

The Journal of the Christian Engineers' Association

CEA Perspective – Winter 2004/5

In this Issue...

Editorial <i>and</i> Reviewing the Issue	<i>John Baden Fuller</i>	2
Risk section	<i>We look at Risk from a number of points of view</i>	
Do we ever take risks?	<i>John Baden Fuller This paper is a reprint from an IEE Journal</i>	7
Risk as it affects Christians	<i>John Baden Fuller adds a Christian commentary</i>	12
Risk – A Christian Perspective	<i>David Kay adds a further commentary</i>	15
Risk Assessment	<i>Brian Allenby writes for Christians</i>	23
Risk from a Scientists' point of view – Abstracts of three presentations at a Christians in Science conference on the topic of Risk in 2003:		
Assessing risk: Science or Art?	<i>Derek Burke</i>	24
Risk, Creativity & Innovation	<i>John Ling</i>	26
Health, Safety & Ergonomics	<i>Andrew Pinder</i>	27
Something of myself	<i>Chris Rasiah answers some questions</i>	29
Building the Kingdom with Brass Tacks	<i>David Kay highlights a missionary endeavour of relevance to Engineers</i>	31
Conference report	<i>David Kay</i>	33
Committee Report	<i>Chris Rasiah</i>	35

Editorial

John Baden Fuller

The CEA Journal ought to reflect the views of our members. This issue reflects the views of the committee, but we would rather it reflected the views of the membership as a whole. We hope to do better with the Summer 2005 issue. Please send us your contributions for the next issue before **15th April 2005**.

Our Internet presentation is probably the most important public image of CEA. Our web page needs updating. Some of the information there is out of date and the whole presentation could be improved. Unfortunately, since Richard Rigg left the committee, no member of the committee has had the time to undertake this duty. **If you have the time and expertise to undertake the revision of our web pages, please contact me as soon as possible.** The depth of revision would be up to you. There is no need to make a commitment to undertake an enormous operation or to become a member of the committee although new committee members will always be welcome. **Even the smallest offer of help will be welcome.**

For some time, **David Kay** has been reviewing our membership situation and he has contacted some of you to find out what you think of CEA. Consequently, we have made him membership secretary. He has also agreed to act as assistant editor for the Journal. **Chris Rasiah** has become a very active member of the committee and is concentrating on recruitment among new graduates, particularly in London.

Risk

This issue of our Journal assembles a large number of contributions on the topic of Risk. It is amazing how the subject has surfaced from a number of different sources. It is a topic which is on the minds of many Christian leaders at this time, and we have attempted to give an Engineering approach. Some months ago, while thinking about this issue of the Journal, I was leafing through a pile of old magazines prior to throwing them away. A copy of *The Engineering Management Journal* turned up, in which I had written a short article on the topic of *Risk*. Having completely forgotten about this article, it suddenly seemed to be a suitable theme for this issue of our Journal with my article as an introduction to the topic. Then a number of other presentations on the topic also came to our notice. I believe that God guides by circumstances and that, when people pray, coincidences happen. So Risk has become the major topic for this issue.

Creation

I was recently invited to preach on the topic of the first chapter of Genesis, and I would like to share some thoughts with you.

In the beginning, God created the heavens and the earth. Gen.1.v.1.

In the Bible, God comes first. God existed before any of the universe existed. Scientists tell us that it all started with the *big bang*. As far as we are concerned, time did not exist before the big bang, but God was there. He existed before time began because He made it all and He continues to sustain it all now. Without God, there would be no universe, no time and no earth and its people. The good news is that God loves us. God wants us to be happy, as we fulfil His creation intention to express our love in worship and service to Him and to our fellow human beings. Genesis 1 is incredibly accurate as it describes what happened after the big bang. Genesis says:

The earth was without form and void. Gen.1.v.2.

The immediate aftermath of the big bang was chaos as all the atomic particles dispersed chaotically. The other effect was an enormous pulse of electromagnetic radiation. Its aftermath still exists today as a universal background radiation. Genesis 1.v.3 tells us that God created light first, i.e. at the time of the initial chaos, electromagnetic radiation existed. Considering that this part of the Bible could have been written at least four thousand years ago, it amazes me how much it agrees so well with our modern theories as to how the universe began. It makes God so much more wonderful, especially if we allow that God probably dictated this part of Genesis.

Mankind and Free Will

Then we read that God created human beings and gave us free will to make our own choices. God created the possibility for us to disobey Him and to do our own thing apart from God. Recently, I have been full of the idea that God made us to be free agents and that He wants us to freely choose to love and worship and serve Him. If we are to make any real choice, then there has to be the possibility of disobedience. Uncertainty has to be built into the system. Scientifically, we see one aspect of this in the impossibility of identifying the position of an individual electron. However, free will is only one aspect of reality. The Christian needs to accept that this is only one side of a paradox. The other side is God's foreknowledge and predestination. Free will is obvious to all of us. Predestination is not obvious and needs to be taught by God. I was recently brought up short on this question as I read the first chapter of Paul's letter to the Ephesians.

Daily Bible reading

I had been neglectful of my daily Bible reading, concentrating on various talks I had agreed to give.

Consequently, I believe my views on free will had become rather biased. This was a salutary lesson to me. To return to Paul,

Blessed be the God and Father of our Lord Jesus Christ,... even as he chose us in Him before the foundation of the world,... Eph.1v3 & 4.

In love He predestined us for adoption through Jesus Christ according to the purpose of His will. Eph.1v5.

