A Study on Managing the Army's Research and Development Investments in a Time of Declining Resources

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Abstract

The Army's FY16 projected defense budget continues on a declining trend necessitating end strength reductions and deferring some modernization programs. The Army's Operating Concept to "Win In a Complex World" requires a more efficient means to develop an increasingly capable Army while meeting affordability levels. Discovering and developing technologies to ensure battlefield dominance is a key component of Army modernization even under fiscal constraints. The research investigates how collaboration between Government Research, Development, and Engineering (RDEC) organizations and industry can further enhance the Army's ability to meet this important mission in defense of the nation.

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Chapter 1 – Introduction

As the DoD leadership continues to address the challenges associated with the defense budget reductions (Figure 1, Figure 2), collaboration has gained importance. The RDA (Research, Development, and Acquisition) budget shows a decline at a much higher rate than the Army TOA (Total Obligation Authority); 34% vice 17%. The Warfighter still has extremely critical needs for increasingly capable weapons. Therefore, the importance of research and development investments in a time of declining DoD resources is even more critical. The research will explore if collaboration can help DoD be in a better position to meet Warfighter requirements.

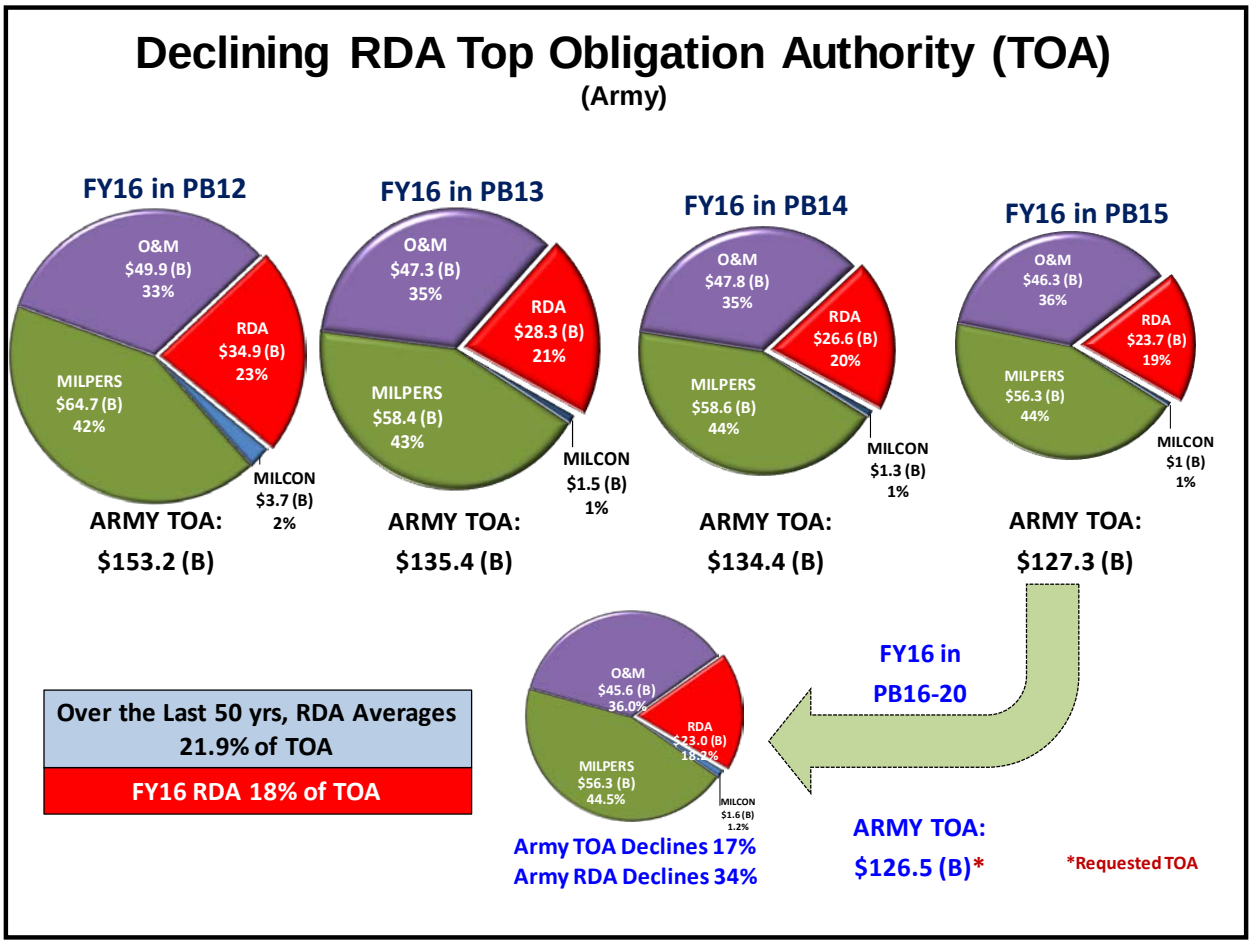


Figure 1. Army Budget Top Obligation Authority (USARMY Headquarters ASA(ALT)), 2016)

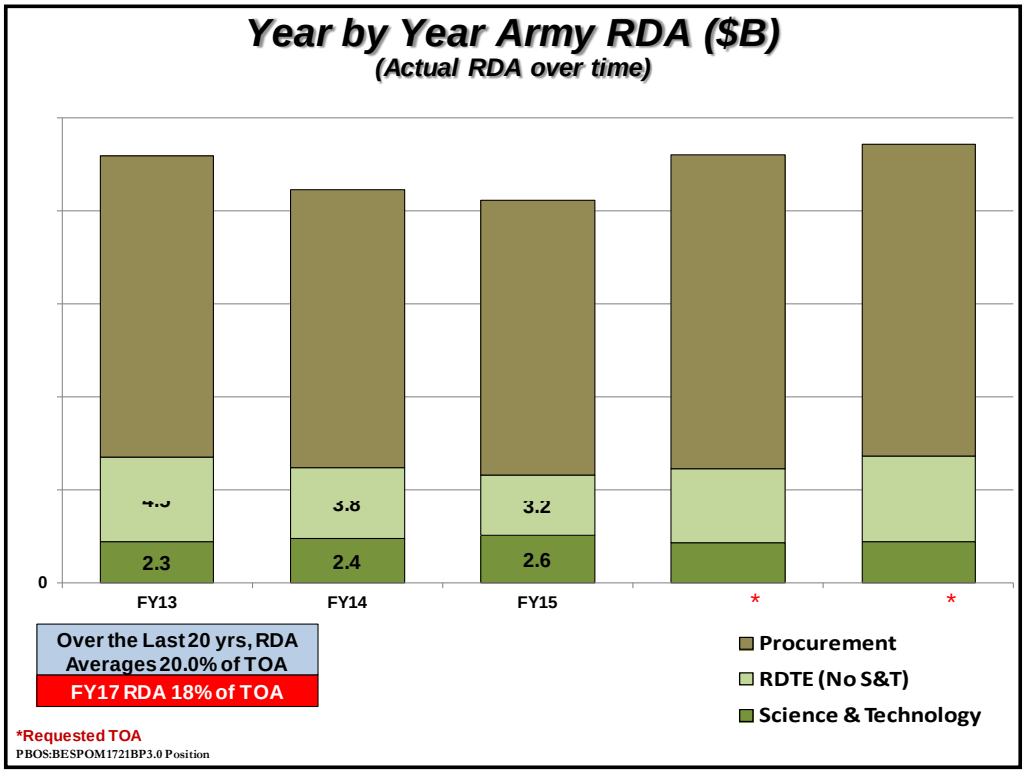


Figure 2. Army Budget – Research, Development, and Acquisition (RDA), FY13-FY15, PB16, POM17 (USARMY Headquarters ASA(ALT)), 2016)

Problem Statement

The research addresses the problem statement: How does the Army best manage organic (Government) and defense industrial base (DIB) research and development in a time of declining resources? Even if the Army were not in an era of declining resources, the need to be more innovative and efficient with critical funding resources by the U.S. taxpayer would drive the need for this action. The findings and recommendations provided in the research address how DoD can garner more capabilities with fewer dollars and make collaboration with the industrial

base a more important part of the culture. The research includes interviews from senior leaders in government and industry on collaboration contributions to capability developments that benefit the Warfighter.

Chapter 2 – Literature Review

The purpose of the literature review is to research formal documentation on collaboration that can benefit the Army, especially in an era of declining resources. In that regard, the literature review included sixteen (16) relevant sources addressing several major themes to include: (1) Internal Research and Development (IRAD) investment, (2) increased open communication between government and industry, (3) Federal Acquisition Regulations (FAR), (4) impact of intellectual property on collaboration, and (5) RDEC focus on science and technology (S&T) development. The literature sources substantiate the benefits of collaboration as well as obstacles to greater collaboration -- most notably the FAR regulations (FAR, 2016). Recommendations on methods to improve opportunities for non-traditional suppliers (those not currently supporting DoD) to participate and collaborate with DoD are addressed by the literature sources.

According to the Undersecretary of Defense for Acquisition, Technology, and Logistics (USD AT&L), IRAD (Internal Research and Development) represented $4 Billion in Fiscal Year (FY) 2014 DoD Research and Development defense-related spending (Implementation Directive, April 2015). Changes in legislative guidance and authorities in the early 1990's removed almost all DoD supervision of corporate IRAD ((Implementation Directive, April 2015)). DoD recognizes the need to have greater communication with industry and restore a higher degree of

government oversight of defense related technology investment, while avoiding the burdensome regulatory environment that existed prior to the early 1990's (Implementation Directive, April 2015). According to USD AT&L some development proposals are being reduced by using a separate source of government funding (allowable IRAD overhead expenses) to gain a price advantage in a specific competitive bid (Implementation Directive, April 2015). This was not the intended purpose for making IRAD an allowable cost (Implementation Directive, April 2015). Industry proposals should acknowledge the collaborative efforts with government research and development organizations, to include cooperative research and development agreements (CRADAs), have contributed to development of technologies (Implementation Directive, April 2015).

DoD is not attracting the most innovative offerings of the private sector according to the Defense Business Board (DBB, FY14-02). DoD continues to pursue non-traditional suppliers into the defense supplier base, however, the FAR requirements remain a key obstacle preventing smaller suppliers from participating in the DoD enterprise (DBB, FY14-02). DoD will have to change its ways to attract innovative companies willing to adhere to the heavy burden of a government-compliant Cost Accounting Standard and a lengthy procurement cycle in order to participate in the DoD enterprise (DBB, FY14-02). Since commercial sectors fund their own research and development, there will be apprehension in changing the business model for defense applications that are a small portion of the customer base (DBB, FY14-02). The Defense Business Board (DBB) report to the Secretary of Defense recommended several steps the DoD can take in order to be more attractive to non-traditional companies in the commercial sector without new legislation or executive orders (DBB, FY14-02):

(1) Establish FAR Part 12 (Acquisition of Commercial Items) as the default procurement method for non-platform acquisitions instead of FAR Part 15 (Contracting by Negotiation);

(2) Dedicate acquisition training to provide greater focus on FAR Parts 12 and 10, and commercial business models;

(3) Establish a commercial "ombudsman" with appropriate decision-making authority to cut through DoD internal processes and serve as an advocate for commercial industry;

(4) Rebalance policies on the ownership and rights of intellectual property

The DBB also advocates rebalancing policies on IP because the pendulum has swung too far to the government side (DBB, FY14-02). The DBB indicates that there is a great deal of confusion within DoD and industry as to what and how IP policies are applied (DBB, FY14-02). The DBB advocates policies be enacted clarifying that industry is entitled to gain full value from its IP and that industry owns its self-funded IP through self-funded research and development (SFR&D) (DBB, FY14-02). The DBB advocates for a clearer policy on ownership of data rights with mixed funding from government and industry as guidelines before contracts are signed (DBB, FY14-02). Actions on IP after signing the contract is extremely challenging, time consuming, and even more costly to consider for purchase at a later date (DBB, FY14-02).

