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LOW DENSITY MATERIEL ACQUISITION AND SUSTAINMENT ON THE BATTLEFIELD

BY

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LOW DENSITY MATERIEL ACQUISITION AND SUSTAINMENT ON THE BATTLEFIELD

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ABSTRACT

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This paper provides insight to problems associated with the acquisition and sustainment of low-density materiel for Army divisions. It also examines the impact of low-density acquisition on the defense technology and industrial base. As the defense technology and industrial base is down-sized following the collapse of the former Soviet Union and its client states, preservation of the United States mobilization base is essential. This paper presents a discussion of acquisition strategy management of budget constraints, contractor selection, training and sustainment considerations that should be addressed prior to awarding a procurement contract.

INTRODUCTION

The end of the "Cold War" is causing a fundamental change on the way we in the West have viewed the world. When former Soviet President Gorbachev stated he was "removing the threat,"[1] little did the West recognize the significance and change in western thought that would result when he followed through with his statement.

The last forty years evolved a defense technology and industrial base (DITB) with a single focus:[2] to meet and beat the threat of Soviet communism and to assure the secure life style to which the United States had become accustomed. In the United States Army this meant we sought to capitalize on our nation's technological lead. We developed and integrated into the force weapon systems designed to give a smaller army the edge over a larger yet technologically capable adversary. Even so, within the U. S. Army localized elements presented special challenges when it came to the development of affordable technologically advanced systems. Some of these elements included the medical, air defense, and intelligence communities. The common thread is that, in general, these elements did not develop technology based systems in large quantities. As a result of these elements' low density materiel requirements, the amortization of the development and production costs[3] are spread over fewer fielded products. This has resulted in a greater unit cost for each system. The increased unit cost in turn limits the quantity that can be purchased. Finally, at some point the system becomes unaffordable and a decision not to purchase the system is finalized. As the armed services reduce their force structure and simultaneously their infrastructure, more and more system acquisition programs are being reduced in scope and eventually eliminated, as they reach the point that the reduced quantity makes them unaffordable. While this process is on-going, the number of required low density materiel is increased rather than decreased.

The logic behind this phenomenon goes something like this: as you reduce the size of your military force, you attempt to keep a core of everything needed on the battlefield in the active force. There are certain units of a combat support or service support nature that are thus moved to the reserve force structure. Generally, these are units which will not be required early in a conflict or which contain skills that are compatible with the civilian sector, dual use, or are more easily trained and therefore can be quickly expanded if needed.

Thus, as the active force is reduced in size, the number of systems in a given military unit is proportionally reduced. But some of these systems are already at the minimum effective level. For example, consider the Firefinder counter battery radar system. A maneuver division presently includes three Firefinder sets. With an Army of twelve divisions,[4] there were approximately thirty-six Firefinder sets in the active force. If the Army reduces to eight or nine divisions, then there would be only 24 or 27 sets in the active force. When these systems require replacement, the defense technology and industrial base will be asked to establish a production line to manufacture this small number of systems. To replace a quantity as small as this, the production process will, more than likely, not be based on an assembly line on the Henry Ford model. Rather units will be "stall built", which means that the systems are assembled by hand and are custom built. In this process, none of the benefits associated with the economies of scale are realized. Systems built in this manner are more expensive. When the Army had twelve divisions, one low density system built on an assembly line process was the tracked intelligence electronic warfare system known as Trailblazer. Operationally, eight of these systems were to be arrayed across a division front. Funds available for production fell short of the goal of eight systems per division. In fact only five systems were ever procured. The shortfall was made up by developing the Teammate wheeled version of Trailblazer. This system was not as technologically advanced as the Trailblazer; it also had a right turn speed constraint placed on its operation by safety experts.

What can be done to moderate the problem experienced in the development and sustainment of low density materiel? This paper will examine the development process as it relates to low density materiel. It will also recommend some changes that are necessary if companies of the Defense Technology and Industrial Base (DTIB) engaged in development and manufacture of these systems and are to continue as members of the defense industrial base. Finally, the paper will also present views on low density sustainment.

