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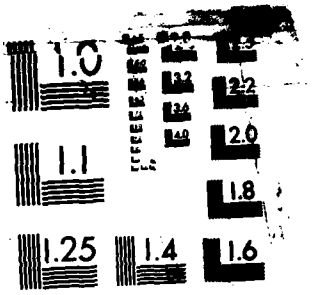

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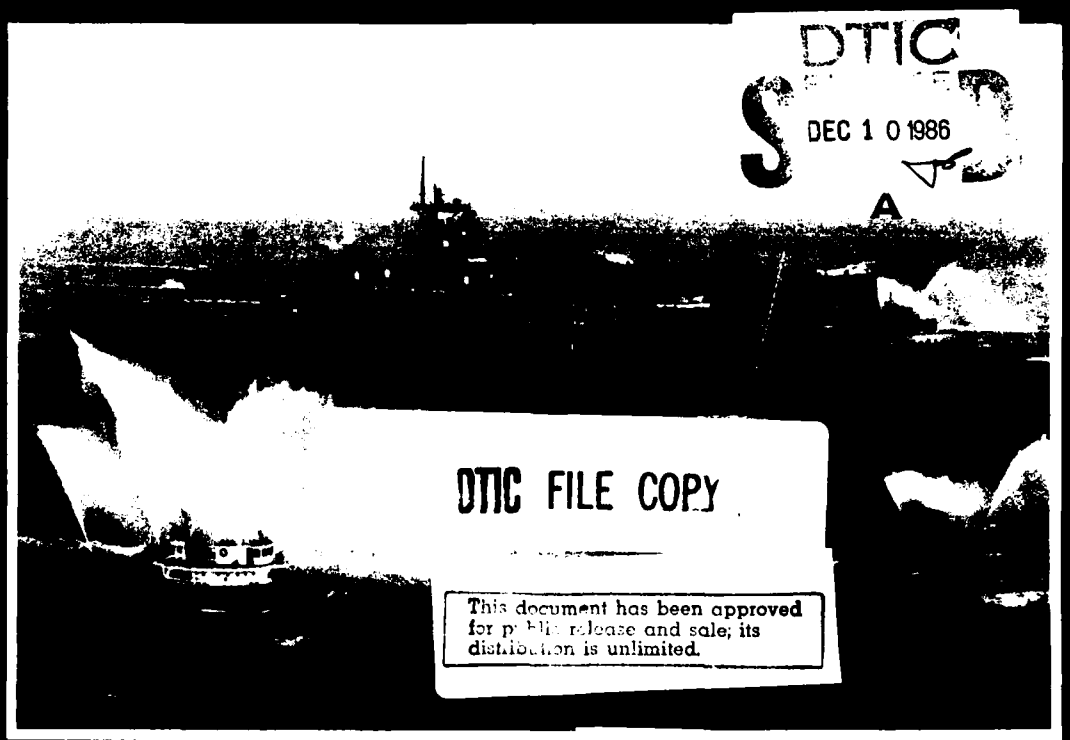

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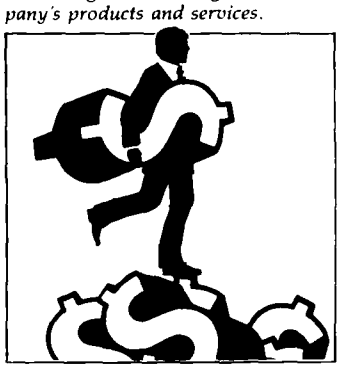

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Program Manager is intended to be a vehicle for the transmission of information on policies, trends, events, and current thinking affecting program management and defense systems acquisition.

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Cover: Tugs spray water as the battleship USS Missouri is recommissioned. An SH-3H Sea King helicopter hovers over the bow in San Francisco Bay.

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Buying the Right Ships And Weapon Systems

Rear Admiral Stuart F. Platt
SC, USN

Hundreds of thousands of civil servants and military personnel are doing just that.

Many of you will agree that our defense business is not sentimental; and, that it is very difficult to get special credit for being right! I am convinced if you do your job right every day, you will get credit the old-fashioned way—by earning it. I see hundreds of thousands of civil servants and military personnel doing just that.

The world's early navigators pointed out that two-thirds of the earth's surface is covered by water. They failed to tell us that in later years it would appear as though the other one-third of the globe is covered by congressional staff members, auditors, and an army of lobbyists with endless lists of programs demanding immediate attention. However, it is only fair to say that their concern, as yours, for our national defense is sincere.

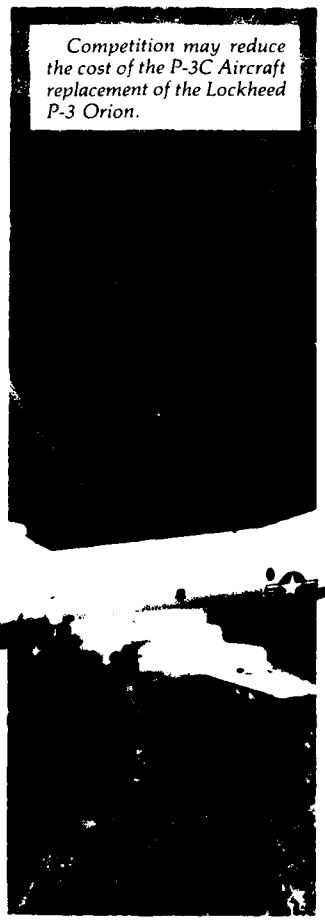
You should recognize that the political and economic pressures on our nation's top decision-makers are probably as heavy now as at any time in our peacetime history. The Navy and the Department of Defense are under intense scrutiny as the Congress and the Administration examine what we are doing, why we are doing it, and whether we should be doing it at all.

Discussions of budget deficits and the need to reduce government spending are real and severe. Therefore, keep in perspective that the steps to build an affordable 600-ship navy are needed and are being taken.

600-Ship Force

We have had more than a striking success in our growth to a 600-ship force, and we have learned valuable business lessons in the process. The larger U.S. Navy fleet we see today is being constructed on schedule and at a lower cost than most would have thought possible 5 years ago.

A significant point we rediscover time and time again is that without the competitive strategy and cost-sensitive management approach we followed, we would not have accomplished the goals we are now getting close to marking off as achieved.



Competition may reduce the cost of the P-3C Aircraft replacement of the Lockheed P-3 Orion.

Three Topics of Discussion

I will discuss three topics. First, today's Navy and how the research and development work at the Naval Surface Weapons Center helps our forces meet the increasing national security demands placed upon them; second, our Navy procurement business itself; finally, our economy because it affects what we can do in our business.

Today's Navy

The global responsibilities of our fleet continue to expand. There is at least one certainty about the Soviet Bloc—they are an aggressive force and their military power is increasing every year.

You who have followed the Navy during the last few years must agree that the world's oceans know our ships all too well. At any given time we see that one-third of our fleet is at sea. "High Tempo" is the term aptly describing our operating environment.

Our fleet has proved its worth as a seagoing force. Recent operations in the Gulf of Sidra and the Mediterranean, and what we hear from the fleet yesterday, today, and every day, attests that Navy readiness is high by any standards. Our fleet and its logistics support systems are working well. The testing we do of our equipment and supplies on the shop floor and at our naval test centers gives us confidence the equipment we provide our young men and women will work in time of crisis, and will work well.

Our Team Plays Better

The Naval Surface Weapons Center has been a key link in the difficult process involved in fielding the modern weapon systems that are vital to our Navy's offensive capability and survivability. The importance of your efforts has not been global news; but, we in the weapons business know our team plays better because you're on it.

My view is that our nation's journalists too often overlook contributions made by thousands of scientists and engineers; i.e., those at Dahlgren, whose technical skills and innovative approach to combat system research, development, testing, and evaluation programs are the catalyst in bringing tomorrow's technology to the fleet today. Henrik Ibsen noted: "I hold that man is in the right who is most closely in league with the future."

The Aegis, the most sophisticated fleet air defense system in the world today, benefits from the Naval Surface Weapons Center's ongoing technical programs.

The Trident II Program, our sea-launched ballistic missile, has drawn upon the talents of this same scientific and technical work force.

Realm of the Engineer

We in the Navy live in the realm of the engineer. In our ships and aircraft

we are surrounded by engineered structures, systems, products, and processes. No matter what we do, much of our mission is accomplished with the military hardware designed and built by engineers.

Yet, in my view, the engineer has comparatively faded from center stage, though the lack of recognition of the engineer is hardly a recent phenomenon. History records the name of the man who built the great pyramid (Knufu-Onekh), but it is less commonly recognized than the name of Cheops, the Egyptian king who ordered the task to be carried out.

Virgil and Cicero are still quoted by scholars, but who designed and built the Coliseum?

Many of you have heard of Homer and Plato, but the identity of the person who engineered the Acropolis is generally a mystery.

In war or crisis, our equipment must work even if actions must be taken for quality deficiencies, as they were on the Skipper Bomb.

The total value of competitive awards has increased from $9 billion to more than $20 billion. This is a doubling in 3 years rather than in what some thought would take 25 years.

Competitive contract awards account for more than 70 percent of our procurement actions, up from only 30 percent during the same time period.

Spare-parts prices have dropped an average of 12 percent for the past 2 years.

Competitions

The U.S. Navy has run an abundance of competitions, and our total experience has been favorable. The results of our management initiatives are demonstrated in enormous savings for the taxpayer as we identify opportunities to set competition to work effectively in the free-enterprise system.

In our traditional area of procurement expertise, naval shipbuilding, total savings now exceed $6.1 billion the last 4 fiscal years.

In the Aegis Cruiser program we have saved more than $1.8 billion as a result of annual contract competitions. Although a few electronic firms and systems houses associated with this program downplay competition in public statements, they were not reluctant to accept the program's profits. Their double talk is something for them to reconsider.

Subcontract competition is a special area I view will need more attention in the future for the Aegis and other large weapon system programs.

Equipment Must Work

Let me re-emphasize a fundamental tenet of Navy business—in war or crisis, our equipment must work. Our performance at sea this year shows that we carry this goal out and that we mean what we say. I see no need to be fainthearted about insisting on quality workmanship.

Some of you may have read an article describing actions the Navy took regarding quality deficiencies in producing the Skipper Bomb. I can assure you we will not hesitate to halt production or take stern measures in situations where suppliers fail to meet our standards of quality. This is an area

Engineers Solve Problems

One reason for this is simple—engineers normally solve problems instead of creating them, and a problem solved is a problem forgotten. Their responsibility as engineers is focused, but enormously significant. They must manage somehow to do the things that need to be done, and we constantly rely on them to do things better.

If scientists and engineers do their jobs well, the equipment will do its job. Then, our "Top Guns," submariners and surface warfare specialists, will be well served.

R&D Role

As suppliers of goods and services the Naval Surface Weapons Center uses to fulfill its research and development role, you surely recognize our Navy's commitment to quality, at reasonable prices, is not a passing trend. We don't plan on being bashful about seeking quality. We know that the Navy's firm insistence on quality is the acceptable path to follow.

You have a stake in making sure the equipment developed at Dahlgren works, that it will last, that it is maintainable, and that the American taxpayer's concern for affordability is kept in the forefront. Your commitment to help us meet that goal will not go unnoticed.

The Business of Defense

Let's drop back in time to set our Navy management approach in perspective. A review of naval history shows that too often "memorable" events do not equate to "effective" decision-making.

The situation today is much improved. Results of our Navy Competition Program prove that what we started out to do was the correct strategic plan. It is a course we see our planners of the future accepting as axiomatic.

■ *Rear Admiral Platt, competition advocate general of the U.S Navy, presented these remarks in September at the Naval Surface Weapons Center, Dahlgren, Va.*

where we have, and will keep, a no-nonsense attitude.

Second Sources

Our Navy policy to develop second sources for major weapon systems has reduced costs and enhanced quality. This is a practice we intend to use more.

For example, Standard Missile-2, our Surface-To-Air Fleet Ship Defense System, should produce an additional savings of $200-300 million during competitive dual-source production, which begins in fiscal 1988.

In the Trident Submarine shipbuilding program, Newport News Shipbuilding is planning for its first work on this newest class of fleet ballistic missile submarines. Recently, I received mail from Mr. Ed Campbell, president of Newport News Shipbuilding, in which he enclosed this quote by Henry Clay: "Of all human powers operating on the affairs of mankind, none is greater than that of competition."

If people at Newport News keep these words at their masthead, I think they will be a strong competitor when the Navy begins competitive Trident shipbuilding awards in fiscal 1988. The result will be overall lower costs to the taxpayer for this vital strategic weapon system. In these and other major Navy programs, our experience shows that production competition can yield high-quality weapons at lower prices, without impacting our goals for operational performance or maintainability.

I advised the secretariat that the P-3G Aircraft, to be designed as the replacement for the 30-year-old Lockheed P-3 Orion, is clearly a program in which costs could be dramatically cut through the use of competition. Though some obstacles remain to be overcome in developing our acquisition strategy, I am confident that turning up the heat on this competition burner will produce favorable results.

A few people in the combat weapon systems business have questioned the wisdom of the Navy's competition program, particularly as it affects their work. My view is that these critics are on the wrong track; if they continue to create debates needlessly, they will be seen as friends of Rip van Winkle who woke up in a town where things had changed. The author, Washington Irving, points out: "Refusing to accept reality will not change it."

The Economy

Many people would agree that two of the biggest problems facing the United States today are drugs and the economy.

As for drug abuse, the Navy faced that problem a few years ago and cleaned the drug users from our ships' fantails. If you stand tall and remain firm, such problems can be resolved.

As for the economy, my first observation is that, contrary to what some educators would have us believe, we have not become a nation of hamburger flippers and fast-food servers. That is a myth. Yes, there are people in the goods and services business, and there are a lot of people selling fast foods. As far as the industrial strength of the nation is concerned, the United States is in a better shape than some economic forecasters predict. They do not have the opportunity to see the technological and engineering developments we do.

I grant the deficit problem is real. Almost every economist feels that it's real, but there is general disagreement on what to do about it.

Standard Missile-2 should produce savings of $200-300 million during competitive dual-source production.

Stop and consider this: The drop in the price of oil has produced hardship for some and a savings for others. However, there are many good overall signals in our economy, and signals about our country. This helps corporate planners prepare to take risks that move nations and economies forward.

The Administration's defense buildup has not only increased the strength of our armed forces, it has created jobs — economically key jobs. Many of these new jobs have been in manufacturing, further easing unemployment and allowing firms to retain engineers and technicians with essential skills.

Technology

An important benefit of defense spending is the additional research and development contracts for complicated weapon systems. These are contributing to U.S. leadership in technology today and for the decades ahead. Our hardware is the embodiment of sophisticated and new technologies.

Lower interest rates are making spending and investing more attracting. Lower interest rates influence business decisions on capital investment. I look for productivity gains to show on the shop floors of our defense contractors through their determination to remain viable suppliers in the defense world's competitive market.

Only the Best

Challenging our engineers, striving for the best, and letting the marketplace work to control prices will give us the strong military we need for the future.

Overall, I think that the defense industry is doing a good job. But, a better job can be done, and it is up to us to see that it is a better job.

I assure you that I do not view the private market as a cure for all public problems. There always will be areas where civic or national security values must prevail.

What must be our primary concern from a military standpoint? We must buy the right ships and weapon systems, pay fair prices that are affordable, and operate in an intelligent and sensible manner. This is our goal and what we are clearly doing.■

Fishing For Quality

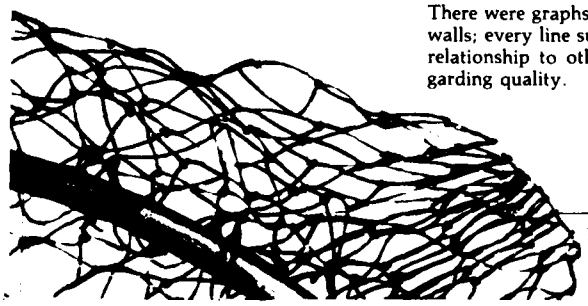
Major Jerry R. McMahan, USAF

The steady influx of Japanese cars, nuclear power plant concerns, defects in weapon system acquisitions, and the space shuttle mishap have surfaced another hue and cry about quality. Television documentaries, the evening news on major networks, and guest speakers on talk shows commented about American industry's quality. The topic has drawn a following. All too often, people have an idea about what should be done, but when program managers look for a meaningful "how" it is as elusive to grasp as fog. Usually, when faced with a dilemma, any large bureaucracy will provide what it does best—mandate a policy.

The Department of Defense has made a conscious effort to mandate quality into the weapon system process. The DODI 4155.1[1] is the result of that effort. Additionally, senior executives throughout government are legitimately concerned about products the acquisition community is receiving for the taxpayer's dollar. I do not want to collate all guidance existing on the subject of quality. There are many

source documents requiring program managers to have an effective quality assurance effort on their programs. My objective in this paper is to focus attention on what I call "fishing for quality." I present a method for program managers' personal involvement in emphasizing quality.

A word of caution, or a brief disclaimer, is in order. This paper is not a panacea. It will not make you an instant expert on the subject of quality. If you thought that "Juran and Crosby was a rock group," that "9858 was a new science fiction movie," or that "Willoughby was a wild beast on a National Geographic television special," then this article may be helpful. Perhaps after you have read this article you may have a few more questions to ask during your next walk-through of the production facility or at an upcoming program review. Let's get the rods and reels and head for the river. One other thing before we start—I'm a trout fisherman; so, you bass and pike fishermen, and others will have to be patient or write your own article.



Attitude

The first thing we must be aware of is attitude. I've heard that what a person reads is a window on the person's interests. Much of the same observation applies to fishing and quality. When you walk into a real fisherman's house you'll probably see a ragged copy of Ray Bergman's *Trout*, several issues of *Fly Fisherman*; and, if you see pictures in the room they are usually of trout.

Early in my Air Force career I spent 3 weeks[2] in a contractor's plant as part of an Education with Industry program. This particular contractor had a solid reputation for producing some of the best HAM equipment in the industry; however, he had not been able to grow fast enough in that market to keep his workforce employed. He was forced to decide to continue competing in both the commercial and defense markets or to focus completely on the defense market. He chose the latter. The goal was not to build the cheapest electronics countermeasure device in the business but to build the *best*.

This contractor took his role seriously. He concentrated on gaining a piece of the market through solid research of the threat; he kept costs within control via a modern management information system and with the head of accounting as second in command. The company had a top-notch manufacturing engineer; a "young tiger," who was a major innovator in productivity, hired from a Texas competitor. To round out the team, the contractor hired a leading manager in the field of quality. There were posters about quality everywhere in that plant.

One of the first things the new quality manager began was a quality award presentation program. The department head winning the award received public recognition, with his picture published in the industry newspaper. There were graphs and bar charts on walls; every line supervisor knew his relationship to other supervisors regarding quality.

Did all of this work? I asked the local Defense Contract Administration Service inspector, who said they had a real good program. Fine, but I wanted to know more. So, I asked other plant hierarchy and everyone explained the plant's quality picture, knew the quality status for their product line, and knew who was doing the best toward winning that week's award. I finally was convinced when I asked one senior engineer about a quality issue; he gave me his copy of the company's guide to quality, which included MIL-Q-9858-A and other key reference documents. Sure enough, it was just like my copy of *Trout*—well worn from plenty of use.

Corporate Attitude

Leaving the plant, we had an "outbrief" with the operating division head. I asked about the quality program.

The head man, skeptical at first, had spent years in the industry and could not see how those charts would produce a better product. However, he gave it a shot because the man he hired to run the program had a top reputation in quality. The results were amazing. Phillip Crosby points out the importance of the corporate attitude in his book *Quality Is Free*.[3] Crosby stresses the importance of a top-level commitment to quality, and advocates that corporations have a vice-president for quality to make it happen. The quality circles movement[4] uses a grassroots approach to interest the employee in quality. Attitude is basic to either approach. Program managers can look for quality posters, review the company organization chart, or check to see if the company has quality circle meetings. All are attitude indicators.

Another attitude indicator I learned during my tenure as chief of quality operations for Air Force Logistics Command (AFLC) is the materiel review board process. A materiel review board has two basic reasons for existence: correction of defects, and disposition of defective property. The focus of the effort is an indicator about where an organization places the em-

■ *Major McMahan is chief of the Program Integration Office, Headquarters, Air Force Systems Command, Andrews Air Force Base, Md. He is a graduate of PMC 86-1.*

phasis. Far too often the process is directed at "getting by the check" instead of correcting the cause. Correcting the cause often is complex and sometimes is downright embarrassing. Cause identification can be a difficult problem when you consider that the product design (engineers), the manufacturing process (workers and line-production supervisors), and the product's fitness for use (the customer's need and sometimes just "nice to have") are involved.

Fitness for Use

Dr. J. M. Juran makes a strong case in his quality assurance seminar[5] that the "fitness for use" issue is the true measure of product quality. The design and process contribute to that end.