The Office of the Assistant Secretary of the Army, Acquisition, Logistics and Technology (ASA(ALT)), has developed a guidebook (U.S. Army Product Data & Engineering Working Group, August 2015) in coordination and cooperation with the U.S. Army Materiel Command to aid the acquisition and logistics workforce in identifying, acquiring, and managing

Government required data and data rights throughout the acquisition life cycle (DoD Open Systems, August, 2014). The ASA(ALT) Memorandum encourages Program Executive Officers, Program Managers and their support personnel to use the subject guidebook (Shyu, 2015).

No single government research laboratory provides expertise in every area important to the Army (Lyons, 2013). The Army gains new technical knowledge through investing in internal laboratories that have close collaboration with University Affiliated Research Centers (UARCs) in areas such as nanotechnology for the soldier and biotechnology (Lyons, 2013). Collaboration with Federally Funded Research and Development Centers (FFRDCs) and the Small Business Innovation Research (SBIR) Program expose government laboratories to new ideas and new approaches (Lyons, 2013). Efforts such as the Army Research Laboratory's engagement with Collaborative Technology Alliances (CTAs), Collaborative Research Alliances (CRAs), and the Information Technology Alliance (ITAs) prove effective now and will need to be emphasized even more as DoD becomes a smaller customer in commercial industry component purchases (Lyons, 2013).

DoD tasks its Science and Technology (S&T) community to develop innovative technologies that can drive the technological advancements in its weapon systems (Muzello, 2014). The challenge of transitioning pioneering technologies into Programs of Record (PoR) is the same challenge expressed by senior leaders in the research (Muzello, 2014). Arcella (2005) indicates that available technologies suitable for transition that are not already part of the acquisition program's Program Objective Memorandum can result in the candidate projects being at risk for transition. This is a concern as DoD invested some $12.2 Billion in S&T according to

FY12 figures (Arcella, 2005). Unlike the DoD, the venture capitalist investing in commercial companies places a high value on success, but a relatively low penalty for failure, which creates a strong incentive to succeed while accepting failure as part of the process (Arcella, 2005).

Chapter 3 - Research Methodology

Overview of Research Methodology

The research was conducted using two research instruments. The first part of the research was performed by conducting twenty (20) high-level interviews with senior leaders in the Defense Department, major defense industry partners, and a Federally Funded Research Development Center (FFRDC). The senior leaders included General Officers, members of the Senior Executive Service heading some of the largest RDEC's in the DoD, and major defense industry President, Vice-Presidents, and Directors. Fourteen (14) interview questions were provided approximately one week in advance of the interviews (see Appendix A). The interviews each took 45 minutes to 1 hour and were conducted face-to-face, over video-teleconference, or by telephone. Most of the interview dialogue encompassed the first ten (10) of fourteen (14) questions within the allocated time for the senior leaders. The second research instrument used a survey as shown in Appendix C.

The premise behind the research approach was to get qualitative data from senior leaders on means to better make use of research and development investments in a time of declining Army resources based on their broad knowledge and experience from successes and lessons learned. The findings in the research reflect primary themes based on consolidated input from all the interviews. The research findings were then further analyzed by collecting anonymous

survey data from a broad spectrum of government and industry professionals in research and development supporting the DoD.

Limitations of the Study

The limitations include no direct applicability of the research to other Military Services since interview questions were focused on Army research and development. However, the aspects of collaboration and dialogue with industry indicated in the findings, conclusions, and recommendations likely can benefit the other Military Services and DoD overall. The total sample population from the interviews represent senior leaders that collectively direct over a hundred thousand personnel across large RDEC's and leading defense companies. From the total population of 20 interviews, nearly 20 hours of direct data was captured, but the study cannot reach every sector of commercial suppliers that may have actual accounts of challenges in being part of the defense industrial base and recommendations that might make defense a core element of their business enterprise for the future. The survey questions for the second instrument were conducted with organizations in the Huntsville, Alabama, science and technology area, therefore, future research could expand to additional geographic areas of the U.S. supporting Army research and development. As with most research efforts, the sample size was limited as detailed in the methodology section.

Chapter 4 – Findings

Fifty-five (55)% of the senior leader interviews were conducted with government personnel while forty-five (45)% were conducted with industry personnel. The summary of the findings addressed in Table 1 represent qualitative data from senior leader interviews organized

according to major recurring themes. Interviews were conducted on a non-attribution basis to protect the names of the individuals and their organizations. All of the interviewees were forthcoming with information to help the Army be more innovative and effective in bringing enhanced capabilities to the Warfighter in a constrained budget environment. The responses provide feedback on examples of successful collaboration and opportunities to enhance collaborative efforts between government and traditional defense-related commercial companies as well as commercial businesses that have been reluctant to enter into defense business. Additionally, these senior leaders represent expertise in executing and managing large and small scale projects that reflect the DoD enterprise and the Defense Industrial Base.

Table 1. Summary of Findings from Senior Leader Interviews

1. Government and industry defense organizations use CRADAs (Cooperative Research and Development Agreement) as primary form of formal collaboration
2. There is willingness to share intellectual property
3. Lack of open communication voiced as a primary impediment to collaboration
4. Defense organization views regulations/FAR as stifling innovation and discouraging commercial firms from entering the defense market
5. Need for a formal process that includes government review of IRAD should be considered
6. Align high risk R&D responsibility to government labs with transition to industry as technology matures

Figure 3 illustrates the demographics for the survey respondents. The data illustrates representative breakout of respondents between government (41%) and industry (59%)

personnel.

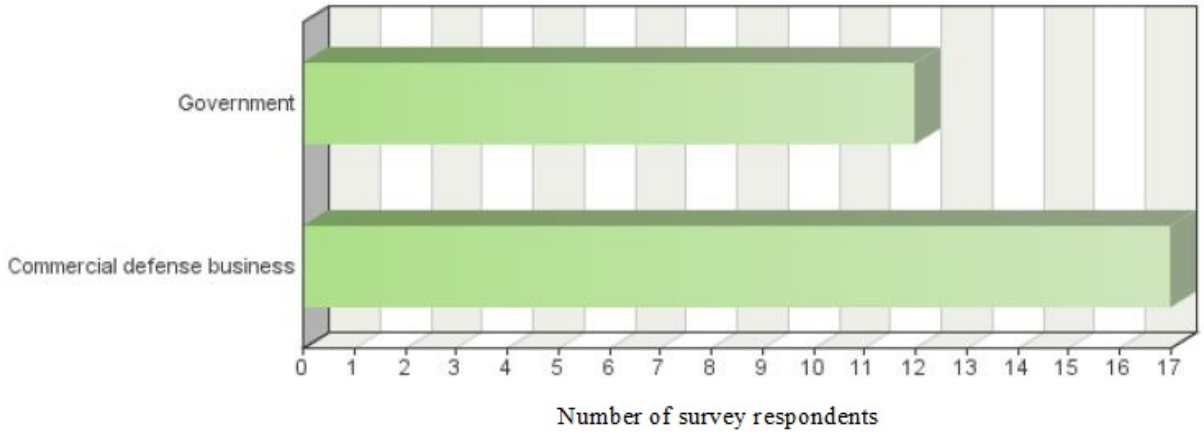


Figure 3. Breakout of respondents that completed survey.

Figure 4 illustrates that 41% of the industry respondents in the survey were part of large original equipment manufacturers, 47% were part of engineering services companies, and 12% were part of a technology development company.

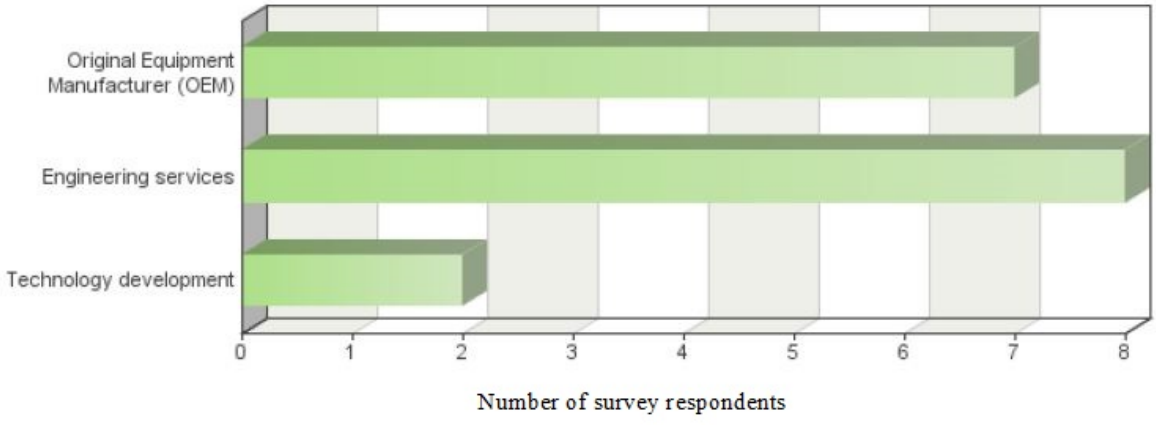


Figure 4. Industry survey respondent's type of organization.

Figure 5 illustrates the population of survey respondents based on their level of responsibility and affiliation with research and development.

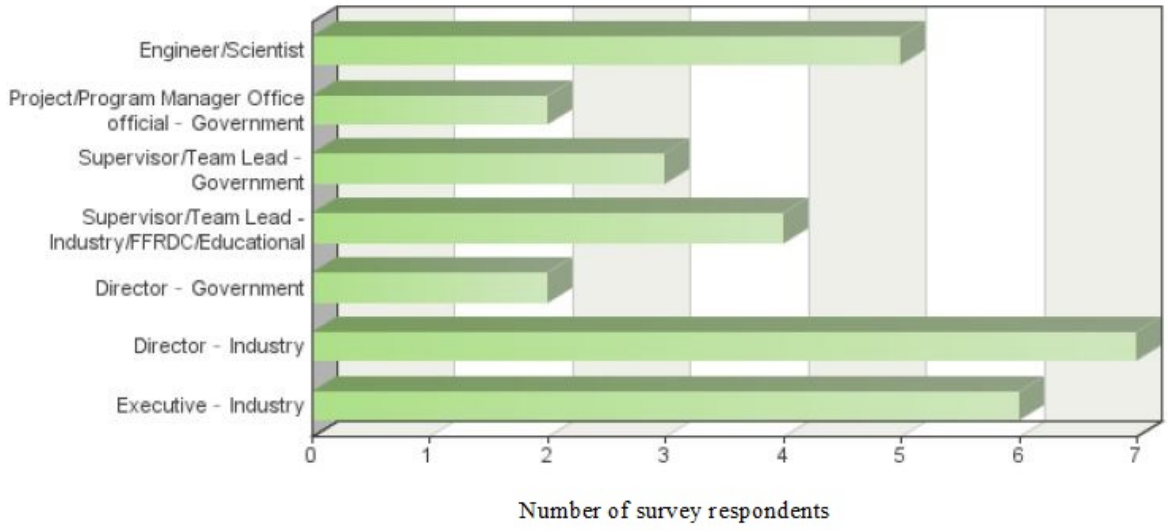


Figure 5. Title/position of survey respondents.

Figure 6 illustrates the size demographics of the organizations to which the survey respondents were employed. Most of the respondents were in organizations of between 251 and 500 employees.

