



7 August 2017

Memorandum for Systems Engineering Analysis Cohort 27 (SEA27)

Subj: FY2017 SEA27 Capstone Projects: Tasking and Timelines

Enclosures:

Tab A: Distributed Maritime Operations and Unmanned Systems Tactical Employment

Development: Counter-Targeting, Decoys, EMW, and Man-Unmanned tactics


Tab B: NPS Warfare Innovation Continuum "Distributed Maritime Operations: Joint, Combined, and Coalition Warfare at Sea"

Tab C: IRB Student Checklist Requirement

1. This memorandum provides the FY2017-18 guidance for the conduct of the Systems Engineering Analysis (SEA) integrated project, which is required as partial fulfillment for the SEA degree. SEA students will deliver completed project reports and final briefing materials to faculty advisors in accordance with the following plan and milestones. Each group will:
 - a. Develop project proposals and management plans during the Fall Quarter AY2018. These proposals and plans will serve to focus initial research and analysis. These plans will be reviewed and updated frequently as research progresses.
 - b. Conduct project reviews approximately every six weeks, finishing with a final brief to interested stakeholders on and off campus.
 - c. Assign a report lead from each team. Work closely with faculty advisors to prepare the final reports for faculty advisor signature by five work-weeks before graduation. The final reports are then due to the SEA chairman one week later; and to the Operations Research and Systems Engineering department chairmen two weeks before graduation.
2. SEA students are expected to identify and integrate students and faculty from across the campus – and also from outside NPS – to participate directly in the project or to provide source documents, technical knowledge and insights, and knowledge of evolving requirements, capabilities, and systems. This participation could include students who would join project groups; students doing related individual thesis topics from TSSE, TDSI, OR, IS or SE; faculty inside or outside NPS who have expertise related to the project; and appropriately engaged government agencies and industry developers. It is the students' responsibility to integrate the efforts of outside participants in the projects. Faculty advisors and the SEA Chair will, of course, significantly assist in these efforts.
3. Prior to commencing the formalized systems engineering and analysis process including stakeholder analysis, **the SEA team will consult with Dr. Larry Shattuck, Chairman of the NPS Institutional Review Board and submit to him** Tab A, a general description of the team's systems and analytical approach to address the tasking, a completed IRB student checklist research form (Tab C) and a list of candidate questions for stakeholders to Dr.

Shattuck to review. The intent is to ensure questions are oriented about the “what” of the systems and not about the “who” of the stakeholder.

4. The analysis will employ the systems engineering and operations research methodologies presented in class work and from the project advisors. The role of the SEA students is that of the lead project systems engineering team, working closely with other members of the project engineering teams from TDSI and other campus curricula. SEA students will be expected to define the functions and performance of systems, develop alternative architectures to meet those functions, and evaluate the alternative architectures for performance and cost. In executing these tasks, students will be defining and understanding the overall project requirements, recognizing that the definition process is iterative and will evolve as the project progresses.
5. Grades are assigned to the participants in these projects. Although work is performed as part of a team, individual performance will be the basis for this evaluation. Successful completion and documentation of the project is a degree requirement.
6. The SEA27 project will build on, possibly challenge, but not replicate, other DOD, Navy and SEA projects. Extending SEA 26 Fleet design project to address Unmanned Systems specifically and SEA 23 on use of unmanned systems for targeting are examples. SEA27 will coordinate their study efforts, participate and occupy leadership roles in other FY17/18 efforts at NPS aimed at contributing to developing the Distributed Maritime Operations concept. These activities, coordinated by the Chair of Systems Engineering Analysis are described in Tab B.



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Distribution: SEA27 students; Profs. Beery, Atkinson, Hughes, Jacobs, Giachetti, Whitcomb, Stevens, Solitario, Kline, Papoulias, Porter, Boger, Brutzman, Buettner, McDowell, President Route; Provost Lerman; Deans Wirtz, Scandrett, McCormick, Paduan, and Moses, CAPT Daniel Verheul; Dr. Shattuck; LCDR Naccarato, RDML Williams, RADM Ellis, Mr. Mike Novak (OPNAV N91B), Mr. Chuck Werchado (N81B), LCDR Karl Hassenfratz, and Ms. Kathie Cain

TAB A

SEA 27 Tasking

Distributed Maritime Operations and Unmanned Systems Tactical Employment Development: Counter-Targeting, Decoys, EMW, and Man-Unmanned Tactics

“Design a cost effective and resilient unmanned and manned system of systems capable of contributing to the Distributed Maritime Operations concept in the 2030-2035 timeframe. Focus your design’s contributions on counter-targeting, decoys, deception, electromagnetic warfare and the manned-unmanned tactics associated with them to achieve desired effects in supporting tactical offensive operations in the air, surface, undersea and cyber domains. Consider employment requirements, power requirements, operating areas, bandwidth and connectivity, interoperability, sensor data processing, transfer and accessibility, logistics, forward arming and refueling (FARPS) basing support in forward areas or from CONUS bases. Where possible, include joint contributions in the systems of systems. Generate system requirements for platforms, sensors, and communications in a challenging EM and contested environment. Develop alternative architectures for platforms, sensors, active decoy packages, manning, communication and network connectivity, and their operational employment concepts. Address the costs and effectiveness of your alternatives in mission areas like at-sea strike and electromagnetic maneuver warfare.”

