Government-Industry Collaboration: Challenging the Brand-New Legacy Solution Paradigm

Michael K. Rambo
Textron Aviation Defense
Wichita, Kansas
mrambo@txtav.com

ABSTRACT

The traditional model of training system creation in the defense arena, especially the aviation space, relies on near-linear progression along a need-solicit-propose-develop-evaluate-select-field-fix continuum. This limits industry to reactionary behavior, precluding government consideration of advanced technical and or philosophical approaches, which in the absence of established funded programs, may be more immature than they would have been under a more cooperative developmental environment. Further, this requirement dominated approach adds undesirable rigidity to programs which could otherwise exploit co-evolution of technology and concepts for revolutionary advances in capabilities. Cooperative research and development agreements (CRADAs) and new approaches to contracting and experimentation have gained more prominence in recent years, and the intent is promising; however, industry investments rely heavily on hope that a program will eventually materialize, justifying the sharing of risk with the government. It is a posture which, when programs do not materialize, suggests the status quo is perhaps more comfortable – and appropriately less costly. This paper will suggest a methodology by which industry partners can establish relationships with each other and the government to arrive at solutions in tandem with the realization of need - not fielding a brand-new legacy solution. It will outline effective current and historical programs where such relationships were successful, examine the lessons learned from recent experimentation activities, and evaluate possible outcomes of theoretical scenarios using a suggested cooperative approach. Finally, the paper will provide recommendations and specific examples of how such an approach will enable dramatic increases in solution acquisition and fielding efficiency, implementation of solutions at the speed of operational relevancy, and establishment of relationships critical to getting to the future faster.

ABOUT THE AUTHOR

Michael Rambo (Lieutenant Colonel, USAFR-ret) is a 1997 graduate of the United States Air Force Academy where he studied military strategy. He received his Master of Joint Military Operational Art and Science through the Air Force's Air University in 2011. He is currently the Director of Training for Textron Aviation Defense and is responsible for overseeing all training activity and solutions across a spectrum of Textron defense aircraft. He is a former Air Force instructor pilot and also held positions in contract management, inspection, and strategic command and control.

Government-Industry Collaboration: Challenging the Brand-New Legacy Solution Paradigm

Michael K. Rambo
Textron Aviation Defense
Wichita, Kansas
mrambo@txtav.com

DEFINING THE PROBLEM

If there were a single word to define the root of the acquisition conundrum, it would be *requirements*. Requirements are the driver, the construct, the binding agent of the acquisition machine – they are what drives the rest of the ship, and are by far the most comprehensive time consumer of the entire process. Why is that? In short, the warfighter needs something. He or she has reached the end of a capability's technical edge, or has emerging needs requiring new technology, or maybe even has an emergency wherein a device/product/solution is urgently needed to save lives. The process of defining exactly what those requirements are, feeding them to program offices, conveying them to potential solution providers, receiving feedback and so on is pervasive in the early milestones of an acquisition, and insidiously present all the way through post-contract-award activity. It is important to note that this concept applies broadly to solutions, from specific hardware parts and pieces, through complex total programs. This paper will focus on training-related solutions, or more accurately part of one in the hypothetical scenario.

In order to find the inefficiencies, or areas for improvement, an overview of the system is warranted. However, rather than approach such a task per the guiding regulations, it is more useful to have a pragmatic look from the generalized perspective. To achieve this, we will take a walk through the life of the provision of a training gizmo. We will look at how it moves through the need-solicit-propose-develop-evaluate-select-field-fix continuum. We will not touch on *all* of the steps in the middle – just the heavy hitters as it were. We begin with a holistic look at acquisition.

On examining the Defense Acquisition Life Cycle Compliance Baseline, a depiction of which is shown in Figure 1 below, one is reminded of the complexity of the acquisition model. It is this complexity, and this diagram, which has motivated more than one conversation on reform. Note: it is not necessary to attempt to read the figure, as its inclusion is to aid in visualizing the complex system. Naturally, a certain reasonableness has to be accepted given the fact the model must conform to every possible acquisition, spanning the gamut of possible needs from hammer to F-35.

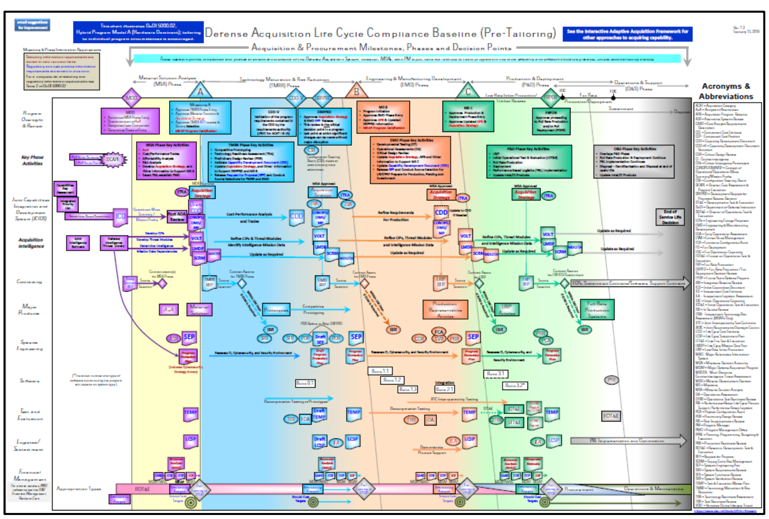


Figure 1 The Defense Life Cycle Management System (Defense Acquisition University, 2019)

