

The development of a borehole based investigation tool



GEOTECHNICAL
SYSTEMS
AUSTRALIA



ACARP

Australian Coal Association Research Program

Part 1- 2002

- Feasibility study to identify priority needs for a borehole based investigation tool.
- Conclusions:
 - Develop in phases – minimise expense
 - Device needs to be adaptable
 - 1st goal is to get to bottom of borehole, sample gases, measure temperature and get video footage, investigate mobility beyond hole

Devices already exist



Revised Simbot after modification



Borehole camera

Cerberus



- Greek mythical beast guarding the gates of Hades – multiple heads, keeping out live humans.

First prototype



Part 2

- Built prototype 2
 - Capable of deploying in 150 mm borehole to depth of 500 m
 - Analog video with 50 watt light – not IS
 - Gas extraction line + carries real time monitor
 - Thermocouple
 - Carries spare electrical cabling for future use
 - Identified two propulsion schemes.

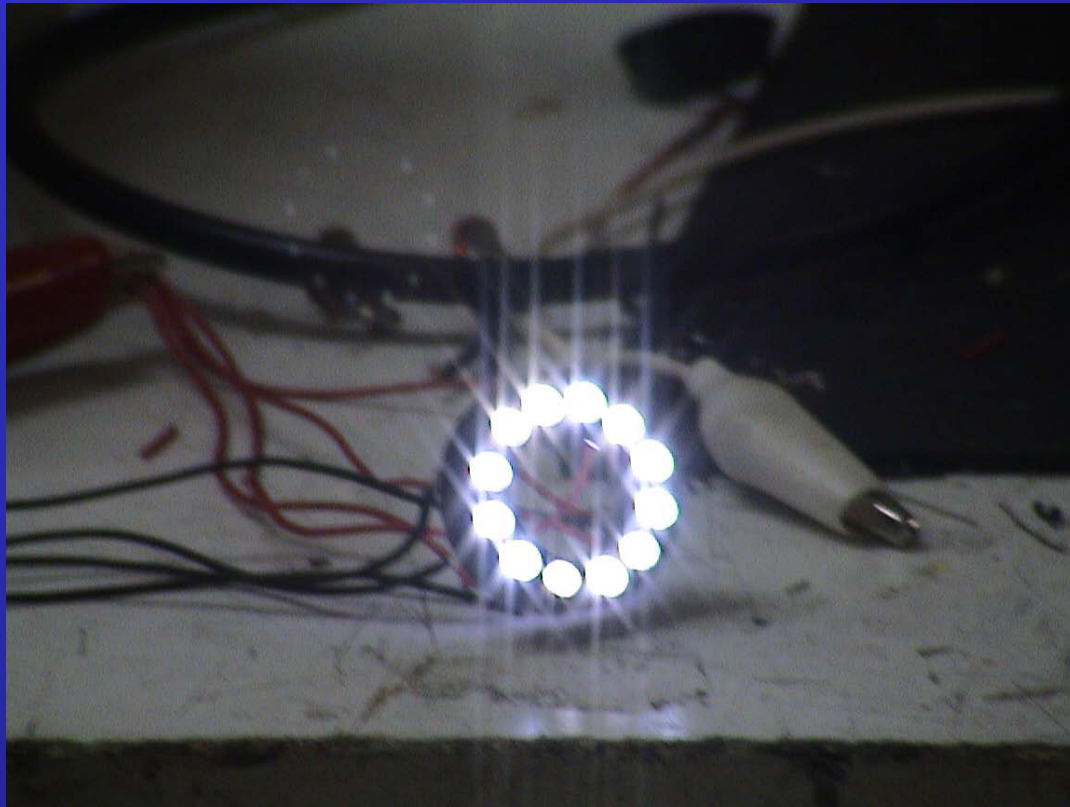
Field trials

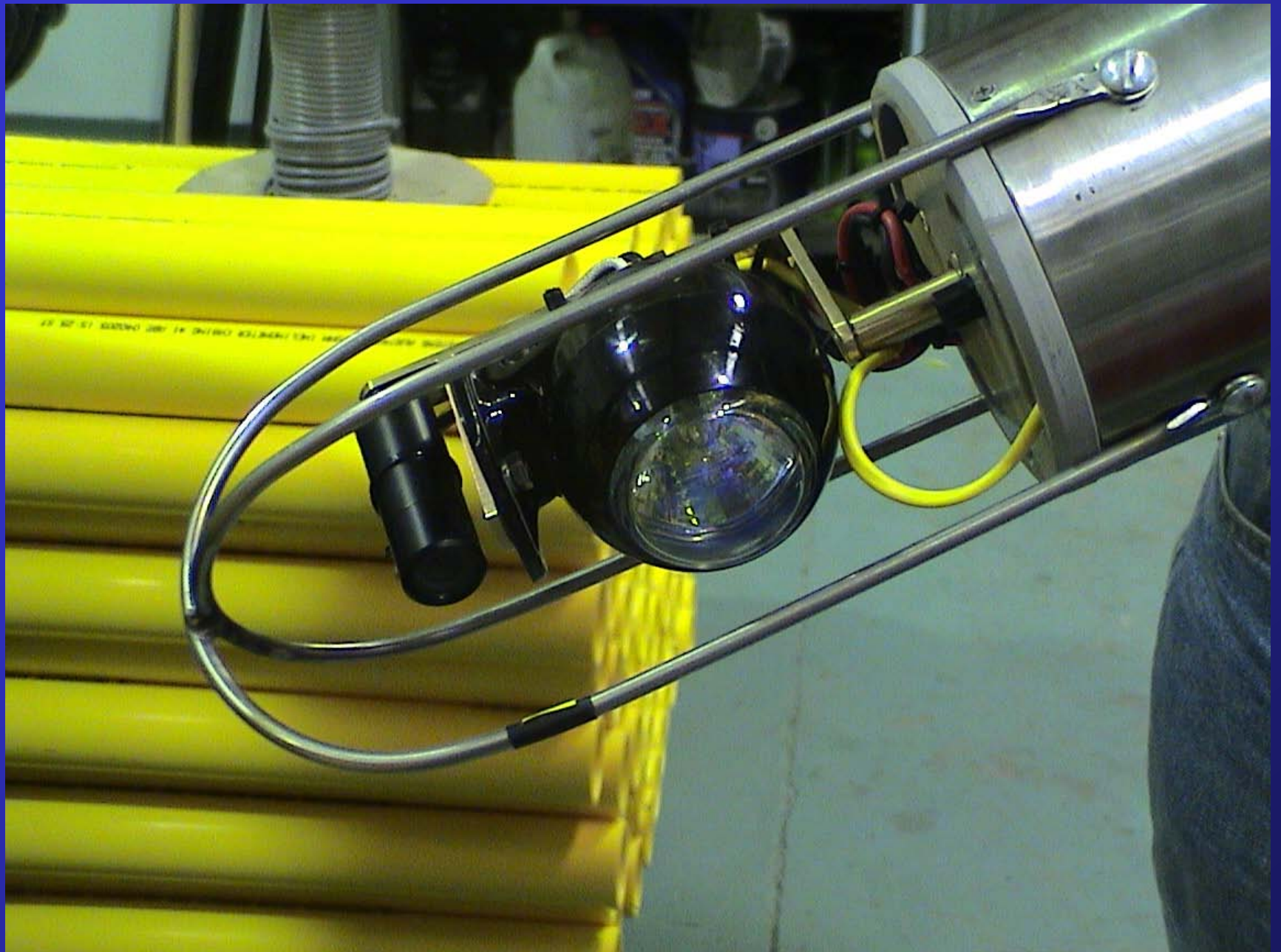
- Dartbrook 270 m concrete drop hole.
- Developed SOP including risk assessment
- Met site inspection requirements – AS3000 wiring IP 68 etc.

