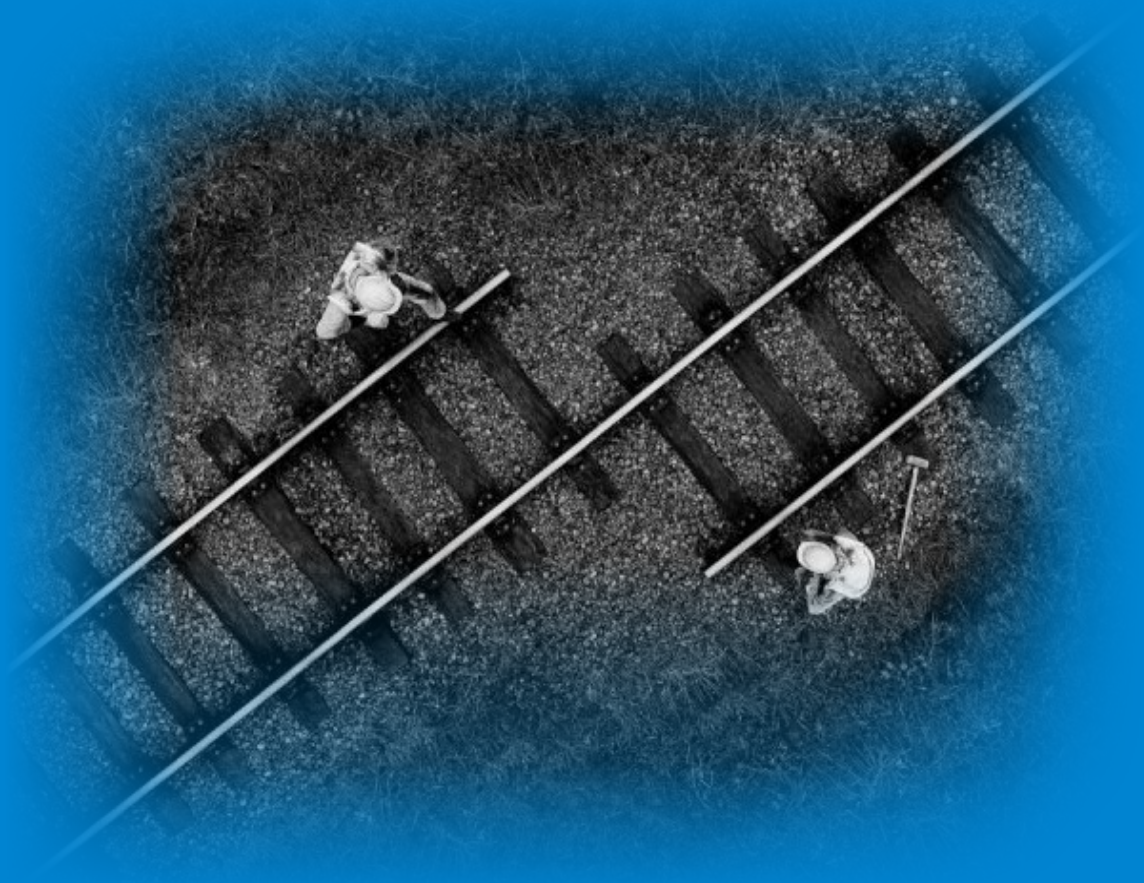
Learn from the mistakes of others...

...you won't live long enough to make all of them yourself.



