

Executive Overview

Broad hands-on design engineering background in the following:

- Product design and development of medical, industrial, scientific, and consumer products
- Component and system-level electronic circuit design encompassing analog, digital, embedded microcontroller, motor drive, RF, and micropower circuits; low and high frequency PCB design and layout; SPICE simulation
- Electronic and electromechanical sensor design; system and motion control design; robotics
- High volume manufacturing, production, and sustaining engineering; overseas manufacturing and sourcing
- Firmware architecture and design, assembly language coding; Freescale, Microchip, and ST microcontrollers
- Design process and documentation; UL, FCC, and FDA approval requirements and certification processes
- Managing projects, business activities, and negotiations related to electronic design, price/supply negotiations and manufacturing; initial product concept ideation

Licensed aircraft mechanic with flight-line experience and a degree in aircraft mechanics and avionics engineering. Affords a unique and solid foundation from which to approach and solve a wide range of electronic / electromechanical engineering challenges. **Proven track record of innovation and bringing money making concepts to market.**

Electronic/ Electromechanical Design Experience (Mechanical to follow)

Owner – Electron Engineering LLC, Brookline, MA

Currently providing electronic design consulting services for Cardiorobotics – a startup company developing a robotic snake for use in certain types of cardiac, throat, and thoracic surgical procedures. This will allow some procedures to be kept minimally invasive thus reducing risk, cost, and recovery time. Responsibilities include system design, circuit design, EMC strategy design, FDA documentation, and motion control system design. Began project in May'09.

Consulted as electronics project manager for Cue Acoustics; a consumer electronics start-up that is producing a tabletop radio to compete in the same market space as the Bose Wave Radio and similar consumer audio products. Brought in and managed an external design firm that completed the detailed component level electronic design. Developed practices and procedures for documentation, revision control, and knowledge capture. Built business relationships with electronic component manufactures and distributors. Assisted in the design of a system-level ESD protection strategy. Worked to place the design into high volume local and overseas manufacturing while working to reduce the BOM costs.

(Mar 07 – Present)

Lead Electronic Design Engineer, Consumer Robotics Division – iRobot Corp., Burlington, MA

Responsible for system and component level analog, digital, embedded microcontroller, sensor, and RF design for iRobot's Roomba robotic vacuum product line, as well as several advanced development projects. Solely responsible from start to finish for the debris sensor, RF communication module, and docking station designs used in the Roomba product line, as well as the microcontroller system architecture for the second generation Roomba. Responsible for extensive high volume component cost savings through aggressive vendor relationship building and business development efforts. Additional responsibilities and experience included:

- Project management involving schedule creation and tracking; budgeting, including collaboration with marketing to flush out preliminary COGS and ROI numbers; design technology and approach risk analysis; working with the legal department on initial IP filings; traveling to India when working with and managing the iRobot India design center resources; working with UL and other approval agencies to gain safety and FCC compliance ratings
- Printed circuit board design, layout, and layout management when internal and external resources were utilized
- Taking designs to production including travel to iRobot's contract manufacturers in China to help create, set-up, and debug assembly processes of engineering pilot manufacturing runs
- Electromechanical design to support sensor development
- Low power design for battery operation and battery charger design for NiMH batteries
- Very high electro-static discharge immunity design as the Roomba product is very much like a Van De Graaff generator that requires specialized and unique ESD mitigation strategies

(July 03 – Feb 08)

Owner – Electron Engineering LLC, Brookline, MA

Electronic circuit design for a low cost, high volume/high reliability medical device for Proven Process Medical Devices. Product focus was analog, microvolt-level sensor signal acquisition and digital processing for a hand-held, disposable, micropower, battery operated surgical device. Electronics worked in conjunction with hydraulic and pneumatic subsystems. Electronics had to be tolerant to EtO gas and electron beam sterilization processes, and low cost given this was a disposable device. Solely responsible for all phases of electronics hardware design, including:

- Design of an electronics hardware module that ensured low component, manufacturing, and testing costs
- Component-level circuit design and simulation of analog sensor and microcontroller-based digital circuitry
- Management of custom LCD design and fabrication outsourcing
- Management of PCB layout and fabrication
- Management of project mechanical (as needed for electronics) and software engineers
- All phases of prototyping, including initial hand-built prototypes and PCB prototypes
- Component-level circuit design of manufacturing test equipment
- Design of manufacturing functional test protocols
- Design, implementation, and documentation of FDA verification test protocols
- Sourcing components, including aggressive vendor negotiating to obtain high volume competitive pricing
- Identifying vendors and setting up multi-million dollar business relationships to support high volume manufacturing (500K/year after ramp up)

(June 02 – July 03)

Electrical Engineer, Engineering and Technology – Design Continuum, Inc., West Newton, MA

