

Fraser Alexander Mackie – Consultant engineer

06/01/1976

Profile

I am a freelance consultant specialising in safety & reliability analysis servicing a wide variety of industries. Specifically my work assists clients with deterministic & probabilistic analysis. Simply put this means measuring risk based on known physical limits, environmental conditions or indeed historical events.

Whilst the subject matter can indeed be complex, it is with some satisfaction that my studies are prepared in such a way so as to make them approachable for the wider audience. And thereby allowing key stakeholders to take confidence in their decisions.

Keywords: Integrated Logistical Support, Reliability analysis, Safety engineer, RELEX, Windchill Quality Solutions, Failure Modes & Effects Analysis (FMEA), FMECA, MTBF, RAM analysis, RAMS, Whole Life Cost (WLC), life cycle, risk assessment, Weibull, Poisson, Markov, RBD, Monte Carlo, HALT, ALT, Spares analysis, SAE ARP4761, IEC 60812, IEC 60508, IEC 62380 MIL-HDBK-1629, MIL-HDBK-217, MIL-HDBK-338, DEF-STAN 00-600, EN50126, The Yellow book, Common Safety Method on Risk Evaluation & Assessment CSM REA, OREDA

Scope of intervention

- Manage and implement new methods of working
- Enable clients and associated stakeholders with confident decision making
- Employ cross industry experience to identify & enable best practice

Project highlights

2014

Rolls Royce Deutschland – Lean Burn Flow Scheduling Valve research

2014

ALSTOM Transport – Consultation to facilitate RAMS implementation

2013 – 2014

FACC AG – Paper comparing composite reliability prediction approaches & WLC

2013

FACC AG – COMAC C919 Composite spoiler assembly reliability prediction

2012 - 2014

AKER Solutions – Rochelle Oil & Gas subsea control system RAMS analysis

2012 - 2014

FACC AG – Paper on COMAC C919 Composite reliability prediction

2012 – 2013

ALSTOM Transport Deutschland – RELEX / RAMS implementation consultation

2012 – 2012

Supply Design Ltd – Mayflower product assurance & reliability assessment

2011 - 2012

MTU Aero Engines – TP400 Engine Protection & Monitoring unit safety analysis

2010 – 2011

Quiet Revolution Ltd – QR5 v1.4 Vertical axis wind turbine reliability analysis

2010 – 2011

Rolls Royce Deutschland – V2500, BR700 fleet support / risk assessment

2009 - 2010

Marshall Aerospace – C130 Hercules Aircraft cockpit upgrade

2008 - 2009

THALES Air Defence – Starstreak self-propelled high-velocity missile system

2008

THALES Aerospace – Watchkeeper UAV reliability analysis

2007 – 2010

Rolls Royce Marine – Tenfjord & Frydenbö steering gear ILS support

2005 – 2006

National Air Traffic Services – Terminal Control & Military Air RADAR relocation

2005

EADS – Typhoon Aircraft Crypto Variable Management unit, Reliability & FMECA

Summary of Third-level Experience

1995-1998

Glasgow Caledonian University - BSc Electronic Engineering

Extra Curricular Courses/studies

2004 – 2006

University of Strathclyde

Whilst working with MacTaggart Scott I undertook a part time masters course in Operational Research. After two years of study I decided the course was steering me away from my core engineering interests and I made the difficult decision not to pursue the course any further. However during the course I successfully completed the following subjects:

- Statistics
- Simulation and systems
- Performance measurement
- Mathematical modelling
- Forecasting
- Information systems
- Working with organisations
- Organisations
- Decision support
- Support skills
- Consulting skills
- Operations strategy

2002

RELEX Reliability (Birmingham)

1988 - 2001

Leadership effectiveness; Advanced microwave theory; EMC Design; Data communications; RADAR fundamentals; Project risk management; Systems Engineering practice; Report writing; Presentation skills

