



UK's 7th Risk Forum

To Automate or Not To Automate

5-6 October 2016
Stratford Manor Hotel, Stratford upon Avon, UK

crarisk.com

CIR Risk Management

AWARDS 2016

shortlisted

CRA⁶

risk analysis

We provide bespoke holistic Safety, Risk and Reliability consultancy services to the safety and mission-critical industries.

- Nuclear
- Oil and Gas
- Defence
- Process
- Power
- Transport

crarisk.com

CIR

RISK MANAGEMENT
AWARDS 2014

WINNER

Risk Management
Specialist Company
of the Year

WINNER



IOP Institute of Physics

Awards 2015

Winner! Best Practice in
Professional Development



CHAIRMAN'S FORWARDING ADDRESS

'To Automate or not to Automate'; so why this particular theme for this year's Risk Forum?



Well the greatest bard the world has ever seen on these hallowed grounds probably said some four hundred years ago, *'we happy few, we band of brothers'* (not forgetting the sisters) are gathered here amongst an illustrious team of experts, to increase our knowledge and nurture our skills in all matters regarding the world being over taken by computers; how do we stop this dark menace? ...well, possibly not.

However, the greater use of computer controlled normal operating systems, safety systems, process, etc., is a serious issue facing our high hazard industries and our national critical infrastructure. How, far should we go with automation? Should the decision be purely driven by cost versus risk benefit? Or do we stop, reflect and conclude that some processes are best left in the hands of human beings for societal reasons.

Last week (29/09/16), there was the awful news of the train crash in New Jersey (USA) at Hoboken station when a runaway train ploughed into the station killing at least one and leaving over a hundred severely injured. It is remarkable that there were not additional immediate fatalities. Although it is far too early to draw any meaningful conclusions, it has been reported in the press that the train had not been fitted with a Positive Train Control System. PTC relies on computer controlled systems to automatically apply the brakes on a train if certain measured parameters are exceeded – effectively eliminating human error. I am sure we will discuss this further at the Forum.

As a Nuclear Engineer, I am very pleased with the news regarding the UK government giving the go ahead for building the Hinkley Point C Nuclear Power Plant. Is it the right decision for the nation? Of course it is; the nation needs the power. Is the cost too high? Well that depends on how you perform the calculation, if you factor in the benefit to the nation in keeping the lights on then probably not. Coming back to our theme for the Risk Forum, our existing nuclear fleet has already started to see a significant increase in computer controlled components and systems being introduced. Our new build programme including SMRs, rely heavily on computer controlled technology; so is this good, bad or just ugly? Should we be fearful, are we as human beings giving up too much control? How do we make a meaningful safety case, without breaking the bank, which demonstrates that one day your software controlled components or systems are not going to cause an undesirable event or be hacked by an outside agent to cause an undesirable event? Lots and lots of questions in this area and plenty of debate to be had.

Driverless cars, unpiloted passenger planes and trains (already in operation), is this really a good idea? AI controlled systems and processes introduce a whole host of other issues when we sit down and try to make appropriate safety cases. Maybe one day we will get to the stage where we won't need to make a safety case as it will not be meaningful to do so...? Maybe we are just afraid of change? Why don't we just embrace change at the break neck speed that it is happening in all areas of our lives, and lie back and ponder the next two days instead?

As in previous years my aims for this Risk Forum are to:

1. Establish the UK Nuclear Industry's voice for PSA/HFA;
2. Set-up a fund for promoting focused PSA/HFA research and development;
3. Disseminate information on the latest techniques and developments in PSA/HFA;
4. Provide the necessary information to enable better education of the general public on Nuclear Risk issues.

I'll be discussing these aims during the course of the Forum. It's worth noting though that over the years I think we have been successful in delivering items 1 and 3 but we definitely need to do more with 2 and 4.

And finally, I am delighted that CRA has been shortlisted for another Risk Management Award – Risk Management Team of the Year 2016, which was hot on the heels of winning the Institute of Physics Best Practice in Professional Development award. I feel extremely privileged to be surrounded by an awesome team 😊.

I hope you find the next two days both informative and enjoyable.

