

Improved Mortar Set-up Technique

Presented at the
Mortar Systems Conference

By
D de Villiers

May 2009



CSIR
our future through science

Mobile Mortars



Mobile Mortars



Mobile Mortars



Mortar Tests



Mortar Tests



Electronic Sensors



GPS Compass



Electronic Sight



Close Range Reference Device (Prismatic Mirror)



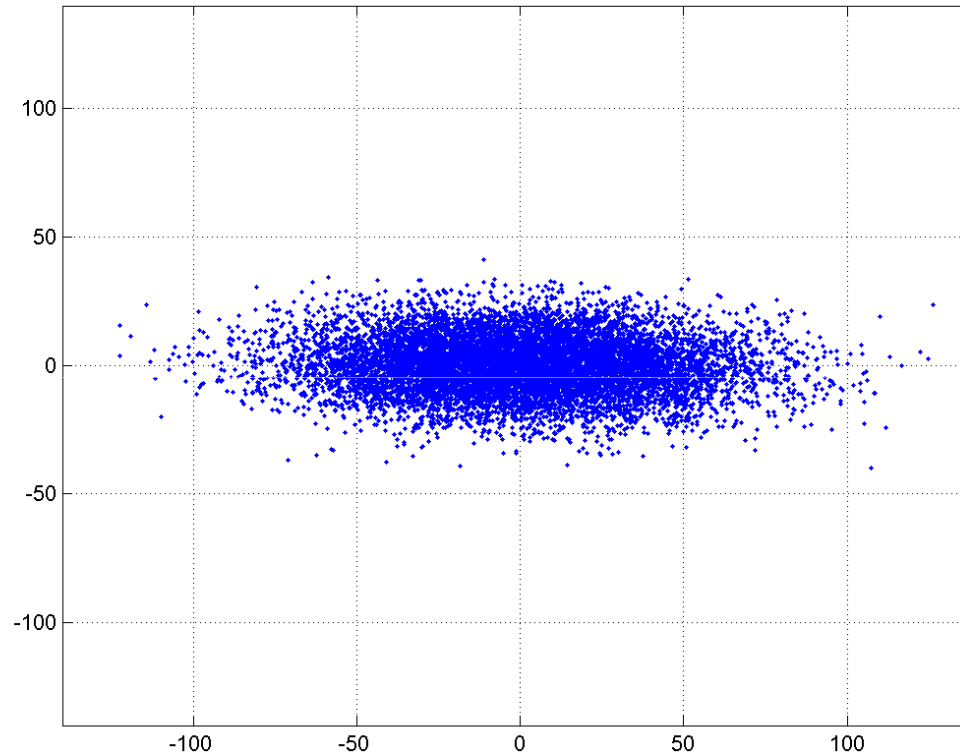
Close Range Reference Device (Prismatic Mirror)

- Problems with aiming posts
- Description of the Prismatic Mirror
- Prismatic Mirror set-up
- Passing adjustment bearings and paralleling
- Mortar lay
- First shot and small corrections
- Large corrections
- Advantages



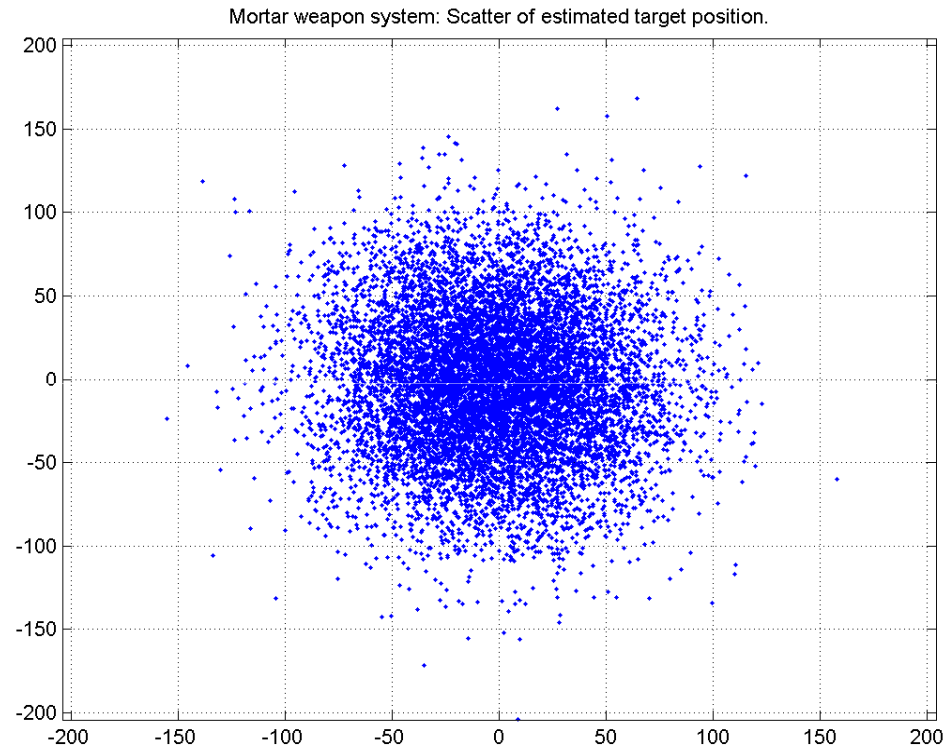
Calculated Beaten Zone

Mortar/mortar bomb beaten zone: Scatter of estimated target position.



