

CReST BOLD IDEAS SEMINAR

LESSONS LEARNED FROM THE OFFICE OF THE SECRETARY OF DEFENSE



FEATURING
MR. ALAN SHAFFER
MAY 8, 2015



POTOMAC INSTITUTE FOR
POLICY STUDIES
901 N. Stuart St. Suite 1200
Arlington, VA 22203

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Potomac Institute for Policy Studies
901 N. Stuart St, Suite 1200
Arlington, VA, 22203
www.potomacinstitute.org
Telephone: 703.525.0770; Fax: 703.525.0299

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Email: webmaster@potomacinstitute.org



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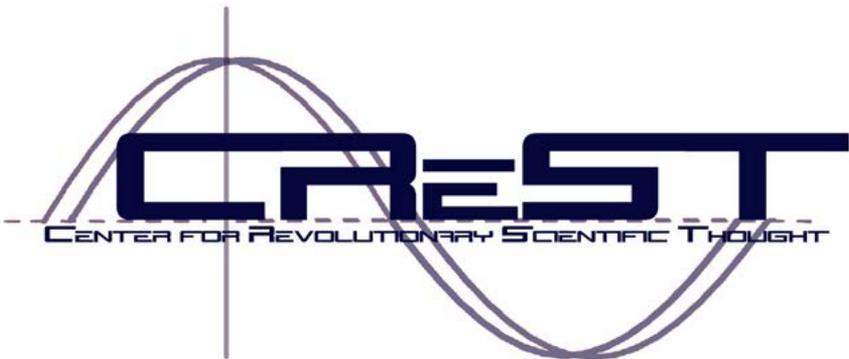
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CReST

The Center for Revolutionary Scientific Thought (CReST) at the Potomac Institute for Policy Studies brings together individuals from a variety of backgrounds to enable a comprehensive outlook of science and technology (S&T) futures from academic and policy perspectives. CReST intends to: 1) develop new ideas, 2) formulate strategies on how to achieve revolutionary gains in S&T, 3) provide a discussion forum to address political, ethical, legal and social issues related to S&T, and 4) inform the public and policymakers about the most pressing issues and concerns regarding the future of S&T.

The CReST mission of solving vital societal problems is enacted through research studies, products, seminars, and conferences designed to address the most trying challenges facing our society.



AGENDA

CREST BOLD IDEAS SEMINAR

LESSONS LEARNED FROM THE OFFICE OF THE SECRETARY OF DEFENSE

INTRODUCTION

GENERAL ALFRED M. GRAY

*Chairman, Board of Regents, Member of the Board of Directors,
Senior Fellow, Potomac Institute for Policy Studies*

MODERATOR

MR. GARY SOJKA

*Secretary/Treasurer and Member of the Board, Potomac Institute
for Policy Studies*

FEATURED SPEAKER

MR. ALAN SHAFFER

*Principal Deputy, Assistant Secretary of Defense for Research and
Engineering*

EXECUTIVE SUMMARY

Mr. Alan Shaffer's seminar provided key insights into personal experiences throughout his career, both in the Air Force and in public service. Furthermore, Mr. Shaffer spoke and reflected on lessons and highlights acquired from more than a decade of serving in senior roles in the Pentagon. Attendees were provided a glimpse into his Pentagon career as a leader in research and engineering, including assignments as the Acting Assistant Secretary of Defense for Research and Engineering. In this position, Mr. Shaffer was responsible for formulating, planning and reviewing the DoD Research, Development, Test, and Evaluation (RDT&E) programs, plans, strategy, priorities and execution of the DoD RDT&E budget totaling roughly \$25 billion per year.

Mr. Shaffer discussed the acquisition and technology strategies employed at the DoD. He addressed the need for project managers to own the technological baseline, with an emphasis on technical expertise and experience. While the DoD operates on very complex statutory processes, Mr. Shaffer spoke to the Department's ability to continue to be an innovating force. The DoD works in tandem with commercial technologies and Congress as partners in the technology innovation process. Mr. Shaffer posed his ideas for fueling agile innovation in the DoD through the development of open systems that work with industry, creating new markets for upgrades, and providing opportunities for creativity across all systems. Mr. Shaffer engaged the younger generation of attendees and reflected on the most important lessons from his career.

SEMINAR TRANSCRIPT

INTRODUCTION

Bob Hummel: The Potomac Institute is pleased and honored to welcome the honorable Al Shaffer to the Potomac Institute for Policy Studies. Here to welcome us today is the Chairman of the Board of Regents, General Alfred M. Gray.

General Alfred M. Gray: We are very privileged and proud to be having this session today. We have a member of the Potomac Institute's Board of Directors today, Gary Sojka, so I will not go into too much detail. Mr. Sojka has some words prepared for you, and so here he is.

Gary Sojka: Thank you and welcome. I am a member of the Board of Directors at the Potomac Institute as well as a member of the Board of Directors at the U.S. Technology Leadership Council that is providing for the reception. I have the distinct privilege of being the moderator of this discussion. The Potomac Institute has sought to interview senior government officials who have spent the majority of their time working in government. We want to know their opinions of what works, and what does not work. Typically, these interviews are recorded and turned into a formal booklet and uploaded to the Internet. Our hope is that young leaders can benefit from the wisdom of those who come before them, and learn what it means to have a successful career with the U.S. Government.

We are particularly fortunate to have Mr. Al Shaffer, the Principal Deputy Assistant Secretary of Defense for Research and Engineering, here today. I say we are fortunate, because in the last decade, Mr. Shaffer has become the leading figure of research and development within the Department of Defense (DoD). We have provided a biography of Mr. Shaffer, and what I want to stress is that he holds degrees in mathematics and meteorology. Those domains tend to focus on probability and forecasting, and at some point we will ask

Al for his predictions, perhaps on Presidential elections, and see how he compares to the local weatherman. Mr. Shaffer may want to start off by saying a few words, but this will be a moderated discussion with questions and answers. With that as an introduction, I give us Mr. Al Shaffer.

Al Shaffer: Though I certainly wanted to come out and lead this seminar, I am not sure that I have any great insight. In my opinion, there is not any magic to succeeding in the Pentagon. Nevertheless, I do enjoy coming out and interacting with people and hearing questions from the audience. There are not that many young people in here, but I will be looking for questions from the young staff. After all, you will be the ones dealing with what we leave behind. So if you think something is broken or does not look good, please ask a question.

AL SHAFFER'S BACKGROUND

Gary Sojka: There should be some good questions. However, I am going to force the issue a little bit and ask about your background. First, we should start with your career. How did you get into the Department of Defense, and what positions did you hold there? In particular, which jobs you have found most rewarding? Finally, how would you rate your performance overall?

Al Shaffer: Overall, that is a very broad question. One Friday night around 1972, when I was a 17-year-old college student, I was walking around campus and had no money in my pocket. Since it was the 1970s, I also had something of a ponytail. I glanced up at an ROTC sign that said, "We will pay you \$100 to go to class." My first year I was studying English, but I had always been good with numbers. I thought to myself, "\$100 equals 200 beers." So I went in to the ROTC office wearing some patched jeans, a t-shirt, and a "ban the bomb" button and asked, where I could sign up. From there, I discovered I could actually like this.

I came out in what was one of the darkest times in American history. As General Gray may remember, that was during the time of the Watergate scandal. I thought, "I can do better than that." So, I enlisted in the Air Force and had the opportunity to do some very interesting things. You asked what job I liked best? Well, I liked them all. The Air Force saw that I had a math degree and so they sent me to meteorology school. My first tour of duty was at the University of Utah, which was terrific. I got to walk around campus with second lieutenant pay, which was not much at that time, but on a college campus, it made life pretty good.