Alison Lloyd

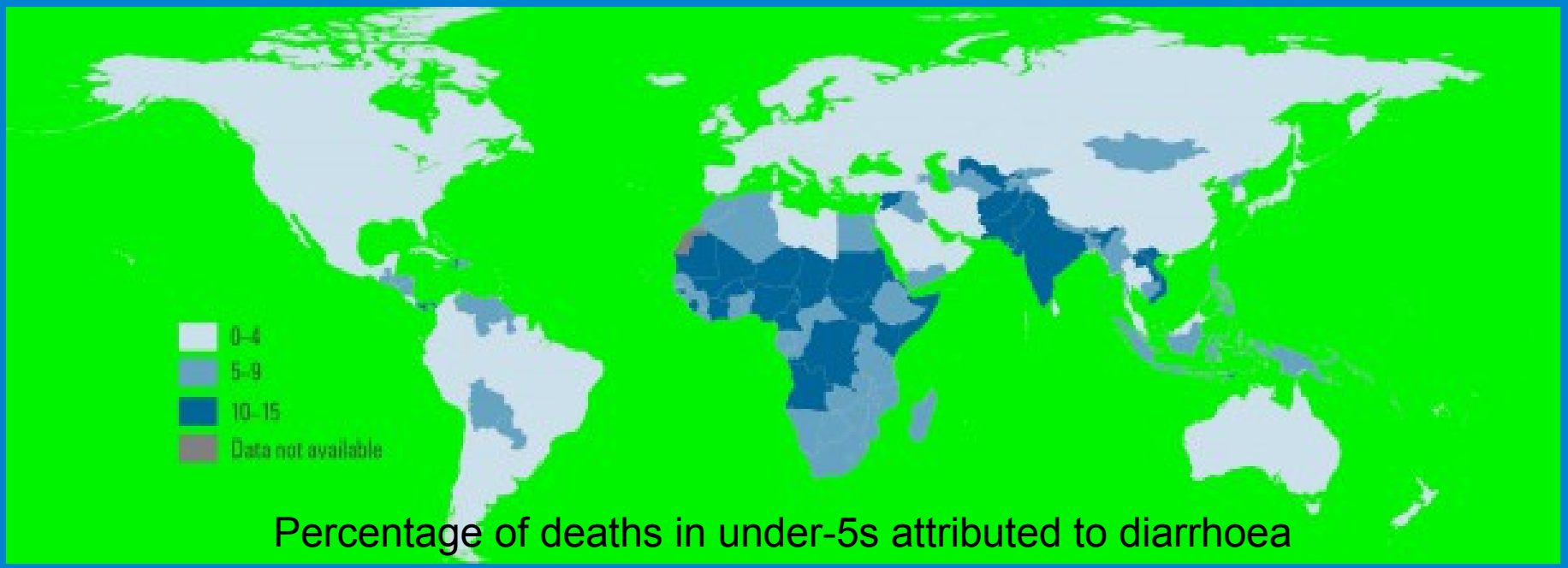
Introduction

- About me
- Aims of the talk
  - Case studies
  - Slides will be simple (mostly)
- Please ask questions!
  - Technical discussions welcome in the bar

Study 1:
Oral Rehydration Salts (ORS)

Disease statistics

- Diarrhoea kills approximately 580,000 children per year, world-wide – 9% on average (Unicef)
- Before 2000, over 1.2m deaths per year in under-5s



