Engineered Resilient Systems Community of Interest

Overview

In a defense environment marked by rapidly changing threats and missions, Engineered Resilient Systems (ERS) seeks to create engineering concepts, techniques, and tools that lead to the design, development, testing, and manufacturing of trusted, assured, and easily modified weapons systems.

Focus Going Forward

The ERS community will apply proven techniques to DoD acquisition programs. These joint efforts will:

- Enable the use of ERS toolsets and processes, powerful tradespace analytics, and high-performance computing (HPC) resources earlier in the engineering process
- Foster further development of multi-dimensional tradespace exploration, virtual prototyping, and decision support technologies
- Demonstrate and distribute tutorials, technical documentation, and a rich knowledge management environment for the broader Acquisition community.

Engagement Opportunities for Industry

- Seeking industry output across ERS gaps and opportunities
- Encouraging participation in ERS collaborative groups, including Architecture Working Group
- Identifying platforms that could benefit from ERS

Connect to ERS

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ERS
ENGINEERED RESILIENT SYSTEMS
DEPARTMENT OF DEFENSE

Success Stories and their Impacts on Capability Needs

Small Surface Combatant (SSC) — Using ERS tools and methods, the Navy examined design options for a new class of ships. Datasets and visualizations were passed to a task force panel, and a modified version of the Littoral Combat Ship was chosen as the design for the Navy's new small surface combatant.

Impact —

- Traditional methods took three weeks to generate 7,000 designs. By employing ERS tools and techniques, 3.6 million options were produced in 27 minutes.
- ERS allows reuse of data for future ship design projects.

CH-47 Chinook — CREATE-AV software is currently being used by ERS collaborators within the Army to test proposed new rotor blades for the CH-47 Chinook. The blades are expected to provide 2,000 pounds of improved hover thrust.

Impact —

- CREATE-AV tools use high-fidelity, physics-based modeling to assess the interaction between the blades, rotor, and fuselage.
- The new blades are aimed at allowing the helicopter to carry extra food and water, more troops, more munitions, etc.

Autonomous Mobility Applique System (AMAS) — Through the utilization of ERS simulation models, the Army is predicting the performance of AMAS sensors in diverse terrains and weather conditions, as well as at different times of day and multiple following distances.

Impact —

- The effort allows for better understanding of system possibilities and provides input needed to mitigate weakness before fielding.
- By ensuring the success of AMAS in a variety of mission contexts, the Army is preparing to use convoys of unmanned military ground vehicles to transport vital materials across theater while Soldiers remain safely on base or within protective command ground vehicles.

C-X — The Air Force employed ERS methods to unite performance, effectiveness, and cost data into a single design tradespace for the C-X cargo plane project, a change from the historical method of first calculating performance and then delivering point designs to cost estimators and effectiveness analysts for further evaluation.

Impact —

- Designers know more about effectiveness and cost results much sooner in the design process, allowing for better informed decisions.
- Resulting designs are traceable and can be documented in Concept Characterization and Technical Description Documents for competitive Analysis of Alternatives.

Scope/Thrust Areas

Conceptual and Computational Representation

Objectives

- Readily available, easily configurable models of systems and environments
- Computational environments that allow for rapid configuration and execution of models at scale
- Representative mission environments compatible with desired level of fidelity

Opportunities

- Ability to easily move from concept to virtual prototype to analysis
- Ability to leverage DoD M&S and analytic tools for all stages of acquisition
- Ability to utilize realistic environmental data and models for performance modeling

Tradespace Analysis

Objectives

- Comprehensive tradespace analytics that support complex DoD systems and systems of systems under a wide range of operational scenarios

Opportunities

- Today's acquisitions are increasingly complex, with many heterogeneous operational and business demands; effective decisions require balance among multiple, varied interests.
- Need to present decision-makers with alternatives that satisfy a range of possible futures—insight generation

Collaborative Analysis and Decision Making

Objectives

- Technology to present and share results among a range of diverse, distributed stakeholders
- Ability to retain and re-use representations, scenarios and analysis results across trades and over time, to ensure that the knowledge gained can be leveraged broadly

Opportunities

- Effectively communicating complex results to stakeholders is critical to support effective decision processes
- Developing and maintaining a repository of analysis results in a searchable and accessible manner, offering a ready resource to jumpstart new analyses by providing the ability to leverage the knowledge that accrues over time

Capability Integration and Demonstration

Objectives

- Enable an "open" architectural framework that allows software to plug-and-play
- Use the open architecture to drive opportunities that enhance innovation and re-use across government, academia, and industry
- Leverage technical standards that support a modular, loosely coupled, and highly cohesive system structure
- Perform pilot projects to demonstrate ERS concepts and to drive refinement of ERS tools
- Development of an open architectural framework, integration technologies, and the regular application, evaluation, and demonstrations enable:
  - Near-term benefit from evolving technology
  - Effective assessment of progress
  - Constructive identification of gaps to drive technical investment

Opportunities

- A framework is needed to empower sharing and reuse (tools, models, algorithms, data, etc.) in the ERS technical areas