

Health and Safety
Executive



We are all human

Graham King

Health and Safety Executive



We are all human

- Need we be unduly concerned about human factors and human reliability?
- What is the worst that can happen if it is not managed it well?





“It will never happen to us”



How is this relevant to cutting the toll of machinery accidents?

Typical immediate causes of machinery accidents

- Safeguards of inadequate design or construction.
- Safeguards removed or fallen into disrepair.
- Safety systems overridden or defeated.
- Inadequate systems of work.
- Individual inadequately trained.

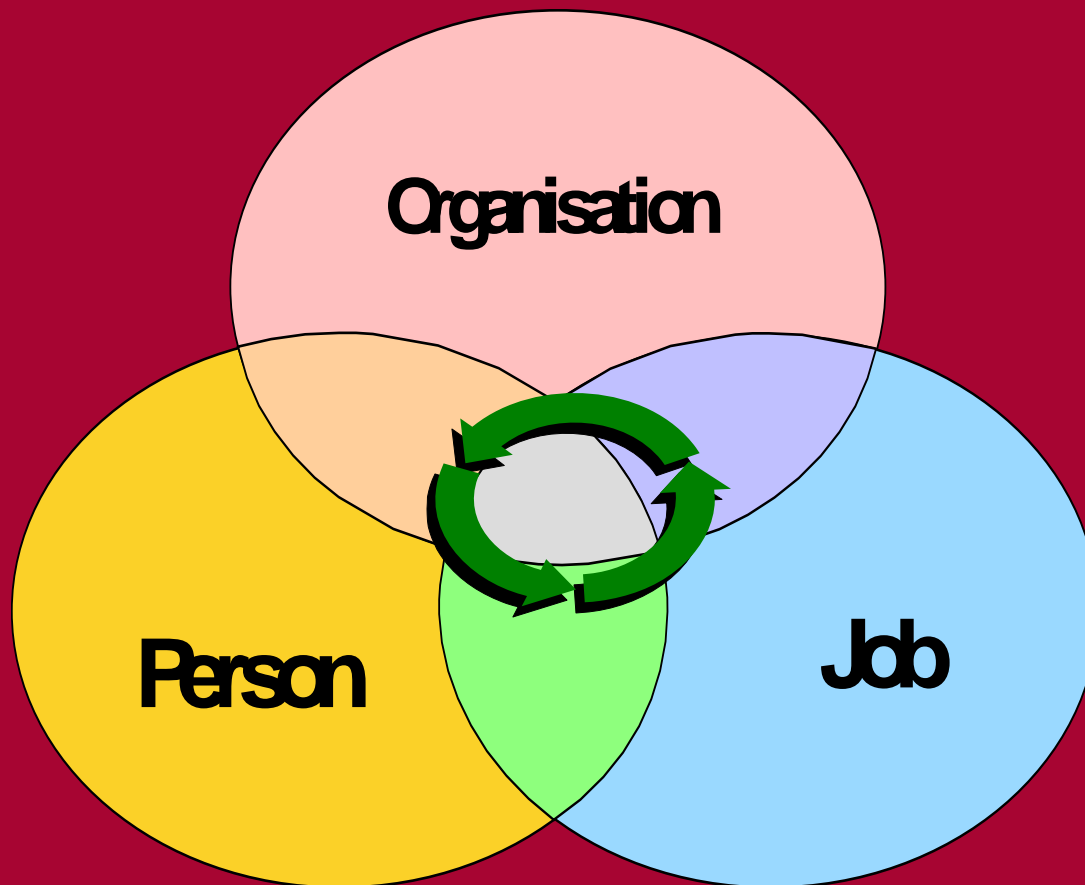
The challenge

- Identify & understand the *underlying* causes.
- Involves answering the *why?* questions.

Underlying causes

- *Not just technical.*
- *Human factors* play a key part.
- Technical solutions *must* take account of human factors.

What Do We Mean by 'Human Factors?'



