

Have North America and the Caribbean Shown Resiliency to Recent Natural Disasters and Human-induced Accidents? A Debate on the Issues (An Application of Systems Engineering and Systems Thinking)

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Abstract. During the past few years, we have witnessed major natural disasters in North America and the Caribbean. For example, severe snow storms in the Northeastern US (2013); Super Storm Sandy (2012) and Hurricane Irene (2011); 5.8 scale earthquake centered near Richmond, VA (2011), severe tornadoes (13 EF4 in 2010, 6 EF5 in 2011; 4 EF4 in 2012; 1 EF4 so far in 2013); Haiti earthquake (2010), and severe hurricanes in the Caribbean (Issac 2012; Sandy 2012). We have also experienced human-induced disasters (accidents) such as the Gulf Oil Spill (2010); rail accidents (23 in US from 2010-2012); and the Chevron Refinery, Richmond, CA explosion (2012). These events have resulted in significant loss of life, injuries, and property. They have strained federal, state, local government, insurance, and personal resources as well as changed the lives of millions of people. With the steady rise of severe natural events and the continual threat of human-induced events, we ask these questions: How resilient have U.S. and Caribbean communities been with regard to these events? How will these areas and the industries associated with catastrophic accidents fare in the future? Have they applied the lessons learned from these major disasters? What actions might improve resiliency or reaction to the disasters and accidents? This panel will explore these questions from the viewpoint of systems thinking and systems engineering and the mechanism of a debate. For this debate, we adopt Scott Jackson's definition of resiliency: 'the ability of organizational, hardware and software systems to mitigate the severity and likelihood of failures or losses, to adapt to changing conditions, and to respond appropriately after the fact.' With this basis, we present affirmative and anti-affirmative arguments of the 'how resilient' question. Then panelists discuss specific disasters, their experiences, and their viewpoint on resiliency and future implications. Each discussion may have requirements and design analysis, measures of effectiveness, add to or subtract from current strategies, an emergency preparedness strategy, and provide a decision, benefit, and risk analysis. Each argument may also address factors such as to what is an affordable strategy, what are the consequences for the law and personal freedoms (e.g., ability to build a home despite risk to life and destruction; restoring a community despite the risk of re-destruction), what is feasible, and the ability to prepare, respond, recover and mitigate natural and human-induced disasters. As in any debate, panel members and attendees may question and challenge the arguments. Systems engineers will benefit from this multidisciplinary debate. They will see that our systems engineering principles, techniques, and practices have application to complex multidiscipline societal problems. The objective, disciplined approach to problem analysis controls the emotional response to such difficult problems and offers insights that inform government and industry decision makers. The INCOSE Anti-Terrorism International Working Group organized this panel in accordance with its charter to apply systems engineering to societal problems. Though initially formed as response to the 9/11 terrorist attacks, it now addresses the breadth of societal issues where systems engineering and systems thinking can help clarify the issues with discipline and methods. Previously, ATIWG sponsored panels at INCOSE symposia (2002-2009), wrote papers for publication (2003), offered a tutorial (2004), and edited an Insight Issue (2006). Its activities have addressed the application of collaborative engineering environments, simulation and modeling, religion, system solutions to defend against terrorism, psychology, and the root causes of terrorism in order to address the vulnerabilities of systems as well as the attack responses to terrorist threats.

Biography

William Mackey (Systems Engineering Solutions) - wmackey@cox.net

William Mackey, Ph.D., J.D., ESEP, President of Systems Engineering Solutions, is also an adjunct professor at the University of Maryland University College. He attended the U.S. Naval Academy and has B.S. and M.S. degrees in physics from the University of Pittsburgh and the Rensselaer Polytechnic Institute. He received his Ph.D. in systems engineering from the University of Pennsylvania and his J.D. in law from the Washington College of Law, American University. Dr. Mackey is presently President of Systems Engineering Solutions consulting in major systems engineering issues. Dr. Mackey has more than 40 years experience in scientific research, engineering, and management applied to homeland security, aerospace, energy, transportation, systems integration, and law. He has held a number of progressively responsible management positions, including leadership of 120 professionals involved in systems engineering, telecommunications and networking, office information systems, and major systems development in the CSC Systems Division. During 2005 and 2006 he was Vice-President of Professional Services, Vitech Corp. Dr. Mackey is a member of both the District of Columbia and the State of Virginia legal bars. He has led and served on several INCOSE WG/IG_s and was Chairman of the Systems Engineering Applications Technical Committee from 1995 to 2001. He served as the INCOSE Technical Board Chairman from June 2001 to June 2004. He chartered the Anti-Terrorism International WG within INCOSE in October 2001. He was facilitator of the INCOSE panels on Anti-Terrorism at INCOSE 2002 in Las Vegas, NV, INCOSE 2003 in Washington, D.C, INCOSE 2004 in Toulouse, France, INCOSE 2006 in Orlando, FL, INCOSE 2007 in San Diego, CA, INCOSE 2008 in Utrecht, NE, and INCOSE 2009 in Singapore, SG . Dr. Mackey has also been the Chair of the INCOSE Fellows from 2006 -2010, having served as Vice-Chair from 2005-2006. Dr. Mackey led the development of a biometric-based Pedestrian Border Crossing Prototype intended for use by the Department of Homeland Security. It has been fielded at the San Ysidro border crossing in the United States.