Before leaving the fisherman's house, you may notice a gadget with feathers, hooks, and different colors of thread. We may have found a fly-tying purist instead of just a trout fisherman, and we can learn a bit from this individual; he is enamored with fly fishing. For the sake of this paper, this character is "Old English Style," who would not consider taking a fish on a wet fly. The true art is in matching the hatch (simulating insects hatching above the water).

What does this have to do with quality? Quite a bit!

Have you ever had a design that was so complex that it simply would not work? Yet, try as you may, you could not convince the designer to stop improving the design and figure out a way to make the product. Mr. W. J. Willoughby, Jr., with a strong industry and NASA background, found that the Navy had some of the "let's get the most out of the design" in its approach to acquisition. I suspect that the Navy is not alone in this area.

The World of Design

If you have tried to tie a size 26 hook you will appreciate one of Mr. Willoughby's favorite concepts: derating. Several years ago while stationed near Yellowstone National Park, I noticed that large hooks caught large fish. I also knew that being large, they were easier to tie. However, many fishermen and especially the purists would spend the winter months tying small hooks—even size 26, one of the smallest. Based upon several years of climbing over missile sites, I sometimes believe the same philosophy of compactness has migrated into the world of design. I am not an advocate of wasted space, but I point out that the end-result of successful effort is something that works. It is difficult to get designers to trade-off performance for reliability; but, to achieve any real measure of reliability, that is exactly what must be done. Derating is simply easing the stress points to a level within the operating regime of the system. Dr. Juran and Mr. Willoughby point out the use of derating to achieve better system reliability.[6] Tying that size 26 hook was beyond my fly-tying system operating regime, if I wanted a sufficient quantity to last the season.

Dr. Juran provides a list of other things a program manager should look for at program design reviews. Some basic questions follow.

Has the real need of the user been met? Remember that the operator and maintainer of the system probably will be out in the middle of nowhere when the system breaks. Consider the trade-offs. Some user-needs can be served better by a simple approach.

Are redundant systems used in such a way that failure of the first is not detectable until the redundant system also fails? That can be disastrous in a critical part of the system.

Are there new or unproven parts? If so, here is a place to watch.

Are operating regimes adequately controlled to limit shock, heat and dust from destroying the system?

Has "failure prevention through service and removal" been adequately considered?[7]

The Walk-Around

Enough of this living-room fishing; let's head for the river. As you glide up a stream, you should approach quietly and with the sun in your face to keep from scaring the fish. The same type of approach should be used during your walk-around of the production facility. You know some attitude clues you hope to find; but, there are more to be learned during the plant tour. The process is of specific interest.

As you approach a machine area, listen for loud clanking noises. We had a GS-14 in our quality office at Air Force Logistics Command who focused on audits in the area of the loudest noise; he had many years of experience in quality, and a strong opinion that machinery made a noise for a reason. If things were really loud, he wanted to know why. Was the machine designed to hold a tolerance that had not been maintained? Was the machine set up properly? When was the operator trained? Did the operator have bad habits? These were things the GS-14 wanted to find out. Sometimes it was just a noisy machine but, more often than not, it was a symptom of a problem—poor process control!

Controllability

Dr. Juran defines controllability in three parts: knowing what is supposed to be done, knowing what actually is being done, and regulation.[8] Phillip Crosby makes a strong case for conformance to a standard in *Quality Is Free*. A clear standard and strong enforcement are essential for conformance. My AFLC supervisor said: "Properly trained people with good supervision, adequate tools, and clear technical data do quality work."

There is definitely a human dimension to process control. There is also a machine dimension. Our GS-14 looked for the machine that was out of tolerance. Another approach is to look for people not following the procedure. Remember what I said about how to approach the stream when fishing—that definitely applies if you want to find the out-of-tolerance person. When I assumed duty at AFLC, there were horror stories about how bad things were in some technological repair centers (depots). As I had just left a Site Activation Task Force where I commanded a depot field activity, the stories seemed exaggerated and amusing. On my first trip to one center, I asked for a brief tour of the maintenance area. I wanted to see first-hand if things were as bad as I had heard. Clearly, the first evidence pointed toward exaggeration. The technicians were competent just like those I worked with as a commander. When I walked to the aircraft maintenance line, the technician was using technical data to work on the airplane. I looked at his job, replacing an actuator, and all applicable procedures were being followed. He had the proper tools and his supervisor had assigned the job to a properly trained technician; work break-down schedule was on a routing board next to the aircraft.

More Information

Realizing that one brief walk-around of a maintenance area did not make me an expert or provide a statistically significant sample, I concluded that I needed more information. So, I asked quality assurance people in the quality office (none were on the line) why things seemed bad. Their problem was with customer defect reporting; people in the field were not satisfied with the product. What did the complaints have in common? Although there were common threads, for the most part there was random feedback. Not until almost a year later did I get a clue to the probable real culprit.

One of my AFLC responsibilities was going to other headquarters and finding how well we were supporting the combat commanders. The focus was in the maintenance area.

Our premise was that if maintainers were not having problems, the logistics system probably was functioning properly. Awareness of customers' problems was our goal. Certainly, there was more to the program than feedback. The end-result was usually enhanced support. Some common themes surfaced. Among the more common was a basic misunderstanding of the AFLC role in certain areas. Years before, AFLC had repaired airplanes under an "inspect-and-repair-as-necessary" concept. With funding cuts, the command workforce was reduced; thus, a programmed depot maintenance concept was initiated as a replacement. Each work package was negotiated with the owning command headquarters and AFLC during annual workload conferences. The basic thrust was that field activities would do more, and AFLC would do the "too-tough-to-handle" type jobs. Sometimes, the word did not get back to troops in the field. Thus, write-ups in the reporting system continued. The feedback system was out of control: The system was responding to a baseline that no longer existed. A wary fly fisherman knows trout are hard to catch. Finding out what is out of control can be just as difficult.

More Clues

Leaving a program manager with that generality would not be too helpful. More clues may be useful. In trout fishing, you learn fish are usually around changes in the water; look where fast water meets slow water, and you usually find trout. Before I had heard of Kepner-Tregoe, Inc.,[9] my grandfather, a talented auto mechanic, taught me the same premise applies in trouble-shooting defective machinery. During your walk-through, look for places of change. Where does one job function connect with another? Where does one process start or stop? How about shift changeover? Invariably, if something will drop through the crack, that is where it will happen.

Has the contractor begun business with a new subcontractor or vendor; another contract recently been introduced; moved to another location; hired new employees? These elements of change have the potential to induce error into the process—into your weapon system. Look closer at those situations. In trout fishing, where you want to fish is where the fish are most likely to be found.

Look for attitudes of quality. A company believing in producing a quality product should not keep it secret. Be sure it is more substance than public relations or marketing. The thrust of their materiel review board process should provide a real clue. Use all your senses during a walk-through of a plant: Listen for out-of-the-ordinary noise. Ask when the set-up was done. When was it checked? Who checked it? Look for changes in the process. Look at changes in functions. Concentrate on the interfaces: That is where the greatest potential for problems is found. Remember the people part of the process: Find out if they are trained and if their training is current. Now, for some tools to consider.

Part II

Let's look at three sets of tools at a program manager's disposal: the contract, the contract administrative service, and the program office including any matrix staff. In contracting, a review of applicable quality requirements like MIL-Q-9858-A or MIL-I-45208 is in order. I will give a brief discussion of the error-detecting quality workforce, and explore ways the program office can assist with the process.

An experienced fisherman will say the tools of his craft are important. A brief visit to my garage, the basement or other nooks at my house will reveal an assortment of what my wife calls "junk." To the trained eye—another fisherman's—there is a different reaction.

A look at a contract will undoubtedly lead to similar differences of opinion. Some will want to cut through the legal "mumbo jumbo" and get to the statement of work. The same will be true of specifications referenced or data item descriptors. Unless they mean something to the reader, it is like a non-fisherman looking at a graphite fly rod. Specific tools in the quality world are used for specific tasks.

The first of these tools is MIL-Q-9858-A which is a military specification that requires contractors to have "an effective and economical program...." At the heart of this 9-page document, you find a discussion on managing a quality program, a section on facilities and standards, purchase control, manufacturing control, and government/contractor actions. The document is basically a survey of general principles the government expects the contractor to follow in setting up a quality program. *Handbook 50* is a companion document with more detail on each topical area. The handbook is

intended for inspectors to use in validating a contractor's quality program. Therefore, if you want to see how your contractor's quality program was inspected, a review of *Handbook 50* is in order. What if your contract involves MIL-I-45208A, not MIL-Q-9858-A? Then, more than likely, what you are buying is simpler and easier to inspect. *Handbook 51* is the companion document for MIL-I-45208A.

Accuracy

Frequently, fishermen are accused of exaggerating their prize catch or "the one that got away." Using a scale or tape measure would eliminate these problems of accuracy.

Such is the case for calibration as a contractual requirement. (It's a good thing that MIL-C-45662A is never applied to fishing, for it would shorten considerably the size of fish and do irreparable harm to most fishing stories.) The specification simply requires contractors to use a validated standard for measurement. Applying this standard eliminates much discussion about "what the test-set really said," which is appropriate unless you are only interested in "fishing stories" at program reviews.

It is highly probably your program may need statistical sampling inspections. If so, MIL-STD-105D should be applied prudently. Because it is statistically based, some understanding of the power of that tool is needed to preclude someone gaming the system. There is another adverseness to this standard. Because by statistical definition there is an "acceptable quality level," strong potential exists to actually weaken or politicize the quality program. To minimize such adverse potential, be sure process control is actually in control; be sure lots or batches are aggregated correctly; be doubly sure the batches are not a grouping of items that may or may not be similar. Even if you are inspecting like-items, a change in process affects lot characteristics. Sampling techniques, if properly applied, have value. Be sure the application is accurate. *Handbook 53* provides guidance on sampling applications.

Non-Conforming Materiel

I have discussed attitude toward defective materiel disposition as a key indicator of the contractor's overall attitude toward quality. Dr. Feigenbaum, a renowned quality consultant, is adamant about the end-result of reworking defective materiel: the hidden factory.[10] To keep track of nonconforming materiel, MIL-STD-1520A should be part of your contractual requirement.

Sharp hooks catch fish! I spent many Montana evenings with a file sharpening hooks before they were launched toward unsuspecting trout. Sharpening may be in order with two program management tools: contract administrative service and program office staff.

Accomplishing meaningful sharpening takes time and effort. First, get to know the person who will be your "eyes and ears" in the contractor's plant. Yours may be one of many programs, or the only one in the facility; either way, it's your program you want to emphasize, and that is accomplished best in person. *In Search of Excellence*[11] notes that top corporations that succeeded invariably had two things in common: emphasis on team identification and shared goals. My experience on the SIDEWINDER team convinced me that teamwork is vital. Our program had 14 contractors, two military services, and multiple foreign military sales customers. Frankly, I had never seen such diversity. Yet, the team emphasis was contagious; the same attitude applied to our plant representatives.

"Eyes and Ears"

What, exactly, do you want your "eyes and ears" to look for in the plant? Do they have an inspection plan? Have you taken the time to ask? You may be surprised at the responses. Many (probably most) inspectors you deal with are "General Schedule," career series 1910 or "Wage Grade," career series 1960 civilians. What is the background of your inspection team?

The driving question is: How do you expect them to inspect? Within the Air Force, operational units usually select top maintenance technicians to inspect the work of other technicians. Those super technicians have expert authority as well as official sanctioning to accomplish their mission. Are your inspectors capable of verifying the contractor's effort?

How long has your quality team been with your contractor? Has he "gone native?" B. F. Skinner warns about the subliminal effects of socialization. According to Skinner, conditioning can occur without the subject being aware of, or in agreement with, the conditioning process.[12] An inspector's role is difficult, for at times he has to be the dissonant voice—a "nay sayer, a critic." Your support from the program office will make the job possible.

Emphasis

As for the program office, the key word should be *emphasis*. There is plenty of banter about emphasis on quality, and some advocates are sincere. A real test comes when your schedule is in jeopardy, or your funding is being cut, or you see the gleam in the customer's eye as he talks about more capability. From personal experience, our acid test always came from our program manager's marching orders, orders which never changed. Our program manager had two overriding rules: "Don't do dumb things just to do something, and I won't put junk in the fleet!"

General Richard Cavozas,[13] former commander of Forces Command, provided insight into how a program manager can lead in the area of quality. His philosophy was one of "moral ascendancy." History is replete with examples of leaders who succeeded against almost unsurmountable forces. The winners invariably had one thing in common: moral ascendancy. This is not to say that right always won, but that leaders are more apt to be effective when they have a vision they believe is correct.

In summary, program managers need to approach quality with the skill of an experienced fly fisherman. I have attempted in this paper to provide an overview of some methods available to meet the challenge. For those who want to go deeper into the subject, I highly recommend Dr. Juran's writing.

As one fisherman would say to another: good luck and good fishing!■

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2. "Education-With-Industry" is normally a 1-year program. The Air Force Institute of Technology also has a 3-week version included in its production management course, which the author attended.

3. Phillip Crosby, *Quality Is Free* (New York: McGraw-Hill, Inc., 1979).

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7. Juran, *Quality Planning and Analysis*, pp. 188-189.

8. Juran, p. 314.

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Manual Outlines Best Practices In Weapons Systems Procurement

The Department of Navy has released a new government publication designed to encourage proper management of the technical process of weapon systems procurement. Best Practices: How to Avoid Surprises in the World's Most Complicated Technical Process, a companion document to DOD 4245.7-M, describes proven practices to assist government and private sector managers and executives in reducing the technical risk associated with military weapon systems acquisition programs.

This manual expands on the templates of DOD 4245.7-M to provide more detailed guidance to government and industry by identifying specific patterns in current use and their potentially adverse consequences in terms of cost, schedule, performance, and readiness. It describes proven best practices that avoid or alleviate these consequences, and provides enough background information to explain their rationale. The manual covers funding, design, testing, production, facilities, logistics, and management in terms of the transition from development to production, and presents tested best practices for each phase of the procurement process.

This 302-page publication, stock number 008-050-00234-4, is available for $19.00. Send prepayment to Dept. 36-RX, Superintendent of Documents, Washington, D.C., 20402; or, to order with Visa, Choice or MasterCard, phone (202) 783-3238.

More Power, Less Noise

The standard generator that powers the Army Regency Communications Network has been modified by the Troop Support Command's Belvoir RD&E Center to comply with local noise ordnances in populated areas. Electrical engineers increased the generator's output from 15 to 20 kilowatts and "hardened" it to resist nuclear attack.

The modified set consists of the same basic parts as the original unit so that it can be easily supported in the field. The generator now registers less than 65 dBA at seven meters in any direction, about as loud as a normal conversation.

Pricing the Cost Estimate

Dr. Paul O. Ballou, Jr.

One of the major problems of a company manager is to establish a selling price for its products or services. The manager must consider the existing business environment and forecast company business activity for 5, 10 or even 20 years. The manager must consider detailed cost estimates for product or services along with tactical considerations of winning the contract and strategic implications for the company in coming to its price decision.

Most cost estimates are derived by making some subjective relationship to historical data for a similar product or service. The cost-estimating process results in a range of possible cost outcomes for a specific product or service. Figure 1 illustrates the probability distribution of the estimates based upon assumptions of the company's environmental impact on actual contract performance.

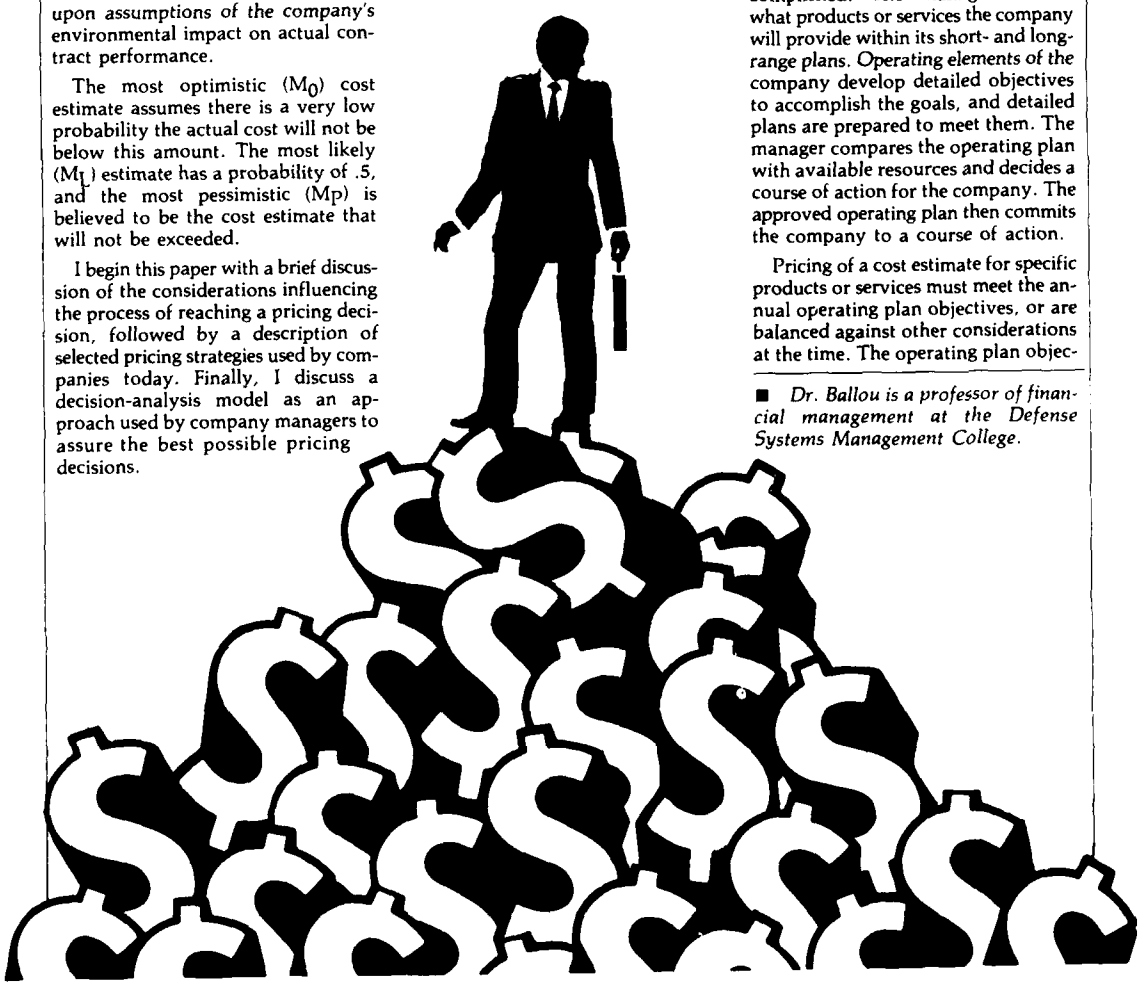
The most optimistic (M_0) cost estimate assumes there is a very low probability the actual cost will not be below this amount. The most likely (M_L) estimate has a probability of .5, and the most pessimistic (M_P) is believed to be the cost estimate that will not be exceeded.

I begin this paper with a brief discussion of the considerations influencing the process of reaching a pricing decision, followed by a description of selected pricing strategies used by companies today. Finally, I discuss a decision-analysis model as an approach used by company managers to assure the best possible pricing decisions.

Pricing Considerations

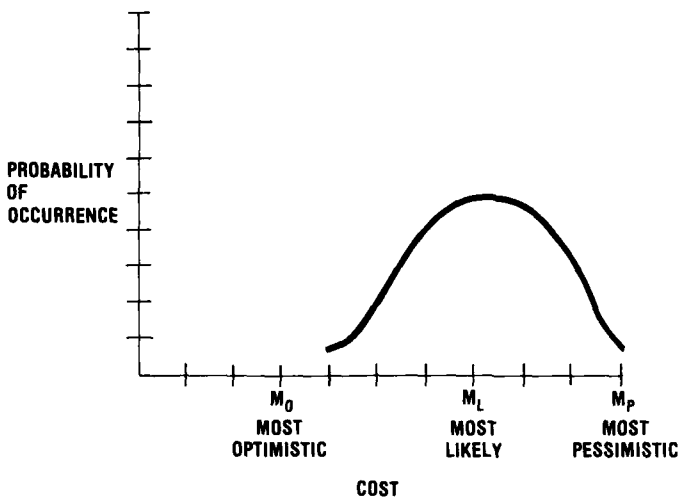
An analysis of the pricing considerations provides an insight and understanding of strategies and tactics used by a company manager in pricing a cost estimate. Pricing the product or service requires knowledge of the company and its business environment. The manager must understand the strength and weakness of the company. Figure 2 summarizes considerations influencing the pricing decision for a specific product or service. I will address each of these considerations in turn. Managers believe that if you don't know where you are going, any road will get you there. The most important task of a manager is to establish what the company will be doing in the future. A widely used technique for establishing goals and objectives is the annual operating planning process. The cycle varies among companies, but the annual operating planning process is used to decide what are its goals and how will its objectives be accomplished. The manager decides what products or services the company will provide within its short- and long-range plans. Operating elements of the company develop detailed objectives to accomplish the goals, and detailed plans are prepared to meet them. The manager compares the operating plan with available resources and decides a course of action for the company. The approved operating plan then commits the company to a course of action.