Mental health

Musculo-
skeletal
disorders

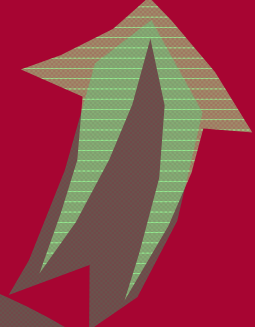
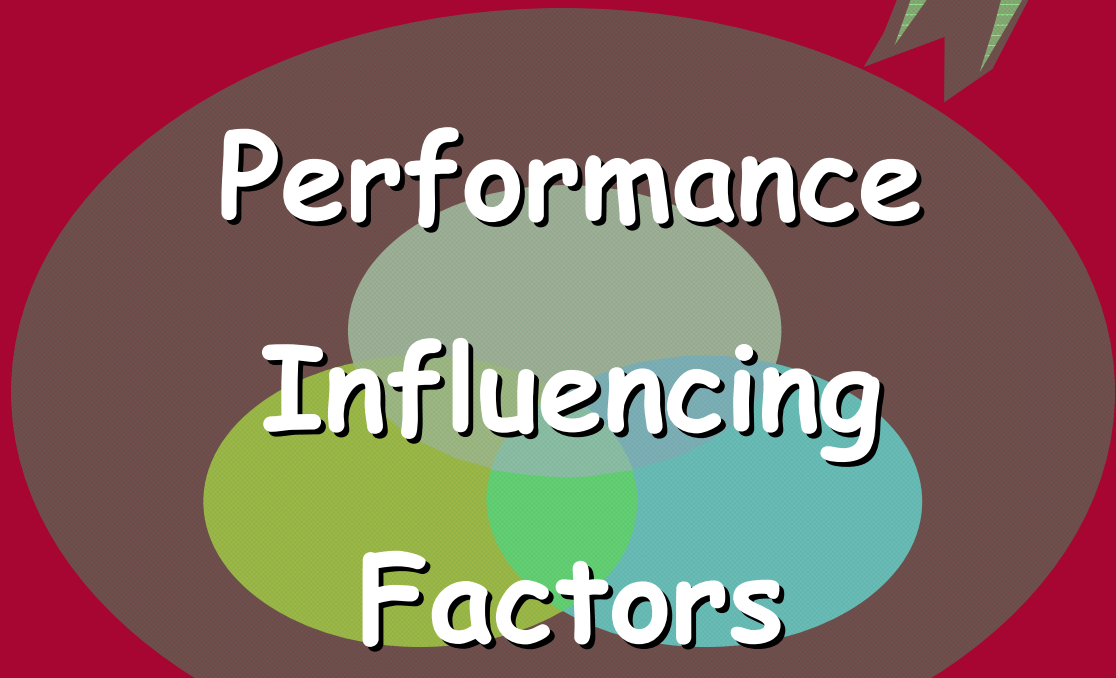
Personal injury
frequency

Probability of
disaster

Direct effects on
health

Human
reliability

Dysfunctional
culture Unclear procedures
Poor interface design
Interaction between people, their
organisation, and physical and
psychological factors in their
work

