

DTIC FILE COPY

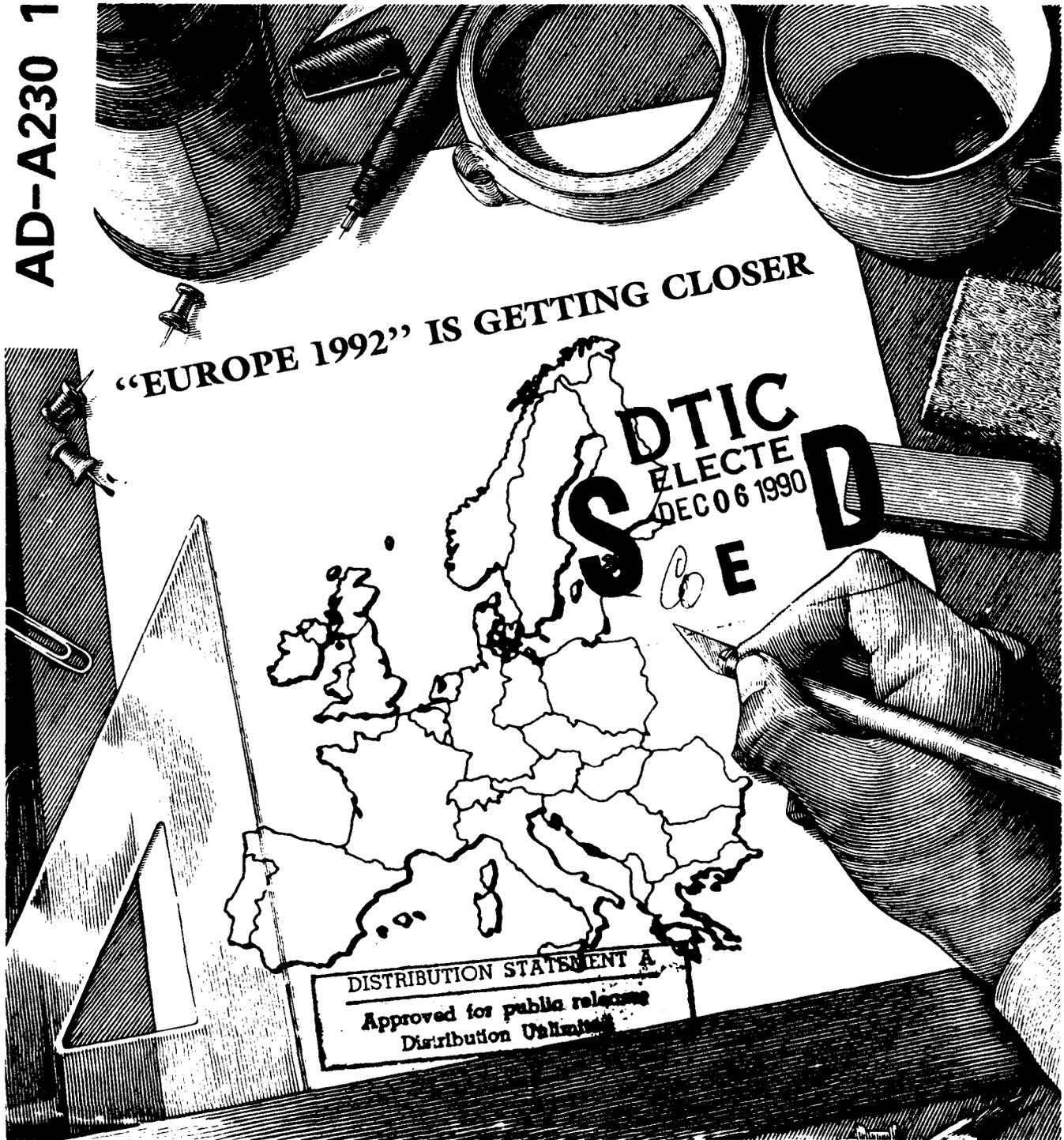
12

FEATURE
COLUMN
BY US(DG)
JOHN A. BETTI

PROGRAM *manager*

November-December 1990

AD-A230 149



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.



Accession For	
NTIS GRA&I	<input checked="" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
GPO 92-50	
By _____	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A-1	24

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402

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.

Statements of fact or opinion appearing in *Program Manager* are solely those of the authors and are not necessarily endorsed by the Department of Defense or the Defense Systems Management College. Unless copyrighted, articles may be reprinted. When reprinting, please credit the author and *Program Manager*, and forward two copies of the reprinted material to the Director of Publications.

To subscribe, government personnel should submit written requests (using their business addresses) to the Director of Publications.

Manuscripts and other correspondence are welcome and should be addressed to the Director of Publications. Inquiries concerning proposed articles may be made by phone at (703) 664-5082/5092 or AUTOVON 354 5082 5092.

ACQUISITION IMPROVEMENT UPDATE



In my first article on acquisition improvement, I said we must collectively "...strive to create an acquisition process characterized by program stability, accountability and trust—one that would be focused on customer satisfaction achieved through continuous process improvement." My second article in *Program Manager*, focused on the importance of integrity in developing trust and reducing micromanagement.

In this issue, I am focusing on another essential ingredient that permits an organization to operate effectively and efficiently while providing maximum satisfaction to people involved—*Organizational Alignment*.

Professor Peter Senge of the Massachusetts Institute of Technology describes an organization as a collection of arrows. If these arrows are generally pointed in one direction, their effect is additive and the organization moves in that direction. If, as is true in most organizations, arrows are pointed in random fashion, the output and direction of the organization is a result of the net rather than the cumulative effect of those arrows. Worse, efforts to improve the situation may be counterproductive if the arrows are not properly aligned. Time and effort spent on increasing the length of the individual arrows through empowerment, training, etc., may have a minimum, or even a negative effect, on the organization's output.

Alignment *must* be the goal of any organization.

It should come as no surprise that the larger and more complex an

organization is, the more difficult it is to achieve alignment.

The *defense acquisition* organization and the process it manages is one of the largest and most complex in the world. There are more than half-a-million government employees involved and more than 40,000 contractors with millions of employees. Every working hour the acquisition system executes 7,000 contract actions and spends an average of more than \$70 million. It manages a research and development (R&D) effort representing approximately 25 percent of the total R&D of this nation, more than the combined defense R&D efforts of Germany, Italy, the United Kingdom, France and Japan. In addition, we have a board of directors of 535 members.

Is it any wonder that it is difficult to get all arrows pointed in the same direction?

Following are examples of the lack of alignment often mentioned by acquisition system critics.

—The military is accused of being interested primarily in having weapon systems with the most advanced capabilities available as quickly as possible with cost and reliability secondary considerations.

—Program managers often are perceived to be interested primarily in keeping their programs sold and fully funded during their watches.

—Office of the Secretary of Defense staffers are accused of measuring successes and importance by their influence on initiation, redirection or termination of programs, regardless of what the military think they need.

—Comptrollers are perceived to measure successes by how much money they can save regardless of the impact on programs.

Whether there is an element of truth in these accusations or perceptions is not important. Various constituencies in a process can bring different viewpoints without negatively impacting organizational alignment. What is important is that various constituencies be prepared to blend differing viewpoints to achieve common goals.

I am convinced we will not make significant progress in improving the acquisition process until we significantly improve our alignment, which begins with a shared vision of success and common values and guiding principles.

I want to propose a *Vision of Success* and a set of *Values and Guiding Principles* to be shared by all members of the defense acquisition team. (See box on inside back cover.)

I am interested in your comments and suggestions concerning proposed *Vision of Success* and *Values and Guiding Principles*. Please forward them to the Defense Acquisition Improvement Team, The Pentagon, Room 3D944, Washington, D.C. 20301-3000.

The bottom-line is: we can do a better job for our men and women in uniform as well as our taxpayers and have more fun in the process if we can find ways to work together better as members of the same team.

(Continued on inside back cover)

DEFENSE SYSTEMS MANAGEMENT COLLEGE

Commandant
Major General Lynn H. Stevens,
USA

Provost
Gregory T. Wierzbicki

*Dean, Department of
Research and Information*
Captain Ralph W. Ortengren, Jr.,
USN

Director of Publications
Robert W. Ball

PROGRAM MANAGER

Managing Editor
Catherine M. Clark

Associate Editor
Esther M. Farris

Art Director
Greg Caruth



Program Manager (ISSN 0199-7114) is published bimonthly by the Defense Systems Management College, Fort Belvoir, VA 22060-5426. Non-government employees and organizations may subscribe at \$7.50 annually through the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Second class postage paid at Fort Belvoir, VA, and at additional entry offices.

POSTMASTER: Send address changes to *Program Manager*, Defense Systems Management College, Fort Belvoir, VA 22060-5426.

