LYNN E. COSTLOW

520 Colorado Mountain Rd NE, Rio Rancho NM 87124 925-382-2352 (Day or Night) lcostlow@gmail.com

HIGH-TECHNOLOGY EXECUTIVE

An experienced professional with a strong record of developing products for lean manufacturing using a proactive leadership style built on a background as an accomplished circuit design project engineer. Achievement includes recognized leadership of leading edge, technically challenging development projects for highly successful automotive gyro sensors and flight-critical avionics. Career focus on product developments and production transition. A multi-discipline technical background, a risk mitigation approach to achieve budgeted cost and schedule, extensive experience in Europe and Asia, and fervent commitment to good communication have produced these strengths:

- Program and Project Management
- International Business Experience
- University Research Coordination
- Mixed Signal ASIC Development
- Proposal Strategy/Generation
- Systems/Software/Hardware
- High Volume Manufacturing
- Acquisition Due Diligence
- Fault Tolerant Systems
- Product Design/Development/Qualification
- Silicon and Quartz Inertial MEMS Sensors
- Intellectual Property Management
- Contract Preparation/Negotiation
- Design to Unit Production Cost
- Marketing Presentations
- Production Automation
- Strategic Planning
- Risk Management

PROFESSIONAL EXPERIENCE (at Systron Donner and SiTek)

Systron Donner Inertial (SDI) and Systron Donner Automotive (SDA), Concord CA, and BEI SiTek, Hayward CA, all divisions of Custom Sensors and Technologies (CST). Management positions:

• Director of Engineering, SDA	2006- Dec 2008
• General Manager, SiTek (concurrently)	2004-2005
• Engineering Manager, SDA	2004-2005
• R&D Engineering Manager, SDI	2001-2003
• Engineering Product Manager, SDI	1998-2000
• Manager of Programs, SDI	1995-1997
• R&D Manager/Project Engineer, SDI	1992-1995

SELECTED ACCOMPLISHMENTS (at Systron Donner and SiTek)

1996-2008 Directed engineering team that achieved No. 1 global market share (44 percent in 2007) of MEMS gyroscope Yaw Rate Sensors for automotive brake Electronic Stability Control (ESC) systems. By adapting aerospace piezoelectric quartz gyro technology, guided development of nine successive product generations to successfully lower cost and size 10X in 12 years. Grew automotive revenue from zero to $190M from 1996 to 2002, as key member of Executive Staff. Global vehicle installations exceeded 55 million in years 1996-2008, with peak exceeding 10 million gyros shipped in 2007.

1996-2008 Directed ASIC and quartz gyro R&D that successfully automated factory calibration and continuous temperature compensation to achieve industry-leading performance and significantly lower cost.

2004–2008 Directed silicon inertial MEMS activity leading to successful gyro and accelerometer intellectual property, with 21 patent applications and seven patents. The gyro concepts are unique and technically superior to other known approaches. Coordinated university research with USC and UC Irvine, leading to one USC joint patent and one UCI joint patent application, followed by a patent license agreement for four UCI gyro concepts for product development at SDA.

2004-2005 Appointed General Manager of SiTek silicon MEMS foundry for de-commissioning the facility. Recommended a foundry asset disposal approach that was accepted by CST parent company corporate management. Selectively transitioned best engineering talent to SDA.

2001–2006 **Directed development of SDA's first surface mount device quartz MEMS gyro (the MicroGyro) for automotive ESC and Lane-Keeping applications, currently the highest performance automotive gyro.**

2000–2003 **Significantly reduced ESC system cost by leading development of first automotive Sensor Cluster containing both gyros and accels (2 each) package (SC01 on 2 circuit boards). Further reduced SC01 cost by roughly 20% more by component miniaturization to 1 circuit board (SC03).**

