



Does Anybody Out There Understand the Requirements Process?

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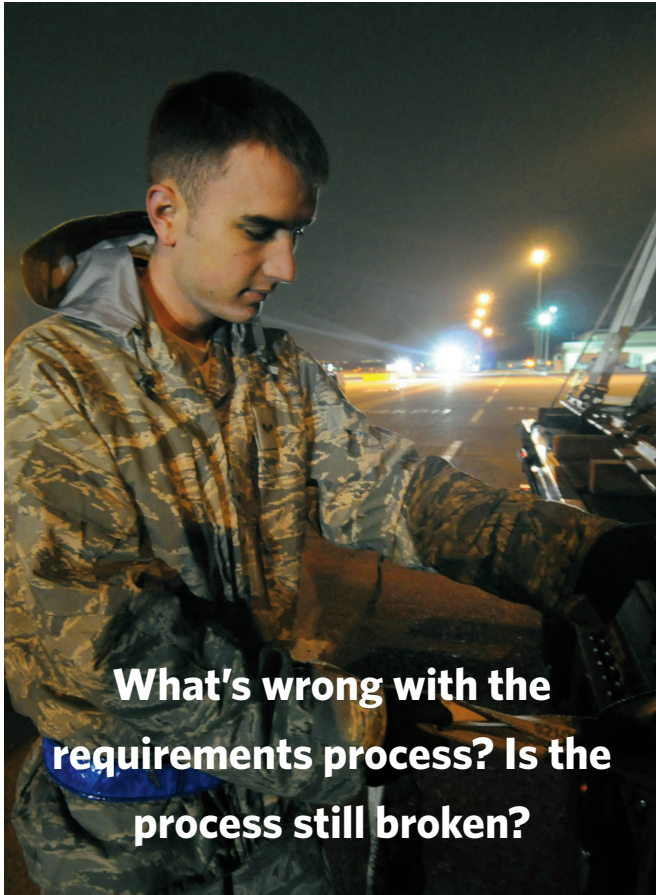
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eginning in 1993, over the course of more than a year, a group of 14 individuals from Air Force Space Command and the Space and Missile Systems Center pursued a charter established by senior Air Force officials. Their primary goal was to determine what was wrong with the requirements process and make recommendations to fix it. In the course of developing recommendations, many experts from the field were invited to present their perspective. Individuals came from the Defense Systems Management College, the Air Force Institute of Technology, the Air Force Office of Aerospace Studies, individual program directors and managers from a number of system program offices, different major command requirements personnel, and even a noted expert and author in space requirements and architecture from the U.S. Air Force Academy. The findings were extensive and, for

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What's wrong with the requirements process? Is the process still broken?

Few people understand the complex nature of the requirements process, resulting in major program problems later on in the acquisition phases.

Where can one go to find (study) the requirements process? Is the process definitively laid out in any documents? If you look into the DoD 5000 series or even the latest AFI 10-6 (or AFPD 10-601), which specifically addresses requirements, there does not appear to be anything called a requirements process. What one will find is something called “evolutionary requirements definition,” which basically states that requirements begin very broadly and are more and more defined as time goes on. Some very top-level requirements-type activities are mentioned (such as the mission area assessment [MAA], also known as “strategy-to-task” analysis), but how one actually accomplishes the tasks is left to the reader—not very edifying. There is also mention of a planning process and an acquisition process, and both seem to contain portions of what one might assume are requirements tasks.

Fortunately, since these observations were noted in the 1994 timeframe, some progress has been made. The old requirements regulation (AFR 57-1) indicated that MAAs were a continuous process. One could assume from that statement that a major command’s planning shop would have a cadre of professionals accomplishing the tasks. The facts were that some major commands had never accomplished a MAA. Since then, some major commands have been putting more resources into upfront requirements analysis such as MAAs, so there appears to be some progress. Nonetheless, in order to determine if anything has changed, shouldn’t DoD’s first focus be on how effective Services are in ensuring that their people understand the process?

Today, many senior leaders are exposing the methodology of retired Lt. Gen. Glenn Kent, director of the Weapons Systems Evaluation Group in the 1970s. His strategies-to-task process appears to have been embraced by much of the Air Force senior leadership, if not by all of DoD, as the way to link national objectives to acquisition programs. Without that linkage, it is argued that the need for new weapons systems cannot be connected to battlefield outcomes and, as a result, will not receive the priority required in the program-planning-budgeting system to obtain funds. Review of the systems under development indicate few systems underwent that or any similar type of approach.

