GPS-Based Personnel Tracking

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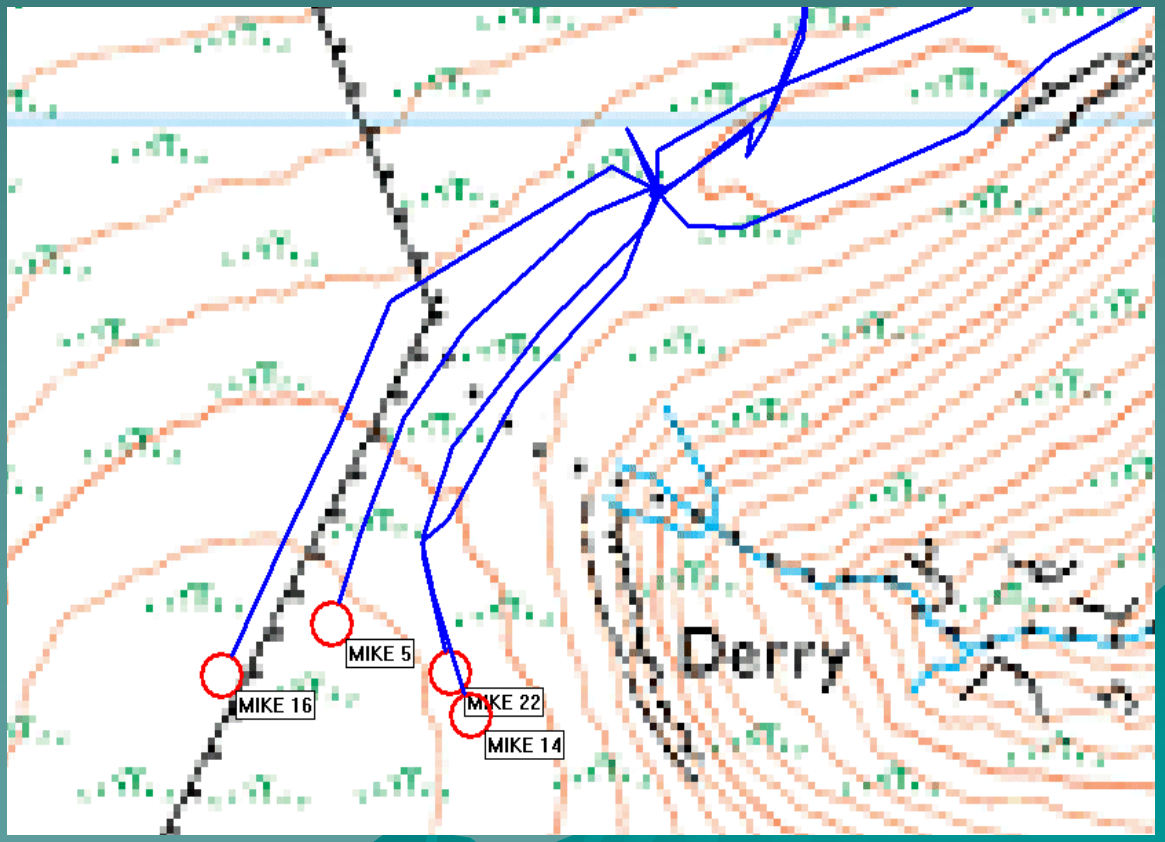
~England~

With thanks to Dave Binks
Duddon & Furness MRT



GPS-Based Personnel Tracking

- Why track personnel?
- GPS
  - What is it?
  - How does it work?
- Lake District Search and Mountain Rescue Association's GPS tracking project
- Demo

Why Track Team Personnel?

- Safety
  - Lone worker
  - Health & Safety
- Coordinating rescues made easier

The Original Problem

- Casualty found: Where are you?

Pre-Radios Days

\+ Legs

- Run down to the nearest phone with an idea of where you were
  - Slow “transmit” time
  - Accuracy could be dubious

