
Ben Cook

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I have 20 years' experience in embedded systems, software and electronic hardware design for aerospace and defence applications. I have delivered proven equipment designs for operation in harsh physical and electromagnetic environments and for safety-critical applications. I hold MoD Security Clearance to both SC and DV levels.

Education



Loughborough University

Systems Engineering Meng (Hons)

Sept 1994 – July 1999 • 4 yrs 10 mos

Loughborough, Leicestershire, UK

5 year MEng Systems Engineering (Hons) degree. I was awarded 2:i.

This course was jointly developed by British Aerospace and Loughborough University, and was unique for its time. I was awarded a five year undergraduate bursary by British Aerospace Defence Ltd, and had the opportunity to work for the company during summer vacations and during a year in industry. In doing so, I also received a Diploma in Industrial Studies (DIS).

I specialised in electronic systems design through the selection of final and penultimate year modules.

I served on the Staff / Student Committee between 1994 and 1996.

Upon graduation, I was awarded the 1999 Institute of Measurement and Control prize for my final year project, which was an avionic system test rig for a UAV (Unmanned Aerial Vehicle)



University of Bolton

Short Course in Systems Design using FPGAs

Oct 2007 – February 2008 • 4 mos

Bolton, Lancashire, UK

This was one of a number of courses offered by the University of Bolton as part of a Continuing Professional Development (CPD) programme.

I needed to develop some new skills with FPGAs, so I enrolled on this 12 week (200 hour) part time course. This was self-funded, although I did receive a small bursary from the Engineering and Physical Sciences Research Council (EPSRC).

The course was practical in nature and taught FPGA programming using Verilog HDL and design flows using the ALTERA Quartus II environment for CYCLONE II FPGAs.

Employment



Director & System Design Specialist
Airspeed Electronics Ltd

Oct 2018 – Present

Hitchin, Hertfordshire, UK

In October 2018 I incorporated a new limited company called Airspeed Electronics Ltd.

Airspeed Electronics Ltd is an electronic design consultancy based in the United Kingdom. We specialise in designing high-reliability embedded systems for operation in demanding environments, such as aerospace, defence, and industrial applications. Our expertise covers systems engineering, software and hardware design disciplines. We focus on rapid prototype development, high integrity embedded systems design and conducting research studies into emerging electronic technology and applications.

<http://www.airspeed-electronics.com>



Electronic Design Consultant

BJC Designs

Jun 2014 – Oct 2018 • 4 yrs 4 mos

Hitchin, Hertfordshire, UK

In parallel to my day-job at MBDA, I also engaged in freelance design and development work of embedded systems. In 2014, I created a business enterprise called BJC DESIGNS, which I used as a trading entity for this.

I picked up a number of jobs, including the development of a CANbus control system for a phased array SATCOM antenna system. This involved development of hardware, embedded software and the co-specification of the communication data interface.



CANbus Node Controller



A Prototype



Altium Design

Technical Expert – Digital Electronic Design & Architecture

MBDA Missile Systems

Jun 2014 – Dec 2018 • 4 yrs 7 mos

Stevenage, Hertfordshire, UK

In 2014 I accepted the role of Technical Expert for the area of *Digital Electronic Design and Architecture*. The Technical Expert scheme comprises a number of individuals across the company who are recognised for expertise in their field. My remit was twofold; firstly, to provide technical direction to Electronic Engineering managers across multiple projects, and secondly, to identify and exploit new electronic technology and to develop future electrical architectures and methods for missile electronic design. I tried to split my time equally between supporting current projects and working on the next generation of technology and techniques. For the future technology, I led or conducted research and development activities in the following areas:

- Missile electrical and electronic architecture, improved system partitioning, more modular electronic systems for missiles and ground equipment
- Contactless / wireless technologies, with a specific focus on EHF RF communications and contactless power transmission
- Miniaturisation of electronics
- Digital transmission of safety related information

Due to the international nature of MBDA, many of these concepts are developed with our international colleagues. I travelled frequently to France, Germany and Italy in order to develop these ideas further. I also co-presented some of this material at a large research conference in Lille. I also won numerous Innovation awards and a business award from MBDA.

I picked up a number of one-off, or novel engineering jobs, which would not otherwise warrant a full production engineering design process. For example, I developed the safety system electrical architecture for a prototype Laser Directed Energy Weapon (LDEW) system and have also developed one-off trials electronic hardware to accurately control fast moving mechanisms.

