SPONSORED RESEARCH TOPICS

The Acquisition Research Program (ARP) of the Graduate School of Business & Public Policy at the Naval Postgraduate School accepts research topics from potential sponsors. These topics have been compiled to assist graduate students in locating topics for their research projects. If interested in a topic, please contact the ARP office at arp@nps.edu.

Topic #	Sponsored Topic
T17-020	**Topic: Evolutionary/Incremental Acquisition** Primary Research Question: How difficult is it to develop a successful incremental acquisition approach for defense acquisition programs? Within Defense Acquisition, an evolutionary strategy with incremental developmental approach is the preferred strategy for most acquisition programs. The basic advantage over a single-step acquisition developmental approach is that the warfighter can get some capability sooner than waiting for full capability. But, how hard is this to do for program managers (PMs)? The focus of this research is to examine how difficult it is to successfully develop an evolutionary acquisition strategy with an incremental development approach. The research will use the Joint Common Missile (JCM) program and the subsequent Joint Air Ground Missile (JAGM) program as the basis to survey acquisition professionals. The research will develop a survey for acquisition professionals that will ask them to develop an acquisition strategy for the JCM program based on approved requirements, a consensus technology risk assessment and sufficient funding. The results of the survey will be recommended acquisition strategies. These strategies will then be compared to the actual strategy implemented in the JAGM program. The research will provide insights into how PMs can better develop acquisition strategies based on requirements, technology, risk, urgency and funding. The study will also examine the effect that the approved requirements, technology risk assessment and funding levels have on the recommended acquisition strategy.
T17-019	**Topic: Why Do Programs Fail? An Analysis of Defense Program Manager Decision Making in Complex and Chaotic Program Environments** This qualitative and ethnographic study will study at least 30 DoD Program Managers to better understand the sense-making processes in complex and chaotic program environments. We will focus on how the program manager gains insight in the decision making process and correlate this with overall program performance. Chaotic and complex decision making environments are not limited to Defense program environments. Commercial programs tend to organize similarly to Defense programs and experience similar cost and schedule issues and cost their corporations millions of dollars in lost revenue. This study will provide a greater level of insight into these issues and will be the basis upon which future research and possible policy can be derived to effect the performance of complex programs. Additionally, by studying decision making in complex and chaotic environments, we may be able to correlate

Topic #	Sponsored Topic
	these findings with other chaotic scenarios such as disaster relief and other emergency situations environments. The nonlinearity of these events in which human decision making is predicated by chaos may have certain similarities and patterns that can be studied with regard to their association with the individuals involved in the decision making process. If we better understood the human in the loop influence on decision making in ambiguous environments, perhaps future organizational and leadership theory and methods could be better tailored to the environment leading to more predictable outcomes. **Research Question:** How does the program manager gain insight in the complex and chaotic decision making process and how does this insight correlate with overall program performance?
T17-018	**Topic: Transitioning Technology to a Program of Record** Technology transition to "programs of record" has often been challenging, especially when new capabilities emerge that weren't originally envisioned for increasing existing ones, such as next generation aircraft, fighting vehicles, etc. The recent evolution of unmanned aerial systems (UAS) is perhaps a good example of extemporaneous proliferation of new capabilities. As such, these technology-driven advances may not fit into conventional paradigms of warfighting concepts and may have organizational and infrastructure impacts. The Anti-Submarine Warfare (ASW) Continuous Trail Unmanned Vessel (ACTUV) is a DARPA project that is nearing the end of prototype demonstration and testing of capabilities. The ACTUV project built a surface ship, christened SEA HUNTER, now being tested in San Diego, which can autonomously conduct 70 day missions of up to 7000nm without a manned crew aboard. The Office of Naval Research (ONR) is conducting a two year test program to confirm it complies with international collision regulations (COLREGS) and to confirm it is capable of conducting ASW and Mine Countermeasures missions. Other missions and sensor tests are envisioned if funding permits. In order to transition to a Program of Record, a validated requirement must exist, along with funding for development/procurement across the Future Years Defense Program. Using this case as an example, research should be focused upon what specific actions, including deliverable products, should be taken by potential stakeholders across the DoD to effect its transition. Processes involved will include "Big A" Acquisition support systems of JCIDS, PPBES, as well as Acquisition Management.
T17-017	**Topic: Measuring process efficiency in defense acquisition management: Comparing the acquisition processes of the US, other countries and/or large multi-nationals** Study Questions: • What are the key development processes used by nations and multi-nationals? • What are the efficiencies? • Can the development costs for similar acquisitions be compared? • What (if any) are the reasons for more or less efficiency? • What are the differences in buying performance between nations and multi-nationals? • What causes the differences? • What are the results? • How can you measure efficiency?
T17-016	**Topic: Cyber Security Topic Options:** - <u>Advanced analytics for packet inspection</u>. We want to apply machine learning/artificial intelligence techniques to identify any packets out of the normal. I think this is technically achievable with control systems since they are very deterministic. They would need to discuss error tolerance and false positives. - <u>Cost analysis of different approaches to cybersecurity</u>. The old COTS vs GFE

