

ELIZABETH R. CANTWELL, PhD.

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- Fellow, AAAS •

BIO-SKETCH

Dr. Elizabeth R. Cantwell (Betsy) is the Senior Vice President for Research & Innovation at the University of Arizona (UA). Dr. Cantwell reports to the UA President and is responsible for a \$735M annual research portfolio, a department staff of 557, and an annual operating budget of \$60M. Her responsibilities include the 1,268-acre UA Tech Park, one of the nation's premier university research parks, with 2 million ft² of office, laboratory, and production space. More than 40 businesses, including IBM and Raytheon, are Tech Park tenants, and contribute \$1.7B annually to the regional economy. Dr. Cantwell came to UA from Arizona State University (ASU) where she served for 4.5 years as the VP for Research Development and the CEO of the ASU Research Enterprise, a 501.c.3 dedicated to translating research to commercial outcomes. There she directed a \$45 million annual budget and an organization of 150, and grew the overall research enterprise at ASU from \$435M to \$~680M.

Prior to ASU, Dr. Cantwell served at the Lawrence Livermore National Laboratory (LLNL) as Director for Economic Development and Director for Engineering Mission Development. Dr. Cantwell spearheaded a progressive strategy for LLNL to accelerate innovation and enhance national economic competitiveness and helped to create the Livermore Valley Open Campus. From 2008-2010, she served as Deputy Associate Director for Global Security at the Oak Ridge National Laboratory, where she worked with the US DOE and the National Nuclear Security Administration, the US DOD, the Defense Threat Reduction Agency and NASA. Prior to joining ORNL, Dr. Cantwell served as the Division Leader for the International and Space Research (ISR) Division and Director for the Threat Reduction Directorate Office of Strategy at the Los Alamos National Laboratory. Earlier, Dr. Cantwell spent a decade at the Lawrence Livermore National Laboratory, where she helped stand up the Homeland Security organization after 9/11. She spent several years at NASA HQ as a Program Manager for the life and microgravity sciences, and conducted research at the Ames, JSC and Glenn Research Centers of NASA.

Dr. Cantwell is a graduate of the University of Pennsylvania, Wharton School (MBA, 2003); the University of California, Berkeley (PhD, Mechanical Engineering, 1992); and the University of Chicago (BA, Human Behavior 1976). She is a current member of the National Academy of Sciences Engineering and Medicine Strategic Planning Committee and has served as the co-Chair of the Aeronautics and Space Engineering Board, and a Member of a number of National Academies studies in space science, space systems engineering, National Laboratories operations and advanced manufacturing.

EDUCATION

University of Pennsylvania, Wharton School

MBA	Finance & Entrepreneurship	2003
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University of California, Berkeley

PhD	Mechanical Engineering	1992
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University of Chicago

BA	Human Behavior	1976
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Professional Registration(s) and Certification(s):

Current security clearances: DOE Q, Top Secret (TS), other specialized clearances

EXPERIENCE

University of Arizona, Tucson, AZ

Senior Vice President, Research & Innovation

8/2019 - present

- Manage the Office of Research, Innovation & Impacts operational budget of \$60M annually (centrally allocated funds + state allocated TRIF), and oversee research expenditures of over \$730M annually and an innovation portfolio of over \$25M in annual operating expenditures.
- Integrate research and development funding across government, commercial, and not-for-profit funding sources to bolster new discoveries.
- Manage the university's Office of Research, Corporate Engagement Programs, Tech Launch Arizona, Research Parks, Arizona FORGE, and the UA Center for Innovation.
- Responsible for bringing discoveries to market through collaborative research, technology licensing, and the creation of new companies to enhance the innovation economy throughout Arizona.
- Directly oversee 12 major university research centers and facilities, including Biosphere 2, Bio5 Institute, Arizona State Museum, and the Udall Center for Studies in Public Policy.

Accomplishments at UA to date include:

- Growth of total research expenditures from \$687M in 2019 to \$735M in 2020 (a 6.5% increase).
- Instituted major new science programs in climate and energy resilience, space science, hypersonics and defense research, and multidisciplinary COVID-19 research.
- Secured \$150M of external funding for medical, space, and optical research.
- Sustained UA research at ~90% of fully funded capacity during the COVID-19 pandemic, based on pandemic continuity of operations plans.

