Maintaining Operational Effectiveness for U.S. Naval Forces in Highly Degraded Environments: Ensuring Trusted, Resilient Data in the Face of Data Warfare

Committee

Bernadette Johnson

Chair

Dr. Bernadette Johnson is the chief technology ventures officer at the Massachusetts Institute of Technology (MIT) Lincoln Laboratory, where she is working to strengthen the transfer of technology to and from the commercial sector. From August 2016 through March 2018, she served as the chief science officer of Defense Innovation Unit Experimental (DIUx), where she worked to promote the rapid transition of technologies to the warfighter. Prior to joining DIUx, Dr. Johnson was the chief technology officer at the Massachusetts Institute of Technology (MIT) Lincoln Laboratory. Her responsibilities there included the development of the laboratory's long-term technology strategy and the coordination of collaborative research with the MIT campus and other universities. In her previous research career, she worked to develop technologies for military and civilian chemical and biological defense and forensics sensing, and was engaged in various applications of laser development and remote sensing. Dr. Johnson was and remains actively involved in technology innovation initiatives. She previously served on the National Academies of Sciences, Engineering, and Medicine (National Academies) Committee on Review of Testing and Evaluation Methodology for Biological Point Detectors, Committee on Mainstreaming Unmanned Undersea Vehicles into Future U.S. Naval Operations, and Committee on the Role of Experimentation in the Innovation Life Cycle. Most recently, she served as co-chair of the National Academies Planning Committee on Accelerating Delivery of Innovative and Emerging Technologies to U.S. Naval Forces, a workshop hosted by the NSB; and she is a member of the NSB. She received a B.S. in physics from Dickinson College, an M.S. in condensed matter theory from Georgetown University, and a Ph.D in plasma physics from Dartmouth College.

Arthur H. Barber

Member

Mr. Arthur H. (Trip) Barber is the chief analyst of Systems Planning and Analysis (SPA), Incorporated, where he is responsible for improving and expanding the quality, breadth, and depth of the analytic products of the company and enhancing the professional analytic skills of its workforce. (SPA is a privately held company that provides technical and analytical support services to government executive decision makers; its services include, in part, strategic planning, technical analysis, systems engineering and technical trade-off analysis.) Prior to joining SPA in 2014, Mr. Barber served for 12 years as deputy director of the Assessment Division in the Office of the Chief of Naval Operations. As a member of the Senior Executive Service (SES) from 2002 to 2014, Mr. Barber served as the chief operating officer of the U.S. Navy's corporate analytic organization and the Navy's senior analyst, where his responsibilities included, in part, developing, managing and executing the Navy's overall corporate analytic agenda of over 120 studies/year on future capability and force structure requirements to inform budget and requirements decisions. Prior to his SES appointment, Mr. Barber served for 28 years in the U.S. Navy as a surface warfare officer, retiring at the rank of Captain after a career that included command of a destroyer and of the Norfolk Navy Base. Between his uniformed and civilian Navy careers he spent 25 years in the Pentagon working on program and capability analysis and budget development. He is a Fellow of the Military Operations Research Society and has been awarded three distinguished service medals by the Navy and the Department of Defense for his Pentagon work. In addition to his professional interests, Mr. Barber has been the volunteer manager of Team America Rocketry Challenge (TARC), which he co-founded in 2002 and continues to manage today. TARC is a national rocketry-based STEM challenge competition that has drawn over 65,000 7th through 12th grade students in nearly 11,000 teams over the last 16 years, getting them to design, build and successfully fly a complex payload-carrying model rocket to a precise altitude and flight duration. Mr. Barber is a member of the NSB. He earned a B.S. in aerospace engineering from the Massachusetts Institute of Technology and an M.S. in electrical engineering (with an additional subspecialty in Weapon System Engineering) from the Naval Postgraduate School.

