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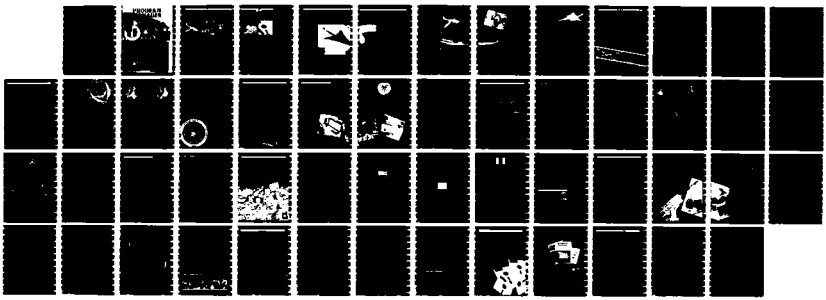

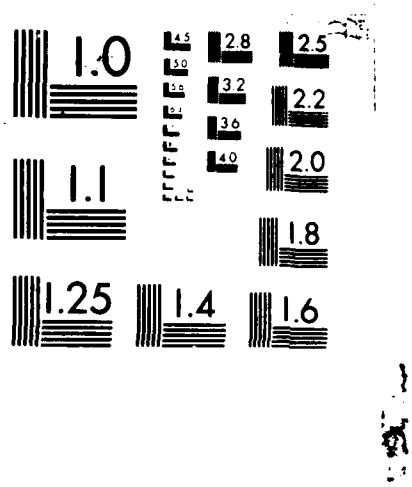

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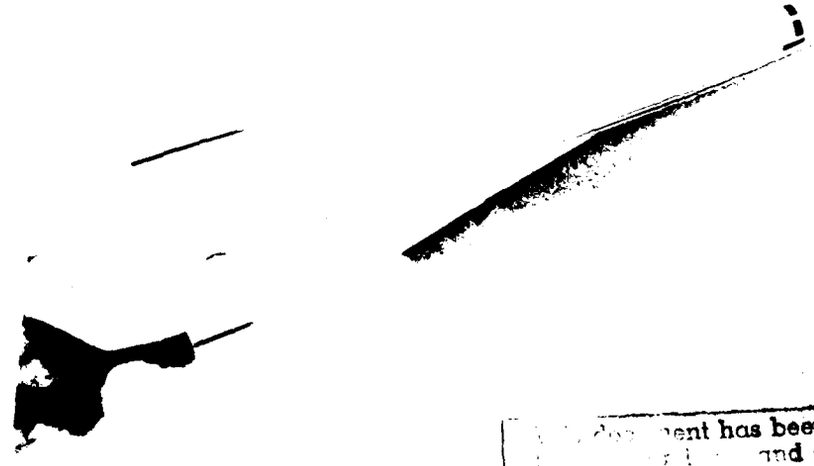

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JOURNAL OF THE DEFENSE SYSTEMS

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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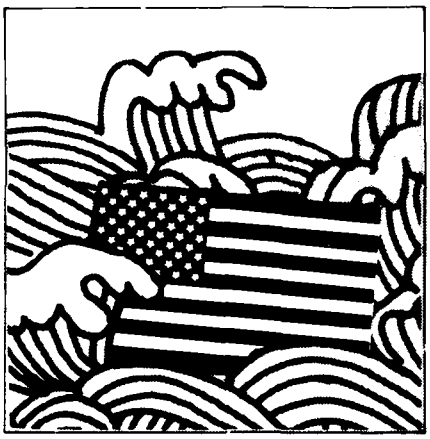
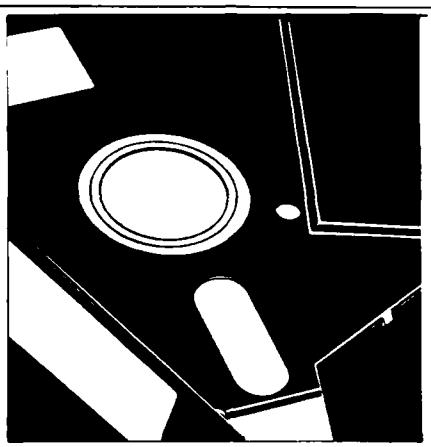
Cover: Artist's concept of the national aerospace plane.

Cover background texture: The Sikorsky UH-34D Helicopter, used in late '50s and early '60s, was replaced by the Huey.

MANAGEMENT COLLEGE





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FROM PISTON TO

Brigadier General Robert R. Rankine, Jr., USAF

I will address the National Aerospace Plane from two perspectives: the Air Force and the Strategic Defense Initiative (SDI). I am directly involved in the National Aerospace Plane program in two ways. First, I am responsible for the Air Force science and technology program which holds the Air Force share of the program. Second, I am responsible for the portion of the Strategic Defense Initiative that is assigned to the Air Force for execution, including the Strategic Defense Initiative organization's share of the National Aerospace Plane program.

I will describe what the National Aerospace Plane is or, better, what it is envisioned to be. I will discuss the possibilities such a vehicle portends, and why it is of such great interest to all program participants. I'll try to explain why the aerospace plane concept presents such an advantage over current technology; what makes us feel we can now achieve the National Aerospace Plane goals; and, I will provide background for the program. I'll describe program management aspects of the National Aerospace Plane and clarify what the Department of Defense and NASA hope to achieve.

Program Objective

The objective of the National Aerospace Plane program is to advance and then demonstrate, in an experimental flight vehicle, the requisite technologies that will permit the nation to develop both military and civil vehicles capable of operating at sustained hypersonic speeds within the atmosphere, or as space launch vehicles to deliver payloads into orbit. The generalized charactistics of an aerospace plane are: It will be hydrogen-fueled, ramjet scramjet-powered, and capable of horizontal takeoff and landing. Specific future applications will produce vehicles capable of sustained hypersonic cruise or direct single-stage-to-orbit insertion, or both, as required.

This is adapted from remarks made last May by Brigadier General Rankine, director of space systems and command, control, communications, Office of the Deputy Chief of Staff for Research, Development and Acquisition, U.S. Air Force.

The National Aerospace Plane program that we have embarked upon will demonstrate technology from which an entirely new family of aerospace vehicles can spring: space launch vehicles which operate at dramatically lower cost per pound-to-orbit than the shuttle; hypersonic airliners, like the Orient Express referred to by the President in his Feb. 4 State of the Union message, that will shrink the passenger routes of the Pacific, fostering a new center of international economy; air defense and fleet defense interceptors to protect our nation and our ships at sea; global surveillance—the possibilities are virtually endless.

New Class of Vehicles

The National Aerospace Plane truly holds the potential to open up an entirely new class of vehicles both for atmospheric flight and for space launch. Such a revolutionary advance would be similar to that experienced in the leap from piston engine to jet-powered aircraft.

An artist's concept of a commercial jet transport powered by liquid hydrogen fuel, which would not pollute the atmosphere.

In that regard, I would like to make a historical diversion here. The first jet-propelled airplane developed in this country was the Bell XP-59A. Its development was started personally by General Arnold (Gen. H.H. "Hap" Arnold, commander of the Army Air Corps during World War II) in September 1941. The XP-59A was made to appear as a modification to the propeller-driven XP-59 for security reasons. The General Electric Co. produced the jet engines for the XP-59A in this country from production drawings and specifications for the Whittle engine which were provided by the British.

On Oct. 1, 1942 — and that's incredible to me, that's only 13 months later — the contractor's test pilot, Robert M. Stanley made flights at Muroc Dry Lake to 25 feet and 1,000 feet, and on the following day made flights to altitudes of 6,000 feet and 10,000 feet. On Jan. 6, 1944, information on the existence of jet-propelled aircraft in this country was first released to the public. The newspapers carried stories about Brigadier General L. C. Craigie, who had been the first military officer to fly a jet-propelled airplane in this country.

During the past 43½ years, the entire nature of civil and military aviation has been transformed by the turbine engine. The XP-59A flight test led first to fighter aircraft applications, and then to the first U.S. bomber aircraft application with the first flight of the XB-45, powered by J-35 turbojet engines, on March 17, 1947, and the XB-47 on Dec. 17, 1947. Seven years later, we saw the first commercial application of the turbojet with the first flight of the Boeing 707, powered by the commercial version of the J-57 engine, on July 15, 1954. That aircraft was also the prototype of the Air Force first turbojet-powered tanker aircraft, the KC-135. Today, the U.S. Air Force fleet is entirely turbine-powered and the whole world travels on turbine-engine-powered passenger aircraft.

I believe we may be on the threshold of an equally important revolution in transportation with the advent of the supersonic combustion ramjet or scramjet. If a scramjet-powered experimental aircraft can be successfully flight tested, I believe that event will shape military and civil space and air transportation for decades into the future, just as the XP-59A did.

Applications

Regarding the National Aerospace Plane, if you compared the flight patterns or trajectories of typical aircraft and space launch vehicles and those of an aerospace plane, you would see that the aerospace plane profile can combine the two. What results from this hybrid capability is an ability to overfly anywhere on the globe in a very brief period of time. *A 30-minute flight would provide coverage for a significant part of the Earth.*

In addition to the potential space and aeronautics applications for future civil transportation needs, the potential military missions of the aerospace plane are numerous. Because of its ability to get to almost any part of the globe quickly, a hypersonic cruise version could be used as a long-range strategic interceptor. Global range, plus the ability to orbit at will, would make another version invaluable in a surveillance role.

Finally, flexible basing and low-cost launch capability have obvious benefits for a space transportation version which can launch and service Department of Defense space payloads. On May 8, 1986, the Air Force Requirements Review Group validated the Air Force Space Command's Statement of Need for the surveillance and space launch missions of a future aerospace plane; hence, the Air Force has a documented, validated requirement for the technology that the National Aerospace Plane will demonstrate.

Launch Cost Reductions

Technically speaking, what provides the space launch advantage to the aerospace plane over conventional rocket-powered vehicles such as the shuttle? Defense Advanced Research Projects Agency and NASA studies conducted as a part of the Copper Canyon program that we now refer to as Phase I of the National Aerospace Plane program, indicated that a space launch vehicle derived from such technology might reduce payload-to-orbit costs significantly.

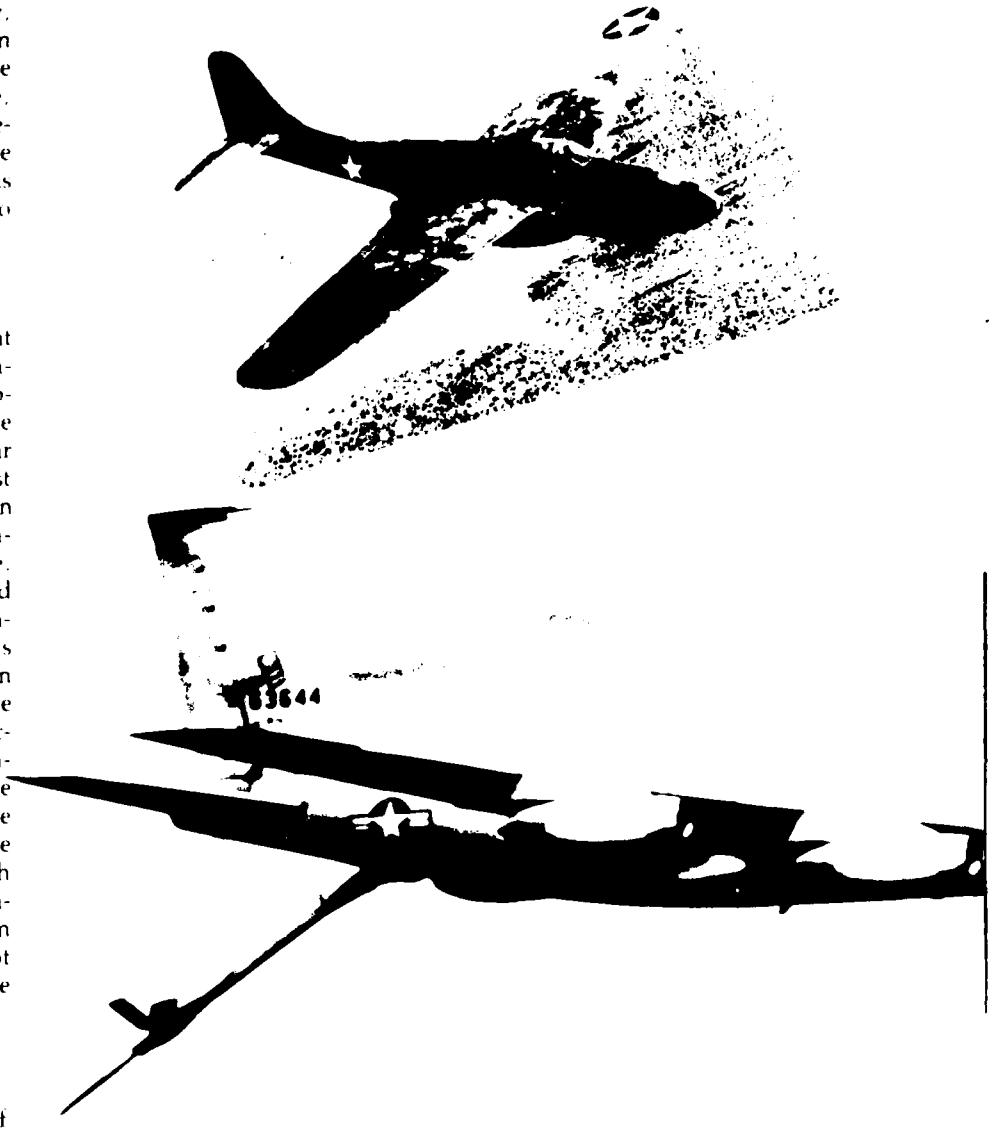
By eliminating the need to carry an oxidizer for the atmospheric portion of flight, ramjets and scramjets provide considerably higher specific thrust than rockets over the entire velocity regime. This reduces the fraction of the vehicle weight which must be carried as fuel at takeoff and during flight through the atmosphere. By comparing a space-launch version of the aerospace plane to the shuttle weight breakdown, you can see clearly how being able to utilize atmospheric oxygen, rather than carrying it along in liquid form, greatly reduces the takeoff

weight. This more than compensates for the losses due to the increase in aerodynamic drag.

The launch cost reduction aspects of the aerospace plane do not depend totally on this tremendous efficiency, however. The other key cost-reduction factors lie in the reusability of the system. Also, the facts that large, dedicated launch complexes are not required, and that the vehicle will have autonomous, aircraft-like operations and maintenance can contribute to considerably lower costs.

SDI Applications

It is in the area of space launch that the aerospace plane concept has potential for Strategic Defense Initiative applications. Since the beginning of the Strategic Defense Initiative, one of our objectives has been to reduce the cost of putting payload into orbit by an order of magnitude or more, in comparison with today's space shuttle. Much of the recent research toward low-cost access to space has concentrated on evolutionary improvements to liquid-hydrogen liquid-oxygen fueled rockets, on reorganization of the space transportation system infrastructure to make it less manpower intensive, and on changes in the space transportation system architecture such as by the introduction of reusable upper stages. Taken together, such changes do offer potential for considerably reduced space transportation costs for the future, but possibly not to the extent which may be achievable with an aerospace plane.



Deployment of Defenses

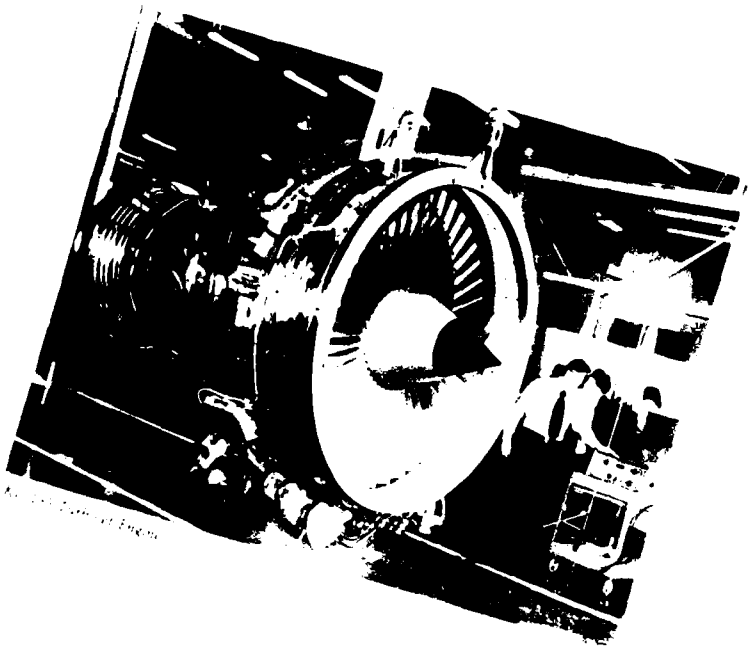
But will a launch-vehicle version of the aerospace plane be available in time for a potential deployment of defenses against ballistic missiles? The Department of Defense and NASA have completed a study of the architectural options available and technologies required for the next-generation space transportation system after the current infrastructure consisting of the shuttle and our presaent, expendable launch vehicles.

That study, the National Space Transportation and Support Study, found that the existing space transportation architecture would be unable to handle effectively the increased traffic of normal growth anticipated in civil and military space missions for the post-1995 time period, even without an SDI employment.

This leads to the requirement for an unmanned cargo vehicle with a high degree of reusability to be introduced in the mid-'90s. Then, when the existing shuttle fleet reaches its lifetime limits at about the year 2000, a new manned vehicle will be required to complement the unmanned cargo vehicle. One of the options in the study for this new manned vehicle is an advanced airbreathing launch vehicle derived from the technology to be demonstrated in the National Aerospace Plane program.

This preferred architecture, consisting of an unmanned cargo vehicle and a new manned vehicle, would provide robust, cost-effective space transportation into the next century; it would be capable of being expanded as necessary to meet additional growth requirements such as those that a decision to deploy space-based elements of a strategic defense would produce.

The Department of Defense and NASA have had ongoing research into hypersonics for a number of years. Only in recent years, however, has technology matured to the point that an aerospace plane might actually be possible. Advances in hypersonic, air-



U.S. AIR FORCE

breathing propulsion, in lightweight, high-temperature materials, and in computational fluid dynamics are the three major elements of this appraisal. Let me give you some examples of Air Force contributions to the state of these technologies.

Propulsion Technology

In the key area of propulsion, Air Force support of hydrogen fuel research and air-breathing hypersonic engines began as far back as 1945. Both liquid air cycle and supersonic combustion ramjet engines were seriously examined in the 1960s. A lightweight, regeneratively cooled, hydrogen-fueled subsonic combustion ramjet was successfully tested at simulated Mach 6 to Mach 8 conditions in the late 1960s. The Air Force Marquardt Dual Mode Scramjet in 1967-1968 successfully demonstrated the transition from ramjet to scramjet and back again at Mach 3 in a ground test facility. More recently, in 1980, as part of the Advanced Strategic Air Launched Missile Program, the Air Force actually demonstrated in free flight a liquid-fueled ramjet engine which accelerated to Mach 5.

High-Temperature Materials

In the area of high-temperature, high-strength materials, the Air Force has a long history of pioneering research successes from the development of high-temperature alloys for the SR-71 and B-70 to the development of carbon-carbon materials for the reentry vehicles and rocket nozzles. Air Force Materials Laboratory efforts in rapid-solidification-rate metallurgy are producing lighter weight alloys with higher strength at high temperature than alloys produced by traditional techniques.

Another crucial area in hypersonic research is computational fluid dynamics. The aerospace plane will be the most highly integrated engine airframe in the history of flight vehicle development, and supercomputers will be required to accomplish the integrated engine airframe design through fluid dynamics calculations.

This computational capability will be required in the modeling of internal dynamics to estimate engine behavior and in the modeling of external aerodynamics to estimate vehicle stability, control, skin temperature, drag and so forth.

The Air Force and NASA have made the United States the world leader in this area, with unique wind tunnel test facilities and supercomputer capabilities. The Air Force Flight Dynamics Laboratory has played a major role in numerous past aircraft projects and was intimately involved with NASA in the modeling and simulation of hypersonic airflow over portions of the space shuttle orbiter structure. The Air Force has done significant work in modeling, simulation and calculation of complex flow fields in ramjet/scramjet engines.

Schedule

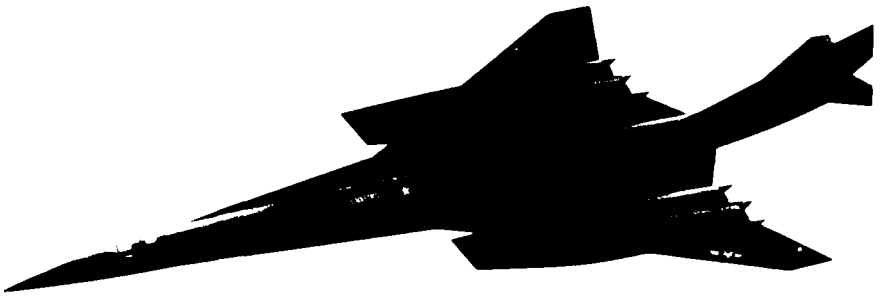
The Department of Defense and NASA approval to initiate joint program planning activities for a National Aerospace Plane program was granted by the under secretary of defense for research and engineering and the NASA associate administrator for aeronautics and space technology on Oct. 18, 1985. Less than 6 months later, April 7, 1986, the Department of Defense and NASA announced the award of seven contracts with potential total value in excess of $450 million for engine development and research vehicle design.

I think the fact that five separate government organizations—Air Force, Navy, Defense Advanced Research Projects Agency, Strategic Defense Initiative Organization, and National Aeronautics and Space Administration—cooperated to initiate such a challenging program in a short time should be a clear indication of the promise for the future these organizations believe the aerospace plane offers.

What, then, are we trying to accomplish in the National Aerospace Plane program? Let's begin by emphasizing that it is not a system program, nor is it a prototype development. It is an experimental, X-vehicle, advanced technology development program.

It consists of three phases. Phase I, the Defense Advanced Research Project Agency Copper Canyon program

is complete. Copper Canyon was a classified program, results of which were released to the Congress in open testimony in the summer of 1985. That program determined, through a series of extensive studies and unique experimental and computational work, that the propulsion technologies, materials and computational capabilities were sufficiently maturing in the same timeframe: this made possible their exploitation for the construction and flight of an experimental aerospace plane.



