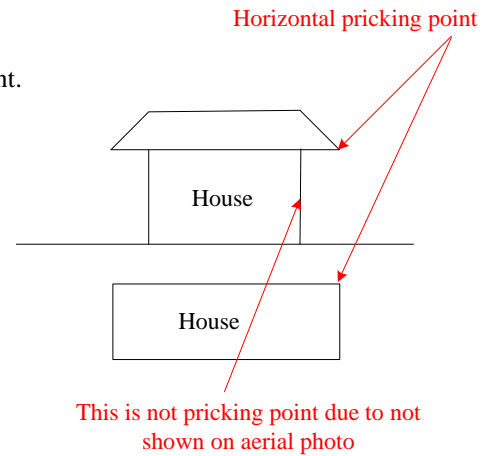
- 1) Location must be flat.
- 2) The point must be clearly identified on the aerial photo.
- 3) Upper field of view must be secured.
- 4) Additional point (P1 and P2) must be observed considering the safety factor.
- 5) Snap photos must be taken to be able to grasp the surrounding condition of pricking point.
- 6) Detailed sketch must be drawn and pricked point must be shown on the sketch.
- 7) The distances between pricked point and major artificial structures must be observed and shown on sketch.
- 8) Profile of pricked point must be drawn.

Location of horizontal pricking point

In general, following points will be selected for horizontal pricking point.

- 1) Sharp Corner of artificial structure such as building or house.
- 2) To establish the aerial photo signal on horizontal pricking point.

Location of the horizontal pricking point should be taken into consideration. (refer to right figure).

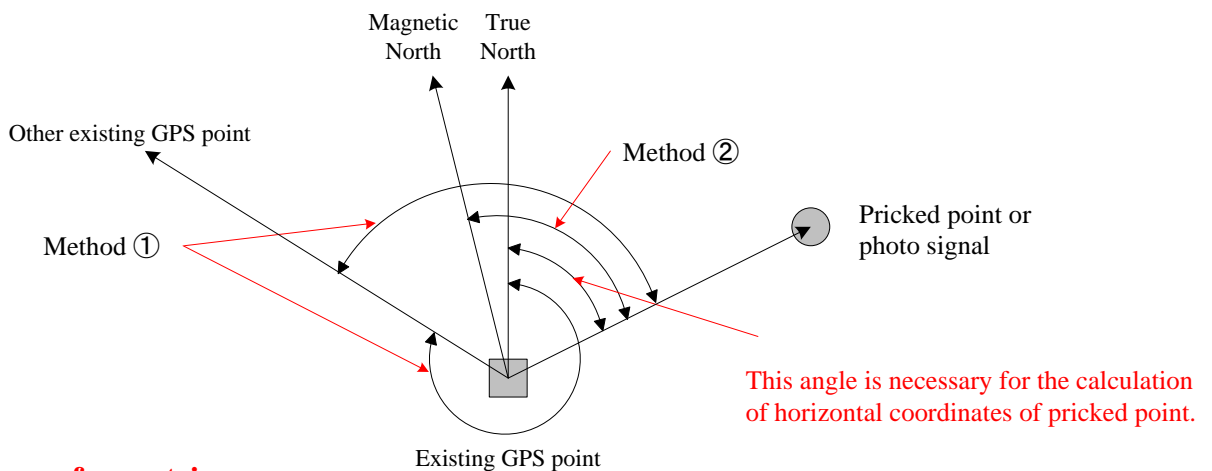


Eccentric survey:

There are several methods for eccentric survey as mentioned below:

- 1) Eccentric survey by GPS
- 2) Eccentric survey by Total Station
- 3) Eccentric survey by Theodolite and electro optical distance meter (or measuring tape)
- 4) Eccentric survey by Plane Table and measuring tape

In case of 1), high tower on the existing GPS point will be necessary due to the reason of trees, building and so on. In case of 2), 3) and 4), it is necessary to consider how to decide the true north direction for the calculation of horizontal coordinates.



Error of eccentric survey

The error of eccentric survey caused by the angle discrepancy is as follows:

Distance	10m	20m	10m	20m
Angle discrepancy	1 degree	1 degree	0.5 degree	0.5 degree
Horizontal error	17.5 cm	34.9 cm	8.7 cm	17.5 cm

Pricking of Height Point

Purpose of pricking of height point:

To keep the vertical accuracy of aerial triangulation, the ground height necessary for the aerial triangulation will be observed by leveling from the existing BM and the location of height point will be marked on the aerial photos.

