

**Defense Innovation Days
SENEDIA | Newport, RI**

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Introduced By: Senator Jack Reed

Introduction

Good evening! Senator Reed, Jack – thank you for the kind introduction. I also want to thank **Tim DelGiudice (Board Chair, Raytheon) from SENEDIA** (Southeastern New England Defense Industry Alliance) for hosting this conference on innovation. This is the second year of the event and I am glad to be back. I also know you have a strong supporter in my classmate, Jack Reed.

It is a real pleasure for me to be here tonight and to discuss innovation in the defense acquisition enterprise. I just finished seeing some of the exhibit displays and I am glad to see that innovation is thriving as it is vitally important to the department.

Innovation has become a very popular word lately. Secretary Hagel announced the Defense Innovation Initiative about a year ago. At about the same time the draft Better Buying Power 3.0 set of initiatives, which are focused on technical excellence and innovation, were published for comment. Deputy Secretary Work has led the effort to develop an innovative “Third Offset Strategy.” Most recently, Secretary Carter announced the opening of the Defense Innovation Unit – Experimental, or DIUx, in Silicon Valley. DIUx will focus on building

relationships in what is largely a non-traditional Defense area as they scout for new technologies with potential Defense applications. President Obama has also led the administration's successful opening of several Manufacturing Innovation Institutes, most of which are being sponsored by the Department of Defense, and more institutes are on the way. The last one was in Rochester, New York and another one to be announced soon by Secretary Carter.

Today it is possible to obtain advanced degrees at major University's in the fields of innovation and entrepreneurship. Many books and articles have been written on innovation, perhaps none more well-known than Christensen's "The Innovators Dilemma." I'd like to add a few thoughts to that body of work by making some very unscientific (meaning not supported by data) comments on the **ingredients that are needed to foster and encourage innovation** – and on the extent to which the Department of Defense acquisition enterprise has or does not have those ingredients today.

The **first and absolutely necessary ingredient is knowledge**. Technical innovation is itself, almost by definition a new idea, but new ideas are rooted in the knowledge that makes the new idea conceivable and practical. Part of Better Buying Power 3.0 is increased support for STEM education. Our education system provides the foundation of our knowledge, but it is just the beginning.

Experience, exposure to a wide and diverse range of technical fields, and continuing in-depth study are all important. For the more exciting areas of technical innovation today this knowledge is increasingly highly specialized and deep. I was at MIT recently talking to researchers in the fields of biological process based materials production, novel computational architectures, and autonomy. These are areas in which enabling innovation is not possible unless one has a deep knowledge of the science and associated technology. I believe that we are in the early stages of some explosive growth in the products that these technologies and other technologies will make possible, but to achieve that potential some very specialized advanced technology work will have to be accomplished. Once that occurs, innovative applications of these technologies will be created at an exponential rate. In many cases today the Department of Defense is not the primary financial supporter of the relevant work. Nevertheless the Department's basic research program still represents an important contributor, and it provides a basis by which the Department can shape and capitalize on new technical knowledge as it is created. By reaching out to non-traditional sources, such as through the DIUx, the Department intends to increase its knowledge of the possibilities that commercial cutting edge technology can offer to DOD.

My second ingredient is freedom. By this I mean the freedom to have a new idea and to take action in pursuit of that idea. I mean the freedom to fail and

start again. I also mean freedom from bureaucratic constraints. Our free enterprise system provides this ingredient on a national scale and it is the most powerful economic engine ever created. The United States stands out as a place in which it is amazingly easy to start a new business – I’ve done it a couple of times. Within the Department of Defense one of our most effective and successful institutions, the Defense Advanced Research Projects Agency, or DARPA, is a living testament to the value of freedom. I zealously guard DARPA’s freedom from the many parts of the Defense Department who see DARPA’s budget as an opportunity to fund something they need. The whole concept of DARPA is that the organization has the freedom to choose its own high risk but high payoff investments. In DOD more broadly, we set strategic goals for technology investment, require a certain fraction of the Services Science and Technology work to be in these areas, and leave those organizations the freedom to choose their own priorities for the balance of their work. Within DOD we also allow our contractors to pursue Independent Research and Development or IR&D as an allowable overhead cost with very little constraint. I’ve made industry a little nervous recently by proposing in Better Buying Power 3.0 to increase the Department’s oversight of this work. The fundamental concern by industry has been the possible loss of freedom to make their own IR&D investment decisions. That was never my intent. I once ran a major defense contractor’s IR&D program, and I appreciate industry’s perspective.