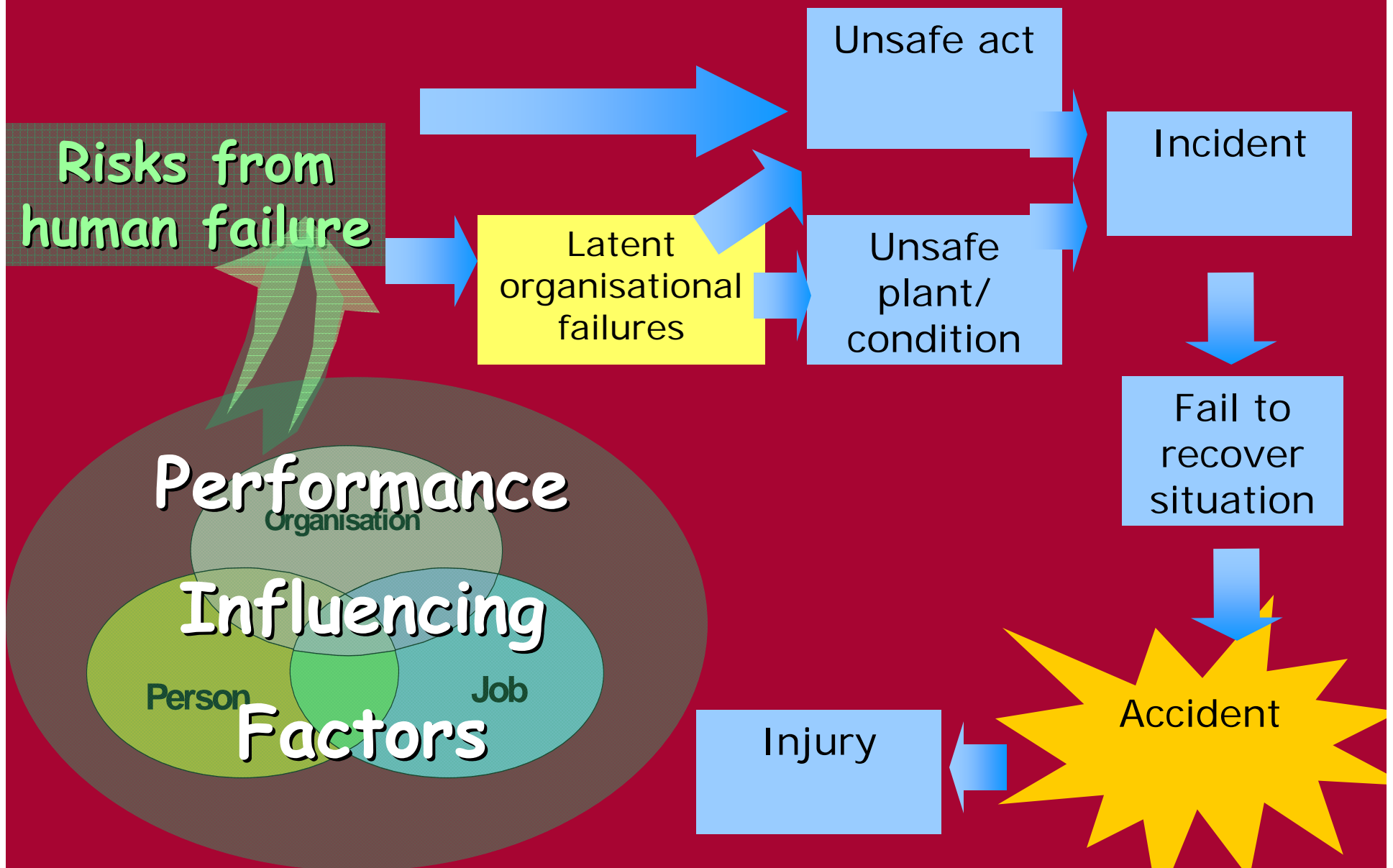


Human reliability

Personal injury frequency

Probability of disaster

Accident Model



Key messages

- Human failures...
 - *Not* random
 - Different patterns/types
 - Different influencing factors
 - Different means of prevention/reduction
- *You and your managers and supervisors need to understand them*

Key messages

- Many human failures can be predicted.
- Most active human failures are predisposed by factors remote from the individual (blaming the individual gets us nowhere).
- You can take action to prevent/reduce human failures.



Human Failure Types

A simplified view

Errors

Violations

Errors

Human error is far too vague a term to be useful. We should ask “What sort of error?” because different sorts of error require different actions if we are going to prevent the errors happening again.