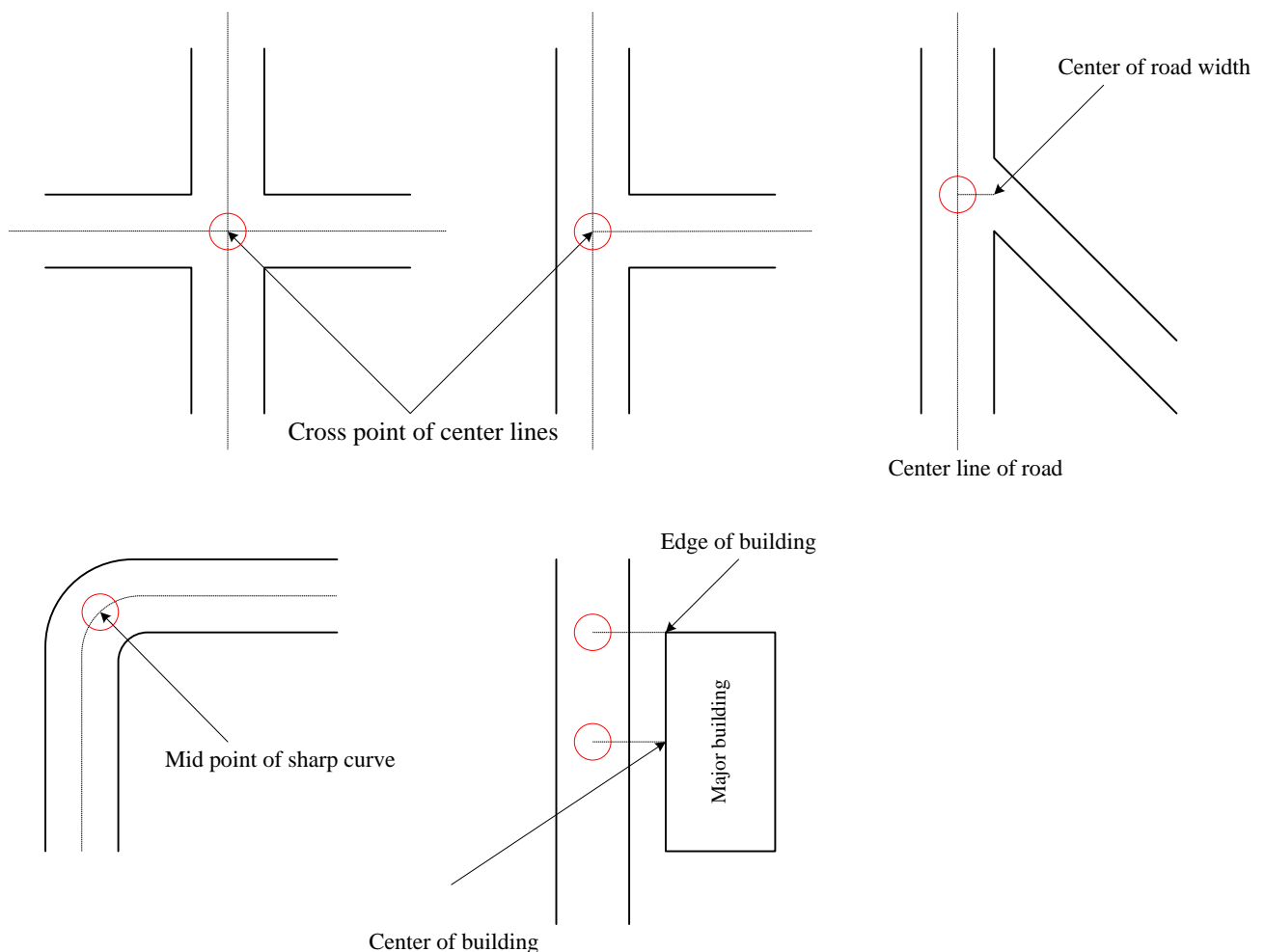
Site selection for pricking of height point:

Following points must be taken into consideration at the time of selection of site for height point

- 1) Location must be flat.
- 2) The point must be clearly identified on the aerial photo.
- 3) Upper field of view must be secured.
- 4) Elevations of several points per one location must be observed considering the safety factor
- 5) Snap photos must be taken to be able to grasp the surrounding condition of pricking point.
- 6) The point should be selected on the paved road as much as possible.
- 7) Detail sketch must be drawn and pricked point must be shown on the sketch.
- 8) Profile at pricked point should be drawn according to the site condition.