Few people follow the process, even at the macro level, as laid out by regulation.

A frustrating fact is that for those few who understand the process, it is rarely followed. The requirements process starts with taking what is known of national objectives and determining what the military objectives should be. In order to accomplish those objectives, the military has to be able to accomplish specific tasks. That is the MAA pro-

ease of interpretation, were divided into six broad categories: training; documentation; responsibilities/resources; planning and teamwork; customer satisfaction; and modifications, upgrades, and follow-on programs. That study was used as the basis for the comments in this article.

What’s wrong with the requirements process? Is the process still broken? Those questions raised significant problems in the early 1990s and continue to be asked today by people from all military services. The requirements process is inextricably tied to other key questions in the acquisition environment, such as why does it take so long to field systems and why are costs seemingly always much higher than predicted?

I would like to know if any of the problems we saw in the early 1990s have been solved (and whether any of the recommendations have been enacted and are useful). Did the new Joint Capabilities Integration and Development System approved on June 24, 2003, actually improve anything or did the same problems simply get rearranged under new titles? Is the requirements process still broken?

In order to systematically analyze and provide potential solutions to such a complex problem, this article follows a specific format. A problem is asserted, and then is followed up with data, analysis, and, in some cases, recommendations. All of these comments were derived from the Space Command study accomplished in the early 1990s.

cess (strategy-to-task analysis). Commanders determine the objectives each year using a variety of techniques and sources of data, to include the Defense Planning Guidance, which lays out broad objectives for the military. It is the theater commander's (or major command's/combatant commander's) job to translate that guidance into a list of specific tasks. Once a list of tasks is developed, the forces to implement the tasks are determined—called “task to need,” or mission need analysis (MNA). During that phase, operational scenarios are modeled, and computer simulations run using existing and planned forces to meet the objectives of the Defense Planning Guidance.

Those wargaming exercises result in success or failure. Failures result first in changes in tactics, organization, operational concepts, doctrine or training, and non-material solutions. Significant, and hopefully obvious, is the need for a concept of operations, or CONOPs (i.e., how forces are employed and deployed, maintained, operated, pre-positioned, etc.) The very last consideration to resolve a deficiency is a material solution. That requires the writing of a mission need statement (MNS), which, in very broad terms, indicates the mission deficiency. It is not solution-oriented although it may list potential alternatives. All of that information can be found in the regulations (if you look hard enough), so what's the problem? The answer is simple: It is rarely followed. There are many cases in which the MAA, CONOPs, or MNA is not accomplished, but a requirement is identified and a MNS is written! How does that happen?

There are two ways in which a MNS might be written without going through the MAA/MNA process. First, it could be that a new technology has been developed and a user wants to take advantage of it. Secondly, a fielded product may not be performing as previously planned and a substitute must be found. Unfortunately, most MNSes result from technology push, and that causes its own problems.

Technology MNS without linkage to operational objectives and the rigors of the MAA/MNA process results in products that are difficult, if not impossible, to assess in terms of operational suitability. If the mission effectiveness of the end product was not run through the operational scenarios (models and wargames), acquisition personnel won't know how well the system meets the need. That is the first and foundational problem with acquisition programs today.

There is a failure between user and developer to communicate or work as a team.

The question the developer asks should not be just, “What does the user want?” as if anything asked for will be provided. In these times of defense spending cutbacks, cost is a major limiting factor. A good customer-supplier relationship demands a more detailed understanding. Better and more fundamental questions are, “What is the mission (operational objectives, environment, etc.)?” and “How

do I know when the product is good enough?” If the user does not provide enough operational information—such as a CONOPs—and the mission objectives to the developer, then the user is not going to get an optimal system. That is because with the seemingly omnipresent shortage of funds, tradeoffs almost always have to be made somewhere in the performance and supportability regimes.

Some users do not feel it is important that the developer know the details, and some developers conversely do not feel the user needs to know much about the design. That is flawed thinking. Systems are complex, and decisions and tradeoffs due to performance and cost must be made continuously. Design trades must have the support of the user. The solution is simple—complete communication using an integrated product team approach.

