RISKTEC ESSENTIALS

Risk-Based Decision Making and ALARP

An introduction to making risk-based decisions and reducing risks As Low As Reasonably Practicable (ALARP)

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Foreword

Welcome to this volume of *Risktec Essentials*, which brings together a collection of short articles on risk-based decision making and reducing risks As Low As Reasonably Practicable (ALARP).

No industrial activity is entirely free from risk. But is there a framework to help make risk-based decisions? And what exactly is the ALARP principle? What other tools are available to improve our risk-based decision making? We hope ***Risktec Essentials*** provides some useful insights to answer these questions.

Articles on other risk and safety management topics can be viewed at risktec.tuv.com/knowledge-bank.aspx

Risk-based decision making

Decisions revolve around the need to make choices, either to do or not to do something, or to select one option from a range of options. The choices available are often constrained by social, technical, business, safety and environmental requirements and objectives. Successful decision making requires an understanding of these many requirements and objectives, their relative importance, and how to assess options and make the 'best' decision.

A typical framework for the decision making process is illustrated in Figure 1. The importance of the change dictates the extent and formality of assessment, documentation, review, consultation and approval.

RISK-BASED DECISION MAKING PROCESS

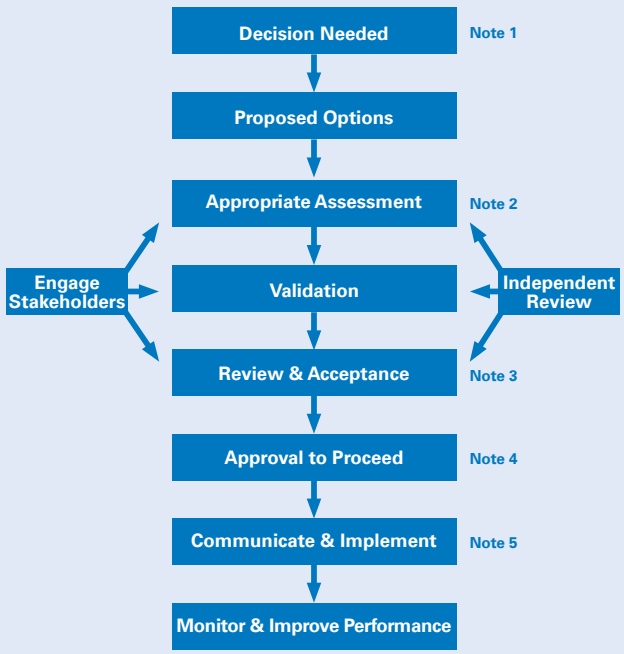
The overall decision making process steps remain the same in risk-based decision making: define the issues, examine the options and implement the decision. What is different is that the decision is arrived at by a structured understanding of the risk-reward balance and uncertainties, illustrated in Figure 2.

The options available will be based on one or more of the '4Ts' risk response strategies: Terminate, Treat, Transfer, Tolerate. A well designed risk response portfolio will focus not only on reducing the likelihood of a risk occurring, but also includes plans for stabilisation and recovery to ensure business continuity and effective reputation management. It may also be possible to reduce the potential for financial loss by hedging techniques or insurance purchase.

Next, an evaluation of the risk response options is required, taking into account their cost, benefits and views of relevant stakeholders. Whilst risk responses which are not cost-effective (i.e. the value of any reduction in risk is out-weighed by the cost of the control) would normally be discarded, there may be mandatory requirements imposed by internal standards or external regulatory authorities.

Ultimately, a decision is made. Sometimes the decision is clear-cut: the proposal is clearly worthwhile

FIG 1. STANDARD PROCESS FOR DECISION MAKING



NOTES

1. The need to change could come from a number of sources, including statutory requirements, internal reviews, audit findings, lessons learned from major incidents, etc.
2. The extent of assessment and documentation will be dependent on the significance of the change. This will range from experience-based assessment through to more comprehensive numerical assessment.
3. The extent of review will be dependent on the significance of the change. This will range from internal review through to independent review and involvement of regulatory bodies.
4. The approval body will be dependent on the significance of the proposed change.
5. Implementing the change effectively is arguably the most important step, since it is only at this point that the risk is reduced.

or not. More often there is no clear answer, requiring further investigation of the underlying issues or a simple consensual decision. Any decision requires an assessment of whether the 'residual' risk is acceptable, given the risk appetite of the organisation which, while difficult to quantify, is surprisingly well understood, if subconsciously, within most organisations.

PRACTICAL DIFFICULTIES

Although this process is reasonably straightforward in principle, in practice there can be demanding issues to overcome, for example:

- Ensuring the options have been properly selected and defined.
- Setting assessment criteria, and objectives and their relative importance.
- Identifying risk issues and perceptions.
- Assessing the performance of options against aspects that may not be quantifiable, or which may involve judgements and perceptions that vary or are open to interpretation.
- Dealing with differences in the uncertainties of estimates, data and analyses - it may not be able to provide a fair reflection of the actual differences between the options being considered.
- Managing or avoiding hidden assumptions or biases.