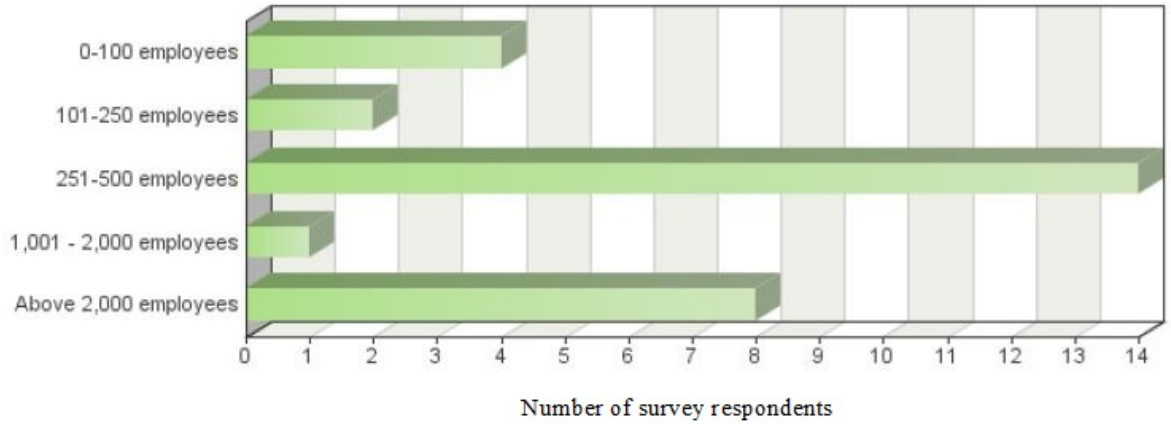


Figure 6. Survey respondent's organization size based on number of employees.

Figure 7 illustrates the survey respondent's type of research and development that is most conducted in their organization. Most respondents are from organizations that work in Advanced Technology Development closely followed by Demonstration and Validation in conjunction with Engineering and Manufacturing.

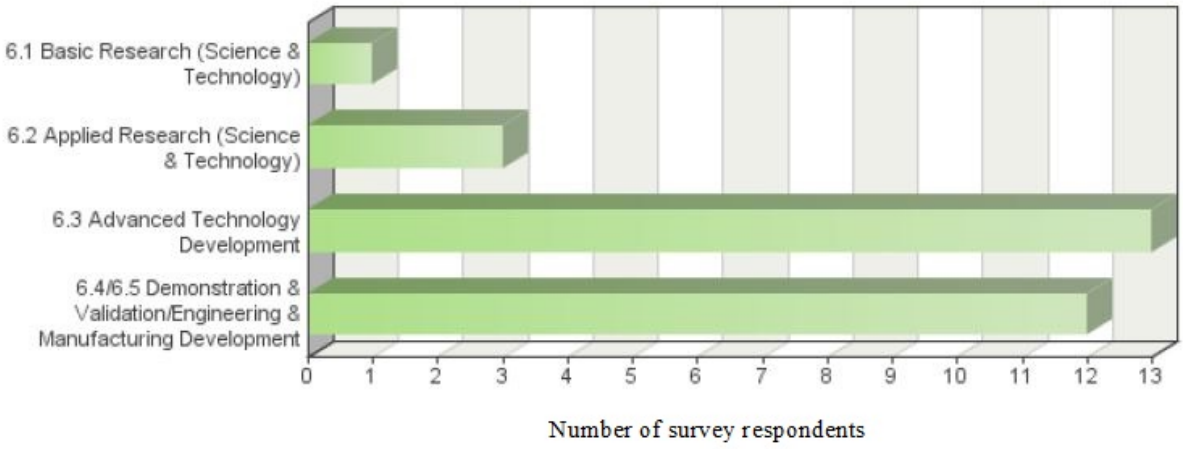


Figure 7. Survey respondent research and development type most involved in.

Finding 1 - Government and industry defense organizations use CRADAs as primary form of formal collaboration

Senior leaders in the research interviews indicated that DoD is benefiting in technology transfer areas through collaborative efforts such as CRADAs (Cooperative Research and Development Agreement). A CRADA is a means for both the government and industry to bring something to the table in terms of skills or capabilities. A CRADA is a mutual agreement on developing capabilities that allows the government and industry to work together. The government does not provide direct funding for the CRADA, but does internally fund for development of any agreed to capabilities as part of the CRADA agreement. Industry can invest money into a CRADA and may be able to recover some of the cost as IRAD (Internal Research and Development) reimbursable if a contract is awarded where the technology developed can be used. Industry can still claim intellectual property (IP) rights on CRADAs which is why it is important for both the government and industry to understand how IP will be handled before the CRADA is signed. Since the FAR and DFARS (Defense Federal Acquisition Regulation Supplement) do not apply to CRADAs, there is more flexibility with respect to treatment of IP rights. The interviewees indicated that the whole point of the CRADAs is flexibility, unlike the FAR or DFARS. CRADAs, as described in an interview by a senior government leader, are not used for developmental efforts under a competitive acquisition. The CRADA has to have specifics as shown by an excerpt of standard CRADA language in Appendix B.

CRADAs are one of the primary collaboration tools being used by R&D organizations as illustrated by the survey results in Figure 8. The time to establish a CRADA was a concern voiced by three senior leaders during the interviews. Figure 9 from survey data illustrates that the time required to establish a CRADA for government RDEC's and for industry was typically

6 to 9 months. A senior leader indicated that the key contributors to delays beyond the averages shown in Figure 9 have been attributed to: (1) requirements development that include statement of work development, limitation of liability, and indemnity clause considerations, (2) legal reviews and contract negotiations for intellectual property and data rights, and (3) obtaining funding. A senior leader in an interview reiterated the need for a more streamlined process to make a final decision on CRADAs in 30 to 60 days because after 6 to 9 months of waiting, companies may give up. Appendix D also provides comments from the survey respondents with respect to timeline to establish a CRADA.

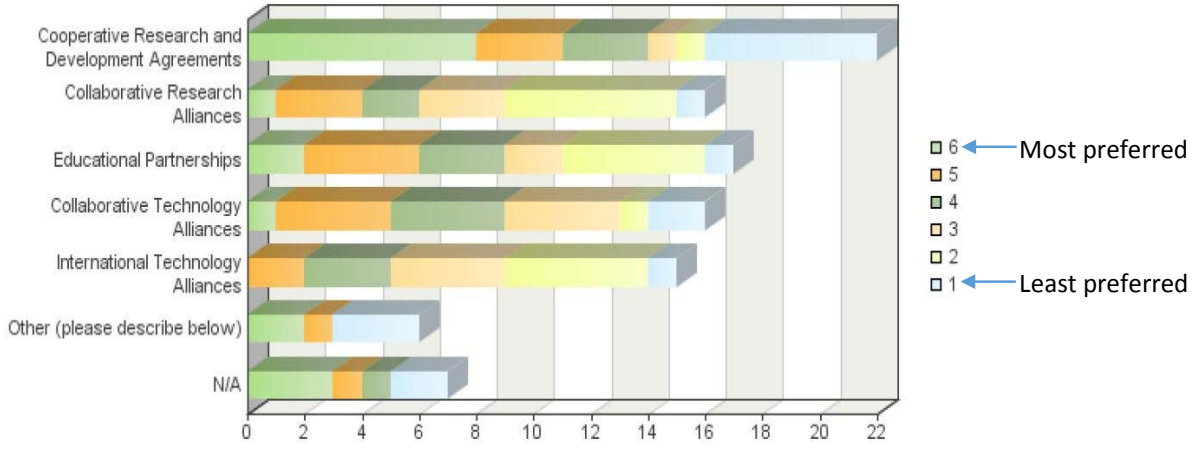


Figure 8. Collaborative Research Agreement Types most used based on data from survey respondents.

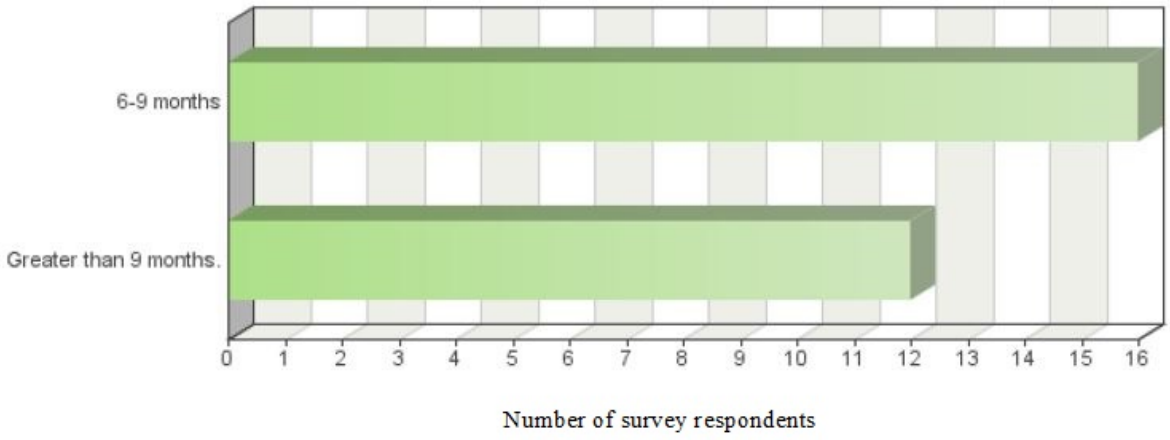


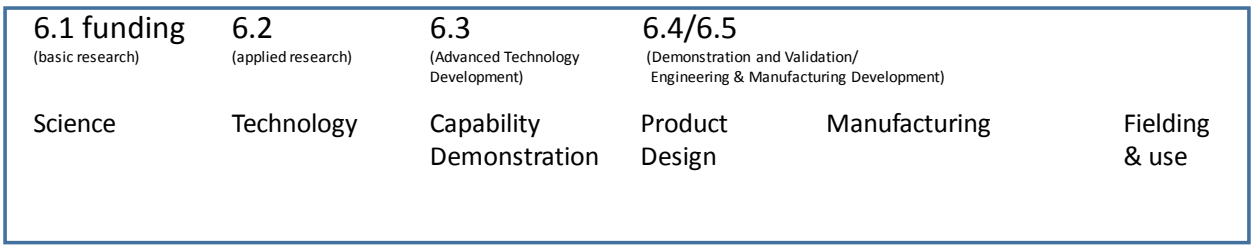
Figure 9. Time to implement CRADAs (selection is 0 to 3 months, 6-9 months, or greater than 9 months) based on data from survey respondents.

Several government RDEC organizations that participated in the interviews indicated an increase in collaborative efforts with academic research institutions in the form of Educational Partnership Agreements, Collaborative Technology Alliances, or Cooperative Research. These support Army defense research in science and technology as the precursor of applications in 6.1 type Basic Research. Based on an interviewee's response, collaborative research with educational institutions is an important synergistic relationship that key senior leaders expressed as needed to capitalize on academia to help bring enhanced capabilities to the Warfighter.

High Energy Laser mobile demonstrator was also referenced by a senior government leader during an interview as a successful collaborative effort through use of a CRADA because the Army helped focus industry on the use of their IRAD to understand the greatest potential for future capabilities. The High Energy Laser Technology Development includes 6.1 (Basic Research), 6.2 (Applied Research), and 6.3 (Advanced Technology Development) funding as

shown in figure 10. Interviewees stated that CRADAs benefit the government and industry by establishing a common set of goals for both organizations.

Figure 10. DoD Acquisition – Funding alignment and Potential for Collaboration.



An interviewee stated that CRADAs can be effective in maturing DoD technologies. An interviewee also defined the success of CRADAs as developing mutually successful objectives that focus on getting technologies to the Warfighter. An interviewee from the government stated that there is also renewed emphasis within the Army for all of the RDEC's to operate in more of a collaborative enterprise environment with each other. An example of this is Degraded Visual Environment used to increase flight safety of aviators in brown-out dust cloud conditions.