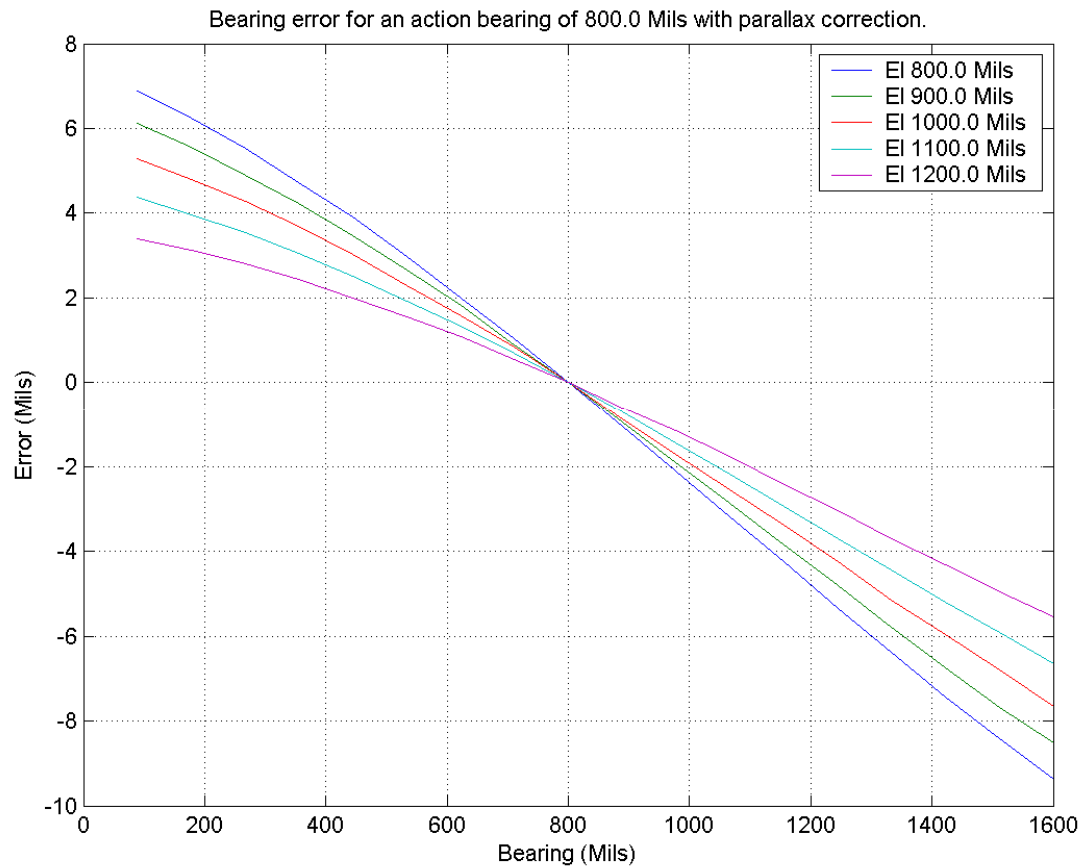
Mortar Uncertainty Analyses

First Round Projection



Uncertainty in determining the bearing

Expected Parallax Error from using Aiming Posts



Disadvantage of Aiming Posts

- Parallax Error.
- Takes time to set-up.
- Need a suitable terrain (up to about 50m).
- Could place user in dangerous situation during set-up.
- Difficult to use in an emplacement.
- Difficult to use at night.

Prismatic Mirror (Close Range Reference Device)