After the University of Utah, the Air Force sent me to the Mather Air Force Base in California, a base that is now closed. From there, I walked into the 320th Bomb Wing. I had an absolutely fantastic time as the wing weather officer for a double bomb and double tanker wing. For the young people, the Strategic Air Command (SAC) sector of the Air Force was a no-fooling-around organization. Every other week, I was on alert. I had to be available to be in the wing briefing room within 15 minutes. If you were not there in 15 minutes, you would get what is known as an article 15, a non-judicial punishment procedure. Still, I came to find that I enjoyed the discipline because it was a very structured way of life.

As a second lieutenant, I got to brief the wing commander on a daily basis. In fact, the wing commander would start each day with the weather forecast since the weather was extremely important for all ongoing operations. During my time at SAC, we went through a series of wing commanders. One of the last ones, Chuck McDonald, retired as a four star at what was then the Air Force Logistics Command. I remember that he came to my going-away session. He said, "You know you could make a lot more money in industry. However, you will never have as much responsibility." That is one of the things I love about the Department of Defense. Throughout my career, I have always been able to make more money on the outside, but nowhere else have I had the same amount of responsibility. I enjoy being able to look out for people and organizations.

From there, I went to the Naval Postgraduate School in Monterey, California. Do you see the trajectory? I went from Salt Lake City, to Sacramento, and then to the Naval Postgraduate School. Following this, I went back to the Foreign Technology Division, a place that no longer exists. The Foreign Technology Divisions was an intelligence division, and was a terrific job since I spent my day looking at what the Soviets were doing. Following that tour, I got to do something very unusual for an Air Force officer, and again, this was another great job. I was assigned to the Army, specifically one of their Special Forces groups, and spent the better part of two years in Honduras, which was interesting. From there, I went to the Third Armored Division, east of Frankfurt, Germany. So, I spent five years of my military career on the ground with the Army. I must tell you, I never planned any of this. Getting to go out and run around in the woods like Ranger Rick was just terrific.

I came back from Germany in 1990, just as the First Gulf War hit, and I returned to the Headquarters Tactical Air Command. When I walked in, they informed me that they were short on lieutenant colonels and colonels selects, so I got the opportunity to run the battle staff. At that time, CENTAF (the Central Air Forces) was unable to maintain the battle staff rear, so I became involved in the deployment of all the forces – the air forces – to the Middle East. That was a fascinating tour. You asked what was good and what was bad about my experiences. One of the most fascinating things that I did was that I kept on volunteering. When I was in Germany, I had a weather squadron and all my guys deployed with their army units to Saudi Arabia and Iraq. I kept on volunteering to go back, and I kept on being told that I could not go.

The war ended and I got a phone call from my general officer, saying that there was a plane out of Norfolk in 12 hours that I was going to get on. The United States had just destroyed the fourth largest army in a matter of days, and there I was, this guy from the rear echelon, coming up to say, “Hey everyone, I am supposed to see how well you do your job.” I cannot say that this went over very well, but it was

fascinating. In a 30-day period, I visited about 45 sites. Obviously, I came back and said that we did great.

I then went to Langley, where I had the pleasure of trying to put together SAC and TAC (Strategic Air Command and Tactical Air Command). This was kind of like trying to mix oil and water. Or maybe cesium and water because there were some explosions in there. These were two uniquely different cultures and I was put in charge of the team trying to figure out how to merge the support functions. I went from there to the War College, which I loved. I went from the War College to the Pentagon. I thought that I was going to be there for just a couple of years, but I kept on being given assignments and being pulled back in. So, I went to an MA (Military Assistant), who is still one of my heroes: Dr. Hans Mark. For young folks here, if you want to look up the definition of a hero, look up “Hans Mark” on Wikipedia. Dr. Mark came to the country as an émigré. His family fled Germany prior to World War II. He has since been the Secretary of the Air Force, the Director of Defense Research and Engineering, the Director of the National Reconnaissance Office, and Assistant Administrator of NASA. He was the president of the University of Texas. He is 85 years old. I still see him once a month when he comes back to Washington to help out, which he always does with grace and incredible professionalism. How many folks out here know Dr. Mark? I would consider him to be one of my mentors and one of the people I try to emulate. Think about this person with all of those achievements and yet, completely humble and still trying to help at 85. I think there is a lesson in there.

I went off for my last command tour in Omaha. Command at the O-6 level is always good. I had an interesting turn where the person who was in charge of my career field took all three of us who were eligible to become general officer and asked to stay an extra year. This was the first part of my career where I said, “What am I going to do now?” I got a call from the Pentagon asking me to work in Senior Executive Service, in research and engineering. I came back and I have had the fortune to do some incredibly wonderful things in that role. A couple of the more interesting ones: I got to run the

BRAC session (Base Realignment and Closure) for all of our physicians, labs, and test ranges. We need a BRAC now; we did not necessarily need a BRAC then. No business would ever try to downsize when you are having 10% growth per year, which is exactly what we did in the last BRAC. That ended and I was working for John Young. He was working on the MRAP (Mine Resistant Ambush Protection Vehicle) task force, and I became the Director of the MRAP task force. It was an amazing acquisition effort. We fielded about 27,000 vehicles in under four years from start to go, and that is pretty remarkable. I do not know how many lives we saved. I would say that the biggest highlights of my career have been when a service member or a parent have come up to me and said, “Thank you, your MRAP saved my life,” or “Thank you, your MRAP saved my child’s life.” We all worked pretty long days during that time, but when you are saving lives, it is important. I went from there to where I am now, Acting Assistant Secretary. I have loved every job I have had. I have tried to do my best, and I have never gone looking for a job. So, that is the summary of my career.

Audience Question: During all of that, and that is a really interesting history there, what kind of hobbies did you keep up with?

Al Shaffer: I played sports. I found that, for the most part, my jobs were 12 hours-a-day jobs or longer. But it is only work if you do not like what you are doing. I played basketball on a couple of base-level teams, which are analogous to roughly Division II college teams. Then, I damaged my knee playing basketball, so I got into running. Between running, racquetball, I probably need a knee replacement, but I would not have given up any of those experiences. Now, I think my hobby is trying to stay awake at night for an hour after I get home. I enjoy woodwork and that type of thing. You have to keep some balance. Find something that you really enjoy doing. I loved running, racquetball, and basketball. I also coached sports. One of the nice things about getting old is that you meet people and you remember certain quotes from people. There was a guy at MIT Lincoln Laboratory whose name was Aldous Winter, and his favorite saying was, “Life is not a dress rehearsal.”

ACQUISITION

Gary Sojka: Let me take you back to the MRAP because you are known for that program, specifically. As I solicited questions for today's event, it was apparent that many people were interested in hearing about those days. The recurring question was, "What lessons did you learn from that experience?" Is there anything you can take away from the government acquisition process, or is each one of these programs basically unique?