Arizona State University, Tempe, AZ

Vice President, Research Development

2015 - 2019

- Managed operational budget of \$45M annually and oversaw research expenditures of over \$650M annually.
- Created teams across all disciplines within the ASU academic community, working closely with faculty, academic leaders, institute and initiative leaders and center directors to execute strategies for large partnerships and projects, in pursuit of significant increases in research support. Created a Team Leadership Academy to prepare faculty to manage large projects and partnerships – trained over 300 faculty in 4 years.
- Created a growth and partnering strategy for research that focused on National Security, Health and the Energy / Water Nexus, to both develop ideas for strategic, large initiatives (scale and impact) and then to capture and execute these projects.

- Developed and executed strategy in 10 core Grand Challenge areas to take ASU from research expenditures of \$410M in 2015 towards its 2020 target of \$700M.
- Established close working relationships with Entrepreneurship & Innovation (E+I) activities at ASU, the ASU Foundation, corporate relationship initiatives and Arizona Technology Enterprises (AzTE, the tech transfer arm of ASU, now called Skysong Innovations).

Arizona State University Enterprise Partners (ASURE), Scottsdale, AZ

Chief Executive Officer

4/2017 - 8/2019

ASURE is a 501.c.3 applied research unit which specializes in conducting classified and midrange technology readiness level (TRL) services for the defense and security industry. It supports commercial and government clients, with a particular focus on maturing and improving advanced technology products that provide truly innovative advancements for our sponsors. ASURE has domain expertise in military and federal network integration, intelligence, surveillance and reconnaissance; data and services; operations and information assurance; and command and control.

- Provided strategic leadership working with the ASURE board of directors, ASU leadership and the academic units to establish long-range goals, strategies, plans and policies.
 - Grew total contract volume from \$0 to over \$15M in a year.
 - Grew partnerships between ASU and ASURE to a stable of over 50 cleared faculty partners across 6 discipline areas.
- Responsible for building the contracts, security envelope and facilities necessary to meet the needs of our initiatives and drive ASU innovations into large to extremely large programs, specialized contracts, complex consortia, unique business models and classified work.
 - Partnered with City of Mesa, AZ to take over large former UA Air Force SCIF, developing a commercial leasing model that brought 10 new companies in 2 years to the facility.
 - Created and managed 3 secure classified facilities.
 - Created a partnership with Lockheed focused on novel mechanisms to deliver deep space missions.
- Connected the workforce needs of our DoD and Intelligence sponsors with the higher education capacities at ASU.
 - Created and ran classified capstones projects jointly with ASU, GD, Honeywell and Boeing, involving over 20 students.
 - Created and ran 6 Innovation Challenges (over 100 participants each) jointly with ASU, US Army, US Navy and AZ National Guard on AI, drones, mega-city scenario planning, augmented reality, cybersecurity and adaptive training.

Lawrence Livermore National Laboratory (LLNL) Livermore, CA

Director, Office of Economic Development, Director's Office

6/2013 – 1/2015

The Office of Economic Development was created in 2013 to integrate existing functions involving intellectual property management, licensing, sponsored research, and cultivation of partnerships with businesses, industries, entrepreneurs, economic development organizations, and higher education institutions. A key objective was to expand LLNL's access to talent and innovation and impact in the innovation ecosystem of the LLNL region by integrating all of the above elements and enhancing the Lab's access to Silicon Valley.

- Led Public-Private Partnerships and mission-enhancing initiatives with the private sector such as the California Network for Manufacturing Innovation.

- Spearheaded a partnership between the Department of Energy Lawrence Livermore and Sandia National Laboratories to develop a collaboration space outside the two laboratories' fenced perimeters - the Livermore Valley Open Campus (LVOC) – an innovation hub for unclassified research and development activities.
- Established the High Performance Computing Innovation Center (HPCIC) at LVOC to support commercial partnerships to solve grand challenges with high performance computing resources. Between 2011 and 2015, the HPCIC established CRADA and contractual relationships with over 55 private companies, including Applied Materials, US Steel, IBM and Intel.
- Oversaw the Industrial Partnerships Office (IPO), which managed all of the Laboratory's technology transfer activities and industrial partnerships.
 - In 2015, over 80 patents were issued, more than 20 new CRADAs were signed, and almost 400 technology licenses were in place.
- Responsible for developing and championing all external community stakeholder activities and partnership for LLNL.
 - Member of 8 regional economic development boards, including the Silicon Valley Leadership Group.
 - Created the iGATE Innovation Hub, through a collaboration between the City of Livermore, Sandia National Laboratories (Sandia-California), and LLNL to support startups and economic development in the TriValley region of California. iGATE's work is particularly centered around the national labs as anchors of innovation, and the iGATE has incubated and supported over 10 high-tech startups that are commercializing technologies originally developed at LLNL.

