

New Curriculum and Certification Standards

Systems Planning, Research, Development, and Engineering Career Field

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"I should note ... that we have taken important steps that will help us to produce improved capability on time and within budget by re-energizing our approach to systems engineering. This critical discipline has always contributed significantly to effective program management."

Testimony of Ken Krieg, USD(AT&L), before the U.S. House Armed Services Committee, Sept. 27, 2005.

A primary goal of the under secretary of defense for acquisition, technology and logistics (USD(AT&L)) has been to return good systems engineering (SE) practice to the way we do business. This initiative was born of a Systems Engineering and Training Summit held at Wright-Patterson Air Force Base, Ohio, in 2003. The summit was attended by technical leaders from the Defense Department, academia, industry, and technical professional societies. The group examined many problems experienced by acquisition programs at that time, including major technical

failures, and schedule and cost overruns. A central question was whether the SE process used on defense programs since the late 1950s was insufficient and needed a major overhaul. After much examination and deliberation, the consensus was that the process was still sufficient, but it was not being consistently applied on all programs.

With that, the former USD(AT&L), Michael W. Wynne, established an imperative for OUSD(AT&L) Defense Systems to "help drive good systems engineering practice back into the way we do business." Implementation of the SE Revitalization initiative became the responsibility of Mark Schaeffer, the director, systems engineering. The revitalization effort has three major components (as shown in Figure 1): policy, guidance, and tools; education and training; and assessment and support.

Significant Changes Already Implemented

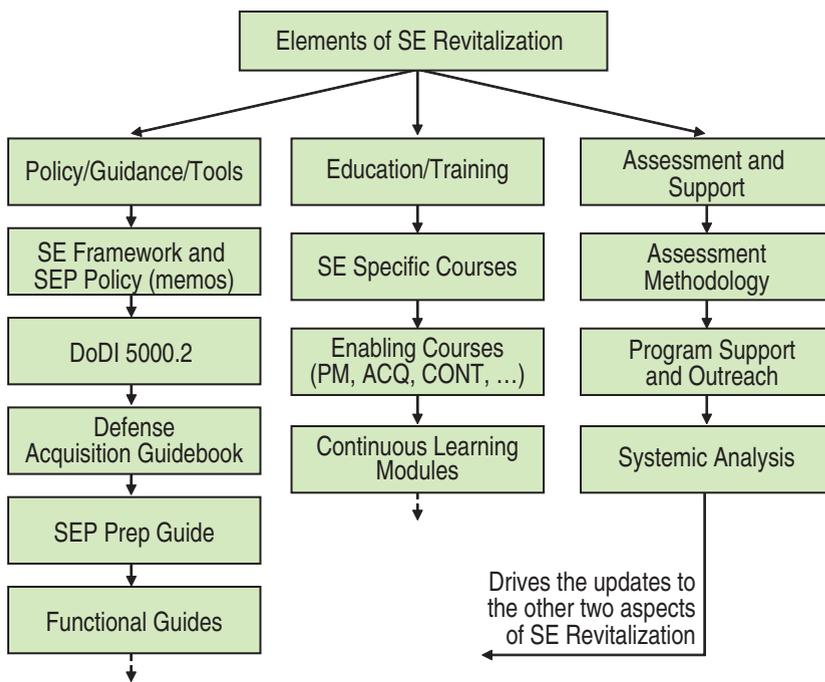
The acquisition workforce has already seen significant changes instituted as a result of this initiative. Within the policy component, two memos were released in 2004 changing the way SE is implemented within the DoD:

- *Policy for Systems Engineering in DoD*, Feb. 20, 2004, requires any program, regardless of ACAT [*acquisition category*], to submit a Systems Engineering Plan (SEP) to its Milestone Decision Authority for approval at each acquisition milestone.
- *Policy Addendum for Systems Engineering*, Oct. 22, 2004, requires each program executive officer or equivalent to designate a lead systems engineer to implement and oversee the SE efforts of programs in the PEO's cognizance, to include using event-based technical reviews with independent subject matter expert participation to assess technical maturity and risk mitigation.

The memos can be found at the OSD Web site <www.acq.osd.mil/ds/se/publications.htm> or through the Systems Engineering Community of Practice at <<https://acc.dau.mil>>.

