

# The Elephant in the Room: Major Accidents, the Business Case Fallacy, and What to do About It

Graham D. Creedy, P. Eng, FCIC, FEIC  
[gcreedy@rogers.com](mailto:gcreedy@rogers.com)

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# The Elephant in the Room: Major Accidents, the Business Case Fallacy, and What to do About It

## Abstract

- The business case for process safety makes a lot of sense, but has a serious logical fallacy that can lead to trouble if not recognized and even threaten the sustainability of the organization. That is the assumption that what is true of the whole is also true of its parts – in other words, if process safety is good for an organization then that will also hold true for managers and other individuals involved in its implementation.
- Using examples from the process industries and elsewhere, this presentation shows how the opposite business case – one for **taking risks** – can make sense for individuals and thus influence motives and decisions at all levels of the societal control system when managing risk.
- This is well known in the field of office politics, but seems almost heretical in process safety. Its significance appears to be overlooked – or even intentionally ignored – in risk assessment, perhaps because of the lack of data and a view by risk assessment practitioners that “we’ve always done it this way.”
- Nevertheless, some useful lessons can be learned, to guide in managing organizational behaviour and the control measures to detect and correct deviance before hazards develop into major accidents. The presentation will review these lessons, and the main principles for application.

# The Elephant in the Room: Major Accidents, the Business Case Fallacy, and What to do About It

- Overview
  - Issues with the *Business Case for Process Safety*
  - Examples from various fields
  - How decisions get made, and organizational aspects
  - Defences

# Issues with the *Business Case for Process Safety*

- The CCPS *Business Case for Process Safety* looks good: there's a list of benefits, testimonials from executives of leading companies, etc., etc., ending with a call to act and where to get more info.



***The Business Case for Process Safety***

**New Industry Study Shows Four Benefits:**

- **Corporate Responsibility**
- **Business Flexibility**
- **Risk Reduction**
- **Sustained Value**

**CCPS**  
CENTER FOR  
CHEMICAL PROCESS SAFETY  
An AIChE Industry  
Technology Alliance

# Issues with the *Business Case for Process Safety*

- However,
  - There's a lot about the benefits, but not much on the risks (of adopting)
  - If the relative balance between benefits and risks is so high, why isn't it automatically adopted?
  - Because: there are significant risks, e.g. the extra work required and thus the reduction in economic efficiency, and the difficulty of “keeping more balls in the air at once”

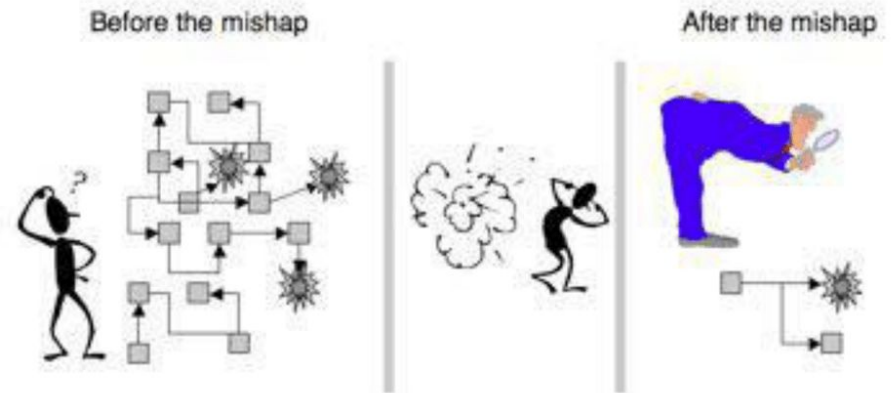
# Issues with the *Business Case for Process Safety*

- There are two large assumptions here:
  - That the benefits outweigh the risks for the primary organization and also related orgs at the points of control in society
  - That those benefits also hold true for the individuals who make the decisions at all parts of the process
- The first may well be true, but to know would need a full cost-benefit analysis, including opportunity costs, of at least a representative sample of the process industries. However, for the purposes of this presentation I'll assume that it is justified, on moral if not economic grounds
- The second is a **known logical fallacy**: assuming that what is true of the whole is also true of its parts
- This is rarely the case, as shown by incident investigations where different motives and conflicting priorities led to (often small) decisions that caused a slow migration of the whole control system to a state of high risk

