SENIOR SERVICE COLLEGE FELLOWSHIP RESEARCH PAPER

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IMPROVING RISK MANAGEMENT IN AN EVOLUTIONARY ACQUISITION ENVIRONMENT

BY

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Improving Risk Management in an Evolutionary Acquisition Environment

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ABSTRACT

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In October 2000, DoD made a significant change to its Defense Acquisition System by establishing a policy making evolutionary acquisition strategy the preferred approach to satisfying operational needs. This change was precipitated through the realization that the traditional approach was not integrating new technology into weapon systems rapidly enough. Given the current rapid technological changes, the traditional approach to acquiring and fielding warfighter capabilities often exceeds cost projections, are dated when they arrived on the battlefield, and lacks interoperability and flexibility. This paper argues for accelerating the implementation and use of the evolutionary acquisition approach to facilitate Army transformation and maintain a technological advantage over future adversaries. Secondly, the paper explores the program risk management implications of accelerating the use of evolutionary acquisition strategies. Finally, the author provides recommendations for improving program risk management through better integration of the Defense Contract Management Agency's supplier risk management activities into the program management office's overall risk management process.

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Introduction

The Army is in the process of a sweeping revolution not seen since the Second World War. The foundation for the new revolution in military affairs is a shift from producing and employing individual platforms or systems to integration of all platforms and systems into a single networked grid that continuously considers changing circumstances and facilitates its own success or survival.[1] This so-called "System of Systems" concept is driving the development and design of the Army's Objective Force.

The Army envisions its Objective Force to be an offensively oriented, combined arms, and multi-dimensional maneuver force that will employ revolutionary operational concepts – enabled by new technology.[2] The Army is relying on weapons technology breakthroughs to provide greater tactical, operational, and strategic lethality from smaller, more agile forces. In addition, the Army expects advanced technologies to play a crucial role in achieving situational dominance and decision-making momentum, which will create a new construct for the application of force.[3] The Army's vision is to leverage state-of-art technology to create network-centric systems that will enable commanders to dominate the battlefield through better control, situational awareness, and enhanced abilities to target and engage the enemy seamlessly with the most efficient and effective weapons systems available.

The problem is that the Army, and the Department of Defense (DoD) in general take too long to incorporate advanced technologies into weapon systems using the traditional program model structure. This is especially true in the information technologies area where commercial market demand is driving significant innovations that are desperately needed to successfully implement the Objective Force's "System of Systems" concept. Clearly, the Army and DoD must change the way business is done to achieve Objective Force goals.

This paper argues for accelerating the use of the evolutionary approach to facilitate Army transformation and maintain a technological advantage over future adversaries. Secondly, the paper explores the program risk management implications of accelerating the use of evolutionary acquisition strategies. Finally, the author provides recommendations for improving program risk management through better integration of the Defense Contract Management Agency's (DCMA) supplier risk management activities into the program management office's overall risk management process.

It should be noted that the target audience for this paper is DoD program managers and DCMA commanders. The intent of this paper is to convince them that evolutionary acquisition strategies will force changes in the way they do business, and one of those areas of change is risk management. To be successful in the future, both parties will need to search for ways to leverage the skills and resources that each "brings to the table" to reduce program risk and achieve the Army's transformation objectives. The author's recommendations provide a top level starting point to begin this search.

Accelerating the Use of Evolutionary Acquisitions

Program Structure Models

DoD Directive 5000.2 requires a program manager to develop an acquisition strategy in the process of acquiring a new weapon system. An acquisition strategy is a business and technical management approach designed to achieve program objectives within specified resource constraints.4 The DoD Deskbook defines program structure to mean "the phases and milestone decision points established for a program." Phases and milestone decision points facilitate the orderly translation of broadly stated mission needs into system-specific performance requirements and a stable design that can be produced efficiently. Program structure provides the context within which a system is designed, developed, and deployed during its life cycle. The program structure is a fundamental

building block of the program's acquisition strategy.[5] The decision to use a particular program structure is one of the most important decisions a program manager will make; it will have a lasting impact on the program throughout its life cycle.

Government and commercial program managers use one of six basic types of program structure models to achieve their program objectives. The two least used are the *vee* and *spiral* program structure models. The DoD Deskbook describes four program structure models routinely used by the Department of Defense: *grand design*, *incremental*, *evolutionary*, and *traditional*. These six models are briefly described below.

The vee model, which has a V-shaped flow, was introduced to focus attention on the need to consider test or verification issues at each phase of production development. Initial phases of the vee model define the need and how to test on the left-hand leg of the vee, whereas the later phases of the vee (upward right-hand leg) implement these tests.[6]

The spiral life cycle model reflects the underlying concept that each cycle involves a progression that addresses the same sequence of steps, for each portion of the product and for each of its levels of elaboration, from an overall concept of operational document down to the coding of each individual program.[7]

The grand design model is characterized by acquisition, development, and deployment of the total operational capability in a single increment. The required operational capability can be clearly defined and further enhancement is not foreseen to be necessary. The grand design model is most appropriate when the user requirements are well understood, supported by precedent, easily defined, and an assessment of other considerations indicates that a phased approach is not required.

The incremental model is generally characterized by acquisition, development, and deployment of capability through a number of clearly defined system "increments" that stand on their own. An incremental model is most appropriate when the user requirements are well understood and easily defined, but an assessment of other

considerations indicates a phased approach is more prudent or beneficial. Systems that have Pre-Planned Product Improvement (P3I) are good examples of this model.

The evolutionary model is characterized by the design, development, and deployment of a preliminary capability using current technology that includes provisions for the evolutionary addition of future capabilities as requirements are further defined and technologies mature. Evolutionary Defense Acquisition (EDA) combines and collapses Engineering Manufacturing and Development (EMD) and Production phases through maximizing the use of proven state-of-the-art technology and concentrating on manufacturing concurrent with design development.