Pricing of a cost estimate for specific products or services must meet the annual operating plan objectives, or are balanced against other considerations at the time. The operating plan objec-



■ *Dr. Ballou is a professor of financial management at the Defense Systems Management College.*

Figure 1. Cost Estimate Probability Distribution



tives may include specific requirements for some or all of the following factors: return on investment, return on equity, internal rate of return, new technology, market share, employment levels, sales levels, capital budgets, and/or cash-flow projections. Pricing of products or services not in the plan usually requires special management attention and approval. The operating plan is continually reviewed and updated during the performance period.

General Economic Conditions

Both the macro- and micro-economic business conditions influence pricing decisions. General economic conditions must be translated into the industry, company, and product to forecast buyer demand and cost-estimating problem areas. For example, a growing gross national product, with increasing productivity rates, provides a signal for a good economy; but, the manager must look at specific trends of a product within the company and forecast trends of a product in establishing its particular price.

Figure 2. Pricing Considerations

- Goals and Objectives
- Business Conditions
- Competitive Position
- Degree of Risks

Assessments of product or service market trends influence the pricing decision. A new product usually will be priced at a level to acquire market share, while an established product may be priced to maximize return on investment. The company data base provides the product or service records of past performance and current situations that are used in forecasting business conditions at the time of new sales.

Evaluation of a company's competitive position is part of the annual operating planning process. The company's strengths and weaknesses are identified and analyzed. The manager must know the company's true capabilities, and that of competing companies, to realistically forecast sales volume. Forecasts are based upon the allocation of company resources (plant, people, capital) when the operating plan is approved. Plant capability determines the operating leverage and break-even point for product pricing.

Breaking Even

The greater a company invests capital equipment the higher are its fixed cost, and the larger production volume must be to break even. In pricing a product the manager considers cost-volume-profit tradeoff by knowing its break-even point; also, what amount of additional company resource investment may be required if a lower profitable price is to be proposed. Management decisions to increase resource are usually considered during the decision process of establishing a product or service price. The company's assessment of its competitive position is most effective measured by the accuracy of its sales forecast. There is no right or wrong attitude toward risk taking. There is only the realization that, ultimately, everything the company does is a risk. Generally, the more risk a company takes the higher is its return on investment. Figure 3 compares the probability of return for two investments. Investment A is lower risk with a lower range of return; Investment B is high risk with higher return.

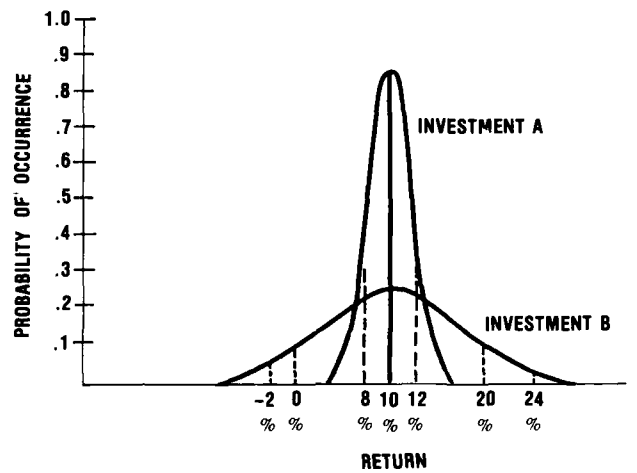
The company increases its skill at risk-taking by deciding clearly during the annual operating planning process what its goals and objectives are. One way to clarify the goals and objectives is to bolster the manager's beliefs in the values of the company; e. g., "quality is job 1," "service is our most important product." The next step in risk management is preparation. Knowledge about the company and the business environment is power for the manager in risk-taking. The final step is to generate as many alternatives as possible to assure that the manager's decision is in the best possible direction, but leaving room to negotiate.

Pricing Strategies

Pricing of a product or service is a process of balancing the needs of a company with those of its customers. Products or services are identified as parts of the strategic planning process. Once they are identified the company develops items to satisfy the customer's needs and includes cost estimates in budgets that are prepared during the annual operating planning process. Figure 4 summarizes alternative strategies a manager will consider in pricing a product or service to satisfy company goals and objectives specified in the operating plan. Figure 1 highlights the range of cost estimates that may result for a specific product or service. The three-point cost esti-

mates are based upon assumptions of the cost impact of "known" and "unknown" uncertainties. For example, the estimator can reasonably know there will be some economic inflation in the cost, but cannot estimate the impact of an unknown government tax. Impacts of technology on product demand or manufacturing process are other examples of factors that result in a probability distribution for the outcome of the actual final cost. Without the benefit of hindsight the manager must price the product or service with knowlege that the outcome may be much different than is planned. The manager will establish a product or service price based upon an analysis of the pricing considerations, a strategy to winning the contract, and the cost estimates.

Figure 3. Risk—Return Probability Distribution



Optimistic, Likely, Pessimistic

The following is a brief description of the strategies set forth in Figure 4. A most optimistic strategy is based upon the optimistic cost estimate with few contingencies included for uncertainties. The strategy is aggressive and the risk of loss is high. It usually represents a new product competing for market share. The most likely pricing strategy is based upon a 50/50 chance that the actual cost will be the likely estimated cost. There is only moderate competition for the contract, and the performance risk is low. The most pessimistic strategy is based upon the pessimistic cost estimate, little or no competition, and no risk in performance. A buy-in strategy is based on a price below the most optimistic cost estimate, in a very competitive market environment, with a known loss for contract performance. The manager selects this strategy when it is consistent with the company's goals and objects which may include: acceptable long-term internal rate of return, investment in a new product, to stay in business, increase cash flow, and/or maintain a customer. A market pricing strategy is to price the product or service in excess of actual cost at an amount determined by market forces.

Pricing the Estimate

Decision-making in proposal pricing is complex. A manager must understand company motivations and values to determine a price for specific products or services. Many managers have developed an intuitive reaction in pricing based upon years of experience within the business. Every decision involves some degree of intuition by the manager, but most decision-makers prefer some analytical analysis to organize the independent variables.

Graham Allison puts forth the following three models of decision-making in his book, *Essence of Decision: Explaining the Cuban Missile Crisis*.

—Rational Actor (Model I). Decisions are based on results of a logical analysis of the facts.

—Organization Process (Model II). Decisions are based upon routines and repertories of organizations involved.

—Organization Politics (Model III). Decisions are made by the power and skill of proponents of the issues.

Allison used the models to describe the decision-making used to avoid World War III in the Cuban missile crisis. The model paradigms can be used in other situations, like management decisions in pricing the cost estimate. The basic concept of Model I is to identify goals and objectives for the problem, define the alternatives, estimate the consequences, and reach a logical decision supported by the analysis. Model II requires a comprehensive analysis of the organization in which the decision will be made to determine its behavioral patterns, tendencies, standard operating procedures, and action patterns, which then lend to a decision consistent with this analysis. Model III is the negotiator's approach that is supported with extensive knowledge of the people involved and an understanding of their needs, the environment in which the involved people operate, and a realistic assessment of the relative power of the responsible people. Model III decisions will be based upon a subjective analysis of all available information.

The three models are related because they are useful in the decision-making process. Each model requires a mix of evidence and judgment in reaching a decision. The extent of information required for each model varies from very complete for Model III to relatively small for Model I. However, each

Figure 4. Pricing Strategies

- Most Optimistic
- Most Likely
- Most Pessimistic
- Buy In
- Market

model requires information for decision-making. Information obtained through analysis of each model significantly strengthens the manager's post-decision administration. Any decision resulting from the models will result in a choice of the best alternative, taking into account potential consequences and their probabilities and utilities. Each model's examination of the facts gives a total view of issues, but each tends to result in a different answer to the same question. A decision analysis may be conducted of alternative pricing strategies for a specific product or service. However, a risk analysis of the potential alternative should be made before the manager's final decision. Risk analysis will identify vulnerable potential problems, their likely causes, and ways to prevent them.

Each alternative strategy should be evaluated for its ability to satisfy company objectives, which may come from the annual operating plan. Important objectives to a company include: producing a good product that satisfies the customer's need, developing a long-term relationship with its customers, improving cash flow for operations, return on investment as a measure of management efficiency, and/or developing new products for future growth. Each objective is an independent variable that directly influences accomplishment of the dependent variable goals of the company. The purpose is to determine which alternate test fulfills each objective.

Evaluating the Alternatives

One technique of evaluating alternatives is assigning a weight to each objective according ot its relative importance to the company. The weighing scale will identify relationship among objectives and ensure their relative importance is appropriately considered in the final decision. Alternatives are comparatively evaluated against the objectives by several managers who will assign a numerical score on how closely it meets each objective. A weighted score is established by the multiplication of the objective score for each alternative, times the weight of each objective. The total weighted score produces a comparative measurement of the alternatives and results in a tentative selection. Before final decision, consequences of the alternative must be considered; also, what risks may be attached to the final selection that could jeopardize its safety and success. Figure 5 shows some company objectives that may be selected. An example of the decision matrix is set forth in Exhibit A.

Figure 5. Company Objectives

- Good Product
- Long-Term Relationship
- Improved Cash Flow
- Return on Investment
- Develop Capabilities

The weighing scale will identify relationship among objectives and ensure their relative importance is appropriately considered in the final decision.

Exhibit A. Decision Analysis

ALTERNATIVE	COMPANY OBJECTIVES					TOTALS
PRICING STRATEGIES	GOOD PRODUCT	BUYER RELATIONSHIP	IMPROVED CASH FLOW	RETURN ON INVESTMENT	DEVELOP CAPABILITIES	
MOST OPTIMISTIC						
MOST LIKELY						
MOST PESSIMISTIC						
BUY-IN						
MARKET						

Conclusion

The manager's pricing decision requires a great deal of knowledge about the business environment. Collecting information is a major function of the company's planning activities. The annual operating planning process is a management tool that facilitates the company in establishing its goals and objectives. The approved plan commits the company to action. Progress against the plan is reviewed by the manager. Performance feedback permits changes to the plan based upon actual accomplishment and changes in the environment.

Actual performance evaluation must include measurement of customer satisfaction with products and services, return on investment as a measure of operations effectiveness, and a return on equity that retains and attracts investor capital. ■

Quality Teams Assure Success

The C-17A System Program Office Logistics Division, Wright-Patterson Air Force Base, Ohio, is using reliability, maintainability and availability (RM&A) quality teams to influence C-17A reliability and maintainability early in the program.

Major James F. Guzzi, C-17A RM&A manager and developer of the quality-team concept, along with the C-17A System Program Office (SPO), the Air Force Acquisition Logistics Center, and Douglas Aircraft Company have incorporated the idea as a permanent part of acquisition logistics strategy. Major Guzzi said "using the team concept addresses the mechanism needed to implement reliability and maintainability 2000 objectives in a design organization." He said the teams apply a system-management approach using existing resources and organizational structures to strengthen existing RM&A programs. The short-term goal is to integrate design engineers with RM&A engineers during the development effort. This maintains strong functional control while allowing the engineers to work as a team. Experience gained will be the basis for potential industry-wide use of the quality team concept.

Using past experience with transport aircraft like the C-5A, C-130, and C-141, the teams (composed of engineers, designers, and specialty engineers) study the C-17A design for inherent R&M problems and pass on possible solutions to program managers. The teams use methods to solve many R&M problems ranging from landing gear, to the potable water chiller, to the interior lighting system. ■

Air Conditioner For Vests

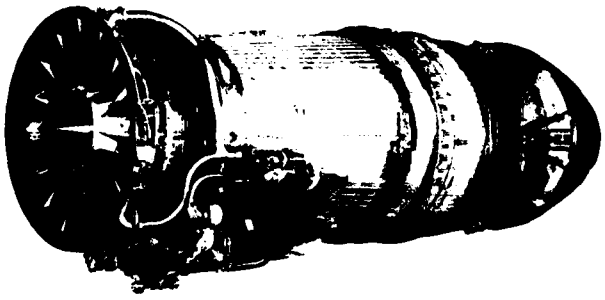
A unique environmental control system has been developed by the U.S. Army Troop Support Command Belvoir Research, Development and Engineering Center, assisted by Natick and Chemical RDE Centers. Called a Microclimate Conditioning/Collective Protection System, it forces contamination-free cooled air into special vests worn by crew members and troops in the M113 armored personnel carrier. It is designed to keep soldiers inside an armored vehicle cool in ambient temperatures as high as 120 degrees fahrenheit, even when wearing NBC protective clothing.

Cooling vests used with the system, developed at Natick RDE Center, are designed to be compatible with protective clothing; the cooling vest is worn underneath the uniform to allow cool air to be pumped around the soldier's torso. ■

Managing Defense Programs

General Lawrence A. Skantze, USAF

B-1 engine



Football Coach John Heisman gave sound advice each year to his team. I'll share it because the story concludes with a valuable quote for would-be program managers. Gathering his squad on the first day of practice each season, Heisman demonstrated a flair for the theatrical—he also was a Shakespearean actor. While displaying a football to the newcomers, he explained: "A prolate spheroid—that is, an elongated sphere—in which the outer leathern casing is drawn tightly over a somewhat smaller rubber tubing."

Here, Heisman would pause dramatically, before his profound advice: "Better to have died as a small boy than to fumble this."

I am delighted to talk to such a distinguished Defense Systems Management College class. Addressing this gathering of the chosen few reminds me of Henry Kissinger's remarks in a similar situation: "I haven't seen so much talent assembled in one room since I stood in the hall of mirrors."

An Elite Class

I want to offer some thoughts on the Defense Systems Management College, the defense acquisition environment today, and what it takes to run a strong program in these challenging times. First off, you're lucky to be here. The Defense Systems Management College is a respected "graduate school" for program managers. Since Deputy Secretary of Defense David Packard started DSMC in 1970, it's been a visible statement about DOD's commitment to excellence in acquisition management. You've been chosen for the kind of expert training the defense department expects and the American public deserves.

You're also an elite class. It's tougher than ever to get in, especially since the fiscal '86 authorization act requires DSMC or equivalent training for managers of major defense programs.

A classic example of risk management is the B-1 engine adaptation for a fighter environment. The Air Force got two quality engines, a warranty, data rights, a second source, and a lower cost for new engines and spare parts.

There was stiff competition for this class' 270 slots. The Air Force, Navy, and Army each had roughly 80 openings to fill; the rest are from industry and other government agencies. Let me tell you about those 80 Air Force slots. Air Force Systems Command could fill 55. For those 55 slots, I had 2,123 eligible field grade officers, all candidates for program manager jobs. So I picked only the best major and lieutenant colonels, and a few hot-shot captains. The idea was to target those clearly destined for key program management positions. I know the selection process was just as tough for the other military services.

You are calculated investments for your organizations, which accounts for their avid interests in managing your career paths. Consider the public trust:

—The U.S. defense acquisition is the largest business enterprise in the world.

—Annual purchases by DOD total almost $170 billion—more than the combined purchases of General Motors, Exxon, and IBM.

—The DOD research and development (R&D) expenditures are more than 15 times those of France, Germany, or the United Kingdom, and 80 times those of Japan.

—Defense acquisition involves almost 15 million separate contract actions per year, or an average of 56,000 contract actions every working day.

The DOD employs more than 165,000 people, military and civilian, to manage its vast array of R&D, procurement, and logistics programs.

Pivotal Positions

You men and women are training for the pivotal positions that can make or break the success of these programs. When the Packard Commission listed six criteria for successful programs, high-quality management was on the list. I assure you that national attention is riveted on your training and capabilities, and the Congress is looking over your shoulders. Elected leaders expect defense program managers to be held personally responsible for failures. They demand skill, tenure, technical proficiency and, above all, accountability.

I'm reminded of the story about a program manager being mercilessly grilled at a Senate hearing. The questioner demanded: "And tell me, sir, how would you have managed the program today, under the same circumstances?"

"Under an assumed name, senator," replied the program manager.

Legislators want to pin the rose on somebody when a program is in trouble, and there's intense scrutiny of our business. That's understandable; management of tax dollars is the issue.

This is a challenging, dynamic era, and you're going into the profession as the winds of change whip through the acquisition arena. The reasons for the change are several. First, support for the defense buildup has slipped. In this decade, the President and the Congress have given the nation a firm foundation to build upon. But public opinion about defense shifted radically. In 1980, a Harris survey showed that the American people overwhelmingly favored spending more on defense. By 1985, a meager 9 percent of those polled in a follow-up survey said the military needed more funds.

Increased Deficit

Second, an increased deficit is foremost on the public mind. Conventional wisdom holds that America is mortgaging its future.

Third, horror stories have taken their toll. The perception exists that if DOD can't be trusted to buy claw hammers and Allen wrenches, how can it be trusted to build and acquire tanks, missiles, and ships? No matter the actual facts, $7,600 coffee pots and $1,000 stool caps have eroded public opinion. The 1985 Harris Poll showed a common belief that there was too much waste in defense spending, that cost overruns occurred too often, and that our weapon systems are impractical or don't work.

Under all the pressure, the Congress reacted as a political body. In recent years, it did so with an avalanche of "how-to" legislation for work measurement, dual sourcing, warranties, competition, post-government employment, and many others. Unfortunately, the tendency has been to legislate the details of the acquisition business rather than policy. The result: semiparalysis.

On Capitol Hill 10 years ago, four committees and subcommittees wrote defense legislation. Last year, by one count, 64 had at it. In 1983, DOD witnesses gave 1,453 hours of testimony, and responded to 84,148 written inquiries and 592,150 telephone requests. Last year the Congress changed 1,800 separate programs. There's been an explosion of mandated DOD reports and studies; from 36 in 1970 to 458 in 1985. That's a 1,272 percent increase. How does that affect you? Program office people provided the lion's share of the data for those reports and testimonies.

The fact that, at times, laws and proposals have conflicted with each other has not daunted some legislators. Neither has the net effect of micromanagement: instability, delayed schedules, and inefficiencies. The Congress wants what we all want: effective spending and a healthy acquisition system. But the micromanagement approach reminds me of Poet Charles Baudelaire's words: "Life is a hospital in which each patient believes he would recover, if only he could be moved to another bed." Changing programs and procurement details has never been the answer. It's part of the problem.

Focus on Big Picture

We've needed a focus on the big picture, a top-down look at the entire acquisition process. President Reagan thought so too because, last year at this time, he formally recognized that it was time for the Congress, the military, and industry to get out in front of our problems, not cover them with band-aids. Formation of the Packard Commission represented an Executive Branch plea for acquisition sanity. Its final report, "A Quest for Excellence," is a blueprint for action by the Congress and the Department of Defense, a plan for coherent improvement of defense management.

Legislative branch tasking addresses a 2-year budget; defense strategic policy vs. line-item budget review; milestone decisions coupled with multiyear contracts; and a single, simplified procurement code. Acquisition-oriented recommendations include streamlining of organizations and procedures; using technology to reduce cost, and prototyping for select

General Skantze, commander of the Air Force Systems Command, made these remarks at the Defense Systems Management College PMC Class 86-1 convocation.

weapon systems; expanding the use of commercial products and competition; and training "top gun" acquisition personnel.

The Air Force is moving out on the Packard Commission's acquisition-oriented recommendations. Organizationally, we're assessing different reporting procedures for program managers. We've reoriented program acquisition strategies to respond to the Packard impetus. The recent Air Force decision to build prototypes for the advanced tactical fighter, its engines, and ground avionics is a notable example.

Acquisition Personnel

On the personnel front, the Air Force continues to improve the quality of acquisition personnel, as are the other military services. A structured career model for acquisition managers is not news. The Air Force has had a professional corps of military program managers for a quarter of a century.

Of the current SAR program officers, 6 general officers average 19 years of acquisition experience and 10 years operational experience. The 19 colonels average 17 years of acquisition experience and 4 years operational. The 7 lieutenant colonels average 12 years acquisition experience and 3.7 years operational. Right now, Systems Command is charting a specific path for all program managers to follow from entry to senior levels. It certifies skills at four stages, for an entire career force with the same scope of expertise as the SAR program managers. The Defense Systems Management College is at the core of the AFSC career model. The fact is, the procurement process is as critical as the technology its buys. The judgment behind program decisions, contract terms, and pricing can make or break a program.

Tommy Lasorda, Los Angeles Dodgers manager, once said there are three kinds of baseball players. His description also fits program managers. He noted: "There are those who make it happen, those who watch it happen, and those who wonder what happens." I'd like to add to that my own philosopy on what it takes to run a solid weapon system acquisition program.