Sample of the location for pricking of height point

following is the sample of the location for pricking of height point



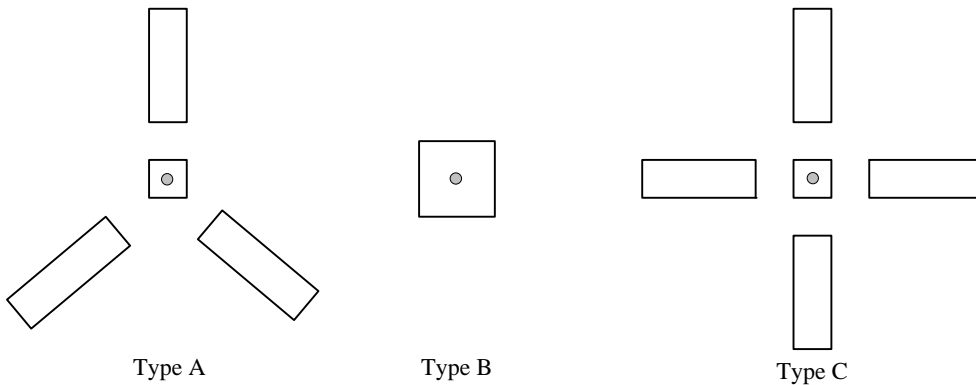
Establishment of Air Photo Singal (1)

Purpose of air photo signal:

Air photo signal will be established on the Ground Control Point, Bench Mark, GPS point and so on to show the exact location on the aerial photos for aerial triangulation.

Type of air photo signal:

There are three (3) type of air photo signal.



Standard size of air photo signal:

Standard size of air photo signal on each map scale level is as follows:

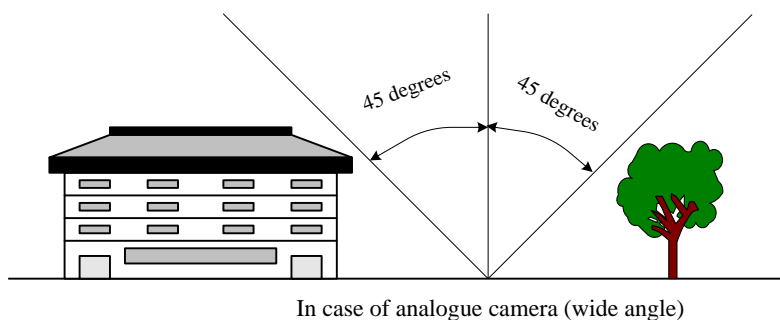
Photo Scale	Type A & C	Type B
1:500	20cm×10cm	20cm×20cm
1:1,000	30cm×10cm	30cm×30cm
1:2,500	45cm×15cm	45cm×45cm
1:5,000	90cm×30cm	90cm×90cm
1:10,000	150cm×50cm	150cm×150cm

Color of aerial photo signal:

In general, white color will be used for aerial photo signal. Depend on site condition, yellow color or black color will be used

Upper field of view:

45 degrees from the vertex should be open.



Note:

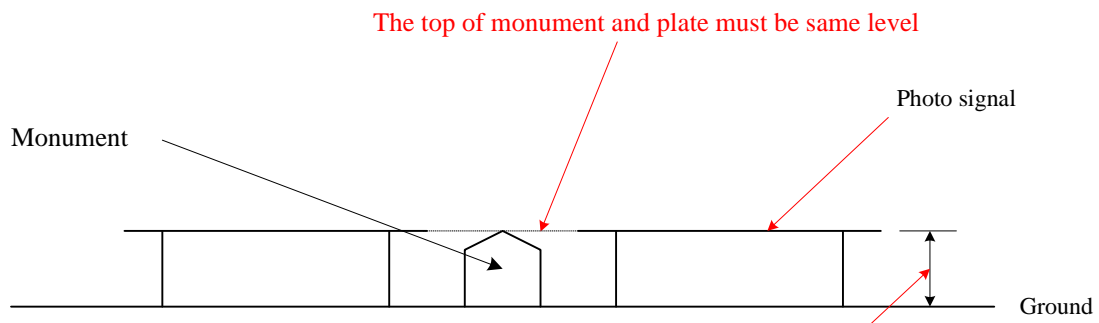
In case of DMC camera, the angle of upper field view become narrow due to the reason of short distance of base line length.