ACQUISITION STRATEGY

The Army is presently experiencing a period of reduced resources. This reduction is directly related to the end of the Cold-War and the anticipated savings--the peace dividend--that can be accrued by down-sizing the armed forces of the United States. This force reduction comes after a period during which the budgets of President Reagan were favorable toward the military industrial sector of the economy. This drawdown period impacts all the Department of Defense pillars, as specified in the 1992 Defense Planning Guidance (DPG)[5] and Army imperatives set forth in The Army Plan (TAP)[6]. Perhaps no pillar is more greatly affected than systems acquisition--specifically, those systems which exist in small quantities and low densities within the Army's table of organization and equipment (TOE).

A very important task for the program management team during this time is the formulation of an acquisition strategy.[7] Clauswitz asserts that "tactics teaches the use of armed forces in the engagement, strategy the use of engagements for the object of war."[8] If we look at the concept of an acquisition strategy we see the objective, or end, of an acquisition strategy is to provide the armed forces with a necessary system or materiel. The concept, or way, to do this is through a contract with a materiel provider. The resources, or means, are the funds appropriated and authorized by Congress for the program.

The acquisition strategy, then, is the plan[9] to apply resources to a concept for the purpose of achieving the objective of fielding the best weapons systems within constraints in the Army. In today's acquisition environment this strategy calls for much more. In the past the program management system did not work well because of the political and bureaucratic elements inherent in it. The program manager had no control over the stability of the program environment. He still does not. Congress appropriates funding[10] based on the President's budget and constituents' desires, not on the capability needed by a service to accomplish its assigned mission. The acquisition strategy gives the program manager (PM) a tool with which his team can plan for the development over the entire life cycle of the program. When the acquisition strategy is agreed to by the program manager's superior, a contract is established between the PM and higher management on how the program is going to be executed and what resources will be needed for proper execution. The acquisition strategy is also an agreement between the PM and supporting organizations. It informs supporting organizations of what they can expect and of what is expected of them to execute the program.

Acquisition strategies are tailored for each program. As programs are developed consideration is given to the system's life cycle phase and a variety of factors. A primary goal is to minimize acquisition time and cost, yet to satisfy the need with common sense and sound business practices; the strategy is also expected to evolve and be tailored to meet the specific needs of each program.

In evaluating alternative acquisition strategies for low density systems, favorable consideration should be given to those strategies that will use the existing sustainment base within the force. As an example, if the completed system is to be fielded in a heavy division and it is possible to use materiel that also already exists in the division, then substantial savings can be realized with such dual use. These pre-existing systems would be non-developmental items, (NDI) as opposed to systems requiring new development. The other advantages are the cost savings derived from not introducing new materiel to the division and the resultant expansion of the division's sustainment base. The division also benefits in that the Division Support Command (DISCOM) does expand its class IX repair parts inventory. The addition to the division of items that are already supported by it has the effect of increasing the demand for common items. If the system to be fielded is a low density system but there are other users within the division that are using sub-elements of the low density system, then the field user benefits from the larger support base. The bottom line is that all low density strategies should attempt to capitalize on the existing sustainment base. However, we must look carefully at the echelon to which the system is being fielded. If the sub-element does not appear at that echelon, the benefits anticipated will not be realized, even if the sub-element is an Army standard item.

In the acquisition world, how many discrete strategies exist? When a critical analysis is applied to the acquisition strategy end or goal of minimizing time to satisfy a need with common sense and sound business practices, we can isolate a number of acquisition strategies from these factors. First we should critically analyze the requirement and its associated risk factors. Programmatically those risks are cost, schedule and performance. Next the requirement will be satisfied through the application of some technology. Technology has the same three risk factors: cost, schedule and performance. These items and their associated risk factors can be mathematically visualized as two items with a total of six risk factors or 2^6 (two to the sixth), which results in the generation of 64 combinations of discrete acquisition strategies. Another, less complicated method is to take the two items, requirements and technology, and make a determination of whether they are stable or unstable. Table 1 depicts the resulting combinations.

Acquisition Strategies

	Unconditional	Pre-planned[11]	Incremental	Evolutionary[12]
Requirement	Stable	Stable	Unstable	Unstable
Technology	Stable	Unstable	Stable	Unstable

TABLE 1

The strategies as arrayed in the table range from most risk averse, on the left, to least risk averse. Department of Defense Directive 5000.2 identifies only two of the above strategies, pre-planned and evolutionary.