Kick the Tires

First, as the coach implied, the program manager has to know what's going on...get out and "kick the tires" so to speak. That requires personal visits to the laboratory, design center, or factory; making sure the contractors measure daily progress, and can track the hardware down to the least critical piece part; and analyzing technical indicators like cost-performance reports to sense the soft spots in a program. The only way to make informed judgments is with current information that gets you out in front of problems. Developing a non-adversarial relationship with the contractor is vital; so is keeping the right people informed on program status and problems.

Part of the AMRAAM technology challenge was to take the equivalent capability of the F-16 radar and package it into the nose of a 7-inch diameter tube . . . an inherent schedule and cost risk.

Second, running a good program means managing risk. Pushing state-of-the-art technology entails risk; the program manager's job is to measure it and then manage it. The combat capability of the Army, Navy, and Air Force today did not result from marginal improvements. No risk means no payoff. It's surprisingly difficult to explain to some decision-makers that risk management doesn't mean trying to invent something on a schedule. It does entail solving challenging business and technical problems in programs that are achievable. You'll soon learn that in the real world of program approval, even the appearance of risk can get a program turned off.

AMRAAM Development

In the Air Force, nowhere has the challenge been more public than in the development of the essential and controversial advanced medium range air-to-air missile(AMRAAM). Part of the technology challenge was to take the equivalent capability of the F-16 radar, and package it into the nose of a 7-inch diameter tube. Any time you take a technology leap like miniaturization, you have inherent schedule and cost risk. The AMRAAM early development schedule took longer than forecasted, and delays threatened the program. We knew the schedule was a risk, but accepted it because of an immediate requirement for the missile. We're not pleased that we didn't pull off the original IOC. However, if the missile were killed today, we'd have to reinvent AMRAAM tomorrow—at much higher cost. The greatest fighter aircraft in the world can't shoot down another if it doesn't have the fire power.

Another classic case of risk management involved the alternate fighter engine (AFE) program in the 1970s. The Air Force was fed up with only one source for fighter engines. We couldn't afford their high life-cycle costs or the attendant disservice to the industrial base or the fact that absent the threat of competition, we had no leverage for improvements. The program manager took the risk of qualifying a second source at a cost of hundreds of millions up-front. There would be no quantifiable return for 6-8 years, and GE had to adapt the B-1 engine for a fighter environment. The risk was worth it. We ended up with two top-quality engines, and split the award with Pratt and GE. Competition delivered a warranty industry originally said we couldn't have; resolved the data rights logjam; and lowered cost not only for new engines, but for Logistics Command spare-parts buys.

The AFE program manager's initiatives are still paying off.

Calculated Risks

You're not always going to have a consensus when you take calculated risks. Back in 1971 when I was program manager for the Air Force short range attack missile (SRAM I), I tried to generate a second source for the rocket motor. It was a real battle convincing people of the potential payoffs. We knew qualifying a second source would take up-front dollars, but that we could get Lockheed's unit price down with the investment. As it happened, just the threat of competition—merely putting Thiokol on contract to qualify a motor—served to reduce Lockheed's price. In fiscal '71, we bought 101 motors for $267,000 each; by 1974, the unit price plummeted to $65,000 for 465 motors. Part of the drop in cost was a function of the learning curve, larger quantities, and rate production. But competition had a major impact. It was tough to get the money on the front-end to qualify a second source. And there wasn't widespread confidence of a return to offset the initial expense. In fact, at that time, bringing on a second source for the sake of price competition was not standard practice. It's hard work to use innovative business strategies...and harder work to convince your critics you're managing risk.

A third key to sound programs is a balance of cost, schedule, performance, and supportability. Keeping the four legs equal is critical. When most of you entered the military service, performance was emphasized more than supportability. Vietnam cost so much in the way of money and public support that we had to allocate scarce resources to rebuild the force structure. Getting rubber on the ramp was paramount. It's possible we would have been better off buying a little less hardware, and a little more supportability. The military services are taking a fresh look at reliability and maintainability, making sure program managers are working support issues early and up-front in the acquisition cycle—in design. In Air Force Systems Command source selections, R&M is ranked up there with cost and performance criteria.

A fourth essential to running a strong program is promoting stability; sticking to a baseline. After all players sign up to the ground rules, limiting change is pivotal to cost and schedule control. My advice to program managers who get phone calls from up-channels suggesting changes is to say: "Great idea. We'll consider it for block II." If a modification would alter the baseline, say: "Go ahead and see if you can get the chief of staff to change the baseline. Then, send the money." Watch how fast your "helper" hangs up. You are the one ultimately responsible for slips and overruns. Do what you can to limit changes once a baseline is signed.

Sounding Boards

One final recommendation: Use your people as sounding boards, and listen to their opinions. Don't create an environment that locks out the honest opinions of people who work for you. They generally have a better feel for the second, third, and fourth program tiers. If you're perceived as someone who doesn't want to listen, you won't get the bad news. If you don't get the bad news, I guarantee you won't be a successful program manager. I've seen too many "good news" program managers shipwrecked on the shore of naivety.

No discussion of program management is ever complete, and today is no exception. These are just some ideas that can help you bring your program home. You may not have much to say at this point in your careers about whether to spend more on defense. But those of you who become program managers will have a great deal to say about how to spend the money wisely. To the extent you can maintain stable and successful programs, you lead the Defense Department's effort to create an environment in which public trust and support are locked in, and the national security is guaranteed.■

Ethics in the eighties

Part II. Ethics in Management

Studies of human behavior reveal our value systems determine our attitudes, which determine our actions. Consider this. Our attitude toward a crumpled piece of paper on the sidewalk may be one of indifference or disgust; if a second glance reveals the piece of paper to be a $100 bill, our value system immediately changes our attitude. While we wouldn't stoop to pick up trash before, we no longer have a degrading thought as we reach for the money before someone else.

We need a universal value system—standards of conduct accepted and practiced worldwide. The possibility of this becoming a reality, of course, is a dream. In America, we assume other Americans will abide by common ethical principles. Wouldn't that be wonderful?

■ *Mr. Acker is a professor of management in DSMC's Department of Research and Information.*

We who work for the U.S. government know that our standards of conduct, integrity, and concern for the public trust are expected to be above reproach. High standards of conduct and integrity, of course, also are desirable traits in business, industry, and other endeavors. Ignoring standards of conduct and lacking integrity are no excuses for not practicing them. An obligation to our employer is to recognize events vulnerable to fraud, waste, and mismanagement, and to avoid entrapment.

We cannot afford to be naive, assuming everyone operates to the same value system. Our standards of conduct have changed throughout the centuries, but not always for the better. Historians generally agree that our value system started to decline in the 17th century. However, some see a ray of hope; a reverse in the trend, and claim our standards of conduct improved during the past 50 years.

Because of the uncertainty we face in dealing with ethical standards, we

A MAN'S PERSONAL PHILOSOPHY

A man's personal philosophy, his way of looking at the world and the men and women around him, determines his success as a manager of things and people more than any other single factor. His basic attitudes are far more significant than the techniques he uses....As we look ahead, we have reason to believe that this will be increasingly true.

—Dean Stanley F. Teele
Harvard Business School

Editor's Note: This is the second of a three-part series devoted to the author's viewpoints on ethics in the 1980s. Part I concerns development of a general understanding of ethics; Part II, patterns of ethics in management; Part III, ethics in education.

[redacted]

There is a fourth dimension in the life of the executive...We call this fourth dimension business ethics. To achieve success in his career it is not enough that the executive be intelligent, decisive, and articulate. Unless he has also an awareness of the line dividing right from wrong, a sensitivity to deviation from principle, and a determination to do the right as he sees it at all times regardless of expediency, he will be a menace not only to his company but to society. The greater his power, the greater will be the menace.

If he is a church member, and a regular attendant at services of worship, he must be the same man on Monday that he was on Sunday. If he has no conventional faith, he must formulate his own code of honor and be true to it at all times, regardless of the impact on his own material welfare or that of his corporation. Without such an inner compulsion to do the right, his life will have no direction, his company no favorable reputation.

—Clarence B. Randall
President
Inland Steel Company

may find the only path is one of trial and error. This is difficult on U.S. defense systems programs, and more difficult on international programs. In the latter, a trial-and-error methodology could be disastrous.

The lack of an ethical science causes suffering within our society except, possibly, for amoral people. As world population increases, we may be forced to standardize ethical practices; but, this will not happen soon.

People possessing high standards of conduct act fairly and honestly. In this paper, I describe what this can mean to the program manager—in terms of ethics—as part of a leadership group.

Ethics in Program Management Office

James P. Burke, a graduate of DSMC Program Management Course 81-2, later a member of a program management team at the Air Force Aeronautical Systems Division, believes "the program manager accepts the obligation to uphold and advance the honor and dignity of the management profession." Burke feels a program manager should adhere to the following canons:

—Be honest and impartial. Exercise diligence in carrying out the assignment.

—Keep the public trust.

—Serve with honor and integrity. Assure accountability for actions taken on the program.

—Strive to increase competence and prestige of the program management profession.[1]

Burke believes, and rightfully so, that program manager relationships with superiors, associates, and the public should have the highest ethical standards. He suggests fundamental principles for program maangers, which I outline and augment below.

When dealing with a superior:

—Serve as superior's trustee of the program. Be economical in commitment of resources provided for the program.

—Be truthful, accurate, and realistic when reporting program performance, cost, and schedule.

—Advise superior of possible adverse consequences if program manager's judgment is overruled.

—Accept responsibility for errors of commission and omission.

—Act fairly and justly within the laws and regulations governing conduct toward contractors, subcontractors, and vendors.

—Inform superior of any personal financial interest you might have with contractors, subcontractors, or vendors.

—Do not disclose information concerning business or technical affairs without receiving superior's consent.

—Avoid engaging in transactions that may, or may appear to, conflict with the proper discharge of duties.

—Accept the obligation to promote improvements in the program management profession, and intelligent use of human and physical resources on the program.

When dealing with program team member:

—Treat with integrity, respect, and tolerance. Share personal knowledge, skill, and experience for enhancement of program team effort.

—Be fair, honest, considerate, sincere, and impartial.

—Ensure member receives credit for work accomplished.

—Do not injure maliciously member's professional reputation or the product.

—Provide suitable working conditions.

—Provide professional development opportunities.

When interfacing with public:

—Maintain strong commitment to national ideals.

—Show proper regard for safety, health, and welfare.

—Endeavor to extend public knowledge and appreciation of program management and its achievements. Oppose untrue, unsupported, or exaggerated statements regarding the program management profession.

—Participate in advancement of program management profession.

—Maintain public trust.

A program manager functions more effectively with personal values and ethical standards for daily guidance and to provide a greater sense of purpose than received from routine activities. Hurried, harried and harassed, the program manager has little time for reflection and contemplation. Daily program activities are the center of thoughts and actions and, too often, family and church are on the peripherey. Although looking for inspiration, the program manager is occupied with the job at hand and has no time to reflect or be inspired. However, to attain program success, the kind of which to be proud, the program manager must show concern for people; then, he can assume situations requiring the application of high ethical standards, and be able to cope with moral judgments in a better way.[2]

Principles of Operation

A program manager, often challenged to exert high ethical standards of leadership, may assert rights for personal privacy, but must know how to perform in a "fish-bowl." The moral and ethical tone of an organization is set at the top—in the case of program management, by the program manager. To be effective, the program manager must understand four principles of operation stated in the axioms below.[3]

Success is preceded by discipline. No one has found an easy route to successful program management. It takes hard work and diligence to keep a program on course, especially when the manager faces a seemingly overwhelming task. Although we assume most people are honest and trustworthy, we must be alert to those who are not.

When we compromise to gain, we eventually lose. When we compromise our standards to achieve a goal, we will pay the consequences eventually.

We tend to judge ourselves by our *intentions* and others by their *actions*. If we have a dual set of standards, we are heading for trouble.[4] Fairness demands that we judge everyone by the same ethical standards.

We have an obligation to see that associates uphold standards of the profession. Burke advised: "When your associate has been unethical, illegal, or unfair, advise the proper authority."[5] If you do, be tactful, remembering unethical operations affect everyone adversely.

Coping with Program Management Interfaces

Routinely, the program manager interfaces with four types of people: superiors, subordinates, contractor personnel, and the public media. Each has peculiarities affecting the way the program manager responds.

First, the superior places special trust in the program manager assuming a sense of responsibility. The superior, source of the program manager's authority, must be informed of the program's key developments, and notified at the first sign of a change. This builds trust and keeps vital channels of communication open. The program manager should admit to an error as soon as possible. Above all, regardless of the program manager's feelings, the superior must be shown loyalty so that the organization can function effectively.

Second, the program manager should deal with subordinates in an equally ethical manner, showing the honesty and fairness he expects from the superior. The program manager should give subordinates suitable attention, seek their participation, and be sincerely interested in their careers. A good program manager "tells it the way it is," handling reactions of subordinates in a frank manner.

Third, the program manager's relations with the contractor should be given special care. An adversarial relationship could find the program manager fighting for every inch of ground; avoid this situation. A cooperative spirit with the "win win" attitude benefits both parties. Although the program manager may vary information presented to contractors, it should not differ in quality. The program manager should not forget the contractor is supporting the program, whose success is based upon each organization performing to the utmost. Government and industry program managers have a common objective, accomplishing the program successfully. Accordingly, the program manager and contractor should be equally responsive to requests from each other.

Fourth, the program manager should never forget the public and the media, recognizing he will be dealing with perceptions that can become realities. When the program manager faces a TV camera, radio microphone, or a journalist, he will find the situation easier if there is nothing unethical to hide. This is where strong ethical conduct pays off, because "Honesty is the best policy"; perhaps "Honesty is the only policy." Lies will get any man into trouble, but honesty is its own defense.[6]

In every situation, the program manager must be alert to responsible media wanting to provide an objective and truthful report to the public, as well as to irresponsible media who may not. Some media may relish roles as a counterforce to their views of malfeasance in government. Steven J. Zaloga, author of magazine articles and more than 30 books on defense issues, said some cub reporters dream of "basking in the glory earned by a major investigative report of some government misdeed." The applause for Bob Woodward and Carl Bernstein by the press establishment and some schools of journalism has fostered journalism that is, according to Zaloga "solely concerned with negative, critical reporting on apparent government abuses....cheap and flashy scoops of leaked material seems much more appealing to much of the press than careful analysis of the wealth of defense information already available on an unclassified basis to the interested party." Institutional preferences for this style of reporting do not require a particular ideological bias to succeed.[7]

As taxpayers, we can't criticize efforts to uncover government or defense industry corruption, but we should know that investigative journalism, regardless of defense matters, requires a high level of research and knowledge. If an article appears in the national media criticizing a defense system or program, it could be picked up by other media. This creates a cycle, often of misinformation, about defense system acquisition. This could pose a threat to our way of life. Program managers must ensure the integrity of their programs in hostile environments.

WE SHOULD ACT AS ETHICAL CREATURES

Knowledge is not a loose-leaf notebook of facts. Above all, it is a responsibility for the integrity of what we are, primarily of what we are as ethical creatures. You cannot possibly maintain that informed integrity if you let other people run the world for you while you yourself continue to live out of a ragbag of morals that come from past beliefs.

—J. Bronowski
The Ascent of Man

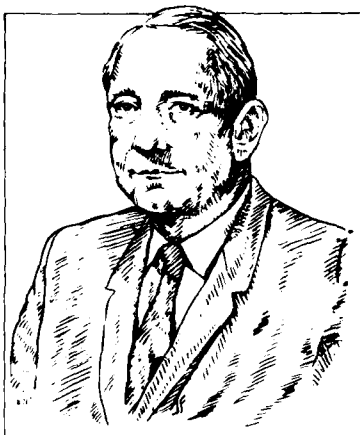
"I believe that every right implies a responsibility; every opportunity, an obligation; every possession, a duty."

—John D. Rockefeller, Jr., 1941.

Ethics in Defense Industry

President Reagan's Blue Ribbon Commission on Defense Management, often referred to as the Packard Commission, completed its study in June 1986. A separate report prepared by commission member William P. Clark recommends that each company in the defense industry set up strict codes of ethics for employees.

In a recent interview, Former Deputy Secretary of Defense Packard said, "The code of ethics would make it the responsibility of every individual (in a defense company) to know what good behavior is. They would have the opportunity to report anything they see without danger of retribution of any kind. We [the Packard Commission] think we can get the whole defense business dedicated to a higher level of performance and, hopefully, it will be self-sustaining and self-supporting."[8]



David Packard, commenting on the ethics discussion in the appendix to the final report of the President's Commission on Defense Management, said, "We think the ethics report (written by commission member William Clark) will be very useful for the board of directors of the industries in the defense business because it recommends the establishment of codes of ethics and accounting procedures that will assure that the industry adheres to the highest level of standards."

Packard

Recommendations For Voluntary Corporate Policies

The Ethics Resource Center, Inc., Washington, D.C., at the request of the President's Blue Ribbon Commission on Defense Management, prepared a series of recommendations for the final report. These recommendations pertained to actions that might be taken by defense contractors to improve the level of ethical conduct by individuals and organizations providing products and services for national defense.

The recommendations are listed below.

—**Recommendation One:** All companies involved in defense-related business with the federal government should adopt written standards of ethical business conduct, and these standards should specifically address activities most vulnerable to misconduct.

—**Recommendation Two:** All companies involved in defense-related business with the federal government should adopt and effectively communicate to all employees procedures for reporting apparent misconduct directly to senior management, or to appropriate corporate officers and directors, whenever an employee believes that reporting to an immediate supervisor would be inappropriate or ineffective.

—**Recommendation Three:** All companies involved in defense-related business with the federal government should adopt and effectively communicate to all employees a written policy to protect "whistleblowers" from repercussions and to secure, to the extent possible, their anonymity.

—**Recommendation Four:** All companies involved in defense-related business with the federal government should distribute the corporate standards of ethical business conduct to all employees on at least an annual basis and to all new employees at the time they are hired.

—**Recommendation Five:** All companies involved in defense-related business with the federal government should make discussion of the corporate standards of ethical business conduct and of ethics issues and dilemmas representative of those facing the company and likely to face the employees a part of all new employees' orientation, of regular performance evaluations, and of internal training and development programs.

—**Recommendation Six:** All companies involved in defense-related business with the federal government should establish a committee of outside directors to oversee corporate policies, procedures, and practices pertaining to the monitoring and enforcement of compliance with the corporate standards of ethical business conduct. The committee should be required to report its findings to the board of directors at least annually.

—**Recommendation Seven:** All companies involved in defense-related business with the federal government should maintain and regularly publicize to employees the availability of means for employees to report apparent violations of corporate standards of ethical business conduct directly and anonymously to the board of directors committee that has oversight for corporate policies, procedures, and practices pertaining to the monitoring and enforcement of compliance with those standards.

Many defense contractors have taken significant actions to establish, communicate, monitor, and enforce policies and procedures to ensure a high level of ethical business conduct within their organizations. In each organization, the actions taken to date can be improved upon. Standards of conduct can only be as effective as they are applicable, either as rules or as principles, to the conduct of employees. ■

We should not delude ourselves into thinking that codes alone will dramatically improve ethical conduct. However, codes are enabling devices to strive for higher ideals and to record professional consensus. A code of practice is inherent in the very concept of professional life.

Codes of ethics have increased among defense contractors recognizing the need for an ethical statement employees can read, ponder, and develop a sensitivity and awareness to. The need to emphasize strong ethical conduct is the result of wrongdoing in recent times, over-pricing spare parts, misconduct in defense system contracting, bill-padding, influence-peddling, use of corporate funds for political purposes, and others.

Dr. Edward N. Luttwak, addressing the 1985 Federal Acquisition Research Symposium, said, "Defense acquisition is caught between two forms of extremism: technological, including over-staffing and over-specification; and legalistic, including cultural factors and ethical behavior."

Luttwak

Escalating legal penalities for wrongdoing at the public's expense are powerful motivators for good conduct. Edward N. Luttwak, in his book, *The Pentagon and the Art of War*, said the zealous pursuit of the contractors in the big spare-parts scandal of 1983-84 resulted in companies returning about $14.8 million to the government. When a defense contractor overcharged the government, the secretary of the navy suspended that contractor from obtaining new contracts at two of its divisions until it repaid $75 million and established a "vigorous code of ethics" for officers. Another large defense contractor, pleading guilty to overcharging the government fraudulently on 45 military contracts, agreed to pay $15 million in criminal and civil penalties, and to expand its ethics program. A spokesman said the company "lost some significant business" during the suspension.

Several years ago, J. Irwin Miller, chairman of the Cummins Engine Company, Columbus, Ind., spoke about ethics in New York City at a meeting arranged by the Conference Board. He said, "We are in the process of losing some of our freedoms, not because of the appetite of some monster government, but because we abused our freedoms when we had them." He was referring to disclosures of corruption on the parts of U.S. multinationals operating abroad (1977). "A complex, interacting, interdependent world such as ours is today cannot function without a considerable amount of restraint on the part of each member and each group," he said. "When individual businesses will not restrain themselves voluntarily in the public interest, restraints will inevitably be imposed upon all business by law."