COMMON FEATURES

The UK oil and gas decision making framework was developed specifically to address these issues, and is the best known within the high hazard industries [Ref. 1]. However, effective risk-based decision making processes do have common features, regardless of the business application, as illustrated in Figure 3 [Ref. 2] including:

1. Use of a framework for incorporating societal values/concerns into risk-based decisions.
2. Ability to plan and take risk-based decisions for the long-term.
3. Effective risk-based decision making forums both within single companies and across the industry.
4. Clear understanding of the required inputs for and pride in the output of risk decisions.
5. Positive management of the media and transparency of risk-based decision making.
6. Ability to take rapid risk-based decisions to operate under degraded modes.
7. Co-operation with the regulator(s) leads to co-ordinated risk-based decisions.
8. Evidence from experts provides a sound basis for risk-based decisions.

CONCLUSION

Many organisations in commerce, industry and the public sector have learnt the need for structured risk-based decision making processes after some very painful lessons. Few would state their processes are fully evolved and functioning without problems. Many other organisations are really only now starting their journey. Successfully applied, though, risk-based decision making can be both powerful and cost-effective.

References:

1. Industry Guidelines on a Framework for Risk Related Decision Support, UKOOA, April 1999.
2. Decision-making Practices and Lessons from Other Industries, Rail Safety & Standards Board, Report T266, 2004.

FIG 2. RISK-BASED DECISION MAKING PROCESS

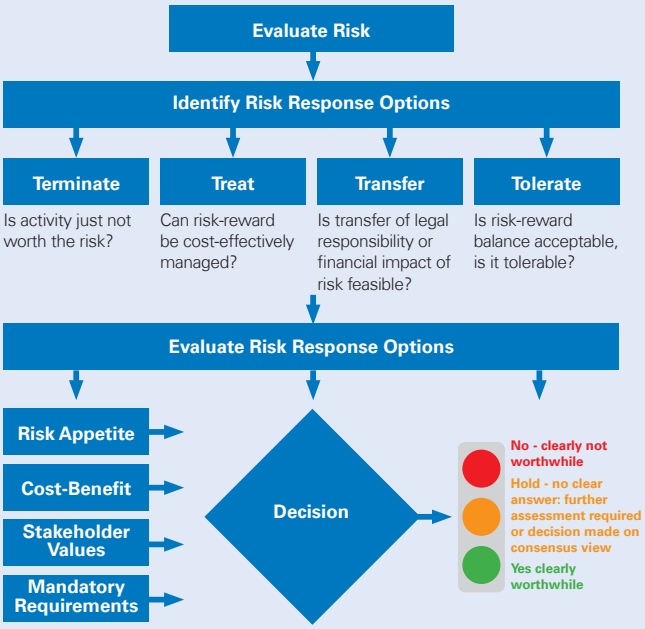


FIG 3. SUMMARY OF KEY LESSONS TO BE LEARNED FROM INDUSTRIES (REF. 2)

	Lesson Learnt	Aviation	Food	London Underground Group	Nuclear	Offshore Oil & Gas
1	Use of a framework for incorporating societal values/concerns into safety related decisions	○	●	◐	●	●
2	Ability to plan and take safety related decisions for the long term	●	○	●	●	○
3	Effective safety-related decision making forums both within single companies and cross country	●	●	●	●	●
4	Clear understanding of the required inputs for and pride in the output of safety decisions	●	○	○	○	●
5	Positive management of the media and transparency of safety realted decisions making	○	●	◐	●	●
6	Ability to take rapid safety related decisions to operate under degraded modes	●	○	●	○	○
7	Co-operation with the safety regulator leads to co-ordinated safety related decisions	●	●	●	○	●
8	Evidence from experts provides a sound basis for safety related decisions	●	●	○	●	○

● Evidence of lesson from the research ◐ Some evidence of lesson from the research ○ No evidence of lesson from the research

ALARP assessment

No industrial activity is entirely free from risk and so many companies and regulators around the world require that safety risks are reduced to acceptable levels. The key question then is what level of risk is considered to be low enough?

Why have risk criteria?

Risk criteria are standards used to translate numerical risk estimates into value judgements such as 'negligible risk' that can then be set against other value judgements such as 'high economic benefit' in the decision-making process (Ref. 1). Put more simply, criteria are used to help decide whether the risk associated with a project or activity is low enough to proceed.

