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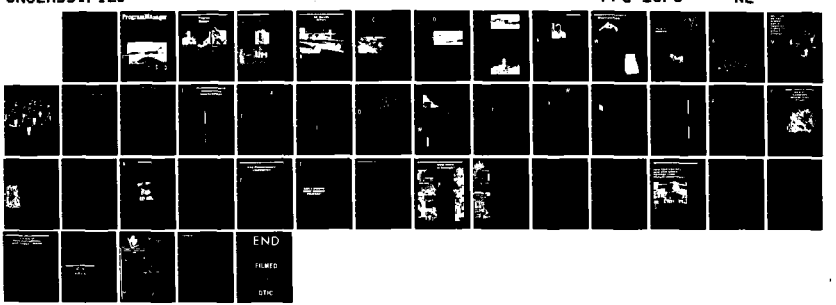

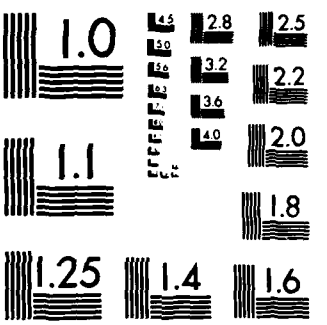

November-December 1984

ProgramManager

The Journal of the Defense Systems Management College

How Contractors and DOD Share Savings from Mutual Investment

Productivity Improvement in the DOD Acquisition Environment

Do You Always Run a Gauntlet Trying to Effect Change?

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Cover: An air-to-air left side view of a F-15 Eagle aircraft being refueled by a KC-135 Stratotanker aircraft while a B-1B bomber stands by.

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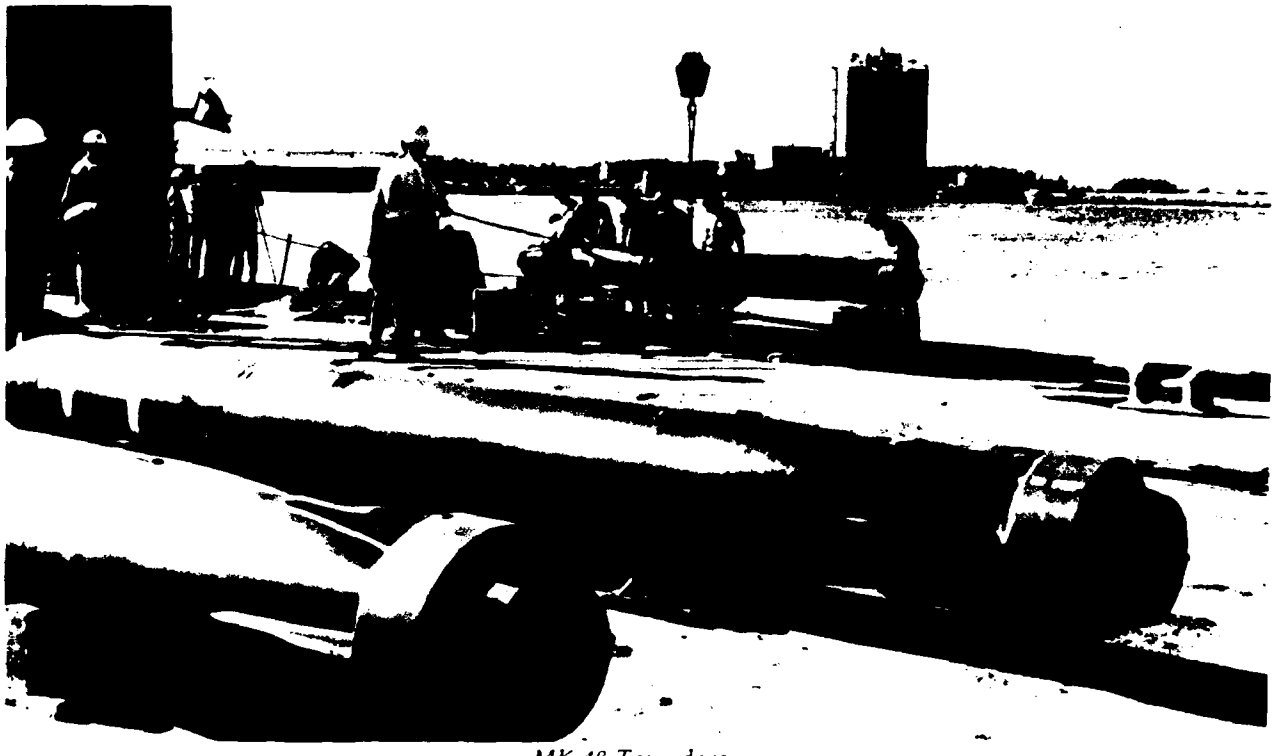
"All Hands" Effort

Chief of Naval Material Looks at Competition, Spare Parts, Quality, Better Business

Admiral Steven A. White, USN, Chief of Naval Material



MK-48 Torpedoes

As the chief of naval material, I am the operating head of the largest procurement activity in the United States. The management responsibilities encompass a broad spectrum of acquisition and logistics efforts. The major ones range from research and development programs, including all nine Navy laboratories plus the test centers and ranges, to the acquisition, delivery, and life-cycle support of naval systems and hardware. In addition, these responsibilities include such diverse areas as: industrial activities (shipyards, weapons stations, and air rework facilities) inventory management and warehousing of 500,000 line items; construction, maintenance and repair of all Navy real property; and operation of the Navy exchange and commissary systems. There are over 250,000 employees in the Naval Material Command, which expends about $66 billion each year through almost 4 million contract actions.

With that snapshot of the organization, I will get right into the meat of my subject. I am going to touch on four topics that are the nucleus of the business strategy I am following in execution of the Secretary of the Navy policy direction. Those topics are:

—*Competition*, and its growing importance in the role of the U.S. Navy as a smarter buyer

—*Spare parts*, and how they also drive our business strategy

—*Quality*, which I predict will be the watchword of the Navy in the next 12 months

—*Better business*, and why I believe both the Navy and industry can change things for the better.

I see my side of the Navy as a business on a moving train. Some of U.S. industry, including shipbuilders, major manufacturers, small businessmen, and others, are on board. The train is gathering speed at a rapid rate. Others are scrambling to get on board, and we are holding out a hand to help. Still others remain in the sta-

■ *These remarks were made by Admiral Steven A. White, USN, Chief of Naval Material, at the Annual Navy League Chief Executive Officer Dinner in September.*

tion saying the train will stop at any minute, and they are left watching the train move away. My goal is to help anyone who wants to get on board, because I am certain the train will continue to accelerate in the coming year. Achievement of my goal can only reap rewards for both the Navy and industry.

I will be candid in telling you about things I think are most important, so that you will have the clearest possible picture of how we view the core of our business strategy, as well as some of the things we are doing more of, or less of, or differently.

First, I will talk about competition.

We intend to obtain what we need at fair prices, with the quality and reliability required by our forces at sea. A principal tool in these acquisitions is competition. I am in strong agreement with the many voices in the Congress and in the administration advocating more competition. I believe that competition is a tremendously effective way to get the taxpayer the best buy for the dollar. We have reviewed empirical data on 45 weapons systems acquisitions that show substantial savings resulted after the introduction of competition in previously sole-sourced programs. In many of these cases, the second source's cost-improvement rate exceeded that of the incumbent; and the establishment of second sources improved the costs and performance efficiency of incumbents. Thus, we know from studies of actual acquisitions that second sourcing of major programs does bring about innovation, cost savings, and, of course, protection against single-source problems. So, whenever possible, we are buying competitively.

Competitive buyirg for the Navy includes research and development as well as production; it includes second sourcing items previously sole sourced; it includes spare parts once thought to be the private domain of the system manufacturer. Competitive buying does *not* mean simply the low bidder—it means the best value for the taxpayers' dollars.

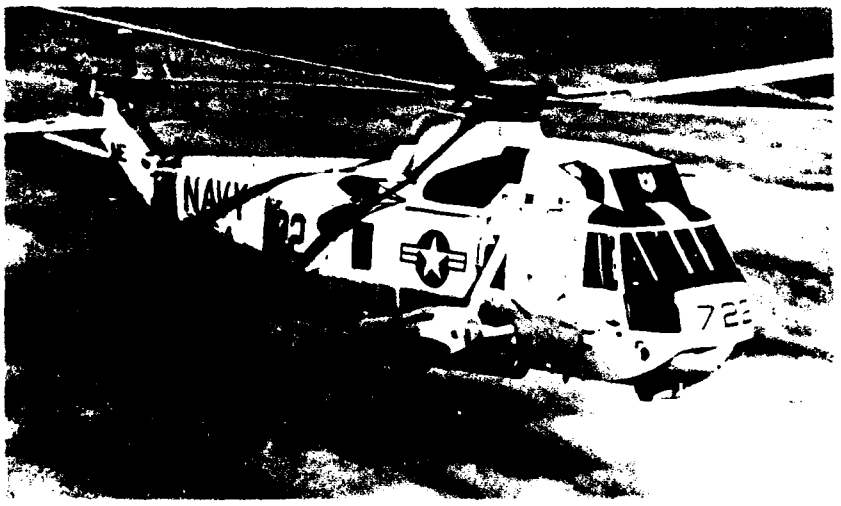
Many of our shipboard weapons and equipment have incorporated competition in their acquisition strategies. These cover the spectrum from the Mark-48 advanced capability torpedo and Mark-50 advanced lightweight torpedo to the propellers for Arleigh Burke class destroyers. We have set the right competitive business posture for the future of this major segment of the Navy budget.

We have made strides in competing aircraft, missiles, and electronic systems. For example, competition is a keystone in such major new starts as the CV inner-zone ASW helicopter and JVX advanced vertical lift aircraft, as well as in other smaller programs such as the common ejection seat and the purchase of commercially owned C-9 aircraft. The Secretary of the Navy decision to establish second production sources for the Phoenix, rolling airframe, and standard missile programs is another important step. I have people working to implement this initiative as soon as possible.

Thus, we are working the competition business on big-ticket items and smaller items. Let me give you some examples of impressive savings we have achieved recently in both categories:

—We saw competition between prime contractors for three Aegis cruisers yield a $228 million savings from the President's budget request. In like fashion, competition for three Los Angeles class nuclear submarines resulted in savings of $108 million.

—A contract for shipboard magnetic tape drives, the so-called RD-358, presented the Navy with savings of $20 million. The incumbent supplier, a sole source for the past 5 years, submitted a losing bid of $47 million, almost twice as much as that winning bid.



SH-3H twin engine, all-weather, ship-based anti-submarine helicopter.

"Competition buying does not mean simply the low bidder—it means the best value for taxpayers' dollars."

—Competition for production of thinline sonar arrays resulted in a contract for 36 percent less than the production estimate, resulting in a total savings of over $10 million.

—Navy standard teleprinters were bought competitively at almost half the price proposed by the previous sole-source supplier, for savings in excess of $50 million.

Cost savings are not the only advantages we have accrued from increased competition. In the shipbuilding arena, for example, we have seen tremendous improvements in the past 3 years—improvements that benefit both the Navy and its business partners.

In ship construction, only a few years ago we were immersed in huge

omnibus claims, multiple disputes, late deliveries, and significant cost overruns.

There has been a dramatic change.

Today, there are zero significant claims and few disputes.

In ship construction, 3 years ago we were seeing 60 percent of our ships delivered late. That percentage is down to 23 percent this year and declining. We intend to drive it to zero. And believe me, early delivery means dollars saved.

As many of you know, we have changed our contracting philosophy. This year, 86 percent of our ships were competed and all of the contracts are fixed price.

In ship overhauls, better industrial management, improved techniques, and increased competition have led to similarly impressive gains in quality, schedule adherence, and costs.

Such positive contractor actions and the healthy economy are presenting the Navy with the ideal climate to execute its business strategy. The shipbuilding arena is but one example.

This past year, we have worked to ensure that we get our money's worth in sole-source contracts. Since the competitive element is not present to encourage efficiency and lower costs, we are placing strong emphasis on should-cost studies. In this effort, we rely heavily on the in-house engineering and design capabilities of our laboratories. These facilities have substantial experience in analyzing documentation, reviewing production-line discipline, and validating quality-control procedures, among others. They are, in effect, our own factories with shop-floor capability similar to concerns in the private sector. Unlike some should-cost studies, the Navy's are not a paper audit, but, rather, are based on independent technical manufacturing and engineering analyses.

During the past year contract price analyses of this type have been completed on several major sole-source programs, including the Aegis weapon system, SQS-53C sonar, UYQ-21 display system, Harm, and Phoenix. Their purpose is to identify the "ground truth," or real cost, of fabricating a particular item. I am convinced that they provide unique and critical inputs to the negotiation of more cost-reasonable contracts.

Our objective here, as elsewhere, is to put forces in place that will stimulate contractors to reduce costs and improve performance so that we can afford the level of naval weapons we must have. I have insisted that we use competition in a way to get us the best value in terms of not only cost, but also a product we can count on to get the job done.

I now turn my attention to spare parts.

PHOENIX Air-to-Air Missile

Several CEOs who have visited my office told me that the Navy's spare-parts business is too small to warrant the attention and resources we have been devoting to it—that what I am doing is not cost effective. I think their message has been that those resources might be better directed to the procurement of big-ticket items, such as cruisers or high-performance aircraft.

Let me set the record straight. The Navy spare-parts business is not small: It is big business. In fact, we spend about $7 billion each year on spares.

Just as important, to the average citizen or to the congressman, is that how well we buy spare parts suggests how well we may be buying ships and aircraft. For example, if the taxpayer hears we are buying hammers for $400 each, we should not be surprised if he reaches the erroneous conclusion that we might be paying far too much for airplanes, missiles, and aircraft carriers.

Let me tell you about a few of the initiatives taken in this area.

First, *Project Boss*, our acronym for "buy our spares smart," to institutionalize the letter and spirit of Secretary Weinberger's program throughout the Navy. *Project Boss* encompasses over 100 individual initiatives covering all aspects of spare-parts acquisition. It involves the logistics, procurement, technical, and operational communities in a coordinated effort to correct recognized problems—clearly, an "all hands" effort. A paramount objective of *Project Boss* is to pay only fair and reasonable prices for spares. To date, although less than a year old, the project has been most successful.

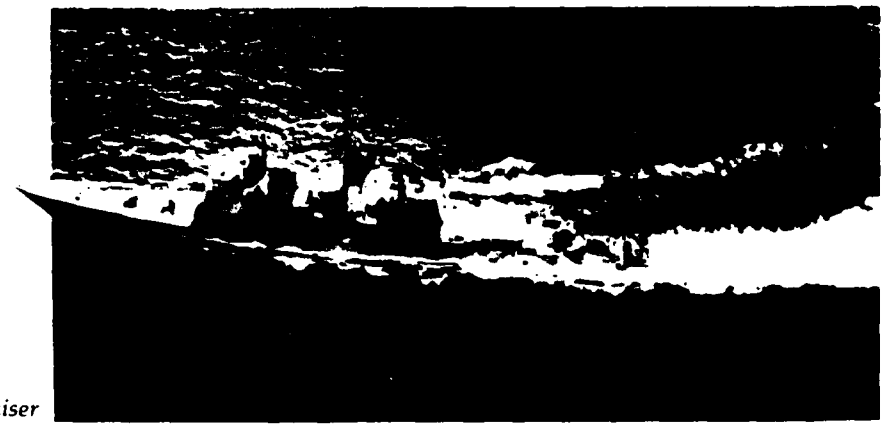
". . . we are placing strong emphasis on should-cost studies."

Competition Rates at the Aviation Supply Office and Ships Parts Control Center, the Navy primary buyers of spare parts, have almost doubled from fiscal year 1983. We intend to exert still more pressure to force similar gains in the coming year.

Price Fighter, a team of Navy experts, has been set up to ascertain the intrinsic, or should-cost, value of spares. We have already received refunds and cost reductions, and have identified potential cost avoidances in the millions of dollars.

A telephone hotline exists to allow anyone in the Navy, anywhere in the world, to report items with suspect prices. Each item is researched to

"Quality will be the name of the game in 1985."



TICONDEROGA Class Cruiser

determine whether a fair price is assigned. The still-questionable ones are referred to the price-fighter team for a value analysis. That phone is ringing literally 24 hours a day, 7 days a week.

Another major initiative is to "break-out" the spare parts we buy so we can procure directly from the real source of the parts rather than a middleman.

The number of items broken out to be screened rises dramatically each month, and I expect an enormous improvement in the next year. In the last 9 months, over 60,000 potential break-out items have already been identified, 5,000 of which (worth over $400 million) have been broken out.

We had excellent cooperation from some of our major suppliers in support of the Navy goal to become a better buyer of spare parts. Let me identify some specific instances.

—*Litton's Guidance and Control Systems Division* has agreed to provide the reprocurement data package for our principal shipboard inertial navigation system. This will make possible sub-system level competitive procurement. They have allowed us to purchase spare parts for several navigation systems directly from the vendors. Finally, Litton has helped the Navy develop its own maintenance capability for the inertial navigation system installed in all our F/A-18 and A/V-8B aircraft.

—*General Electric* has provided data to permit break-out of a significant number of spare parts heretofore purchased directly from GE. At its own expense GE has provided a full-time, break-out program. GE's aircraft engines group has been very active in helping identify candidate items for breakout.

—*Sperry's Computer Systems Division* has placed written permission-to-use legends on all existing, asserted proprietary data, thus permitting us to use the data for procuring spares from other sources. Sperry has advised us of its intention to ensure all spare-parts provisioning data are delivered free of any restricted markings.

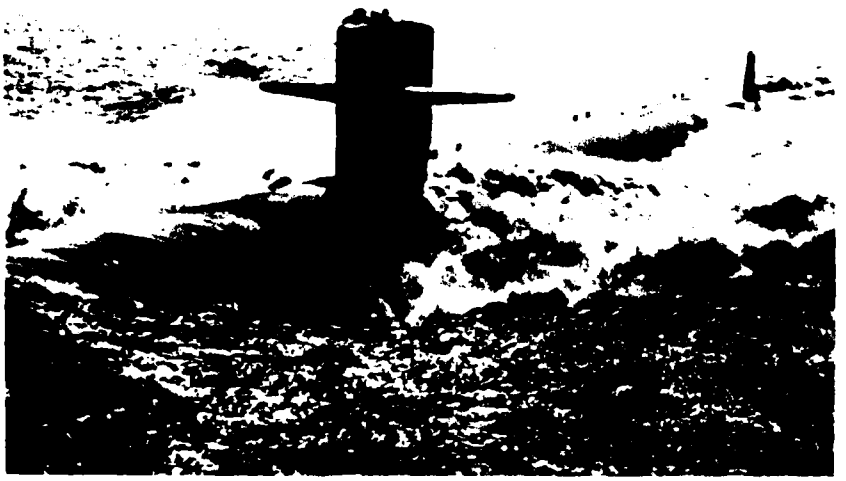
—*United Technologies' Pratt and Whitney Division* recommended breakout of nearly 9,000 aircraft engine parts, and has worked with us to identify 1,800 additional high value-added parts for breakout. Further, *the Sikorsky Division* has given the Navy permission to purchase helicopter parts from its licensees.

I said at the outset that quality would be the name of the game in 1985. The Navy expects to be judged by its actions, not just words!

I believe great strides have been made in 1984. Some headlines have been devoted to the less-positive side of the Navy's hard line on quality—our decision to stop accepting Phoenix missiles, F/A-18 aircraft, and F404 engines are three well-publicized examples. Unfortunately, what received less attention are the positive steps taken by the three major contractors affected—Hughes Aircraft, McDonnell Douglas, and General Electric.