Jasbir Singh Sidhu



Day 1 Wednesday 5th October 2016

09.00 Registration and Refreshments

09.30 Welcome, Introductions and Aims for the Risk Forum
Jasbir Sidhu, Managing Director CRA

09.45 To Automate or Not To Automate – An Operator’s Perspective
Roy Hamm and Maxym Rychkov– EDF-Energy

Max Rychkov is an Operational Engineer working on the Hinkley Point C Project where Roy Hamm is the Project Operations Manager. This presentation will give the delegates an insight into the Operator’s views of risk associated with automatic control loops. They will detail their experiences in a most unusual way and no doubt provoke interesting debate and discussion.

10.25 The Design and Implementation of Modern Automation Systems
Jeton Partini – CGM Sweden

Today, operators are tasked with many activities. Is it reasonable to expect that they’ll be able to respond appropriately to all conditions? What are the human elements that should be taken into consideration in the design and implementation of modern automation systems?

This presentation discusses some of the capabilities available in a modern automation system and how to apply innovative control room planning and technology to support decision making and help humans handle the abnormal situations in a safe and effective manner. Jeton will present results from research performed in-house and centred on operator health, and the impact of an intelligent and ergonomic workspace that can both mitigate risk and increase productivity.

11.05 Morning break

11.25 Small Modular Reactor Automation and Passive Safety
Karl Fleming

This presentation will cover the passive safety features being developed for small modular reactors (SMRs). SMRs are intended to place considerably less reliance on the operator to ensure nuclear safety. Karl will also discuss how the industry is addressing seismic events for multi-unit SMR sites.

12.05 The Automation Myth
Les Ainsworth – CRA/Synergy

The Automation Myth will cover the necessity to integrate automation with an operator’s other tasks. Failure to do this can decrease the reliability of the operation and also make it more difficult for an operator to take manual control of a function when needed. This can largely be due to operator boredom and lack of awareness. Les will give guidance upon the level of support needed to ensure a reliable operation of the task.

Les will also take time to explain Performance Shaping Factors (PSFs) which can materially affect the reliability of task performance.

12.45 Cyber Threats - Fact or Fiction?
Mark Saville – Data2Vault

The world is getting more connected with the Internet of Things, M2M, smart meters, driverless cars, online shopping and Internet payments, but who is winning the information security battle? And which threats are the ones to focus on.

13.05 Lunch



14.00 Pushing the Human Performance Envelope - Simulating Challenging Scenarios for Pilots
Barry Kirwan – Eurocontrol

Accidents these days are rarely caused by a single factor like fatigue or workload or loss of situation awareness - but rather a combination of these factors. So, where do the performance edges lie? This presentation will show highlights from a large scale research project (Future Sky Safety) where we are literally pushing pilots in advanced full-scope cockpit simulators to find their performance edges, and to see how they can recover from them. At what point should automation take over?

14.40 How Controllable is an Autonomous Vehicle? A Functional Safety View
Gunwant Dhadyalla - Warwick Manufacturing Group
The University of Warwick

Over the past decade the electronic and software content in vehicles has increased significantly leading to the evolution of automated systems and driverless cars. Although the technology for the same has made rapid strides, appropriate safeguards from legislation, standards and testing methodologies have lagged behind.

The ISO26262 Functional Safety Standard is intended to be applied to safety-related systems that include one or more electrical and/or electronic (E/E) systems and that are installed in series production passenger cars. However there is a major dialogue ongoing in the automotive industry on how the standard applies to autonomous vehicles where controllability lies solely with the vehicle control systems and hence the clouding the determination of safety integrity levels.

Gunwant Dhadyalla presents the challenges raised by the autonomous vehicle for functional safety analysis and WMG's preliminary approaches to explore the interaction of the user with an autonomous vehicle and using the novel WMG 3xD simulator for Intelligent Vehicles based at the University of Warwick for conducting experiments to understand the impact on controllability.

15.20 Afternoon break

15.40 Culture and Infrastructure Required to Automate Nuclear Processes
Tim Ingram – MMI Engineering

Since the inception of the nuclear industry there has been a cyclical dependence and distance from reliance on SQEP operators to undertake tasks. This has numerous effects; however these few key examples will serve to demonstrate the impact of reliance on automation to throughput processes and overall plant availability. There is a trend in the decommissioning sector towards a greater reliance placed upon the operator. This discussion will be balanced by a critique of approaches and standards used in other industry sectors, all of which have a constant trend to automation, and show how the decommissioning sector may learn from this security battle? And which threats are the ones to focus on?

