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A Publication of the Wayne E. Meyer Institute of Systems Engineering



Director's Corner

Phil E. DePoy
Director, Wayne E. Meyer Institute
of Systems Engineering

The Wayne E. Meyer Institute of Systems Engineering was first established as the Institute of Defense Systems Engineering and Analysis in 2001. The mission of the Institute is to provide an interdisciplinary education and research center, matrixed across the four academic schools at the Naval Postgraduate School. That is, faculty and students are drawn from various schools and departments to form interdisciplinary research teams, and courses from various departments are combined to offer interdisciplinary curricula in systems engineering.

The Naval Postgraduate School has a lengthy history in systems engineering, with the very successful Space Systems Engineering curriculum, dating from 1985, and an equally successful Total Ships Systems Engineering curriculum that was established in 1992. In 1998, a Systems Engineering and Integration (SEI) curriculum was developed for Unrestricted Line Officers to provide Naval warfighters with education in systems development and operation. In 1999, NPS became one of four schools in the country to offer the M.I.T. curriculum in "Product Development for the 21st Century" (PD21), a systems engineering management program, developed and franchised by M.I.T. At NPS, this curriculum is offered via distance-learning to Navy commands and laboratories.

At its formation, the Institute subsumed the SEI and PD-21 programs as well as the Institute for Joint Warfare Analysis (IJWA), which had been conducting research in joint warfare operations, particularly in Fleet Battle Experiments, since its formation in the mid 1990's.

In May 2002, the Institute was renamed the "Wayne E. Meyer Institute of Systems Engineering" after RADM Wayne E. Meyer, USN (Ret.) who was the founding Program Manager of the Aegis combat system, the first large Navy

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Meyer Institute Chairs

Bill Solitario, Director of Technology Development with Northrop Grumman Ship Systems Company, is onboard as the first Industry Visiting Professor of Systems Engineering in the Meyer Institute.

Bill's role will be to introduce an industry-presence and flavor in the work of the Institute, including experimentation, systems engineering education, and the integrated projects. Bill has a distinguished record of performance with the former Litton Industries, now part of Northrop Grumman Ship Systems (NGSS) and, more recently, with NGSS. He has held a variety of positions in engineering leadership as well as in research, development, and technology. He is a member of the CEO's management team at NGSS, which is building the LPD17 and DDG51 class ships. Bill has played key roles in numerous Navy ship-related programs, including DD963, LHA, LPD 17, DDG51, the ongoing USCG Deepwater project, and others. He has also been a key member of NGSS's planning team for DD21, DD(X), and LCS ship projects. Bill can be reached via email at wasolita@nps.navy.mil.



VADM Roger F. Bacon, USN (Ret.), joins the Meyer Institute this month as the Chair of Undersea Warfare and Director of the Undersea Warfare Research Center.

VADM Bacon will be involved in the review of the USW curriculum to assure appropriate content relative to undersea and antisubmarine warfare principles and technology applications. He will also liaise with Navy laboratories, acquisition programs managers, program sponsors, and operational commands to identify prioritized needs for research topics in the USW area. The Chair will also be involved in war gaming support for the Office of Naval Research and other naval activities. Concurrently assigned as the Director of the Undersea Warfare Center, the Chair will be involved in the research planning and program execution of the Center. VADM Bacon served thirty-four years of active U. S. Navy duty that culminated in the assignment as Assistant Chief of Naval Operations for Undersea Warfare, the head of our nation's submarine force. After retiring from active duty in 1993, he served as Vice President of the Pacific Northwest office for Sonalysts, Inc. and later moved on to Tank Waste Remediation Systems and Safe Sites of Colorado. VADM Bacon can be reached at rfbacon@nps.navy.mil.

CAPT Jeff Kline, USN, recently joined the Institute as the Associate Director for Research and Experimentation. A graduate of the University of Missouri School of Engineering, the Naval Postgraduate School, and the National War College, CAPT Kline brings over twenty years of warfare experience to the Meyer Institute.



CAPT Kline will coordinate NPS-wide research efforts with the CNO's SEA POWER 21 experimentation process (SEA TRIAL). He will work with NPS faculty and students to coordinate thesis work and research projects with Navy initiatives in experimentation. Relevant areas of study and experimentation include anti-terrorism and force protection, ballistic missile defense, information security, mine warfare, FORCEnet, and littoral combat ship mission area analysis.