# Examples of System Migration to a State of High Risk

- Examples (where individual decisions lead to outcomes inconsistent with the organization's design intent) can be found in every field of human endeavour. The list below is just a sample:
  - Finance: Lehman, Greensill/Credit Suisse, Archegos, Evergrande
  - Aviation: 737 Max 8
  - Building design/construction: Grenfell Towers/Milan
  - Surface Transport: Rail freight, auto design/human factors
  - Health: Covid-19 and narratives (GPHIN, lab, gain of function, political responses, etc.), Oxycontin, Vioxx, CRISPR(?)
  - Foreign Affairs: Iraq, Afghanistan
  - Others: Able Archer, Phoenix pay system, Sears
  
  - “Classical” PSM: the case of BP  
Texas City/Macondo/North Sea Feb 2020

# Caveat!



Sidney Dekker, 2009

- With any past case example, we need to be careful of hindsight bias
- These examples are cited not to show what should have been done (which in hindsight is obvious) but to give a sense of some of the real-world influences on how humans (and thus organizations) make decisions when balancing opportunity and risk

Coulda, Shoulda, Woulda



# Examples: Finance

- Finance provides the most examples of how individual motives and decisions can damage the (claimed) intent of organizations concerned
- Lehman, Greensill/Credit Suisse, Archegos, Evergrande and many others illustrate how the appeal of leverage, derivatives, etc. in magnifying profit when things are going up lead to increasingly optimistic models and yet more leverage. Those involved think they can rake off the surplus profit while leaving the rest – and the risk – with others. When things go down, they are unable to meet the margin calls for more funding, and crash.

The New York Times

## *The Swift Collapse of a Company Built on Debt*

Greensill Capital promised a win-win for buyers and sellers, until it all fell apart, igniting concerns about opaque accounting practices.



# Examples: Commercial Aviation

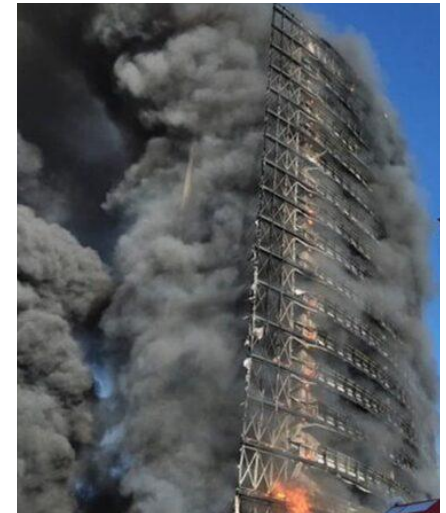
- Commercial aviation provides useful examples for the process industries because they are similar, in that automation takes care of much of the work yet skilled humans are needed for situations the automation can't handle. Accidents are investigated in depth, examining technical, human and organizational factors with detailed public reporting of findings
- Examples such as the Boeing 737 MAX and the recent near-miss at CDG reveal how decisions seemed rational to the decision makers at the time, yet the combination led (or almost led) to a classic Reason “Swiss Cheese” failure. Note that many of these decisions were not primarily technical in nature.



Ethiopian Airlines Flight 302 crash

# Examples: Building Construction

- Grenfell Tower. London (top)
  - 2017 Flammable cladding fire killed 72 and injured another 70
- Milan luxury apartment (bottom)
  - 2021 Similar cladding fire enveloped entire building in three minutes! Fortunately everyone escaped
- A growing global threat
  - Fires fueled by *combustible exterior wall assemblies*—which are often added to buildings to improve *aesthetics and energy efficiency*—used to be uncommon, but the number of incidents has risen drastically in the past 30 years, according to NFPA.
  - Research shows that the frequency of facade fires in large buildings has increased by seven times in the last three decades,



# Examples: Foreign Affairs

- Iraq, Afghanistan

- The initial missions made sense to US strategists
- As they developed, other agendas came to influence and then dominate planning
- Decisions driven by these agendas led to situations that many commentators realized were becoming unwinnable, but could not be stopped – in large part due to vested political and financial interests
- Even after the loss of Iraq, strategists doubled down, including studying the “will to fight” – yet planners were still caught by surprise by the speed of the Afghan govt collapse.
- Enormous sums were wasted on these campaigns from an overall viewpoint – yet they made sense to those whose careers (and bank accounts) benefitted from many of the projects involved