In our hypothetical world, let us say the Training Command desires to employ an in-flight augmented reality system which provides navigational guidance in the absence of a head-up display (HUD). We will call that the *need*. The annunciators of the *need* are the pilots and their instructors, who for simplicity we will label just *Users*. We will neither complicate the *need* by limiting it to an urgent or emergency need, nor expand the conversation to major, or "ACAT 1" programs, like the F-35. Rather, we will approach this need with what would traditionally be a tailored traditional model. After all, per Defense Acquisition University, "[t]he structure of a DoD acquisition program and the procedures used should be tailored as much as possible to the characteristics of the product being acquired, and to the totality of circumstances associated with the program including operational urgency and risk factors" (Department of Defense, 2017). Later, we will discuss the new "rapid" models, which, while slimmer, are still burdened by the same mire of requirements. For now, though, our hypothetical *need* can fall under a tailored acquisition program.

Now that the *User* has identified a *need*, it may be conveyed to industry via a sources sought, market survey, or request for information (RFI) to briefly assess what industry generally may be able to provide according to an immature requirements list. This conveyance occurs through the Federal Business Opportunities website, or FedBizOps. This is the first opportunity for industry to formally engage on the matter, although it is very common for informal conversations to occur via business development interactions between industry and the applicable stakeholders representing the *Users*. Importantly, one of the first caveats to these postings is that there is no guarantee of a contract or formal program implied – industry, enter at your own risk.

Figure 2 The FedBizOps Website

Steps glossed over here include the accomplishment of an analysis of alternatives (AoA), a time-consuming process involving the research of things possibly already available which may meet the *need*. The expectation is that this analysis might inform the requirements which would eventually guide the program. If something already exists, for example on another platform, perhaps there is a shortcut which the *Customer* might consider. However, in our example we will assume that no currently fielded technology adequately meets the *need* and so the *need* remains unfilled.

The RFI for our *need* states the desire for interested parties to propose their solutions to provide an in-flight augmented reality system which provides navigational guidance in the absence of a HUD. It may even go on to say the desired aircraft for this implementation is the [fictional] T-10 trainer, which the *User* operates. Industry will then respond with a variety of possible solutions ranging from helmet-mounted displays, to canopy projection systems, or devices worn under a helmet visor. Some may have off-the-shelf solutions adapted for aircraft use from the automotive industry, or maybe a novel idea brought forward by an inventor otherwise not associated with industry at large.

Now, for brevity, we must generalize the next steps. Essentially, the *need* will be transformed into requirements over a series of acronym-ical steps, a process which can take months for simple projects and years for more complex ones. Among the steps might be opportunities for potential offerors to meet with the *Customer* to review the draft requirements, ask questions, etc. These industry days serve a purpose to help industry understand the *need* and help the *Customer* understand what industry can provide. This is the long road just to arrive at agreed upon and hyper-formalized requirements – which may be somewhat of a departure from the original *need* and possibly so detailed that industry is forced to adapt its products to make them conform, else risk non-compliance. Requirements now finalized, the system moves on to the request for proposals (RFP) stage. This is the first point at which there is an acknowledgement that the program is "real." Possible providers must now get into the details of how they propose to meet the requirements and how much their solutions will cost. Also at this point, industry is no longer able to engage with the *User*. Rather, the back and forth process between the *Customer* and industry can take months, if not years. All the while, technology as it applies to the solution must continue to maintain compliance with the requirements through the fielding of the technology. In the current world of rapidly evolving, Moore's Law-driven technology, such processes result in requirements forged of needs which by fielding have become legacy solutions.

TECHNOLOGY TIMELINES

> "…the time between exposure to the technology and its operational fielding often *exceeds* the time of a leap in technology which Moore's Law predicts."

