

INCUBATOR PROGRAM

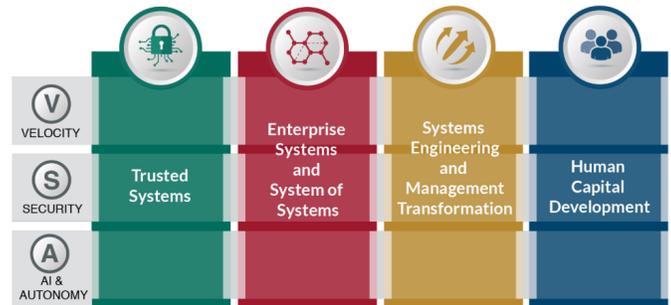
Background: The need for new project incubation is an integral part of the SERC 2019-2023 technical plan. While we believe that the current research programs have great potential to transform engineering in the DoD and Intelligence Community, there is once again a need to support new ideas in their infancy that address emerging DoD challenges and opportunities. We plan to use this call as the primary means of allocating the accumulated funds created by decrementing the current major Core-funded projects by 20% per year after their first two years.

The following is a call open to all faculty and research staff at SERC Universities for research proposals related to the topics included in this solicitation. These research proposals will be assessed for funding from the SERC Core funds and other sponsor funding sources as incubator research projects.

Proposals are due **May 1, 2019** per the included submission instructions.

SERC CROSS-CUTTING MISSION AREAS AND CORE RESEARCH AREAS

Subject to available funding, a number of high-quality proposals will receive initial seed funding not to exceed \$25k per award. Preference will be given to proposals that are in areas or use novel approaches not currently addressed by the existing SERC research portfolio. The proposed research topics must address one of the five research challenge areas in Attachment 1, please identify the area you are responding to in your proposal. The areas were developed by the SERC Research Council in coordination with our SERC sponsors. They align with the cross-cutting mission areas (velocity, security, and AI/Autonomy) published in the SERC 2018-2023 Technical Plan and our UARC research focus areas: SE and SE Management Transformation (SEMT), Trusted Systems (TS), Enterprise Systems and Systems of Systems (ESoS), and Human Capital Development (HCD). Copies of the Technical Plan are available upon request. Also included for reference in Attachment 2 is a list of the current SERC Research Tasks. Additional details about these tasks is available on the SERC website (sercuarc.org) under research programs and projects. Proposed topics should have a strong potential for additional funding outside of SERC core funds. The Sponsors, SERC Research Council and Leadership will determine which proposals will be awarded with this seed funding.



Additionally, in the second phase of the incubator program, a small number of research proposals from within the projects initially awarded seed funding that are determined to be significant and relevant may be selected as regular research projects with significantly higher level of funding (\$200k or higher), as a function of available funding.

SUBMISSION GUIDELINES

To apply for the incubator funding, complete a short description of your proposed research concept addressing the first five Heilmeyer Criteria, namely:

1. What are you trying to do? Articulate your objectives using absolutely no jargon.
2. How is it done today, and what are the limits of current practice?
3. What's new in your approach and why do you think it will be successful?
4. Who cares?
5. If you're successful, what difference will it make?

Following this description provide a short summary of the work to be completed in the incubator phase of your proposed research. Incubator phase awards will not exceed \$25K. Proposals should be less than two pages in length. Include the names of the research team, university, and research challenge area with the title of your proposed research task.

The overall value of the submissions will be judged, as will the final whitepapers, on several criteria: intellectual merit, clarity of the vision, past performance of the investigators, current funding, and the strategic impact on the SERC and DoD, to include taking full advantage of the SERC's multi-disciplinary research capabilities. For past performance, one should include references to previous research reports and published papers. Further, if there are other sponsors within the DoD who are interested in this research and would be candidates for matching funds, please include this information as well.

Submissions should be sent to Tom McDermott at tmcdermo@stevens.edu. It would be greatly appreciated if you could forward the attached Call for New Research Proposals to others in your organization. Research Proposals responses are due by May 1, 2019. Please contact us if you have any questions about the research activity, or about the proposal response format.