Topic #	Sponsored Topic
	approaches discussion and also cost analysis of various solution options/cases. - Study of human machine interface. What sort of network indications should an operator see? What would be useful? What does an optimized solution look like? - Testing techniques. We currently do not have a standard testing technique. It is all over the map. A lot of work could be done on ways to standardize component and system testing for cyber.
T17-015	**Topic: Propulsors for Mono-Hull Electric Warships** This work would determine whether there is a potential benefit for investing in contra-rotating technology or pods for a future mono-hull surface combatant expected to displace between 7,000 and 10,000 mt. This work only examines hull, appendage, and propulsor interactions; it will not examine prime movers. The principal result will be the SHP vs speed curves for each configuration in a systematic study. If this study shows that for a given "capability concept" (see below), if the total SHP for a pod or contra-rotating configuration is lower than the other configurations, then a potential benefit exists. In this case, a future study will examine prime mover and transmission options that when integrated with this study will provide the necessary insight to determine if any improvements in cost or fuel consumption are possible with contra-rotating or podded propulsors. Finally, if a benefit is found from a technical perspective, then a cost analysis should determine if the benefit is worth the required investment. Capability Concepts 1A 27 knot Sustained Speed at 7,000 mt Full Load Displacement 2A 30 knot Sustained Speed at 7,000 mt Full Load Displacement 3A 33 knot Sustained Speed at 7,000 mt Full Load Displacement 1B 27 knot Sustained Speed at 8,500 mt Full Load Displacement 2B 30 knot Sustained Speed at 8,500 mt Full Load Displacement 3B 33 knot Sustained Speed at 8,500 mt Full Load Displacement 1C 27 knot Sustained Speed at 10,000 mt Full Load Displacement 2C 30 knot Sustained Speed at 10,000 mt Full Load Displacement 3C 33 knot Sustained Speed at 10,000 mt Full Load Displacement Trade Space Variation PARENT HULL FORM 3 to 5 Parent Hull forms (scalable from 6,000 to 12,000 mt Full Load Displacement (for potential future excursions). Parent Hull Forms should be chosen to span the trade space for "favoring" the other elements of variation. PROPULSION OPTIONS - Twin Shaft Fixed Pitch Propellers + 2 Rudders - Twin Shaft Controllable Reversible Pitch Propellers + 2 Rudders - Twin Shaft Contra-rotating Propellers + 2 Rudders - Single Shaft Fixed Pitch Propellers + 1 Rudder - Single Shaft Controllable Reversible Pitch Propellers + 1 Rudder - Single Shaft Contra-Rotating Propellers + 1 Rudder - Two Fixed Pods + 2 Rudders - Two Trainable Pods - One Trainable Pod + single shaft Fixed Pitch Propeller (inline contra-rotating) - Two Trainable Pod + single shaft Controllable Reversible Pitch Propeller SHAFT OPTIONS (for non-pod options) A. Open Shafting B. Skeg enclosed Shafting