Turbojet Engine

Current Technology Phase

The current technology Phase II, will iteratively design the research vehicle, will build and test near-flightweight engines, will build and test selected airframe components, and will, in parallel, continue the maturation of key technologies which will continue to be fed into the design. Based on Phase II results, a decision will be made in 1989 on whether or not to proceed into Phase III and fabricate flight vehicles, designated the X-30 for flight test.

The completion of flight tests of the X-30 will conclude the National Aerospace Plane program as we know it. If it is successful, the decision to begin full-scale development of aerospace planes for specific applications can be made by the services and agencies in the mid-1990s. That is, at that time, specific variants derived from the research vehicle could be developed to meet the unique mission requirements of the military, the civil sector, or potentially both, as in the case of space launch.

Program Management

The Department of Defense has lead responsibility for the joint DOD NASA National Aerospace Plane program, and the Air Force has been assigned overall DOD responsibility; hence, the Air Force has established a Joint Program Office at Wright-Patterson Air Force Base, Ohio, staffed by Air Force, Navy, and NASA scientists and engineers. The Defense Advanced Research Project Agency manages the current technology phase of the program. Within the program, NASA has lead responsibility for base technology development and civil applications and an integral role in the overall program. If the decision is made to proceed with Phase II, the flight vehicle build-and-test phase, it will be under Air Force direction. The Defense Advanced Research Project Agency will execute its Phase II management responsibilities through a program management office in the Washington, D.C., area also staffed with Air Force, Navy, and NASA personnel.

The National Aerospace Plane program has the potential to be the means by which this country maintains its pre-eminent role in space and aviation. Five government agencies have joined their science and technology efforts to reach for an entirely new concept for flight vehicles of the future.

The risks are high, but the applications are numerous and the payoffs are great. ■

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Make personal checks payable to the above. Or, you can order by using Mastercard or VISA. (See order form for details.)

This is the first definitive history of the College and commemorates its 15th anniversary which was observed July 23, 1986, at Fort Belvoir, Va.

It includes contributions of each commandant to the College missions: academic, research, information collection and dissemination. It credits many people who have contributed to the College's success. There are 454 pages and hundreds of pictures.

In presenting this genesis, the College recalls issues and problems faced during the past 15 years and how they were overcome.

The College is a major educational institution dedicated to improving the defense system acquisition process and its management within the U.S. Department of Defense.

The author is David D. Acker, a professor of management at the College for 13 years. While a staff specialist in the Directorate of Defense Research and Engineering, Office of the Secretary of Defense, he took part in the preparation of the College charter, and provided assistance and guidance to the commandant from 1971-73. Today, he is a member of the College Research Directorate.

The volume, with dust cover, measures 8½"x 11" and provides a complete genesis of the College, a center of excellence in acquisition management education and research, from which more than 23,000 military and civilian personnel have been graduated. ■

THE LEARNING

Which One to Use

Major Daniel L. Johnson, USA

The learning curve, also called the experience curve, progress curve, or cost-improvement curve, is a widely accepted analytical tool in government and industry. The concept is straightforward and appealing. As a production task, such as the manufacturing of a tank, is repeated, the time required to complete successive units diminishes. Interestingly enough, the first apparent use of the concept was in 1930 during contract negotiations between Boeing Airplane Company and the Bureau of Aeronautics. In February 1936, T. P. Wright published an article in the *Journal of Aeronautical Sciences*. He suggested that as the cumulative number of aircraft produced doubles, the cumulative average cost to produce them goes down at a constant rate. This theory is known as the cumulative average or cum avg theory and was used widely in the aircraft industry for many years.

Near the end of World War II, J.R. Crawford, originally working for Lockheed Aircraft and later for the Stanford Research Institute, suggested that the constant rate decrease in cost should be related to unit costs instead of the cumulative average cost. This so-called Crawford curve has become known as the unit theory curve and is the predominant theory in use today. The learning-curve concept is most often applied in relation to production processes. While the presence of the learning curve is widely accepted, its exact causes are not fully understood. A portion of the cost reduction accrues because of the repetition of a task by the individual worker; it is as simple as the saying "practice makes perfect." This is generally considered to be short-term learning. Other factors contributing to the "learning" process include, but are not limited to, things like efficiency of plant layout, tooling improvements, management improvements and, to some extent, subcontracting. Often, these are considered long-term components of learning. Collectively, these long-term and short-term learning processes result in a constant rate of reduction in the labor hours and, hence, the cost to produce an item.

Government and industry use the learning curve extensively. Industry uses it in several areas. It is common practice to use the learning curve for production planning, scheduling, and facilities planning. In recent years, the learning curve has been used as a strategic tool in areas such as establishment of pricing policies and market-share strategies. Using knowledge of its own particular learning curve for a product, a producer may sell initially at cost or even at a loss, hoping to achieve a larger market share and to recoup early losses through efficiencies gained later during production.

The government uses the learning curve predominantly in the areas of cost estimation and contract negotiation on major hardware procurements. The cost estimator uses the learning curve to estimate manufacturing costs for hardware systems. Likewise, the contract negotiator should know of the learning-curve concept to ensure that the government is receiving the benefits of the contractor's increased production efficiency.

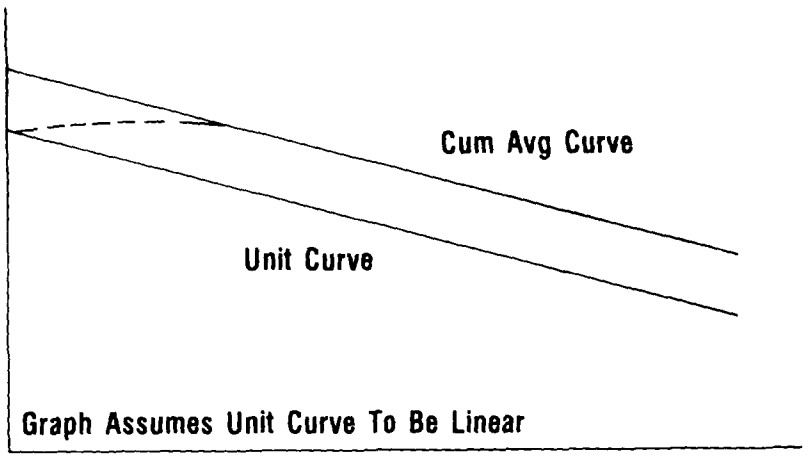
Quantitatively, both the cum avg theory and the unit theory are modeled using the same function:

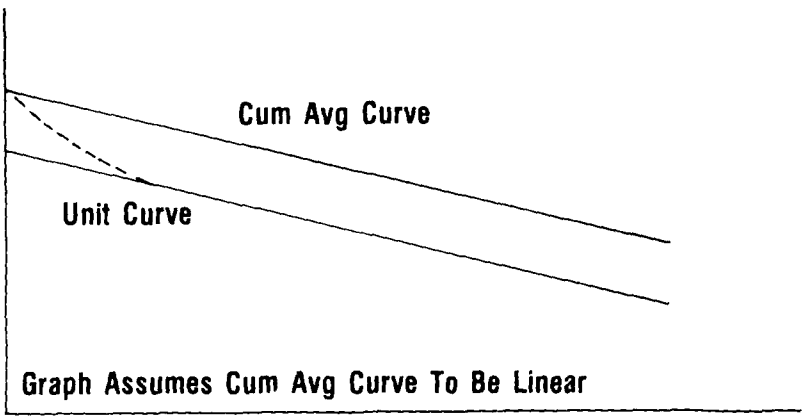
$$Y = A\,x^{B}$$

Where Y = Cost of the Xth unit (unit theory)

= cumulative average cost of the first X units (cum avg theory)

A = theoretical cost of the first unit (both theories)





X = a particular unit number (unit theory)

= cumulative number of units produced (cum avg theory)

B = learning curve exponent, an expression of the rate at which learning occurs (both theories)

This function becomes linear when one takes the logarithm of both sides, becoming:

$$\text{Log } Y = \text{Log } A + B \text{ Log } X$$

This is a straight line when graphed on Log-Log graph paper (sometimes called rate paper).

Note that it is the mathematical function which is linear in its logarithms. Actual production data will show some deviations from this line. Graphical techniques are not reproducible: that is, two individuals given the same set of data will not necessarily end up with the same line. Therefore, least squares regression is generally used to determine the values for A (theoretical cost of the first unit) and B (the learning curve exponent).

Techniques are available for generating both the cumulative average and the unit curve from almost any set of data. The obvious question becomes: Which one?

Under what conditions should one be preferred over the other?

In general, the cum avg curve is approximately parallel to the unit curve after an initial production period, and has a somewhat higher theoretical first unit cost (See Figure 1). This is not to say that the cum avg curve results in higher cost estimates. In fact, often they will give roughly equivalent cost projections. From a purely mathematical sense, there is no reason to prefer one curve over the other. One must recognize that the learning curve is an empirical device, based on experience and on the data. As such, it is the data and the intended use of the curve that should determine which one to use. The cumulative average curve is most applicable to industries using it in support of broad policy decisions or very general applications. For example, a corporation that manufactures two or three similar items may use a cum avg curve to determine what production capacity to build into a new plant to meet corporation production goals.

The government and, in particular, the Department of Defense should use the unit-theory learning curve. The government must be able to track changes as they occur in a production process. The cum avg curve tends to hide changes in the process because it is based on the cum avg cost; i.e., all past production history. It takes a sizeable change in the process to show a significant change in the cum avg curve, particularly if there have been many units produced. Two examples illustrate the point.

Example 1. The data in Table 1 are set up in the format used to generate the cum avg curve.

Using least squares regression to develop the cumulative average learning curve yields a formulation of:

$$Y = 1255\ x^{.220139}$$

This is approximately an 85.8 percent learning-curve slope; this is misleading, however. Table 1A shows the actual unit data from which the curve was generated. Notice that no learning has occurred past the 15th unit; the curve has bottomed out. Continued use of this cum avg curve results in underestimation beyond approximately unit number 21 (this is the unit number on that curve where the unit cost equals 500).

Notice that the cum avg curve has not revealed this plateauing of the unit costs.

Example 2. Most organizations do not maintain data on a per unit basis but rather on either a time basis or most frequently, on a production lot basis. Table 2 shows a set of production data for the first four production lots of an item. Columns 2 and 3 are the actual data being maintained. With these and knowledge of the units be-

Cumulative Units	Cumulative Avg Cost
1	1200
2	1080
3	1000
4	943
5	897
6	860
7	828
8	802
9	778
10	758
15	680
20	635
25	608

$$\text{Algebraic Lot Midpoint} = \frac{F + L + 2 \div (F \times L)}{4}$$

Where F = the first unit in a lot
L = the last unit in a lot

This formula is a combination of the arithmetic mean and the geometric mean, to account for the non-linearity of the learning curve. It generates column 7, which is the unit numbers for use in the unit-theory learning curve. Generation of both the cum avg and unit-learning curves results in the following:

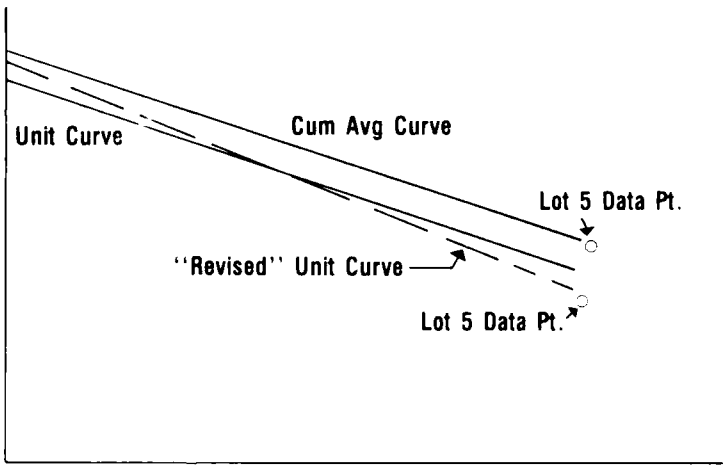
Cum Avg Curve: $Y = 1361\ x^{-.3108}$ (80.6% learning)

Unit Curve: $Y = 978\ x^{-.3179}$ (80.2% learning)

Notice that the cum avg curve has a higher theoretical first unit cost and is approximately parallel to the unit curve (has approximately the same slope).

Unit#	Unit Cost	Cum Avg Cost
1	1200	1200
2	960	1080
3	842	1000
4	768	942
5	715	897
6	674	860
7	640	828
8	615	802
9	592	778
10	572	758
15	500	680
20	500	635
25	500	608

ing produced, it is a straightforward procedure to develop columns 4 and 5. Note that it is column 2 (cumulative number of units) and 5 (cum avg cost) that are used to develop the cum avg curve. Column 6 is the average per unit cost for that particular lot, arrived at by dividing the lot cost by the number of units in the lot. This is the cost number for generation of the unit-theory learning curve. What remains is the computation of which unit in the lot theoretically costs an amount of money equal to the avg lot recurring cost. There are many approximation formulas to arrive at this value. The one used here is taught at the Army Logistics Management Center, Fort Lee, Va.



(1) LOT#	(2) UNITS	(3) TOTAL LOT COST	(4) CUM TOTAL COST	(5) CUM AVG COST	(6) AVG LOT RECUR COST	(7) ALGEBRAIC LOT MID PT
1	1-50	20100	20100	402	402	16.29
2	50-100	12600	32700	327	252	73.46
3	101-500	65800	98500	197	164.50	262.61
4	501-1000	60500	159000	159	121	729.16

Now suppose the data on the 5th production lot comes in. The lot consists of 200 units (units 1001-1200) and costs a total of $14,000. This adds the following data to Table 2, shown below as Table 2a, Amended Production Data.

Notice the rather large decrease in the avg lot recurring cost. Recalculation of both curves with the addition of the data for lot 5 yields:

Cum Avg Curve: $Y = 1405 \times^{.3179}$ (80.2% learning)

Unit Curve: $Y = 1238 \times^{.3783}$ (76.9% learning)

Note that the [illegible] minimal change w[illegible] has changed signi[illegible] some improvement in the [illegible] process. Figure 2 shows this [illegible] ically.

As the preceding example [illegible] shown, the cum avg learning curve [illegible] not responsive to changes in the production data, simply because the change gets averaged over the entire production history, thereby smoothing it out.

While this smoothing effect may be acceptable for some in-house planning [illegible]

LOT#	UNITS	TOTAL LOT COST	CUM TOTAL COST	CUM AVG COST	AVG LOT RECUR COST	ALGEBRA LOT MID PT
5	1001-1200	14000	173000	144	70	1098.25

The Troop Support Command's Belvoir RD&E Center has awarded three contracts for a concept design study for a helicopter maintenance support facility. It will become part of the Army ARAPAHO system, a modularized aviation maintenance facility that will provide intermediate and selected depot-level maintenance to a developing theater for rapid turnaround and repair of Army helicopters. Maintenance comprises pre-flight checks, preventative maintenance, component repair and some air-frame repair for ORF and battle damage aircraft.

The three firms receiving contracts will conduct studies and propose a concept for a "full up" system and parametric trade-off curves relating cost to performance capability. The concepts and trade-offs will be evaluated and an optimal system will be chosen for a technical data package for a competitive design and fabrication contract. Plans call for the competitive contract to be awarded in 1988 with first unit equipped in 1992. ■

Commercial (703) 664-[illegible]
AUTOVON 354-[illegible]

Commandant ..... 632-[illegible]
Provost ..... 632-[illegible]
Executive Officer ..... 632-[illegible]
Protocol Officer ..... 632-[illegible]
Industry Chair ..... 648-[illegible]
Navy Chair ..... 578-[illegible]
Air Force Chair ..... 597-[illegible]
Army Chair ..... 578-[illegible]
Dean, School of Systems Acquisition Education ..... 119-[illegible]
  Assoc. Dean, School of Acquisition Education ..... 298-[illegible]
  Assoc. Dean, Automation Resources ..... 612-[illegible]
  Course Director, Program Management Course ..... 269-[illegible]
  Policy and Organization Management Dept. ..... 616-[illegible]
  Business and Management Dept. ..... 429-[illegible]
  Technical Management Dept. ..... 51[illegible]
  Acquisition Management Laboratory ..... 68[illegible]
Dean, Dept. of Research and Information ..... 228-[illegible]
Deputy Dean, Dept. of Research and Information ..... 247-[illegible]
  Research Directorate ..... 578-[illegible]
  PMSS Directorate ..... 479-[illegible]
  Educational Research Team ..... 578-[illegible]
  Publications Directorate ..... 508-[illegible]
  Managing Editor, *Program Manager* ..... 599-[illegible]
  Information Directorate (Library) ..... 153-[illegible]
Dean, Dept. of College Operations and Services ..... 108-[illegible]
  Registrar/Class Information ..... 107-[illegible]
  Budget Office ..... 228-[illegible]
Regional Offices
  Director, Huntsville, Ala. ..... Commercial (205)876-2730 5[illegible]
  ..... AUTOVON 746-2730 5[illegible]
  Director, Los Angeles, Calif. ..... Commercial: (213)643-1159 121[illegible]
  ..... AUTOVON 833-1159 121[illegible]
  Director, Hanscom AFB, Mass. ..... Commercial (617)377-358[illegible]
  ..... AUTOVON 478-358-[illegible]
  Director, St. Louis, Mo. ..... Commercial (314)263-114[illegible]
  ..... AUTOVON 693-114[illegible]

STANDARDS OF CONDUCT
SELF-DISCLOSURE
GOVERNMENT OVERSIGHT

Caspar W. Weinberger
Secretary of Defense

The very fact of this forum is testimony to the defense industry's interest in getting its own house in order. Still, it is not *good* news that has brought us here. As we all know, waste, poor management and actual criminality in too many companies have made this gathering both desirable and necessary. Only when we have no need for a best practices forum can we say that we have accomplished what we set out to do.

Government officials do no one a service if they merely chide industry for what is called an impression of widespread lawlessness, fueling popular mistrust of the integrity of defense industry. But neither is it possible for us to ignore reality. And if we cast our eyes over the defense landscape today, it is apparent that action to institute self-policing is long overdue. There are many who busy themselves with the unproductive task of affixing blame for this situation. They blame the Department of Defense, they blame the defense industry, they blame Congress, they blame President Reagan.

Productive Approach

It is welcome, therefore, to see your group take a more productive approach, by pursuing the goal of understanding how we can maintain our defense consensus and, even more important, ensure that the American people get the most and best security for the fewest dollars.

Let me begin by noting a historical truth: democracies find it difficult to sustain peacetime military spending. Just prior to the Korean War, a host of analysts were urging the president to increase defense expenditures dramatically. Indeed, the State Department produced a now famous secret document—NSC-68—which painted a grim picture of Soviet intentions and forcefully argued for greater preparedness. The Congress, reflecting the war weariness of the nation, balked at increased security assistance funds for Korea. No more money down that "rat hole," one member said. Some "rat hole"!

It was, of course, the Korean War itself that finally spurred the Congress to appropriate funds for our military. It was the Korean War that convinced the United States that we must take our global responsibilities seriously. Still, defense spending continues to be characterized by the same kind of pendulum-like shifts. These shifts have sent confusing messages to our friends, our adversaries and everyone in between. We should not and must not have to have a war to get adequate resources for defense. Indeed, the whole rationale for defense spending is that if it is adequate, we will never have to have a war.

To some extent, such swings in public support for defense are the natural consequence of democratic government. We tend to prepare for war only at the last minute; we tempt tyrants and fate with the belief that we are thoroughgoing pacifists. Nevertheless, in democracies, strong leadership can make a difference. Strong leadership can design and execute a coherent strategy for free peoples.

But today, as in the past, there are those who would reverse the regaining of America's military strength, achieved by President Reagan's leadership. The actual and assumed abuses of the defense industry are one of the many excuses used by our critics to slash the defense budget. Nonetheless, it has become an effective excuse in their arsenal, and we should not give them any ammunition. They invent enough as it is.

Cuts in the Budget

For Fiscal Year 1985, Congress cut the president's defense budget by $16.4 billion; in FY 1986, another $19.7 billion was slashed; and for FY 1987, the Congress cut fully $28.5 billion from our request. The necessary increases we asked for and received for 1981 to 1985 made a significant contribution to our security. But we cannot live from that capital forever. Indeed, our combined defense budgets for 1986 and 1987 represent a 7 percent real *decrease* below the level of 1985. This is a most serious trend that, if continued, will take us back to the decade of neglect—the 1970s. The budget crisis we face threatens to get worse, not better. Unless we can convince the Congress that despite the deficits, induced by unbridled domestic spending, we will have to try to deter Soviet attacks with the budget of a second-class power.

These remarks were prepared for delivery by Secretary of Defense Weinberger to the First Annual Best Practices Conferences, Washington, D.C., October 30, 1986.

I believe this conference is an important step in the effort to convince the Congress that our defense needs are urgent and that we should not take risks with our security.

Unquestionably, the entire defense industry has been maligned by the misdeeds of a comparatively few contractors. Coupled with a general, and altogether populist, mistrust of big business, the industry as a whole has suffered significantly. But it is, to say the least, unwise to believe that the troubles of the defense industry are the product merely of media or congressional overstatement. True, the abuses so familiar to the public *have* been taken out of context, they *have* been exaggerated, and they *have* been misunderstood. But they also have had their impact. Denying this impact, or the facts behind it, will not help. The best practices forum proves that the defense industry understands this.

The subject of your meeting, contractor self-governance, is a matter of particular interest and encouragement to me, since it represents the continued applicability of a policy I started and encouraged when I was chairman of the Federal Trade Commission many years ago. It is also an opportunity to improve not only the public's impression of defense acquisition, but, and most important, actually to improve the whole process of defense procurement. Rules of conduct that are devised and widely adopted by contractors themselves and openly and vigorously enforced by you yourselves can demonstrate industry's commitment to high standards of doing business. This process can also produce better results than could be exacted by government police work.

A significant error will be made, however, if we think that the whole problem of self-governance is, at root, a public relations challenge. Far from it. The essential challenge is that poor business practices *must be corrected*. Only then can we expect the open and public demonstration of good conduct to yield a more robust defense consensus.

We must eliminate improper, illegal and criminal practices, along with corruption on the part of corporate employees. The key to restoring public confidence is not simply the *promise* of better conduct. It is *action*, taken by business and DOD, to correct abuses and to implement procedures that prevent their recurrence. In short, it *is* better conduct.

It is also incumbent on the government to make itself clear. What is required and what is expected must be laid out explicitly. We cannot ask industry to develop codes of conduct and then leave fuzzy the legal implications of various actions. Government must uphold its end of the bargain.