Lawrence Livermore National Laboratory (LLNL) Livermore, CA

Director for Mission Development, Engineering Directorate

8/2010 – 6/2013

The Engineering Directorate has ~1600 employees who serve all of the missions at the Laboratory with R&D, technology development, systems implementation, standards development and engineering fabrication. My focus areas were nuclear nonproliferation technologies, energy, advanced manufacturing and advanced laser options for the DoD.

- Responsible for leadership and oversight of strategic plans, innovative technology development approaches and private sector program development for all aspects of the Engineering Directorate.
 - Created targeted LDRD growth strategy for the Engineering Directorate that tripled the Directorate's LDRD funding
 - Created and implemented targeted 3D printing funding growth strategy that resulted in significant new funding from the NNSA for this manufacturing technology area
- Maintained and built collaborative partnerships with Laboratory leaders, managers, and staff and with regional universities, government, and industry partners. Built new joint funding partnerships with 5 UC campuses, Purdue and Georgia Tech.
- Drove a significant culture change within the directorate from a service-based model to an expanded model enabling the Engineering Directorate to become an innovation hub for the Laboratory.
- These efforts resulted in the directorate producing far more high quality internally-funded Laboratory Directed Research & Development (LDRD) ideas, tripling the Directorate's overall LDRD funding to up to \$40M/year. These investments supported new initiatives such as additive manufacturing (3D-printing) - now a ~\$200M funded program in the DOE / NNSA budget.

Oak Ridge National Laboratory (ORNL) Oak Ridge, TN

Deputy Associate Laboratory Director, Global Security Directorate

6/2008 - 8/2010

The Global Security Directorate at ORNL provided strategic leadership, expert project management and technical expertise to develop new businesses within the government and private sector consistent with ORNL's science portfolio and the U.S. national security strategy. The nuclear security portfolio focused on development and deployment of technology that enhanced nuclear nonproliferation and safeguards, reduced threats to nuclear material and facilities at risk and expanded national capabilities in radiation detection and nuclear forensics.

- Grew the Directorate's execution portfolio from \$335M to ~\$410M.
- Led business development efforts, expanding the sponsor base of the directorate from 3 to 10 national security sponsors.
- Created new partnerships with Lockheed, United Technologies and Boeing.
- Engaged with ORNL's 9 University partners to ensure robust engagement across the entire portfolio.

Los Alamos National Laboratory (LANL) Los Alamos, NM

Director, Office of Strategy, Threat Reduction Directorate

9/2007 – 6/2008

The Threat Reduction (now Global Security) Directorate at Los Alamos was an ~1000-person organization focused on "mission-driven science for global threat reduction." Successes were measured through quantifiable improvements in national ability deter, detect, and mitigate the threat of weapons of mass destruction, as well as other asymmetric threats to the nation's well-being. The majority of LANL's Threat Reduction research and development was in support of technologies for detecting and monitoring nuclear materials, nuclear processes and nuclear explosions around the world.

- Lead the Threat Reduction (TR) strategic development strategies, including program pivots and growth, and planning for implementation across the entire Laboratory.
- Represented integrated LANL capabilities broadly to sponsors of new and existing TR programs.
- Developed and implemented new program execution tools to increase efficiency.

Los Alamos National Laboratory (LANL) Los Alamos, NM

Division Leader, International, Space & Response Division

9/2006 - 9/2007

The Intelligence and Space Research (ISR) Division at Los Alamos National Laboratory has been designing, building, operating, and interpreting data from highly innovative ground-based and space-based measurement and detection systems for nearly 60 years, to address some of the most challenging scientific and national security problems facing the world today. I served as part of the Threat Reduction senior management team, responsible for execution of projects from small PI-driven basic science through delivery of large satellites and instruments into the space environment and other field deployments. ISR Division comprised ~ 430 people with a budget of approximately \$120M.