Topic #	Sponsored Topic
	NAVIGATION DRAFT LIMITATION A. None B. 10 M C. 8 M Outputs - SHP vs Speed Curve (3 knots to maximum speed) (for each proplusor) - EHP vs Speed Curve (3 knots to maximum speed) (total ship) - PC vs Speed Curve (3 knots to maximum speed) (for each propulsor) - Bare Hull Drag vs Speed Curve (3 knots to maximum speed) - Appendage Drag (3 knots to maximum speed) - Dimensions (Molded Draft, Navigation Draft, LOA, LBP, Beam) - Calculated Full Load Displacement Ground Rules and Assumptions a. Propulsors should be optimized for efficiency at sustained speed within navigation draft and parent hull constraints. Note that once a ship design is developed, the propulsor will likely be optimized for a specific operating profile. A future study should determine the impact on efficiency at sustained speed when optimizing for a profile. b. The capability concepts should be evaluated for points within 1% of the nominal values (sustained speed and full load displacement) c. The steering system should be capable of achieving a tactical diameter in accordance with Section 2.2 of the ABS Guide for Vessel Maneuverability. The test speed should be the sustained speed. The rudder angle (if rudder employed) should not exceed 35 degrees. d. The inclusion of bow bulbs and stern flaps is allowed. If time permits, add one or more trimarans (stabilized mono-hull) as (an) additional parent hull type(s).
T17-014	**Topic: Lightning Protection on Naval Ships** In the past twenty years there has been considerable research and guidance provided for the protection of terrestrial power systems from lightning. There is little guidance for naval ships (especially those with modern power electronics based power systems) with respect to lightning protection; guidance that exists is extremely dated. Research is needed to understand lightning within the marine environment and develop guidance for the most appropriate lightning protection systems for different ship hull and superstructure materials.
T17-013	**Topic: Casualty Power** Casualty power has typically been used to provide loads to specific 450 VAC loads through a network of portable cables and through-bulkhead connectors. The system currently used is power limited and very labor intensive. Future combatant designs are anticipated to implement zonal survivability and selective compartment survivability to the greatest extent practical. One challenge is that for small warships, power generation is not generally located in the forward or aft zone due to the inability to locate intakes and uptakes. Furthermore, the beam of smaller warships may not be sufficient to ensure both port and starboard busses in a two-bus system will survive. In these cases, zonal survivability must consider both vulnerability and recoverability. A casualty power system is the means for recovering power to a zone that may be isolated by generation due to battle damage in a zone between it and the zone with generation. A capable casualty power system will enable the crew to recover power to undamaged zones following battle damage. A solution should not depend on cable or equipment surviving in the damaged zone, but would

Topic #	Sponsored Topic
	employ equipment permanently installed in zones on either side of a damaged zone and portable conductors that the crew could use to “jumper” across the damaged zone. Several redundant portable conductors would be stored in different zones of the ship to ensure a sufficient number of portable conductors survive the battle damage. The casualty power system is intended for MVDC systems with voltages between 6 kV and 18 kV and rated for a current between 300 and 500 amps. The casualty power system should interface with the machinery control system to enable detection of the connectivity and to limit current to below the system current rating. The envisioned solution should be safe to rig and operate. Minimizing system overall cost and weight are key factors. A capable Casualty Power System as described here enables recovering power to undamaged zones following battle damage. The alternative would be to either accept the operational risk of losing the capability provided by systems within the unpowered-undamaged zone or by heavily armoring and protecting each of the longitudinal electrical distribution busses (at great cost and additional weight) to enhance their ability to survive battle damage. This would reduce the acquisition costs due to not having to procure new assets to replace those that were not repairable after sustaining damage.
T17-012	**Topic: MVDC Shore Power** An affordable approach to interfacing with commercial and naval shore power stations is needed. Safety, grounding (including interaction with cathodic protection systems), connectors, power conversion approaches are all issues that require resolution.
T17-011	**Topic: MVDC Cable / Bus Duct Design** This work would examine the alternatives for the design of MVDC cable and bus duct for the port and starboard busses of an MVDC system operating between 6 and 18 kV. Attributes of the cable/bus duct include: - Smoke Free - Fire resistant - Waterproof - Light-weight - Low magnetic signature - Capable of being paralleled (If necessary) to achieve a bus capacity of up to 4,000 amps - Low cost - Minimum 45 year service life (examine insulation degradation) - Bend radius consistent with installation on a ship Additional features that should be examined include: - Embedded sensors for cable/bus duct health monitoring - Embedded control signals to communicate between bus nodes for control and fault management - Cost and benefit of employing active cooling of conductors - Comparison of multiple single conductors, multi-conductor cables, and coaxial cables (and bus duct). - Ease of repair / replacement of damaged cable (or bus duct) The complete design of the cable/bus duct system should be considered: - Cable / Bus duct - Termination kits - Hangers - Bulkhead penetrations - Workload for installing / terminating cable (or bus duct)