Al Shaffer: MRAP was an unusual time because we had the full support of Secretary Robert M. Gates, who is another one of my heroes. Secretary Gates oversaw what was probably the period of time with the greatest number of casualties in our recent activities. For those of you who do not know Secretary Gates – he was a fairly private guy – one of the things that impressed me the most is he would work his day job and then he would go home at night and handwrite personal letters to the families of people who were killed in action. You could say that this is a requirement of the job but it still says an awful lot about him as a person. We had Secretary Gates' full backing for MRAP, which helped to cut a lot of the bureaucracy out. I think the lesson to be learned is that you have to be a professional. You need to know what the rules are, and then you have to know what rules can be broken. We have all these acquisition processes, and yet a great number of the elements can be waived. Most people do not try to do that. If you have senior leadership involved, then you can get waivers. To have an acquisition program, you really only need one document. This is one of Frank Kendall's messages. You need a solid acquisition strategy in order to get going. Then, you can catch up with all the other superfluous stuff that we do later. You can waive a certain amount of testing if you understand the fail points. You do not need to have a formal operational test and evaluation process, a tester engineering attack plan, or a test evaluation master plan before you start fielding. Now, you do not want to do that for every program. I certainly would not want to do these things for the F-35 because the systems become more complex. I think the lesson

with MRAP is that if you have a dramatic need, which we did, you can go much faster. You are going to waste some money, but that is for the politicians and for the senior leadership to determine: is the cost benefit worth it? Do you need the capability badly enough that you can risk having some inefficiency in the funding? That was how the decision was made and it was easier to field the MRAP. We are fast-tracking things right now for Syria. We fast-tracked things for Afghanistan all the way through that operation. And again, it is a matter of asking, “How urgent is the need?”

Audience Question: I liked what you said about the MRAP – you made it clear that the systems that worked for its acquisition might not work for seriously complex programs, like satellites. Satellites are one of the things that I used to build. It seems to me that in many regards, we see that people want to treat acquisition rules as recipes rather than as a menu. In MRAP, it seems to me that you used the rules as a menu. It also seems to me that just because it worked in one program, it does not mean that you can generalize it for the acquisition program and the acquisition process at the DoD writ large. Would you care to expand on that a bit?

Al Shaffer: That is a great observation. Let me preface this by saying that we are capable of being critical of ourselves. But at the end of the day, we have had such unquestioned military dominance for the last 25 years (and of course, the systems were much less complex back then) that no one would come out and play with us. Some of that dominance is eroding a bit because of where our focus has been. But having a 25-year military superiority advantage is really very rare in history. Before I criticize the evolution of acquisition programs, I would like to say that the point of criticism is to improve things while recognizing that we are still fielding better systems than anybody else in the world. Back in the 70s, we took more time thinking about programs before launching them. Bill LaPlante, who is now the Acquisition Executive of the Air Force, has coined a new phrase, saying that he wants his program managers to own the “technological baseline.” Owning the technical baseline means you have to understand the interfaces, and understand where there is technical

risk. I think that this is really critical. I actually talked to a class of senior acquisition program managers yesterday, and 21 of the 22 students were engineers. It pains me to say this as a mathematician, but program managers should probably be engineers. There is a certain amount of rigor that comes with delivering a program, and the Department may have moved away from that. Under half of one service's acquisition executives are engineers. Over half of the program managers in another service are engineers. The Air Force used to have nothing but engineers. However, it recently tried to field the Space-Based Infrared System with a political science program manager. He was a great guy but the job demands the right level of expertise to shut down industry representatives blowing falsehoods up your pant leg. The program went out of control, and I think we ended up with five Nunn-McCurdy breaches.

You have to own the technical baseline. If you own the technical baseline, and the program manager really understands what he or she is doing, then the acquisition executives will be willing to take more risk and allow things to go without all of the documentation. In fact, my boss Frank Kendall is trying a pilot program that he is calling Skunk Works. This is not the Kelly Johnson type of Skunk Works, but it is trying to find a way to get the services and the Office of the Secretary of Defense (OSD) out of the program manager's way. The idea is to let them do their work and then come together with the senior stakeholders to make milestone decisions. This means going through the system engineering plan, the test plan (not the TEMP), the risks, and the status of the program. Let's consider what we have to go through now to reach a milestone for an Acquisition Category 1 program. OSD has a defense acquisition board. For that one defense acquisition board, the service has three dry runs with the service acquisition executive. For each one of those three dry runs, the program executive officer (PEO) has three dry runs. If you take a look at how gravity works and if you think about the poor program manager at the bottom of the process, you have to imagine that they are spending their entire day, every day, getting ready for higher headquarters meetings. They are not fielding systems. So Frank is trying to get away from that, but to get his type of model

to work, you need to own the technical baseline. We finally saw a program where the program manager clearly owns the technical baseline, so we are doing our first pilot with the Skunk Works. It is a Navy program, and if this works, I think it is going to be the way of the future. If we can reduce the red tape that the poor program manager has to go through to get a milestone decision, so that they can actually focus on managing the technical risk, we are going to get better systems, at better costs, in a shorter amount of time. But, management is not a cookie cutter process. I think the enduring truth is that program management is hard, complex, and dirty. You need someone who understands the program, not just the PowerPoint charts. You need someone who really understands the program to field the system effectively. I can give an example from the first Skunk Works Navy program, where the program manager came in and said, "I do not know if we are going to be able to field this system successfully." The reason that the person said this is because they had a 90-pound weight margin for a program that had not yet hit milestone B or hit the B power levels. They had very constrained size, weight, and power equations. When the person talks about understanding the technical risk, he knows where the weight is coming from. He knows where the weight could come out if it works and he knows what solutions he will try to implement. He understands the interfaces and has a very well-articulated developmental test plan with test points to know whether or not it will work. It is all about understanding how the system works in exquisite detail. For example, the program manager must understand questions such as: Why is gallium nitride the best option? What is the potential that it gives you? How do you think about integrating new power sources? What are the interfaces of the power sources? What second order impacts will that have? The program manager has to understand the program at the interface and technologically-based risk level.

Audience Question: I have been thinking about these issues. The Army does not need serious engineering capabilities in the same way that the Air Force does and the Navy does. Would we do better if we had the civilian engineer as the program manager, and then

have the colonel or brigadier that is now the program manager as the boots-on-the-ground guy that says, “This is what this capability needs to do in the field. I may not be able to spell out all of the electronics, but I do know what it needs to do.”

AI Shaffer: There are some civilian program managers. Frankly, being a former uniform guy who spent more time in operations than in science & technology, acquisition, and intelligence, I am not sure if we need that many uniformed acquisition officers and managers. To work a proper acquisition program, one of any size, you are going to have to be there for three to five years. That is not compatible with a typical military career. In the Army, where under half of program managers are engineers, they are fielding some pretty complex systems. Former Combat Systems was pretty complex (you will notice that I renamed it from Future Combat Systems). The Apache upgrade, which is essentially taking out an analog system and replacing it with a digital electronic system, is a complex feat of engineering. The Army is about a lot more than trucks now, and there are some really interesting types of things that they have to buy. The Army is going to be the first service to field the high-energy laser operation, with Integrated Fire Protection Capability Increment 2. I think you do need engineers. There is a certain discipline to engineering. There is a reason why engineers are not fun at parties (we can have some levity here). But the point is that they think about the world in a very systematic way. That is what good program management needs.

Audience Question: I am with the Naval Postgraduate School and I have known AI for a long time. I actually have a number of questions. When I came to the Pentagon, our mantra was that technology is our force multiplier. That worked for quite a while, but I do not consider it to be a guaranteed win. When James Fallows comes out with a cover story in *The Atlantic* asking why we have the best military in the world but we are not seeing success? Having the technology does not mean that you are going to win the war. I am struck by the rigidity of the systems. In today’s world, the DoD is not inventing a lot of the technology, and we gave a lot of it away because

we could not afford to buy it all. Now, we have the real skills out in Silicon Valley or maybe in China, so we may not always be the winner from a technological standpoint. It does not seem to me that the DoD understands that it needs to be a learning organization. And when it has processes that are clearly handicapping us, why is there not a real push in acquisition and personnel to try to figure out how we can make them better? I understand all of the emotional reasons behind that but it strikes me as a taxpayer, I wish you were doing that. The other thing that I would like to suggest is that in all of your programs, you should have a written document that includes the new things that were learned. When I came to the Pentagon, every flag officer had a flag writer who would take 200 pages and condense them down to two. I think we ought to have the contractor do that, so that people at the top could actually learn what they paid for. I think that too many reports just sit on bookshelves.