- Responsible for program execution across the entire ISR portfolio, including project management, strategic planning and execution of those plans for new business opportunities, and resource planning and allocation.
- Worked with senior Program leaders and ISR management to maintain and strengthen the S&T base for ISR activities, managed and developed the largely PhD-level workforce, and planned for and executed new science facilities.

- Managed ISR Division through extremely fiscally constrained period, without adversely impacting capability. Set up lean management structure to accomplish all elements of project/program execution while maintaining core space science capability available for new missions.

Los Alamos National Laboratory (LANL) Los Alamos, NM

Manager for Contractor Transition, Threat Reduction Directorate 1/2006 - 6/2006

- Established and conducted processes for identifying new organizational structure for the then-1200-person Directorate and mapped all employees into the new structure.
- Worked with senior managers from new contract team to establish transition processes across the Laboratory

Los Alamos National Laboratory (LANL) Los Alamos, NM

Deputy Division Leader, International, Space & Response (ISR) Division 6/2005 - 9/2006

- Lead research on magnetospheric physics, planetary exploration, gamma-ray astrophysics, space situational awareness, and solar-terrestrial interactions.
- Built and deployed instruments into space / analyzed and interpreted data from these instruments.
- Advanced new measurement methods as well as developed new detection technologies to improve our understanding of signatures and their sources.

Lawrence Livermore National Laboratory (LLNL) Livermore, CA

External Relations, Homeland Security Organization (HSO) 3/2002 - 6/2005

- Member of team that created the Homeland Security Organization at LLNL.
- Developed and implemented partnerships with industry, state and local partners, and developed actionable plans for transitioning Homeland Security R&D to users.
- Lead security experts in threat, vulnerability & risk assessments of integrated infrastructure (e.g., energy, water and transportation).

Lawrence Livermore National Laboratory (LLNL) Livermore, CA

Section Leader, Center for Micro and Nano Technology 2/2000 – 6/2005

- Established a modern lab to permit nanofab, expanding the portfolio of research from \$10M to \$50M and doubling the size of the research science staff (20-40).
- Management lead for research, operations, staffing and strategy for 50-person microfabrication R&D laboratory supporting basic & applied research, national security, nuclear weapons research and optics development.
- Developed technology R&D roadmaps and strategic research plans for keeping the Center viable and effective in an era of difficult financial, operational and policy constraints.

NASA Headquarters

Washington, DC

Program Manager, Office of Biological and Physical Sciences 1998 - 2000

- Lead \$40M technology R&D program in environmental/medical sensors for crewed missions, technology R&D for human support technologies for advanced missions.
- Directed research portfolio across four NASA centers in air, water and waste recycling, habitat controls, human factors design and extravehicular suits.
- Provided science and technical oversight to ground and flight projects, and crafted new model for rapid transition of basic research into NASA missions – strong emphasis on rapid adoption of new technology in human flight missions.

- Analyzed/integrated biology and engineering for medical care, monitoring air, water and microbes, and autonomy.

Lawrence Livermore National Laboratory (LLNL) Livermore, CA

Research Engineer, Environmental Protection Department

1994 – 1998

- Developed new programs for leading edge research in new sensors, overlapping with other LLNL programs in lasers, optics and materials, leading to new programs with DARPA for LLNL at the \$10M per year level, and system-wide adoption by DOE.
- Conducted research in cost/benefit analyses for environmental risks, environmental sensors, database development & management, Design for Environment, groundwater system reliability, and pollution prevention for metal finishing, printed circuit boards, electronics production and paint facilities.

US Environmental Protection Agency (USEPA) Region IX, San Francisco, CA

Lead Engineer, New Projects, Air Division

1992 – 1994

- Translated legal-based process for risk into science and data-based process for permit development and approval.
- Managed Clean Air Act Permit Program for parts of California, Nevada, Arizona & Hawaii
- Developed risk assessment strategies for human health/engineering equipment safety, PRA, FMEA.

NASA, Ames Research Center Mt. View, CA

Research Engineer / Project Manager, Life Sciences Division

1984 - 1992

- Developed and implemented first end-to-end design for closed loop life support system.
- First team to use PRA and quantitative decision processes to look broadly at space shuttle failures.
- Managed projects in decision analysis, design and construction of experimental facilities to simulate complete human life support systems.
- Extensive research in Spacecraft Fire Safety led to successful Space Shuttle experiments in smoldering combustion.
- Participated in post-Challenger Probabilistic Risk Assessment.

