NAVAL
POSTGRADUATE
SCHOOL

Presentation to the Annual SERC Research Review

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WWW.NPS.EDU

Current Research Topics

- NPS has several research lines that would invite participation extramurally.
- They include:
  - The SE Body of Knowledge and Reference Curriculum project for which NPS shares PI responsibility,
  - Research lines of department members, and
  - Work led by the Meyer Institute of Systems Engineering.

Body of Knowledge and Curriculum to Advance Systems Engineering (BKCASE)

- Stevens has begun a 3-year project to create a robust body of knowledge and a reference curriculum to advance systems engineering. Naval Postgraduate School is the co-lead.
- DoD recognizes that their own SE success depends on having a well-accepted robust SE BoK on which standard practice, certification, and workforce competency and education can be based. They are providing substantial funding for effort.
- BKCASE will likely follow similar approach as did SWEBOK and GSwE2009, two analogous projects for software engineering and leverage other efforts such as NPS Modeling and Simulation Acquisition Curriculum
- INCOSE and IEEE Systems Council have agreed to participate
- IEEE Computer Society and ACM invited to participate

Babel

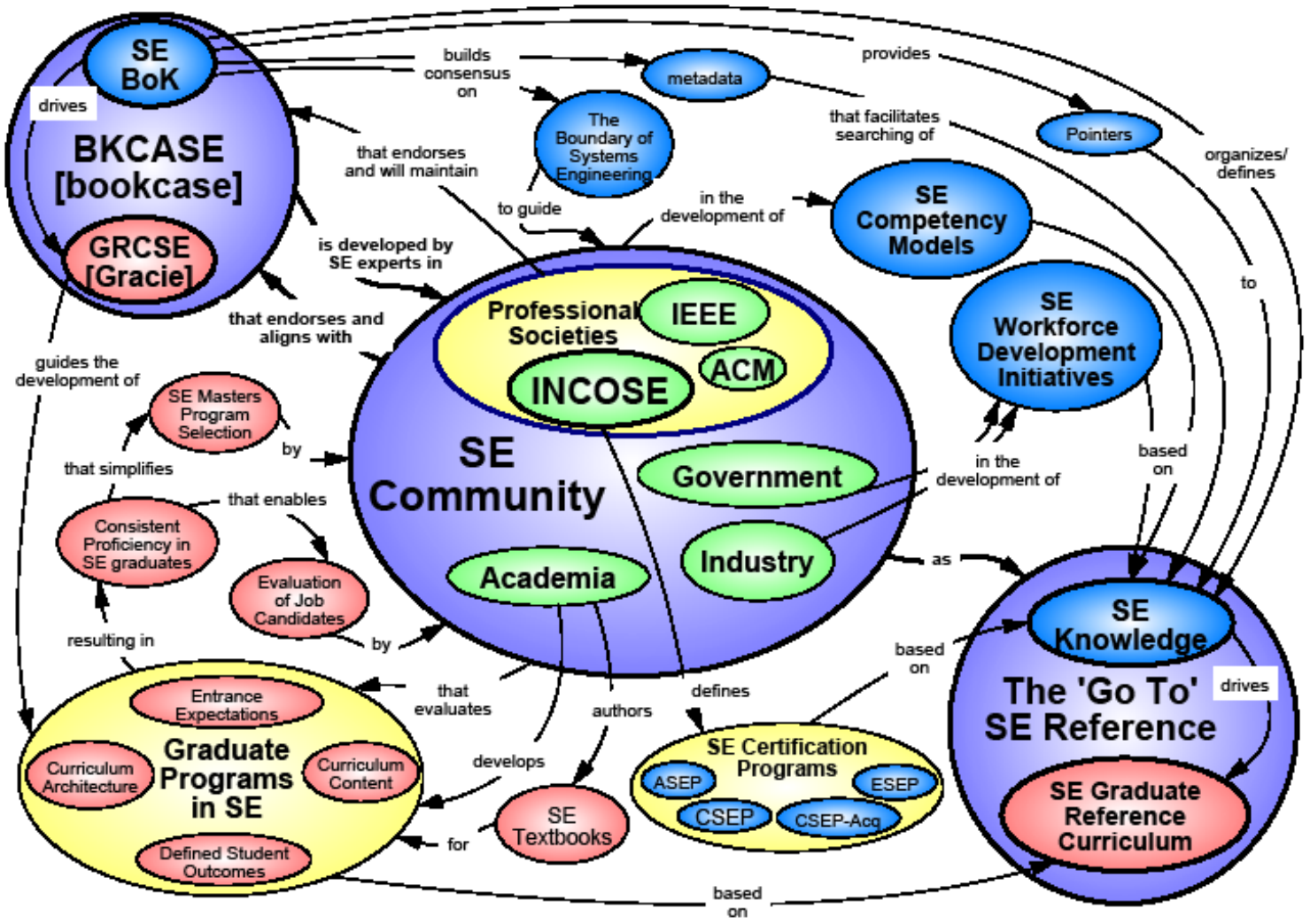
- There are many Systems Engineering (SE) workforce development initiatives that rely on a clear understanding of the knowledge that is included in SE and on how that information is organized – but there is no authoritative body of knowledge on which to rely