—*Hughes* is now working hard to correct problems identified in the Phoenix missile. And there are other encouraging indicators the company is making across-the-board moves to ensure high-product standards. For example, on its own initiative, Hughes has stopped delivering aircraft radars to the Navy until defects that it has acknowledged are corrected.

LOS ANGELES Class Nuclear Powered Attack Submarine



—*McDonnell Douglas* has stood firmly behind the quality of one of its major products in offering to fully fund and effect all required corrective modifications to the 252 F/A-18 aircraft already in the Navy inventory. This action will preclude any future tail cracks in these planes, and, more importantly, allow our pilots to put their aircraft through any maneuvers for which the F/A-19 was designed.

—*General Electric* has taken a similar stand in promptly accepting responsibility to identify the underlying causes and complete required corrective actions to deliver a high-quality engine to the Navy.

I am pleased by these positive outgrowths of our tough stand on quality, and am pleased to say these are not isolated examples. However, it is our intention to continue to be a very tough customer when it comes to quality.

An integral part of our position on quality is meaningful warranties. You don't make personal major purchases without considering a good warranty to protect you, and I see no reason why the Navy should behave differently. Our recent experience has been that, in a competitive environment, we can get better quality and a meaningful warranty without any significant increase in cost.

For those not yet on the moving train I spoke of at the outset, I should point out that things are changing quickly.

Let me tell you a little story to illustrate my point.

In a recent meeting, one of my senior advisors was astonished when I refused to approve an end-of-fiscal-year, sole-source expenditure of $100 million for repair parts. He had a good argument that there was a genuine requirement for the parts. He felt there was no time to compete the contract before the end of the fiscal year, and that the Navy would "lose" the money if we didn't spend it. Besides, he pointed out, the sole-source suppliers were reputable people we had done sole-source business with for years. In deciding against the expenditure, I acknowledged the risk that the $100 million might be lost to the Navy, but noted it would not be lost to the taxpayer, and that at any rate I was willing to take that risk to obtain the advantages—including cost savings—from the competition.

As we become smarter buyers, the smart businessman gains more, and the business-as-usual people fall behind. Even a cursory study of the indicators bears this out.

Admiral White

"We cannot allow ourselves to depart from sound business practices just because a task force is about to deploy or the fiscal year is about to end."

If the Navy is going to be smarter in its dealings with industry, we must be *consistent*. We cannot allow ourselves to depart from sound business practices just because a task force is about to deploy or the fiscal year is about to end. We must pursue an unhurried, deliberate, and consistent buyer strategy.

Just as we do not expect you to concentrate on quality only when it comes easily, or to stand behind warranties only when it is inexpensive to do so, so too must the Navy be fair and consistent across the board—not just firm—in dealing with industry.

With solid backing from the Secretary of the Navy and Chief of Naval Operations, I intend to continue to ensure we do a much better job—for the Navy, and for the taxpayer. ■

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POSSIBILITIES AND EFFECTS

Warranties

Major Peter G. Paulson, USA

Don't go hunting with blanks . . . know what you're after in a warranty before you begin.

With the congressional edict to apply warranty provisions to the acquisition of defense products, the Department of Defense is attempting to develop implementation guidelines for use by its major buying agencies. The congressional direction is clear, but the manner and methods used to comply with that direction leaves considerable discretionary leeway with the departments responsible. The application of warranties in the defense acquisition process appears to be here to stay and it will probably be years before we see a finalized warranty program brought about by an evolutionary period of trial and error. The purpose of this paper is not to address the manner or the methods in which warranties should be applied, but to look at the much broader aspect of the possible effects warranties will have on the military and its fielding of equipment. In addressing these effects, I have chosen only a few selected topics that are by no means exhaustive, but are representative of the far-reaching effects raised by this single issue.

The manner or form that warranties may take on any one given program or product are of course innumerable. They can range from simple quality of workmanship warranties to the most all-encompassing of total performance warranties. The possibilities between are only limited to the imagination of the parties drafting the contractual warranty requirement. The myriad warranty possibilities and their effects are endless. I have elected to look at the warranty provisions as envisioned by Senator Mark Andrews; a total performance warranty not unlike a warranty we have experienced with a new car or a new television, and apply this to the topics I have selected.

Warranties Cost Money

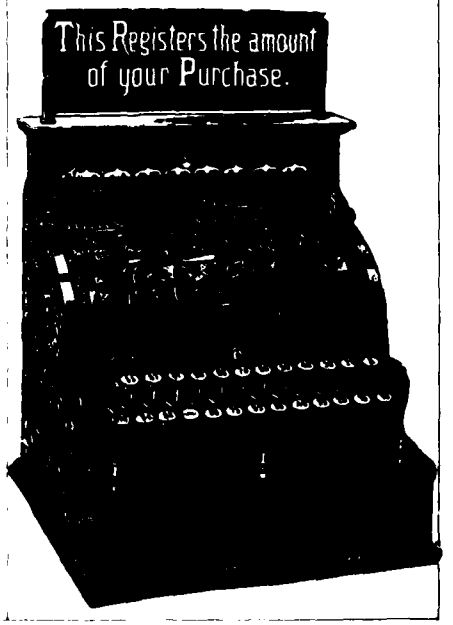
In the area of acquisition cost, few if any can argue that warranties cost money. Depending upon maturation of the design as well as complexity and use of the product, figures ranging as low as 1 percent to as high as 10 percent of the acquisition cost could be devoted to cover the manufacturer's risk against warranty provisions. With state-of-the-art technology and the complex design often employed in military hardware, it would appear reasonable that military warranties would most often approach the high range as opposed to the low end. It is not my intent to debate or to specify the actual cost of any warranty, but to simply point out that the additional responsibility assumed by the contractor will cost the government more money.

The topic of breakout is another area that I feel represents the far-reaching effects that warranties may have on the acquisition community. It is generally acknowledged that breakout can significantly reduce program costs. Buying assemblages direct and furnishing them to the prime contractor as government-furnished equipment, saves the government the application of general and administrative charges, as well as profit by the prime contractor on these "broken-out"assemblages. It is not uncommon for 10–15 assemblages to be "broken-out" in a large complex program, resulting in significant savings by the government. The decision to breakout, and the extent that its done, most often rests with the program office. Faced with the application of performance-oriented warranties, what happens to the breakout of these selected assemblages? In my estimation, one of three outcomes can arise.

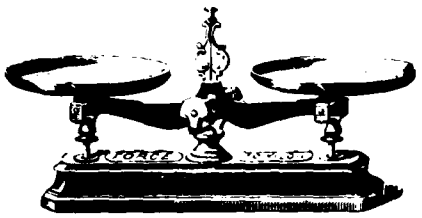
Three Possible Outcomes

First, the government will continue with the breakout position it had prior to the warranty imposition, and force the contractor (prime) to accept

Make sure the cost of the warranty doesn't exceed its value.



A product's failure rate and repair rate should be such that a contractor's risk is minimal to start with.



total performance responsibility for the system. Regardless of the arrangements made, that prime contractor can only reduce his risk in this situation by charging the government more money to warrant the performance of an assemblage he had little control over. His unknowns are great, his confidence is low and his price will be high. Undoubtedly the government would be reluctant to follow this option.

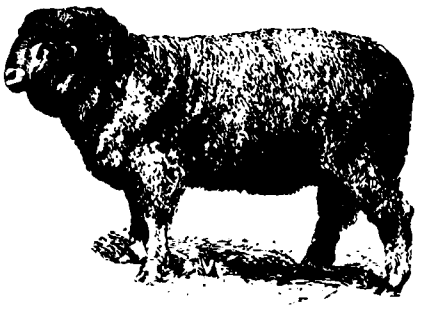
A second outcome could be that breakout continues and the government obtains a handful of warranties from the prime and from the major manufacturers of the assemblages broken-out. With a system failure, the government only needs to find out which one of the warranties needs to be invoked and work with that responsible contractor. For anyone who has attempted to work with such an arrangement, it is anything but optimum. Fault isolation is very often the most extensive and expensive part of repair. The fault is often in dispute and the replacement of otherwise good parts is not uncommon in striving to get the total system to work. Establishing responsibility—and liability—would undoubtedly lead to disputes and, possibly, litigation to determine what really caused system failure. We in the government would find that the problems associated with this type of warranty would soon mitigate any monetary gain we may have achieved through breakout.

The third and most likely outcome is that program management personnel will opt for the cleanest, simplest, and least painful option to significantly reduce the amount of breakout. This will facilitate total-system warranty by the prime at the loss of the acknowledged cost savings experienced by the government in breakout.

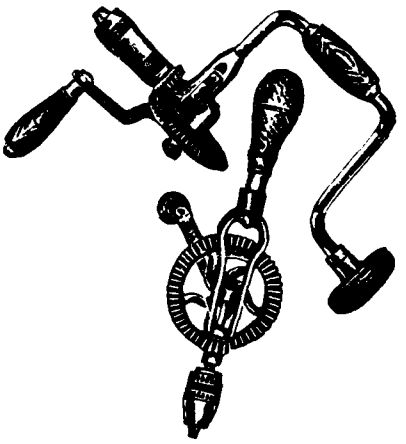
Decreases Readiness

The aspect of readiness is another illustration of the potential for far-reaching impacts imposed by warranties. Obviously, contractors will not be at every field location of their systems. Systems under warranty will either wait for field service by contractor personnel or will be shipped to contractors' facilities for repair. In either case the net result will be an increased delay in effecting the necessary repair of an inoperable system and, thus, decreased readiness. As more systems are fielded under warranty, the more readiness will be effected. I would not view this as a devastating blow to readiness in that at any one time the majority of fielded systems will not be under warranty, but I would expect to find isolated pockets of poor readiness on selected warranted systems. Thus, our newer and often most effective systems will be effected the most as they progress through the warranty period.

A spin-off from the readiness aspect has a much greater potential impact on our ability to wage war. Sustainability can be effected with an outbreak of war when we consider systems that are currently under contractor warranty. Any contractor would obviously be unable to keep up with the demands war placed upon his systems, and we in the government could hardly expect him to do so. Inevitably, we would have to employ military maintenance personnel to maintain these systems and these military maintenance personnel would have little, if any, hands-on work experience in repairing these warranted systems. Thus, the application of warranties denies our maintenance personnel the field training so necessary to ensure our ability to sustain combat operations. The impact of warranties in this regard has the potential to be devastating to our combat capability.



Your personnel may seek the cleanest, simplest, least painful option when preparing a warranty.



A warranty that is full of holes is one that cannot be enforced in peacetime or wartime.

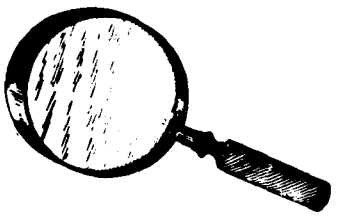
Reducing Exposure to Warranty Costs

A prime contractor facing the inevitability of warranty provisions on his production items will obviously attempt to minimize the monetary costs associated with calls on the war-

■ *Major Paulson is Chief, West Coast Field Office, Bradley Fighting Vehicle System, at the FMC Corporation. He is a graduate of PMC 84-1, and this "think piece" was written in partial fulfillment of the requirements of that course.*

ranty. In attempting to reduce his exposure to the potential warranty costs he can proceed in several directions. First, the quality of what he places in the field will have a direct relationship to the costs he will incur after fielding. By minimizing the mean-time-to-repair (MTTR) and maximizing the mean-time-between-failure (MTBF), the contractor has in effect minimized his exposure to the associated risk (cost) of warranty calls. His motivation in this regard is obviously helpful to the government in that his goals with MTTR and MTBF help to optimize readiness, reliability and sustainability of our fielded systems, as well as contribute to the overall reduction of the government operating costs associated with that system. So the negative aspects of warranties, as they apply to readiness and sustainability expressed above, are partially offset—or even eliminated by the positive aspects expressed here.

A second direction that the contractor may take to reduce his potential exposure to warranty costs deals with the state of the art of his system or product. Whereas the first direction in reducing MTTR and increasing MTBF had positive fallout for the government, the second is not as clear cut and, in many respects, may have serious negative impact on the military. With increased concern



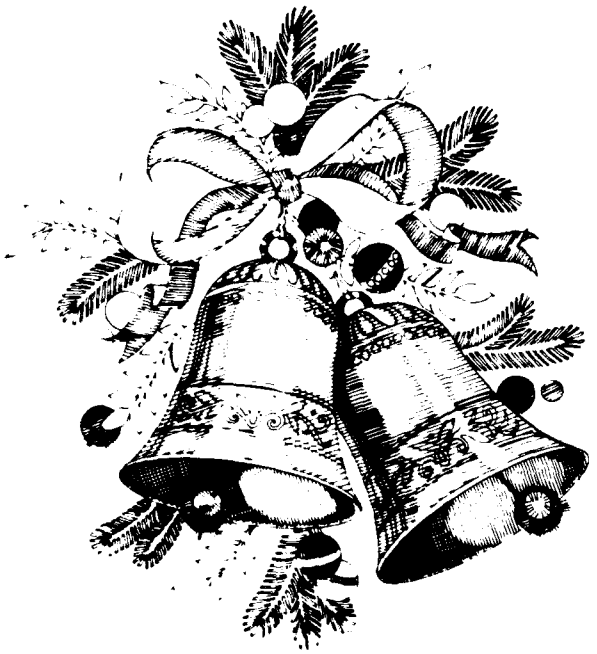
Your biggest problem with a warranty may be fault isolation. Whose fault is it?

over field performance, a contractor will be further motivated to stay with tried and proven methods and subsystems. There is a reluctance to advance the state of the art because of the increased technical risks, and hence, the potential for increased warranty exposure. It would appear reasonable that warranties would be a disincentive in advancing the state of the art and that we would see a slower and much more cautious approach in developing new military hardware. Some would argue that this would slowly erode our technical superiority while others would argue that we would have much more reliable equipment in the field. To some extent, both are probably true.

Acquisition Approach Could Be Altered

The seemingly simple concept of product warranties has the potential to make or to influence dramatic changes in the defense acquisition community. More than any single issue, the implications of system warranty are far-reaching and have the capability to change or alter our basic acquisition approach. It will undoubtedly increase costs, it probably will decrease breakout and, in a large sense, decrease competition. It will probably create an ever-increasing administrative burden on the services and, at the same time, provide us with more reliable equipment in the field. It may limit our technological advancement and hinder our capability to sustain combat operations. There are few areas that warranties won't at least touch and, in some cases, may significantly alter.

We in the acquisition business must look forward and attempt to anticipate what the impact of warranties will be. In applying warranties to systems, we have to recognize the pitfalls and attempt to reduce the many possible negative impacts, and try to maximize the positive impacts. We have to make the best of what appears to be a bad situation. ■



Happy New Year

MANAGEMENT

Do You Always Run a Gauntlet Trying to Effect Change?

Theodore L. Bloomer

Many managers express frustrations about inability to generate or to enrich changes in their organizations. They speak of a common contradiction. That is, wanted changes were obviously right, based upon realistic strategic visions, and were supported by key subordinates; but, the contradiction is that, usually, changes were never fully implemented. Perplexed managers reported they were not certain why some changes "took" and others didn't. Listening to the managers' dilemmas, plus my lack of definitive guidelines, led me to a closer evaluation of this intriguing subject. This paper presents areas that I call "gauntlets," which are critical to effective change management and which prescribe specific actions to improve your ability to influence the change process.

Descriptive Versus Prescriptive Literature

Most pertinent literature I found reflects five major themes, topical descriptions of which are:

—Change is here to stay
—The rate of change is accelerating
—No one is immune to change
—Research and development, and technology will drive major blocks of change
—Without a strategy to cope with change, you may not survive.

These five themes, and I'm sure there are more, are consistent in focusing on the description of our changing environment's nature. Additionally, there are many platitudes such as ". . . you should do something about it . . . ." But my problem is that their authors did not move into a *prescriptive* mode. What and how do I, as a manager (change agent), assure effective change? What are the barriers to influencing effective change? What insight into change management can practitioners provide me? Perhaps a more rigorous message (rather than just causing change) is to focus on ways to enrich the probability that the change "takes" and helps organizational performance.

Forces in the Environment: A Series of Gauntlets

The challenge of inserting change into a viable and dynamic organization can be a difficult task. That task can be insurmountable without specific strategies to deal with forces in the environment that appear to operate somewhat like a gauntlet. The "gauntlet" metaphor is curiously appealing to me since I have felt

thoroughly beaten while attempting to create change.

> **gauntlet**[2] (gônt′lit, gänt -) *n.* Also **gant·let. 1.** Two lines of men facing each other and armed with sticks or other weapons with which they beat a person forced to run between them. **2.** A severe trial; ordeal. (*The American Heritage Dictionary*)

Gauntlet 1: Lack of Congruence

It is easy, especially in the milieu of constant change, to develop and insert changes that solve short-term problems but, in the long term, only superficially meet organization needs. We find the absence of an overall integrated strategy is a major hindrance in implementing effective change. At first blush, you may shy from a suggestion that change implementation must be in congruence with a strategic thrust. The common disconnect is that some planners feel their purpose is to dampen or even resist change; on the other hand, some managers feel that due to so much change, there can be no legitimate planning. Both views have staunch allies. Too bad.

However, change becomes adverse when random change is allowed to influence the performance and direction of an organization. Change that is not in congruence with the organizational strategy frequently dies under its own weight. Executives insisting upon a broad philosophical agreement on basic organizational values and goals are able to insert effective organizational change much easier than those who do not. The notion that the an-

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ticipated change is consistent with the overall thrust of the organization is always present with successful change agents. I am convinced that healthy organizations, exactly like living organisms, will reject initiatives that are not in the best interest of long-term survival. My experience is that senior managers are frequently frustrated and angered at their organizations for not embracing change—they should be angry at themselves for not doing their planning homework.

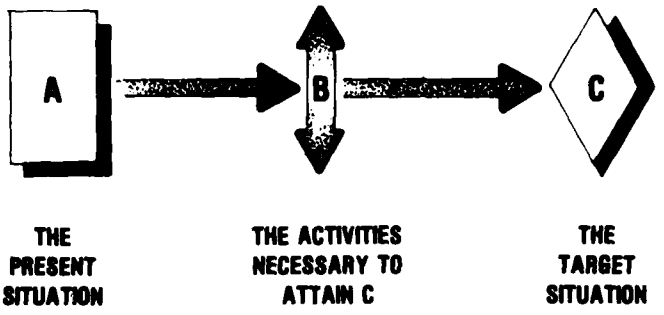
Gauntlet 2: Why Change?

The second gauntlet, by no means unique, is often overlooked by top management. The model that describes this gauntlet looks something like Figure 1. The unsuccessful change manager exerts a great deal of energy focusing on Part C of the change process. By the way, it's probably quite natural for hard-hitting managers to focus only on Part C of the process. That manager frequently makes an incorrect assumption, which is this: "Everybody understands Parts A and B, and will understand the requirement for Part C." Wrong! Many of us have not systematically assessed Part A because we are not in touch with top management's view of the big picture. From our vested perch we are not usually aware that something may not be effective in the present situation. Without a comprehensive understanding of the shortcomings of the present system our tendency is to reject the change strategies. Therefore, it is no wonder we exercise ways to circumvent moving from our "known" portion (comfortable) of Part A. Again, the frustrated executive has not completed his homework.

Gauntlet 3: People Resist Change

Most people believe it is natural to resist change. I believe that a majority of us, in fact, do not resist change; rather, *we resist the way change is promulgated.* I suggest that the politic executive *must* clarify reasons for the change, and allow key players at all levels to participate in the operational design of the activities en route through Part B to Part C—the target situation. Our ability to move effectively into the target situation is directly related to management's willingness and ability to articulate, and to obtain agreement and investment from the people that the changed state is desirable; or, at least, to clearly understand Part C (even if inevitable) with or without invested agreement. Successful change agents "go public" on all parts of the model and have the discipline to ensure broadest possible support of the change. In my opinion, Parts A and C are the most critical elements of the modeled process; one must show where the present state is defective because without that demonstration, you will obtain only token support. Most people probably will welcome the opportunity to develop and perform activities that will result in Part C.

