The National Academies of
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IMPROVING DEFENSE ACQUISITION WORKFORCE CAPABILITY IN DATA USE

Statement of Task

The National Academies of Sciences, Engineering, and Medicine will convene an ad hoc committee to execute a workshop and in-depth consensus study to identify relevant data science skills and capabilities necessary for the acquisitions workforce and develop a framework for training and educating acquisitions professionals.

Specific questions to be considered by the committee during the workshop and consensus study include:

- How can data science improve acquisitions processes and where are the opportunities to improve workforce ability to apply these methods?
- What are the foundational understanding and skills that should be developed broadly in acquisitions professionals, and what more advanced capabilities are relevant for specific job functions?
- What are the characteristics and portfolio of skills of successful data science teams and how can supervisors with non-technical backgrounds effectively manage data science projects?
- What data science training and education models exist in other government agencies and outside of government for employee training and up-skilling?

The workshop will be recorded and webcast live and a rapporteur will summarize the presentation and discussions in a "Proceedings of a Workshop". At the end of the study, the committee will produce a consensus report providing findings and recommendations on how the Department of Defense can accelerate data analysis capabilities within the acquisition workforce.

IMPROVING DEFENSE ACQUISITION WORKFORCE CAPABILITY IN DATA USE

Co-Chairs

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Committee Biographies

Lt. Gen. Wendy Masiello USAF (Ret.) is president of Wendy Mas Consulting, LLC and serves on the board of directors for KBR Inc. and EURPAC Service, Inc., and is on the GM Defense LLC Senior Advisory Committee. She also serves as a director on the Procurement Round Table, National Contract Management Association (NCMA), and as an advisor on the Public Spend Forum Council and the Dean's Advisory Council for Texas Tech University's Rawls College of Business. Prior to her July 2017 retirement from the United States Air Force, she was director of the Defense Contract Management Agency (2014-2017) where she oversaw a $1.4 billion budget and 12,000 people worldwide in oversight of 20,000 contractors performing 340,000 defense and federal contracts valued at $6 trillion and revised the agency's approach to oversight from one of contractor compliance to performance measurement. During her 36-year career, General Masiello also served as Deputy Assistant Secretary (Contracting), Office of the Assistant Secretary of the Air Force for Acquisition (2011-2014) where she designed and implemented a centralized organization (Air Force Installation Contracting Agency [AFICA]) facilitating contracting for seven major commands following a 30 percent personnel cut. AFICA became the model for what became the Air Force-wide Installation Mission Support Center. As program executive officer for the Air Forces' $65 billion service acquisition portfolio (2007-2011), General Masiello initiated the category management concept within the Air Force and set a standard for service contract planning, execution, and oversight within the Department of Defense. General Masiello's medals and commendations include the Defense Superior Service Medal, Distinguished Service Medal, and the Bronze Star. She earned her Bachelor of Business Administration degree from Texas Tech University, a master of science degree in logistics management from the Air Force Institute of Technology, a master of science degree in national resource strategy from the Industrial College of the Armed Forces, Fort Lesley J. McNair, Washington, D.C., and is a graduate of Harvard Kennedy School's Senior Managers in Government. General Masiello is a 2017 Distinguished Alum of Texas Tech University, was twice (2015 and 2016) named among Executive Mosaic's Wash 100, the 2014 Greater Washington Government Contractor "Public Sector Partner of the Year," and recognized by Federal Computer Week as one of "The 2011 Federal 100". She is an NCMA Certified Professional Contract Manager as well as an NCMA fellow.

Rebecca Nugent is the associate department head, the director of undergraduate studies, and a teaching professor in the Department of Statistics and Data Science at Carnegie Mellon

University (CMU) and has been teaching at CMU since she completed her Ph.D. in statistics from University of Washington in 2006. Prior to that, she received her B.A with majors in mathematics, statistics, and spanish at Rice University and her M.S. in statistics at Stanford University. She recently was awarded top teaching honors with the American Statistical Association Waller Education Award; The William H. and Frances S. Ryan Award for Meritorious Teaching; and Statistician of the Year by the American Statistical Association, Pittsburgh Chapter.