An interviewee indicated that the aviation business area in industry tends to have close collaboration ties with government research and development which may be attributed to the smaller number of suppliers in the aviation industry compared to component product areas such as missiles. Interviewees also discussed how Joint Multi-Role (JMR) Technology Development (JMRTD) is a great example of collaboration between government and industry in the aviation area because the technology is directly tied to the Future Vertical Lift program. The interviewee

indicated that JMR includes a heavy IRAD investment. Industry understands the potential for future business to be achieved at the global aviation level with JMR and Future Vertical Lift.

Several interviewees discussed how Open Campus has been successful in taking collaboration to the next level by allowing Army R&D labs to exchange technical expertise with non-federal partners. The Open Campus Model through RDECOM (Research, Development, and Engineering Command) brings the Army, industry, and academia together to carry out compelling research towards solving Warfighter challenges. A major collaborative effort that has recently been formed is the Innovation Summit led by the Army Materiel Command (AMC) which brings government, industry, and academia together. A senior government leader stated how a concept of Open Campus enhances collaborative relationships with the goal of building a science and technology environment that encourages groundbreaking advances in basic and applied research areas that are relevant to the Army. Open Campus collaborations build research networks, explore complex and singular problems, and enables teambuilding for research opportunities.

Finding 2 - There is willingness to share intellectual property.

Intellectual property (IP) was one of the primary discussion questions with senior leader interviews as part of the research. The interviewee indicated that when establishing a cooperative agreement, such as a CRADA the government must state IP rights clearly because there is no standard template, and the agreement on IP rights should be worked out before the CRADA is signed. Better Buying Power (BBP) 2.0 called for IP Strategy guidance that can be implemented over the lifecycle of the product (BBP 2.0, 2012). The 2016 National Defense Authorization Act (NDAA) section 2320 and 2321 of Title 10, U.S. Code now calls for

establishment of a government/industry panel regarding rights in technical data and validation of proprietary data restrictions (NDAA, 2016).

A senior government leader indicated that the Army has to work more closely with Pentagon leaders and members of Congress to effectively pave the way for future collaboration in a manner that addresses our needs for cutting-edge technology with private industry's needs for profitability while maintaining IP rights. An interviewee indicated that sharing of IP from industry is complex and there is no one-size fits all. Another interviewee indicated that industry has pushed back with respect to Better Buying Power 3.0 regarding IP in recognition of concerns that industry IRAD has been too focused on increasing a competitive advantage with the creation of IP while pursuing technologies that may improve the military capability of the U.S. An interviewee indicated that industry recognizes the Army's desire to buy data rights while some industry leaders are concerned because they see it cutting into their overall business base. Figure 11 illustrates that most survey respondents view current policies on government purchase, or industry sharing of data rights as negatively impacting the ability to transition technologies to the Warfighter. Specific comments from the survey respondents are captured in Appendix D.

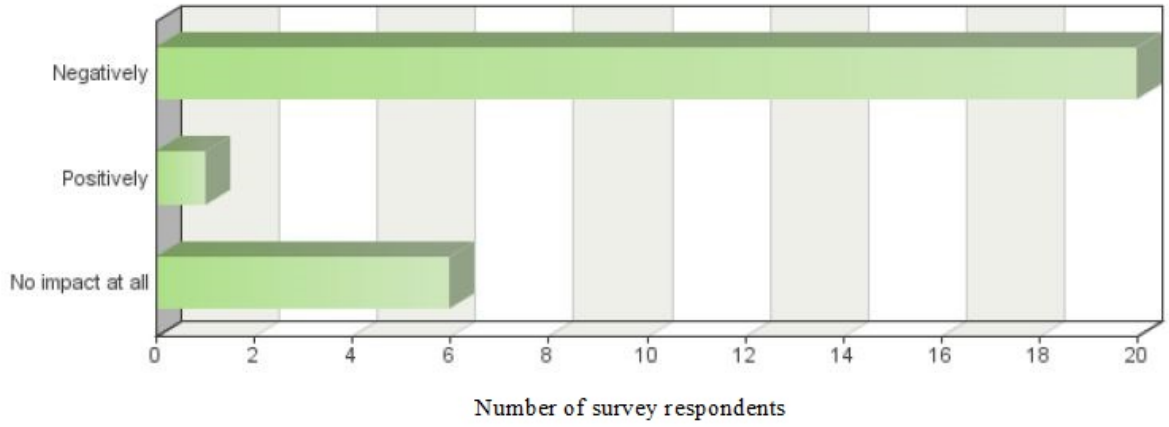


Figure 11. How are current policies on government purchase, or industry sharing of data rights impacting the ability to transition technology into program development and/or fielding of weapons systems?

The majority of industry leaders interviewed (78%) are willing to share IP rights in the spirit of collaboration, but they expect to meet half-way with the government research and development laboratories so there can be a win-win for both. A senior leader from industry indicated that they have evolved their position on intellectual property (IP) from unacceptable to acceptable. The senior leader viewed IP as yesterday's technology (almost like a used car). However, the senior leader indicated that the government is not always clear on why they want the IP. An interviewee from industry indicated that DoD wants to move away from proprietary interfaces, but the government Procurement Contracting Officer (PCO) wants unlimited rights. The senior leader from industry indicated that it seems like the PCO wants the inner workings of a complex piece of hardware to compete efforts within a system, but it does not come across clearly to industry. The government needs to define what level of IP they really need. As

illustrated in figure 12, survey respondents indicated that limited rights are most prevalent in research and development programs.

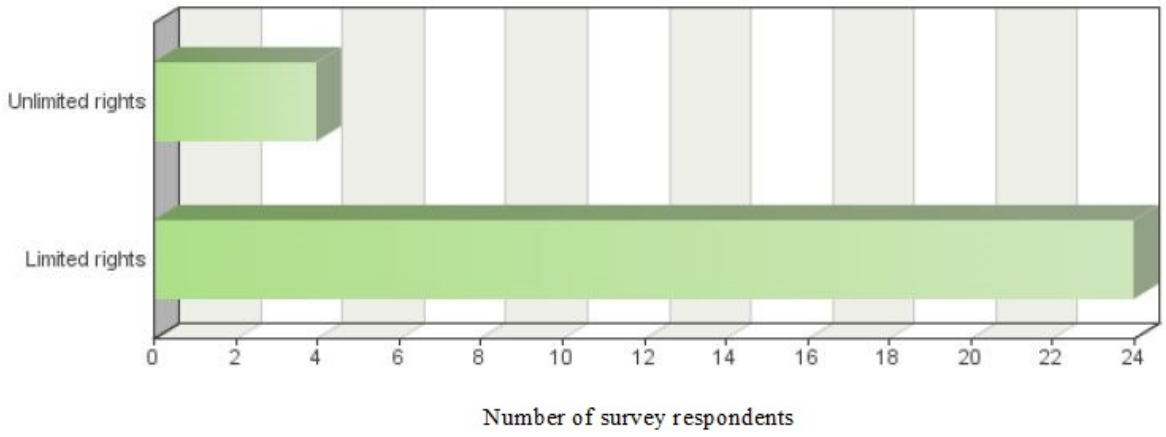


Figure 12. What type of technical data rights are most prevalent on your research and development programs? (Options are unlimited rights, limited rights, or no rights at all)

An interviewee from industry indicated that industry wants to protect IP because it is part of their business strategy for long term support of defense programs. This senior leader indicated that industry is leery of sharing IP rights with the government because of the potential that the information could be shared with a competitor. A senior leader from industry indicated that the BBP 3.0 focus on IP will likely destroy the relationship between government and industry. An interviewee indicated that the government will only end up getting yesterday's IP technology; not future technology upgrades that are most beneficial to the Warfighter.

An interviewee indicated that the government has paid some penalties for going to performance based contracts in the 1990's because industry control of IP led to sole source situations. The interviewee stated that the government wants to have the ability to potentially re-

compete the OEM (original equipment manufacturer) controlled components at some future date. This allows buying the end item competitively.

A senior government leader stated that sometimes the PMO (Project Management Office) needs to own the Technical Data Package (TDP) to have the flexibility for competing a build of a system in the future. The TDP can be purchased during development or during competition, but there is no incentive for the industry to sell the TDP following completion of development.

Figure 13 illustrates that industry has a large stake invested in maintaining rights to technical data and intellectual property.

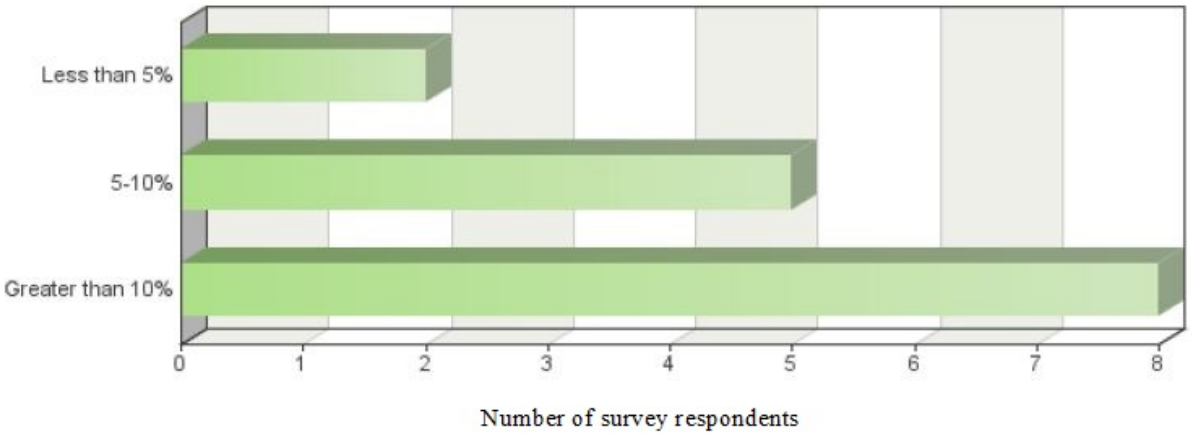


Figure 13. If Industry, on average, what is the historical and expected rate of return on investment for technical data rights/intellectual property?

An interviewee addressed the need for the Army, industry, and academia working together in order to share each other's unique capabilities and maintain overmatch over our adversaries. This ties directly into the nation's third offset strategy (providing a decade and longer major technological advantage to the United States) (OUSD, AT&L, April, 2015). Teaming arrangements between the Army and industry can be complex when R&D is an end

product and IP rules must be addressed. The key is spending the time to work out these IP and data rights agreements before the partnership documentation is signed.

An interviewee stated that technologies matured with industry IRAD and Army S&T are often bogged down at the transition point due to competition requirements and data rights. Collaboration enables competition by aligning U.S. Army long range investment strategies with industry stretch goals. The interviewee stated that IP requirements must be better defined by the government for industry to be innovative and responsive to the Army's technology needs. The interviewee stated that this needs to be addressed in the next iteration of the DAE's (Defense Acquisition Executive) Better Buying Power principles. Figure 14 illustrates that the survey respondents are almost evenly split in terms of an acquisition strategy being clearly defined in their organization. Appendix D also includes an additional comment directly from respondents with respect to a data rights acquisition strategy.