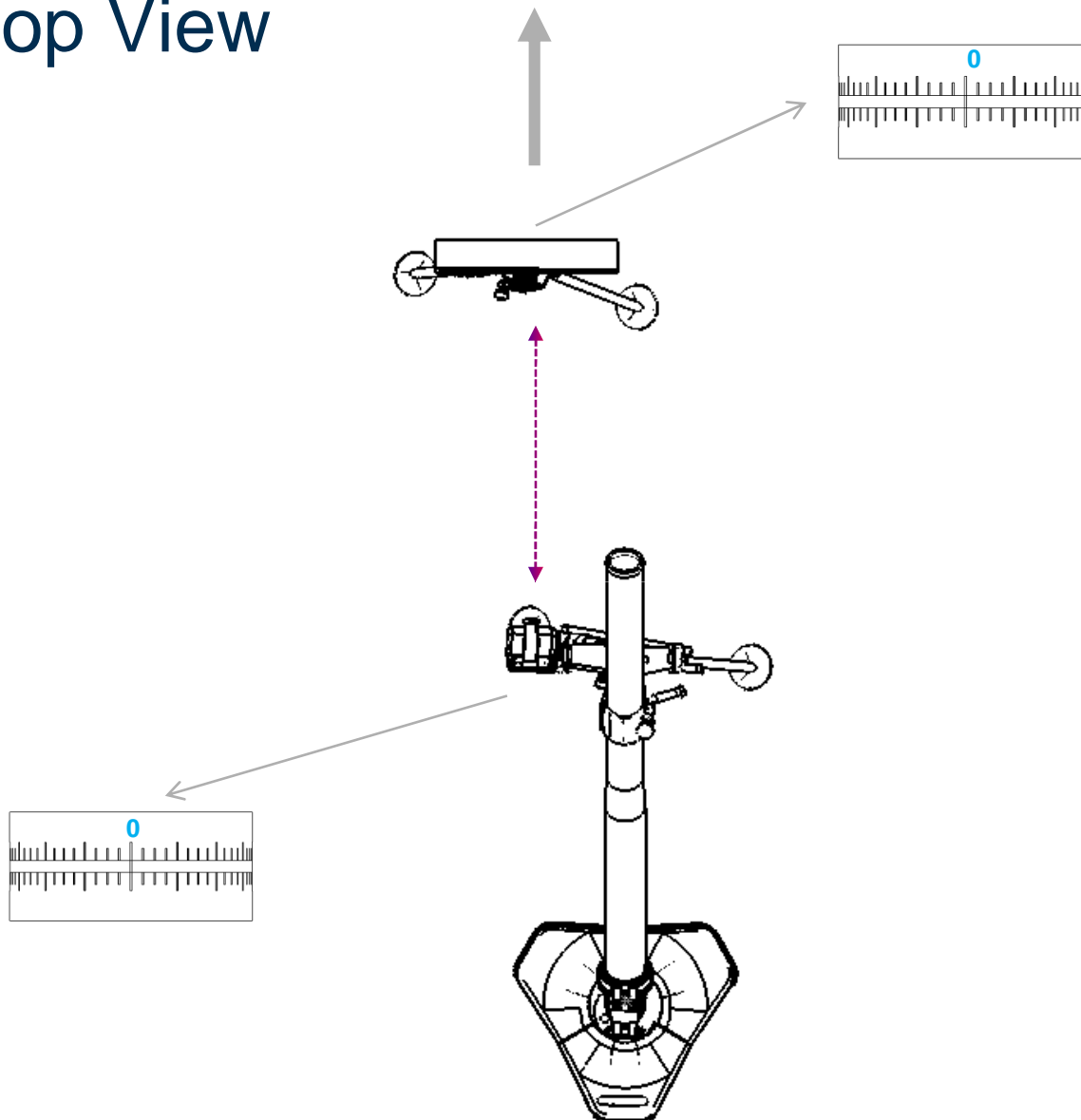
Prismatic Mirror (Close Range Reference Device)



C2A1 Bearing Scale (Close Range Reference Device)