The EDA strategy differs from the incremental program strategy in that the total functional capability is not completely defined at inception, but evolves as the system is built. Evolutionary developments are particularly suited to situations where, although the general scope of the program is known and a basic core of user operational characteristics can be defined, detailed system or operational requirements are difficult to articulate.

The DoD traditional model could be characterized as akin to the waterfall model with very defined phases and milestone approvals that must be accomplished prior to moving on to the next phase. Figure 1 is the traditional program structure model depicted in DoD Directive 5000.1 prior to October 2000. This model represents the Department of Defense's typical approach to major acquisition development programs.[8]

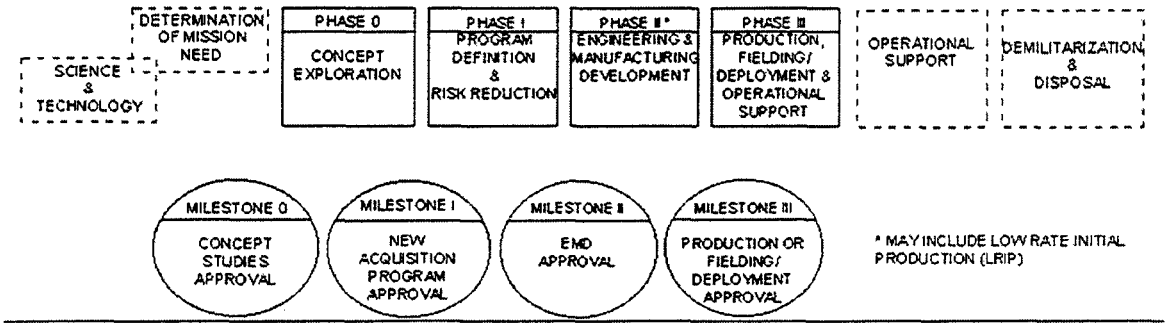

Figure 1. DoD Traditional Program Structure Model Before October 2000

Giving Preference to an Evolutionary Acquisition Approach

The Defense Acquisition System establishes a management process to translate user needs and technological opportunities into reliable and sustainable systems that provide that capability to the user.[9] Changes to the Defense Acquisition System are implemented through policy and principles stated in DoD Directive 5000.

In October 2000, a major revision was made to DoD Directive 5000 giving preference to evolutionary acquisitions over the traditional acquisition model. Figure 2 depicts the new evolutionary program structure model. The major reason cited in DoD Directive 5000.2 for the change was to ensure that the Defense Acquisition System provides useful military capability to the operational user as rapidly as possible. To accomplish this, the Department of Defense stated that evolutionary acquisition strategies shall be the preferred approach to satisfying operational needs.[10]

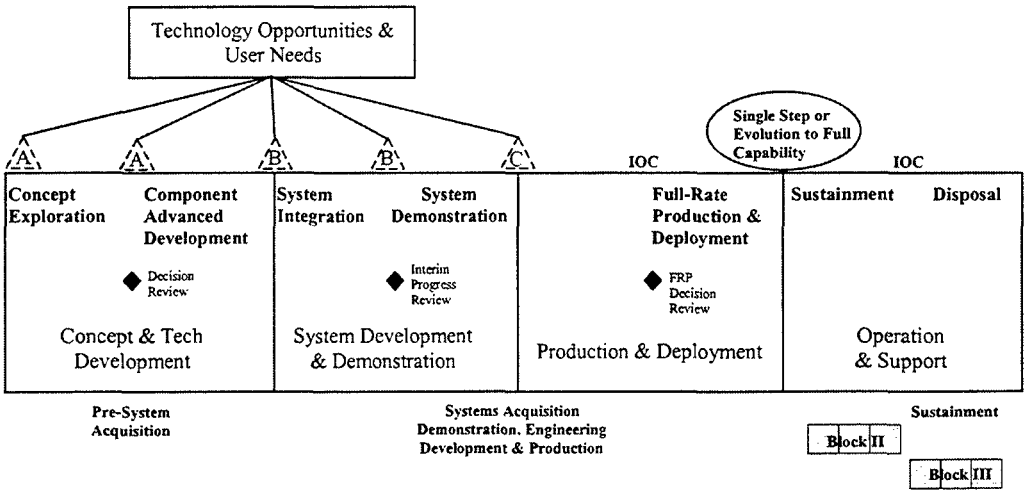

Figure 2. Defense Acquisition Model as of October 2000

Implementing Evolutionary Defense Acquisitions

In DoD Directive 5000.1, five broad policy categories (shown below) are stated. Two of the five categories (bolded) relate directly to implementing an evolutionary approach to weapons system acquisition.

- Achieving Interoperability
- **Rapid and Effective Transition From Science and Technology**
- **Rapid and Effective Transition from Acquisition to Deployment and Fielding**
- Integrated and Effective Operational Support
- Effective Management

Rapid and Effective Transition from Science and Technology. Under this policy category, DoD directs the science and technology executives to encourage the use of initiatives to accelerate the transition from the science and technology base to useful military products. Initiatives such as users stating time-phased requirements instead of "end state" requirements, and program managers specifying operational requirements in an incremental manner will facilitate an evolutionary approach to acquiring capabilities. In addition, this policy category encourages the use of performance-based acquisitions to maximize competition enabling greater flexibility to capitalize on commercial technologies.

Rapid and Effective Transition from Acquisition to Deployment and Fielding. This policy category directs DoD acquisition professionals to give preference to evolutionary acquisition strategies in satisfying operational requirements. To facilitate evolutionary acquisition, it directs program mangers to use appropriate enabling tools, including a modular open systems approach to ensure the latest technologies and products, and facilitate affordable and supportable modernization of field assets.

