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Author: Mr. James MacKinnon
NASA Goddard Space Flight Center Greenbelt MD 20771, United States

TO BOLDLY GO: A SYSTEMS ENGINEERING PERSPECTIVE ON A STRATEGY FOR THE
FUTURE OF ENGINEERING AT NASA

Abstract

The Model-Based Systems Engineering Infusion and Modernization Initiative (MIAMI) at NASA commissioned a “strategy group” comprised of subject matter experts, with diverse experiences and bold ideas, to look into the future of engineering at NASA.

The purpose of this Strategy Group is to provide a Vision for the future state of Systems Engineering practices and develop a Strategic Plan to enable the evolution of the art up to twenty years in the future. The Strategic Plan will help inform new capability development and workforce strategies, guide agency-wide engineering policy, and propose on-ramps for investments.

The Vision provides top-level goals and objectives of future engineering capability, and provides a basis from which investments in the workforce and capabilities can be evaluated.

The Vision emerged from a design thinking approach to gather ideas. We obtained insight into current engineering processes and domain outlook by interviewing engineers of varying expertise and experiences who had worked on teams of different sizes for missions large and small.

These engineers shared their vision of NASA’s future; current and future processes, methods and approaches within their work; aspects of their work that “works”; pitfalls (such as a risk-averse posture and schedule constraints) that should be mitigated and solved; and technology that could help improve their work. We clustered answers into a dozen themes to better understand current status and future needs.

From these themes, a Roadmap into the top-level depiction of desired capabilities was derived. This Roadmap highlights future engineering needs, projected capabilities, and technology and competency gaps. It defines broad categories of workforce development and engineering capabilities, and marks desired waypoints over time to achieve these. A graphic that illustrates what it will be like to perform the role of an engineer in the year 2039 at NASA is created to accompany the Roadmap. The graphic depicts what engineers’ working environment could be, and how they will interact with data.

To ensure the expedient introduction of these capabilities a Strategic Plan was developed. The plan seeks to align Agency values, objectives, strategy, tactics, and controls. It recommends investments to achieve the waypoints and endpoints in the Roadmap. In particular, it highlights resources needed to design and implement increasingly autonomous systems for complex missions of the future. It identifies emerging trends that can benefit the Systems Engineering and discipline engineering communities at NASA as we enter a golden age in which technology is rapidly expanding what’s possible.