Three Essential Steps

There are, in fact, I think, three essential steps that we all must take if we are to keep the confidence of the American people.

First, there is the purpose of this forum. By developing high standards of conduct, as outlined in your six principles, industry will show that it not only understands the fundamental problems, but is willing to do something about them.

In this regard, I especially want to commend you on your efforts to understand more clearly exactly what is meant by the idea of corporate ethics. Much that we read these days confuses ethics with simply obeying the law. Ethics is certainly more than that. At root, corporate ethics must deal with the question of the proper role of the large corporation in a democratic society and the responsibility executives and the corporation have to their nation and their community. This is a responsibility felt most deeply by the defense industry. Your industry, in fact, understands better than any other what it means to support our national security while organizing and executing a large business.

And we should not forget, lest we hear from Adam Smith, that business also does well for the community when it does well for itself. A prosperous, vigorous industrial community provides the most basic and best social service I know of—jobs. It is not capitalists who really misunderstand what corporate ethics are.

As a *second* step to ensure public confidence and fulfill the promise of this forum, we need to develop workable vehicles for government and industry to use in dealing with improprieties and criminal activity. One of the most effective of these will be our self-disclosure program. In fact, and not to get too autobiographical,

when I was chairman of the Federal Trade Commission, we initiated a similiar self-disclosure program. As you well know, this is not a means for excusing contractors from improprieties or illegalities. Rather, it is an expeditious way to restore proper business practice and limit any interruption in the production of vital defense requirements. To the public, our self-disclosure program can demonstrate that companies do not condone illegal or improper conduct.

If self-disclosure works, it will be an important way to build confidence between business and the government. Moreover, it will prove to the public that defense industry sets a standard of conduct for all other government contractors and for business in general.

A *third* step to keep public confidence is government oversight. Because as James Madison said, men are not angels, we must expect that among the some 100,000 defense contractors, there will be improper conduct. Therefore, the government must maintain vigorous oversight, auditing and investigative functions—not to hinder or harass business, but to protect against those who violate the law despite your and our best efforts. All this, of course, will be made considerably easier with self-disclosure available.

Suspensions, Debarments Rise

As you know, we have increasingly used suspensions and debarments in recent years to protect the government. In fact, in 1981, only 151 suspensions or debarments took place; since then, the number has steadily risen to more than 650 in 1985. The 1986 figure will be even higher. Our increasing use of this vehicle for protection of the government reflects our desire to promote a greater adherence to the high standards of ethics and business practices that are the just expectation of the American people from their defense industry.

This *was* and *is* our *only* motivation for increased use of suspension and debarment. These are *not* punitive actions; they are positive steps to protect the American people and ensure the integrity of the defense companies with which we deal.

The settlement agreements we have actually reached with suspended contractors demonstrate conclusively that this process protects the government, ensures improved practices and encourages real and enforceable standards of conduct and ethics in companies that previously lacked them.

In reaching such agreements, we are placing increased emphasis on contractor restitution to the government, including the costs of investigation. More importantly, settlement agreements now outline very specific actions to be taken by contractors to implement comprehensive corporate ethics programs and internal audit and management controls, *and* to enforce them. The General Dynamics and Litton settlements are good examples of these efforts. These settlements define those actions in detail, including provisions for outside oversight of company conduct. Settlement agreements are proving very effective in ensuring honest business dealings with the government and restoring public confidence in our procurement practices.

Better Acquisition System

The three essential steps I have highlighted—standards of conduct, self-disclosure and government oversight—can contribute to the goal we set out to accomplish in 1981—a better acquisition system. However, we must bear in mind that there must be another participant in improved defense acquisition—one that our critics too often ignore. That other participant is the United States Congress.

We believe we have significantly improved our management systems since we took over in 1981. And industry has participated in a continuing process of reform and adjustment to the increasingly complex demands of our national defense. Indeed, industry has long recognized that the responsibility of doing business with the government calls for special practices that are not common to other parts of the business community.

But where does the Congress stand in this reform process? It stands on the outside, looking in and pointing its

tinger. Rather than provide general oversight, broad rules and basic direction, the Congress has become a voracious consumer of the most detailed information on the Defense Department. The insatiable congressional appetite for reports, hearings and meetings has produced burdensome micromanagement. It sometimes appears that the Congress' desire for detailed meddling is designed more for the media than it is for America's national security.

Between 1970 and 1985, there was a 1,172 *percent increase* in reports and studies requested by the Congress [36 to 458]. These reports routinely cover such diverse topics as strategic modernization and the religious preferences of our servicemen. Preparation of these reports takes an enormous amount of manpower and serves a questionable purpose, at best. Preparation of irrelevant reports for the Congress can best be described as congressionally mandated waste.

In the area of micromanagement, the Congress now dictates to the military services, in the most excruciating detail, exactly what they can buy. More often than not, these demands reflect the parochial concerns of a few congressmen and, in the traditional process of logrolling, gain considerable support. Thus, we are directed to compete where there are no competitors; and we are forbidden to compete if competitors reside outside certain congressional districts. Or there are attempts, by those who spend the rest of their time decrying "defense waste," to buy airplanes no one except a weakened company wants. Both time and money are wasted in this process of attempting to please every narrow constituency and special interest.

If we are to reform our acquisition system, more will be needed than just the efforts of DOD and the defense industry. The Congress' detailed manipulation of line items in the defense budget is contrary to the national interest. This is *not* what the founding fathers intended as the Congress' role.

It is time for the Congress to turn inward and think seriously about legislative reforms urged on it by us and others for many years. Only then will the Congress join industry and DOD in our ongoing efforts for reform.

Conclusion

As we all know, the problem is not writing new laws or designing new principles of action. Our basic problem is knowing how to sustain public support for a steady, well-planned defense program. The threat has not diminished. The world has not suddenly become so safe that freedom can take second place to deficit reduction. The need for a robust deterrence remains as long as the Soviets pursue their goal of world domination.

We must all recognize that inherent in our democratic system is an aversion to peacetime spending on defense. With that aversion comes a host of excuses why we need not spend what is the minimum required. Industry, therefore, will always be a target.

It is incumbent on us to see to it that *those* excuses—that the accusations of waste and fraud—have *no* substance. When the familiar cries of the critics are seen to have no content, when the claims of contractor abuse are hollow, then we can say that the job of this forum has been completed.

Nevertheless, as we continue the reforms begun in 1981, we must continue to ask the Congress to join us. The Congress bears at least one-third of the responsibility for a solution.

Allow me to close by congratulating you for forming this vitally needed group, which can help, most significantly, to protect the peace and freedom of all of us.■

A prototype straddle container handler that can unload landing craft in areas where there are no port facilities and then travel between work sites at speeds up to 45 miles per hour is being built under contract with the Troop Support Command's Belvoir RDE Center.

The unique vehicle, which stands 12-feet high and utilizes a spreader bar designed by the manufacturer, is powered by a 730 horsepower diesel engine and travels on off-road radial tires nearly five feet in diameter.

The prototype is scheduled to be delivered in March 1987.■

AND WEAPONS ACQUISITION INVOLVEMENT

Ronald Baker

he oversight role played by the Congress in the Department of Defense weapon systems acquisition process is often not fully understood by some program managers. On the other side of the aisle, some would say that the Congress itself does not understand the Department of Defense acquisition process and, therefore, exercises its oversight role in an inappropriate fashion. It would not be unreasonable to state that there exists a fundamental need to understand each other's responsibility in order to foster a better working relationship in dealing with weapon acquisitions.

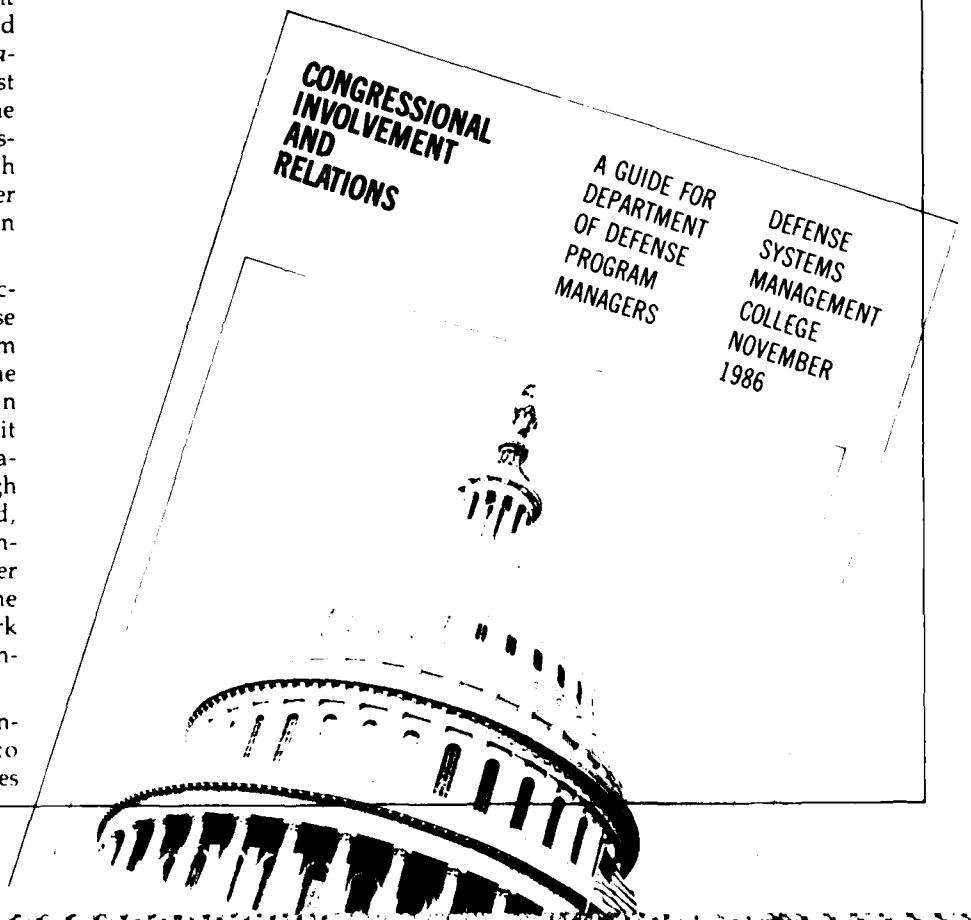
The Defense Systems Management College has developed a guide entitled *Congressional Involvement and Relations*. This guide is written to assist program managers in achieving the necessary understanding of congressional involvement and relations with the Department of Defense. Other DOD officials working in acquisition also may find this guide useful.

To function properly and be successful, the Department of Defense weapon system acquisition program managers must first understand the Congress as an institution, its role in governing, its objectives, and how it operates. Second, the program manager must learn the system through which his program is approved, funded, and monitored by the Congress. Third, the program manager must appreciate the relationship the Congress has with DOD and work within the framework of that relationship to manage his program.

The guide describes how the Congress is organized and structured to carry out its two major responsibilities in dealing with DOD: (1) the legislative process and (2) the oversight function. The congressional decision-making process also is discussed focusing on the defense committees. A chapter is devoted to How the Program Manager Does Business with the Congress. The guide also addresses the following topics: DOD Liaison with Congress; The Congressional Budget Process; Congressional Hearings; Congressional Inquiries and Investigations; and Congressional Data Requirements and Reporting. Congressional trips to program offices and contractors' plants are reviewed. This information should be helpful to DOD personnel who have had limited exposure to congressional members and staffs.

A limited number of copies of the guide are available from the Defense Systems Management College. To obtain a copy, write to *Congressional Involvement and Relations*, Defense Systems Management College, ATTN: DRI-P, Fort Belvoir, VA 22060-5426. In the near future, copies will be available through the Defense Technical Information Center, Cameron Station, Alexandria, VA 22314.■

■ *Mr. Baker is a professor of financial management in the Department of Research and Information.*



THE INFORMATION MEETS A CHALLENGE HEAD ON

Major General John T. Myers, USA

In the spring of 1984, the 7th Signal Command, Fort Ritchie, Md., was doing its job in the Continental United States (CONUS), Alaska, Panama, and Puerto Rico with a dedicated military and civilian work force of more than 9,000.

Our job was to provide communications and electronics services and air traffic control services in our area of operations. Our people were doing a great job with the resources provided.

In May 1984, the Army Chief of Staff made a decision of historical significance. The impact on the 7th Signal Command is still being felt.

Five Business Areas

The decision changed the way the Army did business, which was organized in the areas of automation, communications, printing and publication, visual information and records management. These are referred to as the Information Mission Area (IMA).

With the decision to place the five functions of the IMA under a single Department of the Army staff chief came the decision to redesignate the Army Communications Command as the Army Information Systems Command. With it went the job of delivering all services in the IMA. The Department of the Army staff element became the Office of the Assistant Chief of Staff for Information Management.

Implementing this decision has been a tough and controversial task. All elements of the Army's worldwide major commands were affected. There was a major realignment of mission and resources. The necessary implementing instructions were not always timely, nor were they adequate.

Leading the Way

The role of the 7th Signal Command in this process was to implement these decisions in its area of operation. This placed it in the lead for effecting the changes with three of the Army's major commands and at least half a dozen others. Headquarters, Department of the Army (The Pentagon) is a major task unto itself. The major CONUS players were Forces Command, the Training and Doctrine Command, and the Army Materiel Command.

The first step in the process was a thorough briefing for MACOM commanders and staffs. This was a joint effort by DACSIM, USAISC, and 7th

■ *Major General Myers is the Commander of the 7th Signal Command and Fort Ritchie, Md.*

Signal personnel. Briefings attempted to describe clearly to personnel in the field the breadth and scope of the decision to create the IMA; also, to articulate long-term goals.

The briefings, well-received, were extremely controversial because the detailed implementation instructions had not been provided to the field. This is not surprising because the change impacted on every aspect of the MACOM commander's mission.

Project Implementation

With the establishment of Information Systems Command and its new missions assigned, we were on our way. A project implementation office was established, headed by a colonel to handle problems for the commander of the 7th Signal Command.

Although the IMA had been defined and the mission transfer decided, that implementation would drag out for the next 3 years.

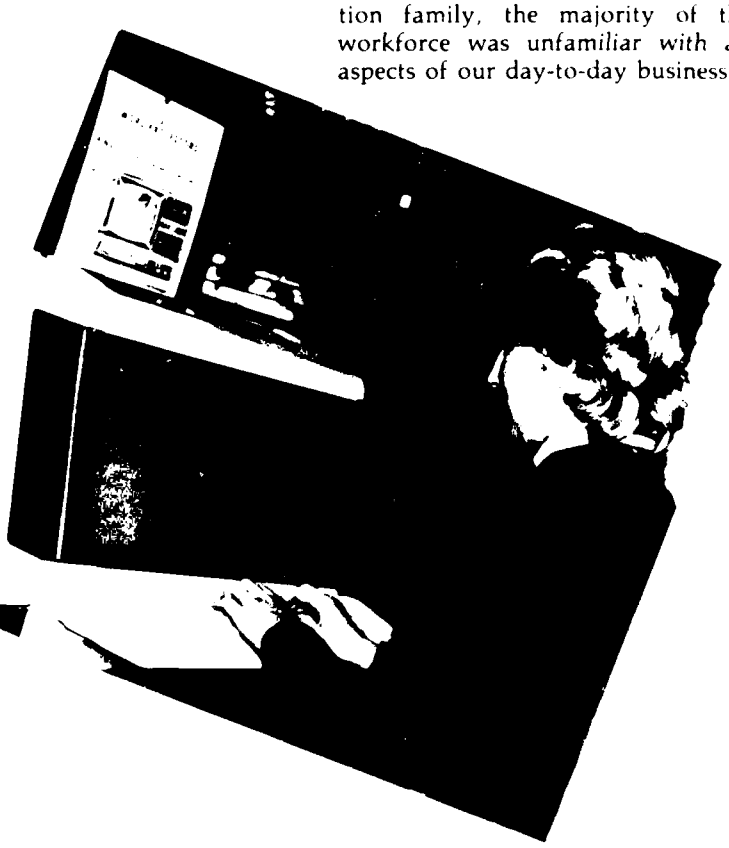
The first major new mission agencies transferred to 7th were the Army Audiovisual Center, the Research, Development and Acquisition Information Systems Agency, and the Army Management Systems Support Agency. The last two are major automation centers in support of Headquarters, Department of the Army. These took place without incident, the customer never knowing the transfer took place from a service perspective.

Milestones

The next actions dealt with the development of memorandums of understanding (MOUs) with Major Commands. The DACSIM published guidance that laid out milestones to be met for the transfer of mission and resources to USAISC. 7th Signal Command. These milestones stretched the actions over 3 fiscal years; all actions were to be completed by the end of Fiscal Year 87. By the summer of 1985, the 7th Signal Command, as agent for USAISC, had completed MOUs with AMC, TRADOC and FORSCOM.

The other Major Commands followed. These documents constituted the first formal agreements on the details of the mission and resource transfers that had to be accomplished. Each was slightly different and reflected initial concerns and priorities of the separate commands.

Other than the obvious issues associated with any move of mission, money and people, the real problem was bringing together a diverse workforce into an integrated, mission-capable team. Since the organizational and procedural core of the organization was the "old" Army communication family, the majority of the workforce was unfamiliar with all aspects of our day-to-day business.



The "old" Army Communications Command hands knew nothing of the automators' world. Neither knew anything about printing and publication, or records management and visual information systems. We had an instant and enormous training and education problem on our hands. This would have been tough enough if everyone was enthusiastic. Almost everyone felt threatened.

On the Road

The commander and deputy commander of 7th Signal Command spent almost every available minute in those early days on the road explaining the value to the Army and the benefits of the change. A great effort was made to explain that the reorganization was a real opportunity for people willing to be retained and move into the high technology world. Most of our dedicated employees, once they understood what was going on, put their shoulders to the wheel and got behind the reorganization with enthusiasm. There was more support early on at the working level than there was at higher levels concerned. Many of those employees have moved into upward mobility positions and are the future managers of the IMA.

From the outset, we recognized that retraining the workforce at the supervisory level was an urgent and immediate requirement. We looked at our new organization and determined that the focus of our training course should be at the installation level; that is, we felt that folks needing the most help the quickest were directors of information management.

Man with a Problem

The DOIM commander or director of the garrison USAISC detachment, who is both a staff officer on the garrison commander's staff and a commander director in the 7th Signal Command chain of command, was the man with the problem.

When we initially brought the IMA functions together at the garrison level, we said that the senior person would be the boss and that would be the call of the garrison commander. As it turned out in FORSCOM and TRADOC about 60 percent of them were the former USACC director and 40 percent were the automation management officers. In the case of AMC, it turned out that 80 percent of those selected were former automation management officers.

The first week-long course of instruction at Fort Ritchie was in the spring of 1985. By the end of October 1986, we trained every DOIM and DCSIM in the command plus several hundred of their staffs. This has been a major effort for 7th Signal Command. Although the investment was significant, the payoff has been exceptional.

Security

We started with an alienated workforce not wanting the IMA integration and with no knowledge of the way USAISC did business. Today, we have a dedicated team understanding and supporting the integration; they know their jobs and how to acquire and deliver first-class service.

The autumn of 1984 and most of 1985 were spent negotiating with the CONUS Major Commands on details of actually implementing the IMA transfer. There were innumerable staff-level meetings. After an issue or set of issues were clarified, there would be a General Officer meeting to try and reach some agreement. These were usually successful although some issues would ultimately be resolved by the Vice Chief of Staff.

In working the issues with TRADOC, most were resolved early. One not resolved dealt with two separate but related visual information issues. The TRADOC held the position that visual information systems were so integral to its training mission that it must keep total ownership and control of the mission area. The related issue dealt with the fact that the Army, for matters of economy and efficiency, integrated training aids and the audio-visual functions several years earlier.

It was not practical or feasible to separate them. The USAISC position was that we were certainly not in the training-aid business but would take on the integrated organization, if directed. This same set of issues became an issue with FORSCOM and was resolved in the same way.

Training-aid support centers, which were the integrated activities discussed above, would remain with the owning Major Command. In cases where you had only an audio-visual support activity, that activity would transfer to USAISC. The policy for visual information would flow from DACSIM and then to 7th Signal Command directors in the field.

Dedicated Team Emerges

Another issue that surfaced early dealt with security accreditation. The Major Commands held the position that they should retain the authority for accrediting information systems and facilities. The USAISC held the position that they should have this authority just as they had always held it for the telecommunications centers that they had always operated. This issue was resolved in favor of USAISC.

Throughout 1985, printing and publications and record management issues were worked at Department of the Army level and the entire mission transferred to USAISC. This again brought another group of workers into the family with a totally different perspective and background. Just as we recognized we had an enormous training problem on our hands, we now recognized that the existing civilian job series and associated development policies and programs were not suited to the IMA; we recognized the kinds of talent we needed and, more important, had to develop. Actions were begun in 1985 to define our job series problem. Department of the Army elements, along with the civilian personnel community working with USAISC, worked on the problem. We wrote a standard job description for the DOIM position, modified only as needed by the local mission. The initial job series was the 301 series. Along with the

(See Signal, page 26)

in the eighties

David D. Acker

he trend toward inclusion of courses in ethics in higher education is encouraging. Those people who are concerned with this subject have only seen *the light at the end of the tunnel* for a few years. "...There is no question that the issues in engineering ethics are intellectually challenging and socially significant, and that scholarly activities dealing with these issues should be encouraged. The only difficult question is that of how to attract sincere and competent individuals from a variety of disciplines to work together in a constructive way, as required by the complexity of the issues. Fortunately, such persons are beginning to come together more or less spontaneously, and a small community of scholars is now coming into existence." So stated Dr. Robert I. Baum, professor of philosophy and director of the Center for the Study of Human Dimensions of Science and Technology, Rensselaer Polytechnic Institute, in the conclusion of the "Ethics and Engineering Curricula" study conducted in 1980 by the Hastings Center. This was a pioneering venture because, as Dr. Baum points out, "many ethical problems associated with the engineering profession have never been explicitly recognized or discussed to any significant degree outside the profession."[1]

The number of ethics courses in engineering curricula in the United States has been growing for the past two decades, but there is a long way to go before more than a token number of students will have had any formal exposure to ethics as undergraduates. This was one of the conclusions reached in the Hastings Center study. The study focused on the steady growth of ethics courses offered in a wide range of disciplines beginning in the seventies. As ethics questions have been raised, courses have found their way into various profession-oriented curricula. This has been due, in part,

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

Aims of Education

The right kind of education is the awakening of intelligence and the fostering of an integrated view of life. So, the truly educated man who cannot be selfish and narrow-minded is freed from the chains of degrading reality and develops a human outlook. He approaches life with intelligence and sympathetic understanding. He tackles controversial issues with the temper of a judge rather than that of the advocate or the notorious expert witness. He resists the trivializing influences of society and the effects of a nervous and mindless culture, which craves for sensory satisfaction. He judges things by standards, which reject what is false and second-rate in life, and weighs all evidence in the scales of a balance which are not tricked, biased, or tilted to one side. In short, he is a successful and a socially well-adjusted citizen with character, personal rectitude, creative thinking, and capacity for cooperation.