1

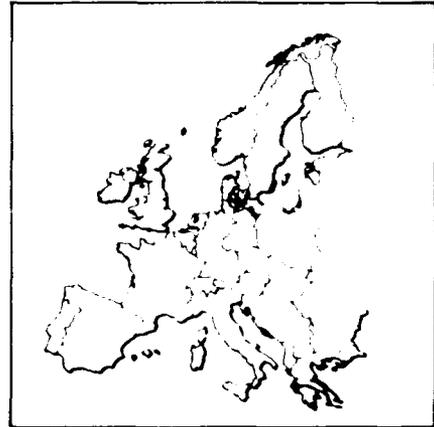


Acquisition Improvement Update

*The Honorable John A. Betti
Under Secretary of Defense
For Acquisition*

A look at micromanagement and integrity.

4



Reshaping the Demand Side Of the European Armaments Market

*Lieutenant Colonel Willie E. Cole,
USAF*

Adapted from a study by three research fellows—Army, Navy and Air Force officers.

32



The Process of Project Management

*Eddie Smith
Dr. Charles J. Teplitz*

The authors present an overview of a process that reveals benefits to be realized and obstacles to be overcome at every phase of the project cycle.

36

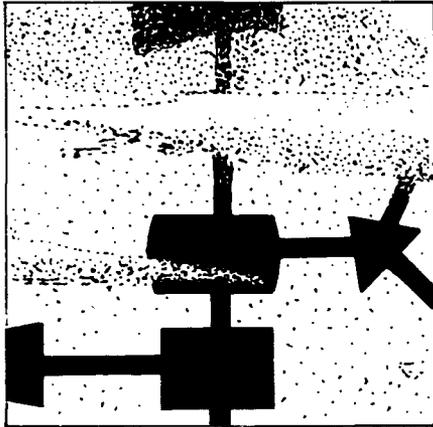


Mini Should Cost With Key Indicators

*Mrinal K. Mukherjee
James G. Gleason*

This approach, during budgetary constraints, could enhance economy and efficiency of defense industrial bases.

14

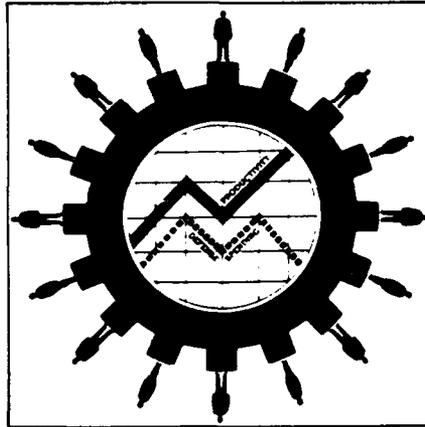


**Accountability in Design:
A Way to Improve
Acquisition Process**

Major Rich Schiripa, USAF

The author explores opportunities for continuing improvements.

18

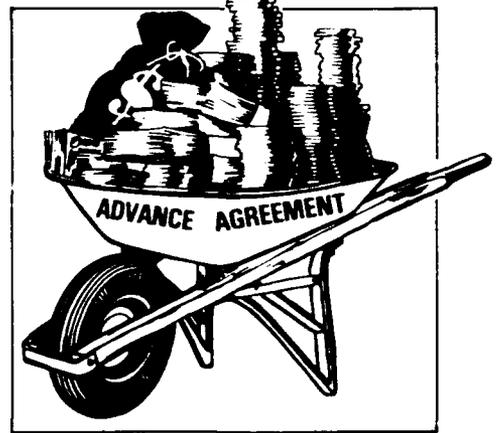


**Industrial Modernization
In a Period of Declining
Defense Budgets**

Dr. Benjamin C. Rush

A DSMC/PMI sponsored conference looks at key issues from both government and industry perspectives.

22



**Non-Mandatory Advance
Agreements On Allowable
IR&D and B&P Costs**

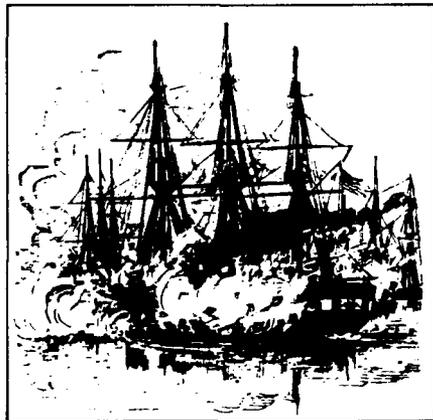
Lieutenant Commander Joseph R. Endres, USN

Dr. James M. Fremgen

How much should the government pay?



46



**Cost Variance in Acquisition:
Descriptive Analysis of
SAR Cost Data**

Miguel A. Otegui

Mr. Otegui looks for insights into programmatic issues that could contribute to more efficient weapon system acquisition.



The PAC Dilemma

Captain Raymond C. Wilson, USA

Is there insufficient manpower in the administrative structure?

Also

Book Review
(David D. Acker) 30

TQM Principles
(Jack Cohen) 45

Reshaping the Demand Side of the **EUROPEAN ARMAMENTS MARKET**

LTC Willie E. Cole, USAF

In 1781, when British General Charles Cornwallis surrendered to General George Washington at Yorktown, the British band put on their finest red coats and marched past American and French generals playing a ditty popular in England. The song's prophetic title was "The World Turned Upside Down."

Today, that tune could just as well be played to describe what is happening on the other side of the Atlantic. Europe's world is being turned upside down as it goes through changes rivaling the one that sent America toward its course of greatness. Warsaw Pact nations are breaking loose from the chains of communism; the two Germanys are uniting, creating turmoil within the North Atlantic Treaty Organization; and 12 European Community nations are racing forward to create the world's largest common market through a widely influential program called Europe 1992.

Travel to Brussels, European Commission headquarters, and you will see the blue European flag with 12 yellow stars hanging above streets and shop fronts. The European Community even has an anthem, Beethoven's "Ode to Joy," symbolizing their new togetherness. Talk to Europeans in Paris and London and you'll hear they are genuinely proud to be part of this determined movement. Once, Japan was the only concern of U.S. industrialists and

economists. Now, the spotlight of economic concern is shifting east to the Europe 1992 program with its 279 directives and regulations designed to make European industries more efficient, world-class competitors.

Yet, this Europe 1992 program is not the only European movement changing the way Europeans plan to do business. Fueled by the Europe 1992 fever, the Independent European Industries Program Group (IEPG), a 13-nation government organization dedicated to reconstructing the European defense market (See Figure 1 for membership), seems determined to combine previously fragmented and protected national markets into a single, coherent European armaments market.

As the IEPG works to bring the demand side of European weapons acquisition together by coordinating European defense research and promoting cooperative programs, the NATO Conventional Armaments Planning System (CAPS), in an exercise of partial duplication, is working on harmonizing national military requirements with NATO force requirements and promoting NATO sponsored cooperative programs.

Not to be left out, a rejuvenated Western European Union (WEU) is asserting itself as a unifying force with concerns about pan-European and transatlantic armaments cooperation. In a process that some have called "parallel integration," Europe 1992 and the IEPG are working toward a stronger, more united European defense acquisition community with the ability to deal with the U.S. defense acquisition community on a more equal footing.

Lieutenant Colonel Cole is the Director of Projects for the Joint STARS Program, Hanscom Air Force Base, Mass. He was assigned earlier this year to the Defense Systems Management College as a member of the second group of military Research Fellows.



FIGURE 1. EUROPEAN CO-MOVEMENT MEMBERS

MEMBERS	NATO CAPS	IEPG	WEU	EC
BELGIUM	X	X	X	X
DENMARK	X	X	-	X
FRANCE	X	X	X	X
GERMANY	X	X	X	X
GREECE	X	X	-	X
ICELAND	X	-	-	-
ITALY	X	X	X	X
IRELAND	-	-	-	X
LUXEMBOURG	X	X	X	X
THE NETHERLANDS	X	X	X	X
NORWAY	X	X	-	-
PORTUGAL	X	X	X	X
SPAIN	X	X	X	X
TURKEY	X	X	-	-
THE UNITED KINGDOM	X	X	X	X



How the United States responds to this stronger, more independent European defense acquisition community will impact our defense industrial base, our balance of defense trade with Europe, and the level and number of cooperative defense programs the United States has with Europe. As chessmaster Savielly Grigorievitch Tartakower said about opening movements in chess: "The mistakes are all there waiting to be made."