Description of air photo signal:

Following information is necessary for description of air photo signal.

- Snap photo
- Aerial photo with pricked point
- Site situation map
- Profile of air photo signal
- Distance from the significant objects
- North direction
- Name of the location (Village name and so on)
- 1:50,000 scale map with pricked point

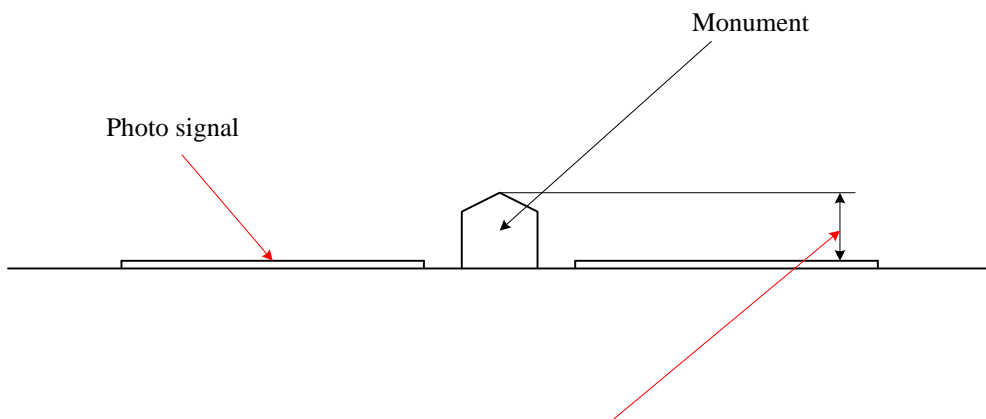
Establishment of Air Photo Signal (2)



The top of monument and plate must be same level

Distance between the ground surface and plate must be measured.

Monument height from the ground must be measured.



Distance between the plate surface and top of monumnet must be measured.

Monument height from the ground must be measured.

Lesson of Aerial Photography Planning

Example 1.

