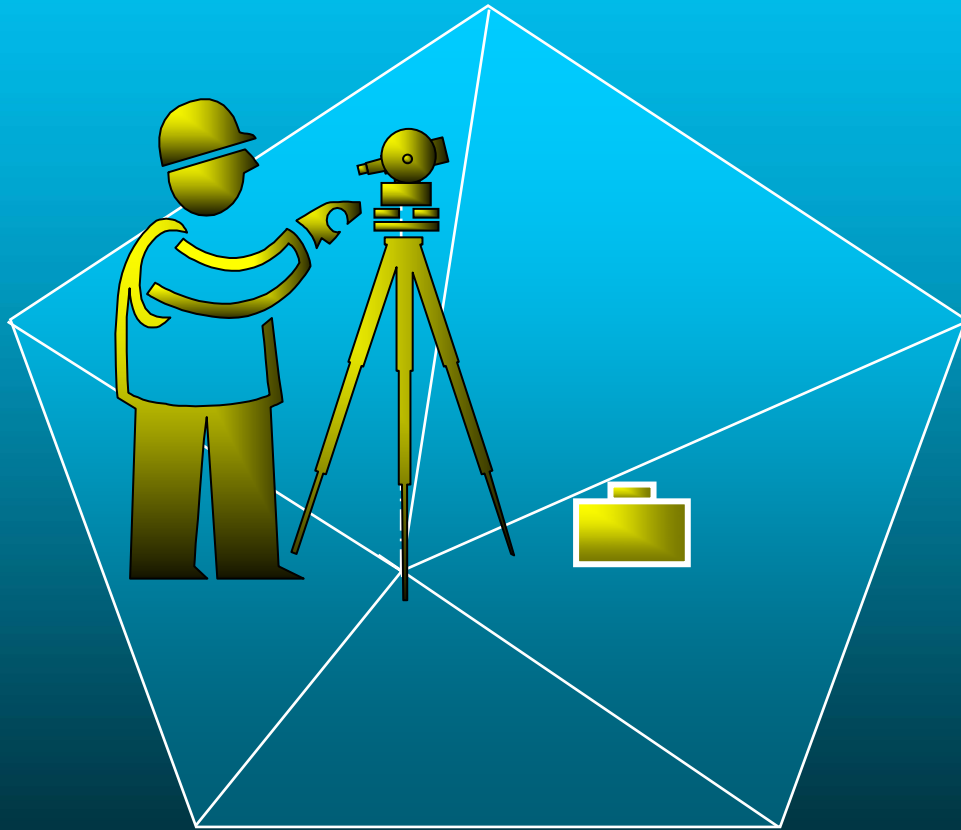


RADIAL SURVEYING

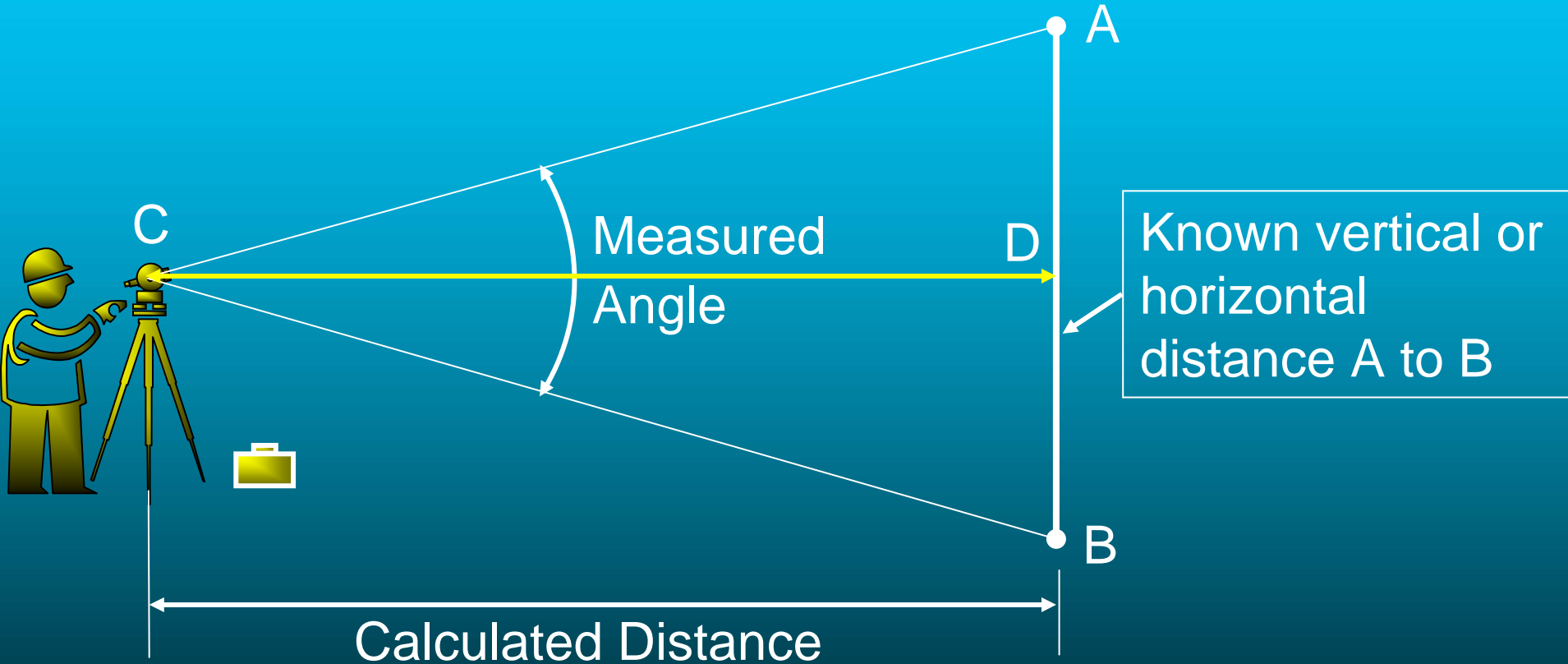
Purpose of this Presentation

- To increase your awareness of a surveying method additional to Tape and Offset
- To realise the potential of computers in your field, e.g. Powerpoint, Excel, Autocad.