Named for Gordon Moore, the co-founder of Fairchild Semiconductor, Moore's Law basically states that computing power doubles every two years. Since this was originally stated, though, the more modern accepted scale is every 18-20 months (Kanellos, 2003). "Doubles" – is the key term. Let us refer back to our example. If we assume the *User* based their need on a technology they experienced at a trade show, for example, it was a technology mature enough to be demonstrated. However, by the time our example technology survives the fog and friction of the requirements machine, processors have (at least) doubled in power, optics and lenses have made leaps, and displays have become more pixel-dense. In that sense, then, the time between exposure to the technology and its operational fielding often *exceeds* the time of a leap in technology which Moore's Law predicts. The result is the fielding of a dated, or legacy solution – despite its being brand-new to the *User*. Industry would prefer to not operate in this somewhat backward manner, being handcuffed to the process despite desiring to advance its wares.

The *User* is motivated to seek innovation to address a *need.* Industry has different motivations for innovation. A company wishes to be competitive, to stay at the forefront of technology because to do otherwise is to fall behind the rest of its industry. Especially in the fields of technology, a company's board of directors and stockholders expect to see growth. Old technology does not grow – it gets older and older until it achieves the dreaded state of having become *obsolete.* In our example, as it applies to the rapidly advancing virtual/mixed/augmented reality (VR/MR/AR) space, it is easy to imagine how this could occur. See Figure 3 Technology Timeline for a depiction of this scenario.

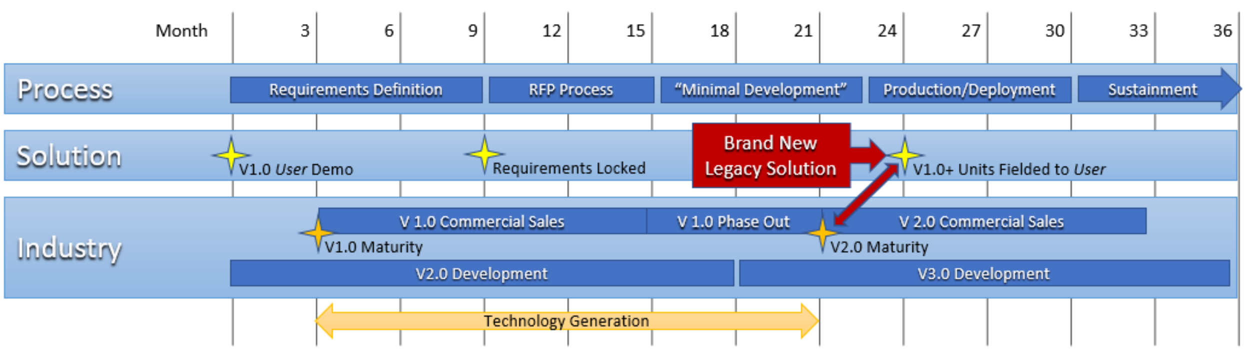


Figure 3 Technology Timeline

It is important to note here that this is assuming the use of highly tailored Middle-Tier acquisition approach. We will discuss this approach in more detail shortly, but in summary, this assumes a commercial product needing only refinement. Larger programs, with more lengthy requirements and proposal processes can exacerbate the problem. In short, industry cannot withhold innovation – there's no money in that – and the *User* ends up on the receiving end of the process, effectively "stuck" with a no-longer-cutting-edge solution.

NEW MODELS OF BUSINESS

The last few years have brought forward some hope for improvements to the otherwise bulky and cumbersome system. The National Defense Authorization Act (NDAA) of 2016 created a process to "fast track" some efforts. "This provision recognizes DoD's need to move faster on promising technologies that are too early to declare an acquisition program, but have the ability to provide significant Warfighter advantages if delivered faster" (Defense Acquisition University, 2019). This Middle-Tier approach calls for greater utilization of mechanisms like Other Transaction Authority (OTA) and rapid prototyping to reduce the time necessary to field a given solution to the *User*. There is somewhat of a catch in the OTA concept, though – and the catch is again requirements.

The 2016 legislation states pathways and expectations for both rapid prototyping and rapid fielding. On their faces, the options appear to be refreshing new and lean acquisition approaches. However, as is applicable to our example, in the fielding version, the legislation states, "[t]he objective of an acquisition program under this pathway shall be to begin production within six months and complete fielding within five years of the *development of an approved requirement.* [emphasis added]" (Senate and House of Representatives of the United States of America in Congress assembled, 2105). Interestingly, the October 2018 letter providing interim guidance on the new practice exclude this verbiage, stating "the objective of a rapid fielding program under this pathway is to begin production within six months and complete fielding within five years. A six-month and five-year limit for entering production and completing a MTA program will be calculated from the date of the first *obligation of funds* [emphasis added] for a program purpose" (Undersecretary of Defense, Ellen Lord, 2018). One could argue the development of an approved requirement and the obligation of funds for a program are not quite the same thing – and in fact could be quite different – and both rely on the requirements phases to be complete before the six-month to five-year clock starts.

In short, the use of these rapid contracting options has tremendous potential but is still hamstrung by the requirements process when considering technology-based programs. That is, the "rapid" component does not necessarily improve the timelines initiated in the requirements process, though it does speed up everything after that point. A recent example demonstrates some of these improvements, but also some of the ongoing challenges surrounding requirements.