16.20 Developing a Safety Case for Use of Unmanned Aerial Vehicle Technology
Andy Buchan – SaRS

Developments in UAV technology offer significant opportunities for cost and risk reduction in a range of inspection and measurement activities. This presentation will cover the challenges of producing a safety case for the use of UAVs, highlighting the deployment and development of UAV technologies at the Sellafield nuclear complex.

17.00 Question and Answer Session

17.15 Close

18.45 Pre-dinner drinks on the terrace

19.30 Forum Dinner



Day 2 Thursday 6th October 2016

**09.00 Designing for Safety Trumps Operability: A Case Study at Sizewell B
Bryan Coxson – EDF Energy**

Bryan Coxson's talk will cover a period of over 35 years and focus on some specific features of the Sizewell B design relating to Instrument Air Systems. In 1995, these features assisted in enabling Sizewell B to be the only 'off the drawing board' design classed by the US Electric Power Research Institute (EPRI) as an 'Advanced PWR'.

The talk will cover how these features have been modified in the light of Operational Experience, the Sizewell B Living PSA, and current HRA techniques. The final outcome – 35 years on – was the automating of a claimed operator action following a plant modification completed during a recent outage at the station.

**09.40 'Computer Says No' - Safety and Security Challenges with Digital Control Systems
Hugh Stephenson - CRA**

An increasing amount of Digital Control and Instrumentation is being used in automation at existing and planned Nuclear Power Plants. Whilst the operational benefits are large, this increase presents a range of new challenges in the areas of both nuclear safety and security. In this session, some of these challenges will be examined further, in particular the estimation of reliability of equipment for use in both probabilistic and deterministic safety cases, drawing comparisons with the equivalent reliability of analogue and manual alternatives.

The increased use of digital technology also requires careful consideration of associated security risks. This session will close with a brief introduction of such issues and their potential impact on nuclear safety risk, drawing on lessons learned from the Stuxnet events of the 21st Century.

10.20 Morning break

**10.40 The Use of Advanced Control Rooms and Automation in the UK Nuclear Sector
A Regulatory Perspective - Richard Screeon – ONR**

The use of computerised control and instrumentation (C&I) has become the established norm across many high hazard sectors. Despite many benefits, the deployment of these technologies is not without risk, and regulatory attention worldwide has been drawn to a number of high profile incidents, where failures in these technologies have been implicated in the subsequent investigations.

Keen to capitalise on the safety and economic benefits that computerised instrumentation and control can potentially offer, the traditionally conservative nuclear industry has finally started to embrace these technologies, and in the UK, all the new reactor designs going through the ONR's generic design assessment process, sport levels of computerised C&I far greater than what is currently deployed. The human performance impact of advanced displays and controls and its modelling is an area of Human Factors research that has not kept pace with the development of the technology. Thus, the safety benefits and detriments of advanced C&I are a key regulatory focus for ONR within the Human Factors domain. Richard Screeon offers a regulatory perspective on this topic and provides a summary of the problem space as viewed uniquely by ONR.



11.20 Automating Train Protection - The Early Successes and Pitfalls
Colin Dennis – Independent Rail Safety Specialist

Traditionally the control of trains, including stopping at red signals, relied solely on the actions of the driver based on them observing the lineside signals. Following notable train accidents in the late 1980's and 1990's technological solutions were sought to provide automatic train protection to initiate the train brakes if the driver failed to do so in time.

This presentation considers the technology introduced and discusses both the successes and the pitfalls that resulted from the influence on driver behaviour and unintended consequences that emerged.

12:00 Safe Innovation in a Future Energy System
Stuart Hawksworth, Energy Innovation Centre, Health & Safety Laboratory

In this presentation Dr Stuart Hawksworth will talk about some of the HSL's recent ground-breaking work, thoughts and role for the future in the UK and internationally.

The activities of HSL cover a broad range of technologies in Power, Heat and Transport, working to ensure that the rapid progress in these fields now, and with an eye to the future, occur safely and smoothly.