A framework for risk criteria

The most common and flexible framework used for risk criteria divides risks into three bands (Ref. 2):

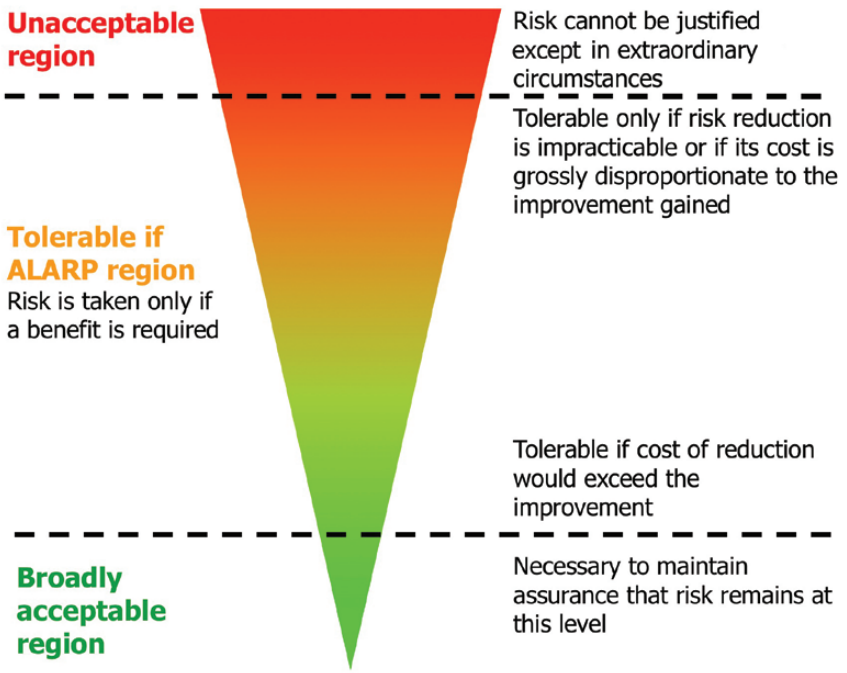
- An unacceptable region, where risks are intolerable except in extraordinary circumstances, and risk reduction measures are essential.
- A middle band, or 'tolerable if ALARP region', where risk reduction measures are desirable, but may not be implemented if their cost is disproportionate to the benefit achieved.
- A broadly acceptable region, where no further risk reduction measures are normally needed.

This framework is shown in Figure 1.

To define these bands, two levels of risk criteria are required: a maximum tolerable criterion above which the risk is intolerable and a broadly acceptable criterion below which the risk is insignificant.

Individual and societal risk criteria are not discussed further here, except to say that there is a high degree of commonality world-wide in individual risk criteria but societal risk criteria show a large variation. For further information see *Risktec Essentials: Quantitative Risk Assessment (QRA)*.

Figure 1 – Framework for tolerability of risk



ALARP ASSESSMENT

Whether considering individual risk or societal risk, safety risks need to be reduced to levels that are As Low As Reasonably Practicable, or 'ALARP'. The region that lies between unacceptably high and negligible risk levels is sometimes referred to as the 'ALARP region'.

If risk is in the ALARP region is it ALARP?

No, this is a common misconception. Even if a level of risk for a 'baseline case' has been judged to be in this ALARP region it is still necessary to consider introducing further risk reduction measures to drive the remaining, or 'residual', risk downwards.

The ALARP level is reached when the time, trouble and cost of further reduction measures become unreasonably disproportionate to the additional risk reduction obtained.

When does the ALARP principle apply?

Risk can be reduced by avoidance, adopting an alternative approach, or increasing the number and effectiveness of controls.

At the concept stage of a new project there is the greatest opportunity to achieve the lowest residual risk by considering alternative options, e.g. for an offshore oilfield development, options may range from fixed legged platforms to floating production vessels to subsea facilities.

Once the concept is selected and the early design progresses, the attention shifts to considering alternative layout and system options to optimise inherent safety. In the detailed design phase, the focus moves on to examining alternative options for improving safety systems.

During operations, the attention is on collecting feedback, improving procedures and personnel competence, and managing change to maintain the residual risk at an ALARP level. However, with advances in technology, what is ALARP today may not be ALARP tomorrow, so periodic reviews will be necessary.

Table 1 – ICAF Guidelines

ICAF (US$)	Guidance
<$10,000	**Highly effective** Always implement
$10,000 - $100,000	**Effective** Always implement
$100,000 - $1,000,000	**Effective** Implement unless risk is negligible
$1,000,000 - $10,000,000	**Consider** Effective if individual risk levels are high
$10,000,000 - $100,000,000	**Consider** At high risk levels or when there are other benefits
>$100,000,000	**Ineffective** Cost grossly disproportionate

How is ALARP demonstrated?

