Industry-Engaged Mission Engineering

The U.S. Department of Defense (DoD) has expanded its emphasis on the application of systems engineering to 'missions'—that is, engineering a system of systems (SoS), which includes organizations, people, and technical systems, to achieve desired impact on mission outcomes.

Traditionally, systems engineering focuses on systems and SoS to achieve specified technical performance. Mission Engineering puts the focus on mission success—the end goal—and evaluates the effectiveness of the proposed SoS in achieving mission objectives when implemented in a realistic scenario in a simulated environment. Industry-Engaged Mission Engineering can help better align commercial industry technical capability and development with identified mission gaps, thereby addressing the right parts of the right problem with the right solution and ultimately speeding up DoD acquisitions.

Engaging Commercial Companies to Enhance the Value of Mission Engineering.

To date, Mission Engineering has largely been a government endeavor. However, even the limited experience gathered through the Rapid Defense Experimentation Reserve (RDER) program indicates engaging industry can greatly enhance the value of Mission Engineering. The following figure and narrative offers opportunities to strengthen the current Mission Engineering methodology through direct industry engagement. Both the DoD and commercial industry will benefit. The DoD gains understanding of industry innovation and capabilities, and companies gain deeper insight into mission gaps, allowing them to shape research and development investments proactively and throughout the acquisition lifecycle. Industry will also gain greater direct understanding of DoD mission needs, allowing them to propose more innovative and efficient solutions, rather than building to program requirements.

Key Questions

- How does Mission Engineering build shared understanding between industry and DoD?
- How does Mission Engineering enable an effective and efficient rapid acquisition process?
- How can access to tools, platforms, and data lower barriers for rapid commercial and dual-use technology adoption to enable warfighter lethality?

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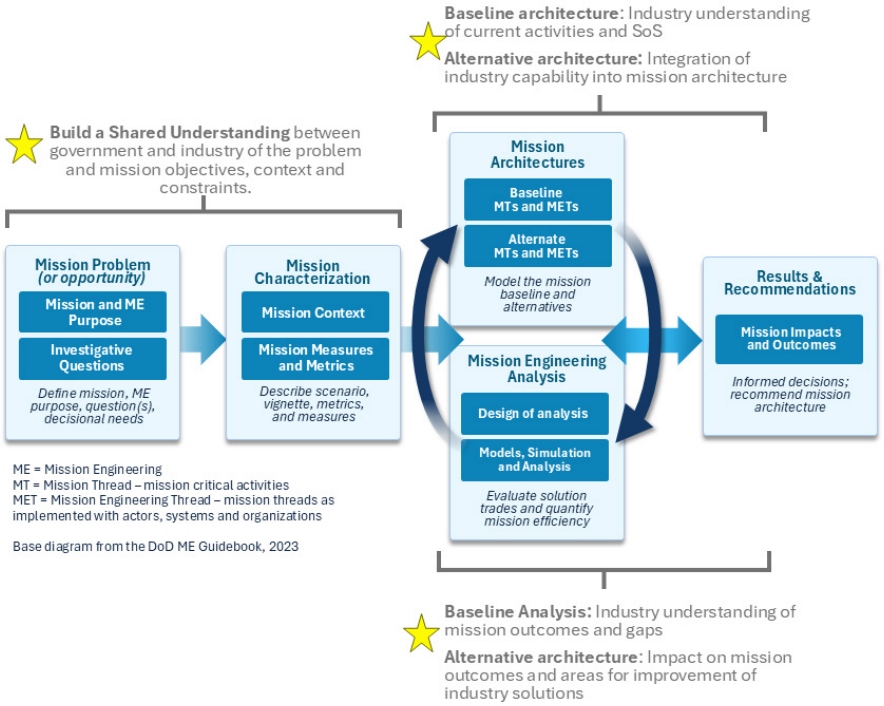

Engage Industry Early and throughout the Mission Engineering Process

Build a shared understanding of mission objectives, context, critical gaps, and constraints through early industry engagement

Mission engineering starts by developing a clear understanding of the mission problem and a characterization of the driving mission context. This is followed by development of a model-based representation of the baseline mission architecture and an operational analysis of the impact of baseline capabilities on mission outcomes. Subsequently, gaps are identified. Together, these steps provide a comprehensive picture of the mission need

Engaging industry earlier in program lifecycles could help identify a wider set of innovative approaches to addressing mission need than is available from government alone and could reduce the time to field new capabilities.

1. Hosting industry days and workshops focused on mission needs at appropriate classification levels will help commercial companies understand operational contexts and align their solutions with DoD priorities.

2. Reduce barriers for companies to participate in these early phase ME activities through simplifying acquisition processes, such as expanding the use of Other Transaction Authorities (OTAs). The MITRE-operated DARPA Bridges program is an example of this in action, with non-traditional companies able to obtain clearance and gain understanding of mission gaps.

3. Provide access to authoritative data, such as baseline mission architectures and threat models, to enable companies to design and test technologies that integrate seamlessly into mission threads.

Support cooperative modeling and analysis of proposed solutions and their mission impact

Building on this shared understanding, the DoD can collaborate with industry to increase alignment between commercial capabilities and mission objectives, reduce rework, and accelerate time to warfigher adoption.

1. Establish collaborative digital engineering environments, at appropriate classification levels, to allow parties to co-develop mission architectures, share models, and conduct operational analyses.

2. Leverage joint experiments such as tabletop or simulation exercises and use tools like AFSIM for iterative and collaborative evaluation of the impact of commercial technologies on mission outcomes, improving mission architectures and paths for technology integration while providing companies needed information to propose and evolve solutions.

3. Encourage assessment of non-development products that could be integrated into the baseline to address gaps rapidly. This not only assesses the impact of the current commercial offering but also provides valuable insight for those companies into potential product changes to address mission gaps and constraints.

4. Share validated performance data and system specifications with industry to facilitate integration into mission architectures and operational simulations.

5. Invest in workforce development and training programs focused on ME and DE tools to build expertise among DoD personnel and foster a culture of collaboration with commercial partners.

Continue mission engineering and analysis informed by prototyping and experimentation

As promising approaches are identified and risk reduction activities are initiated through prototyping and experimentation, a collaborative DoD-industry Mission Engineering environment would enable continuous and increasingly refined evaluation and understanding of solution impact.

1. Update both the mission architectures and operational simulation-based analyses with data from prototypes and experiments to track whether development progress continues to meet mission needs, especially when the mission environment changes with new threat or other blue force systems changes.

2. Adapt mission engineering simulations to support live integration of physical systems and solutions in a synthetic testbed to assess how well the systems, as implemented, provide the capability predicted by the analyses. These simulations can identify integration issues early and prevent rework.

Summary

Mission engineering would benefit from greater industry engagement in three key areas: Engaging industry early to expose them to the mission needs in the threat informed context; providing opportunities to collaboratively explore integration of capabilities into the mission architecture and assess their mission impact; and ensuring continued engagement through prototyping and experimentation.

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