NDIA SE Conference Q&A's 2006

Q1. How will DoD manage fuel efficiency requirements? My concern is that added capability (situational awareness; improve payload; speed; protection) equates to increase energy demand. Therefore comparing fuel consumption alone for new systems versus the old system it is replacing, may be like comparing apples to oranges.

Q2. During the systematic issues presentation, there was mention of the need for better DT&E. How is this to be handled when test resources (e.g. incremental testing on platforms - primarily submarines from my program) are not made available to test communities?

Q3. Discuss the application of systems engineering to early technology development efforts, such as Basic Research (6.1) and early Applied Research (6.2) programs?

Q4. The commercial implementation of Net Centricity includes web services and service oriented architecture. What risks and opportunities exist for DoD and the Services for this approach?

Q5. Please describe how you are conducting the Tech Readiness Assessments for "801".

Q6. How does industry get DAU training in SYS 201, 301?

Q7. What role should government and industry play in standards development?

Q8. Is the OSD SE Vision concentrating on SE policy and training while transitioning most of the program support activity to the services? If so, what criteria should be met to build OSD's confidence in the services' ability to accomplish this function?

Q9. What leadership initiatives is OSD taking to ensure that program managers make visible and share program performance information?

Q10. System Engineering is a process. What is the product?

Q11. Where does cost benefit analysis fit into the SE process?

Q12. Has the 'Guide for Integrating Systems Engineering into DoD Acquisition Contracts' draft been reviewed by legal and contracting?

Q13. What specifically is being done to ensure designing for the following: manufacturability, producibility, supportability, maintainability, testability and affordability?

Q14. What is being done within systems engineering to emphasize or focus on supportability, lifetime support and sustainment in the design phase?

Q15. A common thread in several briefings is the retirement of senior systems engineers and a lack of new hires to fill those positions. Are OSD/ Services giving any consideration to establishing or re-focusing the existing intern development programs for system engineers, including software and systems safety engineers?

Q16. Is DoD interested in exploring Expert Systems to mitigate or atrophy the effects of vanishing technical SMEs?

Q17. Would it be advantageous for the government to invest in establishing knowledge-based systems to supplement the Acquisition 'Brain-Drain'?

Q18. What impacts are you seeing on program performance from the lack of integration of SE & SW?

Q19. Once a contract is let, contractors CANNOT operate at CMMI level 5 because they are not allowed to adjust requirements (process). Why do we push for high level CMMI compliance when JCIDs is so process improvement oriented?

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Q25. What role should/ will DATA exchange standards have in defense acquisition and sustainment of systems?

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Q29. "Drive state of the practice into program planning and execution." The problem is that the state of the practice is not universally good. One or two sentences of 'Do good/ smart things' in policy & guidance will not improve the state of the practice. What resources are you going to provide the services & agencies to help them improve the state of the practice in critical program areas such as pre-concept decision SE, architecture, SoS SE, integration of T&E/ M&S, etc?

Q1. How will DoD manage fuel efficiency requirements? My concern is that added capability (situational awareness; improve payload; speed; protection) equates to increase energy demand. Therefore comparing fuel consumption alone for new systems versus the old system it is replacing, may be like comparing apples to oranges.

A. You are correct in asserting that additional capabilities add to energy demand. However, looking forward, the key is valuing energy efficiency across the system rather than just using the commodity cost of fuel: i.e., using the "fully burdened cost of fuel". Properly accounting for the cost to deliver the fuel to the system (e.g., accounting for support personnel, protection requirements in theater, capital costs of tankers, etc) potentially leads to different material solutions and design trades. For example, if gasoline costs you $12/gal, you'd likely paying a premium to purchase a more fuel efficient car, all other things being equal. Similarly, if estimates of $40/gal for tanker-delivered fuel are used during life-cycle costing, DoD might elect to spend additional money on efficiency in S&T and acquisition for, e.g, advanced engines, lightweight materials, and other systems (digital actuators, etc). Of course, additional warfighting benefits accrue as well if platforms are more fuel efficient: increased range, persistence, agility, etc. Back to top

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Q2. During the systematic issues presentation, there was mention of the need for better DT&E. How is this to be handled when test resources (e.g. incremental testing on platforms - primarily submarines from my program) are not made available to test communities?