In the summers of 2017 and 2018 the United States Air Force conducted OTA-fueled experiments at Holloman Air Force Base near Alamogordo, New Mexico. The Light Attack Experiments (LAE), run by the Air Force Research Laboratory (AFRL) under Air Force Materiel Command (AFMC) brought industry together in an atypical and collaborative way to explore the potential value of light attack aircraft to address combat operations in low-threat environments. In particular, the hope was that such aircraft might be able to reduce demand on more expensive aircraft such that those aircraft could focus on preparation for potential combat with near-peer adversaries – for which they were specifically designed.

LAE 2017. Image courtesy of DVIDS. The appearance of U.S. Department of Defense (DoD) visual information does not imply or constitute DoD endorsement.

The collaborative process allowed industry and government representatives to not only share the financial burden of the experiments, but also empowered program and contracts teams on both sides to make decisions at lower levels than typical. Pilots, mechanics, logisticians, and other program team members from both government and industry worked together to establish training programs, support plans, and even technical requirements. As a result of these innovations, tight bonds were formed between the various industry and government participants, and overall the experiments were considered to be highly successful.

The advancement of the light attack experiments into a procurement ultimately has not yet come to fruition in favor of continued experimentation. However, the program did develop draft requests for proposals, and it was at this point, significant time went into refining the requirements as different commands sparred over what technology should be in the aircraft. The USAF expects to procure light attack assets in the 2022-2024 timeframe (Insinna, 2019). It will be at this point where the speed and innovation achieved in the experiments will then have suffered from the requirements lag, i.e. will the new requirements be based on the technologies demonstrated in 2017 and 2018 still be relevant in 2022, over three technology cycles later?

This is where new methodologies tend to fall short of reality. Working with prototypes and advancing the knowledge base of the *User* has tremendous benefit by showcasing technology. However, if the same speed cannot be translated into the actual procurement of the *need*-solving technology, then the value of speed to capability is lost.

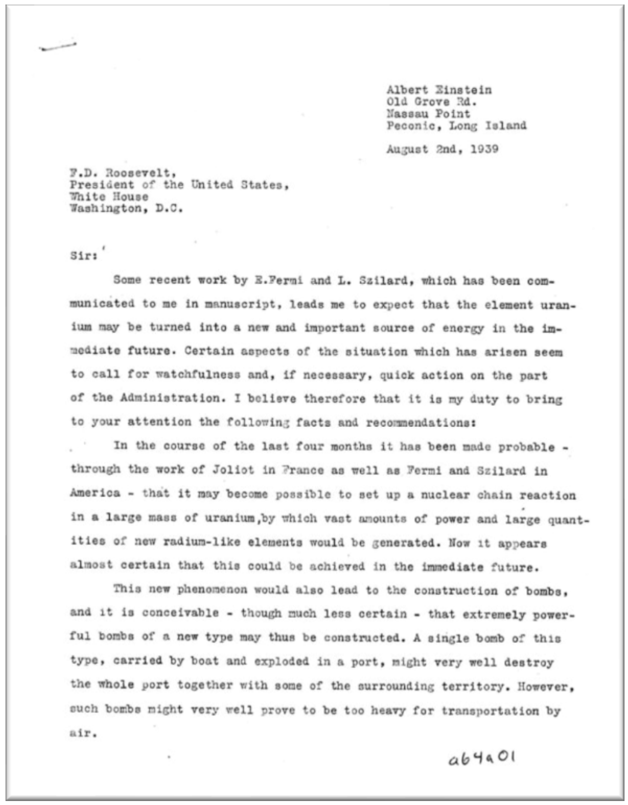
The relationships may dissolve as personnel shift to other programs and industry moves forward with its own motivators of relevancy in the interim.

Looking at our example program once again, it is easy to see the perils if such a timeline applied to our VR training system. Between when the RFIs for the project first came out and when the devices actually became available to the *User,* the technology would not merely have become legacy, it would be downright obsolete! History provides some context to this concept as well, and programs like the Manhattan Project and space programs provide interesting perspectives on collaboration and innovation where the stakes were much higher.

A SELECTIVE HISTORY OF COLLABORATION

The Manhattan Project, the project to develop the first U.S. nuclear weapons, was no small undertaking, and the work accomplished between 1939 and the first use of the weapons in 1945 was extensive. Much of the work in earnest began after a letter from Albert Einstein to then President Roosevelt. Importantly, our discussion of the work surrounding the first nuclear weapons needs to focus on the period between late 1941 and the use of the weapons in 1945. Prior to that time, nuclear bombs as a broader topic was primarily a scientific discussion, and only after President Roosevelt approved funding the construction of a weapon on December 28, 1942 did the formality of a military acquisition program take shape (Gosling, 1999).