Percentage of deaths in under-5s attributed to diarrhoea

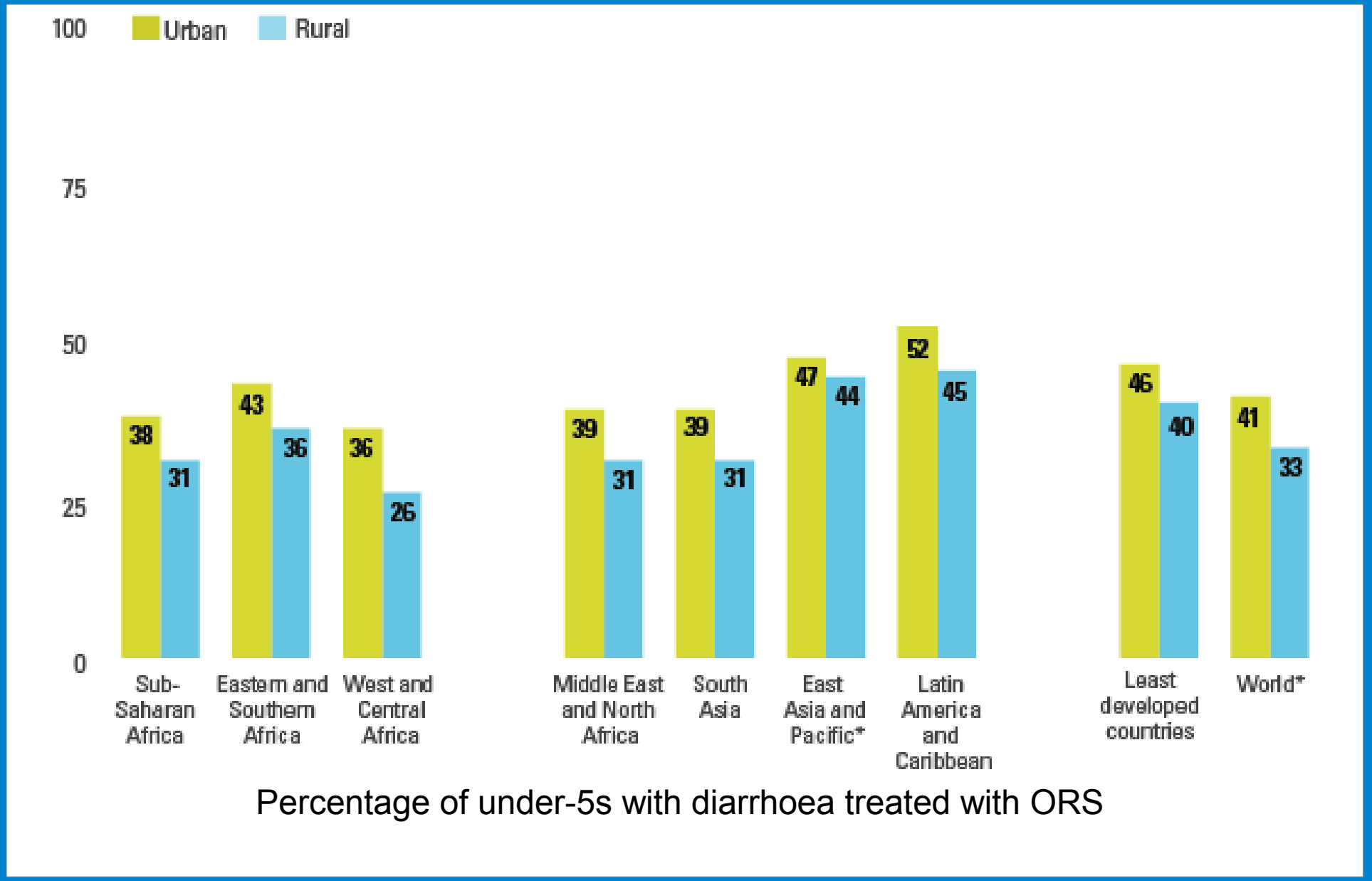
Oral Rehydration Salts (ORS)

- Basically a mixture of salt and sugar to be added to water
- Used as treatment for people suffering severe dehydration
- Based on research in the 60s:
  - Glucose-sodium co-transport mechanism
- Entered wide usage in the 70s

Disease statistics

- Only 30% to 40% of children under 5 with diarrhoea treated with ORS
- Improvement in numbers has stalled since 2000
- Better coverage in urban areas
- Better coverage among wealthy