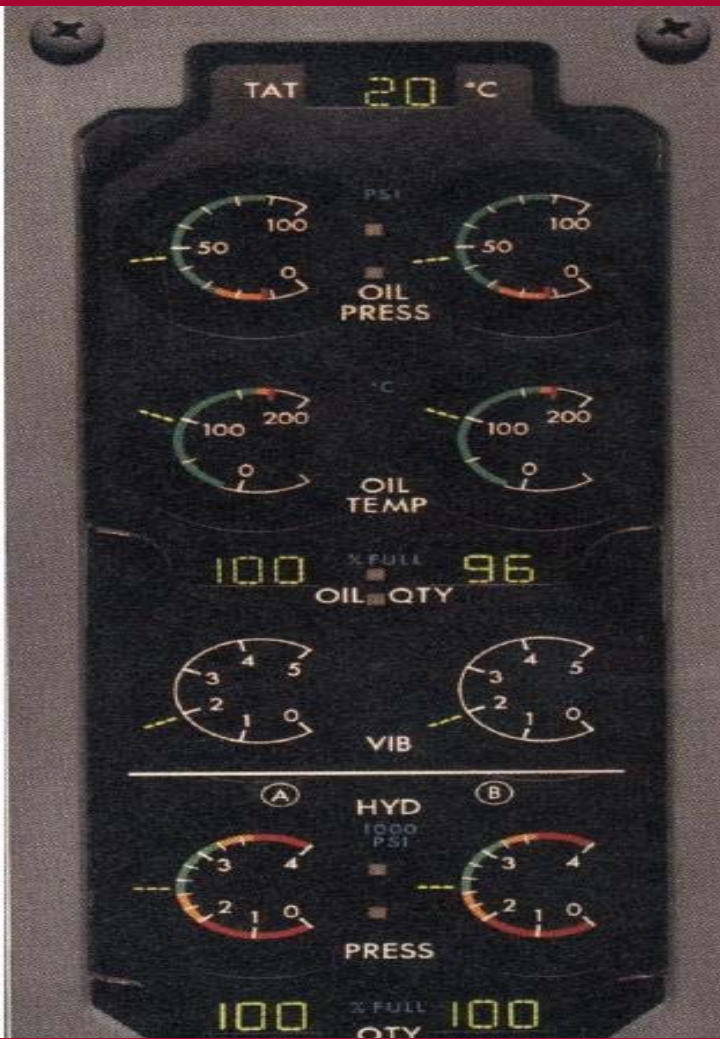
Trevor Kletz. An Engineer’s View of Human Error.

Kegworth



FIG 1: SHOWING CRASH-SITE OF G-OBME





‘Human error’

Who was to blame for Kegworth?

Two equally true, and equally (un)helpful statements about the Kegworth air crash...

- *“The disaster was due to pilot error “(public enquiry).*
- *“The disaster was due to gravity” (me).*

Neither conclusion would help to prevent a repeat.

Fact or myth?



- “Human errors are usually caused by carelessness on the part of the individual”

Fact or myth?

- “Errors are random and cannot be predicted”

Fact or myth?



- “By definition all errors are bad”

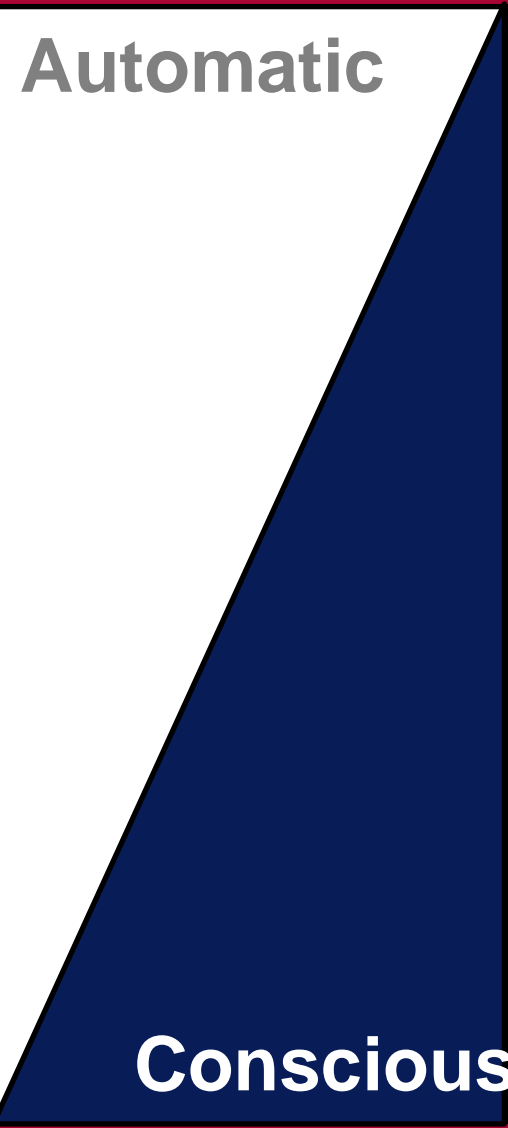
Skill-Based
Automated routines with little conscious attention