CAPT Kline also serves as the Naval Warfare Development Command's Chair of Warfare Innovation and acts as a general liaison for NWDC on the NPS campus to forward fleet-relevant issues and problems to NPS faculty and students. He plans to coordinate a Navy Concepts Symposium between NPS and NWDC, which will provide NWDC the opportunity to present SEA TRIAL initiatives, Tactical Development and Evaluation Problems, and current Limited Objective Experiments to faculty and students, and will expose members of NWDC to current research being conducted at NPS. CAPT Kline can be reached via email at jekline@nps.navy.mil.

2002 Research Year in Review

Research facilitated by the Meyer Institute is designed to develop more extensive interactions and participation with Department of Defense (DOD), Navy, and industry teams conducting significant system-based studies and evaluations. Research is conducted by the faculty and through the selection of topics for student theses.

2002 saw the expansion of the Meyer Institute Research program. From data capture for Fleet Battle Experiments to analysis of Cold War history and current terrorist threats, the Meyer Institute is at the forefront of DoD research efforts. For details on any of the 2002 Research Projects, please email MeyerInst@nps.navy.mil.

- A Retrospective on the Development and Acquisition of Naval Capabilities During the Cold War Era
- Fleet Battle Experiment-Juliet
- Joint Naval Fires Network–Fleet Improvement Process Analysis
- Force Protection Limited Objective Experiments
- Force Protection Experimentation Non-Lethal Weapons Testing
- Anti-Terrorism Information System
- Center for Defense Technology
- PGMT Computing Environment for Sparse Optical Array Codes
- Unconventional Weapons of Mass Destruction: An Assessment
- A Strategy for Dealing with the Long Range Terrorist Threat

Spotlight on Cold War Research and Development

The history of the U.S. Navy is a proud story of battles fought and won, of outstanding leaders afloat and ashore, and of selfless service to our Nation.

It is also a story of the continuing application of new technology to the advancement of Naval capabilities. From smoothbore guns to submarine-launched ballistic missiles, from sextants to satellite navigation, from sail to steam to nuclear propulsion, the Navy's progress has been measured by the introduction of technological innovation.

At no other period in this history has the adoption of new technology in the Navy been as pronounced and effective as during the Cold War. With respect to the research, development, and introduction of weapons and combat systems, this was the most productive period in Navy history.

The question of how the Navy was able to make these advances and successfully meet the operational and technical challenges of the day was examined during a symposium held at NPS in June 2001. Active participants in the Cold War R&D process were in attendance.

Participants included: Dr. Alan Berman, former Director, Naval Research Laboratory; Dr. James E. Col-

vard, former Technical Director, Naval Surface Warfare Center/Dahlgren; Dr. Phil DePoy, former President, Center for Naval Analyses; VADM James H. Doyle Jr., USN (Ret.), former Deputy Chief of Naval Operations for Surface Warfare; Mr. Ralph E. Hawes, former General Manager, Pomona Division/General Dynamics; Dr. Alexander Kossiakoff, former Director, Johns Hopkins University Applied Physics Laboratory; Dr. Walter LaBerge, former Technical Director, Naval Weapons Center/China Lake; VADM Paul F. McCarthy, USN (Ret.), former Director, Research, Development, Test, and Evaluation, Office of the CNO; and RADM Wayne E. Meyer, USN (Ret.), former AEGIS Program Manager.

Several elements essential to successful weapons development during this era were identified:

- ◆Continuity of leadership, funding, and focus.
- ◆Technical competence.
- ◆Existence of discretionary funds in both industry and government.
- ◆Clarity of role among private and public sector institutions and between the policy and execution components of institutions.
- ◆Program managers who were focused and knew the technical details

of their program.

◆Emphasis on results rather than cost, mutual trust and respect, and a sense of urgency between the government, the military, and the corporate world.

◆The existence of a defined potential enemy which created a stable funding environment, and reduced the amount of infighting and institutional competition.

◆A strong uniformed leadership, with rank aligned with responsibility for officers who dealt with the OSD and Congress.