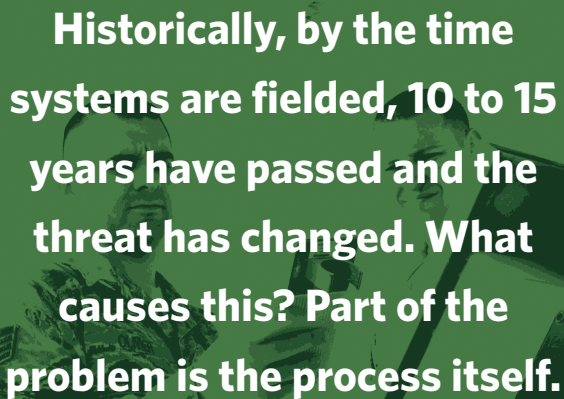
The user is now in charge of all work up to Milestone 1 (now called Milestone B)—and that is a fundamental mistake.

Both the material solution analysis (MSA) phase (MAA/MNA/MNS) and the technology development phase prior to Milestone B are run by the user. That is a mistake because the functions that occur during the phase are acquisition-specific. For example, alternatives are analyzed, cost reports are generated, tradeoffs are conducted, and preparation for the Milestone B Defense Acquisition Board review with all the associated acquisition documentation must take place.

One of the documents that must be generated is the cost and operational effectiveness report (cost and operational effectiveness analysis [COEA], now called the analysis of alternatives [AoA]). Some would say that the COEA is the most critical document to be developed in that it is the basis for the commander's decision on which alternative to pursue. The user, in most cases, does not have the technical or business experience to lead those efforts. In addition, they do not have the funds to pay for the COEA, as research and development dollars are used to fund contractor studies that operational commands do not have.

Weapons are complex and costly. To ensure that proper decisions are made, the phase should be overseen by those who understand the acquisition and requirements process, which in itself is very complex. An analogy is that because I drive a car, I should be able to build one. It doesn't make sense. This position does not mean the final decisions and the structure of the acquisition should not be approved by the major command/combatant commander. The user must have the final decision.

If we must continue with the process as is, then the user commands must be trained in not only the requirements process but the acquisition process as well. The complexity of the acquisition process coupled with the turnover in user personnel does not bode well for success in this area.



Historically, by the time systems are fielded, 10 to 15 years have passed and the threat has changed. What causes this? Part of the problem is the process itself.

The impact of unscientific (political) decisions is a major problem.

All of DoD labors under a process that is fraught with special interests, service parochialism, personalities, and disregard or lack of understanding on the impact of arbitrary decisions. There have been numerous studies and reports on that problem, from the inspector general, the Defense Management Review, and the Government Accountability Office as well as the Goldwaters-Nichols Act, all addressing a variety of concerns for the process by which requirements are formulated. Mechanisms can be set up to minimize the impact of what we'll call "unscientific" decisions, but the naked truth is that these problems, in some cases, do not lend themselves to an easy solution. Rather, they are issues that have to do with human nature and, as such, are difficult at best to regulate.

At a minimum, decisions must be documented in a traceability tool that links design back to the original deficiency. The traceability tool provides the pedigree of the decision. Although these tools existed in 1991, few were employed. Requirements traceability tools should be mandated on all programs.

Weapons systems should result from the study of alternatives (COEA/AoA), which should be composed of potential solutions from all Services (not just one).

Effective concept analysis involves looking at the potential of widely differing systems—including Army, Navy, or Air Force programs—to solve the deficiency. Unfortunately, that rarely happens. Instead, depending on which Service is leading, the study of alternatives usually involves looking at similar systems. For example, instead of looking at a ship versus a satellite versus a tank, the tendency is to look at five different types of ships. The Joint Requirements Oversight Council (JROC) was formed for several reasons, but in particular for ensuring the MNS looked at building systems for multiple Services for the simple purpose of

saving money. There is a general sense that for whatever reason, the JROC is not solving this specific problem. The system is not set up to take the mission deficiency of one Service and force its use on another.

Services see mission deficiencies and the justifications for new starts as their ticket into the budget process. It is difficult to expect military services to advocate a system that potentially would result in another military service obtaining the program. Call it parochialism, Service loyalty, whatever; it is just not going to happen unless an organization above the Service level does it. Currently, both the JROC and the Defense Acquisition Board have the opportunity to review and ensure that other-than-Service-unique alternatives are addressed in the MSA phase (prior to Milestone A). As such, should DoD explore the benefits of accomplishing (or at least certifying) all tools (i.e., modeling and simulation, wargaming assumptions, etc.) for the purpose of ensuring deficiencies and potential solutions are properly developed at the DoD level?

Sometimes requirements are generated to justify the weapons system and not to resolve a mission deficiency.

For example, in one aircraft purchase, the number of aircraft to be produced was based on the the ground coverage of its radar. A later analysis pointed out that based on the given radar coverage, the number of aircraft bought could be reduced; however, instead of reducing the number of aircraft bought, the radar coverage requirement was reduced, resulting in the need for the original number of aircraft. That illustrates once again the need for the traceability of requirements to the mission deficiency, not the weapons system.