In 2016, I developed and delivered a training module about Missile Electronics to a cohort of Officers from the Singaporean Navy.

For a number of years, I actively participated in recruitment activities, and interviewed and recruited a large number of Electronic Engineers, who continue to serve the company. I had to learn how to gauge the values, motivations and technical capability of the candidates, and how to moderate my interview technique accordingly. I enjoyed coaching some of the junior engineers in the business, to help them develop their skills and progress them in their careers.



Laser Weapon at DSEI 2018

Principal Electronic Design Engineer

MBDA Missile Systems

Apr 2008 – Jun 2014 • 6 yrs 3 mos

Stevenage, Hertfordshire, UK

I relocated from the north of England to work for MBDA in 2008. I spent a number of years leading the design of electronic equipment for missile systems which were in the early stages of development. Typically my involvement covered taking early concepts to a state where they were fit for flight trials. Some examples of my work include:

- Detailed design of DSP-based closed-loop motor drive hardware for flight control actuators used in a Loitering Munition
- UK hardware design team lead for an Anglo-French development of a re-useable FPGA-based computer module
- Hardware Design Authority and team lead for the CAMM missile Electronics & Processing Unit (guidance computer). 7 direct reports, with peak manning at 14 men. Task package management with a value of circa. £2.49m.
- Hardware Design Authority and team lead for ASRAAM missile Electronics & Processing Unit (guidance computer).

In addition to system and electronic design, this task involves a lot of Verification and Validation tasks (i.e. firstly, checking you have built the right thing, and secondly, checking that you've built it right). In addition to meeting the functional requirements, other important considerations for military electronics are system safety, information security, operation in harsh physical and electromagnetic environments, long-term reliability, self-test and diagnostics, designing for manufacture and through-life cost. I have learnt a lot in this job about how to produce high-quality, aerospace grade designs, which not only meet requirements, but also satisfy the intent of the end-user.



Fireshadow Loitering Munition



CAMM / Sea Ceptor



Senior Electronic Design Engineer

Ferranti Technologies Ltd

Feb 2005 – Apr 2008 • 3 yrs 3 mos

Oldham, Lancashire, UK

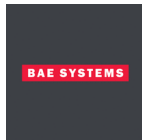
I joined Ferranti Technologies at their Cairo Mill site in Oldham in 2005. My job was to develop a family of three-phase switched-mode power converters and a 5kW emergency inverter for the Airbus A400M Atlas military transport aircraft. The converters were used to convert aircraft three-phase power into domestic mains for running Medevac equipment onboard the aircraft. The emergency inverter was used to hold up essential aircraft systems during the deployment of a Ram-Air Turbine (RAT) during power failure conditions. My contribution to this design was to develop a number of closed-loop control boards, which were used to control a high power IGBT bridge module in order to produce a synthesised AC power output. We had to ensure compliance with Airbus' strict power quality and EMC requirements, which were specified in so called 'Airbus Directives'. These are very similar to, and in some cases facsimiles of US MIL-STD and UK DEF-STAN technical specifications. As there was also a safety aspect to this equipment, we needed to show design assurance to safety processes of DO-254, DAL level B.

In addition to this hardware design task, I was responsible for producing behavioural and functional models of the power converters in SABER. SABER is an electrical system modelling tool similar to Berkeley SPICE, albeit that it can be used to model much larger systems by approximating some of the high-frequency effects. These models were produced as part of the contractual agreement with our customer, Airbus, who integrated them into their aircraft power system simulation.

I learnt a lot at Ferranti about power systems, EMC and analogue electronic design. I developed some lab-craft skills which have since served me well. For example, how to know when an oscilloscope is lying to you, troubleshooting techniques, mitigating EMC issues and real-world experience of tuning unstable control loops.



