RISKworld

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Welcome to Issue 6 of RISKworld. If you would like additional copies, do please contact us, and feel free to pass on RISKworld to other people in your organisation. We would also be pleased to hear any suggestions you may have on what you would like to see in future issues.

Contact Steve Lewis

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Three Years of Business

Falck is a market leader in emergency, assistance, health and training services

This edition of RISKWorld marks three years of trading and we feel that we have made excellent progress in living up to the 'Solutions' part of our name. With total revenue of over £8m the demand for our risk and safety services remains strong. Our willingness to share and transfer our knowledge to our clients, through training and practical workshops, has been extremely well received and has supported our aim of long term relationships with our clients.

In April 2004, Risktec Solutions' main shareholder, Global Safety Group, became a 70% subsidiary company of Falck A/S of Denmark. This concluded a process initiated by the shareholders of Global Safety Group to find a strategic partner with which it will achieve its ambitious development plans to extend training and risk management services around the world. The new company is called Falck Global Safety.

Falck A/S is the market leader in assistance and emergency services in Denmark and has expanded into other European countries. Public authorities are the main customers for Falck's ambulance and rescue services, fire-fighting and healthcare, whereas private customers are the main segment for auto-assistance.

Alan Hoy, Managing Director of Risktec summed up the impact of the change, "For Risktec personnel and our clients it is very much business as usual, as we continue to operate as an independent company with majority employee ownership. The involvement of Falck is very positive. From Risktec's perspective, we have identified a number of new areas for collaboration and we believe that the practical experience of Falck in delivering emergency services, security and training is likely to be of real benefit to our clients."

Falck's Chief Fire Officer, Henrik Hansen commented, "We are very pleased to have access to the expertise of Risktec. In Denmark we are moving towards risk based deployment of our fire fighting resources and Risktec's international experience in risk based regimes and risk management will be invaluable as we move forward."

For more information, contact Alan Hoy

Lessons Learned from the Real World

Risk assessment lies at the heart of risk management and one of the most powerful and increasingly popular risk assessment techniques is the bow-tie method. Its strength is that it goes beyond the usual risk assessment 'snapshot' and highlights the links between risk controls and the underlying management system. It is an excellent demonstration tool, but is also well-suited to communicating risk issues to non-specialists.

Bow-ties originated as a method for assessing hazard and operational risks. The Royal Dutch/Shell Group was the first major company to integrate the total bow-tie method into its business practices and is credited with developing the technique which is widely used today. Use of bow-ties has subsequently spread between companies, industries, countries and from industry to regulator. Their application has extended across all risks, including financial, strategic, security, quality, business interruption, political, human resources, design and project risk.