Rule-Based
IF symptom X THEN cause is Y
IF the cause is Y THEN do Z



Knowledge-Based
No routines or rules available for handling situation



Conscious and automatic behaviour

Skill-Based

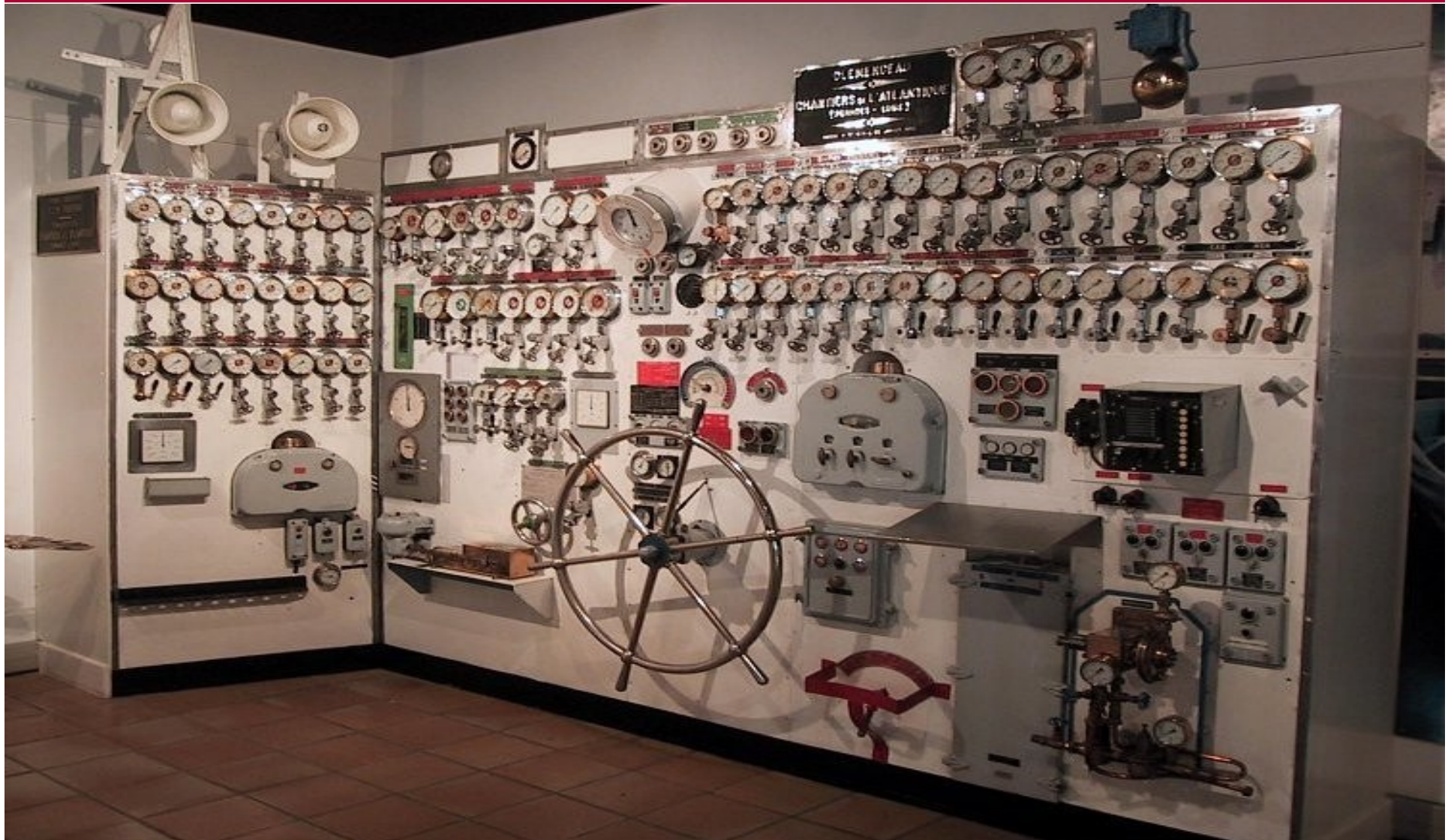
Automated routines with
little conscious attention