Al Shaffer: Another one of the great quotes that I have stored up is that in Washington, more is written than is ever read. We spend a lot of time going out and hiring contractors to write these wonderful long documents that no one ever reads. I want to start with something that you said. I worry sometimes that mass media perpetuates urban legends that are not always true. I do not think that the Department of Defense has conceded innovative thought to Silicon Valley. We have to recognize there is a reality, which is that technology moves very fast in some sectors nowadays. In one of my talks, I have shown how technology has developed over time and it gets compressed a number of times. What used to be a 75-year process for penetration into markets back in the mechanical era is down to five or ten years now in the information era. I do not want to use this as an excuse, but the Department of Defense operates on incredibly complex laws put forth by the 585 members of our “Board of Directors” (Congress). Young folks, a third saying would be, “When in doubt, follow the law.” We have to follow statutes. With the statutory processes that we have been given, we are not going to keep up with the microelectronics industry. We are not going to keep up with nuclear technology. We have actually sent young scientists from our research laboratory to Google to understand their architecture. This

has worked out very well. I talked to the CEO of Google. He drew a great big circle on his whiteboard and then he put a dot in the middle and he said, "This circle is my customer base, this is my market. And then this dot is you. You are not going to drive where I am going." But Google still wants to work with the Department of Defense. Why? The reason that they want to work with the Department of Defense is that we have the coolest problems in the world. I cannot imagine why a young scientist or engineer would want to come to the Department of Defense and work at \$30,000 less than they are going to get in industry. With all the rigidity in the system, we still get them because we have some great projects. But we still get kicked over the concept of innovation. The last time I looked, Facebook is not going to win a war. I think you have to take a look at which sectors we have to protect and focus on. The second change, and this goes back to why we need to have engineers, is that we drove the microelectronics industry back in the 70s, but there was not much of a commercial market. Now, the commercial market dwarfs us. What the Department of Defense has to understand is how to play and work in that world and, by the way, this does not just apply to the DoD. All government agencies need to learn how to work in today's world. How do we put the added military capability on top of a commercial product? I personally think that the communications network for any deployed force should start with a mobile relay tower, or an airborne relay tower, and Samsung radios. This is how people up top can get there very quickly. However, at the end of the day, you are still going to need secure communications on top of that. The secure communications are a capability that the DoD is going to have to build because there is no commercial market for them. If you take a look at some of the things that we have fielded, they are remarkable. We will have a high-energy laser, which is another example of a capability without a commercial market, save for maybe some manufacturing applications.

Audience Question: One of the examples you talked about was the MRAP. The country has been at war for many years, in various conflicts. Why wouldn't we field future systems in the same ways

that you did with the MRAP in times where there might not be the same conflicts?

Al Shaffer: I want to be careful in how I answer this. When we are not at war, we should take our time to field the best possible capability for the best price that we can. At the end of the day, I work for Jane and Joe Six-Pack in Omaha, Nebraska. My job is to give them the best possible value for the tax dollars that they are spending. It irks me to no end when you see all these wonderful big reports written that no one ever reads and we pay \$250,000 for them. We have to be good stewards of taxpayer money. When there is no urgency, we should take a little more time and drive costs down. You do not want to drive costs down if you drive industry down. You have to give industry a fair profit. One of the things I worry about right now is how we are so insistent on some of the acquisition cost reform that we may be squeezing industry too hard. They have to be able to make a profit. I think that the key things to understand are how to go faster, how not to lose the lessons learned from concurrent engineering, how to get immediate support from the Hill, and how to keep the Hill well-informed. One of the things that helped with the MRAP was that I was going over to the Hill two or three times a week, and making them a partner in the process. If we are not at war, we are not going to see rapid fielding. I think that the systems we are going to field in the future are going to be considerably different, and if we are not in a major conflict, we need to think through what those will be.

Right now, we are still on curve with Augustine's Law. Norm Augustine said that at the current rate of the increase in cost to our airplanes, the Department of Defense will only be able to buy one airplane a year in 2050. We have held to that cost curve, for the F-4, F-111, F-15, F-22, and now the Joint Strike Fighter. Our current trajectory is clearly unaffordable. We have the same problem in space. We have the same problem on the ground. We have these exquisite systems that cost a lot of money. When you only have a few systems, you are very vulnerable. I think that the future will be a mix of high-end and low-end expendable systems operating together. We are getting

to the point where you can have some level of autonomy. If I go out with a high-end aircraft, it should operate in tandem with six or eight different drones doing different things. One of the drones might be an attack weapon, another could be a stand off jammer, and another could be a target illuminator. You do not have to field all of the protection systems around them, which keeps costs lower. I think we would have greater capability for lower cost. The idea is not individual platform capability, but rather aggregated capability. The same is true in space. We have these exquisite satellites and we only can buy three to five of them. Who saw the *60 Minutes* piece titled “The Battle Above”? If you did not, I highly recommend it. General John Hyten from Space Command talked about how things have changed in the space arena. We have incredible vulnerabilities in space. If we go to a combined architecture satellite system with drone satellites, China, Russia, and Iran can knock themselves out trying to shoot out our big satellite because we can still operate. Right now, we can be taken offline from Global Positioning Systems (GPS); Intelligence, Surveillance, and Reconnaissance (ISR); and communications. I think that the future will be much more disaggregated. Individual less-capable systems will operate together in some fashion. By the way, this works for dismounts too. It will work for the Marine Corps. How do you aggregate systems that work together with the human, with high-end systems, for greater capabilities? That will clearly be part of the future.

I am talking about getting different parts of the Department to work together to build these systems up. One of the big pushes is to increase demonstrations and prototypes. We have doubled our investment in research and development and prototypes in the last couple of years. The way you are going to build the disaggregated autonomous system is to build some prototypes and play with them. Start experimenting with real humans in the loop. Other nations are building exquisite systems, but to date none of them have products of the American education working on these systems. I still remain in awe of the jobs that our young men and women have done in Afghanistan, and there was a lot of concern with the mil-

lennials would not be able to hang. They have hung pretty well. We train better than anybody.

Audience Question: I would like to ask you about the current war. I am not talking about Afghanistan. I am talking about the cyber war; the one that we are in today. What are we doing about it? What are the systems that need to be completed? What acquisitions do you see taking place to keep up with the system refresh going on in the cyber community?

Al Shaffer: We need to take whatever we can from industry, which is all about cyber defense. They are not very good at it yet. Let me just say that I do not do online banking and the professionals that I know in the business do not do online banking. We should take the best of what they have and then start to layer on top of it. There are a couple of things we need to do. The first thing is that we need to build a cyber workforce and a cyber culture. The *60 Minutes* piece with General Hyten shows some of that. If you go up to Mike Roger's place at NSA and go into CYBERCOM, you will find a bunch of young E5s and E6s who are immersed in this. They look different than Sailors, Airmen, and Marines used to look but they are engaged in it at the end of the day. We have to train these people internally because I do not see much of a culture or a commercial market in cyber counter-defense or offensive cyber capabilities. We are going to have to build that up ourselves. The second thing that I think we have to do is we have to start talking about cyber in words that real people understand. I am forcing my people to come up with metrics for cyber development. I do not care if they are right or not for the first time out. I care if they are understandable by other trigger pullers. We have to start treating cyber like a military domain where you measure things. I mentioned I started out my career in SAC, and the first lesson I learned there is that every SAC crewmember kept books on themselves. That was the phrase. They scored every bomb run and tracked their performance over time. The Marine Corps does the same thing. You have got to keep books on the cyber guys. You need to give them things that they can measure to keep books on themselves. That is the short answer.