The Need to Accelerate Evolutionary Acquisitions

The primary reason for DoD giving preference to an evolutionary acquisition approach is that the traditional acquisition methodology does not support the Army's concept of rapidly integrating state-of-the-art technology into weapon systems. The traditional process of acquiring weapon systems results in fielding warfighter capabilities that often exceed cost projections, are dated when they arrive on the battlefield, and lack interoperability and flexibility.[11] To be sure, the frenetic pace of technological change in the modern world has compressed the interval and stretched the amplitude of change.[12] The pace of commercial technology advancement in many sectors exceeds government sponsored technology efforts.[13] Current commercial development cycle times are less than 3-4 years versus DoD sponsored 8-10 years. It is clear the traditional DoD acquisition model cannot assimilate the technological changes into weapon systems fast enough to ensure that U.S. soldiers maintain technological overmatch against their adversaries. An evolutionary approach to weapon systems development acknowledges the difficulty in predicting future technology advancements as well as future warfighter requirements 10 to 15 years into the future. For this reason, DoD Directive 5000.2 was changed to accelerate the incorporation of commercial technology and shorten the acquisition cycle by adopting an evolutionary approach to weapon system development.

To the Army's credit, it recently reorganized its Science and Technology (S&T) program to speed up and improve the integration of new technology into Army weapon systems.[14] However, it is unlikely that the DoD will greatly influence the majority of future technological advances, particularly in the area of information technology, on which the "System of Systems" concept will rely. In this area, commercial sector technological advancements will outpace the developmental efforts of the DoD.

Getting state-of-the-art technology integrated quickly into the Army's new network-centric systems is a formidable task, but keeping the systems current with modern

technology is the real challenge. The evolutionary concept of adding capability using mature technology through block upgrades is the best way to address the changing needs of our warfighters, which today are dictated by an uncertain enemy and an unclear picture of what future capabilities new technologies may bring.

There are two other very important reasons to accelerate the use of an evolutionary acquisition approach for weapons systems procurements. First, an evolutionary methodology is essential to increasing the number of contractors willing to provide goods and services to the military. Secondly, the evolutionary methodology best addresses the problem of parts obsolescence, which is primarily caused by long development cycles characteristic of the traditional acquisition methodology.

There are two markets that exist in our marketplace today: commercial and government. Up until the later part of the twentieth century, the government market dominated the technology marketplace. The government pushed companies through competition and R&D funding to achieve technological breakthroughs, then allowed the companies to commercialize the technology over time. In recent years however, the reductions in the defense budgets coupled with the growing demand for "high-tech" products has made the commercial marketplace more attractive to technology companies. As a result, there has been an alarming decline in the number of major technology companies willing to do business with the DoD on a large scale. The chart below (Figure 3) shows that over the past 25 years, the Defense Industrial base of major DoD technology companies has shrunk from over 30 contractors to 4 today.

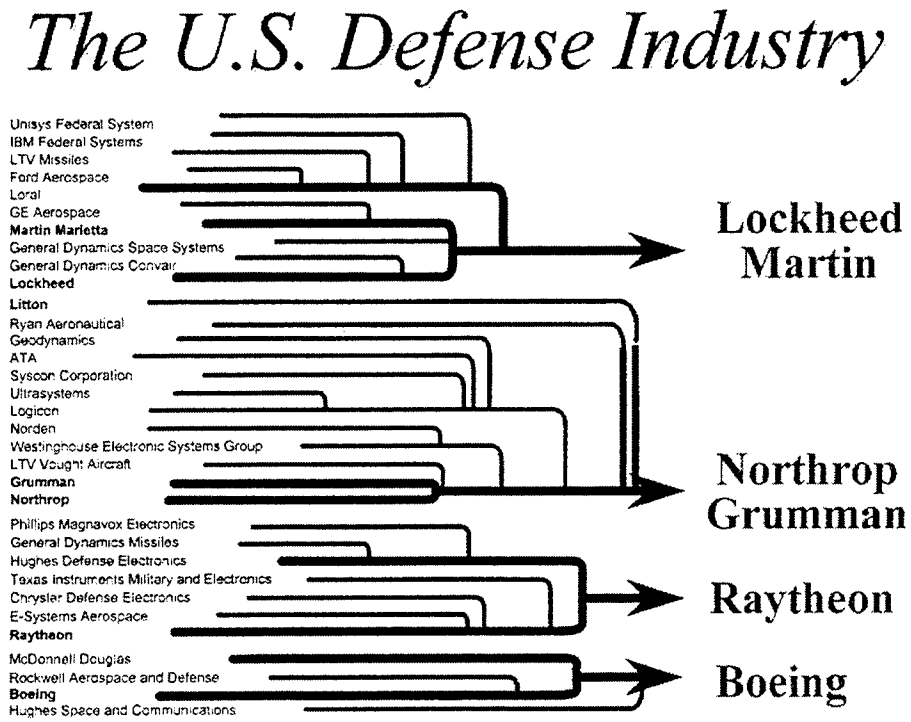

Figure 3. Shrinking DoD Defense Industry[15]

The diminishing U.S. Defense Industry may not be a bad thing. According to John Hamre, "... DoD wants nothing less than to dissolve the infamous 'military-industrial complex' that has existed as a parallel universe to civilian industry since the end of World War II. We don't want a defense industrial base anymore. We just want an American industrial base."[16] While this sounds good, in order to achieve this goal, the military must change its acquisition process so that the government is the receiver of technology currently coming off commercial production lines instead of requiring industry to fabricate specialized weapon system components based on 5-year-old technology that was state-of-the-art during the design phase of the acquisition.