Independent European Program Group Forum for Cooperation And Unity

Established in 1976, the Independent European Program Group was formed to provide a forum for French involvement in European armaments cooperation (See Figure 2 for a chronological history). In 1984, after seeing little progress from the IEPG, the British and Dutch elevated the status and authority of the Group by pushing for periodic meetings at the defense-minister level. For those working in the European defense acquisition community, the IEPG has since become an influential organization. A year after the Group began meeting at defense-minister level, the now-famous Europe 1992 white paper started the European Community toward open and united commercial markets. Then, in 1986, the IEPG caught the Europe 1992 fever through its landmark report, *Towards a Stronger Europe*, that

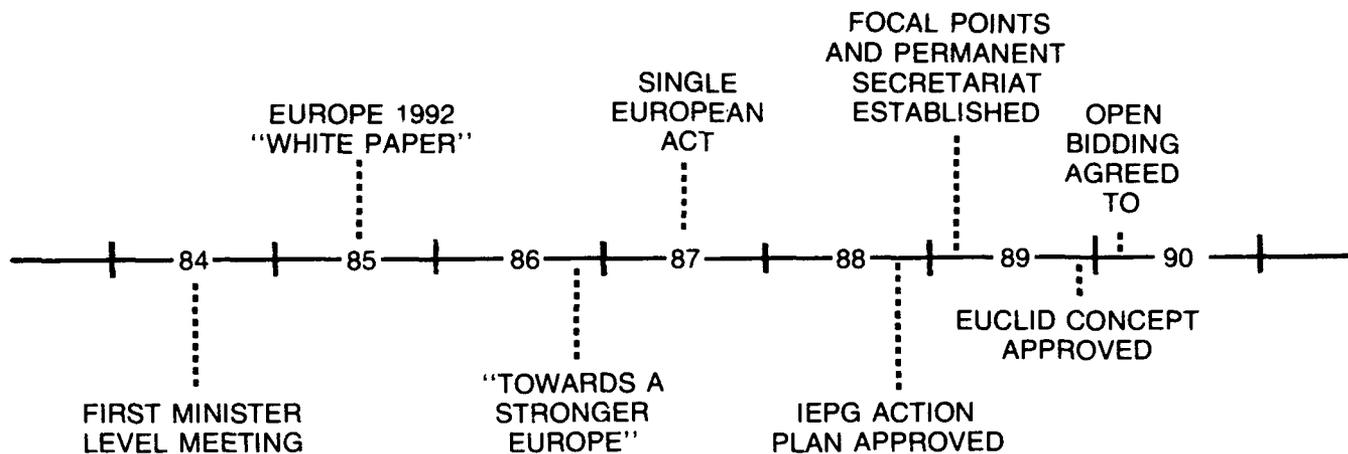
calls for more open defense markets and coordinated military research and development.

The IEPG recognizes there can be no truly integrated and open Western European defense market until fragmented and protected national defense markets of Western Europe are combined. Much of their motivation comes from the Western World's structural disarmament phenomena caused by defense budgets that cannot possibly keep up with the increasing costs of high technology weapons. Another motivating factor is an incentive to create an economic environment where European defense industries can improve their competitiveness to a level that is more on a par with the U.S. defense industry. In 1988, motivated by the twin specters of increasing costs and declining competitiveness, the IEPG published an Action Plan to begin its drive toward an integrated European armaments market.

Step-by-Step

Recognizing strong protectionist sentiments and national sovereignty issues associated with national defense markets, the IEPG Action Plan takes a systematic approach toward integrating Europe's defense markets. To pursue its step-by-step concept, the IEPG formed an organization with three panels (Figure 3) that report progress every 6 months to a meeting of the participating nations National Ar-

FIGURE 2. INDEPENDENT EUROPEAN PROGRAM GROUP TIME LINE



maments Directors, who, in turn, report every 8 months to a meeting of the participants' defense ministers. The IEPG chairmanship normally rotates alphabetically among the nations every 2 years, with the British currently holding the Chair. At the end of 1990, the Chair will pass to Belgium. In 1989, the IEPG took an important step forward and formed a permanent administrative secretariat in Lisbon to perform coordination and provide administrative assistance to the chair nation.

Sonobuoys to Cargo Aircraft

If spiraling weapon costs and European defense industry competitiveness are to be improved, a crucial element will be to increase European defense industries' economies-of-scale. Such duplications as shown in Chart 1 led to inefficiencies and reduced economies-of-scale which, in turn, lead to higher unit costs for European weapons than for U.S. weapons. Lord Carrington, former NATO Secretary General, saw the problem clearly when he said:

We simply cannot afford to perpetuate a system which has resulted in three main battle tanks-four if you count the Americans, being lined up to fight the same battle in the same place on the same day and not even being able to use the same ammunition.

The mission of IEPG Panel One is to attack this problem by harmonizing national requirements and creating cooperative programs among nations. The Panel One method centers around an Equipment Replacement Schedule (ERS) that contains a list of a nation's development programs established to replace current military equipment. Panel One examines the combined ERSs, and works with nations on harmonizing requirements for programs, attempting to match two or more national programs in time frames that would support cooperative programs. Currently, Panel One is monitoring more than 20 programs ranging from the European Future Large Aircraft to sonobuoy programs.

Coordinating Research

Because national duplication of programs and weapons systems pro-

duces duplication and inefficiencies in research, Panel Two is working toward coordinating European defense research and creating technology transfer opportunities among European defense research and creating technology transfer opportunities among member nations to help improve the overall level of European defense technology. Encouraged by the French, Panel Two formed the European Cooperation for the Long-Term in Defense (EUCLID) research program. Taking a cue from other research programs, Panel 2 patterned EUCLID after Europe's 19-nation EUREKA research program. The EUCLID program, to which IEPG nations have pledged \$135.5 million, will be accomplished by each IEPG member nation awarding technology enhancing research contracts within its borders.

To reduce duplication of research and improve European defense

CHART 1. FIELDDED EUROPEAN DEFENSE EQUIPMENT

	3000 combat A/C	22 types
	12000 tanks	12 types
Anti-tank missiles	11 Companies	7 Countries
Surface-to-Air missiles	18 Companies	7 Countries
Air-to-Air missiles	8 Companies	6 Countries
Air-to-Ground missiles	16 Companies	7 Countries
Ship-to-Ship missiles	10 Companies	7 Countries

Source: DOD

CHART 2

CEPAs	DOD CRITICAL TECHNOLOGIES
SILICON MICROELECTRONICS	SEMICONDUCTOR MATERIALS AND MICROELECTRONIC CIRCUITS
COMPOSITE STRUCTURES	COMPOSITE MATERIALS
ELECTRIC GUN	HYPERVELOCITY PROJECTILES
SIGNATURE MANIPULATION	SIGNATURE CONTROL
ARTIFICIAL INTELLIGENCE	MACHINE INTELLIGENCE AND ROBOTICS
OPTO-ELECTRONIC DEVICES	PHOTONICS
MODERN RADAR TECHNOLOGY (AIRBORNE RADARS)	SENSITIVE RADARS
MODULAR AVIONICS	PARALLEL COMPUTER ARCHITECTURE (INCLUDES INTEGRATION OF SPECIAL PURPOSE COMPONENTS INTO GENERAL PURPOSE SYSTEMS)
SATELLITE SURVEILLANCE TECHNOLOGIES (INCLUDING VERIFICATION ASPECTS)	PASSIVE SENSORS, PHOTONICS, AND SENSITIVE RADARS
UNDERWATER ACOUSTICS	PASSIVE SENSORS
HUMAN FACTORS (INCLUDING TECHNOLOGY FOR TRAINING AND SIMULATORS)	SIMULATION AND MODELING (INCLUDES TRAINING SIMULATORS)

Source: 1990 DOD Critical Technologies Plan; Interview with IEPG Officials.

technology in the most strategic and efficient manner, Panel Two is coordinating the nations' EUCLID research projects with an agreed-upon list of critical, prioritized technologies called Common European Priority Areas (CEPAs). A list of EUCLID's 11 CEPAs compared to some of the critical technologies from DOD's 15 March 1990 *Critical Technologies Plan* indicates substantial agreement between DOD and the IEPG on which defense technologies are important for the future (Chart 2).

One impressive feature of the EUCLID program is that the IEPG is working toward sharing results of the research contracts among member nations. At IEPG urging, defense firms belonging to the European Defense Industrial Group agreed to perform basic research in a similar coordinated fashion using their own funds. The EDIG, however, has not fully agreed to the IEPG concept of technology sharing, expressing con-