Career History

Position: Safety & reliability consultant

Sector: Aerospace

Client location: Berlin, Germany

Contract type: Freelance

Duration: < 1 year

Position: Reliability consultant

Sector: Rail

Client location: Salzgitter, Germany; Reichshoffen, France

Contract type: Freelance / Part time

Duration: 9 months

Position: Reliability consultant

Sector: Aerospace

Client location: Vienna, Austria

Contract type: Purchase order

Duration: 1 month, Jan 2014

Position: Reliability consultant

Sector: Aerospace

Client location: Vienna, Austria

Contract type: Purchase order

Duration: 1 month, Nov 2013

Rolls-Royce Aerospace - <http://www.rolls-royce.com/civil/about/>

My third opportunity to provide services to Rolls Royce over the years. This particular project concerns the introduction of Lean Burn technology to existing and future Rolls Royce aero engines. The aim of the technology is to improve the environmental profile of the engines by ensuring fewer hydrocarbons are emitted as a result of combustion. This is a research project in the early stages of development with first test flights set to begin within the next 6-12 months, it has therefore been exciting to see the output of my work influence changes in design.

Specifically my job has been to understand the safety & reliability constraints from introducing a newly developed Flow Scheduling Valve that will control the manner in which fuel is burnt. Several milestones were agreed to develop this understanding, which included an Event Tree, a Functional Hazard Assessment, a Deterministic failure rate prediction, and FMECA.

ALSTOM Transport Deutschland GmbH - <http://www.alstom.com/Germany/>

My second opportunity to provide services to Alstom Transport. Previously my services were retained for a Swedish project to ensure Whole Life Costs were satisfied from the analytical perspective. Specifically the activities were relating to the implementation of EN 50126 and IEC 60812.

This scope of work is largely consultation based. My duties have been to facilitate key stakeholders both internal and external to Alstom Transport with the correct implementation of RAMS activities as described in the standards mentioned above.

FACC AG - <http://www.facc.com/en>

FACC are a high technology company who specialise in the development and production of primary and secondary aircraft components made of composite materials. Their lightweight solutions have seen them become the preferred supplier of many aircraft manufacturers, including winglets for the Boeing 787 Dreamliner.

From earlier work delivered to my client it became clear to them the data used for composite failure rate prediction and the impact to whole life cost shared a telling relationship. That is the quality of data used was proportional to up front capital expenditure and through-life maintenance costs.

The paper discussed three approaches to gathering data for the stochastic process known as Weibull analysis. Discussion also included the time & cost of procurement of for each approach and the accuracy that would be achieved. The data gathered would then be used for a 'physics of failure' model such as the Arrhenius function, which describes the chemical process as a function of temperature.

FACC AG - <http://www.facc.com/en>

This short-term package of work was to prepare a reliability prediction for a spoiler assembly to be used on the COMAC C919 aircraft. The prediction made used of mechanical standards such as NSWC, and the NPRD catalogue. The composite material prediction made use of Weibull data gathered from the composite materials handbook MIL-HDBK-17. The data gathered was in turn used to determine a material failure rate based on the operating conditions of the spoiler assembly.

Position: Reliability consultant
Sector: Oil & Gas
Client location: Aberdeen, Scotland
Contract type: Freelance
Duration: September 12 –

AKER Solutions - <http://www.akersolutions.com>

AKER Solutions provides oilfield products, systems and services for customers in the oil and gas industry worldwide. Demands for increased quality of their subsea control systems and associated projects had led them to seek experience from alternative industries. That was when the phone rang.

The Rochelle Field development programme concerns the recovery of natural gas condensate from the Rochelle field operated by Endeavour Energy Ltd. The field is located in the North Sea some 185 kilometres from Aberdeen, UK. My client is contracted to provide the topside and subsea systems necessary for control and recovery of this resource.

