DEFENSE INNOVATION BOARD

Open Meeting Minutes
January 9, 2017
9:00 AM to 10:30 AM
The Pentagon, Washington, D.C.

The Defense Innovation Board (DIB) is a federal advisory committee within the Department of Defense (DoD) operating pursuant to the Federal Advisory Committee Act of 1972, the Government in Sunshine Act of 1976, and other appropriate federal regulations. The DIB meets quarterly and held its second public session on January 9, 2017 from 9:00 AM to 10:30 AM in room B6 of the Pentagon Conference Center, The Pentagon, Washington, D.C.

DIB Members (voting)(10)
  Dr. Eric Schmidt (Chair)
  Dr. Adam Grant
  Dr. Eric Lander
  Ms. Marne Levine
  Dr. J. Michael McQuade
  ADM (Ret) William McRaven, USN
  Mr. Milo Medin
  Ms. Jennifer Pahlka
  Mr. Cass Sunstein
  Dr. Neil deGrasse Tyson

DIB Ex-Officios (non-voting)(0)
  None

DIB Staff Support (non-voting)(6)
  Mr. Joshua Marcuse, Executive Director
  Mr. Michael Gable, Alternate Designated Federal Officer
  Maj Kaly McKenna, USAF
  Ms. Francine Anderson
  Mr. Nicolas Lopez
  Mr. Aaron Schumacher

Public Session Attendees (86)
  (See List)

DEFENSE INNOVATION BOARD

PUBLIC MEETING SESSION

At 9:06 AM, Mr. Michael Gable, Alternate Designated Federal Officer (ADFO), opened the public session and welcomed the members of the public.

Mr. Joshua Marcuse introduced the Defense Innovation Board members and explained the agenda for the meeting. He then introduced the Chair.

Dr. Eric Schmidt, DIB Chairman, thanked everyone for attending.

Dr. Schmidt explained that the DIB members are all volunteers and that they are happy to serve the country in the way that they have. He listed the locations that portions of the DIB had visited since the last meeting on October 5, 2016. The locations were: Army Research Lab, Aberdeen Proving Ground; U.S. Central Command (CENTCOM) forward operations including CENTCOM Headquarters, Bagram Air Force Base in Afghanistan, the Combined Joint Task Force, carrier operations aboard one of the carriers supporting CENTCOM; Air Force Research Lab, Wright-Patterson Air Force Base; U.S. Pacific Command; the Pacific Missile Range Facility; and a number of other meetings in various labs as well. Dr. Schmidt then asked Mr. Marcuse to read the summary of Recommendation 1.

Mr. Marcuse read the summary of **Recommendation 1** (see attached Executive Summary).

Dr. Schmidt explained that the DIB had observed the less-than-ideal system of disaggregation and the absence of information sharing among innovators within DoD. Establishing a Chief Innovation Officer (CINO) could serve to elevate the importance of innovation in a bureaucracy and be an advocate or champion for best strategies; help build capacities; and spur and spread best practices through the defense innovation network. To do this, the CINO would need resources; it's not costless.

Dr. Neil Tyson added that creating a CINO doesn't create its own stovepipe, but the idea of appointing someone at a high rank and influence would have the power to shift the culture of DoD through the symbolic value.

ADM (Ret) Bill McRaven remarked that he had noticed that having the DIB, chartered by the Secretary of Defense, travel around to various commands has inspired young officers and enlisted personnel to start thinking differently. He stated that people are skeptical that DoD can change, but when there is support at the top and grassroots interest, as the DIB has noticed, having a CINO will effect change quicker than people might think.

Ms. Jennifer Pahlka voiced caution on the recommendation. She observed in other state and local governments that a CINO needs the authority to create process or policy changes. She remarked that she didn't think that the recommendation can't work, but it was very dependent on the budget, authority and ability for the position to actually create change.

Dr. J. Michael McQuade pointed out that the CINO position isn't just about technology, it's

innovation across the enterprise. He said that it should be an innovation officer for the Department, not an innovation officer for the technology function in the Department.

Dr. Schmidt requested that they move on to **Recommendation 2** which Mr. Marcuse then read (see attached Executive Summary).

Ms. Pahlka stated that it's best to assume that people understand the importance of software in the world today, so she would focus on the parallels to other specialized careers, such as doctors and lawyers, in the military for which the result of having career tracks is evident. She commented that the DIB heard from many people about the detrimental effect of not having a dedicated career path for software developers which also affects recruitment and retention. She identified that in order to have a large, very competent corps of software developers, DoD needs to do something different, starting with creating a dedicated career path and supporting those in the career path.