—Indian Air Force Quarterly Summer 1982

Responsibility of the Individual

Individual responsibility that follows from living within a universal moral order is essential to the working of liberty. If each man is to have liberty, he must assume responsibility for himself. If he does not, or if society does not impose it upon him, he will suffer, and he may use his suffering as an excuse for compulsory social action.

—Professor Clarence B. Carson
"Of Virtue and Morality"
The Freeman
March 1964

to the pressures caused by issues the media has brought to the attention of the public.

According to the Hastings Center Director, Daniel Callahan, the professions have had to face new problems that traditional ethics has not had to cope with previously. For example, incidents like the Three Mile Island, the DC-10, and the Hartford Civic Center disasters have emphasized engineering involvement in life or death decisions that have a great impact on the public. Dr. Baum has indicated that engineering decisions often "affect directly the health and welfare of large segments of the general public." In the mid-seventies there were less than five engineering ethics courses in the United States; now there are more than 100. These courses are taught separately from the traditional courses in professionalism, and students have an opportunity to delve into some important ethics issues. In engineering, as in other fields, there is often a great resistance on the part of the faculty to incorporate soft, liberal arts-types ethics courses into the otherwise hard, technical education. Callahan has found that "ethics is often viewed by technical people as irrelevant."

Some key goals of ethics courses, according to the Hastings Report, are to stimulate students' moral imagination and to provide them with the analytical skills needed to cope with a given dilemma. "In a well-taught ethics course, there is less of a chance of indoctrination than in economics or engineering," Baum said, "as the class is taught how to criticize everything, including the teacher."

Ten years ago Derek C. Bok, president of Harvard University, stated, "It is widely believed that most of the sources that transmit moral standards have declined in importance. Churches, families, and local communities no longer have the influence they once enjoyed in a simpler, more rural society. While no one can be certain that ethical standards have declined as a result, most people think that they have...."[2] The Hastings Report implies this situation has changed to some degree since Bok made this observation.

Suppose our ethical standards are eroding, and distrust and suspicion are spreading. Then, our willingness to behave morally toward our fellow workers and others is declining. I hope this is not the case. Rather, I hope we have turned the corner and our ethical standards are heading toward a higher plateau.

Companies in the defense industry have taken the initiative to establish standards of conduct, and the standards are being enforced. Furthermore, our public officials have been using their imaginations in seeking ways to alter incentives in the legal and regulatory structure to encurage good ethical behavior. In the media, we read or hear about ethical problems. These problems are newsworthy because they are not the norm; rather, they are the exceptions.

Basic Role of Institutions

What kind of a role can the military service schools and colleges—like the Defense Systems Management College—and public and private institutions play in improving ethical standards? Sometimes faculty members are reluctant to discuss this subject in the classroom because it tends to appear trite; *everyone* has heard about it at one time or another. Regardless of the attitude held by some, the subject should not be ignored.

Faculties in our institutions of higher learning occupy strategic positions, and can contribute to our knowledge of ethical standards. If, as Bok found a decade ago, our personal values and ethical standards are declining, educators can reverse the trend by contributing in the way we know best by lectures discussions in the classroom and by publication of their best thinking on this subject. For example, this series of articles is an attempt to draw your attention to the subject.

Teaching of Ethics

In most professional institutions, courses devoted to ethics are peripheral to the curriculum, and teachers generally have no special qualifications. Further, teaching ethics is often a personal commitment because it rarely offers professional rewards. Finally, good teaching material on ethics is not generally available. Prevailing problems are solved when agreement is reached on the purposes of such courses. The answers to the following questions can help to solve these problems: What should courses in ethics accomplish? What should the faculty strive to achieve in ethics courses? Should the courses strive to develop the moral behavior of the students? How should ethics courses be evaluated?

The Carnegie Foundation and the Rockefeller Brothers' Fund provided support to the Hastings Center to conduct a 2-year project on the teaching of ethics. The project, involving an extensive examination of the place of ethics in American higher education, included 10 conferences, discussions with 500 ethics teachers at all levels of higher education, and a week-long workshop at Princeton University. A core group of 20, with a diversity of backgrounds and experience, participated. Daniel Callahan, identified previously, and Sissela Bok, a philosopher at the Harvard-Massachusetts Institute of Technology Division of Health Sciences Technology, were project co-directors.

The project team determined there should be at least five basic goals in teaching ethics. Simply stated, these were:

- *Stimulate Moral Imagination.* Encourage students to understand there is a moral point of view.

Recognize Ethical Issues. Strengthen ability of students to perceive when and how issues of morality are present.

- *Develop Analytical Skills.* Explore methods of argument employed in moving from moral principles to practical conclusions.

Elicit a Sense of Moral Obligation and Personal Responsibility. Ensure the teaching of ethics is not merely an abstract exercise. Emphasize the not-

to-be-avoided connection between thinking abut ethics and one's personal conduct.

—*Tolerate and Resist Disagreement and Ambiguity*. Encourage students to find civil and rational ways to handle moral disagreements, and to reduce ambiguity by locating and specifying their sources.

These five goals can animate any class in ethics. However, it is important for students in professional fields to study the history of ethics in their professions; the codes of conduct; and the political, cultural, and social contexts that can lead to and sustain ethical standards.

According to the Hasting's project report, "one goal frequently proposed for courses in ethics is missing from the list (of basic goals): changing student behavior....There is no point in teaching an ethics course unless it will guarantee improvement in student conduct." Although not an explicit goal, a course in ethics will have served its purpose if it helps the students to "perceive, articulate, and analyze moral problems, even in the absence of direct effects on conduct."[3]

Institutions that offer only survey courses in moral philosophy make a limited contribution to the field. Survey courses, as one might expect, do little to help students cope with the moral and ethical dilemmas they will encounter daily.

Enlightened institutions are weaving ethical problems into many courses. This is effective because it displays to students that ethics is integral to their daily lives; however, this approach does not always give the faculty an opportunity to acquaint students with the philosophers, past and present, who have devoted research to studying ethical standards. One might ask: "How many faculty members have sufficient knowledge of ethics to be equal to the task? The answer is, unfortunately, most faculty members are inclined to treat the subject lightly. They present problem-oriented courses focused on subjects like deception, leaking confidential information, breach of contract, unethical employment practices, and other moral dilemmas we face daily."

The ethical concept of moral law should be balanced in classroom presentations with the concept of good or desirable ends. An unbalanced presentation might lead to an understanding that ethics means simply keeping the law, or taking a passive position relative to the public well-being.

We should increase our awareness of the importance of ethics in our lives and make decisions that reflect high ethical standards. Personal concepts of right and wrong are generally formed by our religious persuasion or our understanding of the nature of mankind. Ethical issues embody considerable emotional involvement, and teachers in this field need to concentrate on the objective nature of ethical inquiry. This is especially important when students have differing viewpoints about the ethical nature of a particular situation.

T. A. Murphy, chairman of General Motors Corporation, made a profound statement which supports my thesis. He has raised the question: "In a world where moral and ethical expediency is practiced by some of our loftiest institutions, how do we preserve a sense of the absolute, of unchanging values? A lie is a breach of trust. It is a perversion of communication. It attacks the very foundations of personal as well as business and institutional relationships. In all great religions of the world it is still regarded as an aberration, if not a sin. And anyone who thinks that he or she can function with one code of morality in the world of business, and a different code of morality in his or her personal life, is living a kind of spiritual schizophrenia. That can be just as destructive psychologically as it is spiritually."[4]

David Rockefeller, chairman of Chase Manhattan Bank, is credited with saying, "Personal honesty and ethical integrity must be constantly encouraged and reinforced. Anyone who discourages honesty and integrity—whether in the classroom or boardroom—does a disservice to our society."

Institutions of Higher Learning

During the 1800s, it was normal for the head of an institution of higher learning to address senior students on acceptable ethical conduct and practices. Because of their positions and/or personalities, this left a deep impression on the students. In the 1900s, society often discredited lectures of this type. Many current students and recent graduates of both public and private academic institutions don't always show respect for authority or appear to be impressed by those who are in roles of authority. The social changes in our society since the mid-1900s have caused the heads and faculties of our institutions to become more doctrinaire—even arbitrary. Their lectures have become didactic in nature and they have often failed to prepare students to think for themselves when applying moral principles to ethical issues.

Standards of conduct, whether honor codes at military service academies or other institutions of higher learning, are often subject to narrow interpretation. This may cause distortion of the general view of moral behavior. Malham M. Wakin, Air Force Academy faculty member, believes immature or unsophisticated students frequently narrow their ethical sights to the behavior delineated in a code of ethics. What may have been intended as a minimum listing in the code is treated as an exhaustive guide for ethical action. Wakin says, "We forget all too easily the wisdom concerning these matters given to us by almost every moral philosopher dating back at least as far as Socrates, Plato, and Aristotle. The classical Greek conception of the just

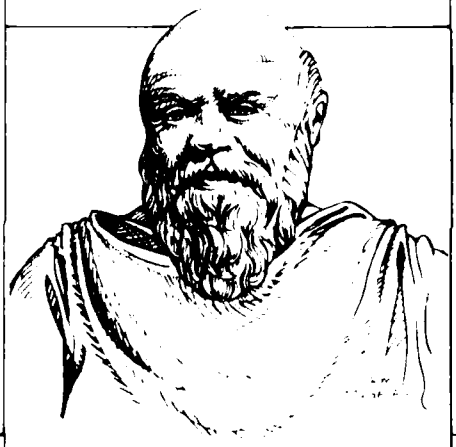
The Quality of the Human Spirit

In professional matters a person must accept personal responsibility for his own actions in order to assure quality of performance and to establish credibility for his advice and the value of his services. This concept of personality, in fact, attests to the highest form of human service. Unfortunately, allied against the promotion and development of this quality of the human spirit are the forces of modern-statism. When a people are led to believe "someone else" will do a necessary task or that "government will take care of their needs without a corresponding effort on their part, the development of a sense of personal responsibility is severly retarded if, in fact, it develops at all.

—John A. Clark
Chairman, Department of Mechanical Engineering
University of Michigan
February 1971

Socrates (c.470-399 B.C.), Greek philosopher and moralist, introduced concern for a method in philosophy, stimulated an interest in the logic of argument, and gave much attention to human affairs. The three paradoxes associated with him are: virtue is one (each virtue is no different from any other virtue); virtue is knowledge; and no one knowingly does what is bad. He was convinced his calling was to search for wisdom about the right conduct by which he might guide the intellectual and moral improvement of the Athenians.

Aristotle (384-322 B.C.), Greek philosopher and scientist, divided the sciences into three classes: theoretical philosophy, practical philosophy, and productive philosophy. He believed man had two kinds of virtues: moral and intellectual. Through these virtues and their pursuit, we arrive at the life of contemplation of truth, which is man's highest activity. He argued that the goodness or virtue of a thing lay in the realization of its specific nature.



Plato (c.427-347 B.C.), Greek philosopher and a brilliant figure in the history of Western thought, believed the final goal of inquiry is a theory of value. His main ideas were concerned with the unity of virtue and knowledge, and of virtue and happiness. He argued for the independent reality of ideas as the only guarantee of ethical standards. Further, he argued that justice cannot be understood fully unless seen in relation to the Idea of the Good, which is the supreme principle of order and truth.

At the military service academies, the codes of ethics single out lying, cheating, stealing—and tolerating these actions by peers—as actions which are strictly prohibited and punishable by severe penalties such as dismissal. This suggests an Aristotelian approach to character development. If we always tell the truth, and if we always refrain from cheating and stealing, these actions become parts of our habitual response to the environment. We may then be described as truthful and honest; however, avoiding lying, cheating, and stealing does not by itself encompass all that we need to be judged as an honorable person.

Consider this. At least one of the academies (Air Force) has an ethics committee concerned with cadet behavior not specifically included in the honor code. Unfortunately, existence of a separate committee may lead some people to erroneous separation of "honorable" behavior from "ethical" behavior. Further, this unsophisticated perception doesn't account for moral behavior, which some view as the narrow personal area of sexual conduct—conduct outside the realm of honor or ethics. Occasionally, we see examples of military leaders whose private conduct is on a totally different level than their public conduct and professional competencies. It would be ironic if the separation of human acts into artificial categories, such as honorable, ethical and moral, were to have started in the institutions which have always placed profound stress on the development of the whole person.

or honorable man encompassed all of one's human acts. Moral prescriptions are given in broad terms: e.g., 'seek the golden mean of moderation between the extremes of too much and too little,' or 'act in accordance with right reason.' Aristotle would advise us not to seek more precision than our subject matter permits; moral philosophy cannot provide the specific conclusions of a mathematical system. We can identify general classes of good and bad human actions: e.g., promise-keeping, truth-telling, lying, cheating, stealing, and so on; but the crucial step to right behavior is not following a rule because it is a rule. Rather, one becomes a good man through developing traits of character, by constantly and consistently performing good actions.

General John D. Ryan, USAFR, placed the value of integrity above unquestioning obedience of commands. He said that integrity can be ordered, but "it can be achieved only by encouragement and example."

Integrity

Integrity—rigid adherence to a standard of conduct—must prevail if we are to continue to grow and prosper as a nation. More than a decade ago, Air Force Chief of Staff General John D. Ryan issued a policy letter for his commanders regarding the relationship between integrity and command. It's worth noting here. The ideal he proposed placed the value of integrity above unquestioning obedience of commands. He made integrity the *sine qua non* of the military command structure when he said, "Integrity is the keystone of military service. In any crisis, decisions made and risks taken by the highest national authorities depend to a large part on reported [illegible] accomplishments. [illegible] was every commander's [illegible] accurate reporting from his [illegible]. We must place our promise of [illegible] so [illegible] We [illegible] compromise integrity [illegible] integrity [illegible] most [illegible]

tegrity of those reporting to them in every decision they make....Integrity can be ordered, but it can only be achieved by encouragement and example."[6]

On a broader basis, Charles M. Schwab, founder of Bethlehem Steel Corporation, made this observation late in his life regarding integrity: "If I were asked to say the most important thing that leads to a successful life, I should say first of all, it is integrity—unimpeachable integrity."[7]

Influences Outside Our Educational Institutions

Personal values and ethical standards, dependent on many forces beyond educational institutions, rely on family influences, religious experiences, and the actions of personal friends and public figures. Most of us succeed not only because of our education, but because of our integrity, judgment, and leadership ability. Most of us who have a desire to live a moral life would benefit from instruction in ethical issues; therefore, actions taken to develop and present courses devoted to personal values and ethics are worthwhile. Benefits can be derived from a course that causes students to think about personal conduct. Such a course can have a positive influence.

The realm of leadership-by-example is worthy of our consideration. A few years ago, the presidents and chief executive officers of the *Fortune 500* were polled to determine their attitudes toward improving ethical behavior. Forty-seven percent of respondents favored two basic approaches: teaching people how to act ethically, and establishing and enforcing standards of conduct. Seventy percent said setting a personal example through the decision making process is the best way to influence a company's ethical climate. 22 percent said this was their second choice. Twenty-three percent said helping develop a formal code of ethics would be their first choice, while 44 percent identified this approach as their second choice. Most of the respondents (69 percent) felt the present status of ethical practices in the United States is "good," but news coverage makes unethical practices stand out. Twenty percent felt that our business ethics is good, but things look bad because society demands more from us.[7]

Charles M. Schwab (1862-1939), American industrialist, was a leading entrepreneur in the expansion of the steel industry. He served as president of Carnegie Steel Company and United States Steel Company, and was chairman of the board of Bethlehem Steel Corporation.

The usefulness of codes of ethics deserves comment. I discussed them in previous articles in this series, but I think it appropriate to make some more comments. Former Secretary of the Treasury Michael Blumenthal feels that adherence to a formally stated code leads to improvement in ethical practices. Today, although most large companies have written codes, the codes have limited value unless supported by management policies, systems and procedures. Because there is a diversity of situations in any company—and in the government, the codes have to be in broad, general terms.

Management has to take care to ensure subordinates are not pressured to act unethically under difficult circumstances. A manager who uses unethical practices—or forces a subordinate to act unethically—might be promoted for achieving his objectives. His apparent success might be construed as an example for his subordinates. This, of course, could lead to disastrous results.

Published standards of conduct are only as good as employees' ability to understand, interpret, and apply them. This situation can be met head-on by turning to courses offered by educational institutions. Some executives however, feel that ethics is too difficult to cover properly in a course. One executive spokesman said his college was not teaching ethics because "you either have them or you don't." I personally feel this is a cop-out, although there may be a grain of truth in his statement. Colleges should influence students to think about and act on ethical principles, develop the judgment needed to assess competing values, and make ethical decisions.

Ethics Is Addressed at Two Levels

Ethics is addressed at two levels in the United States. One concerns personal ethics, the rightness and wrongness of each individual's behavior in interactions with other people. The second concerns actions of institutions and organizations, how organizations treat clients. In either case, ethical conduct involves doing what is fair, right, and just.

Walter Lippman (1889-1974)
American journalist and political philosopher. He believed there is a moral order in the affairs of men and that reason, functioning in the framework of that order, must govern the world of passions and appetites.

The people within an institution or organization are sometimes perceived to possess a degree of fallability while the organization for which they work is expected to be infallable. Then the question that arises is: "How can we have a different standard of ethics for the organization than we have for the people within the organization?" According to Dr. Jere Surber of the University of Denver: "Some philosophers say we should expect no less and no more of the behavior of an organization than we do of ourselves as individuals.... I think that's overly simplistic. There are certain corporate acts that an individual cannot engage in, and there are certain acts that an individual is capable of that an organization can't engage in. That means that you can't have an identical set of codes (of ethics) for both. In the best of all possible worlds, one would hope that the principles that govern the organization would, as closely as possible, correspond to the principles that govern the actions of individuals. But, because they are capable of different sorts of acts on different scales, and qualitatively different kinds of acts as well, then one could not hope for complete consistency."[2]

Integrity of Management

An ethical person possesses the quality of complete fairness to himself and complete fairness in all dealings with other people. Such a person does unto others as he would have others do unto him.

Government entities, companies, professional and trade associations, and unions are developing and distributing codes of ethics to promote the integrity most of us would like to experience in the workplace. I discussed this in Part I and Part II of this series, particularly as it pertained to the federal government and companies doing business with the government. What I did not say, and it is worth saying, is that the carefully prepared code of ethics is not always enforced when violations occur. The reason may be that people feel the promulgation of a code of ethics represents ethical approval to improving personal conduct, [illegible] that people should be responsible for themselves. [illegible] codes of ethics need not [illegible] the lack of personal responsibility [illegible] and [illegible] [illegible] ethics [illegible]

Today, ethicists [illegible] institutions are [illegible] graded ethics. [illegible] winked at and [illegible] endeavor is often [illegible] portant than playing by [illegible] leads to unethical be[illegible] life, in business, gov[illegible] home. Combatting unet[illegible] has to start with the teac[illegible] in the home and chur[illegible] priate, in our pluralist[illegible] teach ethics outside the [illegible] church; that is, in educat[illegible] tutions.

Declining confidence in [illegible] military, political, and social [illegible] probably comes from daily expos[illegible] unethical and/or illegal conduct. [illegible] exposes discourage our youth [illegible] spect authority and leadership. [illegible] pattern of ethical conduct and loyal[illegible] within the group becomes alien [illegible] some people wander from so[illegible] norms; as a result, group norms pre[illegible] vail, which are frequently contrary [illegible] those needed for wide social cohesi[illegible]

Some managers, generally young[illegible] ones, consider themselves expendable [illegible] to their organizations and go a[illegible] with superiors on issues to show th[illegible] loyalty. Most upper-level manage[illegible] consider their personal ethics inside the workplace to be as good or better [illegible] their ethics outside the workplace. [illegible] this is not so, people in lower [illegible] positions suffer.

Walter Lippmann, the late Am[illegible] journalist and author, once [illegible] "If you remove authority and [illegible] pline and tradition, what [illegible] an unsatisfied need, a vac[illegible] is then filled by some [illegible] and by some other form [illegible] He concluded that the [illegible] life are not a code of [illegible] busybodies and old [illegible] gray beards. The [illegible] what is good and [illegible] define the [illegible] which [illegible] possible.

[illegible]

[illegible]

cannot be expected to acquire later on. And management must demonstrate that it requires the same integrity of itself.[13]

Several years ago at a graduation ceremony in a secondary school, the speaker indicated that his greatest hope for each member of the class was that he or she would observe these cardinal principles: fairness and honesty in their use of the fundamental process of learning; fairness and honesty in their hours of leisure and in their home relationships; fairness and honesty in all aspects of their concerns as citizens. He said that although his hope displayed idealism, it deserves consideration by everyone.

Final Thoughts

The importance of ethics has been defined by a former Chief Justice of the United States, Earl Warren:

> "Society would come to grief without Ethics, which is unenforceable in the Courts, and cannot be made part of the Law.... Not only does Law in a civilized society presuppose ethical commitment; it presupposes the existence of a broad area of human conduct controlled only by ethical norms and not subject to Law at all....
>
> "The individual citizen may engage in practices which, on the advice of counsel, he believes strictly within the letter of the Law, but which he also knows from his own conscience are outside the bounds of propriety and the right. Thus, when he engages in such practices, he does so not at his own peril—as when he violates that Law—but at peril to the structure of civilization, involving greater stakes than any possible peril to himself....
>
> "This Law beyond the Law, as distinct from Law, is the creation of civilization and is indispensable to it....[14]

Most of us recognize the peril, but too few of us do anything about it.