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Bruce Shelton is President of BRURAY Associates, LLC., a small business performing training and consulting in systems engineering. Prior to forming his own company, Bruce was a senior systems engineering research analyst with ANSER, a not-for-profit, public service research company. While at ANSER, he helped develop Communities of Interest for the Office of the Secretary of Defense to enable interoperability and knowledge sharing aimed at the prevention and management of natural and manmade disasters. Before that he reviewed over 500 requirements documents ensuring that derived requirements were properly addressed. Previously, he was systems engineer with Boeing Information Services helping to develop a portion of the Defense Information Infrastructure. Prior to that, he was the Director of Business Development for Systems Management & Development Corp (SMDC), a small firm that specialized in teaching Systems Engineering and Acquisition to the Government and industry. Bruce retired after a 22-year career in the Air Force most of which was in joint service/NATO assignments. During his career in the Air Force, Bruce was involved in all aspects of the acquisition process from requirements generation and analysis, to program management and T&E and, most importantly, as a customer/user. It was during the tenure as the Air Force Program Manager for Tri-service (TRI-TAC) Switch Programs, where his systems engineering career matured as he actively managed the development, acquisition, and integration of \$1.2B worth of USAF C4I equipment. An INCOSE member since early 1993, Bruce has been active at the chapter, regional, and international levels. He previously served as President of the Washington Metropolitan Area Chapter, Operations Chair of the first Mid-Atlantic Regional Conference on Systems Engineering, and was the first elected Member Board representative to serve sequentially as Secretary, Co-chair, and Chair. Bruce is now serving as the Chair of the Certification Advisory Group (CAG). Bruce holds an M.S. in Systems Management from Western New England University, MA and a B.A. in Chinese with an Aerospace Engineering minor from the University of Maryland. Bruce is also a Expert Systems Engineering Professional (ESEP) awarded by INCOSE and a Microsoft Certified Professional.

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Stephen J. Sutton, P.E., E.S.E.P. is retired from TASC, Inc. and currently serves as Director, Systems Engineering Program at the Institute for Systems Research at the University of Maryland. At ISR, he has responsibility for the MSSE program and other systems engineering education services. He holds B.E.E. and M. Eng. (E.E.) degrees from Rensselaer Polytechnic Institute and the Engineer Degree (E.E.) from George

Washington University. Mr. Sutton has more than 46 years of experience in systems engineering and analysis, enterprise and system-of-systems architecture, and management for telecommunications, information, and intelligence systems. He has held program management, lead systems engineering, and line management positions. Mr. Sutton has served INCOSE as President of the Chesapeake Chapter, Member Board Representative from Region V, and co-chair of the Anti-Terrorism International Working Group. In 2004, he led the development of the INCOSE Members Guide to Benefits, Services, and Products, an INCOSE product on CD. He also served as the INCOSE Corporate Advisory Board Representative for TASC, Inc.

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Regina Griego, Ph.D. - Dr. Griego is a Principal Member of Technical Staff in the Nuclear Monitoring and Transparency Department at Sandia National Laboratories where she works as an R&D Systems Engineer. She is the Project Lead and the Lead Systems Engineering on the Chain of Custody Project for the NNSA Office of Proliferation Detection (NA-221). She has over 20 years of experience in various positions including first line technical management, leading technical integration on programs, as a lead systems engineer or requirements engineer, teaching requirements and systems engineering, building requirements/systems engineering capability, and as a design engineer. At Sandia, she has worked for 15 years in systems engineering, program integration and design of nuclear weapons and joint test assemblies. Two of those years were spent on a detail assignment with NNSA NA-12. Her academic and industry focus incorporates modeling as a way to formalize problem understanding and develop requirements. Dr. Griego has also been instrumental in enterprise modeling and improvement in various application domains throughout her career. She is a Fellow of the INCOSE (International Council on Systems Engineering) and an Industry Fellow for Stevens Institute College of Systems and Enterprises. Dr. Griego was the Technical Director for INCOSE in 2009-2010 and Founding President of the INCOSE Enchantment Chapter. She has numerous publications related to concept development, systems, and enterprise engineering.