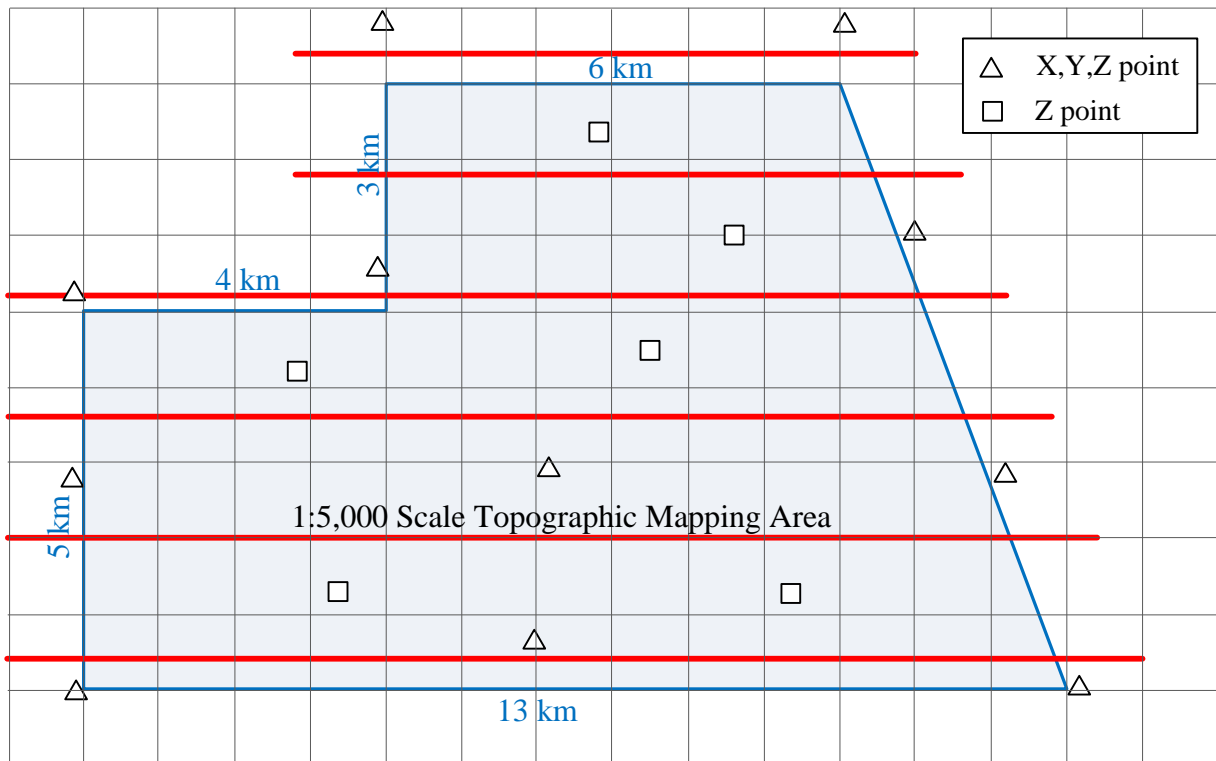


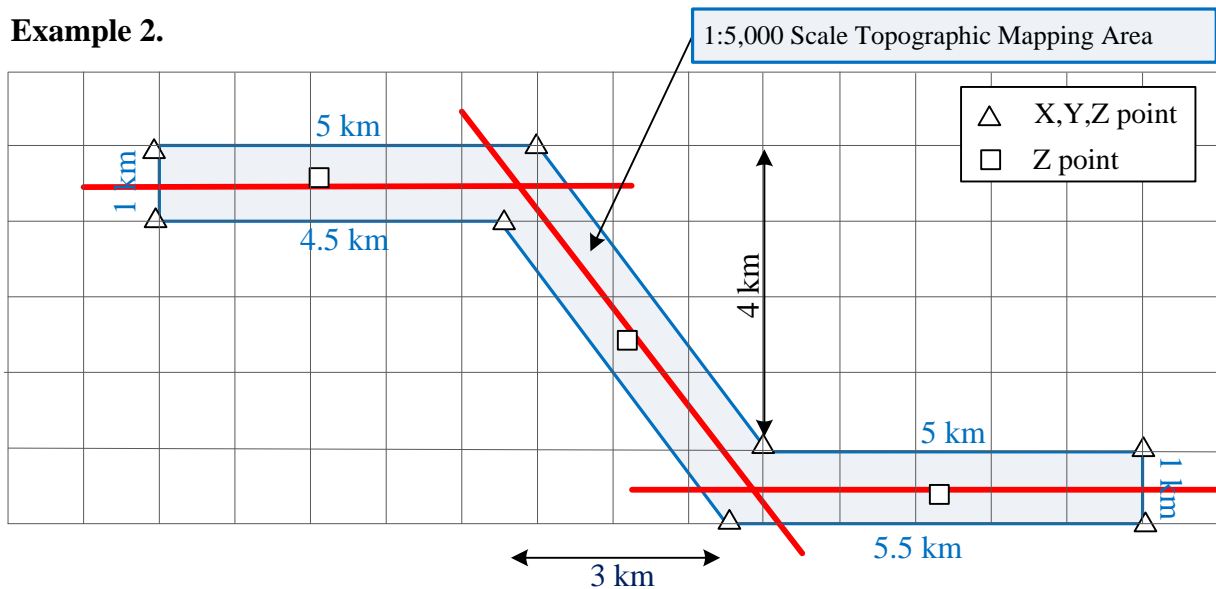
Photo Scale 1:10,000
Focal length: 150 mm



Base line length = 0.92 km
Interval of runs = 1.61 km

Note: 1:5,000 scale topographic maps will be used for irrigation planning.
Terrain condition in the mapping area is flat.
Aerial camera to be used is RC-30 (f = 150 mm)

Example 2.