The second reason for accelerating an evolutionary acquisition methodology is to address the parts obsolescence problems afflicting most DoD weapons systems today. The latest high-performance commercial-off-the-shelf (COTS) technologies become obsolete in 18 months or less while weapon systems still have 5 to 10 years in design

cycles and service life spans of 20 to 30 years.[17] The high turnover of technology is not a side effect of COTS but a fact of life in the commercial world.[18] The military's problem is exacerbated by the fact that crucial semi-conductors, transistors, diodes, capacitors, and circuits that keep everything running smoothly are wearing out and many manufactures that use to make them have abandoned the military to focus on the broader consumer market.[19] This problem seems to be getting worse with each passing year. From 1986 to 1996, the percentage of discontinued military/aerospace electronics devices nearly doubled – from 7.5 percent to 13.5 percent.[20]

Parts Obsolescence is a program manager's nightmare. For example: the Air Force's new F-22 Raptor advanced tactical fighter is finally preparing to move into production after more than a decade of development. In the process, its avionics architecture has passed through at least three cycles of obsolescence and relies on an Intel microprocessor that went out of production four years ago.[21] Another example is the Army's M1 tank which has some significant obsolescence issues that may require redesigning the tank to address the problems.[22] A final example is the Army's FireFinder Radar System. In March 2001, the Army was forced to upgrade COTS circuit boards because parts on the old boards were obsolete.[23]

COL Michael Cox, Program Manager for the new Joint Tactical Radio System (JTRS), stated it best when he wrote, "The dramatic pace of advances in communications technology coupled with the military's traditionally long system-acquisition cycles has resulted in technological obsolescence of new systems before they are fielded. Costs have prohibited retrofitting old systems with improved capabilities, resulting in reduced military readiness."[24]

The negative impact on military readiness mandates accelerating the use of evolutionary acquisition strategies. In the long-run, failure to accelerate the use of evolutionary acquisition strategies will mean sending soldiers into harm's way with

obsolete technology, which could cost soldier's lives in addition to the extra time and money to manage the problem. Moreover, the Army's vision of rapidly fielding the Objective Force cannot be achieved without accelerating the implementation and use of evolutionary strategies.

To achieve these benefits however, the Army must aggressively implement the evolutionary acquisition approach. Implementation will require the Army to take advantage of cost-conscious, market-driven, commercial production and leverage the huge investments in leading-edge technologies made by private industry.[25] In addition, the evolutionary approach to weapon system acquisition will require changes in the way program manager's deal with program risks.

Impact of Evolutionary Acquisition on Program Risk Management

Background on Risk Management

Since the beginning of history there has been gambling, the most common form of risk taking. Gambling has mesmerized and intrigued human beings for millennia. Historical records show Egyptians gambling around 3500 BC with a rudimentary dice fabricated from a square-like bone taken from a sheep's ankle.[26] During the crucifixion of Christ, Pontius Pilate's soldiers drew lots for Christ's robe while waiting for him to die.[27] Although mankind has participated in risk-taking events like gambling throughout history, the concept of risk was not understood in the terms known today, rather it was understood as events or outcomes determined by God, gods, or just plain old "lady luck."

The concept of risk developed over thousands of years. Over time, people began to question the role of fate in determining the outcome of events. In 1654, Blaise Pascal and Pierre de Fermat sought to answer the question, how do you split the winnings between two players if a game of chance is stopped before the end of a game? In the process of answering this question, Pascal expressed the fundamental concept of probability

theory.[28] Mathematicians that followed seized upon this idea to develop the law of probability which states the expected values of an outcome are computed by multiplying each possible gain by the number of ways in which it can occur, and then dividing the sum of these products by the total number of cases.[29] Probability is a fundamental concept in modern risk management.

In 1731, Daniel Bernoulli took issue with the premise that risk can only be defined in terms of probability. Bernoulli's hypothesis was that people do not focus merely on the probability of an outcome when making a decision; they also take into consideration the consequences of the probable outcome.[30] Bernoulli pointed out that price and probability are not enough to determine what something is worth. Although the facts are the same for everyone, "the utility ... is dependent on the particular circumstances of the person making the estimate."[31] Essentially, Bernoulli captures the idea of maximizing utility in decision making by balancing the probability of occurrence with the consequences of such occurrence. Bernoulli's idea of utility is an integral part of the Department of Defense's risk management philosophy.

The father of the concept of risk management as an explicit form of practical art is Nobel Laureate Kenneth Arrow.[32] Unlike many mathematicians of his time who believed all uncertainty in the world would eventually be eliminated, Arrow believed that most people overestimate the amount of information that is available to them. While probabilities and statistics can help reduce uncertainty, one is never certain of anything because people / individuals are always ignorant to some degree. Instead of focusing on the quest for perfect knowledge to better determine probabilities or on how observations regress to the mean, Arrow believed that one should accept that nothing is certain and focus on how people make decisions under conditions of uncertainty as well as how they live with the decisions made.[33]

Risk Management and DoD

Pascal, Bernoulli, and Arrow helped develop the concepts and principles underlying modern day risk management. However, it took until the mid 1980s for the concept of risk management to begin to make its way into government as a practice. In 1986, the Government Accounting Office (GAO) developed five criteria considered essential to assessing technical risk. It took another ten years for DoD to develop these concepts into a risk management guide that was published in 1997.

The DoD risk management guide recognizes that risk is inherent in any acquisition program and considers it essential that program managers take appropriate steps to manage and control risk. DoD risk management is defined as the art and science of planning, assessing, and handling future events to ensure favorable outcomes.[34] According to the DoD Risk Management Guide, the DoD approach to risk management is described as:

- **Planned Procedures**. Risk management is planned and systematic.
- **Prospective Assessment.** Potential future problems are considered, not just current problems.
- **Attention to Technical Risk**. There is explicit attention to technical risk.
- **Documentation.** All aspects of the risk management program are recorded and data is maintained.
- **Continual Process.** Risk assessments are made through out the acquisition process; handling activities are continually evaluated and changed if necessary; and critical risk areas are always monitored.

