

Donald D. Dudenhoeffer (extended biography)

Senior Information Technology Officer (P5), International Atomic Energy Agency (IAEA) Vienna, Austria (March 2012 – June 2018)

Lead for the IAEA's computer security program of activities, coordinating an IAEA team and international experts in supporting 168 Member States in enhancing computer security at nuclear and other radioactive material facilities. Specific accomplishments include:

- Developed a non-existent program into a recognized world leading program in computer security guidance and activities for the nuclear sector.
- Engaged international leadership and experts in computer security and nuclear security by executing over 200 events supporting computer security for Member States.
- Executive editor or major contributor to every IAEA Nuclear Security Series and technical document for guidance on information and computer security document:
 - *Nuclear Security Series (NSS) 17 Computer Security for Nuclear Facilities (contributed as US national expert)*
 - *NSS 23-G Security of Nuclear Information*
 - *NST036 Computer Security of I&C Systems at Nuclear Facilities*
 - *TDL Conducting Computer Security Assessments*
 - *TDL Computer Security Incident Response Preparations*
 - *NST045 Computer Security for Nuclear Security*
 - *NST047 Computer Security Techniques for Nuclear Facilities.*
- Led, as the Scientific Secretary, the first ever IAEA conference dedicated to computer security for nuclear regimes which included: over 700 registered participants from 92 Member States and 16 International Organizations supported by 207 Speakers and Presentations from 87% of the States with nuclear fuel cycle facilities. (<https://www-pub.iaea.org/iaeameetings/46530/International-Conference-on-Computer-Security-in-a-Nuclear-World-Expert-Discussion-and-Exchange>)
- Led international teams in the creation and development of four international training courses in computer security for IAEA Member States including:
 - Conducting Computer Security Assessments at Nuclear Facilities (1 week)
 - Advanced Topics in Computer Security for Nuclear Security Regimes (1 week)
 - Computer Security for Industrial Control Systems at Nuclear Facilities (1 week)
 - Protecting Computer Based Systems in Nuclear Security Regimes (2 weeks).
- Led the development of four eLearning modules on computer security (<http://elearning.iaea.org/m2/course/index.php?categoryid=104>)
 - Introduction to Computer Security for Nuclear Security Practitioners
 - Nuclear Security Threats and Risks: Cyber Threats
 - Securing of Sensitive Nuclear Information (2018 release)
 - Conducting Computer Security Assurance Activities (2018 release).
- Personally coordinated, led and lectured over 40 international training courses for Member State experts in nuclear and computer security.
- Contributing expert to the international nuclear security exercise: Atomic 2012, and Atomic 2014. Additionally, lead editor of draft IAEA guidance on conducting computer security exercises as a nuclear security assurance activity.
- Lead information and computer security expert for multiple advisory missions/assessments for Member States and the IAEA, based on IAEA guidance, ISO 27000 and international best practices.
- Executive editor and contributing author for the university textbook *Cyber Security for Nuclear Security Professionals*, INSEN, Oct 2013.

Senior Vice President, Priority 5 Holdings, Inc. (May 2008 – March 2012)

Program Manager for development and integration of innovative software designed to assist security experts and infrastructure managers in event coordination and response.

- Project Manager for the Office of the Assistant Secretary of Defense (OASD) Knowledge Display and Data Aggregation System (KDAS), a situation awareness and consequence analysis system designed to evaluate critical assets and key resources (CIKR) associated with the Defense Industrial Based (DIB).
- Project Manager for installation of a command and control situation awareness tool for numerous law enforcement organizations including the Greater Lafourche Parish Ports Council and the Arizona Counter Terrorism Information Center (ACTIC) in Phoenix, AZ used by the City of Phoenix for infrastructure management and security during both planned events and unplanned incidents.
- Test Lead and Operator for the Integrated Situation Awareness Visualization Environment (ISAVE) installed at FEMA National Capital Region. The ISAVE system was used to support situation awareness and preparedness for the past 3 US Presidential Inaugurations.
- US Patent Holder for “Event prediction using temporal and geospatial precursor networks.”, Patent number: 9727822 (August 8, 2017)
Assignee: Priority 5 Holdings, Inc.
Inventors: Charles Q. Miller, Allen D. Bierbaum, Donald D. Dudenhoeffer, Anthony J. McDermott, David M. Miller-Klugman