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FIGURE 1. Multi-pronged Approach to SE Revitalization



Additionally, the *Defense Acquisition Guidebook* was published in October 2004, with Chapter 4 dedicated to sound SE practices as applied to the DoD acquisition life cycle framework. The *DAG* is an electronic document and can be found at <http://akss.dau.mil/dag/>. A guide for preparation of SEPs was also published and is available at the OSD or ACC Web sites listed above.

These initiatives laid the foundation for implementing the assessment and support component. Since made a requirement, many Acquisition Category (ACAT) ID (programs for which USD(AT&L) is the milestone decision authority), and IAM (major automated information systems for which the assistant secretary of defense for networks and information integration/DoD chief information officer is the MDA) SEPs have been submitted to OSD for review and approval. Based on review of these SEPs, OSD has refined its SEP guidance to better articulate to programs the essentials of good technical planning, technical leadership, and sound technical execution. This new guidance also contains three frameworks: one for the concept refinement/technology development phases; one for system development and demonstration/production and deployment phases; and one for the operations and support phase. Each poses five critical questions in each of five subject areas. These “5x5” frameworks serve two purposes: guidance on technical planning and the basis for OSD SEP reviews.

Education and Training

The third component of SE Revitalization is education and training. The effort began with the SE Functional Integrated Project Team (SE FIPT) developing a new list of learning objectives for each of the three levels of Defense

Workforce Improvement Act (DAWIA) certification. As a result, the SE career path of the systems planning, research, development, and engineering (SPRDE) career field will see a completely new set of DAWIA certification courses implemented over calendar year 2006. (Note that in 2001, as a result of the assimilation of science and technology managers into the acquisition workforce, the SPRDE career field was divided into two career paths: SPRDE-Science and Technology Manager and SPRDE-Systems Engineering (SPRDE-SE).) Additionally, the SE FIPT is considering enhancements to the DAWIA certification requirements. These changes should result in better educated, more experienced personnel in technical positions within the DoD. The revised career training courses are shown in Figure 2.

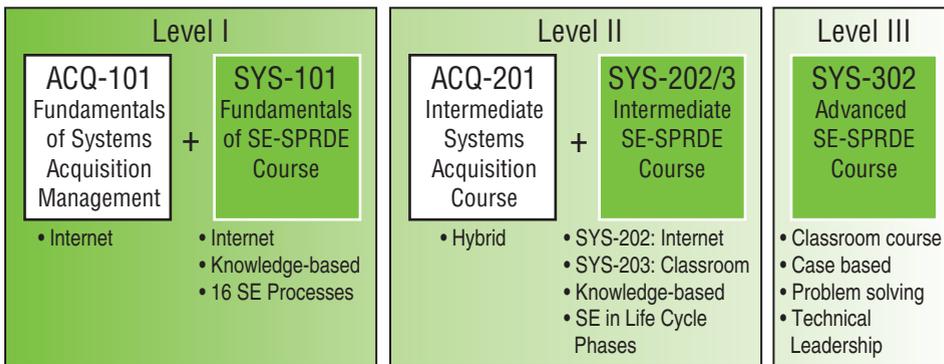
A new Level I SPRDE course, SYS-101, has been added to Acquisition 101 in the SPRDE-SE training track. This course is approximately 30 hours of distance learning and covers an introduction to systems engineering and a detailed discussion of the eight technical processes and eight technical management processes outlined in Chapter 4 of the *DAG*. SYS-101 represents a fundamental shift in training the workforce in systems engineering. Where in the past DAU has used the MIL-STD-499B SE process model, all new courses will use the DAG “Vee” model as illustrated in the *Integrated Defense AT&L Logistics Life Cycle Management Framework Chart* (known as the *IFC*) at <http://akss.dau.mil/ifc/>.

All SPRDE-SE career members entering the training track after SYS-101 is online will be required to take this course in addition to the prerequisite ACQ-101. The current projection is for the SYS-101 course to be online in July 2006.

