

# Systems Engineering Panel Prospectus

Dr. Regina M Griego - Moderator



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# Panel Objectives

- Explore the relationship and synergy between Systems Engineering and T&E in particular in the context of System of Systems
- Create a dialogue among panelist that represent different stakeholders in the T&E of System of Systems
- Begin to identify challenges that the Systems Engineering and T&E community need to address in order to field future System of Systems



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# Contextual Questions

(as addressed by John Thomas in introduction)

1. What can the System of Systems do that none of the standalone systems are able to offer independently?
2. What are the resulting mission-relevant performance metrics of the system of systems? (availability, survivability, and so on)
3. What can't a standalone system be expected to do any longer when operating within the context of the System of Systems?
4. What is the System of Systems' safety envelope? - the performance boundary outside of which it cannot be trusted to protect its users or operators.
5. How vulnerable to cyber activities is the system of systems, and when compromised, what are the resulting dangers?



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# Questions for Panelist

- What are the current challenges you are facing in T&E?
- What practices / methods / tools are working or not working within the T&E domain?
- To what degree have you witnessed Systems Engineering or Systems Thinking work or not work when conducting T&E?
- If you were to ask the Systems Engineering community to focus on three things to support T&E, what would those be?
- If you were to ask the T&E community to focus on three things to advance the state of the practice in T&E, what would those be?



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# **Dr. Regina M Griego**

## **Principle at Sandia National Laboratories**

### **INCOSE Fellow**

Dr. Griego is a respected leader in the areas of requirements engineering and systems engineering. 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. Dr. Griego was the Technical Director for INCOSE in 2009-2010 and Founding President of the INCOSE Enchantment Chapter.

Dr. Griego has 28 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. She has worked at Sandia or NNSA for 14 years of her career in the area of Nuclear Weapons and currently in Nuclear Non-Proliferation. She has a Doctor of Philosophy in Engineering from the Department of Electrical and Computer Engineering from NMSU, an MS in Computer Science from CU Boulder, an MS in Electrical and Computer Engineering from University of Arizona , and a BS in Electrical Engineering and Computer Engineering from NMSU



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**John A. Thomas**  
Sr. VP Booz Allen Hamilton  
President INCOSE



John A. Thomas, a Senior Vice President at Booz Allen Hamilton and its Chief Systems Engineer, specializes in delivery of large-scale systems engineering and integration services. His areas of systems expertise include systems engineering and integration, system analysis, solutions delivery, and conflict management and resolution associated with singular complex problems. Mr. Thomas is the president-elect of the International Council of Systems Engineering (INCOSE), and will be the organization's president in 2012. He is a prolific writer and speaker on the integration of systems engineering with business analysis and program support services. Mr. Thomas has worked in commercial and public sectors, predominantly with organizations whose missions are aligned to U.S. defense, intelligence, and homeland security.



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# Jack Ring

You don't know Jack

- 1955 – Present.
- System Test & Evaluation (Atlas ICBM Radio Guidance System) → System Engineering (State-determined → Stochastic → Non-deterministic Systems).
- GE 20, Honeywell 10, Edelbrock 3, Ascent Logic 2, IBM OTP 1.
- Kennen Technologies LLC, OntoPilot LLC, Educe LLC.
- More than 50 systems, most including humans as active components. Involved Newbies, Crossovers, Remedial cases, Geniuses and wonderful Mentors.
- 1961: race car telemetry. 2012: SySTEM.
- Tutorials, Papers and Panels; INCOSE, INCOSE IL, ITEA, ICSEng, ISSS, IEEE SMC, IEEE SysCon, NIST.
- Co-chair, INCOSE WG's for
  - Intelligent Enterprises, 2002-2007
  - Motor Sports as learning environment, 2008 –
  - Autonomous Systems T&E, 2009 -



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jackring7@gmail.com

# **US Army Col. (Ret.) Otis Ferguson**

## **Senior Military/Systems Analyst**

### **RESEARCH ANALYSIS AND MAINTENANCE, INC.;**

Col Ferguson is a qualified Senior Program Manager, Senior Test Officer, and Senior Systems Engineer who is both Joint and Army qualified with over 30 years of experience. Otis has spent 10 of the last 12 years in various leadership positions in small businesses supporting the Department of Defense. Otis has a BS in Electrical engineering from New Mexico State University (NMSU), a M.S. Computer Science, (Industrial Engineering Minor); Operations Research, Systems Analyses/Systems Management Degree (ORSA) Certification, US ARMY 1980.