A. Early identification of the required test resources for any acquisition program, whether incremental or traditional, is a critical area in test and evaluation strategy development, and the formulation of the Test and Evaluation Strategy (TES) and the Test and Evaluation Master Plan (TEMP). With today's operations tempo the identification and availability of operational platforms to conduct test and evaluation requires significant pre-planning and flexibility. This is especially true for those limited number of platforms which have readiness and deployment schedules to maintain. Just as with any test facility, early and continuous coordination with the responsible scheduling authority is a must, to include alternate platform options. This effort requires senior level support in recognizing the importance of having the platform available for test and evaluation and a clear, complete, and accurate assessment of the risks associated with not having the platform. As part of the early planning, the use and availability of validated models and or simulations must be part of test and evaluation equation. Adding to the complexity of planning is the acquisition strategy for incremental development and fielding. All increments may not be tested on an operational platform and this requires the integrated T&E team to identify where and when the capabilities must be evaluated in an operational environment. Back to top

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Q3. Discuss the application of systems engineering to early technology development efforts, such as Basic Research (6.1) and early Applied Research (6.2) programs?

A. Overall, the flow of the systems engineering (SE) process is iterative within any one phase of the acquisition process and is recursive at lower and lower levels of the system structure. SE processes can be applied to Basic Research, to provide an orderly progression through multiple aspects of the project, without specific applications toward processes or products in mind. As knowledge is gained, the recursive nature of SE allows for increased focus on militarily useful aspects of the research. The results of Basic Research can feed into Applied Research, which is defined as systematic study directed toward knowledge necessary to determine the means by which a specific need may be met. SE processes are more directly applicable to Applied Research, in that the needs, or requirements, are successively decomposed into constituent parts. Results of investigations can be tested in a series of steps, starting at the lowest level of detail, and culminating in an end-to-end verification of the solution to the specific need. Back to top

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Q4. The commercial implementation of Net Centricity includes web services and service oriented architecture. What risks and opportunities exist for DoD and the Services for this approach?

A. DoD's strategy to leverage service-oriented architectures (SOAs) should help us design and build systems that are highly adaptable and capable of rapidly meeting new mission requirements because of the modular architecture with common, but loosely-coupled interfaces. SOAs also yield more affordable and rapid system solutions when built upon widely-used open, standards-based web services. The greatest risk with these approaches lies in the availability of open standards and a sufficient number of corresponding COTS products that meet stringent weapon system requirements. To mitigate this risk, DoD must influence industry consensus standards bodies to ensure emerging standards address these needs. One emerging standard that promises to offer the quality of service (QoS) and real-time performance needed by weapon systems is the Object Management Group's (OMG) Data Distribution System. A net-centric environment will require standards for other critical weapon system requirements, such as fault tolerance, safety and security. Back to top

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Q5. Please describe how you are conducting the Tech Readiness Assessments for "801".

A. Technical Readiness Assessments fall under the purview of the Director of Defense Research and Engineering (DDR&E) and not under Systems and Software Engineering. Some basic information is DDR&E conducts Technology Readiness Assessments (TRA) for OUSD(AT&L) in accordance with the "Technology Readiness Assessment (TRA) Deskbook," dated May 2005, prepared by the Deputy Under Secretary of Defense for Science and Technology (DUSD(S&T)). The Deskbook is available in .PDF form on the Defense Acquisition University website at: https://acc.dau.mil/CommunityBrowser.aspx?id=18545. This document is a description of suggested best practices, responsibilities, roles, and procedures for meeting the Technology Readiness Assessment (TRA) requirements of the Defense Acquisition System. The intent is to provide those involved with TRAs a greater understanding of how TRAs fit into defense acquisition and what is expected by the DUSD(S&T). Back to top

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Q6. How does industry get DAU training in SYS 201, 301?

