



**OFFICE OF THE DEPUTY ASSISTANT SECRETARY OF DEFENSE  
SYSTEMS ENGINEERING**

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**Government as the Integrator of a Large-Scale  
Modernization Effort: A Systems Engineering Approach to  
Balancing Stakeholder Needs**

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**Abstract**

In an uncertain budgetary and political environment, an acquisition program manager may have to adapt quickly to budget cuts and changing customer priorities. An Information Technology program manager must also react to the rapidly changing technology and cybersecurity landscape. Stakeholders include the warfighter, the program office, and the oversight community. The warfighter needs new or modified system capability; the program office needs to know what to acquire and the best way to acquire it; the oversight community needs to ensure the program manages risk and spends its budget well. Balancing stakeholder needs is a key role of the Systems Engineering staff supporting the acquisition program. In this presentation, we describe a Systems Engineering approach that allowed us to effectively develop and organize the requirements and design components, the work needed to achieve the design and satisfy the requirements, and the dependencies between those work packages to achieve a major modernization of the planning software used by United States Strategic Command (USSTRATCOM).

The Integrated Strategic Planning and Analysis Network (ISPAN) is a system of systems that provides planning and visualization tools for USSTRATCOM warfighters. In particular, the command's Joint Functional Component Command for Global Strike uses a family of 15 ISPAN tools called the Mission Planning and Analysis System (MPAS) to plan, to a high level of detail, the targets and missions needed to meet the President's Joint Strategic Capability Plan – Nuclear.

The Under Secretary of Defense for Acquisition, Technology, and Logistics approved a \$162M modernization of MPAS to satisfy new requirements and reduce the costs to operate and sustain the planning programs and designated the program office as the integrator. A large-scale modernization effort presents many challenges including coordinating work across subsystem contractors, and delivering functioning software during the course of development to ensure alignment with customer needs and expectations. As the integrator, many of these significant challenges fall upon the government to manage. We found it difficult to find any lessons learned



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from programs facing similar challenges, and were disappointed to find little to no guidance or successful examples. In fact, the only words of wisdom conveyed were simply that government as the integrator never works. We thus found ourselves striking out into somewhat uncharted territory and needed to invent our own strategies and tooling to reduce and manage technical and programmatic risk.

We created an approach that balances operational needs, acquisition needs, and technical needs of the stakeholders. We adapted concepts from agile software development, and applied them to a higher level of abstraction to guide the development of the system and the subsystems. Our engineering team produced a series of systems engineering artifacts including system and interface requirements, system-subsystem design, and a network diagram of work packages that translates the system level design into the work that we need done. The network diagram provides three major “views.”

The first view consists of all work packages and their dependencies, organized by operational thread and use case, and the targeted subsystem. The second is the Program Managers’ view and visualizes the acquisition implications (cost estimates and workload balance) of the three-spiral allocation of the work packages. The second view also serves as a negotiation tool that we use to reconcile operational needs with acquisition needs. The third view is the spiral network diagram that depicts spiral-specific work packages with their dependencies. We use this subset of the network diagram to coordinate work for the purposes of integration and verification of each spiral’s deliveries. The systems engineers, supporting both acquisition and operations, process the spiral view into user stories that are the object of our incremental integration strategy and operational demonstrations. These user story demonstrations allow the customer to interact with a growing set of operational capabilities for the purposes of eliciting feedback early in the development lifecycle prior to formal test and evaluation. Our systems engineering approach allows the program office to satisfy the customer’s priorities while balancing complexity and workload across subsystems, contracts, and spirals.

This systems engineering approach enabled us to advocate successfully for project funding and drew a “low-risk” evaluation from the oversight community. In the talk, we present the details of our approach showing the benefits at the successful end of Spiral 1 development and how we applied lessons learned to kickoff Spiral 2, and start planning for Spiral 3. We believe any acquisition program can use this approach where long term stakeholder needs and budgets are difficult to assess and predict.

### **Presenter Biography**

Kevin Swanson is the MITRE Corporation’s lead integration engineer in the Air Force Life Cycle Management Center COCOM C2 Division. He is responsible for the allocation of work across the Mission Planning and Analysis System (MPAS) subsystems and the coordination of deliveries to support an incremental integration strategy. Mr. Swanson is a graduate of the Air Force Academy and Johns Hopkins University, holding a master's degree in Systems Engineering. He has worked in defense acquisition for 14 years as a systems engineer assigned to several AFMC program offices.