ORS Usage



Percentage of under-5s with diarrhoea treated with ORS

Improvements…

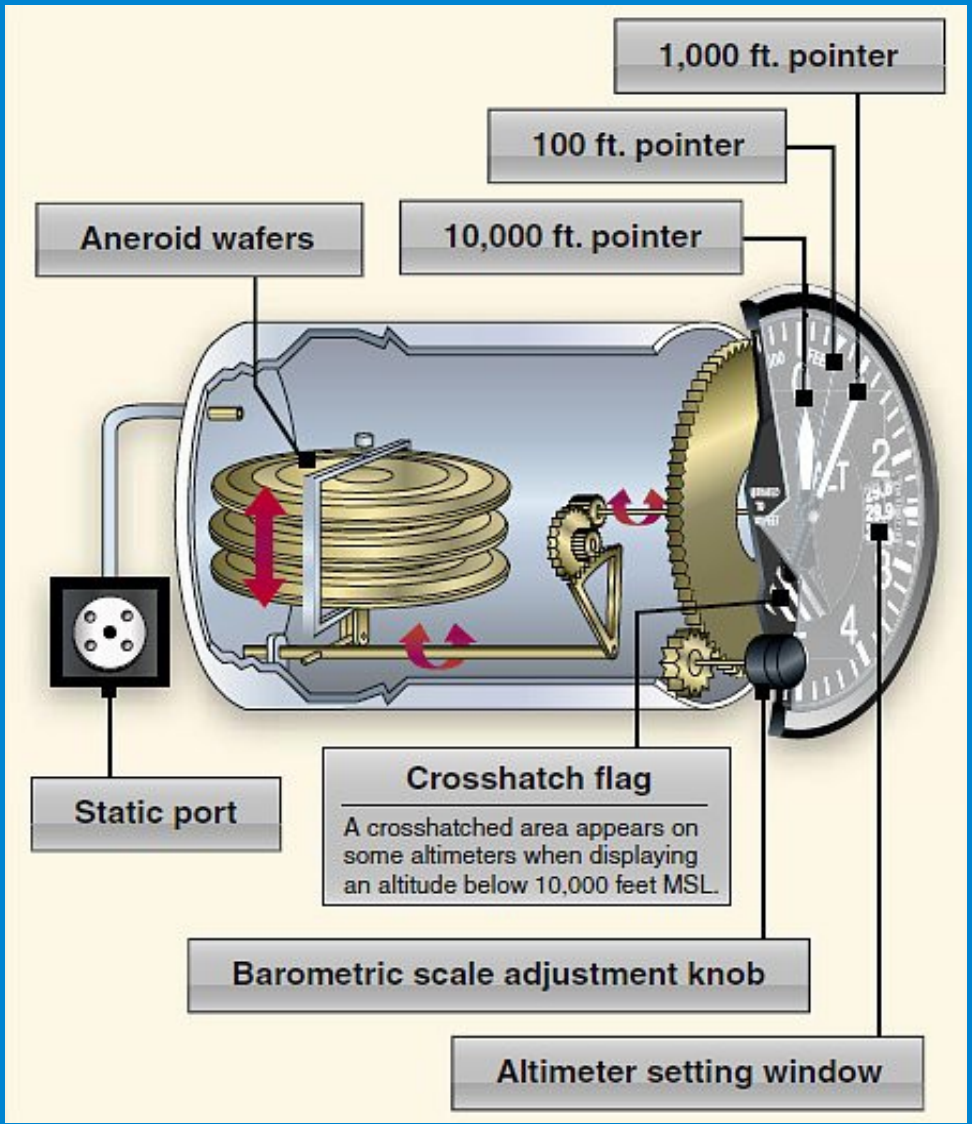
- Very successful program in Bangladesh
  - Used women to go out into rural areas
  - *"…Good water, a litre, pinch of salt with a fistful of gur…"* - Bangladeshi postmark, 1993
- Using the Coca-cola distribution network
- Unicef numbers show some improvements recently

Thoughts

- Sometimes clever, qualified people get it wrong
- Learn from what works
  - Bad practice or ignorance?
- Consider the whole problem
  - No such thing as a simple problem
- “Take the science to the problem”

Study 2: Altimeters

Internal workings



Analogue altimeters

- 'Modern' 3-needle altimeter introduced around 1935
  - Early versions in aviation use around 1913
- Electronic versions using servos in use in 60s
- Accurate to within +/- 80 feet
- ...but UX has stayed roughly the same throughout
  - Various attempts to make them harder to misread
  - Still prone to misreading, especially under stress

What happens when altimeters are misread?

- Maybe nothing...
- United Airlines flight 389, 16 August 1965, Lake Michigan – no survivors, 30 fatalities
- BOAC G-AOVD, 24 December 1958, Dorset – 3 survivors, 9 fatalities