A. Industry/contractors can register for any DAU course through their website at http://www.dau.mil/ under the "I Need Training" icon. The SYS 101 and 202 courses are online and access is usually allowed almost immediately after registration. These courses are also available in a "browse" mode. The SYS 203 and SYS 302 courses are classroom/resident courses at one of the five DAU campuses. The same registration system as noted above should be used; however, as of now, participation by industry students is on a space available basis. DoD students registering to fulfill their certification requirements or DoD students approved to take DAWIA training courses receive the highest priority for attending resident courses. Back to top

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Q7. What role should government and industry play in standards development?

A. Both play an important role because of the vested interest each of them has. Public Law 104-113 requires federal agencies to use Non-Government Standards (NGSs) and participate in their development (with industry) when they support their mission needs and objectives. NGS bodies provide a forum where government, industry and other stakeholders can collaborate to develop open standards for approaches and solutions that satisfy mutual needs and concerns. Back to top

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Q8. Is the OSD SE Vision concentrating on SE policy and training while transitioning most of the program support activity to the services? If so, what criteria should be met to build OSD's confidence in the services' ability to accomplish this function?

A. OSD's SE vision includes partnering with the DoD Services and Agencies on all aspects of systems engineering revitalization: policy, guidance, education and training, and program support. OSD is working on plans to transition portions of its current Program Support Activities to the Services and Agencies. We are currently working with the Air Force to develop their in-house PSR capability. Members of the Air Force team will participate in some reviews led by OSD to better learn our methodology and processes. OSD personnel will participate in some Air Force led reviews of ACAT IC and ACAT II programs. The transition planning is a work in process thus; we do not have firm criteria set at this time. We will however be looking for the Services to develop and implement processes that are consistent, independent and totally transparent. Back to top

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Q9. What leadership initiatives is OSD taking to ensure that program managers make visible and share program performance information?

A. Regulatory guidance is generally adequate to provide data transparency to OSD. Implementation remains a challenge. USD(AT&L)/ARA and DUSD(A&T) are revamping the DAES process to include automated updates between the Service's program data collection and analysis systems and our DAIMERS system. Within ODUSD(A&T)/SSE we have found that once we establish an open and honest relationship with Program Management Offices, usually through the Program Support Review process, information sharing is not an issue. Back to top

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Q10. System Engineering is a process. What is the product?

A. The main products of the System Engineering process are the technical baselines (functional, allocated and product) which provide the means to set the overall system design. These baselines form the basis for future development and are reviewed and approved at the event-driven technical reviews. Trade studies are also a product. Please refer to Chapter 4 of the Defense Acquisition Guidebook at http://www.acq.osd.mil/se/publications.htm and the Technical Planning Continuous Learning Module at the Defense Acquisition University website http://www.dau.mil/ for further information. Back to top

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Q11. Where does cost benefit analysis fit into the SE process?

A. Cost benefit analysis is one of many types of analyses that take place throughout the SE technical and technical management processes (See Defense Acquisition Guidebook, Chap 4). Early systems engineering supports initial cost benefit analysis by providing analysts with a clearer picture of the costs of alternatives and the likelihood of fielding the technologies required to realize the assumed benefits. As programs progress in development, systems engineering recognizes a series of technical trades will be required. Cost benefit analysis helps balance those trades. Back to top

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Q12. Has the 'Guide for Integrating Systems Engineering into DoD Acquisition Contracts' draft been reviewed by legal and contracting?

A. The recently released "Guide for Integrating Systems Engineering into DoD Acquisition Contracts" was reviewed and coordinated throughout OSD, including contracting, as well as the Services and other Agencies. The guide contains a lot of useful information for program teams to effectively integrate SE requirements into appropriate contracting elements in support of systems acquisition—it stresses the importance of early technical planning (and associated documentation in the Systems Engineering Plan) so that the Government's technical strategy can be reflected in the RFP to form a baseline for the offerors to respond

to it. The Guide is posted on the SSE website at: http://www.acq.osd.mil/se/publications.htm. Back to top

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Q13. What specifically is being done to ensure designing for the following: manufacturability, producibility, supportability, maintainability, testability and affordability?