Errors

"action not as planned"

- Simple slips
- Lapses of memory



Skill-Based

Automated routines with
little conscious attention



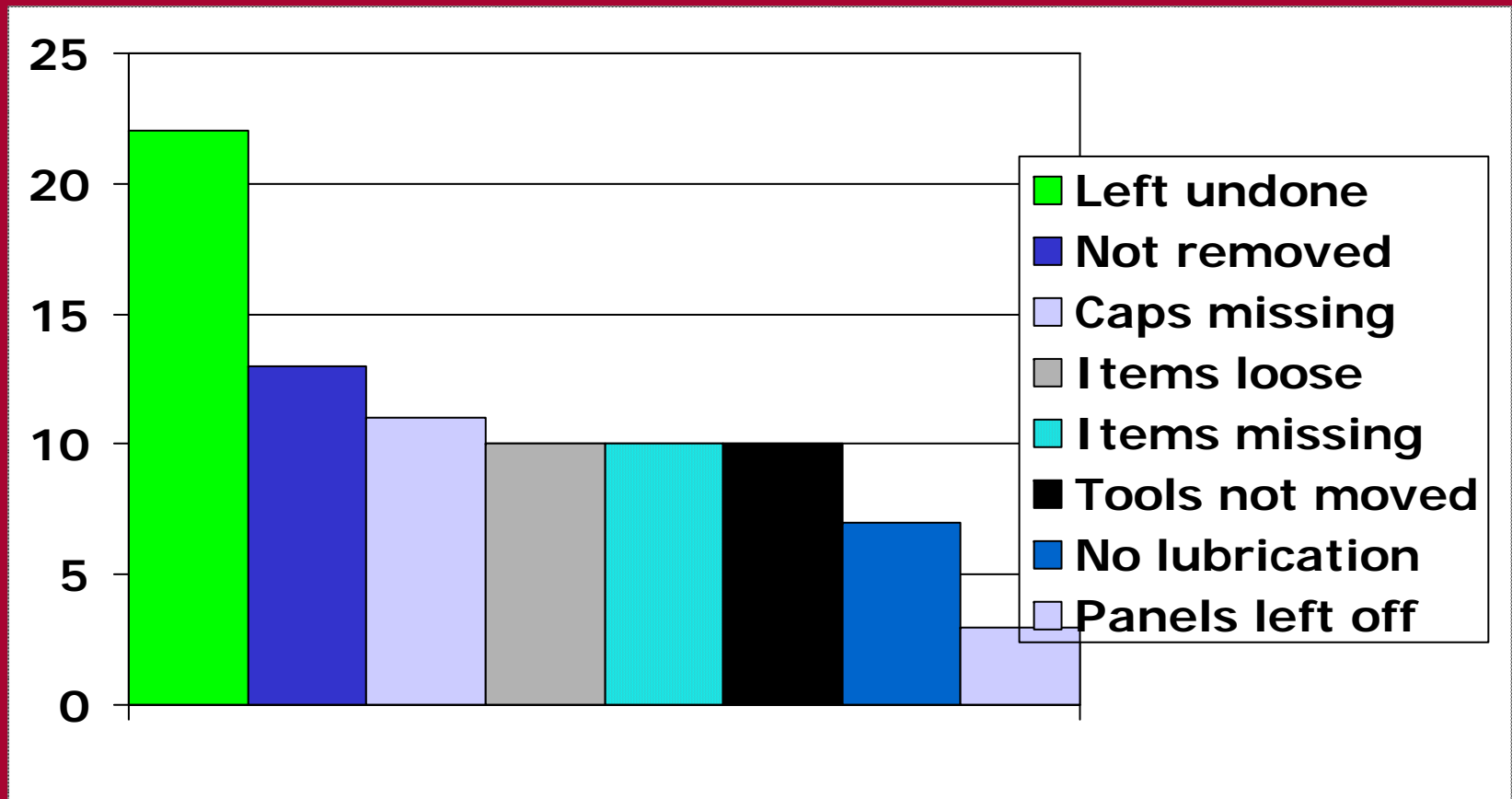
Errors

"action not as planned"

- Simple slips
- Lapses of memory



Example - omissions in aircraft maintenance





Skill-Based

Automated routines with
little conscious attention



Errors

Slips and lapses on
“autopilot”

- e.g. missing a step in a procedure
- Operating the wrong valve

Solutions, e.g;

Checking critical work
(isolation permits)

Error-avoiding & error-
tolerant design.