# Process Industry Example: BP

- Considered a leader in safety until 2005
- March 2005 Texas City explosion
- Jan 2007 Baker report
- May 2007 CEO John Browne resigns, replaced by Tony Hayward who vows to make safety his top priority
- Nov 2007 Hayward cuts BP's mgmt. layers from 11 to 7 and standardizes safety across whole organization
- Apr 2010 Deepwater Horizon explosion (risk recognized in 2003 risk assessment, but considered acceptable)
- Oct 2010 Hayward resigns, replaced by Bob Dudley (stepped down Feb 2020, replaced by Bernard Looney)
- Feb 2020 BP's Etap oil rig (one of largest in North Sea) evacuated due to "small fire" – BP said it was "regrettable" there was no water to tackle it. The pump had been unavailable since June 2019 due to "maintenance issues"

*This is not to imply that BP is necessarily worse than others, but to show how culture pervades not only the company but also the whole system of societal control, and that culture can be extremely difficult to change*



Lord Browne



Tony Hayward

Notice 310560688 served against BP Exploration Operating Company Limited on 09/04/2020	
Notice Type	Improvement Notice
Description	You have failed to ensure that arrangements described in your current ETAP safety case are followed in that, on the 18/02/20 when a fire occurred in the Aux Gen B enclosure there was no firewater available to fight the fire that was occurring, therefore you had to rely on people in the form of an Emergency Response Team to extinguish it thereby placing them in harms way. Your safety case states the provision of Active Fire Protection Systems for all hydrocarbon processing and other high-risk areas and with the requirement for 98% availability of firewater provision at the two Auxiliary Generators; however from June 2019 until present one Auxiliary generator (Gen A) with a firewater pump was not available due to maintenance issues.
Compliance Date	15/10/2020
Revised Compliance Date	
Result	Complied with
Breaches involved in this Notice	

HSE notice issued following Feb 2020 ETAP fire

# Process Industry Example: BP

- To paraphrase Lady Bracknell\*:

*To lose one CEO may be regarded as a misfortune. To lose two looks like carelessness!*

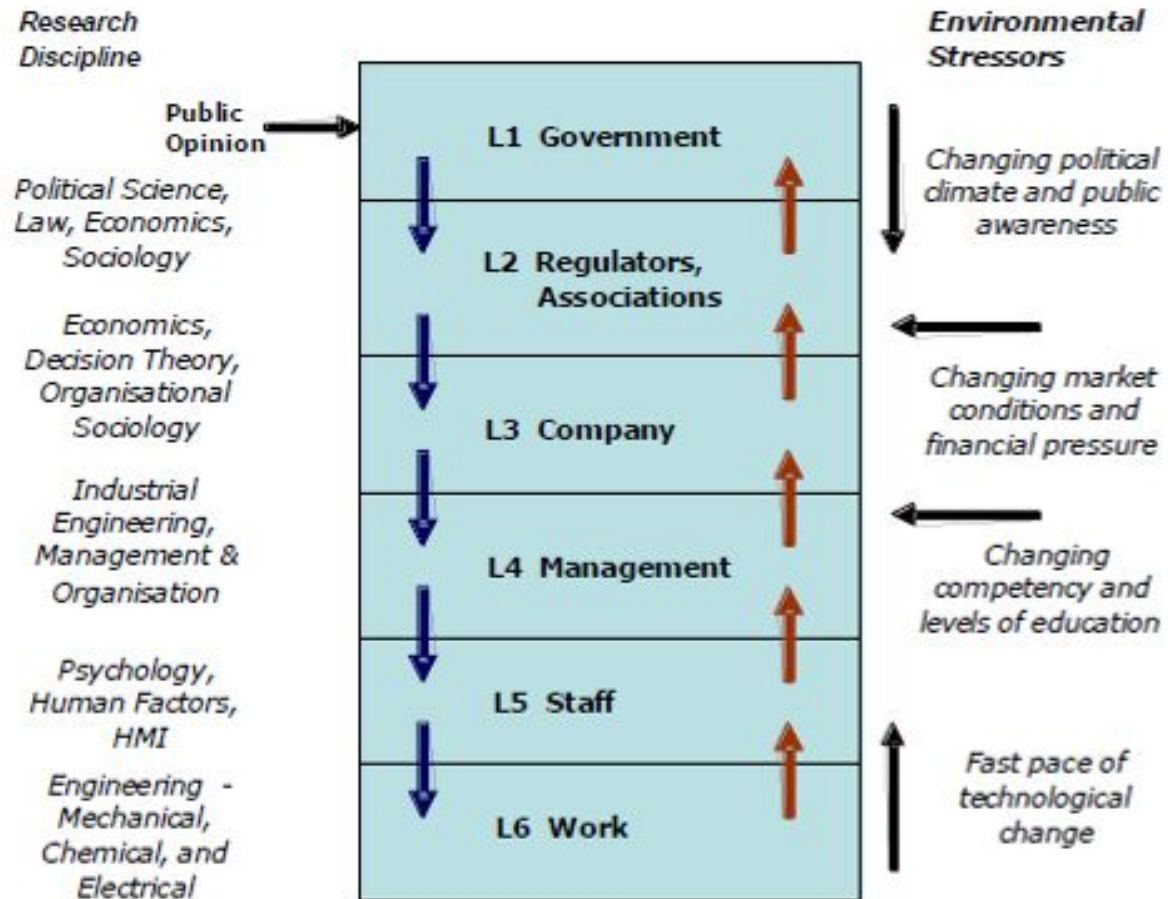
\* a character from Oscar Wilde's play *The Importance of Being Earnest*