Dr. Tyson added that many smart and dedicated people seek opportunity, not measured by money or high salaries. He explained that if you have the most amazing frontier of things going on, DoD will get the best of them.

Ms. Pahlka clarified that while the recommendation is about computer scientists, it's also about product managers, designers and others who collaborate in a team to make great software.

ADM McRaven remarked that to attract great talent, DoD may have to look at an opportunity to attract civilians rather than members of the military.

Dr. Schmidt recalled a conversation with a young officer who said that he was a cybersecurity expert but in a year, he would rotate to something else. He asked someone to discuss the question of uniform versus non-uniform.

Ms. Marne Levine pointed out that it's important to be able to train people in these areas as well, not just focus on recruitment of talent.

ADM McRaven concurred with Ms. Pahlka and Ms. Levine that this is a "full-fledged career path that we would have to manage." He continued that some will want to be in uniform and others may not but still want to be part of DoD and being part of the unique computer science corps may be the attractiveness.

Ms. Pahlka noted that this field moves quickly and you have to invest in people over a significant amount of time and continually if you want to keep people at the top of their game.

Dr. Adam Grant added that there is such a thing as too much specialization; after a period of time you see a cognitive entrenchment kick in. He recommended continued rotation, but within the specialty. Within 2-3 years of specialization in an area, people have a harder time seeing the assumptions that they used to question, so he recommended adding components of focus after the first few years to ensure people are constantly stretching their thinking.

ADM McRaven pointed out that in other military fields, people are expected to do something out of their normal, a disassociated tour. He recommended the same for the computer science career path; a 2-3 year tour in industry or a civilian company to re-baseline them in their expertise.

Dr. Tyson agreed that NASA uses that model with their engineers where there is a lot of crosspollination between NASA and the space industrial complex; the two-way door has been beneficial on both sides.

Dr. Schmidt requested that they move on to **Recommendation 3** which Mr. Marcuse then read (see attached Executive Summary).

Ms. Levine started the discussion by acknowledging that some DoD situations are unique and shouldn't invite experimentation, however, that inflexible approach required for those situations shouldn't be the norm. She continued that the culture of DoD is highly professional; values authority, consensus and tradition; and sometimes has a zero defect mentality, which is admirable but tends to make employees risk-averse related to creativity, experimentation, and dissent. She contrasted this to Silicon Valley where experimentation and iterative learning, which involves calculated risk taking and sometimes failure, are core to their approach to problem solving. She related that in her organizations they have posters that encourage people to be bold, fail harder and remember that done is better than perfect. They build multiple solutions, study, learn, and iterate. She remarked that the junior people often bring the freshest ideas because they're unconstrained by the way things have always been done and don't have the same preconceived notions that more experience people have. The core innovations in image processing, a key part of their business, came out of these sessions. She pointed out that it requires sustained and conscious effort but not at the expense of authority, consensus, and tradition.

Dr. Eric Lander posited that while he strongly supported this recommendation, he was unsure of how best to make it happen to say failure is a necessity where within DoD it is so natural to say that failure is not an option. He stated that those who pick up the recommendation would still need a lot of thought and maybe external help to identify the experiments needed to figure out how to create a culture of experimentation.

Dr. Schmidt asked the DIB how to fix a bureaucracy where there is a downside to your career for taking a risk, and typically no upside for taking a risk.

Mr. Cass Sunstein explained that *Switch*, by the Heath Brothers, posits that often failed efforts at culture change fail because a suggestion is ambiguous, not that there is resistance. He stated that this recommendation has a risk of ambiguity.

Dr. Grant said that DoD is a high-reliability organization where consistency is critical and the consequences of error can be catastrophic. He explained that the small moves that leaders make early in a team's life together have a huge impact downstream. He offered examples of airline crews and hospital teams. In both examples, he explained that when the leader expresses vulnerability, it makes it safe for other people to bring ideas to the table.

Mr. Milo Medin explained the importance of ensuring that resources are available for experimentation. He said that having the ability to experiment without the ability to access the tools to do it well is a challenge. He also expressed that open source libraries exist which, for software development specifically, dramatically decreases the time needed to experiment since it provides a head start.

Dr. Schmidt proposed to vote to adopt or reject the three recommendations already discussed. Recommendation 1 passed with nine board members in favor and one against. Recommendations 2 and 3 both passed unanimously with Dr. Schmidt requesting that Dr. Grant make the wording of Recommendation 3 more precise.

