

Monitoring Vital Signs in Real Time



IMRB 2025



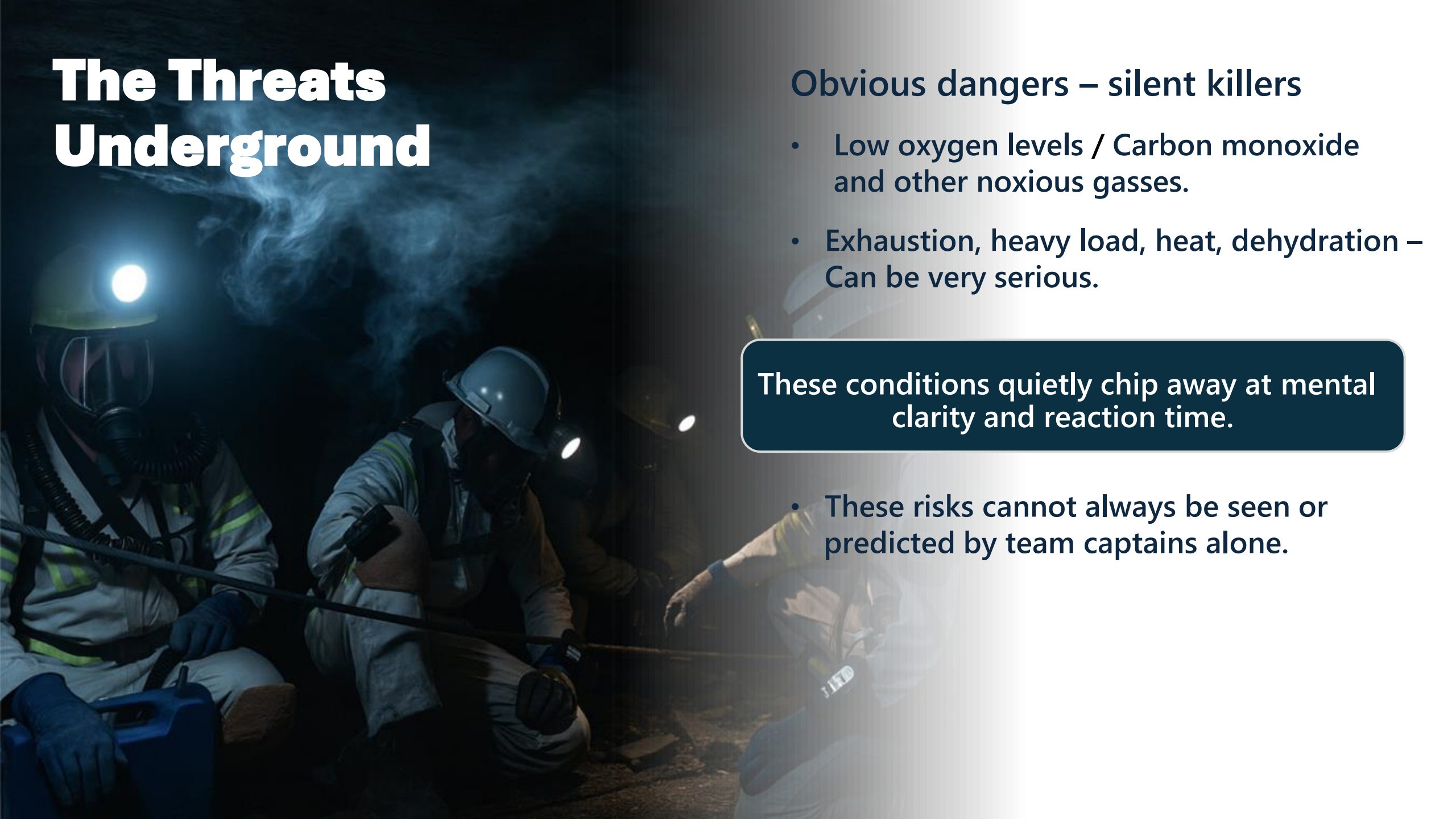
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Introduction

- Inspired by IMRB South Africa (two years ago).
- Explore new piece of technology – a step forward in safety.
- Proven rescue practices saved many.
- Vision of the future.



The Threats Underground

The background image shows a dark, smoky underground environment. Three workers in full protective gear, including helmets with lights and respirators, are working together. One worker is in the foreground on the left, another is in the center, and a third is partially visible on the right. They are all wearing white protective suits with yellow reflective stripes. The atmosphere is thick with smoke or steam, and the lighting is dim, with the primary light sources being the workers' helmet lights.

Obvious dangers – silent killers

- Low oxygen levels / Carbon monoxide and other noxious gasses.
- Exhaustion, heavy load, heat, dehydration – Can be very serious.

These conditions quietly chip away at mental clarity and reaction time.