1992-1995 **Led development team for Army missile Inertial Measurement Unit project (3 gyros and 3 accels) that developed four analog ASICs (functional first-pass success with minor performance adjustments) and one 188K gate digital ASIC (complete first-pass success). IMU prototypes were delivered and successfully flown multiple times after crash landings at White Sands Missile Range. A Corporate Board Program Audit validated and commended the technical success.**

PROFESSIONAL EXPERIENCE (at Honeywell and Sperry)

Honeywell, Inc. Defense Avionics Systems Division, Albuquerque NM, and Sperry Flight Systems, Phoenix AZ. Five promotions at these two major avionics divisions of Honeywell:

- **Engineering Manager** **1989-1992**
- **Engineering Department Head** **1982-1988**
- **Engineering Section Head** **1978-1981**
- **Lead Engineer** **1977-1978**
- **Principal Engineer** **1974-1976**
- **Senior Project Engineer** **1971-1973**

SELECTED ACCOMPLISHMENTS (at Honeywell and Sperry)

1989–1992 **Contributed $1.8M savings from 1991-92 $19.6M budgets by better resource management, function consolidation, wasteful practice elimination, and computer workstation management. Selected over eight peers to rescue a difficult production transition of Digital Map/Optical Disk System for AV-8B and F/A-18 aircraft and entered this leading edge product to production.**

1981-1989 **Personally recruited over 75 engineers in 1981-89, as NM site grew from <200 to >2800 employees.**

1982-1989 **Managed original research and development effort on Helmet Mounted Display System using fiber optic technology licensed from Bell Helicopter. Successfully entered production with over 600 units sold to the U.S. Army as the Optical Display Assembly for mounting on ANVIS Night Vision Goggles.**

Key member of corporate-wide Proposal Review Red Team for quadruple redundant C-17 Inertial Reference Unit (IRU) ring laser gyro navigator. Received corporate commendation for program win. Directed winning proposal effort for USAF C-17 transport aircraft Electronic Flight Control System (EFCS). Supported three other C-17 avionics contract wins – Air Data Computer, Multi-Function Display and Flight Management System. Managed C-17 EFCS Systems/Software development with original quadruple redundant architecture.

Supervised successful triple redundant flight control system development for flight demo on C-130 High Technology Test Bed (HTTB). First Sperry use of Jovial/1750 software and force motor servos.

Successfully completed B-1B Flight Controls System Electronics development and production entry. This was one of the most profitable division programs.

1978-1982 **Directed flight computer development for fly-by-wire KC-10A Refueling Boom Control System. Successfully completed development on schedule and cost. Achieved maximum commonality with MD-80 commercial airliner Digital Flight Guidance System for lower development and production cost. Featured first electronic force-feel control side stick for pilot feedback and dual redundant input/output architecture with fully self-monitored single digital processor with analog backup.**

Managed development of highly self-monitored AV-8B Harrier Flight Control Computer (FCC). Managed Phoenix-to-Albuquerque relocation of AV-8B FCC, AV-8B CNI Data Converter (CNIDC) and AH-64 avionics programs. Implemented first avionics production fiber optic link on CNIDC. First AV-8B flight occurred on schedule despite relocation disruption. Successfully completed qual/rel tests.

1977-1978 **Designed first Sperry multi-microprocessor Flight Dynamics Computer architecture intended for the production version of USAF YC-15 Advanced Medium STOL Transport with dual 16-bit processors.**

1975-1978 **Wrote hardware proposal sections on winning KC-10A Refueling Boom Control and MD-80 Digital Flight Guidance System, the first FAA-certified digital flight control for a commercial airliner. The projects featured common digital avionics flight computers, dual input/output structure, power supplies and Maintenance Test Panels for reduced development, production and field support cost.**

1971-1975 **Developed flight control hardware designs for series of NASA research aircraft: CV-990 Space Shuttle Autoland Experiment, C-8A Augmenter Wing STOLAND, UH-1H V/STOLAND and XV-15 Tilt Rotor V/STOLAND programs. The designs featured error free implementations and pioneered Sperry digital flight control technology leading to production contract wins on MD-80 and KC-10.**