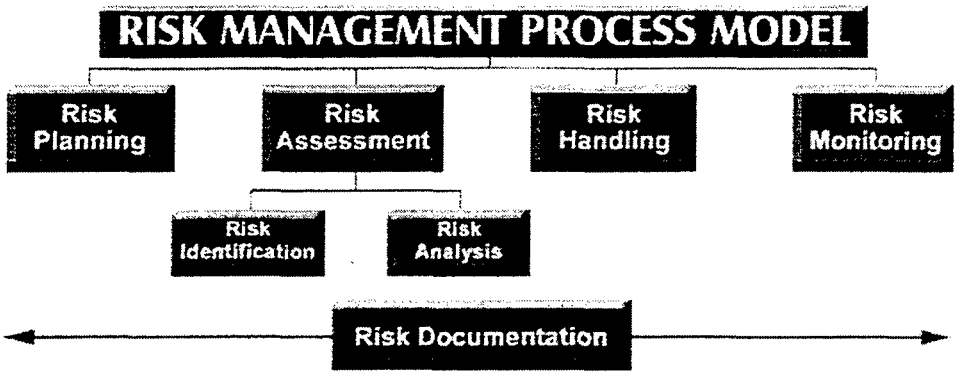

Figure 4. Risk Management Process Model[35]

Figure 4 shows the structure to DoD's risk management process. The risk management process model consists of five major underlying processes, that when used together, enable program offices to manage and control risks. These processes are briefly explained below:

Risk planning is the process of developing and documenting an organized, comprehensive, and interactive strategy and methods for identifying and tracking risk areas, developing risk-handling plans, performing continuous risk assessments to determine how risks have changed, and assigning adequate resources.

Risk assessment is the process of identifying and analyzing program areas and critical technical process risks to increase the probability/likelihood of meeting cost, schedule, and performance objectives. Risk identification is the process of examining the program areas and each critical technical process to identify and document the associated risk. Risk analysis is the process of examining each identified risk area or process to refine the description of the risk, isolating the cause, and determining the effects. It includes risk rating and prioritization in which risk events are defined in terms of their probability of occurrence, severity of consequence/impact, and relationship to other risk areas or processes.

Risk handling is the process that identifies, evaluates, selects, and implements options in order to set risk at acceptable levels given program constraints and objectives. This includes the specifics on what should be done, when it should be accomplished, who is responsible, and associated cost and schedule. Risk handling options include: risk control, risk avoidance, risk assumption, and risk transfer.

Risk monitoring is the process that systematically tracks and evaluates the performance of risk-handling actions against established metrics throughout the acquisition process and develops further risk-handling options, as appropriate. It feeds information back into the other risk management activities of planning, assessment, and handling as shown in Figure 4.

Risk documentation is recording, maintaining, and reporting assessments, handling analysis and plans, and monitoring results. It includes all plans, reports for the program manager and decision authorities, and reporting forms that may be internal to the program management office.

In every human decision or action the question is never one of whether or not to take a risk but rather which risk to choose.[36] In every program, throughout its entire life cycle, program managers are applying Pascal's probabilities and Bernoulli's concept of utility to make decisions under conditions of uncertainty. The DoD Risk Management Guide uses a risk matrix (Figure 5) to graphically show the risk relationship between the likelihood and consequences of an event occurring. An event with a low likelihood of occurrence and an expected minor program consequence would be low risk, whereas an event with a high probability of occurrence and an expected major program consequence would be rated as a high risk event. Program managers are charged with evaluating and balancing the risks and consequences of each decision, and then making it based on the expected value it brings to the Army.

Likelihood	a	b	c	d	e
e	M	M	H	H	H
d	L	M	M	H	H
c	L	L	M	M	H
b	L	L	L	M	M
a	L	L	L	L	M

Consequence

L= Low
M= Moderate
H= High

Figure 5. Risk Matrix

As the Army moves forward to implement evolutionary acquisition strategies to make the Objective Force a reality by the year 2010, program managers must be prepared to deal with these major risk decisions. All acquisition professionals must leverage the proven risk management process that has developed over the 300+ years since Pascal began thinking about risk. Technology continues to drive change in everything we do to include risk management. It is important that current and future program managers understand the impact evolutionary acquisitions will have on their future risk management activities.

Changing the Risk Management Paradigm

Several GAO studies conclude that overly optimistic projections by contractors and program managers are a significant risk factor in programs that use the traditional acquisition model.[37] In March 2001, the Comptroller General stated, "pervasive problems persist regarding the [DoD] process to acquire weapons; cost, schedule, and performance estimates; program affordability; and the use of high-risk acquisition strategies such as acquiring weapons based on optimistic assumptions about the maturity and availability of enabling technologies."[38]

In his book, Effective Risk Management, Edmond Conrow points out that program managers and contractors have an inherent bias towards increasing system performance.[39] This bias greatly exacerbates the maturation risk associated with large complex programs. As a result, program managers spend significant amounts of time and money managing risk on the front end of the program instead of managing the risks closer to the production end of the acquisition. This conclusion is supported by the Defense Manufacturing Council, which concluded in 1998 that the major cause of acquisition problems in DoD is the imbalance between product goals and maturity of engineering and manufacturing processes to achieve the production goals.[40]

Adopting and accelerating the use of an evolutionary acquisition approach should have a significant impact on program risk management. The traditional acquisition approach of a long-term investment and multi-year maturation of new technology into weapon systems lead program managers to concentrate their risk management efforts on the development side of systems acquisition. Evolutionary acquisition models are oriented toward production from the beginning.[41] Therefore, using an evolutionary model to enhance weapon systems through proven commercial technology insertion, in significantly shorter cycle times, will force program managers to intensify their risk management efforts closer to the production end of the acquisition process.