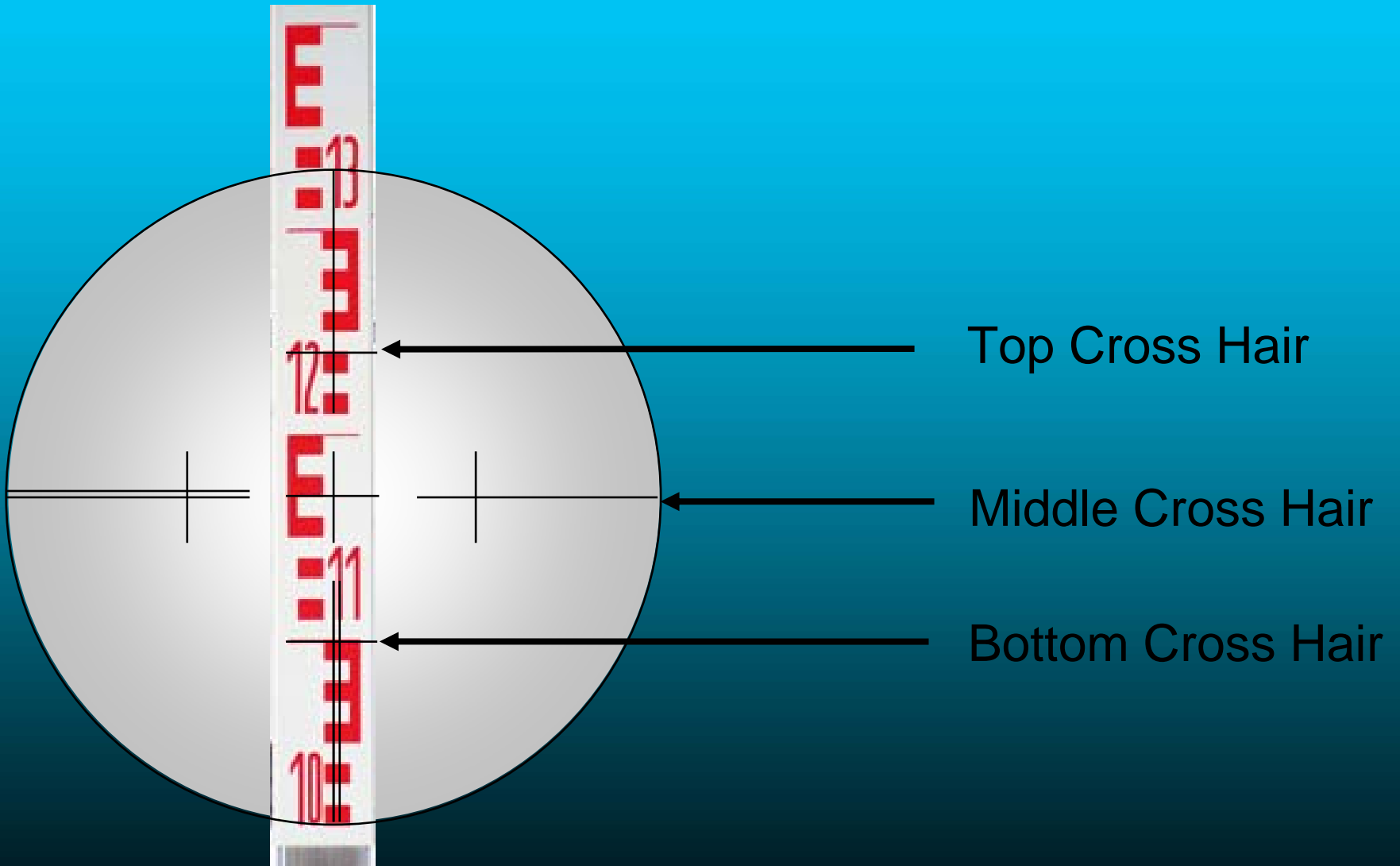
Radial Surveying by Tacheometry



Tacheometry, (Principles)



Tacheometry, (Practice)

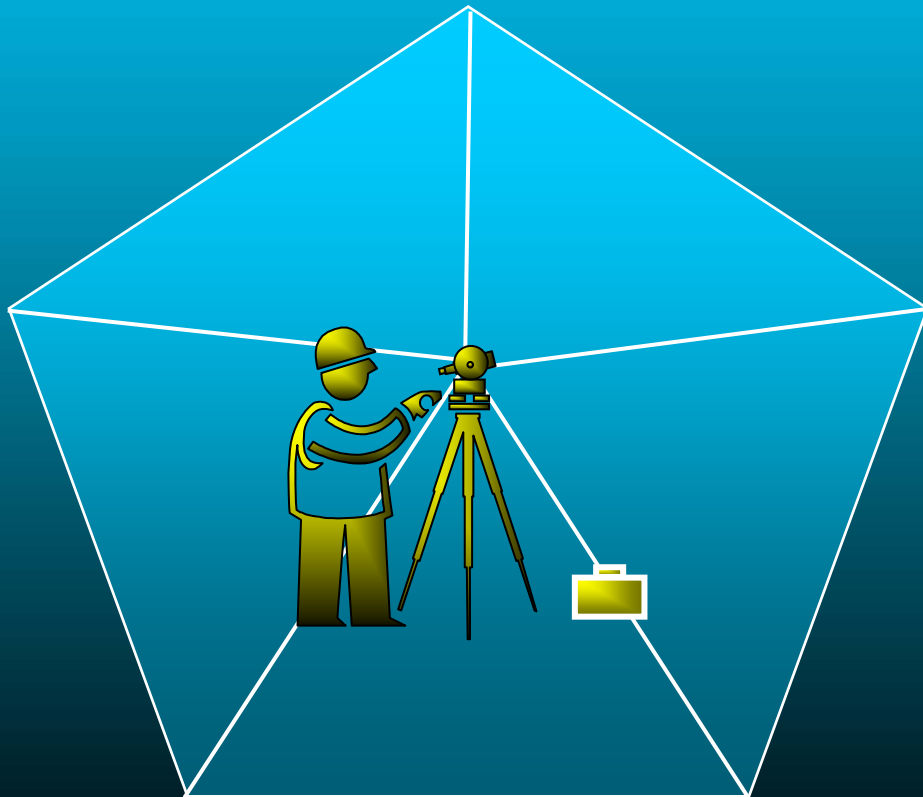


Overview

1. Where to use this method
2. Equipment needed
3. Field methodology
4. Calculation
5. Plotting

1. Where to Use This Method

You must be able to see all the points you wish to survey from a single position.