Bow-tie Method

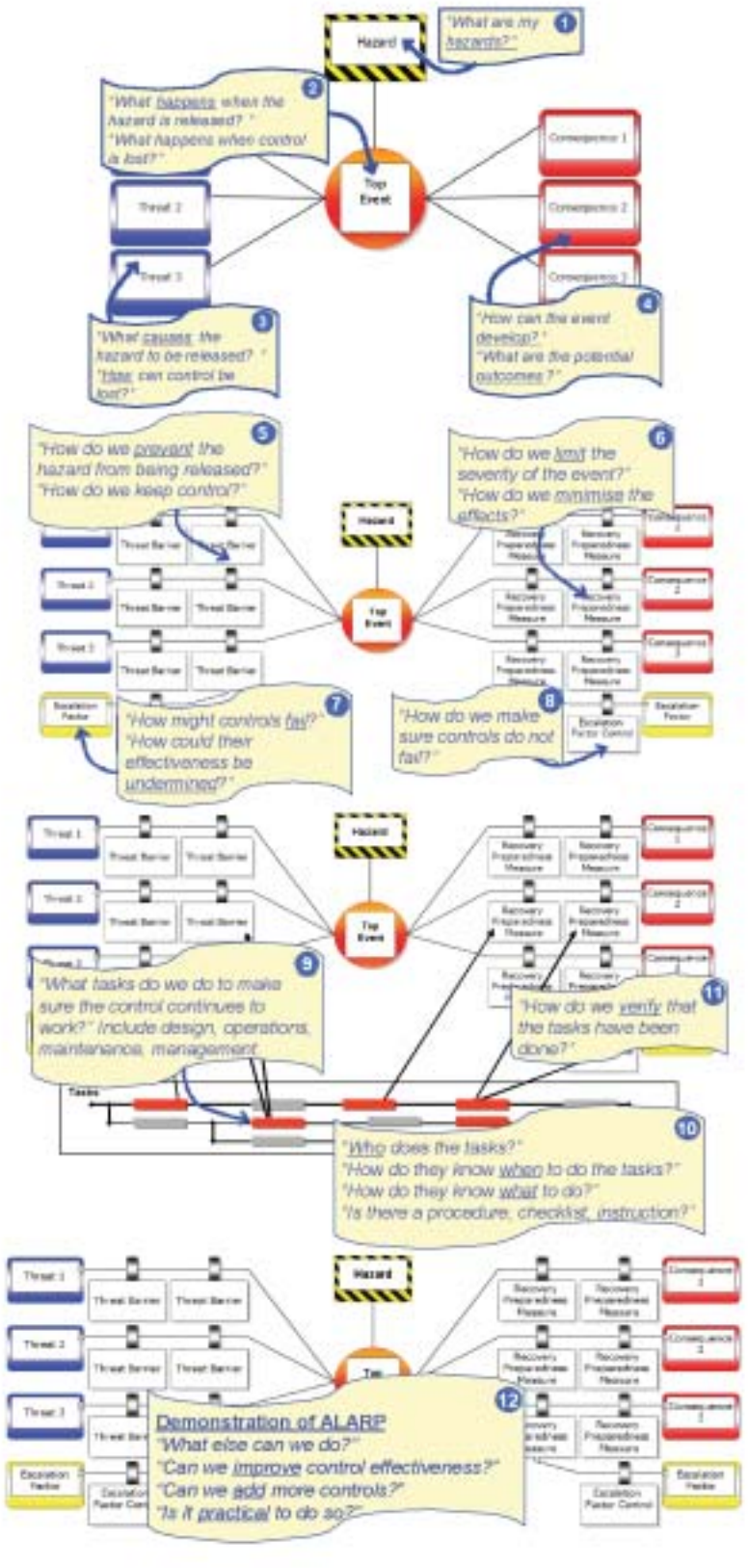
The method for building a bow-tie diagram is well-documented, and involves asking a structured set of questions in a logical sequence to build up the diagram step by step (Figure 1). The completed bow-tie illustrates the hazard, its causes and consequences, and the controls in place to minimise the risk. Facilitated workshops involving people who are regularly confronted with the hazards have proven to be the most effective way of identifying real controls and capturing current practice.

Practical Uses and Benefits

Demonstration – Bow-ties are used to demonstrate that hazards are being controlled, and that there is a direct link between the controls and elements of the management system. For example, bow-ties have been used successfully in safety reports produced for compliance with the UK onshore chemical industry Control of Major Accident Hazard (COMAH) Regulations.

There are other ways of demonstrating this link (e.g. simple tables) but the bow-tie provides a clear graphical illustration which is easy to understand.

Fig 1. Building the Bow-tie



"The main benefit for me is the simple pictorial representation, giving an almost instant top level view on the adequacy of preventative measures."

Application of the Bow-tie Method

Case Study

In one oil and gas industry case, where onshore wells are periodically drilled close to third party land, the operating company has pioneered the use of bow-ties to illustrate to the regulator and members of the public that the hazards associated with the operation are recognised, understood and well managed, both from a preventive point of view and for preparedness in the event of an emergency. Simply drawing bow-ties freehand during public meetings helped considerably in putting across the message that the company was in control of the hazards and that the risks were being minimised.

Communication – The diagram is understood by personnel at all levels of an organisation, including those who are not connected with the day-to-day operation being assessed. The bow-tie can be displayed on posters highlighting key risk control issues. Pocket books and leaflets have also been produced for dissemination of the risk management message, and web-based bow-ties form part of on-line training and information systems. The graphical-based approach is easy to implement with multi-national teams.

It is not necessary to use sophisticated techniques to get the most from the bow-tie method. Talking through the components of a particular scenario whilst sketching a bow-tie layer by layer can clearly illustrate how the hazard is managed.

Organisational improvements – Bow-ties can highlight areas where organisational control is weak, enabling proactive, sustainable strategies for reducing risk to be targeted on these areas. Bow-ties have also been used to ensure that critical controls do not 'fall through the cracks' after a company re-organisation. Bow-ties can be used during incident investigations to identify organisational weaknesses that allowed risk controls to fail.