In educational circles we should be considering how to teach ethics. We should be raising questions about how to develop ethical maturity. In this latter regard, three general approaches have evolved: (1) the *classical approach*, which focuses on the Judeo-Christian philosophical tradition; (2) the *legalistic approach*, which focuses on the laws and codes of ethics to distinguish between "right" and "wrong"; (3) the *environmental approach*, which sensitizes students to the power that they, as individuals, wield. The last approach combines insights of Wayne Leys, who argues that the objective of ethics courses should be to raise the right questions, not to provide the right answers; and of Derek Bok, who believes that ethics can be taught using actual problems and case studies.[15,16]

In the aforementioned *Fortune 500* survey, well-designed and realistic courses in ethics ranked almost as high as inviting executives to institutions of higher learning to express their views. Could the desire for such a dialog be based on the feeling in government, business, and industry that ethical conduct is not well understood by the academic community? I hope this is not true.

Earl Warren (1891-1974), three-term governor of California and 14th Chief Justice of the United States (1953-1969), presided over the Supreme Court during a period of sweeping changes in U.S. constitutional law, especially in the area of race relations, criminal procedure, and legislative appointment. He emphasized what he called the "precious heritage" of the Bill of Rights.

Dr. Peter F. Drucker (1929-), after serving as an economist for a group of British banks and insurance companies, has been a professor of politics, philosophy, social science, and management in the United States. He is the author of several books and essays in the field of management and is a management consultant.

Marshall Field (1834-1906), American merchant, established one of America's first innovative wholesale and dry-goods businesses. He pushed the development of downtown Chicago to make it a great educational and cultural center.

Many years ago, Marshall Field, American merchant and philanthropist, gave us "Twelve Things to Remember." Several are related, directly or indirectly, to high personal values and ethical conduct. They support the case I have been making, and are worthy of thoughtful consideration.

Twelve Things to Remember

1. The Value of Time
2. The Success of Perseverance
3. The Pleasure of Working
4. The Dignity of Simplicity
5. The Worth of Character
6. The Power of Kindness
7. The Influence of Example
8. The Obligation of Duty
9. The Wisdom of Economy
10. The Virtue of Patience
11. The Improvement of Talent
12. The Joy of Originating

How do you feel about the status of ethical conduct in your organization or your community? How do ethical considerations play a part in management thinking? What are your values on the job? What behavior is expected of you by your peers, your superior, and your clients? What kinds of things produce ethical dilemmas for you in your daily work? How do you reconcile competing expectations? Do you facilitate or impede scrutiny of your behavior? Are you going to try to improve the situation in which you find yourself? If so, what are you going to do? Are there circumstances in which you "bend" the rules? If so, why? What are the differences between such concepts as ethics, values, attitudes, and beliefs? Do you have interesting observations on ethical behavior to offer? How can ethical maturity be developed? If an educator, how do you teach ethics?

Your comments and or answers to these questions, if expressed to me in writing, may provide material for an additional article in this series. Please write to me. I will consider your comments and give you credit for them if they are used in an article. ■

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(Continued from page 18)

work for revision of the job descriptions came the development of a standard garrison organization of the DOIM. Here again, it was allowed to be modified only as dictated by local mission differences. This is in place and working well.

Automation

The major issues that affected all commands were in the automation area. They dealt with software development, hardware included and excluded and, of course, the people involved.

The Major Commands generally held the position that all software development should remain with them except for the Army Standard Army Management Information Systems which were already the province of the old Army Computer Systems Command. This organization was now an integral part of USAISC. Only those hard items associated with base operations support would be transferred to USAISC. These issues were debated back and forth throughout 1985 and 1986. As a result of briefings given to the Vice Chief of Staff by FORSCOM, TRADOC and AMC, these issues were finally resolved. At the garrison level, it was directed there would be only one DOIM, which would provide all IMA services to all tenants of an installation. All computers would be owned and, where operated by a regular workforce, would be operated by DOIM/USAISC personnel. All necessary support personnel would transfer to USAISC. All major software houses would remain with the owning Major Command.

Make it Work

Although there is much left to be done, we have come most of the way to implementing the Chief of Staff's May 1984 decision. On a scale of one to ten, I would say we are at about a nine. The tough decisions have been made. The organization is in place. Some people have been trained. The guidance in large part has been published.

The challenge for the 7th Signal Command and the Army is to make it work. It is an historical opportunity. ■

CONCEPTS FOR EXCELLENCE IN DEFENSE MANAGEMENT

Dr. James C. Lew

he recent publication, *A Quest for Excellence*, by the Presidential Commission on Defense Management was the direct result of allegations of fraud, abuse, over-charges and mismanagement in Department of Defense procurements of weapon systems and spares. Periodically, a group is chartered to review DOD systems acquisition policies, procedures, and controls of the annual expenditure of some $170 billion in goods and services. Solutions proposed included structural changes in the procurement system through centers of management excellence, organizational changes in the Pentagon, centralized professional procurement agency, disbarment from government business, and legal prosecution for violators.

Department of Defense and industry contractors realize the need for control. However, adequate control requires a clear understanding of the management processes and inherent problems in complex organizations and operational systems. I proposed an American Management Model (*Program Manager*, September-October 1982) which was depicted as a space vehicle (organization) streaking through time and space using its internal system (management process) to achieve mission success against a variety of environmental factors which require timely course correction (Figure 1).

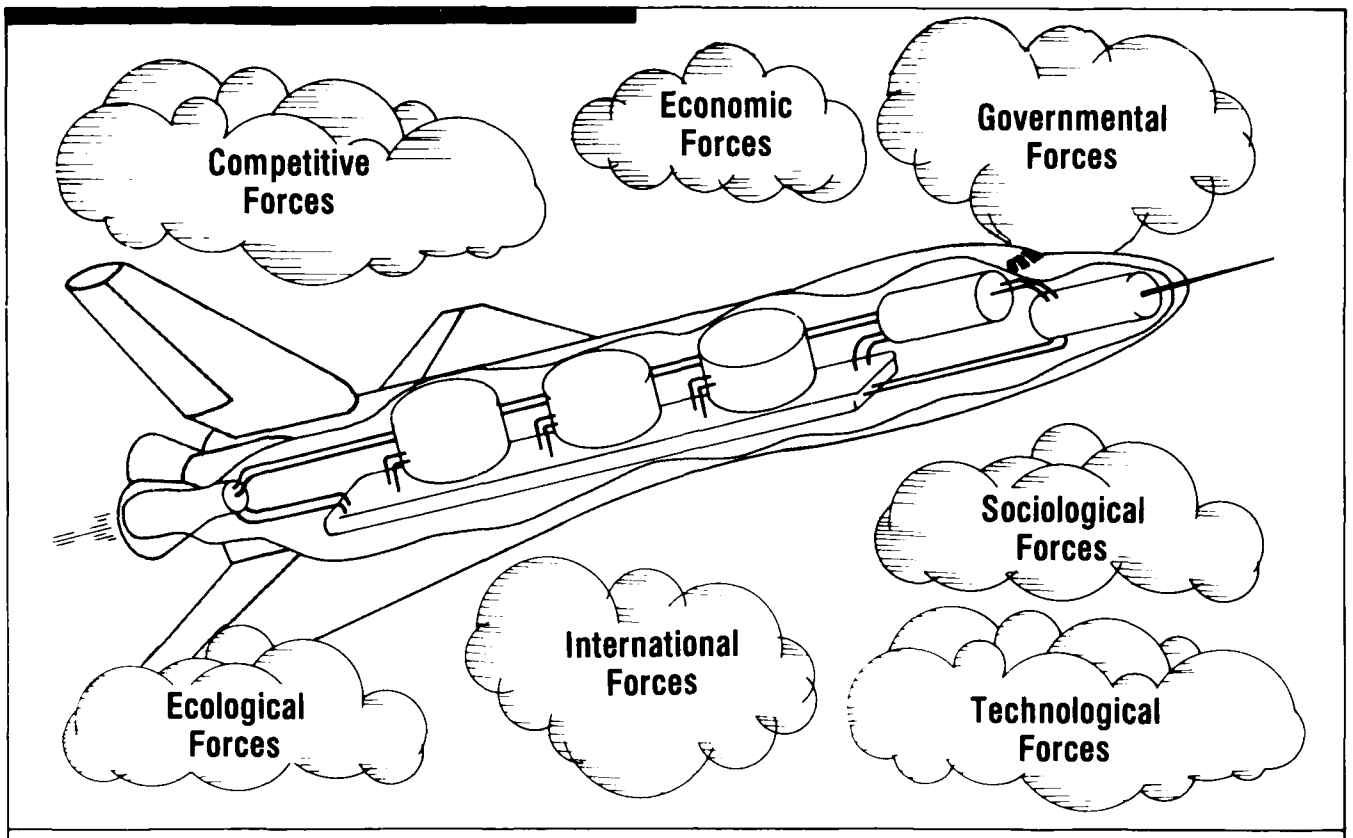
Control is one element of the management process which includes planning, organizing, staffing and directing. Control is the function that determines if mission objectives (contract requirements and program plans) are being met. As in a space vehicle, an organization needs an internal communication and control system providing timely visibility of performance data for management evaluation. The space vehicle needs to have established linkages with ground control which provides mission guidance and feedback. Similarly, linkages between Department of Defense procuring agencies and the industry contractor should be defined clearly, documented, and supported to assure the timely, cost-effective and successful accomplishment of a program.

Many management disciplines have been established by the Department of Defense to "control" systems acquisitions; i.e., cost/schedule control system criteria, system engineering, configuration management, production management, integrated logistic support, life-cycle cost. Even imposing these elaborate management techniques, including program/technical reviews and validation and audits, the Department of Defense continues to encounter fraud, abuse, overcharges and mismanagement in systems acquisitions. To enhance the Department of Defense ability to overcome unintended consequences, more techniques are needed to manage complex intersystem linkages existing within government procurement and support agencies; within contractors organizations; and those between government and contractor. One technique I developed, called Silver Thread Management, provides visibility at both the micromanagement and macromanagement levels. This technique evolved from its initial use during the ballistic missile program to expedite the release of engineering drawings. It was used again to resolve configuration management problems encountered in the activation of the operational sites. The technique was refined to use as management policies and procedures for implementing the contractor's space program. The micromanagement detail at the grass roots provided an effective control model of key events, management and operational processes; also, visibility to organizational roles and responsibilities for carrying out contract and program tasks.

The theoretical foundation for Silver Thread Management was established during the preparation of my doctoral dissertation, "A Comparative Analysis of Management Control in Public and Private Health Care Administrative Organizations." It was evident an intersystem management model was needed to visualize linkages between the public and private sector health care system where fraud was occuring. A Silver Thread Management model analyzed fraud in one private health care system after understanding how fraud was being perpetrated in a similar public sector program.

The segmented functional micromanagement subsystems can be tied together to identify roles and responsibilities, management systems and the linkages between contractor and subcontractors, and between contractor and procuring agency. This becomes a macromanagement overview model which can serve as a roadmap/game plan to provide continuity for contractual requirements and program management through the various phases of definition, development, production and deployment. It can

■ *The author is the president of James C. Lew Associates, Garden Grove, Calif.*



provide visibility for evaluating the effectiveness of any program activity during the life cycle of a program. Through the flexibility of segmentation, the entire program's management control system can be incrementally reviewed and evaluated in a prioritized and systematic manner. Deficiencies in the subsystems/functions can be identified and corrected before the program is adversely affected.

Silver Thread Management's flexibility and responsiveness in handling program changes on a real-time basis strengthens program management and control; this will minimize risk and costs associated with the lengthy systems acquisition process. It can be used by contractor and procuring agency to assure a win-win situation where the contractor maximizes profits and the government minimizes costs to the taxpayer while fielding a cost-effective and technically superior system. Silver Thread Management can be the necessary foundation for building excellence in defense management.■

The Systems Engineering Management Guide (SEMG) has been substantially revised in its second edition. This edition features:

—Additional examples of most procedures, and examples drawn from a wider variety of development project types.

—Enhanced graphics.

—Organizational improvements to simplify use both as a text, and as a reference.

—Updated and expanded reference sections for each topic.

—Checklists for use by the Program Office in executing and evaluating compliance with disciplined engineering guidelines.

—Introduction to, and integrated use of, the template method for controlling program risks during design development and testing.

—Expanded coverage of Software Engineering, Test and Evaluation, Manufacturing, Risk Management, Life-Cycle Cost, and ILS topics.

—Correction of user-identified errors.

—Enhanced textual clarity.

—A level of detail which is more consistent across topics.

—Greater internal integration and cross referencing.

Overall utility of the SEM Guide has been enhanced both as an introduction to the general topic of Systems Engineering, and as a current reference for program office personnel.

The new SEM Guide is available at GPO retail bookstores in Washington, D.C., and several other cities around the country. Mail orders may be placed by citing the title and GPO Stock Number 008-020-01099-5 and writing to:

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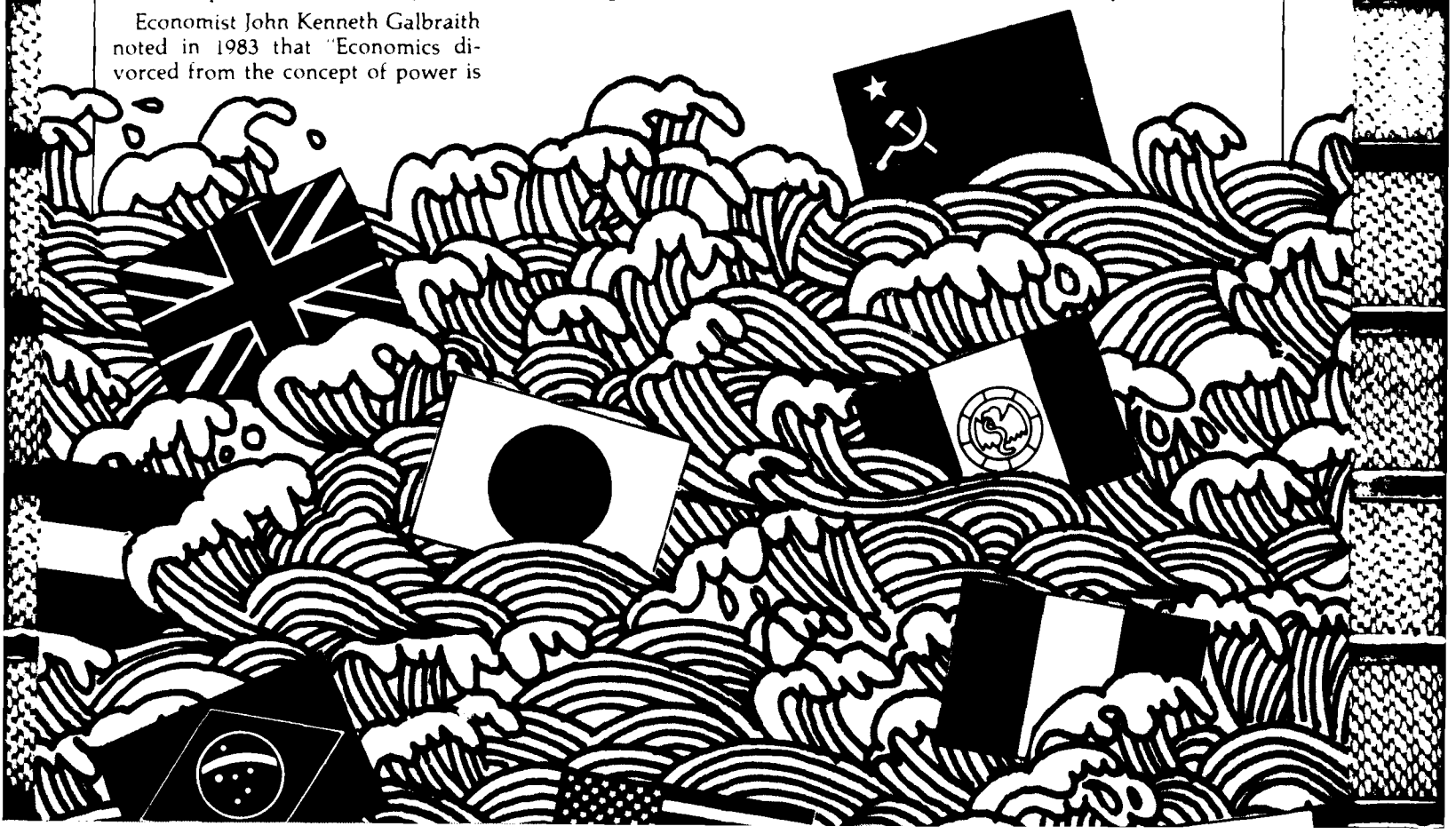
FOR INTERNATIONAL ECONOMIC ISSUES

Major Emile C. Iverstine, USAF

conomic strength, vital to military and political capabilities, is the key to a country's national security. As President Eisenhower said in 1963, "The military establishment, not productive of itself, necessarily must feed on the energy, productivity, and brainpower of the country."

Economist John Kenneth Galbraith noted in 1983 that "Economics divorced from the concept of power is extensively irrelevant."[1] In the words of former Secretary of Defense Harold Brown, "Military capability must rest on an infrastructure of economic strength...." and "Economic developments within nations and economic interactions between nations critically affects political and military balances and strategies."[2]

In this paper, I examine U.S. economic issues from an international perspective. The issues are separated into four categories: international trade, interdependence, transfer of wealth, and international debt. I will explain why these issues are important, how they extend beyond the United States, and how they affect our na-



tional security. I will introduce possible solutions to resolve the issues, and make specific recommendations to outline the best course of action to resolve the issues.

International Economic Issues

The U.S. economic health can no longer be addressed in purely domestic terms. As domestic economies become more interconnected in an international economic order, nation-states must deal with international economic issues to survive. For example, "With the more than tenfold increase in oil prices between 1973 and 1980, inflation went out of control, unemployment rose, and growth rates slowed dramatically."[3] If this situation were allowed to continue, America's long-term ability to generate sufficient national power would be seriously jeopardized. However, public opinion surveys indicate most Americans consider military defense and nuclear war as the prime ingredients to national security, giving very little attention to international economic problems.[4]

What are the salient international economic issues that face the United States? First, the growth of international trade (from $240 billion to $900 billion in the last decade) is of prime importance to the United States.[5] Dependence on international trade makes the United States vulnerable to instabilities in many parts of the world. In a related area, the expansion of international trade is causing much greater interdependence among the world economies. The result is less direct control of a national-states economic machine through purely domestic actions. Also, world friction has developed concerning the transfer of wealth from the "have" to "have not" countries. The mode and method of wealth transfer have become a continuing issue between the industrialized democracies and the emerging Third World countries. Finally, issues surrounding international debt have become paramount to the continued health of the international economic system. Massive defaults of international loans could cause the collapse of the international monetary system, the fuel that drives the international economy.

International Trade

International trade operates in an organizational dilemma. A nation-state controls the foreign economic activity flowing over its borders. Foreigners typically have to ask permission to buy or sell something in another country; but, being foreign in nature, international trade is exempt from direct control by the nation-state. However, the health of many national economies depends on international trade. "Thus, in the nation-state, there is an inherent contradiction between the most basic formal legal structure and the political economic realities where international commerce is flourishing."[6]

Within this organizational dilemma, the United States must deal with four diverse groups of international traders.

First are the other developed countries; they continuously strive for a stable international trading environment, being dependent on international trade and being the major creditors of the world.

The second group, non-oil developing countries, are the disadvantaged element, being buyers and borrowers with minimum capability to compete with the developed countries.

The third group, oil supporters, are the world's new rich. They frequently lapse into an ostentatious show of wealth, characterized by erratic economic behavior.

The final group comprises the communistic element and is somewhere in the middle, displaying a need for more economic interaction but biased politically to an outsider's role.[7]

Trade with these groups significantly influences the national security of the United States. Mutually beneficial trade among the United States, Western Europe, and Japan directly supports the economic strength of the western democracies, an essential ingredient in affording the expense of military preparedness.[8]

Closely related is trade between the western democracies and the non-oil Third World. The United States, Western Europe, and Japan must have the raw materials generated by the Third World to maintain economic progress. Likewise, the United States and Allies depend on the Third World markets to sell goods produced in the industrial economies.

The strategic importance of the oil-producing countries is more clear-cut. Without a steady flow of oil, the economic health of Western Europe and Japan would be seriously jeopardized. Trade with the Communists takes on a more political flavor. The West frequently attempts to use trade with the Soviet Bloc countries as a coercive instrument for influencing Russian military and political behavior. Also, Communist economic and technological growth, supported by trade with the West, makes Russian military capability more affordable.[9]

How should the United States manage its international trade? First, it must control its trade deficit. The main driver of U.S. trade deficits is the abnormally high value of the dollar. "A New York Federal Reserve Bank study of 1980 predicted that the high value of the dollar in that year would reduce the U.S. gross national product (mainly exports) by 1 to 1.5 percent."[10] Specifically, the United States must control the federal deficit, which drives high interest rates translating into overvaluation of the dollar.

In a parallel effort, the United States must actively manage exchange rates through the central banking community by establishing and supporting "target zones" for the dollar within the present "floating" international monetary system.[11] Relative to trading with the Communists, the United States must recognize the differences between Western vice Soviet reactions to economic strain. In the West, economic hard times lead to political disruption as the Western democracies compete for dwindling resources and markets. On the other hand, economic stress causes the Communists to close ranks and re-establishes Soviet dominance.[12]

Interdependence

Along with increasing trade, the United States has become more interdependent with international economic activity. A prime example is the impact to the United States caused by the drop in world oil prices. In March 1986, world oil prices dropped to a 10-year low primarily due to Saudi Arabian oil-producing policies. Falling oil prices

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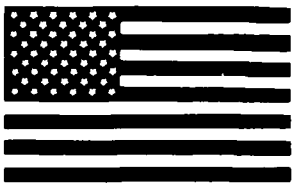
were a prime contributor to the consecutive 2-month drop in the U.S. consumer price index. On the negative side, reduction of oil prices severly impacted the U.S. domestic oil-producing states. Oklahoma had 13 banks fail in 1985.[13] In other areas, some U.S. industries are heavily dependent on foreign trade. More than 50 percent of the wheat, hides, and soy beans, plus 70 percent of the medicinals and botanicals produced by the United States, are exported.[14]

Growing interdependence has been a natural outcrop of more international organizations and the explosion of technology. For example, the United Nations currently has 159 member states maintaining constant dialog.[15] General Motors has 53 plants in 25 countries and employs 140,000 people overseas.[16]

In addition to these organizational factors, technology has contributed to world economic interdependence. Seconds after a currency transaction takes place on the London Exchange, every financial center in the world is updated on the current exchange rate. By increasing the speed with which people can travel and communicate, and by improving their ability to produce more and newer products, technology has made the world more interdependent.[17]

The growth in interdependence directly impacts U.S. national security. From an energy standpoint, current estimates forecast a significant increase in U.S. dependence on foreign oil. By the 21st Century, oil imports will be 50 percent of U.S. consumption.[18] A similar situation exists for non-oil strategic minerals.[19] The United States now imports more than 50 percent of 26 strategic minerals. In addition, there is increased dependence on foreign sources for products vital to the manufacture of defense equipment. A Japanese company produces the horizontal milling machine used to fabricate the turret on the M-1 Abrams tank.[20] "Far Eastern sources provide as much as 90 percent of the semiconductors used in current weapons system production."[21] As such, U.S. economic strength and military strength are vulnerable to world conflict that could disrupt the flow of oil, minerals, or off-shore defense products.