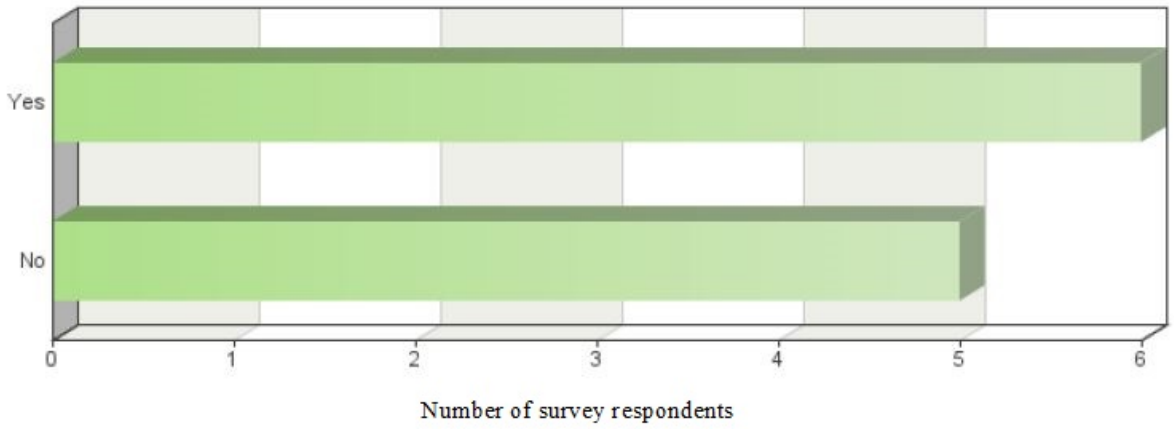


Figure 14. If Government, does your organization clearly provide a data rights acquisition strategy for the science & technology (S&T) community to follow?

Finding 3 - Lack of open communication voiced as a primary impediment to collaboration

Several interviewees indicated the importance of the RDECs having much more dialogue with industry on collaboration. This also impacts trust in a collaborative environment. An interviewee indicated that open dialogue and collaboration between government RDEC's, industry, and academia starts with capability planning in terms of identifying priorities from an S&T perspective that can be transitioned to a program of record within the PEOs (Figure 15). One of the lessons learned to ensure smooth transition is to have the RDECs working closely with the PMs when 6.3 (Advanced Technology Development) dollars are being spent.

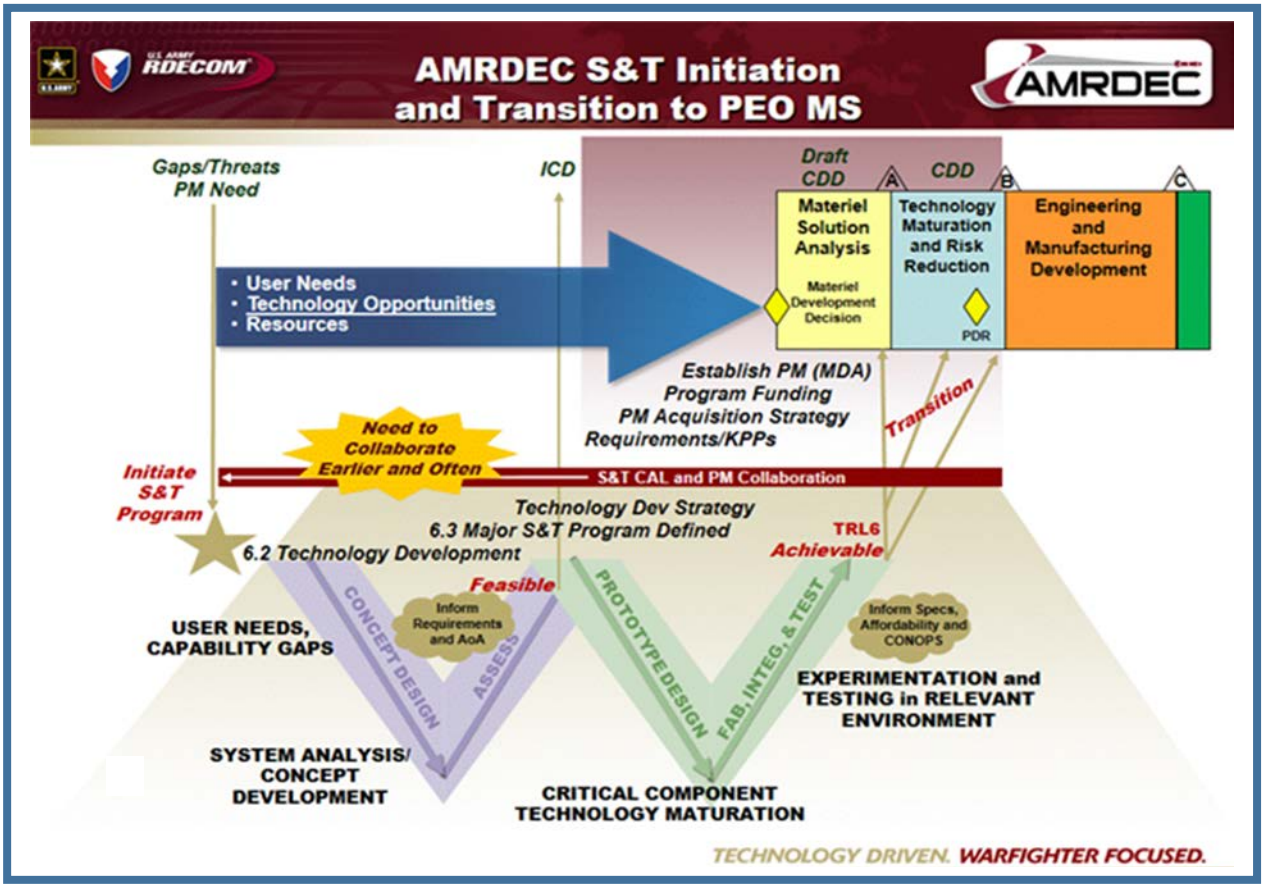


Figure 15. AMRDEC S&T Initiation and Transition to PEO Missiles and Space

An interviewee addressed how the Army uses events such as the AUSA (Association of the United States Army) Global Forces Symposium to discuss what the Army is interested in with a 30 year roadmap. A senior leader from industry stated that the Army needs to participate in more of a collaborative environment with industry to better understand how business and business finance works. A lesson learned from the Acquisition Lessons Learned Portal is to "establish a foundation early in the program for ongoing collaboration with Industry partners through the use of Industry Days and iterative releases of draft program documentation" (AMSAA, 2015) as well as one-on-one sessions with industry.

Figure 16 illustrates that the majority of respondents agree that more "open communication" is needed to enhance collaboration in research and development. Appendix D also includes direct comments from the respondents.

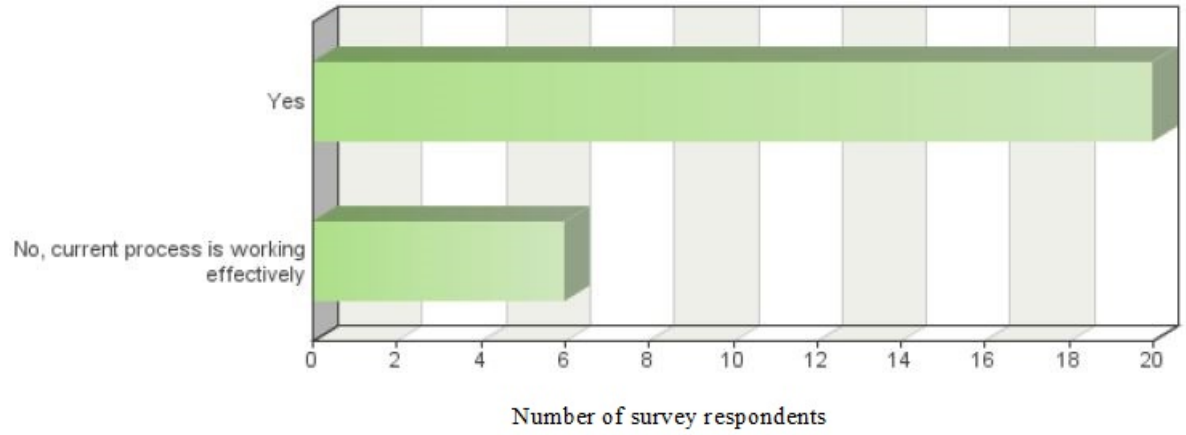


Figure 16. Has lack of open communication between government and industry officials that extends beyond large group discussions held in Industry Days or conferences/symposiums/forums negatively impacted collaboration in Army research and development?

A senior leader from industry stated that as we go forward the government needs to share more technology roadmaps with industry (even in a classified environment). This aligns with the Undersecretary of Defense for Acquisition, Technology, and Logistics (USD AT&L, April 2015) vision on IRAD. Industry does not want to spend precious IRAD on technologies that are not useful to DoD.

A senior leader from industry stated that the Military Services are reluctant to collaborate more closely with industry partners because of procurement integrity concerns. This leader expressed the need for industry to have a more significant voice with Army leaders in terms of how research and development dollars are invested. An interviewee stated that legal and contractual experts in government and industry need to determine how to be fair and reasonable to everyone in industry in order for industry to have that more significant voice.

A senior leader from industry stated that, as we proceed forward in an era of declining budgets, government and industry need to discuss lessons learned from previous DoD programs that were cancelled in order to not repeat those mistakes. The interviewee stated that the environment from the government perspective is to be risk averse because of the potential for a protest.

The interviewee stated that government personnel need to be given guidelines on how an environment of open communication and collaboration can be acceptable. A senior leader from industry stated in an interview that government (and industry) legal experts need to advise us in terms of risk, but we need to ensure that the legal experts are not overly constraining

government-industry dialogue. A senior government leader stated that industry wants insight on how much their work is relevant to meeting the needs of the Army and Warfighter – what gives them a competitive edge.

An interviewee from industry recognized that the Army and DoD wants materiel solutions matured to a higher technology readiness level sooner and at lower cost which should encourage industry and DoD to work even closer for industry to be able to incorporate a higher level of investment in future materiel solutions. Furthermore, the senior leader from industry indicated that there needs to be more flexibility to take advantage of research and development investments from international customers that can also contribute to developing technologies needed for U.S. warfighting capabilities. The Army benefits from this international investment because it can reduce non-recurring dollars required for development.

One of the Army's senior leaders indicated that they gave industry visibility of the Army's long-term strategy (30 years) in order to help industry align their resources to Warfighter needs. In kind, the Army asked to see the industry's business plan. This is how the Army and industry help leverage each other. The interviewee stated that the Army uses the S&T roadmap and execution plan to inform industry. This helps identify if a technology is meaningful to the government.

Interviewees gave examples of successful collaboration, but also gave an example of how collaboration did not work well because of a lack of open communication. This was an industry investment of $10M through a CRADA with a university coordinated through an RDEC. Industry viewed this investment as aligned fully with the objective of the Long Range Research and Development Program Plan (LRRDPP) (October 2014) to identify a suite of technologies to

form the nexus of a third offset strategy. The interviewee indicated that the Army research and development laboratory seemed to want to keep the technology being pursued in-house for the Army's own benefit. The concern expressed by this industry leader is that if industry is making this type of large dollar investment they need to have a better understanding of how they can get a return on their investment. The interviewee stated that this has been a difficult lesson learned.

An interviewee stated that RDECs can help steer industry by evaluating capabilities to determine readiness for Network Integration Environment (NIE). In this capacity, the RDEC is able to tell industry what they think about the capability before the test is conducted in NIE thereby reducing costly tests that would not have favorable results. A senior leader from industry stated that the government needs to better understand what is required for industry to stay in business.

An interviewee from industry believes there is a lack of understanding in DoD regarding return on investment. The interviewee stated that the long term interest of DoD will not be met if industry is not viable to respond to DoD requests for products and capabilities to be developed, integrated, tested, and built to production rates.