Rather than detail the history of the project and its impact on geopolitics and warfare at large, we need to look at the timeline and the necessary haste implied by it. The United States considered that it was necessary to move quickly to develop nuclear weapons technology because of a concern that their primary adversary, Germany, was doing likewise (The Manhattan Project, 2017). In other words, the necessity originated in the fear that an adversary, who posed an existential threat to the United States, might obtain a capability sooner, and this was not acceptable. In order to combat this possibility, speed was not just necessary, it was imperative.



Albert Einstein
Old Grove Rd.
Nassau Point
Peconic, Long Island

August 2nd, 1939

F.D. Roosevelt,
President of the United States,
White House
Washington, D.C.

Sir:

Some recent work by E.Fermi and L. Szilard, which has been communicated to me in manuscript, leads me to expect that the element uranium may be turned into a new and important source of energy in the immediate future. Certain aspects of the situation which has arisen seem to call for watchfulness and, if necessary, quick action on the part of the Administration. I believe therefore that it is my duty to bring to your attention the following facts and recommendations:

In the course of the last four months it has been made probable - through the work of Joliot in France as well as Fermi and Szilard in America - that it may become possible to set up a nuclear chain reaction in a large mass of uranium,by which vast amounts of power and large quantities of new radium-like elements would be generated. Now it appears almost certain that this could be achieved in the immediate future.

This new phenomenon would also lead to the construction of bombs, and it is conceivable - though much less certain - that extremely powerful bombs of a new type may thus be constructed. A single bomb of this type, carried by boat and exploded in a port, might very well destroy the whole port together with some of the surrounding territory. However, such bombs might very well prove to be too heavy for transportation by air.

a64a01

Excerpt from Einstein's 1939 Letter to President Roosevelt

Numerous industrial, scientific, and government agencies worked on the project. In particular, DuPont was a key partner in the effort. Having forged a relationship with the US Government as a gunpowder supplier, DuPont was able to assist with plutonium production in Oak Ridge, Tennessee and Hanford, Washington (Wilmington, DE, 2019). They, amongst other industry partners, shared the difficult task of realizing the *vision* of achieving a nuclear capability, rather than simply chasing a requirement set. In this case, the *need* was to counter an existential threat – there was no time to develop the specifics of how to do that before beginning the work to achieve it. Between the first authorizations and funding in 1939 to the employment of the first weapons in 1945 the timeline to understand, create, test, and field a nuclear weapon, therefore, was effectively around six years. It was exceptionally complex scientific work, on a barely-understood technology, and with no computers. Again, collaborative work was critical for what was perceived as survival. It is reasonable to apply a similar logic to modern times.

Currently, there is a specific intention to re-focus on near-peer competitors in the strategic military environment. The 2018 National Defense Strategy (NDS) clearly outlines that "[i]nter-state strategic competition, not terrorism, is now the primary concern in U.S. national security" and further that "we must make difficult choices and prioritize what is most important to field a lethal, resilient, and rapidly adapting Joint Force" (Mattis, 2018). The war on terrorism, spanning two decades, has not typically been considered as a response to an existential threat to the United States, although this might be arguably true for other nations we protect. However, within the NDS, there is a clear expectation that such a threat may be looming. The "rapidly adapting" aspect of the above is directly tied to the point of this paper. Technology does not wait for the process, it advances at its own pace. In order to adapt rapidly, we must learn to stay ahead of that pace. Various space programs over the last several years also operate in this global environment, from an economic and business standpoint, and show how industry in the absence of government programs advances.

In the past several years, and with the increased reliance on data-provision services, there have been growing demands for space-based infrastructure supporting global communications. As a result, a number of private companies willing to undertake what had previously, and almost exclusively, been government work surfaced. That is, the concept of commercial space companies is relatively new. The technology behind launch, control, and in some cases recovery of space vehicles has advanced to a point where businesses are able to be credible and profitable at this endeavor. In the past, space was the business of governments, and in particular those governments of first world nations with both the technology and resources – including major contractors funded by governments – to conquer it.

A SpaceX Falcon rocket returning to an autonomous landing on the drone ship "Of Course I Still Love You" – © SpaceX

Now, SpaceX, Blue Origin, Sierra Nevada and others are privately able to secure both government *and* private funding to support their efforts. As a result, and as it pertains to our conversation here, the advances necessary to increase the efficiency of and thereby decrease the cost of space access are driven by competition, not a specific set of requirements. Requirements certainly exist, for example, payload capacities, orbital positioning capabilities, etc. However, the driving factor is the industry desire to be able to do more than the competition, and thus win more contracts. To do so requires the company to invest in its own competitiveness by staying abreast or ahead of current applicable technologies and deliver to a broad set of potential customers, not just those of a single government or specific acquisition. For example, the use of reusable space launch capabilities enables cost efficiencies which, while less of a consideration in traditional government-funded space activity, enable cost savings and re-launch options highly valuable to the launching company.

