SYSTEMS ENGINEERING
Research Center

3rd Annual SERC Research Review

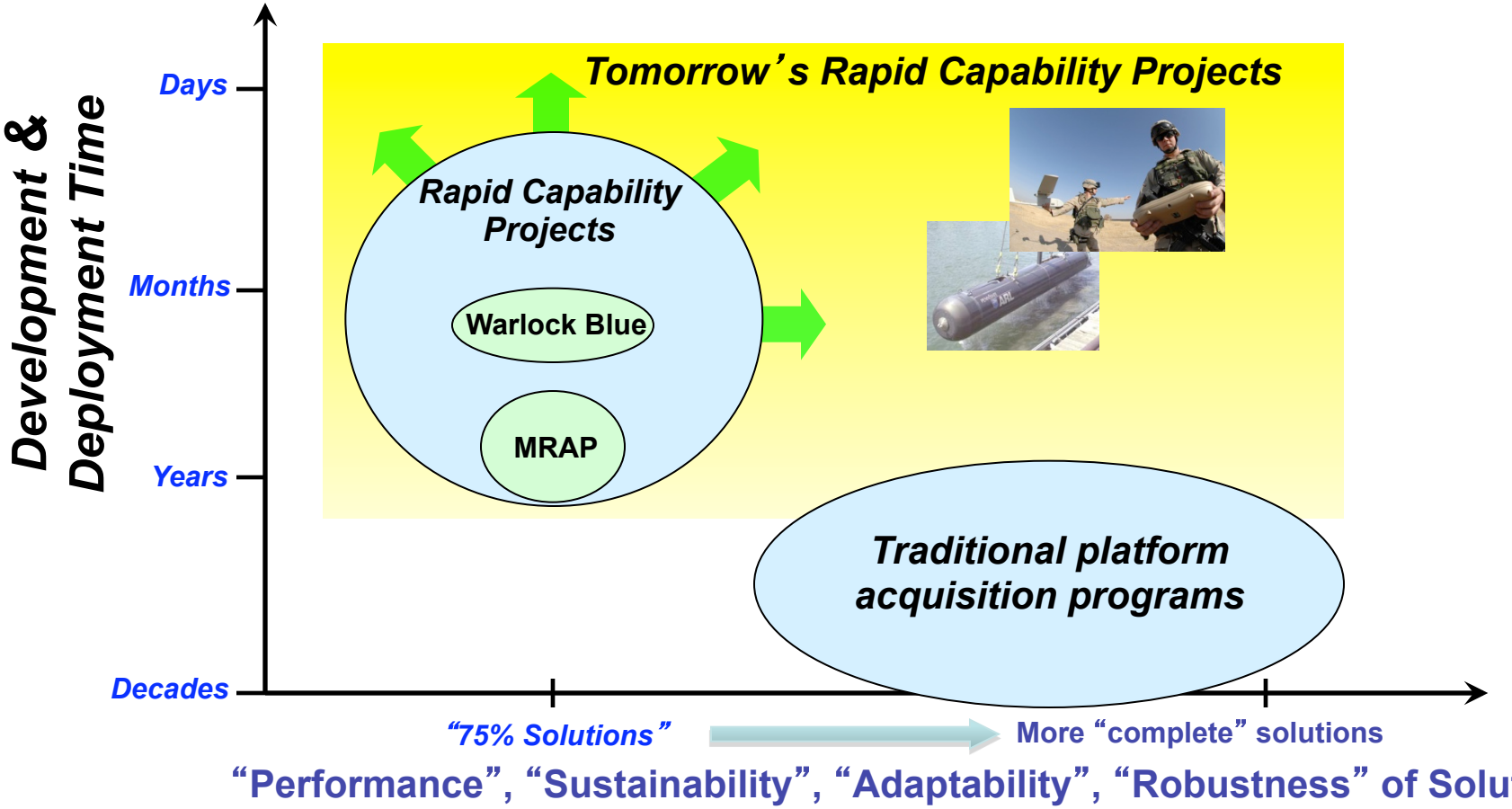
Panel on Model Based Systems Engineering

Observations from the DDR&E Rapid Capability Toolbox Study (2010)