Procedures and competence – A completed bow-tie analysis includes a list of critical tasks undertaken to assure the ongoing integrity of risk controls. The tasks can be used to verify the adequacy of a company's competence assurance system; the competencies defined for each role should align with the bow-tie controls. Bow-ties have also been used to manage handover/new-starter responsibilities.

Critical systems – Systems which prevent, detect, control or mitigate a hazardous event are deemed 'critical'. Such systems are clearly illustrated along the threat and consequence branches of the bow-tie and can be linked to defined performance standards and means of verification.

'Future proof' risk management – Unlike other risk assessment techniques, the bow-tie illustrates not only what controls are currently in place, but, through the use of critical tasks, why they will still be there tomorrow.

Ownership – Bow-tie workshops stimulate communication between key stakeholders who all have a role to play in managing risk. Bow-ties focus on risk management at the operational level for use by operational people, rather than technical risk specialists. All staff can see why what they do is critical for risk control.

Auditable trail – Bow-tie diagrams and critical task lists provide a protocol for auditing management arrangements.

Conclusions

Bow-ties provide a clear visualisation of the relationships between the causes of business upsets, escalation to a range of possible outcomes, and controls which prevent the event from occurring and limit the consequences. More importantly, the controls are linked to tasks, procedures, responsible individuals and competencies, thereby identifying how the management system provides assurance that risks will continue to be properly managed.

The benefits of using bow-tie diagrams for risk management have been realised by organisations world-wide across a variety of business sectors.

"This is the way you make your risk management case real and day-to-day."

For further information, contact *For further information, contact* *Sheryl Hurst*

Tips for Success ...

Involve people. Operational experience or bow-tie experience alone give sub-standard results; a combination of the two is essential.

Pitch at the correct level of detail. Too high and the bow-tie is meaningless. Too low and the exercise is labour intensive. Controls should be independent and self-explanatory. Tasks need to be meaningful and assigned at a level where their completion can be verified.

Keep the end objective in mind. Prioritise effort on risks which are of greatest concern. For operating facilities focus on operational controls not re-assessing the quality of an earlier design process.

Demonstrate risks are reduced to As Low As Reasonably Practicable. Ask "practically, what extra controls can we add?". Avoid simple barrier counting where possible.

Use the method to its full potential. The bow-tie is only part of the picture; critical tasks provide the link between controls and the procedures and people responsible for ensuring they will continue to be effective.

Verify controls and tasks. A follow up audit/inspection helps to assure the credibility of the bow-tie and the completeness of the management arrangements.

BowTie XP

Specified by Risktec and developed by our sister software company, Tritanium, based in Leiden in The Netherlands, the BowtieXP software is now available under licence for developing bow-ties and management system links. BowtieXP enables quicker, less costly and more rigorous analysis. It allows better communication and updating of risk information. A powerful graphical user interface and a large range of reports means BowtieXP is the leading bow-tie software on the market.

Contact Steve Lewis

From Engineering Safety to Competency

In Issue 3 of RISKworld we reported on the initial work carried out by Risktec to develop the operational safety case for Network Rail's Interim Voice Radio System (IVRS) - a digital radio system enabling direct communication between train crew and signallers in an emergency. Since then Risktec has helped deliver safety training to IVRS users. IVRS is now operational on a significant stretch of the West Coast mainline and its use in designated areas is mandated.

Training Requirement

The safety case for IVRS identifies several hazards for which procedural safeguards are the claimed mitigation. The implementation of these controls requires users to be appropriately trained. Risktec has used its experience of the IVRS safety case to extend its role to training. By producing the training material and delivering the training courses, we have helped to embed the safety requirements into day-to-day operations, thus ensuring that hazards which claim procedural controls are managed.

In addition to ensuring that users have a common level of understanding of the IVRS equipment, the training covers its operational requirements, how it should be used, contingency arrangements for when it is not available due to equipment or network failure for example, and fault reporting.

Training Objectives for IVRS Users

- Deliver the required competence to use the IVRS equipment
- Engender confidence with IVRS operation
- Promote an understanding of what risks are associated with IVRS operation
- Provide appropriate training to ensure that these risks will be managed

Approach to Training

The nature of the training needed to take account of the two groups of IVRS users: mobile users who make up the Operating Company train crews and fixed users who comprise Network Rail signalling staff.