Level II training will consist of a new hybrid SYS-202/203 course, consisting of 25-30 hours of distance learning and

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FIGURE 2. New SPRDE-SE Training Track



one week of residency class work. The new course will replace the current SYS-201 A/B courses. The distance learning portion of the course will cover the application of the technical and technical management processes across the DoD acquisition life cycle. The course is centered on a mythical program scenario. Students are assigned as the SE lead for a program IPT and walk through the “Vee” activities for each phase of the scenario’s development

System Development and Demonstration Phase

This covers who, what, when, where, and how to execute the activities covered in the Level I course, as well as the event-based technical reviews that assess the technical maturity and risk mitigation of the development activity. SYS-203, the classroom course, will consist of scenarios and exercises to demonstrate the practical application of both the SYS-101 and SYS-202 online materials. SYS-202 is scheduled to go online in October 2006, while SYS-203 resident classes will begin November 2006.

The new SYS-302 will be a technical leadership course scheduled to replace the current SYS-301 course in December 2006. This course will be a significant change, instituting much more rigorous standards for completion of Level III training requirements. Where SYS-301 currently uses group case studies for learning and assessment, SYS-302 will shift the focus to individual work and assessment as well as demonstration of technical leadership skills. SYS 302 will consist primarily of six exercises with each person on the six-member team assigned an individual key technical role within a program office. The role of team leader (program lead systems engineer) will rotate among each of the team members once during the course. Each exercise presents a complex technical problem and will require individual deliverables by each team member. The team, under the direction of its team leader, must then employ critical thinking skills to arrive at a solution to the issues given in the problem. This culminates in the team leader’s defending the team solution in a brief to the instructors, who will ask questions and provide feedback. In addition to these exercises,

there will also be individual exams. Successful completion of the course will require individual performance in technical positions, demonstrated leadership, and knowledge of the subject material.

Beginning May 1, 2006, the Technical Reviews online distance learning course, CLE 003, will be a mandatory prerequisite to the SYS-201B (to be replaced by SYS-203) and SYS-

302 courses. This requirement may be augmented with additional student-selected continuous learning modules. In this way, students will be able to customize their learning experience in a way more analogous to a degree program at a university. Thus each student will receive specific core training as well as additional knowledge in areas specifically related to his or her current job. It also provides for the presentation of a wider breadth of materials without lengthening the course.

To successfully execute the new Level III training structure, the course will need students who have successfully mastered the prerequisite courses at Levels I and II, as shown in figure 2. At Level III, each team member must be capable of producing the deliverables assigned in the scenarios.

Each of these new courses has been designed so as not to repeat the material in the prior courses. Defense acquisition career managers may still waive the prerequisite requirements for an individual to attend a residential course; however, individuals receiving a prerequisite waiver must take and pass a knowledge exam before beginning the class to ensure they have the required level of knowledge to successfully complete the course. Students who have completed SYS-202/203 will not be required to take such a test. However, students will be responsible for understanding the SE processes described in Chapter 4 of the DAG. The lesson material from SYS-101 and SYS-202 will be available online as CLMs, allowing students who have taken the older courses to update their training. These modules, along with numerous other CLMs, are available 24/7 to provide training at the point of need, whenever and wherever required.

In addition to the changes to the curriculum, the SE FIPT is also reviewing the requirements for certification in the SPRDE-SE career path. With the revitalization of systems engineering and the need for better-prepared systems engineers on our acquisition programs, potential changes include the addition of a third career path—SPRDE-Systems Engineer—within the SPRDE career field. The current SPRDE-SE career path would be renamed to SPRDE-

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General, with essentially the same certification requirements as before, but adding the SYS-101 course to Level I certification. The SPRDE-SE career path would require longer SE-related experience as well as additional training to meet the requirements of each certification level. The clear aim is to develop more capable systems engineers.

The SE FIPT has also examined the SE training objectives and content in other career fields and curricula. We are currently monitoring the update of the SE technical content in certain critical enabling courses.

We are breaking new ground by raising the bar for certification in the SE career path. It is hoped that this new, higher standard will be emulated by other career fields within DoD. As can be seen by the discussion above, successful completion of the educational requirements will demand more in-depth training and better preparation by the student before attending in-residence courses. However, the end result should be a better prepared technical workforce who:

- Conduct technical planning upfront and continuously through a program's life cycle
- Employ sound technical leadership across all DoD programs
- Steward effective technical execution on programs.

These behavior changes will re-instill technical excellence in program execution, and credibility in the acquisition and logistics support processes—a continued emphasis under the current USD(AT&L), Ken Krieg.

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