An interviewee stated that successful collaboration allows the government/industry teams to mature technologies, inform requirements, and reduce program risks through early prototype designs, testing, and integration. The interviewee stated that critical to the successful outcome is timing and transition to a funded Program of Record. The interviewee stated further that technology which matures too late increases integration costs/risks and may miss the opportunity to transition into a Program of Record. This results in the "valley of death" which is defined as efforts that die before a next transition opportunity comes available. An interviewee stated that

collaborative efforts on technology implementation to mitigate warfighting gaps and operational needs are a continuous process to work with the PEO (Program Executive Office), the Warfighter Centers of Excellence, RDEC's, and industry to identify technology opportunities to mitigate warfighting gaps and operational needs. An interviewee stated that future collaborative efforts also need to focus on the LIRA (Long-range Investment Requirements Analysis) process.

An interviewee stated that it behooves the Army to take advantage of the massive amount of R&D dollars in the defense marketplace rather than trying to internally invent or improve upon certain technology areas. As Alan Shaffer, Principal Deputy, Office of the Assistant Secretary of Defense, Research and Engineering, said in an interview May 11, 2015 with Defense News, "The best way to get industry more engaged is by outreach – letting them know clearly what we need… In fact, that is whole point of [Mr.] Kendall's Better Buying Power 3.0". Another idea from a senior government leader would be a coalition of federal labs sharing data and working with industry to prevent silos and splintering."

Finding 4 - Defense organization views regulations/FAR as stifling innovation and discouraging commercial firms from entering the defense market

An interviewee stated that the Army encounters impediments which can stifle innovation in terms of moving faster to implement solutions to further Warfighter effectiveness. These impediments include:

- A rigid, risk averse acquisition process
- A lack of appetite for failures as a nation
- Burdensome statutory and regulatory reports

- Multiple layers of audit to ensure compliance
- Punitive budget process: unrealistic disbursement metric
- The "Valley of Death" (transition from S&T to acquisition)
- S&T not aligned to acquisition programs
- Technology development that takes too long (i.e., polishing the apple)
- Senior leaders not included as stakeholders in S&T priorities
- S&T is not willing to accept ideas from the outside ("not invented here" paradigm)
- S&T is not necessary; let's just buy it from industry

The concern expressed by both government and industry senior leaders during the interviews is the ability for innovative technology companies that typically do not participate in defense business to want to participate in defense business through efforts such as DIUX (Defense Innovation Unit Experimental, 2015) without changes to the FAR and DFARS rules for oversight and reporting. Results from the corresponding survey illustrated on Figure 17 indicate that 58% of survey respondents view the FAR as stifling innovation and discouraging firms from entering the defense market. Seventy-three (73%) of the survey respondents from government organizations viewed the FAR as stifling innovation while 47% on the survey respondents from industry viewed the FAR as stifling innovation. Specific comments from survey respondents on the FAR regulations are provided in Appendix D.

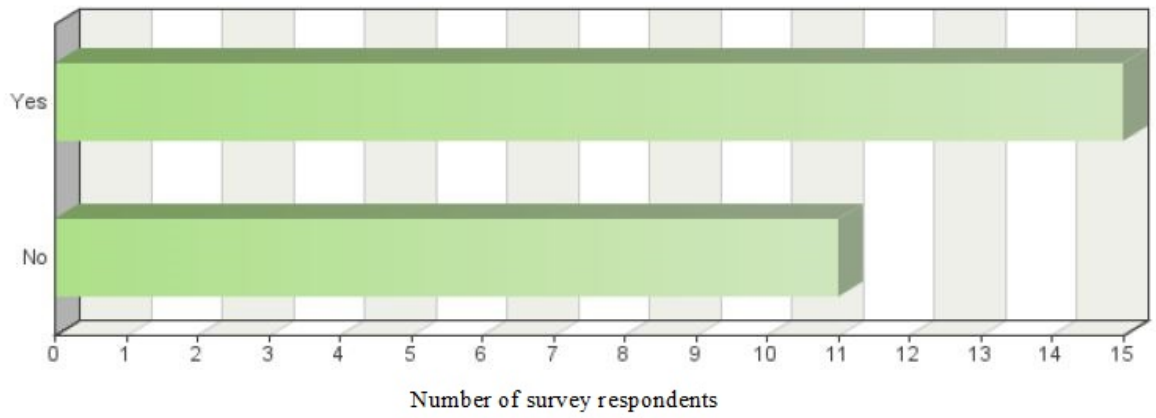


Figure 17. Does your organization see regulations/FAR (Federal Acquisition Regulations) as stifling innovation and discouraging commercial firms from entering the defense market?

A senior leader from industry stated that the Army and industry have to figure out a way to take advantage of what non-traditional defense companies are offering in research and development, such as those in Silicon Valley. Congress also recognizes this issue and has put streamlined language in the FY2016 National Defense Authorization Act (NDAA) known as "Use of Alternative Acquisition Paths to Acquire Critical National Security Capabilities"; Section 805. The NDAA language states that the Secretary of Defense has 180 days following passage of the NDAA to establish procedures for alternative acquisition pathways to acquire capital assets and services that meet critical national security needs. One of the key aspects of this reform is to establish alternative acquisition paths based on the capabilities being bought and the time needed to deploy these capabilities. Section 806 section (c) of the NDAA goes further to allow the Secretary of Defense authority to waive any provision of acquisition law or regulation for the purpose of acquiring a capability that would not otherwise be available to the U.S. Armed Forces.

A senior leader from industry stated that there is no significant increase in competition in DoD business from non-traditional DoD commercial industry because profit margins for DoD industry are typically in the 10 to14% range while pure commercial companies such as those in Silicon Valley are much higher (30 to 40% range). As stated in the literature review, profits for defense related industries can be up to 14% (IDA, Arnold, 2009). This may be lower than non-DoD companies, but DoD companies in the IDA report (General Dynamics, Lockheed, Northrop, and Raytheon) compared well with non-defense companies because of defense business free cash flow return on invested capital. Free cash flow benefits DoD companies because they receive incremental contract payments on a set schedule through invoicing following work performed (IDA, Arnold, 2009).

An interviewee from industry indicated that the government is becoming a smaller portion of the business market in global research and development; therefore the government needs to engage the commercial industrial base better. An interviewee indicated that venture capitalists investing in start-ups do not want to have to work by the FAR because of the many requirements for reporting and oversight. The interviewee further explained that the more rigid the structure is in defense R&D acquisition means the less innovative your organization will likely be. An interviewee stated that part of the reason why CRADAs have become so popular and successful as a form of collaboration is because CRADAs do not have to follow the FAR.

An interviewee indicated that our defense acquisition system unfortunately is not built around flexibility, but accelerating programs could be the best way to be more efficient in the acquisition lifecycle. The interviewee stated that skipping an acquisition phase altogether may be the best way to save precious dollars especially in a declining defense budget. The

interviewee stated that conducting a collaborative S&T program as thoroughly as possible can allow acceleration of capability developments in order to enter the acquisition cycle at Milestone B (MS-B) vice MS-A. This can eliminate the Technology Maturation and Risk Reduction (TMRR) phase of the DoD acquisition cycle. The senior leader indicated that there should be more openness for programs to enter MS-B earlier or enter a pre MS-B by having more mature S&T.

Finding 5 - A formal process that includes government review of IRAD should be considered

An interviewee stated that formal IRAD reviews were eliminated in the 1990's as part of acquisition reform, but this was a mistake. An interviewee discussed the importance of an Independent Research & Development Technical Interchange Meeting to clearly communicate requirement gaps prior to the future year IRAD project planning cycle. The interviewee stated that RDECs and PEOs should be open to participating in IRAD reviews. A senior government leader stated that their government office will try to attend IRAD reviews if invited by industry. An interviewee stated that some government legal experts discourage government participation in meetings on IRAD, but feedback to industry helps greatly in identifying focus on technologies most needed by the Warfighter.

Figure 18 illustrates that the respondents were evenly split on the need for a more formal process for government and industry review of IRAD for transition to defense R&D. Fifty-five (55%) of the survey respondents from government organizations indicated that a more formal process for government and industry review of IRAD was needed while 47% of the industry

survey respondents indicated that a more formal process was needed. Appendix D includes several direct comments from survey respondents on the question of IRAD reviews.

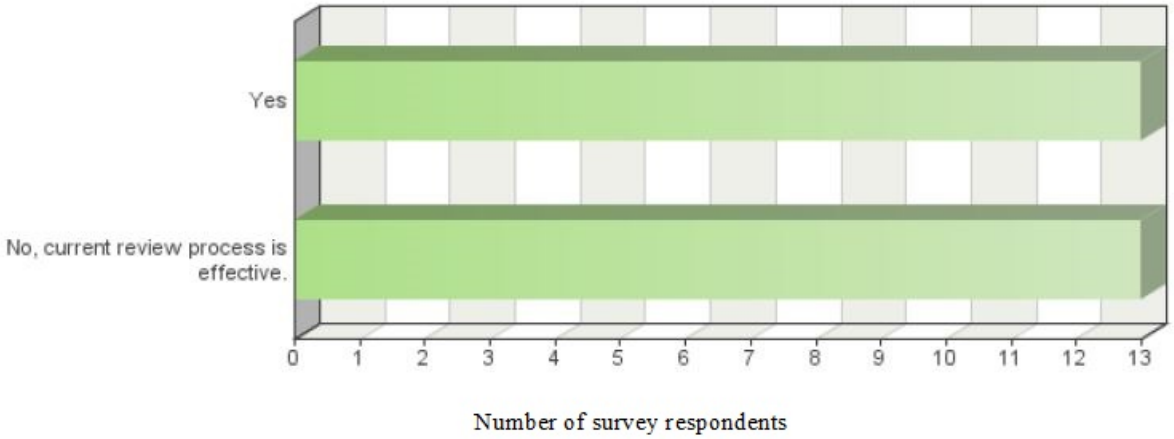


Figure 18. Is there a need for a more formal government and industry process to review Internal Research and Development (IRAD) and determine applicability for transition to defense programs of record?

A senior leader from industry referenced the USD AT&L's letter on Better Buying Power 3.0 (OUSD, AT&L, April 2015) for the use of IRAD, but industry was not in favor of DoD approving it. The interviewee stated that the Army and industry need to meet somewhere in the middle regarding IRAD approval. A senior leader from industry indicated that they are putting much greater emphasis on use of IRAD than they have in the past. Industry investment in R&D is very expensive so the more guidance industry gets from the government the better industry will be able to invest precious IRAD dollars. A senior leader discussed a structured process being used for research and development approval consisting of five phases:

(1) Identify the requirement (this could come from multiple stakeholders)

(2) Confirm the interest by the customer

(3) Secure internal funding and develop partnership. (Does a CRADA already exist or does one need to be established?)

(4) Execute the development and update any funding requirements

(5) Transition (get it aligned with the correct industry business area)

The industry leader recognizes the benefits of collaboration with the government because the product gets more closely aligned with customer requirements. The customer gets to know the product better while industry gets to understand the broader scope of the need. This also gives the government and industry a greater degree of confidence in evaluating emerging technologies.

Finding 6 - Align high risk R&D responsibility to government labs with transition to industry as technology matures

An interviewee indicated that there is, and will still need to be, some balance of what the Army should provide as a core government capability and what industry should provide to make it a win-win for both communities. An interviewee stated that the culture in some RDECs is to team with industry as early as possible with the RDEC conducting some of the high risk technology work that has minimal profit. An interviewee stated that the government needs to be able to take risks that may be more difficult for industry to perform because of their business model. This alignment would reduce industry's needs on IRAD and focuses them on where the Army wants to go. A senior government leader stated that we need to embrace additional use of prototyping to test our developments early and often so we can better plan for programs' transition through the acquisition lifecycle. An interviewee stated that the RDECs need to be able to do the high-risk work in alignment with a plan that would transition technology to

industry for further development. Fifty percent (50%) of survey respondents agreed with a need to better align high risk technology work to the RDECs as illustrated on Figure 19. Within this total 64% of respondents from government organizations agreed with a better alignment while 40% of respondents from industry agreed. Several comments from survey respondents with respect to high risk technology work were also captured in Appendix D.