- These risks cannot always be seen or predicted by team captains alone.

The Pressure Cooker

- Underground rescue environment = pressure cooker situation.
- Every decision counts – delays can be fatal
- Stress clouds judgment.
- Operators using voice comms are forced to make life-or-death decisions with incomplete or distorted info.



Why we need more than Voice Communication

- Voice conveys intent - not body state.
- Seconds from collapse – and might not know it.
- Fresh air base controller depends on rescuer's verbal statement – partly blind.



What's missing

Continuous, real-time view of each rescuer's biometric status.

Early warning signs – rising body temp, fatigue and physical strain.

Early detection of local environmental hazards.

Automatic alerts - when thresholds crossed.

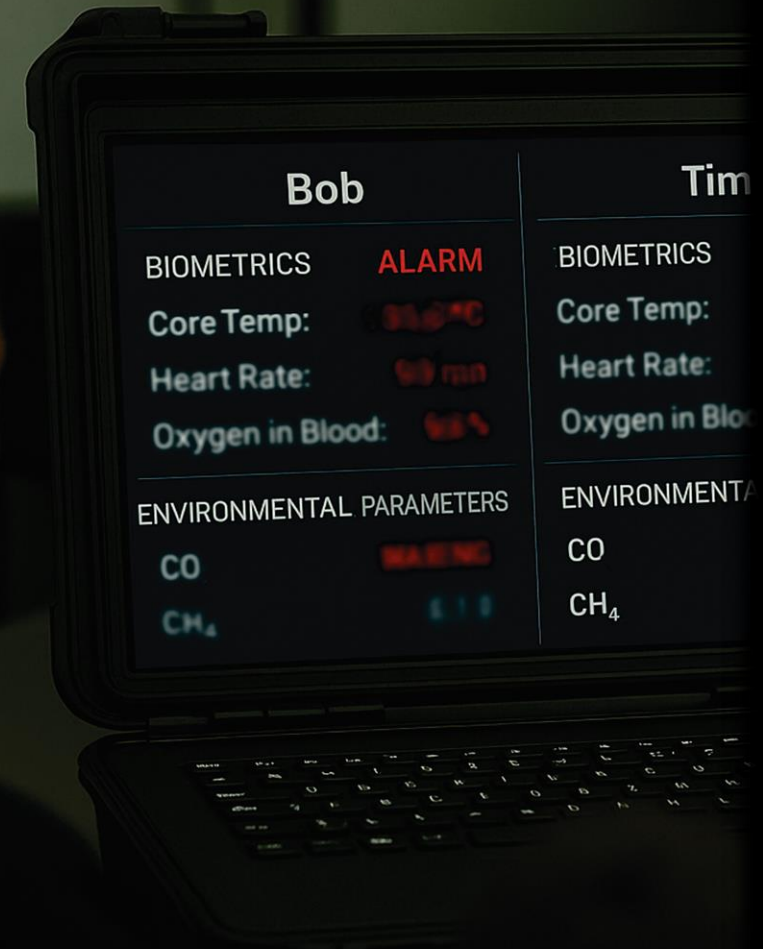


From uncertainty to data-driven safety

Voice and judgment can leave blind spots.

**Real-time biometric data –
Team Captains and even managers in
emergency control rooms gain clear
visibility.**

Decisions shift from instinct to instinct informed action,
brings more clarity, builds confidence.



The Guardian

- Compact data radio linking rescuer to base.
- Built on proven RB2000 technology.
- Pairs with Bluetooth biometric devices.
- Sensor-agnostic - connects to any capable devices, i.e breathing apparatus, as long as it is Bluetooth ready.





Bio-Watch

It begins with the rescuer's vital signs

- As already mentioned - can connect to any Bluetooth watch i.e. Garmin or Polar.
- Purpose of this presentation - Use a South African Bio-watch.
- Checks rescuer's health and environmental status continuously.
- Focus on Bio side.

TYPICAL SYSTEM CONFIGURATION

Surface

Underground

Copper Cable Lifeline (2.5km / 1.55 miles)

Data Link

End of
line Unit
(EOL)



FRESH AIR BASE



Base
Station
HMI
Display

DATA RADIO



BIO WATCH



Base Station overview

- Team at a glance – Names, vitals and environmental conditions - HMI screen.
- At the start of the rescue – all OK.
- Warning or alarm - displays in Orange or red.
- Drill down to individual rescuer's detail screen.



AI assisted

Individual Detail Screen

Biometrics

For example:

- Bob's body temp at 38.8 °C – alarm triggered.
- Heart Rate : 142 beats/min – warning triggered.
- Oxygen levels : 96% - OK.
- Combination confirms danger.
- Intervention required.