Speaking with reporters from *The Washington Post* a month later, Miller said, "I believe the vast majority of American business has always tried to be responsible and honest. They are really shaken by some of the flagrant abuses that have been uncovered. The actions of a few have tended to tarnish all of business." He added, "Almost every company I know is trying to codify proper standards of behavior...codes about corruption are meaningless and even dangerous, unless the corporation possesses a top management which by example and by the signals it sends out with every assignment, 'backs up' its word with tangible proof as to what kind of business behavior it wants."[9]

It is ironic that the abuses and misconduct came to light at a time when many in the defense industry appeared to be paying more attention than they had in the past to their ethical conduct and reputations. Business and industry leaders are showing a growing and genuine recognition that, when they establish and meet high ethical standards, it is easier to meet other goals like product quality and employee loyalty. Accordingly, more than 40 major defense industry contractors have instituted codes of ethics in recent years.

Is the need for better ethical behavior being recognized to the extent it should be? W. Michael Hoffman, director of the Center for Business Ethics at Bentley College, Waltham, Mass., conducted a survey in 1985 of the 1,000 largest industrial and service companies in the United States. Although he received only a 28 percent response, 80 percent responding said they were taking steps to "institutionalize ethical values" within the company. (Nine out of the ten have issued written codes of ethics.) Unfortunately, only 18 percent of the companies responding have established a committee to review the company's performance to the code, and only seven percent have an ombudsman with an open-door to those with information to disclose. Finally, only one percent have organized a judiciary board to handle enforcement issues.[10] What is happening in the companies not responding to the questionnaire? I have to conclude that more attention needs to be given to ethical conduct in large industrial and service companies.

Fortunately, training in ethics is getting a boost by some companies. According to Kirk Hansen of Stanford University, instruction is "on the upsurge." The Boeing Company, for ex-

MAN IS FREE TO ACT

Free man is free. What need is there of more of this? Why does one have to propose to him rules of conduct or values by which to live? Will these not be a threat to his liberty?

Jacques Ellul
The Ethics of Freedom

ample, has a training program to "sensitize" employees to ethical conflicts. This and other training programs are parts of the current defense industry self-policing effort.[11]

Although higher ethical standards are being established by many defense contractors, the Department of Defense has many auditors in the field. Some companies said auditors are getting in the way and causing inefficiencies in their operations; i.e., McDonnell Douglas reported that last year it received 52,000 visits from governmental officials who initiated or completed 5,809 audits. The auditors kept 252 McDonnell employees busy for a full year answering questions![12]

Professor Clarence C. Walton, Department of Ethics, American College, Bryn Mawr, Pa., raises these interesting questions: "What does it mean to corporations whose executives must operate within a cultural milieu that they have not completely created, do not effectively control, and cannot fully direct? By what standards should they be judged: the ethic of liberalism, the ethic of science, the ethic of religion, or the ethic of some new ideology? America is at a watershed. Inaction means disaster and precipitous reaction means the same thing.[13]

How are companies without an ethics committee implementing codes of ethics? How are they monitoring in-house practices? How are they enforcing the codes? Are pressures to break rules and cut corners more apt to occur in a large company or a small company?

Good ethical conduct becomes more difficult for a company under pressure. Hoffman said, "When middle-level managers say they feel pressures to compromise their own personal ethics for corporate goals, you know that kind of environment is going to increase" when a company is in trouble.[14] Pressures are part of the system in industry and government; therefore, prevention has to be made part of the system.

When faced with an ethical dilemma, with whom does a manager consult? Most consult with bosses and spouses. A significant number indicated they seek the advice and counsel of colleagues. A friend at work, or outside the organization, is selected as a source of advice less often. Perhaps we shouldn't expect the same objectivity from our friends as we do from colleagues; many feel the threat of embarrassment when revealing ethical dilemmas to friends. It may not be surprising to you to learn many managers try to work out the problem themselves; they may feel that tough choices are parts of the job.[15]

Several years ago, Robert F. Allen, president of the Human Resources Institute, suggested seven key questions regarding ethical behavior in organizations.

—Is ethical behavior being rewarded or penalized by the organization, and in what ways?

—Is ethical behavior being visibly modeled by leaders within the organization?

—Are people receiving feedback and information relating to whether they are practicing good ethical behavior?

—Are day-to-day interactions and relationships among people supportive of good ethical behavior?

—Do formal and informal training programs in the organization emphasize good ethical behavior and offer skills in connection with it?

—How are new people in the organization being oriented to good ethical behavior?

—Are time and other resources in the organization allocated to show commitment to good ethical behavior?

Program managers in government and industry and their subordinates, who want to earn and retain respect, would do well to consider these questions and reflect on their responses.

Standards of Conduct

In Part I of this series, I set forth the *United States Code of Ethics for Government Service*. This represents the accepted ethical standards for government employees.[16] Business, industry, and professional organizations feel needs to develop and publish codes of conduct for employees. Codes devised by such groups are diverse. Generally, the codes relate specifically to the problems of the business, industry, or the professional organization rather than to management in general; however, there are areas of common concern.

Subjects commonly embodied in such codes of ethics are the following: conduct day-to-day business and private matters with integrity and high moral purpose; possess the ability (qualifications) to perform the assignment; respect the confidentiality of information relating to office business; be truthful in observations and recommendations relating to functions of the organization; be accurate in announcements; and conduct business affairs in a dignified and proper manner.

Some critics feel postulating codes of ethics is "spurious ethics"; that is, they provide a false sanction for behavior affecting a narrow group rather than the general public. What passes for business ethics needs to be examined to ensure the subtle biases thought desirable by a few are not merely clothed by a mantle of ethics to win the respect of the many.[17]

James J. McGurrin, formerly deputy director of the Bureau of Intergovernmental Personnel, Civil Service Commission, feels there is an ethical crisis in officials' conduct of public decision-making. Writing in the *Federal Times*, McGurrin said, "The pervasive insensitivity to conflicts of interest and the moral and sometimes criminal climate of corruption at higher levels of government" is alarming. He said the basic ethical principles he assembled in 1961 for the first basic order on ethics, issued by President John F. Kennedy, "have stood the test of time."

The following ethical principles were contained in McGurrin's executive order:

"An employee shall avoid any action which might result in, or create the appearance of:

—Using public office for private gain

—Giving improper preferential treatment to any person

—Impeding government efficiency or economy

—Losing independence or impartiality

—Making a government decision outside official channels

—Affecting adversely the confidence of the public in the integrity of the government or its operations."[18]

These basic ethical principles should be adherred to by government employees. The detailed regulations on conflicts of interest, financial disclosures, or post-government employment cannot be adherred to in the same way. However, they are meant to be referred to, to get expert advice on, and to be complied with when an employee realizes he is contemplating something to which such regulations may apply.

As a naval officer in the mid-'50s, John F. Kennedy wrote biographical profiles (in *Profiles in Courage*) of the Americans who had exercised naval courage at crisis-points in their lives. Later, as our 35th president, he felt compelled to issue an executive order on ethics in the U.S. Government.

Kennedy

Addressing the Georgia Bar on June 13, 1986, Deputy Defense Secretary William H. Taft IV cited the increasing number of suspensions and debarments and the concern of the Pentagon because "so much rides on the quality of the equipment received from our contractors." In 1981, there were 151 suspensions and debarments of DOD contractors. The number has risen steadily and, in 1985, there were more than 600. Although these numbers are not large, when one takes into account the total number of defense contractors, the increase is dramatic. Greater adherence to high standards of ethics "was and is our only motivation for increased use of suspensions and debarments," Taft explained. He added that "These are not punitive actions; they are positive steps in protecting the American people and ensuring the integrity of the defense companies with which we deal." Taft's views were included in Packard Commission recommendations for reform.

"Apart from the legal issue, the Department of Defense policy provides a prudent means for protecting the government," Taft said. He added that settlement agreements the Department of Defense negotiated with suspended contractors "demonstrate conclusively that this process protects the government, and encourages meaningful and enforceable standards of conduct and ethics in companies that previously lacked such high standards." The settlement agreements place an increased emphasis on restitution to the government including the costs of investigation, Taft remarked. More importantly, he said, they outline specific actions to be taken by the contractor to implement comprehensive ethics programs and internal audit and management controls, and to enforce them. Taft added that the settlements include provisions for outside oversight of a company's conduct.

"There's a growing effort throughout industry to demonstrate publicly their high standards of ethics and conduct," Taft believes. The Packard Commission recommendation for increased industry "self governance" reinforces the momentum in the Department of Defense and industry.

Unethical Behavior

What influences unethical behavior? We learned managers look to bosses and colleagues for guidance when ethical dilemmas arise on the job. An American Management Association survey showed that the behaviors of superiors and peers in the organization contributed most to the ethical behavior and actions by managers.

Last year, William H. Taft IV, deputy secretary of defense, said, "We will work diligently with our partners in industry in our common search for excellence....To renew American productivity and quality, we will need vision, participation, performance, and *integrity*....Our nation, as President Reagan has put it, is 'poised for greatness.' "

Taft

The Link Between Freedom and Ethics

I will examine the connection between freedom—industrial, economic, political—and the equally important subject of *ethics*. They *are* related, and their relationship is a crucial one. When the link between them... trust...is neglected, freedom and ethics are in danger of perishing....

Throughout American history it was generally agreed that certain basic values were essential to the character of the nation and to the character of the people who made up the nation. High standards of ethical conduct were basic to the American way of life, and the country's standards and values were passed on from generation to generation.

Today, it is different. Too many of our homes and schools and religious institutions have failed to promote the nation's heritage. Many young people are growing up with no meaningful exposure to values that once united Americans of all kinds and all origins....

Loss of values has grave implications and grave consequences. People who no longer have a firm grasp on a sound value system—a system that includes such concepts as honor, honesty, loyalty, integrity, self-reliance and adherence to high ethical standards—comprise a society in which attention is focused on expediency and on doing the easy thing. In such a society, more and more individuals are going to care less about doing what's right than handling every situation in whatever way will give the best and biggest payoff in the shortest possible time. In such a society, too few people will be trustworthy.

American industry and the government working together can return America to the values that once defined it. *Each of us has a real and potentially tremendous opportunity to help make it happen....*

We can make contributions through our jobs. We can make contributions by making it clear that we have high ethical expectations of the organizations we represent and the people with whom we deal....

(Excerpts from a speech delivered at a national conference on acquisition streamlining in January 1986.)

—Sanford N. McDonnell
Chairman of the Board and
Chief Executive Officer
McDonnell Douglas Corporation

These choices ranked first and second, respectively, by the majority of respondents from all levels, regardless of age, gender, or education. The ethical practices of one's industry or profession ranked third. Financial needs did not appear to be an important factor. These results were replicated in separate surveys made in 1961, 1976, and 1982.[19]

How do managers handle unethical behavior? What factors should a manager consider in making a judgment? Finding answers to these questions is a difficult task. Few people are willing to divulge their attitudes on this subject for fear it might be incriminating to themselves or their friends. One method to investigate a person's attitude is to pose a hypothetical situation for reaction. He can react to the situation by a direct response, or by selecting a response from a list.

When unethical behavior appears to be involved in a given situation, a good manager will determine whether this is true, or whether the action only has the appearance of being unethical. It is important that the manager verify information before taking action. Most managers believe they are more ethical than their business colleagues, which has been verified in studies.

When Richard F. Schubert was president of Bethlehem Steel, he said "...*management has to do more than* establish codes of conduct. We have a primary responsibility to motivate and inspire employees to conduct themselves honestly and fairly. Starting at the top, we have to set the example for others to follow by acting in a morally proper way. We have to practice what we preach....I don't think we're anywhere near a moral collapse, but there are enough signs of trouble to make it clear that we have a lot of reappraising to do."[20]

Closing Thoughts

Public confidence in government and industry depends upon congruence between executive behavior and the values and aspirations of organizations and the general public. The "scandals" exposing weaknesses in American ethical behavior have, at the same time, shown the strengths of this country's foundation. Citizens have not lost confidence in the system, but have become dismayed by the way it is operating. Therefore, while there may be no authoritative interpretation of management ethics, managers must accept the obligation to keep in touch with U.S. citizens. The active pursuit of enhanced accountability through codes of ethics and other means is a basic ingredient to the restoration of public trust.[21]

Managers in government and industry setting high standards and willing to let people judge them by these standards will probably succeed, all other leadership qualifications being equal. They recognize that when a manager compromises to gain, he eventually loses.

One's belief influences what one becomes; a statement of belief can describe a person or a history of ideas. I hope this creed (author unknown) will have a special meaning for you, as it does for me.

I believe in the greatness of the individual, and that I am in this world for a purpose, that purpose being to put back into life more than I have taken out.
I believe in the integrity of other people, assured that they try as hard to follow the gleam, even as I.
I believe in the gallantry of older people whose seasoned experience and steadfast devotion have preserved for me the heritage of the past.
I believe in the magnificence of the past, knowing that without its storied wealth I would possess nothing.
I believe in the challenge of the future, fully realizing there will be no future except it becomes alive through me.
I believe in the contagion of health, and that I can spread it through cheerfulness, wholesome

habits, sensible expenditure of energies, and wise use of foods.
I believe in the nobility of work as the creative expression of the best within me, and as my share in easing the common load of all.
I believe in the enrichment of play and laughter as the means of cleansing my body of staleness and my soul of bitterness.
I believe in God, who justifies all these beliefs; He is the still, small voice within, ever urging me toward the unattained.
And whatever more I believe is entwined in those precious feelings that lie too deep for words.

William J. Byron, president, University of Scranton, said it so well: "The tendency of men and women (government and industry) to avoid publicity, not proper public scrutiny, suggests to me that they are more capable than we suspect of quiet reflection. They simply must give more thoughtful personal attention to the quality of life in their own inner dwelling places where America's (government and industry) activity really originates...an inner house characterized by a sense of justice derived from common sense, reason, and divine revelation is America's best hope for the discovery of the meaning of ethics in (government and industry)."[22]

This is a good time to contemplate your personal values and ethical standards. A manager, whether in charge of a program or other organizational unit, must set a good example. He cannot expect colleagues to conduct themselves properly if he doesn't act properly. He is accountable for the actual, or apparent, misconduct resulting from the actions of well-meaning but misguided employees.

John W. Gardner, educator and former government official, observed many years ago: "Our problem is not to find better values, but to be faithful to those we profess.[23]

How do your values stack up? Are you faithful to those you profess? If you fall short, accept the challenge presented here.■

A decade ago, John W. Gardner said, "There is a great deal of building to do in the field of values and moving beliefs." Observing a national mood of disillusionment and cynicism regarding politics and government following the Watergate scandals, he made the profound statement that if people "didn't have a sense of values, they wouldn't despair."

Gardner

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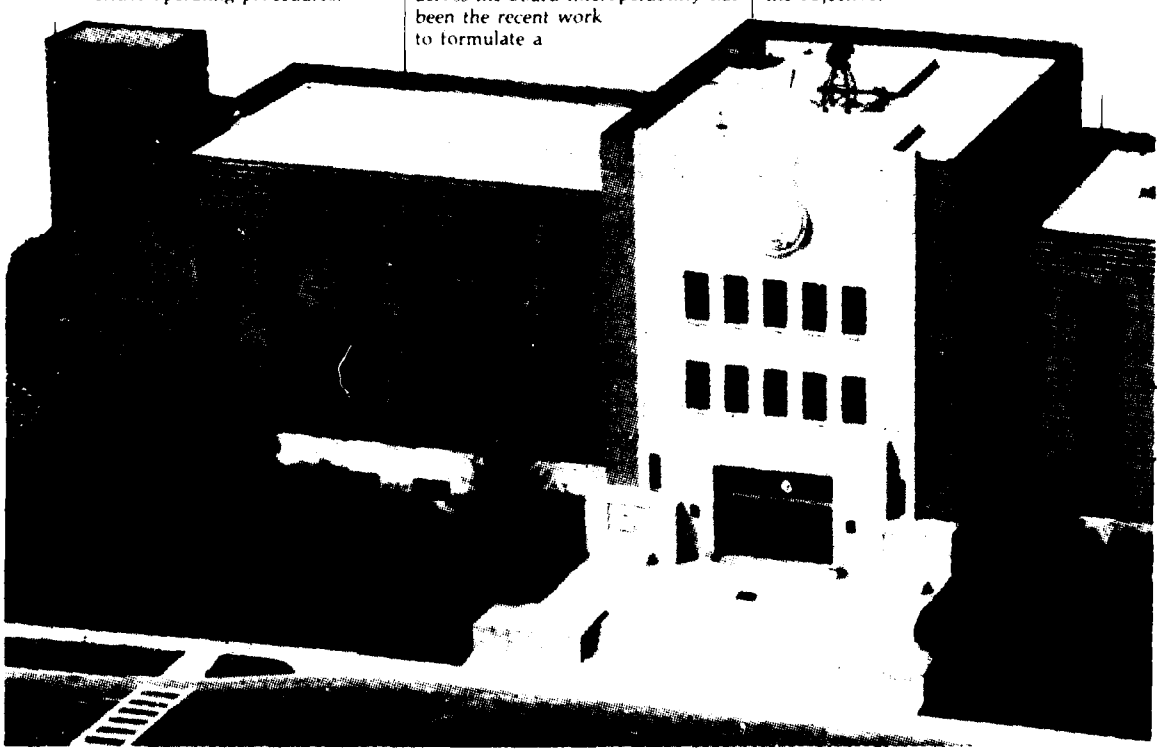
Program Management of Joint Procedural Standards

Dr. J. Robert Christian
Thomas L. Waldrop

The term Program Management Office (PMO) usually elicits a vision of a centrally located nucleus of managers and experts overseeing development, acquisition, and delivery of a "hard" product: i.e., battle tank, ship, or communications equipment. The PMO concept has been applied to other initiatives. In this article, we describe a PMO established to develop and field a "soft" product; namely, standardized message formats and their associated interface operating procedures.

During the past 10 years, the Department of Defense has been steadily increasing its focus on achieving interoperability among tactical command, control, and communications (C^3) systems. By operational necessity, this has been a two-pronged effort: Seeking to achieve interoperability among United States military services and agencies (for joint operations) and among the forces of the United States and its allies (for combined operations). One key to the establishment of across-the-board interoperability has been the recent work to formulate a joint (and combined) tactical C^3 architecture. This architecture, when completed, will consist of the associated technical standards and the appropriate procedural standards for operating the participating command and control (C^2) facilities. To meet the latter requirement, the Joint Interoperability of Tactical Command and Control Systems (JINTACCS) program was established early in this decade.

The main thrust of the JINTACCS program is to provide procedural interface standards that establish the performance and syntactical parameters necessary to achieve and maintain joint and combined interoperability. The program's objective is to attain improved operational effectiveness through development of a common, agreed-upon language for message formats and operational procedures for the use of the formats. From a warfighting point of view, this is being done to ensure timely and accurate delivery of information to the decision-makers on the battlefield. The unique challenge to bring this product to fruition was the necessity to obtain, through frequent use of joint forums, agreement by all program participants on exactly what had to be done to meet the objective.



To give you an appreciation for the magnitude of the program and the challenge it faced, we identify the participants as follows: Army, Navy, Air Force, Marine Corps, National Security Agency (NSA), Defense Intelligence Agency (DIA), commanders-in-chief of the unified and specified commands (CINCs), and the Joint Tactical Command, Control and Communications Agency (JTC^3A). The first six components are charter members of the JINTACCS program; the CINCs and JTC^3A joined the effort in more recent years.

We will provide a summary of the program's genesis, its evolution through several executive agents, the formation of the PMO, the methodology employed in the program, lessons learned, and the development and delivery of the required product.

Interoperability

Before we examine the C^2 problems that provided the impetus for the JINTACCS program, we should look briefly at the more common approach used to achieve interoperability. The C^2 community will generally agree that most interoperability (compatibility) problems can be corrected effectively with equipment (or technical)solutions. Indeed, achievement of interoperability is first contingent upon the ability of one C^2 system to exchange information or data with another C^2 system. This requires common or compatible equipment to be used on both sides of an interface, and this capability is clearly within the sphere of the technical community.

The second key aspect of interoperability is usefulness. This means that once information (data) has been exchanged successfully, it can be understood *and used* by the recipient. This is the area in which products delivered by the JINTACCS program will have their greatest impact. To this end, the JINTACCS program genesis was based on the need to solve tactical C^2 interoperability problems related to information transfer and intrface procedures.

Problems Defined

Hundreds of thousands of words have been written to describe the many problems that exist in the area of information transfer. This estimate is most likely a conservative one. Nevertheless, we have chosen to sort these problems into six categories, as shown in Table 1. With the exception of the last category, the information transfer problems are generally the result of undefined requirements. From the JINTACCS point of view, interface procedure problems are also present because of a lack of definition. In other words, procedures are not determined ahead of time for the C^2 process or the required interfaces. The information exchange requirements (IERs)—who needs to talk to whom and about what—have not been defined. This creates a need to develop C^2 arrangements in *ad hoc* fashion on an operation-to-operation basis. Our forces are placed in a reaction mode as each operation is planned from scratch. The tendency is for the participants to set their own standards and ways of interpreting their combat tasks.

