

Managing Risk

in **EXTREME ENVIRONMENTS**

Front-line business
lessons for corporates
and financial institutions

Duncan Martin

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London and Philadelphia

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Preface: One winter's day in Kabul

On 31 March 2004, insurgents killed four US security guards in Fallujah, Iraq. A crowd gathered and mutilated the bodies, then set them alight, dragged them round the city, and finally hung them from a bridge over the Euphrates. The incident invoked comparisons with the 'Black Hawk Down' incident in Mogadishu 1993, when a mob of Somalis killed and mutilated American soldiers and dragged them around the city, live on CNN.

A US security company had contracted the security guards to protect a convoy. The company's protection strategy was to use highly visible armoured vehicles and heavily armed personnel who responded aggressively to any perceived threat. This company believed in the power of deterrence: insurgents wouldn't attack because it was too dangerous.

The client firm that had in turn contracted the security company to protect its employees had for some time been concerned that deterrence was ineffective. Worse, it was concerned that making them such visible targets for the insurgents might even increase the danger to its employees. In particular, in the light of the increasing frequency of suicide bombings, it seemed unlikely that people who were prepared to kill themselves would be deterred by danger of death.

Shortly after the incident in Fallujah, the company changed its security contractor. The new contractor used beaten-up Iraqi vehicles, not brand-new white Land Cruisers. It dressed both guards and clients in Iraqi clothing, and its employees kept their weapons concealed unless they had to be used. Concealment was the centrepiece of the strategy: if the insurgents couldn't find you, they couldn't kill you.

RISK MANAGEMENT IN EXTREME ENVIRONMENTS

Regardless of the specific pros and cons of these two strategies – and there is a real debate, with real consequences – what struck me when I heard this story on a dreary Christmas day in Kabul in 2004 was that the core issue was risk management. However, this risk management was more vivid and more accessible than the highly abstract and mathematical version I practised day to day in my job in investment banking. For all of my 15 years in finance, first as a consultant and then a banker, it had always been difficult to explain what I did to non-specialists. In addition to the senior executives who were and are my clients, my parents, friends and in-laws all struggled to understand what I meant when I talked about risk and risk management.

Yet they understood what Sebastian Junger meant when he described *A Perfect Storm*, and every day they goggled at accounts of earthquakes, avian flu and terrorist attacks. Somehow people related to extreme events and extreme environments, so I thought perhaps there was an angle here. Perhaps I could use personal experiences in extreme environments to illustrate risk and risk management. I also thought there might be some lessons to be learnt professionally. Risk management in extreme environments might provide some insight on risk management in more mundane ones like banking. At the very least it would be fun to research, and I'd have a good answer ready if someone asked me to explain what I did at future Christmases in less exotic locations.

This book is the result. It is aimed at managers of risk, both those who call themselves risk managers and those who don't. The primary intention is to use life and death experiences in different extreme environments to illustrate and explain what risk management is, how it works and why it is important. I also intend to show that the study of risk management in extreme environments provides some lessons for risk management in mundane ones.

I hope to entertain while informing, and to give a window into extreme environments. To this end, I have tried to use the original words of my interviewees as far as possible, and to avoid academic prose, formulae and Greek symbols, and jargon. Please let me know whether it worked by email at duncan@lifeanddeathrisk.com.



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Introduction

STUFF HAPPENS

What is risk? Risk is: stuff happens. Something unexpected, perhaps unexpected, occurs. Thousands of miles from its source in southern China, SARS kills 38 people in Toronto; the nuclear reactor at Chernobyl is driven into a state that never even occurred to its designers, even as its operators disable critical safety features, and it explodes; events in the Middle East cause Britons to blow themselves up on the London Underground. The unexpected, the unthinkable, the impossible – they happen. This is risk. It is a fact of life, something we deal with every day, in every decision we take. We may take it out of choice, even in expectation of reward. Most often we take it because we have no choice.

This book is about risk management in extreme environments. What is risk management? Risk management is knowing your pain threshold, being prepared, and keeping your wits about you. Before an event, you need to know how much pain you can take. After it's happened, it's too late. Identify possible events, figure out how painful they will be, then make a plan to deal with them. Once you have the plan get the necessary resources, practise obsessively, and if the event happens, keep your head. Even if it's something you hadn't anticipated, if you have planned and practised, your odds of surviving are much better. Panic is usually worse than doing nothing.

What are extreme environments? Extreme environments are those where the stakes are life and death. You are an infectious disease consultant on an isolation ward in Toronto and your 'atypical pneumonia' patient isn't responding to antibiotics and is drowning in his own mucus. You are the off-duty deputy shift head when the reactor blows up, and you have to replace the on-duty shift head who's incoherent in hospital

with radiation poisoning. You are the first responder on the platform after a bomb explodes on the London Tube and you have to decide who to save. An unconsidered decision in these circumstances might cost a life; a considered one might save it. In other words, managing risk in extreme environments is dealing with 'stuff' happening when life and death are at stake.