Airbus A400M Atlas



Battlespace Architect, C4ISR Missile Defence

BAE SYSTEMS

Apr 2003 – Feb 2005 • 1 yr 11 mos

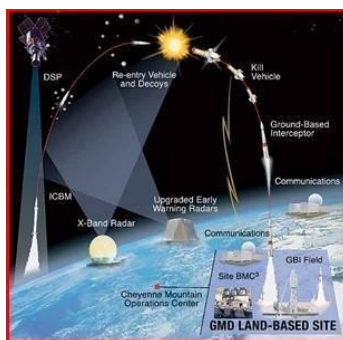
Warton Aerodrome, Lancashire, UK

In the early 2000's, BAE SYSTEMS set up a business unit to focus on activities related to C4ISR (Command & Control, Communications, Computing, Intelligence, Surveillance and Reconnaissance). I joined a team in this Business Unit to develop concept systems architectures for a National Ballistic Missile Defence System. This was a battlespace "system-of-system" design job, where our lowest level components were already established, complex systems in their own right (for example a warship, satellite or early-warning radar). We were given the title of "Battlespace Architects", but it was in fact Systems Engineering, albeit at a higher level of abstraction than I had previously been used to.

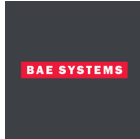
I helped to develop a man-in-the-loop computer simulation of a nuclear missile strike launched from a peninsula in East Asia, targeting the eastern seaboard of the United States, and London. This simulation was ultimately used in a real-time transatlantic 'wargaming' training exercise connecting two Command and Control centres in the UK and US, with the objective of evaluating the efficacy of various postulated multi-national command and control regimes. We worked with various external experts to develop accurate behavioural models of the human and machine components on both 'friendly' and 'hostile' sides.

I had to learn new methods to describe the battlespace we were designing, specifically DoDAF and MoDAF architecture frameworks, and the use of IDEF notation (which is similar to UML). I used a tool called System Architect by IBM to capture the design, and travelled to various locations to talk to experts about radars, missiles and satellites.

This job was a fascinating excursion in my career, but I ultimately decided that I wanted to work on low level hardware and software problems, so I left BAE SYSTEMS in 2005.



Ballistic Missile Defence



Embedded Software Engineer, Eurofighter Avionics IPT

BAE SYSTEMS

Aug 2001 – Apr 2003 • 1 yr 9 mos

Warton Aerodrome, Lancashire, UK

I moved into an Embedded Software Development team in 2001, in order to expand my programming and software development skills. This team was part of the Eurofighter Avionics IPT (Integrated Product Team). My job was to develop and test ADA code for the aircraft's cockpit computers. Initially I developed software for the Cockpit Interface Unit. I introduced the Defensive Aids Sub-System and Microwave Landing System data entry panel functionality to the left-hand glare shield. I then went on to work on the Computer Symbol Generator, which produces the symbology for the three head-down displays. The code I produced went into the only two Typhoon development aircraft flying in the UK at the time (DA2 and DA4), and subsequent Instrumented Production Aircraft. (DA2 and DA4 now reside at the Imperial War Museum in Duxford, and the RAF museum in Hendon, respectively). I used to work in closed proximity to these aircraft, which were actively flying from Warton on a daily basis at this time. Having your concentration interrupted by a pair of EJ200 turbofans in reheat is a visceral reminder of what you are doing!

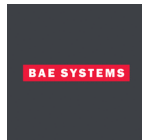
The wider IPT was multi-disciplinary, and meant that I had to work closely with Hardware Equipment Engineers, Human Factors engineers, and Test and Proving engineers throughout the development lifecycle of my code. As a language, ADA is somewhat obsolete these days, however, the skills I picked up in producing robust, maintainable code have stayed with me, such as the use of objects, encapsulation, code walk-throughs, software unit testing and hardware / software integration. Most of the embedded software I have produced since this job has been using the 'C' language, or some variant of 'C'. The design processes I learnt at BAe have stayed with me though. To me, proper testing of embedded software and firmware involves the use of oscilloscopes and logic analysers. In other words, you haven't tested it unless you've measured something physical in the 'real' world.



Eurofighter Typhoon



Typhoon Cockpit



Electronic Systems Engineer, Systems Engineering R&D

BAE SYSTEMS

September 1999 – Aug 2001 • 2 yrs

Warton Aerodrome, Lancashire, UK

Following graduation, I re-joined British Aerospace (which later became BAE SYSTEMS), working for the Systems Engineering R&D department.

Prior to the American F-22, aircraft systems used many bespoke 'black boxes' connected via different electrical interfaces. These units each implement a system function, such as flight control, navigation, or weapon system management. This is known as a 'federated' avionics system and is commonplace in most 20th century aircraft. The cost of this escalates quickly with system complexity. In the early 1990's, BAe identified this trend, and started to invest in developing Integrated Modular Avionics (IMA). IMA comprises a system of generic processing modules, interconnected on a common high-speed data network. In developing common specifications for the modules, suppliers compete to provide Commercial Off-The-Shelf technology, which greatly reduces system cost. The challenge then becomes how to concurrently host multiple functions on common physical hardware without compromising performance.