A. We have provided ample guidance on these important design considerations in the form of the Defense Acquisition Guidebook (DAG), Chapter 4, as well as in the Systems Engineering Plan (SEP) Preparation Guide and the revised "DoD Guide for Achieving Reliability, Availability and Maintainability (RAM)." The Technical Reviews Continuous Learning Module on the DAU website and the risk assessment checklists also address these. In addition, for those MDAPs that are overseen by OSD, we are leveraging Program Support Reviews and SEP reviews prior to each DAB/ITAB to ensure these, and other, design considerations are being addressed. Back to top

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Q14. What is being done within systems engineering to emphasize or focus on supportability, lifetime support and sustainment in the design phase?

A. Program managers are required by DoDD 5000.1 to base major decisions using a total life cycle system management (TLCSM) approach. TLSCM requires several design and support factors be considered early in the system development and continuously evaluated at technical reviews to ensure that the selected design alternative will adequately balance overall system performance with other design considerations. To aid system designers and evaluators, ODUSD (A&T)/SSE is developing a series of risk assessment checklists that highlight common technical factors that should be considered during technical planning and reviews—these include system sustainment and supportability design considerations.

In addition, through OSD guidance documents mentioned in the answer to the previous question, we encourage full stakeholder participation early on in the design phase, especially with the recent addition of reliability as a KPP. The RAM guide in particular focuses on what can be done to achieve satisfactory levels of reliability and maintainability, successfully demonstrate them during operational test and evaluation, and sustain them through the systems' life cycle. Back to top

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Q15. A common thread in several briefings is the retirement of senior systems engineers and a lack of new hires to fill those positions. Are OSD/ Services giving any consideration to establishing or re-focusing the existing intern development programs for system engineers, including software and systems safety engineers?

A. We share your concern over the forecasts of declining numbers of systems engineers at a time when we are trying to revitalize systems engineering throughout DoD. While we are not aware of any specific intern programs for systems engineers, we have worked closely with DAU and the Services to provide new Education and Training and guidance materials to develop and retain systems engineering expertise within the workforce. This won't necessarily help on the front end as far as new hires, but it hopefully will help to keep the systems engineers we do have and groom new ones through a combination of OJT and formal training. Back to top

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Q16. Is DoD interested in exploring Expert Systems to mitigate or atrophy the effects of vanishing technical SMEs?

A. AT&L's number one goal, a high performing, ethical and agile workforce, clearly addresses the problems this question raises. That's why Education and Training, as well as guidance to the workforce, is an integral part of helping to retain systems engineering expertise. For instance, the DAG, when used in its fullest interactive capacity, is essentially

an expert system, as are other guides that we've issued. And in the area of E&T, we recently developed four new DAU SE courses as well as many Continuous Learning Modules that get back to the basics of sound systems engineering. This will continue to remain a top priority for us as we face the challenges brought about not only by a shrinking workforce but by a workforce that, as a whole, can improve upon its ability to apply Systems Engineering principles. Back to top

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Q17. Would it be advantageous for the government to invest in establishing knowledge-based systems to supplement the Acquisition 'Brain-Drain'?

A. See answer to question immediately above. Back to top

Q18. What impacts are you seeing on program performance from the lack of integration of SE & SW?

A. Programs that do not perform good technical planning or do not technically manage the contractors' performance are often surprised by issues down stream resulting in cost and schedule overruns. Back to top

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Q19. Once a contract is let, contractors CANNOT operate at CMMI level 5 because they are not allowed to adjust requirements (process). Why do we push for high level CMMI compliance when JCIDs is so process improvement oriented?

A. CMMI is an indicator of an ability to perform under managed processes. A project team operating with a high CMMI level has a higher probability of success than a project operating under a lower CMMI level. We do not see a conflict between CMMI and JCIDs. Back to top

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Q20. How do the Service PMs and PEOs really feel about OSD's "HELP" in the area of Systems Engineering?

A. As one would expect, we have mixed reviews. Some PMs and PEOs have been quite vocal, publicly and privately, in praising the assistance we have provided. Some have not seen any value added. In an independent study on the SE revitalization efforts, PMs with positive views of our "help" significantly outnumbered PMs with negative views. Back to top

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Q21. Are changes to FAR required?

A. At this time we see no need for FAR changes to implement our recommendations, guidance or policies to reinvigorate systems engineering. Back to top

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Q22. Does OSD plan to develop SE Capability evaluation tools for use in source selection?