The large number of mobile users (over 3,000 handsets have been issued to Operating Companies) necessitated a 'train the trainer' approach. Each Operating Company identified a suitable trainer from their own staff to receive the IVRS training and then continue to train their own staff.

For signaller training, the smaller number of staff meant that direct training was possible. To date, Risktec has presented 15 training courses and trained 30 signallers.

The IVRS handset in use on a train

Continuous Improvement

There have been several IVRS emergency calls made by drivers to signallers and this experience has been used to monitor the effectiveness of the training. A poster campaign is being used as the continuous improvement mechanism by which any lessons learnt from analysis of real operational use is being passed on to all system users.

For further information, contact Ian Woodward

The IVRS handset

Did you know ...

that product safety warnings may make you laugh?

The following selection of product safety warnings were allegedly found on real products:

- On a hairdryer: Do not use while sleeping.
- On a steam iron: Do not iron clothes on body.
- On children's cough medicine: Do not drive car or operate machinery.
- On sleeping tablets: May cause drowsiness.
- On Xmas lights: For indoor and outdoor use only.
- On a bag of peanuts: May contain nuts.
- On a chainsaw: Do not attempt to stop chain with your hands or genitals.
- On a Superman costume: Wearing of this garment does not enable you to fly.

For more laughs, visit siri.uvm.edu/ppt

If only Daedalus had known about Tripod

Even the first documented aviation accident, the death of Icarus, warrants some re-evaluation from time to time. Traditionally, his death is blamed on his recklessness.

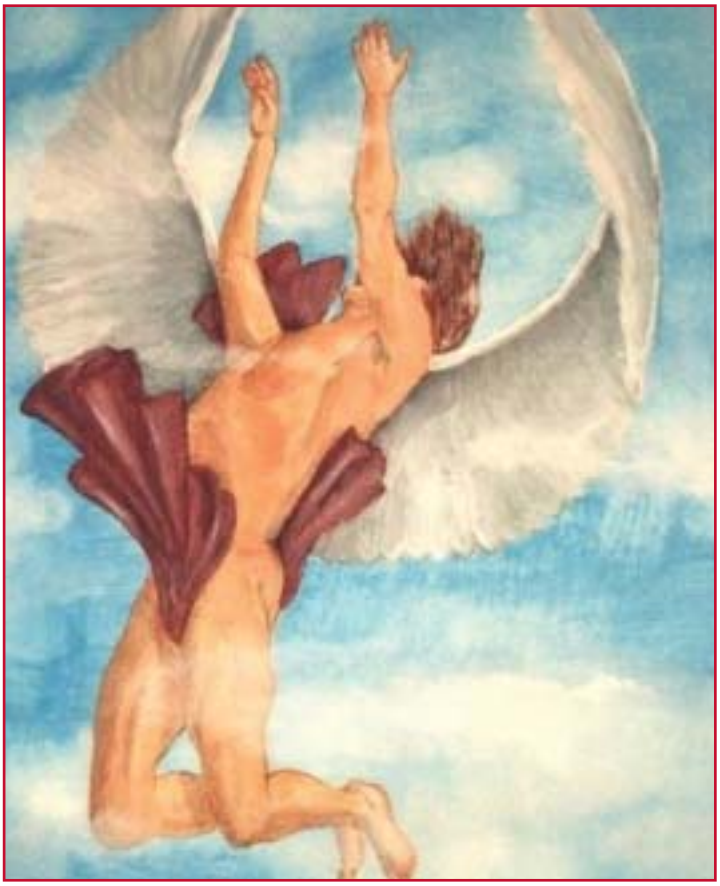
Icarus and Daedalus, his father and a brilliant inventor, were exiled by King Minos on the island of Crete. Daedalus hatched an escape plan which involved flying from the island. He made two pairs of wings by adhering feathers to a wooden frame with wax. Before setting out on their flight, however, Daedalus warned his son not to fly too low, where the sea spray could bog down his wings, nor too high, where the heat of the sun could melt the wax that held them together. But Icarus, too thrilled by the freedom of flight to heed his father's words, flew higher and higher, until his wings came apart, and he plunged to his death before his father could save him.