Department Manager, Human Factors and Nuclear Instrumentation and Control

Department, Idaho National Laboratory (INL) (2007- 2008)

(Scientist/Research Project Lead, 1999 – 2007)

Manager of an outstanding group of 17 researchers in Human Factors, Statistical Analysis, and Nuclear Instrumentation and Control at the Idaho National Laboratory, a Department of Energy National Laboratory. Relevant projects while at the INL:

- Lead author of the collaborative effort: “Technology Roadmap on Instrumentation, Control, and Human Machine Interface to Support DOE Advanced Nuclear Power Plant Programs,” developed for Tom O’ Connor, DOE Program Manager. This DOE roadmap identified technology gaps and presents a path forward for integration of Human Factors and I&C technologies/research for Generation IV reactor systems. This was a Level 2 DOE Milestone.
- Program Manager and developer of the “*Critical Infrastructure Interdependency Modeling & Simulation*,” which examined the relationships and interdependencies between critical infrastructure networks. The project involved developing a simulation model to examine the relationships between networks especially in the presence of natural disaster and or terrorist attack. The CIMSuite Tool set was nominated by the INL for a 2007 R&D 100 Award and won the 2007 Idaho Innovations Award. Additionally, the copyrighted CIMS technology has been commercially licensed. CIMSuite was the 2007 winner of the Idaho Innovation Award.
- Project Team Member for the National SCADA Testbed Program and Co-Lead for a commercial SCADA System assessment. My role included developing cooperative research agreements with major SCADA vendors in the United States and assistance in developing the programmatic and project execution plans for evaluating SCADA designs. This included coordinating red-team members while conducting vulnerability assessments for UNIX/ Windows based SCADA networks.
- Project Team Member for the Control System Security Program Evaluation Project. This project sponsored by the National Cyber Security Division (NCSA) of the Department of

Homeland Security, was a survey of current research efforts by government and academia in the field of control system security. I was responsible for collecting and analyzing information from a subset of institutions. This included direct contact and open source research. The findings were published in an external INEEL report to DHS titled: "Evaluation of Control System Security-Related Programs," (2004) INEEL/EXT-04-02131.

COMMANDER (O5) Retired, United States Naval Reserve

United States Naval Officer serving for over 26 years, 12 years active duty as a Submarine Officer and 14 years in the US Naval Reserves in multiple Command positions. Qualifications include nuclear engineering and nuclear weapons safety/security.

PUBLICATIONS

Rowland, M.T, D. Dudenhoeffer, S. Purvis "Computer Security for I&C Systems at Nuclear Facilities", In *Proceedings of the ANS 10th NPIC and HMIT Topical Meeting*, June 2017.

Dudenhoeffer, D. D., M.T. Rowland, J. Hilliard, K. Mrabit "Gates, Guards, Guns and Geeks: The changing face of nuclear security and the IAEA's leading role in promoting computer security for nuclear facilities" in *Proceedings of the ANS 9th NPIC and HMIT Topical Meeting*, February 2015.

Holste, S. T, D.A. Ciccimaro, D. Dudenhoeffer "Increasing the Mobility of Dismounted Marines: Small Unity Mobility Enhancement Technologies: Unmanned Ground Vehicle Market Survey", SPAWAR Systems Center Pacific Technical Report 1988, October 2009.

D. Dudenhoeffer, M. Manic, "Fuzzy simulation for infrastructure effects uncertainty analysis", 20th European Modeling and Simulation Symposium (Simulation in Industry), EMSS08, Campora San Giovanni, Amantea (CS), Italy, Sep. 17-19, 2008

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Dudenhoeffer, D. D., David E. Holcomb, Bruce P. Hallbert, Richard T. Wood, Leonard J. Bond, Don W. Miller, John M. O'Hara, Edward L. Quinn, Humberto E. Garcia, Steven A. Arndt, Joseph Naser, "Technology Roadmap on Instrumentation, Control, and Human Machine Interface to Support DOE Advanced Nuclear Power Plant Programs", INL/EXT-06-11862, March 2007.

Tran, T.Q., Boring, R.L., Dudenhoeffer, D.D., Hallbert, B.P., Keller, M.D., & Anderson, T.M. (2007). Advantages and disadvantages of physiological assessment for next generation control room design. Official *Proceedings of the Joint 8th IEEE Conference on Human Factors and Power Plants and the 13th Annual Workshop on Human Performance/Root Cause/Trending/Operating Experience/Self Assessment*, 259-263.