Philip Antón is a senior information scientist at the RAND Corporation, where he conducts research on acquisition and sustainment policy, cybersecurity, emerging technologies, technology foresight, process performance measurement and efficiency, data science and analytics, aeronautics test infrastructure, and military modeling and simulation. From 2011 to 2016, Antón served two tours on loan to the Pentagon filling an senior executive service position directing the Acquisition Policy Analysis Center. Reporting directly to the Under Secretary of Defense for Acquisition Technology & Logistics, he conducted strategic initiatives to improve the performance of the Department of Defense's policies and institutions, crafted affordability policy, and brought new analytic insights into the performance of acquisition and sustainment policies, processes, and tradecraft. For these contributions Antón received the Secretary of Defense Medal for Outstanding Public Service in 2017. From 2004 to 2011, Antón was the director of the Acquisition and Technology Policy Center in RAND's National Security Research Division. This center addressed how accelerating technological change and modernization efforts will transform the U.S. national security establishment. It also explored new acquisition and management strategies and ways to maintain core defense technology and production bases. Antón earned his M.S. and Ph.D. in information and computer science from the University of California, Irvine, specializing in computational neuroscience and artificial intelligence. His B.S. is in engineering from the University of California, Los Angeles, specializing in computer engineering.

Trilce Estrada is an assistant professor in the Department of Computer Science at the University of New Mexico. She earned her Ph.D. in 2012 from University of Delaware. Her research interests include self-managed distributed systems, big data analysis, crowd sourcing, and machine learning. Her overarching research goal is to solve computationally intensive and data intensive problems in science, health, and education, especially in scenarios where resources and trained professionals are scarce. She is also actively involved in improving participation of women in computing-related fields.

RADM Millard S. Firebaugh, USN (Ret.) [NAE] is Glenn L. Martin Institute Professor of Practice at the University of Maryland in the Department of Mechanical Engineering. After more than 33

years in the US Navy as an Engineering Duty Officer he became Vice President Innovation at General Dynamics, Electric Boat Division from which he retired in 2005. He consults for General Atomics, IDA, and others. He serves on the Board of Directors of the Ocean Renewable Power Company and chairs the board of the Energetic Technology Center. His area of technical interest is naval engineering, principally the design, systems engineering, naval architecture, and integration of weapons and combat systems of warships with emphasis on nuclear powered submarines. Admiral Firebaugh is a member of the National Academy of Engineering. He served on the NRC's Committee on Materials Research for Defense-After-Next, the NRC's Panel on Structural and Multifunctional Materials, the Naval Studies Board study concerning unmanned undersea vehicles, and the Air Force Studies Board Study, "Owning the Technical Baseline." He received a B.S. in physics, M.S. in electrical engineering, Naval Engineer degree and D.Sc. in ocean engineering from the Massachusetts Institute of Technology. He resides in Annapolis, MD with his wife of 52 years, Barbara.

Stephen Forrest [NAS] is the William Gould Dow Collegiate Professor of Electrical Engineering and Computer Science, a professor of materials science and engineering, and a professor of physics at the University of Michigan. His research interests include optics and photonics, quantum science and devices, solid-state devices and nanotechnology, energy science and engineering, organic electronics, photonic integrated circuits, and photonic materials. He received his B.A. in physics from the University of California, Berekely, and his M.S. and Ph.D. in physics from the University of Michigan.

Christine Fox became the assistant director for policy and analysis of the Johns Hopkins University Applied Physics Laboratory (APL) in 2014. As the nation's largest University Affiliated Research Center, APL performs research and development on behalf of the Department of Defense, the intelligence community, the National Aeronautics and Space Administration (NASA), and other federal agencies. The laboratory has more than 5,000 staff members who are making critical contributions to a wide variety of nationally and globally significant technical and scientific challenges. Previously, she served as Acting Deputy Secretary of Defense between December 2013 and May 2014. With her appointment, Ms. Fox became the highest-ranking female official in history to serve in the Department of Defense. Until August 2013, Ms. Fox served as the Director, Cost Assessment and Program Evaluation in the Office of the Secretary of Defense. She was appointed to that position in November 2009. A presidential appointee confirmed by the U.S. Senate, Ms. Fox served as the principal staff assistant to the Secretary of Defense for analyzing and evaluating plans, programs, and budgets in relation to U.S. defense objectives and resource constraints. Ms. Fox possesses three decades of experience as an analyst and research manager focusing on defense issues, with a special emphasis on operations. She formerly served as the president of the Center for Naval Analyses (CNA), a

federally funded research and development center, and as the scientific analyst to the Chief of Naval Operations. Prior to her appointment as president of CNA, Ms. Fox was the vice president and director of CNA's Operations Evaluation Group, responsible for approximately 85 field representatives focused on helping operational commanders execute their missions. She oversaw CNA's analysis of real-world operations, including the operations in Bosnia and Kosovo in the 1990s, operations in Afghanistan immediately following the September 11th attacks, and the operation in Iraq in early 2003. She served as a member of NASA's Return to Flight Task Group, chartered by the NASA Administrator to certify the recommendations made by the Columbia Accident Investigation Board. She was also a member of the advisory board of the Applied Physics Laboratory, University of Washington, from 2007 until 2009. Hon. Fox earned a bachelor of science degree in mathematics and a master of science degree in applied mathematics from George Mason University.