As consultant to the Rochelle project it is my responsibility to provide the management and delivery of activities to demonstrate the installation shall meet or exceed the end client's required availability targets. These activities include the preparation of reliability prediction and failure mode analysis in accordance with standards such as OREDA 2009 and API RP 17N. Beyond this other industry experience is introduced where the benefit is shown to have advantageous outcomes. This benefit is most notable when historical data for dynamic components is substituted with those practices that consider material coefficients. The application of procedures in the NSWC (Naval Surface Warfare Catalogue, Handbook of reliability prediction procedures for mechanical equipment) is one such example. This standard has been employed to demonstrate the changes to predicted component reliability when use and material quality is considered.

Position: Reliability consultant
Sector: Aerospace
Client location: Vienna, Austria
Contract type: Freelance
Duration: 1 month, Sep 2012

FACC AG - <http://www.facc.com/en>

This short-term package of work was to assist my client with the methods required for developing reliability prediction techniques of a composite winglet to be used on the COMAC C919 aircraft.

The very nature of composite materials makes the traditional stress versus strength deterministic approach for reliability prediction redundant. Only with isotropic materials is this approach most successful. The delivery in this instance was a written paper describing the probabilistic approach to reliability prediction. Details included the planning and procedure with which new production could be tested to verify the required customer reliability allocations. The paper is public and available on request.

Position: Reliability consultant
Sector: Rail
Client location: Salzgitter, Germany
Contract type: Freelance / Retainer
Duration: August 2012 –

ALSTOM Transport Deutschland GmbH - <http://www.alstom.com/Germany/>

ALSTOM transport is one of the leading suppliers of complete railway solutions for passenger and freight transport. Their customers include railway authorities, municipal and private operators in Europe and all over the world.

My client's interests are focused towards reducing both manufacturer and customer Whole Life Costs. This is achieved by recognising that capital expenditure shall be mitigated through planned & corrective maintenance activities that are the result of a coherent Reliability, Availability, Maintainability, & Safety [RAMS] assessment.

Facilitating the increased awareness of the necessary RAMS activities, in accordance with EN 50126, incorporated a move away from highly configurable worksheets of MS Excel to the software tool known as RELEX. (Now called Windchill quality solutions).

As consultant to this change in process my activities comprise:

1. The understanding of my client's way of working when performing RAMS activities so that they may successfully utilise the benefits of the new software.
2. That the introduction of new processes meets the obligations of EN 50126 and IEC 60812.
3. That I support key stakeholders within the company to ensure the correct implantation of the newly introduced processes.

Position: Reliability consultant
Sector: Commercial
Client location: Scotland
Contract type: Freelance
Duration: February 12 to May 12

Position: Senior Safety & Reliability Engineer
Sector: Aerospace
Location: Munich, Germany
Contract type: Freelance
Duration: February 11 to Dec 11

Position: Consultant engineer
Sector: Renewable energy
Location: London, UK
Type: Direct Work package
Duration: October 10 to April 11

Supply Design Ltd - <http://www.supplydesign.com/>

The purpose of this project has been to establish the reliability and environmental performance of the SSE (formerly Scottish and Southern Energy) Mayflower Lighting System.

Mayflower Complete Lighting Control systems, a trading name of Scottish & Southern Energy Contracting limited and part of the Scottish & Southern Energy group, requested a verification assessment of their street lighting control system. The system controls and manages a number of streetlight nodes together with their associated equipment controlled by radio link network.

The reliability assessment consisted of several elements, which were summarised by identifying: The long-term product confidence, the most cost effective reliability verification method, the warranty assessment, the cost of replacement, and finally the client reputation damage associated with unit failure.

The system consisted of outdoor and indoor elements. In addition, the outdoor elements were not restricted to the same geographical location. The product reliability assessment was required to consider the impact to function from the climates of sub Saharan Africa to outlying coastal regions of the northern hemisphere. The assessment would also consider the impact of cumulative heat & thermal cycling (such as diurnal cycling), shock, vibration, water ingress, and solar/UV resistance.