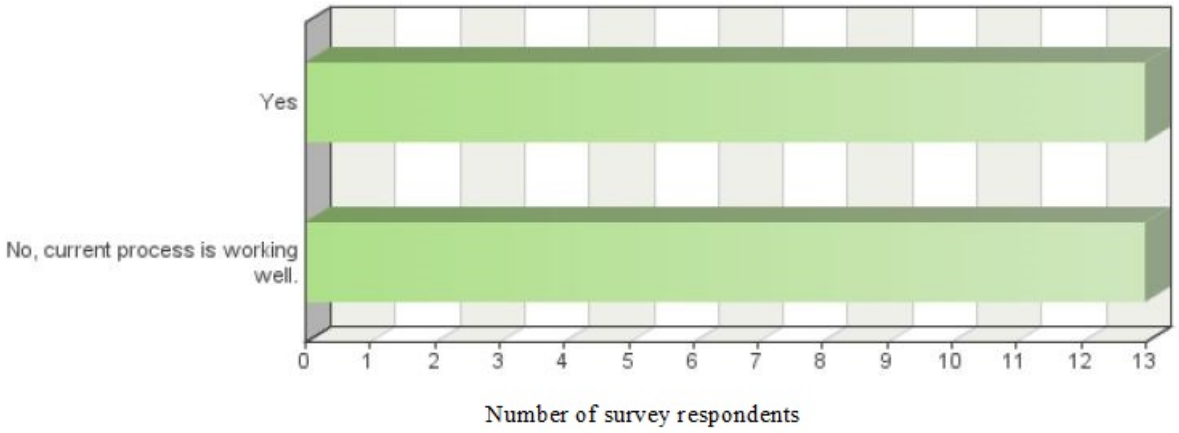


Figure 19. Does your organization see a need to better align high risk research & technology development to government labs with transition as technology matures?

An interviewee indicated that the RDEC's mission should include informing the Army where industry is heading with capabilities. The interviewee stated that collaboration between government RDEC's and industry is important even if we were not in an era of declining resources. A collaborative environment can foster building of virtual components that are satisfactory for assessments without building physical prototypes that can be costly. One senior government leader contends that 70% of our capability evaluations can be accomplished via virtual means.

A senior government leader stated that collaboration works in part because Army labs can provide capabilities to industry that cannot be obtained elsewhere or industry could not otherwise afford testing at non-government facilities. RDECs provide a collaborative function to industry by helping industry certify products for military use. An interviewee stated that we need to have a culture in DoD research and development (government and industry) where an organization is allowed to fail while pursuing state of the art capabilities as well as high risk technologies that can benefit the Warfighter.

Chapter 5 – Conclusions

The research addressed the problem statement of "Managing the Army's Research and Development Investments in a Time of Declining Resources**."** The research using senior leader interviews and survey data clearly showed how collaboration has worked across government and industry with CRADAs (Cooperative Research and Development Agreements) increasingly being used as an instrument of collaboration. The process for implementing CRADAs needs improvement, especially in providing a more efficient means to define intellectual property protection to create a win-win for government and industry.

A significant majority of industry partners interviewed in the research (78%) were willing to share intellectual property rights with the government, but many wanted to understand the impact on future business opportunities. The survey data further expanded on how technical data rights and IP are a big contributor to the return on investment for industry, creating the need for agreements on IP to be a win-win for both government and industry.

Lack of open communication was one of the most significant concerns voiced by senior leaders in research interviews, especially coming from industry. The survey respondents indicated that a lack of open communication was negatively impacting collaboration in Army R&D. Open communication affects how industry makes decisions on investing precious Internal Research and Development (IRAD) dollars, how industry focuses their research and development efforts to align with the needs of the Warfighter, and the ability to have trust in the defense acquisition system. Open communication as discussed here goes beyond what is normally conveyed during typical Industry Days. Both government and industry gave examples of the way open communication has worked well to the benefit of the Warfighter on maximizing precious research and development dollars.

Revamping the FAR requirements to reduce the reporting burden for innovative small companies to participate in developing defense capabilities was voiced by multiple senior leaders from industry. Fifty-eight (58%) of survey respondents agreed that the FAR was stifling innovation and discouraging commercial firms from entering the defense market, but not by an overwhelming majority.

Senior leaders both from government and industry voiced a greater need for a process to review IRAD, but industry was not in favor of government approval of IRAD as interpreted by Better Buying Power 3.0. Senior leaders indicated in interviews that removal of IRAD reviews in the 1990's with acquisition reform eliminated a very important forum for providing feedback to industry on aligning investment to the needs of the Warfighter. However, survey respondents were evenly split on a need for a more formal government review process for IRAD. Industry does want to partner with the RDECs to get an independent assessment of the value of potential

product/service applications or identify ways that would make it more valuable to the Warfighter. These exchanges provide industry with information necessary to focus their IRAD investment where it is most likely to transition to Army acquisition programs. Industry investment in research and development is very expensive so the more guidance industry can get from formal reviews with RDECs and PEOs the better companies can make wise investments of precious IRAD dollars.

Some senior leaders from government and industry recommended that government RDECs should perform high risk technology work that is low profit and more challenging for industry to invest in with a plan to transition to industry at higher technology readiness levels (TRLs). Survey respondents however were evenly split on the need to better align high risk research & technology development to government labs with transition as technology matures. In an era of declining budgets it is difficult for industry to invest large amounts of dollars without knowing if they have a reasonable chance to obtain a return on investment. The question of where high risk technology development is best performed will continue to be debated. One can speculate that the declining budgets as envisioned in the near future may, however, lead to more deliberate allocation of work between RDECs and the defense industrial base.

Chapter 6 - Recommendations

The results from the surveys and interviews provided useful information for the formulation of several recommendations to improve efficiencies in investing in research and development to support the Warfighter in defeating adversaries to win in a complex world.

Recommendation 1. The process for approval of CRADAs and Teaming Agreements should be streamlined beyond the current process that now can take 6 to 12 months.

Recommendation 2. Review and revise current policies on government purchase and industry sharing of data rights that affect technology transition for fielding weapons systems.

Recommendation 3. The government needs to be open to sharing more technology roadmaps with industry (even in a classified environment) in a way that goes beyond what is covered in large forum briefings to industry.

Recommendation 4. RDECs and PEOs should be open to participating in IRAD (Internal Research and Development) reviews as advisors not approvers, if invited by industry.

Recommendation 5. Engineers and Scientists from RDECs should consider doing more work detail assignments in industry plants as part of collaboration to have a better understanding of how business finance and operations works.

Recommendation 6. As part of the approval funding plan for S&T beginning with Applied Research, identify a clear transition plan with end state capability where the technology can be applied within the acquisition cycle.

Chapter 7 – Areas of Additional Research

Two areas of primary discussion in the responses from senior leaders merit further research. The first area revolves around the ability to have increased open communications beyond that conducted in Industry Days. The second area encompasses the Federal Acquisition Regulations (FAR) provisions that discourage small innovative technology companies from participating in the DoD business enterprise. Additional research on open communications should include further actionable input from legal experts in government and industry on how these additional sessions can be conducted while meeting rules maintaining procurement

integrity and for avoiding organizational conflict of interest (OCI). Input from small non-traditional, innovative commercial companies is needed to quantify input on what measures, in terms of acquisition reporting relief, are needed to help encourage participation in developing future technologies for DoD support to Warfighter capabilities.

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Glossary of Acronyms

AMC (Army Materiel Command)

AUSA (Association of the United States Army)

BBP (Better Buying Power)

CONOPS (Concept of Operations)

CRA (Collaborative Research Alliance)

CRADA (Cooperative Research and Development Agreement)

CTA (Collaborative Technology Alliance)

CS (Computer Software)

DBB (Defense Business Board)

DCMA (Defense Contract Management Agency)

DFARS (Defense Federal Acquisition Regulation Supplement)

DIB (Defense Industrial Base)

DIUX (Defense Innovation Unit Experimental)

DoD (Department of Defense)

FAR (Federal Acquisition Regulation)

FFRDC (Federally Funded Research Development Center)

FYDP (Future Year's Defense Program)

FVLP (Future Vertical Lift Program)

HELMD (High Energy Laser Mobile Demonstrator)

IP (Intellectual Property)

IRAD (Internal Research and Development)

ITA (Information Technology Alliance)

JMR (Joint Multi-Role)

JMRTD (Joint Multi-Role Technology Development)

LRRDPP (Long Range Research and Development Program Plan)

NDAA (National Defense Authorization Act)

NIE (Network Integration Environment)

OCI (Organizational Conflict of Interest)

OUSD (Office of the Undersecretary of Defense)

PM (Project/Program Manager)

PMO (Project Management Office)

PEO (Program Executive Office)

PoR (Program of Record)

R&D (Research & Development)

RDA (Research, Development, and Acquisition)

RDEC (Research, Development, and Engineering Center)

RDECOM (Research, Development, and Engineering Command)

S&T (Science & Technology)

SECDEF (Secretary of Defense)

SFR&D (Self-Funded Research & Development)

STRL (Science & Technology Reinvention Lab)

TA (Teaming Agreement)

TD (Technical Data)

TDP (Technical Data Package)

TMRR (Technology Maturation and Risk Reduction)

TOA (Total Obligation Authority)

TRADOC (Training and Doctrine Command)

TRL (Technology Readiness Level)

UARC (University Affiliated Research Center)

USD AT&L (Under Secretary of Defense for Acquisition, Technology, & Logistics)

APPENDIX A

Interview questions:

1. Has your organization previously teamed in collaborative research, development, and demonstration efforts with Industry?

2. If so, can you explain how the collaboration worked?

3. How do you define success in these collaborative efforts? Can you also describe how the technology/capability gets incorporated into the defense application?

4. Would your organization participate in a collaborative effort again? Please elaborate and address any specific advantages and pitfalls.

5. Has your organization sought or been approached previously to participate in a teaming agreement? Please elaborate.

6. What changes (lessons learned) would you recommend to improve this collaborative/teaming opportunity? Can you share any notes/reports that you have on this topic? (The origin will not be specified in the paper.)

7. Are there impediments to participating in a teaming arrangement? Please elaborate.

8. Do you view the collaborative organization as a competitor? Please elaborate.

9. Is your organization willing to share intellectual property? Please explain. Are you willing to be part of a patent application?

10. Do you see that teaming agreements with industry organizations are necessary in an era of declining defense resources? If so, what areas offer the most productive technology areas or activities? Please elaborate.

11. Are you familiar with RDEC/Industry teaming agreements that you believe were successful?

12. Are you aware of any teaming agreements that were not successful? Can you elaborate and suggest ways the effort might have been more successful?

13. Do you have any advice for the future that would present an opportunity for better outcomes in Defense budgeting and technology program execution?

14. Would you like to cover anything else that may not have been addressed that would be valuable to this research?

APPENDIX B

Critical language excerpt from model CRADA (CRADA, 2014)

Joint Statement of Work

Cooperative research and development efforts under this Agreement shall be performed in accordance with the JWS attached in the subject appendix. The RDEC and PARTNER will participate in this cooperative effort and utilize such personnel, facilities, equipment, know-how, and information consistent with the Joint Work Statement and their own policies.

Intellectual Property

The RDEC and PARTNER hereby identify all intellectual property, including issued patents, pending patent applications, inventions, technical data, computer software and other information which was created prior to this Agreement which will be used for purposes of this Agreement.

Background information which is considered to be proprietary or protected information should be further identified below with a restriction of use designation such as "Limited CRADA Rights" or "Restricted CRADA Rights". Alternatively, the PARTNER can use the terminology "Limited Rights" or "Restricted Rights".