This tendency that brings about the phenomenon of dual reporting, which means that the same information is exchanged in different formats depending on the whims and perceived requirements of each military service, headquarters, and nation. Each will tend to develop its own reporting formats meaning that as information passes from one to the other, it must be reformatted. This precludes a flow-through capability. It also eats up valuable time during a high-intensity conflict situation.

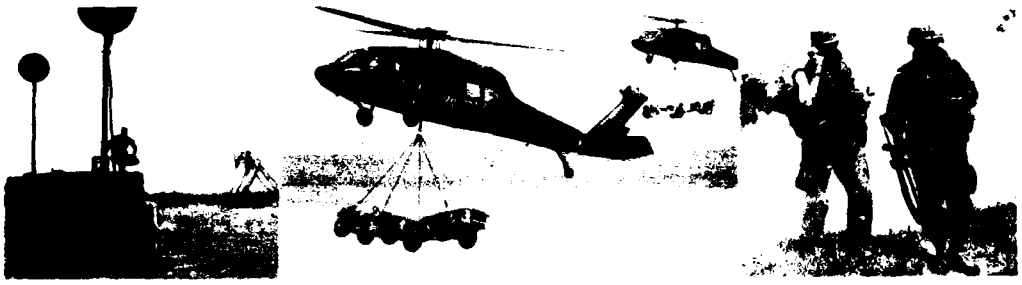
The purpose of the JINTACCS program, then, is to achieve interoperability by developing procedural standards that will eradicate the problems associated with information transfer and interface procedures. This purpose is achievable by getting the C^2 community to agree on a prepositioned set of message standards and operating procedures.

Historical Perspective

The JINTACCS program was formally established in 1978, but it evolved from several programs including one that commenced in April 1971: Joint Interoperability of Tactical C^2 Systems in Support of Ground and Amphibious Military Operations (GAMO). The purpose of GAMO was to develop message standards and operating procedures to meet the C^2 information exchanges required to support the operational tasks defined in JCS Pub 12. A key product of the effort was to be character-oriented messages that were human-readable and machine-processable in the same format. These are now referred to as message text formats (MTFs). The joint chiefs of staff designated the chief of staff, U.S. Army, to serve as executive agent for the GAMO program.

The second effort, which was subsequently put under the JINTACCS umbrella, was the Tactical Air Control Systems/Tactical Air Defense Systems

JINTACCS headquarters, Fort Monmouth, N.J.



(TACS/TADS) interface program. Starting in the late 1960s, TACS/TADS was still in development when GAMO was initiated. This program, oriented toward the automated exchange of air operations data, was geared to the development and implementation of bit-oriented messages. These message standards are called tactical digital information links (TADILs) and were approved for operational use in 1979. The chief of naval operations had been designated by the joint chiefs of staff to be the TACS/TADS executive agent.

A third venture, which also began in the late 1960s but did not receive formal status or its current name until 1974, was the Joint Tactical Information Distribution System (JTIDS) program. In a pure sense, JTIDS is a hardware procurement program designed to provide near real-time, secure, and jam-resistant communications during tactical operations. The message standard being developed for JTIDS is called TADIL J. The JCS-designated executive agent is the Air Force chief of staff.

In 1977, the year before GAMO was changed to JINTACCS, several important decisions were made.

In 1977, the year before GAMO was changed to JINTACCS, several important decisions were made that would have a lasting impact on JINTACCS and its scope of activities. The first decision was to initiate action to transfer to GAMO the responsibility for configuration management of the TACS/TADS interface. The second decision was to transfer to GAMO the responsibility for development of the TADIL J interface for JTIDS.

Even as the preceding decisions were being made to expand the program,

Table 1. Information Transfer Problems

PROBLEMS	HOW MANIFESTED
TOO MUCH INFORMATION	This problem arises primarily during surges in combat operations. The C^2 systems become saturated, and useful data cannot readily be distilled from the total set of data.
TOO LITTLE INFORMATION	If there is a scarcity of information and data, commanders are forced to make key decisions with unacceptable levels of uncertainty.
INFORMATION RECEIVED TOO LATE	This problem also results from the clogging of the C^2 system. Late information is frequently more harmful than no information at all.
WRONG KIND OF INFORMATION	Commanders cannot afford to get bogged down in minutiae. To make critical decisions, they need to receive large chunks of compacted information and data.
UNSTRUCTURED INFORMATION	Traditionally, information is exchanged in messages that are built in a free text format. Critical data are often buried in these messages and are difficult to cull out by the message recipient.
UNINTELLIGIBLE INFORMATION	This problem can manifest itself in three ways: Direct language difficulties between countries in combined operations, differences in military service's acronyms and slang in joint operations, and C^2 system automation non-interoperability due to incompatible software and hardward.

GAMO was under fire from the U.S. Congress. Both the Senate and House of Representatives had criticized DOD management of the GAMO program. Principal concerns centered on the following perceived shortfalls: lack of firm program definition and coordination, lack of realistic milestones, and lack of a detailed systems architecture. As a result, the Congress requested that DOD provide assurances that an adequate management structure would be created to accomplish the GAMO program objective.

In an August 1977 memorandum, the secretary of defense directed the following actions:

—Establishment of a high-level body to oversee GAMO. This body, which included OSD and OJCS representation, was called the Joint Tactical C^3 Systems Council (JTC^{3}S Council)

—Modification of the GAMO Office into a Systems Architecture/Engineering Office

—Providing the GAMP program director with the authority to make the program binding on all military service and agency participants. If participants took exception to any decision, they could appeal to the JTC^{3}S Council

—Modification of the JCS Joint Standardization Group for Tactical C^3 to include OSD participation.

In response to this direction, OJCS developed and jointly coordinated the memorandum that would implement the JINTACCS program. When the JINTACCS charter was promulgated in 1978, it included all tasks being addressed in GAMO and the responsibility to consider NATO interoperability "to the maximum extent practicable."

When its charter was promulgated in 1978, JINTACCS became an umbrella program.

It gave the program director the requisite decision-making authority. Thus, JINTACCS became the umbrella program for achieving joint and combined interoperability through the development, test, implementation, and maintenance of procedural interface standards.

As JINTACCS evolved and expanded from 1978 to 1984, the Army chief of staff had responsibility for a rather full plate of joint interoperability programs. A major general on the Army staff was designated to wear two hats relative to JINTACCS: he served as the executive agent's representative and as the JINTACCS program director. To carry out day-to-day management of the program, the JINTACC Systems Architecture/Engineering Office (JSAEO) was formed. The JSAEO was jointly staffed and headed by an Army colonel who also served as the deputy JINTACCS program director. The program director also established the Joint Interface Test Force (JITF) at Fort Monmouth, New Jersey, to perform compatibility and interoperability (C&I) testing of the JINTACCS products. During this period, work was nearly completed on the development, documentation, and testing of the MTF standards. The TACS/TADS program was declared operational and, in 1982, its name was changed to The Joint Tactical Air Operations (JTAO) interface program. The development of TADIL J continued to move forward.

In July 1984, the JTC^{3}A was established with the principal charter mission to "ensure the interoperability of tactical C^3 sytems for joint or combined operations." As part of its formation, the JTC^{3}A assumed responsibility for the JINTACCS program from the Army. The director, JTC^{3}A, was designated as JINTACCS program director and was assigned in August 1984 as the implementation manager for the JINTACCS MTF

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■ *Mr. Waldrop, who has been employed for more than 6 years on the System Development Corporation JINTACCS program support contract, is leader of the Program Management Group providing direct support to the program manager, JINTACCS.*

standards, which the JCS directed to be jointly implemented by September 30, 1986. As the JTC^{3}A began to build up, management action was initiated to absorb the JINTACCS program effort into the agency's organizational structure, initially, portions of the program were handled by matrix management with action officers dispersed throughout the various agency directorates. After a few months under this management scheme, it became obvious that the matrix approach could not provide adequate and timely coverage for all of the diverse elements of the program. In large measure, this recognition came about because of the actions associated with the mandated implementation of the JINTACCS MTFs.

Formation of the PMO

Throughout the MTF developmental stage, most work was carried out by relatively small cadres of operational and technical experts who represented their respective military services and agencies. As MTF implementation began to loom on the horizon and its impact came into sharper focus, the operational community at large became increasingly interested in the JINTACCS program. Therefore, it was decided that the matrix structure had to be replaced by single-point management. The formulation of the JINTACCS PMO was approved by the agency's director in February 1985. The PMO was created and its staff doubled in size to provide full support of the program, reduce the director's span of control, and exert the degree of management and leadership needed to deliver the necessary products. The PMO was charged with its broad responsibilities for MTF/TADIL/JTAO and support of

The procedural interface standards development process consists of six phases with an attendant configuration management function.

exercises as well as participant trainers through the JINTACCS training committee, chaired by USREDCOM.

Program Methodology

The procedural interface standards (JINTACCS) development process consists of six phases with an attendant configuration management (CM) function. The process is shown in Figure 1. Phase 1—Statement of Need—is the formal documentation of an operational requirement that has to be satisfied, or a problem that must be solved. In the context of JINTACCS, the second phase consists of developing an architecture that establishes a compatibility and interoperability solution to satisfy needs and requirements identified in Phase 1. Phase 3 is the development of specific MTF or TADIL message standards that will satisfy the architectural requirements.

The standards are documented in a Technical Interface Design Plan (TDIP), which is the basic document used to proceed into C&I testing and operational demonstration (Phase 4). The standards and procedures are tested in a controlled environment where the tests can be replicated and evaluated. The developmental standards are evaluated to ensure that messages prepared in accordance with the standards can be exchanged by C^2 information exchange elements and their supporting systems. After testing is completed, operational demonstrations are conducted when tactical forces employ the standards in a simulated combat environment (such as a joint field exercise). This provides operational feedback to the standards validation function.

Training, the fifth phase, is necessary to ensure all operational users have a working knowledge of the standards. Although various forms and levels of training occur during earlier phases, training activities will intensify in the period immediately preceding joint approval and implementation of the new standards.

Phase 6 is implementation and, simply stated, the action whereby the participants put standards into operational use.

As we noted earlier, a CM function comes into play during the preceding process. Developmental CM begins during Phase 3 (Standards Development) and continues until Phase 6, at which time operational CM commences and remains in effect for as long as the standards are in use. The

objective of CM is to identify and document precisely the interface standards and then control changes to standards. The obvious goal of the CM function is to ensure that all participants mutually agree to any changes to the standards.

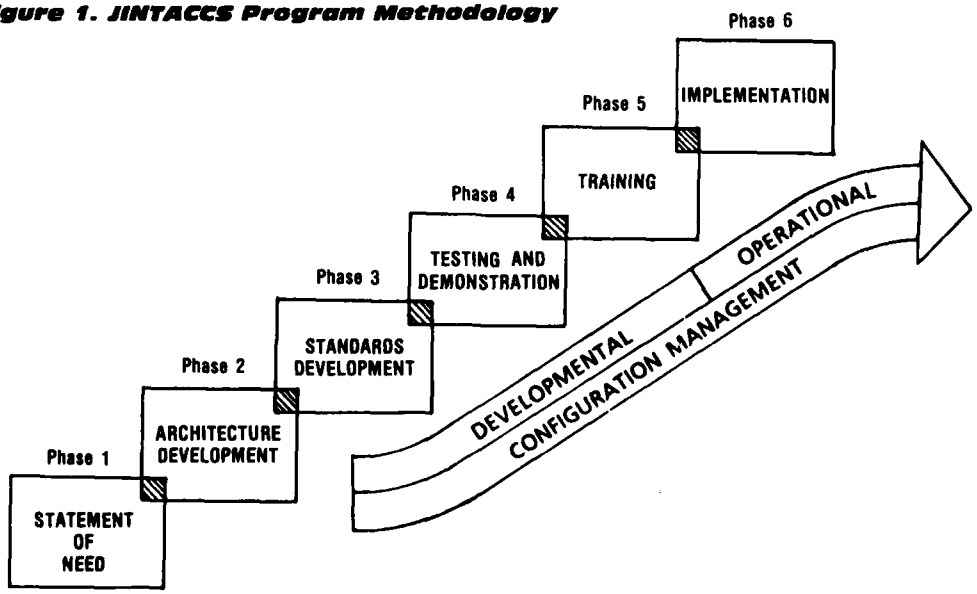
This brief sketch of the JINTACCS program methodology may give the impression that each phase is a clearly discernible and manageable activity. In truth, the phases will tend to overlap in a given product area. In addition, the three major products—JTAO, MTF, and TADIL J—are each in different phases. The JTAO interface is operational, and JINTACCS is responsible for CM of this product. The MTF standards are in the training phase and scheduled for implementation in September 1986. The TADIL J message standard has been developed and is being prepared for testing. Finally, in the combined operations area, NATO has been using MTF standards for years and has operational experience. Our current program objectives are successfully harmonizing our USMTF standards with those of NATO. In the Pacific area, procedural standardization is in its infancy and needs accelerated attention. This is the millieu in which JINTACCS program management must be performed.

JINTACCS has phases that tend to overlap in a given product area . . . the three major products are each in different phases.

Joint Process

We need to emphasize that the JTC^{3}A is not in the business of unilaterally developing and fielding interoperability standards. As a joint program, the factor of "jointness" plays heavily in all phases. Oversight for the program is provided by the assistant secretary of defense for C^{3}I and by the Organization of the Joint Chiefs of Staff. The JTC^{3}A sponsors and chairs most of the committees and forums in which the actual work is accomplished. The military services, de-

Figure 1. JINTACCS Program Methodology



fense agencies, and CINCs send representatives to participate in the activities and to voice positions of sponsoring organizations. It is up to the JTC^{3}A to capture and document accurately the results of each forum and then see that the documentation is jointly staffed and approved.

In the combined interoperability area, the overall goal is to achieve maximum exportation of the U.S. joint standards. Within NATO, this effort is conducted by various working groups of the Allied Data Systems Interoperability Agency (ADSIA), in which the United States participates. The JTC^{3}A provides various levels of support to the ADSIA working groups including one chairman, delegates, supporting delegates, and other technical support. The authority for national direction and strategy is necessarily retained by OJCS, with JTC^{3}A in the supporting role. This role creates a considerable strain on agency resources because the same staff members work the joint *and* combined aspects of the program.

Team Building

All of the preceding explains the framework and environment in which the JINTACCS PMO was created. Clearly, JINTACCS was in motion and rapidly accelerating when the decision was made to establish the PMO. Although the structure of the PMO was on paper in March 1985, many actions had to be completed before the PMO could assume its responsibilities. For example, transition plans had to be formulated, offices constituted, military and civilian personnel repositioned, new people hired, and job descriptions and performance standards written. Even though transitional growing pains were experienced during the period of increasing production, the program focus was maintained.

Geographical Problems

A unique problem faced by the new PMO was coming to grips with geography. With its headquarters at Fort Monmouth, the agency is physically separated from the key program participants who are based in the Washington, D.C., area. Most of the PMO staff are located at Fort Monmouth, but a very small cadre of people work in Alexandria, Va., near the Pentagon. The PMO support contractor (System Development Corporation) operates out of McLean, Va. The challenge should be obvious. The entire process of joint standards development requires the quick transfer of large volumes of paper among action offices in all of the participating organizations.

When the PMO was first established, there was heavy use of overnight mail services, and of travelers serving as couriers. Later, facsimile systems played a key role in transmitting documents from one location to another. Finally, office automation and electronic mail systems were installed at each dispersed location so that documents could be prepared and coordinated interactively in near real-time. To successfully utilize office automation, technical compatibility problems had to be resolved, and procedures developed to achieve necessary PMO internal command and control.

Conclusion

In our view, the application of the PMO concept to the JINTACCS program has been beneficial in spite of early growing pains. Lessons have been learned from the experience. The first is that centralized management has demonstrated it can create the necessary focus to forward a product in a short timeframe. Proper staffing based on in-depth analysis and planning is required to develop and maintain productivity. A second lesson is that problems of geography can often be solved by current technology; the potential of office automation should not be ignored. Third, the joint process can be made to work through creation of win-win situations. The need for cooperation must be stressed as the only way to meet multiparticipant goals. Mutually agreed upon milestones must be carefully orchestrated to ensure that the community's goals are achieved.

To complete this article, we need to acknowledge the difficulties encountered in managing and measuring the progress of a program that will not end with the delivery of a traditional product. With JINTACCS, the product is ideas—standards and procedures—that have been documented and agreed to by the major participants of the DOD community. In spite of the long duration of the program since its genesis as GAMO, the major changes in management and program structure, and the large turnover of people during, a major product of the JINTACCS program will be in operational use this year: the MTF standards and procedures.

In large measure, MTF implementation will be the result of the single-point direction that has been provided by the PMO in concert with OJCS for little more than a year. Considering the critical stage the program was entering when the PMO was established, the PMO ability to maintain program momentum was a remarkable feat. First, the PMO staff had to establish quickly its credibility to avoid being the "new kid on the block." Additionally, as larger segments of the operational community were exposed to JINTACCS, several participants erected resistence to change and fear of the unknown barriers.

Through the sound application of technical expertise; responsiveness to the community's needs; and support of OJCS, military service, agency, and CINC action officers, the PMO will help ensure that MTFs are fielded successfully to support operational commanders.

The same kind of tight programmatic control will pave the way for successful TADIL J utilization in JTIDS when it is implemented in the future. ■

Intrusion Detection System

The Army Troop Support Command Belvoir RDE Center has awarded a $15.8 million contract for enhancement of a facility intrusion detection system (FIDS).

This is an advanced, computer-controlled system that will provide a high security alarm system for Department of Defense (DOD) installations. It will be used to guard all DOD resources including tactical and strategic weapons arsenals. The system consists of a network of sensors, audio and video surveillance equipment and deterrent devices, all linked to monitor and command/control consoles.

The first FIDS systems are scheduled to be delivered to Fort Belvoir, Va., and Ft. Huachuca, Ariz., in early 1989. The FIDS is part of the overall Army physical security program. ■

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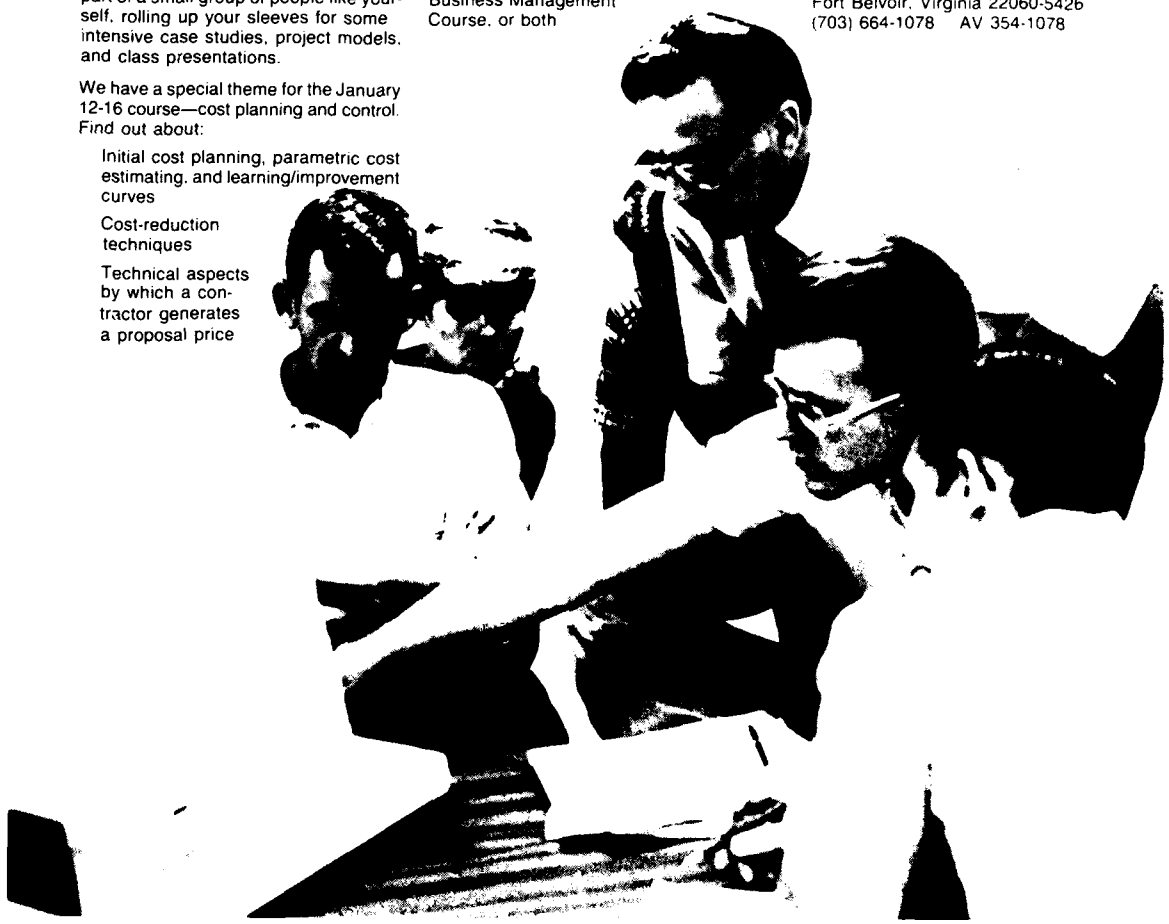

WINNING

Anatomy of Competitive Advantage

Start Out Front, Stay Out Front!