Tran, T.Q., Gertman, D.I., Dudenhoeffer, D.D., Boring, R.L., & Mecham, A.R. (2007). Cognitive virtualization: Combining cognitive models and virtual environments. Official *Proceedings of the Joint 8th IEEE Conference on Human Factors and Power Plants and the 13th Annual Workshop on Human Performance/Root Cause/Trending/Operating Experience/Self Assessment*, 195-200.

Dudenhoeffer, D.D, M. R. Permann, and M. Manic, "CIMS: A Framework for Infrastructure Interdependency Modeling and Analysis." *Submitted to Proceedings of the 2006 Winter Simulation Conference*, ed L. F. Perrone, F. P. Wieland, J. Liu, B. G. Lawson, D. M. Nicol, and R. M. Fujimoto. Piscataway, New Jersey: Institute of Electrical and Electronics Engineers, 2006.

Dudenhoeffer, D. D., M. R. Permann, and R. L. Boring, 2006. Decision consequence in complex environments: Visualizing decision impact. In *Proceeding of Sharing Solutions for Emergencies and Hazardous Environments. American Nuclear Society Joint Topical Meeting: 9th Emergency Preparedness and Response/11th Robotics and Remote Systems for Hazardous Environments*.

Dudenhoeffer, D.D., Permann, M.R., & Boring, R.L. (2006). "The human factor in network system survivability". *Proceedings of the 8th International Conference on Probabilistic Safety Assessment and Management*, May 14 - 18, 2006, New Orleans, Louisiana, USA, pp. 1-8:PSAM-0090.

Boring, R.L., Dudenhoeffer, D.D., Hallbert, B.P., & Gore, B.F. (2006). Virtual power plant control room and crew modeling using MIDAS. *Joint Halden Reactor Project and CSNI Special Experts' Group on Human and Organisational Factors Workshop on Future Control Station Designs and Human Performance Issues in Nuclear Power Plants*, Paper 5.3 (pp. 1-5).

Pederson P., D. Dudenhoeffer, S. Hartley, M. Permann, *Critical Infrastructure Interdependency Modeling: A Survey of U.S. and International Research*, INL Technical Document: INL/EXT-06-11464, August 2006.

Dudenhoeffer D., P. Pederson, S. Hartley, and M. Permann, "Critical Infrastructure Interdependency Modeling: A survey of U.S. Research", In *Proceedings of CRIS, Third International Conference on Critical Infrastructures*, Alexandria, VA, September 2006.

Hallbert, B.P., Boring, R.L., Gertman, D.I., Dudenhoeffer, D.D., Whaley, A.M., Marble, J.L., Joe, J.C., & Lois, E., *Human Event Repository and Analysis (HERA) System*, Overview, NUREG/CR-6903, Vol. 1, U.S. Nuclear Regulatory Commission, Washington, D.C., July 2006.

Hallbert, B.P., Joe, J.C., Blackwood, L.G., Dudenhoeffer, D.D., & Hansen, K.F. (2006). Developing human performance measures. *Proceedings of the 8th International Conference on Probabilistic Safety Assessment and Management*, PSAM-0207.

Hallbert, B.,P., Boring, R., Lois, E., Gertman, D.I., & Dudenhoeffer, D. (2006). Framework for the human event repository and analysis (HERA) system and its use to quantify human actions. *Proceedings of the 8th International Conference on Probabilistic Safety Assessment and Management*, Paper PSAM-0224 (1-7).

Boring R., D. Dudenhoeffer, B. Gore, and B. Hallbert, "Virtual Power Plant Control Room And Crew Modeling Using Midas", OECD/SEGHO International Workshop On Future Control Station Designs and Human Performance Issues In Nuclear Power Plants, Halden Norway, 8-10 May 2006.

Miller Dr. Don, Mr. Steve Arndt, Dr. Leonard Bond, Donald Dudenhoeffer, Dr. Richard Holcomb, Dr. John O'Hara, Dr. Joseph Naser, Dr. Richard Wood, Mr. Edward (Ted) L. Quinn, "Instrumentation and Control and Human Machine Interface Research and Development Plan in Support of Advanced Reactors and Fuel Programs in the U.S. "In Press *Proceedings of the ANS 5th NPIC and HMIT Topical Meeting*, November 2006.