Beyond the environmental and reliability assessment a HALT plan was written to further support the verification of the product reliability by identifying unknown failure modes.

MTU Aero Engines - <http://www.mtu.de/en/index.html>

The Airbus A400M transport aircraft is fitted with TP400-D6 engines, developed and built as part of a joint venture between Industria de Turbo Propulsores, MTU Aero Engines, Rolls Royce, and Snecma. For the TP400-D6 engine programme, MTU develops and produces the intermediate-pressure compressor, turbine and shaft, the engine protection and monitoring unit (EPMU) as well as the engine control software.

My function in this project has been to demonstrate customer operational safety and reliability criteria have been met through analysis and/or simulation. The work included the management of external companies that would perform reliability and FMEA activities. Internally my technical function was to produce and develop the analysis to consider system level effects, which external organisations would have no knowledge of. Additionally I would develop a process for understanding the impact of Single Event Effects (SEE) and Single Event Upsets (SEU) on complex semiconductors due to atmospheric radiation.

The scope of work employed the use of ARP 4761, ARP 5580, and IEC TS 62396 process management for avionics, atmospheric radiation effects.

Quiet Revolution Ltd - <http://www.quietrevolution.com/>

An exciting opportunity to be involved with the development of a new design of wind turbine. Quiet Revolution Ltd has developed an innovative vertical axis wind turbine for use in urban environments. This design offers a number of advantages over the more traditional turbine in terms of function and location.

An internal requirement driven by Quiet Revolution had meant a need to understand mechanical and electronic reliability of their qr5 product so that design feedback and maintenance activities could be planned. In some cases the analysis was tailored for specific installations. A Statement of Work was prepared and agreed before an analysis and report would commence, which was delivered within the agreed timeframe for delivery.

The scope of work employed the use of Windchill Quality solutions (RELEX), NSW Mechanical reliability prediction techniques, Telcordia, MIL-HDBK 217. It was also necessary to support the client with the acquisition of various materials that would support the analysis.

Position: Senior Safety & Reliability Engineer
Sector: Commercial aerospace
Location: Berlin, Germany
Type: Freelance
Duration: April 09 to February 10

Position: Senior ILS Engineer
Sector: Aerospace
Location: Cambridge
Contract type: Work package
Duration: Dec 09 to May 2010
Clearance: SC

Position: Senior ILS Engineer
Sector: Defence
Location: Bedfordshire
Type: Contract
Duration: October 09 to Dec 09
Clearance: SC

Rolls-Royce Aerospace - <http://www.rolls-royce.com/civil/about/>

A repeat opportunity to work with Rolls-Royce once again. In the mid 1980's Rolls-Royce took the decision to have an engine available for as many new aircraft as possible. The result has seen the company's share of the civil engine market triple during those two decades to a current level of 30%.

Over the years a growing need for supporting the safety and reliability of the already in service fleet has emerged. Specifically for engine types BR710, BR715, BR725 & the V2500.

My duties were to provide fleet support for the products mentioned above. Largely these activities involve using data from operators after an event has occurred in order to assess the safety and reliability of the fleet. Using techniques such as Weibull analysis, Monte Carlo simulation and Fly Forward models I am able to anticipate likely future events. The outcome of the analysis allows Rolls-Royce to put in place changes to maintenance schedules or indeed instruct their operators to take immediate mitigating action to make their operations safe.

Marshall Aerospace - www.marshallaerospace.com

Approaching 80 years in aircraft engineering, Marshall's Aerospace is one of Europe's leading privately owned aerospace companies, operating as both a manufacturer and maintainer of military and commercial aircraft.

The Royal Netherlands Air Force C-130 Hercules aircraft cockpit electronics have undergone a major upgrade to meet increased operational requirements.