Dr. Frank L. Edwards

Competitive advantage is the single common asset of winners! The advantage may change hands throughout the contest, but at the finish line it is the sole property of the winner. This is a disarmingly simple concept. Yet, the outcome of competition is often surprising and bewildering to all except the winner. The question, "What constitutes a competitive advantage?" is a vital concern of the successful competitor. In this article, I examine that question as it pertains to competition in today's defense market.

Today's federal procurement standard of "full and open competition" was mandated by the Competition in Contracting Act of 1984. The act permits only seven narrowly defined exceptions to competitive procurement. The Department of Defense high-gear pursuit of competition is apparent throughout the acquisition commands. Large and small procurements are included, and virtually all contractors are affected.

Severe Demands on Managers

This dramatic shift in acquisition policy places severe demands on managers in the private and public sectors. One such demand is the concept of competitive advantage. For any particular setting, three basic questions are of paramount importance:

—What constitutes a competitive advantage?
—How can competitive advantage be attained?
—How can the competitive advantage of others be countered?

This is excerpted from the author's Ph.D. dissertation presented at Claremont College in California.

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To resolve the first and second questions, a study was conducted of the competitive outcome of more than 60 major system development programs. This study was based on the premise that competitive advantage is not usually bounded by the specific requirements expressed in a Request for Proposal (RFP). A proposal fully responsive to an RFP is, by itself, insufficient to assure a win. Other factors, external to the RFP, can and do color the selection process. The more commonly accepted factors are often regarded as "keys" to competitive advantage. Nine such generic "keys" frequently espoused throughout the community were selected for study. The objective was to determine statistically, from a sufficiently large and representative sample, the validity of each "key."

Separating Fact from Fiction

The nine competitive advantage "keys" selected for study were derived from defense marketing literature, suggestions of colleagues, and personal experience in this industry. They are presented in Table 1. To assess their general validity in a substantial way, a fairly large data base was required. A questionnaire, developed expressly for this purpose, was mailed to 250 senior and middle managers throughout the defense community. The response was excellent. Usable responses total 141—97 from industry and 44 from government. All military service branches and most major prime contractors were included. The industry response comprised 56 winners and 41 losers.

The questionnaire provided 38 elements of program-specific data concerning a program of the respondent's choosing. Respondents were instructed to select recent major programs about which they had personal knowledge and good recall. A sample of the questionnaire topics is provided in Table 2.

Computer analysis of the data, using the Statistical Package for the Social Sciences (SPSS) program, provided descriptive and inferential statistics for each variable. These included frequent distributions, correlation matrices, multiple regressions and chi-square tests. Statistics were generated for the total sample and various sub-samples; i.e., industry vs. government and industry winners vs. losers.

Six of the competitive advantage "keys" were validated statistically. Two were rejected and one was indeterminate. These results are summarized in Table 3.

To add substantive interpretation to an otherwise sterile set of statistics, interviews were conducted with 30 questionnaire respondents. The interviews were used to "flesh-out" statistical results and explore related competition topics. A composite data base was developed that addressed these competitive advantage "keys," quantitatively and qualitatively. Tempered by personal observation and experience, it formed the basis for the conclusions I present here.

Insurmountable and Competitive Advantage

Early program involvement and front-end technology investment are two competitive advantage "keys" overwhelmingly validated in this study.

Until recently, early involvement, coupled with front-end technology investment, could result in a sole-source position. Today, that possibility is becoming remote. Nonetheless, it still affords the opportunity for a significant and, sometimes, insurmountable, competitive advantage.

Early program involvement may or may not entail technology investment; however, technology investment generally implies early program involvement. A notable exception is a technology developed for one program that is found to be adaptable to others. The

■ *Dr. Edwards is advanced program manager, Hughes Aircraft Company, Fullerton, Calif.*

Table 1. Competitive Advantage Keys

1. **Early Program Involvement.** Involvement with the customer during the formative (pre-RFP) stages of the program is essential to winning.
2. **Preproposal Technical Investment.** Preproposal investment in program specific technology prior to the proposal period is a major factor in winning.
3. **Cost and Schedule Track Record.** The contractor's cost- and/or schedule-performance history on similar programs is *not* a significant factor in winning.
4. **Technical Track Record.** The contractor's technical performance history *is* a significant factor in winning.
5. **Buy-In Effectiveness.** Buy-in strategies are effective in development programs because the government program funding process and the competitive selection process both operate to encourage buy-ins.
6. **Least Cost Wins.** Cost is usually the most decisive factor in winning development programs
7. **Congressional Influence.** Congressional influence exerted by a competitor is frequently a significant factor *in winning*.
8. **Use of Small/Minority Subs.** The use of small and/or minority subcontractors will significantly improve competitive posture.
9. **Ghost Story Effectiveness.** The use of proposal "ghost stories" to discredit or cast doubt on your competitors is an effective-competitive tactic.

cost of adaptation is usually a small fraction of the original development cost. The element of adaptability is an important, though often disregarded, factor in the technology investment decision process.

In addition to adaptability, the decision process should consider at least the following three issues:

—The most affordable and least risky technology investment will build on the firm's existing strengths.

—Technology investment can often be leveraged by capture of government contracts for development of the same technology. Such contracts provide many corollary benefits.

—The technology investment with the greatest competitive advantage will address the customer's perceived need, and will be difficult and expensive for a competitor to replicate.

Since the required investment may entail millions of dollars and man-years of effort to succeed, it is clearly a high-stakes strategy. Critical management attention on a continuing basis is essential.

The investment cost of the "Start Out Front, Stay Out Front" approach to competitive advantage has substantial risk factors. Two principal ones are program cancellation and technologi-

Table 2. Questionnaire Topics

1. Service Connection of Program
2. Value of Development Program
3. Size of Competitive Field
4. Winners vs. Losers
5. Respondent's Principal Responsibility
6. Range of Firm's Direct Investment
7. Importance of Program to Top Management
8. Relationship Between Firm and Customer Complex
9. Degree of Firm's Early Program Development
10. Preproposal Tech Posture
11. Extent of Definition of Government Requirements
12. Congressional Influence on Competitive Outcome
13. Contractor's Cost, Schedule and Technical
14. Level of Program Risk
15. Competitive Contribution of Affirmative Use of Small/Minority Subs
16. Final Price, Winners vs. Losers
17. Evidence of "Buy-In" Pricing
18. Extent of Evaluation and Weighting Factors Definition
19. Effect of Government Procurement Strategy on "Buy-In" Pricing
20. Projection of Program's Final Cost
21. Competitive Effectiveness of "Ghost Stories"

Table 3. Hypotheses Validity Results

HYPOTHESES	STATISTICAL TESTS APPLIED*
Accepted	
1. Early Program Involvement	1, 2
2. Preproposal Technical Investment	1,2,3
3. Cost and Schedule Track Record	1,2,3
4. Technical Track Record	1,2,3
5. Buy-In Effectiveness	1,2,4
6. Least Cost Wins	1,2,4
Rejected	
7. Congressional	1
8. Use of Small/Minority Subs	1
Indeterminant	
9. Ghost Story Effectiveness	1,2,3

*Statistical Tests: 1. Frequency Distribution; 2. Correlation Matrix; 3. Multiple Regression; 4. Chi Square

Fiction

Congressional Clout. This was firmly rejected as an effective tactic to gain competitive advantage. Congressional pressure affecting the competitive outcome was indicated by less than 10 percent of the respondents. Suggested exceptions included programs affecting large numbers of constituents' jobs and/or economically depressed geographic areas.

The real competitive advantage of strong congressional support is found in the competition for program funds. There are always more Department of Defense programs than the budget can accommodate. Thus, keeping the program "sold on the hill" is a key element of its viability. It is a vital concern of both government and industry vested interests.

cal failure. Usually, substantive indicators will emerge well in advance of either risk being realized. But, these can become obscured by arrogance, optimism, or close involvement with the program. The dynamics of the environment demand that a critical and objective management perspective be focused on these risks. They should be examined at frequent and regular intervals. The astute manager will not rely on a single data source on which to assess these risks; too often, such reliance has led to disastrous consequences.

In summary, the "Start Out Front, Stay Out Front" concept is a highly effective and widely accepted technique of gaining and maintaining competitive advantage. It does, however, place large demands on a firm's resources, and poses substantial risks as the program evolves. The recipe for its success is thorough planning, objective real-time visibility, and timely management control.

The Importance of Images

A favorable customer image is generally accepted as a desirable and important asset to any firm. But how important is it in today's competitive environment? Moreover, what specific image do winners most often have?

To resolve these questions, three elements of image were examined. They were the cost, schedule, and technical past performance of the winning firms for all programs included in the study.

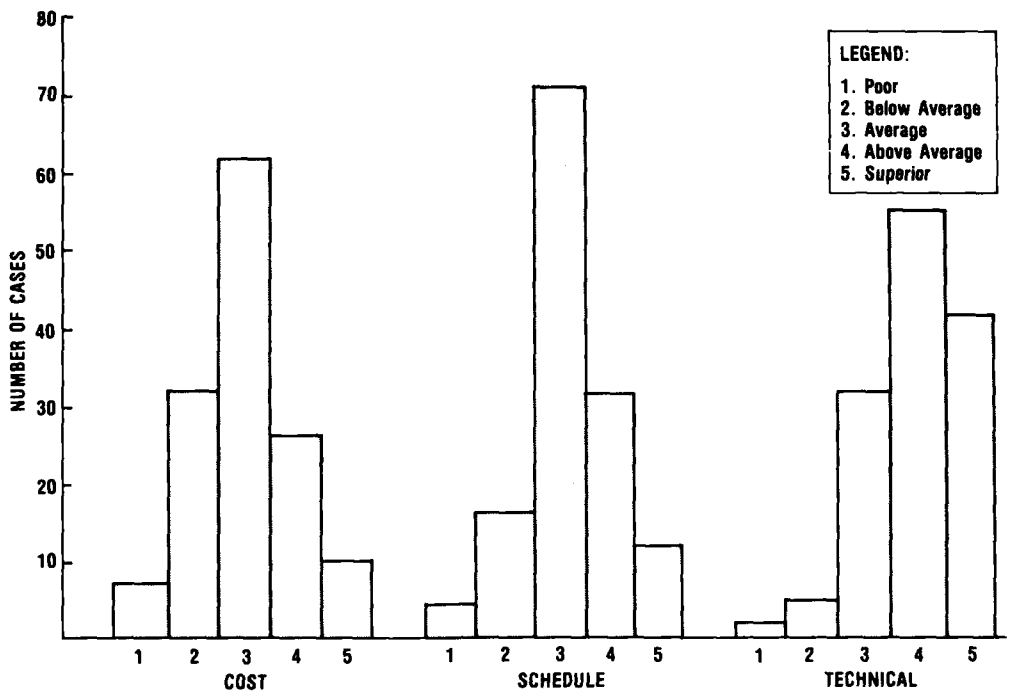
It was hypothesized that a firm's technical track record would be a factor in winning, but not those of cost or schedule. The statistical tests fully validated that hypothesis. A comparison of the winners' cost, schedule, and technical track records is presented in Figure 1. It depicts a normal distribution of cost and schedule past performance. In contrast, the distribution of technical past performance is heavily skewed toward superior performance. Thus, a significant statistical relationship was demonstrated between winning and technical image.

The underlying reasons for the preeminence of technical image are, in part, mission related. If a system or item of equipment is unable to perform its intended mission, program cancellation is the likely consequence. If produced and fielded despite significant deficiencies, it becomes an albatross about the necks of its developer/producer and its DOD sponsor. In contrast, cost overruns and schedule delays are far less tangible after the fact. Thus, in the long run, poor cost or schedule performance will likely be forgiven if not forgotten. Poor technical performance will not. Therefore, in consideration of attaining future competitive advantage, sacrificing required technical performance in the interest of achieving cost and schedule objectives is usually not the best trade-off alternative.

The High Cost of High Price

The competitive advantage of two similar, though distinct, elements of pricing strategy were examined. These were buy-in pricing and least-cost pricing. Their effectiveness was solidly confirmed, both statistically and by respondent interviews. The latter provided much of the following commentary concerning the competitive advantage of both pricing strategies.

Figure 1. Performance Track Record of 141 Contract Winners



"Buy-ins," though not proscribed by procurement regulations, are ostensibly frowned on by the government. Yet, the practice has wide appeal as an effective competitive tactic. Many senior managers held the view that the "buy-in" tactic offered an irresistible competitive advantage to certain competitors. My experience strongly supports that view. They also believed that "buy-ins" were frequently the result of the government's own acquisition strategy. One supporting argument was that many major development programs would never be funded if the true estimate of cost were revealed at the outset of the program. A second was that government contracting officers are measured against negotiated reduction in the contract cost and fee awarded to the winning firm.

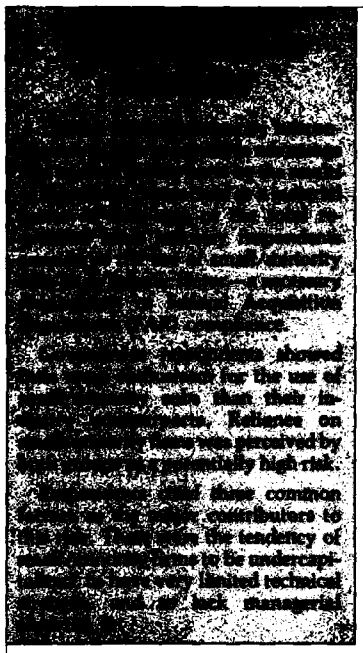
They are not held accountable for the program ultimately realizing these negotiated costs. Another frequently expressed view was that the government is unable to detect a "buy-in" in most development program competitions.

Of the total programs studied, nearly seven out of ten were won by the lowest bidder! This is a remarkable statistic since 72 percent were reported as "high risk." The winners' cost track records cannot account for this statistic, since they reflect a normal distribution. What, then, is the basis for the widespread effectiveness of buy-in and least-cost pricing? Clearly, government funding limitations are a major contributor. These may result from budget constraints, from uninformed "should cost" analyses, or from a combination thereof.

Two additional arguments supporting least-cost pricing are suggested. The first is that normally there are two or more competitors whose technical and management proposals are above the acceptable threshold. The choice between them is then based on the lowest price proposal. Frequently, the price proposed is further depressed by the request for a Best and Final Offer (BAFO) process. In the end, the government often negotiates a final contract cost that bears little resemblance

Shadow vs. Substance

The effectiveness of "ghost stories," created to discredit the competition, was examined but not confirmed by this research. Results were mixed. Most government respondents regarded ghost stories as transparent and ineffective. In contrast, industry respondents tended to support their utility as a competitive advantage tactic. Both groups indicated the efficacy of the ghost-stories tactic would be highly dependent on program specifics. A substantive basis and a [illegible]



to the winning firm's original estimate of cost.

The second argument is that often the spread of scores between the leading competitors' technical management proposals is relatively close. This, in effect, diminishes the relative weight of technical and management evaluation factors while amplifying the importance of cost.

The message here is unmistakably clear. Aggressive pricing is still one of the most effective means of gaining that final competitive advantage. At "best and final offer" time, price is the only hole card left to be played. Thus, the high cost of high price is all too apparent. It is an inescapable fact that "Only winners need ever be concerned with meeting ambitious and aggressive cost objectives!"

Conclusion

Competitive procurement in today's defense market has become a fact of life to be acknowledged and reckoned with. It is patently clear that both the Congress and the Administration are committed to a policy of increased competition to drive down the cost of weapon systems. This policy is exemplified by the competitive trend of Navy procurements. In the last 5 years, the percentage of Navy contract dollars awarded competitively rose steadily from 25 percent in fiscal 1981 to 44 percent in fiscal 1985. The fiscal 1986 goal is 50 percent. In terms of competitive contract awards, the percentages for fiscal 1981 and 1985 were 29 percent and 68 percent, respectively.

A solid grasp of the dynamics of the competitive process and of the concept of competitive advantage is essential to a firm's survival and prosperity in this environment. To know what constitutes a competitive advantage and how to establish it is of paramount importance. Many generic factors have been postulated as contributors to gaining competitive advantage. The objective of this study was to determine which of those were the principal attributes of winners. The results confirmed three such attributes. They are:

—Early program involvement and investment
—Superior technical image
—Aggressive pricing.

Though other factors may, and do, influence the outcome of specific competitions, these three are unique in consistency and frequency of occurrence.

Given the future outlook of the defense market, a firm would be well advised to develop these attributes to the maximum extent practical.

As the centerpiece of a comprehensive business plan, they can provide a competitive advantage of overwhelming proportion.■

Designing Next Generation of Combat Vehicles

A contract to demonstrate the military capability of molded thick laminate composites (reinforced plastic) in the construction of lightweight combat vehicles has been awarded by the U.S. Army Materials Technology Laboratory (MTL), Watertown, Mass. The $13 million, 4-year contract is a major step toward providing materials technology for designing the next generation of combat vehicles for the United States military.

This new program will transfer applicable MTL composites research to private industry to assist in the design, analysis, fabrication, and evaluation of a composite hull (outer shell) structure using the Bradley Fighting Vehicle as a demonstration of this technology. According to William E. Haskell III, senior engineer, "the Bradley Fighting Vehicle was selected because of its complex shape and mission objectives which optimized the composite application. The Bradley Fighting Vehicle is in production and provides a unique opportunity for materials engineers to compare the composite hull to an existing data base." According to Maj. Steven P. Medaglia, "Getting composites into future systems can offer better protection for our soldiers in the years ahead."

The MTL mission as the Army's lead laboratory for materials, materials testing technology, solid mechanics, lightweight armor, and manufacturing testing technology is directed by the U.S. Army Laboratory Command (LABCOM) Adelphi, Md. The LABCOM is the major subordinate command responsible for managing the corporate laboratories of the U.S. Army Materiel Command (AMC) Alexandria, Va., which is the major, command over LABCOM and MTL.

Toward achieving the Army-wide goal of lighter, less expensive, and more durable systems for the military, MTL will be sharing results from the demonstrator hull program with the U.S. Army Tank-Automotive Command (TACOM), Warren, Mich. Systems developers at TACOM will incorporate these results when planning the materials requirements for the next generation of ground combat systems.■

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.■

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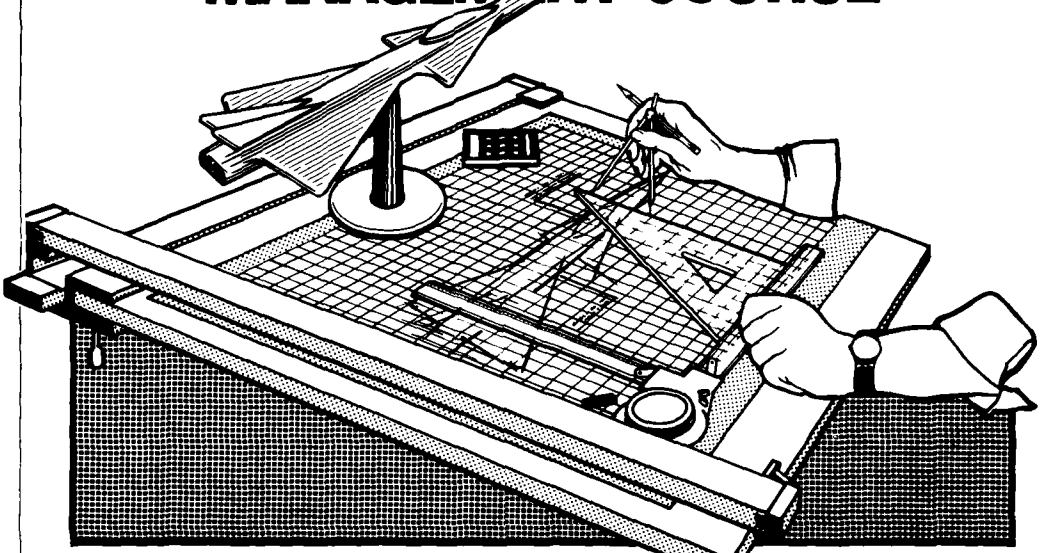

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People on the Move

Dyer

Ehrenberg

Fitzgerald

McGurk

Ramsey

Stiltner

Additions

Senior Chief Radioman (Surface Warfare) Larry Dyer, USN, is the Senior Enlisted Advisor, Office of the Commandant. He served on board the USS Independence out of Norfolk and Philadelphia before reporting to DSMC. He is a graduate of the U.S. Navy Senior Enlisted Academy, Newport, R.I.