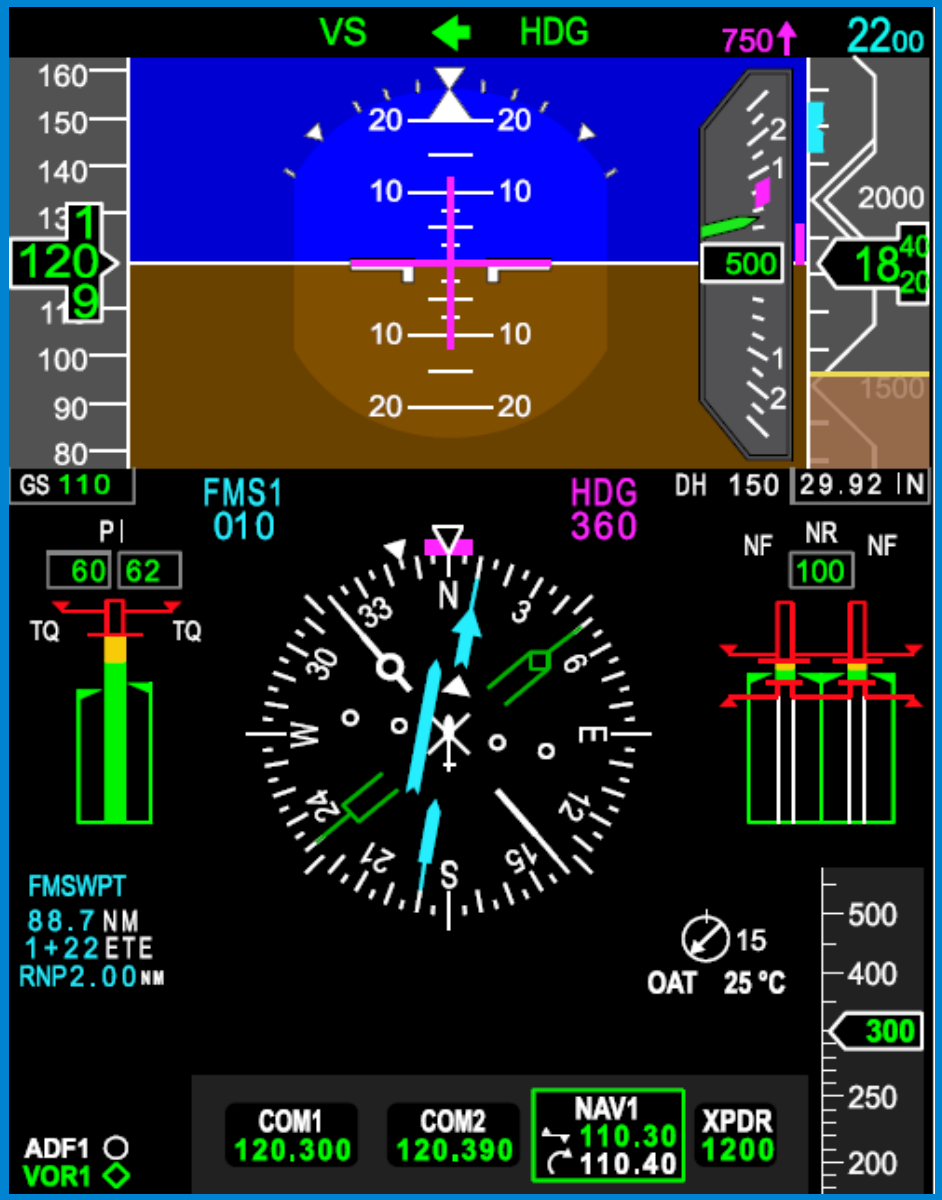
- 'Human factors' / Controlled Flight Into Terrain (CFIT)

So what can we do?

- Addition of cross-hatch area
- Addition of rotating numerals
- Updated procedures to require cross-checks of altitudes
- Require 2 pilots for (commercial) IFR operations
- Train pilots to beware of errors

OR…

Improve the UI!



AW139 Primary Flight Display (PFD)

Improved UI – A320 PFD

Thoughts

- UI matters!
- Consider the users of your system

  (Please, please, please...)
- Consider the worst case scenario your system will be used in

Study 3:
Early commercial helicopter ops

Helicopters at work

- First commercial operations in late 1940s
  - Crop dusting, whaling, ferrying
- Most pilots were ex-military, trained in WW2

- Vietnam war (1955 – 1975) – first major use of attack helicopters
- Boom in commercial operations in '70s on back of demobbing pilots

Risk factors

- Military flying is very different from commercial flying
- Many helicopter operations were in remote areas
  - Logging in Canada
  - Whaling / tuna boats
- 'Getting the job done'
- Commercial pressures

Result

What went wrong?

- *"Rule 43: If you do something stupid and it works, it's still stupid and you're lucky."* - Howard Taylor, Schlock Mercenary
- Swiss cheese theory of accident causation
- Ignoring the risk factors because "everyone knows…" or "he did it and was ok…"
- Rebels without a clue

