

UNIT-5

MODERN SURVEYING

ADVANCED SURVEYING

- By the 1970's, relatively small, lightweight and easy-to-use electronic distance measuring devices, called EDM's were in use.
- The advance of technology and miniaturization of electronic components enabled the building of theodolites that measure angles electronically, called Electronic Theodolite
- Combination of an electronic theodolite and electronic distance meter, and software running on an external laptop computer known as a data collector, called Total Station
- The Global Positioning System (GPS) was designed for military applications. Its primary purpose was to allow soldiers to keep track of their position and to assist in guiding weapons to their targets
- A computerized data base management system for capture, storage, retrieval, analysis, and display of spatial data, called GIS

MODERN SURVEYING EQUIPMENTS

- Electronic Theodolite
- EDM – Electronic distance measurement eqp.
- Auto Level.
- Digital Level.
- Laser Level.
- Laser Distance meter
- Total station.
- GPS – global positioning system.

ELECTRONIC THEODOLITE

1. For precise surveys the vernier theodolites are replaced by modern theodolites such as optical and electronic theodolites.
2. The electronic theodolites have optical system to scan both horizontal and vertical circles and display them digitally on a screen

Electronic Distance meter

1. Measurement of distance is done by a modulated microwave or infrared carrier signal
2. The distance is determined by emitting and receiving multiple frequencies, and determining the integer number of wavelengths to the target for each frequency

DIGITAL LEVEL

- They are not popular instead auto levels are more extensively used.
- The Trimble DiNi Digital Level : Determine accurate height information 60% faster than with automatic leveling
- Eliminate errors and reduce rework with

digital readings

- Transfer data to the office easily
- Measure to a field of just 30 cm

LASER LEVEL

- The word **laser** is an acronym for Light Amplification by Stimulated Emission of Radiation and is the name applied to an intense beam of highly monochromatic, coherent light.
- Laser rangefinders use these

relationships to calculate Distance

- **Distance = speed of light * (time/2)**
- The time refers to time of pulse to go from the instrument to the tree and back again

EDM+ THEODOLITE

- EDM is used to measure the horizontal distances.
- Some EDM are attached with electronics theodolite which has the adapter system.
- Some are advanced models which itself reads the distance without theodolite

TOTAL STATION

- A **Total station** integrates the functions of a **Electronic theodolite** for measuring angles, an **EDM** for measuring distances, digital data and a data recorder
- Angles and distances, coordinates and height differences and many other items can be computed, displayed and stored into internal memory.

Photogrammetry

Photogrammetry or photographic surveying is a method of surveying in which plans or maps are prepared from photographs taken from suitable camera stations

Two Types

1. Terrestrial or ground photogrammetry
2. Aerial photogrammetry

Terrestrial Photogrammetry:

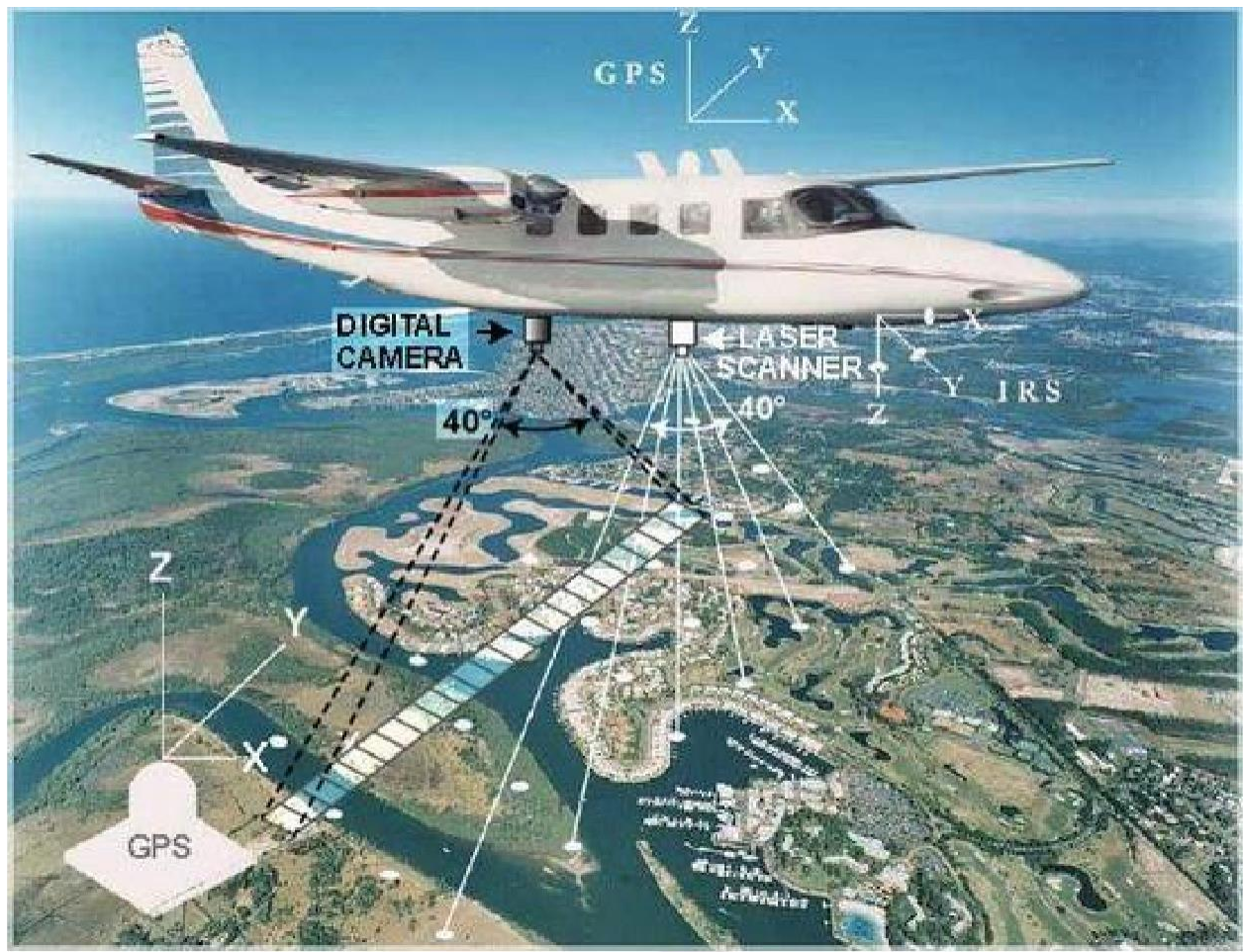
Maps are prepared from photographs taken from some fixed positions on or near the ground with camera axis horizontal



Used for-

- Small scale mapping of open hilly or mountainous countries
- Reproduction of plan and elevation views of buildings and structures
- Motion picture photography
- For furnishing supplementary ground control for aerial photography

Aerial Photogrammetry



Maps are prepared from photographs taken by a precision camera mounted in an aircraft flying over the area with camera axis vertical.

Used for-

- country's reconnaissance and preliminary surveys
- Survey of rivers, roads and railways
- Survey of inaccessible regions like deserts and wooded countries
- Survey of power schemes and transmission lines
- Acquisition of land
- Town and village planning
- Flood control, irrigation, drainage and soil conservation
- Harbors, navigation channels and coastal defense
- Mining prospects

- Study of geology
- Soil and agricultural studies
- Military installations, camping and forbidden zones

DEFINITIONS

- **Static Photographs:** photographs of still or static objects; such as building
- **Quasi- Static Photographs:** A series of photographs taken in fairly rapid sequence in order to picture the positions of a slow moving object at various circumstances;
 - such as movement of ships near a port or traffic flow after a regular interval of time
- **Dynamic Photographs:** Photographs of an object which changes its size, shape and position or orientation from one instant to another
 - Taken by motion picture camera
- **Eccentric camera station:** when it is not possible to get a greater photo coverage from the main camera station the photo theodolite is placed over a position eccentric to the main camera station
- **Side camera station:** neither the main nor the eccentric camera station is found suitable to obtain a greater photo coverage, the photographs are taken with the photo theodolite centered over a point remote from the primary or eccentric camera station
- **Vertical Photograph:** It is an aerial photograph taken with the camera or optical axis coinciding with the direction of gravity
- **Tilted photograph:** It is an aerial photograph taken with the camera or optical axis unintentionally tilted from the vertical by a small amount, usually less than 3 degree
- **Oblique Photograph:** It is an aerial photograph taken with the camera or optical axis intentionally tilted by about 30 degree to the forward direction
- **Exposure station:** It is a point in space, in the air, occupied by the camera lens at the instant of exposure
- **Flying height or flight altitude:** It is the elevation of the exposure station above the mean sea level or any other selected datum
- **Stereoscopy :** If two overlapping aerial photographs containing the same objects, taken from different positions, are viewed through a stereoscope, the corresponding objects will fuse and the terrain will appear in three dimensions.