Advisors:

Dr. Paul Beery, Systems Engineering Department--Nominated

Dr. Michael Atkinson, Operations Research Department -- Nominated

On Campus Subject Matter Experts:

Dr. Doug Horner (Unmanned Systems—CAVR Lab)

Dr. Ray Buettner (Unmanned Systems—CRUSER Director)

Dr. Phil Pace, (NPS ECE Department)

CAPT Wayne P. Hughes, USN (ret)

Dr. Wayne Porter, CAPT, USN (ret)

CAPT Chuck Good, CNSF Surface Warfare Chair

Dr. Dan Nussbaum, Operations Research Department

LCDR Vince Naccarato, USN SEA 20 Graduate and SEA Program Officer

Off Campus Points of Contact:

Mr. Mike Novak OPNAV N9I B

Mr. Chuck Werchado OPNAV N81

Mr. David Mortimer, NUWC Keyport

Dr. Craig Bleile, NWDC Science Advisor

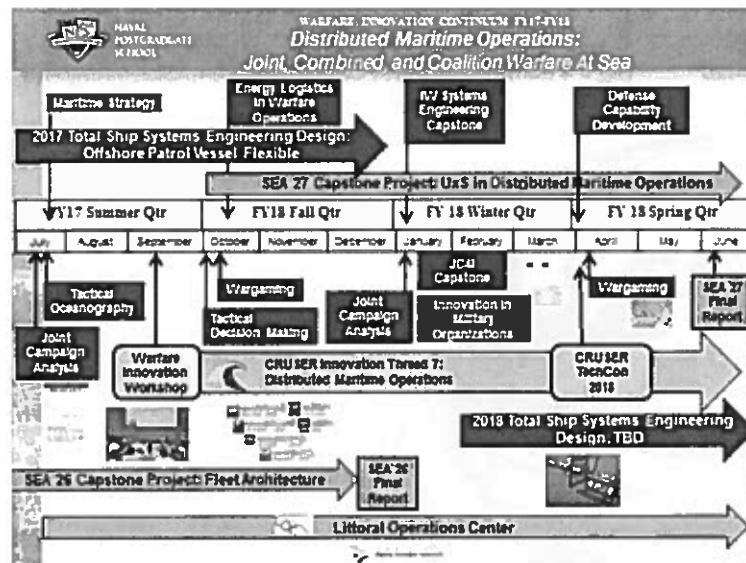
Dana E Lopez, USFF N92—Capabilities Innovation

TAB B

NPS Warfare Innovation Continuum
A Coordinated Naval Postgraduate School Cross-Campus Project FY17-18
“Distributed Maritime Operations:
Joint, Combined, and Coalition Warfare at Sea”

Purpose: Coordinate and execute a series of cross-campus educational and research activities synchronized by the OPNAV N9I Chair of Systems Engineering Analysis with a central theme of developing concepts, technologies, tactics, and relations to advance the Distributed Maritime Operations concepts – particularly those contributions made by joint, combined, and coalition forces. Focus for a major portion of this effort will be on leveraging unmanned systems to enhance cross domain operations.

Background: Emerging technologies in unmanned systems; autonomy; missile systems; undersea systems; long-range, netted and multi-domain sensors; and networks create a new environment for operations in the littorals, on and over the sea. This changing technology environment both challenges traditional fleet operations and provides opportunities for innovative tactics, techniques, and procedures to achieve maritime domain objectives in sea control, power projection and distributed maritime operations. The Warfare Innovation Continuum (WIC) is a series of independent, but coordinated cross-campus educational and research activities to provide insight into the opportunities for warfighting in the complex and electromagnetically contested environment at sea and littorals. Unmanned systems technologies; joint, combined and coalition forces contributions; and multi-domain C2 provide opportunities to support integrated fires and tactically offensive operations, and further develop the concept of distributed maritime operations. The larger research question is: **“How might emerging technologies; concepts; joint, combined and coalition forces contribute to distributed maritime and cross-domain operations?”**



TAB C

IRP Student Research Check list is found at:

[http://my.nps.edu/documents/103449465/105822173/IRB Student Research Checklist.pdf/4fe273c8-af1f-42e8-9d72-5a750f3736df](http://my.nps.edu/documents/103449465/105822173/IRB_Student_Research_Checklist.pdf/4fe273c8-af1f-42e8-9d72-5a750f3736df)