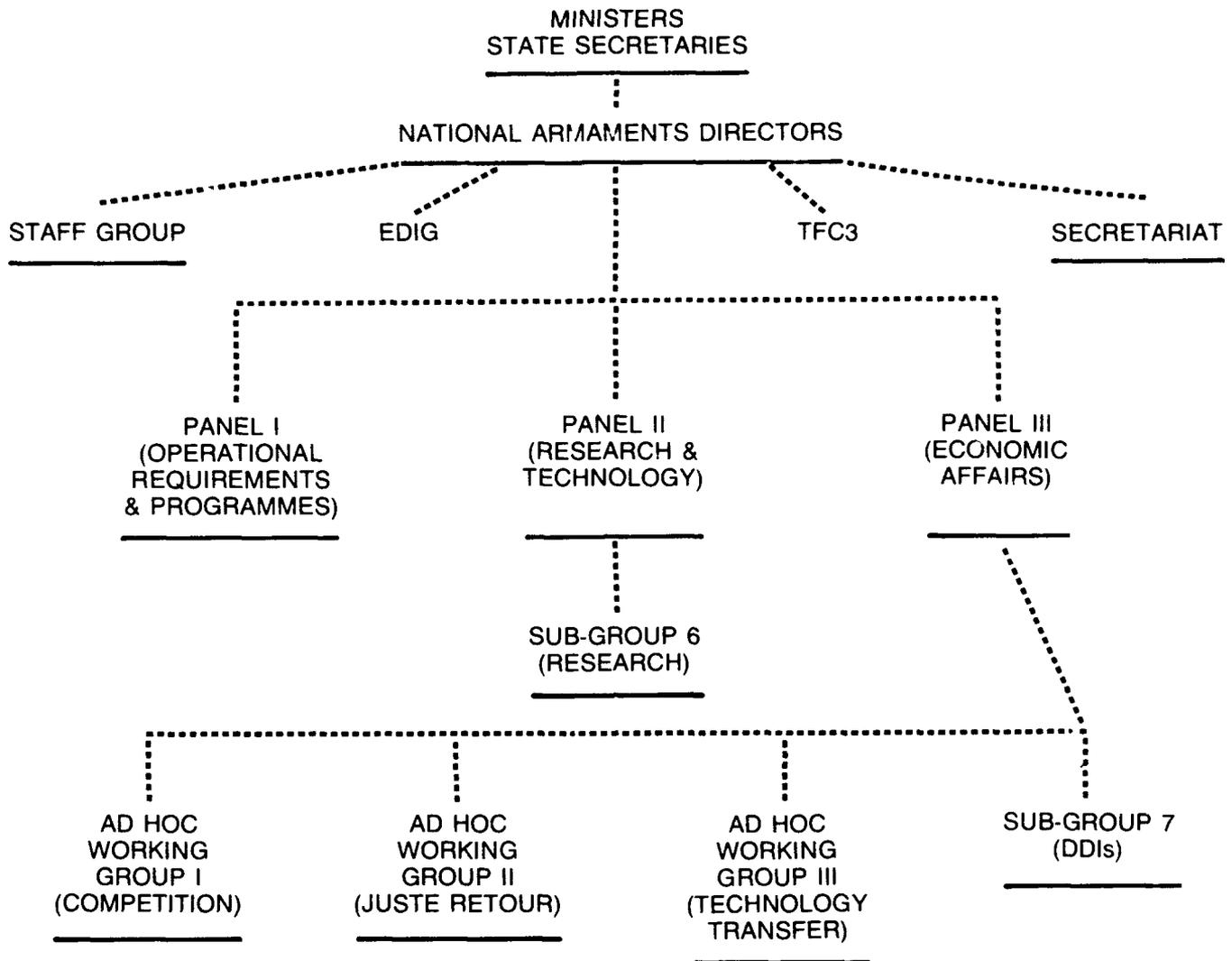
cern about losing proprietary background information. Nevertheless, Panel Two accomplishments in coordinating European defense research should improve that Continent's defense technology base, and has caused one report to call EUCLID a "major milestone in the development of the IEPG and a more efficient and competitive European defense capability."

Tearing Down Walls

While Panel Two is working toward improved technology, Panel Three is responsible for economic affairs and is taking a three-pronged approach toward opening European defense markets. First, single points of contact, called Focal Points, have been established within each nation to facilitate entry of member nations' firms into national defense markets. These Focal Points provide information on national acquisition procedures and are an important contact point for foreign firms wishing to do business in the Focal Point's nation.

The second effort at opening defense markets is directed toward advertising upcoming defense business for each nation. The IEPG pushed through a concept whereby each nation will publish a periodical similar to the U.S. *Commerce Business Daily*, which advertises future U.S. defense business. One difference between the IEPG approach and the U.S. *Commerce Business Daily* is the fiscal threshold of the advertised defense business. The IEPG concept involves defense programs in excess of 1.1 million European Currency Units (approximately \$1.4 million) while the U.S. *Commerce Business Daily* advertises any business more than \$25,000. At a meeting in February 1990 in Gleneagles, Scotland, 9 of the 13 IEPG nations announced they are publishing periodicals similar to the British *MOD Contracts Bulletin*. Not surprisingly, this concept proved to be popular among European defense firms. For example, 244 United Kingdom companies subscribe to the

FIGURE 3. STRUCTURE OF IEPG



French bulletin while 128 French firms subscribe to the United Kingdom document.

At Gleneagles, a third thrust toward opening markets was established when IEPG defense ministers reaffirmed commitment to the Action Plan and agreed to open national bidding procedures among member nations' defense markets. This concept will allow foreign defense contractors to bid on defense contracts in participating nations' markets. The process by which nations pursue this open-market concept will be in a policy document containing principles and procedures for operating an open European defense market. Writing this document, assigned to senior procurement officials, will, no doubt, be difficult because of issues it must address.

Juste Retour (Just Returns)

The policy document is expected to contain approaches to *juste retour* (just returns) and methods for aiding the Developing Defense Industries (DDIs) of Portugal, Turkey and Greece—two controversial and problematic issues originally introduced in the IEPG Action Plan. *Juste retour* is explained in the IEPG Action Plan general remarks section: "Because of very important national interests, IEPG countries will only be prepared to admit border crossing competition if they are sure to get an equitable and fair return back in a suitable time corresponding to their vital interests and their possibilities. Therefore some kind of *Juste Retour* has to be arranged." *Juste retour* is basically a managed trade concept whereby each nation receives defense business

somewhat equal to the amount of defense business that it gives to other nations.

Panel Three, overseer of *juste retour*, will be responsible for developing a system to monitor cross-border defense sales to determine when the concept should be exercised. *Juste retour* implies that less competitive nations' industries could receive preferential treatment in a to-be-defined manner. The EDIG particularly opposes *juste retour* and points out that such an approach runs counter to the Europe 1992 basic concept of improving European economies through the benefits of open competition. Companies in the EDIG are concerned that *juste retour* may be applied through government defense contracts, thereby reducing efficiencies to be gained by allowing

prime contractors to choose their subcontractors through a competitive process.

Members of the IEPG are quick to point out that they recognize *juste retour* is detrimental to competition, but that it is necessary for a period of time, say 3 years, to help improve competitiveness of the DDIs. Others counter with the argument that helping the DDIs through *juste retour* could involve an increase in European defense industry capacity at a time when the industry has too much capacity and defense budgets are declining. Currently, the IEPG plan for applying *juste retour* is not clear. What is clear, however, is that applying *juste retour* without reducing benefits of competition or increasing capacity will be difficult to achieve through practical and credible operating policies and procedures.

Transparency Concerns

Another difficult issue that must be covered by the open-bidding policy document is the set of source-selection procedures and criteria that nations will use to choose winners of defense contracts. The transparency and openness of these procedures is a concern of U.S. and Canadian observers. Many worry that *juste retour*, combined with a growing preference for European-only weapon systems, will create a European defense market with opaque procedures hiding favoritism toward European firms. This would, in effect, lock out U.S. and Canadian firms that have been involved for years in the European armaments markets.

The office of the chairman of the IEPG NAD assembly stresses that the IEPG has no desire to create procedures that could be construed as protectionist toward the North American NATO nations. Previously, the IEPG agreed upon a broadly defined set of criteria that nations should use to select sources for defense business, but it remains to be seen how the upcoming policy document will resolve this issue of transparency of source-selection procedures and criteria.

Currently, there is no formal interface between the United States and the IEPG that would allow the former

to express concerns regarding such issues. When Caspar Weinberger was Secretary of Defense, he twice offered to establish a U.S. IEPG Memorandum of Understanding to facilitate cooperation in armaments between the two communities. Perhaps it is time for the United States to renew such an offer. Participation or observation by a dominant United States would neither be welcomed nor appropriate and could divert IEPG energy and attention away from its goals. However, some sort of established relationship could go far toward alleviating U.S. concerns about *juste retour*, transparency, and IEPG exclusivity.



***Aerodynamicists
say the bumble bee
should never be
able to fly with
such small wings,
but nobody has explained that to the
bumble bee and it
flies anyway.***

One idea worth pursuing is cooperation between the United States and the IEPG on the EUCLID research program. This concept, proposed by John A. Betti, Undersecretary of Defense for Acquisition, at the April 1990 NATO Conference of National Armaments Directors, was tentatively accepted by the IEPG nations. If pursued, it has promise for improving U.S. and IEPG relations.

Strengths and Weaknesses

Lack of formality within the IEPG contributes to another problem the IEPG must deal with. Unlike NATO and the Western European Union, the IEPG is held together by the common motives and political will of the member nations rather than by a formal treaty. Sir Peter Levene, current chairman of the NAD group, said in a recent *Armed Forces Journal International* interview, "As much as the IEPG is becoming an effective organization, it's a voluntary association of sovereign nations." Therein lies both a strength and a weakness of the IEPG. Participants have motives strong enough to work toward a set of common goals, but the organization is not a treaty-empowered body that can push aside national sovereignty concerns and legally force nations to open their defense markets. Nevertheless, fueled by economic pressures and prodded by the British, who strongly believe in open markets and competition, the IEPG has made substantial progress.