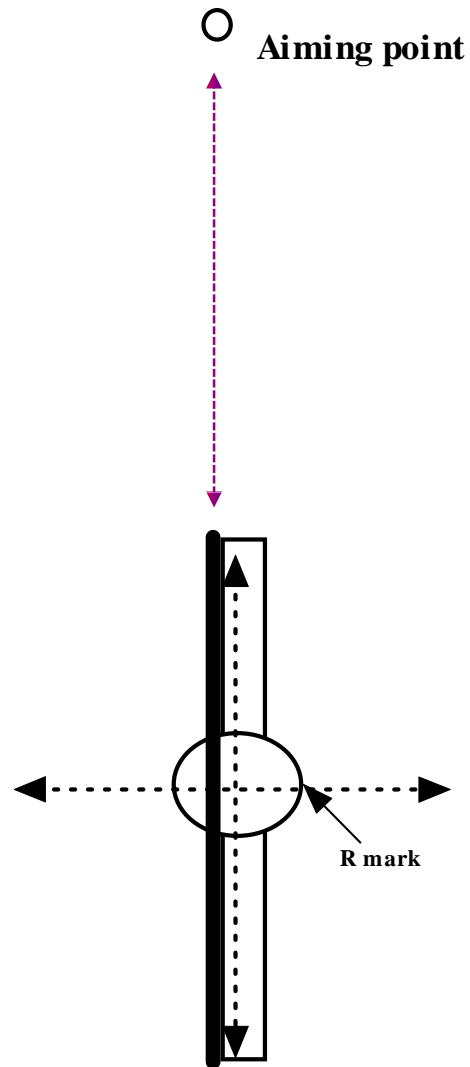
Top View



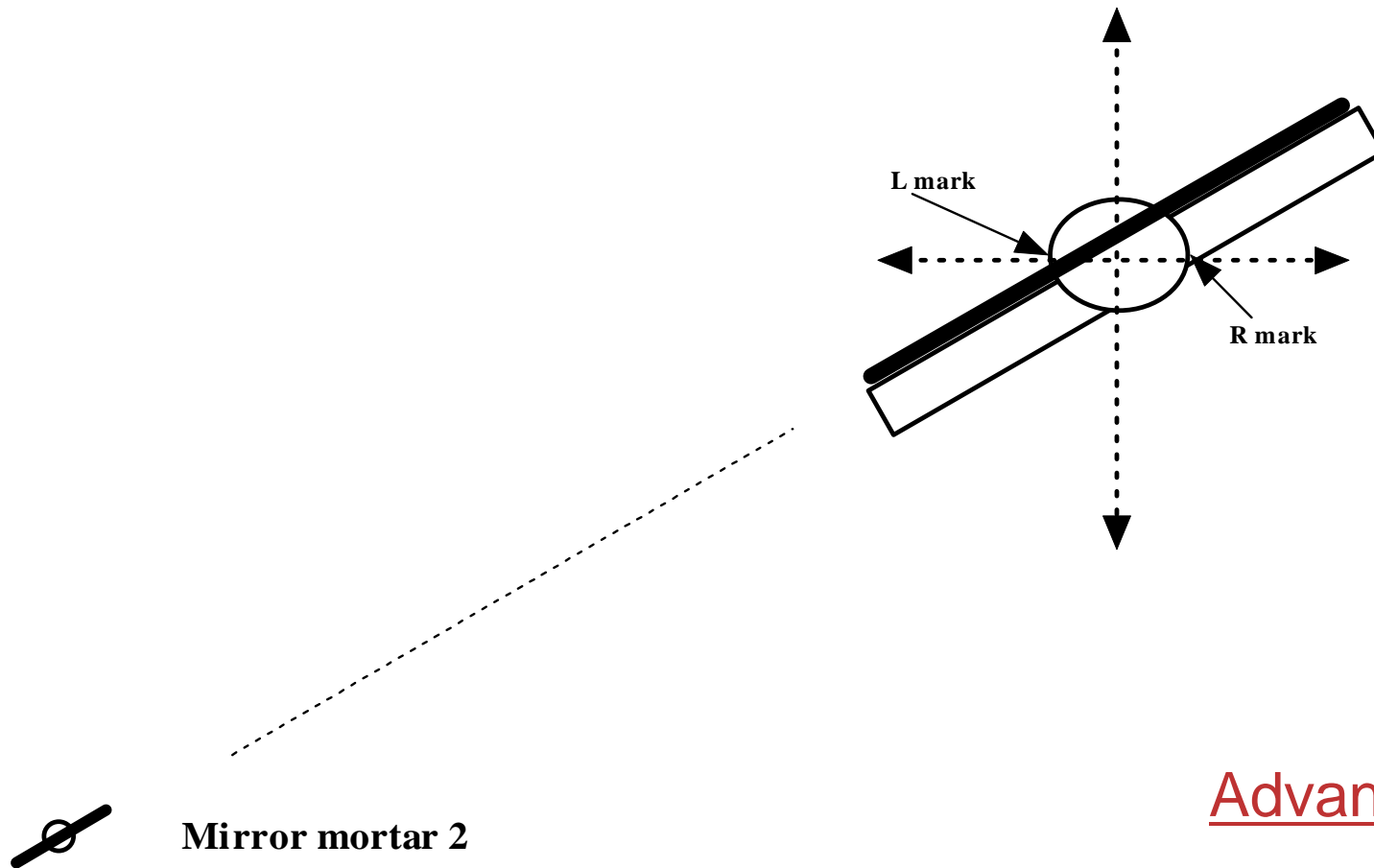
Determining the Set-up Bearing

- Take a compass bearing on a distant object and aim the mirror at this object.
- Get the GPS position of an object and calculate the bearing to the object.
- Use an electronic map to get the bearing to a distant object (for instance a mountain peak) and aim the mirror at this object.