Dr. Schmidt requested that they move on to **Recommendation 4** which Mr. Marcuse then read (see attached Executive Summary).

Mr. Medin began the conversation by describing that one of the major things the board had seen was the transition from primarily hardware-driven major weapon systems to primarily software-driven. He added that addressing vulnerabilities within software is quite a different process than addressing vulnerabilities within hardware. He provided the example of systems once designed to operate in isolated environments are unprotected from more current threats once connected to networks, a use case not designed for when originally built. These systems are thus entirely reliant on firewalls for protection. Furthering his point, he added that software does not age well and needs constant testing and upkeep as bugs and vulnerabilities are constantly found. Mr. Medin also mentioned that the board has seen systems in the field that are no longer commercially supported and have known vulnerabilities in them. He recommended that DoD should allow experts to conduct penetration testing and vulnerability analysis as part of the life cycle of systems by leveraging the NSA and CYBERCOM's skillsets to do so.

Dr. McQuade clarified that, to him, the most important word in the recommendation is "regular." He then agreed with Mr. Medin's sentiment that 'software does not age well' and that threat environments change over time. Therefore, he stated, bringing in NSA and CYBERCOM should be done on a regular basis.

Dr. Tyson asked for clarification on what it means to 'patch' a software vulnerability and with what confidence can it be done correctly.

Mr. Medin replied that there are two parts to Dr. Tyson's question. First, the government needs access to the source code and build environment. He noted that this is part of another recommendation that would be discussed shortly. Second, he described the vulnerabilities as ever-changing alongside the context and threat environments in which weapon systems operate.

Dr. Schmidt continued to answer Dr. Tyson's question, confirming there are formal mechanisms and proofs that can be developed that are 'unbreakable.' However, he cautioned that if DoD does not have access to the source code, then there is no way to be certain the 'patches' were even applied to the weapons systems.

Dr. Schmidt requested that they move on to **Recommendation 5** which Mr. Marcuse then read

(see attached Executive Summary).

Dr. Lander began by describing the predominant technology that cemented a state's military superiority has shifted over the past few decades from nuclear weapons to the technical ability to leverage massive amounts of data rapidly to gain strategic advantage. He described autonomous vehicles as needing massive amounts of data to analyze threats and recognize patterns. He also described the future environment in which the warfighter will be operating will be data-centric which will impact planning, training, recruiting, and addressing asymmetric threats such as drone swarms. He continued by positing that these future needs rely on artificial intelligence and machine learning. It would be a mistake, he continued, to not create deep expertise within DoD in these areas; it would be akin to DoD not creating a deep expertise in nuclear weapons starting in the 1930's. He used foreign language translation and facial recognition as two examples of the diversity of applications of Artificial Intelligence and Machine Learning.

Dr. Tyson added that he emphatically agreed with Dr. Lander's statements. He mentioned that AI has beat the world's best chess players and the world's best jeopardy player, all technologies developed by the commercial sector. He stressed that it would be dangerous if the world's greatest military neglected these technologies and let other actors become more advanced. He concluded by saying there is no end to how much damage could be caused if the Department is not in front of the curve.

Dr. Lander resumed by highlighting two core essences of the recommendation. First, he said, it is critical for future competitiveness that the Department develop the talent and expertise and effectively manage that enterprise. Second, he continued, the board has seen a pattern of people being tasked to do things machines are better at doing, for instance, image recognition. The purpose is not to cut jobs, but to have humans focused on what they are good at and let machines focus on what they are good at.

Dr. Schmidt expanded on Dr. Lander's point by describing that the Board had seen a lot of soldiers and airmen busy watching things when computers are well-suited, and more efficient, at watching things and generating notifications. Dr. Schmidt continued by recalling a conversation with a military scientist who said there were human watch errors, though he could not recall the exact error rate. Therefore, Dr. Schmidt concluded, it would be a win-win for the military and the tired soldier to use computer systems to watch and notify in many applications.

Dr. Tyson proceeded to clarify that although machines throughout history have mainly alleviated the burden of specific tasks, Artificial Intelligence and Machine Learning will breed a new era where computers conduct cross-task functions and produce insights, recommendations, advice, and predictions. In the future, he continued, computers will be more than just task slaves and will become partners with human-machine teaming yielding better results than either alone.

Dr. Schmidt requested that they move on to **Recommendation 6** which Mr. Marcuse then read (see attached Executive Summary).