...the riches of His grace, which He lavished upon us, in all wisdom and insight making known to us the mystery of his will, according to His purpose, which He set forth in Christ. Eph.1v7-9.

In Him we have obtained an inheritance, having been predestined according to the purpose of Him who works all things according to the counsel of His will. Eph.1v11.

We exercise free will as we choose to love and serve God through Jesus Christ our Lord. But God is completely in control. He chose us to be His people from the beginning of time and many Christians can see God's hand at work through coincidences and guidance as we come to belief in Christ. However this does not absolve us from the need to make a conscious effort all the time to walk in God's way and to serve Him in the world. We hope that CEA can provide an engineering slant to our theology and help us to live as engineers and God's children in the world.

And prayer

Prayer is a peculiar exercise which we all undertake in various ways. The committee sometimes discuss the viability of CEA and its activities and have always come to the conclusion that we ought to continue. However, I am sure we could be more effective if we all were more conscientious in praying for one another and for guidance for the committee who organise activities on behalf of the membership.

Reviewing the Issue

Risk is the theme of this issue of the Journal and the Risk section starts on p.7. I have already shared with you how God seemed to guide me to the topic. Consequently, something I wrote for the IEE Engineering Management Journal is reprinted on pp.7-11 as a lead into a general discussion. That article is an example of how we can spell out Christian ethical principles as applied to our work without being explicit about our faith. It is followed by two articles looking at risk from a particularly Christian point of view on pp.12-19. Then Nick Stroud gives us on p.20 a personal view as to how the Ministry of Defence approaches Risk. Brian Allenby writes about Risk Assessment as applied to Christians particularly in their workplace. He is the National Director of Christians at Work and this paper was originally presented as the Christians at Work *e-broadcast* for Friday 8th October 2004. We were also guided coincidentally, because David Kay attended a Christians in Science conference whose topic was Risk long before he knew that I was going to suggest such a topic as a subject for this issue of our Journal. Abstracts of three presentations at that conference are given on pp.24-28. Moving away from Risk, Chris Rasiah tells us *something of himself* on p.29. David Kay introduces a new missionary topic on p.31. In the Autumn issue of *net.working*, Norman Woolcock gives a report about the *Christians at Work* annual conference in which we participate and which was a great success. At that meeting, Professor Jan Wright led a seminar under the auspices of CEA. On p.33, David Kay gives a resume of his contribution to the conference. Finally we keep you up-to-date with our Committee Report on p.35.

Acknowledgement. Scripture quotations are from The Holy Bible, English Standard Version, published by HarperCollins Publishers © 2001 by Crossway Bibles, a division of Good News Publishers. Used by permission. All rights reserved.

Do we ever take risks?

John Baden Fuller

(This article was written for a secular audience and first published by the IEE in the Engineering Management Journal, June 2001. Consequently, some may find it dated and wish it had a more overtly Christian outlook. However it does show a Christian moral stance and it is supported by a following article giving a specifically Christian approach to the same topic.)

Is anything completely safe?

As good engineers we ought to do everything to the best of our ability to make things that are safe and easy to use. Not for us any short cuts or political or financial expediency; always the best despite the cost. Never any compromise. The big question mark is how safe is safe? As honest engineers, can we ever say that anything is completely safe? There is always the remotest possibility that something will break, or that it will be operated in a way that the manufacturers never anticipated. Have we thought about the problem? Nothing is ever 100% safe!

Nothing is ever 100% safe!

In June 2000 the IEE held a seminar, *Too risky? Understanding risk and the public's perception of it*. Jorge Kubie touched on the same problem in his article *One safeguard too many*, (IEE Engineering Management Journal April 2001). As engineers we think we can quantify risk and prove something *safe* whereas the general public is not necessarily prepared to take our word for it. In some cases it appears that public perception persuades legislators to go against the best scientific advice and to ban perfectly legitimate activities.

As an example, it has always seemed to me that nuclear energy was the best available option for providing cheap, reliable, clean power. In 1989 in *IEE News* No. 25, the editorial was entitled *Green Energy*. It advocated nuclear power, which uses a plentiful raw material in highly concentrated form so saving transport costs, and does not produce any greenhouse gases. Comparison with deep mined coal as an energy source shows that the nuclear industry has a much safer record. The alternative of open cast coal mining causes enormous scars on the countryside. To quote from the *IEE News* editorial,

Not one life was lost as a result of the Three Mile Island accident. Unit 1 of Three Mile Island was undamaged, but has never been allowed to operate in the 10 years since the accident. Pollution from the use of substitute power from other power stations (mostly coal fired) has caused the premature death of more than 250 people, based in the Brookhaven calculations.

The public perceive that nuclear energy is intrinsically unsafe

But there is still a public perception in this country that nuclear energy is intrinsically unsafe and we are unlikely to commission any new nuclear power stations in the near future. In Britain we seem to be moving to an oil-based energy system, but oil spillages cause enormous pollution and it is even possible that the clean up causes more damage than the original spillage. In a recent letter to *IEE News*, Walter Dale (January 2001, p.5) suggests that present assessments and evidence point strongly towards the conclusion that the low-level radiation that can be emitted from nuclear installations is not nearly so damaging as originally assumed.

Risk is balanced between the costs of a particular action and the benefits that accrue from it. There will always be a need to trade off these two issues. Critical systems have duplicate or triplicate safety

systems so that, if one safety system fails, there are still other safety systems providing protection. However, the difficulty is that things become much too expensive or much too massive for anybody to buy them, or they are continually out of order because one of the safety systems has a fault! Increasing the number of safeguards does not necessarily reduce the risk of large scale accidents, since it is possible for the safeguards to initiate faults. It is even possible to have an overprotected and less safe system. There has to be a compromise.