  - INCOSE SE Handbook
  - FAA SE competency model
  - DoD SE competency model
  - UK INCOSE SE framework
  - INCOSE SE reference curriculum framework
  - NASA SE Handbook
  - etc

Everyone is forced to invent their own or rely on references to other non-authoritative sources

Systemigram

Body of Knowledge and Curriculum to Advance Systems Engineering (BKCASE)



Alice Squires 10/13/2009

Multiple opportunities to collaborate

- As authors
  - Volunteer authors will work an average of about 1-2 days per month, attend quarterly workshops and participate in periodic virtual meetings. Approximately 30-40 authors will be sought representing different locales and business segments. Some authors will work on both SE BoK and GRCSE; others will work on only one product.
- As reviewers
  - Volunteer reviewers will work as their time permits. Several hundred authors will be sought representing different locales and business segments. Some reviewers will review both SE BoK and GRCSE; others will review only one product.
- Small organizational meeting at NDIA in late October; larger meeting at NPS 8-9 December.
- Contact us at BKCASE@gateway.stevens.edu
- Website coming

Selected faculty research lines

- Dave Olwell
- Ray Madachy
- Cliff Whitcomb
- Gary Langford

Dave Olwell

- SE BKCase project (RT1)
  - Three years, $550K
- M&S curricular development for the acquisition community (Thrust area 3)
  - Two years, $500K

Ray Madachy

- Software Data Quality and Estimation Research in Support of Future Defense Cost Analysis (RT6)
  - FY 2009 and 2010 funded through AFCAA MIPR
- Effectiveness Measures (EM)(RT15)
  - Collaborative research and provided EM tool in first phase
  - NPS tool and case studies included in EM TTO extension

Cliff Whitcomb

- **Unmanned Vehicle SoS Architecture** – create and demonstrate an effective methodology to design, development, and assess alternative system architectures for the ONR UV Sentry program. Use the architecture to provide consistent quantitative evaluation of the SoS requirement suitability, effectiveness, technology maturation, risk, and cost.
  - $125K, ONR
- **All-Electric Warship Architecture** – create an integrated architecture and design simulation methodology for exploring different electrical distribution system tradeoffs to find optimal total ship designs in terms of operational effectiveness metrics.
  - $175K, ONR
- **Software and System Architecture** – build behavior models using tools for design and analysis of executable architecture for behavior modeling based on event grammars.
  - $TBD, ONR

Gary Langford

- Border security project
  - Theory of systems engineering (funded by TRAC-MRY)
  - Systems of systems integration (funded by TRAC-MRY)
  - ~$500K

Wayne E. Meyer Institute of Systems Engineering – Founded 28 May 2002

Rear Admiral Wayne E. Meyer (1926 - 2009) is regarded as the "Father of AEGIS" for his 13 years of service as the AEGIS Weapon System Manager and later the founding project manager of the AEGIS Shipbuilding Project Office. He is the son of Mr. and Mrs. Eugene Meyer of Brunswick, Missouri, where he was born and raised. He retired from the U.S. Navy in 1985 as the Deputy Commander for Weapons and Combat Systems, Naval Sea Systems Command and Ordnance Officer of the Navy.