Figure 1. A Sequential Change Process



Admittedly, energy required to utilize the model effectively creates drains on management's time. I suggest that you must take the time early on; otherwise, you will have to use exponential blocks of time to back-fill and you will be burdened by damage-control actions, possibly resulting in the abandonment of your change strategy.

Gauntlet 4: Not-Invented-Here

The not-invented-here (NIH) syndrome works in strange and exotic ways. The one I encounter most is subtle but quite visible. Here is how it works.

The senior executive brings key players together to investigate the propriety of instituting "Change WTF." After reasonable discussion the group agrees enthusiastically that the new WTF effort, with minor adjustment, is precisely what the organization needs.

We now move to Cascade Event One: Key players talk to top staffs and agree that the WTF initiative, with minor tweaking and adjusting, is just what the organization needs.

Cascade Event Two: Top staffers meet with project and program people and agree that WTF, with minimal adjustments, is just what the organization needs.

Let's jump to Cascade Event Six: Project managers and senior worker-bees implement a WTFO[2] (different, but similar) because they find it compulsive for players, at each subsequent cascade event, to apply their individual professional and personal twists to the project.

Successful change agents find it absolutely necessary to establish a reality check system from the top down to the worker-bee level. (See Figure 2.) I am not convinced that this not-invented-here syndrome is a pejorative process; rather, it is natural, pervasive and, unless checked, a powerful force that undermines change initiatives.

Gauntlet 5: The Grand Visionary

You who have worked near or around senior executives will understand problems inherent with the "grand visionary," who releases an overwhelming amount of energy into launching his/her new ideas or approaches. Usually, the vision is exciting and enthusiastically accepted by the body politic. Unfortunately, at later operations meetings, that same executive presents *another* exciting initiative; and, two weeks later, up pops *another* exciting idea. The rapid movement of resources and energy to keep up with this executive, much less to support his articulated initiatives, places top-management on a high-

speed roller coaster. Frequently, the visionary is only a dreamer and does not effectively manage the thrust of his organization. Another shortcoming of this visionary is the necessary discipline to make tough decisions to implement the visions. Subordinates are justifiably confused and may eventually participate in innocent to criminal conspiracies to subvert the executive's initiatives. These grand visionaries are often characterized as being "unguided missiles without warheads . . . ." Nonetheless, visionaries of organizations are desperately needed because they provide the basis for strategic building blocks. Successful change managers develop a hardball approach toward selecting the *right* visions, and directing the execution of those visions within organizational constants.

Gauntlet 6: Feed-Forward Networking

Successful change managers demonstrate a different kind of information exchange format. Many of us grow up in the "management by exception" approach to controlling systems and programs. The successful change manager does review past information, but doesn't dwell only on programs not within established performance criteria. This manager not only looks at the whole program, but he focuses on two specific results.

The first is focusing on data that show the organization is doing well; also, how the overall data package is instructive for the big picture in a futuristic sense. For example, this manager does not inadvertently move assets from successful subparts of a program to remedy other subparts; to do so would continue the never-ending cycle of "robbing Peter to pay Paul." This manager is constantly aware that information, when clustered into quality information packages, is more instructive for future decision scenarios than for fixing past shortfalls. Therefore, a strategy to gather and cluster information that has a futuristic decision-making orientation is preferred over an information gathering system that is designed to assess shortfalls of past events. Another way to perceive this is to resist thinking about ways to fix past shortfalls, and, rather, to design data and concepts to ensure, where possible, that future events are successful.

The second specific of the feed-forward concept is that change or meeting projected change (strategic thinking) is not a rigid process. For example, some change agents tend to harden the target situations (Part C, Figure 1) and muscle the organization into the performance window to ensure that the change happens. I think the successful change agent uses a feed-forward system that keeps a constant surveillance of the present world, while insisting upon flexibility to react to the real time change in data, en route to the target situation. The target situation is more powerful when the largest possible plurality has, as a minimum, some philosophical agreement of imperfect visions. This is better than attempting to strike a consensus on some concrete vision of a changed state. The feed-forward-network would honor the constant movement or quality information that focuses on the ever-dynamic change state, rather than on a backward, retrofit focus, or on driving for a concrete out-year changed state.

Gauntlet 7: The Hidden Agenda

The most significant gauntlet concerns people's perceptions that there are hidden agendas. We must assure that *all* agendas are public and open for a plurality of inputs. Some day we may be sophisticated enough to go public on everything. Information placing us in an unfair competitive position, and activities adversely impacting individuals seem to be candidates for extraordinary control. The tendency not to go public on as much organizational information as is possible fosters the belief that "they" are withholding information; therefore, hidden agendas must be underpinning proposed changes. The genesis for lack of trust (hidden-agenda syndrome) may be imbedded in the inferior way we process organizational information. Because managers often launder and reshape information in an attempt to dampen fears, many people feel that everything emanating from senior management is questionable. Change strategies that operate under clouds of distrust are frequently doomed before obtaining positive results.

Summary

What is change all about? It is the top brass saying: "This new process will be implemented on Monday! I look forward to your support. The results of this change will dramatically influence the performance and productivity of our organization."

Use your head. Get as many people involved as possible. Do your homework. Go public on *all* issues. Select input actively. Treat change as a healthy requirement for growth. Share the design.

Most of all, smile—or, run the gauntlet. The choice is yours!■

Figure 2. Check List for Change Analysis

1. WHAT ARE THE CONSEQUENCES OF NOT INSERTING THE CHANGE?
2. HOW DOES IT INFLUENCE PERFORMANCE AND PRODUCTIVITY?
3. WHAT ARE THE OBSERVABLE BENEFITS?
4. WHAT ARE THE ASSOCIATED COSTS?
5. HOW DOES IT INTEGRATE WITH ON-LINE STRATEGIC ACTIVITIES?
6. HOW DO WE ENSURE THE RIGHT INPUT FROM KEY PLAYERS?
7. DOES IT MAKE PROGRAM MANAGEMENT (CONTROL) EASIER?
8. DOES IT HAVE SHORT- OR LONG-TERM LIFE?
9. HOW DO WE "GO PUBLIC" AND MARKET WITH OUR OWN PEOPLE?
10. ARE THE PROPOSED CHANGE CUSTOMER, EMPLOYEE, AND ROI FRIENDLY?

Whenever in this publication "man," "men," or their related pronouns appear, either as words or parts of words (other than with obvious reference to named male individuals), they have been used for literary purposes and are meant in their generic sense.■

Productivity Improvement

in the Department of Defense Acquisition Environment

John A. Mittino
A. Douglas Reeves

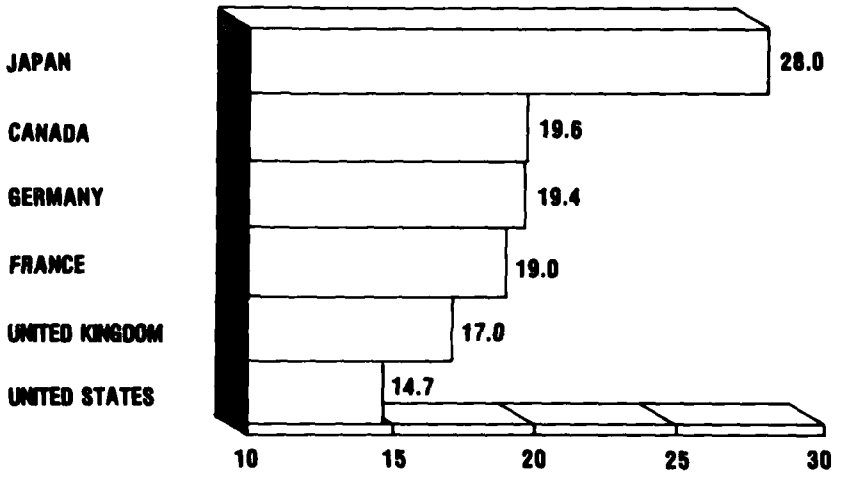
Just as productivity has become a priority at the national level, so too has the achievement of increased productivity and manufacturing efficiencies become a paramount concern to the Department of Defense. It is a critical element in improving our defense posture and, most importantly, in reducing costs. Improving productivity in the acquisition environment is the key to this process. The impact becomes apparent when one recognizes that the DOD is by far the largest purchaser of systems, equipment, products, and services in the Federal Government—with a procurement budget exceeding $90 billion; and research, development, test, and evaluation adding another $30 billion in FY 84. The magnitude of DOD expenditures is indicative of the leverage that the department has in promoting productivity improvement in the commercial industrial base on which the DOD heavily relies.

Public perception of productivity improvement in the acquisition environment probably centers around spare parts and warranties. In reality, there are many facets of the issue, and a complexity that is not always apparent on the surface. But there are tremendous challenges and opportunities, and the DOD has a variety of aggressive programs and initiatives aimed at promoting improvements. Our purpose here is to foster a better understanding of the environment that exists and describe productivity improvement efforts under way.

The Acquisition Environment

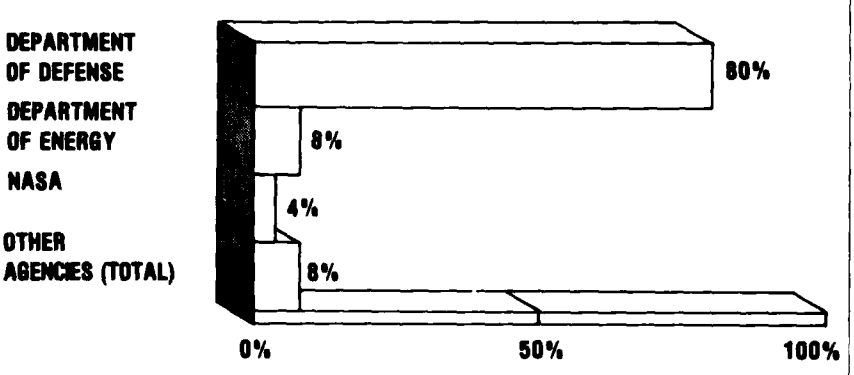
The first step of any productivity improvement effort is to examine carefully the environment in which it occurs. Most observers familiar with the private or commercial sectors of our economy have a perspective that is different from that of the DOD as it pertains to acquisition. This is not meant to imply that the DOD never operates in a similar environment, because in many cases it does (particularly when dealing with lower-tier subcontractors and vendors). But there are many cases where the differences are extreme—and we intend to draw out and highlight these differences. It is important to do so to understand the impediments to productivity improvement and the

Average Annual Rate of Capital Investment as a Percent of Output



SOURCE: U.S. DEPARTMENT OF LABOR

Contract Profile by Departments and Agencies
(Based on Federal Procurement Data Statistics)



% OF TOTAL CONTRACT DOLLARS BY AGENCY OR DEPARTMENT

mechanism necessary to overcome these impediments.

For instance, the industrial concern operating in the commercial marketplace typically sees either of two related forces: (1) improved productivity reduces costs and permits realization of greater profit, market share, or both, depending on pricing strategy; or (2) competitive pressures necessitate productivity improvement. Prices of many DOD weapon systems, on the other hand, are negotiated so that profits are based on costs. The same incentives to reduce cost that exist in the commercial sector are not present to the same degree in many DOD procurements. A contractor who takes risks and acts to reduce cost may reap benefits on the instant contract, but also may have many of the long-term benefits negotiated away as his cost base decreases. The absolute dollar value of his profit is correspondingly reduced.

The market structure present can be markedly different. Rather than a number of suppliers with similar products and a variety of users, the extreme that occurs in some DOD procurement is a single supplier with a unique product and only one user—the Department of Defense. Both components of the law of supply and demand are affected.

The product being produced is unique and, in many respects, is the cause of the market structure difference. The billion dollar, technically sophisticated weapon system (with a 7-8 year development span) has no parallel in commercial industry.

The preferred method of procurement for the Department of Defense is to award to the lowest responsive bidder. One problem associated with this method of procurement is that we have less latitude than private industry in buying the best product at the best price. This occurs because of the difficulties in precisely defining desirable characteristics, evaluation factors, and associated cost tradeoffs. Federal procurement leaves less room for subjective judgment. Contractual enforcement features are dissimilar in some important respects. For instance, one feature of commercial procurement is the ability to remember poor performance and to ensure that a contractor who provides substandard equipment is not afforded the opportunity to do so in the future. For various reasons, ranging from the size of the bureaucracy to political considerations, this is much more difficult in the case of federal procurement.

Sweeping generalizations about defense contractor manufacturing capabilities cannot be made. There are many bright spots and many areas where major improvements are needed. Productivity problems and solutions in the various segments of industry vary. However, a significant portion of manufacturing on defense programs is done in an environment that can be characterized as utilizing outdated and inefficient capital equipment and as labor-intensive.

Batch-production methods are used extensively in manufacturing for the DOD. Quantities are small and deliveries are over a period of time. Engineering changes frequently occur. As a result of these factors, flexible manufacturing systems appear to offer the greatest promise in the DOD manufacturing environment. These computer-controlled and integrated machines, work stations, transfer mechanisms, and tooling allow production of a variety of products in small numbers.

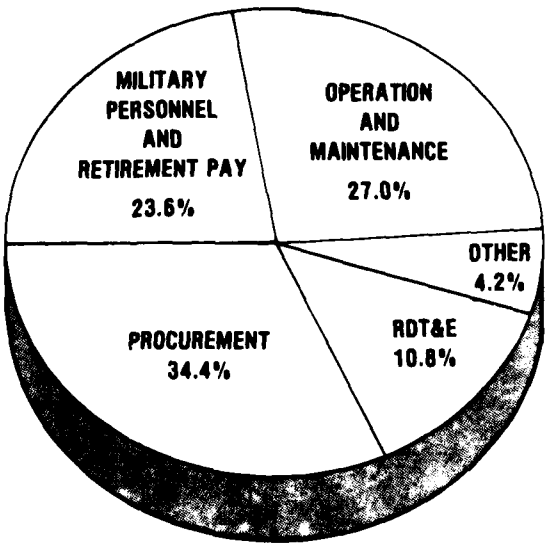
A final but important factor when pondering productivity improvement in the acquisition environment is the relationship of the parties involved. Most organizations, industry or government, are concerned with improving their own productivity. Benefits are usually direct and control is substantial. Improving productivity of a second party, such as a defense contractor, is usually a matter of influence rather than control. Questions of rewards, mechanisms, and responsibilities (and the danger of diminished responsibilities to be discussed later) are critical.

We intended the preceding discussion to provide the context in which the DOD is seeking major productivity improvement of the contractors for which it is a customer. Hereafter, we will highlight the activity, programs, and initiatives that serve as the vehicles to improved productivity and reduced DOD acquisition costs.

DOD Acquisition Improvement Program

Three and a half years ago, the Reagan Administration entered office

Procurement and Research, Development, Test, and Evaluation (RDT&E) as a % of DOD Budget



determined to make significant changes in the way the Department does business. It was simply not enough to pledge to increase spending for national defense; it was essential to ensure that this be done responsibly in ways that are consistent with the principal security concerns, as well as with sound management principles. Then Deputy Secretary of Defense Frank Carlucci took on the formidable task of re-examining the acquisition process from top to bottom. The result was 32 initiatives designed to shorten and simplify the acquisition process, to control costs, and to make certain that major concerns such as logistics support and competition were properly considered and incorporated into acquisition planning and implementation.

The Carlucci Initiatives have undergone changes during the past 3 years. Former Deputy Secretary of Defense Paul Thayer reviewed the original 32 initiatives and decided to place priority attention on the six management areas that provided the greatest challenge and the greatest potential payback. These areas include: program stability, multiyear procurement, economic production rates, realistic budgeting, support and readiness, and competition.

The remainder of the original initiatives, however, are not being ignored. Thirteen of the original 32 initiatives have been essentially completed, including initiatives to reduce Defense System Acquisition Review Council (DSARC) data, to ensure use of the proper contract type, and to tie the DSARC and budget processes together. Monitoring of these initiatives continues to assure that they stay on track. In addition, we are working hard on the remaining important initiatives, such as Initiative 5 on encouraging capital investment to enhance productivity, and Initiative 14 on optimizing contract requirements. These are particularly pertinent to productivity improvement and will be discussed separately later in this paper. Perhaps the most important initiative of the original 32 is the one on which we continue to place the highest priority—implementation.

Program Stability. From the beginning, the DOD has placed priority emphasis on achieving greater stability for our defense programs. Improved program stability provides a more timely, more efficient means to achieve our military security objectives. It is recognized, however, that some instability is inevitable, if not desirable, in many programs. For example, programs must remain flexible enough to be able to respond to changes in the Soviet threat. We must retain sufficient flexibility to be able to take advantage of technology opportunities. It's the arbitrary instability, particularly that brought on by fluctuations in the budget, which we are trying to minimize. Unfortunately, with so many players in the act, this is a difficult objective to achieve.

We are using more realistic inflation indices, and have expanded the use of independent cost estimates.

The hope is that a new effort on baselining/cost capping, which the Air Force has introduced in its programs, will prove to be an effective means to improve program stability. The baseline/cost cap program is designed to reach an agreement among all the major components within a program as to its scope, configuration, and cost. In order for a major change to be incorporated into a program, agreement must be reached among all the signatories to a program baseline document. Thus, the consequences of major changes are realized and agreed to by all parties before the change can be incorporated. So far, the Air Force has baselined over 70 programs and is expanding the coverage of the program each year. The applicability of the Air Force approach to the other services is being examined.

Multiyear Procurement. One of the most successful means toward improving stability that has been initiated is the use of multiyear procurement for major programs. Multiyear buys reflect the maturity of a program and the confidence at all levels of management that a program will stay on track. In addition, multiyear procurement has the important advantage of saving everyone some money. The 23 multiyear programs that have been approved by Congress so far are expected to save about $3.7 billion over annual contracting methods. The DOD has 12 new multiyear candidates in the FY 85 budget that are expected to save more than a billion additional dollars. To be successful, this initiative requires the support of the Congress, which has waivered in the past.

Economic Production Rates. Economic production rates encourage program stability through attainment and maintenance of cost-effective production rates. The FY 83 and FY 84 budgets contained 18 major programs that we budgeted for more economic production rates. Savings of about $2.6 billion are estimated for these programs. Unfortunately, funding more economic production rates has become increasingly difficult in the current atmosphere of budget reductions below originally programmed levels. Nevertheless, the DOD intends to maintain support for this initiative to the extent that the budget will allow.

Realistic Budgeting/Support and Readiness. The DOD has taken some important steps to ensure that cost estimates used in budgeting for our programs are more realistic than in the past. We are using more realistic inflation indices, and have expanded the use of independent cost estimates. Budgeting for technological risk is being systematically applied through service programs such as the Army TRACE (total risk assessment cost estimating) program. In the long run, as a result of these initiatives, there will be fewer surprises and, consequently, less instability in our programs. Similarly, our efforts to improve support and readiness continue through means such as better up-front planning and review, and greater visibility in the program budget review process.