Topic #	Sponsored Topic
T17-010	**Topic: ESM functionality** The DCPM (draft) defines five ESM functionalities (ESM-F1 through ESM-F5) (UPS, frequency support, etc.), but provides no guidance on the analytical method(s) to establish sufficient power and energy capacity requirements to accomplish those functions. Methods to determine aggregate requirements for ESMs that fulfill multiple functions are also needed.
T17-009	**Topic: Electrical System CONOP and Design Features to Support Damage Control Efforts** Research is needed to tie electrical system design and CONOPS to damage control efforts in zones that sustain battle damage. The research should identify design features in the electrical system (including controls) to facilitate damage control efforts (firefighting, controlling flooding, and shoring) in a safe manner and safely re-energizing and operating equipment that survived the damage (or have been repaired). Consideration should be given to identifying critical systems that should remain energized during fire-fighting and dewatering, and if possible, powering those systems with DC voltage sources below 50 volts (either from external sources or energy storage). (Systems such as emergency lighting could be powered from low voltage DC sources) For those critical equipment that require higher voltages, consider the application of Class C or Class D GFCI to protect damage control parties. Determine if these types of GFCI could result in false-tripping that may result in greater harm than benefit provided. Identify methods to establish that energizing equipment in a damaged zone would be safe prior to re-energizing the equipment.
T17-008	**Topic: System Stability** Overall electrical system stability is generally understood, but how to develop appropriate criteria for allocation to individual pieces parts (components) or subsystems that can be specified well enough to invoke/design/test during the purchasing process is still an open issue. For a system to be stable, the following conditions must hold: - A steady-state solution that adheres to power quality requirements must exist - The system must be small-signal (linear) stable (also known as static stability) - The system must be large-signal (transient) stable (also known as dynamic stability) and remain within transient power quality requirements. The goal is to be able to specify components / sub-systems and associated factory acceptance tests for procurement and be able to successfully integrate those components / sub-systems onboard ship such that the resulting system is stable. The integration process should also enable modification to the power system during the ship’s service life to support modernization and ensuring the ship remains militarily relevant. The primary components / subsystems of interest are: - PGM (power generation modules) - PMM (propulsion motor modules) - PCM-1A (zonal power conversion with energy storage) - PCM-1B (large pulse load power conversion with energy storage) - PCM-SP (Shore-power power conversion module)
T17-007	**Topic: Fault Management for a 12 kV DC Distribution System** 12 kV MVDC electrical distribution systems (with bus ratings up to 4000 amps) are being considered for future naval combatants to affordably achieve power and energy density sufficient to successfully integrate advanced high power electric weapon systems and electric propulsion. One of the key technologies needed for a reasonably priced MVDC system is an affordable, reliable method and associated hardware to manage faults (i.e. detect, localize, and isolate faults) on the MVDC bus while still maintaining power of the requisite Quality of

Topic #	Sponsored Topic
	Service to individual loads. The use in MVDC power systems of traditional electromechanical circuit breakers common in AC systems is complicated by the need to extinguish the arc once the circuit breaker contactors open. In an AC circuit breaker, the natural zero crossing of the current waveform provides a mechanism for extinguishing the arc and establishing a voltage barrier to prevent the arc from re-striking. DC circuit breakers cannot take advantage of the current zero crossing. Hence, electromechanical circuit breakers are limited in the amount of DC current they can interrupt. Several manufacturers are developing hybrid DC circuit breakers that use semiconductors to shunt the current when the electro-mechanical breaker opens, thereby eliminating the arc. Although these hybrid DC circuit breakers are anticipated to work, they cost more than traditional AC breakers and will require more volume. Alternate affordable solutions are desired that minimize the number (to include complete elimination) of DC circuit breakers. Solutions shall not have a significant negative impact on the overall power system energy efficiency. Since power electronic rectifiers create MVDC, fault currents can be limited by controlling the power electronic rectifiers, enabling alternate strategies such as employing less expensive disconnect switches to reconfigure the plant once the power electronics have halted current flow (requiring however, zonal energy storage to power loads while the fault is cleared on the MVDC bus). The challenge confronting system designers of a MVDC system is to understand the behavior of the MVDC system when upstream rectifiers limit current and interrupt current and the rectifiers' criteria for doing so. Localization of faults on an MVDC bus must consider the bi-directional nature of power flow of a zonal system. In AC zonal systems, a Multifunction Monitor (MFM) assists in the localization of faults. An analogous component may or may not be needed for an MVDC system. Topics and concerns to be addressed under this topic include: a. What challenges, relative to fault detection, localization and isolation, are unique to MVDC systems? b. What features can and should be implemented to meet these challenges? c. How can/should these features be implemented, either from a device or topology perspective? d. Do MVDC systems (on their own or when considering ubiquitous power conversion) represent a significant enough shift from AC systems to warrant a paradigmatic shift in the approach taken, and if so, what should the approach be? How could fault detection, localization and isolation methodologies be integrated with a more generalized agent-based approach to electric plant control? Can the fault management itself be implemented as agent-based controllers?
T17-006	**Topic: Automated Design Reference Mission (DRM) Creation** Electrical Power systems must be robust. Design Reference Missions are often used to measure the ability of a system to operate as expected while employing the planned CONOPS and while operating within the projected operational environment. However, if a design is based on a very limited number of DRMs, then the possibility exists that the design will become optimized for those specific DRMs and will not be robust enough to operate successfully when in operation. Testing the power system to a large number of stochastically generated DRMs improves the probability that the electrical power system will be robust and capable within the environment it will eventually operate in. This task includes developing methods to automate the creation of relevant DRMs and the automated analysis of electrical power systems within the context of the DRMs.