There soon may be additional pressures to push the IEPG further toward open defense markets. The ongoing restructuring of the European defense industry into fewer but larger national defense firms portends the formation of one or, at most, two national defense firms in France, the United Kingdom, Germany and Italy. This near-monopoly situation can be expected to help, if not force, these nations toward open defense markets if they expect to enjoy the benefits of competition while buying weapon systems.

The Bumble Bee

Can the IEPG establish a truly open European defense market in the face of such issues as national sovereignty, *juste retour* and transparency? In 1976, skeptics did not believe the IEPG would make any progress among nations which always had separate defense industries and protected markets. Times have changed and, with the opening of European Community borders and restructuring of European industries, there is a strong regional thrust within Western Europe toward economic unification. Perhaps the IEPG trend of progress, combined with this new sense of

unification and growing pressures form a restructured European defense industry, will be enough to form a true European armaments market.

Somehow, the IEPG has been like the bumble bee. Aerodynamicists say the bumble bee should never be able to fly with such small wings, but nobody has explained that to the bumble bee and it flies anyway. The IEPG, with no binding treaty and faced with difficult issues, has not been told that it cannot make progress—so, it does anyway.

NATO CAPS--Forum for Cooperation

Lord Carrington, former NATO Secretary General, initiated the NATO Conventional Armaments Planning System (CAPS) in 1987 because of his concern for the lack of standardization and interoperability of NATO weapon systems. To help resolve these problems, the CAPS program was established to coordinate national military research and development programs with future NATO military force requirements and thereby improve interoperability and standardization, decrease duplication, increase production economies-of-scale, and promote cooperative NATO programs.

The CAPS program comes under the NATO Council of National Armaments Directors (CNAD), composed of the same members as the IEPG National Armaments Directors (NAD) with the addition of the U.S. and Canadian armaments directors. It is the first formal and systematic NATO program directed toward relating long-range NATO military force goals to national armaments research and development and acquisition planning. As such, it has tremendous potential to impact NATO nations' acquisition communities and generate cooperative programs. One impressive attribute of the CAPS program is its potential to impact nations' armaments planning systems early in the weapons-development cycle.

The procedure that NATO CAPS follows is remarkably similar to the procedure IEPG Panel One uses to harmonize European cooperative programs. The NATO CAPS program is set up to produce a long-

range Armaments Planning Questionnaire (similar to the IEPG Equipment Replacement Schedules) from each NATO nation. Responses to questionnaires indicate national development programs that could be used to meet NATO force goals. As France does not have forces positioned under NATO's integrated military command, France submits the programs she is pursuing against her own national military requirements.

After receiving questionnaires, the NATO international staff combines them into a Preliminary Analysis Review Document (PAD) for submission to the NATO Conventional Armaments Review Committee (NCARC), established in 1988 specifically to support NATO CAPS. It is in the NCARC where the important and difficult process of coordinating nations' programs occurs. Results of this coordination, including recommendations for cooperative programs, are contained in a Conventional Armaments Plan (CAP) presented to the CNAD for approval, if acceptable.

In 1988, all NATO nations agreed to 2-year trial implementation of this process. In the summer of 1989, the CNAD recognized potential of the CAPS program and agreed on a further 2-year extension to allow the system time to work out problems.

Conflicts of Interest

Content of the first Conventional Armaments Plan was the first major problem. Mr. Betti, also U.S. representative to the CNAD, recognized merit of the CAPS process but felt recommendations produced by the initial trial cycle lacked substance and did not address specific programs.

Another problem facing the NATO CAPS program is the near duplication of its effort to those of IEPG Panel One. Both have similar goals, motives and methods, except that NATO CAPS involves Canada and the United States, while IEPG Panel One does not. This duplication easily could create a conflict of interests among NATO European nations and provides potential for weakening the NATO CAPS program.

Recently, a RAND Corporation study, *NATO and 1992: Defense Acquisition and Free Markets*, suggests opening defense markets is another IEPG area in which NATO should become more involved. Noting duplication of the membership of the IEPG and the CNAD and benefits associated with open defense markets between Europe and North America, the study recommended that "Any free-bidding system should operate NATO-wide."

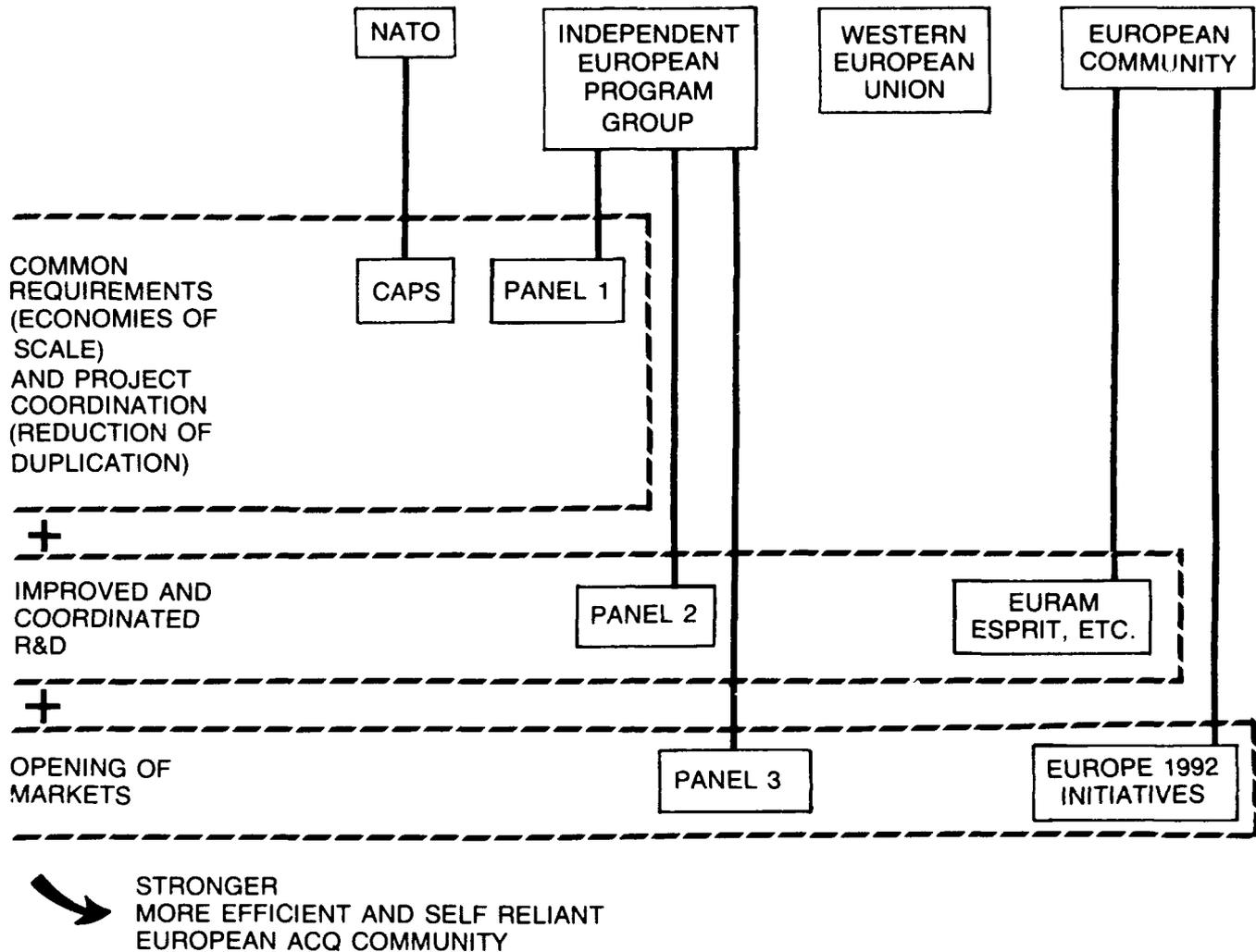
Renewed Efforts Required

Unfortunately, there is no formal connection or coordination between the two groups to address such issues. Inputting IEPG Panel One results into the NATO Conventional Armaments Review Committee process is one alternative to establishing coordination between the two bodies. Another concept would be for NATO CAPS to work in conjunction with the IEPG in opening defense markets NATO-wide. Whatever the method, NATO should strive to ensure that the existence of the two programs does not weaken the NATO CAPS effort. Besides the tremendous economic and military benefits possible with NATO CAPS, the program has the potential to strengthen the Alliance at a time when NATO's purpose and usefulness are being questioned in some circles.

As a minimum, the United States should do its part to help strengthen the program by ensuring that the U.S. Programming, Planning and Budgeting System (PPBS) and Defense Acquisition Board (DAB) processes fully consider NATO CAPS. That is not happening at this time. The United States should pursue more open defense markets within the Alliance, possibly using as a model the recently formed North American Defense Industrial Base (NADIB) concept that allows defense manufacturers in Canada and the United States to be treated equally for procurement purposes.

European skepticism toward such a move would be high considering how defense trade between the United States and Europe has been heavily skewed in the United States favor for the last 40 years. Such a move could be interpreted by Europeans as an attempt to continue that

FIGURE 4. EMERGING EUROPEAN ACQUISITION COMMUNITY



imbalance of trade and prevent them from improving the competitiveness of their own defense industries.