Mr. Sunstein opened the conversation by acknowledging that although acquisition reform has been the time-honored subject of discussion, the Board has a unique approach. He continued to

explain that the acquisition process is less hide-bound and bureaucratically rigid in its legal requirements than its cultural instantiation. He expanded on the Board's suggestion to promote speed and timeliness by taking advantage of existing waiver authorities to prevent delays and stultification. Mr. Sunstein added that there must be a multi-track system for acquisition versus the current one-size-fits-all approach. He proceeded to contrast the differences between procuring an aircraft and procuring software and concluded by saying there are pockets within the Department that have taken advantage of waivers but it must become much more widespread.

Ms. Pahlka continued to stress the cultural barriers to taking additional risk by using exemptions and waivers must be addressed before the Department can plausibly expect to see their use rise.

ADM McRaven also pointed out the need for resources to be paired with exemptions, otherwise no one will exercise the exemptions. He continued to tie this recommendation back to Recommendation 1, creating a Chief Innovation Officer, to ensure a top-down approach to innovation is aligned at every level.

Dr. Schmidt requested that they move on to **Recommendation 7** which Mr. Marcuse then read (see attached Executive Summary).

ADM McRaven began by saying that the recommendation was a 'no brainer.' He alluded briefly to Recommendation 3, embracing a culture of experimentation, and proceeded with an example of the National Training Center (NTC) at Fort Irwin and the Joint Readiness Training Center (JRTC) at Fort Polk. Both, he said, are examples where new technologies and tactics are tested and iterated on, and where failure is acceptable. He then mentioned that Defense Advanced Research Projects Agency (DARPA), Strategic Capabilities Office (SCO), and Defense Innovation Unit Experimental (DIUx) activities should be more closely linked with NTC and JRTC to foster collaboration and efficiencies. He recommended a battle-rhythm where the teams teleconference every month or quarter to exchange best practices, reduce duplication, and get real-time feedback. ADM McRaven also mentioned that DoD ought to tap the civilian sector more often and draw insights into how to incorporate those practices and technologies into the military at large.

Dr. Schmidt extended on ADM McRaven's last point by agreeing that there are lot of isolated places in the Department that would benefit from collaboration with commercial operations and universities. He continued to say that building durable, structural links across academy and private industry would strengthen innovation and the military, and make it easier for people to go back and forth.

Dr. Tyson asked if Recommendation 7 is mainly a budgetary concern. ADM McRaven replied saying it is more of an alignment issue on how to get organizations like DARPA, SCO, and DIUx aligned with organizations like NTC and JRTC and the private sector. ADM McRaven summarized that the goal is to connect the dots in a meaningful fashion that allows the military to move quickly to solve particular problems.

Dr. Lander proceeded to point out that the throughout the board's research, it identified that the different sections of the military have different requirements, cadences, and connections to

industry. He concluded by stating that the goal should be to enable the groups that need, or want, to move fast.

Ms. Pahlka added that the Defense Digital Service was an example of an innovative organization experiencing success within the Department and could grow significantly to provide enormous value.

Dr. Schmidt proposed to vote to adopt or reject recommendations 4, 5, 6, and 7. All four of the recommendations passed unanimously. Dr. Schmidt then requested that they move on to **Recommendation 8** which Mr. Marcuse then read (see attached Executive Summary).

Mr. Medin began the conversation by stating that the recommendation is not about having the government own the code for the sake of it, but rather because being able to access and build the code on-demand allows for rapid bug fixes. Especially, he added, as systems age the evolution and changes to those systems get slower which increases the importance of the government to be able to fix software itself. Mr. Medin continued to describe that as systems evolve and get networked for the fusion of information, the need to modify the systems evolves in lockstep. He believes that fusing this data can be done in a more expeditious way if the government has access to the code and can make changes. He added that this recommendation is part of a broader context of how the Department needs to view information as a core competency so it has the ability to process and combine it in flexible ways.

Dr. Tyson posed a question to Mr. Medin to clarify how realistic it is that the Department would be able to open, understand, and alter source code written by private vendor.

Mr. Medin answered by saying that it is most important to be able to modify the code where needed, not necessarily understand every in and out of the system. He agreed that getting utility out of the source code is paramount and that it is in the Department's best interest to not be reliant on the original vendor for every minor tweak.

Dr. Schmidt then moved on to **Recommendation 9** (see attached Executive Summary).