Comment on IChemE/OGUK Dec 2020 webinar on Deepwater Horizon 10 years on



# It's not just at the organization concerned

- In all these examples, the outcome was the result of a host of decisions by people at various levels and in many organizations



Hierarchical Model of the Sociotechnical System involved in Risk Management (Rasmussen, 1997)

# How decisions get made

- *“In theory, there’s no difference between theory and practice. In practice, there is.”*
- All decisions are made by individuals – even a single decision by a group follows from multiple decisions, often minor or even trivial, by group members and others
- These decisions are influenced by the subjective perception of relative benefits and risks to the individual decision maker, and are affected by both conscious and subconscious motives



# How decisions get made

- **Managing risk is never the top priority** for any organization (or individual employee).
  - Odds: likelihood of **benefits** and risks in my term of office, and of ability to deflect blame/credit as situation develops
  - What's good for the org, for my dept, my boss, **me** (and my family)
  - **Many factors encourage taking risks**
  - Kahnemann & Tversky: Thinking fast & slow
  - Pressure to act, and to be seen to be acting – but on what?
  - Org culture: How we do things around here, when no-one is watching
  - Listen to what I mean, not what I say
  - Groupthink and “externalities”:
  - Influencers, “office politics”
  - Plausible deniability, transfer of blame, opportunism
  - Bounded ethicality
  - **Migration of the whole system to a state of high risk**, (~ Brownian motion)

# How decisions get made

- Bounded ethicality

- “as soon as there is any ambiguity about a judgment...we reason in a way that is selective enough to serve our interests and yet plausible enough to convince others (and ourselves) that we are not intentionally distorting the facts.” <sup>1</sup>
- Individuals’ choices are governed by how others behave.
- Under pressure, ... people often do not efficiently analyse information that could otherwise keep them on the straight and narrow. The problem is exacerbated by confirmation bias, a human tendency to seek out facts that back up their pre-existing preferences. <sup>2</sup>

The Economist, September 19, 2020, quoting:

1. Oliver Sibony, HEC Business School, Paris

2. “Reducing bounded ethicality: How to help individuals notice and avoid unethical behaviour,” by Ting Zhang, Pinar Fletcher, Francesca Gino and Max Bazerman

# How decisions get made

- There's an awareness of these situations in everyday life, but engineers tend to focus on engineering aspects of failure while ignoring organizational and sociological aspects. People are assumed to act like the rational beings in economic models, considering only the narrow frame of one issue when making decisions. Everything else becomes an “externality.”
- Much knowledge exists (especially from finance and commercial aviation) but there is strong resistance to learning from it.
  - Not in our field/country/organization (we're different – we know what we're doing)
  - This can't be relevant for us (we're the experts in this – if it were relevant we'd know about it and be using it. The fact that we don't/aren't is evidence that it's not relevant) *circular reasoning*
  - We've always done risk assessment this way – it's an established, tried and true methodology
  - We don't have data on these variables
  - etc., etc.