October 6, 2011

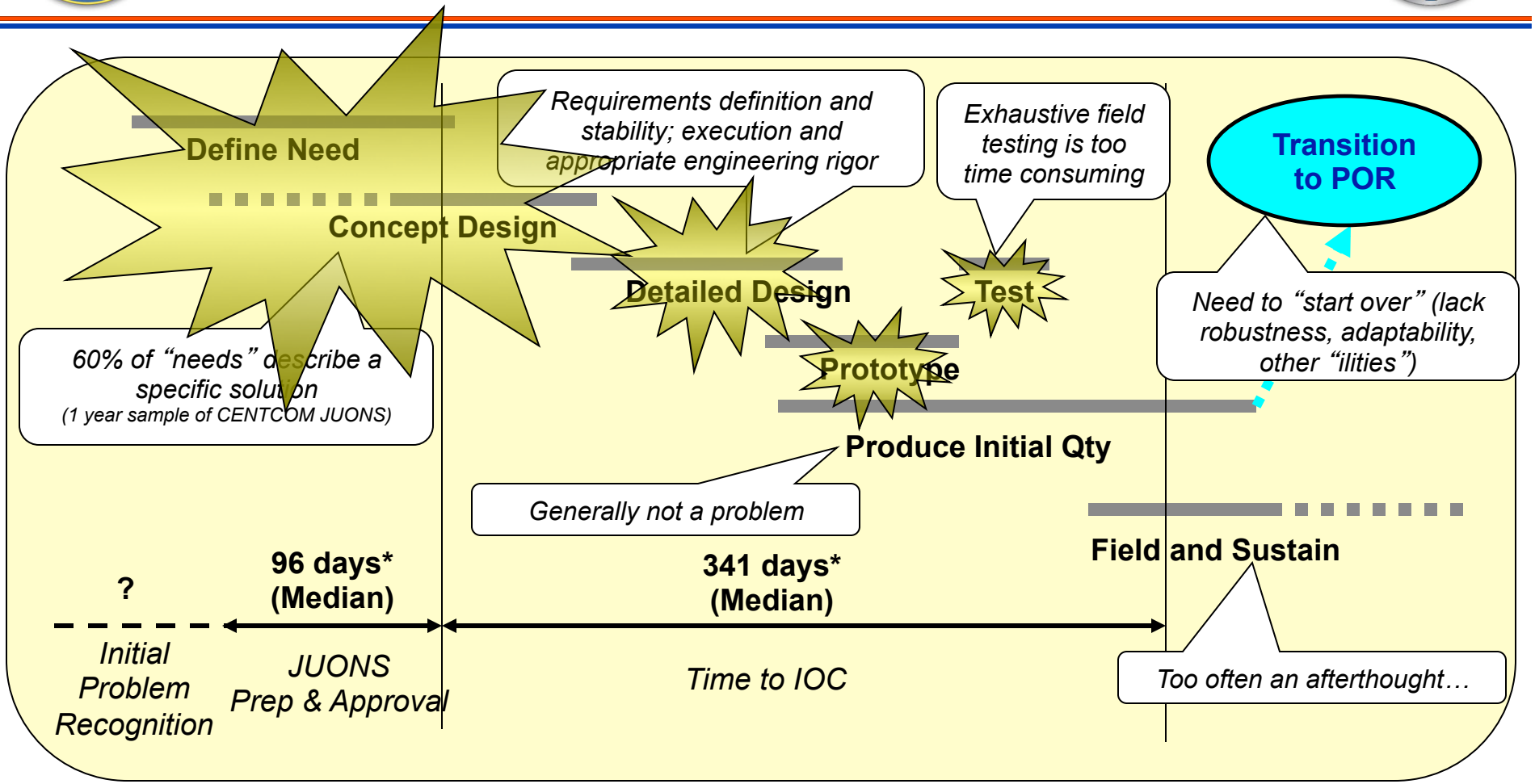
Michael McGrath, D.Sc.
michael.mcgrath@anser.org

Enabling Better Rapid Capability Fielding



DDR&E Rapid Capabilities Technology thrust will develop capabilities to enable more rapid, adaptive, robust, and sustainable solutions to the warfighter

Where is the Leverage?



Get it right up front: anticipate, properly define the need and technical requirements, assess options/CONOPS, account for sustainment (or obsolescence)…..

*2009 DSB Report

Findings

- Significant opportunities exist to develop and deploy technologies to strengthen the Department's ability to conduct rapid capability fielding
  - However, non-technical challenges (e.g. cultural, budgetary, contracting, etc) must be simultaneously addressed
- Greatest leverage in the "front end" of the life cycle
  - Concept Engineering: Rapidly elucidating the need, exploring solutions, developing CONOPs, and deriving requirements for materiel solutions
    - Virtual environments and rapid physical prototyping are linchpin technologies
- Opportunities exist to increase design, test, and production efficiencies
  - Examples include physics-based M&S to reduce testing and model-based engineering and manufacturing approaches

Concept Engineering Tools

Virtual Environments

- Persistent, virtual environment
- Gaming, virtual/mixed/augmented reality, 3-D visualization
- Rapidly create relevant environment to explore concepts and CONOPS
- Couple to physical prototyping where user interaction important
- Real-time user feedback
- Bootstrap training
- Remote users

User-centered Design

- Create routine user-centered feedback
- Employ selected tools and techniques from "design" community (i.e. IIT, Stanford, Ideo Inc)
- Build upon DARPA TIGR and network of forward-deployed S&T personnel
- Systematically anticipate needs and user-centered design factors
- Iterate with CONOPS

Rapid Prototyping

- Where possible, rapidly develop physical prototypes of candidate concepts
  - Physical mockups and functional prototypes as technology permits
- Inform CONOPS development, user interfaces, logistics and maintenance driven changes
- Leverage vast array of capabilities across DoD
- Over time, seamlessly integrate with virtual environment

Technology Gaps Confirmed in Later Studies

- Systems 2020 Studies *(Summer 2010)*
  - Parallel studies by SERC and BAH identified broad range of SE technology gaps
- Core team categorized gaps in 3 areas:
  - Lack of a conceptual design environment
  - Lack of tools to integrate system modeling capabilities across domains
  - Lack of open virtual realistic environment for validation and manufacture