Topic #	Sponsored Topic
T17-005	**Topic: EPLA Generation** Historically, the Electric Power Load Analysis (EPLA) (see DDS 310-1) was used primarily to determine the required rating of generator sets. With modern integrated power systems employing zonal distribution systems and power conversion equipment, the EPLA is also used to size zonal equipment. Because the traditional load factor method amalgamates loads at the total ship level, it has been augmented by the zonal load factor method as well as stochastic and modeling simulation methods in the Rev 1 to DDS 310-1. For many ships, accurately calculating the required zonal loads for zonal power conversion equipment (to include QOS considerations), requires an understanding of the steady-state control behavior of the loads – need to understand which loads can be on at the same time within a zone. This level of complexity requires computational and data management capabilities beyond that provided by the spreadsheets previously used to generate EPLAs. The proposed work includes defining the algorithms for a software tool to enable specifying the steady-state modes for different sets of loads in order to determine the required power ratings and energy storage requirements for zonal power conversion and energy storage. The proposed work should include demonstrating the algorithms in prototype software. The algorithms should be designed for eventual integration into ASSET, LEAPS, and or S3D.
T17-004	**Topic: Power System Design Metrics** The Navy is continuously developing and evaluating various electric plant distribution architectures, and topologies for a given mission platform. Warfighting capabilities are becoming increasingly reliant on the electric power system, making these development and evaluation processes even more critical to the overall ship design process. Concurrently, the Navy ship design community is working to improve design tools (such as ASSET and S3D) to assist with both rapid, early-stage ship concept exploration and more detailed concept development and design efforts. Development and evaluation of potential electric plant configurations to support concept development require high “human-in-the-loop” participation, and current evaluation methodologies are a combination of qualitative and heuristic. Both of these factors preclude seamless integration of electric plant concept development into rapid early-stage exploration using automated design tools. In order to more quickly, and less subjectively, develop and evaluate electric plant concepts, quantitative metrics and methodologies that can be computationally automated are needed. At a minimum, the Navy needs such a methodology for measuring power quality, quality of service, survivability and operability (the latter per Cramer, Sudhoff, and Zivi). Broadly speaking, these terms capture the notion of how well an electric plant design (or concept) responds to a given range of plausible normal operation (power quality), casualty scenarios based on equipment failure due to reliability (Quality of Service) and casualty scenarios based on combat damage events (survivability or operability). For example, a general heuristic that is used is that faults should be isolated, and their impact contained, to the smallest possible set of potentially affected loads. In breaker-based AC systems, one method of implementing this heuristic for ground or phase-to-phase fault scenarios is for system designers to coordinate breaker opening times based on fault current and time. However, it is not clear how well (or even if) that specific implementation translates to DC distribution systems, or how the heuristic can be analyzed, calculated, and/or validated for other casualty scenarios and for a generic distribution system; for example, ‘how do we determine or [quantitatively] define what the “smallest possible set” is for the generic casualty scenario’, or ‘what is the impact of losing bus x vs. bus y’? Such questions become even more challenging when considering that the overall impact to ship’s mission of losing a certain subset of loads may vary according to the operational context. Note that while the examples above emphasize casualty scenarios, similar issues present when dealing with high-power pulse and/or stochastic loads. It is expected that a robust

Topic #	Sponsored Topic
	computational method for assessing and measuring topologies and control algorithms would provide a standardized basis on which to judge such candidate topologies and algorithms for their ability to handle stressing scenarios. Specific efforts to be pursued under this topic area would be a. quantitatively define such metrics, b. provide methods for analyzing and calculating it, c. offer methods for the metric to account for operational context, d. offer methods for deriving thresholds of acceptability for the metric. Solutions offered should have wide applicability across a range and variety of distribution architectures and topologies, vs. customized to a “point solution”.
T17-003	**Topic: Integrated Power and Energy System (IPES) Controls** Current and projected trends in electric warship design indicate an ever increasing role of control systems in effectively and reliably managing ship’s power and energy. The post-WWII electric plant design philosophy has been to provide more generation capacity than total connected load (with some application of an assumed load demand factor). However, when accounting for available and soon-to-be-available weapons and sensors, future combatants’ total connected load will sum to more than the generation capacity that can practicably be provided within combatant design constraints. While integrated electric plants (i.e., incorporating electric drive) provide the flexibility to “divert power from drive to torpedos”, the control systems algorithms (and likely, the entire paradigm of approach to control systems) that are needed to dynamically manage the available power and energy in order to effectively accomplish ship’s mission are in a nascent stage and require significant advancement. The challenge is compounded by the stochastic and pulse-load nature of the new weapons and sensors. In short, future combatants will need to deliver with control platforms that integrate the power and energy backbone with ship mission control and other HM&E systems. The integration will require close coupling between these systems and will need to account for large dynamics and real-time responses at time scales that are beyond operator-in-the-loop cognitive abilities. Control algorithms, and methods to test control algorithms are needed to address the following IPES control functions: a. Power and Energy Management b. System monitoring c. Equipment remote control d. System Stability Management e. QOS Load Shedding f. Mission Priority Load Shedding g. Maintenance tag-outs h. Equipment health monitoring i. Logging j. Cyber attack detection k. Fault-Management Additionally, the control algorithms should be implementable in a control system that is - Modular - Scalable - Able to respond to cyber attacks - Survivable - Based on open architecture principles Employs clearly specified communication protocols.