1970–1971 **Project Engineer, F & M Systems Company, Dallas TX (industrial control and security system design)**
1967–1970 **Electronic Engineer, E-Systems (formerly LTV Electrosystems), Garland TX (satellite payload design)**

EDUCATION

- **MSEE, Southern Methodist University, Dallas TX, Computer Architecture / Communication Theory**
- **BSEE, University of Texas, Austin TX, Tau Beta Pi and Eta Kappa Nu honor societies, Longhorn Band Engineering Scholarship**

SELECTED PROFESSIONAL DEVELOPMENT

- **AeA/Stanford Executive Institute, two-week course on Strategic Management, Finance and Accounting, Organizational Behavior, Marketing, Operations, Negotiation and Entrepreneurship**
- **Finance and Accounting for Non-Financial Managers**
- **Presenting Data & Information by Edward Tufte ("The Leonardo da Vinci of data", NY Times)**
- **Shainin techniques for failure analysis**
- **Six Sigma quality improvement**

PROFESSIONAL ASSOCIATIONS

- **Professional society memberships at Systron Donner: IEEE, ASME, SAE, ION**
- **Professional society memberships at Honeywell: AIAA, AHS, AIA**

Honeywell external representative:

- **Technical Management Committee, Aerospace Industries Association**
- **Management of Technology Task Force, University of New Mexico/NM Industry/NM National Labs**
- **Honeywell Engineering Scholarship Coordinator, University of New Mexico**

PATENTS

- **US 7,222,533, Torsional rate sensor with momentum balance and mode decoupling**
- **US 7,228,738, Torsional rate sensor with momentum balance and mode decoupling**
- **US 7,360,422, Silicon inertial sensors formed using MEMS**

PUBLICATIONS / CONFERENCE PRESENTATIONS

Authored, co-authored and/or presented 19 publications/presentations in technical journals, trade magazines and/or technical society conferences. List attached.

PUBLICATIONS / CONFERENCE PRESENTATIONS

1 - **Lynn E. Costlow**, "Optimizing Microprocessor Input/Output Techniques", *Computer Design Magazine,* April 1981. Cited with Editorial Excellence Award by Computer Design Magazine.

2 - Gary G. Gaston, **Lynn E. Costlow**, James R. Perry, "A Highly Monitored Digital Flight Control System for the AV-8B Harrier", *AIAA/IEEE 6th Digital Avionics Systems Conference,* Baltimore, Maryland, December 3-6, 1984.

3 - **Lynn E. Costlow**, "A Third Generation, Highly-Monitored, Micromachined Quartz Yaw Rate Sensor for Safety-Critical Vehicle Stability Control", *Proceedings, Sensors Expo 2000*, pp. 53-69, Detroit, Michigan, September 19-21, 2000.

4 - Asad M. Madni, **Lynn E. Costlow**, "A Third Generation, Highly Monitored, Micromachined Quartz Yaw Rate Sensor for Safety-Critical Vehicle Stability Control", *Proceedings, 2001 IEEE Aerospace Conference*, pp. 2523-2534, Big Sky, Montana, March 10-17, 2001.

5 - Asad M. Madni, **Lynn E. Costlow**, Randall P. Jaffe, "Aerospace Technology and Low Automotive Costs Benefit Quartz Micromachined Gyros", *Proceedings, Institute of Navigation 57th Annual Meeting*, Session B1, Paper No. 4., Albuquerque, New Mexico, June 11-13, 2001.

6 - Asad M. Madni, **Lynn E. Costlow**, "Lessons Learned in Aerospace Technology Transfer to Automotive Applications: A Mature Company Undergoes a Start-up Experience," *Proceedings, IEEE International Management Conference (IEMC)*, Paper No. P465, Vol. 2, pp. 854-859, Cambridge, United Kingdom, August 18-20, 2002.