Involved in all aspects of electrical engineering to bring products from concept through mass production for a product design firm. Sought new business relationships and brought revenue-generating projects to the company. Projects ranged from consumer products, scientific and medical devices, and interactive art to industrial equipment and controls. Design responsibilities included:

- Component-level circuit design and SPICE simulation of analog, digital, mixed signal, and microcontroller circuitry
- Electromechanical design
- Collaboration with design strategy group, industrial designers and mechanical engineers to explore how to meet end user's product design needs, and how to package electronics into overall product design
- Architecting and writing firmware for embedded devices
- Constructing physical prototypes
- Component selection to meet client's manufacturing target costs, product performance, and agency approval needs
- Management of PCB layout, design, and fabrication using in house and external resources
- Developing strategic client-vendor relationships
- Creating system-level designs and performing RF/Wireless sub-circuit design verification and testing
- Participation in client sales meetings and proposal reviews

(Dec 99 – June 02)

Product Design Engineer – Scott Aviation (Health and Safety Division), Monroe, NC

Involved in new product design from concept through production for fixed and portable gas detection instrumentation and for portable electronic safety devices for firefighters. This included a hand-held infrared vision unit that aids firefighters in finding people and safe exit points in smoke-induced blackout conditions. Responsible for:

- Component level design and SPICE sim of analog, digital, mixed signal, and embedded microcontroller circuits
- PCB layout and design
- Extensive hand-built physical prototype construction
- Design and development of assembly language based, high reliability firmware for microcontroller hardware
- Creation of manufacturing production line test procedures (ISO 9000)
- Component and system level design of manufacturing test equipment
- Design of functionality/cost improvements to existing product line

All designs were compliant with ANSI/UL 913 intrinsic safety specifications for Class 1, 2, 3, Division 1 explosive gas atmospheres.

(Sept 98 – Nov 99)

Electronic Design Engineer / Exhibits Specialist – Discovery Place Inc., Charlotte, NC

Responsible for designing, SPICE simulating, prototyping, constructing, documenting and installing custom application-specific analog, digital, mixed signal and microprocessor based electronic circuitry used in various new sensor-based, interactive exhibits for a hands-on science museum. Responsible for embedded software design and development to support microprocessor based designs. Troubleshoot, repaired, maintained and designed upgrades to the electronic and electromechanical components of existing exhibits. Maintained and repaired audio, video, computer and theatrical lighting equipment used for in-house and traveling exhibits and science shows. Involved in the creative design process for new in-house and traveling exhibits. Presented small science workshops for children. *(May 95 – Feb 98)*

Freelance Electronic / Electromechanical Designer & Consultant, Charlotte, NC; Indianapolis, IN

Responsible for design, prototyping, construction, software development and complete project documentation services from concept through assembled and tested units. Sample projects include:

- **Microprocessor Controlled Solid-State Audio Record / Playback Unit** – Created operator interface for industrial textile machines that communicated (RS-485) with machine's PLC. Unit provided verbal warnings of hazardous conditions, reports of machine status and prompts for operator input.
- **Lighting Controller for World's Largest Anatomically Correct Human Eyeball Model** – (Discovery Place) Designed and built microcontroller based circuit and wrote firmware to sequence graphic panel backlighting for a museum exhibit. Lighting was in sync with audio script identifying anatomical features for museum visitors walking through the eyeball.
- **Electric Eel Discharge Display Meter** – Designed and built complete instrumentation system and large LED-bar graph display for aquatic museum exhibit that showed the electric eel's relative discharge voltage magnitude and polarity. Submerged probe system fed instrumentation amplifier front end, followed by logarithmically responding display drivers for bipolar, 60dB display (eels have quite the dynamic range...).
- **Microprocessor-Based Motion Control System** – Designed and constructed control system hardware and created firmware to provide adjustable timing and sequence control for 26 synchronous AC motors. Unit was used to control motion in dynamic, mixed media art exhibit.
- **Nitrous Oxide Injection Controller** – Designed and built an all analog controller that used K-Type thermocouple as exhaust gas temperature input to servo NO₂ injector solenoid valve. This prevented thermal/mechanical damage to race car engine. Important features included user adjustable temperature, gain, and hysteresis settings and built in self-test modes.
- **Electronic Engine Fuel / Air Mixture Control** – Designed and constructed oxygen sensor-based, analog, closed-loop servo controller for butterfly air valve assembly with user adjustable set point and gain. Valve was used to provide fuel/air mixture ratio control for experimental automotive fuel vapor system.