The definition of ALARP implies there is a mathematical formula to wield at the problem, and it is true that there is one. Having selected a range of possible risk reduction options, a QRA can be re-run for each option to identify the associated reduction in risk. Combining this improvement with the total cost of each option enables the options to be ranked in order of cost-effectiveness, using a Cost-Benefit Analysis (CBA). The Implied Cost of Averting a Fatality (ICAF) is expressed in terms of $ per statistical fatality averted and comprises the following generally annualised elements:

$$ICAF = \frac{\text{Net cost of option}}{\text{Potential saving of life}}$$

where *Net cost of option = Cost of option minus Reduction in loss of assets & production*

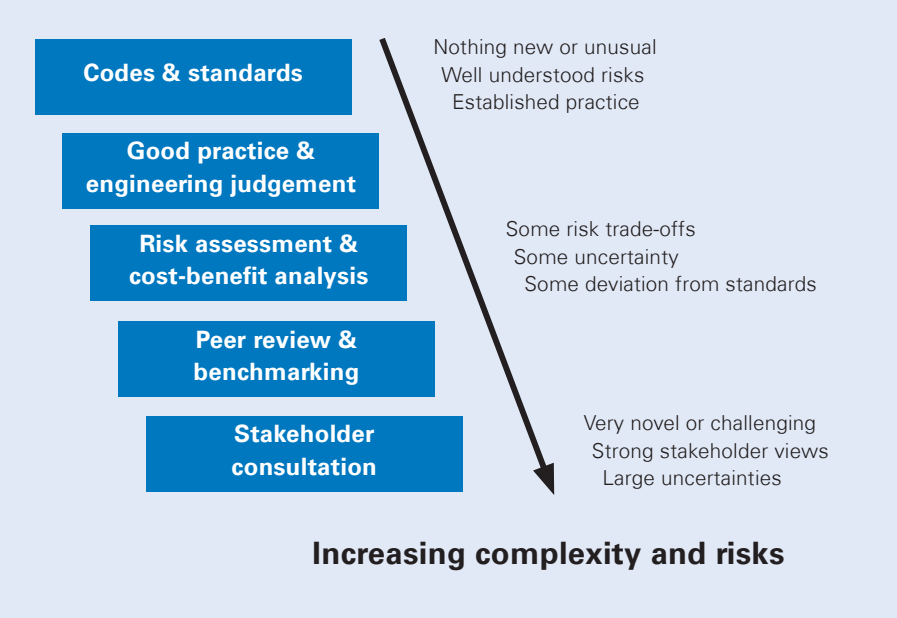
This calculation takes account of the fact that measures to reduce risk to people are also likely to reduce the potential damage to assets and loss of production.

The derived ICAF values for the proposed options may then be ranked and compared against company standards for ICAF. The typical ICAF value used by the UK offshore industry is around £6,000,000, i.e. in simplistic terms a measure that costs less than £6,000,000 and saves a life over the lifetime of an installation is reasonably practicable, while one that costs significantly more than £6,000,000 is grossly disproportionate and therefore is not justified. The UK HSE considers this to be the minimum level for the application of CBA in the offshore industry (Ref. 3).

In reality there is no simple cut-off and often a band of ICAF values is applied, as illustrated in Table 1.

Discussion on this subject can be emotive and care must be taken to provide an explanation as to why it is necessary to venture into this seemingly sensitive area of option evaluation. However, experience is that derivation of ICAF achieves not only a ranking of improvement options but also provides a spur to the creative development of yet safer and more economic options.

Figure 3 – ALARP tools



So is ALARP demonstrated by QRA and CBA?

This is another common misconception. QRA and CBA are inexact and a high variability in results is often seen. This variability can arise from poor standards in performing the study, e.g. omitting hazards or making calculation errors, as well as genuine uncertainty in data and modelling methods. The use of numerical estimates of risk, by themselves, can be misleading and can result in decisions that either do not meet adequate levels of safety, or overestimate the real risks.

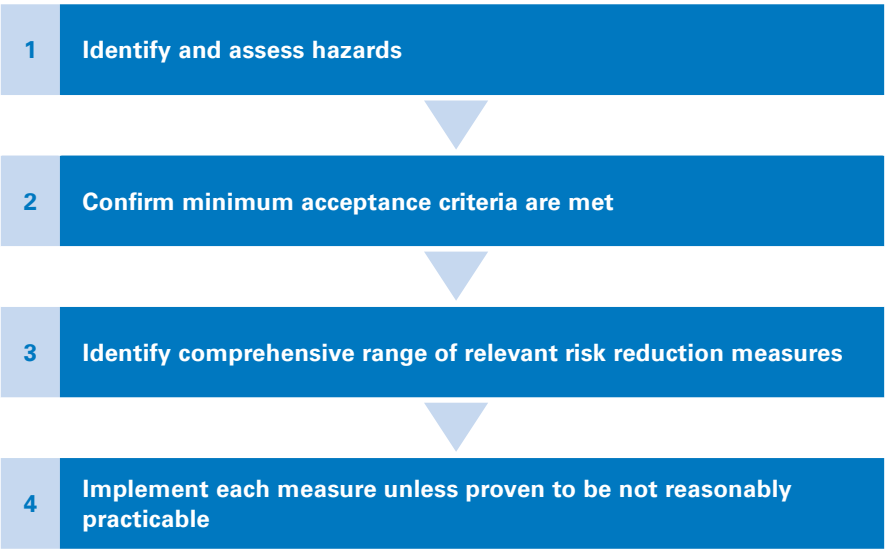
The 'formula approach' therefore should be used very cautiously and only in support of qualitative or engineering arguments. In general, an approach that uses information from engineering and operational analysis, supplemented where appropriate by QRA, will lead to more robust decisions. As such, demonstrating ALARP is a process rather than simply a calculation. The steps to follow are shown in Figure 2.

