Human factors - Why we need to change practice

Guy Hirst FRAeS
SHOT Symposium 2014
July 9th 2014
Professor Sir Bruce Keogh
There’s a lot of risk out there!

“By embracing human factors understanding and making such understanding mandatory aviation has become a much safer environment over the last three decades”
27 per million departures

0.2 per million departures
Culture affects safety

<table>
<thead>
<tr>
<th>Dates</th>
<th>Fatalities</th>
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<td>Oct 2011</td>
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Boeing data 2012
We can't do it. We're going to be in the Hudson.
Why things go wrong every day

Perception

Assumption

Communication
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Assumption

Off the rails

thanks luv, just pop it over there next to the telly!
Perception - Assumption - Communication

Correct mental picture

Effective decisions

Safe outcome

Wrong mental picture

Ineffective decisions

DANGER
3 Quick Questions

Take a piece of paper and write down your answers to each of these three questions.

You have about 10 seconds for each response

P. Croskerry 2010
A bat and a ball cost £1.10 in total. The bat costs £1.00 more than the ball.

How much does the ball cost?
If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets?
In a lake, there is a patch of lily pads. Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half the lake?
Answers

1. The ball costs 5p and the bat £1.05

2. 5 minutes to make 100 widgets

3. The lake would be half-covered in 47 days
Cognitive Reflective Test

- The test distinguishes intuitive from analytical processing
- It tests the ability to resist first response that comes to mind
- Of 3428 people tested only 17% got all 3 correct
- 33% answered all three incorrectly.

*Frederick 2002 (MIT)*
In a study 1000 people were tested. Among the participants there were 150 engineers and 850 lawyers. Jack is a randomly chosen participant of this study.

Jack is 36 years old. He is not married and is somewhat introverted. He likes to spend his free time reading science fiction and writing computer programs.

What is most likely?  

a. Jack is an engineer  
b. Jack is a lawyer

Adapted from De Neys & Glumicic, 2008
Have you ever had a firmware update?
The way we are

95%

Automatic
• Fast and effortless
• Subconscious
• Highly practiced

5%

Conscious
• Slow and effortful
• Uses working memory
• Last resort method

Daniel Kahneman
Using our fallible System 2

Conscious control is required when:

- Task is novel
- Task is critical, difficult or dangerous
- A habitual task needs over-riding
- Prioritising competing tasks

The Multitasking Myth - Loukopoulos et al - 2009
When we are most at risk

High risk situations:

• Interruptions and distractions
• Tasks required out of normal sequence
• Unanticipated new tasks arise
• Interleaving multiple tasks.

*The Multitasking Myth - Loukopoulos et al - 2009*
The Good - The response - 7 days later

AAIB Bulletin S3/2013
SPECIAL

ACCIDENT
Aircraft Type and Registration: Airbus A319-133, G-EEDE
No & Type of Engines: 2 x IAE V2522-A5 turbofan engines
Year of Manufacture: 2001 (Serial No 1374)
Date & Time (UTC): 24 May 2013 at 0716 hrs
Location: London Heathrow Airport
Type of Flight: Commercial Air Transport (Passenger)
Person on Board:
- Crew - 5
- Passengers - 75
Injuries:
- Crew - None
- Passengers - None
Nature of Damage:
- Fire damage to the right engine, mechanical damage to fuel and hydraulic pipes, cuts, laps, horizontal rudder, landing gear and fuselage skin
Commander's License:
- Airline Transport Pilot's License
Commander's Age:
- 50 years
Commander's Flying Experience:
- 14,357 hours (of which 335 were on type)
Information Source:
- AAIB Field Investigation

Notification:
At 0716 hrs local on 24 May 2013, the Air Accident Investigation Branch (AAIB) was notified of an occurrence involving an Airbus A319 departing from London Heathrow Airport. An investigation was commenced immediately and a team of AAIB investigators was deployed. In accordance with the circumstances of this incident, the findings will be published as soon as possible.

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The bad - How and why did that happen?
Maintenance checks during night on entire fleet
The ugly - Not sharing information?

★ Over 30 previous incidents world wide on CFM56 engines?

★ Too many safety alerts from Airbus Industries - woods/trees?

★ Were flight crew aware of potential?

★ Corporate branding versus safety?
Do we break rules?

INDIVIDUAL BENEFITS

Driving 85+ mph – the ‘illegal-illegal’ space (for almost all of us!)

Driving 75 mph – the ‘Illegal-normal’ space

The posted speed limit is 70 mph – the ‘legal’ space

Life Pressures

Perceived invulnerability

Belief Systems.

Based on: Amalberti
We need our team to help us from breaking rules

PERFORMANCE

INDIVIDUAL BENEFITS

VERY UNSAFE SPACE

ACCIDENT

Handwashing – every patient, every time

Life Pressures

Perceived invulnerability

Belief Systems

Based on: Amalberti

Handwashing when patient has MRSA

Only wash hands on audit days

Handwashing – every patient, every time

We need our team to help us from breaking rules
Communication - Home advantage

- Most seasons away teams win ≈ 30%
- Home teams familiar with environment
- System 1 dominates, leaving System 2 with spare capacity
- Clinicians/airline crews are always the home team
- Home team must make allowances for visitors
- Home team must lower stress levels
- Home teams must communicate effectively
Communication - use questions carefully

Question types

CLOSED - fact or yes/no
OPEN - extensive reply
SPECIFIC - determining facts
PROBING - elicit more detail
LEADING - indicates answer.

DANGER!!!
Communication protocols

“Brakes Off”

“Brakes On”
Standard communication language

“Brakes Off”

“Brakes On”
No compliance - no licence to operate!

“Brakes released”

“Brakes set to park”
The power of sharing and learning - Kathryn Schulz
Possible solutions - many are nil cost!

http://www.milbank.org/quarterly/8901feat.html
One example from paper - Checklists

- **Read-and-Do** (Anaesthetic equipment checklist)
- **Challenge-and-Response** (WHO Surgical safety checklist)
- **Aide memoire** (Pre-shift/list briefings)
- **O.R. crisis** (Gawande et al)

In simulated trials error rates reduced from 35% to 6%
Crew resource management (CRM)

- Most airline disasters caused by people
- CRM is assessable
- Latest iteration of CRM (*Threat and Error Management*) well suited to health care
Corporate training responsibility

- Mandatory training provided by airlines
- Crews rostered for such training
- Team accountability reinforces the message that safety is not an individual responsibility
No blame reporting culture

- Air Safety Reports mandated
- Reporting incidents gives immunity
- BASI 4 in BA
Do we always pull in the same direction?
“Sorry, I have no idea what happened to MH 370”