Environmental Parameters

- CO : 32 ppm – warning triggered.
- CH₄ : 0.1 % – OK
- H₂S : 4.5 ppm – OK



AI assisted



But numbers alone don't save lives. Action must follow:

Call to Action

- Base Station Controller reviews data, consults with Team Captain and in certain cases, Surface Management through voice comms.
- If withdrawal is needed, the order is sent instantly.
- This can be done via vibration alert on the rescuer's unit, but always confirmed by voice communication.

Proven Backbone

Voice System in South Africa

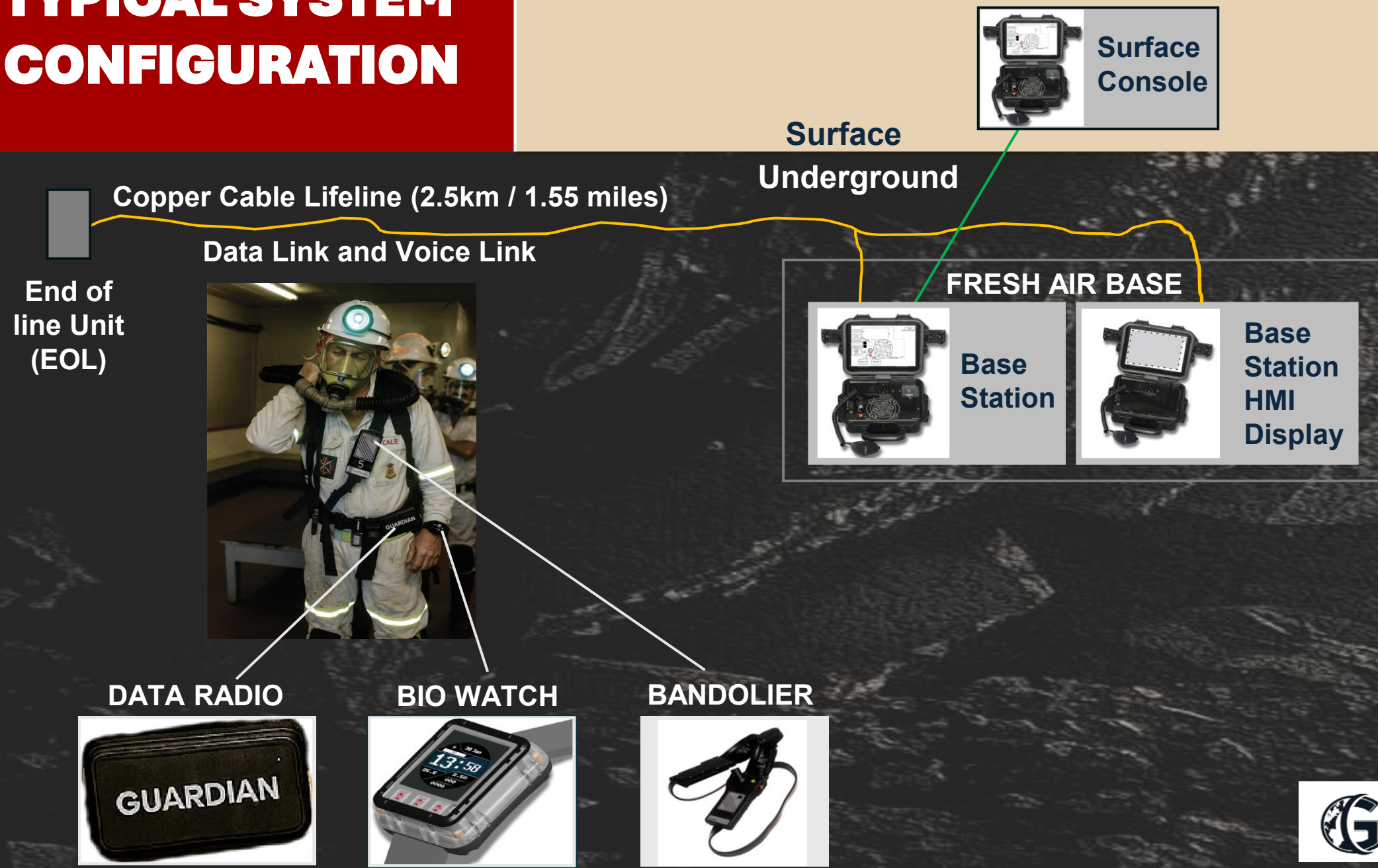
RB 2000

The RB2000 has been used by Mines Rescue Services South Africa for over 40 years.



Bandolier
(SC2000 Radio)

TYPICAL SYSTEM CONFIGURATION



Conclusion

- Real-time visibility.
- Better informed decisions.
- Safer rescues, more lives saved.
- Guardian turns brave rescues into safe returns.



Closing thought – Courage with clarity

Thank you

We now welcome your questions