SIGNIFICANT PROFESSIONAL SERVICE

- Member, NASEM Strategic Plan Committee, 3/2020-pres.
- Chair, NASA Technical Review on CASIS and the ISS National Lab, 8/2019 - 2/2020.
- Member, National Academy Aeronautics and Space Engineering Board (ASEB), 2013 – 2019.
- Guest Scientist, Lawrence Livermore National Lab, 2015 – Present.
- Member, National Academy Division on Engineering and Physical Sciences (DEPS) Board, 2010 – 2016.
- Member, National Academy Space Science Board (SSB), 2007 – 2013.
- Member, National Research Council Panel to Track and Assess Governance and Management Reform in the Nuclear Security Enterprise, 2016 – 2017.
- Co-Chair, National Research Council Committee on Space-Based Additive Manufacturing, 2014.
- Co-Chair, National Research Council Decadal Study in Life and Physical Sciences Space Research, 2009 – 2011.

- Member, National Research Council Committee on Human Spaceflight Technical panel, 2013 – 2014.
- Committee to Review NASA's Exploration Technology Development Program, 2008.
- Committee on Review of NASA's ISS Roadmap, 2006.
- IOM Committee on the Review of NASA's Bioastronautics Critical Path Roadmap, 2004 – 2005.

CURRENT BOARD MEMBERSHIPS

- University of Arizona Applied Research Corp
- University of Arizona Campus Research Corporation – Executive Committee
- AURA/Space Telescope Science Institute
- The MILO Space Science Institute
- Sigma Sciences Science Advisory Board
- TechSource Advisory Board
- Chair, CASIS Board of Directors. CASIS is the managing entity for the ISS National Lab.

RECOGNITION / PRESENTATIONS

Fellowships

- 2019 AAAS Fellow: Industrial Science & Technology

Selected Presentations

- **Speaker**, Commercial Spaceflight Federation (CSF), "Microgravity Research in the Age of Commercial Access to Space," February 2019.
- **Speaker**, National Council for Science and the Environment (NCSE) Annual Conference "Transforming How Companies Operate in a New Carbon Economy: Industry Leading Innovation," NCSE 2019 Annual Conference: Sustainable Infrastructure & Resilience, January 2019.
- **Speaker**, Washington State University, "A Recipe for Growth: Building the ASU Enterprise," May 2018.
- **Speaker**, Future Tense (a partnership of *Slate*, *The New American*, and Arizona State University), "How Autonomous Vehicles Will Help Us Reimagine Our Cities," March 2018.
- **Speaker**, Dawn of Private Space Science Conference "Innovative Funding Mechanisms for Space Science Missions: A National Lab and Public University Perspective," June 2017.
- **Moderator**, "Partnership Models in the Western Region" at Western Region Innovation Partnership Workshop: Mission Innovation and Clean Tech Acceleration, February 2017.
- **Speaker**, DOE Webinar, Clean energy Technology Innovation, Water-Energy Nexus in the Southwest, September 2016.
- **Speaker**, The McCain Institutes Next Generation Leaders Conference, April 2016.
- **Keynote speaker**, Arizona Technology Enterprises Inventor Recognition Event, March 2016.

- **Speaker**, APLU Institutional Strategies Session: “Global Learning, Research, & Engagement,” representing Arizona State University, 2015.
- **Keynote speaker**, 2nd Annual Smart City Hack Finale: Arizona Institute for Digital Progress, June 2016.
- **Speaker**, Innovation Tri-Valley Forum, Lawrence Livermore National Laboratory and the Regional Innovation Ecosystem, July 2014.
- **Speaker**, “Recapturing a Future for Space Exploration: Research for a New Era,” presented as part of the session: Science from the International Space Station, American Association for the Advancement of Science (AAAS) Annual Meeting, Boston, MA, February 14–18, 2013.
- **Speaker**, Asia-Pacific Center for Security Studies (APCSS), The Interface of Science, Technology & Security, Emerging Energy S&T: Understanding Issues with Potential Security Impacts, November 2012.
- **Speaker**, ESA ISS Space Symposium, The Importance of Research on ISS: A Perspective from the US National Academies Decadal Survey, 2012 Presentation, NASA Advisory Council, Recapturing a Future for Space Exploration: Life and Physical Sciences Research for a New Era, April 2011.
- **Speaker**, Pacific Operational Science & Technology Conference, Defining a Need for Soft Power Tools, March 2010.
- **Speaker**, Resource Assurance: Balancing the Resource Equation, EUCOM/AFRICOM S&T Conference, June 2009.