To deal with the vulnerabilities of interdependence, the United States must avoid artificial measures such as international trade and payment barriers. Relieving U.S. vulnerabilities through these measures "...would be achieved only at considerable cost—cost in terms of a lower rate of economic growth, a less efficient utilization of resources, a more stagnant international economy, and ultimately lowered standard of living for all."[22] Some authors feel the United States needs a more coherent strategy to deal with the increasing dependency on imports. The strategy must include stimulating domestic production, understanding resource supplies and uses, and improving research and development activities supporting economic independence. The strategy must build political consensus on the use of strategic stockpiles, and deal with the economic vulnerabilities of Western Europe and Japan (80-90 percent dependent on foreign sources of raw materials).[23]

Transfer of Wealth

As the United States deals with international trade and interdependence, American foreign policy must contend with the economic crises of developing countries. In the industrialized "North," prosperity is a way of life. However, the picture is much different in the developing "South."

Between 1980 and 1984, the per capita income of the developing countries dropped by more than 5 percent.[24] Some economists believe that the "South" is practically bankrupt. Their economies lack the basic flexibility, responsiveness, and stability to compete effectively in world economic activity.[25] Likewise, their ability to trade off short-term domestic economic pain for long-term economic stability is inhibited by immature political and social systems. For example, a harsh deflation of their domestic economies would make them more competitive in the world market. However, such a cut in domestic consumption would be "...bitter medicine for nations with fragile political structures, social tensions, rising populations, and high unemployment."[26] In summary, the economic survival of the "South" is becoming more and more dependent on transfusion of wealth from the industrialized "North."

The process and procedures of wealth transfer drive many "North-South" conflicts. The developing nations are demanding a new economic order where they play a larger role and receive more automatic economic assistance. The industrial countries accept responsibility for helping the developing nations, but insist on the right to decide "how much" and "to whom." Mechanically, the "North" prefers bilateral processes. The "South" bids for formal organizations governed by majority vote.[27] For example, during the Law-of-the-Sea Negotiations, the developing countries bid for a one-vote-one-nation sea bed authority controlling the "Enterprise," a company exercising a monopoly of sea bed mining. The industrial countries, on the other hand,

insisted on a "weighted voting" scheme similar to other international economic organizations like the World Bank. The result—the treaty has never been ratified.[28]

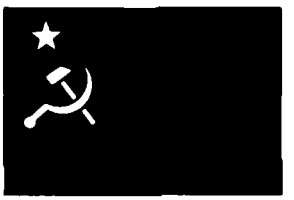
These conflicts directly influence U.S. national security from two perspectives. On one hand, the developing countries are calling for a new economic order. The United Nations General Assembly, where the developing countries control a majority vote, adopted a "Charter of Economic Rights and Duty of States" embracing a broad doctrine of economic revisionism. The United States feared this fact would legitimize expropriation of foreign property and drive toward producer-dominated cartels as a means of managing international trade for the benefit of developing countries.[29] Disrupting the flow of raw materials and world markets could seriously impact the long-term economic health of the United States and its Allies.

Collapse of Third World economies would be equally as threatening. Economic failure of the larger developing countries (India, Nigeria, Philippines, Egypt) "...could destabilize an entire region."[30] And the Russians are primed to follow up on any such difficulties.

In the words of former Soviet Premier Leonid Brezhnev, "Our aim is to gain control of the two great treasure houses on which the West depends, the energy treasure house of the Persian Gulf and the mineral treasure house of Central and Southern Africa."[31]

What should the United States do to mediate the transfer of wealth issues? Many authorities feel aid to developing countries must be increased, but moved away from grandiose projects. Instead of new hydroelectric generating plants, the aid should be directed toward educational, vocational services, agricultural production, and community development. Large Western-style projects depend on technical and administrative talents absent in most developing countries. The result—illusionary expectations that quickly degenerate into frustrations and rebellion as the large projects fail to provide instant prosperity.[32,33,34] From a broader view, some experts support a three step process.

First, economic help should be designed by bilateral teams tailoring



the aid package for the social, economic, and political structure of the recipient country.

Next, both giver and receiver must formally commit to the development plan. The donor signs for a time-phased amount of aid; the recipient agrees to work in the direction mapped by the aid team.

Finally, the dialog and resultant road map must be looking forward to predict the medium- and long-term impacts to both sides.[35]

International Debt

Another element of the Third World economic crisis is international debt. First, international debt has experienced phenomenal growth during the last decade. From 1973-83, the loan balances of developing countries grew from $130 billion to more than $664 billion.[36] As a result, the debtor countries were forced to cut imports and the industrial countries were forced to provide more and more export credits. The impact to the United States becomes clear by examining American exports to developing countries. The United States supplies more than 50 percent of the developing countries' imports. By comparison, the United States sells more goods and services to the Third World than to either Western Europe or Japan.[37]

The mechanics of world debt extend well beyond the interaction between the United States and the Third World. The explosion in world debt can be traced to the oil price shock of 1973. When the price of oil skyrocketed, billions of petro-dollars were deposited in Western banks. In order to put the funds to work, the banks lowered interest rates and extended credit to marginal borrowers. The developing countries were eager to borrow because the cheap money allowed them to weather the increase in oil prices and expand their domestic economies while still supporting domestic consumption.

However, the second oil price shock of 1979 set off a downward spiraling chain reaction. The industrial countries (mainly the United States) tightened up economic policies and raised interest rates, triggering a worldwide recession. The highly leveraged Third World debtor countries were caught between a rock and a hard place: a large debt to service with decreasing income from soft world markets. Their first reaction was to borrow more; however, the Western financial community was reluctant to increase their loan exposures to the economically troubled countries. When Mexico announced in 1982 that it could no longer pay its debts, near panic spread throughout the world financial community.[38]

The world debt crisis has two major implications for the United States. If the world economic system is unable to resolve the dilemma of an increasing debt burden on those least able to pay, "...the whole international financial system could begin to disintegrate, with most disagreeable effects on the private banking systems in developed countries."[39] The U.S. banks hold more than 40 percent of the Latin American debt (the largest concentration of debt-troubled countries in the world). Default of even part of the $300 billion of Latin American loans could be disastrous to the U.S. banking system. The domino effect on the

U.S. export market has similar implications. Exports fell by $10 billion from 1981-82 to Mexico alone.[40] From another perspective, the instability produced by failing economies in the Third World promotes revolutionary activity hostile to the Western democracies. The possibilities of having another Cuba or Nicaragua in the Western Hemisphere severely complicate U.S. security planning.

Solving the debt problem is a multifaceted equation. First, the capital investment process must shift from "debt" to "equity." By encouraging direct investment, the Third World countries could expand their economies without having to service a fixed-interest payment. Direct investment by the industrial countries would stimulate the transfer of technology and management expertise; it would better integrate the developing countries into the international political and economic process.[41]

Second, the Third World needs to focus their developments in less-energy-intensive enterprises. Financing large oil-import deficits can result only from cutting other imports, like food, or consuming capital needed for economic growth. Neither option holds promise for the present or future.[42] Finally, the debtor countries, with support from the industrial West, must create more export opportunities for their goods. The Third World countries can no longer overvalue their exchange rates, keeping imported consumer goods cheap while making their exports more expensive.[43] The industrial countries need to support increased exports from the debtor countries by lowering trade barriers and by increasing short-term trade financing.[44]

Recommendations

The United States must deal effectively with international economic issues to maintain our national security. The American trading activity in the international arena must be based on economic strength. The key is controlling the federal deficit; then, interest rates will drop, the dollar will return to reasonable exchange rates, and the United States can compete effectively in world markets. Likewise, the United States must avoid protectionist measures to reduce artificially American interdependence with the world scheme. If the United States is economically strong, free-market forces will ensure a steady supply of raw materials and export markets.

Dealing with the other industrial nations and the oil-rich countries from a position of economic power will support U.S. national security; however, attacking the issues of wealth transfer and international debt requires a slightly different recipe.

The United States should maintain bilateral arrangements with the developing countries, establishing comprehensive plans to help the Third World to economic prosperity. Specifically, the three-step process (bilateral teams to tailor aid packages, commitment from both sides, and forward-looking plans) should blueprint U.S. help to undeveloped countries. Part of the help must involve a solution to Third World debt problems. Using the bilateral connections, the United States must encourage and support non-energy intensive developments employing American equity investments, technology, and management expertise.

At the same time, the United States must have the political courage to open its markets to exports from the developing countries. ■

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INSIDE DSMC

Additions

Lieutenant Colonel Raymond L. Strom, USA, a professor of acquisition management in the Acquisition Managment Laboratory, came to DSMC from the Office of Program Manager Tank Systems where he worked in logistics and deployment. He holds a B.S.B.A. degree in area development from the University of Arizona, and an M.A. degree in management and supervision from Central Michigan University.

Strom

Janice Conley, Business Management Department, transferred.

Commander L. M. Kost, USN, Acquisition Management Laboratory, retired.

Louis Rager, LI3, USN, Printing and Duplicating Division, retired.

Losses

Lieutenant Colonel Mason Botts, USAF, Department of Research and Information, retired. He is associated with Advanced Technology, Inc., Reston, Va.

Correction

Colonel John R. McGurk, USA, Deputy Dean, Department of Research and Information, received a degree in engineering from West Point, and was assigned to the Office of the Secretary of the Army (not Defense).

George Mason University, in conjunction with the Society of Logistics Engineers, will offer continuing education courses in logistics beginning in January and continuing throughout the academic year. All courses will be taught at George Mason University Professional Center, 3401 North Fairfax Drive, Arlington, by instructors with extensive academic and work experience in the field of logistics. Continuing Education Units will be awarded to all participants.

Course titles are Introduction to Configuration Management, The Integrated Logistics Support Program, Overview of Quantitative Logistics Methodologies (CPI, Review), Software Configuration Management, and Software Quality Assurance.

For further information, contact the office of Off-Campus Instruction at 323-2494. ■

MAJOR MAINTENANCE SYSTEM

Ken Perrotte

The maintenance portion of the Logistics Management Systems Modernization Program took a step forward in the summer when contractors were invited to bid on development of a new information system—the Depot Maintenance Management Information System (DMMIS). Contractors were mailed requests for proposals and interested bidders were to submit proposals by Oct. 15. The target date for award is June 1987, according to Colonel Larry Dix, deputy for maintenance systems, Logistics Management Systems Center. The center is located at Air Force Logistics Command Headquarters, Wright-Patterson AFB, Ohio.

The DMMIS is one of nine new computer systems being developed for the Command under the modernization program. Most new systems will be connected and allow managers access to abundant and timely information.

"This major system will interact with others to provide maintenance having a more refined and modern way of doing business," said Brigadier General Trevor A. Hammond, AFLC deputy chief of staff for information systems.

Colonel Dix said the goal is to have the system fully on-line by June 1990. It's been 3 years in the development stages. We collected information from each air logistics center listing what maintenance people need. Now, we've compiled those needs into an overall command requirement.

We're planning to bring the system on line in stages. First, the contractor will build a prototype system at Ogden ALC (Hill AFB, Utah) and at the Aerospace Guidance and Metrology Center at Newark AFS, Ohio. If the prototype is successful, we'll begin implementation throughout the command."

The new information system will replace 41 of the Command's 56 maintenance computer systems. The older systems are slower, more cumbersome batch-processing systems using punch cards and tapes.

Streamlining the flow of information from a headquarters manager to a maintenance hangar mechanic is one purpose of the system. Flexibility is designed to allow users more latitude in assessing alternatives in managing flow or repair parts, work flow patterns and shop floor control.

"For instance," Colonel Dix said, "a maintenance scheduler can enter the system and immediately see the projected availability of materials and working areas. We'll have the capability to do simulation. One could ask, 'What would happen if I had to run 18 more engines through this shop?' We could simulate the workload through the work center to see how this extra requirement would work. The amount of information that would be in the system makes this possible.

"The great thing about this system is that it will be easily accessible, carry the most current information and allow the work center supervisor to plan better and manage the work," Colonel Dix said.

The request for proposal requires contractors to use manufacturing resource planning (MRP II) concepts in the final product. The MRP II is popular in commercial industry, especially the manufacturing world. It automates the planning, scheduling and execution functions in a production environment.

Core modules of the MRP II system are similar to software packages of any home computer. But they're larger and more detailed. Core modules of MRP II will be at the foundation of meeting requirements under DMMIS.

Brigadier General John M. Nowak, AFLC deputy chief of staff for maintenance, said "We're asking contractors to use an MRP II system and adapt it to the unique requirements we face at the depot-level of maintenance logistics. The MRP II will allow AFLC to operate the depot maintenance units as businesses, using proven industrial methods."

Colonel Dix put maintenance managers on notice that DMMIS will challenge the current information management mind set. He said "It's going to be a functionally different way of managing maintenance operations. With a management commitment to make it work, it'll become a valuable tool that will help this command repair weapon systems within cost and on time."■

■ *Mr. Perrotte is assigned to the Public Affairs Office, Air Force Logistics Command, Wright-Patterson Air Force Base, Ohio.*

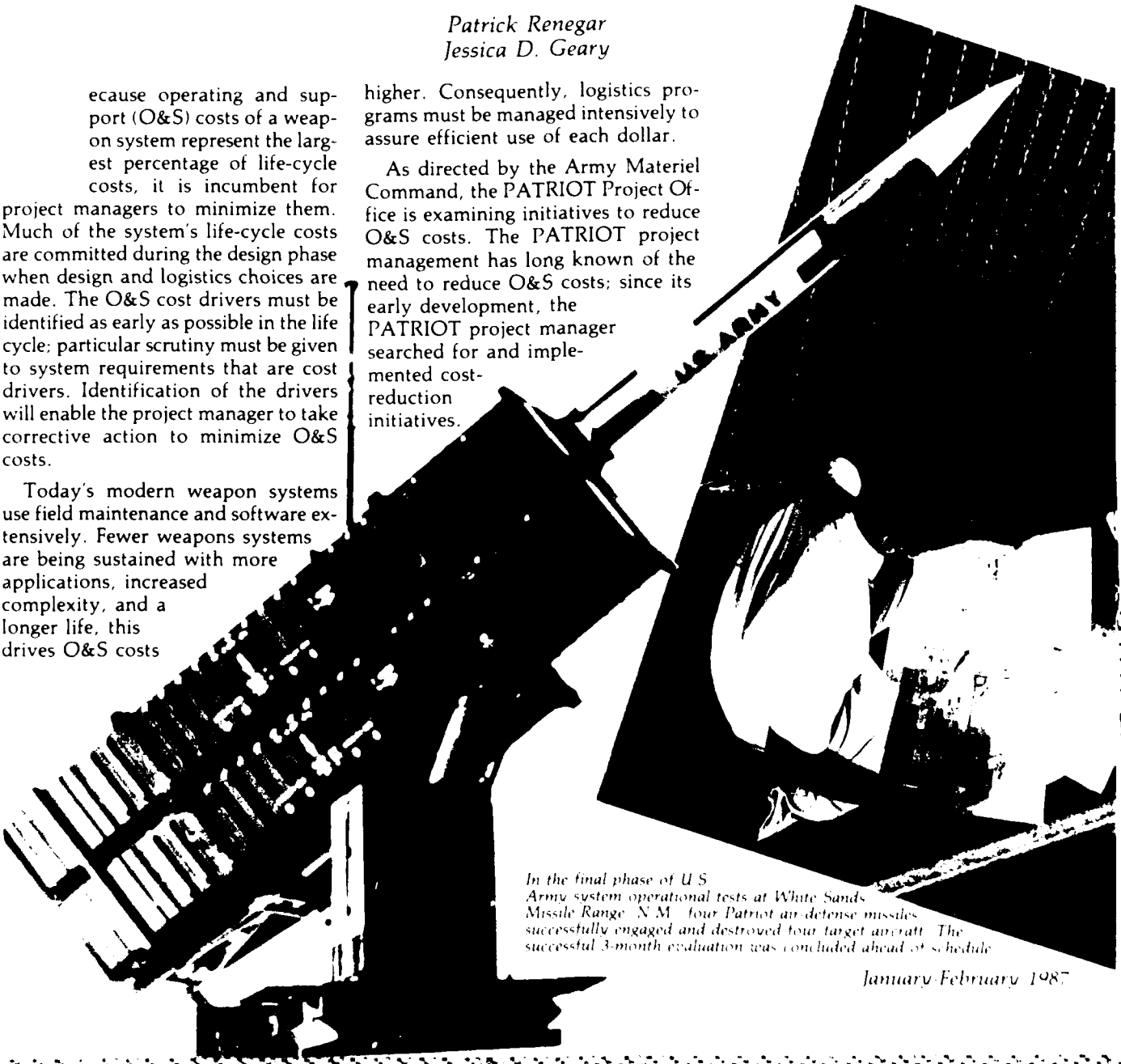
THE OPERATING AND SUPPORT COST-REDUCTION PROGRAM

Patrick Renegar
Jessica D. Geary

Because operating and support (O&S) costs of a weapon system represent the largest percentage of life-cycle costs, it is incumbent for project managers to minimize them. Much of the system's life-cycle costs are committed during the design phase when design and logistics choices are made. The O&S cost drivers must be identified as early as possible in the life cycle; particular scrutiny must be given to system requirements that are cost drivers. Identification of the drivers will enable the project manager to take corrective action to minimize O&S costs.

Today's modern weapon systems use field maintenance and software extensively. Fewer weapons systems are being sustained with more applications, increased complexity, and a longer life, this drives O&S costs higher. Consequently, logistics programs must be managed intensively to assure efficient use of each dollar.

As directed by the Army Materiel Command, the PATRIOT Project Office is examining initiatives to reduce O&S costs. The PATRIOT project management has long known of the need to reduce O&S costs; since its early development, the PATRIOT project manager searched for and implemented cost-reduction initiatives.

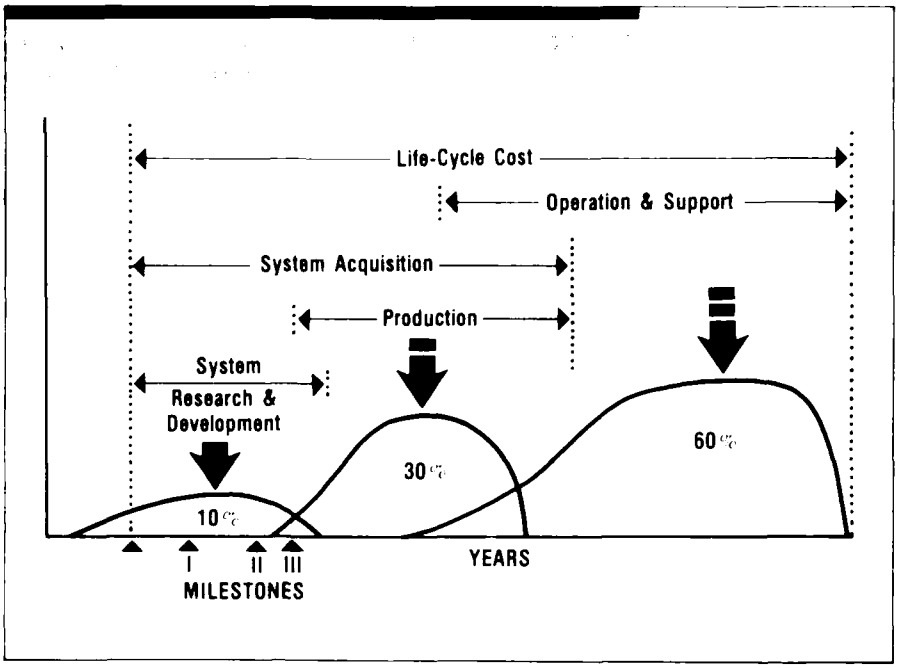


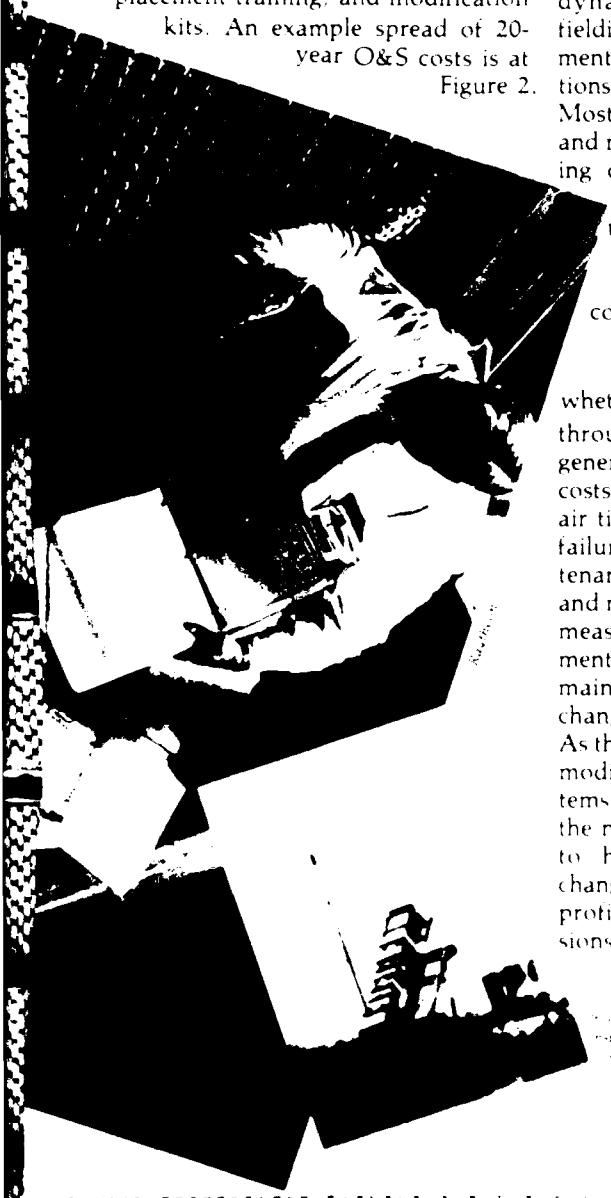
In the final phase of U.S. Army system operational tests at White Sands Missile Range, N.M., four Patriot air-defense missiles successfully engaged and destroyed four target aircraft. The successful 3-month evaluation was concluded ahead of schedule.