- www.answers.com

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Meyer Institute within NPS

- One of four NPS Institutes
- Reports to Dean of Research
- Six assigned faculty and two admin staff
- Participating faculty from across campus
- Visiting faculty from academia and industry
- Director assignment is for 3 years
  - SE Faculty / MI Director (50/50)
  - Primary NPS-wide SE **research** POC
  - Facilitate interdisciplinary projects across NPS
  - Receives guidance/funds from external and internal stakeholders/sponsors

Associated Chair Professors

- Chair, Undersea Warfare
  - RADM (Ret.) Jerry Ellis, USN
  - Director, NPS USW Research Center
- Chair, Expeditionary and Mine Warfare
  - RDML (Ret.) Rick Williams, USN
  - Assistant Director, NPS USW Research Center
- Other Chair Professors
  - In progress, TBD

USW Research Center Functions

- Fostering education and research in Submarine Warfare, Anti-Submarine Warfare (ASW) and Mine Warfare (MIW)
  - Ongoing dialog with external sponsor for research topics and research proposals
  - NPS coordination of research and thesis topics with professors/advisors and students
  - Guidance and advice to the NPS USW Academic Committee on the content and management of the USW Curriculum

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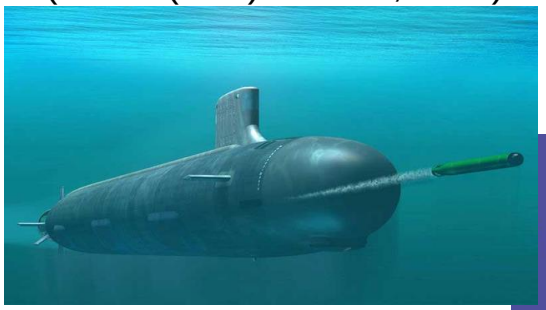
Other Current Meyer

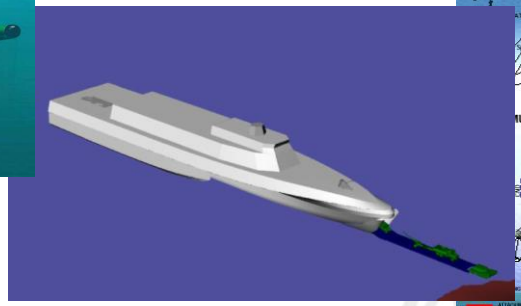
Underwater bomb trajectory prediction for mine clearance (Dr. P. C. Chu)

ASW Operational Scenario Simulation (CAPT (Ret.) J. Kline, USN)

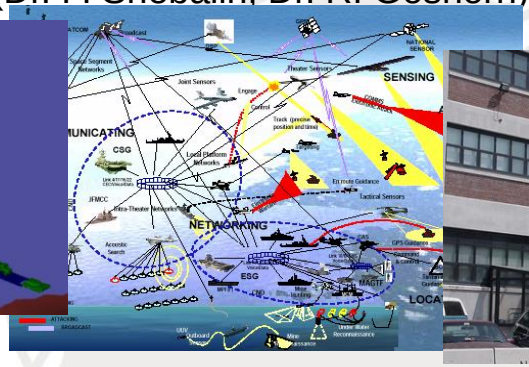


http://www.militarypictures.info/submarines/Virginia_class_submarine.jpg.html

Navy Ship Design (Dr. F. Papoulias)

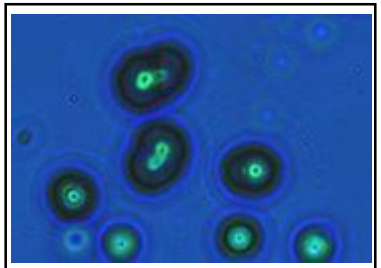


Network-Centric Enterprise Systems Engineering (Dr. P. Shebalin, Dr. R. Goshorn)