The critical step of this process is step 3, the need to identify a comprehensive range of relevant risk reduction measures. They should be based on modern good practice and be targeted at the largest risk contributors. This is typically achieved through 'brainstorming' workshops to identify technically feasible improvements that may:

- Eliminate the hazard
- Reduce the exposure of personnel to the hazard
- Reduce the frequency of occurrence
- Mitigate the consequences if the event does occur
- Improve evacuation if control is lost

Risk levels are only ALARP once every measure identified during step 3 has either been implemented or proven to be not reasonably practicable. It is surprising how many people need reminding that risk levels will remain the same, or even increase, until real improvements are fully implemented. A formal risk assessment can generate a large number of recommendations and they need to be properly managed.

Figure 2 – ALARP process



What tools are available to help demonstrate ALARP?

The tools available for demonstrating risks are reduced to levels that are ALARP are illustrated in Figure 3 (Ref. 4):

In general, the more complex the project, the more complex the decisions and the more sophisticated the tools required. Also, the higher the risk, the more comprehensive and robust the ALARP assessment needs to be.

For example, in many common engineering situations, what is reasonably practicable may be determined simply by reference to the relevant code or current practice. The majority of decision making will usually fall into this category. The codes and standards capture the lessons from past experience and try to reflect best use of current technology and understanding.

In other cases, optioneering together with the use of risk assessment and cost-benefit analysis may be appropriate. A risk-based approach can go some way towards addressing situations where, for example, there is high complexity, high costs, conflicting risks and uncertainty. It can provide a clearer picture of the implications and the pros and cons of the various decision options.

There may also be the need to take into account the views and concerns of those stakeholders affected by the decision. Their perception of the risks and benefits may be different from that analysed, affecting what they believe to be reasonably practicable as a solution. What one organisation may deem as the appropriate solution to manage the risks may be different from another organisation and in excess of that required by regulation.

CONCLUSION

In practice, ALARP decision making amounts to taking a balanced view and reaching a defensible consensus on prioritised improvements. A convincing ALARP demonstration lies in the documented consideration of improvement options, both implemented and discounted, at a level of detail appropriate to the facility lifecycle and magnitude of risk.

References:

1. **CMPT 1999**. A Guide to Quantitative Assessment for Offshore Installations, Publication 99/100a, The Centre for Marine and Petroleum Technology (CMPT), 1999.
2. **HSE 2001**. Reducing Risks, Protecting People – HSE's Decision-Making Process, 2001.
3. **HSE 2006**. Offshore Installations (Safety Case) Regulations 2005 Regulation 12 – Demonstrating Compliance with the Relevant Statutory Provisions, HSE Offshore Information Sheet No. 2/2006.
4. **UKOOA 1999**. Industry Guidelines on a Framework for Risk Related Decision Support, UKOOA, Issue 1, May 1999.

Debunking the ALARP principle: Four myths and realities

Much has been written about the ALARP principle. Here, we debunk four common myths by portraying the reality of a good ALARP justification.

KEY TO SUCCESS

The key messages that come across are that ALARP decision making should:

- Be applied throughout the whole project / facility lifecycle.
- Be integrated with existing safety processes.
- Consider accepted good practice.
- Identify options and consider a range of factors.
- Be underpinned by sound engineering argument.

Results should be used with a degree of caution and should be supported by qualitative understanding before informing decision making, such as a design change.

The more complex the project, the more sophisticated the risk assessment is likely to be, involving a larger number of potentially affected stakeholders. Equally, the higher the associated risk, or sensitivity to an increase in risk, the more robust and comprehensive the supporting evidence should be.

CONCLUSION

To some, the ALARP principle may seem like another legislative hurdle. However, in the right hands, the ALARP principle is a powerful means of choosing between improvement options or showing that no further improvement is warranted. As the ALARP principle is applied with increasing success, we can only hope that the myths surrounding its use will fade away.

References:

1. www.hse.gov.uk/risk/theory/alarpglance.htm

MYTH #1 — ENSURING THAT RISKS ARE REDUCED ALARP ALWAYS MEANS CONTINUOUSLY IMPROVING SAFETY

Reality #1 —ALARP assessment is not synonymous with continuous improvement

Whilst it is true that as technology develops, new and potentially better methods of risk control may become available, it is not a given that they should be adopted. It is the responsibility of the operator / owner to assess the options available periodically and determine whether the cost, time and trouble of implementing new risk controls are grossly disproportionate to their risk reduction, in which case improvement is not warranted.