Not prevented by more training!

Knowledge-based mistakes

- Working from first principles
- wrong assumptions or choices



Knowledge-Based

No routines or rules available for handling situation

Solutions, e.g;

Competence assurance

Provide procedures & good communications



You are chief aircraft washer at the company hanger and you.....

- (1) Hook up the water hose to the soap suds machine.
- (2) Turn the machine "on".
- (3) Receive an important call and have to leave work to go home.
- (4) As you depart for home, you yell to Don, your assistant, "Don, turn it off."
- (5) Assistant Don thinks he hears, "**Don't turn it off**". He shrugs, and leaves the area right after you.

Result.....



Technology may change but.....



.....humans still make the same mistakes

Rule-based mistakes

- E.g. assuming everything 'normal' – alarm is at fault



Rule-Based

IF symptom X THEN cause is Y
IF the cause is Y THEN do Z

Solutions, e.g;

Procedures for abnormal but foreseeable situations

Enable good situational awareness





Human Failure Types

Errors

Violations

Violations



Violations

- Probably more significant than errors when it comes to accidents
- Can be routine – “everybody else ignores the rule, so do I”
 - 30mph limit.
 - closing bow-doors on Herald of Free Enterprise (Zeebrugge disaster).
 - Are *normal* behaviour.
 - Have to be *anticipated and managed*.





Violations

- Can be situational – perceived benefits of ignoring outweigh perceived penalties.
 - Time/deadline pressure.
 - Staff shortages.
 - Discomfort/inconvenience.
 - e.g., skimping permit to work procedure.



Violations

- Can be exceptional, only happen when things go wrong.
 - To solve the problem employee feels obliged to break the rule/take a risk.

Performance Influencing Factors – Violations – a few examples

Job factors,

- Procedure a pain or doesn't fit situation

Person factors:

- Stress
- Risk perception

Organisational factors:

- Likelihood of getting caught
- Lack of compliance monitoring/enforcement
- Blind eye turned/walked by
- Organisational culture...

Solutions

- Design of rules and procedures
 - Relevant, practical, useable
 - Owned & valued by users (involve the users in writing them!)
- Monitoring/measuring compliance
 - Audit
 - Behaviour observation
- Dealing effectively with violations disclosed
 - Addressing root causes
 - ‘Fair’ or ‘just’ blame

Solutions



- Tackle the culture

Is there really zero tolerance of rule breaking?

Is there committed management leadership in H&S that is “visible” and “felt”?

Human Factors - Do we learn from incident investigations?

Often focus on error or rule-breaking
& put down to:

- “Insufficient care”
- “Competence”
- “Supervision”