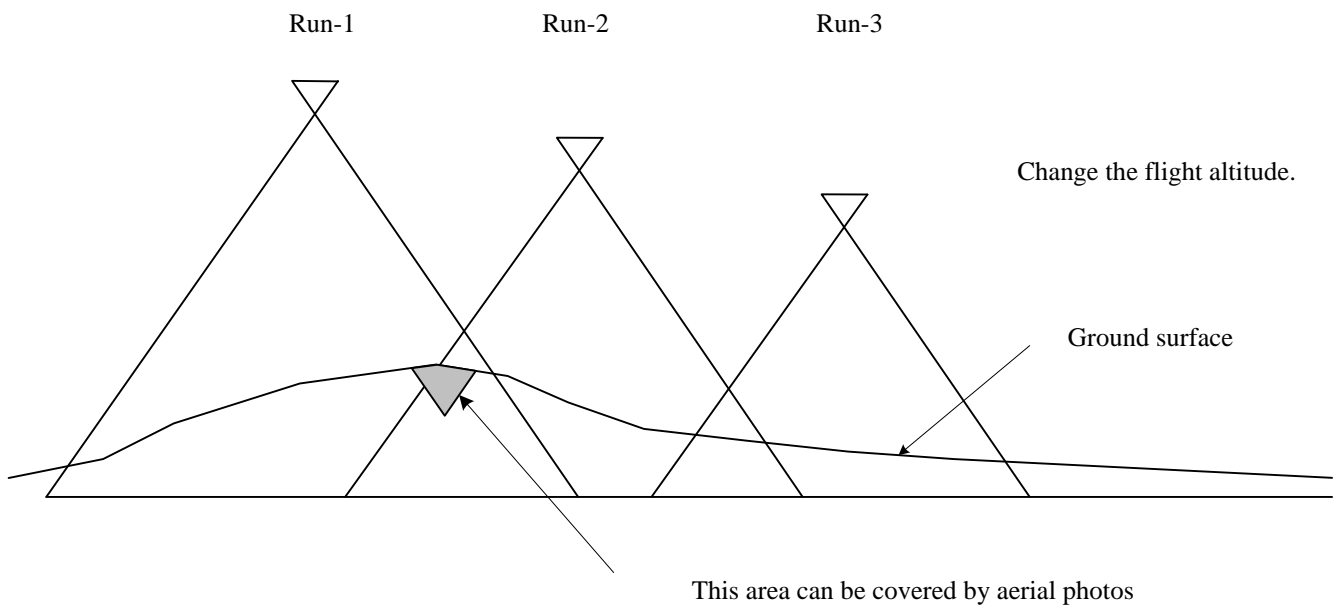
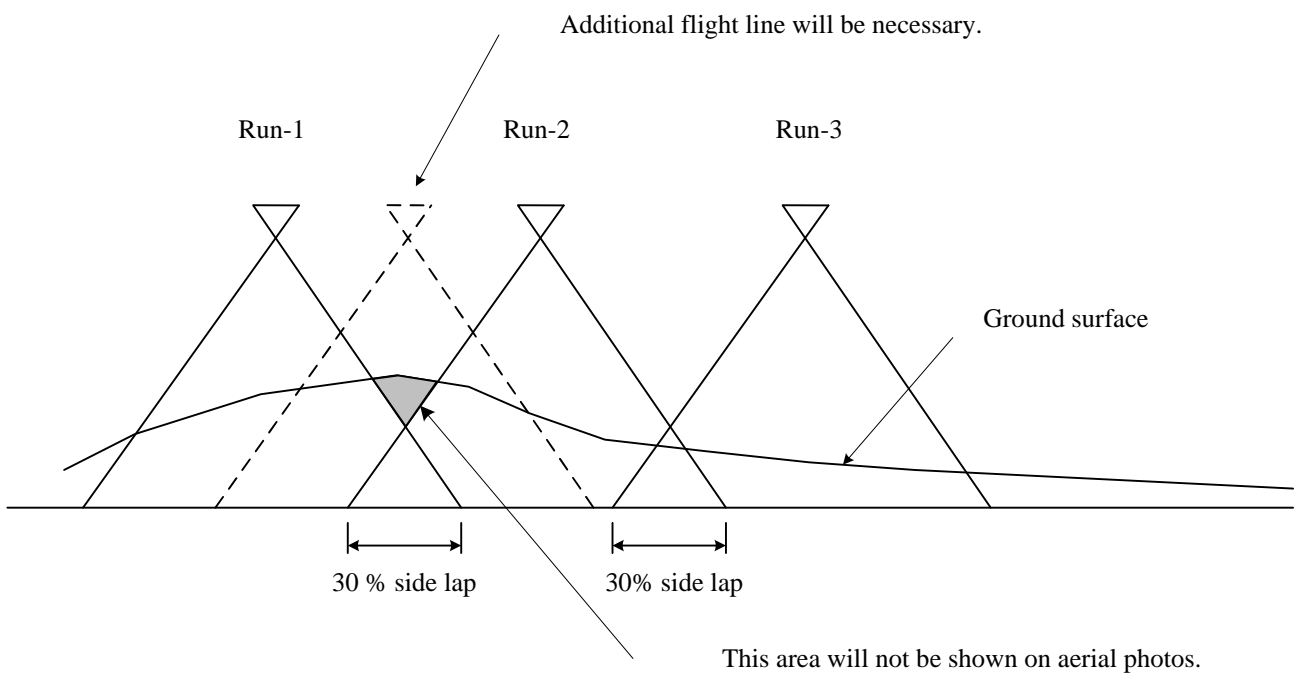