Gregory K. Crawford

Member

Dr. Gregory K. Crawford is the vice president for the Joint and Services Portfolio in The MITRE Corporation's National Security Engineering Center (NSEC) where he leads all MITRE's work for the Army, Navy, Office of Secretary of Defense, Joint Staff/Combatant Commands, Defense Information Systems Agency, and Missile Defense Agency. The NSEC is a federally funded research and development center sponsored by the Department of Defense (DoD) and operated within MITRE's Center for National Security. Dr. Crawford's expertise includes space physics and solar terrestrial physics, as well as intelligence, surveillance, and reconnaissance (ISR) sensing and exploitation. He has managed numerous projects, ranging from basic research and development to system design, experimentation, and end-to-end systems engineering. Dr. Crawford guided MITRE's research in integrated sensing, processing, and exploitation with a focus on filling sponsors' capability gaps, as well as led efforts to promote ISR integration across the DoD and the Intelligence Community. Most recently, he served as co-chair of the National Academies Planning Committee on Accelerating Delivery of Innovative and Emerging Technologies to U.S. Naval Forces, a workshop hosted by the NSB. Dr. Crawford is the chair of the NSB. He received a B.S. in physics and a B.A. in chemistry from California State University, Fresno; an M.S. in geophysics and space physics from the University of California, Los Angeles (UCLA); and a Ph.D. in space plasma physics from UCLA.

Michael Farrell

Member

Dr. Michael Farrell is the co-executive director of the Institute for Information Security and Privacy at the Georgia Institute of Technology (Georgia Tech); chief strategist of the Cybersecurity, Information Protection, and Hardware Evaluation Research Laboratory at the Georgia Tech Research Institute (GTRI); and adjunct professor in the School of Electrical and Computer Engineering at Georgia Tech. He leads applied research and development (R&D) programs that span four main areas of security: reverse engineering, vulnerability identification, and exploitation; resilient network systems engineering; malicious software analysis, threat intelligence and penetration testing; and multi-level, secure software systems and collaboration tools. Dr. Farrell also has managed a portfolio of high-risk cybersecurity investments via the organization's independent R&D program. He also leads collaborative faculty and student teams from across a wide swath of the Georgia Tech community, to assess emerging technology and societal and geopolitical impact as well as the effect of cybersecurity trends on organizational strategy. Dr. Farrell's current research focus is to create a science of attribution and traceback for malicious cyber activity; specifically, applying machine learning (ML) to information risk and network security. Previously, he served in a number of technical operations and positions within the Department of Defense, through which he received the Meritorious Unit Citation presented by the director of national intelligence for extraordinary teamwork in intelligence operations and a Special Achievement Award for outstanding individual research presented by the director of the National Security Agency. He received an M.S. and Ph.D both in electrical and computer engineering from the Georgia Institute of Technology.

James Freebersyser

Member

Dr. James A. Freebersyser is the director of advanced systems at Raytheon BBN Technologies, where his research interests span the applications of many types of communications systems, such as terrestrial and satellite communications, internetworking, and mobile, wireless (ad hoc) networks. He has held industry positions at Honeywell Aerospace Laboratories, GE AstroSpace, and GTE Government Systems, as well as government positions at the Army Research Office, the Office of Naval Research, and the Defense Advanced Research Projects Agency. He is a member of the National Academies Board on Army Science and Technology. He received a B.S.E. in electrical engineering from Duke University, an M.S. in electrical engineering from the University of Virginia; and a Ph.D. in electrical engineering from North Carolina State University.

Anup Ghosh

Member

Dr. Anup Ghosh is the managing director of Accenture Security—an entity of Accenture which provides a range of services to public and private sectors in strategy, consulting, digital, technology and operations. Prior to joining Accenture in June 2018, he was founder and the former CEO at Invincea, Incorporated, machine learning cybersecurity company, until Invincea was acquired by Sophos in March 2017. Dr. Ghosh's expertise includes software security, operating system security, networking security, and malicious code detection, as well as cyber security and emerging approaches involving artificial intelligence. Prior to Invincea, he was a research professor and chief scientist at the Center for Secure Information Systems in the Volgenau School of Information, Technology, and Engineering at George Mason University. Dr. Ghosh previously served as a senior scientist and program manager at the Defense Advanced Research Projects Agency, where he managed an extensive portfolio of information assurance and information operations programs for the Department of Defense. He received a B.S. in electrical engineering from Worcester Polytechnic Institute, as well as an M.S. and Ph.D. in electrical engineering from the University of Virginia.