Topic #	Sponsored Topic
T17-002	**Topic: Assessing the Present Ability for United States Navy Ships to Complete Missions Outlined in the 2014-2020 Navy Arctic Roadmap** The Navy executes several key missions in concert with joint forces, interagency stakeholders, and allies and partners, to protect sovereignty, ensure freedom of the seas, and defend the homeland in the Arctic Region. As in all regions these missions include: Maritime Security*;* Sea Control / Power Projection*;* Freedom of Navigation; Search and Rescue (SAR); and Disaster Response/Defense Support of Civil Authorities (DSCA). In near term period, the Arctic Roadmap assumes that surface ship operations will be limited to open water operations but that even in open water conditions, weather factors, including sea ice, must be considered in operational risk assessments. Further, in the midterm period starting in2020 – 2030 timeframe, the Roadmap envisions that the Navy will have the necessary training and personnel to respond to contingencies and emergencies affecting national security. There is a real question however, given the design requirements for the present surface fleet, that the ships themselves will be capable to perform these missions. This assessment will focus on current capability of the DDG-51 and LHA/LHD classes to perform two of more challenging of the traditional missions when performed in the Arctic. Specifically: • Disaster Response/Defense Support of Civil Authorities (DSCA): How capable are the two identified classes of ships to move resources across great distances to support other United States Government agencies in the Arctic Region? What equipment and design shortfalls exist? • Freedom of Navigation (FONOPS)*:* United States' policy since 1983 provides that the United States Navy will guarantee freedom of navigation in Arctic Ocean waters and help ensure the free flow of commerce on the global commons. How capable are the two ship types, individually or in concert, to perform an operation of this type in the Arctic? It is anticipated that this assessment may be classified. Recommend that Jeffrey Smith from NAVSEA 05 be assigned as the Study Topic Subject Matter Expert
T16-031	**Low-Cost UAV Swarming Technology (LOCUST) Innovative Naval Prototype (INP)** **Topics: Doctrine, Organization, Training, Material, Leadership, Personnel and Facilities (DOTMLPF) Assessment; Cost / Benefit Analysis; Developing Potential Acquisition Strategies** Summary: The LOCUST INP will develop and demonstrate a scalable system of inexpensive, commoditized, swarming Unmanned Aerial Vehicles (UAVs) to provide disruptive capability against anti-access area denial (A2AD) defenses enabling manned strike operations and localized landing site superiority with reduced cost and risk. Modern missiles, IADS, and precision indirect fires threaten littoral and amphibious assault forces. Past & current S&T developments have provided a robust foundation for addressing many of the key technical challenges present in this concept through the utilization of swarms of low-cost UAVs. This INP will develop and deliver the Distributed, Collaborative, Coordinated, & Cognitive (DC3) autonomy science and architecture, command & control (C2) architecture, and a series of modular payloads (sensors, kinetic, and electromagnetic spectrum (EMS)-enabled) providing a robust, scalable, flexible, multi-functional swarming unmanned aerial vehicle (UAV) system providing cross-domain capability, integrated and employable from surface, sub-surface, airborne, and ground manned and other un-manned systems. **Potential Study Questions and Areas of Interest:** • Compare the cost of utilizing a LOCUST swarm to conduct a mission(s) vs