Exterior Insulation Technology (Dr. F. Marquis)

Condensed Matter Nuclear Science (Dr. Melich, Dr. Johnson, Dr. Hagelstein)



Pits in CR-39 from experiments at SSC San Diego. The pits have been interpreted as evidence of low-energy nuclear reactions. [Wikipedia]

Carbon Nano Tubes and Heat Transfer (Dr. Y. Kwon, Maj R. Pollack, USAF)

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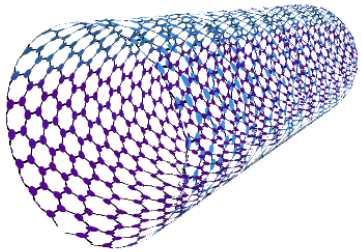
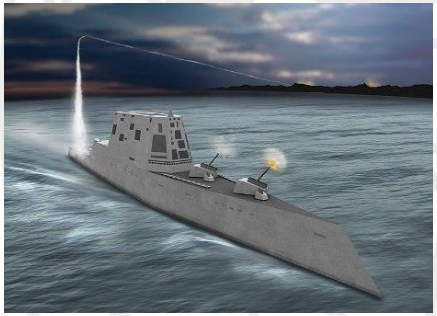
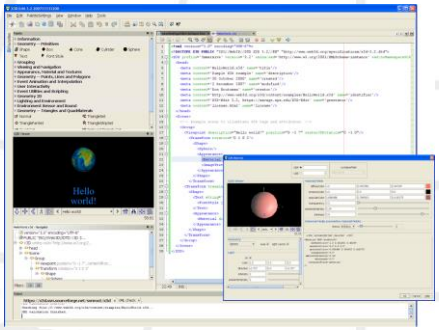


Electric Plant Modeling (Dr. G. Oriti, Dr. A. Julian)



http://www.weeklystandard.com/weblogs/TWSFP/SHIP_DD-X_Concept_Firing_lg.jpg

Open Source Tools for Modeling and Simulation (Dr. D. Brutzman)



Future Meyer Institute Research Areas

- Warfare Systems (Surface, C4ISR, …)
- Energy
- Follow-on SSBN/SSGN Launcher Technology
- Point Sur Ocean Acoustic Laboratory
- Collaborative Engagement Capability
- Enterprise Systems Engineering
- Systems Science
- Autonomous Agents and Multi-Agent Systems
- …

Backup

Mission

- The Meyer Institute provides NPS faculty and students with **relevant, tailored, and unique research opportunities** in systems engineering and designated warfare areas to support NPS graduate education that increases the combat effectiveness of U.S. and Allied armed forces and enhances the security of the United States.

Contact Information

- Dr. Paul Shebalin
- Director, Wayne E. Meyer Institute of Systems Engineering
- Phone: 831-656-1047
- Email: pshebali@nps.edu

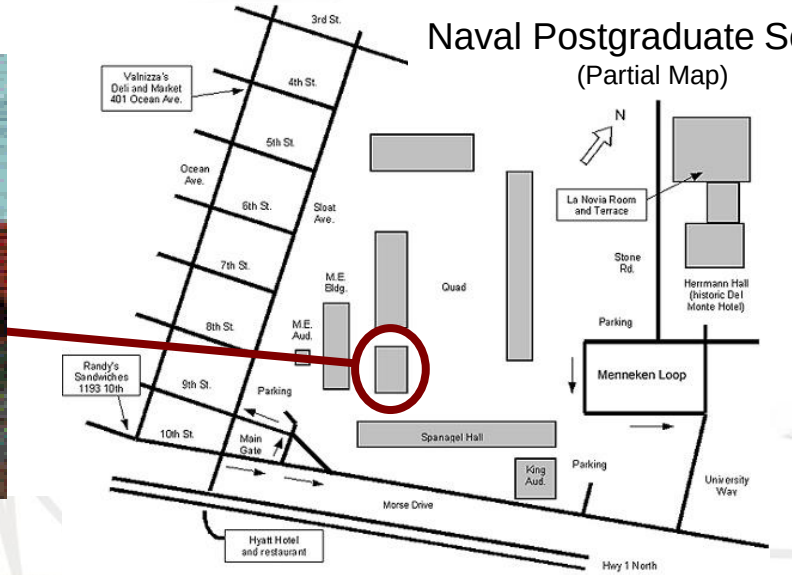
Facilities and Material to Support SE Students and Interdisciplinary Projects