Any background intellectual property of Government CRADA Support Contractors or PARTNER Contractors should be identified as well.

Subject Data created by employees of either party or jointly by employees of the parties may be designated as protected subject data by either party and marked in accordance with this article if such information would be proprietary information if obtained from a non-governmental party or if such information is non-public Government information. AMRDEC and PARTNER will provide appropriate protection against dissemination of such information, including, as applicable, exemption from 5 U.S.C., Chapter 5, Subchapter II, for (0, 1, 2, 3, 4 or 5 years (as appropriate)) after the subject data is created unless the information loses its protected status earlier. In addition, AMRDEC shall inform CRADA Government Support Contractors and PARTNER shall inform PARTNER CONTRACTORS to provide appropriate protection against dissemination of such information in accordance with this paragraph. The Government shall have a Government Purpose Rights license in all technical data and computer software created by PARTNER during performance of this Agreement including, without limitation, all improvements and enhancements to any of PARTNER's preexisting technical data and computer software used to perform this CRADA. A Party to this Agreement may file a patent application containing subject data created by its employees prior to the aforementioned five year period of protection of this paragraph without being in violation of the terms of this Agreement. Also, a CRADA Government Support Contractor may file a patent application containing subject data

created by its employees prior to the aforementioned five year period of protection of this paragraph without being in violation of the terms of this Agreement.

Liability

The Parties make no expressed or implied warranty under this Agreement.

The PARTNER is solely responsible for its actions and the actions of those acting for the PARTNER in the performance of this Agreement, other than any Government employee, and for any damages that may arise from any suit, action, or claim resulting from such actions, and for any costs from or incidental to any such suit, action, or claim.

All of the RDEC actions in executing this Agreement are the acts of a sovereign, the United States of America. The RDEC liability to Partner or third parties is limited to areas authorized by Federal law.

APPENDIX C – Survey Questions

1. I understand this survey is for academic purposes and all responses are anonymous. I have read the Informed Consent Statement.

2. What designation best describes your organization?
    a. Government
    b. Commercial defense business
    c. Federally Funded Research Development Center (FFRDC)
    d. Educational institution

    Comments:_____

3. Please indicate what best describes your title/position in the organization
    a. Engineer/Scientist
    b. Project/Program Manager Office official – Government
    c. Project/Program Manager Office official – Industry/FFRDC/Educational
    d. Supervisor/Team Lead – Government
    e. Supervisor/Team Lead - Industry/FFRDC/Educational
    f. Director – Government
    g. Director – Industry
    h. Executive – Government
    i. Executive – Industry

    Comments:_____

4. If Government, what best describes your organization's function:
    a. Research & Development Center
    b. Program Executive Office/PM Office
    c. Headquarters

    Comments:_____

5. If Industry/FFRDC/Educational, what best describes your organization's function:
    a. Original Equipment Manufacturer (OEM)
    b. Engineering services
    c. Technology development

    Comments:_____

6. What best describes the size of your primary organization:

a. 0 to 100 employees
b. 101 to 250 employees
c. 251 to 500 employees
d. 501 to 1,000 employees
e. 1001 to 2,000 employees
f. Above 2,000 employees

Comments:_____

7. What is the research & development type your organization is most involved in?
    a. 6.1 Basic Research (Science & Technology)
    b. 6.2 Applied Research (Science & Technology)
    c. 6.3 Advanced Technology Development
    d. 6.4/6.5 Demonstration & Validation/Engineering & Manufacturing Development
    e. No research & development

    Comments:_____

8. Does your organization utilize formal collaborative research & development agreements with other organizations? If yes, please rank order from 6 for the vehicle your organization prefers most to 1 for the least preferred type of agreement and how many of the agreements were established in calendar years 2013, 2014, and 2015:
    a. Cooperative Research and Development Agreements – rank number, number of agreements established in 2015, 2014, 2013
    b. Collaborative Research Alliances – rank number, number of agreements established in 2015, 2014, 2013
    c. Educational Partnerships – rank number, number of agreements established in 2015, 2014, 2013
    d. Collaborative Technology Alliances – rank number, number of agreements established in 2015, 2014, 2013
    e. International Technology Alliances – rank number, number of agreements established in 2015, 2014, 2013
    f. Other (Please describe) – rank number, number of agreements established in 2015, 2014, 2013
    g. N/A (Our organization does not utilize these types of agreements.)

    Comments:_____

9. If your organization has Cooperative Research and Development Agreements (CRADAs), what best describes the typical time to establish these agreements? If other type of collaborative agreement is used please provide type and typical timeline for approval in the "Comments" field.

a. 3 months or less
b. 6 to 9 months
c. > 9 months

Comments:_____

10. How are current policies on government purchase, or industry sharing of data rights impacting the ability to transition technology into program development and/or fielding of weapons systems?
    a. Negatively
    b. Positively
    c. No impact at all

    Comments:_____

11. What type of technical data rights are most prevalent on your research & development programs?
    a. Unlimited rights
    b. Limited rights
    c. No rights

    Comments:_____

12. If Industry, on average, what is the historical and expected return on investment for technical data rights/intellectual property?
    a. Less than 5%
    b. 5 to 10%
    c. Greater than 10%

    Comments:_____

13. If Government, does your organization clearly provide a data rights acquisition strategy for the S&T (Science & Technology) community to follow?
    a. Yes
    b. No

    Comments:_____

14. Has lack of open communication between government and industry officials that extends beyond large group discussions held in Industry Days or conferences/symposiums/forums negatively impacted collaboration in Army research and development?

a. Yes
b. No, current process is working effectively

Comments:_____

15. Does your organization see regulations/FAR (Federal Acquisition Regulations) as stifling innovation and discouraging commercial firms from entering the defense market? (Please elaborate on item c following selection of a or b.)
    a. Yes
    b. No impact at all
    c. Please elaborate on a. or b._____

16. Is there a need for a more formal government and industry process to review Internal Research and Development (IRAD) and determine applicability for transition to defense programs of record?
    a. Yes
    b. No, current review process is effective

    Comments:_____

17. Does your organization see a need to better align high risk research & technology development responsibility to government labs with transition to industry as technology matures?
    a. Yes
    b. No, current process is working well

    Comments:_____

APPENDIX D - Respondents' comments from Survey questions.

Questions 1-6:	**No comments.**
Question 7. What type of research and development is your organization most involved in?	**(a) 6.1, 6.2 and 6.3 applies equally**
	(b) The team of 60 government engineers and 60+ contractors supporting are funded by 6.2, 6.3, 6.4 and 6.5 funds. The lion share of funding is in the 6.4/6.5 world.
Question 8. Does your organization utilize formal collaborative research & development agreements with other organizations? If yes, please rank order from 6 - for the vehicle your organization prefers most to 1 - for the least preferred type of agreement, and how many of the agreements were established in calendar years 2013, 2014, and 2015:	**No comments.**
Question 9. If your organization has Cooperative Research and Development Agreements (CRADAs), what best describes the typical time to establish these agreements? If other type of collaborative agreement is used please provide type and typical timeline for approval in the Comments field.	**(a) Time to establish varies wildly - Depends a lot on the legal departments of the agreement partners.**
Question 10. How are current policies on government purchase, or industry sharing of data rights impacting the ability to transition technology into program development and/or fielding of weapons systems?	**(a) Other answer is that data rights are ALWAYS an issue in negotiated contracts/agreements - We almost never get the "full rights" that we desire, but if the rights are not sufficient for our technical purposes, the agreement is not consummated.**
	(b) I believe government technical engineers need to be better educated in data rights. I believe too often the government gives in regarding data rights.
Question 13. If Government, does your organization clearly provide a data rights acquisition strategy for the S&T (Science & Technology) community to follow?	**(a) We desire full rights as a starting point - The major companies that we partner with generally relent only government purpose or limited rights.**
Question 14. Has lack of open communication between government and industry officials that extends beyond large group discussions held in Industry Days or conferences/symposiums/forums negatively impacted collaboration in Army research and development?	**(a) Other venues for open communications have been severely curtailed in the anti-conference policies.**
	(b) Example. During the last conflicts, there was an urgency to get proven solutions out to the field to protect our soldiers against IED attacks. As a result, the government was much more open to share their operational information and data. That type of discussion has again become limited.

APPENDIX D - Respondents' comments from Survey questions (continued).

Question 15. Does your organization see regulations/FAR (Federal Acquisition Regulations) as stifling innovation and discouraging commercial firms from entering the defense market?	**(a) We see it especially on the small end where a non-traditional defense business, may do a SBIR or two and hits that threshold where the entirety of the FAR hits them and they have to completely reorganize and enlarge their Accounting and Legal departments.**
	(b) We are investigating the use of Other Transactions Agreements (OTA) as a way to bring non-traditional (non-FAR) vendors into the innovation mix.
	(c) Not necessarily...large defense firms understand government regulations and requirements and can be the conduits for transiting commercial technology into applications. Commercial firms do not want to deal with the differences in accounting processes and should not have to adopt if they can work with a defense prime counterpart.
	(d) The overhead associated with Government contracts is excessive.
	(e) Regulations are not necessarily the issue. I see people who don't understand the flexibility that the regulations allow stifling innovation and discouraging collaboration. Needs to be poliices and procedures that help Government personnel become more comfortable with collaborating.
Question 16. Is there a need for a more formal government and industry process to review Internal Research and Development (IRAD) and determine applicability for transition to defense programs of record?	**(a) It is working reasonable well on the S&T side since we work more day to day on projects that they invest IRAD in. We hear more complaints from the PMs that feel that the Prime is not working to their goals and the company hides behind the IRAD rules or blames the RDEC. It would be nice to have more of a deliberate IRAD investment review with the Prime, PM and RDEC which is currently not possible due to the rules.**
	(b) It is always beneficial to get R&D data to a wider breath of potential users. However, the concern is that the government will disallow certain research because they do not find it applicable. This would be stifling to the "I" in independent research and development (IR&D). The government should not be the decision authority for managing independent project portfolios.
	(c) There should be a way to lean the operation to obtain a CRADA that results in a "win-win" for everyone.
	(d) The current process is not effective, however the answer is not more formal reviews by the Government. In my view, the single most powerful factor is the making the defense departments requiremets and needs known to industry. Not simply via briefings and industry days, rather by sharing technical documentation on an on-going basis. Properly vetted companies with perpetual access to Government technical documents - requirements, specs, etc., will be able to use that information to inform both their IR&D and on-going procurements. The Govt. would get a large number of companies actively engaged by simply providing more information. The end result will be organizations much better prepared to provide the Government with capabilities that are in line with where the Government is trying to go.

APPENDIX D - Respondents' comments from Survey questions (continued).

Question 17. Does your organization see a need to better align high risk research & technology development responsibility to government labs with transition to industry as technology matures?	**(a) In the Aviation S&T side, the Army investment is such a small share that we are largely at the mercy of the primes to really make the impactful investment which they are largely not interested in. It would be nice to have the resources to really invest in the high risk Aviation technologies that would make an impact.**
	(b) It is often very difficult to force government-developed technology into industries without a major program funding behind the effort.
	(c) We have not experienced a lot of benefit from transitions from the government labs. The government labs should attack areas that industry cannot (because of capabilities) or will not pursue.
	(d) I don't think the current process necessarily is efficient. But programs that enter the RDECOM R&D effort do not seem to transition to industry; and if the program does, it takes years. There should be an analysis of how many programs actually transition to become a part of a program of record. My experience is that few programs actually transition from RDECOM.
	(e) The only time Government labs should be doing the work is when industry cannot do so. If there are companies in sector that have the capability the Govt. should be contracting out to get it done. Industy should not have to compete with labs. Labs should have sufficient expertise to evaluate whatever industy brings to them, however they should not be in the business of development. They should know enough to make sure the government is an informed buyer.