Cecil D. Haney

Member

ADM Cecil D. Haney, USN (Ret.) is an independent consultant, having retired from the U.S. Navy as a four-star admiral after 38 years of distinguished service. As a four-star Admiral, he commanded the U.S. Strategic Command (2013-2016) responsible for strategic capabilities involving nuclear weapons, missile defense, space and cyberspace; and the U.S. Pacific Fleet (2012-2013) responsible for the manning, operations and maintenance of the U.S. Navy fleet located in the Pacific and Indian oceans. He now serves on the John Hopkins University Applied Physics Board of Managers, the Center for a New American Security Board of Directors, and is a member of the Naval Studies Board. As a career submariner, Admiral Haney had command of the fast attack nuclear submarine USS Honolulu (SSN-718), Submarine Squadron ONE (Pearl Harbor, HI), and Submarine Group TWO (Groton CT). He has also served on the Chief of Naval Operations staff as the Director of Submarine Warfare and the Director of Naval Warfare Integration Group. Admiral Haney completed graduate education at the National War College in National Security Studies and the Naval Post-Graduate School in Engineering Acoustics and Systems Technology. He received a B.S. in Ocean Engineering from the United States Naval Academy.

Joseph A. Langsam

Member

Dr. Joseph A. Langsam is a policy fellow in the Center for Financial Policy of the University of Maryland’s Smith School of Business, which he joined in 2011. He spent the previous 25 years at Morgan Stanley, where he was a Managing Director and Global Head for analytic research and the valuation of derivatives for the Fixed Income Division. Prior to joining Morgan Stanley, Dr. Langsam was an assistant professor of mathematics at Case Western Reserve University. He is co-editor (with Jean-Pierre Fouque) of the landmark 2014 volume, Handbook on Systemic Risk. Dr. Langsam is a member of the National Academies Board on Mathematical Sciences and Analytics. He received a Ph.D. in mathematics from the University of Michigan in 1982 and a Ph.D. in urban studies with a concentration in economics from the Massachusetts Institute of Technology.

Ashley J. Llorens

Member

Mr. Ashley J. Llorens is the chief of the Intelligent Systems Center at the Johns Hopkins University Applied Physics Laboratory (JHU/APL), where he leads research and development activities in machine learning, robotic and autonomous systems, and applied neuroscience towards addressing the nation's most critical challenges from defense to health. During his 15 years at JHU/APL, Mr. Llorens has led technical teams in applying machine learning to advance autonomous sensing capabilities for the U.S. Armed Services and has served as an advisor to Defense Science Board. He was awarded a Government Purpose Innovation Award by JHU/APL and has been honored as a Modern Day Technology Leader at the Black Engineer of the Year Awards. Mr. Llorens is a voting member of the National Academy of Recording Arts and Sciences, the organization that facilitates the Grammy Awards, and has managed a career as a hip hop artist alongside his career at Johns Hopkins. He leverages his dual careers to inspire youth, speaking and performing at elementary schools, high schools, and colleges around the country. Recently, Mr. Llorens served as a member of the National Academies Planning Committee on Multi-domain Autonomous Systems for U.S. Naval Forces, a workshop hosted by the NSB. He received an M.S. in electrical engineering, with a concentration in digital signal processing, from the University of Illinois at Urbana-Champaign.

