Bob Manson
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What Can Be AT Risk

- Injuries (short and long term, them & us)
- Deaths (Support for survivors, them & us)
- Cost of evacuation (shelter & needs)
- Cost of sheltering stranded travelers
- Loss of cultural/historic artifacts
- Loss of past
- Loss of future
- Resource impacts

Things That People Value

- Destruction/loss of asset
- Lost business - supplies, workforce, access to markets, communications (short & long)
- Loss of infrastructure
- Cost of recovery - cleanup, removal, assessments, restoration, communications
- Liability - legal costs, settlements
- Cost of mitigation
- Cost overrun
- Increased insurance costs
- Personal reputation
- Professional reputation
- Organization's reputation
- Professional/corporate license, accreditation
- Loss of equipment, tools
- Loss of intellectual property/trade secrets
- Time loss to replace
- Impacts of reliance
- health
- Mental Health
- Welfare
- Morale
- Social factors
  - -Blame
  - -Cohesion
  - -Psychological impact
  - -Stress, uncertainty
  - -Loss of trust

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Questions To Think About

- Can you measure risk?
- Can you manage risk?
- Can you have real or actual risk?

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Paradigms

Risk Analysis

Risk Perception

Risk Interpretation

-Kadvany (1997) Varieties of risk representations

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When Can 'It' Happen?

- Deterministic
- Probabilistic
  - Opportunities
  - Frequency
  - Scientifically Determined
- Unforeseen

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What is Risk?

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Perceptions of Risk Perception

Die in the next year?	18.7%	0.1%
Die before turning 20?	20.3%	0.5%

-de Bruin, Parker, & Fischhoff, (2007). Can adolescents predict significant life events?

http://1.bp.blogspot.com/-HiYiNDBK-os/T9lWF5lF7LI/AAAAAAAAACU/_HF90gARW54/s320/Skate.jpg

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CBS NEWS / *September 8, 2017, 8:20 AM*

"500-year" rain events are happening more often than you think

Monster Hurricane Irma comes just two weeks
rainfall to parts of Houston. But Harvey and oth
happening far more often than their name impl

Just two years ago Charleston had flooding that
thousand-year event. Now with Irma approachi
massive flooding event, it begs the question of v
whether these really are once-in-a-lifetime even
correspondent Kris Van Cleave.

The flooding Hurricane Harvey left behind in H
devastating. Entire neighborhoods became subr
exceeded "500-year" levels, but as it turns out t
so rare.

WHIOTV 7 AM NEWS 1290 WHIO

Louisiana flooding: What is a 500-year flood and why is it happening so much?

Published: Wednesday, August 17, 2016 @ 8:23 AM
Updated: Wednesday, August 17, 2016 @ 8:27 AM
By: Debbie Lord - Cox Media Group National Content Desk

As of Wednesday morning, 11 people have died and more than 40,000 homes have been damaged in ongoing flooding in southeastern Louisiana.

Up to two-and-a-half feet of rain that swelled rivers and swamped the area in and around Baton Rouge, La., has led the National Oceanic and Atmospheric Administration to classify the flooding as a once-in-every-500-years event.

Expressions of Risk

- Individual Risk
- Deaths Per Unit Measure of Activity
- Loss of Life Expectancy
- Frequency Against Consequence

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Risk Definition

Adverse Consequences Under Uncertainty.

-Kadvany (1997) Varieties of risk representations

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Benchmark

1 in [redacted] Year

1 in 6,900 Per Year

1 in ~80

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Ways of Quantifying

- Expert Opinion/Expert Audit
- Simple Stratification Method
- Weighted Scores
- Traditional Financial Analysis
- Calculus of Preferences
- Probabilistic Models

-Hubbard (2009). The failure of risk management

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Formulas for Calculating Risk

Risk = Vulnerability × Hazard

Hazard × Vulnerability [× Exposure] = Risk ➔ Impact

(Hazard × Vulnerability × Exposure) / Resilience = Risk ➔ Impact

Risk = [Hazard × Vulnerability] - Capability ⇦

Risk = Hazard × Vulnerability / Capacity ⇦

Hazard × (Vulnerability / Resilience) [× Exposure] = Risk ➔ Impact

Risk = Likelihood (Probability) × Consequences ⇦

[Probability (Freq.) + Magnitude (Extent)] / 2 = Hazard Risk Value

Risk = (Freq. + Magnitude)/2 × (Exposure + Fragility + Resilience)/3

Risk = Probability Of Failure × Consequence

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Formulas for Calculating Risk

- Require Calibration
- Can Only Be Used to Compare Options Calculated With The Same Process
- Highly Subjective
- Influenced By Biases, Heuristics, Experience
- Meaningless Outside of Their Context
- Can be Misleading

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Risk Perception

What shapes it?

- Voluntary vs. Involuntary
- Edgework
- Affect Heuristic
- Representativeness Heuristic
- Availability Heuristic
- Anchoring And Adjustment Heuristic
- Group Experience
- Optimism Bias
- Risk Homeostasis

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Culture

- “The mix of shared values, attitudes and patterns of behaviour that give the organisation its particular character. It is 'the way we do things round here'” - HSE(2005)
- Frames our Reference, Perceptions, Risk Acceptance, Attitudes, Priorities, Goals