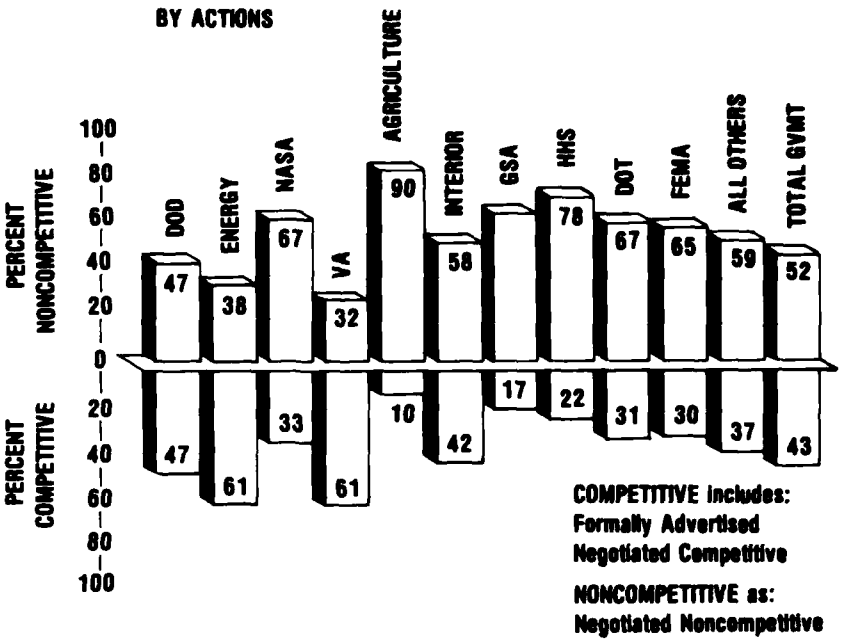
Competition. The DOD continues to focus on ways to improve competition. For generations, competition has been the preferred means for acquiring supplies and services in the government. However, for many years, observers have wrongly equated competition with the method of procurement; that is, formal advertising. The Commission on Government Procurement highlighted this problem more than a decade ago. We require our purchasing activities to solicit competitive offers whenever practicable, whether by the negotiation method or by formal advertising. However, formal advertising is a procurement method that is, for the most part, unique to government and, even then, inappropriate for many of our programs and contractual efforts.

Obtaining effective competition is a longstanding objective. Almost all of our major programs, for instance, had competition among prime and subcontractors during the development phase. Those which were not competed were sole source as a function of necessity, not choice. For example, only one shipyard makes nuclear aircraft carriers.

Nevertheless, actions are under way to improve our performance in competition. The DOD components have designated advocates for competition within their respective organizations. Competition goals have been established. We are working to make it easier to determine costs and benefits of competition in the production phase, and clarify potential application of leader/follower and other means of second-sourcing for programs being planned, or already in production. The potential for savings in this area is high.

Through actions such as these, the entire procurement process is focusing on increasing competition where it makes sense. But we also recognize there are other initiatives and efforts that run counter to this general theme. For instance, a widely recognized way of promoting increased productivity and improved quality is for a company to work closely with its suppliers and vendors in this area. This involves building long-term relationships and, in a sense, providing the same type of stability and planning opportunities we are trying to encourage with multiyear procurement. It generally results in a reduction of the total number of suppliers. The Japanese are using this approach, the automobile companies are using this approach, and we've seen defense contractors using this as an important element of their productivity improvement programs. We have to strive for a proper balance in our approach.

Degree of Competition



SOURCE: FEDERAL PROCUREMENT DATA SYSTEM

Industrial Base. The deputy secretary has created another initiative, which has been added to the list of high-priority management concern. There is a growing concern about the state of the industrial base and its ability to respond to a crisis. Deputy Secretary Taft has directed that a high-level joint working group be formed to establish an industrial base action plan encompassing issues such as funding priority, surge capability, and minimum sustaining production rates consistent with reasonable responsiveness.

Industrial Modernization Incentives Program (IMIP)

The cornerstone of DOD efforts to improve defense contractor productivity is the ongoing test of the Industrial Modernization Incentives Program (IMIP) authorized by the Deputy Secretary on November 2, 1982. This program is intended to develop and refine contract incentives encouraging industry to make productivity enhancing capital investments. The incentives being tested include shared-savings rewards and contractor-investment protection, and are primarily aimed at motivating contractors to invest their own funds. The program is directed at overcoming the two problems most frequently cited as inhibiting modernization in defense—a profit policy which, in certain acquisition circumstances, is based on cost; and, program uncertainties that hinder investment amortization and inhibit long-term planning.

Note: Mr. Mittino presented this paper at the NASA Symposium on Productivity and Quality, September 25-26, 1984, Washington, D.C.

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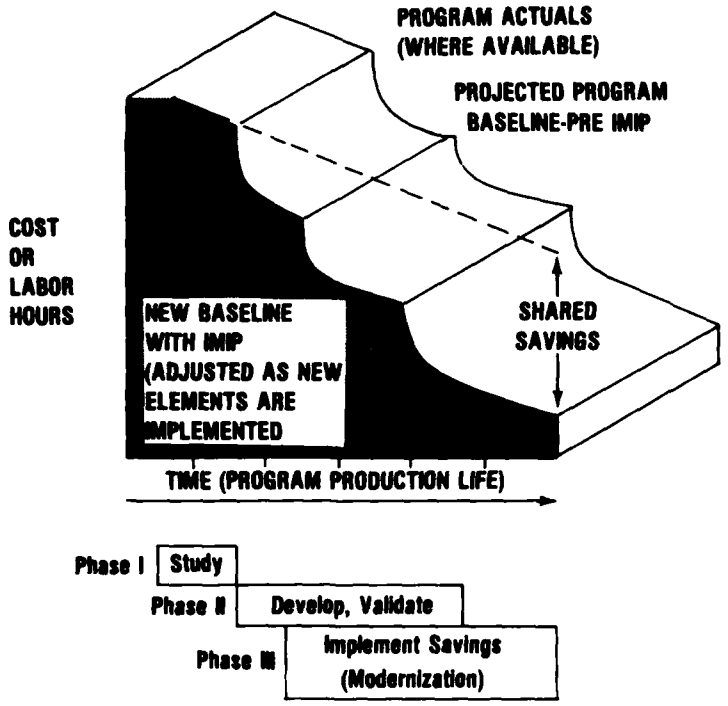
Mr. Reeves is an Industrial Engineer, Industrial Productivity Office, Office of the Secretary of Defense.

IMIP Concept and Impact

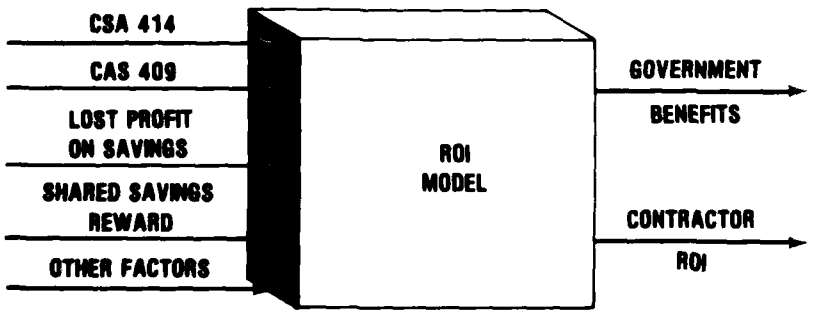


As an early step in IMIP, contractors are encouraged to take a look at *their facility in a manner unconstrained* by the "As Is" situation. Emphasis is on factory-wide improvements with multicontract and multiservice applications. Quantum improvements are desired—not incremental, isolated, or machine-by-machine changes.

We in the Department of Defense recognize our responsibilities to spur modernization and improved productivity. We must make sure we are always using 20th Century manufacturing methods *in the production* of defense products. We can't be considered successful if it takes us until the year 2000 to achieve this goal. Bruce Springsteen's latest hit record contains the lyrics, "you can't start a fire without a spark." The DOD hopes the IMIP will provide the spark to spur increased capital investment and reduced acquisition costs.

The test of the IMIP is a uniquely structured effort in many respects.

An IMIP Investment Analysis Tool



Although productivity problems are well recognized and documented, solutions are not always as apparent. By providing an "umbrella" test, DOD components have the opportunity to be innovative and creative. Reluctance to try new ideas because precedents do not exist, coupled with a unipolar reward system that only penalizes mistakes, are the psychologies being attacked. The incremental approach to implementation allows knowledge to develop regarding what does and does not work, and to make adjustments. It overcomes the "Catch 22" of not being able to develop policy without knowing all of the effects, and not being able to gain the necessary experience because policy is not in place. It is indicative of the "bias for action" necessary to achieve results. Success of the test IMIP may result in its being used as a model for other programs.

Important new tools and techniques have been developed to support IMIP. A Return-on-Investment (ROI) model permits evaluation of the effects of an investment decision. It allows both the contractor and the government to understand the interrelationship of capital investment and government finance and profit policies. An innovative sharing factor approach (whereby shared savings rewards are allocated proportionately over all contracts at a manufacturing facility) is being tested to facilitate factory-wide IMIP applications.

The latter technique is particularly important since it has the potential of reaching the subcontractor and vendor base—a very high priority goal of the program. Purchased equipment and material can account for greater than 50 percent of the value in the production of some defense systems. The prime contractor of the B-1 bomber uses more than 5,000 subcontractors, vendors, and suppliers.

A great deal has been accomplished during the IMIP test to date. There has been significant activity under IMIP up to the point of actual implementation of individual contractor capital investment plans. After this phase, with some notable exceptions, experience is more limited. However, the IMIP process is an iterative one that builds on earlier efforts. Broad implementation and maximum bene-

fits at a particular facility are likely to span many years.

The most important lesson learned is that the process does work. Increased capital investment and enhanced productivity can be stimulated through efforts like IMIP, which is a viable acquisition tool that can be used when situations warrant. Flexibility must be retained to tailor the concepts to the particular application. Knowledge and good judgment are essential—not rigid adherence to specific procedures. IMIP will not be the answer to every problem but will make an important contribution to a modernized efficient DOD manufacturing base where it applies.

More Cost-Effective Contract Requirements

An extremely important example of our efforts to improve the acquisition process deals with promoting more cost-effective definition of requirements in our weapon system contracts. This is one of the efforts DOD has undertaken that ties closely with major recommendation of the White House Conference on Productivity to "consistently evaluate government actions, regulations, and legislation in terms of their effects on productivity in the public and private sector."

This initiative, authorized by the Deputy Secretary of Defense on January 11 of this year, is aimed at fostering greater attention to more cost-effective application of specification, standard, and data requirements. It will encourage greater flexibility in how requirements are imposed—particularly early in a program. We will stress progessive definition of requirements as a weapon moves into development instead of working from the start with detailed contract requirements that may turn out to be inappropriate. We will try to express our requirements more in "what is required" rather than "how to" terms. We will encourage greater contractor participation in defining appropriate requirements, and in identifying and suggesting changes to requirements that may be excessive.

The services have identified 12 major programs for initial application of this concept, including four important aircraft programs. Many companies are involved with these systems and will have an opportunity to facilitate development of new approaches and new impetus to more cost-effective contract requirements.

The DOD sponsored a workshop on optimizing contract requirements along these lines. The approximately 150 key government and industry personnel attending had varied backgrounds in program management, contracting, and engineering. Most were associated with the 12 programs mentioned earlier, and the constructive and enthusiastic atmosphere was encouraging. The concrete recommendations made on overcoming the risk adverse nature of many of our acquisition participants are being considered and acted upon. We will monitor the many initiatives engendered by the conference and will provide lessons learned, good and bad, to as wide an audience as possible. A follow-up conference on this initiative is being sponsored by an industry association and will be held this winter.

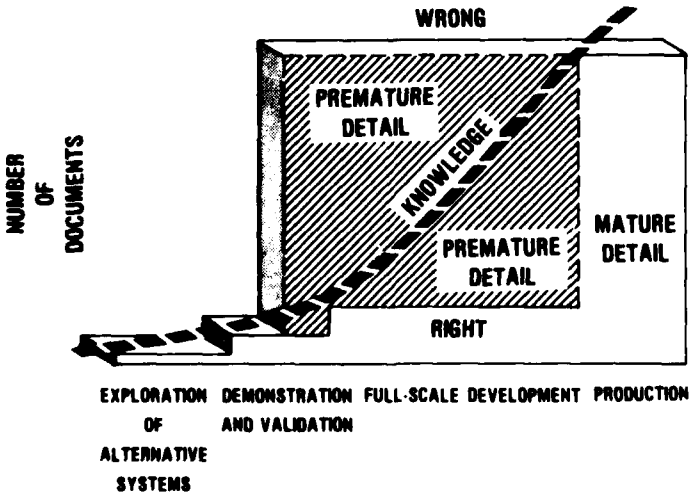
Manufacturing Technology

The Manufacturing Technology Program (MANTECH) is a well-established program aimed at making first-case manufacturing process and equipment improvements in the production environment. An element of technical risk is involved. Government funding participation (nominally at $200 million a year) is significant. The 400 to 500 investments active at any one time focus on a broad range of processes and products; for example, rubber boots, TNT lines, composite aircraft skins, and rocket engine nozzles. Spinoffs into the commercial sector are significant. Indeed, Department of Defense actions in promoting the development of numerically controlled machines (where we virtually purchased, furnished, and mandated their initial application by defense contractors some 20 years ago) provided a major impetus to modern manufacturing methods.

Contract Finance, Patent, and Technical Data Rights Policies

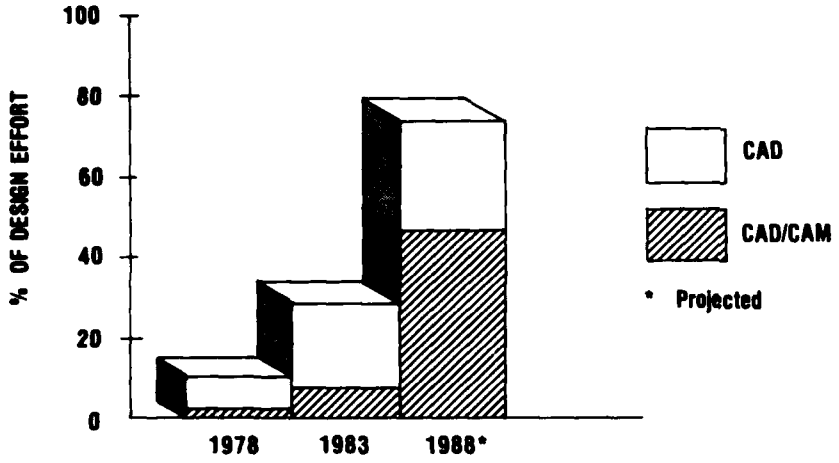
A variety of activities are under way in areas such as cost accounting standards, flexible progress payments, expedited paying cycles, economic price adjustments, profit levels commensurate with risk, patent policies, and technical data rights policies that have an impact on capital investment and contractor productivity. A recent revision to our acquisition regulations, which broadens those activities included in the definition of manufacturing and production engineering and their allowability in manufacturing overhead, is one example of DOD efforts in this area.

Proper Application of Requirements
A Matter of Timing as Well as Substance



Trends

COMPUTERIZATION/INTEGRATION OF DESIGN/MANUFACTURING EFFORT



SOURCE: USAF "Blueprint for Tomorrow"

Twelve Weapon System Acquisition Programs Targeted for Initial Implementation of the DOD Initiative to Develop More Cost-Effective Contract Requirements

ARMY:	LHX	EXPERIMENTAL LIGHT HELICOPTER
	AATWS	ADVANCED ANTI-TANK WEAPON SYSTEM
	PERSHING II	MISSILE SYSTEM
	MICNS	MODULAR INTEGRATED COMMUNICATIONS & NAVIGATION SYSTEM
NAVY:	VTXTS (T-45TS)	UNDERGRADUATE JET FLIGHT TRAINING SYSTEM
	JVX	JOINT SERVICES ADVANCED VERTICAL LIFT AIRCRAFT PROGRAM
	CV IZ ASW HEL	REPLACEMENT INNER ZONE AIR ASW VEHICLE
	LHD-1	AMPHIBIOUS ASSAULT SHIP (MULTI-PURPOSE)
AIR FORCE:	ATF	ADVANCED TACTICAL FIGHTER
	INEWS	INTEGRATED ELECTRONIC WARFARE SYSTEM
	ERAM	EXTENDED RANGE ANTI-ARMOR MUNITION
	AFWIS MODERNIZATION	AIR FORCE WORLDWIDE MILITARY COMMAND AND CONTROL SYSTEM INFORMATION SYSTEM MODERNIZATION

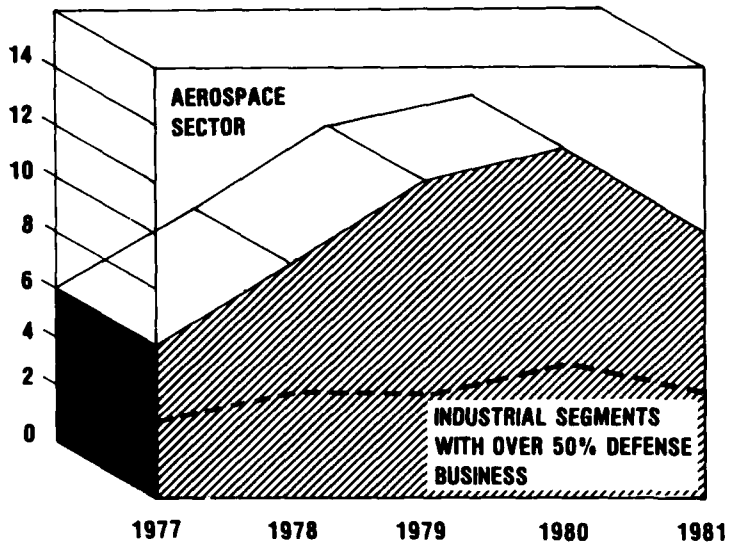
We in the DOD are taking another intensive look at our contract finance and investment policies as a follow-on effort to the study completed in 1976. The Defense Finance and Investment Review will examine areas such as CAS 409, CAS 414, profit policies, and their interrelationship and impact on an effective and efficient industrial base. Extensive surveys and data gathering should provide a clearer picture of the state of conditions and the motivators that are working or not working in industry. The study is scheduled to be completed early next year.

Overhead costs illustrate dichotomies that can occur. We tend to put tremendous pressure on defense contractors to keep overhead rates low, the implication being that high overhead rates indicate inefficient operations. The opposite may actually be true in the most advanced manufacturing facilities with their low direct-labor components—possibly as low as 5-10 percent of total costs. Our pressure has the effect of creating a contractor reluctance to do anything that may increase overhead rates, and that can extend to modernization. One problem is a classical case of conflicting objectives related to cost accounting. On the one hand we require consistency—the first rule of accounting. But we also desire that costs be directly charged wherever feasible. Unfortunately, whenever we deviate for specific reasons from the norm in the second instance we may be forced, for the sake of consistency, to continue allocations in overhead on a wider scale than may otherwise be necessary. We will have to relook at our cost accounting standards as we move to next-generation manufacturing techniques. Deputy Secretary Taft is considering establishment of a special project to promote incentives to reduce overhead costs that may have a bearing on this general area.

Science and Technology

The Department of Defense conducts a wide range of projects—from basic research to advanced technology demonstrations—that have resulted in manufacturing advances. Programs involving very high speed integrated circuits, acoustics, computers, computer software, sensors,

Comparison of Capital Investment as a Percentage of Sales of the General Aerospace Sector to Defense-Oriented Industrial Segments Within This Sector



SOURCE: 1983 FEDERAL ACQUISITION PAPER BY LT COL O. M. COLLINS

robotics, controls, and various materials provide new knowledge that benefits both national security and the private sector. The private sector carries out about two-thirds of this DOD effort, greatly facilitating the transfer of such technology to commercial applications.

The DOD continues to support well-established programs like Independent Research and Development (IR&D). Despite congressional limitations on total IR&D ceilings, we are placing special emphasis on industry/university interactions and systems readiness and support projects. We are accommodating these special interests through our normal negotiation process, with special treatment in the technical-evaluation process. In addition, we are engaged in early discussions about the possibility of making productivity improvement a similar area of special interest.