Boring R., Hugo J., Richard C. Dudenhoeffer D. The Role of Human-Computer Interaction in Next-Generation Control Rooms. *CHI 2005 Special Interest Group*. CHI 2005 Conference Companion, Portland, May 2005, ACM Press (2005), 2033-2034.

Dudenhoeffer, D.D., Gertman, D.I., Boring, R.L., and Marble, J.L. (2004). Transitioning to advanced human-machine interface technologies. *Proceedings of the Fourth American Nuclear Society International Topical Meeting on Nuclear Power Plant Instrumentation, Controls, and Human-Machine Interface Technologies*, Columbus, Ohio, September

Marble, J. L., Bruemmer, D. J., Few, D. A. & Dudenhoeffer, D. (2004). Challenges in the design and conduct of usability testing of human-robot control architectures. In *Proceedings of the 10th International Topical Meeting on Robotics and Remote Systems for Hazardous Environments*, Gainesville, FL, March 28 - April 3.

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Blackman, H. S., Dudenhoeffer, D.D., et alt. (2004) "Advanced Nuclear Power Plant Control Room Simulator System Design Description Document" , INEEL/EXT-04-02274.

Staff, "Evaluation of Control System Security-Related Programs", (2004) INEEL/EXT-04-02131.

"NUREG: Human Event Reliability and Analysis", Nuclear Regulatory Commission (NRC). Draft due out in Nov 04.

Marble, J. L., Bruemmer, D. J., Few, D. A., & Dudenhoeffer, D. (in press). "Evaluation of supervisory vs. peer-peer interaction with human-robot teams." In *Proceedings of the Hawaii International Conference on System Sciences (HICSS)*, Hawaii, January 5-8, 2004.

D. D. Dudenhoeffer, M. R. Permann, E. M. Sussman, "A Parallel Simulation Framework For Infrastructure Modeling And Analysis" In *Proceedings of the 2002 Winter Simulation Conference*. E. Yücesan, C.-H. Chen, J. L. Snowdon, and J. M. Charnes, editors. December 2002. (peer reviewed)

D. J. Bruemmer, J. L. Marble, D. D. Dudenhoeffer, M. O. Anderson, M. D. McKay. "Mixed-Initiative Control for Remote Characterization of Hazardous Environments", Accepted for publication and presentation at HICSS 2003, Waikoloa Village, Hawaii, January 2003. (peer reviewed)

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D. J. Bruemmer, D. D. Dudenhoeffler, J. Marble. "Dynamic Autonomy for Urban Search and Rescue", 2002 AAAI Mobile Robot Workshop, Edmonton, Canada, August 2002. (invited paper)

Dudenhoeffler, D. D., D. J. Bruemmer, and M. L. Davis, 2001. *Modeling and Simulation for Exploring Human-Robot Team Interaction Requirements*. In Proceedings of the 2001 Winter Simulation Conference

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Dudenhoeffler, D. D., D. J. Bruemmer, M. O. Anderson, and M. D. McKay. 2001, *Development and Implementation of Large-Scale Micro-Robotic Forces Using Formation Behaviors*. In Proceedings of SPIE, Unmanned Ground Vehicle Technology II, 4024. Bellington, Washington: SPIE- The International Society for Optical Engineering.

Dudenhoeffler, D. D. and M. P. Jones, 2000. *A Formation Behavior for Large-Scale Micro-Robot Force Deployment*. In Proceedings of the 2000 Winter Simulation Conference, eds. J. A. Joines, R. R. Barton, K. Kang, and P. A. Fishwick, 972-983, Orlando, Florida: Institute of Electrical and Electronics Engineers.

Dudenhoeffler, D.D., Hill, S., and Blackman, Harold S. *Human Factors Observations on FSIS Hotline Food Irradiation Inquiry Data*, Proceedings of the 2000 ANS/ENS International Meeting, Washington, D.C., Nov 2000.

Gaver, D.P., Jacobs, P.A., and Dudenhoeffler, D.D., *Failure, Repair, and Replacement Analysis of a Navy Subsystem: Case Study of a Pump*, Seventh International Symposium on Applied Stochastic Models and Data Analysis, Dublin, Ireland, 12-15 June 1995.