I appreciate the value, to industry and DOD, in allowing industry to place its own bets on technology that might increase a firm's competitiveness. After careful consideration of several alternatives, the policy I am proposing would merely require industry to brief an appropriate DoD officer or official prior to and after concluding an IR&D project, and to record that meeting as part of the accounting for the project. This policy would not require sponsorship or approval of an IR&D project by a DOD official, but it would require industry to communicate directly with someone appropriate in the DOD and to obtain feedback on the proposed work and to communicate the results when the work is complete. This should not constrain industry's freedom in any way that current regulations and statute don't already require, and it will have the benefit of ensuring more frequent and effective communication between industry and government.

My next two ingredients enter the area of what I will call subjective human intangibles. These intangibles are also manifested in what we call organizational cultures. One could generate a pretty long list of the human qualities needed for successful innovation. The list might include innate intelligence, creativity or the ability to think "out of the box," and curiosity to name a few. These get at the capacity to have a new idea. A lot of work has gone into creating organizational environments that encourage and foster creativity. This can include physical arrangements, workplace layouts, and a range of

approaches intended to foster cultural norms that support creativity. I believe all this work has merit, but I also think its goal is to select creative people and to draw out the inherent creativity that people either possess or do not. I'm only going to mention two human qualities that I think have great importance and that DOD managers at all levels should be especially conscious of - **risk tolerance and persistence.**

I was asked by a reporter during an interview two or three years ago if the Department was taking too much risk in its programs. My response was that we are not taking enough. With respect to our major programs I find myself pulled in two directions simultaneously by the political winds in Washington. At the same time I'm told that the expectation for all our programs is to have no schedule slips or cost overruns AND that we should go much faster in our programs and not have so much oversight. I'm sorry but you can't have both. To me both perspectives miss the point. Development of new products, particularly a new generation of cutting edge and militarily dominant systems cannot be made risk free. If we want risk free defense acquisition we should just buy fully developed products from other countries. If, on the other hand, we want the best military in the world, and one in which our warfighters always have innovative and dominant equipment, then we are going to have risk in our programs. One of our Program Manager's most important responsibilities is to understand and proactively manage the risk

inherent in any development program. To borrow a line from the movies, the secret of life is balance. We have to balance risk against urgency and resource constraints. If we are too cautious, our programs will take forever and be too modest in their ambitions. If we gamble wildly we will waste precious resources and not meet our objectives.

At the enterprise level in DoD today there is strong support for accepting the risk of embarking on a number of what I will call advanced technology demonstration programs. The recently completed Long Range Research and Development Planning Program recommended several advanced technology demonstration programs for consideration in the FY17 budget. Steve Welby is leading this study. Similarly the Strategic Capabilities Office is proposing nearer-term demonstration programs based on novel applications of currently fielded systems or those in development. Will Roper is our lead on this action. In the FY16 budget I was able secure funding for the Aerospace Innovation Initiative which will culminate in X-plane like demonstrators and propulsion technology demonstrators to inform our understanding of the options for the systems that will some day follow our current Joint Strike Fighter. This fall these demonstration proposals will collide with budget reality at the President's Budget request level. Needless to say, if sequestration occurs that collision will be even more violent. In some cases we could reasonably accept more risk and move directly into

Engineering and Manufacturing Development programs instead of pursuing concept demonstration programs, but we simply don't have the resources needed to conduct those EMD programs.

The **other intangible characteristic successful innovators demonstrate is persistence.** When they encounter obstacles they find ways through or around them. Two obvious historical examples are Edison and his quest for a practical light bulb, and the Wright brothers and their pursuit of controlled, powered flight. The Defense Department has sometimes been criticized for sticking with programs that encounter problems. The F-35 is a current example. Earlier ones in my experience include the C-17, AMRAAM, the F-18E/F. In all those cases we persevered and achieved good results. In other cases we have stopped programs we probably in retrospect should have continued. In still other cases we kept going for far too long on programs that should have been canceled earlier. In general, my sense is that for most programs we can get to a product that meets our requirements, if we have the patience and persistence to continue. There are exceptions however.

There is an important difference between the persistence applied to commercial innovation and that applied to innovative products in DOD. For commercial products, both in start-ups and large corporations, the decision to continue product development when problems are encountered is driven by the

judgement of the management and by the resources available to the firm. In DoD's case, these decisions have a high political content – both internally and externally. My observation is that the politicization of these decisions does not generally lead to better results. I have no solution to offer for this, other than to continue the work of the last several years to ensure we don't start unaffordable programs, and to manage risk professionally and proactively in our development programs. The Department spends taxpayer provided money; we will always be under close public scrutiny, and we will always have internal competition for resources.