Major Policy Engagements

- *America’s Human Presence in Low Earth Orbit, Before the Committee on Science, Space, and Technology*, U.S. House of Representatives, May 17, 2018.
- *Life and Physical Sciences in Low Gravity; the Scientist Perspective*, Brief to the Office of Science and Technology Policy and the U.S. Space Council, January 19, 2019.

Lead or Major Contributor

- **Chair**, Decadal Study, “Recapturing a Future for Space Exploration: Life and Physical Sciences Research for a New Era,” The National Academies Press, 2011.
- **Co-Chair**, 3D Printing in Space, The National Academies Press, 2014
- **Lead Author**, “Building a New Carbon Economy: An Innovation Plan,” New Carbon Economy Consortium (NCEC), 2018
- **Reviewer**, “Achieving Science with CubeSats, Thinking Inside the Box,” The National Academies Press, 2016
- **Reviewer**, “NASA Space Technology Roadmaps and Priorities, Restoring NASA’s Technological Edge and Paving the Way for a New Era in Space,” National Academy Press, 2012
- **Reviewer**, “Severe Space Weather Events Understanding Societal and Economic Impacts: A Workshop Report,” The National Academies Press, 2008

- **Committee member**, “Report 1 on Tracking and Assessing Governance and Management Reform in the Nuclear Security Enterprise,” 2017
- **Committee member**, “Predictive Theoretical and Computational Approaches for Additive Manufacturing, Proceedings of a Workshop,” The National Academies Press, 2016
- **Reviewer**, “NASA Space Technology Roadmaps and Priorities, Restoring NASA’s Technological Edge and Paving the Way for a New Era in Space,” National Academy Press, 2012
- **Reviewer**, “Severe Space Weather Events Understanding Societal and Economic Impacts: A Workshop Report,” The National Academies Press, 2008
- **Committee member**, “Report 1 on Tracking and Assessing Governance and Management Reform in the Nuclear Security Enterprise,” 2017
- **Committee member**, “Predictive Theoretical and Computational Approaches for Additive Manufacturing, Proceedings of a Workshop,” The National Academies Press, 2016
- **Committee member**, “Pathways to Exploration, Rationales and Approaches for a U.S. Program of Human Space Exploration,” The National Academies Press, 2014
- **Committee member**, “Sharing the Adventure with the Public: The Value and Excitement of ‘Grand Questions’ of Space Science and Exploration: Summary of a Workshop,” The National Academies Press, 2011
- **Committee member**, “A Constrained Space Exploration Technology Program: A Review of NASA’s Exploration Technology Development Program,” The National Academies Press, 2008
- **Committee member**, Review of NASA Plans for the International Space Station, US Nuclear Regulatory Commission
- **Committee member**, Review of NASA Strategic Roadmaps Space Station Panel, The National Academies Press, 2006
- **Committee member**, Review of NASA Strategic Roadmaps: Space Station Panel, A Risk Reduction Strategy for Human Exploration of Space: A Review of NASA’s Bioastronautics Roadmap, Institute of Medicine Committee, The National Academies Press, 2006
- **Participant**, Leverage. Phase I Sector Study: Water & Manufacturing U.S. Council on Competitiveness, 2016
- **Participant**, Tri-Valley Rising: Its Vital Role in the Bay Area Economy, Bay Area Council Economic Institute, 2014

PUBLICATIONS

20. Jang, W.Y., Paskaleva, B., Hayat, M.M., Bender, S.C., **Cantwell, E.**, and Krishna, S., “Algorithmic Spectrometry and Matched Filtering for Bias Tunable Quantum Dots-in-a-Well Infrared Photodetectors,” IEEE Sensors Journal, Vol. 10, No. 3, 2010.
19. Jang, W.Y., Hayat, M.M., Tyo, J.S., Attaluri, R.S., Vandervelde, T.E., Sharma, Y.D., Sheno, R., Stintz, A., **Cantwell, E.**, Bender, S., and Krishna, S., “Demonstration of Bias Controlled Algorithmic Tuning of Quantum Dots-in-a-Well (DWELL) Mid-Infrared Detectors,” IEEE Journal of Quantum Electronics, Vol. 46, No. 6, 2009
18. Edmunds, T., **Cantwell, E.**, Sholl, P, Yao, Y., Gansemer, J., and Prosnitz, D., “Simulation Analysis of Inspections of International Travelers at Los Angeles International Airport for US-VISIT,” UCRL-TR-20273, February 2004