The acquisition strategies apply over the life cycle and may be changed or modified when a program exits a given life cycle phase. Each phase of the life cycle may have its own strategy. Just as there is a National Security Strategy supported by a National Military Strategy, an economic strategy, and a diplomatic strategy, there can be and often is a developmental, test, risk aversion and contracting strategy in support of the overall acquisition strategy. In some cases, public law and regulations inhibit exercising some strategies.

Consider a strategy of strategic partnership which could support any of the identified acquisition strategies. In strategic partnership, the government would establish a relationship with a contractor to specialize in an area which did not lend itself to dual use, one having both commercial and defense applications. The contractor would be given a multi-functional contract related to the low density acquisition area of specialization. The arrangement would be long term and focused on a low density functional area, such as intelligence. The contract medium would be essentially sole-source, and the government, by continually returning to the same contractor, would dry up competition in that sector of the defense industry. The benefit to the government is that during a period of defense down-sizing, random chance and market forces are minimized to assure that critical defense technologies and manufacturers continue to be supported. However, the Competition in Contracting Act[13] will not allow this to happen, even though it may be the right thing at this time.

In a democratic society the acquisition community is destined to live with artificial inefficiencies. At a time when more and more defense-related materiel development becomes low density, the acquisition laws are not being revised. Every day defense contractors are moving out of the defense industry due to reduced profitability. Some critical skills are inevitably lost. Strategic partnership may be a solution to prevent the loss of specialized skills and to retain a core of talent from which to expand should the need occur. But before it can even be considered as a solution, it must be allowed in the solution set. The existing acquisition laws should be examined and, if necessary, changed.

Congress provides the "means" for acquisition in the form of an authorization and appropriations bill. These bills allow the implementation of the "ways" both legally and fiscally. In a military that is directed by the civilian department secretaries, the military exercises no control over the "means". Some companies have very elaborate strategic plans on how to go about lobbying the Congress to achieve their ends. Thus, they have more influence over the "means" and may cause funding to be dedicated for a specific program over Service objections. This was the case in 1986, when the appropriations bill directed the purchase of T-46 jet trainers at a cost of $750 million, over the objection of the United States Air Force.

DEFINING LOW DENSITY MATERIEL

The whole acquisition process starts with a mission need statement. As a rule, the mission need statement is not very specific, nor is it constrained. After the program management team has been formally established as the materiel developer at milestone 0 (MS0) and has had some time to look at the mission need statement, direct interaction between the combat developer and the materiel developer must take place. The greatest cause of increased cost for low-density materiel is the inclusion of nice-to-have requirements, as opposed to need-to-have requirements. The nice-to-have or desirable requirements as a rule add complexity to an already complex process, which results from attempts to integrate nice-to-have with need-to-have requirements. The combat developer expects the materiel developer to challenge requirements. The burden is on the materiel developer to show the combat developer why a requirement that has been requested is not in the best interest of the government or the Army. Through such a free exchange of ideas, thoughts and discussions, consensus is achieved. Finally, once a set of requirements have been agreed to, they must not change! If they change, the effects will ripple through the entire design of the system, again driving the cost up. Requirement changes rarely cause the cost of a system to decrease.

Low-density materiel refers in this analysis to nine or less systems, when the intended user is a military unit assigned to or in support of a maneuver division. When a system is developed in support of an Army division, it should never be produced in quantities which are not devisable by three. The logic behind this is quite simple, maybe even mystical: the U. S. Army generally assigns three brigades per division. When a brigade goes to exercise, the Army tailors the support to the brigade and send a "brigade slice". If we truly intend to practice in peace what we intend to do in war, we should never send a brigade slice larger or healthier than we would be capable of sending the other brigades of the division at the time the exercise occurs. This will create a more realistic training situation and condition future commanders not to form an expectation for war that cannot be satisfied by the supporting commander.

In reality the low density quantity determination varies with each system produced. A low density occurs at the point where the economies of scale do not contribute to substantial price reductions as the production quantity is increased. The low density production quantity can also be associated with the cost above which the purchaser is unwilling to pay for the system being produced. The unit cost includes such items as the cost of materiel, labor, taxes, facilities utilities and profit to name a few. This point may not be the economic production rate,[14] which will be discussed later in this paper. Nine end items will be posited as the low density quantity threshold for this paper.