7 - Asad M. Madni, **Lynn E. Costlow**, John LaBoskey, "Full Circle Commercialization of a Quartz Rate Sensor: Aerospace to Automotive to Aerospace", *Proceedings, The 7th International Conference on the Commercialization of Micro and Nano Systems Conference (COMS 2002)*, pp. 443-451, Ypsilanti, Michigan, September 8-12, 2002.

8 - Asad M. Madni, **Lynn E. Costlow**, Stuart J. Knowles, "Common Design Techniques for Quartz Rate Sensors for Both Automotive and Aerospace/Defense Market Applications", *Proceedings, IEEE Sensors, First IEEE International Conference on Sensors*, Orlando, Florida, Paper No. 10.4, Vol. 2, pp. 1597-1602, June 12-14, 2002.

9 - Asad M. Madni, **Lynn E. Costlow**, "A Dual-Use Micromachined Quartz Rate Sensor Technology", *AAAS Annual Meeting,* Denver, Colorado, February 13-18, 2003.

10 - Asad M. Madni, **Lynn E. Costlow**, Stuart J. Knowles, "Common Design Techniques for BEI GyroChip® Quartz Rate Sensors for Both Automotive and Aerospace/Defense Markets," *IEEE Sensors Journal (Transactions)*, Vol. 3, Issue 5, pp. 569-578, October 2003.

11 - Cenk Acar, Andrei Shkel, **Lynn Costlow**, Asad Madni, "Inherently Robust Micromachined Gyroscopes with 2-DOF Sense-Mode Oscillator", *IEEE Sensors 2005, The 4th IEEE Conference on Sensors*, Irvine, California, October 30 – November 3, 2005.

12 - Asad M. Madni, **Lynn E. Costlow**, "Quartz MEMS Gyroscope Sensors", *Encyclopedia of Sensors, Editors: Craig A. Grimes, Elizabeth C. Dickey, Michael V. Pishko, Publisher: American Scientific Publishers,* 10 volumes, 8000 pages, ISBN: 158883056X, October 30, 2005.

13 - Asad M. Madni, **Lynn E. Costlow**, Marc W. Smith, "The *u*Gyro: A Quartz MEMS Automotive Gyroscope", *SAE 2006 World Congress, Session AE7: Intelligent Vehicle Initiative (IVI) Technology,* Paper 2006-01-0143, Detroit, Michigan, April 3-6, 2006.

14 - Huisui Zhang, Qiang Zou, Eun Sok Kim, Asad M. Madni, **Lynn E. Costlow,** Roger F. Wells, "Frequency-Mismatch-Tolerant Silicon Vibratory Gyroscope without Vacuum Package for Automotive Applications", *2006 World Automation Conference (WAC 2006)*, Budapest, Hungary, July 24-26, 2006.

15 - Asad M. Madni, **Lynn E. Costlow,** John LaBoskey, "Managing Configuration Control in an Automotive Sensor Mass Customization Manufacturing Product Line", *2006 World Automation Conference (WAC 2006)*, Budapest, Hungary, July 24-26, 2006.

16 – **Lynn Costlow**, "A MEMS Gyro for the Harsh Engine Compartment Environment", *Sensors Magazine*, April 1, 2007.

17 - Michael Layton, **Lynn Costlow**, Marc Smith, Mark Collins, "MEMS Gyroscope for Electronic Stability Control**",** *Sensors Expo and Conference 2007, Pre-Conference Program 3, Automotive Symposium,* Rosemont, Illinois, June 11, 2007.

18 - **Lynn Costlow**, "Quartz MEMS Gyro Technology Enables Life-Saving Electronic Stability Control (ESC)", *14th Asia Pacific Automotive Engineering Conference (APAC-14)*, Hollywood, California, August 5-8, 2007.

19 - **Lynn E. Costlow**, "Approach and Strategy to Meld Quartz Inertial MEMS Experience with Emerging Silicon Inertial MEMS Capabilities", *Custom Sensors and Technologies (CST) MEMS Conference,* Simi Valley, California, September 17, 2007.