Radios

+

- Radio down ‘estimated’ location
  - Fast “transmit time”
  - Accuracy problems

Radios and GPS

- Radio down accurate location
  - Fast “transmit time”
  - Accurate position

Radios and GPS Microphone

+

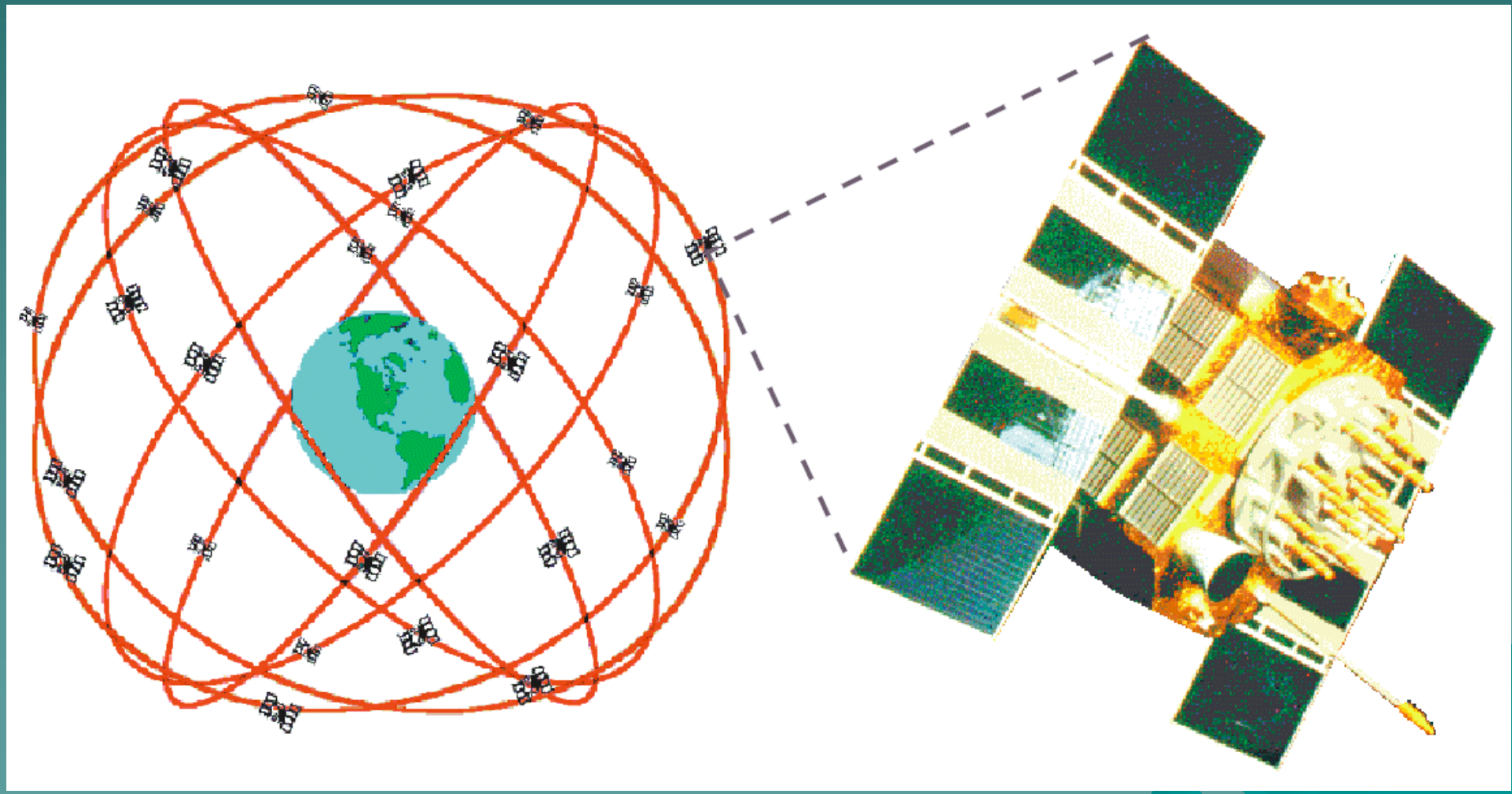
- Integrated GPS
  - Fast “transmit time”
  - Accurate “Real Time” position at Control