The cost of security against risk can price a great benefit beyond the reach of the general population

The cost of security against risk can price a great benefit beyond the reach of the general population. 'Expert' guidance may be inconsistent or inadequately informed. In a letter in *IEE News*, David Wright (December 2000, p.7) gives examples of gross discrepancies between established practice among the general public in Britain and in the USA. What we consider safe, they don't and vice versa. Keith Armstrong in an article in *IEE Review*, 'EMC and functional safety' (November 2000, p.34) highlights weaknesses in some current safety regulations; meeting the EMC directive and its standards may be inadequate for safety.

Public appreciation of risk suffers from double standards

Public appreciation of risk suffers from double standards. The radiation and chemical technology used in industry is considered high-risk/low-benefit whereas the same technology in the medical field is considered to be low-risk/high-benefit and therefore acceptable. When risks are voluntary, the public is likely to accept a risk a thousand times greater than when it is imposed by society. The HSE has adopted a 1 in 1 000 000 probability of an individual dying in any one year as the level of acceptable risk at which no further improvements in safety need to be made. This is the same as the risk of being electrocuted at home and is about one-hundredth of the rate of traffic accident mortality. Yet we continue to use our motor cars. Where we make the decision ourselves and only we are involved, we often choose very dangerous practices. Experts and the lay public have divergent views of risk, and often even the experts disagree. Risk perception by experts is based on technical estimates of any effect. The public are swayed by subjective qualitative aspects, such as the ethical, legal, political and cultural considerations.

To take some examples from rail transport. Recently the carriages used for the Orient Express have had to be changed from the antique original rolling stock with a wooden superstructure to a modern reproduction using as much steel and non-inflammable material in the construction as possible. The old fashioned wooden rolling stock was considered too much of a fire risk. Similarly, the ultra-safe rolling stock used in the Channel Tunnel passenger trains are supposed to be many times as strong/safe/reliable than the ordinary rolling stock used elsewhere on railways in Britain. It is good that we have the ability to construct ultra-safe passenger coaches to travel through more than 20 miles of tunnel but is it good that we have decided that we cannot afford to use the same standard of rolling stock elsewhere on the British railway system? We cannot even afford to run the Channel Tunnel passenger trains north of London.

Public controversies have undermined trust

Recently, the increasing influence of environmental pressure groups and ease of international communications have enabled the public to become better informed and more sensitive to environmental risk. In December 2000 the IEE held a seminar in the topic, *Responsibility for environmental protection and the engineer's liability*. Increased media coverage of environmental and scientific issues and increased public interest in science together with increased legal rights to environmental information have all placed information on environmental issues such as pollution control in the public domain. The publicity given to crises such as Chernobyl, BSE, genetically modified organisms and nuclear waste disposal have exposed the uncertainty and complexity of many

potential risks. Public controversies such as these have undermined public trust and contributed to a growing debate on risks and their acceptability to the public at large.

Suspicious of the new

We are always suspicious of the new and frightened of the effect it will have on us. The Luddites destroyed knitting machinery which was taking employment away from hand knitters. The first trains had to proceed at walking pace. Steam power had replaced men and horses to move heavy loads. The horses were always accompanied by men on foot, so nobody saw any need to proceed faster than walking pace. In fact, many thought that travelling at a speed faster than walking pace would be dangerous. The first motor cars were limited to a very slow speed. In the 1950s, many were really fearful of the possible effects of travelling faster than the speed of sound. We all take risks every day. Should the state try to protect us from all risk or should they provide the information and let us decide? If it were a new drug today, in the light of what we now know about it, aspirin would probably be a banned drug. Tobacco would certainly be a banned substance.

We all take risks every day

As engineering designers we are able to take a much more informed decision as to risk than the general public. The great danger is that, in the past, industrial processes have not always been intrinsically safe and unscrupulous manufacturers have ignored safety considerations. Products have been marketed that were unsafe. Pollutants have been needlessly dumped on land or into the atmosphere. The public do not trust the experts, who appear to have got it wrong so often in the past.

Can we make a decision to take a risk for the better good?

Where do we stand? We have to accept that we do not know all the answers, but we can always use the safest techniques without compromise. However, in all honesty we can make a decision to take a risk for the better good. Is it better to do something despite the risk or not to do it at all? We must never needlessly expose anybody to unnecessary risk but equally we must not fail to do good because there is some faint possibility of something going wrong. Especially if we may be to blame when it fails.

Acknowledgement: First published by the IEE in the Engineering Management Journal, June 2001, Vol.11, No.3, pp.98-100. Reprinted with permission.

Risk as it affects Christians

John Baden Fuller

It is risky being Christian

The article was originally written for a secular audience. Here are some further thoughts about Risk given from a Christian perspective. We are invited to take risks for God and for our faith. The great figures of faith in the Bible took risks. Many Christians today take risks in their witness for Christ. The Old Testament prophets took risks for God as they proclaimed God's word, because what they had to say was unpopular. Their message was usually a call to repentance which the hearers ignored. The Bible records how Jeremiah, in particular, had a very bad time. His message was unpopular and he was very badly treated.