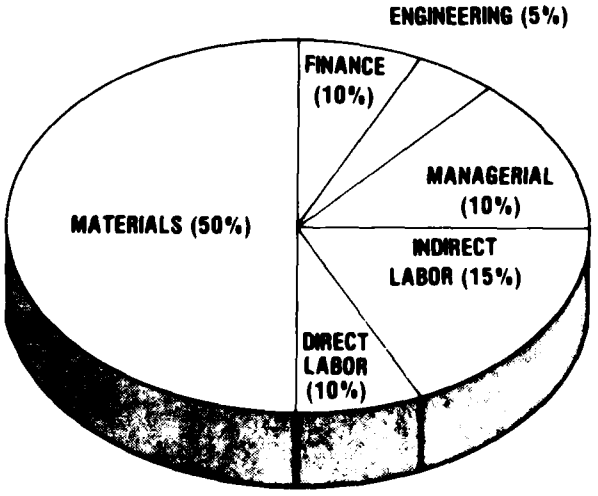
Quality

Productivity and quality are inseparable issues. Because quality has such a major impact on decisions about manufacturing processes, equipment, and supplies (and because quality has become an increasingly significant problem in defense materiel acquisition), the DOD is re-emphasizing its policies and programs aimed at improving product quality. The department encourages commitment from top management and is promoting increased awareness and attention to quality problems during design and manufacturing. The DOD is re-examining its qualification and certification programs to determine whether quality is sufficiently stressed. Perhaps most importantly, we are trying to find new ways to include quality history into our source selection process.

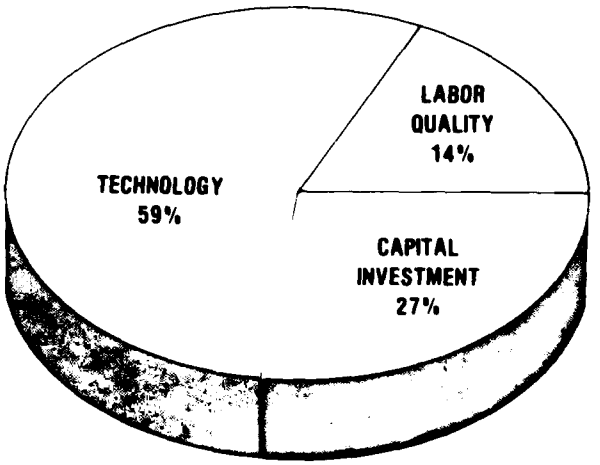
Defense Industries Productivity/ Quality Computer Conference

The DOD has taken the lead in organizing a Defense Industries Productivity/Quality Computer Conference as an outgrowth of the White House Conference on Productivity and the Defense Industries Productivity Workshop held in Houston, Texas, in July of 1983. The computer

Typical Components of Manufacturing Costs



Factors Affecting Productivity
(Composite Findings of Kendrick, Denison & Jorgenson)



conference, which is close to operational, is intended to enhance communications and activity aimed at improving productivity and quality in the defense acquisition environment; it will be oriented toward identification, discussion, and solution of practical problems; it will serve as a stimulant, catalyst, and vehicle for necessary actions. The computer conference results are expected to provide discussion and input into current issues confronting DOD, establishment of projects, assignment of responsibilities, coordination and comments on related documents (such as regulations and handbooks), communication about ongoing activities, quick feedback on issues of concern to the participants (such as reaction to proposed legislation), information and data gathering, and "case studies" of actual experiences. Participants are expected to provide individual perspectives rather than official organizational positions.

Manufacturing Plans and Emphasis

Too often in the past the DOD has emphasized the performance characteristics of products it acquires rather than manufacturing efficiency; DOD selected contractors based on their design and engineering capabilities rather than on their manufacturing capabilities. This is changing. DOD is now promoting increased attention to productivity and quality improvement plans as integral parts of our acquisition strategy, and acting to reinforce contractor activities and foster greater emphasis in this area. Efficiency of the manufacturing process, manufacturing plans, and quality are being given more visibility. They are increasingly important considerations during our source selection evaluations and major system reviews.

The DOD recently issued two Directives that will have an impact in this regard—DoDD 4245.7, "Transition from Development to Production," and DoDD 4245.6, "Defense Production Management." Both are the result of a recently completed Defense Science Board study on the problem of transitioning from design to production. The study recommended the use of a series of templates for design, testing, production, facilities, and capital investment. These templates will enable a contractor to assess and compare his facility and thereby identify desirable improvements. The government benefits as well in that the templates give productivity factors greater visibility and provide the tools by which manufacturing risk can be progressively minimized.

Integration of Contract Incentives

The DOD is revitalizing the Value Engineering Program and developing new incentives under the Industrial Modernization Incentives Program. These actions highlight concern that the department has numerous contract incentives, all developed in isolation, which are neither always understood nor congruous. These include design-to-cost goals, reliability incentives, award fees, potential quality incentives, and cost-plus-incentive contracts. At present, the DOD is developing guidance on the systematic use and interrelationship of incentives.

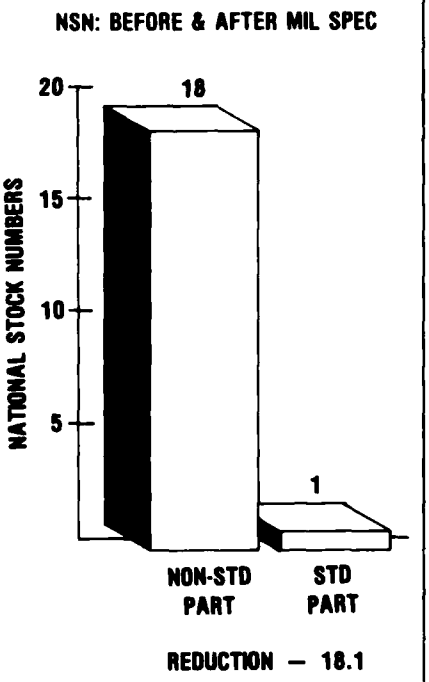
Productivity Measurement

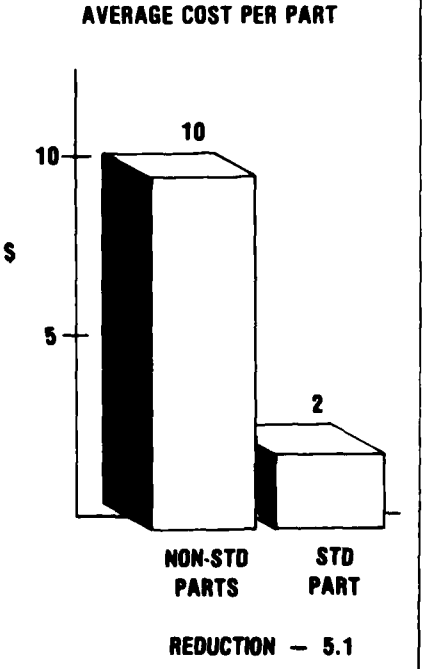
Productivity measurement is usually one of the first subjects all organizations must grapple with in establishing a productivity improvement program. The DOD sponsored a study under cognizance of the Army Procurement Research Office, with support from the Air Force Business Research Center, to develop practical measures of productivity relative to defense contracting that can support both overall baseline assessments and Industrial Modernization Incentives Program negotiations. One of the not too surprising conclusions is that improvements in this area are needed. It is a difficult subject and much remains to be learned.

Spare Parts and Warranties

Spare parts, a highly visible and controversial subject, is indicative of the problems and complexities we face in improving our acquisition process. "Horror stories" have permeated the media during the past year, but the full story has rarely been told: that DOD employees found the examples of overpricing; that they represent only a small percentage of our purchases; that DOD employees found the examples

Variety Reduction Through One Part Mil Part
MIL-M-38510/10101





of overloading; and that we have taken steps to solve the problems. But the fact remains that there have been problems and we must do everything possible to make sure necessary improvements are made. We have to be careful that the cures we institute to correct the problems do not overcompensate to the point of reducing overall efficiency and productivity.

Accordingly, last year Secretary Caspar Weinberger instituted a conscientious and responsible 10-point program to reform spare-parts procurement. It provides for a variety of measures—incentives to employees who detect and correct over-pricing, hotlines for them to check on questionable prices, the appointment of competition advocates to challenge sole-source procurements, tighter contracts to provide for future spares competition, sanctions against irresponsible contractors, and continuing audits to review our progress in correcting problems.

Value engineering is one of the programs we are emphasizing in this regard. We issued a new directive on this subject, are sponsoring a major workshop on value engineering in early November, and expect in the near future to establish and test a comprehensive value engineering data base as part of Government Industry Data Exchange Program (GIDEP).

Another example is our parts control program where we strive to promote the greater use of standard parts in our equipment. This allows us to make larger quantity buys and reduces our inventory costs; it supports competition because we typically have technical data available to allow procurement of these items. We estimate that through the parts control program alone the Department of Defense saved well over $100 million in 1983.

Warranties present a different challenge to the DOD. Section 794 of the Appropriations Act has required that, in addition to design and workmanship warranties, we obtain a performance warranty on all weapon systems and components. We in the DOD have utilized warranties effectively for many years, and thus continue to support their use where appropriate. The Air Force alternate fighter engine warranty is one example of the kind of warranty that is in the public's best interest. However, everyone needs more experience in tailoring warranties to the specific situation. Warranties will be successful to the extent they foster greater acceptance of contractor responsibilities in ensuring quality, reliability, and productivity objectives. If, on the other hand, warranties function as the traditional insurance policy (where in a probabilistic sense expected costs exceed expected benefits), they will be inefficient.

Thirteen of the original 32 initiatives have been essentially completed, including initiatives to reduce DSARC data, to ensure use of the proper contract type.

Other Initiatives

We have attempted to outline the breadth of activity under way in the DOD to improve productivity in the acquisition environment. Space does not permit an exhaustive discussion of every subject. The following are examples of additional topics, some less well defined than the aforementioned, that are receiving attention and may be expected to receive additional visibility as productivity improvement efforts proceed:

—Production engineering talent, capabilities, and availability
—Program manager training
—White-collar productivity
—Human resource programs
—Inventory cost reduction
—Methods of motivating acquisition participants
—Scrap and rework reduction
—Contractor productivity centers
—Incentive and bonus systems for both productivity and quality
—R&D limited partnerships
—Factory of the future
—Productivity in U.S. naval shipbuilding
—Educational training, and DOD/University interactions.

Responsibilities

Because of the nature of the system, the DOD has a more intensive relationship with its contractors than may typically occur. Part of this is due to our program management structure and involvement. Other reasons include general public attitudes and pressures. It is important that overall responsibilities are not diminished, obscured, or lost. For instance, modernization is first and foremost an industry responsibility. We in the DOD don't want IMIP to inhibit industry from moving aggressively on its own. Indeed, IMIP is most appropriate when a company can demonstrate that it is already making significant strides to improve productivity. The IMIP is a way for DOD to demonstrate that we recognize our responsibilities, and to reinforce ongoing contractor activities. Another case in point is illustrated by an example that parallels our focus on more cost-effective contract requirements. Recent problems of soldering on one of our weapon systems was attributed by some to be the result of relying on a contractor's procedures rather than imposing the DOD specification on this subject. Ultimately, however, the contractor has the responsibility of furnishing to the government equipment meeting performance requirements, regardless of whether or not the military specification was imposed. Unfortunately, the message to government personnel will probably be that they cannot afford to relax this requirement under any circumstances because in one instance a problem occurred.

A related concern is that we in the government may be trying to operate from too many lists of initiatives and recommendations. The DOD Acquisition Improvement Program, the White House Conference on Productivity, the Defense Industries Productivity Workshop, the Grace Commis-

(Continued on page 28)

How to Separate Wheat from Chaff

Facilitating Program Management*

Kenneth H. Stavenjord

Programs, including System X at the Defense Systems Management College, tend to be complicated. This presents a problem to many program managers and program management students because they tend to be sensing, thinking, and judging (STJ) Jung types. Essentially, they would like to take a program, put it in preformatted order, set up relationships, and have it stay put. But, in fact, the very nature of programs prevents such static order. Visualize for a moment a three-dimensional blob of soft clay. Now visualize separate areas on the blob labeled "technical performance, business, and policy." You may want to further subdivide each area. As this blob, *your program*, moves along, it changes shape. Boundaries of separate areas change in relative size, shape, and importance. At a given point, policy may be the highest priority of the program; a later, technical performance may dominate. The program may split into separate programs, merge with other programs, grow, or shrink. Always, it is changing.

Because it is a three-dimensional body, apparently what you see in the program depends upon your vantage point. If an accountant looks at the program, he will view the business portion. An engineer will have a different perspective, and so on. This is similar to the different views of the world held by the two 5th century B.C. Greek philosophers Parmenides and Heraclitus. Parmenides said thought and words require "objects" outside themselves. Since a thought can be returned to at anytime, the "object" must always exist. Therefore, there is no change. Heraclitus, on the other hand, said the world is in a continuous state of change. You can never put your foot in the same river twice because the river is flowing and is never the same. They were looking at the world. Each had a point.

My objective as a facilitator at DSMC is to have future program managers gain insight into the complexity, dynamics, and messiness of programs. I want them to look at a program from the different perspectives of accountants, engineers, and congressional staffers. To understand, students must look at where they're viewing from. System X at the Defense Systems Management College presents an opportunity to change hats and to experience many view points, to rotate and examine the program from different orientations, and to develop the future program manager's generalist perspective.

Back to the problem of program managers who are sensors thinkers. Program managers tend to want more structure than they will find. They want to see where the program is going, a road map if you will. In response to this need, the SFM puts a bit of structure back into program management while guarding zealously that essential ingredient, flexibility. It is a process that starts with climate setting, and moves through discovery, problem solving, planning, sharing, and evaluation. (See Figure 1).

**Also known as the SFM (Stavenjord Facilitation Model), the process was developed by Professor Stavenjord of DSMC. Application by professors and students in experiential learning situations at DSMC has proved the model to be a thought-process standard for program managers.*

Each manager approaches program management with a unique technical, policy, business, and experience background, which could be likened to the batteries in an imaginary laser flashlight. I use "laser" to illustrate the tendency to illuminate, very brightly, an extremely narrow portion of the problem or program. Facilitation, then, acts like a defuser to your program management laser beam. It spreads the beam and helps illuminate more of the problem, albeit less intensely. Without it you would possibly beam right through the program management process; e.g., here's a problem and here's a solution. What we're trying to do, the purpose of facilitation and the purpose of this facilitator, is to ensure that students glean the maximum value from each step in the program management process.

In the first step, *climate setting*, we look at the environment in which our program exists. Obvious things like dates, politics, limitations, R&D phases, funding, society, organization, history, service inclinations, and the Congress are environmental considerations. For example, the Congress is now talking warranties; previously, it was competition. To understand what our program is, we must step back, take a holistic approach, and ask what is pertinent about the total environment the program is currently existing in; not only the specifics of our program and its immediate environment, but the bigger picture. What is our service objective? What are our total defense objectives? How do they fit our national objectives, of which defense is only a part?

Into this construct of program and environment, we interject our objective. Quite often in the DSMC System X cases, we give students the general objective: i.e., how to assess contractor performance; another, how to ensure successful software development; yet another, how to ensure successful systems engineering.

After looking at the environment, seeing your program in it and injecting an objective, comes the step, *discovery*, when students identify and prioritize issues. Four issues will be found in the DSMC System X cases: *obvious, embedded, hidden*, and *invented*. One reason we stress issues and issue papers throughout System X cases at DSMC, is to emphasize significance of *discovery*. An essential element of successful program leadership is discovering and prioritizing significant issues. The program manager sets the stage and priorities for team efforts. Once he decides the priority of the issues, the team can more effectively spend their resources of time, money, expertise, and people. Once you've found the problem, you can solve it. But, have you found the right problem? Are you zeroing in on the most significant problem for your program—at this time, in this environment, for your objectives? Herein lies the real challenge for successful program managers. The importance of discovery is stressed repeatedly in the DSMC System X. What is important in each case? Not that the case is a mess; and not the credibility gap of too little data. Rather, what do students see as significant to their objective based upon what they have available in the case? Here's a chance to exercise discovery leadership, to walk in as a program manager, and ask: "What has to be done here, what's significant, what's wheat, and what's chaff?"

Having selected the most significant issue, students are ready for the next step, *problem solving*, generating an issue's alternative solutions and selecting one. Other issues still may have to be solved. But concentrate on the most significant one for the moment; in the real world, there probably are two or three alternative solutions. Quite often in the DSMC System X world, I encourage students to decide on one and exercise the crucial process of decision-making. It is said that you can tread water, sink and drown, or you can decide. Throughout the PMC at DSMC, students are urged to make decisions.

The *how* of the decision-making model is something students research and think about. Decision models, or risk-assessment models, vary from the quick and simple to the complex. Are students going to make decisions by red, yellow, or green go? By flipping a coin? By consensus? By some operational research process? Decision models include risk profiles, utility, multiattribute utility, networks, iso-risk contours, delphi, trace, and ends-means. Another option available in the real world is the consultant specializing in good decisions.

Whichever model is used to make decisions, students should include reflective thinking. What's that? John Dewey, American philosopher and educator (1859-1952), said that all thinking is caused by a difficulty. Difficulty is the motivator that causes you to think. There are four levels of thinking in Dewey's theory.

—*Barely thinking* or *panic thinking*. When faced with a problem, we grab the first solution that comes along and go with it.

—*Stereotypical thinking* or *pat answer*. If you are looking for a type of contract to issue for production, you check business class notes and find contract types; then, you choose the one recommended for production. This is going to a cookbook, consulting a laundry list, looking up your situation, and reading the answer. Stay away from this.

—*Reflective thinking*. Based on your analysis, you draw upon business, policy, technical, and experience to arrive at alternatives, which, perhaps, are unique—not necessarily the exact ones in the cookbook, although students might take those alternatives as input. Instead, you apply common sense in choosing alternatives, basing decisions upon your analysis of the situation—not because the cookbook

said so, but because it made sense for your particular problem or program.

—*Habitual reflective thinking.* We strive to achieve this. We give students many opportunities to use reflective thinking in System X at DSMC so that when an issue presents itself in real life they will automatically think reflectively; i.e., take a step back, look at the issue, develop alternative solutions, and arrive at a decision making sense to the student.