Dr. Tyson began by making a connection between the digitalization of his field, astrophysics, and the growing need to make sense of out the overwhelming amounts of data in both astrophysics and the military. He mentioned that if the warfighter doesn't have access to insights derived from the vast amounts of data available, he or she will be effectively fighting blind.

Dr. McQuade clarified that Recommendation 9 deals mainly with creating an indigenous computer science capability at the commander level so that changes to systems can take place in real-time. He added that this recommendation is related to most of the others because it requires the right people, the right accessibility to the code, and the right culture to embrace experimentation. In the private sector, he said, the resources exist to task a few people with a problem and generate a solution in hours and days, not weeks or months.

Dr. Schmidt requested that Mr. Marcuse read **Recommendation 9** to recap the exact language, and then proceed to read **Recommendation 10** as they are related (see attached Executive

Summary).

Dr. McQuade continued by saying that the working title for this recommendation was 'modernize information technology,' which did not get to the essence of making computing and bandwidth abundant. He added that it is critical to move towards a culture where a user or developer does not need to think about where and when they will have the computing resources to do what they need to do. Dr. McQuade pointed out that there are over 600 unfilled IT billets, partially due to the fact that the Department's IT community does not operate in a modern cloud infrastructure and does not have access to unlimited software, computational resources, or bandwidth.

Dr. Schmidt clarified that the term 'unlimited' is relative to where the Department is currently. He used an example about the low megabyte limit for DoD email inboxes causing employees to spend a great deal of time deleting emails to stay under the limit.

Mr. Medin added that the focus must be on reductions in cost of storage, compute, and bandwidth in order to get the level of each needed to perform modern tasks efficiently and retain modern talent.

Dr. Schmidt then requested that they move on to **Recommendation 11** which Mr. Marcuse then read (see attached Executive Summary).

Dr. Grant began by mentioning that the greatest predictor of Silicon Valley startup failure is whether the founders, when asked what their ideal organization looked like, used works like rules, formal, and job description. He proceeded to note that a Stanford professor, Hal Levin, concluded after fifty years of studying large organizations that they are unhealthy environments for humans. However, Dr. Grant added, large bureaucracies are needed for very large tasks, like keeping our country safe. He outlined two types; coercive bureaucracy that alienates people, and enabling bureaucracy, which provides clarity about what people should do and when. The example he used was Dow Chemical's call for innovative ideas on how to save energy and reduce waste. Dow provided its employees with guidelines on time and costs and provided small cash prizes for the best ideas. Dow ended up saving an average of $110 million per year from 575 ideas coming mainly from employees with non-innovative jobs. Dr. Grant concluded by saying the Department should put out a call for certain kinds of innovation and make sure that those who contribute are actually rewarded.

Dr. Schmidt proposed to vote to adopt or reject recommendations 8, 9, 10, and 11. All four of the recommendations passed unanimously. Dr. Schmidt then requested that Mr. Marcuse read the proposed 12th recommendation (see attached Executive Summary).

Dr. Schmidt continued by outlining that the board observed there is no place in the military where data is aggregated, and that a lot of organizations hide the data, don't know they have it, lose it, or don't care about it. This starkly contrasts, he said, senior leadership talking about 'data fusion.' Dr. Schmidt explained that the reason the board finds the new recommendation important is because it is necessary to implement current and future strategies reliant on datasets.

Dr. McQuade clarified that the culture around data needs to be one of sharing with the expectation that when data is collected, it will be made available for broader fusion uses.

Dr. Schmidt agreed and added that in other words, data itself is a valuable, strategic asset. He then asked Mr. Marcuse to summarize how the government is responding to the board's interim recommendations and then close out the meeting.

Mr. Marcuse thanked Dr. Schmidt and began by providing context that federal advisory committees, such as the Defense Innovation Board, exist to provide advice to senior leaders and are not directly charged with implementation. He continued that on October 28, 2016 Secretary of Defense Carter adopted three of the recommendations. The first was to create a DoD Chief Innovation officer. The second was that he announced a new cyber-recruiting initiative and other key initiatives to make computer science a core competency within the Department. The third was that DoD would create a center for Artificial Intelligence and Machine Learning.