12.40 Question and Answer Session – Summary

13.00 Risk Forum Close - Lunch and Delegates Departure



BIOGRAPHIES

Jasbir S. Sidhu, BEng (Hons), MBA



Jasbir Sidhu is one of the founders of CRA and is currently the CEO. Jasbir is one of the UK's leading Engineering Risk Analysts with over twenty five years of experience as an integrated NPP Safety Case, PSA/HRA specialist. He provides power generation clients with an understanding of their plant operational risks and suggests ways of managing risk profiles by means of plant re-design and/or modifications to plant operating procedures. Jasbir studied for an honours degree in Nuclear Engineering at Manchester University, a year after the accident at Chernobyl. Since graduating, Jasbir has worked predominantly in the Nuclear Industry as a consultant providing specialist technical risk management services. Jasbir has developed many PSA models including the Level 1 PSA/HFA model for the Leibstadt Nuclear Power Station in Switzerland. He was the master

architect of the first Periodic Safety Review (PSR1) PSAs/HFAs for most of the British Energy NPPs and since then has been involved in their continued development. Jasbir has an in-depth knowledge of PWR, BWR, Magnox, and AGR reactor designs. Today, Jasbir spends time with clients running risk awareness workshops to develop and instil a risk aware culture.

Les Ainsworth, PhD



Les Ainsworth is a Human Factors specialist who obtained his PhD in Applied Psychology at Nottingham University in 1975 and has been practicing or lecturing ever since. He has been on the staff at Aston, Cranfield and Ulster Universities and also headed the ergonomics team at Vickers where he was responsible for human design interfaces for Trident. Les was a founding director of Synergy Consultants and now splits his time between Synergy and CRA where he is the highly respected Senior Ergonomics Practitioner.

Andrew B Buchan, BSc (Hons), CChem, MRSC, FSarS, MIFirE



Andrew Buchan graduated from Aberdeen before working in the nuclear industry at UKAEA Harwell, in the chemistry of nuclear waste disposal. He then carried out technical and safety assessments for decommissioning projects at the Sellafield and Windscale sites. He has been extensively involved in the development of safety assessment and safety case approaches for BNFL and Sellafield Ltd. Andrew is familiar with the constraints of operating within a strict regulatory framework. Andrew leads a programme of Severe Accident Analysis for the Sellafield site and has been heavily involved in the companies' response to the Fukushima event. He is the current President of the Safety and Reliability Society (SaRS) which represents engineers and scientists working in Safety and Reliability.

Bryan Coxson, CEng, MIET



Bryan Coxson studied reliability distribution, transmission, and power generation in the Electricity Supply Industry, before joining the Sizewell B team introducing PWR to the UK. Bryan was in the licensing Safety Case team, responsible for procuring the operational, equipment failure, and human error data. He currently works in the Design Authority for EDF Energy, Nuclear Generation, as a Safety Case engineer supporting the Sizewell B Living PSA. Bryan is particularly interested in facilitating MCR simulator sessions that challenge operators to perform safety actions claimed in the living PSA. This involves the choreographing of fault sequences that are presented to MCR operators as unannounced scenarios.



Colin Dennis, CEng, FIMechE, FSaRs



Colin Dennis is an Energy Technology graduate from Aston University and has spent his career developing safety and reliability analysis primarily within the rail and nuclear industries. He has been responsible for the RSSB Safety Risk Model and oversaw the safety performance and risk products provided by RSSB. Colin is currently involved with the development of an MSc programme at Huddersfield University. He also chairs the London branch of SaRS.

Gunwant Dhadyalla, MSc



Gunwant Dhadyalla graduated from Imperial College with a Masters (Hons) in Engineering. He was initially a sponsored student with the Rover Group and later worked for Rover in the Advanced Research Group. He became a consultant within the Electrical and Electronics Group at Rolls-Royce and Bentley and then with Valeo in Germany. Gunwant is a Principal Engineer at Warwick Manufacturing Group.

Karl Fleming, MSc



Karl Fleming is one of the USA's leading innovators of PRA methodologies and one of the most well known experts within his field. Karl developed the technical basis for the common cause failure models such as Beta Factor, MGL, and Alpha Factor models now in common usage in the nuclear industry. He has been deeply involved in many large scale Level 3 PRA projects in the U.S. and Europe including the only multi-unit Level 3 PRA which was done for Seabrook Station. He is a co-author of the ASME/ANS PRA Standard and the leading author of the IAEA Safety Report on Multi-Unit PSA. In recent years he has been very active in the areas of multi-unit PRA and passive component reliability as it relates to the nuclear reactor safety and risk analysis.