Bullard Hall

- Meyer Inst.
- SE Dept
- SSAG

1ST FLOOR

2ND FLOOR



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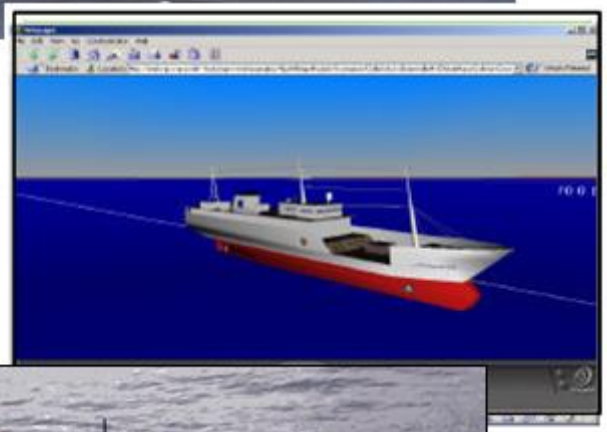
USW Education and Research

Improving the USW Curriculum

Fostering USW Research



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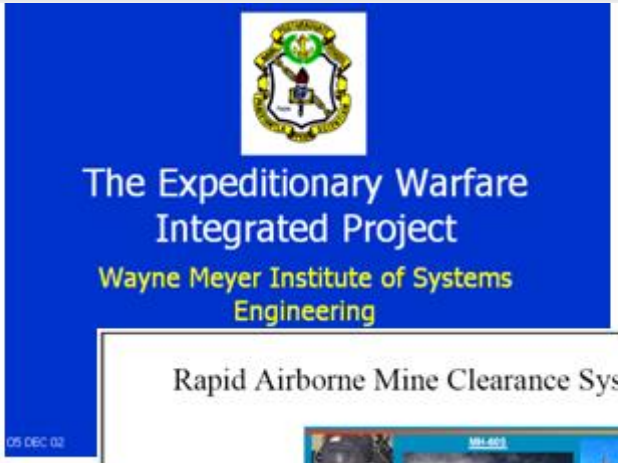
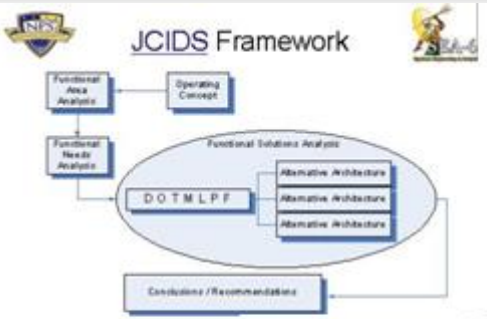
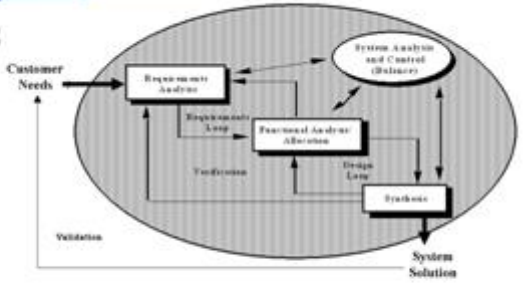
Expeditionary and Mine Warfare Capstone SEA Projects

2002 Expeditionary Warfare







2003 Expeditionary Warfare Force Protection

2004 Joint Expeditionary Logistics

2007 Riverine Sustainment

2008 Maritime IEDs in Domestic Ports

Plus 10 years of METOC MIW Theses