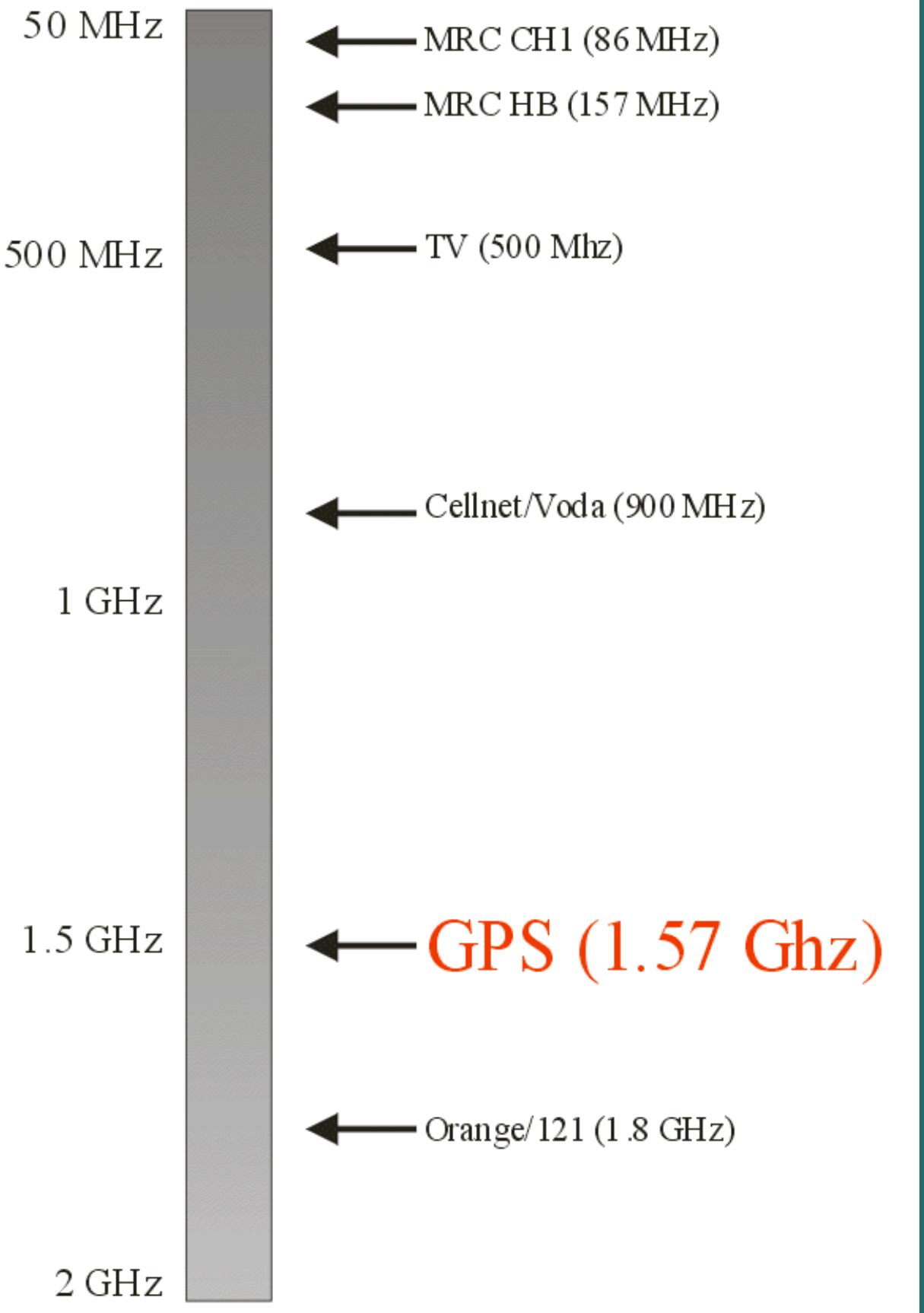
GPS

- Global Positioning System
- Developed for US military
- 1963 - Development started
- 1990 - Operational (~100m)
- 2000 - SA (selective availability) removed (~10m)
- 2008 - European System Available (~1m)

GPS Satellites

- About 32 Satellites + (spare)
- 10,000km orbit




50 MHz
MRC CH1 (86 MHz)
MRC HB (157 MHz)
500 MHz
TV (500 Mhz)
Cellnet/Voda (900 MHz)
1 GHz
1.5 GHz
GPS (1.57 Ghz)
Orange/121 (1.8 GHz)
2 GHz

GPS Signal

How does it work?

- Timing satellite signals
- Time converted to distance
- The rest is magic
- Accurate to about ~10m on a good day
- Affected by:
  - Weather (heavy rain)
  - Trees
  - Buildings
  - Valleys
  - Unusual satellite positions

In the beginning

- On the mountain
  - VHF Radio
  - Modem + Battery
  - Hand held GPS

In the beginning

- Control
  - VHF Radio
  - Modem
  - Computer
  - GIS software
- Trials in 1997 (it worked)
- Bulky, not waterproof and noisy