My job was to satisfy an internal requirement [for management team within Marshall's] to ensure the safe and reliable design of the C-130 cockpit upgrade. Upon my recommendation we planned and constructed a bespoke failure mode analysis [FMEA] that examined the upgraded equipment of the cockpit at the interface level. This approach gained favour after considering the project maturity. It had been reasoned that this approach also offered the most cost effective method to establish that a safe design had been achieved while consuming the least time to deliver results.

Lockheed Martin - www.lockheedmartin.com

The Future Rapid Effects System (FRES) is a proposed replacement to the fleet of currently in service vehicles used by the British army. The proposed family of tracked vehicles shall offer enhanced electronic capabilities and provide a multi function role.

Lockheed Martin is assisting General Dynamics with the Scout Vehicle (SV) variant by proposing a modular turret with a close in defence capability. The design must be supportable while achieving the best value for money.

The submission for the bid was November 2009. My task was to investigate the through life support cost of operating and maintaining the turret's proposed design. This included a spares analysis, understanding the turnaround times from OEM's and identifying potential obsolescence issues.

Position: Reliability/Safety Eng
Sector: Defence
Location: Belfast
Type: Contract
Duration: April 09 to Oct 09
Clearance: SC

THALES Air Defence - www.thalesgroup.com/uk

The STARSTREAK self-propelled high-velocity missile (SP-HVM) system has been in service with the UK armed forces since 1997. Mounted on a BAE SYSTEMS tracked vehicle the system provides a close in defence capability to the UK armed forces. The UK armed forces now wish to ensure the availability & safety of this system through to its end of life date. In doing so a complete analysis of the upgraded command and control systems has been approved.

My task was to investigate, identify, and perform failure modes, effects & criticality analysis [FMECA] on the new equipment that constitutes the upgrade. The FMECA is a tailored analysis that specifically examines the input/output [I/O channels] of the entire electrical system. The main objective of the analysis was to identify mission & safety critical consequences of system failures and rank them in accordance with the procedures identified in MIL-STD-1629A. This data shall then be used make decisions for the design and construction of built-in-test equipment.

The reliability data that supports the criticality analysis is procured from a variety of sources, which include: Field data, in-house analysis conducted by the client, and my own analysis using the 217 standard. All analysis was conducted using my own procured software, RELEX.

Position: Reliability/Safety Eng
Sector: Defence
Location: London
Type: Contract
Duration: 8 months from Sep 08
Clearance: SC

THALES Aerospace - www.thalesgroup.com/uk

The WATCHKEEPER programme is to develop & supply an unmanned air vehicle (UAV) for the British army that will provide intelligence, surveillance, target acquisition and reconnaissance (ISTAR) information. The UAV does not support any defensive capability, as there is also a civilian requirement for the UAV.

My task was to assist the WATCHKEEPER Prime Contract Management Office (PCMO) with reliability prediction & safety analysis. In addition to this function I was also responsible for the total accumulation of Failure Rate data from various suppliers to predict system reliability through to developing a top-level system FMECA. WATCHKEEPER is a complicated programme involving many stakeholders, thus in the gathering of this data it was important to capture all pertinent information whilst ensuring that no undesirable end effects went unforeseen. Ensuring the success of the mission without compromising safety was my top priority.

In addition to the above task the client required that I interface with the Integrated Product Team (IPT) at Abbey wood [Bristol, UK] on a regular basis to ensure that they were delivering the completed requirements to the customer's satisfaction. Previous engagements with the IPT, prior to this client, have allowed me to maintain an advantageous relationship with IPT. This provided me with important insights that allowed me to help the client understand the customer's needs.

This position requires an in depth knowledge of Defence Standard 00-56 (and SAE ARP 4761) Safety management requirements & defence standard 00-40 Reliability & Maintainability.