This logic is not at all different from the situation stemming from the hypothetical example presented earlier. A company capable of providing augmented reality solutions might rather achieve an understanding of a customer's vision, translate that vision into a collection of possible solutions, and therefore offer capabilities in a more timely and effective way. It is a matter of teaming with the customer and sharing in a philosophy that speaks to a vision. It is not telling industry to "meet these specifications" as much as it is to say, "you are experts in this area, what should we do here to solve our *need*?" There is a means of combining the effectiveness of new contracting methods like other transaction authorities (OTA), cooperative research and development agreements (CRADAs) and rapid fielding acquisition in a meaningful and effective way. However, to do so requires the dispatching of a few paradigms, understanding the role of risk, and creation of a new holistic approach.

THE BRAVE NEW WORLD

The concept of industry attempting to sway the requirements of a program one way or the other in its early stages is not new. For example, prior to the issuance of a request for information (RFI), sources sought solicitation, or other exploratory device, governments will often entertain visits by industry to propose their wares in informal office calls with acquisition offices or at trade shows such as mentioned early on. However, these efforts, taken on by industry are often analogous to semi-blindly throwing darts at a dart board and hoping one finds its way close to the bullseye. That is, companies try to guess what requirements might be brewing and brief what they think might be interesting to the *User.* As these visits fall outside of the processes of the formal acquisition system, they seldom gain much ground for industry, who therefore must sit by the wayside waiting for the next RFI, etc. to surface. Once RFIs do come out as a rough presentation of a *need,* the responses to them are partly guesses at what the requirements might eventually be and part an attempt to convince the customer the solution desired should be "shaped" to look an awful lot like a product a respondent happens to make.

Taken to an even greater extreme, when larger programs are under consideration, it is not uncommon for larger industry to invoke powerhouses of lobbying groups, congressional delegations, high-ranking retired officers, and other instruments of industrial power to *sway* the customer to consider a particular solution over another. In such cases, this too can result in a glossing over of the actual *vision* in favor of an existing product, or even a product which happens to be built in a particular district. It is not an attempt to be devious – it's just business! It is a mechanism to increase a given company's "P-win" or probability that when the requirements finally come out, that a given product happens to look more like the desired solution than another company's product. While this is a pragmatic approach, it does not always work in the favor of the most important part of the whole system, the *User*.

There is also the process of entering into cooperative research and development agreements, or CRADAs. This is essentially a teaming of resources between the government and industry to research advanced capabilities. CRADAs are extremely valuable in the grand scheme as they at least provide some insight into the technical viability of a *vision* in its early stages. However, there is no specific tie to a potential acquisition unless a participant in the partnership is so persuasive that the customer ultimately creates an acquisition shaped by the partner – a situation specifically avoided within the language of the agreement. The processes above share a common motive, another component of programmatic success and business profitability – risk reduction.

RISK

Risk comes in many forms. On the customer's side, the risk resides in the trust instilled by the taxpayer that their taxes will be well spent on the right solutions – programmatic success. If the *need* is not fully met, more money will have to be spent, which translates into lost voter confidence in politicians, which translates into swings in policy, sometimes at the national level. Accepting this risk is a political/military gamble which has, over the decades, likely created the very dense bureaucracy at the heart of the problem.

There is also the obvious risk of a given company's solution not meeting the requirements and therefore not winning a given contract. For larger publicly traded companies, this puts at risk the value of the company's stock, trust of the board of directors, the stockholders, and the employees themselves. For smaller companies, it could well mean risking that company's very survival. Accepting this risk is a financial gamble based on sound research and the advice of knowledgeable experts in the field.

Lastly, and most importantly is the risk to the *User.* As we discovered very early on, the *User* has a *need*, which if not met, could simply mean frustration or worse, a life-or-death impact to the ability to accomplish a mission. Accepting this risk is a personal one for the warfighter who oftentimes has the least overall impact on the process. Arguably, this is the most important of all the risks accepted by any participant in the entire process, and one for which the risk owner should have a controlling vote.

> No-fail approaches "[are] not going to get us where we need to go" in an era of fast-moving competition with America's adversaries. – Maj. Gen. William Cooley

Risk is not comfortable. In recent years, the focus of many new acquisition strategies and policies has been to increase the acceptance of risk at all levels. It is a goal easy to say, and very difficult to actually embody. Per an article in Air Force magazine, "Maj. Gen. William Cooley, head of the Air Force Research Laboratory, said the service has come through a period where Congress and the Pentagon leadership demanded a no-fail approach to system development, which in turn put it 'under scrutiny to have things done in a time-certain' fashion. 'That set the risk rheostat very low,' Cooley said, and in turn put technology development on a slow track. 'That … is not going to get us where we need to go' in an era of fast-moving competition with America's adversaries" (Tirpak, 2019). Fast-moving is key, and the threat presented by the more advanced adversaries rings with a similar chord to the challenges of nuclear development in WWII. If all of those mentioned above are to accept their various risks, there must be a mechanism to reduce risk across the board.