MYTH #2 — ALARP ASSESSMENT SHOULD FOCUS ON QUANTITATIVE COST-BENEFIT ANALYSIS

Reality #2 —A balanced ALARP decision is needed, which considers a range of factors

Cost and risk reduction are just two of many potential factors that should be considered during ALARP decision making. The overriding decision should be based on sound engineering argument supported by a range of factors. This should start with benchmarking against good practice, followed potentially by qualitative consideration of the benefits and detriments of an appropriate range of options. In less clear-cut situations quantitative cost-benefit analysis may help, but should always be supported by other means of assessment. The nature of ALARP decision making should also vary according to risk.

MYTH #3 — ALARP ASSESSMENT IS A SEPARATE ACTIVITY TO DESIGN

Reality #3 — The ALARP process should feature prominently at every stage of the facility/project lifecycle

The ALARP principle is an extremely powerful tool that can be used to great effect as a front-end activity. In this role it can influence not only the design but also the amount of analysis and the level of application or interpretation of codes and standards. A good design review process should identify improvements early on (when they are cheapest). In the operational phase, as operational feedback grows, ALARP assessment can be used as a risk-based decision tool for improving procedures and processes. Decommissioning options should also be assessed using the ALARP principle, since a short-term increase in risk can often be weighed against the long-term reduction in risk.

MYTH #4 — IF A FEW ORGANISATIONS HAVE ADOPTED HIGH STANDARDS, THESE DEFINE ALARP LEVELS

Reality #4 —ALARP relates to risk reduction based on accepted good practice

In the context of the ALARP principle, good practice has a very precise meaning in the UK — it refers to those standards for controlling risk which are recognised by the UK's Health and Safety Executive (HSE) as satisfying the law when applied to a particular circumstance, and includes Approved Codes of Practice, HSE guidance, national and international codes and standards (Ref. 1). Although some organisations may implement higher standards than this to meet corporate goals, this does not constitute accepted good practice. Equally, an improvement should not be immediately discounted simply because it is not recognised as good practice. Organisations should make their own assessment of the available options, taking into account their own particular circumstances.

Thinking power: Avoiding mental traps in risk-based decision making

In his international bestseller *Thinking, Fast and Slow*, Daniel Kahneman (winner of the Nobel Prize in Economics in 2002) describes mental life by the metaphor of two agents, called System 1 and System 2.

System 2, the slow thinker, is deliberate. It is in charge of self-control. It is much too slow and inefficient at making routine decisions. But it can follow rules, compare several attributes and make deliberate choices between options. It is capable of reasoning and it is cautious.

System 1 on the other hand is the fast thinker, it is impulsive and intuitive. It is more influential than your experience may suggest and is the secret author of many of the choices and judgments you make. It operates automatically and quickly, with little or no effort. It executes skilled responses and generates useful intuitions, after adequate training, but is the source of many mental traps or 'biases'. Despite what you might believe, high intelligence does not make you immune to these psychological biases and there are many biases which can have a profound impact when making risk-based decisions. This article briefly introduces just three of these.

GROUPTHINK BIAS

Groupthink is the desire for harmony or conformity within a group which results in an irrational or dysfunctional decision-making outcome – very few people like to be the 'odd one out'. Groupthink was a significant contributor to the Deepwater Horizon oil well blowout in 2010 (Ref.1). The culture of drillers is of a group of highly skilled, opinionated technicians taking a personal interest in every well. They take on a leadership role, in practice if not in definition. The complexity of drilling operations is typically reflected in an obscure language with extensive use of technical slang and acronyms. What is more, peer pressure is extensive, with widespread use of teasing and competitive humour. 'Dumb' questions are not well received.

So it is perhaps no surprise that when one of the drillers proposed the 'bladder theory' as an explanation for the failed pressure test of the well integrity – a theory with no credibility in hindsight – the first and then eventually the second of the two company men in charge agreed despite initial scepticism. The failed test was 'reconceptualised' and the operations continued.

CONFIRMATION BIAS

Confirmation bias is the unconscious tendency of preferring information that confirms your beliefs – a tendency to selective

PROBLEM A

- In four pages of a novel (about 2,000 words), how many words would you expect to find that have the form

  __ __ __ __ ing (seven-letter words that end with ing)?
- Indicate your best estimate by circling one of the values below:

  0 1-2 3-4 5-7 8-10 11-15 16+

PROBLEM B

- In four pages of a novel (about 2,000 words), how many words would you expect to find that have the form

  __ __ __ __ __ n __ (seven-letter words that end with n _)?
- Indicate your best estimate by circling one of the values below:

  0 1-2 3-4 5-7 8-10 11-15 16+

Figure 1 – The availability bias in action

use of information, while giving disproportionately less consideration to alternative possibilities. Put more simply, we see and hear what fits our expectations.