Innovation, in the commercial context and in the DoD context, tends to be based on collaboration. Multiple technical disciplines often have to come together, and the synergy between multiple disciplines may be the central feature of the innovative idea. In the Department technical ideas only reach the market when the using military service decides to embrace the new concept or new product. This is not quite the same as the commercial market where “early adopters” from a large customer base may help a technology establish a foothold and gain credence. Commercial entrepreneurs build the better mouse trap first and expect customers to come. In DOD the customers, the Military Departments, ask for fairly specific products and then budget the resources to pay for the development of those products. The DoD also uses a formalized requirements process that is based on the perception of “gaps” in capability. Requirements are

generated to fill these perceived gaps. This approach tends to be self-limiting and to discourage new concepts and innovative approaches that deviate from existing paradigms. Henry Ford's famous quip that if he had asked his customers what they wanted it would have been a better horse has some relevance here. The fact is, however, that despite our formal process, requirements are often the children of senior Service leadership. For this reason I welcome the initiative from the Senate to increase Service leadership involvement in acquisition. A strong collaboration between Service leadership and the technical acquisition community, starting as early in the product life cycle as possible, is essential to effective innovation in DOD and it is a component of Better Buying Power. I would also add that close collaboration with the intelligence community is critical as well; potential adversaries are moving very quickly to develop products that are clearly designed to defeat US capabilities. The Department must be both innovative and quick to market in responding to these emerging threats. Achieving these objectives requires strong and continuous collaboration between operators, the intelligence community and the technical acquisition community.

If we look at this **list of ingredients: knowledge, freedom, risk tolerance, persistence, and collaboration**, I can point to numerous places in DoD where we are taking steps to improve in each of these areas. For the last few years we have worked hard to emphasize and increase the professionalism of the government

acquisition workforce. Secretary Carter's "Force of the Future" initiative is specifically intended to bring high knowledge people into our workforce. With help from the Congress through the Defense Acquisition Workforce Fund and a number of internal actions we have continued to build on our strong foundation in this area, despite budget constraints. We are protecting and emphasizing the freedom of our managers to find creative solutions to technical and managerial problems. Last year I tasked each of our Program Managers to communicate directly with me about problems, issues and recommended solutions. The result was a huge testament to the creativity, dedication and professionalism of our workforce. The demonstrations that I mentioned, if they can be funded, show our willingness to take risk on new and non-traditional approaches to operational problems. Deputy Secretary Work's "Third Offset" strategy, by its very nature, will require the Department to accept the risk associated with new operational concepts and the technologies that enable them. Our ability to persist in bringing all of these initiatives to fruition remains to be seen, but the closely aligned leadership in the Department, including the Secretary and Deputy Secretary, myself, and the new Joint and Service uniformed chiefs makes me optimistic that we can do so. Leadership is also essential to effective collaboration, and there I am optimistic also. There is however one necessary ingredient that I have not discussed yet. That ingredient is **capital**.

Small start-ups and large business' alike depend on capital to survive and to bring new products to market. So it is for DOD, and this is my greatest concern. Our capital comes from the budgets we receive from the Congress. As long as we remain trapped in the grip of sequestration and as long we continue to prepare budgets that are far out of alignment with the funds we may receive, we will not be able to innovate effectively. Innovation isn't just about thinking outside the box, or about demonstrating new technologies and operational concepts. It is about developing, producing, fielding, and training with those new capabilities. Today I believe our pipeline of new products in development is inadequate to deal with emerging threats. We are facing a major recapitalization bill for the strategic deterrent that is about to come due. There is nothing that I or the Department can do to improve our productivity and efficiency that will fully compensate for inadequate capital. All the efficiencies I can even imagine will not make up this shortfall. By conducting well-chosen demonstrations we can reduce the lead time to acquiring real operational capability, we can keep an essential fraction of our industrial base gainfully employed, and we can position ourselves for changes in threat perceptions and the availability of additional funds. But, without relief from the specter of sequestration we cannot increase the relative combat power of the United States against our most capable potential adversaries.

Conclusion:

And to end on an optimistic note.

In closing, the DOD recognizes the importance of innovation and has taken real actions over the last couple years to ensure innovation influences future capabilities for the Department. We do place a premium on innovation and much of that innovation comes from those represented here today.

I thank you again for focusing this conference on innovation and I look forward to your questions.