INNOVATION AND OPEN SYSTEMS

Audience Question: In some respects, our innovation process in the DoD is looking through a rearview mirror. The US was always the critical center for the innovation in the world, but today, that gap is closing dramatically. Global commercial technology development is moving at a very rapid pace. Between examples like the Budget Control Act and the removal of Air Force Systems Command, are we on a trajectory right now that may not be able to deliver innovation that can compete with future adversaries who are not looking through a rearview mirror? How can we change, close, and manage this gap better? Do we need to break some glass in our processes today? How can we jump on Apple's technology curve versus staying on a curve with slower processes?

Al Shaffer: That is a great question. We need to change some things. Some of those changes can arise internally. I will provide a great story regarding Apple, but then I will ask you if the Department of Defense could buy something like this. Steve Jobs dreamed up the concept of the iPod. He took this concept to his engineers and said that he had three requirements: the device must hold 10,000 songs, be able to access any song within two seconds, and do all this with only one operational button. Those were his sole requirements, and he told his engineers to go build that vision. Do you think that we would ever build a Department of Defense system with three requirements? Referring back to owning the technical baseline in engineering, we absolutely need to understand what we are specifically looking for from requirements. At the same time, we need to ensure that we give people the tradespace to actually fulfill these requirements. Some of this culture change could come from the fact that millennials are the ones doing important work in the Department.

How many folks love open systems? How many folks know what open systems are? Right now, we have exquisite fielding systems with Boeing, Raytheon, and Lockheed where each company has their own proprietary open systems. The Department has to take

that on if we want to be innovative and creative. The caveat is that in order to be creative, you have to be agile. Commercial markets are agile. Open systems work such that emerging mature capabilities can be slotted right into usage. Apple is pretty agile because they define a broad scope for their apps, which allows anyone to develop their own software and put it on the App Store. This system creates its own market, and we need to think about how the military can try to replicate this model. We need to think about ways to circumvent the rigidity of requirements. We need to recognize that there is a global market and buy from overseas suppliers. Some of our current laws are not helping with this. I have watched procurement efforts flailing for 18 months just trying to find athletic shoes that comply with the Berry Amendment. It turns out that there is only one company in the United States that can build athletic shoes that do not use overseas components. We live in a globally competitive market. We have scouts out there, but we have to be able to buy things from overseas. By the way, the first MRAP came out of South Africa. which saw the development of the Buffalo mine-protected vehicle.

Gary Sojka: I am struck by this issue of innovation in the Department of Defense and the commercial sector. It seems that often times, we focus on software companies and microelectronics companies. These are areas where the capital barrier to entry is not that great. If I want to develop an app, I need a few computer programmers to put something together and then I have what I need. There is a world of competition out there, with lots of money, and the DoD is probably not going to compete. But then there are other areas where the capital barrier to entry is enormous, from aircraft carriers to submarines and next-generation bombers. How is it that these require a completely different way to ensure innovation? I was recently involved in an Army program and two innovators were the small companies. The non-innovators were the large companies. The large companies said that they are never going to work with the smaller companies because they are averse to putting money into the smaller companies' business. I understand that point, but that is why this is a tough issue. Do you have any suggestions about those portions of the Department of Defense where you are talking

massive programs with large capital barriers to entry? These are not areas that use the Apple model or the Google model. It is a large part of the Department of Defense, and we certainly need aircraft carriers and next-generation bombs.

Al Shaffer: Open systems and innovation are intertwined. If we demand open systems (which means that the Department will have to work with industries to learn precisely what they mean), we can create a new market that will be able to build upgrades and get them inserted more easily. Those upgrades could come in a Boeing prime system or it could come from Aunt Jenny and Uncle Fred working in their garage if they can find the right capability set. In my opinion, we have to break the tyranny of proprietary systems that lock us into one vendor for a long period of time. I realize that this would cause some reverberations on the Hill when the Big Six would respond.

Frank Kendall is trying to get better insight into the Big Six's Independent Research and Development (IRAD) spending and Better Buying Power. The Department reimburses industry for roughly \$6 billion a year to cover their allowable costs in IRAD. Industry spends our IRAD and if, on a follow-along procurement, any of that IRAD applies, then that becomes an allowable cost to their overhead. We had an onerous process before 1994, where the government evaluated every IRAD project, and that got to be too much. It was too much for us and too much for them. Now, there is no rule set, so the allowance is really run through the contracting auditor at DCAA. They do not have the tools to determine whether someone is in alignment and they are basically allowing everything. The government does not get anything out of this. Mr. Kendall is trying to change this process, because industry is pretty smart and has learned how to estimate their allowance costs from IRAD as part of their future bids and buy down their bids, counting on that reimbursement. They are using IRAD to undercut the bidding structure to win competitive awards. That's not what the system is designed to do. He is reinstating a rule that says that industry must have a government sponsor before we allow their costs. This is a fairly low barrier of entry; it is just a matter of finding a single person in the Department of Defense

who cares enough to be a sponsor. But within weeks, industry was all over the House and Senate’s Armed Services Committees saying that the Department is trying to influence their IRAD.

Before I came here today, we had a meeting in my office with the Big Six. It was a successful meeting, but it was very candid. I tried to make it clear that the Big Six would have to work directly with the Department to create a better solution. We have to find common ground on where we can find some seams in company propriety. We need to find places where openness, modularity, and drop-in capabilities work. It sounds simple, but we will get some resistance. At the end of the day, this is a tough market, especially with sequestration, and it is in these companies’ best interests to have as many competitions and competitive entry points as possible.

PARTNERING WITH INDUSTRY

Audience Question: We work on an OSD program with small companies in Silicon Valley. These companies really do not want to work with DoD, even if they have technology that DoD really wants. Do you have any advice on how to get technology out of these start-ups, perhaps through acquisition? How do we get them to work with DoD?

Al Shaffer: A lot of companies do not want to work with us. But we have a program started by Congressman Norm Dicks from Washington, called the Rapid Innovation Fund. This program is working pretty well. When Dr. Ash Carter was preparing for his “Everything Is Great in the Valley” speech in Silicon Valley, he asked for some examples. We sent over five examples of companies with ten to twenty employees that only wanted to work for DoD contracts and not commercial entities. So, while some companies do want to work with us, there are not nearly enough. We need to expand our use of Other Transaction Authority and the Federal Acquisition Regulation to allow us to purchase more quickly. At

the end of the day, we need help from our “Board of Directors” (Congress) to get more discretionary money. The reason that companies do not want to work with us is that we kill their cash flow and it takes too long for a payout. It will take a leap of faith from Congress, but if we could find a way to pay more up front, then we will find companies more willing to cooperate.

It is really all about the money. Can we get enough money out the door, and quickly enough, that we can keep these companies alive? The intelligence community praises In-Q-Tel, which finds these great companies. Senior leadership is on board and invests millions of dollars into In-Q-Tel. This is great, and they might do some very interesting stuff. Someone north of me, a senior official at the Pentagon, asked for some examples of companies that In-Q-Tel had funded. They came back with two examples. One was a company called Gator, a small company in Huntsville, Alabama that makes lightweight, highly portable, and deployable satellite communications technology. They said that In-Q-Tel funded them and the CIA bought some of their receivers. Gator was going out of business before we found them. In-Q-Tel funded them in 2007, which turned into \$400 million worth of business from the Marine Corps and SOCOM.