- Modern operational safety required a change in mindset

Thoughts

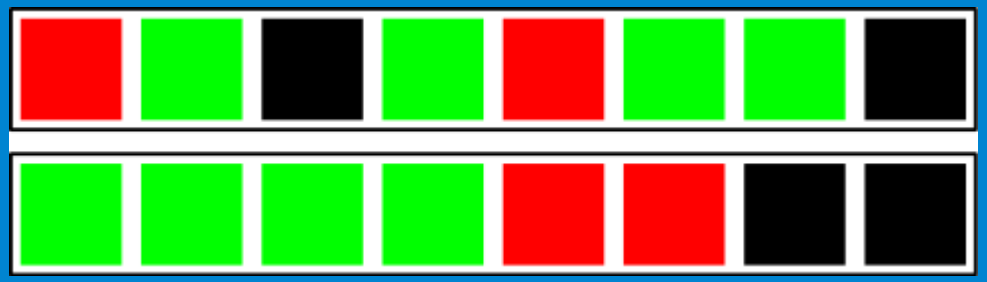
- Humans are really bad at risk assessment
- People are better at risk assessment when they understand the risks
- It's not enough to design safe systems, you have to allow for human operators

- In technology, the human aspect is at least as important as the technical ones

More about people and stats

I heard this song...

- What do you expect to happen when you press 'shuffle' on a music player?
  - Actually random vs. 'perceptively' random
- Fisher-Yates algorithm



Spotify

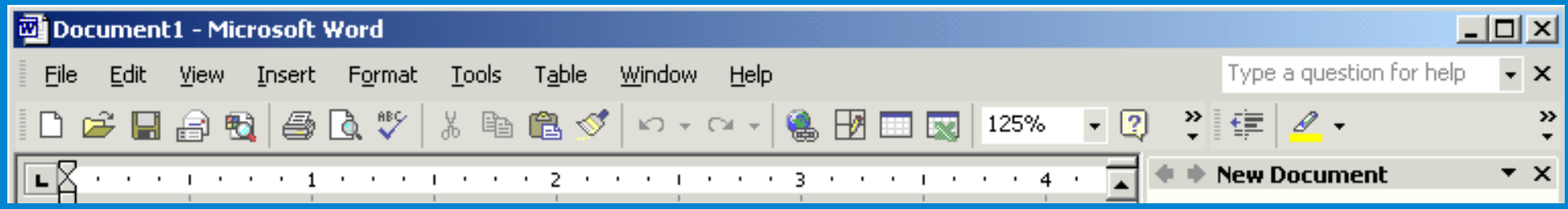
- People are bad at stats...
- ...but very good at pattern recognition
- Also not bad at making stuff up
- Spotify adjusted their shuffle algorithm in 2014 to produce a more 'human-friendly' random shuffle

Study 4:
UI part 2 - changes

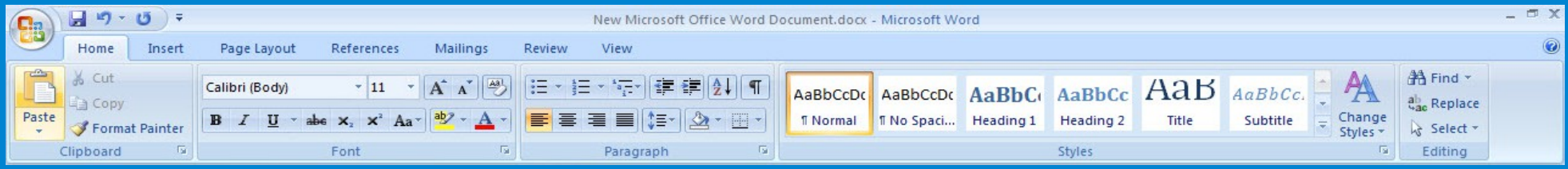
What happens when UI changes?

- Users complain
- Some users will leave
  - …if they can
- Most people care more about what changed than why it changed
- Two case studies:
  - MS Office (ribbon UI)
  - Firefox (Australis)

MS Office ribbon



To



MS Office ribbon

- In many ways, a good example of change
- Changed for the right reasons
  - Users had problems finding stuff, found the UI overwhelming
- Lots of user research and serious thought and effort went into the redesign
  - Multiple trials and discarded possibilities

MS Office ribbon - results

- New users are fine
- 'Basic' and casual users generally happier, once they get used to new design
- Power users generally unhappy
  - …until they get used to it
- Hard to get a clear idea of number of users, but MS suggest 1 in 7 computer users now use Office, with numbers continuing to increase

Firefox

- Release 29 made numerous changes to browser look (Australis UI)
- Many changes were minor, but some major
- Many previously-available settings and customisations no longer available
- Much wailing and gnashing of teeth