Melvin Greer is chief data scientist, Americas, Intel Corporation. He is responsible for building Intel's data science platform through graph analytics, machine learning, and cognitive computing to accelerate transformation of data into a strategic asset for public sector and commercial enterprises. His systems and software engineering experience has resulted in patented inventions in cloud computing, synthetic biology and IoT bio-sensors for edge analytics. He functions as a principal investigator in advanced research studies, including nanotechnology, additive manufacturing, and gamification. He significantly advances the body of knowledge in basic research and critical, highly advanced engineering and scientific disciplines. Greer is a member of the American Association for the Advancement of Science (AAAS) and U.S. National Academy of Science, Engineering, and Medicine's GUIRR. Greer received his Bachelor of Science degree in computer information systems and technology and his Master of Science in information systems from American University, Washington, D.C. He also completed the Executive Leadership Program at the Cornell University, Johnson Graduate School and the Entrepreneurial Finance program at MIT Sloan School of Management.

Dr. Charles Isbell received his bachelor's in Information and Computer Science from Georgia Tech, and his MS and PhD at MIT's AI Lab. Upon graduation, he worked at AT&T Labs/Research until 2002, when he returned to Georgia Tech to join the faculty as an Assistant Professor. He has served many roles since returning and is now The John P. Imlay Dean of the College of Computing. Charles's research interests are varied but the unifying theme of his work has been using machine learning to build autonomous agents who engage directly with humans. His work has been featured in the popular press, congressional testimony, and in several technical collections. In parallel, Charles has also pursued reform in computing education. He was a chief architect of Threads, Georgia Tech's structuring principle for computing curricula. Charles was also an architect for Georgia Tech's First-of-its's-kind MOOC-supported MS in Computer Science. Both efforts have received international attention,

and been presented in the academic and popular press. In all his roles, he has continued to focus on issues of broadening participation in computing, and is the founding Executive Director for the Constellations Center for Equity in Computing. He is an AAAI Fellow and a Fellow of the ACM. Appropriately, his citation for ACM Fellow reads "for contributions to interactive machine learning; and for contributions to increasing access and diversity in computing".

Peter Levine is senior fellow at the Institute for Defense Analyses in Alexandria, Va. Previously, he served as principal assistant and advisor to the Secretary and Deputy Secretary of Defense on readiness; National Guard and Reserve component affairs; health affairs; training; and personnel requirements and management, including equal opportunity, morale, welfare, recreation, and quality of life. Prior to assuming this role, Mr. Levine served from May 2015 to April 2016 as the Deputy Chief Management Officer (DCMO) of the Department of Defense. As DCMO, he served as the senior advisor to the Secretary of Defense and the Deputy Secretary of Defense on business transformation and led the department's efforts to streamline business processes and achieve greater efficiencies in management, headquarters, and overhead functions. Prior to his appointment as DCMO, Mr. Levine served on the staff of the Senate Armed Services Committee from August 1996 to February 2015, including two years as staff director, eight years as general counsel, and eight years as minority counsel. Throughout this period, Mr. Levine was responsible for providing legal advice on legislation and nominations, and advised members of the committee on acquisition policy, civilian personnel policy, and defense management issues affecting the Department of Defense. Mr. Levine played an important role in the enactment of the Military Commissions Act of 2009, the Weapon Systems Acquisition Reform Act of 2009, the Acquisition Improvement and Accountability Act of 2007, the Detainee Treatment Act of 2005, and numerous defense authorization acts. Mr. Levine served as counsel to Senator Carl Levin of Michigan from 1995 to 1996 and as counsel to the Subcommittee on Oversight of Governmental Management of the Senate Committee on Governmental Affairs from 1987 to 1994. In this capacity, Mr. Levine played a key role in the enactment of the Lobbying Disclosure Act of 1995, the Federal Acquisition Streamlining Act of 1994, and the Whistleblower Protection Act of 1989. Mr. Levine was an associate at the law firm Crowell and Moring from 1983 to 1987. He received a bachelor of arts degree summa cum laude from Harvard College and a juris doctor degree magna cum laude from Harvard Law School.