2. Equipment Needed

- Theodolite (preferably electronic)
- Tripod
- Levelling staff
- Marching Compass
- Clipboard
- Booking sheets
- Two people

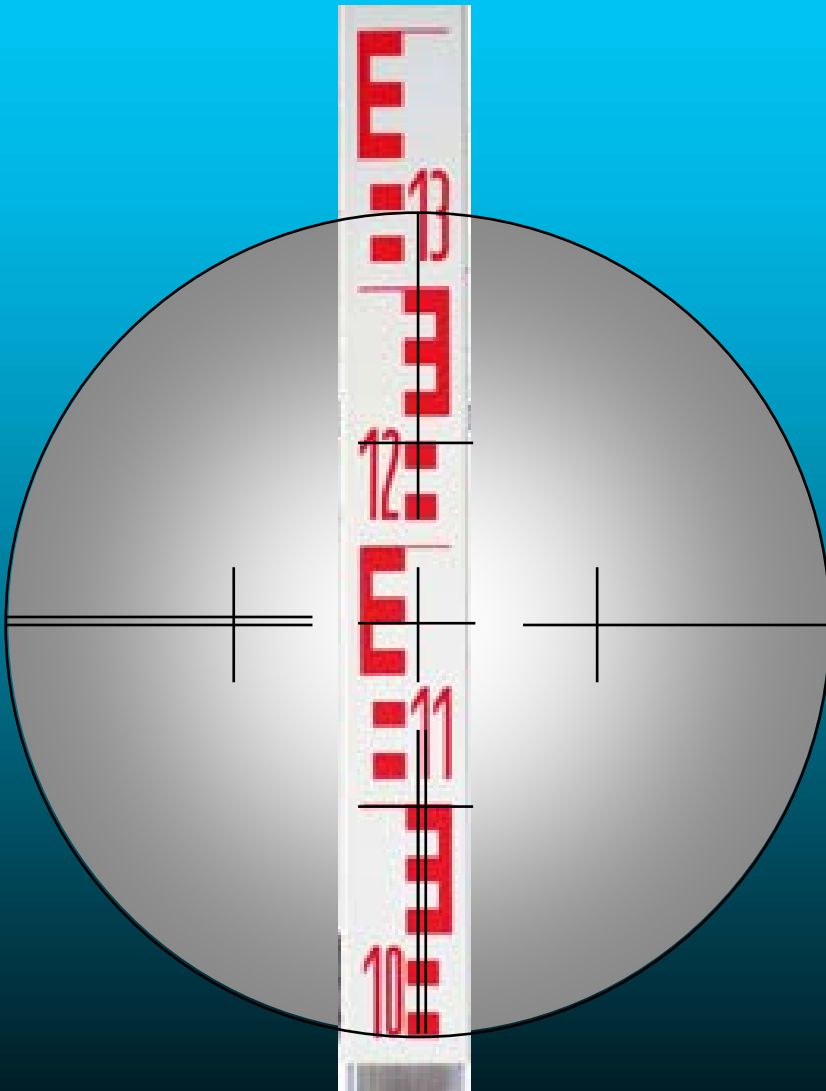
3. Field Methodology

1. Setup the theodolite at the chosen point.
2. Using a marching compass, obtain the magnetic bearing to a prominent feature.



3. Align the theodolite on the same feature using the same bearing.
4. Check this alignment at frequent intervals.
5. Start the radial survey.