Firefox post-release

- Plug-in to return most aspect of UI to old look was made available
- Public clashes and general snottyness
- Many users felt forced into the changes
- “It took me an hour to fix this…”
- Most reactions were emotional rather than intellectual

Firefox Australis - results

- Continued loss of market share
  - Approximately 1% drop with v29
- Anecdotal evidence that many people disabled automatic updates
- General negativity surrounding Firefox community

Thoughts

- Change is hard
  - Users grow attached to the familiar
- When changing UI, be prepared for emotional fall-out
- Gradual vs. sweeping change

- Here be dragons…

Other UI change examples

- Windows 8 Metro
  - Changing UI for wrong reasons?
- Every time Facebook changes something…
- …or Google does…
- …etc…

Study 5:
Getting the engineering right

Concorde

- Developed by joint French – British team
- Amazing feat of engineering
- First commercial aviation use of:
  - Fly-by-wire engines
  - Digital computer control of critical systems
  - Carbon brakes
  - Hybrid circuits
- *"…an absolute delight to fly, it handled beautifully."* - John Hutchinson, Concorde Captain

Engineering problems solved

- Very fine control required on engine intake
  - Digital processors controlling intake ramp
- Heating issues
  - Novel heat sinking (fuel), reflective paint, testing, visor
- Possible radiation due to altitude
- Visibility at landing and take-off
  - Droop nose

Outcome

- Concorde proved an economic loss
- Retired in 2003 after 27 years of commercial operations
- Uneconomical to maintain
- Higher fuel costs, 11 September 2001 downturn
- Competition from subsonic airliners in first class
- Big advances in numerous fields as a result of Concorde program

Thoughts

- With sufficient effort (and money), solutions can be found to almost any problem
- …but really good engineering isn't enough on its own
- Projects have to be technically AND commercially successful
  - …and one doesn't guarantee the other

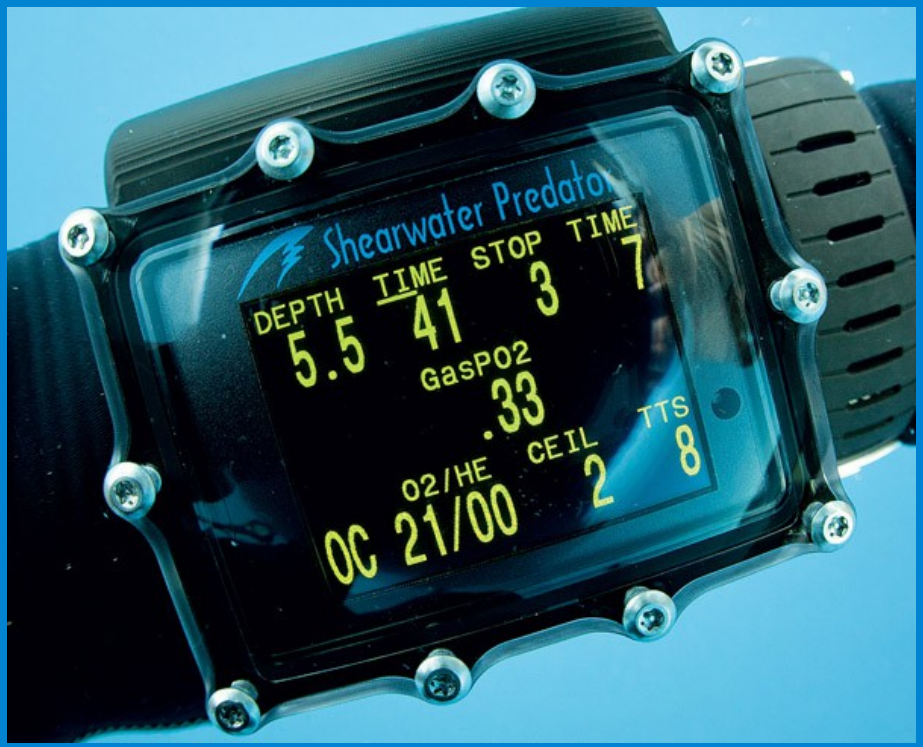
Ultimately...

It's all about people!

Coda

"*Nothing is truly idiot proof because idiots are so ingenious*" - unknown

The decompressing dive computer



Health and safety at work