Using an evolutionary acquisition strategy, the focus of program managers should shift towards emphasizing the rapid inculcation of mature technology into weapon systems and the immediate fielding of new or enhanced capability to soldiers. Reducing the cycle time of getting new capabilities out of development and into the hands of soldiers will be a significant factor in determining the success of future program managers. As such, program managers must take appropriate actions to better plan for, monitor, and control program production risks.

Recommendations for Improving Production Risk Management

What can Army acquisition professionals do to improve the overall risk management process given the increased use of evolutionary acquisition strategies and the resulting need to place more emphasis on production risk management? The author believes Army acquisition professionals can do a better job planning for, managing, and controlling production risks by more effectively integrating the Defense Contract Management Agency (DCMA) supplier risk management activities into their programs' overall risk management processes.

In the final portion of this paper, the author will describe the mission of DCMA, the process DCMA uses to perform supplier risk management, and give program managers five specific recommendations for integrating DCMA's supplier risk management process into the program manager's overall risk management process. The author's recommendations are based on his research and observations made of numerous program managers while serving as a DCMA commander over a 36-month period.

Defense Contract Management Agency (DCMA)

DCMA is the Department of Defense contract manager, responsible for ensuring Federal acquisition programs, supplies, and services are delivered on time, within cost, and meet performance requirements. DCMA's mission is to provide customer-focused contract management services - throughout the acquisition life cycle - around the clock, around the world. DCMA's goal is to minimize post-award acquisition problems by helping the buying activities select more capable contractors, identify performance risk, construct more effective solicitations, and develop contracts that are easier to execute.[42]

DCMA performs many functions in support of major defense programs. The agency can coordinate all the technical and business functions for program managers. It also performs surveillance of a contractor's cost and schedule control system using earned value management, as well as examining a contractor's efforts relative to acquisition logistics. DCMA technicians have experience and engineering skills to act as the program manager's independent quality assurance specialist. DCMA technical specialists also know how to control spare parts, conduct nondestructive testing, ensure proper packaging, and help ensure that software development efforts are successful.

Over the past several years, DCMA has radically changed the way it does business. In the past, DCMA developed contractor surveillance plans and used a Performance Based Assessment Model (PBAM) to determine how to allocate resources in support of program management offices. Recently, DCMA has changed from using surveillance plans and the PBAM to an integrated risk management approach to performing the contract management function. The products of the integrated risk management approach are risk handling plans addressing technical and business risks associated with contract requirements at specific supplier locations. Unlike the previous approach, the new integrated risk management approach is focused more on the cost, schedule, and performance objectives of the program. Figure 6 depicts DCMA's supplier risk management approach.

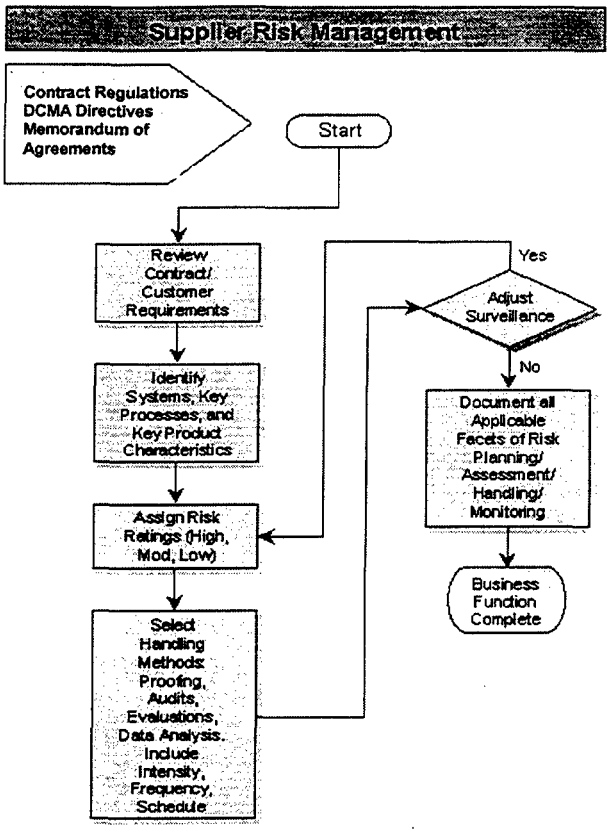

FIGURE 6. Supplier Risk Management Process

A comparison of DCMA's supplier risk management process with the risk management process used by program management offices (Figure 4) reveals that both DCMA and the program management offices use the same basic process for managing risk. The program management offices' risk management process, however, is focused on total program risk, while DCMA's focus is on production related risks. Unfortunately these two processes often run independently of each other until a major problem surfaces that threatens the program's cost, schedule, or performance objectives. Only then will the organizations pull together and integrate the two processes to adequately address the risks facing them.

As noted earlier, evolutionary acquisition strategies are oriented toward production from the beginning. As such, production risk planning should be fully integrated into the program's overall risk management plan at the very start of a program, and it should

continue throughout the program's life cycle. A fully integrated risk management plan will require extreme cooperation and support by all parties involved in the acquisition of the weapon system. Any attempt to implement an aggressive forward-looking risk management program without the involvement of all program management office subordinate organizations will result in confusion, misdirection, and wasted resources.[43]

Program managers should consider their assigned DCMA program support team as a subordinate organization and ensure that they are fully integrated into the risk management process from the beginning to the end of the acquisition life cycle of the program. Below are five recommendations for facilitating this integration effort. These recommendations are not all inclusive, rather, in the opinion of the author, the five areas result in the largest payoff in improving the overall risk management process for the program management office and DCMA.

Early Integration of DCMA Into the Risk Management Planning Process

Even before a contract is awarded, DCMA can assist the program management office in developing a comprehensive risk management strategy through its early contract administration services. Given DCMA's presence in DoD production facilities around the world, few government agencies have the overall perspective of U.S. industrial base capabilities and its associated risks than DCMA. DCMA industrial specialist, engineers, quality control technicians, and contract specialists work daily in every major DoD manufacturing facility. In performing their duties, DCMA specialists acquire a current and detailed understanding of the business and manufacturing processes used in those facilities. They also gain insight into a manufacturers' strengths and weaknesses, and consequently, what the high-risk areas will be during the production phase of an acquisition.