The Old Testament Prophets had a bad time

Over the years, the Israelites had ignored God. Some of the time, they maintained the temple ritual, but they did not let religion affect the way they lived the rest of their lives. Many of the Old Testament prophets preached in this period, but the Israelites did not reform their ways. They were God's people, so they assumed that God would look after them, whatever they did. They thought they were OK, even though they tended to ignore God. Eventually, God allowed them to be conquered and to be deported to Babylon. At that time, Jeremiah's message was that the people ought to surrender, and allow themselves to be deported. It was God's will, so it would happen anyway. Give in, and you will live. Fight and God will allow you to be conquered and possibly killed, and those of you left alive will still be deported. God's messengers in those days took risks and were unpopular. The writer of the letter to the Hebrews summarises it all,

Some were tortured, refusing to accept release, so that they might rise again to a better life. Others suffered

mocking and flogging, and even chains and imprisonment. They were stoned, they were sawn in two, they were killed with the sword. They went about in skins of sheep and goats, destitute, afflicted, mistreated – of whom the world was not worthy – wandering about in dens and caves of the earth. Heb.11v35-38.

What about us?

What about us? Do we take risks for God? Is it dangerous to go to church for worship with God's people? Do we risk our lives because we are known to be Christians? For most of us in the affluent west, it is quite safe to be Christian, but there are many places in the world where it is not so. Churches are being burnt down. Congregations are being harassed or arrested or killed. Jesus foretold that this would happen.

They will put you out of the synagogues. Indeed, the hour is coming when whoever kills you will think he is offering service to God. Jn.16v2.

In some places, even today, it is like the early church. It is very risky being a Christian. To withstand that, we need to know Christ. We need to believe what God tells us. The writer of the letter to the Hebrews summarises it for us.

Now faith is the assurance of things hoped for, the conviction of things not seen. Heb.11v1.

We can only hope. So we are taking a risk. We shall only know for certain when we die. But Paul tells us that God provides glimpses of heaven.

The Spirit himself bears witness with our spirit that we are children of God. Rom.8v16.

The witness of the Spirit

The witness is the power of the Holy Spirit that many of us have experienced in various ways. There is the very famous passage in Wesley's Journal where he records that his heart was strangely warmed. We are all different, so God treats us all in different ways. Not all Christians have the same experience. We just need to accept that God has come into our lives. However, we need to take care that we are not like the Israelites at the time of the prophets. Does being a Christian make a difference to our lives? Are we just as much Christian at work on Monday as we are at church on Sunday? That is a problem we must all consider. Paul writing to Timothy says we must work at it.

Do your best to present yourself to God as one approved, a worker who has no need to be ashamed, rightly handling the word of truth. 2 Tim.2v15.

Jesus was a carpenter, a skilled craftsman. Paul was also a skilled craftsman, a tent maker. Paul tells Timothy to put as much effort into learning about his faith as a skilled craftsman puts into learning his trade. We are all trained engineers. We put much effort into learning our trade and many of us put even more effort in keeping up with the latest advances in theory and practice. As Christians, our textbook is the Bible. How well do we know our trade as Christians? We need to know our textbook. As Christians, we are servants of God. To serve God, we need to know His will, and the best way to find out is to know what God says in the Bible.

If someone asks us what we believe, can we defend our faith? Can we justify our belief?

As somebody once said, if we were arrested for our faith, would there be sufficient evidence to convict us?

Risk – A Christian Perspective

David Kay

Introduction

Some Christians feel that because God is Lord of the whole of life, they need to have a view on absolutely everything linked to all their activities and interests. Thus, some engineers may feel that it is important to have thought out in some depth their attitudes to safety and risk. Others are naturally interested in the subject. There is, however, little in the Bible that is specific to this subject, because these topics have gained prominence only in recent times.

Living with risk in Biblical times

In Old and New Testament times there were obviously many accidents associated with building work, fishing and other activities regarded as essential. Perhaps there were options with fishing – relative safe areas and more dangerous ones. All we know is that storms could quickly develop on a lake. Overall, we do not know what view was taken of the concepts of safety and risk, as the bible gives few insights into people's thinking in these areas. Whatever the situation, such thinking must have been at a relatively primitive level technically.

The development of risk concepts

Technological developments have generated an appreciation of the value of human life, and allowed the concept of risk to develop. Perhaps this process gathered some initial momentum when the Industrial Revolution occurred in Britain. In more recent times the prospect of nuclear energy a few decades ago was a major driving force in the development of risk assessment, as it was realised that man could cause an accident with consequences far beyond anything previously possible.

Risk assessment theory looks at both the probability and consequences of an accident or undesirable outcome of an incident. An interesting idea emerged: A very low probability coupled with major consequences was deemed similar in risk terms to a high probability coupled with minor consequences. The reasoning was that the same number of fatalities would occur in the long term. Thus, the concept of risk is intimately linked with the human toll of injuries and fatalities. If the effect of a person's death is assessed in financial terms, a further concept emerges: the value of a

human life. (The actual assessed figure varies, depending on certain factors, but in very broad terms it is around £1M.) This treatment of life, however, is purely secular; it has no theological basis whatsoever. The most acceptable part of this aspect of risk analysis is the ability to compare different courses of action, and prioritise possible solutions to problems, so that human life is preserved as far as is practicable. The alternative would be to use prescriptive means to enhance safety, for example, blanket speed limits on the roads.