Nevertheless, such an approach, if pursued through a NATO forum such as NATO CAPS or the CNAD in a fair and equal manner, could help counter U.S. concerns about IEPG exclusivity while discouraging European armaments protectionism and promoting the benefits of open defense markets NATO-wide. Assurance that open European defense markets would be accompanied by an equally open U.S. defense market would be essential if the United States pursues such an approach.

Western European Union: Forum for Unification

The Western European Union (WEU), formed from the 1984

Brussels Treaty, was the forerunner to NATO. The WEU lay dormant for years after NATO came into existence, but came to life in 1984 when a move failed to include defense matters in the European Community. Since then, it has been a unifying force among treaty signatories for military issues outside of NATO's area of defense. For example, during the 1987 Persian Gulf war, the WEU coordinated Western European contributions such as Italian mine-sweepers.

Signatories also discuss and prepare European positions on bilateral relations between the United States and the Soviet Union. During the Reykjavik Summit between President Reagan and Soviet Premier Gorbachev, U.S. positions were passed to U.K. Prime Minister Margaret Thatcher who immediately

went into a WEU conference to determine the Western European position.

Another area in which the WEU is involved is military collaboration between France and the other WEU nations. Since France withdrew her military forces from NATO in 1966, the WEU provides a convenient forum for France and the signatory nations to coordinate military force plans. Recently, in another move toward European unity, the WEU began discussing the possibility of an all-European armed force to replace United States and Soviet forces in a united Germany.

Originally, the WEU included Belgium, the United Kingdom, France, Luxembourg, and the Netherlands. In 1954, the Federal Republic of Germany and Italy joined. Spain and Portugal became

members in 1988, bringing the WEU up to its current membership of nine nations. One unusual but positive feature of the WEU is that when its council meets, Ministers of Defense and Foreign Affairs Ministers sit side by side, rather than in separate meetings as in NATO.

As evidenced in their October 1987 *Platform on European Security Interests*, the WEU considers itself "...an important contribution to the broader process of European unification." With such an all-encompassing mandate, it's not surprising that the WEU sees itself becoming more involved in weapons procurement.

In March 1990, at the Defense Systems Management College, Ft. Belvoir, Virginia, Dr. Willem van Eekelen, Director General of the WEU, said the WEU has an obligation to increase cooperation in weapons procurement. He sees the WEU role in this area dealing mostly in the political arena while the IEPG deals with practical aspects of European armaments cooperation.

Dr. van Eekelen closed his speech with three actions necessary for maintaining Western European security: creation of a framework for economic aid for Eastern European nations; encouragement of democratization in Eastern European na-

tions; and maintaining an alliance with North America. He noted that to maintain the European alliance with North America, "...more cooperation than ever will be required in arms procurement."

What role the Western European Union eventually plays in weapons procurement and armaments cooperation remains to be seen. It's possible they could be a catalyst for new efforts in armaments collaboration. Others see WEU and the IEPG combining into a defense-related arm of the European Community as the European Community slowly becomes more involved in defense matters. Whatever their future course, the Western European Union has already contributed to the move toward European unification.

A Stronger, More United European Acquisition Community

These parallel moves toward European unity will create strong impacts in European and transatlantic armaments collaboration. Whether designed to an overall plan or not, government co-movements are rebuilding the demand side of the European armaments market in a way that will create a more efficient and self-reliant European acquisition community.

The NATO CAPS and IEPG Panel One are working toward reducing duplication and increasing Europe's economies-of-scale through common requirements and cooperative programs; IEPG Panel Two and European Community research programs are improving the European defense technology base; and IEPG Panel Three and the European Community Europe 1992 initiatives are moving European nations toward a more open European armaments market.

The result should be a stronger, more united European acquisition community capable of dealing with the U.S. acquisition community on a more equal basis (Figure 4).

At a time when the United States is concerned with a Europe that seems to be going in its own direction, such a stronger and more self-reliant European acquisition community could well result in what the Defense Policy Advisory Committee on Trade calls "polarized U.S. and European acquisition communities."

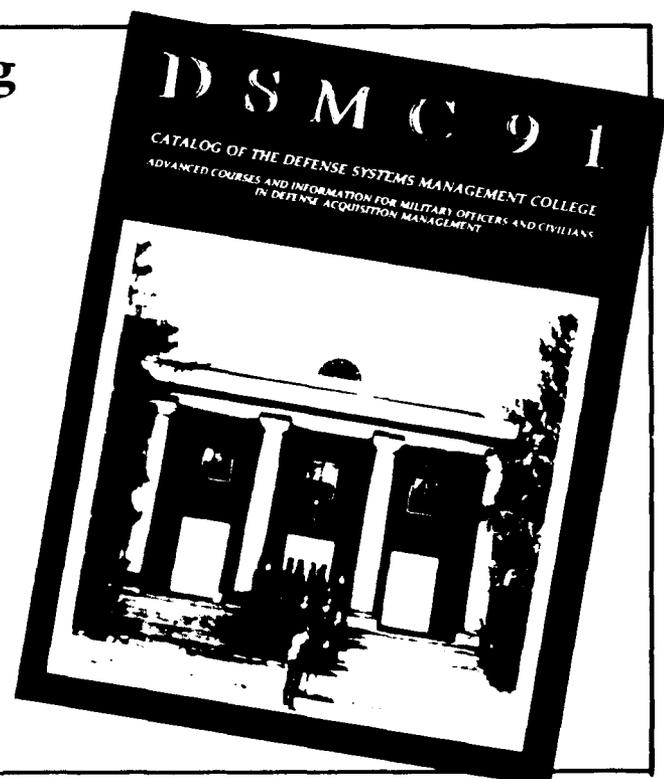
Such trends behoove the United States to support a closer relationship with the IEPG, a stronger and more productive NATO CAPS program, and the establishment of a NATO-wide defense market.

The New DSMC '91 Catalog Is Back from the Printer!

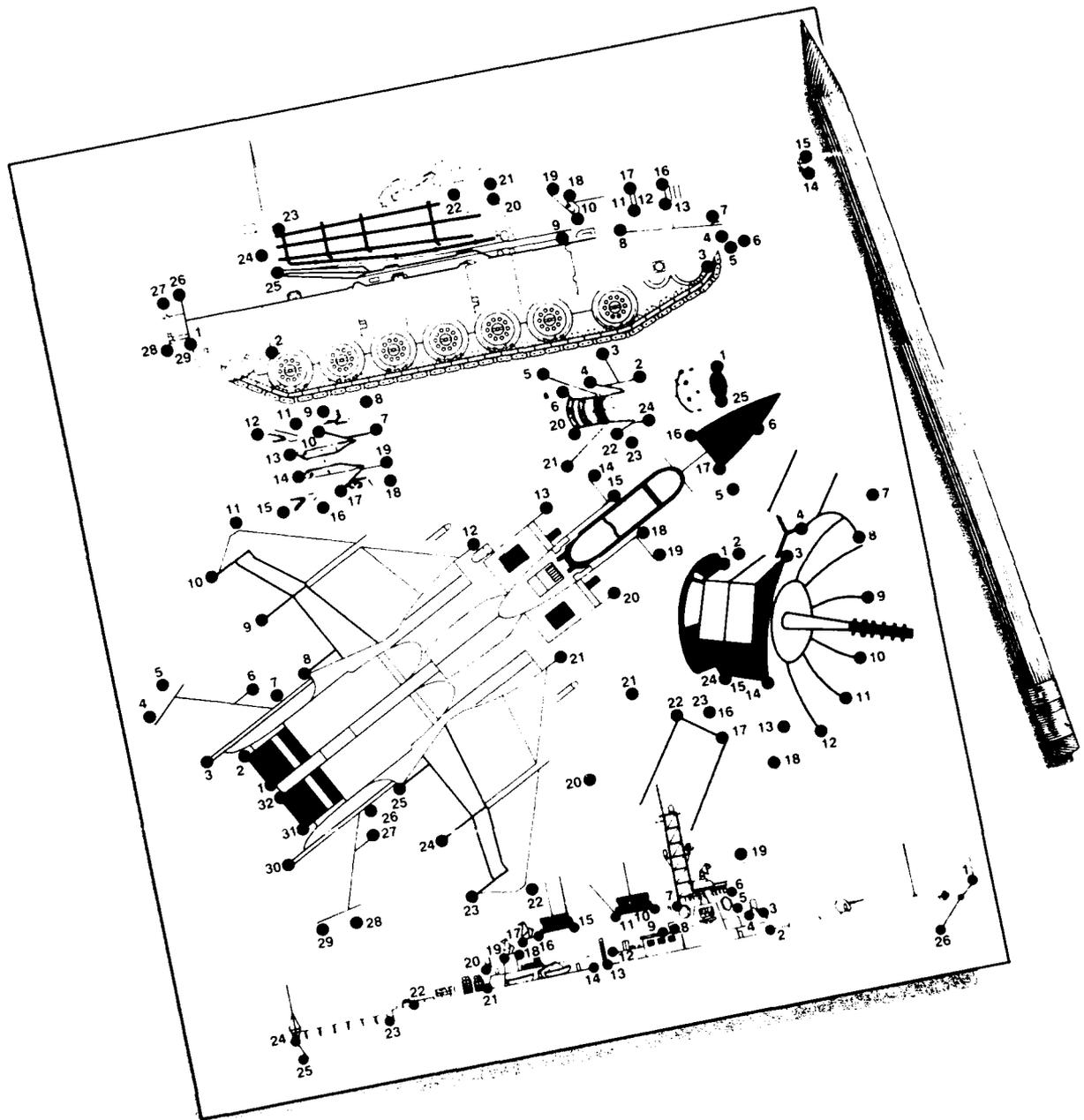
You may be on our automatic mailing list. You may even have your copy on your desk! But if you need a copy and aren't likely to get one, call the registrar at (703) 664-2152/4777 or Autovon 354-2152/4777.