Colonel Rudolph H. Ehrenberg, Jr., USA, is the Dean, Department of College Operations and Services. Since 1977, he has served in key resource management positions with the United States Army Europe, on the Army Staff, on the Joint Staff, and in the Office of the Secretary of Defense. Colonel Ehrenberg holds a bachelor's degree in engineering from the U.S. Military Academy, and a master's degree in operations research from Stanford University.

Janet Fitzgerald is an illustrator in the Graphic Arts and Photography Division. Previously, she worked for the U.S. Navy. Ms. Fitzgerald holds a bachelor of fine arts/illustration degree from Columbus College of Art and Design, Columbus, Ohio. She was chosen for the All Army Artists Team while serving in the U.S. Army, Heidelberg, Germany.

Colonel John R. McGurk, USA, Deputy Dean, Department of Research and Information, served in the Office of the Assistant Secretary of Defense (financial management) before coming to DSMC. He received a B.S. degree in electrical engineering from the U.S. Military Academy, and an M.S. degree in industrial engineering and operations research from the University of Massachusetts. He is a graduate of the Command and General Staff College, Fort Leavenworth; the Indusrial College of the Armed Forces, Fort McNair; and the Training With Industry Program, Chrysler Corporation.

Captain Lawrence F. Ramsey, USA, Director of Technical Services, came to DSMC from Fort Ord, Calif., where he was a Company Commander, 7th Infantry Division. Captain Ramsey received a bachelor of arts degree from Virginia Tech.

Linda Stiltner is the new Registrar, Administration and Personnel Services Directorate. Her last assignment was Education Services Specialist at the Army Education Center, Fort Belvoir. Ms. Stiltner holds a B.A. degree from Keuka College, Keuka Park, N.Y.

Losses

Bill Adams, Supply and Procurement Division, to Information Systems Engineering Command.

Lieutenant Colonel Frank D. Allen, USAF, retired.

Major Barry Berkowitz, USAF, to Maxwell Air Force Base, Ala.

Jackie Boyd to Alexandria, Va., as an occupational analyst.

Calvin Brown, resigned to accept position with the Quality Management Institute, Washington, D.C.

Lieutenant Colonel Robert L. Christopher, USAF, retired.

Lieutenant Colonel Samuel Craig, USAF, to Norton Air Force Base, Calif., as Chief, Operational Systems Engineering Branch.

Lieutenant Commander Linda DeBella, USN, to Naval Postgraduate School, Monterey, Calif., for 2-year master's program in operations logistics.

Rudy Garrity, to National Security Agency, Fort Meade, Md.

Jeanette McGill, relocated to Fort Benning, Ga., with family.

Master Sergeant Melvin C. Mosley, USA, to the 8th Personnel Command, Republic of Korea.

Lieutenant Colonel Donald T. Ostlund, USA, retired.

Anne Pearson, Office of the Registrar, retired, after 31 years of government service, 15 at DSMC.

Lieutenant Colonel William H. Pentz, Jr., USA, retired.

Lieutenant Colonel Rock C. Wheeler, Jr., USA, retired.

Gustave C. Zader, Jr., to the Office of the Secretary of Defense, Comptroller's Office, Acquisition Cost Management Directorate.

Prototypes

Prototypes for the Army's new 6,000-pound variable reach rough terrain forklift truck is being tested at Aberdeen Proving Ground. The prototypes, built from specifications developed by the Troop Support Command's Belvoir RD&E Center, were procured under competitive contracts awarded by the Tank-Automotive Command to three contractors.

Each contractor built four prototypes for evaluation and testing, and manufacturers whose vehicles successfully complete the tests will be permitted to bid on the production contract scheduled for awarding in July 1987.

Requirements for the forklift, developed by the Ordnance Missile and Munitions Center and School, call for a highly maneuverable 6,000-pound forklift. ■

WHITE PAPER

Cost/Schedule Control Systems Criteria

Wayne Abba

The DOD Instruction 7000.2, Performance Measurement for Selected Acquisitions," first issued in 1967, requires, that on major contracts, contractors use management control systems meeting the Cost/Schedule Control *Systems Criteria* (C/SCSC or CS³). The C/SCSC can be controversial. While many experienced program and business managers in both government and industry are sold on its benefits, other equally experienced managers consider it a burdensome requirement that generates excessive data. This paper summarizes the objectives of C/SCSC and the associated cost performance reports, and what can and cannot be expected from their use.

C/SCSC Objectives and Purpose

The objectives of C/SCSC are:

—For contractors to use effective internal cost and schedule management control systems, and

—For the government to be able to rely on timely and auditable data produced by those systems for determining product-oriented contract status.

Both objectives are essential. However, government managers should recognize that effective contractor management does not in itself require product-oriented cost reporting in addition to cost reporting by contractor organization. On the other hand, contractors should recognize the government's need for such information on contracts that involve substantial cost risk to the government. Differences arising from these divergent needs, such as the level of reporting detail required, should be discussed during contract negotiations. The criteria are not subject to negotiation, but many problems concerning timing of C/SCSC implementation and reporting requirements can be avoided or minimized through negotiation.

The C/SCSC is not a system! It is a set of criteria designed to define an adequate contractor cost and schedule management control system. Changes to an existing system are required only to the extent that it does not meet the criteria. The criteria do not purport to address all of a contractor's needs for day-to-day or week-to-week internal control, such as informal communications, internal status reports, reviews, and similar management tools. These management tools are important and are not intended to be replaced by C/SCSC requirements. The basic purpose is to assure the contractor has in place, and uses, adequate cost and schedule control systems providing reliable contract status at least monthly.

C/SCSC Requirements

The C/SCSC improves on the budget vs. actuals (or "spend plan") management technique by requiring that actual work progress be quantified through "earned value," an objective measure of how much work has been accomplished on the contract. Without earned value, one can only compare how much has been spent with what was planned to be spent, with no objective indication of how much of the planned work was actually accomplished. The C/SCSC requires the contractor to plan, budget, and schedule authorized effort in time-phased "planned value" increments constituting a performance measurement baseline (time-phased budget). As work is accomplished, it is "earned" on the same budget dollar basis. Earned value compared with planned value provides a measure of work accomplishment against plan, called a schedule variance.

The contractor's accounting systems provide accumulation of actual cost of accomplished work, which is compared with earned value, providing a cost variance for the accomplished work and indicating whether the work is over- or underrunning its plan. Planned value, earned value, and actual cost data provide an objective measure of performance, enabling trend analysis and evaluation of cost estimates at completion at all levels of the contract.

In addition to earned value, C/SCSC requires thorough planning, baseline establishment and control, information broken down by product as well as by organization or function, measurement of accomplishment against the plan at relatively low levels with summarized reporting to higher management, reporting discipline, variance analysis, and corrective action. These are all desirable features of a good management control system.

The C/SCSC requirements have been overwhelmingly acknowledged by both government and industry managers as representing good management principles. The extent of effort needed for a contractor to meet these requirements depends on how much change, if any, is needed for the existing systems to meet the criteria.

Baseline Implementation

An initial and critical contractor step in applying C/SCSC to a contract is establishing the baseline for performance measurement. The work involved in establishing a baseline may be substantial, but must not be avoided or delayed because valid cost data depends on it. It should be planned during the proposal phase and completed as soon as possible after contract award.

When the contract is awarded, internal documentation must be updated and work planned in detail. Work authorizations, schedules, and budgets must be negotiated between the contractor program office and the various functional organizations and managers who are responsible for accomplishing the work. This process can be time-consuming, but is necessary to develop a baseline that is meaningful for internal control. Some additional time also may be needed to verify the data produced after the baseline is negotiated. The time required by the contractor to complete these tasks and be prepared to demonstrate compliance with

C/SCSC may be negotiated if it is likely to exceed the time specified in the standard C/SCSC contract clause.

The desired result is a timely, well planned and realistic baseline for controlling internal performance and for reporting valid contract status information to the government.

Relationship to Contractual Schedules

The C/SCSC performance measurement baseline represents the contractor's internal work plan, the dollarized schedule for performing the contract effort, and may allow a "cushion" with respect to the contract delivery schedules. These cushion (or "setback") schedules anticipate typical problems such as late vendor deliveries and rework. If not understood, setback schedules can cause confusion because a negative schedule variance would not affect contract deliveries if the cushion can absorb the delay.

A C/SCSC schedule variance is stated in terms of dollars worth of work and must be analyzed in conjunction with other schedule information such as provided by networks, Gantt charts, and line-of-balance. By itself, the C/SCSC schedule variance reveals no "critical path" information, and may be misleading because unfavorable accomplishment in some areas can be offset by favorable accomplishment in others. A C/SCSC schedule variance is an "accomplishment variance" that provides an early indicator of cost problems when it shows the contractor is not meeting the internal work plan. Further analysis must be performed to determine the effect on contract cost and schedule.

Management System Acceptance

Contractors are required to demonstrate to the government that their cost and schedule management control systems comply with the criteria. A comprehensive demonstration review is required once for research and development effort and once for production; shorter subsequent application reviews (SARs) are conducted for follow-on contracts requiring compliance with C/SCSC. Because the criteria approach permits a wide variety of equally effective ways for contractors to meet the criteria, trained, experienced government people are used to conduct the reviews and follow-on surveillance. Similarly, contractors need skilled people to develop, maintain, and monitor their systems.

The C/SCSC review reports are usually coordinated among the military departments, resulting in tri-service acceptance (or "validation") of contractors' systems. Along with frequent meetings of the DOD Component C/SCSC focal points, this coordination helps to ensure uniform criteria interpretations.

Reporting

There are no explicit external reporting requirements in the C/SCSC. The criteria require that contractors have and use effective *internal* control systems. Summary data from the internal system are reported to the government through the Cost Performance Report (CPR), as specified on the Contract Data Requirements List. The CPR has five formats, which provide cost and schedule performance data broken down both by product (work breakdown structure) and by contractor functional organizations; baseline information; planned vs. actual manpower usage; and problem analysis. The problem analysis section is also used to reconcile the dollar-based CPR schedule information and actual time-based schedules.

The CPR is almost always submitted monthly, and is intended to report summary information from the contractor's internal cost and schedule control system. Summary reporting suffices because C/SCSC discipline assures that the contractor uses objective performance measurement information to manage at levels where work is performed, allowing management attention to be directed to areas where significant problems are indicated. When a problem area surfaces in a CPR, detailed data may be requested until the problem is resolved. It is important to recognize that CPR frequency, reporting levels, variance analysis thresholds, and format are all subject to negotiation, and any needed adjustments in these areas may be proposed by either party during contract execution.

In addition to earned value, two important CPR data elements are the estimated cost at completion (EAC) and management reserve. The EAC is of prime interest and must be updated periodically by the contractor using approved procedures, including evaluation of cost and schedule variance trends along with information from other management tools. Management reserve is an amount of the contract budget set aside by the contractor for management control purposes, such as for use in performing unanticipated tasks that are within the scope of the contract. It is not a contingency fund, and may neither be eliminated from contract prices by the government during subsequent negotiations nor used to absorb the cost of contract changes.

CPR Timeliness

Typically, the CPR is submitted about 25 days after the close of the contractor's accounting month. That time is needed to accumulate, verify and correct data, analyze significant variances, and prepare reports. Although 25 days may appear excessive to some recipients, the CPR is timely for its intended purposes—to provide an objective indication of contract status, a basis for observing trends, and formal communication between contractor and government managers. Negotiation with the contractor may result in shorter submission time, using such techniques as submitting the data first and analysis later, or substituting contractor internal formats provided they contain adequate data in a form suitable for use by government managers.

Use of CPR

The CPR, like C/SCSC, is no substitute for day-to-day contract management or communication between the contractor and the government program manager. The CPR may not reveal many new problems, but within the government program office it is valuable for confirming and quantifying the problems reported by the contractor's functional managers. For example, a CPR would confirm a previously anticipated schedule slippage or previously known technical problem, allowing analysis of the effect on current and future contract cost and schedule.

Government program offices also use CPRs to monitor cost and schedule variance trends and to project the trends to contract completion to determine the validity of EACs and completion dates. In addition, CPRs are used

to correlate contract cost performance with program financial planning by verifying funding requirements identified by contractors on the Contract Funds Status Report.

Above the government program office level, CPRs are used as the basis for various management oversight reports. The CPRs are not provided routinely above the major command level in the military departments, but data summarized from the CPRs are used in periodic program status reports to higher headquarters, including the Office of the Secretary of Defense (OSD), and the Congress. This high-level interest reflects awareness that it is necessary to understand how performance on major contracts is progressing in order to assess whether overall program schedules and budgets are reasonable. Graphic portrayal of CPR data from contractor systems accepted under C/SCSC is a key feature of the military department and OSD reporting systems.

C/SCSC Implementation Problems

Typical points of contention between the government and industry concerning C/SCSC implementation include time required to implement, levels designated for management and reporting, variance analysis thresholds, and system discipline requirements. These are not a direct result of the criteria, but can affect the cost of implementing and operating a C/SCSC-compliant management system. The cost of C/SCSC, sometimes perceived to be excessive, has defied quantification because it is virtually impossible to separate the incremental C/SCSC cost from the management cost that would be incurred in any case. However, there is no dispute that improper implementation imposes an unnecessary burden on the contractor.

Reasons for improper implementation include overreaction to C/SCSC and CPR requirements by contractors as well as excessive government contractual and review requirements. In most cases, improved communication can correct these problems. Government C/SCSC specialists should review solicitations for appropriate work breakdown structure, C/SCSC, and cost performance reporting requirements. Contract negotiations should include discussion of implementation schedules, reporting levels, and variance analysis thresholds. When a contractor believes changes are necessary, they should be brought to the procuring agency's attention. After contract award, certain revisions can also be made. For example, variance analysis thresholds may be adjusted if they generate too much problem analysis narrative.

When a contractor has a C/SCSC implementation problem and is unable to resolve it with the procuring agency, an appeal may be made to the DOD Component C/SCSC focal point. Failing resolution at that level, further appeal to the Performance Measurement Joint Executive Group is possible.

Cost Schedule Status Report

On smaller contracts that do not require the contractor to comply with C/SCSC, the Cost/Schedule Status Report (C/SSR) approach to performance measurement may be used. The C/SSR is similar to the first format of the CPR, and like the CPR has a narrative problem analysis section, but the data required are not as extensive and the contractor is not subject to the in-depth demonstration reviews or management system acceptance associated with C/SCSC. The manner in which C/SSR data are generated is subject to negotiation and inclusion as part of the contract.

The C/SSR may be required as an alternative on large contracts for which C/SCSC compliance is not considered mandatory. In this case, the DOD Component may conduct a more detailed C/SSR review, but the administrative and reporting effort both for the government and the contractor is less than with C/SCSC or CPR requirements.

Conclusion

The C/SCSC is the best tool available to assure that contractors have and use adequate cost and schedule management control systems. It provides better overall planning and control discipline on defense contracts. The associated cost performance reports summarize objective data from contractors' internal systems for contractor and government managers. The C/SCSC and CPR requirements have proved their value over many years. Real improvements in contract management can be achieved by top-level attention to developing and using good cost and schedule management control systems and by taking timely corrective action when a problem is identified. Problems are corrected by management decisions. A C/SCSC-compliant system can ensure that valid cost and schedule performance data are generated, easing the manager's task in making the correct decision.■

■ *Mr. Abba, Office of the Secretary of Defense, prepared this white paper. He is an honorary professor at the Defense Systems Management College.*

Coatings on Floating Piers May Save $2 Million

A value engineering proposal submitted as part of a product improvement package for the Army's "A" DeLong pier barges may save the service nearly $2 million. The proposal, which was the idea of Robert M. Smith, an engineer in the Logistics Support Directorate at the Troop Support Command's Belvoir RDE Center, calls for eliminating the wood planking forming the support structure for the pier and replacing it with less expensive deck coating systems. "A" DeLong pier barges are used for loading and unloading containerized cargo along coastlines and inland waterways.

The steel barges are being modernized and strengthened to support 250-ton cranes and rough terrain cargo handlers.

Results so far have shown that these lightweight coating systems provide good traction, are easier to repair, and can be installed at a cost of $60,000 to $70,000, far less than a wooden deck. Total savings for replacing the decks on the four DeLong pier barges now used by the Army is estimated at $1.8 million.■

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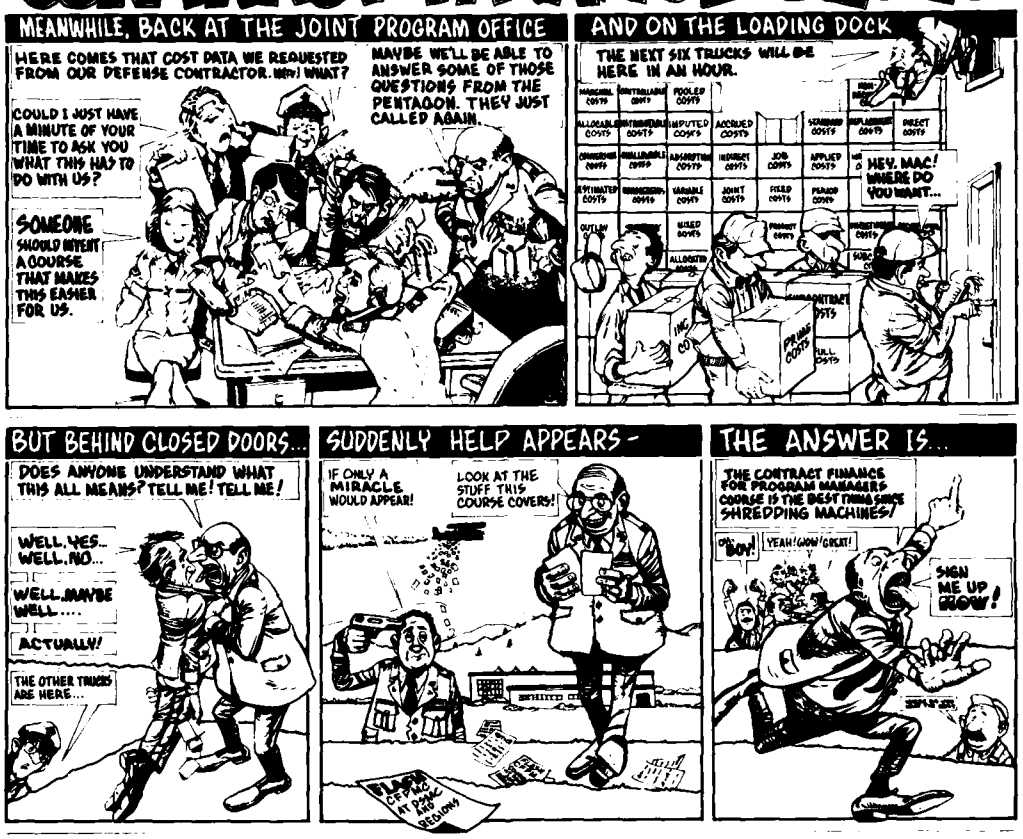

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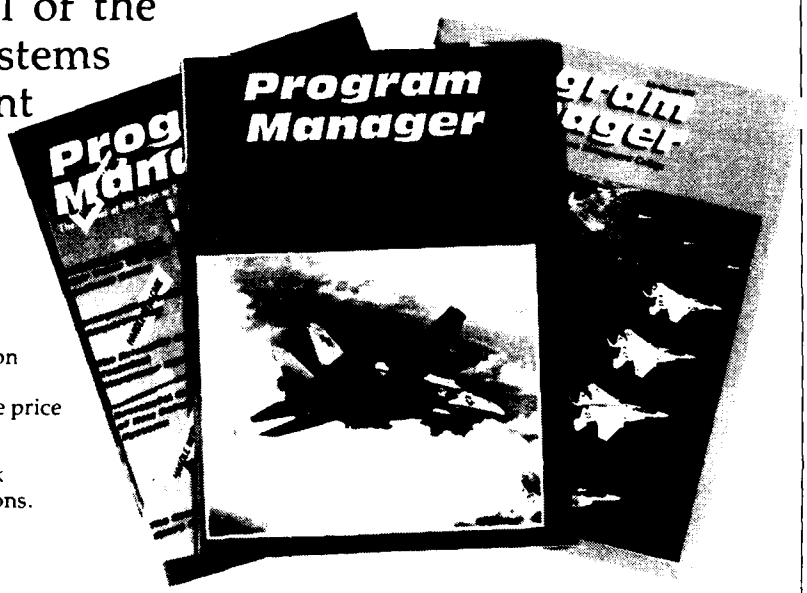

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