Topic #	Sponsored Topic
	conventional assets and weapons. For instance, while an individual UAV may be cheap, a swarm of them may start to cost the same as other unitary weapons. Launch a SWARM to kill, launch a HIMARS to kill; is there a difference in cost and capability? • Low cost vs expendable. Examine support and reconstitution of a swarm with a % UAV recovered. What happens when I recover 80% of the vehicles? What happens if I only recover 5%? Are there recovery goals based on mission sets? HV SEAD 5%, ISR 90%. How do these numbers flow in the persistence and supportability of the capability assuming that they can be refurbished / reutilized quickly? • Examine the logistics support of a LOCUST swarm vs current munitions such as HIMARS and artillery. Can a cycle rate really be supported by a MAGTF? • Examine time on station (TOS) considerations for LOCUST and ability to adapt to change in mission timelines. • Based on Navy ship standoff requirements and LOCUST range capability can shipboard launch provide meaningful swarm persistence with relevant TOS relative to specific missions? • What is the comparison of utilization of Group 5 UASs (long time on station but increased standoff required for survivability) versus close-in deployment (e.g. from submersible) of LOCUST? • How does the resiliency to attrition of a swarm (e.g. ability to have large numbers or ability to reconfigure due to lost elements) compare to higher value assets in performing specific missions? • Effectiveness and survivability of the swarm against adversary defenses. • Build a general model for range from launch vs time on station vs persistence vs mission vs cost vs cube/weight.
Primary Focus: Program Management / Strategic Leadership / Decision Making	
T16-028	**Topic: Workforce Development** **Training/Education** Optimize professional development time by merging the acquisition basic course and ILE/CGSC into a single program giving AC officers an MBA. Study Question: What would the new career roadmap look like for Army MOS 51 program management and contracting officers?
T16-023	**Topic: Innovative Defense Acquisition Concepts** **Strategic Communication (STRATCOM) Plans for Defense Acquisition Programs** This project would look at the importance of a STRATCOM plan in the success or failure of defense acquisition programs. A Stratcom plan is more than a public affairs guidance, and it serves as a program synchronization tool for the PM to get an entire Service "on the same sheet of music" for a particular program. This project would investigate the existence of Stratcom plans for particular programs, and examine possible correlation with program success. This project would also look into the best techniques to develop and get a plan approved that is actually useful to Senior leaders.
T16-001	**Topic: Need to have an electronic tracking system to load training in CAPPMIS for students using a scan of their CAC card based on a preloaded file for onsite courses. Have a local database that functions like CAPPMIS for DAU.** Many members do not load their information in the IDP in a timely manner. This tracking system would make the load instantaneous and save manpower/time for each individual to load manually. Currently using an XLS file and a CAC reader to create rosters for training but it does not load into CAPPMIS, GOARMYED, ACT, etc.

Topic #	Sponsored Topic
T15-019	**Topic: Cost Savings / Avoidance** Cost savings/avoidance associated with early testing, detection and remediation of faults vice finding/fixing flaws later in design/development. Specific application to software intensive systems. Approaches might include: (1) case studies to document savings (2) methodology to quantify savings (3) enabling tactics and strategies for early T&E
T15-018	**Topic: Title 10 Program Manager Authority** **(PMS 385 - Strategic & Theater Sealift Program Office)** It would be instructive to PEO Ships to have an academic assessment of how Navy Program Manager's authority has been impacted by Sequestration, changes to policies and procedures, the Navy's technical authority construct, OSD's Better Buying Power, and the recent PM-to-USD AT&L direct reporting mandate.
T15-017	**Topic: Mitigating the risk of a limited supplier base for key Navy ship components (PMS 500 - Zumwalt Destroyer Shipbuilding Program Office)** There are numerous key military-unique components acquired for the construction of today's complex Navy ships that have diminishing manufacturing supplier sources including high voltage power cable and propellers. Reasons for the limited supplier base will be investigated including: - Military-unique requirement driving limited orders - Inconsistent demand or other issues that impact suppliers - Negligible post-new construction demand for key components during full ship service life This research project will assess the needs of PEO Ships shipbuilding programs, identify risks, alternate solutions, and recommend actions that Navy and the shipbuilders can take to minimize the potential deleterious impact of the loss of a single manufacturer.
T15-016	**Topic: Why Program Managers Can Never Truly Be Life Cycle Managers** The problem: a lack of alignment of funding with responsibility for PM managed systems. Background: Exploring roles and responsibilities of Program Managers, the type of funding they use at various points in a systems lifecycle, and the perceived inability to execute performance based logistics and sustainment strategies that are deemed best value for the Army. The current construct for resourcing does not provide the PM the authority to identify, program, manage and control the O&M resources needed to execute the optimum sustainment strategies for their systems. This split, where the ASAALT has control over RDT&E and Procurement funding, and AMC has control over O&M funding has resulted in a polarity of strategies and rationale that should be, but is not, decided by the Lifecycle manager. With the system funding managed and controlled by in different PEGs and different organizations with different chains of command, the PM cannot take a true lifecycle view to managing his/her program. Importance: In this era of limited resources and need for efficiency, often the largest portion of a system's cost (sustainment) is left sub-optimized. PM's, if they are to be empowered as true lifecycle mangers must be given the authority to make early and informed decisions that drive to the best value solution and strategy.
T15-015	**Topic: Organic and Commercial Industrial Base** How to maintain the viability of each in a time of declining resources.