Early integration is crucial to an effective risk management process because both organizations need information from each other to develop and execute an effective risk management plan. To focus risk handling and monitoring efforts, DCMA needs a clear understanding of the program's cost, schedule, and performance objectives, as well as the consequences of not achieving these objectives. The program management office needs a good understanding about the likelihood of production problems so that it can determine the appropriate risk handling options needed to mitigate the risks identified as well as acquire the necessary resources to implement the proposed risk-handling plan.

Unfortunately, rarely are DCMA personnel involved early in the risk management planning process despite the wealth of knowledge they possesses regarding contractors' production capabilities and processes. In fact, according to Mr. Bill Motley, the Director for the Manufacturing Department at the Defense Systems Management College, a recent survey of program managers indicates that many of them do not think about production until their program begins to enter that phase of its life cycle.[44] According the Col. Patrick O'Rielly, the Theater High Altitude Area Defense (THAAD) program manager, applying DCMA expertise to plan for and identify program production risks earlier will result in development of a more accurate and comprehensive overall risk management plan.[45]

Use an Outcome-based Memorandum of Agreement (MOA) to Facilitate Integration

The importance of a good MOA cannot be over-emphasized. The program manager should establish an outcome-based MOA with DCMA that clearly defines the program office's support requirements and expectations. The MOA needs to address program specific risks and processes as well as technical performance areas that are of special concern to the program manager. The MOA should also state the overarching program objectives and goals of the program support team, which will form the basis for the development of the individual risk management plans, focus areas, and activities

necessary to achieve and maintain effective program support. Figure 7 depicts the process and importance for establishing an MOA with a program office.

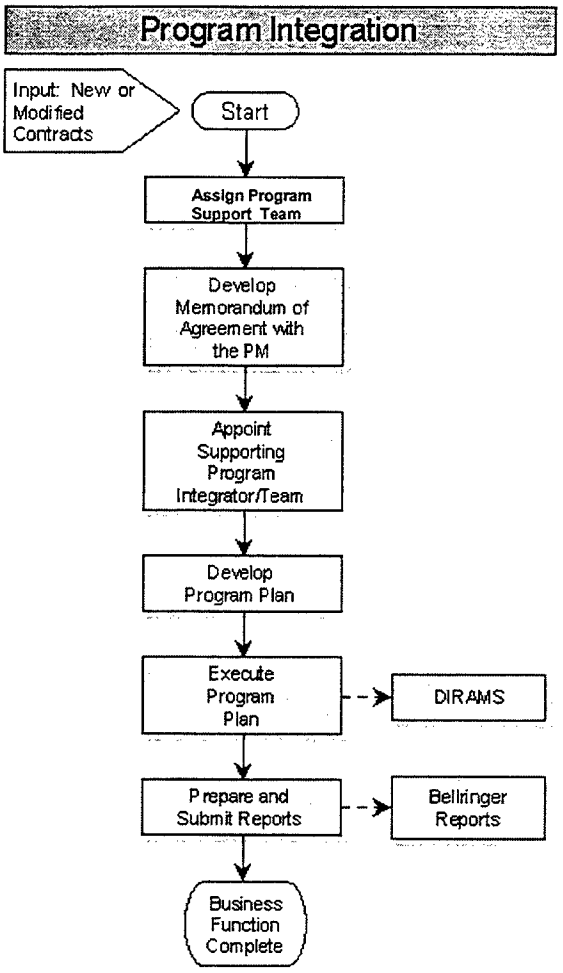

FIGURE 7. Program Integration Policy Process Flow Chart

If the program manager does not take the time to ensure a thorough MOA is established, then DCMA's program plan will be inadequate to address the program manager's real risk concerns. In addition, resources will not be properly focused on outcomes needed for the program to succeed. Since the MOA defines the DCMA resources that will be committed to the program and establishes the type, format, and frequency of communication that will occur between DCMA and the program office, a weak MOA will result in a dysfunctional program support team that is poorly integrated into

the program office's risk management process. All MOA requirements should be fully integrated into the program office's risk management plan.

Integrate the Selection of Key Processes and Key Product Characteristics

As shown in Figure 6, DCMA normally relies on a review of the contract to determine program objectives and customer requirements. From this review, the program support team identifies key processes and product characteristics from which risk handling plans are developed to monitor and control risks. Many times, this plan is developed without any discussion with the program management office. While program objectives can be extracted from a review of the contract, it is extremely difficult to completely ascertain what the program manager's expectations are from only this review.

The author recommends that the program manager meet with the assigned program support team as soon as possible to participate in identifying key processes and product characteristics that will be included in DCMA's risk handling plans. Key processes are those processes which, if not properly controlled, can have a significantly adverse effect on contract performance, schedule, or cost requirements. Agreement and integration into the program office's risk management plan of key processes ensures both parties understand what is important to the success of the program. A firm agreement should also be reached regarding the specific thresholds used to define high, moderate, and low risk ratings. For example, the program office might specify a software simulation test on a piece of hardware as a key process and that one failure will constitute changing the risk rating to high. This understanding makes it clear what is expected and precludes any misunderstanding regarding what constitutes a high-risk situation.

Frequent Joint Reviews to Ensure Continuous Integration

The DoD risk management approach mandates that risk management be a systemic and a continual process. Therefore, the risk management plan must be a "living document" that changes as the likelihood and consequences of events change.