The Lexington aircraft crash in the USA in 2006 is a case study in confirmation bias (Ref. 2). A regional jet took off from the wrong runway in darkness and failed to get airborne in sufficient time to clear trees at the end of the runway, causing the deaths of 49 passengers and crew. Multiple cues were missed by the pilots that should have alerted them to the fact that they were on the wrong runway. Instead, it is believed that the crew talked themselves into believing they were in the correct position. For example, in response to a comment about the lack of runway lights, the first officer said that he remembered several runway lights being unserviceable last time he had operated from the airfield.

AVAILABILITY BIAS

Availability bias means you judge the probability of an event by the ease with which occurrences can be brought to mind. You thus implicitly assume that readily-available examples represent unbiased estimates of statistical probabilities.

Try the simple test in Figure 1 before reading on.

If you answered a higher number for Problem A then you are in good company – most people do. But all words with seven letters that end in ing also have n as their sixth letter. Your fast thinking System 1 has fooled you. Ing words are more retrievable from memory because of the commonality of the ing suffix.

The availability bias can create sizeable errors in estimates about the probability of events and in relationships such as causation and correlation. Be aware, your risk analysis assumptions may not always be right, especially when they are backed by quick judgements.

SO WHAT'S THE REMEDY?

Think slow! Engage your System 2. Control your emotions and the desire to jump to conclusions. Take your time to make considered decisions and be ready to ask for more evidence, especially when pushed to make a fast decision. Request explicit risk trade-off studies. Challenge groupthink, and base your opinion on facts. Never be afraid of speaking up, you could save the day.

Consult widely and generate options. Involve a diverse group of people and don't be afraid to listen to dissenting views. Seek out people and information that challenge your opinions, or assign someone on your team to play 'devil's advocate'. Learn to recognise situations in which mistakes are likely. Try harder to avoid mental traps when the stakes are high. And finally, practice, refine, practice.

CONCLUSION

It is human nature to think in short-cuts, which bring with them a host of associated psychological biases. When making risk-based decisions it is essential to slow down our thinking, and apply formalised processes backed by science and data.

References: 1. Disastrous Decisions: The Human and Organisational Causes of the Gulf of Mexico Blowout, Andrew Hopkins, 2012.
2. Accident Report, NTSB, AAR-07/05, 2007.

Proportionality: avoiding 'one size fits all' solutions

Proportionality is a fundamental attribute of modern risk management. But what do we mean by proportionate? Put simply, we should target our efforts and resources into those facilities, and hazards, where the risk is greatest and not expend unwarranted levels of effort where risks are low.

This article explores three facets of proportionality:

1. The level of effort and detail put into analysing risk.
2. The time, cost and trouble expended on actually reducing risk.
3. The resources allocated during operations to manage risk.

LEVEL OF DETAIL

The goal of any good risk assessment is to provide sufficient information to help stakeholders make robust risk-informed decisions. The higher the level of risk or magnitude of the consequences, the greater the certainty that is needed from the analysis. For example, the assessment of a nuclear power station with the potential for widespread offsite consequences necessitates more comprehensive and advanced analyses than an offshore oil platform where the impact is largely localised, which in turn would require more detail than an onshore chemical site with a small inventory of flammable materials.

In all cases, however, the key is to begin analyses at as high a level as practical and only perform more detailed evaluations in areas where the additional effort will significantly help decision makers. In general, the more detailed the analysis the greater the confidence and the more certain the conclusions, but the greater the resources invested.

As you can imagine, this is not quite as straightforward as it might first appear. For instance, complex analysis can give the appearance of robustness but if it is based on unfounded assumptions or large uncertainties in data, then the old adage 'garbage in, garbage out' will apply. Too much analysis can paralyse an organisation, as decision makers wait for it to arrive or are overwhelmed by options or reams of detailed results. Moreover, excellent decisions to reduce risk can often be made on the basis of surprisingly simple analysis, or even by judgement and common sense.

REDUCING RISK

The concept of proportionality should already be familiar to anyone who has used the principle of ALARP – As Low As Reasonably Practicable. The ALARP principle sits at the heart of risk management in the UK, as well as a number of other countries and many global corporations. The

The work of sculptor Jaume Plensa, entitled 'House of Knowledge', is to many, perfectly proportioned.

principle is a 'gift' to decision makers because it recognises that whilst risk reduction is desirable it is not always warranted.

For example, hazards found to lie in the 'tolerable if ALARP' risk region will require further risk reduction measures unless the money, time and trouble (the 'sacrifice') involved in implementing them can be shown to be grossly disproportionate to the benefit gained.

Many organisations develop a sliding scale to determine gross disproportion, whereby the higher the risk the greater the factor and hence the more likely it is that additional risk reduction measures will be adopted.

MANAGING RISK

It is common in the major hazard industries to specify the required safety performance of engineered systems and their human operators. For instance, the importance of a safety-critical system that provides the primary barrier in preventing a major accident is clearly higher than a system which would only be called upon after several other independent barriers had already failed. This concept drives a proportionate approach whereby the higher the safety importance of a system, the greater the frequency and depth of assurance activities such as design substantiation, commissioning, maintenance, inspection and testing, as well as verification activities like auditing and management review.