A. We do not have any such plans at this time. We have recently published the "Guide for Integrating Systems Engineering into DoD Acquisition Contracts". The guide contains a lot of useful information for program teams to effectively integrate SE requirements into appropriate contracting elements in support of systems acquisition—it stresses the importance of early technical planning (and associated documentation in the Systems Engineering Plan) so that the Government's technical strategy can be reflected in the RFP to form a baseline for the offerors to respond to it. The Guide is posted on the SSE website at: http://www.acq.osd.mil/se/publications.htm. Back to top

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Q23. DoD requires a standard process to evaluate: alternatives to balance cost, schedule, performance and risk. What M&S tools exist to make business case decisions?

A. There are many M&S tools that can aide decision making, but no single tool that will replace a PM needing to use good judgement in structuring a program that evaluates all possible alternatives associated with a program's cost, schedule, performance and risk. However, using specific models and simulations can help to make informed decisions about the feasibility of a program. There are design and engineering models, physics of failure models, logistics and support models, and cost models that can be used collectively to make better business case decisions. Examples include, but are not limited to, PATRAN and NASTRN (CAD Tools), Logistics Planning and Requirements System (LOGPARS) Computerized Optimization Model for Predicting and Analyzing Support Structures (COMPASS), and Equipment Designers Cost Analysis System (EDCAS). No matter what tools are involved, the program will have to do a significant amount of work to understand each models capability (and limitations) and how they can be used to evaluate selected alternatives and determine which provides the optimal program balance of cost, schedule, performance and risk. Back to top

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Q24. ACTDS is the present vehicle to get systems to the field quicker, but it fails to consider sustainment. How will the new 'shorter' JCIPS process deal with sustainment while continuing to get to IOC quicker?

A. ACTDs were not designed to accelerate fielding although may systems have used the ACTD process to circumvent the acquisition process resulting in fielded systems that are not as operationally suitable as they should be. The Department is piloting several new acquisition approaches based on recommendation from such recent studies as the QDR and DAPA. These include "Time-Defined", combined "Concept Decision"- Milestone A and "Risk Based Source Selection". None support selling sustainment short to accelerate fielding. Back to top

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Q25. What role should/ will DATA exchange standards have in defense acquisition and sustainment of systems?

A. Data exchange standards are an integral part of the overall data management process to manage defense system data during each phase of the system life cycle. They are useful for the description of technical publications, product definition, and other data that are used in the design, installation, operation, and maintenance of equipment or software. Establishing data exchange standards and formats promotes data reuse, fosters competition, facilitates collaboration, and helps to ensure that data can be used consistently throughout the system or system of systems. Back to top

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Q26. Top 10 Systemic issues presentation did not include early lifecycle or SoS. They are acknowledged as challenges. What is being done to address these two issues?

A. System engineering and test and evaluation of systems of systems, especially when the component systems are managed by different organizations and are at different stages of their life cycle are among the most complex issues facing the acquisition community today. We are currently piloting the "System of Systems (SoS) Engineering Guide" as a start point to address these issues. Additionally, we are co-leading, along with the Air Force, a study of early systems engineering being conducted by the National Academies. Back to top

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Q27. Within the OSD mission, the statement: "provide technical insight to PMs" is weak. OSD needs to back PM's rejecting JROC approved requirements that are un-doable within project scope. Can't we enable a program's system engineering to take ownership of requirements past Milestone A?

A. The Department is starting to move in the direction you suggest. A recent solicitation encouraged contractors to identify the performance capabilities that drive program cost and

schedule. Contractors were to identify which performance attributes, including KPPs and KSAs, might need to be deferred, tightened, or deleted to ensure that the target IOC date can be met. Plans that do not meet KPP-related requirements must be revalidated by the JROC.

In addition, the Department is reviewing three initiatives to properly scope system requirements during program definition: Concept Decision Reviews, Time Defined Acquisition, and Capital Accounts.