What You See



Record the Following

- W.C.B.
- Z.A
- Bottom X Hair
- Middle X Hair
- Top X Hair
- Any Comments

4. Special Booking Sheets

	POINT	I.H.	W.C.B. DDD.MMSS	Z. ANGLE DDD.MMSS	TOP X- HAIR	MIDDLE X-HAIR	BOTTOM X- HAIR	MUG TRAP	H. DIST.	V. DIFF.	X	Y	Z
FROM	XOYOZO	1.360									500.000	100.000	20.000
TO	1		12.3144	87.2000	1.404	0.992	0.581		82.122	3.825	517.815	180.166	24.193
TO	2		32.2736	96.4000	3.346	2.794	2.244		108.715	-12.707	558.348	191.730	5.859
TO	3		44.2556	92.3131	3.346	2.794	2.244		109.986	-4.851	576.997	178.539	13.715
TO	4		52.1213	95.4242	3.346	2.794	2.244		109.108	-10.913	586.217	166.868	7.653
TO	5		55.5555	91.1232	3.346	2.794	2.244		110.151	-2.324	591.246	161.704	16.242
TO	6		60.4547	92.5658	3.346	2.794	2.244		109.908	-5.663	595.907	153.682	12.903
TO	7		95.2121	93.2546	3.346	2.794	2.244		109.806	-6.580	609.326	89.751	11.986
TO	8		132.5624	89.1212	3.346	2.794	2.244		110.179	1.532	580.658	24.943	20.098
TO	9		179.5959	85.1212	3.346	2.794	2.244		109.429	9.183	500.001	-9.429	27.749
TO	10		181.1245	84.5658	3.346	2.794	2.244		109.346	9.664	497.686	-9.321	28.230
TO	11		258.4547	82.2356	3.346	2.794	2.244		108.272	14.449	393.804	78.901	33.015
TO	12		270.0101	80.4556	3.346	2.794	2.244		107.362	17.455	392.638	100.032	36.021
TO	13		284.3256	84.3926	3.346	2.794	2.244		109.245	10.217	394.259	127.443	28.783
TO	14		294.5623	87.5632	3.346	2.794	2.244		110.058	3.954	400.205	146.407	22.520
TO	15		312.4548	90.0000	3.346	2.794	2.244		110.200	0.000	419.095	174.823	18.566
TO	16		333.2124	91.0156	3.346	2.794	2.244		110.164	-1.985	450.599	198.467	16.581
TO	17		321.2345	95.1712	3.346	2.794	2.244		109.264	-10.111	431.826	185.387	8.455
TO	18		342.2627	94.1728	3.346	2.794	2.244		109.583	-8.222	466.940	204.477	10.344

Summary

What has been learned.

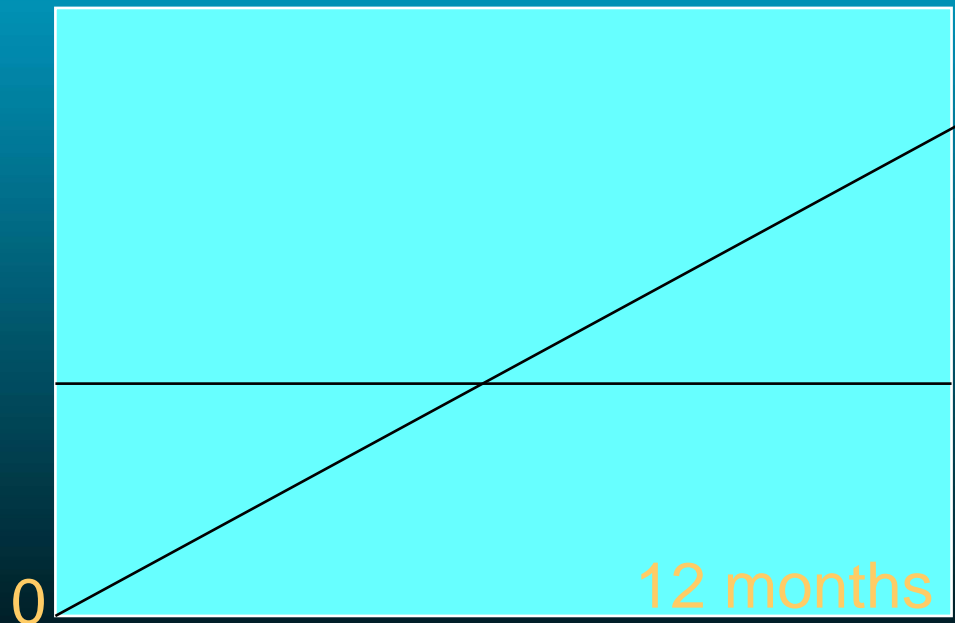
1. Where to use this method.
2. Equipment needed.
3. Field methodology.
4. Calculation by Excel.