Ann McKenna is the vice dean of strategic advancement for the Ira A. Fulton Schools of Engineering at Arizona State University and is a professor of engineering in the Polytechnic School, one of the six Fulton Schools. McKenna's research focuses on entrepreneurial thinking in the context of engineering faculty mentorship and curricular innovations, design teaching

and learning, the role of adaptive expertise in design and innovation, and the impact and diffusion of education innovations. She was named one of the nine 2019 American Society for Engineering Education (ASEE) fellows for demonstrating outstanding contributions to engineering education. McKenna has been an ASEE member since 1996. McKenna is PI on the NSF-funded ASU Revolutionizing Engineering Departments (RED) project that focuses on instilling an additive innovation and risk-taking mindset among faculty to transform engineering teaching practices. She is also PI on the Kern Family Foundation project that is conceptualizing and implementing a national-focused effort on applying an entrepreneurial mindset approach to faculty mentorship. She was a co-investigator and instructor for the first I-Corps for Learning project, which fosters an entrepreneurial mindset in the education community to design and implement novel and effective teaching strategies, technologies, and curriculum materials. McKenna has twice been the recipient of the ASEE best overall paper award (1998 and 2011), as well as the recipient of the outstanding paper award from the IEEE/ASEE Frontiers in Education (FIE) conference (1997). Her work in the area of design education has been nationally recognized by receiving the best paper award for three consecutive years, 2009, 2010, and 2011 in the Design in Engineering Education Division of ASEE. She has also received the best research paper (2018) and best teaching paper (2017) in the Entrepreneurship and Engineering Innovation Division of ASEE. McKenna works across the disciplinary lines of engineering, education, and design and has published in diverse disciplinary venues including Science, Journal of Engineering Education, IEEE Computer, ASME Journal of Mechanical Design, and Teaching in Higher Education. McKenna recently served as a senior associate editor for the Journal of Engineering Education (2012-2015), the leading research journal in the field of engineering education. She served a two-year term (2011-2013) as a director of the Educational Research and Methods (ERM) Division of ASEE. She was a member of the advisory board for the National Academy of Engineering (NAE) Frontiers of Engineering Education Symposium (2011-2013), as well as a panel member for Canada's Natural Sciences and Engineering Research Council's (NSERC) Chairs in Design Engineering (CDE) program (2011-2014). Prior to joining ASU, she served as a program director at the National Science Foundation in the Division of Undergraduate Education and was the director of education improvement in the McCormick School of Engineering at Northwestern University. McKenna received her bachelor's and master's degrees in mechanical engineering from Drexel University and doctorate from the University of California, Berkeley.

Alyson Wilson is a professor in the Department of Statistics and principal investigator for the Laboratory for Analytic Sciences at North Carolina State University (NCSU). She is a fellow of the American Statistical Association and the American Association for the Advancement of Science. Her research interests include statistical reliability, Bayesian methods, and the application of statistics to problems in defense and national security. Prior to joining NCSU, Dr. Wilson was a

research staff member at the Institute for Defense Analyses' Science and Technology Policy Institute (2011-2013), an associate professor in the Department of Statistics at Iowa State University (2008-2011), a technical staff member in the Statistical Sciences Group at Los Alamos National Laboratory (1999-2008), and a senior statistician and operations research analyst with Cowboy Programming Resources (1995-1999). Dr. Wilson received her Ph.D. in statistics from Duke University, her M.S. in statistics from Carnegie Mellon University, and her B.A. in mathematical sciences from Rice University.

Jun Zhuang is a professor in the Department of Industrial and Systems Engineering, School of Engineering and Applied Sciences (SEAS), at the University at Buffalo (UB). Dr. Zhuang received a Ph.D. in industrial engineering in 2008 from the University of Wisconsin-Madison. Dr. Zhuang's long-term research goal is to integrate operations research, big data analytics, game theory, and decision analysis to improve mitigation, preparedness, response, and recovery for natural and manmade disasters. Other areas of interest include applications to health care, sports, transportation, supply chain management, sustainability, and architecture. Dr. Zhuang's research has been supported by the U.S. National Science Foundation (NSF), by the U.S. Department of Homeland Security (DHS), by the U.S. Department of Energy, by the U.S. Air Force Office of Scientific Research (AFOSR), and by the National Fire Protection Association. Dr. Zhuang is a fellow of the 2011 U.S. Air Force Summer Faculty Fellowship Program, sponsored by the AFOSR, and a fellow of the 2009-2010 Next Generation of Hazards and Disasters Researchers Program, sponsored by the NSF.Dr. Zhuang has published 90+ peer-reviewed journal articles in Operations Research, IISE Transactions, Risk Analysis, Decision Analysis, and European Journal of Operational Research, among others. His research and educational activities have been highlighted in The New York Times, The Wall Street Journal, Spark CBC Radio, Metro, The Washington Post, USA Today, Stanford GSB News, NSF Discovery, Science Daily, Industrial Engineer, The Council on Undergraduate Research Quarterly, and The Pre-Engineering Times, among others. Dr. Zhuang is dedicated to mentoring high school, undergraduate, and graduate students in research.