SERCH RESEARCH FUTURE CHALLENGE AREAS

- **Mission Engineering and Integration:** Developing an architectural framework for the integration of a heterogeneous array of systems for the execution of a mission:
 - Innovative approaches to modeling systems as missions and enterprises: systems as a service model, large-scale simulations with dynamic objectives, modeling incentive schemes that overcome mission enterprise fragmentation, simulating human machine co-adaptation, methods to enable the assessment of “weak links” in the mission thread
 - Assessing mission impacts of emergent technologies: means to predict or dynamically evaluate emerging technologies for insertion into the mission thread, approaches to predict or dynamically reevaluate mission concept of operations driven by disruptive technologies
- **Velocity:** Developing and sustaining capabilities that support emergent and evolving mission objectives (deter and defeat emergent and evolving adversarial threats and exploit opportunities, affordably and with increased efficiency):
 - Innovative uses of digital engineering: model curation and validation, integrating MBSE with large scale dynamic simulation, ontologies that address resilience and other qualities, analytical approaches sustainability in SE lifecycles
 - SE methods for continuous development and deployment: system architectures that enable continuous development, decomposition of system to micro-scales, managing macro-scale systems, platforms & interoperability
- **Security:** Designing and sustaining the demonstrable ability to safeguard critical technologies and mission capabilities in the face of dynamic (cyber) adversaries:
 - Integrating Dependability/Safety/Security engineering to provide potential economies for defenders via cost-effective means for achieving mission security, including applications of these approaches to new domains such as space
 - Innovative approaches to automate assurance case design, coverage, and evidence collection and to monitor for and recognize potential design deviations and errors derived from engineering and program management activities
- **AI & Autonomy:** Developing and supporting system engineering methods, processes, and tools to understand, exploit and accelerate the use of AI and autonomy in critical capabilities:
 - AI-enabled SE: big data analytics, machine learning, and novel human-computer approaches to aid SE data analysis, model building and evidence building
 - SE-enabled AI: synthesis of human, physical, and AI/ML systems sciences to promote better design and trusted performance of next-generation DoD capabilities
 - Lifecycle processes for AI systems: development approaches that adapt with the AI components and resilience architectures and solutions that sustain operation during adaptation; Test and evaluation for AI systems
- **Human Capital Development:** Creating the future Systems Engineering workforce:
 - Accelerating the impact of digital engineering, model-based engineering, model-based assurance, artificial intelligence and machine learning, and continuous development approaches on systems engineering, including leadership, teamwork, collaboration and change management
 - Education for the systems engineering of complex, evolving systems

CURRENT SERC RESEARCH TASKS

TS: Trusted Systems | **SEMT:** Systems Engineering and Systems Management Transformation

HCD: Human Capital Development | **ESOS:** Enterprises and Systems of Systems

- RT183 Next Generation Adaptive Cyber-Physical Human Systems | **TS**
- RT194 Design and Develop Tools for the Systems Engineering Experience Accelerator – Part 4 | **HCD**
- RT195 Transforming Systems Engineering through Model-Centric Engineering - Phase 5 | **SEMT**
- RT197 SE Capstone Marketplace | **HCD**
- RT198 Helix – Organizational Effectiveness in Systems Engineering | **HCD**
- RT199 Interactive Model-Centric Systems Engineering (IMCSE) 2018 | **SEMT**
- RT201 Human-Machine Team (HMT) Concepts for Resilient Autonomous Systems | **TS**
- RT203 Meshing Capability and Threat-based Science & Technology (S&T) Resource Allocation | **SEMT**
- RT204 Systemic Security and the Role of Heterarchical Design in Cyber-Physical Systems | **TS**
- RT205 Identifying & Measuring Modularity Violations on Cyber-Physical Systems | **ESOS**
- RT206 Data Science Approaches to Prevent Failure in Systems Engineering | **SEMT**
- RT207 Game-theoretic Risk Assessment for Distributed Systems (GRADS) | **TS**
- RT208 Tools & Methods Frameworks for Shipboard Power & Energy Systems | **ESOS**
- RT209 Systems Qualities (SQs) Ontology, Tradespace & Affordability (SQOTA), Phase 7: 2018-2019 | **SEMT**
- RT210 Formal Methods in Resilient Systems Design using a Flexible Contract Approach – Part 2 | **SEMT**
- RT213 Systems Engineering Business & Analytics | **SEMT**
- ART001 Characterization of Emerging Technologies in Military | **TS**
- ART002 Transforming Systems Engineering through Model Based Systems Engineering | **SEMT**

For detailed descriptions of these tasks: [SERCUARC.org/programs-and-projects](https://sercuarc.org/programs-and-projects)