The moral of the story is that there are a lot of useful pieces out there. There are a lot of urban legends about In-Q-Tel out there and then there are some counters to them. Liquid Robotics was another In-Q-Tel discovery. The company makes small autonomous surfboards that either travel on the surface or up to 10 meters deep. The can sail for 6 to 9 months and carry payloads of acoustics, optical equipment, or communications. We visited Liquid Robotics in 2009 and the Navy is looking at picking them up. The problem or opportunity, depending on how you look at it, is that there are so many cool companies out there and we cannot know about all of them. It is a great idea to develop a point of presence in Silicon Valley, but we should not stop there. We have to go to San Diego for biotechnology and synthetic biology. We need to go to upstate New York, which has seen large investments in microelectronics. We need to go to Austin, Texas and Boston, Massachusetts. In order to develop

and keep that model, and to remain a visible and viable customer, we need to get Congress on board. We need to have a flexible funding pot. Congress has the power of the purse and it needs to know where money is being spent, but I do not know if they need to know it 18 months out. We are currently working on the fiscal year 2017 budget, which is 18 months from now. We need to specify where every dollar we spend is going, and this just does not work in industry. Congress should put aside funding so that when we find something applicable, we tell Congress about it. After a 30 or 60-day period, without Congressional objection, we buy it. There are ways to speed up the process, but we need help from Congress to do it.

Audience Question: I have a question about profit policy, money, and innovation. I have gone through life thinking that people do things for money. People who do profit policy in the DoD have told me recently that there is no incentive effect. These are serious people, and I ask what is the basis of that position? They tell me that if you go back and look at the empirical case studies and survey all of them you find that you do not see much of an effect. If you dig in a little deeper you come to find that part of the reason is that the empirical studies are deeply biased because they cannot really dig into the decision making in the firms that are responsible for those programs. Another problem is that all of those studies are dated; they were completed a decade or two decades ago. Have there been more recent investigations into profit policy as it relates to innovation?

Al Shaffer: Yes, there has been a little bit of in-house work on this topic. Frank Kendall's people have worked on it. There was a push in the authorization bill to include language for the more frequent incorporation of firm fixed price. Firm fixed price is an issue because there are no incentive structures for industry. Frank Kendall is trying to go the other direction where we use more fixed price incentive fees or cost plus incentive fees, depending on where it is in the process. We would pay industry in some ratio for coming in under cost or higher capability. If you set an article at \$100 and give them allowance at 70/30, and they come in at \$90 they get \$7 more

of profit and \$3 goes back into the treasury. That is a pretty good way of thinking about incentivizing industry, and you can also do it for performance.

Audience Question: If you go back and look at some of the theory on incentive contracting, the last serious work was done in the 1960s. The only place that still practices this is the SSBM program office, and they have been doing it successfully for decades. But their contracts read more like engineering documents linked to financials. In other words, weapon system effectiveness is specifically linked to profit.

Al Shaffer: We do not have enough of a corpus of evidence yet. When we looked back to about 18 months ago, we really started to hit upon the incentive contracts idea and away from firm fixed price. So, in a couple of years, we will have evidence on whether the system works or not.

Audience Question: My comment is based on my experiences being a project manager in the satellite industry and in Army RDT&E building tools and capabilities for the Army. Building and managing talent pools is very important. You said that we are always able to get good engineers that want to come into the industry to solve hard problems. That is true. But you give them two years with government-side, non-technical project managers that focus on more paperwork and processes. This makes so many good engineers leave. How do we retain these engineers? I have lost engineers to Google and Apple where the life cycle of a product is much faster. They get very frustrated with not being able to move things forward.

Al Shaffer: I do not think that the structures that we have in place always allow us to compete for the type of person that will get hired at Google or SpaceX. If I was a young engineer or scientist, I would love what we do at the DoD, but what Elon Musk is doing with SpaceX is a mind breaker. What does that mean for DoD? You have to make those companies part of us. I told the story of a laboratory scientist for the Quarter program. We sent one of the winners off to Google

to work for 4 months. Hopefully, he will stay with us, but Google is pretty cool. They give free meals to their employees, flexible hours, and interesting projects. I do not know how DoD could compete with that. So, we send some of our people there to get their help on some of our hard problems, because that will also help them in the commercial markets.

Second, we have a program called SMART, which I think we should do more often. I call it the “ROTC for scientists and engineers”. Instead of serving in uniforms, they serve in labs. We retain about 70% of those people after 4 years. I wish it were bigger, because we get about 100 people out of 15,000 applicants. The DoD also needs to stop believing that we are the only people who can invent stuff. We need to go out to partner with companies like SpaceX. That might not be the political answer but I believe that is what we have to do by accepting the market dynamics around us.

We still have some pretty cool problems. Army SMDC is doing two experiments for us that are pretty mind-boggling. One experiment is working on small satellites, on the order of 10 to 20mg. A tactical commander on the ground can control small satellites. These are not going to be controlled by the Joint Space Operations Center or the National Reconnaissance Office. These could be game changers.

Audience Question: You will be moving to the NATO S&T office. We have a subcontract to a university, but they said that they want nothing to do with the International Traffic in Arms Regulations (ITAR). If there is any ITAR data, they shut it down. ITAR has been difficult in terms of the ways we deal with technology. I understand that some things need to be protected and classified, but if it does not need to be, then why all these extra rules? So I am wondering, given your new job, how we can expect ITAR to effect data?

Al Shaffer: Right now, our arms regulatory statutory process is horrendous. We do not have a process in place to differentiate between protecting the “crown jewels” and letting the other parts flow freely in the free market. Some of that is the result of self-inflicted brain

surgery and other parts come from the Hill. We have situations where places like India want to buy a million night vision devices, and we tell them no. The figure of merit for what they want to buy is 16 and restrictions start at – and I do not remember all the denominator and nominators, but the number is – 15. But since the rest of the world is selling at 18, we will continue to kill our industry and ourselves without getting rid of these restrictions. Until we get there, we are hurting our industry more than we are helping ourselves. The Department of Defense needs to work on this, and it is not just Frank Kendall's job. Policy drives more of it than acquisition does. I think that Frank needs to keep beating away at the Under Secretary of Policy, but also interface with the Department of State, which is a large driver of all of the trade and tariff restrictions. It will be an interesting process because, within policy, you have the Defense Technology Security Administration. Their job is to prevent technology from going overseas. If we skinny back on the ITAR restrictions, there will be a lot of people out of work. But they are good engineers and can figure it out.

Audience Question: A lot of research and development goes to sexy and glamorous projects, but you get a lot of bang for your buck when you invest in more mundane projects, like maintenance. It does not feel like a significant portion goes to that. What do you think?

Al Shaffer: I think you are right, but we have initiated research projects looking into life cycle extension. I published a strategy about a year ago. In the Department, we do research for three reasons, listed in priority. We do research to mitigate threats that exist today, or will soon be fielded by other countries. This includes cyber, electronic warfare, and missile defense. The second reason is affordability, and this includes logistics, open system, and buying systems to last longer. We are not nearly where we need to be in these areas. That is a huge function of my world and it is getting more and more vital as we are buying fewer and fewer things. The third research area is in developing potential technology surprises against our advisories. But you are right that we do not have enough invested in life cycle management and life cycle enhancement.