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# Bob Kohout

## VP for Research

### iRobot

Bob Kohout joined iRobot as the Vice President for Research in late 2011. Prior to that he was a Program Manager in DARPA's Information Innovations Office. While a Program Manager at DARPA, he managed several programs, including the Personalized Assistant the Learns (PAL), COORDINATORS, Military Applications of Learning Technology and Architectures (MALTA) and Oh By the Way (OBTW). During his time at DARPA, Dr. Kohout directed a variety of empirical evaluations of complex software systems, including rigorous experimental evaluations designed to measure the technical performance of software, small controlled field studies of effectiveness involving human participants, and large operational assessments involving military units. Prior to becoming a Program Manager, Dr. Kohout supported DARPA as a technical advisor and was involved in various capacities in the evaluation of robotic systems in the LANDroids, Learning Locomotion, and Learning Applied to Ground Robots programs.



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# **Dr. Catherine Warner**

## **Science Advisor**

### **Director, Operational Test and Evaluation**



CATHERINE WARNER, PH.D., became the Science Advisor for DOT&E on September 13, 2010. She serves as the technical advisor to the Director on all matters of testing and evaluation in the DoD. Previously, Dr. Warner was an assistant director and head of the Air Warfare group for the Operational Evaluation Division at the Institute for Defense Analyses (IDA). She managed a team of project leaders supporting the DOT&E Deputy Director for Air Warfare and provided technical support as needed to the Director, OT&E for special interest items. Her analysis portfolio included major aircraft systems such as the F-22, F/A-18E/F, V-22, and H-1 Upgrades. She also evaluated unmanned aerial vehicles such as the Global Hawk, Predator, Shadow, and Hunter UAV systems. Earlier, Dr. Warner worked at the Lawrence Livermore National Laboratory in the laser materials group and as a research chemist at IBM Corporation in San Jose, California.

Dr. Warner grew up in Albuquerque, New Mexico, attended the University of New Mexico as an undergraduate, and earned both bachelor of science and master of science degrees in chemistry from San Jose State University. She earned both master of arts and doctor of philosophy degrees in chemistry from Princeton University. E-mail: [catherine.warner@osd.mil](mailto:catherine.warner@osd.mil)



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## **Col. Dave Wellons** commands the Integrated Test and Evaluation Directorate at Fort Bliss, TX

COL Dave Wellons commands the Integrated Test and Evaluation Directorate at Fort Bliss, TX. The Integrated Test and Evaluation Directorate stands as the Army's leading organization tasked with providing an integrated network to the operating force.

COL Wellons recently commanded the Fires Test Directorate at Fort Sill, OK from 2008-2011. During this command, he served as the FOA IX Commander forward deployed in Afghanistan in 2010. He conducted 22 field operational assessments ISO U.S. Forces, Afghanistan. LTC Wellons deployed to CENTCOM as chief of plans and deputy commander for 4<sup>th</sup> Battlefield Coordination Element in support of Operation Iraqi Freedom. After four years in Korea, LTC Wellons assumed command of the Non-Line of Sight Battalion, Unit of Action Experimental Element, at Fort Knox, KY. Following battalion command, Upon completion of battery command, CPT Wellons was assigned to the National Training Center (NTC), Fort Irwin, CA, as Fire Support Officer, 11<sup>th</sup> Armored Cavalry Regiment. After NTC, he attended Command and General Staff College and School of Advance Military Studies (SAMS). Following graduation from SAMS, he completed a tour as a plans officer at 2<sup>d</sup> Infantry Division (Uijongbu, South Korea), followed by assignment as executive officer in 6-37 MLRS Battalion and a 2-year joint plans officer assignment in CJ35.



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# Systems Engineering Key Concepts

- Systems thinking
  - Multiple contexts
  - Stakeholders and viewpoints
  - Modes and states – in particular failure modes
- Life cycles
  - System (Define – Design – Build – Test – Deploy – Operate – Upgrade/Retire)
  - Project (People, work artifacts, baselines, etc.)
  - Concept of life-cycle
- Requirements
  - Mission (Capabilities & Characteristics), System (Functional / Non-functional)
  - Tied to performance measures
  - Traced



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# Systems Engineering Key Concepts - Continued

- System design for operational effectiveness
- Trade-off – prioritization and negotiation
- Model-based systems engineering – model as specification of the system



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# Role of Systems Engineer

- Leader of System Engineering & Integration Team (SEIT)
- Honest broker – balances technical and programmatic concerns
- Defends the integrity of the system
- Orchestra conductor – for multiple disciplines that realize the system

*Who plays these roles for a System of Systems?  
How is this accomplished during T&E?*



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