(1994 – 1999)

Avionics Bench Technician – In-Air Aviation, Indianapolis, IN

Performed testing, troubleshooting and component-level repair for return-to-service of analog Air Data Computers used in the B-727, B-737, DC-8, and DC-9 aircraft auto-flight systems. FAA repair station. *(June 94 – Aug 94)*

Mechanical / Electromechanical Experience**Flight Line Aircraft Mechanic – Piedmont Aviation Services Inc., Monroe, NC**

Performed scheduled and unscheduled inspection, maintenance, troubleshooting and repair on the following commercial aircraft types: B-737-200 and CL-600. Had engine run-up / aircraft taxi qualifications. Worked on engine, airframe, electrical, and avionics systems in a flight line setting at Charlotte-Douglas International Airport, NC.

(Part-time / On-call, Jan 97 – Sept 99)

Industrial Textile Machine Mechanic / Fabricator – Lygad Inc., Matthews, NC

Assisted in fabrication (gas welding, general machining), installation, and troubleshooting of design modifications made to existing machinery. Worked with motor drives, PLCs, pneumatics, and associated motion control components.

Performed redesign and documentation of machine electrical and motor control systems to upgrade machine functionality

(Oct 94 – May 95)

Flight Line Aircraft Mechanic / Lead Night Shift Mechanic – Mountain Air Cargo, Denver, NC

Performed troubleshooting and maintenance of avionics, engine, and airframe systems to ensure on time departure of home-based and quick-turn cargo aircraft in a fast paced flight line environment. Aircraft types included: F-27, SD3-30 and C208. Had Engine Run/Aircraft Taxi qualifications and Required Inspection Item sign-off authority. Set-up and established Oklahoma City maintenance base, and ran single-man outstations on rotating basis in Saint Louis and Oklahoma City. Responsible for Service/Intermediate checks, parts ordering/tracking and general station logistics and operation for FAR Part 121/135 FedEx contractor at Indianapolis, IN station. *(Mar 93 – June 94)*

Airframe and Powerplant Mechanic – Panorama Flight Service, White Plains, NY

Performed troubleshooting and repair of airframe, engines, and electrical systems. Prepared aircraft for 100 hour and annual inspections. Performed general preventative and required maintenance for corporate light twins and general aviation aircraft. *(Summer Internship, May 90 – Aug 90)*

Lab Instructor – Embry-Riddle Aeronautical University, Daytona Beach, FL

Taught troubleshooting techniques and designed repair exercises for reciprocating engines. Maintained and repaired training engines and ground support equipment. Completed overhaul of P&W R-985 engine. *(Feb 89 – Dec 89)*

Patents

- Debris Sensor For Cleaning Apparatus 7,459,871 / 7,288,912 / 6,956,348
- Autonomous Robot Auto-Docking And Energy Management Systems And Methods 7,332,890 / 20050156562 / 20070114975 / 20070267998 / 20080007203
- Robot Confinement 20080039974
- Lawn Care Robot 20080109126
- Remote Fire Extinguisher Station Inspection 7,574,911 / 7,188,679 / 6,585,055 / 6,488,099

Education

B.S. Aircraft Mechanics and Avionics Engineering, Embry-Riddle Aeronautical University, Dec. 1992

Dean's List, 3.56/4.0 cumulative GPA

Professional Licenses

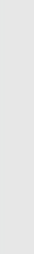
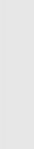



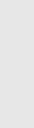
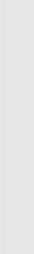



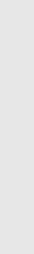


FCC: General Radiotelephone Operator's License with Ship Radar Endorsement, 1992

FAA: Airframe & Powerplant Mechanic licenses, 1990 / 1989
Student Private Pilot, Current

Other Skills

- Milling machine / Lathe / General machine shop fabrication and metal work
- TIG / Oxy-Acetylene welding
- Fine pitch surface mount hand soldering / rework
- Hands-on electrical / mechanical prototype building

Graphical Career History Time Line follows on next page:

ID	Task Name	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	
1	Entry-Grade University Student																								
2	University Student / Lab Instructor																								
3	University Student / A/P Mechanic - Summer Internship, Picoanca																								
4	Fight Line A/P Mechanic, Mountain Air Corp																								
5	Aircraft Bench Technician, In Air Aviation																								
6	Industrial Textile Machine Mechanic / Fabricator, Lygel Inc.																								
7	Electronic Design Engineer Exhibits Specialist, Discovery Place Inc.																								
8	Fight Line Aircraft Mechanic, Polmont Aviation Services Inc.																								
9	Freelance Electronic and Electromechanical Designer & Consultant																								
10	Product Design Engineer, Scott Aviation																								
11	Electrical Engineer, Design Continuum Inc.																								
12	Owner / Electronic Design Engineer, Electron Engineering, LLC																								
13	Lead Electronic Design Engineer, (Robot Corp)																								
14	Owner / Electronic Design Engineer, Electron Engineering, LLC	