THE SOLUTION – EMPOWERED LEADERS AND VISION-FOCUSED EFFORT

The combination of successful simplification efforts coupled with broader acceptance of risk can produce a synergistic effect when applied to rapid acquisitions. Most importantly, redefining the nature of requirements into *vision* enables a shared approach to realizing the *need* to the benefit of the *User*. See Figure 4 Achieving the Co-Solution below.

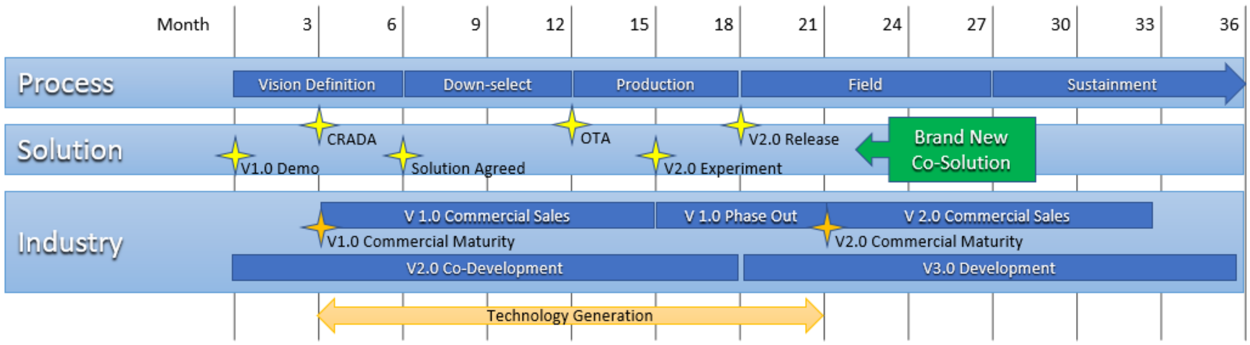


Figure 4 Achieving the Co-Solution

Returning to our example provides a useful means of explaining the hypothetical approach depicted above. If we recall, our *User's need* is an augmented reality means of providing navigational information to pilots in a training aircraft. The times depicted above therefore relate to a commercial technology likely to follow Moore's Law, as it did in Figure 3. More complex programs, perhaps such as the one to acquire the aircraft, could conceivably apply some of the same concepts, though some stages, such as production, would likely be longer.

In this example, the initiation point would once again be the demonstration of a goggle-based device to the *User*. Then, rather than enter a prolonged requirements development and honing process, the *Customer, User,* and industry would develop a preliminary *vision*. It is critical to note that this is a philosophical, conceptual conversation more than a discussion of technical details! It is not an opportunity for industry to sell products, or shape requirements, but rather a roundtable approach to understanding the *need* and how industry might approach it from a forward-looking standpoint. The conversations may include approaches by different companies with existing versions of technology applicable to the *vision*. In our example, let us say the *User* indicates a preference for a monocle-based solution.

During this process, those companies able to offer solutions – monocles – enter into CRADAs with the *Customer,* perhaps even partnering where applicable. These programs, partially or largely funded by the *Customer,* provide opportunities to refine the achievability of the *vision* as a parallel effort by industry, and in collaboration at all steps with the *User*. All parties drive toward a common solution while agreeing on matters of intellectual property rights, exportability, etc. At this point, the technology is not based on technical requirements, per se, but rather on the approach to achieving the solution. Once agreement is reached on the solution, really a co-solution, as it has been collaborative, the *Customer* identifies, using data gathered through use of the CRADA(s), which company or companies are capable of being successful in meeting the *need*.

In our example, makers of military helmets partner with makers of monocle-based projection systems and continue with the process. Accordingly, the new effort is effectively now a co-development of the second version of the applicable technologies because adherence to requirements has not forced otherwise. While this phase will utilize some aspects of the traditional acquisition system, the primary difference is that the focus has been on the result and not on pre-defined requirements.

The end of the down-select process is the issuance of an Other Transaction Authority (OTA) contract to remaining participants to develop prototypes of the agreed upon approach to the solution. The participants will then demonstrate the prototypes in an experiment. Again, there is acceptance of risk at this phase by each participant. For industry, the risk of their product not meeting the *need* is balanced by the reward of having accomplished development funded to some degree by the *Customer* and with considerable input by the *User*. They, in the absence of locked requirements, have been able to continually make small technology changes both to the advantage of the solution and not necessarily at increased cost, which reduces their risk in the commercial market. For the *Customer,* the risk of spending tax funds is offset by the fact industry is participating in the cost. The *User* must accept the risk that shifting priorities or other matters could cause interruption to the overall project at any time – this is no different than the real-world process now in place, though. In these phases, the *User* will also have had to accept risks involving airworthiness and other technical hurdles which would otherwise greatly prolong typical efforts.