Living with risk – the railway scene

The campaign to make the railways safer has led to what some people in the industry would consider to be disproportionate expenditure on a safety system known as TPWS (Train Protection Warning System). The money could instead have been spent on improving rail services, whereby more people would have travelled by train and fewer by car, with a reduction in the number of lives lost on the roads. The point is that the quest for zero risk can result in a more dangerous outcome if the widest perspective is taken. Comments following the level crossing accident on November 6, 2004, near Upton Nervet, Berkshire, illustrated once again the no-risk “requirement”, whereby some people seem to think that accidents can be eliminated. The ideal is commendable, but the railways had enjoyed a long period without a major accident. It now appears that steps are being taken to try to educate the general public about relative safety issues.

Living with risk – the present age

In our present age we have choices as far as our own safety and the safety of others are concerned. Activities which require high insurance premiums tend to attract more risk. One of these is car driving. Even here we have a good deal of choice about the amount of risk we take. At the cost of varying degrees of inconvenience, we can, for example, avoid driving in the middle lane of a three-lane bi-directional road. We may be able to reschedule some journeys so that we avoid times of day when drivers are more liable to fall asleep or be under the influence of alcohol. Driving on the roads obviously affects other people. Some activities, such as hiking alone, put mainly the participator at risk, at least in a direct sense.

In the world of work senior employees may be encouraged to take business risks, although there could be penalties for negative outcomes. Safety risks are different, as legislation covers the health and safety of employees.

Personal risk analysis

We could, if we so wished, analyse just about everything we do from a risk perspective. A colleague at my previous place of work sent an e-mail round the department asking for help with a personal risk problem. His daughter was due to work abroad, and would be exposed to infection through possible contact with discarded needles. He wanted to know whether he should spend a large amount of money on precautionary treatment to reduce the risk. The answer could be determined by assessing the probability of an infection, multiplying it by his assessment of the value of his daughter’s life, and comparing the result with the cost of the precautionary treatment. I began to feel rather uncomfortable about this approach, because it was so personal. Nevertheless, we can engage in similar assessments ourselves. However, most people probably prefer to base their actions on qualitative judgements.

Much exercise of mind is involved in doing risk calculations, using techniques such as HAZOP, event tree analysis, consequence analysis. This mental activity can be pleasurable in itself, irrespective of whether the outcome is positive in terms of the well being of the world’s population.

Some very difficult situations crop up in life, not necessarily with a direct link to engineering, but no doubt of interest to engineers. Two ladies in Iran were born with their heads joined together. After

many years of suffering the huge distress of this “joint life”, they were offered an operation to separate their heads. The risks were appreciated in advance, but could not be quantified. Sadly, the operation failed, and both the ladies died. As adults, we have to face uncertainty, and make decisions about difficult issues without having all the facts to hand. The whole world must have been saddened by the death of these ladies, but who can judge whether they made the right decision? A baby has been at the centre of a court case, brought to defend the right of a child to live at almost any cost. In this situation the risk of intolerable suffering arising from the inability to lead anything resembling a normal life must be considered. Much sympathy has been expressed in the case of Ken Bigley, kidnapped in Iraq, and executed a few weeks later by a ruthless group of men demanding the release of women prisoners in that country. It must be remembered that working in Iraq involves taking a significant risk. Does the fact that work may be undertaken out of choice affect the situation?

The Christian response

Three points are worth noting from the gospel records. First, the cutting off of the high priest’s ear (Luke 22v50) was a deliberate infliction of injury, rather than an accident, although the immediate outcome would not have indicated the cause. Jesus did not withhold his ability to bring healing in this predicament, so it is reasonable to assume that he saw accidental injury as a valid case for a touch of healing. Second, it is interesting to note that the servant who dug a hole in the ground and put his master’s money in it was condemned in Jesus’ parable of the talents (Matthew 25v14-30). This servant was effectively taking a no-risk approach, ensuring his own interests were protected. Third, Jesus encouraged Christians to serve, and not to count the cost. The cost may include the risk of injury or even death. It is worth noting that in Luke 14v25-33, Jesus talks about the *cost* of being a disciple, but not about the *risk* of being one.

Christians are encouraged in preaching and in books to take risks. Embarking on a specific career involves risk. Marriage involves risk. As noted earlier, there is little in the Bible that gives clues about the merits of voluntarily taking on a high-risk activity, unless service to others is involved. Joni Eareckson is a well known Christian singer, speaker and writer, who became famous following a diving accident, which left her partially paralysed. The diving activity was presumably optional, and involved some risk. Joni has turned this tragedy into something positive by developing a Christian ministry, the foundations of which are based on how she responded to the aftermath of the accident.

Conclusions

- Safety and risk are parameters that Christians have to reckon with. There is no specific biblical guidance, but the bible takes a pro-life approach, and, in particular, recognises the quality of human life as something of supreme importance.
- Everyone must decide for himself what risks to take, and to what extent personal risk assessment is appropriate.
- The techniques of risk analysis are difficult to undertake, but are valid, and reflect truth. Proper execution of the methods can be seen as a potential source of pleasure to the one who performs the calculations, and a means of bringing glory to God.
- The bible commends the service of others, and puts no constraints on the cost or risks involved.

Risk Assessment!

Brian Allenby, *National Director of Christians at Work.*

I spent some time recently talking to a group in Hampshire, we had been looking at my presentation, *Working out your faith in the workplace*, and one of the points that I try to make is the fact that being a witness at work, or a witness anywhere for that matter, is not an option it's a God given command, *Go into all the world and preach the gospel to all creation*. What it doesn't say is, *If you feel like it today!* For many of us, that world, is the world of work. But somebody said to me, "When I undertake a difficult or dangerous task at work, I have to carry out a risk assessment, isn't preaching, speaking or living out the Gospel a risk?" Well the answer is clearly yes it is. But despite EU directives and the need to remain at least sensibly correct in the workplace, we do still enjoy freedom of religion and freedom of expression.