This is an excellent number because it is devisable by three and for the reasons mentioned above.

BUDGET CONSTRAINTS

Presently Army leadership is challenged to be creative in approaching the force development issue. The cost of acquiring systems is, by nature, high. In times of diminishing resources, it is imperative that we explore alternate innovative methods of acquiring materiel for the Army. In the best of times, the economic acquisition of low density end items presents a series of challenges that are not unique to systems acquisition. However, because of the small quantities needed and the reduced budgets caused by organizational down-sizing, low density systems could become unaffordable much sooner than they otherwise would in less austere times. Increased acquisition costs tend to eliminate new or replacement low density systems, solely because of cost. This greatly delays force modernization of low density systems until a time of prosperity. This would not necessarily be the case if the end items had been integrated in substantial quantities throughout the force.

For example, assume that a low density system is presently in production at an economic production rate. Congress cuts funds for the program, and the Project Manager (PM) is forced to restructure the program. The restructuring will more than likely include stretching out the program and reducing the quantity ordered to make more money available. If the annual quantity produced is reduced below the economic production rate, the per unit cost of the system will increase. Quite possibly the Project Manager will find that the amount of money available presents a worse situation than that which existed prior to the reduced budget. That is, his austere decision resulted in acquisition of fewer items at a substantially greater cost: less bang for the buck.

Central to this scenario, then, is the concept of the economic production rate. As the Army goes about down-sizing, it should pay particular attention to the economic production rate of each weapons system in production. The economic production rate is that level of production where the addition of one unit to the production quantity results in a substantial unit price decrease and the subsequent addition production units does not have a similar effect. When this point is reached, the savings associated with the economies of scale are realized. This point is unique for each specific production effort. Thus, a decision to reduce production should trigger a review that might result in the summary elimination of the weapons system. This would, in turn, make the program funds available to prolong the life of some other project. At the very least, sound business practices dictate that the decision to continue production be consciously entered into with the full knowledge of the associated costs and the consequences, long and short term, of any decision made.

The Army must give more consideration to the economic production rate as the military reduces its appetite for weapons systems. The part played by the economic production rate of low density systems should always be considered by PM's as they manage their programs, especially if they experience, or expect to experience, a reduction in funding or desired quantities. The economic production rate is so important that, when a source selection evaluation board is considering prospective bidders for contract award, it should be an essential item of analysis. As the materiel developer considers alternatives the best alternative will be the one offering the lowest cost with the lowest economic production rate.[15] A low economic production rate allows the PM to achieve greater flexibility in prolonging the economic life of the system in his charge.

Some of the variables which can affect the economic production rate are the manufacturer's geographic location, the cost of labor, the cost of raw materials, the fixed plant costs, the amount of waste generated in the manufacturing process, and, of course, the number of end items to be produced. For example, consider FMC Corporation of San Jose, California the manufacturer of the Bradley Fighting Vehicle System (BFVS). The economic production rate for the BFVS is 310 units per year. If production were to dip below this magic number, the BFVS becomes unaffordable for the Army. It is important to remember that this example cites a high density system existing in large numbers across the whole Army. But all variables must be carefully considered to understand the economics of any given item.

FMC will be retained as the example in this discussion.

First,the manufacturer's location in San Jose, California, offers a mild climate. This is a benefit for FMC, because seasonal changes do not cause large energy costs. However, the manufacturer's labor costs are really high because the cost of living in California is much higher than that in other parts of the United States. Further, the manufacturer provides a good benefit package and pays additional fixed costs such as local taxes. The educational level and skill level of the work force are also related directly to the manufacturer's costs.