> "Risk management models, methods, and software provide valuable tools for project planning and design, but obtaining the right answer still depends upon specialist expertise. Judgments must be made, in some cases based upon hard data, in others based on sound conventional guidelines. In other cases creative innovation and well-schooled intuition based upon a wide range of relevant experience must be used."[46]

Missed or misconstrued perceptions of the consequences of decisions are of themselves a major, arguably the greatest, source of risk in decision making, and any responsible decision maker will make every effort to obtain a complete and accurate perception of the risks faced before attempting to undertake an analysis and assessment.[47]

For the risk management process to be effective in an evolutionary environment, program managers must routinely get reliable feedback from the people closest to where the product is being produced. For DoD acquisitions, program support team members are the people closest to the production of weapon systems. As such, program managers should routinely conduct joint reviews with the program support team to ensure their perception of the risks and consequences reflect reality, as well as to understand and approve adjustments being made in the intensity of the surveillance activities. The frequency of the review should vary depending on the program manger's risk perception; however, the author recommends at least two joint reviews annually regardless of the risk rating associated with the program.

Integrate Reporting and Documentation Using DCMA's RAMP Program

In 1999, DCMA began deploying a new system to implement its integrated risk management approach to contract management. The Risk Assessment and Management

Program (RAMP) is an online Internet based system that automates the risk management process in DCMA. RAMP serves as an operational risk management tool for the program support team functional specialists. It enables them to independently, as well as interactively, plan, identify, assess, control, monitor, and document the risk management process on a particular program. Key processes necessary to produce and deliver a product are selected in the online RAMP database. Using risk matrices like Figure 8 and the criteria of the likelihood of occurrence and consequences of failure, functional risk ratings are then assigned. RAMP "rolls up" the functional risk assessments and requires the DCMA team leader (GS-13) to review, validate, and assign an overall risk rating to the program.

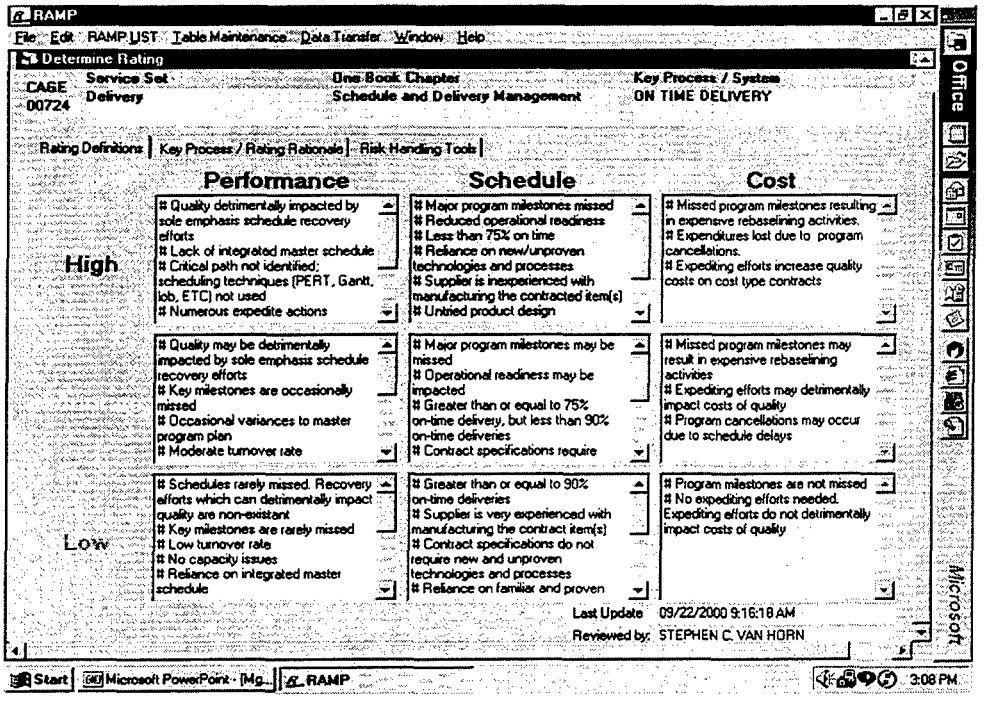

FIGURE 8. RAMP RISK MATRX

The output of RAMP is a risk-handling plan that tells the program manager what the current production related risks are and how the program support team is monitoring and

controlling these risks. The risk-handling plan is produced as an MSWORD® document that can be e-mailed to program management offices for integration into the overall risk management process. Additionally, DCMA plans to allow program management offices access to RAMP information on their program via the Internet.

The DoD Risk Management Guide states, "Program Managers should have a database management system that stores and allows retrieval of risk-related data." The author suggests two things in this area. Firstly, that the program support team be given access to the program management office's risk database system. Secondly, that the RAMP database be integrated into the program manager's risk management database in some manner. Implementation of these two recommendations will go a long way towards integrating the risk management efforts of the program management office with those of the DCMA program support team.

CONCLUSION

Technology is forcing changes in the way the DoD does business. As a senior acquisition general officer stated during a recent discussion with the USAWC Fellows at The University of Texas, "If we don't change the way we do business, we will not be relevant in the future." Acquisition professionals need to take heed of these words and embrace change as a natural and necessary thing. DoD recognized this when it adopted the evolutionary acquisition approach to doing business as the preferred model to acquire weapon systems. There are, however, ramifications to implementing an evolutionary acquisition approach, one being a requirement to focus more on the production end of the business as program managers begin to concentrate on manufacturing concurrent with design development. With this, program managers and DCMA commanders will face new risk management challenges as pressure increases to get new capability into the hands of our soldiers and meet unit set fielding deadlines. While the task is formidable, it is not

insurmountable if everyone in the risk management business works together to identify, assess, handle, monitor, and control risk. This paper recommends, as a starting point, a few ways to better integrate the risk management processes of the program management office and DCMA to meet the risk management challenges ahead.

WORD COUNT: 6,695

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