The Prismatic Mirror Set-up



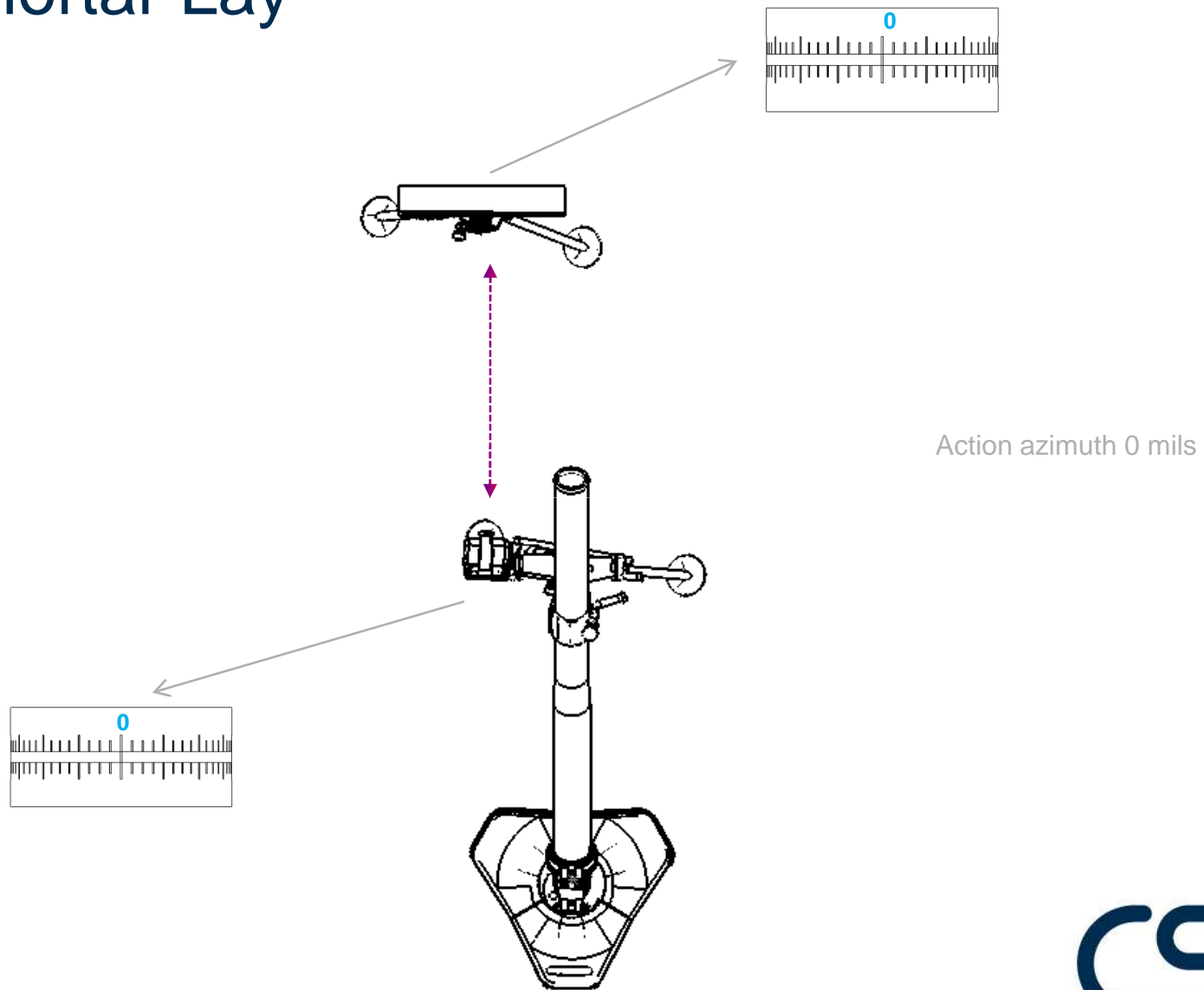
Passing Adjustment Bearing and Paralleling



