



OFFICE OF THE DEPUTY ASSISTANT SECRETARY OF DEFENSE SYSTEMS ENGINEERING

System of Systems Engineering Collaborators Information Exchange (SoSECIE)

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Naval Integrated Fire Control - Counter Air Capability-based System of Systems Engineering

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Abstract

“Understanding the environment in which a system or System of Systems (SoS) will be developed is central to understanding how best to apply systems engineering (SE) principles within that environment. [1]” Since 1996, the Naval Integrated Fire Control-Counter Air (NIFC-CA) project has been striving to develop a SoS capability to defeat overland cruise missile and Over-the-Horizon (OTH) air warfare threats. Lacking the luxury of a “directed” SoS SE organization with component systems subordinated to the overarching SoS, the NIFC-CA project has utilized the “acknowledged” SoS SE methodology. This approach empowers a SoS SE team to work collaboratively with independent component system SE teams to achieve SoS capabilities and objectives.

The NIFC-CA SoS SE approach has been very challenging but also very rewarding and is viewed by the Deputy Assistant Secretary of Defense for Systems Engineering (DASD(SE)) as a pilot model for future SoS acquisition programs¹. With the successful completion of all critical design review (CDR) milestones in 2009 and successful NIFC-CA live-fire missile engagements in 2012 and 2013, a review of the NIFC-CA SE environment, approach and accomplishments is timely and instructive for similar developmental programs.

This presentation will provide an overview of the NIFC-CA acquisition environment, collaborative teaming construct and SoS SE approach. A key team challenge was to “uncouple “ the highly integrated and fully organic detect/control/engage sequence of the Aegis shipboard combat system and re-distribute key functionality to multiple air and surface sensors, the Cooperative Engagement Capability (CEC) sensor network and a new active-sensor missile. Insights will be provided into the application of the fundamental SE principles and processes utilized to analyze, design and produce this distributed fire control capability across multiple independent major defense acquisition programs (MDAP).

SoS systems engineering provides great opportunities to leverage national investments in defined-purpose military systems in order to achieve unique and powerful capabilities within the overarching SoS. It is apparent that most future military SoS acquisition and engineering programs will be of the acknowledged type. The acknowledged type of SoS SE environment provides many opportunities and challenges but requires flexible, creative and active program leadership and systems engineering leadership that is mindful of the fundamentals of systems engineering while encouraging and guiding collaborative engineering teams toward SoS-unique objectives. Within that type of leadership framework the collaborative community consisting of SoS systems engineers working with the diversity of the component system engineering teams can produce innovative, extensible and powerful warfighting capability.

[1] Deputy Under Secretary of Defense for Acquisition and Technology (DUSD(A&T)), Systems Engineering Guide for Systems of Systems (U), Version 1.0, August 2008



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Biographies

Mr. Jeffrey McConnell serves as a Principal Systems Engineer in the Capability Definition and Analysis Branch at the Naval Surface Warfare Center, Dahlgren Division (NSWCDD) and has over 31 years of experience in Navy and Joint Service systems engineering and program management. He is currently on a two year assignment to the USMC Amphibious Combat Vehicle (ACV) program office at Quantico, VA. His systems engineering experience ranges from the system/platform level including the original F/A-18A, TOMAHAWK Block 0 and Aegis ship Combat Systems to the system of systems level including Navy Theater Ballistic Missile Defense, Cooperative Engagement Capability (CEC) and Naval Integrated Fire Control-Counter Air (NIFC-CA). Jeff holds a Bachelor of Science degree in General Engineering from Geneva College and is a certified Level III Acquisition Professional in Systems Planning, Research, Development and Engineering – Systems Engineering (SPRDE-SE).

Ms. Lorra Jordan currently serves as the Head of the Track Management Branch at the Naval Surface Warfare Center, Dahlgren Division (NSWCDD). With prior experience as a system architect for varying System of Systems (SoS) programs (i.e., Multi-Service System Engineering Team (MSSET), Naval Integrated Fire Control-Counter Air (NIFC-CA), and Integrated Architecture Behavioral Model (IABM)), she has been afforded the opportunity to realize the benefits of a collaborative engineering approach to developing SoS solutions. Lorra holds a Bachelor of Science degree from Hampton University and 13 years of experience working DoD Programs that have cut across varying Surface Navy Programs that include the AEGIS Combat System, Cooperative Engagement Capability (CEC) Sensor Netting Capability, and multiple C2 Elements (e.g., Tactical Data Links, Shipboard Gridlock System with Auto Correlation). She is a certified Level III Acquisition Professional in Systems Planning, Research, Development and Engineering – Systems Engineering (SPRDE-SE).