

# **Cadastral Surveying using GNSS Equipment**

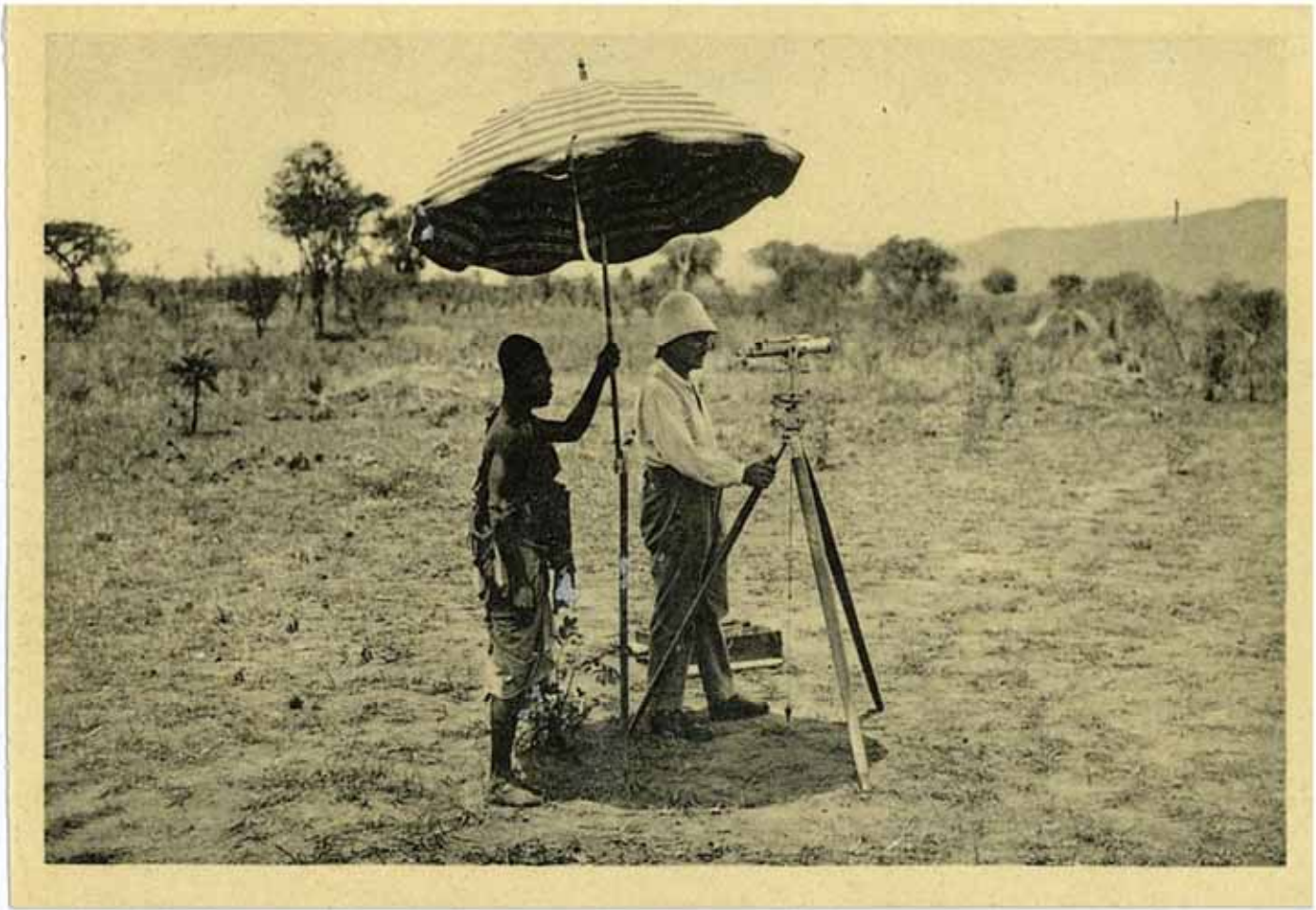
Best Practices or Standards?

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Visée topographique à Tré-la-Porte, par J. Vallot.









- RTK
- Static
- Auspos
  
- Provides absolute & relative checks on position

- Techniques derived & adapted for the use of GNSS in Cadastral Surveying – not for geodetic or control surveys
- Surveys cover large or vast distances
- Results achieve higher accuracy than demanded by regulations
- Higher accuracy than conventional terrestrial techniques

- GNSS equipment is just another tool
- It is not infallible
- It does not relieve us of our responsibilities to check our work
- It is not an excuse for poor field procedures

- **Check everything.**
- **Leave nothing to chance**
- Modern equipment does not ensure the answers are “right”
- The Surveyor must do that!

- My field techniques
- My office reduction techniques
- My plan presentation methods
  
- This has led to the adoption of:
- My “Best Practices”

# Field Techniques

The base station needs to be:

High

Have a clear sky view

Safe (knocks & theft)

Multipath at the base is transmitted to the rover







# Beware of Multipath













# Bodgy Observations

- Multipath
- Sun flares (till about 2018)
- “Stuff in the sky”
  
- These are affected observations
- They are NOT unavoidable
- They can be detected and discarded

- An **UNAFFECTED** observation will be **REPEATABLE** under different conditions in the time, position and number of satellites
- An **AFFECTED** observation is **NOT** **REPEATABLE** with a substantial change in time and satellite geometry

# Office Reductions

INDICENT OF RADII AND ARC.

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NATURAL SINES AND COSINES

—  
—  
Every Ten Seconds of Arc and in Seven Places of  
Decimals.



1d .004167 2d .008333 3d .012500 4d .016667 5d .020833 6d .025000  
7d .029167 8d .033333 9d .037500 10d .041667 11d .045833





- Thoroughly analyze the data
- Invest time in checking everything
- It is cheap insurance

- You are not a fool if you make a mistake
- You are a fool if you don't find and fix it

# Plan Presentation



# Legal Traceability

- Legal Traceability of lengths determined through the use of GNSS techniques
- The National Measurement Act 1960

# ICSM Committee

- Resolved to adopt a “risk management approach based on best practices for traceability of GNSS length”
- Considerations included:

- The low disputation level based on whether the measurements are what they purport to be
- The general understanding and acceptance of GNSS measurements by the courts
- The ICSM established the ability to assign Reg.13 certificates for *position* to GNSS Base Stations
- The technical difficulties in assigning true legal traceability to GNSS for *length*









**Trimble**  
CB430

Pitch (%)	0.7	Bucket Up
Design Mfall (%)	50.4	Left
Cut Left (m)	▼ 0.03	H. Offset
Cut Right (m)	▼ 0.01	V. Offset
		GPS

± -0.075m ±

Physical keypad controls including directional arrows, a central 'OK' button, a '+' button, a '-' button, and a power button.



# Two statements I make about legal traceability

- **Having legal traceability of your measurements does NOT mean your measurements are correct**
- **Having legal traceability of your measurements does NOT diminish your responsibility or the need for best practice procedures**

- The adoption of best practices DOES NOT provide legal traceability of derived measurements

# Best Practice:

- Is a management idea asserting that there is a technique that is more effective than any other
- Maintains that with proper processes and testing, a desired outcome can be delivered
- Is based on repeatable procedures that have proven themselves over time
- Can be expected to evolve as new technology, information, testing and methodologies become available

# Change is challenging

- Professional surveyors have a responsibility to not only seek answers, but to ask questions
- We are lucky to have enquiring minds
- We are extremely privileged to be in times of constant change