Audience Question: Frank Kendall has been putting out a lot of information about Better Buying Power and how he wants industry to do more in terms of steering R&D. One of the challenges for industry is to identify which problems and concerns are important to the Department. We need to improve how that level of detail is provided to industry, so that they can be better producers. Compounding that, things are pretty locked down in the intelligence community post-Snowden. How do you cross-walk the impact of Snowden and Frank Kendall's desire to make the department a better buyer and helping industry improve its understanding of department desires?

Al Shaffer: That is an excellent question. You have hit on the crux on a very real problem. When the final tally is done, Snowden will be one of, if not the worst, instances of damage to our national security. But the idea that we have to go into information lockdown in response is just not where the world is. If we go to complete compartmentalization, which we are doing more and more, it will hurt our development. So we have to find the balance, and I use NDIA as an example. A lot of what I have been working on concerns anti-access/area denial. Many hard problems are classified, but NDIA helped me out with a classified conference. I am not sure how the hell I managed to do this, but I had 200-250 industry people in a room and we spent a half-day talking about the hard problems. It was very successful and later I had a lot of industry people coming back to me with their capabilities. I think that is a way to move forward. Frank is trying to do more to get the most out of IRAD and get transparency but he is also beating me up to get more information to industry on what we need. We will continue to pay for the Snowden situation for years, but in my opinion, it is in my best interest for you to spend your money on my problems. That might be crass, but it is true. So it is in my best interest to make sure you know what they are.

Audience Question: The context of my question is in software acquisition policy. It is sad that the DoD uses the same acquisition process to acquire an aircraft carrier as they do to acquire a piece of software. They set up these massive specifications to some contractors, and they never really work out. On the civilian side, follow-

ing the disaster of the Affordable Care Act software, a group was formed within the White House to determine more agile ways to perform this process. Using FAR, they found that there might be a more agile and timely process to do this than people think. They have been trying to proselytize that fact, but mostly on the civilian side. Do you think that this is applicable to the defense side, and is that something that is being pursued?

Al Shaffer: Yes, it is certainly possible, we are pursuing it, and it is part of the systems process. If we are open, we can go ahead and assemble software the way we assemble other systems. Where we get ourselves in trouble are monolithic software programs that are incredibly complex. When I look at the amount of code that some of these programs are trying to deliver, it is more than mere humans can understand. If we go to openness and move towards assembly, you might get a system that works better.

Audience Question: On the open side, you need very smart people defining the interfaces. In industry, it is usually done through a very contentious process where companies butt heads until they ultimately come to a resolution. How would that work within a defense context, would DoD people spec that?

Al Shaffer: It would ideally be a partnership. We are moving in that direction right now. I am not sure if it will work. But it is in both the government and industry's interest to get it right. I do not think that there are enough smart people in government or in industry to get that right without utilizing both sectors.

Audience Question: There is something that we have not touched on and that is the community of interests. In the last couple of weeks, I have received telephone calls from 3 of the Big Six firms. Basically, their CTOs have come to me and asked for a community of interests brief. It is good to know that you will do so, but what is the intended role for the community of interests?

Al Shaffer: How many people think that there is too much duplication in the defense and technology research world? How about duplication of activity or funding of programs? Those are commonly held beliefs and there may be some truth to them. The S&T program is too complex for anyone to understand by himself or herself. Through the community of interests program, I divided it into 17 portfolios where all the services are investing (materials, electronics, cyber, etc.). I have tasked the senior leadership in the services that controls their program to create an integrated roadmap/execution plan. This is yielding incredible dividends. We can present the entire program plan in a technology area and they can look at places where they have some overlap. I do not need to go tell a lab director to change his program. If I do, then I am focusing on the wrong thing. These are smart people who want to get the most out of their dollar. We have gone through the second round of presentations and we have seen progress. There are some coherent plants in these areas. If we brief industry in our areas and tell them where our gaps exist, then industry can work on them with the right people and interest areas. I want industry to work on my problems, and then I want to buy their product when they are done. If we are moving towards an era of government-private industry partnership, we will be better partners if we tell them what we need.

LOOKING TO THE PAST AND THE FUTURE

Audience Question: I am curious as you think back over your career and your formative years. Who or what else had an impact on you? You mentioned Dr. Marks – was there an event, whether in high school, college, or your early career, that left a strong impression on you?

Al Shaffer: I was six when Allen Shepard went into space and I thought that was really cool. I was eight when JFK got shot, and that was the first time I had seen adults lose it. But everyone has those experiences. A lot of it is luck. A lot of it is what you are born with.

I had a paper route when I was ten because we did not have any money. I determined that if I did my best, and provided the best service, I would succeed. This included meeting the paper truck at 4:00 AM instead of 6:00 AM like my friends, and customers appreciated that. I have always thought about the world in terms of meeting needs and asking myself, “What can I do to meet my customer’s needs?” Growing up without money and having to put yourself through school focuses you. The military works in many of the same ways. As a military leader, you think about what you can do to satisfy your customer’s needs. I remember when I joined the military, post-Vietnam in 1976, when public opinion of the military was poor. When I actually met the people in the military, they were incredible. The culture of the military is to never leave someone behind. If your battle buddy is working on something, you go work on it too. There is a culture of working together to get the mission done. I find that very fulfilling and still believe that. If I can be considered successful, and I am not sure that I am, I achieved it because I build my office with people with the same ethos. How do you work together to get the job done? Chuck McDonald and Dick Gettssey were both like that. Gettssey took himself out of the running for 4 stars because he could not stop smoking, but he got 3 stars in 28 years, which was quick. He was an incredible leader. I have been fortunate to have great bosses. I have been fortunate enough to never have had to look for a job because others would call me up.

Audience Question: That level of visibility might be unique to institutions like the DoD and the military. Young people today are more and more finding themselves in gig jobs.

Al Shaffer: I had 14 jobs in 24 years. I had one career but so many different jobs. We will see in a few decades if this new system is working better or worse. We will also see if we are speaking Mandarin or English by then.

Gary Sojka: What would you like to leave the young generation with? What advice would you give them? My advice has always been to consider a stint in the military.

Al Shaffer: You make it sound like this is my wake! Absolutely, I would encourage a stint in the military. The military is a meritocracy and it will test you in ways that you are not necessarily tested otherwise. Life is not a dress rehearsal. I am going to also quote someone else, Bob Hesslen, whom I worked for. He is not famous. He was a soldier for 12 years, got commissioned, and then got passed over for captain once, for major twice, and for lieutenant colonel twice. He must have been 92 when he retired, but he made it. He grew up in Pottstown, PA. He always said that you are going to spend too much time at the place you call work to not enjoy it. You are never going to be a success if you do not love what you do, and you are never going to be a success working just 8 hours a day. In my neighborhood, people did their 40 hours and hated it. But that is not enough. If you are going to be a success, you are going to work long hours, and you cannot do that if you do not love what you do. Life is too short to do something you do not love.

Audience Question: In the position you are in now, you have experienced a wide spectrum of problems and issues. What is the greatest problem that you would like to see solved? If it is unsolvable, what is the problem that keeps you up at night?

Al Shaffer: There are a couple of things. The first is the question of whether we are preparing ourselves if we ever have to go to real war again. Afghanistan was tough, there were real casualties, but it was not force on force combat, it was counterinsurgency. Are we ready if we ever have to go to real war again? Second, how will the nation react when we have a nuclear weapon detonated or a chemical weapon attack on Wall Street? A small nuke going off on Wall Street is viable and I am not sure if we are prepared. Looking on the darknet, there are do-it-yourself instructions for nuclear devices. We are reaching a similar point in nuclear weapons as we did with the do-it-yourself chemical and biological weapons with the ability to make a small quantity of fissionable materials. How is that for a downer? What keeps you guys awake at night?