As PATRIOT is produced and deployed, each system change is examined to identify opportunities to improve equipment reliability and maintainability while optimizing O&S costs.

Background

Operating and support costs, incurred when a weapon system is deployed, usually account for about 60 percent of the total life-cycle cost (see Figure 1). Initial training, staging, and transportation costs do not fall under the O&S umbrella; all costs associated with initial deployment of men and equipment fall under fielding costs. The major contributors to sustainment (O&S) are depot maintenance, military personnel, other (indirect) sustainment, and replenishment spares. Lesser contributors include petroleum and oil and lubricants, transportation, replacement training, and modification kits. An example spread of 20-year O&S costs is at Figure 2.



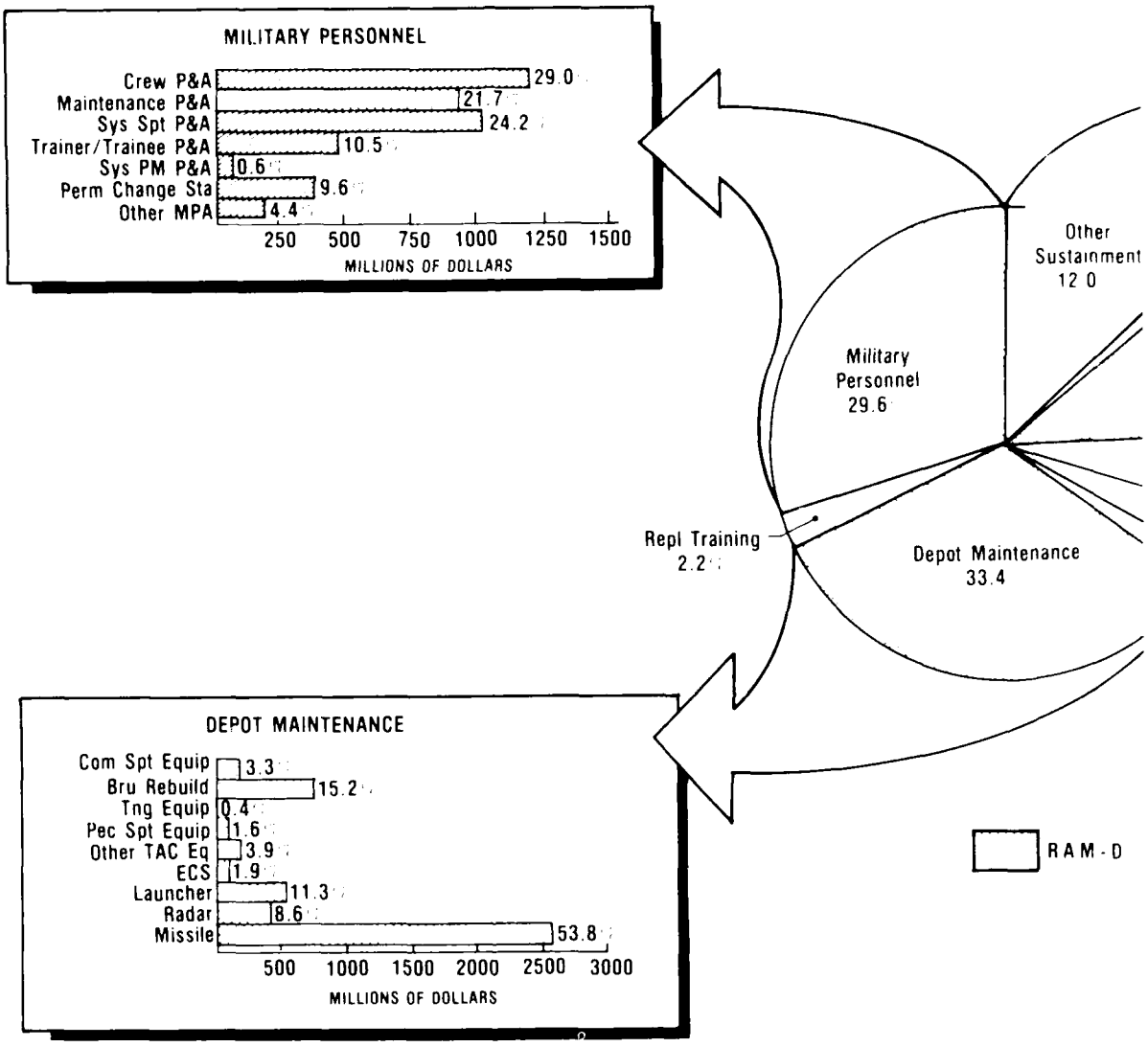


Weapon system sustainment is a dynamic process. After system fielding, there are changes to equipment, people, concepts and operations, which directly affect O&S costs. Most weapon systems have reliability and maintainability growth, engineering change proposals, and are impacted by new technology. As modifications are incorporated into the system, performance characteristics are altered and costs associated with sustainment change; for example, reliability and maintainability growth, whether planned for or occurring through normal system evolution, generally cause a decrease in O&S costs; as a system requires less off-the-air time for maintenance, due to less failures or less repair time, the maintenance logistics burden is reduced and may warrant less spare parts, test measurement and diagnostic equipment, depot-level maintenance, or maintenance personnel. The ever-changing threat influences O&S costs. As the threat is updated and redefined, modification of existing weapon systems may be necessary. In addition to the necessity for direct modifications to hardware or software design, changes can comprise new operational profiles, deployment concepts, missions, and force structure.

Establishment of O&S Cost-Reduction Program

In October 1984, General Maxwell R. Thurman, Army Vice Chief of Staff, directed Army materiel developers to instigate a program whereby reliability, availability and maintainability-durability (RAM-D) driven O&S costs associated with weapon systems would be reduced by 50 percent, and their non-mission capable rates reduced by 50 percent. Initial target date for introduction of cost-reduction initiatives was 1991 with an overall program objective of 20 years.

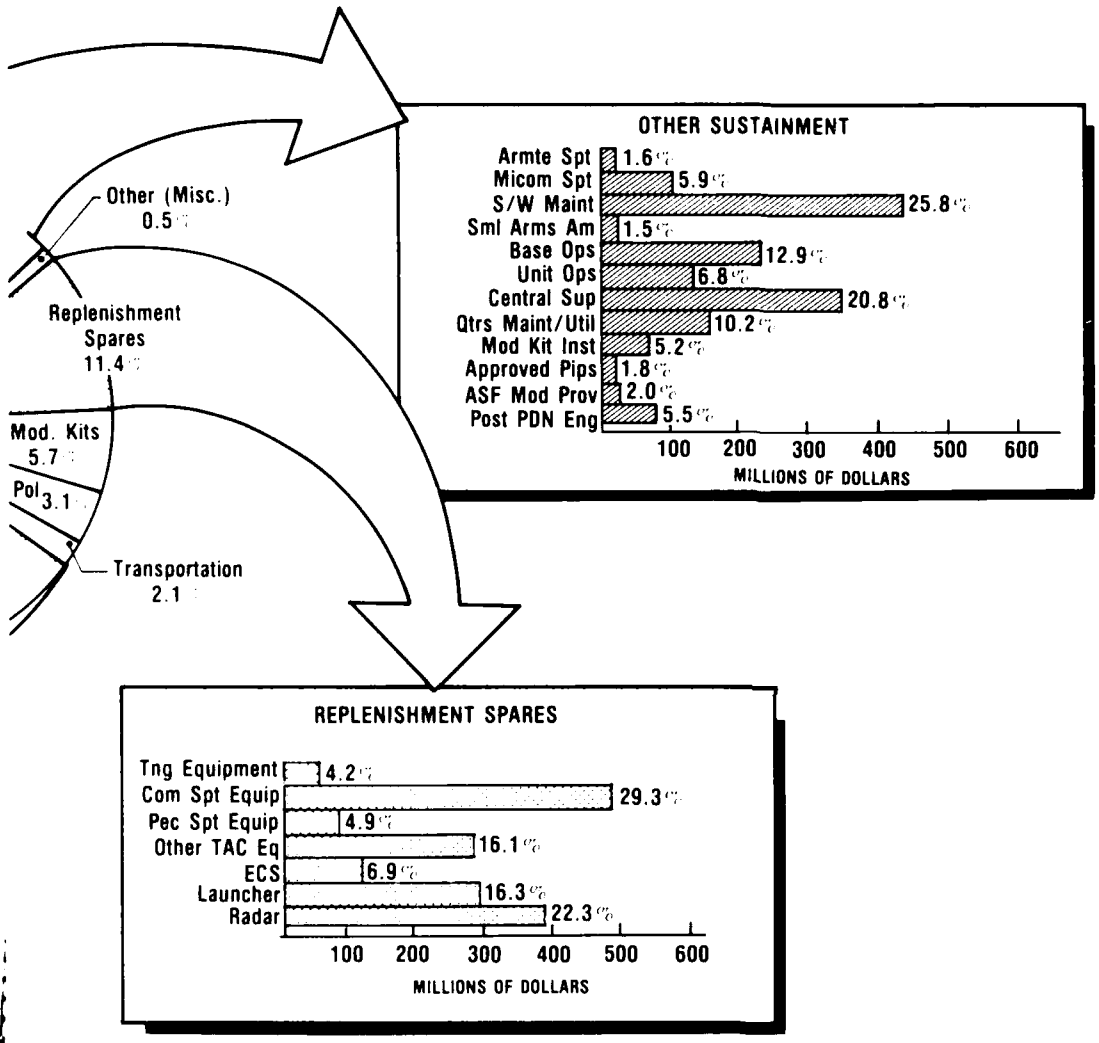
The baseline cost estimate was chosen as the instrument against which all projects would measure O&S savings initiatives. Because the baseline cost estimate is revised periodically, a particular year and timespan must be specified; for the present U.S. Army Missile Command O&S Cost-Reduction Program, 1984 was directed a base year for the baseline cost estimate, and 1985 through 2004 as O&S years for savings calculations. Selecting a common base year for all projects was difficult for measuring a project's progress toward the goal due to varying points in the system's life cycle. Figure 3 indicates the degree to which life-cycle costs are committed by program milestone. Life-cycle costs are committed early as compared to the rate they are expended; by Milestone II, ap-



proximately 85 percent of a system's costs are committed by design and logistics choices already made. It is evident that the base year established for the O&S Cost-Reduction Program strongly influences the degree to which a project can achieve the 50 percent O&S cost-reduction goal. For a project fielded before the base year, significantly influencing O&S costs during the next 20 years, or any timespan, is difficult. On the other hand, a project in prototype development will be able to introduce O&S cost savings initiatives more effectively with larger savings during the life of the system.

■ *Mr. Renegar is manager of the Product Assurance Department and Ms. Geary is a reliability, availability maintainability engineer, both at CAS Inc., Huntsville, Ala.*

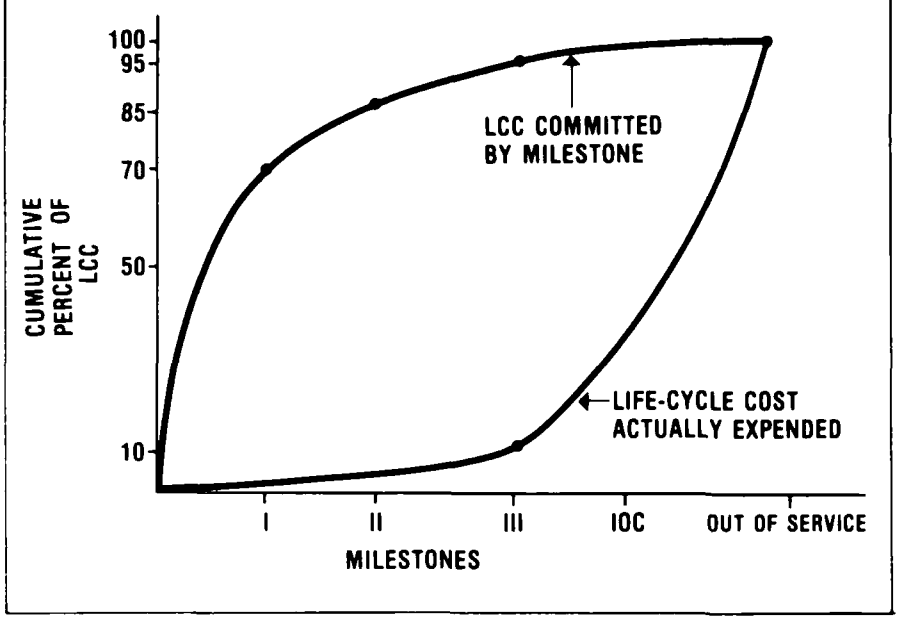
When the Army Vice Chief of Staff directed the RAM-D driven Cost-Reduction Program, the PATRIOT system was in production and initial deployment, and was at a pivotal juncture in its life cycle. Few O&S dollars had been expended, yet the design was in place and logistics support was well defined. The PATRIOT's O&S cost projections were reviewed and many initiatives were considered that could have a dramatic impact on O&S in



cluding extension of the recertification period of the missile—planning up to this point involved a 5-year recertification cycle, yet millions of dollars could be saved by extending the recertification period 7-10 years. Considering the potential for savings, studies analyzed missile components having a limited shelf life to determine whether initial predictions were accurate, or whether the missile's life could be extended. Other initiatives, like refurbishment of end-items, in theater versus CONUS, were examined. Had PATRIOT been fully deployed, the ability and feasibility of altering such activities would be tenuous. Once facilities, support personnel, and programs are established and operating, it is usually costly to revise and redirect a major effort. While concepts, like logistics and maintenance concepts, are being developed and/or formalized, the optimal period exists for reshaping or guiding them to encourage a minimal O&S cost in the future. Had PATRIOT been approaching Milestone II, rather than already having

The views, opinions, and/or findings contained herein are those of the authors and should not be construed as an official Department of the Army position, policy, or decision unless designated as such by other documentation.

Figure 3. System Life Cycle



passed Milestone III, operating and support cost-reduction initiatives would have been introduced more efficiently into project planning.

Challenges

Selecting the baseline cost estimate introduces unique problems in applying program results to actual dollar savings at Army or Department of Defense levels. The PATRIOT is a case in point. The baseline cost estimate is the project manager's estimate of system life-cycle costs, including O&S; however, O&S funding is done through the program analysis and resource review modernization resource information system as a subset of the planning, programming and budgeting system. There is an inherent difference in the development of the project manager's estimate of O&S cost in the baseline cost estimate and that of the Major Command/Department of the Army estimates of O&S funding requirements in the MRIS system. This difference has existed since creation of the PARR/MRIS system. The baseline cost estimate is developed through life-cycle cost estimating methodology, as recognized by the cost analysis/cost estimating community and in accordance with the DA PAM II-Series. The baseline cost estimate focus is on life-cycle cost estimating, covering 20-30 years beyond the sunk cost. Conversely, MRIS estimates are developed by the program/budget community with focus on near-term budgets and out-year programs of up to 5 years. The Army management structure does not provide weapon systems specific coding for O&S accounts; therefore, there is no historical O&S budget execution data to support O&S estimating by appropriation. The baseline cost estimate for PATRIOT is based on engineering estimates developed at the project level. The MRIS estimates vary by Major Command and are developed at that level. Although the Army management structure (restructure) is intended to solve this problem, it is not in place. The baseline cost estimate process, as compared to the modernization resource information system development process, is summarized in Figure 4.

Besides methodology differences, there are systemic differences. Some major differences for PATRIOT are guidance, timing of guidance, procurement schedule, operating tempo, fuel consumption factor, cost factor, and validation process.

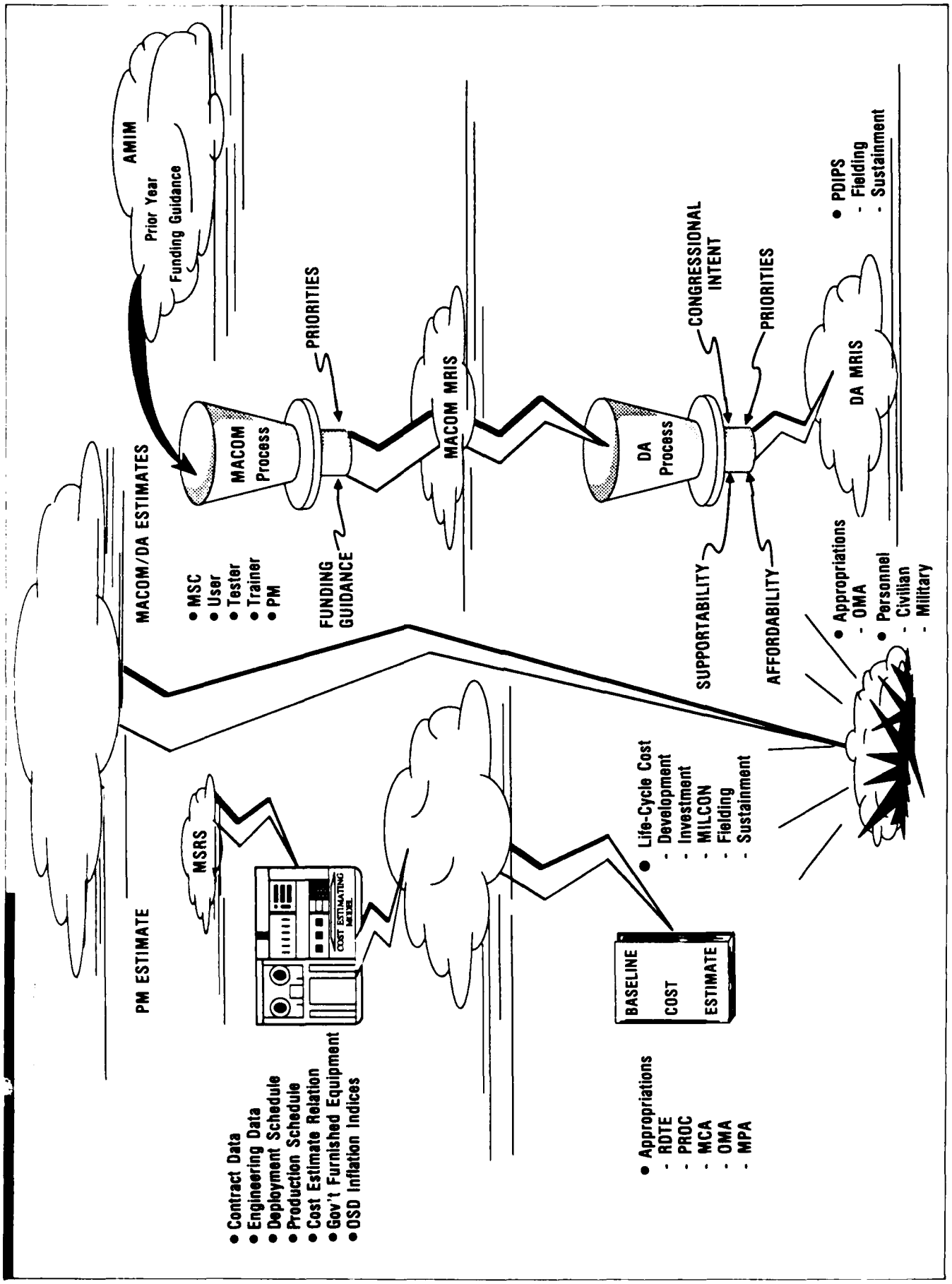
Different guidances and their timing provided different assumptions for estimates. Procurement schedules' differences would provide different deployment schedules. Although updated by the Army Staff during the program objective memorandum building process, estimates were not recosted by the original estimating Major Command. This created a disjointed estimating process, especially affecting estimates of fielding cost and the quantity of units to be supported under the sustainment cost. Operating tempo differences especially impacted sustainment cost in the areas of petroleum and oil and lubricants and repair parts. Cost-factor differences affect all areas of fielding and sustainment. The different validation process created separate channels for test of reasonableness. All baseline cost estimates flow through one channel of validation, while modernization resource information system validation flows through Major Commands and Department of the Army appropriation subappropriation directors. Major PATRIOT differences are summarized at Figure 5.

Direct and Indirect Benefits

Many benefits in addition to O&S cost-reduction initiatives are realized through this program, the most significant being emphasis on future impacts resulting from today's decisions. Quantification of changes in O&S costs for potential system modifications becomes a key element in the decision-making process. Additionally, project office functional managers are aware of sustainment costs and their significance in system life-cycle costs; because O&S costs are influenced by all project areas, this program provides integration. Increased project awareness of potentially impacting O&S costs during the decision-making process necessitates interaction of all project office elements.

Because the base cost estimate was established as the program baseline, it was objectively and thoroughly reviewed by people not directly involved in its creation. Methodologies, schedules, factors, and equations were defended from derivation and applications standpoints by the project functional manager to independent analysts. Figure revisions of the base cost estimate can reflect knowledge gained; i.e., clarification of methodologies, corrections and identification of data sources.

To avoid the reallocation of a project's funds to another activity based on the project's projected savings, the entire Army Materiel Command community was aware of the mismatch


AMIM
Prior Year
Funding Guidance
MACOM/DA ESTIMATES
• MSC
• User
• Tester
• Trainer
• PM
MACOM Process
PRIORITIES
FUNDING GUIDANCE
MACOM MRIS
DA Process
CONGRESSIONAL INTENT
PRIORITIES
SUPPORTABILITY
AFFORDABILITY
DA MRIS
• PDIPS
- Fielding
- Sustainment
• Appropriations
- OMA
• Personnel
- Civilian
- Military
PM ESTIMATE
MSRS
COST ESTIMATING MODEL
• Contract Data
• Engineering Data
• Deployment Schedule
• Production Schedule
• Cost Estimate Relation
• Gov't Furnished Equipment
• OSD Inflation Indices
• Appropriations
- RDTE
- PROC
- MCA
- OMA
- MPA
BASELINE
COST
ESTIMATE
• Life-Cycle Cost
- Development
- Investment
- MILCON
- Fielding
- Sustainment

BASELINE COST ESTIMATE (BCE)		MODERNIZATION RESOURCE INFORMATION SYSTEM (MRIS)
MSRS - APRIL 1985 •	GUIDANCE DOCUMENT	• AMIM - JULY 1984
POM - FY'87 - FY'91 •	PROCUREMENT SCHEDULE	• POM FY'86 - FY'90 "UPDATED"
NATO PEACETIME REQUIREMENT •	OPERATING TEMPO	• 50% NATO PEACETIME REQUIREMENT
100% TACTICAL POWER •	FUEL CONSUMPTION FACTOR	• 68% TACTICAL POWER
LATEST CONTRACT DATA •	COST FACTOR	• SPECIFIC COST FACTOR
LIFE-CYCLE COST ESTIMATING • (DA PAM 11 - SERIES)	ESTIMATING METHODOLOGY	• MACOM METHODOLOGY (COULD VARY BETWEEN MACOMs)
COST ANALYSIS COMMUNITY • (MSC/AMC/DA/OSD)	VALIDATION	• PROGRAM/BUDGET COMMUNITY (MACOM/DA)

among BCE, PARR, and MRIS. Savings identified as a result of this program cannot be reallocated without first determining relationships among the methods of financial management used within the Department of Defense.