Additionally, the manufacturer must consider the cost of money or working capital. How much interest must he pay to start up, until he receives progress payment or is able to charge for delivered goods? Raw material is a large cost driver: it requires "up-front money" to purchase long-lead items. The cost of raw materials to enter production must be paid up-front. If the prime contractor is a large company, they will most often use their own money for the up-front expenses. But this can also cause difficultly, especially if the raw material necessary to start production is high cost or long lead. In the FMC example, electrical connectors are long-lead items and take from six to eight months to acquire. Kevlar is also a long-lead item. Defense systems have unique requirements for specialty material such as kevlar, manufactured only by the Sioux Indians. The acquisition lead time for kevlar typically takes as long as 14 months because it is manufactured by a small minority business which must be paid up-front in order to purchase the raw materials required in the manufacturing process. The electrical connectors and kevlar examples reveal how the raw material problem can tier from the prime contractor down to subcontractors, with potentially devastating programmatic effects.

The economic production rate is also effected by fixed plant costs. Fixed plant costs can also have a dramatic impact on the end item cost. A plant that is located in a high cost area and has a high degree of automation, in the form of computer-aided design (CAD), computer-aided manufacturing (CAM), and statistical process control (SPC) can often compete very effectively with competitors in a low labor cost area. Manufacturing facilities in low cost regions are often characterized by a large, moderately paid, labor force working with little or no automation. The trade-off in selecting a manufacturer might best be made by examining the respective economic production rates and recognizing, that in the case of low-density materiel acquisition, the ordered quantity of the product is more likely to go down than up.

Next consider the taxes and fees that the contractor is liable to incur. As the government establishes a contract with the prime contractor, it should consider such things as the condition of the plant site and the potential cost of environmental site clean-up upon termination of the contract. This obligation must be consciously recognized and funded as required by law. Environmental clean-up costs can be very large requiring the trade-off of other alternatives to pay them. Environmental concerns certainly impact FMC, which has been producing vehicles for the U. S. Army in San Jose since the Second World War.

A major environmental issue is manufacturing waste. At each stage of manufacturing, waste is generated. If you compare the end product with the waste produced all through the manufacturing process, you generally find that substantially more waste is generated than product. Consider the 12 metric tons of waste produced per automobile manufactured in the United States.[16] Disposal of this waste is another cost that must be considered. Therefore, when you develop a manufacturing process that produces less waste, the cost of the product decreases a waste disposal costs decrease. A manufacturer that recycles all or part of his product has a long term view, from the perspective of salvage, of his product. Recycling may also reduce system costs and environmental impacts.

The effect of a low economic production rate on each of the previously discussed variables makes the selection of an ideal manufacturer an exercise in balance. The balancing act requires careful consideration of each variable.

The manufacturer's location translates into infrastructure costs. Generally, we should stay away from large industrial centers with high labor costs and burdensome taxes. But the problem with avoiding industrial centers is the higher transportation costs associated with a remote location. The key is to balance the increased costs of transportation and the infrastructure costs, with the purpose of achieving the lowest overall cost profile possible.

The costs of raw materials are relatively unaffected by location. However, the transportation cost of moving the raw material is added onto the raw material costs, thereby making them appear to be more expensive. Appearances are reality.

The next variable is labor costs. When industrial centers are avoided, a skilled labor force can be difficult to find. But in industrial centers the cost of labor can be held artificially high by unions, even during recessions. The cost of union labor is generally high. Again the choice is not clear.

Fixed plant costs are generally lower away from an industrialized center with its greater tax base.

As the Army draws down, it is important that the low density materiel developer consider the manufacturer's economic production rate. Based on the situation of each manufacturer, the PM should determine the impact that a reduced quantity or budget might have on the weapons system being developed. We must acknowledge that defense contractors, through their lobbyists, exert greater influence on Congress than does the military PM. This influence often causes allocation of dedicated resources without regard to the needs of the military.

As funding is reduced during a period of down-sizing, low density materiel developers find that their budget constraints hurt more than supposedly similar constraints on the developers of larger programs. This concept is best understood as follows: If one person has ten dollars and the other has one hundred dollars, each views the loss of one dollar differently. The loss of one dollar from the individual who has ten dollars has a greater utility impact than does the loss of one dollar from the individual with one hundred dollars. Thus, a low-density materiel developer generally has a higher utility value of money than does the higher density materiel developer. In short, the low-density materiel developer's money means more because even a small reduction may cut deeply into his system or renders the system unaffordable.