At the end of the experimentation phase, the *Customer* has substantial data from the CRADA and experimentation to place orders under rapid acquisition authorities to purchase and field the new device – or even devices – from one or more of the participating companies. The *User* has confidence, having been part of every step to this point, their *need* will be satisfied by the now thoroughly vetted solution. The companies have gained credibility and funding valuable to their commercial markets, and all along, the *vision* was the guiding principle, not the requirements.

Now, with contract in hand, the partnered industry team or teams can finalize their product and begin producing and delivering it to the field, or to the commercial market, having been able to utilize knowledge gained to keep pace with their industry. They are free to do so from an intellectual property perspective, having agreed to as much in the CRADA early in the process. The *Customer* now has options from which to choose. Now in production, the monocle displays enter the capability set of the warfighter, at or ahead of technology available commercially.

SUMMARY

The defense acquisition system is a complex and risk-averse construct which, despite many efforts to add efficiency and speed, makes it difficult to field technology to the warfighter in reasonable timelines. The system, based heavily on the development of and adherence to overly-specific requirements causes eventual solutions to be fielded which have not kept pace with the forward march of technology, and are oftentimes legacy in nature, despite being "new" equipment. In recent years, Congress and military leaders have made attempts to shorten the acquisition process and have enabled mechanisms to shorten aspects of the timeline. In fact, experiments like the Light Attack Experiment (LAE) showcased the potential power of these new authorizations, but no program yet has been able to overcome the requirements burden and actually field new technology with relative speed. History would suggest existential threats are motivators to collaborative approaches to improvements in the system, and logically so. In the increasingly competitive global environment, and given a new focus on near-peer competitors, the pressure is rising to keep pace with or exceed their capabilities. Likewise, industry has shown they are willing to invest in solutions which enable their businesses to grow in a similarly aggressive economy. By limiting the anchoring effect of protracted requirements generation and by empowering industry and their government partners to work together to achieve a common vision, solutions can reach the warfighter faster, and in doing so, more effectively position us to win the future fight.

REFERENCES

Defense Acquisition University. (2019, February 13). *Defense Acquisition life Cycle Compliance Baseline (Pre-Tailoring).* Retrieved from Defense Acquisition University: www.dau.mil/tools/t/ILC

Department of Defense. (2017, August 10). DoD Instruction 5000.02. *Operation of the Defense Acquisition System, Change 3*, 3. Retrieved from https://www.esd.whs.mil/Portals/54/Documents/DD/issuances/dodi/500002_dodi_2015.pdf

Gosling, F. G. (1999, January). *The Manhattan Project: Making the Atomic Bomb.* Retrieved from DOE/MA-0001; History Division, Department of Energy: https://www.osti.gov/opennet/manhattan-project-history/publications/DE99001330.pdf

Insinna, V. (2019, March 13). *Air Force to buy handful of light-attack planes, but will a bigger program follow?* Retrieved from DefenseNews.com: https://www.defensenews.com/smr/federal-budget/2019/03/13/air-force-to-buy-handful-of-light-attack-planes-but-will-a-bigger-program-follow/

Kanellos, M. (2003, February 11). *Moore's Law to Roll On for Another Decade.* Retrieved from c|net: https://www.cnet.com/news/moores-law-to-roll-on-for-another-decade/

Mattis, J. (2018). *Summary of the 2018 National Defense Strategy of The United States of America.* Retrieved from Defense.gov: https://dod.defense.gov/Portals/1/Documents/pubs/2018-National-Defense-Strategy-Summary.pdf

Senate and House of Representatives of the United States of America in Congress assembled. (2105, November 25). National Defense Authorization Act for Fiscal Year 2016. Washington, D.C., United States.

The Manhattan Project. (2017, May 12). Retrieved from Atomic Heritage Foundation: https://www.atomicheritage.org/history/manhattan-project

Tirpak, J. A. (2019, March 4). *The Speed of Risk: Industry Chiefs Ready to e Challenged*. Retrieved from airforcemag.com: http://airforcemag.com/Features/Pages/2019/March%202019/The-Speed-of-Risk-Industry-Chiefs-Ready-to-be-Challenged.aspx

Undersecretary of Defense, Ellen Lord. (2018, October 9). Middle Tier of Acquisition (Rapid Prototyping/Rapid Fielding) Interim Governance. Washington, D.C., United States.

Wilmington, DE. (2019). Retrieved from Atomic Heritage Foundation: https://www.atomicheritage.org/location/wilmington-de-0