17. **Cantwell, E.**, "Commercialization Opportunities in Homeland Security," International Conference on Advanced Technologies for Homeland Security, University of Connecticut, December 2003
16. **Cantwell, E.**, Boulanger, R., Barta, D. and Kortenkamp, D., "Integrated Controls for Advanced Life Support Systems," An Introductory Paper for the Plenary Session of the Advanced Controls for Life Support Systems Workshop, Monterey, CA, August 2003
15. **Cantwell, E.**, Coleman, S., Defour, J., Dooher, B.P., Lopez, B., McKinley, S. and Woodward, R., "Vulnerability Assessment for Pueblo Dam and Reservoir and Fountain Valley Conduit, Pueblo, Colorado," UCRL-151560, Lawrence Livermore National Laboratory, Livermore, CA, 2002
14. **Cantwell, E.**, "Early Warning Monitoring to Detect Hazardous Events in Water Supplies," International Life Sciences Institute (ILSI) Risk Sciences Committee Report, December 1999
13. Ahlf, P., **Cantwell, E.**, Ostrach, L, and Pline, A., IAF/IAA-99-G2.03, "Mars Scientific Investigations as a Precursor for Human Exploration," 50th International Astronautical Congress, Amsterdam, The Netherlands, October 4–8, 1999
12. **Cantwell, E.**, "Environmental Applications for Chemical Microsensors," UCRL-AR-134508, June 1999
11. **Cantwell, E.**, "National Ignition Facility Pollution Prevention and Waste Minimization Plan," UCRL-AR-131194, September 1, 1998
10. Dooher, B.P., and **Cantwell, E.**, "Setting Reasonable Remediation Goals Using Risk and Cost/Benefit Considerations to Prioritize Efforts," 8th Annual Conference on Contaminated Soils in Groundwater, Oxnard, CA, March 1998
9. **Cantwell, E.**, "Design for Environment Study for the National Ignition Facility (NIF)," UCRL-AR-124791, December 1997
8. **Cantwell, E.**, "Evaluating the Benefits of a Reliable Groundwater System," Paper #ST3-5, AWWA Water Quality Technology Conference, Denver, CO, November 1997
7. **Cantwell, E.**, Clark, M., Bennett, T., Minskey, B. and Stern, G., "Benefits to the Groundwater Disinfection Regulation from Increased Reliability and Availability of Drinking Water Systems," Report to the Groundwater Disinfection Regulation EPA Workshop, Irvine, CA, March 1997
6. **Cantwell, E.**, and Macler, B.A., "Risk Analysis for Setting Drinking Water Standards for Long- Term Space Missions," SAE 1993 *Transactions: Journal of Aerospace*, Section 1, Pgs. 734–746, 1993
5. Macler, B.A., and **Cantwell, E.**, "Assessment of Environmental Contaminant–Posed Risks to Human Health in Closed Life Support Systems," IAF/IAA-92-0283, The World Space Congress, Washington, DC, September 1992
4. Bilardo, V.J., **Cantwell, E.**, Schlater, N., Forsberg, K., and Mooz, H., "Case Study: Tailoring a Generic System Engineering Process for the Development of Research and Technology Projects," presented at the 2nd National Committee on System Engineering International Symposium, Seattle, WA, July 1992
3. **Cantwell, E.**, and Fernandez-Pello, C., "Smoldering Combustion Under Low Gravity Conditions," AIAA1990-648, 28th Aerospace Sciences Meeting, Reno, NV, January 8–11, 1990
2. **Cantwell, E.**, Robinson, P., Shenk, T., and Upadhye, R., "Automated Simulation as Part of a Design Workstation," NASA TM 102852, August 1990; presented at the 20th Intersociety Conference on Environmental Systems, Williamsburg, VA, July 9–12, 1990; recipient of the NASA Tech Briefs Award, 1990
1. Mehta, R., and **Cantwell, E.**, "Mean Flow and Turbulence Measurements in a Half-Delta Wing Vortex," *Fluid Dynamics Research*, Vol. 4, No. 2, Pgs. 123–137, 1988