Lastly, this program promotes establishment within the project of one focal point responsible for maintaining current records on all system modifications and their O&S impact. One focal point permits centralization of information, consistency in analysis methods, and a project perspective of system sustainment costs. Using a single office aids in timely and accurate response to O&S guidance and program reporting requirements.

In summary, the RAM-D operating and support cost-reduction program directed by the Army Vice Chief of Staff has emphasized to Army Materiel Command personnel the importance of sustainment-cost considerations during system development and management. Sustainment costs can be reduced effectively through many avenues within the project manager's control; but, some of the largest contributors to sustainment costs, like military personnel, are managed at a level much higher than the project and are, therefore, out of the project manager's control.

The RAM-D operating and support cost-reduction program promotes a project's consciousness of the future impact present decisions may have on sustainment cost and resources. ■

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"FOOL ME TWICE"

The Use of Past Performance in Source Selection

Lieutenant Commander Michael J. Dougherty, USN

If all the catch-phrases, cliches, rules of thumb, and old-fashioned saws that apply to program management were laid end-to-end, they would undoubtedly circle the E-ring of the Pentagon. Yet, their numbers by no means make them invalid. On the contrary, a more liberal use of some of these one- and two-liners would be in direct compliance with today's policies of streamlining, quality, and common sense.

The dedicated program manager who tries to employ these phrases will often find, unfortunately, that there is a catch to their usage. For every adage the program manager likes to use, there is at least one counter-adage that adversaries will surely use. From the day he sets up his program office, the program manager is choosing between "Many hands making light work" and "Too many cooks spoiling the broth." The program manager has to "Look before (he) leaps" but if he "hesitates, (he) is lost." The list goes on and on, permeating every aspect of the acquisition process from the simplest to the most complex. In fact, the more complex the task, the more the all-too-human program manager will yearn for a simple phrase that will get to the heart of the problem, calm the restless natives, and stamp out brushfires in one fell swoop. One of these tasks is source selection.

Few tasks rival source selection as a microcosm of the entire program management process. While sliding up and down the scale of technology versus requirements versus capability and striving for the best fair and reasonable contract with a limited, unstable budget, the program manager and the procuring contracting officer are exposing their judgments to concentrated financial, legal, and political pressures. Their technical expertise, interpersonal skills, business acumen, and prescient powers are put to a visible test. The last attribute is particularly vulnerable when attempting to foresee future contractor success based on that contractor's past performance. In this situation, it's no wonder that "Fool me once, shame on you; fool me twice, shame on me," slips in so readily. The fact that this homespun philosophy reflects official policy makes its application easier still.

Beginning with Federal Acquisition Regulation Subpart 15.6, the use of past performance as a selection criteria is codified:

> Other evaluation factors that may apply to a particular acquisition are cost realism, technical excellence, management capability, personnel qualifications, experience, past performance, schedule, and any other relevant factors.[1]

Its listing among these factors so vital to program success highlights its importance in the view of FAR authorities. The Office of Management and Budget echoes this view in Circular No. A-109:

> Selections from competing system design concept proposals will be based on a review by a team of experts . . . . Such a review will consider . . . .The relevant accomplishment record of competitors.[2]

The Department of Defense makes its collective thoughts known via Directive 4105.62, "Selection of Contractual Sources for Major Defense Systems." The latest edition of this document states, in part:

> The offeror's recent and relevant past performance (measured by such indicators as quality, timeliness, cost, schedule, operational effectiveness, and suitability) may be considered in assessing the probability of successful accomplishment of the proposed effort in a timely and cost effective manner.[3]

Each military service has, in turn, applied this philosophy down its chain-of-command. Notably, though, the Air Force took the idea one step further several years ago. As noted in Aeronautical Systems Division Pamphlet 800-7, *Source Selection Guide*:

> The key point in the AFSC policy is that past performance criterion shall be equal in ranking or stature to all other criteria if all are equal, or *first* if ranked in order of importance. (emphasis added)[4]

Furthermore, from the Carlucci Initiatives of 1981[5] to the ongoing Taft quality emphasis,[6] numerous DOD officials have personally praised the virtues of considering past performance in source selection. In fact, past performance has been a factor since at least 1960[7] and probably long before that.[8] Why then, do adjectives that surround discussions of this topic run the gamut from basic and smart, through controversial and difficult, all the way to impossible and absurd? Perhaps the answer to this dichotomy lies in some instances not conducive to using past performance.

In the area of poor past performance, there is the "people who live in glass houses" instance. A common occurrence, this scenario shows cost growth, schedule slips, and/or poor quality to be a shared government contractor responsibility. A budget cut led to requirements redefinition, which changed the design causing wasted effort, which slipped the schedule, etc., etc., etc. The contractor who loses the next competition because of poor performance in this context, could probably convince a court that he had been handed the dirty end of the stick.

Next, there is the "don't change horses" situation. After working with a contractor for several years, the program manager has finally forced him to toe the line. The contractor's product may be later and more expensive than planned, but it does the job; the contractor's people are experienced, know the system and the requirements and, most importantly, the program manager knows them, their strengths, weaknesses, and motivators. Non-selection for a follow-on contract based on the early poor performance may be another case of the government shooting itself in the foot.

"Biting Off More"

The "don't kick a man" instance applies after a contractor has, in fact, lost a competition because of validated poor performance. Chances are good that, in the interval, this contractor will get his act together and make necessary, corrective changes. A further non-selection would smack of black-listing.

Related to this scenario is the one of "biting off more." Here, a contractor is either in an area beyond his expertise, or attempting to push technology too far and fallen on his entrepreneurial sword. This poor performance may have little to do with future success as long as the contractor stays within his true capabilities.

The relatively new "one bad apple" situation involves a teaming arrangement. Should the entire team of contractors be marked down because one company had past problems? What effect would this have on the willingness of smaller companies teaming to compete against larger ones? What about the effect of commercial peer pressure?

Lastly, there is the "silk purse from a sow's ear" scenario which is the domain of larger companies. The relevancy of past performance in, for example, a Lockheed versus Hughes competition is questionable. In the words of Dr. Gordon: "How does one, given the requisite information, cope with every contractor's past performance being, in effect, a 'mixed bag?' "[9] For the giants, this is especially true, as different plants or divisions are basically different companies. It is here that the question of poor performance vis-a-vis illegal activities receives the most scrutiny, although the principle applies across the board.

■ *LCDR Dougherty was graduated with PMC 86-1 the past June.*

No Chickens Uncounted

In summary, using past performance as a selection criteria is questionable when dealing with big companies, small companies in teams, over-enthusiastic companies, improved companies, familiar companies, and companies subject to government-directed changes. That doesn't leave many chickens uncounted. It also doesn't make much sense. Therefore, to bring these situations into perspective, a look at the mechanics of using past performance is required.

The two key questions in this process are: What sources of past performance data are available to the procuring contracting officer? How does the procuring contracting officer use this data in evaluating competing proposals? While the first question has basically only three answers (personal observation, the contractor involved, and other government agencies), the second opens a Pandora's box of replies.

Obviously, personal observation of a contractor during the life of a contract gives the procuring contracting officer extensive data. Even more critically, though, it includes not only the facts of cost, schedule, and technical performance, but the nuances and individual circumstances of these facts. To a certain extent, the pre-award survey fulfills this need. An astute inspector will be able to take the true pulse of a company from environmental factors far removed from the ultimate product. Cleanliness, attitude, and morale could be the picture worth a thousand words of cost-performance reporting.[10] The pitfalls of this personal involvement could be "forest and trees" related, and the "don't change horses" situation mentioned above.

Best Foot Forward

"Putting your best foot forward" would certainly apply to contractor-provided information. However, there are numerous values to this source. Essential elements of current contracts and those within the last 3-4 years can be requested readily via the Request for Proposal (RFP). Not only does the procuring contracting officer receive a good data summary and a good starting point for further investigation,[11] he gets a built-in integrity check. Whatever his past performance, any-

thing other than total honesty here says volumes about the contractor. This source provides the contractor's definition of relevant past programs and can become a first indicator of the "biting off more" syndrome referred to earlier.

When all is said and done, other government agencies remain the primary sources of information for procuring contracting officers. During the years, formal and informal systems, objective and subjective, have tried to provide requisite data. The Contractor Performance Evaluation system of the 1960s was an extensive and expensive attempt to formalize performance documentation. It was cancelled in 1971 due to cost, complexity, and overall lack of effectiveness.[12] Today, Defense Contract Administration Service offices provide an extensive range of services from historical data to real time pre-award surveys. Likewise, direct contact with program managers procuring contracting officers who have had, or currently have, a contract with a company will provide a great deal of information. The latter source may fall prey to "if you don't have something nice to say"; certainly, it cannot be discounted on this basis alone. For the future, many organizations are investigating standardized data bases. The hope is that the proper system will facilitate input and, thereby, increase availability of this information to procuring contracting officers during the evaluation process. In turn, this availability will enhance the quality of the source selection decision through better correlation of future performance to past performance.

In reality, however, the availability of information on past performance has not been, nor will be, the critical factor. It is the proper use of the available information by the individuals involved that truly determines attainment of the goal of better selection decisions.

Eluding Pigeon-holing

Past performance eludes easy pigeon-holing in many ways, including the situations cited earlier and the mechanics discussed here. For instance, should the importance of past performance fluctuate in response to the type of contract? Is past performance less of a concern if the contractor agrees to a firm fixed-price contract? Does the size of the contract make a difference? Additionally, up to this point, the procuring contracting officer has been identified as the user of past performance information making the selection decision; however, not in all cases does he make the call. If used, the Source Selection Evaluation Board is charged with comparing proposal against specification and the Source Selection Advisory Council evaluates proposal versus proposal. The decision, though, rests with the Source Selection Authority.[13] Where should the past performance factor take effect? If the Source Selection Evaluation Board does know past performance, should this affect their evaluation? This could mean including it as an objective part of technology, management, and cost.[14] It could mean formalizing a subjective halo effect or its antithesis, a risk effect. In essence, a good company would be ranked higher in all areas and a bad company would be ranked lower, based not on the proposal but on past performance. Lastly, with this application to each area, is there a basic double jeopardy if the Source Selection Authority also applies an overall past performance factor?

Despite these risks, Air Force Systems Command chose to implement both the objective and subjective factoring in 1979. Termed a "specific" and a "general" consideration, past performance is part of the "integrated assessment (which) will involve a determination by the government of the overall value of each system . . . recognizing that subjective judgment on the part of Government evaluators is implicit in the entire process."[15] In the last part of this statement is the crux of the past-performance controversy. Despite the risks, can government evaluators be allowed to use their judgment?

In "Problems in Numerical Input for the Source Selection Decision," Robert F. Williams states:

> The lesson in planning for factor weights is that beyond asking officials how important a factor is, the officials should be asked to what degree they really see a difference in anticipated competitor responses.[16]

The implication is that if the difference is so small as to not be a factor, eliminate it. Carried further, the implication is that if the use of past performance will not facilitate the source selection decision, the procuring contracting officer should have the latitude to eliminate it as a criteria. Carried still further, the implication is that in all facets of past performance, the procuring contracting officer should have significant latitude.

Checking Track Record

To return to the adjectives cited above, "basic" and "smart" do apply to the use of past performance. It does make good sense to check the track record of the competing companies. It does follow best commercial practice. It *should be* one of the factors used to make the selection decision. Likewise, "controversial" and "difficult" apply. The questioning of a reputation, no matter how benign the questions, is a sensitive undertaking, as is the use of answers received. The difficulty of separating the wheat from the chaff is obvious. Finally, "impossible" and "absurd" apply, specifically when the very round peg of past performance is forced into the square hole of rigid ranking requirements and armchair quarterbacking of contracting officials' decisions; in essence, use of past performance is a complex problem that demands a complex response.

Information systems that document past performance and quantify and analyze it are critical tools in building this complex response. Yet, emphasizing the tools at the expense of the user is erroneous. Emphasis on enhancing the judgment of contracting personnel through training, incentives and, most critically, support for their decisions will get the desired "bang for the buck."

In its report, *A Formula for Action*, the Packard Commission stresses that "DOD should enhance the professional status of contract specialists"[17] and that "defense procurement practices must be less cumbersome."[18] Mr. Reinhard voiced this same message in 1980; i.e., "allow competent professionals in contracting, cost analysis, and technical areas more room to exercise judgment."[19] On the audit side, emphasis has shifted to reviews based on "good business judgment in the circumstances,"[20] rather than rigid compliance with outdated procedures.

Lastly, a 1982 study found that subjective judgment, rationally based and applied in good faith, resulted in fewer

protests. It appears that numerically objective schemes invite rebuttals while use of final discretion is respected as just that.[21]

Human Being Chooses

The bottom line is that it takes a human being to make the choice depending on the circumstances. To some, "fool me once, shame on you; fool me twice, shame on me," shows use of past performance in the source selection process to be easy.

Then again, "Nothing difficult was ever easy!" ■

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Industrial Preparedness Planning Emphasis

Program managers must detail industrial preparedness planning aspects of their programs when approaching Joint Requirements and Management Board (JRMB) Milestones. Such requirements, "on the books" for a long time, have received little command attention in the past. No longer.

Several events in 1986 demonstrate renewed awareness of the interrelationships among logistics support (operational logistics), operations plans, and industrial base response. Mobilization and industrial response capabilities were shown to be decisive factors in the execution of national strategies for protracted conflict at the U.S. Naval War College Global War Game 86. The new Defense Acquisition Team at the Pentagon is emphasizing industrial preparedness. There is a new Secretary of Defense directive implementing planning coordination through a joint industrial mobilization planning process (JIMPP). Highlighted will be foreign dependency and emergency steps that can be taken on ambiguous warning.

Watch these pages as the prescriptive actions required are resolved. The DSMC has augmented its material on the industrial base by an elective course concerning Mobilization and Industrial Preparedness. A handbook on the subject is planned. ■

—Albert M. Bottoms
Navy Chair

"We should all be concerned about the future because we will have to spend the rest of our lives there."
—Charles Franklin Kettering
Seed for Thought, 1949

"Let every nation know, whether it wishes us well or ill, that we shall pay any price, bear any burden, meet any hardship, support any friend, oppose any foe to assure the survival and the success of liberty."
—John Fitzgerald Kennedy
Inaugural Address, January 20, 1961.

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. ■

INITIAL

FUNCTIONAL

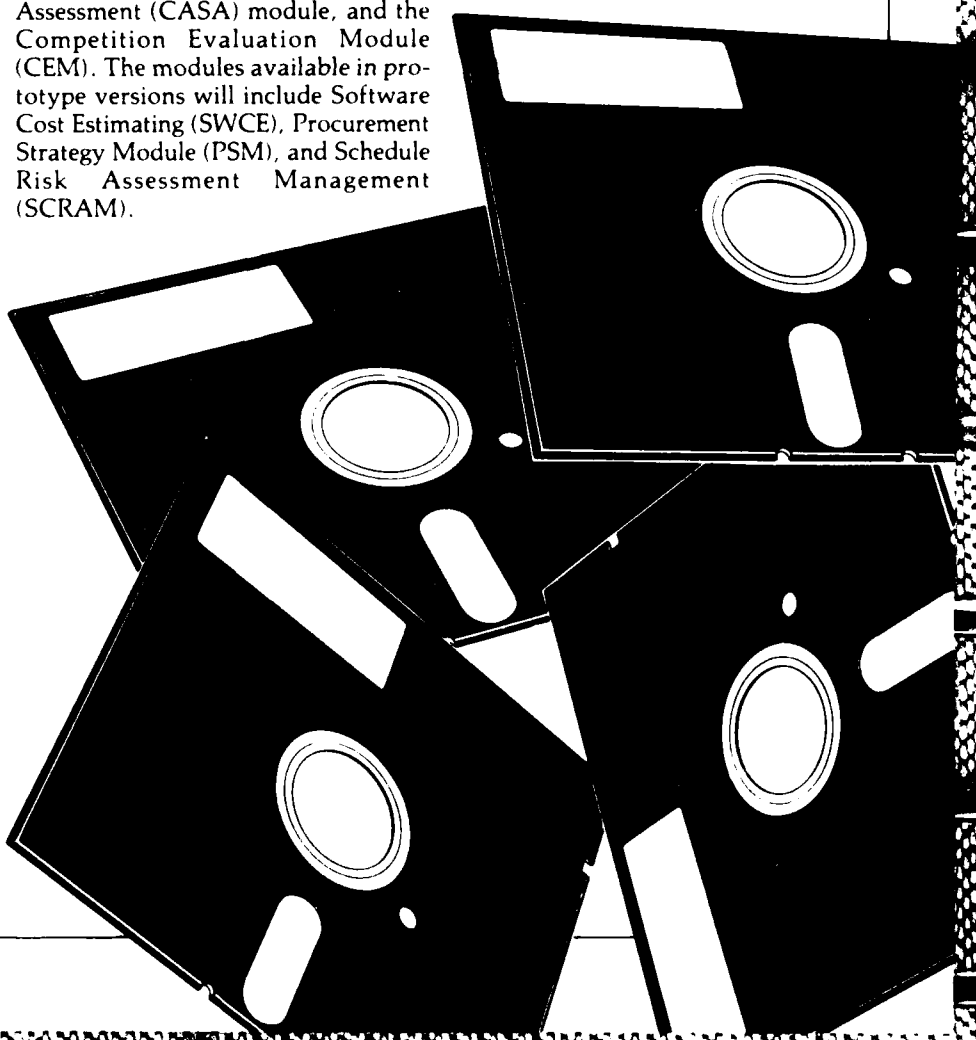
AVAILABLE SOON

The Program Manager's Support System (PMSS) is an application of decision support systems technology to the defense acquisition program management environment. It is a research program at the Defense System Management College with the purpose of providing management tools for managers in a program management office. The PMSS is being designed to assist these managers with their decision-making process and to help them execute their project in a more effective and efficient manner. The PMSS is intended to support the program manager and his/her first echelon staff: for example, the chief engineer, plans and programs officer, configuration manager, integrated logistics support (ILS) manager, etc.

The PMSS consists of two major parts, functional modules and the overall integrated system. Functional modules are software programs that can be used as stand-alone programs to assist in specific functional areas such as planning, cost estimating, scheduling, budget generation, contract monitoring, etc. The overall integrated PMSS system is a software system that integrates the individual functional modules with other functions such as program impact analysis, executive support, and management aids.

The individual functional modules have been developed separately from the overall integrated PMSS so that their capabilities could be made available as soon as they are developed rather than wait for the entire PMSS to be completed. Several of these functional modules will be ready for distribution soon. These include both operational and prototype versions. The operational modules will include the Contract Appraisal System (CAPPS), the Cost Analysis Strategy Assessment (CASA) module, and the Competition Evaluation Module (CEM). The modules available in prototype versions will include Software Cost Estimating (SWCE), Procurement Strategy Module (PSM), and Schedule Risk Assessment Management (SCRAM).

Descriptions of these modules and complete ordering instructions will be published in the next issue of *Program Manager*. Watch for the annoncement and review the descriptions carefully to determine which modules would benefit you. All modules will include complete users' manuals. ■



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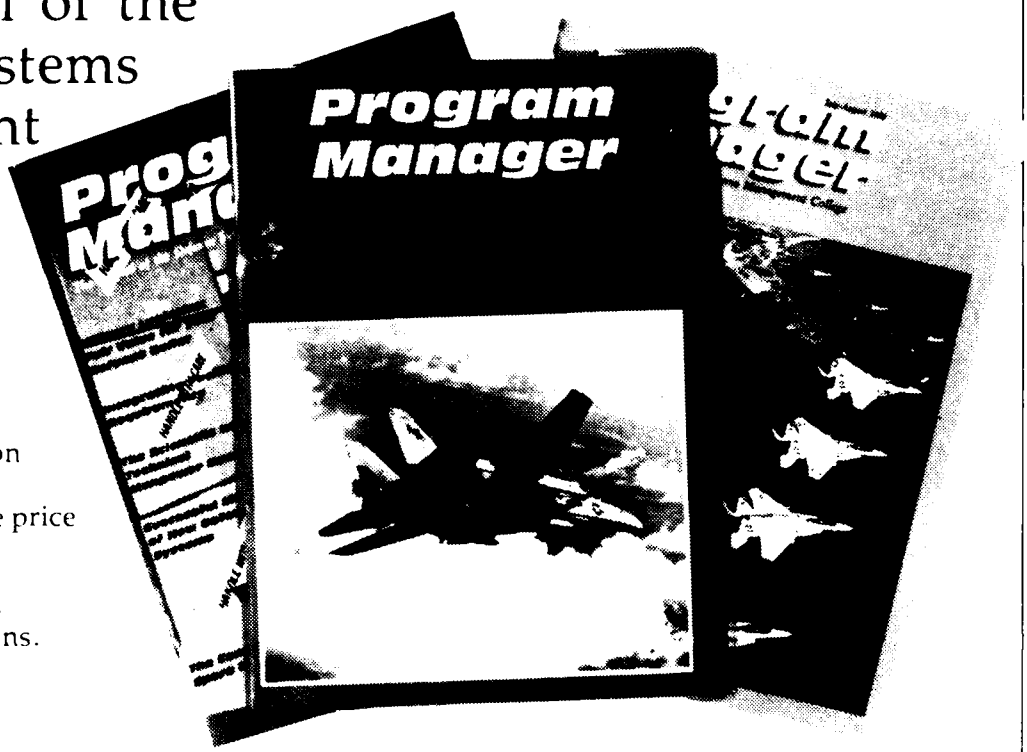

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