CORE CONCEPTS IN RISK

More formally, there are four core concepts in risk: frequency, severity, correlation and uncertainty.

An event is *frequent* if it occurs often. Most extreme events are mercifully infrequent. Historically, there is a severe earthquake (7 or greater on the Richter scale) about once every 25 years in California. Hence the frequency of big earthquakes in California is 1/25 or about 4 per cent each year.¹

An event is *severe* if it causes a lot of damage. For example, according to the US Geological Survey (USGS), between 1900 and 2005 China experienced 13 severe earthquakes which in total killed an estimated 800,000 people; the 1920, 1927 and 1976 quakes each killed over 200,000 people. The average severity was 61,000 people killed.

Most people's perception of risk focuses on events that are low frequency and high severity, such as severe earthquakes, aircraft crashes and accidents at nuclear power plants. We feel that flying and nuclear power plants are risky since there is a small chance of a horrible accident. However, a fuller notion of risk includes two additional concepts: correlation and uncertainty.

Events are *correlated* if they tend to happen at the same time and place. For example, the flooding of New Orleans in 2005 was caused by a hurricane; the 1906 earthquake in San Francisco caused an enormous fire.

Estimates of frequency, severity and correlation are just that: estimates. They are usually based on past experience, and as investors know well, past performance offers no guarantees in the future. Similarly, the

¹Note that frequency need not be measured over a time period. In many instances it is relevant to use other denominators. For example, in 30 years only two ejector seats failed on the UK Air Force planes, but then, the ejector seats were only rarely used. The relevant risk measure would have been how many times they would have failed had they been used. A survey revealed that several hundred ejector seats were faulty – accidents waiting to happen.

probabilities, severities and correlations of events in the future cannot be extrapolated with certainty from history: they are uncertain.

The rarer and more extreme the event, the greater the *uncertainty*. For example, according to the US National Oceanic and Atmospheric Administration, in the 105 years between 1900 and 2004 there were 25 severe (category 4 and 5) hurricanes in the United States. At the end of 2004, the frequency of a severe hurricane would have been estimated at 25/105, or about 24 per cent per year. However, there were four severe hurricanes in 2005 alone. Recalculating the frequency at the end of 2005, we end up with about 27 per cent per year (29/106). That's a large difference, and would have a material impact on preparations.²

Which estimate is correct, 24 per cent or 27 per cent? Neither, and both: uncertainty prohibits 'correctness'. Uncertainty is the essence of risk, and coping with it is the essence of risk management. Risk management in extreme environments is then predicting and managing the consequences of rare, severe and potentially correlated events under great uncertainty.

THINK, PLAN, DO

Risk management is a three-step process: Think, Plan, Do. The steps themselves are universal, the same everywhere, but exactly what they entail varies enormously.

Think

Thinking comes first. Before being able to manage risk, a risk manager must know how much risk is acceptable, and conversely at what stage to cut his or her losses. This appetite for risk is not self-evident. It is a philosophical choice, an issue of comfort with the frequency, severity and correlation of, and uncertainty around, potential events.

Different individuals, and different groups, have different preferences. Some people enjoy mountain climbing. They are comfortable with the knowledge that they are holding on to a small crack in a wet rock face with their fingertips and it's a long way down. Others prefer gardening, their feet firmly planted on the ground, their fingertips on their secateurs and not far from a cup of tea.

²With more data, uncertainty decreases. If we knew about 250 hurricanes over 1,050 years, the long-term average would be the same but the impact of the four hurricanes in 2005 would have been to change the odds from 250/1050 to 254/1051, an increase from 23.8 per cent to 24.2 per cent.

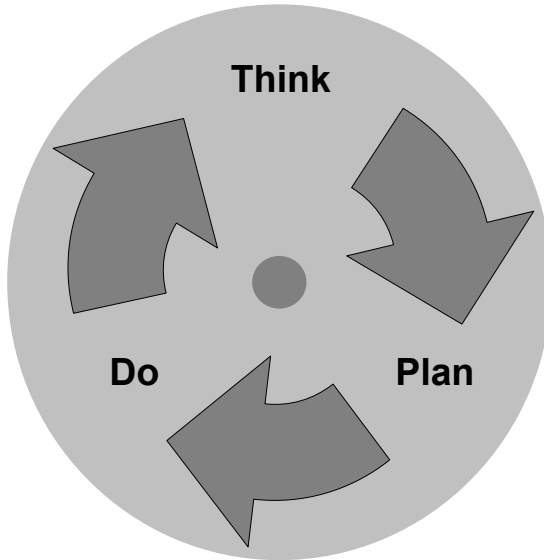


Figure 0.1 Think, Plan, Do

In the financial world, risk appetite simplifies to how much money an organization is prepared to lose before it cuts its losses. In life and death situations, it is the frequency with which a certain event results in death – the frequency and severity of fatal terrorist attacks in London, say. In some cases it is defined externally. For example, on oil rigs in the North Sea it is defined through legislation. Events that cause death more often than once in 10,000 years are not tolerable, and rig operators must mitigate the risk of any event with worse odds than this.