Concept Decision. The Department is looking to adjust the acquisition process to ensure that priority warfighting needs of the Combatant Commanders are adequately addressed within fiscal and schedule constraints with an acceptable level of operational risk. The pilot approach to integrating the requirements, budgeting and acquisition processes employs a tri-chaired committee with representatives from these three major business processes. This committee conducts a Concept Decision Review when considering whether to undertake a major new capital investment. The Concept Decision goal is to ensure, as early as possible, that (1) DoD is making the right corporate investment choices balancing operational and programmatic risk, (2) that those choices are affordable, and (3) that any resulting non-materiel solutions and/or materiel acquisitions are designed for success. The Department currently has four pilot Concept Decision programs.

Time-Defined Acquisition strongly considers the needed time to delivery by selecting an acquisition approach with the approved materiel acquisition concepts. One or more tailored approaches may be used. For example, if the requirement responds to an immediate joint urgent operational need, a rapid acquisition approach may be employed; if a near term joint response is required, a joint capability technology demonstration may be directed. If the investment is in long-term future capability, the approach will capitalize on the Concept Decision and seek the best balance between time and total programmatic risk. These acquisition approaches may be employed independently or in combination to ensure that the full range of user requirements is satisfied. Time-Defined Acquisition reflects a strong customer focus and a corporate determination that no one acquisition process can effectively respond to the full range of potential user needs.

Capital Accounts. The Department is examining Capital Accounts for Major Defense Acquisition Programs as a means of stabilizing program funding. This issue frequently has been cited as a significant issue in program management. The intent of such a concept would commit a set amount of funding for the development portion of a project -- and hold that commitment by avoiding adjustments of funding, up or down, until the product is delivered. Checks and balances are necessary, as the Department will be equally disciplined in managing a program's requirements and schedule. This concept is being formalized in three pilot programs: (1) the Air Force's Combat Search & Rescue Helicopter, (2) the Army/Navy Joint High Speed Sealift Vessel, and (3) the Army's General Funds Enterprise Business System. Back to top

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Q28. Software Engineering is a relatively new discipline when compared to other specialty engineering disciplines (e.g. Electrical, Civil, Mechanical, etc.). It seems part of the lack of rigor and problems with Software Engineering stems from the misunderstanding in industry of the differences between Software and computer engineering and software development and programming in education and background of personnel. This can be seen by the number of positions filled (and requested) by people without the proper background and hired under software engineering positions just because they know a bit of programming. Can you comment on this? It seems the industry is hurting itself by trying to just fill positions without true engineers.

A. The lack of trained, and experienced, systems engineers is a recognized problem in the DoD. A recent study done by CSIS for the DoD specifically looked at the issue of demand for software engineers and the availability of needed skilled people (reference). In general they found that the real gap is in experienced senior software engineers who are equipped to address the issues facing DoD in the development, field and evolution of large systems with high degree of dependence on software. AT&L is investigating options for addressing these needs which affect the ability of both the government and industry to meet the increasing demand for large scale distributed systems. (Ref. Software Industrial Base Study, Center for Strategic and International Studies) Back to top

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Q29. "Drive state of the practice into program planning and execution." The problem is that the state of the practice is not universally good. One or two sentences of 'Do good/ smart things' in policy & guidance will not improve the state of the practice. What resources are you going to provide the services & agencies to help them improve the state of the practice in critical program areas such as pre-concept decision SE, architecture, SoS SE, integration of T&E/ M&S, etc?

A. There are many resources we have made available to the acquisition workforce that can help them improve the state of the practice in systems engineering. These include education and training opportunities via new 100, 200 and 300 level DAU SE courses and Continuous Learning Modules (www.dau.mil) and guidance in the form of the Defense Acquisition Guidebook (DAG), most notably Chapter 4 (SE) and Chapter 9 (T&E). Other reference guidance includes the Systems Engineering Plan (SEP) Preparation Guide, the DoD Guide for Achieving Reliability, Availability and Maintainability (RAM), the Guide for Integrating Systems Engineering into DoD Acquisition Contracts, and the Risk Management Guide, all of which can be found on our website at http://www.acq.osd.mil/se/publications.htm. And guides on CMMI and Systems of Systems are coming soon. In addition, for those MDAPs that are overseen by OSD, we are leveraging Program Support Reviews and SEP reviews prior to each DAB/ITAB, and are encouraging and assisting the Services to implement Systems Engineering WIPTs, to help ensure systems engineering principles are adequately being addressed at all levels.

Back to top