In fact, these benefits are enshrined in EU legislation and, would you believe it, there is not even a British law that hinders the proclamation of the Gospel. However, there are EU employment directives concerning the workplace, which can be used against us, if any Gospel talk is seen as nuisance causing. So yes there is a risk. But there has always been a risk, in fact becoming a Christian was always a risk, especially if you lived during the first three or four centuries. Christ Himself warned His disciples about risk in Lk.21v16-18. *But you will be delivered up even by parents and brothers and relatives and friends, and some of you they will put to death. You will be hated by all for my name's sake. But not a hair of your head will perish.*

I'm sorry, but suffering or the possibility of suffering is all part of being a Christian, the problem for us is that, in the developed world, we enjoy our comforts and that comfort can create a real sense of apathy as far as risk taking for the Gospel is concerned. God of course has a great advantage over you and I – He never has to take a risk! The *all knowing*, omniscient God, by His very nature knows the outcome of His every action. We do not have this attribute and therefore risk is and will always be a reality, but we do have that promise, *But not a hair of your head will perish*. That will do for me! But remember also, the Gospel **IS** a life and death issue!

Risk from a Scientists' point of View

David Kay was able to attend the 2003 Christians in Science Sheffield Conference on the topic of "Risk". He has stimulated us to reproduce the abstracts of three presentations to the conference. They are reproduced by kind permission from the authors.

Assessing Risk: Science or Art? – Derek Burke

There was an excellent Science Minister a few years ago who wanted a 'Richter scale of risk'; an agreed figure that we scientists could give him that would accurately represent risk, and which would be accepted by all. This was an impossible dream. Why? After all, once upon a time, all we scientists had to do was to decide whether a novel food, a novel medicine, a novel technology was safe or not and the public would accept what we, the experts said. We knew best. But times have changed. Because of BSE, because of nuclear power station accidents, because of damage to the environment, science and scientists are no longer trusted as they were. What has happened? Is there anything that we can we do about it? In particular what have we to offer as Christians?

At one time, all we thought we had to do was a technocratic assessment of risk: a purely technical process that arrived at a figure, often a negative power of ten, and expressed all risks on the same scale. We very soon discovered that the way that we scientists see risk was different from the way the consumer sees risk, for example, over so called GM foods. Value systems are different and since we cannot make decisions for the consumer, we had to widen the regulatory process; consumers had to be involved and were.

Then there were ethical issues. We very quickly found that some risks which seemed perfectly acceptable to scientists were unacceptable to consumers because of ethical concerns. Ways of identifying and dealing with such concerns had to be found, and were.

The next development was the use of the precautionary principle, but the problem there is that it can be interpreted in so many different ways. At its most extreme, it means that no risk however small is acceptable, and that of course means that we would never introduce any new technology. So how do we weigh risks which are as yet undefined? What about “unknowns” and “unknown unknowns”? And how do we weigh risks against benefits?

Finally, we now have to recognize societal influences, so we are in the process of opening up the risk assessment process, widening membership of committees, publishing the agenda, publishing Minutes, meeting in public, using much wider consultation about difficult issues, all to rebuild confidence in the outcome. The process is not easy to work.

Finally what are we to say as Christians? Many of the concerns that face new technologies arise because people think they are “unnatural”. There is in society a widespread romantic view of nature which sees everything “natural” as good and any thing tampered with by man as bad. I think that this is because, in an age of widespread unbelief, what is “natural” becomes the “good”. We worship the Creator of the natural.

Finally what are we to say as Christians about the loss of trust – in science and scientists? Society cannot function without some trust. Trust too is central to Christian faith: trust in God and trust in each other is a pillar of faith. We who live in a cynical society have to demonstrate that trust is still reasonable and workable, and live lives of integrity.

The complete article by Derek Burke has been published in Science and Christian Belief, Volume 16 (1) April 2004, pp.27-44.

Risk, Creativity & Innovation – John Ling

The assessment of “risk” in general and technical management is important. In multinational corporations, educational systems, in meteorology and in the domestic arena, risks are constantly assessed and reassessed.

Huge costs are associated with the failure to manage risk properly. The collapse of WorldCom, Enron and the Mirror pension fund under Maxwell have vividly highlighted the risks that are taken and the importance of assessing in whom we can reasonably put our trust. The recent Higgs report on boardroom governance has highlighted recommendations for reform in the British boardroom in order to manage risk, asserting the need for newly defined roles for non-executive directors.

The development of new and emergent technologies continually brings issues of risk into technology management, for example, legal and commercial factors as well as moral, ethical and spiritual concerns. Increasingly the way these issues are considered has global impact. Companies like Monsanto, who have sought to develop genetically modified foods, have paid a heavy price for the perception of “risk”.

It is often said that change involves risk. However the risks of not changing need also to be considered. For example, it is self evident that in recent years there has been a rise in the use of computers and information technology. Therefore it makes sense to include these areas in the traditional school and university curriculum. In the area of meteorology the Kyoto declaration has clearly gone some way to address the risks of standing still and has persuaded many of the need for active management where this is achievable.

Creativity and innovation are closely associated with change. This is because creativity is often seen as value generative. However, it is inherently difficult to measure the value of creativity at any given time. It is also clear that not all creativity is helpful or timely. Optimism would dictate that innovation, that is, creativity leading to change in action, might be more useful. Reality, however, more usually informs that the uptake of innovation is dictated by market demand which can be fickle, unprincipled or uneducated. It is therefore argued that the process of taking an idea through development to marketing and commercialisation requires good political and social governance if it is to find a sustainable basis.