Position: Senior ILS/Reliability Eng

Sector: Marine

Location: Norway

Type: Contract

Duration: Apr 07 - 2009

Clearance: Not required

Rolls-Royce Marine - www.rolls-royce.com/marine

Rolls-Royce Marine has been a manufacturer of surface vessel steering gear systems for over 50 years. The latter years have seen an increase in the number of ILS requirements from commercial and defence customers. To meet this requirement Rolls Royce are now having to produce an ever increasing amount of data relating to their two main steering gear products, Tenfjord & Frydenbö.

The end customers were focused towards minimising life cycle cost, which is one of the core objectives of ILS. I had to prove to the end clients that the legacy equipment was reliable, as the product design took place long before ILS was considered.

Fulfilling this requirement began with providing reliability data for the two steering gear systems from a component level. MTBF data was gathered from sources such as manufacturers and the NSWC (Naval surface warfare centre reliability handbook). Reliability analysis was conducted in accordance with Mil Std 756. In addition FMEA work was carried out in accordance with Mil Std 1629 for the Tenfjord steering gear system. Safety hazards were identified however they were rescinded because of a Lloyd's requirement.

A bespoke spares calculator was developed for Rolls Royce allowing the sales team to produce a spares quote based on MTBF data and operational behaviour of the equipment. It was necessary for the bidding team to produce a quick yet accurate spares list suited to the end user requirements. This spares tool provided a competitive edge during ITT (Invitation to tender) over my client's competitors.

In addition to the above tasks there was also a need to develop the existing technical documentation to a standard more widely recognised by the end customers (defence standard 00-60). Experience gained from previous employment has allowed me to adapt resources to suit Rolls-Royce Marine's desired delivery package, which I now understand fulfilled their customer's requirement thanks to some positive feedback.

Position: Senior ILS Engineer

Sector: Commercial

Location: Hampshire

Type: Contract

Duration: 17 months from Dec 05

Clearance level: SC

National Air Traffic Services (NATS) - www.nats.co.uk

The main deliverable of this position was to assist with the smooth transfer and installation of bespoke (and sometimes commercial off the shelf (COTS)) equipment for the new London terminal control & military air RADAR system based at Southampton.

I was also required to consult on the best way forward for the continuing maintenance strategy of obsolete equipment. Solutions considered were to 'replace by design' or continue with an 'End of Life' purchase for the length of the project. Several factors were considered during the analysis not to mention cost. For sparing the Poisson distribution method was used to determine quantities while minimising the risk of stock-out against a predetermined availability target.

Working in the commercial sector introduced new challenges perhaps the most testing of these was translating the dynamic requirements of the end users to the organisation's suppliers. Following standards within the defence industry (such as DEF-STAN 00-60 & 00-40) has been key to my day to day working practice, this experience allowed me to keep my focus in delivering the needs of my customer when objectivity became clouded. My client recognised the supportability benefits this approach offered and I was rewarded as a result. I was offered to continue with a new project at the end of this contract by which time a position in Norway was brought my attention.

Position: Senior ILS/Reliability Analyst

Sector: Defence security

Location: Newport, Wales

Type: Contract

Duration: 6 months from Jun 05

Clearance level: SC

Position: ILS/Reliability Engineer

Sector: Marine

Location: Edinburgh

Type: Permanent

Duration: 2002 to Jun 2005

Clearance level: SC

Position: Design Engineer

Sector: Defence

Location: Dundee Technology Park

Type: Permanent

Duration: 2001 to 2002

Clearance level: SC

Position: Systems Engineer

Sector: Defence

Location: Glasgow

Type: Permanent

Duration: 1998 to 2001

Clearance level: SC

EADS Defence & Security Systems (formally Cogent) - www.eads.net

Day-to-day duties included the management and implementation of ILS activities for the crypto communications project ACVMU (Aircraft Crypto Variable Management Unit) within the Eurofighter aircraft project. This unique opportunity allowed to me to take control and manage my own activities to the client's satisfaction, which I found very rewarding and enjoyable.