Video Camera



Alternative lighting – LEDs

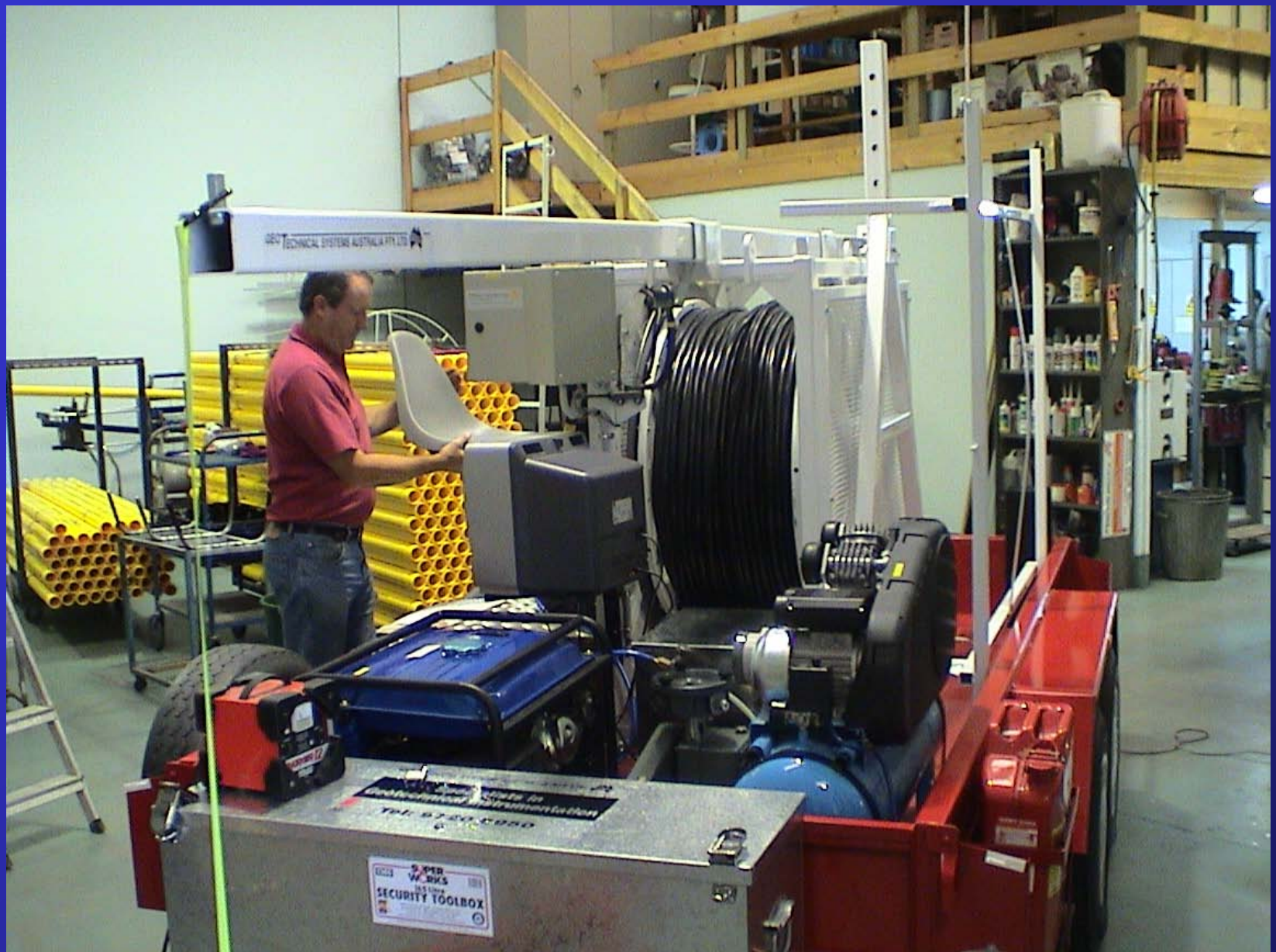








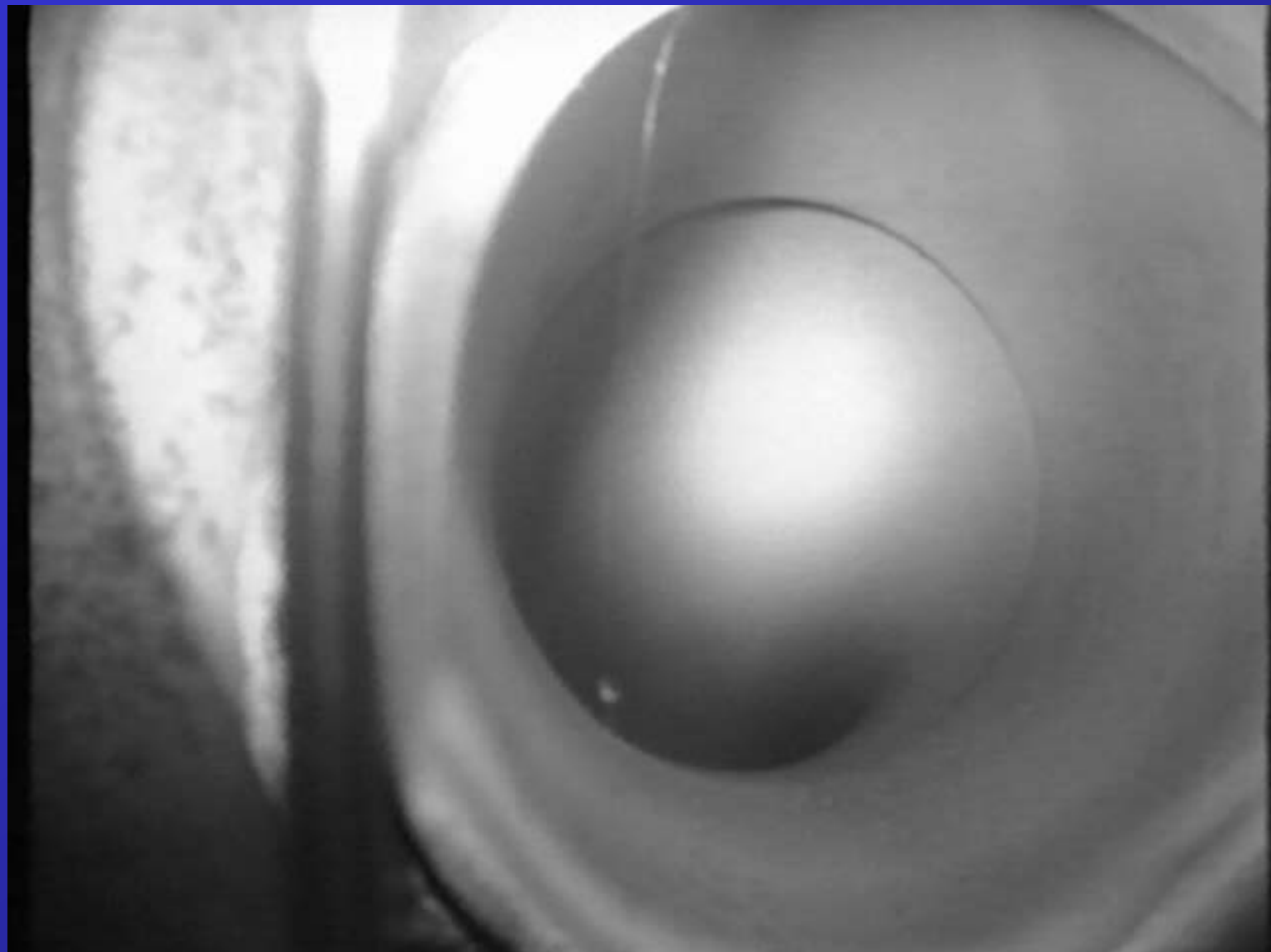




Controls













Results of testing – field evaluation

- 100 mm borehole
- Deploy away from borehole
- Improve lighting/focussing system
- Improve visibility
- Mechanism to clean lens
- Zoom lens/ two cameras
- Interchangeable heads
- seal surface prevent air ingress into borehole
- Surface security



Mobility options



Options (nice to have)

- Air velocity
- Atmospheric pressure
- Infrared/thermal imaging (?)
- Digital video/still + image enhancement technology
- Inert gas shield to render head nonflammable
- Microphone/speaker

Next phase

- New ACARP applications to extend probe and include options and mobility
- Applications in two parts – extension of probe and investigation of alternate vision technologies. The latter has relevance beyond the borehole device and extends to in mine work and mines rescue.

First prototype



Key considerations when using a borehole camera

- Must have SOP
- Must ensure not possible to be ignition source – not IS
- Secure surface area
- No leakage into or out of borehole
- Continue to monitor u/g gas concentration

Other potential applications

- In seam evaluation of sealed areas
- In seam evaluation of boreholes
- Surface based - evaluation of boreholes
- Surface based – evaluation of voids/cavities
- Miniversion – camera and low power light only – 50 mm diameter.

Thank you

- Thanks to ACARP for funding it.
- Thanks to Dartbrook for letting us trial it at their mine.
- Thanks to all the personnel who have made valuable contributions to its development so far.

Questions

Bob Myatt, Metropolitan Colliery – Did you try different camera and lighting scenarios?

David – We can use high powered diodes or concentrated beams. We can also wash an area with light to “paint” a picture as used to be done using cap lamps to illuminate areas for still photos.