Katherine A. McGrady

Member

Dr. Katherine A.W. McGrady is the president and CEO, CNA, which is a nonprofit research organization that operates the Center for Naval Analyses and the Institute for Public Research. She was appointed to that position in May 2015. In 2009, Dr. McGrady was appointed as CNA's first chief operating officer, where she was responsible for the execution of CNA's strategy and business processes, assuring consistency of policy and approach across the organization, and maintaining an environment of accountability and high research performance. She began her career with CNA as an analyst in 1988 and as the field representative to the Commander of Marine Forces Central Command and Commander, I Marine Expeditionary Force, serving in the Persian Gulf during the first Iraq war (Desert Shield and Desert Storm). Dr. McGrady received the Department of Navy's Superior Public Service Award for her contributions during Desert Shield/Desert Storm. She also deployed as part of the Unified Task Force to Mogadishu, Somalia. Subsequent assignments led to her selection as vice president and director, Integrated Systems and Operations division, where she led a team focused on issues at the interface between the Navy and Marine Corps, including analysis of expeditionary systems, logistics, operations and tactics, and training for expeditionary operations. Simultaneously, she directed the Marine Corps Program, where she developed the annual research program and was the primary interface between CNA and the senior Marine Corps leadership. In 2004, Dr. McGrady became CNA's senior vice president for research, providing oversight of research planning, research quality, cross-division staffing, and hiring, development, and training of research staff. She recently served on the National Academies Committee on Defending Forward-Deployed U.S. Navy Platforms from Potential Enemy Missile and Rocket Attacks. She is a current member of the NSB. Dr. McGrady received a B.S. in chemistry from Smith College, and an M.S. and Ph.D. in macromolecular science and engineering (polymer chemistry) from the University of Michigan, Ann Arbor.

José M. Moura

Member

Dr. José M.F. Moura (NAE) is the Philip and Marsha Dowd University Professor of Electrical and Computer Engineering at the Carnegie Mellon University (CMU). He is also an associate department head for research and strategy in the Department of Electrical and Computer Engineering and, by courtesy, a professor of biomedical engineering at CMU. Moura's research interests include data science, and statistical signal and image processing, and his current research projects include data analytics for unstructured big data and distributed inference in networks. Dr. Moura received the Institute for Electrical and Electronics Engineers (IEEE) Signal Processing Society Award for outstanding technical contributions and leadership in signal processing, and the IEEE Signal Processing Society Technical Achievement Award for fundamental contributions to statistical signal processing. A member the National Academy of Engineering, he is also a member of the Portugal Academy of Science, as well as fellow of the IEEE and the American Association for the Advancement of Science. He has served on numerous National Academies activities; currently, he is a member of the Committee on Applied and Theoretical Statistics; Planning Committee for the Workshop on Frontiers of Big Data, Modeling, and Simulation in Urban Sustainability; Panel on Review of In-house Laboratory Independent Research in Network Sciences at the Army's Research, Development, and Engineering Centers; and a member of the NSB. He received a M.Sc. and D.Sc. in electrical engineering and computer science from the Massachusetts Institute of Technology.

Katherine A. Rink

Member

Dr. Katherine A. Rink is the associate division head of the Air, Missile and Maritime Defense Technology Division at the Massachusetts Institute of Technology (MIT) Lincoln Laboratory, which develops and assesses new technologies and integrated systems for defense against ballistic missiles, cruise missiles, and air vehicles in tactical, regional, and homeland defense applications. Before this, she served for two years as the group leader of the Advanced Concepts and Technologies Group, developing and integrating advanced air and missile defense capabilities across the Department of Defense and the Services, with particular emphasis on developing new technologies for the U.S. Navy to address the advanced missile threat. Dr. Rink joined MIT Lincoln Laboratory in 1999 as a member of the technical staff in the Systems Engineering and Analysis Group, where she worked on many technical aspects of the then-emerging Aegis ballistic missile defense system, including systems analysis, tracking, and discrimination, prototyping, and flight test analysis. She led the laboratory’s Aegis ballistic missile defense program and later led the development of advanced air and missile defense capabilities and electronic warfare prototypes for the U.S. Navy. Dr. Rink recently served on the National Academies Committee on Defending Forward-Deployed U.S. Navy Platforms from Potential Enemy Missile and Rocket Attacks. She is a member of the NSB. Dr. Rink received a B.S. in systems science and mathematics, a B.A. in mathematics, and an M.S. and D.Sc. in systems science and mathematics, all from Washington University in St. Louis, with an additional M.S. in operations research from Columbia University.