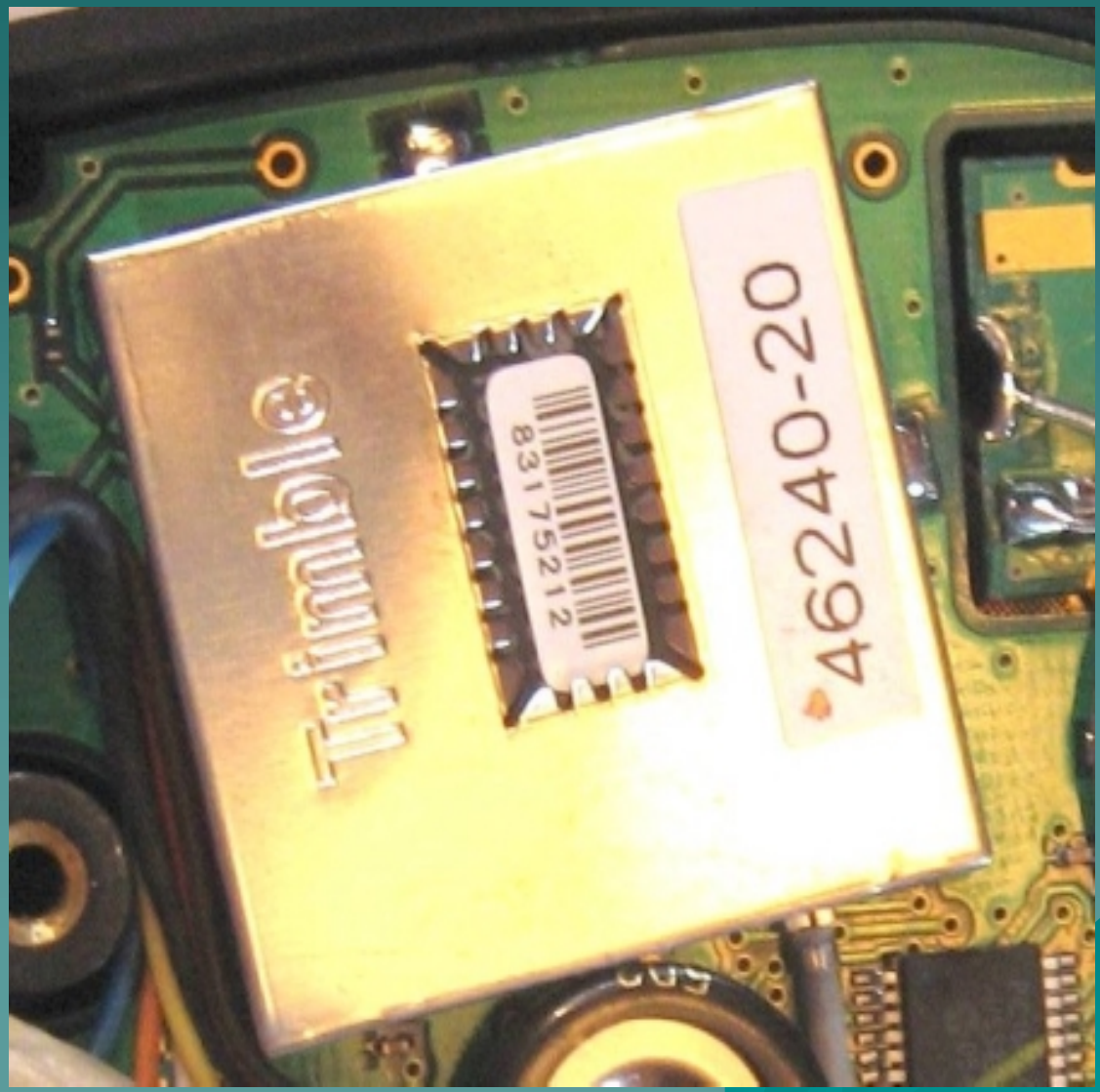
Now - GPS Microphone

- Integral GPS
- Radio able to transmit data

Now - GPS Microphone

GPS Unit

- Trimble Unit
- ~ 2.5 cm square
- ~ 0.5 cm thick
- 80mA maximum



Control

- Radio
- Computer and suitable software

How is it done?

- Magic
- GPS data transmitted as FFSK
  - When “Press to Talk” button is released
  - When base computer requests it
- Shares channel with voice
  - Data muted
  - Technically possible to fully mute
- Excellent support from TMC (Simoco)
  - Fixing bugs in radio firmware
  - Adding features to the radio

Computer Software

- Required to display GPS data on a map
- Commercial programs do exist
- Mostly for “Automatic Vehicle Location”
  - Designed for roads
  - Annual licensing cost high
  - Didn’t quite do what we wanted
- LDSAMRA decided to have go
  - Wrote software in C++ for Windows

Requirements

- Must be easy to use and install
- “Real time” tracking of multiple parties (theoretically 65500)
- Viewing 1:25,000 Ordnance Survey maps

Live Demo

- Customs – potential problems with importing radio equipment
- Licence infringements – UK MR frequencies not the same as those used in Slovenia
- May not work with Slovenian radio system

Trial & Demo

- Hijacked a team “Search Practice”
- 6 Radios with GPS mics
  - One or two per search group
- Thick mist
- Unexpected results
  - Practice hijacked the trial
  - 60 seconds of “training” and the search manager took over computer

Demo Step Through

- Radio registration
- Dead radio
- Search group task management
- Call of nature
- Casualty location
- See groups going the wrong way
- Much reduced radio communications

Further Development

- Drag Non-GPS assets on to radio
  - Equipment
  - Casualty
- Developments limited by time of programmer
- Written in C++

Cost

- Radios (Simoco)
  - Already have these
- GPS microphones (at least 1 per hill party)
  - ~£150 (€230) each
- Base computer
  - ~£500 (€750) - may already have suitable one
- Maps
  - OS 1:25,000 free in UK (since September 2006)
- Software
  - Nominal charge

Finally…

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