SOURCE SELECTION AND POST AWARD

Source selection designates the process[17] of selecting the contractor that will be given a contract to manufacture the system under development. A number of factors need to be considered as a part of the source selection process; the contractor's performance history and experience, the size of the company, the company's overhead costs, and those factors discussed in the section on budget constraints. Part of this process may also look at what it would cost to terminate the contract for each of the contractors being considered. Generally, termination should be considered a loss for both the contractor and the government; generally it should be avoided.

When a contract has been awarded, the contractor's understanding of the requirement is the most critical part of the development. The contractor must understand in detail what it is he has agreed to build. The system under development is in life cycle phase II, engineering and manufacturing development. The government has Cost Schedule Control System Criteria (C/SCSC)[18], which are required for major contracts. The C/SCSC provide a means of surveillance by comparing budgeted expenditures of cost and schedule verses the actual expenditures. This system is expensive, especially if the selected contractor does not have a validated system in place at the time of contract award. Often if the contractor has a history of managing to cost and schedule without a validated C/SCSC, the best course of action may be not to force him to learn a new system to satisfy a bureaucratic requirement. The contractor does need to have a system that will meet the criteria established in C/SCSC if the criteria makes sense. Generally, a low density materiel developer will use Cost/Schedule Status Reports (CSSR), which apply to contracts between two million and 40 million dollars for research and development or two million and 160 million dollars for procurement. The CSSR that are useful to both the contractor and the government management team are central to the monitoring of program progress. The surveillance procedures give program managers the ability of making timely decisions concerning the program. Decision points must be carefully considered. At major reviews the criteria for approval of the review to continue the program should be established with the government team and communicated to the contractor in advance. Due to the tight financial plan on which most low density systems are developed, the contractor's progress must be closely monitored. It is less expensive to stop and correct a problem than it is to allow the problem to continue and try to correct it at a later date. Fixing the problem at a later time generally entails re-work which is more costly than doing the job right the first time.

Frequent visits and communications with the contractor are necessary during the engineering and manufacturing development phase. During this phase the production prototype system is being fabricated, and adjustments to accommodate system production are made. This phase consumes a large amount of resources, and the PM must assure that they are expended efficiently. Part of this phase includes the development of training packages. These training packages--referred to as new equipment training (NET)--include training for the operators of the system and also for the leadership who will determine how the system should be employed on the battlefield.

TRAINING

The development of the training packages, although resourced by the program manager, is directed by the user's training "experts." These experts have established a training development methodology that is oriented on systems procured in large numbers. The contractor is directed to develop training packages, which focus on institutional training as opposed to unit level or individual based training. The "experts'" logic is as follows: the unit level training packages are developed at the institutional base; therefore institutional base training must be developed by the contractor to allow for the development of the unit-level soldier's manuals. The process does not consider where the greatest training impact occurs. Such impact does not occur at the institutional level, but at the unit. The Army has developed a training system codified under Army Field Manual (FM) 25-100.[19] It works exceptionally well in training and reinforcing unit-level skills, both individual and collective. As new equipment is introduced to the force, the first unit to be fielded is the institutional training base. Fielding the equipment to the institutional base first gives the base a head start in the development of institutional platform instruction. Once the platform instruction is completed, unit-level training tasks are developed for eventual compilation in a soldier's manual that will eventually be issued to the field units for sustainment training. While the above process is under way, new unit equipment sets are introduced to units worldwide, who in the mean time are left with a net equipment training (NET) package designed not to the FM 25-100, but rather to a platform instruction methodology. The majority of the unit's training is delivered in a performance oriented tasks-conditions-standards form. The NET package does not conform to the FM 25-100 standard; thus each unit adapts the NET package to their organization as best they can. Eventually, usually in around two years plus, the institutionally prepared training packages are developed and sent to each unit.

This process could be greatly improved simply by having the original equipment manufacturer develop a training package in the FM 25-100 unit level format. That FM 25-100 package would be left behind with the unit for immediate integration by the unit operations officer, S-3, without any change to the unit's present method of operation. The institutional base, which would have been trained from the same package, would reverse its normal procedure of going from a training narrative to a FM 25-100 tasks-conditions-standards format; rather it would go from the FM 25-100 format to a platform institutional package. The institution base would also derive an additional benefit from all of the FM 25-100 packages left with each unit in the form of constructive feedback based on a standard training baseline.