It is acknowledged by Pentagon bureaucrats that the military services' real battle is not the next war, but the next budget exercise. In order to cut inefficiencies and bogus requirements, connectivity of the requirement to measures of effectiveness—i.e., battle outcomes—must be shown. Major commands are not very effective at obtaining resources using strategy-to-task analysis, and this was also a draft finding of the Air Force Studies Board during its pre-milestone 1 (now Milestone B) review.

Why all these problems? A couple reasons come to mind. Firstly, modeling and simulation requires a certain level of assumption. Changes in those assumptions can make the difference between having or not having a need. Since the major commands are running the models, Congress may view it as the wolf guarding the hen house. Secondly, the Air Force hasn't had too many programs that resulted from MAA/MNA. Most have been top-down (i.e., Congress, the president, etc.) directed (outside the process) and generally based more on the availability of technology or the need to replace an aging system. The notion that major commands are out there annually running fully capable

and accepted Office of the Secretary of Defense-endorsed models is not widely accepted.

Traceability tools that take lower-level requirements and trace them back to the initial need are not being used.

This problem was noted elsewhere in this article, but it needs to be emphasized. Traceability tools provide a structured technique for identifying performance requirements and system concepts; providing uniform communication of requirements; providing baseline data for system design, logistics support, test activities, and training and operations; and defining source requirements for end-item specifications. The tools document the rationale and the process for requirements from the MAA to the operational requirements document (ORD, now call the initial capabilities document, or ICD). Currently, there is no technique that does that, resulting in a lack of traceability and confusion. Traceability tools should be mandated.

The requirements process takes too long.

Historically, by the time systems are fielded, 10 to 15 years have passed and the threat has changed. What causes this? Part of the problem is the process itself, which will be explained in a moment. Both the documentation requirements and budget process adds to this problem.

Contrary to popular belief, program stretchouts, which have for years been attributed to Congress, were shown through a report (Betti Streamlined Acquisition Initiative) to actually be the result of internal DoD realignments of funds. The process is DoD's to fix.

One of the problems that lead to extended timelines is a lack of upfront planning. Upfront planning, to include such things as assessing alternatives, accomplishing trade studies for performance versus cost, etc., is essential to get the most bang for the buck. Any student of acquisition or Lean engineering will tell you that there is a direct relationship between schedule (and cost) savings and early problem resolution. If this is the case, why then is the funding for the MSA phase so minuscule?

The old DoDI 5000.1 stated that the under secretary of defense for acquisition would provide funding for the phase 0 (now MSA phase) activity, yet in essence, the funding was so small as to be nonexistent. (The new DoDI 5000.01, dated May 12, 2003, no longer addresses this issue.) Funding for phase 0 activities had to be begged, borrowed, and stolen from other sources. That results in minimum alternatives being reviewed and/or trade studies that are not completely accomplished.

Obviously, the need for upfront planning is a tenet accepted by all. Unfortunately, either the means is undefined or the will is lacking. Initial project direction is absolutely crucial to effective and efficient acquisition of programs. The need for

phase 0 (now the MSA phase) funding must be planned and budgeted by the users without the worry of having the money cut for other purposes. As mentioned, the user currently has that responsibility but cannot use research and development funds—a real catch-22.

Major acquisition programs are characterized by long timelines. Unfortunately, these timelines are unnecessarily stretched out by the bureaucracy, e.g., the documentation coordination cycles of the ORD/ICD, COEA/AoA, acquisition program baseline, etc. Disconnects with any of those documents can cause major perturbations in the schedule.

The requirements documents are improperly accomplished.

There appears to be a mentality among all users to fill out the first ORD (now ICD) as completely as possible and as soon as possible. The ICD is the place for listing critical performance parameters; however, there is no need to have the initial ORD reflect everything quantitatively. The initial ICD, created prior to the material development decision (prior to the start of the MSA phase), has been inappropriately used to generate the system specification because of its detail (in some other programs, it is not even signed when the system specification is released to industry). This mentality drives program cost and reduces performance tradeoff opportunities. The Army's Training and Doctrine Command approach is to attempt to limit the ORD to one page. In contrast, AFI 10-6 has nine pages of just instructions on what should be in the ORD. The final ORD, indeed, needs to have that level of detail, but not the initial one. Instruction needs to be provided to the users on what is and is not acceptable in the initial ORD. Air Force Directorate of Operational Requirements concurs that initial ORDs are too detailed. Processes and examples of how to determine critical performance parameters should be included in the next AFPD 10-601 update. It is imperative that the developer have some room to trade off requirements in order to obtain the best mix of cost and performance. The key is that the user must trust the developer to provide the various options. Using the entire team to fill out the ORD is the right direction in solving this problem.