Plan

Planning is next. There are two parts: a strategic plan that matches resources and risks; and a tactical plan that assesses all the risks faced and details the response to each one.

The first part is the big picture. If, for example, you have decided that the frequency, severity and uncertainty of suicide bombings in London is too great, the big picture is that you need to change your life and move out of London, incurring whatever costs this requires. For organizations, the big picture has to dovetail with the organization's overall strategy. For example, although low-cost airlines need to be cheap, they cannot afford to cut corners on safety. Valujet discovered this when it was forced to ditch its brand following a catastrophic crash in 1996. Similarly, although

the high command of the US Army Rangers recognizes that they operate in very dangerous environments – such as Mogadishu: see the preface – and hence will on occasion lose soldiers, they have adopted a policy of ‘no man left behind’. This helps to ensure that in combat Rangers are less likely to surrender or retreat, perhaps as a result winning the day. Consequently airlines spend a lot on safety, and armies spend a lot on search and rescue capabilities.

The next stage is detailed planning. First, identify all the risks, all the things that might go wrong. Then assess and compare them to see which ones are the most likely and the most damaging. Finally, figure out what to do, who is going to do it, and how much it will cost.

California’s state-wide disaster planning process is an excellent template for responding to extreme events, perhaps because of the high frequency of all manner of major incidents there – earthquakes, tsunamis, floods, wildfires, landslides, oil spills – you name it. State law specifies the extent of mutual aid between local communities, and requires each community to appoint a state-certified emergency manager. Each emergency manager creates a detailed disaster management and recovery plan for his or her local community, reflecting local issues and needs. These plans are audited by state inspectors and rolled up into a state-wide plan. The plan is input to the state budgeting process in order to obtain the necessary resources.

Critically, risk aversion does not necessarily make you safer. Many people or communities express a low risk appetite but balk at the expense of reducing their risk to match their risk appetite. They don’t put their money where their mouth is, and instead simply hope that the rare event doesn’t happen. However, in the end, even rare events occur. The results of mismatching risk appetite and resources were devastatingly demonstrated recently as Hurricane Katrina drowned New Orleans.

Conversely, a large risk appetite is not the same thing as recklessness. A counterintuitive aspect of risk management in extreme environments is that although the individuals concerned are very comfortable with risk, they come across in conversation as somewhat risk averse. While they accept risk in the sense that ‘everyone dies sometime’, they work hard to eliminate or mitigate tangible risks as far as they can. They want to live – fully – for a long time. Anyone who does not manage risk very carefully in an extreme environment ends up dead fairly quickly, and is usually isolated within the risk group long before this happens. One former UK Special Forces officer relates the following episode:

We were in the back of the Land Rover, expecting contact [a fight] any minute. Everyone was quiet, going through the plan in their heads,

controlling their fear – except for one bloke at the back, who was mouthing off. He hadn't been in a fight before and I guess this was his way of compensating. I decided that the first thing I would do when we got out of the Land Rover was hit him in the head with my rifle butt. He was too dangerous; I couldn't accept the risk that he posed to the operation.

Gareth Owen, the head of security at Save the Children, is pithier. 'Mavericks don't last', he says. It would seem that life imitates *Top Gun*.

Do

Doing is a combination of activities. Before an event, *doing* means being prepared. This consists of recruiting, training and rehearsing response teams; acquiring and positioning the appropriate equipment, communications systems and budget; and ensuring that both the public and the response teams know what to do and what not to do. After an event, *doing* means keeping your wits about you while implementing the tactical plan, managing the inevitable unexpected events that crop up, and to the extent possible, collecting data on the experience.

Once the epidemic has broken out or the earthquake has hit, the key is not to panic. Colin Sharples, a former Red Arrow acrobatic pilot and now the head of training and industry affairs at Britannia Airways, observes that instinctively 'your mind freezes for about 10 seconds in an emergency. Then it reboots'. Frozen individuals cannot help themselves or others. To counter this instinct, pilots are required go through a continuous and demanding training programme in flight simulators which 'covers all known scenarios, with the more critical ones, for example engine fires, covered every six months. Pilots who do not pass the test have to retrain'.