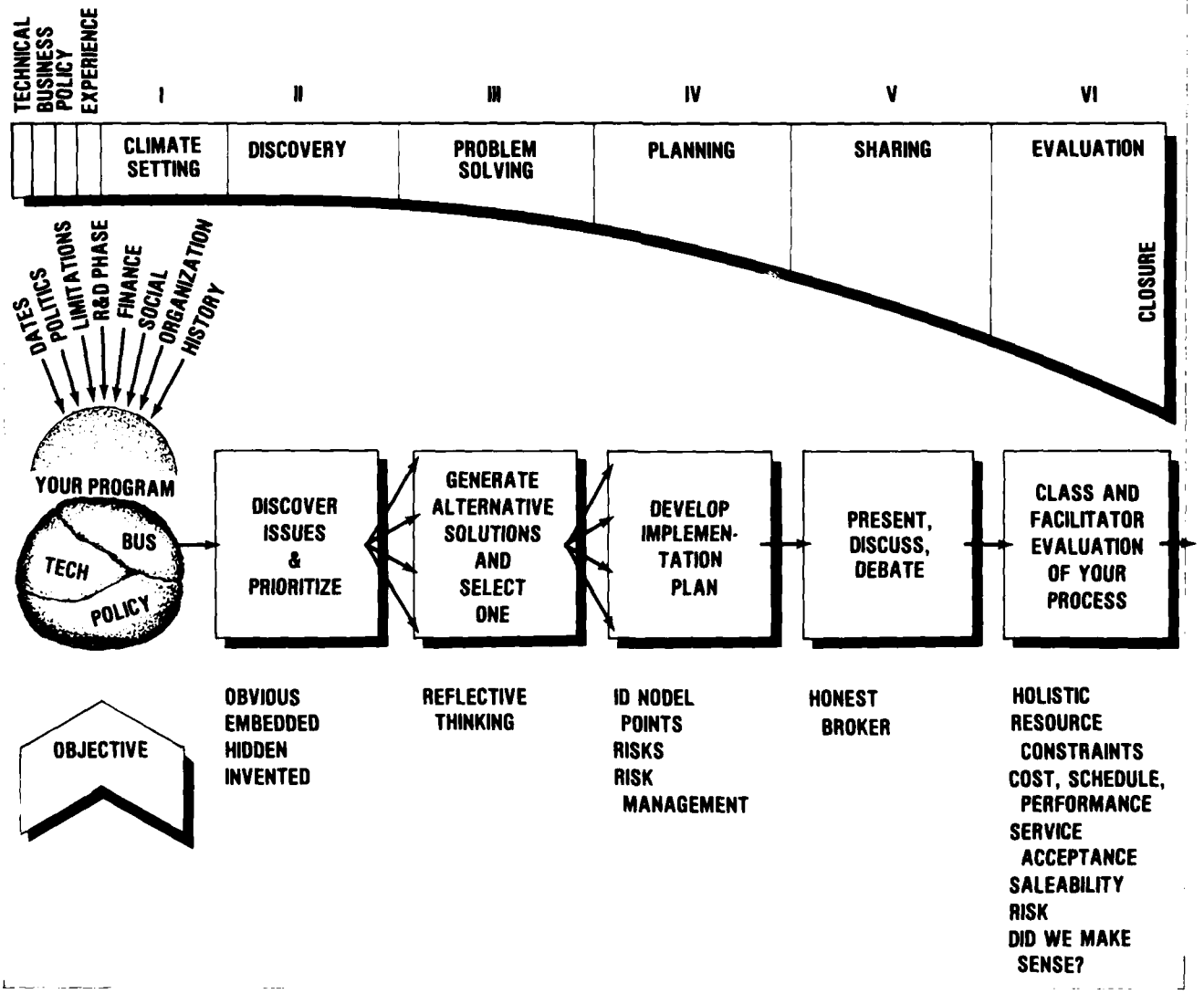
This brings us to planning—implementing a selected solution to a selected and most significant issue. In the planning phase, lay out a detailed plan of exactly how to implement a solution, and be sure to include things like nodal points, or future decision-points unique to a particular plan. If you take one course of action at a nodal point, your program may become budget sensitive; another, politically sensitive; yet another, service-criticism sensitive. What risks or sensitivities are added by a decision, and how do you manage them? Would you reorganize your office to cope with the highest areas of risk? Would you let particular types of contracts? Would you budget risk-funds or risk-schedules? Precisely how do you make a solution and program real?

Having laid out plans, we want students to share and present them to the System X section, and discuss how they chose the plan. Group time is valuable. Sharing experiences, dilemmas, and impasses that had to be overcome in finalizing a plan are significant learning experiences.

In presenting a particular solution, I look for the honest-broker attitude, which will serve well in presentations in the real world. What do I mean by

(Continued on page 28)

Figure 1. SFM—You Are the Program Advocate



NEW BOOKS

Defense Manufacturing Management

A Handbook for the Program Management Community

David D. Acker

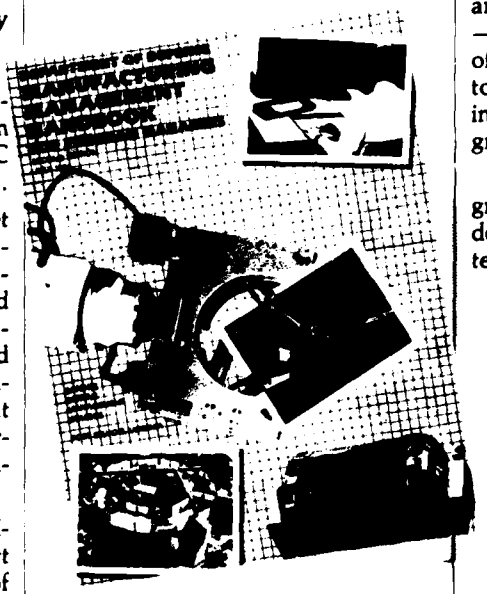
A major revision of the Defense Manufacturing Management Handbook has just come off the press. The second edition of this popular handbook, dated July 1984, replaces the original edition published in 1982. The revision incorporates significant new and timely information. Conceived by DSMC, the project was accomplished through contract support from Analytics, Inc., under the direction of Thomas M. McCann. I served as the DSMC project manager.

A number of Department of Defense organizations provided information, as well as advice, to enhance the handbook text. Among the organizations were the Office of the Undersecretary of Defense for Research and Engineering; the Army, Navy and Air Force Product Engineering Services Offices; HQ AMC; HQ AFSC; HQ AFLC; AFSC's Aeronautical Systems Division; many program management offices; and DSMC faculty, students, and alumni.

At the outset, the contractor met with the DSMC project team to outline the broad subject matter to be included in each chapter. We decided that each topic included in the handbook should be written to stand alone, so that anyone using the handbook would be able to find sufficient detail on a given topic without reference to another area of the handbook.

The second edition of the handbook contains 16 primary subject areas (chapters): an overview of DOD manufacturing management, the industrial base, product development, manufacturing planning, manufacturing scheduling, manufacturing cost estimating, contracting issues in manufacturing, producibility, manufacturing processes, manufacturing controls, manufacturing surveys and reviews, transition from development to production, management during the production phase, product assurance, manufacturing in multinational programs, and the factory of the future.

Although the text of the original handbook was revised, the basic purpose of the handbook did not change. The handbook still gives the user an understanding of, and a basic working familiarity with, the newest and most effective manufacturing management methods used in defense systems acquisition programs. Manufacturing and manufacturing management, as used in the handbook, have been defined as follows:



—*Manufacturing*: the conversion of raw materials into products and/or components thereof, through a series of manufacturing procedures and processes. It includes such major functions as manufacturing planning and scheduling; manufacturing engineering; fabrication and assembly; installation and checkout; demonstration and testing; product assurance; and determination of resource requirements.

—*Manufacturing Management*: the technique of planning, organizing, directing, and controlling the use of people, money, materials, equipment, and facilities to accomplish the manufacturing task economically.

The handbook also explores the objectives of defense manufacturing management which are to:

—Ensure that sufficient manufacturing planning has been accomplished early in a progam so that the manufacturing effort will be performed smoothly and at a reasonable cost.

—Ensure that the defense system or equipment design will lead to efficient and economical quantity manufacture.

—Assess the status of the program at any point during the production phase to determine if schedule, costs, and quality standards are being met.

—Conduct assessments and reviews of the manufacturing effort required to meet decision points at each phase in a defense systems acquisition program.

The handbook is to be used by program managers and their staffs as a desk reference during the defense systems acquisition process, particularly when preparing for and executing the production phase of a program. Therefore, the handbook includes discussions of Department of Defense policies, directives, methodologies, and practices—along with a list of acronyms and a glossary of terms—applicable to the management of the manufacturing effort of defense contractors.

In late 1978, the Joint Logistics Commanders, who originally recognized the need for this handbook, requested that such a document be prepared for use by program management offices. About the same time, Defense Systems Management College Executives were considering the preparation of a handbook for use in courses focusing on defense manufacturing management. The handbook satisfies both of these needs. It describes the basic activities associated with producing defense systems and associated equipment, the current critical issues affecting manufacturing management, the common causes

■ *Mr. Acker is a Professor of Engineering Management in the Research Directorate, Department of Research and Information, at DSMC.*

(and cures, when known) of manufacturing problems, and lessons learned on past defense system programs. Manufacturing management considerations during the development phase, as well as the production phase of a program, are given special consideration. The handbook also relates the manufacturing function to the fielding of defense systems and the subsequent logistics support activities.

The second edition of the handbook contains revisions, deletions, and a rearrangement of the topics included in the original manuscript. It also contains many new topics and an expansion of previous topics (when appropriate). New and expanded topics include preplanned product improvement, transition from development to production, establishing leadtimes, "should cost," multiple incentives, producibility, robotics, CAD/CAM, investment in facility modernization, low rate initial production (LRIP), post-production support, and flexible manufacturing systems. Although much new material has been added, with rigorous editing the contractor has been able to reduce the length of the second edition by one-third.

As manufacturing problems or questions arise on a particular program, one should be able to turn to the appropriate section of the handbook and find a discussion pertinent to those problems or questions. Although it was not the intention of the College to provide an exhaustive treatment of any subject, the handbook does provide sufficient information to be responsive to the needs of a program office or students in the classroom.

A limited number of copies of the handbook are available from DSMC. They may be obtained by addressing a letter to the following:

Defense Manufacturing Management Handbook
ATTN: Project Manager, DRI-R
Defense Systems Management College
Fort Belvoir, VA 22060-5426

Copies will be available for broad distribution through the Defense Technical Information Center, Alexandria, Va., (Autovon 284-7633 or Commercial 274-7633) in the near future. However, as of this writing, no accession number has been assigned. ■

Productivity Improvement

(Continued from page 23)

sion, Reform 88, most likely the NASA Symposium, and numerous other forums generate initiatives and recommendations. There are enough recommendations to keep people busy for years. Few people try to relate or integrate these recommendations or build on earlier efforts. Most try to portray theirs as the immediate answer to all problems. Others are busy generating new recommendations; however, initiatives and recommendations are the easy part of the process. Real progress is made by actually doing all of the detailed work associated with implementation. Proper implementation is the key to success and is the most difficult task. To the extent that the proliferation of initiatives and recommendations keeps us from focusing on specific actions (usually accomplished one at a time), we detract from our ability to effect change. More attention needs to be placed on assignment of responsibilities and follow-through.

Conclusion

The Department of Defense is committed to productivity improvement and is attempting to factor the effects on productivity into all relevant decisions. The department believes that determinations based on narrow issues are unacceptable unless the broader consequences are also considered. Admittedly, some areas are going to be beyond control but, in most instances, improvements are possible. Productivity is not, however, being pursued for its own sake, but rather as a way of reducing DOD acquisition costs.

Discussions with defense contractors having excellent productivity improvement records indicate that the "little things" cumulatively result in large productivity gains. Much can be achieved from small investments in the right equipment and from creating an environment in which all employees have the responsibility and opportunity to make needed changes and produce quality products.

The goal is to make defense contractors aware of the importance of enhancing productivity, to focus attention on what specifically can be done to effect improvement, and to overcome complacency. A steady, long-term, and iterative approach is necessary—with a great deal of attention paid to detail. ■

How to Separate

(Continued from page 26)

honest broker? Detached enthusiasm. I mean presenting each service point of view of the best solution. One doesn't necessarily present an opponent's view, but, is willing to address it if necessary. An alternative view may have credibility.

Having presented, discussed and debated a plan, we evaluate it. This is particularly important for "organization" types. In System X classes at DSMC, we don't evaluate performance on whether or not the "right" decisions were made. Rather, we evaluate in terms of the process. The PMC class and I look at each process to see that problems were addressed with a holistic approach, reflective thinking, considered resource constraints, saleability, service acceptability, risk, cost, schedule, technical performance, "ilities," and that the process makes sense.

Evaluation and closure are not intended to be a cap on the exercise, or a conclusion. They are intended to give feedback on a process and, perhaps, additional guidance on attacking future problems. Frequently, students walk out of the System X class with more questions than solutions. They may have identified areas where they want to learn more and obtain more expertise. They may want to do additional research, or pose questions to faculty members. We at the Defense Systems Management College encourage this. Our evaluation and closure are intended to be a calibration point for the thinking process. The DSMC objectives are to have students develop an appreciation for complexities of program management, develop a holistic approach to problem solving, become habitual reflective thinkers and, continuously check to see that, in fact, they *are* making sense. ■

OFPP Report Relates to

Key Procurement Legislation in the 98th Congress

Dr. William N. Hunter

The Competition in Contracting Action of 1984 (Public Law 98-369) was signed July 18, 1984. The Act incorporates many ideas from the "Proposal for a Uniform Federal Procurement System," which was submitted to the Congress by the Office of Federal Procurement Policy in February 1982:

—Use of advance procurement planning to obtain full and open competition
—Simplifying and streamlining the procurement process
—Promoting the use of commercial products, whenever practicable
—Requiring the use of functional specifications, whenever practicable.

Amendments to the Armed Procurement Act (ASPA)

The general requirements are to:

—Require the use of competitive procedures in order to obtain full and open competition
—Define competitive procedures to include also procurement of A-E services under Brooks Act procedures, competitive selection of basic research proposals, and GSA multiple award schedule programs
—Eliminate the preference for formal advertising, which puts use of competitive proposals on par with use of sealed bids
—Eliminate the exceptions justifying negotiation
—Significantly limit the use of noncompetitive procedures.

Use of competitive procedures is involved. Use of sealed bids is required if

—Time permits solicitation, submission and evaluation of sealed bids
—Award will be made on the basis of price and other price-related factors
—It is not necessary to conduct discussions with the responding sources about their bids
—There is a reasonable expectation of receiving more than one sealed bid. Otherwise, competitive proposals must be requested.

Competition in Contracting Act of 1984

The head of an agency may use competitive procedures, but exclude a particular source in order to establish or maintain an alternative source or sources of supply, if he/she determines that it would:

—Increase or maintain competition and likely result in reduced overall costs
—Be in the interest of national defense to have the facility available in case of national emergency or industrial mobilization
—Be in the interest of national defense in establishing or maintaining an essential engineering, research, or development capability to be provided by an educational or other nonprofit institution or an FFRDC.

H.R. 4209 allows the head of an agency to provide for the procurement of property or services using competitive procedures, but excluding other than small business concerns, in furtherance of Sections 9 and 15 of the Small Business Act.

The provisions of Section 8(a) of the Small Business Act are neither superseded nor affected by these new procedures.

Procurement procedures are involved. In preparing for procurement of property or services, the head of an agency is required to:

—Specify agency needs and solicit bids or proposals in a manner designed to achieve full and open competition
—Use advance procurement planning and market research
—Develop specifications to obtain full and open competition (functional specifications are preferred).

Evaluation and award procedures remain essentially the same as they were for formal advertising and competitive negotiation. For sealed bids, award shall be made without discussions to the responsible bidder whose bid conforms to the solicitation and is most advantageous to the United States, considering only price and the other price-related factors included in the solicitation. For competitive proposals, award shall be made, with or without discussions with responsible sources within the competitive range, considering only price and the other factors included in the solicitation.

(Continued on page 31)

■*Editor's Note: Dr. William N. Hunter, former Director of the Federal Acquisition Institute and current occupant of the Office of Federal Procurement Policy Chair in the DSMC Executive Institute, uses this space to keep* Program Manager *readers informed about the activities of the Office of Federal Procurement Policy (OFPP).*

Can't Attend DSMC Campus Courses?

Contractor Performance Measurement Individualized Self-Paced Course (CPM/ISP) —An Alternative

Dr. Anthony Webster

The Defense Systems Management College introduced the Individualized Self-Paced (ISP) Course in June 1982 and it has been an overwhelming success. The subject matter, Contractor Performance Measurement (CPM), provides instruction for people who, for whatever reason, are unable to attend a regular course presentation. With personnel turnover in defense program offices, with program managers being criticized for not having sufficient school-trained individuals, and with limitations on program personnel temporary-duty funds and class quotas, the College needed a way to extend this course offering. CPM/ISP was that alternative.

I have written this article to introduce this alternative to program managers in government and industry, and to provide information on the current status of CPM/ISP.

Objective

This course, focusing to improve on-the-job performances to program office personnel, does not include frills or "nice-to-know" material. Selected parts may be skipped, depending on the student's job requirement and contractor performance measurement. The course objective is to make individuals more effective on-the-job in activities such as detecting trends on a program performance, spotting trouble areas, forecasting cost at completion, assessing the cost impact of problems, and recommending corrective actions.

Course Components

The course, developed by J. Stanley Baumgartner who previously had developed the instructor-oriented CPM Course at DSMC, comprises 11 topic areas or modules:

—A course overview
—Introduction to CPM
—Work breakdown structure
—Five groups of criteria
—Data analysis techniques
—Estimate at completion
—An interim summary
—Baseline management and financial reporting
—C/SCSC implementation and surveillance
—Cost schedule status report, and
—Final test.

For the most part, instructions are presented through workbooks in an easy-to-read format. That's not to say the course is not demanding. Most modules are intense and require in-depth understanding of the concepts, and the ability to apply the principles. This course requires greater demonstration of skills than do instructor-oriented courses.

Unique Characteristics

The CPM/ISP Course allows the individual to work according to his/her own schedule. It can be taken a unit at a time (modules are broken into units); this is what makes the course *self-paced*. Students should be able to complete the course within 4 months after registration; however, they are given a year for completion.

Another unique course characteristic is that the student has flexibility in individualizing or tailoring it to one's particular needs. Aimed at on-the-job objectives, anything that doesn't contribute to job performance is eliminated. An individual may elect one of five *tracks*, tailored to one's work responsibilities; to qualify for a certificate of completion, however, a student *must* complete all 11 modules.

Approach to Learning

Emphasis is on exercises requiring students to evaluate work-breakdown structures, analyze reports for trends, and identify trouble areas. Other exercises and caselettes require analysis of a budget, a schedule, and development of estimated costs at completion. All case incidents are based on actual situations "disguised to protect the innocent."

We recognize there are certain aspects of learning the student will not realize through the CPM/ISP Course; the opportunity to discuss topics with the instructor is lacking, as are enriching topic areas, and the benefit of dialogue among students. A substantial part of the responsibility is transferred to the individual, thus requiring more student discipline to complete the ISP Course than does a resident course. Each instructional module contains a test for self-evaluation; a final test, to be submitted to DSMC, is provided in Module 11. A grade of 75 or better is required to pass.

Current Status

As of September 1984, 1,126 students have enrolled in the CPM/ISP Course—308 military and 818 civilians; 227 students have completed the course to date. A statistical breakout of student participation is provided in Figure 1.

The reactions of students have been favorable and most indicate the course has been useful. Perhaps the following comment from Captain Lawrence E. Sweeney, USAF, Deputy Director for Technology and Profes-

■ *Dr. Webster, a Professor of Financial Management in the Business Management Department at DSMC, is the Course Director for the CPM and the CPM/ISP Courses.*

Figure 1. Total CPM/ISP Statistics to Date

	Enrolled			Graduated		
	Mil	Civ	Total	Mil	Civ	Total
Army	144	127	271	24	21	45
Navy	25	78	103	2	13	15
Air Force	122	131	253	25	39	64
Industry	—	280	280	—	72	72
Other DOD	15	141	156	1	24	25
Other Federal	—	54	54	—	4	4
Foreigners	2	7	9	2	—	2
Total	308	818	1,126	54	173	227

sional Development, Directorate of Computer Resources, sums up student reaction:

> I am writing to tell you how much I enjoyed the quality and content of the Contractor Performance Measurement (CPM) Self-Study Course. The caliber of the material presented is superb and the knowledge I gained will benefit me one-hundred fold. It is rare to find a self-study program that is top-notch, but the CPM course certainly fits the bill. This is one of the few times I can truly say I completely enjoyed every hour I spent studying. The people at the Defense Systems Management College who prepared this program certainly deserve congratulations. Please extend them my thanks on a job well done.

