

# ProSafe 2016

## Black Swan Survival

### Avoidance of Unpredicted Catastrophic Events

A series of five orange chevrons pointing to the left, arranged in a row.

Lachlan Dreher  
Director and Principal Consultant

A series of three white chevrons pointing to the left, arranged in a row.

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# Overview

1. Process Safety Objectives
2. What is a Black Swan?
3. Modern Black Swans
4. Process Safety Black Swans
5. Managing Black Swans

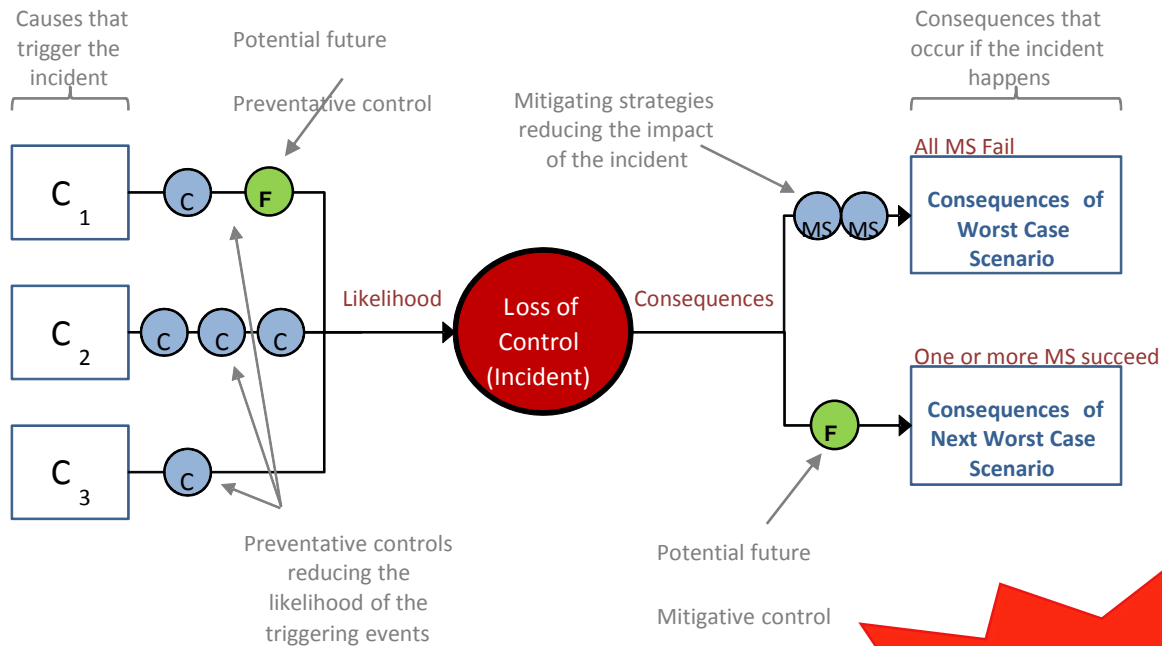
# Process Safety Objective

- The objective of a modern safety management approach is to provide for safe operation, in order to:
  - Reduce the likelihood of a **major event(s)** occurring
  - Reduce the consequences to health and safety and damage to property and the environment etc. of a major event
  - *Improve organisational understanding of risk issues and to ongoing improvement of performance*

# Safety Management

- Utilise a *management system*
- Apply the management system to the following:
  - ✓ Systematic identification of hazards
  - ✓ Selection of preventive and mitigation control measures
  - ✓ Implementation of the control measures
- Monitors and measure performance
- Leads to continual improvement

# Bowtie Analysis



**“I can only manage that which I know”**

**But what about those things I do *not* know?**

# Juvenal

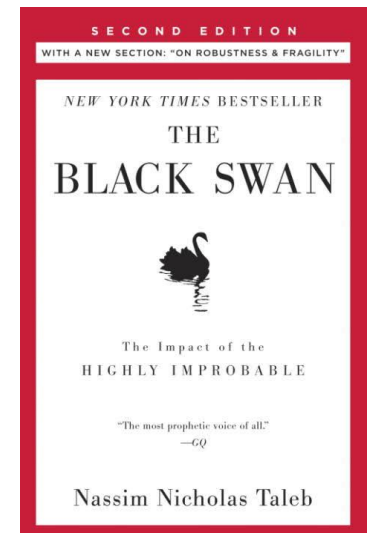
- Roman poet
- Author of the *Satires*
- *Satire 6 contains the phrase:*
  - *rara avis in terris nigroque simillima cycno*
- In English....
  - *a rare bird in the world like a black swan*



# Nassim Nicholas Taleb

- Describes himself on his Twitter page as:
  - *Flaneur, with focus on probability (philosophy), probability (mathematics), probability (logic), probability (real life), deadlifts, Lebanese wine, dead languages*
- Author of several books, including

***The Black Swan:  
The Impact of the Highly Improbable  
(2007)***



## Nassim Nicholas Taleb cont.

Characteristics of a “Black Swan” event:

- *It is an Outlier*
- *It has extreme impact*
- *Retrospective (though not prospective) predictability*



# Other Coloured Swans

- White Swan
  - Things we know about
  - Black Swan becomes “white” after its occurrence
- Grey Swan
  - Things that we reasonably should have known
  - Things that we did know but have forgotten
  - White Swans may turn “grey”



# Knowns and Unknowns

- Known Knowns
  - Things we know about, which we can plan for
  - White Swans
- Known Unknowns
  - Things we can predict, even if they are yet to occur
- Unknown Knowns
  - Past events that have been forgotten
  - Grey Swans
- Unknown Unknowns
  - Things that we don't predict or dismiss as totally non-credible
  - Black Swans

# Black Swan Events

- What is an “Outlier”?



# Black Swan Events

Some events referred to as Black Swans include:

- 1987: Stock market crash
- 1997: Asian financial crisis
- 2001: Dot-com bubble bust
- 2001: 9/11 Terrorist attacks
- 2008: Financial crash of the U.S. housing market
- 2008: Hyper-inflation in Zimbabwe
- Invention of the internet



# Black Swans in Process Safety



# Buncefield

- Massive VCE from a vapour cloud generated from a petrol release in the open air
- General wisdom of the time was that this would not occur.
- Previous similar incidents had occurred
- Lessons of these were not learnt

# Fukushima

- Nuclear meltdowns and release of radioactive material
- 13-15 metre-high tsunami overwhelmed the plant's seawall (5.7 m)
- History of tsunamis  $>10$  m occurring  $\sim 1$  in 12 years



# Other Process Safety Events

Key underlying causes:

- Failure to identify common hazards
- Failure of independent protection layers
- Failure of integrity management



# Black Swans in Process Safety?

- Do we really have Black Swans in Process Safety?
- Does it matter how we classify these things?



# How to Deal With Black Swans?

## 1. Hazard Identification

- Have a sense of vulnerability
- Draw from broad experience
- Potential common-mode failures

## 2. Sound selection of the “risk design” scenarios

- What is “credible”?
- Challenge assumptions
- Understand the implications
- What risk is being accepted?

# How to Deal With Black Swans? cont.

## 3. Management of controls

- The heart of good risk management

## 4. Crisis Management / Emergency Response

- Known outcomes
- Suitable contingencies in place
- Corporate response
- Third party aid

## In Summary...

*Imperium moderatio*

*Control the controllable*



Thank you



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