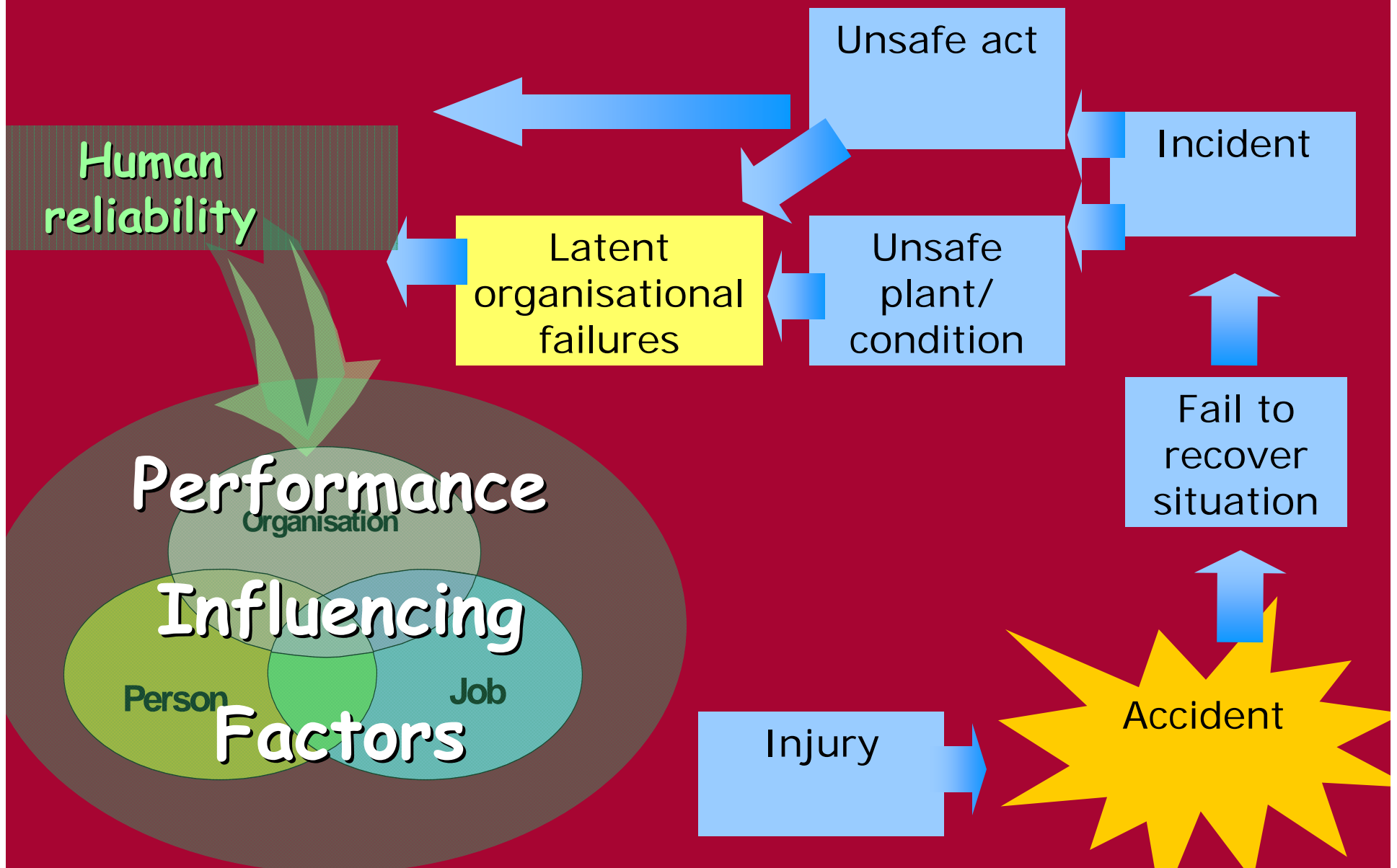
i.e. the easy explanations!

Board of Enquiry – Challenger Space Shuttle Disaster.....



“Many accident investigations make the same mistake in defining causes. They identify the widget that broke or malfunctioned, then locate the person most closely connected with the technical failure: the engineer who miscalculated an analysis, the operator who missed signals or pulled the wrong switches, the supervisor who failed to listen, or the manager who made bad decisions. When causal chains are limited to technical flaws and individual failures, the ensuing responses aimed at preventing a similar event in the future are equally limited: they aim to fix the technical problem and replace or retrain the individual responsible. Such corrections lead to the misguided and potentially disastrous belief that the underlying problem has been solved”.

Accident Investigation Model





What to Remember

What to remember

- *All* humans are prone to failure.
- Often they are *predisposed* to fail.
- Blaming the individual does nothing to solve the problem.
- *Organisational* factors are critical.
- If you understand *why* errors and violations happen you can prevent/reduce them.

How?



A final quote



“Rather than being the main instigators of an accident, operators tend to be the inheritors of system defects created by poor design, incorrect installation, faulty maintenance and bad management decisions. Their part is usually that of adding the final garnish to a lethal brew whose ingredients have already been long in the cooking”

James Reason, Human Error, 1990