Registration and Course Administration

To register for CPM/ISP an enrollment form (DSMC Form 10) is required. To obtain this form, write the Registrar, Defense Systems Management College, Fort Belvoir, Va., 22060-5426; or call Autovon 354-1054, or Commercial (703) 664-1054.

The only approval required is from the applicant's supervisor. Military officers, and corresponding civilians (government civilians and employees in private industry), whose jobs require knowledge in contractor performance measurement, are eligible to enroll. A charge of $50.00 is required from industry students.

Upon registration, course materials will be provided to each applicant in a package consisting of the 11 modules and a set of reference documents. The student is allowed 12 months to complete the course, and may request a 1-month extension if necessary. If the course is not completed within the 12-month period, the student must wait a year to reapply.

In a Nutshell

The CPM/ISP Course conducted by DSMC is an alternative means of bringing instructions to the individual. This course does not replace resident instruction of CPM on the College Campus at Fort Belvoir. The biggest and most important payoff is that CPM/ISP provides an alternate means for individuals in the acquisition community to enhance their abilities to accomplish programs' costs, schedules, and performance abilities.■

Key Procurement Legislation

(Continued from page 29)

Truth in Negotiations involves a uniform threshold of $100,000 (instead of $500,000) established for both statutes. Also, the agency head is authorized to require cost or pricing data for procurement actions below the threshold if he determines that the data is necessary for the agency to evaluate the reasonableness of the price.

Implementation means, for one thing, that the provisions of this Act apply to any solicitation for bids or proposals issued after March 31, 1985. Also, FAR implementation must be completed by March 31, 1985. Draft changes to the FAR were made available for public comment on October 1, 1984; comments were due October 9, 1984, and a public meeting was held that morning.

Amendments to the Office of Federal Procurement Policy (OFPP) Act

Commerce Business Daily (CBD) Notice Requirements comprise provisions added to the OFPP Act, which contained requirements for publication in the *CBD* of notices of solitication and award. Also, H.R. 4209, which was passed by the Congress on October 4, 1981 (but is not yet signed), will make parallel amendments to the OFPP Act and Section 8(e) of the Small Business Act. Effective April 1, 1985, these amendments will:

—Require notice of solicitation to be published in the *CBD* for contracts of $10,000 and over; notice must also be published of intent to place an order expected to exceed $10,000 under a basic agreement, basic ordering agreement or similar arrangement. Notice of award of a contract exceeding $25,000 must be published if subcontracting opportunities are likely to occur.

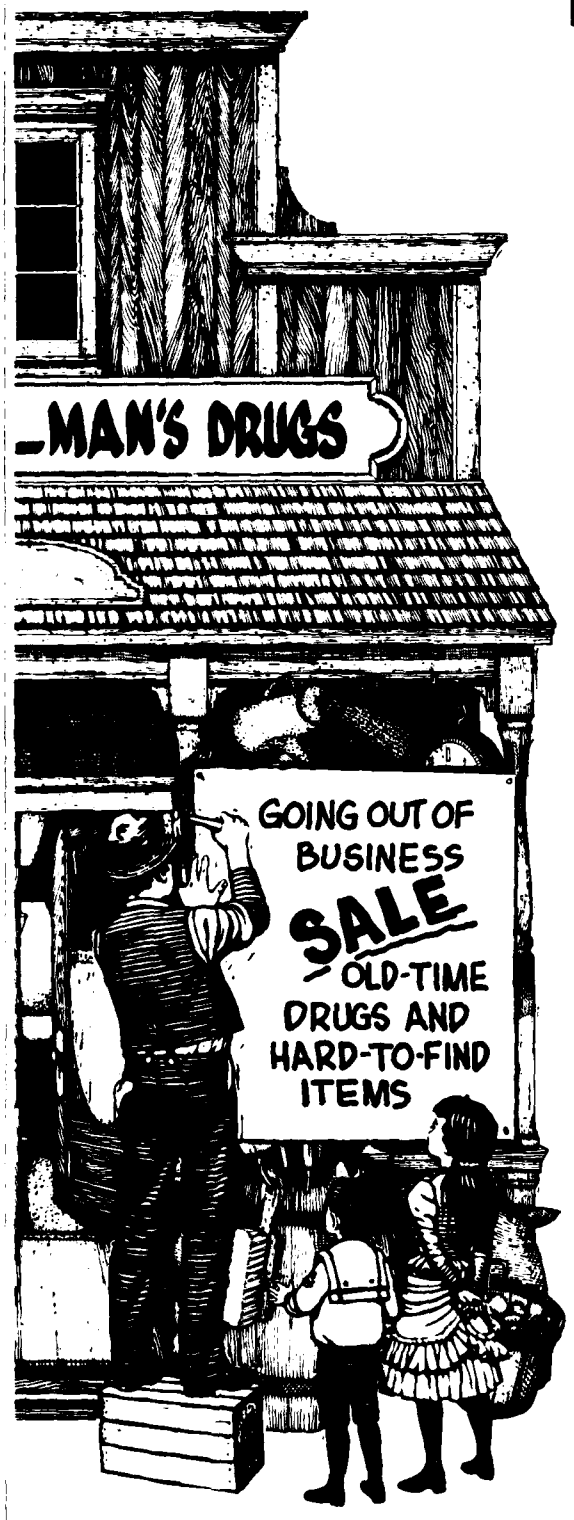
—Require 15 days between notice and issuance of the solicitation. Thirty days must elapse between issuance of the solicitation and submission of proposals (or between notice and submission of proposals for an order); 45 days must elapse between notice and issuance of the solicitation in the case of a research and development solicitation.

—Require detailed information in the notice of solicitation, including a statement that all responsible sources may submit a bid, proposal, or quotation, which shall be considered by the agency; and, if "other than competitive procedures" are used, a statement of the reason justifying use of those procedures and the identity of the intended source.■

How Much Is Enough?

Understanding Government Contract Profit

Alan W. Beck

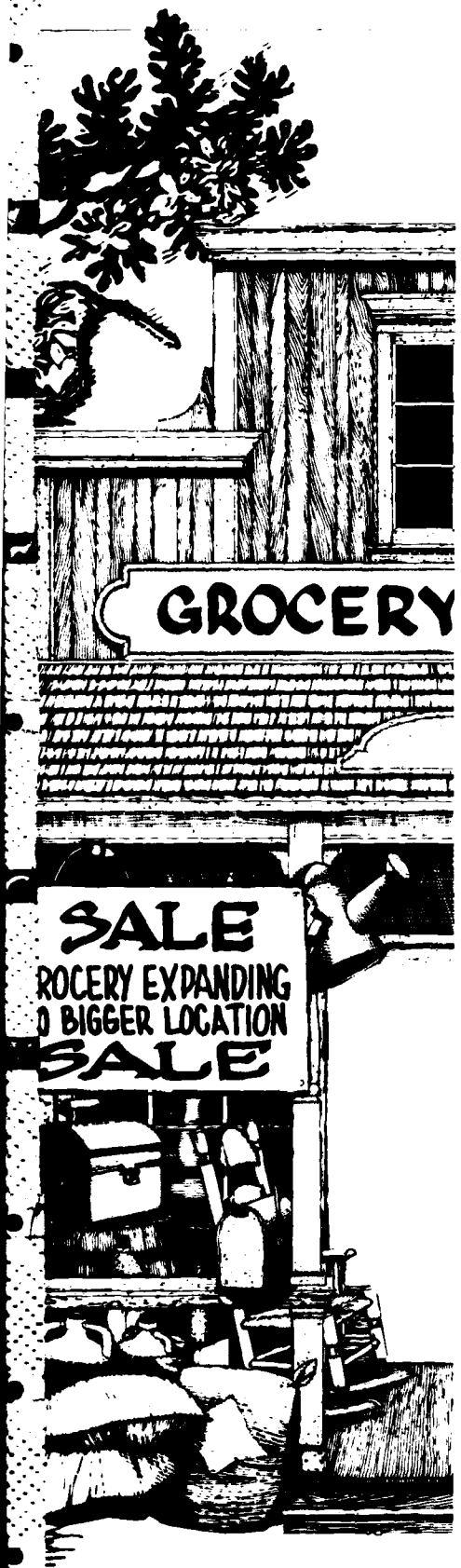


Profit motivation is fundamental to stimulate entrepreneurial effort. Profit has been called the lubrication for the gears of our free enterprise system. Businesses are started daily out of expectation of profit; others fail due to lack of profit. Profit is essential to long-run business survival.

But how much profit is enough?

In a free-market system, with many suppliers and buyers, the marketplace determines the range of profit. New firms enter more profitable businesses; this competition brings down prices and profits to approach some theoretical "equilibrium" level. Conversely, firms leave when profits decline.

Unfortunately, we all know that much of our government's buying is not done in a competitive, free market; therefore, we have had various legislation and policy over the years to control profit. Legislators, government managers, and the public are concerned that the government not pay excessive profits. Some feel profits on government contracts are too high, while others, including those in companies diversifying and leaving government business, feel profits are too low. Many have instant opinions based on experiences, prejudices, or simple lack of understanding. My purpose here is to review profit theory and policy to open readers' minds to the complex considerations and different views of how much is enough.



What is profit? Profit means different things to different people, yet it is a term we use with unquestioning confidence that we, and therefore others, know what is meant. Let's look at some views of profit to expand our understanding.

Price - Cost = Profit

One basic concept is that profit is what is left after all costs have been paid; therefore, profit is the difference between price and cost. Typically, government personnel focus on this profit as a percentage of cost. This is probably the most common concept and is the basis for government contract profit policy. Back in the Great Depression, when there was concern with the potential for excessive profiteering on government contracts, the Congress passed the Vinson-Trammell Act limiting profit percentages on ships and aircraft to 10 and 12 percent, respectively. Later, control was applied through the World War II War Powers Act. The Renegotiation Act of 1951 established the Renegotiation Board to review and recover excessive profits of government contractors. These laws have been rescinded or superceded. Present legislation provides for profit renegotiation only in time of national emergency, as declared by the president.

Government profit policy uses this concept of a profit percentage based on cost. Although cost, plus a percentage of cost government contracts, are illegal in our country (not so in some countries), our profit policy for negotiated contracts is based primarily on cost. In other words, the higher the cost for a given effort, the higher the profit dollars.

Leftover Money

Another concept of profit is that which is left over, or is surplus, after some period of business activity; businesses looking at what is left to pay stockholders, or to invest in expansion, often have this view. Here, we introduce the economic concept of time where a little profit each day, or each transaction, can become a large profit over a quarter or a year.

A favorite example of this effect of time and volume is the supermarket, which may be very profitable from an end-of-the-year sense, yet operates on a markup closer to 1 percent than the high percentages some call "obscene." A problem used to explain this to new microeconomics students is: "Would it be more profitable to run a grocery store selling $5.00 of detergent every ½ hour with a 20 cents profit per sale, or the pharmacy selling a $5.00 bottle of pills each week with a $4.00 profit per sale?" The student quickly decides that the 4-percent profit, fast-moving soap may be more profitable than the 400-percent profit, slow-moving pills. This leads to questions about shelf-storage cost of inventory investment, plus other store costs like labor. Business must focus on reducing all costs in seeking to maximize profit (leftover money) for a given time period.

Opportunity Cost

So far we have looked at profit based on cost, and profit realized over time. Within these concepts are buried more nuances and misunderstandings on what profit is. Often, in our haste, we make conclusions on what profit is without accurately figuring our costs. We do well generally with material costs, although sometimes we understate materials due to higher replacement costs, and cost necessary to get and keep materials. We often fail to consider opportunity costs; that is the opportunity for profit by doing something else (which we gave up in order to do what we are doing). Opportunity costs must be considered by business in planning the most profitable use of resources.

To understand opportunity costs look at the example of the ladies baking or knitting for the church Christmas bazaar. They sell a cake or a knitted shoe bag for $5.00 and exclaim, "Wow, we made $5.00 profit." Or, if more business-like, they say, "The yarn or materials were only $2.00, so we made a $3.00 profit." Here they captured the material cost but ignored the labor and opportunity cost. Perhaps they should say, "We donated 6 hours of knitting at 50 cents per hour." The opportunity cost

■ *Mr. Beck is a Professor of Acquisition Management in the Business Management Department, School of Systems Acquisition Education, at DSMC.*

of that knitting is the profit that could have been earned in some other endeavor. Perhaps they could have earned $10.00 per hour selling cosmetics door-to-door, or $8.00 per hour having a car wash, or $2.00 per hour babysitting—these are opportunities given up by the decision to knit. Likewise, a production business will not want to use the valuable and skilled labor of engineers on jobs that just cover the engineers' salaries—this labor must be used where it offers the greatest present and future returns.

Economists have developed the concept of labor as "human capital" with value based on individual knowledge, skill, and ability. Where industry has highly skilled labor, its cost and associated return (profit) is normally higher. If either the labor or the material resources of the firm are not used in the most productive mode, the organization suffers an opportunity cost; that is, a lower return of a missed profit opportunity.

Government Profit Viewpoint

The government generally looks at profit as the difference between cost and price. However, the government decides which costs are allowable, allocable, and reasonable and "disallows" some items from consideration as cost. Interest paid on borrowed money is a major disallowed cost. Government policy on profit, stated in the Federal Acquisition Regulation Subpart 15.9, is that profit be sufficient to "(1) stimulate efficient contract performance; (2) attract the best capabilities of qualified large and small business concerns to government contracts, and (3) maintain a viable industrial base." Normally, the government prefers to award fixed-price contracts to low bidders in competition and not worry about profit. However, in negotiated acquisitions the government is concerned with establishing profit objectives appropriate for a particular contract. The government considers the complexity of the work, levels of skills required, components of the effort, contractor capital investment supporting contract performance, and other factors, like socioeconomic programs, independent development, and past performance. One significant factor in profit is the contract risk, which reflects in contract type. When the contractor assumes more cost risk with a fixed-price contract, the profit rates are generally higher. On the other hand, if the contractor has little cost risk, as with a cost-reimbursable contract, the government will normally negotiate for a lower fee (fee is the term used for profit on a cost-reimbursement contract). In fact, the Congress has passed fee limitations in 10 U.S.C. 2306(d) and 41 U.S.C. 254(b) limiting fee structuring on cost plus fixed fee contracts to 10 percent generally, but 15 percent for research and development. The FAR also applies these fee limits to cover cost plus incentive fee and cost plus award fee contracts.

Weighted Guidelines

Department of Defense contracting officers use a weighted guidelines form and procedure to calculate prenegotiation profit/fee objectives. The weighted guidelines procedure is a structured approach that develops a dollar, rather than percentage, profit objective for contract negotiation by assigning percentage weights, within four broad categories of 1) contractor effort, 2) contractor risk, 3) facilities investment, and 4) special factors. Contractor effort contains the various cost elements that would be on the proposal summary sheet like material, engineering labor, manufacturing labor, overheads, general and administrative, and other costs. Work done in-house and with a higher-skill level generally computes to more profit than subcontracted items or lower-skill work. Contractor risk is driven largely by contract type with higher profit weights allowed for fixed price and less for cost contracts. Facilities investment is an imputed cost of capital to be employed on contracts for manufacturing. Special factors allow consideration of productivity, independent development, or other factors such as participation in small and small-disadvantaged business programs. Once the percentage weights for each factor or subfactor are subjectively selected, based on the criteria in the DOD FAR Supplement 15.9, the dollar cost (best estimate, not necessarily that proposed) for each subfactor is multiplied by the selected weight to arrive at a profit dollar objective for that particular effort. The overall profit objective is obtained by adding up the individual factor's profit/fee dollars.

The weighted guidelines procedure calls for much subjective input; however, the form, its allowable weight ranges, and the DOD FAR supplement guidance tend to keep profit/fee levels relatively similar across DOD for similar types of contracts and work.

The government profit approach has been criticized for being cost-based, which doesn't really consider time velocity (turnover), asset requirements, or opportunity costs. Because it computes profit as a percentage of proposed costs, some argue that it may motivate certain firms (without other competition) to keep costs up, thus promoting inefficiency.

Industry View

Industry has a different view of cost-based profit. Take an item with a cost of 100 and a profit or fee of 10. The government would say this was a 10 percent profit. Industry, on the other hand, would look at the return as 10 on sales of 110 or 9.1 percent. This is just a starting point. Industry knows that it has other costs not allowable by government rules, so the true or net profit is much less than 9.1 percent. Interest costs are unallowable, thus reducing profit, as do questioned business expenses, like lobbying costs. After industry subtracts unallowable costs and pays tax, the net-profit percentage is much lower than was indicated on the contract. The real return may be only 3-5 percent, or less.

Why do companies stay in government business for a 3 or 4 percent profit? The answer is: Profit percentage on cost is not their real measure of success. We have to look further, to their profit based on investment and business volume/payment (cash flow) considerations.

Return on Investment/ Return on Equity

Businesses are generally more concerned with return on investment than with the percentage of profit based on costs. The store with the choice of selling drugs which sell infrequently, or bread which sells frequently, will look further than the percentage markup. Turnover is the key consideration.

Business will look at total profit after a time period and the total assets required to generate that profit.

In a more sophisticated analysis, owners (stockholders) may be concerned with return on equity, based on the stake they have in the business. They may have a lesser amount invested than the total assets, much as the typical homeowner has a small downpayment invested in his home. If the homeowner's house sells for 10 percent more than he paid a year ago, and if he had put 10 percent down, the profit may be 20 percent, but the return may be 100 percent. This leverage is a significant concern when looking at profit (or loss). Thus, industry can increase profit by either increasing profit margin, asset turnover, or financial leverage, because all three determine return on equity. It is important to understand this when looking at profit motivation. Cash-flow considerations, such as earlier payment, may impact on a firm's profit more than a stated profit percentage on the contract, because cash flow affects asset turnover. A firm with a low-asset investment and a cost-reimbursement contract (like a firm with a rented office and employees who are paid 2 weeks after they work) may make a return on equity far greater than the stated contract profit.

DOD Profit Policy Reform

During the early 1970s, many firms were concerned with lower profitability on Department of Defense business. Some firms diversified into commercial business or dropped DOD business due to lack of sufficient financial incentive (profit). With increasing double-digit interest rates raising the cost of borrowed money, firms were more conscious of cash flow and the cost of money spent on new capital investment. Because interest is unallowable as a cost on government contracts, there was less motivation to invest in capital equipment for Department of Defense production.

"Profit '76" was a formal DOD study of profit policy and industry motivation to seek and invest in DOD business. After "Profit '76," DOD revised its policy to allow an imputed cost of capital on contracts, and to consider this facilities capital cost of money in computing profit objectives. This change let contactors receive additional costs for capital investment based on net-book value (depreciated), but that new allowable cost was partially offset in computing profit on the revised weighted guidelines form.

The 1976 changes did not result in significant increases in capital investment by firms doing Department of Defense business. Some said the small changes were not enough to motivate an industry investment. In 1980, the Department of Defense revised the weighted guidelines procedure to significantly increase the incentive for capital investment but, during this period of 20-percent interest rates, critics maintained that changes only lessened the disincentive to invest or, at best, made it a neutral decision.

In March 1982, President Reagan signed Executive Order 12352 concerning federal procurement reforms. Following the spirit and intent of the executive order's challenge to improve procurement practices, DOD, in December 1983, initiated a formal 1-year study, the Defense Financial and Investment Review, to recommend changes for contract pricing, financing, and profit policy.

How Much Is Enough?

The bottom-line question on profit is: "How much is enough?" The government policy is that financial rewards should be sufficient to stimulate efficient performance, to attract the best capabilities of business, and to maintain a viable industrial base. The question then becomes: "What is sufficient, and how do we measure it?"

