SYSTEMS ENGINEERING Research Center

SERC Ilities Tradespace and Affordability Program (ITAP)

PROJECT DESCRIPTION:

- Build on previous SERC research, other research from Collaborators, and ERS to create MPTs to better analyze tradespace in complex systems

VALUE:

- Being able to quickly and rigorously analyze the tradespace of complex systems, especially with regard to "ilities" such as safety, resilience, and availability, will aid decision makers early in the life cycle in a project when alternative requirements, architectures, and implementation technologies are all under consideration.

STATUS:

- A workshop was held on July 18-19 to shape the specific research
- Project expected to begin in November
- There are several current SERC projects that informed the workshop, including *Valuing Flexibility* (RT-18), *Flexible Vehicle Requirements* (RT-26), and *Software-Intensive System Cost Models* (RT-6). Projects outside the SERC with which the SERC could collaborate were also identified

TEAM:

- USC, MIT, Stevens, Georgia Tech, UVA, Wayne State, AFIT, NPS

PAST AND CURRENT EFFORT:

- Almost $2.5M has been awarded on other SERC projects that informed the July 18-19 workshop that developed the project approach
- $345K from FY12 RDTE funds for first phase of research

FUTURE EFFORT AND TRANSITION:

- Approximately $700K in FY13 RDTE funding requested for second phase of research. Primary focus will be on maturing and piloting strongest existing toolsets.
- Projects outside the SERC with which the SERC may coordinate would provide overall funding several times OSD immediate investment

IMPLEMENTS:

- Thematic Area*: Systems Engineering Transformation*
- Strategies: *Make Smart Trades Quickly*

PHASE 1 PRODUCTS:

- Tech report on DoD priorities for ilities and their tradeoffs
- Tailoring and demonstration of current SERC tradespace and affordability toolsets at INCOSE IW, Jacksonville FL, Jan 28, 2013 and CSER, Atlanta GA, March 18, 2013
- Technical report on various frameworks for tradespace and affordability; e.g., value-based, means-ends based, process-based, and architecture-based
- New MPTs on tradespace and affordability

Importance of Ility Tradeoffs

Major source of DoD system overruns

- **System ilities have systemwide impact**
  - —System elements generally just have local impact
- **Ilities often exhibit asymptotic behavior**
  - —Watch out for the knee of the curve
- **Best architecture is a discontinuous function of ility level**
  - —Large system example below
  - —Highly risky to "Build it quickly, tune or fix it later"
    - o Complementary RT-40 addresses quantiative risk assessment