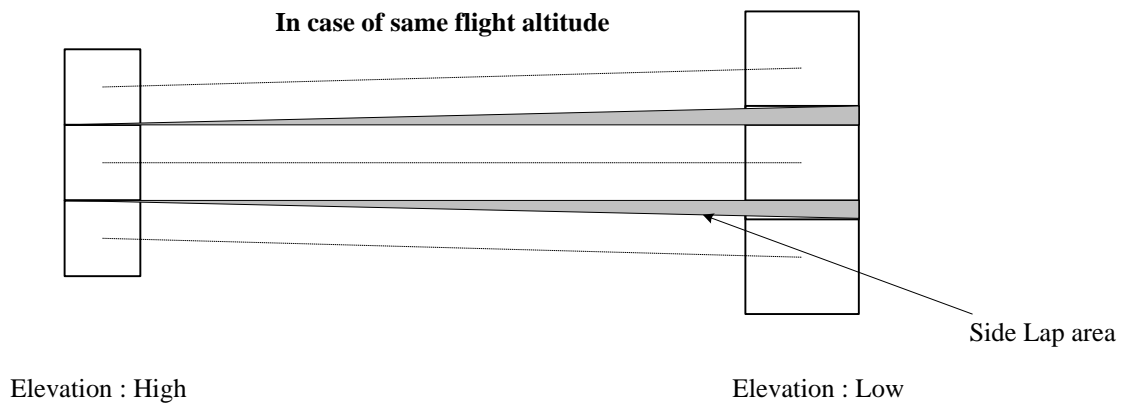