Advantages

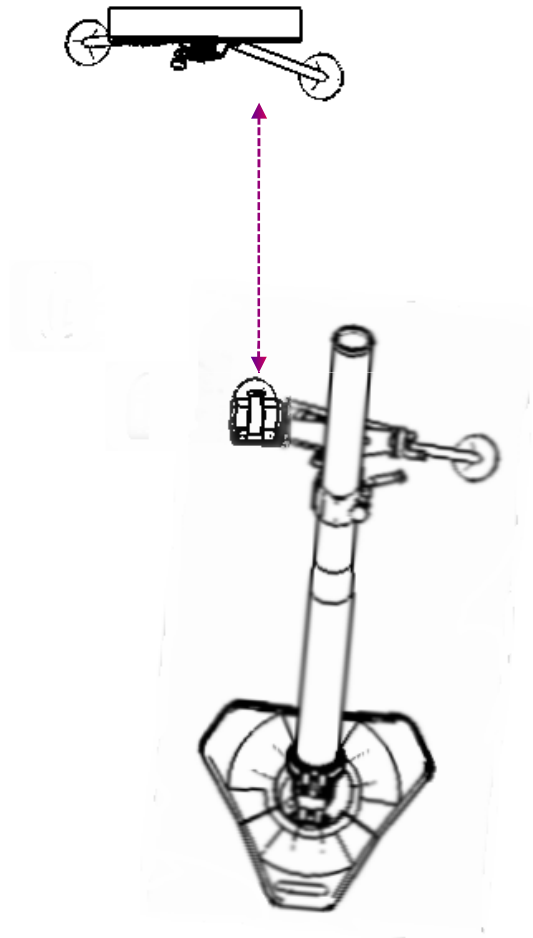
CSIR
our future through science

Mortar Lay

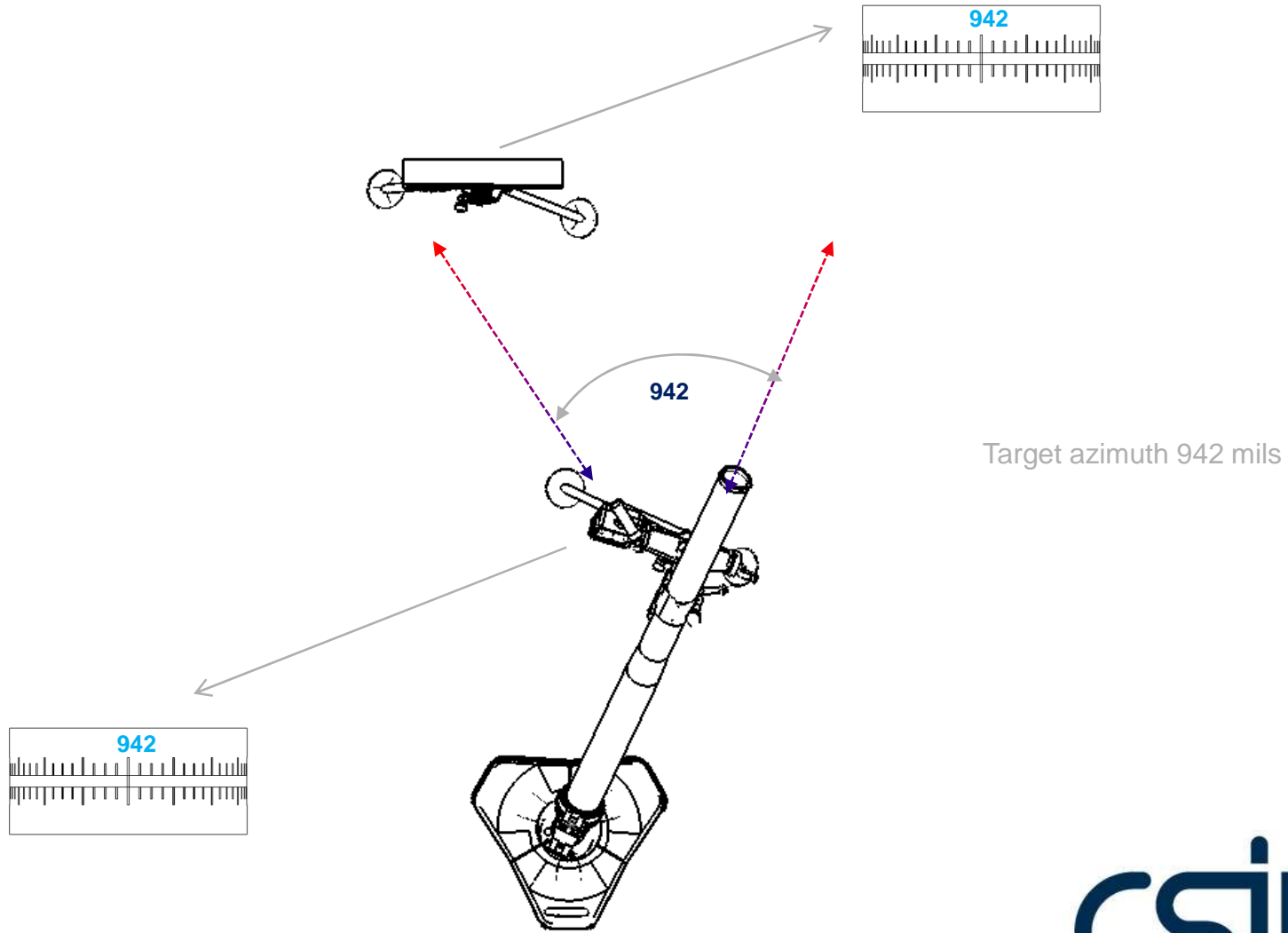


Action azimuth 0 mils

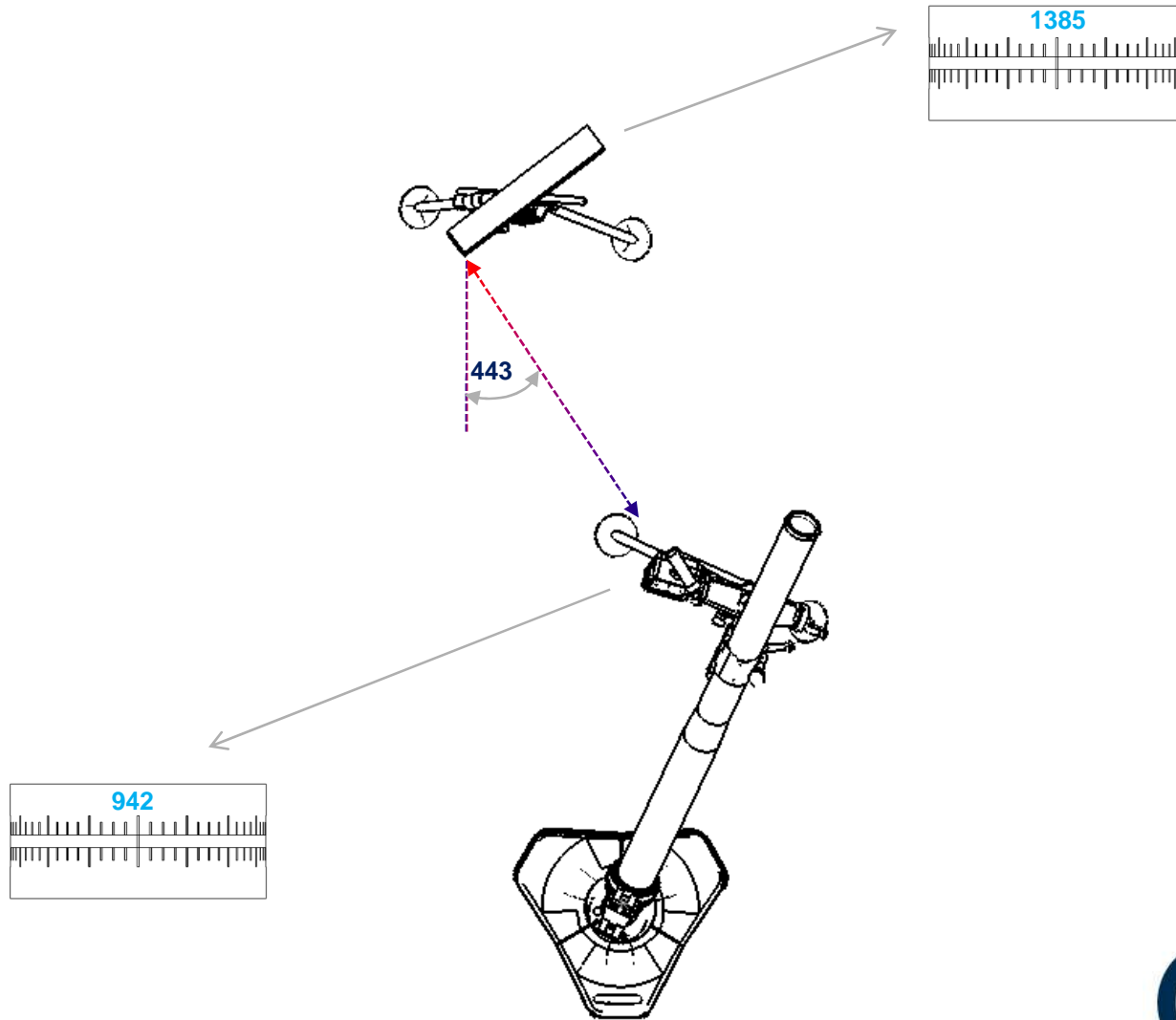
First Shot and Small Corrections



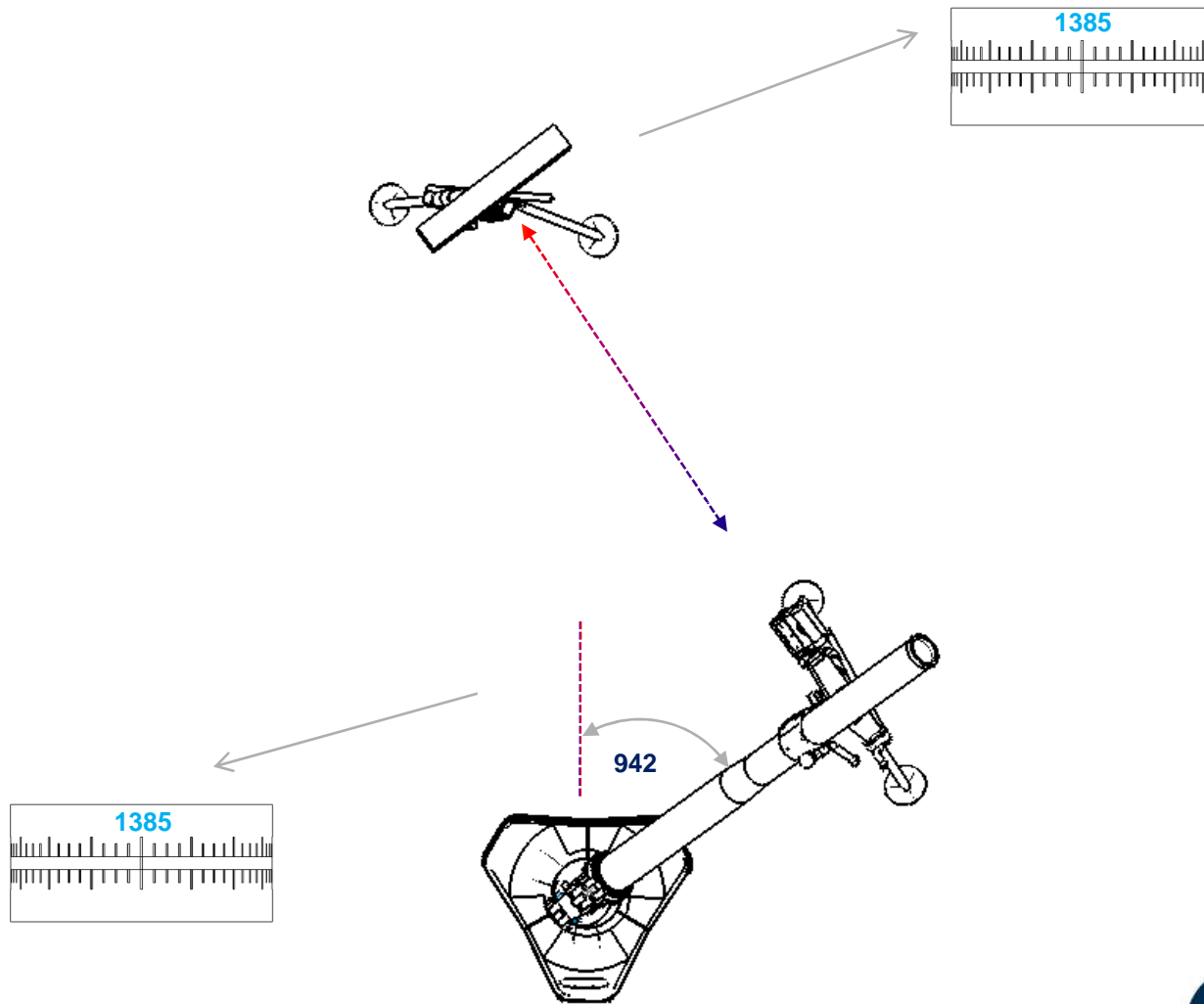
Large Corrections step 1



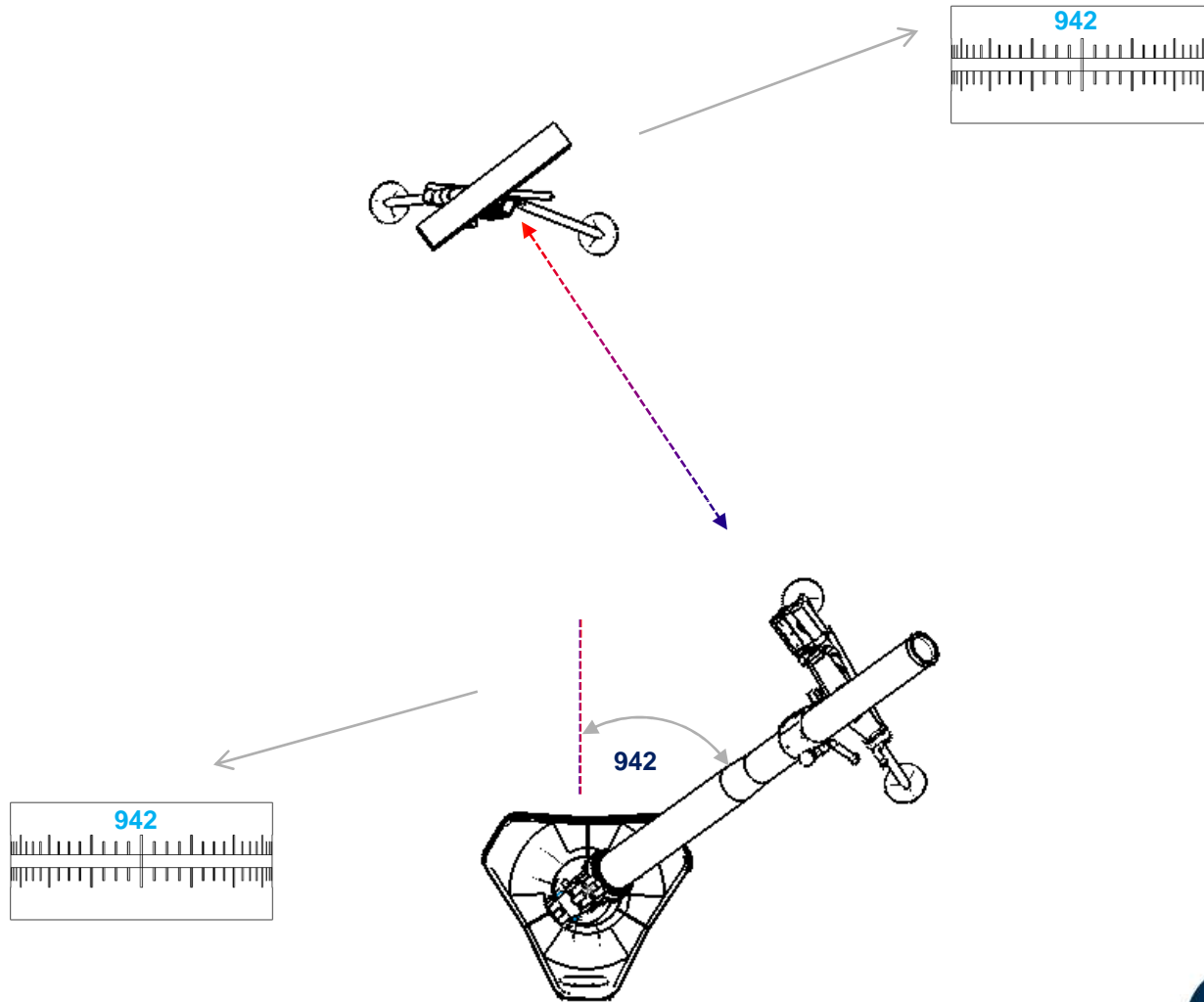
Large Corrections step 2



Large Corrections step 3



Large Corrections step 4



Advantages

- Requires no change to current mortar sights – The Prismatic Mirror is just an add-on.
- Faster than previous set-up procedures of two aiming posts.
- Easier to use when bringing four mortars onto a parallel bearing.
- Improves the reaction speed of engaging opportunity targets.
- Provides a wider arc of fire with no parallax problems.
- Can be used at night.

Advantages

- Can be used by dug-in mortars since the mirror is close to the mortar (2 m).
- No regular calibration is needed (since the system is not directly on the mortar when firing).
- No extra calculations are required by the user when changing the mortar bearing.
- It can be packed up quickly.
- No batteries, no wires.
- Light and simple.

Questions?

Project team info:

Nick Hartley (Hall&Watts) +44 1727 791200

Danie de Villiers (CSIR) ddevilliers@csir.co.za