The Christian may reasonably assert that they have a moral frame that has lasted the test of time and which follows Christ's example of integrity and discipline. They look, through the hopeful expectation of grace, to implement these principles for sustained, good governance exercised in the spirit of love for the benefit of all nations.

Health, Safety & Ergonomics – Andrew D J Pinder

The purpose of this paper is to give an overview of how health and safety professionals deal with risk, to look at how this relates to public perceptions of risk, to give examples from a specific priority area, and to comment on the relationship between the biblical worldview and this view of risk.

Risk is a concept that means different things to different people. The Health and Safety Executive uses the slogan "Reducing Risks – Protecting People". In this context, 'risk' is defined as the probability that someone will be harmed by a hazard. Less precisely, it is often used to mean both the hazard and the harm. In principle, risk can be quantified but, in practice, it is often almost impossible to do so. However, hazards can often be ranked in order of severity of the consequent harm.

The levels of risks that we accept are variable and depend on perceptions of the nature of the hazards and the magnitude and nature of the consequences. In some circumstances we will accept only negligible risk (nuclear power, trains, fairgrounds). Broadly acceptable risks are those which are generally not questioned (e.g., low back pain). Tolerable risks are accepted because the perceived benefits outweigh the perceived costs (e.g., road transport). Other risks are deemed unacceptable (e.g., variant CJD from beef on the bone).

Ergonomics is the study of the relationship between people and the working environment. One aspect deals with issues of health and safety and therefore of risk. One current priority is the area of musculoskeletal disorders. These account for approximately one third of the over 3 day accidents reported to HSE and are a major economic cost. In particular, industrial manual handling is associated with an increased incidence of low back pain. However, 60-80% of the population will suffer from an episode of low back pain at some point in their life. Fortunately, it is low severity since most cases get better within a few weeks but it is often recurrent. (It is a curious fact that there are no cases recorded of Jesus healing anyone with simple mechanical low back pain.) Most of the current methods of assessing the risks of manual handling are subjective. The more objective models either estimate risk relative to a standard task or sum absolute risk scores derived from the intensity of particular risk factors.

The Bible does not deal with risk in the way that it is currently understood. However, there are important themes such as dealing with danger and the hazards and costs of being one of God's people. Unfortunately, there is considerable scope for confusion due to misapprehensions that faith is risky, ranging from the popular cliché "faith is spelt R I S K" to the philosophical arguments of Pascal's wager and Kierkegaard's "leap of faith".

***Disclaimer:** The views expressed are those of the author and not necessarily those of the Health and Safety Executive.*

Something of Myself

Chris Rasiah *answers some questions*

Why are you an Engineer?

It was quite natural to move into Engineering. Even though no one in the close family is an engineer I felt the attraction to it. I remember as a teenager thinking that it was rather fulfilling to see things built. I had good GCSE results and especially enjoyed Chemistry. The route into engineering is very established. I did my “A” levels in Mathematics, Chemistry and Physics.

During my sixth form, what clinched engineering, specifically Chemical Engineering, was a presentation by the Chemical Industry Association. At the time they promoted the stability of the industry and the need for chemicals for most things. Later that year, I also had the opportunity to do a BP sponsored three-day course at Swansea University promoting Chemical Engineering. The course offered a breadth of opportunity in Chemical engineering from commercial aspects to actually building something with considerations of the environment and people. That excited me and clinched my decision to choose Chemical engineering.

How has being a Christian affected your work?

I realised that as a Christian, the Lord wants us to make our lives point to him. As a Christian engineer my work should offer the opportunity to add value to society and also glorify His name in my actions and works. I feel my work does this in a number of ways:

- By considering health and safety issues in building a chemical plant. This upholds integrity and shows a respect for life.
- Consideration of environmental issues in my design work shows a respect for the World that God created.
- In my job I come into contact with people from all walks of life, which is an ideal opportunity for evangelism. I am open about my faith and colleagues at work know that I am a committed Christian.
- I have sought God’s guidance in my career decisions and have been blessed that God has presented me with a job offer to meet my needs.

What is your current job?

I presently work for an oil and gas Consultancy based in Central London. My role as a process engineer can vary on different projects. I can work on conceptual studies for new field developments or Front Engineering Design (FED), which start to size equipment and define the process. Presently I am working on a project where we are determining the best way to develop an oil and gas reserve.

Would you recommend Engineering as a career and why?

Of course I would recommend engineering. It offers such a diverse opportunity where one can focus on one area or take a broader picture. Engineering has a lot of practical uses in society. It can be a stepping stone to serving the practical needs in less developed countries such as providing clean water.

I still do not have any regrets in following a career in Chemical Engineering nor could I imagine doing anything else.

Building the Kingdom with Brass Tacks

David Kay *highlights a missionary endeavour*

There are many well known Missionary organisations. A large proportion have existed for many years, although there are a few which are relatively young. Not so well known are related organisations engaged in Mission Support. A considerable number of these organisations have been founded over the last two or three decades. An example is *Brass Tacks*, which dates from 1986. It is a registered charity set up in the UK to provide practical support for Christian projects and general missionary work. As its name implies, *Brass Tacks* operates in technical areas, and has periodical requirements for technical advisors with specialist knowledge. For this reason *Brass Tacks* may be of interest to engineers.