Note: 1:5,000 scale topographic maps will be used for road planning.
Terrain condition in the mapping area is flat.
Aerial camera to be used is RC-30 (f = 150 mm).

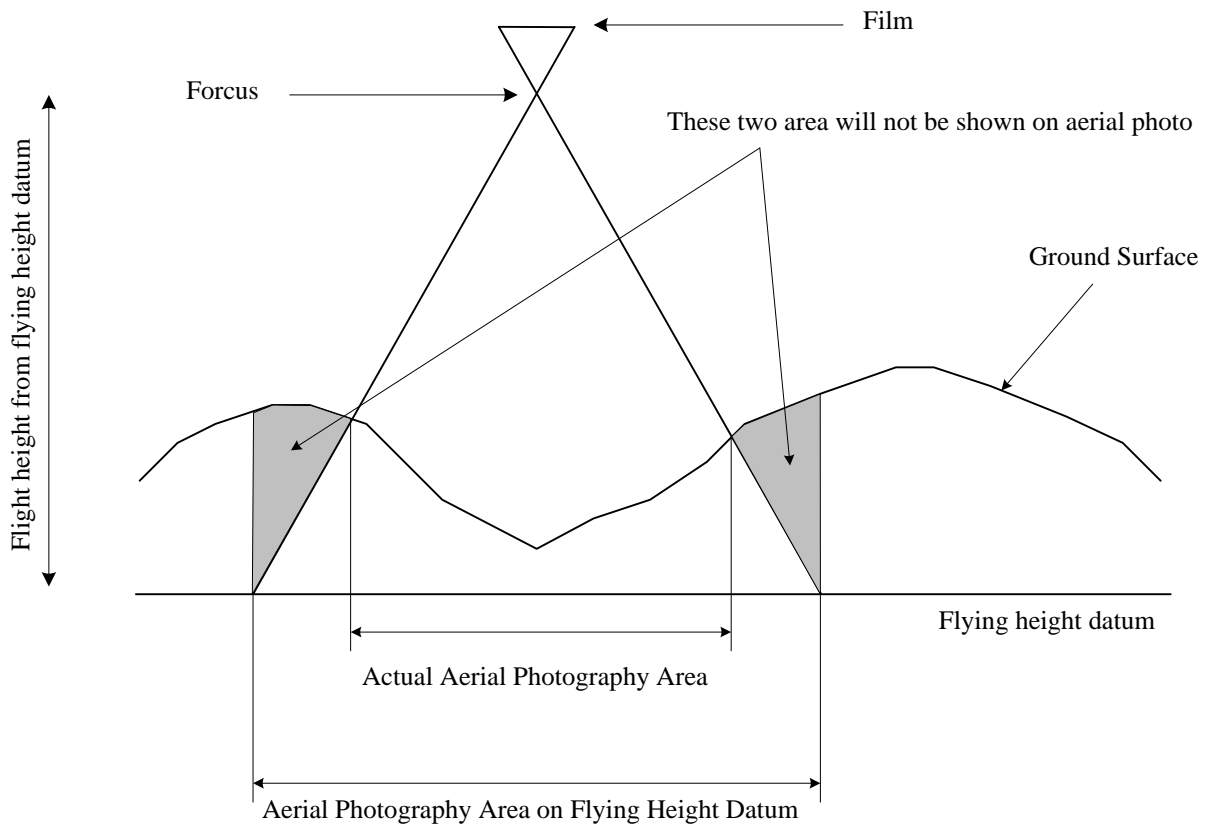
Lesson

1. Decide the photo scale
2. Make the flight line plan
3. Make ground control point plan

Aerial Photography Planning at Mountain Area (1)

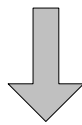


Aerial Photography Area at Mountain Area (2)



In mountain area,

- 1) Actual aerial photography area is not same as aerial photography area on flying height datum.
- 2) Photo scale will be changed according to the elevation of ground surface.



In case of aerial photography planning at mountain area, it is necessary to consider the difference of elevation of ground surface in the aerial photography area.

In general,

Difference of elevation in one model $< 1/3$ of flight height from flying height datum

* Photo Scale = Focal length of aerial camera / Flight height

In case of RC-30 camera, Focal length = 150 mm, Flight height = 3000m,

$$\text{Photo scale} = \frac{150 \text{ mm}}{3,000 \text{ m}} = \frac{0.15 \text{ m}}{3,000 \text{ m}} = \frac{1}{20,000}$$

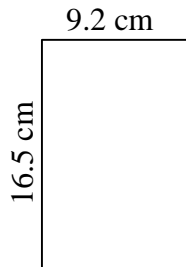
Aerial Photography by Digital Camera

Most popular digital camera for aerial photography is DMC.

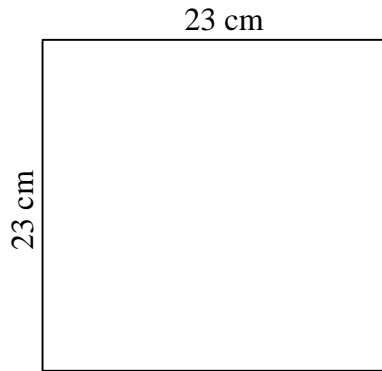
Maker Z/I Imaging (U.S.A.)

	DMC	RC-30
Flame size :	16.5 cm × 9.2 cm	23 cm × 23cm
Number of Pixel:	13,824 × 7,680	-----
Pixel size:	12 micron	-----
Focal length:	120 mm	150 mm (Wide angle)
Flame rate (Shutter interval) :	2 second	Approx. 5 seconds

Flame size

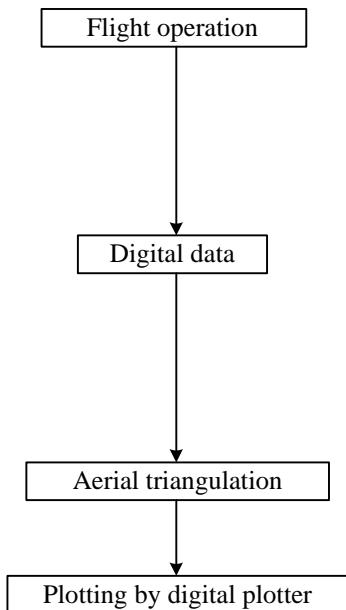


DMC



RC-30

In case of digital camera



In case of analogue camera