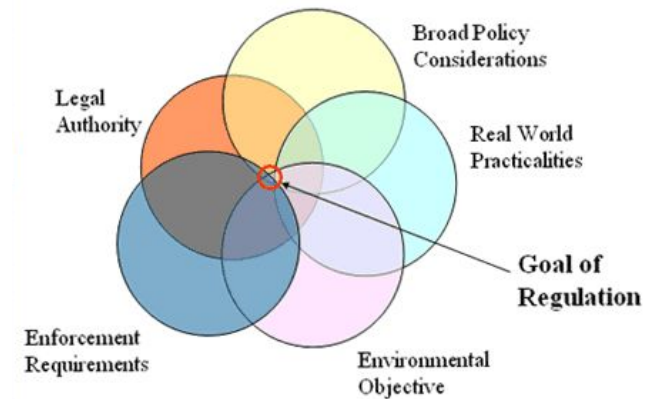
# How decisions get made

- Trevor Kletz: Organizations have a memory span of about ten years
- After Bhopal, Seveso and Pasadena there was a lot of progress, with engagement of senior management. As years passed, risk management processes became more ritualized, with delegation “out of sight” and “fill in the boxes” exercises by junior staff who inherited software and procedures without the same depth of understanding as during the development stage
- “Rules” get bent to meet the pass/fail criteria during project approval, and are then subject to more pressure during the operating phase to loosen controls and improve efficiency (cut costs)
- Reason, Vaughan, Hollnagel, Leveson, Dekker, Hopkins and others point out that this leads to increasing vulnerability, and that audits fail to draw attention to the drift
- The longer the period since a major incident affecting **that group of people**, the more self-reinforcing the drift becomes
- These effects are magnified where PSM reports to line operations or site managers without a reporting line to the executive level, and where bonuses are strongly linked to financial performance (Hopkins)
- Financial leverage (debt) can also drive urgent and excessive cost cutting

# and from the regulatory perspective

## Development of Regulations

Competing considerations



- Irv Rosenthal (member of the original CSB): Jurisdictions do not learn from other jurisdictions (they must have their own major accidents)
- CALOSH\* and the ILO *Code of Practice for the Prevention of Major Industrial Accidents* example here in Canada
- Scope and roles: PSM vs COMAH
- Regulatory oversight of major hazards can become a backwater, with little incentive to improve
- Even major incidents can produce a “CYA” mentality with a façade of action but little substantive change
- Absence of regulatory interest helps topic to drift down the priority list in regulated industries, consulting orgs, academia, etc.
- Even well-motivated managers can then find it difficult to justify assigning resources where regulators are not interested (Why are we doing this if we don't have to? It can't be that important, or the government would have done something about it)

\* Canadian Administrators of Legislation on Occupational Health & Safety

# Key defences against organizational error and normalization of deviance

Senior management must lead, and be seen to be leading, in these roles, so that the thinking becomes established in the culture

- **Maintain a sense of vulnerability**

- Watch for lessons from incidents and near-misses, **not only from PSM or your own org/sector but also elsewhere**, and how they could apply to your situation.

- **Recognize economic and other constraints, and use triage:**

- We must do these things, no matter what;
- We're going to drop these, at least until conditions improve;
- We'll do these if we can fit them in, but they're secondary to the "musts" (allowing a little flexibility in negotiating the "drop" list can help with team acceptance).

Recognize when and where resources are clearly not enough

- **Trust, but verify**

- Management by wandering around (keeping a "finger on the pulse" of what is really going on) – bypass the courtiers, above or below you; to convey with tact the message you want to get through; find what's actually happening and not what people think you want to hear.  
**Senior management should be visibly engaged in oversight of PSM!**

- **Build resilience**

- Don't look for optimal strategies but for robust ones – strategies which perform well when compared with the alternatives across a wide range of plausible futures.

# Questions?