Where to Get More Information

- Other training sessions

5. Plotting Using Autocad

- Learning Curve & productivity



To Conclude

- Interactive Excel Demo
- Interactive Autocad Demo

THE END

Slide 1

- This is an avenue of future learning which you may find of interest.
- The 1st. part is a PowerPoint presentation, and will be followed by interactive demos of Autocad and Excel.

Slide 2

- Terminology
- Radial Surveying, Setting up a theodolite (centrally), on a site such that all the points that need to be surveyed can be seen from that point. (Like spokes of a wheel).
- Tacheometry, - a method of obtaining distances by measuring the angle subtended by an object of known size.
- Envisage the site you have just surveyed by tape & offset, and the difficulties you encountered. Consider surveying the whole site from just one point using a theodolite to measure angles and distances, with appropriate computer software for calculating and plotting.

Slide 3.

- You can calculate the distance, (C to D), to any object providing: -
 1. You can see it.
 2. You know how big it is. (A to B).
 3. You can determine the angle between the extremities. (The angle at C).
- D is the midpoint of A – B.
- The known distance must be either horizontal or vertical

Slide 4

Practical Tacheometry

- A Levelling staff is held vertically on the point to be surveyed. The vertical distance is determined by reading the top and bottom telescope cross hairs on the staff, and subtracting the smaller reading from the larger.
- This distance is known as the “intercept”.
- It is not necessary to measure the angle between the top and bottom cross hairs as this is fixed at 0.573 degrees, i.e. 1/100.
- That is to say, the intercept multiplied by 100 equals the slope distance from instrument to staff.
- Thus we know the distance from the staff to the instrument, and if we centre the vertical X hair on the staff, and read the horizontal circle of the instrument, we know the direction.
- If we now read the vertical circle, and the middle X hair, we can calculate the elevation at the bottom of the staff.
- It is often convenient to set the bottom cross hair on 1 metre.

Slide 5

- That was the background & principles.

Slide 6

- It is not practical to exceed distances of 100 metres as it becomes difficult to read the staff.
- If you had to survey Trafalgar Square, could you use the tape and offset method that you used previously?

Slide 7

- An electronic theodolite is much easier to read than an optical micrometer theodolite.
- You have already used all the equipment listed except the theodolite, for which you would need some instruction.
- You would also need to undertake a field exercise, (I suggest one day), to reinforce this tacheometry theory.

Slide 8

The theodolite position.

- Put a peg, or nail, in the ground for the theodolite.
- Consider peg security & longevity. (Ideally, immovable for ever, and easily found again).
- Measure and record the instrument height.

Slide 9

Observation Procedure.

- Position the staff on the point to be surveyed.
- Centre the vertical X hair on the staff.
- Set the bottom X hair on a convenient reading, (say 1.000), and record this value.
- Read and record the middle and top X hairs.
- Read and record the WCB and ZA.
- Record any comments, (e.g. Oak Tree, spread radius 7m).

Slide 10

- This is a calculation sheet; it is advisable to have something similar for recording in the field.
- Booking sheets do not have to be identical to calculation sheets. but do need to be designed to ensure that no observations are missed out.
- In this example, the observer needs to complete the green cells.
- The computer will complete the remaining cells.
- We will cover this in detail in part two of this session.
- Plotting can be by polar co-ordinates. (WCB & H Dist.) Or
- Rectangular co-ordinates, (X & Y).

Slide 13

- The horizontal line represents the productivity of a competent traditional draftsman over 12 months.
- The sloping line represents the same person learning and using Autocad over the same period.
- The Crossing point depends on individuals and the time they spend on Autocad.

Slide 14

- The student edition of Autocad is available for £70.00, (rrp = £3500).
- The student edition of Microsoft Office is available for £98.00, (rrp = £550).
- A theodolite costs £1200 to buy but can be hired.
- A Levelling staff costs £35 to buy.