This year's new improved catalog includes these helpful topics:

- A schedule of classes on each short-course page
- Better maps to Fort Belvoir and a main campus overview map
- A complete academic schedule in the back
- Information on the revised PMC 20-week course
- Updated information on graduate credit
- Current "How to Apply" section
- Our newest list of faculty and staff
- Useful phone index.



Program Management can be a real puzzle...



If you haven't seen our latest offerings, it's time to take a good look. We offer more courses in more locations than ever before. See your new 1991 DSMC Catalog or call the Registrar, (703) 664-2152/4777 or AV 354-2152/4777.

ACCOUNTABILITY IN DESIGN

A Way To Improve Acquisition Process

Major Rich Schiripa, USAF

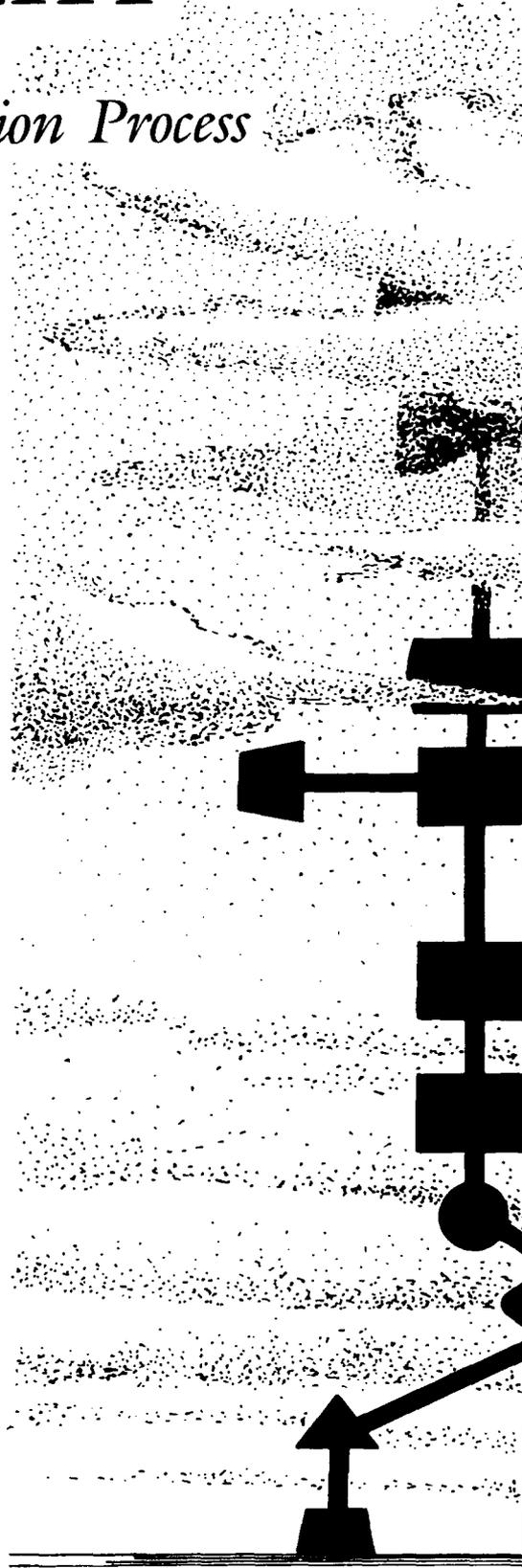
The defense acquisition process is undergoing major changes. Changes in our national priorities and associated reduced defense resources are making us take a hard look at the efficiency of our acquisition processes. Secretary of Defense Richard Cheney's *Defense Management Report* (DMR) to the President defined the cultural changes to the acquisition process needed to achieve improved efficiencies. One Air Force System Command (AFSC) activity to address these needed cultural changes was the formation of the Acquisition Process Excellence (APEX) team.

The APEX team was chartered to review the acquisition processes within the various acquisition functions with an objective to standardize and streamline the structure of program offices and associated support organizations. A key issue identified by the APEX team, and the subject of this article, centered on clouded accountability between the contractor role for technical design development and that of the government in management of program design requirements. This confusion of roles is often exacerbated by inadequately defined and changing requirements, excessive data requirements, government interference in the contractor's design business, and an often excessive specification review, approval and authentication process. This environment not only adds significantly to contract costs, but often has the effect of causing accountability for the system design to become clouded.

Major Schiripa is a systems engineering manager at HQ Air Force System Command, Directorate of Engineering and Technical Management. He is a graduate of PMIC 83-1.

The APEX team specifically highlighted the need to develop a strategy for managing system design at the system specification level and, more directly, making the contractor accountable for the system design and allowing contractor control of all lower-tier specifications. Such a strategy would allow the government to center its efforts on defining requirements and ensuring contractor performance without impeding contractor progress.

What can the Air Force and industry do to provide clear accountability for the system design? What needs to be done to create an environment that allows the selected contractor maximum design flexibility and creativity while the government maintains rights for overall program management responsibility and visibility into contractor progress? Under what conditions/parameters would the government successfully manage the system design at the system specification level? We need to look at how we can establish an environment of accountability (government and contractor) and teamwork that enables us to increase the quality of our products, reduce costs, and decreases the time it takes to get new weapon systems to the operational user. The Commander of AFSC has implemented an initiative called Clear Accountability In Design (CAID) with the support of Chief Executive Officers from the defense industry and established an Air Force/industry team to address these questions. Under this initiative, six potential areas of opportunity have been identified for effecting significant improvements in the acquisition process relative to clear accountability in design. A summary of the initial six areas follows.



Program Documentation

The first area of opportunity to be explored involves what we can do to ensure the effective development, application, and control of government and industry documents. These documents include requirement documents, specifications, military standards, statements of work, and contract data requirements. To meet this objective, there needs to be a process that encourages formal government and industry communication and teamwork throughout the requirements definition, acquisition strategy planning, and draft/final RFP development efforts. It is critical to the success of the program to develop a clear and complete set of system requirements and supporting documentation before contract initiation. It is very important that this documentation be supported by adequate system studies, cost/benefit analyses, and system simulations as necessary to assure viability of the system concept, identify major cost drivers, assure that program requirements are consistent with the budget, and that the technical risk is acceptable.

The process must also encourage contractor participation in tailoring of military specifications and standards and allow, where possible, the use of commercial documentation. Also, the current process of how the government reviews, approves, and controls system/system segment, development and product specifications is a costly and manpower intensive process, and tends to restrict contractor initiative. Consideration should be given to a process that allows the contractor, rather than the government, to maintain configuration control of detailed development and product specifications until the system has been verified and delivered. This would improve the contractor's design flexibility and responsiveness to system requirements by allowing the contractor to make design trade-offs and changes without the lengthy contract change, engineering change, and deviation/waiver processes. The final point to be made on the issue of documentation is that we need to consider those benefits that may be associated with reliance on demonstrated contractor

management systems (quality, configuration control, estimating, cost control, etc.), automated data capability and real-time data access to support government documentation requirements. We should take advantage of current management information systems technology and rely on automated data systems in lieu of the myriad paper products used by the government to monitor contractors' efforts.