I worked on some of the company's early system level concepts for IMA, in particular, System Initialisation and run-time System Reconfiguration, and helped to specify a prototype Real-Time Operating System (RTOS) for use in IMA. I later conducted a study to re-target the functions on Eurofighter Typhoon from a federated to an IMA architecture. In the late 1990's, we were also looking at putting this type of system into a future aircraft concept (known as FOAS at the time).

In addition to the technical nature of this job, I developed some fundamental research skills. For example, how to turn fragile ideas into robust concepts by producing and circulating good quality papers and presentations. I also learnt how to articulate complicated ideas using UML, to show a concept through state, sequential and dataflow oriented descriptions. Throughout my subsequent career, I have used these skills to explain complex technical ideas to non-technical people.



Integrated Modular Avionics (IMA)



FOAS (Future Offensive Air System)



Undergraduate Systems Engineer

British Aerospace, Military Aircraft Division

July 1995 – Sept 1999 • 4 yrs 3 mos

Warton Aerodrome, Lancashire, and Farnborough, Hampshire UK

I received a bursary from the military aircraft division of British Aerospace whilst at university. I was also able to work for them during summer vacations and through a year-long industrial placement. This gave me around 18 months of valuable industrial experience prior to graduation and I was awarded a diploma in Industrial Studies in addition to my master's degree. As an undergraduate, I was seconded into the following projects and departments:

- Harrier II Mission System Qualification Test: Based at Farnborough. I developed software test scripts for the Harrier Mission Computer (GR7 and US Marine Corps. AV8-B)
- Tornado Project Office: Process improvement change management for Tornado aircraft
- Systems Engineering R&D: Integrated Modular Avionics (IMA) – I assisted with the development of a line replaceable avionics module
- Aerodynamics: I worked on an EC funded project using genetic algorithms to optimise wing design for fast jets
- Stealth Facilities: I developed an Uncertainty Budget for a facility used to test stealthy materials



US Marine Corps. Harrier AV8-B

Other Courses and Training

Jul-18	Power Distribution Design Course	University of Oxford
Jun-18	Applying Practical EMI Design and Troubleshooting Techniques	University of Oxford
May-17	STM32 GFX Training Course	ST Microelectronics
Mar-17	STM32 Workshop	ST Microelectronics
Nov-16	Negotiating Skills	MBDA
Sep-16	Triz Advanced Workshop	Oxford Creativity
Mar-16	The Art of Influence and Conflict Management	MBDA
Jan-16	Tempest & EM Security Training Course	Qinetiq
Jan-16	CANOpen Protocol Training Course	ISIT
Sep-15	Technical Experts Training Program	MBDA / College de polytechnique, Paris
Jun-15	The Science of Data Visualisation	The O.R. Society
Nov-14	Basic TRIZ workshop	Oxford Creativity
Nov-14	Introduction to Managing Safety	British Safety Council
Oct-13	Introduction to Failure Modes and Effects Analysis (FMEA)	Egerton Consulting
Sep-13	Zuken CR-5000 System Designer training	MBDA
Sep-13	US Export Control ITAR and EAR 99 Legislation	MBDA
Aug-13	Reliability Availability Maintainability Safety (RAMS) General Training Program	MBDA
Apr-13	Foundations in Project Management	MBDA
Jan-12	Manual Handling Training Course	MBDA
Sep-11	High Voltage Electrical Course	MBDA
Apr-07	Schematic Capture with Altium Designer	Premier EDA Solutions
May-05	SABER Introductory Training course	Synopsis
Feb-04	C4ISR 4D Orientation Programme	BAE SYSTEMS
Aug-03	System Architect C4ISR	Popkin Software
Jun-01	1 Week ADA programming course	BAE SYSTEMS
Apr-01	DSE Assessors Course	Messam Rider
Jun-00	3-day STATEMATE System Design Course	BAE SYSTEMS
Jun-00	1-day CRADLE requirements capture course	BAE SYSTEMS
Sep-99	Kaizen	Sid Joynson Partnership
Nov-96	CATIA Basics & Solid Design	IBM UK