◆In-house laboratories that were honest brokers and keepers of the technical safety net.

◆Leaders, in both industry and government, who were rotated through both experiential and educational assignments and developed an understanding of the Navy and industry from a corporate sense.

The difficulties encountered in developing combat and weapons systems during the Cold War era were formidable, and the conceptual, technological, and engineering advances required to bring them to fruition were remarkable.

For a copy of the Cold War R&D report, please email MeyerInst@nps.navy.mil.

Education

The Meyer Institute is engaged in a wide variety of educational endeavors in addition to its research efforts. From support of the campus-wide systems engineering project to distance learning programs in Systems Engineering and Analysis, the Meyer Institute plays an integral part in the development of tomorrow's engineers.

Systems Engineering and Analysis (SEA)

The eighteen-month Systems Engineering and Analysis (SEA) program at the Naval Postgraduate School offers students an opportunity to study contextual matter (sensors, weapons, information systems, networks, C4I), and techniques (combat modeling and simulation, project management, fundamentals of systems engineering). Graduates will earn either a Masters Degree in Systems Engineering or in Systems Analysis. While the primary audience is Unrestricted Line Officers, and the projects tend to look at broad naval issues, officers from all communities are welcome. Skills learned in this degree program will deepen a student's understanding of how the military builds and fights large systems.

An integral part of the SEA education is the design and management of the annual campus-wide systems engineering project. Students who lead and participate in this campus-wide project leave NPS with an unparalleled grasp of the strategic, tactical, and technical concerns surrounding important defense issues. SEA students participate in this project in lieu of writing a thesis.

For the 2001 project, SEA students developed the concept and designed a force for combat in the littorals (Project Crossbow). This force included UAV combat aircraft; UAV ISRT aircraft; small fast

fighting ships; a new, very fast, automated carrier designed from the keel up to support UAVs; the command and control network; the logistical support system and ships; and several new weapon systems such as a Free Electron Laser for point defense. They developed and tested the operational concept through campaign analyses. Other student groups on campus designed the pieces to the SEA requirements, and then SEA assembled the total system and ensured its integration. The project results were widely disseminated, with Executive Summaries read by or briefed to the CNO and the Defense Science Board, among many others. Student work had great visibility and an impact on major policy discussions.

The 2002 Project involved the design of a concept and force for Expeditionary Warfare. This is a multi-year project which will be continued by the next group of SEA students.

For more information on the SEA program and the campus-wide integrated student project, please contact Professor Chuck Calvano, Associate Director for Education, at ccalvano@nps.navy.mil, Dr. Dave Olwell, Academic Associate, at dholwell@nps.navy.mil or CDR Mark Rhoades, SEA Program Officer, at mmrhoades@nps.navy.mil.



Office of Distributed Learning



The Meyer Institute Office of Distributed Learning offers two systems engineering distance learning degree programs.

Both programs are delivered by a combination of video tele-education (VTE), web-based education (WBE), and/or onsite classes.

SEM-PD21

The Systems Engineering Management (SEM)-Product Development for the 21st Century (PD21) is a joint engineering and management degree program offered by NPS through a partnership with the Massachusetts Institute of Technology (MIT).

SEM-PD21 is for experienced technical professionals who desire to move into product development leadership and management positions in their organizations. The two-year program is designed in an executive format in which students continue to work at their companies while taking classes using video conferencing (VTC). All students earn their masters degree from NPS and also receive a certificate of recognition from the Massachusetts Institute of Technology (MIT) and SPRDE Level III DAWIA certificates. Students select an elective track that leads to another certificate: Systems Acquisition (DAU equivalency with PMT302), Information Systems Operations (ISO ONLINE certificate), or Software Engineering (S/W Engineering certificate). Other elective tracks can be designed to meet a particular sponsor's needs. The program is open to military officers, federal civilians, and a limited number of defense contractors. Organizations sponsor students on an individual basis and students are typically located throughout the nation.

The SEM-PD21 program provides the educational foundation needed by technical leaders to drive major improvements in product development capabilities, sustain superior business performance, and meet user needs. Details on the SEM-PD21 program can be found at <http://oclc.nps.navy.mil/pd21>.