“Brass Tacks” stands for “British Assemblies Tactical Support”. It is a Yorkshire expression used by drapers. Historically, when a decision to purchase material was made, the material was measured along a line of brass tacks on the back of the counter. The tacks were hammered at 3-inch intervals. The expression means: “to get on with things, down to basics” (down to Brass Tacks).

Brass Tacks is an Open Brethren organisation, is autonomous, and works with a number of mission organisations that agree with its basis of faith. It has three specific objectives:

1. To relieve missionaries and full time Christian workers of their work in planning and undertaking construction projects and building maintenance
2. To build new or extend existing schools, camps, church buildings, children’s homes, hospitals and recording studios
3. To encourage Christians by involving them in mission work

A hydro-electric scheme in Zambia

At present *Brass Tacks* has three full-time workers and 80 volunteers who have worked on over 70 projects across 21 different countries, especially Africa. Typical engineering projects are hydro-electric schemes, or other water installations. *Brass Tacks* is already involved in the construction aspects of a new hydro-electric scheme in Kalene, which is in the north-west province of Zambia. The purpose of the scheme is to provide electricity for a hospital, school, farm and villages. When completed, the management arrangements will take the form of a co-operative. There may be a specific requirement for engineers to provide support as the work progresses.

More generally, the work of *Brass Tacks* is overseen by Trustees, who have a wide knowledge of missionary matters and needs. Applications for new projects are handled by a Project Selection Group. *Brass Tacks* is financed by church giving, individuals’ gifts and some Charitable Trusts.

Volunteers are men and women from evangelical churches in the UK. They must be dedicated to the Lord Jesus Christ, and must also be committed members of their local fellowship. They are usually guests of the missionaries; thus, they live just as the missionary does. As far as costs are concerned, volunteers are required only to cover their own travel costs. Many volunteers have returned for additional trips. Since the work began, the full-time workers and volunteers have put in a total of over 10,000 man-days of effort.

For further information, contact Brass Tacks at:

17 Osborne Avenue, WALLASEY CH45 1JD, UK; Tel. +44(0)151 630 1182; website: www.brass-tacks.org.uk.

The Christians at Work Conference

David Kay reports on the conference

The CEA contribution

It is customary for CEA to provide a seminar speaker for the Annual Conference of Christians at Work. This year we invited Prof. Jan Wright, who works in the Mechanical Engineering Department at the University of Manchester, to introduce the seminar.

Jan's topic was "The Engineer's Conscience", although the actual presentation was widened to make it applicable to as many people as possible.

Ethical issues are not new in engineering. In the past the realisation that asbestos and tobacco were harmful to health, and that significant loss of life was occurring in the railway, mining and ship-building industries, must have touched the conscience of a number of thoughtful people.

In his introductory message, Jan referred to the fact that we live in an ever more complex society, where there are many great benefits of technology and scientific development. Unfortunately, there are also many disastrous consequences. Our "tinkering" with nature has caused us to push at and beyond the boundary of right and wrong. Some technological developments, aimed at improving our security in the face of terrorism, have made an impact on our freedom. Technology has also led to terrifying methods of warfare, and "efficient" killing machines. Higher standards of living have caused a depletion of natural resources. The growth in travel has contributed significantly to air pollution.

Two key aspects of our lives are:

1. The content of our work
2. How we treat people in the work environment

Some principles were identified:

1. We should be led to honour God as we observe "good" developments in technology.
2. We should recognise and measure our lives against absolutes of right and wrong.
3. We should be constrained by the command to love our neighbour.
4. We should strive to work for equality, and, in particular, help the poor.
5. Technological developments should respect the earth's resources.

Jan highlighted the term "networking", a relatively recent concept relating to getting business by developing opportunities. However, it is so easy just to "use" people, ditching them when it suits us.

Scripture verses in the handout were:

Gen 1v28

Dan 12v4

Heb 1v10-11, quoting Psalm 102

Rom 12v2, 9

Ecc – general reference to the "everything is meaningless" theme

Ecc 12v13

Finally, as redeemed people, we should expect God to guide us. He may lead us into something new if, through the Holy Spirit, our conscience is touched about our current work activities.

As usual, the discussion at the seminar was lively, but was time-limited.

Committee Report

Your committee met on the 6th November 2004 at John Baden Fuller's home in Leicester. It had a clear agenda with specific discussions on the next issue of the journal, a review of the Christians at work conference and membership numbers.

John Baden Fuller was editor in charge of the Winter CEA journal. It was apparent that there was a lack of material from CEA members. This was a concern and it was felt an area where members should be encouraged to support their journal. The Summer issue of the CEA journal was reviewed and discussed. This aim was to provide greater accountability to readers and highlight ways of improving the journal. David Kaye volunteered to review future issues of the journal to ensure a consistent standard was met.

The Christians at Work conference was discussed. This was a good event overall. CEA's involvement was to provide a guest speaker, who was Professor Jan Wright. He led a very good session opening a lively discussion on the problems faced with evangelism in the workplace and suggested the Christian engineer's perspective in the workplace. Though there was a good turnout to the event there were no CEA members outside the committee present.

Membership numbers were discussed. There had been no change. It was highlighted that there are initiatives under way to promote CEA to final year undergraduates and newly graduated engineers. This work is in liaison with UCCF. The aim next year by UCCF is to hold a graduate conference about working life and promote all the professional groups with a CEA representative present. The CEA website was discussed with a need to improve and update it. A call to members or graduates to assist in this task was seen as the best way forward.

Overall the meeting was productive in assessing actions and tasks to be carried out. The next meeting has been arranged for February 2005.