Leadership training for new low density materiel is rarely provided at the time as NET. It is generally provided in the form of tactics, techniques and procedures (TTP). The development of TTP again occurs at the training institution; it is derived from the experience of lieutenants and captains with, perhaps, one tactical assignment. The development of TTP would be better served if the training developer assigned the TTP developer early enough so that the officer could lead and participate in the system level testing. This would allow the developer to begin formulating ideas which focus on TTP and acquaint him with the most value to be derived from the system as it would be employed on the battlefield.

SUSTAINMENT

As the system is fielded, the sustainment base is developed in each division and corps. This base has been designed to support systems and materiel which are integrated into the force in high density. However, low density sustainment is overwhelmed by the mass associated with the other systems sharing the same logistic pipelines. In Operation Desert Storm (ODS), the Intelligence Electronic Warfare systems were supported by the Communications Electronics Command's Intelligence Materiel Management Center located at Vint Hill Farms Station, Warrenton, Virginia. Support came through the establishment of three Special Repair Activities (SRA) in Saudi Arabia. The number of military intelligence units supported by the SRA were on the order of ten. The SRAs were contractor-operated, with civilian technicians. In every war in which the United States has been involved, even during the Revolutionary War, the defense industrial base has placed civilian contractors on the battlefield. The military typically writes a contract and leaves contractors to fend for themselves, with little support from the military. But sustainment of low-density systems by contractors is often critical. If the government expects contractors to provide system sustainment, then the government must provide housekeeping support for the contractors. That support must include food, shelter, chemical or special protective clothing, transportation, medical support and communications. In Saudi Arabia such support was not well planned. Thus when the Iraqis launched a SCUD attack, some contractors did not have all of the protective inoculations available, nor did they have complete sets of protective clothing. In addition, Army area tactical communications were provided only days before the commencement of the ground campaign. So forward deployed intelligence units had no method, other than courier, to communicate with the SRA. The entire operation was well-intended and accomplished great things, but support and coordination could have been much better.

Still the SRA concept was clearly superior to other support mechanisms in theater. It applies the repair-forward concepts while consolidating a highly skilled pool of technicians who are shared among all of the intelligence units. Further, it allowed the consolidation of intelligence and electronic warfare (IEW) related materiel at Vint Hill Farms and permitted the concentration of materiel shipments in easily recognized palletized loads. These loads were marked with rainbow stickers, which facilitated locating the load at the aerial ports of debarkation (APOD). This method overcame the problem of mixed consignment pallets, which resulted in materiel being unidentified at the time it was needed.

CONCLUSION

Low density materiel presents many challenges in its acquisition and sustainment. These challenges can be met and managed in such a way that the soldier who depends on the materiel can reasonably expect the best, most affordable systems in the shortest possible time.

In order to keep development costs down, developers must focus on the echelon being supported.

The acquisition life cycle is not going to change for low density materiel. Attentive monitoring of the life cycle combined with common sense and timely decisions are the keys to success as the materiel is developed, especially during phase II, engineering and manufacturing development.

The Program Managers must have a vision of what they expect the end state of the development to be. The acquisition strategy must reflect: the resources, the means; the concept of development, the ways; and the objective, the ends. This will provide the entire program management team with a road map of the program manager's intent.

As the program is developed, a clear recognition and understanding of the constraints imposed by Congress, the acquisition system, Army leadership and other internal and external sources must be achieved.

Often the impact of budget constraints can be moderated by consideration of such things as economic production rates prior to the selection of a contractor. Other factors should be considered at the time of source selection. But a long-range rather than a short-range perspective is essential if the low-density system is to be successful.

After the contract has been awarded, a great effort must be expended to immediately assure that the contractor truly understands the requirement and does not start off with a misunderstanding which may not become visible until very much later.

Part of the system development includes the development of training packages. The present method of NET package should be refocused to support the soldier in the field, rather than institutional training centers. Contractor supported maintenance facilities should be developed and staffed as a part of the echelon above the corps force structure.

The acquisition and sustainment of low density materiel is a critical area requiring extensive management techniques and practices. To be successful the pitfalls outlined in this paper need to be recognized early and precluded from occurring--the soldier on the 21st century battlefield demands no less.

ENDNOTES

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