Audience Question: There are a hundred ways that the world could end. I come from a biochemistry background and the whole weaponized biology concept scares me to death. When you have technology that allows anyone to use it, it reminds me of Mickey from *Fantasia*, who runs around unaware of the true power of the Sorcerer.

Al Shaffer: Yes, that is true. I can feasibly see the next war being over resources. For water, for example, I see a solution. We just have to be willing to see it for the commodity that it is and pay for it. Desalinization can help that. Then it becomes an energy issue.

Gary Sojka: At this point, we need to get Al back in the Pentagon. Thank you again Al for coming to speaking with us. Let's once again thank Al Shaffer for coming, and for his service.

Al Shaffer: I am glad to be here. I often believe that people do not really care too much about what I have to say. But I value these dialogues and the opportunities that they bring. I learn so much through your questions. Life is about learning, so thank you.

SPEAKER BIOGRAPHIES

GENERAL ALFRED M. GRAY

USMC (Ret.), Chairman, Board of Regents, Member of the Board of Directors, and Senior Fellow, Potomac Institute for Policy Studies

In 1991, General Al Gray retired from the U.S. Marine Corps after 41 years of service. From 1987-1991, General Gray served as a member of the Joint Chiefs of Staff, was the 29th Commandant of the Marine Corps, and was advisor to both Presidents Reagan and George H.W. Bush. As Commandant, he institutionalized and published a Warfighting Philosophy for the Marines. General Gray developed and implemented a new long-range strategic planning process for the Marine Corps, established the Marine Corps University, and implemented other longstanding changes, such as ensuring that every Marine is a rifleman first and the Marine Corps was special operations capable. General Al Gray enlisted in the Marine Corps in 1950 and achieved the rank of Sergeant while serving in amphibious reconnaissance with the Fleet Marine Force, Pacific, aboard the submarine USS *Perch* (ASSP-313). He was commissioned a Second Lieutenant in 1952. He has held every infantry command assignment from Platoon Leader through Division Commander. He has also commanded every Marine Air Ground Task Force from Marine Expeditionary Unit to Marine Expeditionary Force.

General Gray holds a B.S. from the University of the State of New York. He also attended Lafayette College, the Marine Corps Command and Staff College, Army War College and did graduate work at Syracuse University. General Gray is the recipient of two honorary Doctor of Law degrees, one from Lafayette College and the other from Monmouth College, and is a recipient of a Doctor of Military Science degree from Norwich University. He was the first awardee of an Honorary Doctorate of Strategic Intelligence degree from the Defense Intelligence College (now the Joint Military Intelligence College). He also has an Honorary Doctorate from the Franklin University, and an Honorary Doctorate in public service from the American Public University System.

GARY L. SOJKA

Secretary/Treasurer and Member of the Board, Potomac Institute for Policy Studies

Gary L. Sojka is a partner and cofounder of The Potomac Advocates. He focuses his efforts on representing defense, intelligence, electronic, and transportation companies before the executive and legislative branches. In addition, he assists companies perform executive search, acquire domestic and foreign technology, identify teaming arrangements, obtain large-scale financing, and sell products overseas.

Prior to joining The Potomac Advocates, Mr. Sojka served for eight years in the U.S. Senate, on both the Armed Services Committee and the Intelligence Committee. Mr. Sojka had programmatic responsibility for space and intelligence programs, including advance research and development, totaling over \$30 billion per year. He chaired the Senate Intelligence Committee's Arms Control Group and provided oversight of numerous, sensitive foreign policy activities. During these years, Mr. Sojka became a seasoned negotiator, managing numerous provisions through mark-up, floor debate, and conference. He worked with both the executive branch and foreign representatives to insure proper execution of programs.

Mr. Sojka started his career in the Office of Naval Intelligence, where he managed collection and analytical efforts concerning foreign military threats. He subsequently moved to the Defense Intelligence Agency, where he supported high-priority operational programs under the auspices of the Joint Chiefs of Staff. Towards the end of his career in the executive branch, he performed several projects for the Director of Central Intelligence.

Mr. Sojka is Secretary and Treasurer of the Potomac Institute for Policy Studies, a non-profit organization specializing in technology policy. The Institute provides non-partisan analysis of technology and technology policy to leaders in government, business and academia.

ALAN SHAFFER

Principal Deputy, Assistant Secretary of Defense for Research and Engineering

Mr. Shaffer serves as the Principal Deputy in the Office of the Assistant Secretary of Defense Research and Engineering (ASD(R&E)), a position he has held since 2007. In this position, Mr. Shaffer is responsible for formulating, planning, and reviewing the DoD Research, Development, Test, and Evaluation (RDT&E) programs, plans, strategy, priorities, and execution of the DoD RDT&E budget that totals roughly \$25 billion per year. He has also served twice as the Acting Assistant Secretary of Defense for Research and Engineering, during the absence of the ASD(R&E). Additionally, in 2009, he was appointed as the first Director, Operational Energy, Plans and Programs (Acting). Mr. Shaffer has also served as the Executive Director for several senior DoD Task Forces. In 2005 he served as the Executive Director for the Technical Joint Cross Service Group that reviewed the 300 DoD research, acquisition and test activities during the Base Realignment and Closure activity. In 2007, he was the Executive Director for the DoD Energy Security Task Force, which led to the establishment of a congressionally confirmed position to focus on DoD operational energy use. From 2007-2012, he served as the Executive Director of the Mine Resistant Ambush Protection (MRAP) Task Force, where he was responsible for fielding 27,000 MRAPs.

Prior to entering the federal government, Mr. Shaffer served a 24-year United States Air Force career with assignments in weather, intelligence, acquisition oversight, and programming. His career included deployment to Honduras in the mid-1980s and direct support of the United States Army 3rd Armored Division in Hanau, Germany. During Operation DESERT STORM, he was responsible for deployment of the 500-person theater weather force. Other assignments include Wing Weather Officer supporting the 320th Bombardment Wing at Mather AFB, California; Intelligence Officer at Foreign Technology Division, Wright Patterson AFB, OH; Deputy Director of Weather for Air Combat Command, Langley AFB, VA;

numerous staff and command assignments in the Air Staff and Office of the Secretary of Defense, in the Pentagon; and finally, the Air Force Weather Agency, Offutt AFB, Nebraska. Upon retirement from the United States Air Force in 2000, Mr. Shaffer was appointed to the Senior Executive Service; in 2001, he assumed the position as Director, Plans and Programs, Defense Research and Engineering.

Mr. Shaffer earned a Bachelor of Science in Mathematics from the University of Vermont in 1976, a second Bachelor of Science in Meteorology from the University of Utah, a Master of Science in Meteorology from the Naval Postgraduate School, and a Master of Science in National Resource Strategy from the Industrial College of the Armed Forces. He was awarded the Distinguished Executive Presidential Rank Award in 2007 and the Meritorious Executive Presidential Rank Award in 2004.

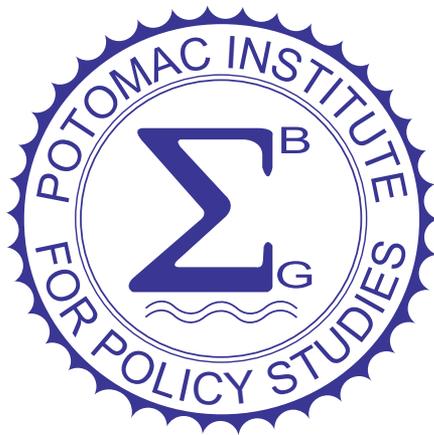
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