Historically, blame is put on Icarus the pilot, who 'forgot' his father's words. From a Tripod point of view [see inset] this was a clear case of poor supervision (Organisation), poor Design, defective Hardware and lack of testing of a new technology, poor Training as no test flights were made, and Error Enforcing Conditions as there was really no need to fly during the day.

No information is available about the Communication between Icarus and his father. It is not clear if Icarus had received the information about flying close to the sun at all. We only have Daedalus's word on that.

What is more, Icarus was put under time pressure by his father to leave the island as soon as possible, as he could not stand to live in captivity anymore. Daedalus had Incompatible Goals - get off the island quickly and do it as safely as possible. Last but not least, a technical investigation might have revealed that the problem was not related to flying too close to the sun at all. When flying higher the temperature gets lower instead of higher.

The crash is unfairly blamed on Icarus to cover up for the poor management of the project by Daedalus. To prevent a future Icarus from crashing, a 'corporate' Daedalus should ensure that organisational factors are controlled, a far more effective strategy than giving a warning not to fly too low or too high.



The Fall of Icarus by Charles Butka

Our thanks for this short story to Dr. Jop Groeneweg, Project Manager Human Error at the Centre of Safety Research, Leiden University.

Jop is one of the originators of the Tripod theory and his definitive book, "Controlling the Controllable" has been recently revised.

The Tripod Theory

In 1986 the Universities of Leiden and Manchester were asked to consider the question "why do things go wrong?" They identified that 75% of incidents are the result of organisational failures, leading to the conclusion that to prevent incidents, control of the working environment is the most effective approach.

Their research highlighted 11 basic risk factors that are the underlying causes of organisational, human and technical failures. They have a direct bearing not only on those incidents which have happened but also those which have yet to occur. Outside these 11 BRFs, there is little else under the control of an organisation that has any significant effect on operational behaviour.

The 11 Basic Risk Factors:
Design
Hardware
Maintenance
House keeping
Error enforcing conditions
Defences
Training
Procedures
Communication
Incompatible goals
Organisation

The Tripod methods are captured in two tools which are used by Risktec to help organisations make sustainable improvements in their risk management:

- Tripod Beta; an incident investigation tool - the reactive approach
- Tripod Delta; an organisational performance audit - the proactive approach

With well over ten years of research and science built-in, the Tripod tools provide a solid foundation for making lasting improvements and preventing those accidents that are waiting to happen.

For further information contact Andy Lidstone

tripod Solutions

Major Milestone for Asute Berthing Project

On 29 April 2004, Amec declared design freeze of the new submarine berthing facility to be built at HM Naval Base Clyde (Faslane).

The primary purpose of the new submarine berthing facility is to support the future operation of the new Astute Class submarines, although Swiftsure and Trafalgar classes would also be accommodated.

Approaching the facility from the shore, bridges will provide access for road vehicles and pedestrians as well as carriage of nuclear safety-related services with two-fold redundancy. The bridges land on a floating concrete jetty with a displacement of approximately 44,000 tonnes. The jetty is free to move vertically, but is laterally restrained by a monopile at each corner. As a floating structure, the jetty is largely isolated from the effects of earthquake and tidal variation.

To minimise the consequences of impact damage due to vessel collision, the structure has a cellular construction created by transverse and longitudinal concrete bulkheads. Clear deck area has been maximised by locating mechanical and electrical services below the upper deck.

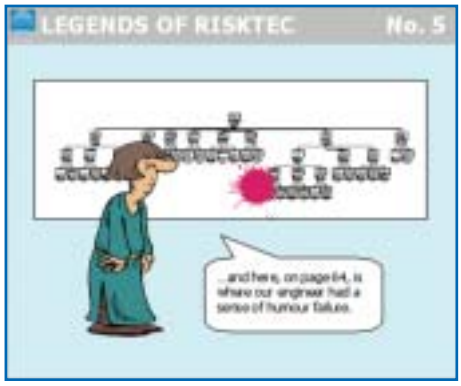
A maximum of six submarines can be berthed at any time, with two single berths on one side and two double berths on the other. A travelling portal crane is able to serve any of the berthed submarines.