Roy Hamm



Roy Hamm is the Project Operations Manager for Hinkley Point C. Prior to this Roy headed operational training for all of EDF's EPR projects. He has managed the construction and deployment of training centres and simulators for the Hinkley Point C and for Sizewell C reactors.



Stuart Hawksworth, PhD



Stuart Hawksworth has worked at HSL for over twenty years, establishing and leading the Major Hazards Unit until April 2014. Current areas of interest include technology development and process safety across all sectors, but particularly in the energy field. He has led a number of projects in the area of hydrogen/ energy, and current activities include: developing a Cross Cutting Energy Storage Joint Industry Project for HSE’s Shared Research Programme, oversight of the High Hydrogen Project for the Energy Technologies Institute, Sub task leader in International Energy Agency Hydrogen Implementing Agreement Safety Task and he is an active member of the International Association of Hydrogen Safety, HySafe.

Tim Ingram, MEng



Tim Ingram is a System Engineer with broad experience supporting operational facilities, as well as those currently being designed across several sectors including the nuclear and defence domains. Following graduation from Liverpool University, Tim started his career working on Sellafield’s Mixed Oxide Fuel Plant (SMP) and THORP as a System Engineer responsible for balancing the maintenance, improvements and production requirements. This included a variety of automated systems including centreless grinders, mechanical handling systems; visual recognition QA equipment and dust extract systems.

Barry Kirwan, PhD, MSc



Barry Kirwan currently works for the European Organisation for the Safety of Air Navigation (Eurocontrol) where he is European Safety Culture Programme Manager and also co-chairs the Action Plan on Safety Research. Prior to this Barry was Head of Human Factors for the National Air Traffic Services and has been a Human Factors lecturer at the University of Birmingham. He is a successful author in his spare time with more than eight published books and many short stories.

Jeton Partini, MSc



Jeton Partini is an interaction designer and human factors expert with an MSc in Entrepreneurship and a BSc in Interaction Design from Malmoe University. He is one of the design team for CGM in Boras, Sweden. CGM’s area of expertise is the design and safe operation of control rooms and the company has provided their expertise to many areas of industry including Oil and Gas, Energy, Marine and Process.

Max Rychkov, MSc(Hons), CEng



Max Rychkov is an engineer who graduated with an MSc in Mechanical Engineering from Sevastabol (Sebastopol in the Crimea). He then studied for an MSc in Sustainable Engineering from Kth Royal Institute of Technology in Sweden. He is currently a Senior Operational Engineer working on the Hinkley Point C project.



Mark Saville, Higher BTEC



Mark Saville is the founding director of Data2Vault. The company offers a range of cloud services to reduce and mitigate risk. Mark believes that managing security risk must be at the core of data protection and is working extensively in the area of Cybersecurity.

Richard Sreeton, MSc PGCE

Richard Sreeton is an experienced Human Factors specialist who has worked in the UK defence and civil nuclear sector for 18 years. He currently works at the Office For Nuclear Regulation (ONR), where he is the lead HF inspector for: the Generic Design Assessment (GDA) and licensing of the Westinghouse AP1000® pressurised water reactor; ONR's Nuclear Research Register – Human Factors; and future Small Modular Reactors.

Previously, Richard worked for Rolls-Royce Submarines, where he was the Principal HF engineer responsible for the Human Factors aspects of the Astute SSN Manoeuvring Room (Nuclear Control Room), and Atkins and AEA technology, where he provided consultancy services to a wide range of GB and international nuclear licensees and organisations.

Hugh Stephenson, BEng (Hons)



Hugh Stephenson graduated from Kingston University with a first class Hons degree in Automotive Systems Engineering Design. He has been part of the PSA team at CRA for over 10 years and is now a highly respected Principal Consultant with the company's PSA team working under his management. Recently, Hugh has been involved in a range of projects related to Control and Instrumentation (C&I) for both existing and new NPPs. These projects have focussed particularly on C&I reliability and how C&I is currently modelled in PSA, exploring the ways in which this could be refined to improve insights and aid risk informed decision making. Hugh has also been involved in the testing of Risk Spectrum PSA software and regularly delivers training on PSA to current clients, to raise awareness of its uses, benefits and limitations.



CRA⁶

risk analysis

CRA is a diverse, specialist risk analysis consultancy employing a multi-disciplined team to service the requirements of the safety and mission critical industries.

crarisk.com