Such an approach ensures that design, operations and maintenance resources allocated during the facility's lifetime are focused on where risks are highest.

CONCLUSION

The concept of proportionality should drive the level of detail of risk analysis, the resources expended on risk reduction measures and the ongoing resources allocated to establish and maintain safety system performance. Proportionality is a very powerful tool in the effective management of risk, avoiding 'one size fits all solutions'. In short, proportionality helps funnel resources where they are needed to manage the risks that matter.

About Risktec

Risktec is an independent and specialist risk management consulting and training company. We help clients to manage health, safety, security, environmental (HSSE) and business risk in sectors where the impact of loss is high.

OUR SERVICES ENCOMPASS:

Consulting

Specialist risk management services, delivering packaged and proportionate solutions to help reduce and manage risk.

Learning

Online and classroom training and postgraduate education to help develop competent risk management professionals.

Resourcing

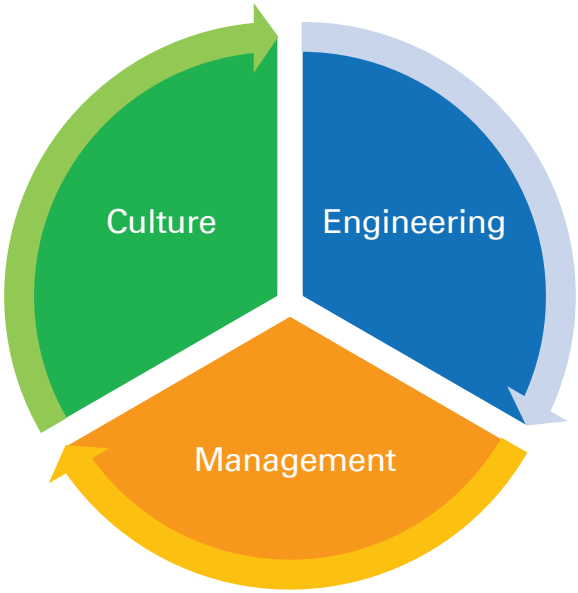
Specialist risk, HSSE and engineering associates to work at client locations to help fill resource and skills shortages.

Inspection

Industrial and vendor inspections and assessments to ensure asset integrity and mitigate project risks.

Consulting

Our experience ranges from delivering small self-contained work packages to managing complex multi-disciplinary projects with a large number of stakeholders.



Our services recognise that controlling risk requires understanding engineered and technological systems, management systems and organisational, cultural and behavioural factors.

ENGINEERING
Identifying, analysing, evaluating and reducing the risks associated with facilities, operations and equipment to acceptable levels.

MANAGEMENT
Identifying, developing and implementing effective policies and procedures to maintain control of risks and minimise loss.

CULTURE
Accelerating cultural and behavioural improvement, and ensuring a solid foundation for building sustainable improvements in risk control.

Learning

We provide a unique training and education service, from a single training course to a Risktec professional qualification or a tailored master's programme in Risk and Safety Management, all developed and taught by our experienced consultants. Our courses encompass the breadth and depth of our consulting services.

- Postgraduate Certificate, Diploma or Master's Degree (MSc) in Risk and Safety Management
- Degree Apprenticeship in Risk and Safety Management
- Risktec Professional Qualification (RPQ) in Risk and Safety Management
- Training courses from single modules to multi-year programmes for corporate clients
- Game-based learning
- Computer-based training
- Delivery via face-to-face, distance or blended learning
- Accredited by professional engineering institutions and industry bodies
- Our whole approach is flexible to meet client needs

Resourcing

We provide resource to support our clients' activities by working at their main offices, project locations or industrial sites, anywhere in the world. The support is delivered by our professional resourcing business, ASTEC, which has access to a huge pool of professional associates.

We provide associates who:

- Are well known to us.
- Are suitably qualified and bring the required specific skills and experience.
- Have many years' experience and hence can make an immediate and positive impact on projects.
- Can be supported by work packages from consultants in our own offices.

Inspection

We provide a risk-based programme to focus inspections where they are most needed, to mitigate project, safety, environment, production and regulatory risks.

- Inspection strategies and workscopes
- Site inspections including non-destructive testing
- Integrity assessment
- Weld repair solutions
- Component life extension
- Failure assessment
- Third party equipment inspection
- Quality assurance / quality control
- Vendor capability assessments

TÜV Rheinland

As part of the TÜV Rheinland Group we have access to a very large range of services via the group's 20,000 employees in over 65 countries worldwide, including:

Testing, inspection and certification services to ensure the safety, reliability and regulatory compliance of assets and components throughout their lifecycle; as well as technical consulting and training to energy, industrial, transportation, products and healthcare sectors.

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Risktec

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