Most extreme environments have similar training programmes, albeit usually without the fancy hardware. As Davy Gunn of Glencoe Mountain Rescue puts it, 'Our training is to climb steep mountains in bad weather, because that's what we do [when we're called out]'. In addition to providing direct experience of extreme conditions, such training also increases skill levels to the point where difficult activities become routine, even reflexive. Together, the experience and the training allow team members to create some 'breathing space' with respect to the immediate danger. This breathing space ensures that team members can play their part and in addition preserve some spare mental capacity to cope with unexpected events.

The importance of this 'breathing space' reflex reflects a truth about many extreme situations: they don't usually start out that way. Rather, a

‘chain of misfortune’ builds up where one bad thing builds on another, and the situation turns from bad to critical to catastrophic. First, something bad happens. For example, a patient reports with novel symptoms and doesn’t respond to treatment. Then the person dies, then one of his or her caregivers dies too. Then one of his or her relatives ends up in hospital with the same symptoms, and so on. A team with ‘breathing space’ can interrupt this chain by solving the problems at source as they arise, allowing them no time to compound. For example, a paranoid and suspicious infectious disease consultant (the best kind) might isolate the patient and implement strict patient/physician contact precautions before the infection is able to spread.

Closing the loop

When the *doing* is over and the situation has returned to normal, risk managers must close the loop and return to *thinking*. The group has to ask itself, ‘So how did it go?’ Using information collected centrally and participants’ own experience, each part of the plan is evaluated against its original intention. This debrief can be formal or informal, depending on what works best. Sometimes it might even be public, such as the Cullen enquiry into the disastrous Piper Alpha North Sea oil platform fire in 1989, which cost 165 lives.

Where performance was bad, the group must question whether the cause was local – training, procedures and equipment – or strategic. Perhaps the situation was riskier than the organization wants to tolerate, or is able to afford. These conclusions feed into the next round of thinking and planning.

Thinking, planning and doing are usually group activities. Group structures vary from place to place, but most often there is a community at risk and an authority that manages that risk. In addition, there are usually various levels of authority, climbing a hierarchy. The upper levels of the hierarchy, such as national or provincial governments, dictate standards and maintain surplus people, equipment and money in reserve. The lower levels, such as cities or national parks, comply with the standards so they can call on these extra resources if they cannot cope by themselves. For example, city and state disaster management plans in the United States must comply with US Federal guidelines if the city or state wants the option of asking for Federal assistance in an emergency. Since each level maintains both plans and response capacity, thinking, planning and doing take place at all levels of the group. This creates major challenges in coordination, as we shall see later.

STRUCTURE OF THE BOOK

This book describes and analyses risk and risk management in nine extreme environments, and then links them together through common themes and the ‘seven laws of extreme risk management’. Part I, Chapters 1 to 9, consists of nine case studies which analyse extreme environment risk management, from medicine to mining to mountain rescue. To help keep track of the various interviewees, each chapter has a list of those quoted at the front in the order in which they are quoted. These case studies illustrate and compare thinking, planning and doing in each environment, and draw parallels to risk management in more mundane environments such as banking.

Part II, from Chapter 10 onwards, describes the themes that cut across the case studies. Chapter 10 summarizes the case study findings. Chapter 11 offers some suggestions for risk management in the more mundane environments found in financial institutions and corporations. Chapter 12 closes the book, and boils down these findings to seven ‘laws’ about risk management from extreme environments that are universally applicable. At the end of the book there is a listing of useful resources for readers who want to follow up on any of the points raised.

The book can be read in any order. I recommend dipping into the case study that interests you most and taking it from there. Our story starts with the risk management of outbreaks of unknown infectious diseases.

Part I



Case Studies

Epidemic

Interviewees

Susan Coffin	Head of infectious disease control at the Children's Hospital of Pennsylvania in Philadelphia, USA
Alison McGeer	Consultant of infectious disease at Mount Sinai Hospital in Toronto, Canada
Geraldine Martell	Consultant in occupational health at Addenbrooke's Hospital in Cambridge, UK
Neil Rau	Infectious disease consultant at Credit Valley Hospital, Toronto, Canada
Sian Griffiths	Director of the Chinese University of Hong Kong School of Public Health, China
Sam Allen	Consultant in tropical medicine at the Westminster and Chelsea Hospital, London UK
Richard Fielding	Clinical psychologist at Hong Kong University, China
Penny Bevan	Head of emergency preparedness for the National Health Service, UK

Usually the work of an infectious disease physician is routine, not extreme. Rather it is 'gumshoe epidemiology', the bread-and-butter tasks of tracking down the cause of a patient's infection. 'Most of the time we have other problems under our nose', says Dr Susan Coffin, head of infectious disease control at the Children's Hospital of Pennsylvania in Philadelphia. Her day-to-day focus is to stay abreast of and implement the latest epidemiological research findings, for example improvements in treating newborns with a cardiac condition. This is the normal work pattern in her profession.