Master of Science in Systems Engineering (MSE)

The Master of Science in Systems Engineering degree program is designed for DoD organizations involved in a wide range of systems engineering and integration challenges that seek to transform themselves into world class organizations.

These commands can partner with NPS to educate and train engineers with tools and technologies relevant to their work, resulting in employees with greater knowledge and expertise to enable them to better meet the needs of their customers.

DoD organizations or sponsors provide the students, and the Meyer Institute Office of Distributed Learning provides the instruction, course materials, and hands-on experience. Courses are delivered at the students' local site using a combination of on-site instruction, video conferencing, and web-enhanced on-line courses. The program can begin any academic quarter, in accordance with the sponsor's needs.

Students take two courses per quarter over a two-year period. There are ten core courses in the 16 course program. The remaining six courses can be tailored to meet the sponsor's need. Students must participate in a capstone design project in lieu of writing a thesis.

Students receive an NPS degree and two NPS Systems Engineering certificates of accomplishment (Fundamentals of Systems Engineering and Systems Engineering Integration) and DAU equivalency certificates for all SPRDE Level III training requirements.

The MI distance learning office will help establish partnership arrangements with other organizations if desired. Additional information on the program can be found at <http://oclc.nps.navy.mil/msse>.

Director's Corner (cont'd from page 1)

acquisition program in which a total systems approach was used in the system development and design.

Shortly after its formation in 2001, the Institute developed a distance-learning program to offer a Masters in Systems Engineering degree to engineers at Port Hueneme Missile Division. The first cohort of this program included over 30 engineers, and after one year a second cohort of equal size was selected. In 2003, the program has been expanded to include the Marine Corps Tactical Systems Support Activity (MCTSSA) at Camp Pendleton, CA, the Naval Surface Warfare Center-Corona, the Naval Surface Warfare Center-Crane, and the Naval Undersea Warfare Center-Keyport. At the present time, this distance-learning program includes 115 students. The first cohort from Port Hueneme completed their studies and graduated in June 2003.

In 2002, the SEI curriculum was modified to a new curriculum, Systems Engineering and Analysis (SEA), but it is still focused on educating warfighters to understand and employ technology using large systems of systems to fight and win. The SEA curriculum recruits primarily U.S. Navy officers from the unrestricted line. It is planned that approximately 20 students will enter this program in January and July of each year.

A key component of the SEA curriculum is a capstone project. Each year, the SEA students are integrated with capstone design teams from other engineering departments, as well as students from other curricula such as Information Sciences and Operations Research, in a single project. In 2001, the combined team of students designed a high-speed air-capable ship and an unmanned aircraft for littoral combat. The SEA students were responsible for developing the requirements for the ship and aircraft, as well as integrating the systems.

In 2002, the integrated project team completed a study of expeditionary warfare, including a top-down "system of systems" examination of current and proposed expeditionary warfare systems and designs of a class of amphibious warfare ships, two types of heavy-lift aircraft, and a space system to provide surveillance. Over 90 students and 18 professors participated in this study.

Other research projects recently completed or currently being conducted in the Meyer Institute include analysis support for Fleet Battle Experiments, systems engineering support for the Joint Fires Network (JFN), analysis of the Joint Force Maritime Component Commander's Maritime Planning Process, and experimentation with force protection concepts.

Phil DePoy can be reached via email at pdepoy@nps.navy.mil.

June 2003 Distance Learning Graduates

June 2003 saw the first graduating class of the Masters of Science in Systems Engineering (MSSE) Distance Learning program.

These students are full time engineers who completed their degree requirements while actively employed with NSWC-Pt. Hueneme. This class is a milestone for the Meyer Institute Distance Learning program because it represents the success-

ful melding of practical experience and teleducation.

The commitment of the sponsoring Command and its Technical Director, Charles Giacchi, was instrumental in the success of this program.

Graduates traveled to Monterey for the ceremony. Three students were selected as recipients of the Meyer Institute Award for Excellence in Systems Engineering.



MSSE Graduates and RADM Meyer on graduation day



RADM Meyer and Professor Dave Matthews, recipient of the Meyer Institute Award for Teaching Excellence in Systems Engineering



RADM Wayne E. Meyer and the new Wayne E. Meyer bust, unveiled during the June 2003 graduation festivities