Activities included:

- Reliability Predictions, in accordance with MIL-HDBK-217 Notice 2
- FMECA
- Sub-contractor management/support
- Assist the preparation and delivery of all commercial and military bid documentation
- Maintaining close liaison and excellent working relationships with the customer

I also assisted with logistic support for the Skynet 5 project.

MacTaggart Scott & Co. Ltd - www.mactag.com

Working as an Integrated Logistics Support/Reliability engineer I was involved in many new defence projects. My duties included the creation of handbooks & manuals for various clients around the globe. During this time my experience of implementing the procedures of Def Stan 00-60 grew considerably.

I was the sole producer of reliability models (incorporating Reliability Block Diagrams RBD) for the company. The models I produced determined weak areas of a system highlighting the possibility for introducing some form of redundancy. On top of this my models were used to determine a suitable spares list for the client whether the constraints were budget or performance related.

Besides the above duties I also enjoyed participating in the negotiations of new contracts where support issues were becoming of evermore importance to our clients.

WL Gore & Associates - www.gore.com/en_xx/products/cables/microwave

In this position I supported application engineers and product specialists with the design of microwave cable assemblies and their interfaces (i.e. connectors). Designing for manufacture models had to be accurate and without error. Most if not all projects were for Avionics, i.e. Eurofighter project.

Responsibilities included the management of numerous projects, from the point of customer request to concept design and then onto prototyping. I was the only person controlling and driving the project and therefore the onus was on me to make sure the work was completed on time and to company standards.

The working environment within GORE is very different to most companies in that a lateral environment is used and there is no hierarchical structure. This way of working encourages creativity, leadership, and thus keeps motivation high.

BAE Systems Marine Ltd - www.baesystems.com

My duties and responsibilities as Systems Engineer (Brunei Project)

- Hazard Analysis and Management
- Integrated Logistics Support (ILS)
- Change Management
- Resource Support to Priority Activities
- Support Equipment and Trials Material
- Maintenance – Management and Co-ordination of subcontractor activity
- Risk Management

Prior to my duties on the Brunei project I was part of the Forward Design group. Working within a small group of twenty people whose responsibility was to respond to Requests for Information (RFI) from potential clients. It was my shared responsibility to identify the requirements from the compliance matrix, identifying any ambiguous statements. Duties would also include creating & preparing initial Product Design ideas from the information made available by a multidisciplinary group.

Position: Apprentice Electrician

Location: Oban

Type: Permanent

Duration: 1994 to 1995

OBAN ELECTRICS

Apprentice electrician working in the electrical installation industry. During my time here I followed instructions written out by the IEE as a guide for installation procedures. Realising that the challenge of the work did not fulfil my capabilities I pursued a degree in Electronic Engineering.

Interests and activities

My interests are twofold at present. The first is a passion for travelling, learning and understanding the ways of other cultures. My solo experiences thus far have included Australia & Hong Kong. Most recently I have travelled to New Zealand, Norway, Zanzibar (Tanzania) & India. I have also travelled to many European destinations.

My second is the exploration of the sciences, in particular physics, which is of much interest to me. Since graduating in Electronic Engineering I have enjoyed following the many developments in popular scientific magazines such as New Scientist. Subjects of particular interest include the development of clean energy generation. I also enjoy reading about the latest ideas in cosmology, when time allows I explore my own ideas by writing about them.

Keywords

Integrated Logistical Support, Reliability analysis, Safety engineer, RELEX, Windchill Quality Solutions, Failure Modes & Effects Analysis (FMEA), FMECA, MTBF, RAM analysis, RAMS, Whole Life Cost (WLC), life cycle, risk assessment, Weibull, Poisson, Markov, RBD, Monte Carlo, HALT, ALT, Spares analysis, SAE ARP4761, IEC 60812, IEC 60508, IEC 62380 MIL-HDBK-1629, MIL-HDBK-217, MIL-HDBK-338, DEF-STAN 00-600, EN50126, The Yellow book, Common Safety Method on Risk Evaluation & Assessment CSM REA, OREDA