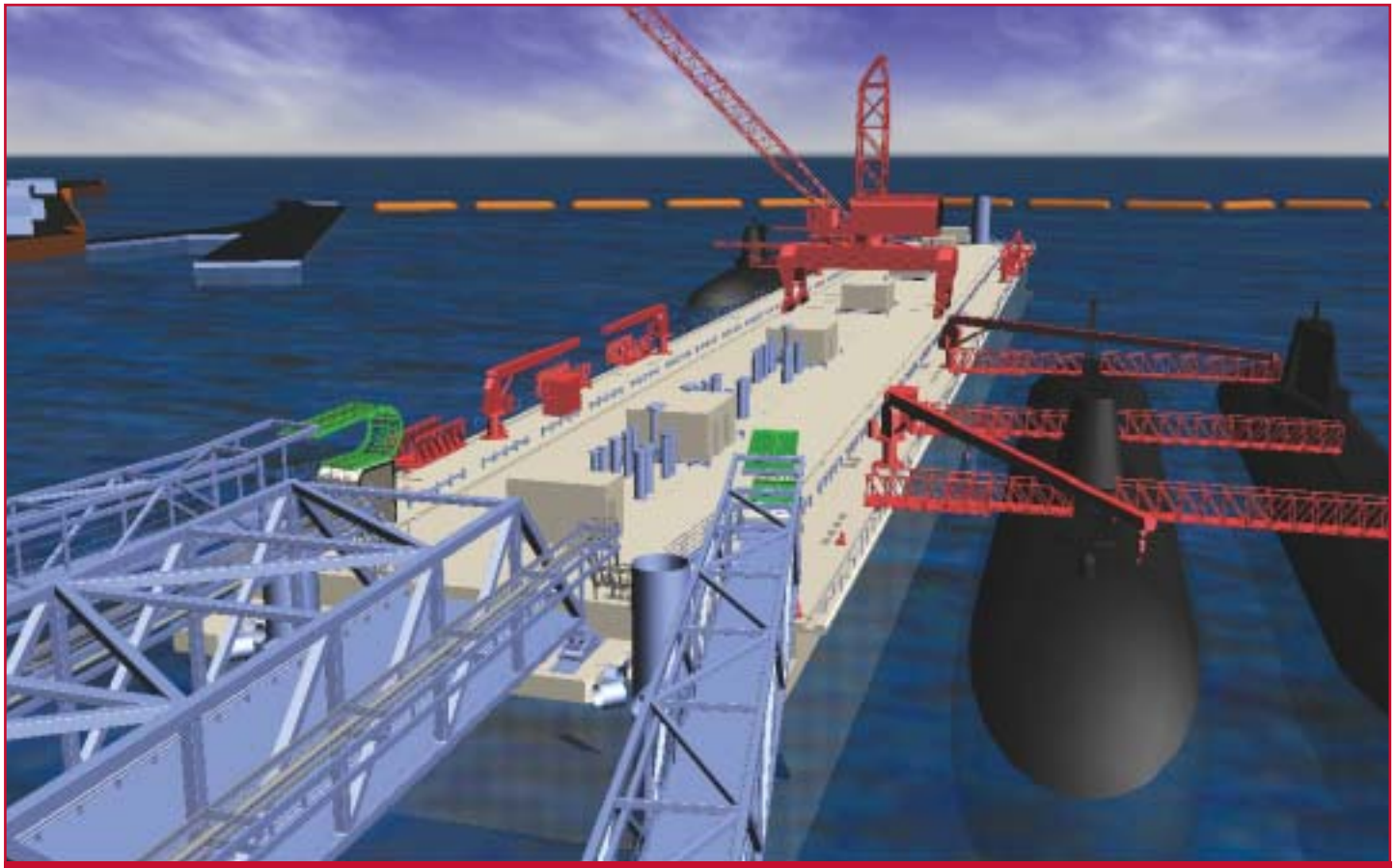
As prime contractor, Amec brings together civil, mechanical and electrical design teams from within the Amec Group, crane designer Stothert & Pitt and a safety case team from Risktec. To support design freeze, Risktec has developed a submarine-centric formal safety assessment and produced an 'Interim Safety Statement', which previews the eventual Pre-Construction Safety Report.

Amec project manager, Mike Parker, sums up the achievement so far:

"We now have sufficient confidence in the major elements of the design to impose a tighter degree of change control. The key to success has been and continues to be integration."

For further information, contact Steve Pearson





The new submarine berthing facility to be built at HM Naval Base Clyde (Faslane)

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