Mr. Marcuse then outlined several ways the Secretary's staff had already begun to make these ideas and concepts a reality. First, the staff had begun conducting additional interviews with DoD stakeholders in U.S. government agencies and private industry to inform the chief innovation officer's roles and responsibilities. Second, they had begun developing specific proposals for the workforce-driven innovation programs like innovation tournaments and special training. With respect to computer science becoming a core competency, he added, the staff had begun thorough interviews with the different parts of the Department with cyber-recruiting initiatives. Mr. Marcuse pointed out that they had found many departments trying to solve the human capital problem but, with 600 IT billets yet to be filled, there is evidence that something is not working. Mr. Marcuse continued to describe a similar state of affairs with respect to the Center for Artificial Intelligence and Machine Learning. The staff had found many different labs in the S&T enterprise working on different activities around artificial intelligence yet with no overarching structure or knowledge transfer. He mentioned the board is looking to coordinate a stakeholder meeting with all of the key players in Q3 2017 to synchronize efforts.

Mr. Marcuse thanked the audience and board for their attendance.

END OF PUBLIC SESSION

ADJOURNMENT

Mr. Marcuse, with the concurrence of the ADFO, adjourned the DIB's January 9, 2017 public meeting session at 10:35 AM.

I hereby certify, to the best of my knowledge, the foregoing minutes are accurate and complete.

Dr. Eric Schmidt, Ph.D.
Chairman, Defense Innovation Board

DEFENSE INNOVATION BOARD

PUBLIC SESSION ATTENDEES:

Ms. Iris Alon
Ms. Francine Anderson
Mr. Saad Ansari
Mr. Ben Bain
Mr. Matthew Bauer
Mr. Tony Bertuca
Mr. Clark Culley
Mr. Ross Dakin
Ms. Sandra Erwin
Mr. Ben FitzGerald
Ms. Beth Flores
Mr. Igor Fridman
Mr. Zachary Fryer-Biggs
Mr. Michael Gable
Ms. Jackie Garrick
Mr. Dan Glickstein
Mr. Erwin Godoy
Dr. Adam Grant
Mr. Mikhail Grinberg
Mr. Derek Grossman
Mr. Giovanni Gutierrez
Mr. Robert Hargate
Mr. Phillip Harman
Mr. Andrew Herr
Mr. Rich Hicks
COL Bebe Hollingshead
Mr. Pat Host
Mr. Andrew Hunter
Mr. Church Hutton
Mr. Keith Ibarguen
Mr. Joe Jacky
Mr. Noah Kanter
Mr. Craig Kaucher
Mr. Andrew Kim
Ms. Jacqueline Klimas
Mr. Rob Kuhlman
Dr. Eric Lander
Mr. Erik Leklem
Ms. Marne Levine
MAJ Melissa Lewis
Ms. Riva Litman
Mr. Nicolas Lopez
Mr. Chris Lynch
Mr. Joshua Marcuse

Mr. Enrique Martinez
Mr. Scott Maucione
LT Melissa McCafferty
Mr. James McGarrahan
Mr. Michael McGruddy
Maj Kaly McKenna, USAF
Ms. Maura McQuade
Dr. J. Michael McQuade
ADM (Ret) William McRaven, USN
Mr. Milo Medin
Mr. Rob Medve
Mr. Aaron Mehta
Ms. Sarah Mineiro
Mr. Daniel Minton
Mr. Pete Modigliani
Mr. Richard Morefield
CDR Micah Murphy
Mr. Chris O'Keefe
Ms. Jennifer Pahlka
Ms. Jackie Parziale
CPT Jim Perkins
Ms. Terri Phifer
Mr. Brandon Pollak
Mr. Brian Powell
Dr. Libbie Prescott
Mr. John Price
Mr. David Reist
Mr. Riley Repko
Mr. Kevin Richman
Ms. Jane Roberts
CAPT Brad Rosen
Mr. Justin Rubin
Ms. Jen Santos
Mr. Will Scales
Dr. Eric Schmidt
Mr. Aaron Schumacher
Mr. Joe Schuman
Dr. Arun Seraphin
Ms. Joy Shanaberger
Mr. Brian Sinacore
Mr. Richard Sisk
Ms. Johanna Spangenberg Jones
Mr. Richard Stoops
Mr. Cass Sunstein
Mr. Chris Taylor
CAPT Rob Thompson

DEFENSE INNOVATION BOARD

Ms. Alex Toma
Mr. Jim Tripiano
Mr. Patrick Tucker
Dr. Neil deGrasse Tyson
Mr. Andy Vanlandingham
Mr. David Wheeler
Mr. Richard White
CDR David Whittaker
Mr. Brian Williams
CAPT Chris Wood
Mr. Jim Young
Mr. David Zubrow