Present government profit policy is to prospectively estimate profit based on cost. The DOD weighted guidelines form allows some subjective latitude for considering various elements of cost, the cost risk assumed by the contrator based on contract type and the contractor's facility investment. Under incentive- and fixed-price contracts, the contractor should be motivated to reduce costs to increase profits. However, in a sole-source environment, the contractor may receive less profit on the next contract if he reduces costs on this contract. Thus, cost reduction may not get high priority. Cost-based profit does not necessarily stimulate efficient performance.

Capital investment can be a key to increased productivity and lower overall costs. Although profit policy changes after "Profit '76," and the 1980 changes aimed at rewarding facilities investment, the return may not be enough to motivate investment when other factors are considered. Industry may not invest if they have doubts about securing enough future business to make the investment pay off. The labor-versus-machine choice may be resolved in favor of laborers who are paid after working and who can be laid off when work ends. Present profit policy does not highly motivate contractor capital investment, but DOD tries other incentives, like special direct support of industrial modernization. In the end, the key to capital investment decisions is not just contract-profit rate but, rather, understanding the complex business motivation discussed above, including: (1) the firm's opportunity cost of other investments; (2) its leverage decision of how much to borrow, which relates to interest rates and the financial market; (3) its expected turnover of assets, which is affected by contract financing, payment, and delivery terms; and (4) the expected volume and duration of future work, which relates to the payback the firm sees for using its scarce capital resources.

Each of the above topics has many implications on a firm's final return. Different firms have different situations. In the short run, a firm may feel a lower profit is acceptable to establish market share, ensure future business, or for other reasons. In the long run, the firm must make sufficient return on its assets to satisfy stockholders and stay in business.

In this discussion, I have introduced some considerations regarding profit. We need to remember that, although cost-based profits are the way government business is done, this is not all of industry's motivation. For more detailed reading on profit, read the FAR Subpart 15.9 for overall policy, the DOD Supplement to FAR 15.9 for the weighted-guidelines methodology, or the DOD "Profit '76 Study" or AFSC "Profit Study 82."

How Contractors and DOD Share Savings from Mutual Investment

Lieutenant Colonel Eugene Kluter, USAF

The landing gear subcontractor on the F-16, F-15, and B-1 aircraft shares a portion of IMIP savings with the prime contractor.

Sagging productivity growth in the United States continues to be a threat to our economic well-being. Domestic industry is challenged by foreign competition. In particular, the steel and automobile industries have suffered erosion of their competitive positions. U.S. industry is now responding to the international productivity challenge.

The defense industry has traditionally faced little foreign competition, but this too is changing. Cooperation with our allies has led to coproduction and licensing programs for many sophisticated weapon systems. Foreign defense capabilities are improving and such countries as France and West Germany are increasingly entering the world arms sales arena. U.S. defense contractors must respond to remain competitive.

Air Force Systems Command Technology Modernization Program

In the late 1970s, the Air Force Systems Command (AFSC) became increasingly concerned with the declining productivity of the defense aerospace industry. In 1978, AFSC initiated a concept on the F-16 program known as the Technology Modernization (Tech Mod) program. This concept combined manufacturing technology with an aggressive capital investment program designed to reduce the cost of the F-16 and future aircraft. The Air Force advanced "seed" money for application technology development while the contractor, General Dynamics, provided the funds for the capital equipment. The F-16 production contract was modified to give the contractor a share of the resulting savings and to indemnify contractor equipment purchases. This arrangement was the forerunner of the current DOD Industrial Modernization Incentives Program (IMIP) and provided the foundation for similar "business agreements" among the services and defense contractors.

Industrial Modernization Incentives Program (IMIP)

The IMIP is a response to well-documented low levels of contractor capital investment in support of defense sales. The deputy secretary of defense authorized a test of the IMIP on November 2, 1982, to develop, test, and finalize contract incentives to encourage industry to invest in capital equipment. Each of the military services, as well as the Defense Logistics Agency (DLA), is testing and evaluating incentive concepts under the "umbrella" of the IMIP test. The AFSC diverse Tech Mod experience base provides ongoing programs in which to conduct practical evaluation. Our objective is to simplify contract provisions and provide for simple flow-down procedures that allow all levels of the industrial base to participate in the IMIP.

IMIP Business Agreements

The heart of the IMIP is the agreement between the Department of Defense and the contractor to share in savings generated by mutual investments in technology, capital equipment, and labor. This agreement is often described in a memorandum of understanding (MOU) followed at a later date by a contract provision known as the IMIP Business Agreement. Generally, it provides the contractor with a share of the IMIP current- and future-year savings (or cost avoidances) necessary to realize a fair and reasonable return on its investment. The primary tool used to negotiate the IMIP sharing agreement is the discounted cash flow model (DCFM). The Department of Defense has developed a standard internal rate of return (IRR) discounted cash flow model for use during the IMIP test. This model was derived from those first used by AFSC on its Tech Mod programs. The IRR methodology provides a sound basis for an IMIP sharing arrangement. A before sharing return is calculated to determine if adequate incentives exist for the contractor to make the incremental investments necessary to reduce costs and become more competitive. The model takes into account such DOD policies as CAS 409 "Depreciation of Tangible Capital Assets," CAS 414 "Cost of Money as an Element of the Cost of Facilities Capital," and the Weighted Guideline method of determining negotiated profit levels. Often, insufficient returns are available to the contractor because he has few long-term, firm, fixed-price contracts and must incorporate modernization cost avoidances into future contract proposals.

This environment forces the contractor to pass 100 percent of the future cost avoidances to DOD, resulting in less profit dollars because the cost base for profit determination is reduced. The IMIP, however, offers a new way of doing business. Under IMIP the contractor is allowed to keep a portion of the future cost avoidances, in return for modernizing its facilities and reducing future contractor costs. The incentive is that portion of the generated savings that allows the contractor to earn a competitive return on its investment. On the other hand, the IMIP is not primarily a cost-reduction program. Rather, it is a program designed to increase defense contractor spending for capital investments, and thus overcome a significant problem in the defense acquisition process.

Protected Sharing

All Air Force Systems Command Tech Mods, as well as recently negotiated IMIP business agreements, rely on protected sharing as the incentive payment method. This concept requires identification of major participating programs that comprise a significant percentage of business at a contractor's plant. Participating programs are those that pay or rebate a share of the IMIP savings, or cost avoidances, to the contractor. To simplify the administrative workload associated with modifying current and future contracts, the number of participating programs is generally limited.

Most IMIPs are more effective if conducted factory-wide and not directed at specific programs. In factory-wide IMIPs, all programs generally benefit and should pay their fair share of the IMIP productivity savings reward. Under the protected sharing concept, however, only a few large programs fund the IMIP while many other non-participating programs get a free ride. Additionally, this approach can be extremely complex and time-consuming. Advance agreements must be reached among various acquisition agencies that comprise the participating programs. Often, memoranda of understandings defining roles of the parties must be negotiated. This approach puts a large burden on the designated lead contracting agency and often results in delays that translate to lost savings and increased frustration by all parties, including the contractor, who often is caught in the middle.

While the IMIP concept is simple, it has been difficult to implement. Currently, IMIP benefits are limited by the inability of DOD components to execute the program beyond a few, selected prime contractors. For the potential of the IMIP to be realized, it must be applied against a broad segment of the industrial base. To accomplish this goal, an alternative to the protected sharing methodology must be developed.

Sharing Factor Methodology

The F-16 program office and General Dynamics decided to expand the original F-16 Tech Mod program to include a number ot critical subcontractors. This effort is known as the Industrial Technology Modernization (ITM) program. The implementation of this program by General Dynamics and the Air Force has resulted in the joint development of a new concept designed to simplify implementation of the IMIP and make it easily available to all contractors who can demonstrate benefits to DOD.

The new approach has been coined the "sharing factor" approach. It is an option to the protected sharing approach and is designed for use on multiple program, factory-wide IMIPs. It is designed for cases where DOD does not directly contract for the item produced by the IMIP contractor. For example, the Air Force is interested in reducing the price it pays for landing gears for F-16, F-15, and B-1 aircraft. These parts are not, however, purchased directly by the Air Force; they are provided by a prime contractor such as General Dynamics in the F-16 program. The sharing factor approach will allow the landing gear subcontractor to retain a portion of the IMIP savings while benefits are flowed to the Department of Defense by the primes doing business with the subcontractor.

Figure 1. Sharing Factor Elements

	Years (Sharing Period)				
	1	2	3	4	5
(A) Productivity savings reward (from business agreement)	$1M	$2M	$3M	$3M	$3M
(B) Sharing base	$100M	$180M	$270M	$300M	$300M
(C) IMIP sharing factor	.01	.011	.011	.01	.01

Figure 2. IMIP Sharing Factor Example

Proposal without IMIP

- cost 1,000
- profit 100
- price 1,100

*Productivity Factor = (.01)

Productivity savings Reward = (.01) (980) = 10

Proposal with IMIP

- cost 980
- profit 98
- price 1,078

+

- Productivity savings Reward 10

**IMIP Price 1,088

*Rationale would be in IMIP business agreement

**IMIP DOD cost avoidance = $1,100 − $1,088 = $12

Composition of Factor

The IMIP sharing factor is similar to forward pricing rates and other factors used for prospective pricing of DOD contracts. The sharing factor applies only to prospective pricing. Existing priced contracts must still be addressed. Generally, the contractor is allowed to retain the IMIP savings on existing priced contracts as long as this amount is included as part of the productivity savings reward (PSR) and is appropriately reflected in the IMIP discounted cash flow model. The sharing factor is defined as the contractor's productivity savings reward divided by the sharing base. The sharing base is the total projected cost of production for the DOD programs that benefit from the IMIP. The contractor's productivity savings reward will be stipulated in the IMIP business agreement and normally will not span a period in excess of 5 years. A sharing factor can be determined for each future year that IMIP savings are to be shared with the contractor (see Figure 1).

Application of Factor

Simplification of the IMIP process depends on proper application of the productivity factor. Once the factor has been negotiated it is applied to all DOD cost proposals that contain IMIP cost avoidances (future contract savings). The contractor incrementally bills for the PSR amounts under all contracts that benefit from the IMIP. This procedure allows the IMIP contractor, whether prime or subcontractor, to recover its share of the IMIP savings through its normal course of doing business with the Department of Defense, which receives benefits due to increased proposal visibility and the provisions of P.L. 87-653 (see Figure 2.)

The implementation procedures for this concept have been developed and submitted to the IMIP Steering Group for approval to assess the concept during the IMIP test. On December 19, 1983, Admiral Joseph Sansone, Chairman of the IMIP Steering Group, authorized this concept to be tested. A special contract provision, along with implementing policy and instructions, has been prepared.

Many controls must accompany the use of the factor approach. For example, the factor cannot be applied to cost proposals until the IMIP project has been implemented and verified. Also, upon contract termination, any productivity payments made to the contractor are subject to downward adjustment to reflect the amount applicable to the work completed. Additionally, all productivity payments are subject to reduction in accordance with the clause entitled "Price Reduction for Defective Cost or Pricing Data," FAR 52.215-22. These controls are not, however, unique to the factor approach. They are generally used throughout the IMIP process, regardless of the payment method chosen by the parties.

Conclusion

The development and implementation of the IMIP productivity factor has the potential of expanding the benefits to be gained from the Department of Defense IMIP. It will allow the Department of Defense to pay less for needed weapon systems while ensuring a modern, state-of-the-art industrial base. The annual DOD budget is adequate to provide needed industrial modernization. The amount of benefit is only limited by the commitment and innovation of defense contractors and their counterparts in the government. While the Department of Defense IMIP is a major force in contracting for productivity, it cannot solve all problems facing the defense acquisition community. We cannot reward inefficient, high-cost, low-quality producers with contracts to produce our much needed weapon systems. The Air Force Systems Command is developing new measures of contractor efficiency, which will have a major impact in the past performance area during source selections.

Also, our profit policy, based upon a percentage of costs expended, tends to reward poor cost control while penalizing cost reduction. This policy has contributed to the inefficient practices we observe in our contractors' plants today. The IMIP addresses and recognizes this concern as the major obstacle to increased DOD contractor productivity. Clearly, this is a fertile area for further analysis.■

■ *Lieutenant Colonel Kluter is Special Assistant for Business Management, Strategic Defense Initiative Office, Office of the Secretary of Defense, at the Pentagon.*

BOOK REVIEW

A View of Past Perceptions and Today's World

Issues in C³I Program Management Requirements, Systems, and Operations

Edited by Dr. Jon L. Boyes, Foreword by Donald C. Latham
AFCEA International Press

In a rapidly changing technical environment, a collection of articles written at different times provides a view of the past as a series of snapshot perspectives. As time passes, however, the snapshots may fade from photographs of current application to tintypes of history. Thus, absent any body of conclusions, or firm commentary such as "Lessons Learned," history does not so much point to the future as it does to spotlight past perceptions that may have caused the state of affairs we must deal with today.

Issues in C³I Program Management, Requirements, Systems, and Operations has five sections. Each consists of articles that previously appeared in *Signal*. I provide an overview of each section with comments on selected articles.

Requirements Analysis

The first section, "Issues in C³I Program Management," deals with requirements analysis. It presents points of view about what is needed and why. Critical review of this group of 13 articles, the earliest of which appeared in 1971 and the latest in 1983, raises a number of questions that are left unanswered:

—How do the C³I functions vary from service to service?
—How much information is required to perform those functions?
—Where should the functions be performed (at what command level and at what physical location)?
—What degree of detail does each command element require? Absent a clear statement of Air Force needs, the final article on Air Force organization leaves a feeling of uncertainty about whether the solutions discussed there will provide a useful framework to solve that service's C³I problems.

Design, Acquisition, and Test

The second section deals with design, acquisition, and test functions. Most of the articles in this section were published recently. Thus, the overall impression is one of considerable cohesiveness—of particular utility are articles that provide exposition about the methodology of simulation, testing, and cost analysis.

Written within the past 2 years, they describe current thinking about how design and test activities can be made to interact more closely and provide synergism in the design phase of the acquisition process. The article on life-cycle cost is a useful presentation. It concerns the difficulties of using previously developed cost-data bases in time of rapid technological change. The second section is more timely and integrated and, consequently, more representative of what is included within the DSMC curriculum.

C³I Systems Management

The third section, "C³I Systems Management," begins with ten general "Do's and Don'ts" of C³I management that advise the reader to be realistic in his expectations, choose good people to work on the program, and to take care in his approach to concept and contractor selection, procurement, and program management. This good advice is followed by a series of snapshots describing the initial mid-1970 efforts to organize for efficient C³I systems management. Finally, six articles articles are presented that:

—Describe that period of frustration between 1971 and 1980 when all of us came to the realization that commodity and capital scarcities were, in fact, going to be a continuing way of life;
—Present the responses made by the Defense Community to that realization including design to cost, track cost, compete whenever possible, and make incremental rather than quantum improvements at reasonable cost.

This is valuable background for those who did not participate actively during that period; it is necessary to understand why we have in place today that series of DOD directives that deals with electronic system development activities. Section Three may be necessary to understand why Section Four contains the articles it does.

Impact of Software

Section Four deals with the impact of software on C³I. It is a thorough treatment that ranges from a discussion of the cost of a line of old and new codes to the way in which distributive C³I systems work at the Department of State. However, it is not so much the breadth of coverage that makes this section excellent but, rather, the pointedness of the concepts presented here. Some noteworthy abstracts from the articles follow.

—Software development processes are fundamentally different from hardware development processes. And since software people do not usually occupy top positions, the kinds of problems presented in soft-

ware development programs are not well understood by the user community.

—There is difficulty in early generation of sufficiently detailed software specifications. Thus, there is introduced a basic instability in the system requirements, which generates difficult software development problems. These kinds of problems will not be solved by introduction of new languages or technology, but rather by iterating development programs and ensuring a very-high degree of user involvement. But, very-close user involvement creates a climate conducive to a high rate of change in user requirements (Catch 23?).

—The problems of changing direction also result from budgetary variables. The question is: How much uncertainty (both in requirements and in program time phasing) can be tolerated before the program itself becomes impossible of achievement?

—Because of various uncertainties, the concept of "build a little, test a little, try a little" can increase the chances of successful system development. Testing at each stage of system development, can, if properly applied, materially assist in system validation.

Section Four should be extremely helpful to anyone who wants a brief synopsis of software issues and problems, and the latest thinking about the methods available to solve them.

Soviet Weaponry

Section Five presents 10 articles that document the processes by which U.S. technology has been exported to the Soviet Union and the extent to which that technology has been applied to Soviet weaponry. The impression one gets is that the technology export policies put in place in the 1970s have materially improved the Soviet military capacity by permitting them to purchase, at market price, advances resulting from our own very costly civilian and military research and development efforts.

While most of us may be familiar with the rapid rate of technology export, what comes as a surprise is the rapid rate at which the Soviets have been able to incorporate that technology into their own military development programs.

The clear message in Section Five is that the United States must make a concerted effort to increase the rate at which military acquisition programs come to fruition. If we cannot do so, then we may soon find that our own technological advances have been turned to deployed Soviet military equipment before we have managed to produce our own!

In sum: The book is a worthwhile document that summarizes various aspects of C^3I Research, Development, and System Deployment. My feeling is that the first section lacks cohesion, and to some degree leaves the reader groping for a message. Subsequent sections, however, are useful additions to the literature, and are coherent and cogent presentations of the major issues facing C^3I developers today. This collection of articles is current, and will likely remain so for some time.■

Henry C. Alberts

INSIDE DSMC

People on the Move


Garrity


Hein


Karol

Rudolph B. Garrity is a Professor of Systems Acquisition Management in the Policy Organization and Management Department, School of Systems Acquisition Education. He came to DSMC from DARCOM where he was Chief, Program Management Division, PLRS/TIDS. Mr. Garrity holds a bachelor's degree in science and a master's degree in business administration, both from Monmouth College.

Dr. Julius Hein is the Director, DSMC Central Region, St. Louis, Mo. His previous assignment was Deputy Product Manager, U.S. Army Amphibious and Watercraft Program, Troop Support Command, St. Louis. Dr. Hein holds a B.M.E. degree from Ohio State University, a master's degree from the University of Missouri, and a doctorate from Nova University.

Lieutenant George J. Karol III, USN, is the Executive Assistant to the Commandant. On his last assignment, he was Navigator, USS Coontz (DDG-40), homeport, Norfolk, Va. Lieutenant Karol holds a bachelor's degree in general engineering from the U.S. Naval Academy.

Other Staff Additions

Esther Mae Farria to the Publications Directorate, Department of Research and Information.

Marilyn Marie Koestler to Information Directorate, Department of Research and Information.

Paulette A. Langlas has returned to DSMC to be secretary to the Commandant.

Terry Bouslough and **Suzy Potts**, student aides, to Technical Management Department, and Department of Research and Information, respectively.

Losses

Lieutenant Colonel Thomas M. Brown, USA, Business Management Department, transferred to Ballistic Missile Defense Systems Command, Huntsville, Ala., to be Chief of Program Management.

Deborah McVee, Publications Directorate, Department of Research and Information, to the U.S. Army Military Personnel Center, Alexandria, Va.

Promotions

Robert W. Ball to be Director of the Publications Directorate and Editor-in-Chief of *Program Manager*.

Kenneth E. Wilson, USA, Department of Administration and Support, laterally transferred from SP-5 to SGT.

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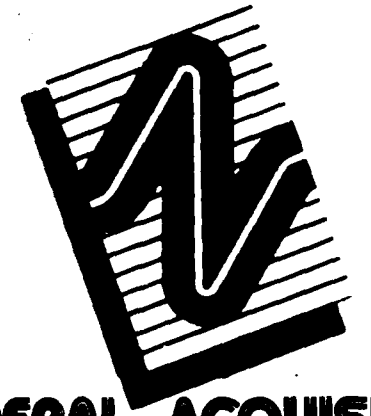

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