Topic #	Sponsored Topic
T15-014	**Topic: Contractor Logistics Support** Is it still relevant today?
T15-013	**Topic: Ethics - Can It Be Taught?** What changes are needed in civilian and military leadership training to address recent ethics violations occurring to ensure that future leaders are well grounded in their ethical responsibilities and standards of conduct? The on-going saga of ethical violations by leaders at all levels of the government drives the need to determine what is causing this lapse in judgment and then an assessment of what changes can be made in training, assignments and expectations of performance.
T15-012	**Topic: Transition from Production to Sustainment** **What changes are needed in the planning and execution of resources (funding/people) to improve future readiness?** As the number of systems that transition from production into sustainment increases along with slower timelines for modernization leading to an older mixed fleet of systems, there will be increased pressure on OMA accounts to provide the required funding for maintenance, leading to higher risks of reduced readiness and equipment issues/support. What changes are needed for how systems and funding are allocated between the EE PEG and the Sustainment PEG?
T15-011	**Topic: Electronic tracking for required and mandatory training for acquisition and non-acquisition workforce.** Request a training database that will provide reports based on individual required/mandatory training per labor category, not just DAWIA type training. STRI currently pulls reports from multiple systems in order to track required and mandatory training (CAPPMIS, CHRTAS, CPOL, IA, ALMS). CAPPMIS added ETHICS training to their automated system but have not added all of the regulatory/mandated training requirements per year. Examples include training listed in AR 350-1, AR 525-13, AR 600-85, AR 600-63, AR 530-1, etc.
T15-010	**Topic: Force structure impact and Army's manpower constraints as we look to equip the Army with a manned and unmanned Intelligence, Surveillance and Reconnaissance (ISR) platform with leading edge technology.** The Army has evolved a heavy and costly reliance on contractors for systems sustainment, and in some complex cases, systems operations. Can this capability be trained and retained as organic to the Army? What investment and changes to force structure would be required to facilitate this? Proper "ground truth" ability of 35T Maintainers to fix and repair complex Military ISR systems and longevity (i.e., how long they will stay in the Army based on training expertise and ability to shift to competitive, higher paying industry position with IT domain) . What right "contract (terms of service commitment promotion path/jobs)" ought to be set up with these unique skill sets and pay incentive plans to retain after Army invests in training? The challenge is that dialogue on these issues has always existed, but there is no empirical data to show if the Army is better off simply investing in Contract Support; or as an alternate, allowing for potential promotion for these skills as a requirement to perform in leadership roles and establish competitive zones for promotion potential.

Topic #	Sponsored Topic
T15-009	**Topic: In order to help streamline the DoD milestone decision process, identify the documentation requirements that do not add value and are no longer needed.** The National Defense Authorization Act for Fiscal Year 2014 mandated GAO to review DoD's weapon system acquisition process. GAO's report, published in February 2015, provided two recommendations to DoD to cover near-term and longer-term actions. The near-term actions include: identify and potentially eliminate (1) reviews associated with information requirements, with specific focus on reducing review levels that don't add value, and (2) information requirements that don't add value and are no longer needed. For the remaining reviews and information requirements, evaluate and determine different approaches, such as consolidating information requirements and delegating approval authority, which could provide for a more efficient milestone process.This recommendation focuses on the second point listed in the near-term recommendation, which is identifying milestone information requirements that don't add value to the process and are no longer needed.
T14-024	**Topic: Humanitarian Aid Disaster Relief** Provide an assessment of the potential utility of LCS and JHSV ships in HADR operations.
T14-023	**Topic: Warfighting Requirements** What requirements process would best define warfighting requirements in a future of uncertainty and unknown threats? How do we define warfighting requirements that say, "system X must be combat relevant for its entire service life" vs. "system X must have a P-sub-K of 0.95 against threat missiles A, B, and C, and a P-sub-K of 0.85 against threat missile D"? Or, "system X must have a P-sub-K of 0.90 against projected threat missile E (which has not been invented yet), but we predict that Country Z will invest it in 25 years."
T14-022	**Topic: Cost Trade-offs for use of Commercial Equipment in Ship Design** The current cost modeling tools drive selection of smaller ship designs at the preliminary design stage. This drives cost into all the equipment installed aboard ships (prior studies have shown a 300-500% cost premium for military-unique equipment). Is there a cost benefit to using more commercially based equipment that would be larger, thereby making the ship larger? What is the trade-space cost?
T14-021	**Topic: Alternative Ship Cost Modeling Methodologies** Most ship cost modeling has been traditionally weight-based. This drives the Navy to select smaller ships and consequently requires custom-designed shipboard components. Is there a more accurate way to empirically predict ship cost?