To create an ORD without the other team members results in two of the current problems we have with the system. First, it takes 47 weeks to get an ORD coordinated. That is too long. The reason is the users have to "inspect in" the quality of the draft versus ensuring the quality upfront using a team approach to development. Second, the other Service users (when there is more than one, such as for the GPS program) are frustrated at the requirements process because their requirements are either relegated to secondary status or are not addressed at all. That results in some users going directly to the acquisition community to be heard. Bypassing the "executive" user causes its own unique communications problems.

Finally, there is little written procedure for how to accomplish the documentation, to include the MAA, MNA, and COEA. It

was discovered that some documents are created not as part of the process but after the fact as backfill or “box-checks” for those that are missing. The CONOPs often fall into this category as well. When you put poorly trained personnel together with a lack of sufficient written guidance, the result most likely will be negative.

Communication must be open and honest.

Without a clear understanding of roles and a process for ensuring anomalies are processed according to an agreed-to methodology, confusion will continue to confound the participants in the process. One way of reducing the size of this problem is to put the rules of engagement in writing—e.g., employ a charter, signed off by all the participants.

Inhibitors to careful planning and teamwork are decisions by individuals without regard for analysis or trades. Other reasons for seemingly arbitrary decisions are the need to justify the expense of existing architectures, to include base operating support facilities. A structured and analytical approach to all requirements is required versus the arbitrary decision of an individual. Uninformed (and sometimes capricious) decisions could be curtailed if they have to meet the scrutiny of fiduciary prudence. One of the findings of earlier studies is that many decisions are made by fiat, in contradiction to the results of modeling.

Cost is driven up by the instability of requirements.

Requirements often change when people are reassigned and new philosophies are introduced. This problem indicates that requirements can be more personality dependent than scenario driven. A similar problem is requirements creep, which occurs when a new technology is being marketed either by a lab or by industry. They know if they can get the need for their system into the requirements document, it will ensure a business base for years to come.

The Navy is very proactive in ensuring that new requirements without associated funding are rejected. Instability and creeping requirements and the problems they cause are another good reason why decisions must be documented and arrived at by a given process, not the whims of individuals. Whims, like people, change. Change, without understanding, causes confusion and frustration as well as increased cost.

Training and experience are critical.

Without a firm understanding for the technical issues raised, experience in writing requirements, and a good knowledge of the budget process, military officials can get lost in the requirements process—and they frequently do! Most of the time, the individuals actually writing the requirements are junior officers. That results in requirements that tie very poorly to system utility. The problem is not only with the junior officers. Many senior officers are not aware of the impact of their requirement decisions on the process. To hold a critical position in the requirements process, an individual must be

Questions For Readers

- Do you feel people today understand the requirements process?
- The names of the processes have changed; have the results? Is there a system in place to develop requirements using some form of strategy-to-task analysis? Is it better?
- Do you believe the integrated product development is used effectively in DoD?
- Are document processing times still taking inordinate amounts of time?
- What changes have occurred to improve the acquisition knowledge of the end users?
- Are program management offices able to trace requirements back to credible source data (that drove the acquisition initially)?
- How effective is the process today in addressing cross-Service solutions?
- What percentage of new programs is the result of warfighting shortfalls versus being top-down directed?
- Where does one go now to see templates and find assistance with documentation?
- Are charters employed to establish roles and responsibilities?
- Are there minimum levels of competence required today to hold positions in requirements positions?
- Did the elimination of many acquisition professional positions in the early 2000s make the requirements process worse?
- What can be done to fix this process, and does it need to be fixed?

trained and a obtain level of individual competency. If pre-Milestone B activities are not going to be returned to the developing agencies, user personnel must become proficient in the acquisition field.

Three things must occur to ensure competency. First, a certain level of experience (time in position) in the requirements/acquisition process must be mandated. Secondly, the problems and processes associated with requirements and the problems associated with managing multi-user programs must be developed and provided. Finally, there should be a method to assess, both before and during tenure, an individuals ability to accomplish the tasks. This can be accomplished using either oral or written (e.g., tests) methods or through customer feedback metrics.

These were the problems that existed in 1993—has anything changed?

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