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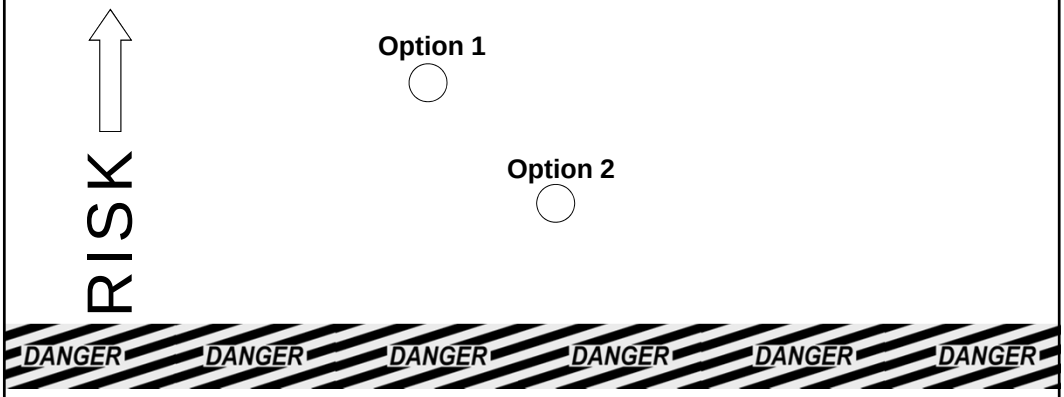
Acceptable Risk

- Risk Appetite, Risk Tolerance
- Acceptable Risk vs. Risk that is Accepted



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Acceptable Risk

Challenger
1986

Columbia
2003

Herald of Free Enterprise
1987

Deepwater Horizon
2010

Costa Concordia
2012

"...From top to bottom the body corporate was infected with the disease of sloppiness..."

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Safer? How'd They Do That?

- Systems Approach
- Checklists
- Comprehensive Training, Cross Training
- Multiple Redundancies
- Research
- Guidelines
- Organizational Learning
- ASRS
- Built Resilience

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Probability

What are the odds? How Are They Determined? Professional Gamblers Know

- Delta Flight 810
- UA Flight 232
- Vincennes Shootdown
- Barings Bank
- Exxon Valdez
- Mt. St. Helens

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Things that have never happened before happen all the time.

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Risk Matrices

Probability		Impact: Insignificant damage, minor injury (1)	Non-reportable injury, slight damage (2)	Reportable injury, limited damage (3)	Major injury, damage, single fatality (4)	Muli-fatalities, catastrophic loss (5)
Almost certain	5	**5**	**10**	**15**	**20**	**25**
Will Probably occur	4	**4**	**8**	**12**	**16**	**20**
Possible	3	**3**	**6**	**9**	**12**	**15**
Remote possibility	2	**2**	**4**	**6**	**8**	**10**
Extremely unlikely	1	**1**	**2**	**3**	**4**	**5**

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"...they can be 'worse than useless,' leading to worse-than-random decisions."
-Cox (2008). What's wrong with risk matrices?

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Rating Probability

Certain	>99%	Near Certainty	90%	Very High	>80%	Almost Certain	>95%	Almost Certain	1 in 10
Likely	50-99%	Highly Likely	70%	High	10%	Likely	>65%	Likely	1 in 100
Possible	5-49%	Likely	50%	Medium	>1%	Possible	>35%	Possible	1 in 1,000
Unlikely	2-5%	Unlikely	30%	Low	>0.1%	Unlikely	<35%	Unlikely	1 in 10,000
Extremely Rare	<1%	Remote	10%	Very Low	<0.01%	Rare	<5%	Rare	1 in 100,000

What Context?

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Parts of Risk

A Proposed Way of Looking at Risk

(Reese & Schmidt, 2008)

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Hazard

Types of Hazards:

- Biological
- Physical
- Chemical
- Ergonomic
- Psychological
- Environmental

- Executive Failure
  -Perrow (2007). The next catastrophe

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Hazard Controls

- Elimination
- Substitution
- Engineering controls
- Administrative Controls: Education & Training, Procedures, Scheduling, Regular Inspections, Warning Systems

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Are Warnings Enough?

http://www.funnysigns.net/files/if-you-hit-this-sign-you-will-hit-that-bridge.jpg

Exposure

- Opportunity, Occasion, Opening
- Passive (Hazard is Active)
- In Time And Space
- People, Equipment, Reputation, Liability
- Short Term, Long Term (Once or Multiple)

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Exposure Controls

- Communications
- Barriers, Boundaries
- Alternative Courses of Action (Plan B, C, D)
- Set Rules and Limits; And Follow Them
- Have Redundancies, Resources in Reserve

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Vulnerability

- Weakness, Fragility, Sensitivity, Susceptibility
- Passive (Hazard is Active)
- Determines The Magnitude of The Impact
- Lack of Capacity to Anticipate a Hazard, Cope With It, Resist It And Recover (Rottach, 2010)
- Different Vulnerabilities - Physical, Social, Economic, Technological, Biological, Community, Environmental (at risk list)

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Vulnerability Controls

- Build Resilience
- Put “Tools” In The “Toolbox”
- Consider An 'All Target' Approach
- Plan to Address Contingencies: What If...?
- Ability to Prevent, Mitigate, Respond, Adapt

Familiarization, and prolonged exposure without incident, leads to a loss of appreciation of risk.
-Dr. Kamler (1996)

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"Concentrations of hazardous materials, populations, and economic power in our critical infrastructure make us more vulnerable to natural disasters, industrial/technological disasters, and terrorist attacks."

-Perrow (2007). The next catastrophe

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Build Resilience

- Seek Out Every Opportunity for Improvement
- Learn As An Organisation From Experience
- Listen to The Weak Signals
- Think That Adverse Outcomes Are Organizational Problems
- Educate, Equip
- Identify Vulnerabilities And Exposures And Fix Them

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Parting Thoughts

- Regard Risk as a Property of Our Decisions
- Think About What Professional Gamblers Do
- Address Residual Risk, Secondary Risk
- Consider That Risk Cannot Be Quantified or Measured, Only Certain Indicators
- Methods For Assessing Risk Vary Widely
- Risk Cannot Be Objectively Assessed

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Worth Reading

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