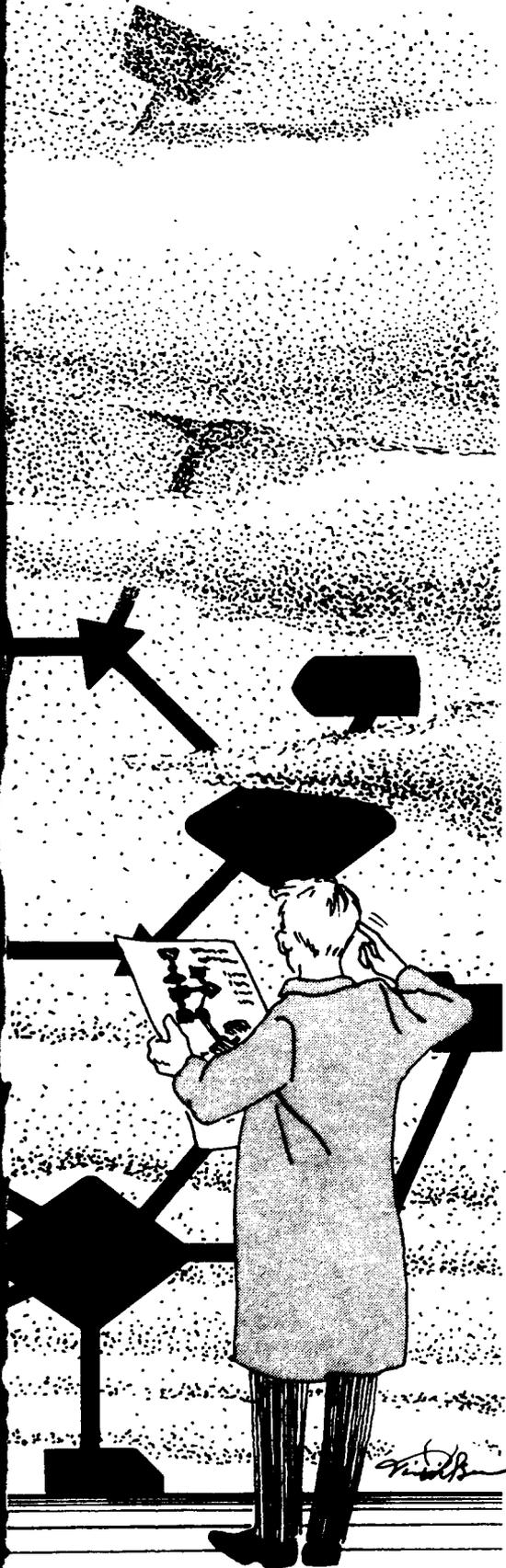
Contractor Source Selection

The second area of opportunity that may have potential for improving accountability in design is the contractor source selection process. The current source selection process is structured to balance technical, financial, economic, and business considerations in selection of the contractor most capable of meeting the proposed program objectives.

In order to achieve this balance and have a high probability of meeting program objectives, it is necessary to contract at costs and schedules that are achievable, permit independent analyses and risk mitigation actions as necessary, and allow the contractor a "fair" profit. Although processes currently exist to facilitate such a source selection, we need to consider a shift in emphasis to encourage contractor innovation, performance, capability, streamlining, quality products, user satisfaction, and away from price. Past performance, use of disciplined technical and management processes, proactive risk management, and contractor tailoring of proposed contractual documents are ways to make the source selection process more effective.

Technical Risk Management

A third opportunity area is to develop and implement a technical risk management approach that allows for the assessment of a program's technical risk on a continuing basis. Although early identification of technical risks and plans to mitigate these risks are very important, not all program risks and problems can be anticipated before contract initiation. Therefore, to be effective, risk assessment must be a



continuing function throughout each program phase. For this to be done, risk drivers need to be clearly identified and addressed in terms of capability of the product to do its intended job and the ability to produce, test, and support the product efficiently once designed. The selected technical risk management approach needs to provide the government with the visibility to verify that the contractor understands these risk drivers and has an approach to resolve them. It is vital that the government and contractor technical teams maintain close interaction to manage the risk elements at the appropriate level of detail.

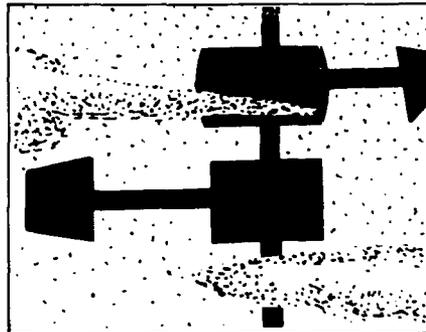
Demonstration Milestones

The fourth area of opportunity is to establish demonstration milestones tied to incentives that focus on the critical events needed to show progress. The government and contractor team need to define and agree, before contract award, on selected demonstration milestones that verify completion of significant design events, specific criteria for meeting defined milestones, a milestone schedule, and associated contractual incentives. The number and type of demonstration milestones selected should be defined according to the contractor's qualifications, process maturity level, past performance and program risks. Therefore, it is very important that the contractor's demonstration milestone program be properly evaluated and assessed during the source selection process. The key is to establish a process where government focus at demonstration milestones will be to verify satisfactory contractor performance at the appropriate specification levels and not to direct specific design solutions. A logical flow of these demonstration milestones will allow the government to address clearly where the design and associated processes are vis-a-vis where they should be at any given time.

Disciplined Process

The fifth area of opportunity, which relates closely to the area above on demonstration milestones, involves establishment of disciplined processes during product develop-

ment. The current method of intensive government oversight in managing a contractor's design to the lowest level of detail requires significant amounts of both government and contractor resources. The assurance of disciplined processes will allow a more effective utilization of these resources when assessing milestone progress toward meeting program objectives. These processes may be grouped into such categories as design and production operation controls, automated databases and management systems (e.g., Computer-Aided Acquisition and Logistics Support), factory production control, and resource management systems. The government and contractor team must develop and implement processes and tools (analytical/simulation) that provide the outputs needed to understand test results, support government evaluation of requirements compliance, and that allow effective assessment of program progress without excessive government oversight.



Problem Resolution

The sixth area to be addressed is the delineation of a process which defines government involvement in the resolution of design problems. The key to the process is to define when and how the government gets involved in problem resolution, details of involvement levels, and how to initiate involvement while the contractor maintains accountability for the design. This requires that government and contractor roles and responsibilities be clearly defined before contract award. Generally, the roles and responsibilities would be structured so the government will not need to specify design solutions to the problem. The government's role should be of a top-level nature aimed at assuring that the system requirements are being met and the

level of risk is acceptable. However, government and contractor roles may vary depending on many factors such as risk, contract type, contract strategy, program phase, technology involved, and contractor selection. A process needs to be defined that will allow appropriate government/contractor interaction without compromising the contractor's accountability for the system design.

CAID Approach

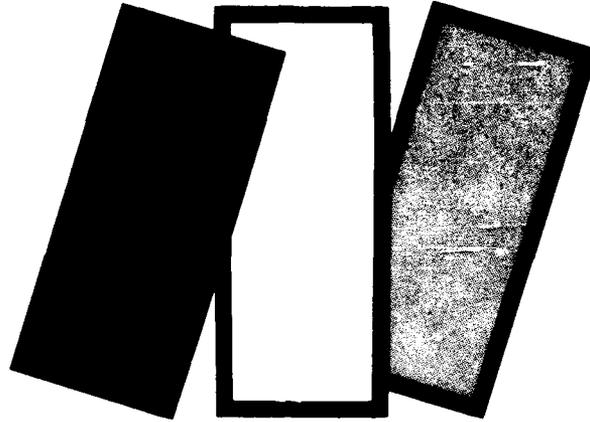
A high-level Air Force Industry team has been formed with expertise in the functional areas of program management, engineering, contracting and logistics. As a start, the team will address the above six areas and select elements showing the most promise, and flesh them out for prototype implementation. This team will identify additional areas of opportunity that will result in a clear definition of accountability, foster teamwork, and develop an approach to implement new ideas and concepts. These new concepts or processes will be implemented on selected Air Force prototype programs at each AFSC Product Division for demonstration/verification. This effort will be reviewed by industry chief executive officers and senior Air Force leadership before broad-based institutionalization.

Summary

The Clear Accountability in Design concept offers an opportunity for continuing acquisition process improvement. The six areas discussed above are areas within the acquisition process where such improvements may be achievable through smart Air Force/industry teamwork. The basic elements of the clear accountability in design initiative are essential to any program's success. They include clearly defined requirements, interactive management disciplined processes, milestone agreement and demonstrated progress, incentives tied to demonstrated progress, and a team built on trust right from the start. For this new approach to work, we need to establish an environment of accountability through teamwork, open communications, a fair business deal (contract type, realistic schedule and price, acceptable sharing), and adherence to established processes by all parties.

CALL FOR PAPERS

ACQUISITION FOR THE FUTURE



Imagination, Innovation, and Implementation

1991 ACQUISITION RESEARCH SYMPOSIUM

CO-SPONSORED BY THE
DEFENSE SYSTEMS MANAGEMENT COLLEGE
AND THE
NATIONAL CONTRACT MANAGEMENT ASSOCIATION
WASHINGTON, DC CHAPTER

SHERATON NATIONAL HOTEL
ARLINGTON, VIRGINIA

JUNE 4-6, 1991

Outstanding papers will be selected for presentation at the symposium and/or printing in the symposium "proceedings."

Selection of papers will be based on their relevancy to current issues in acquisition management.

Special consideration will be given to topics concerning international aspects of acquisition and implementation of previous or current acquisition research efforts.

Papers must be received by January 18, 1991. Send to:

DSMC-DRI-R(ARS)
Fort Belvoir, VA 22060-5426

FOR FORMAT INSTRUCTIONS AND ADDITIONAL INFORMATION CONTACT

Mr. Calvin Brown or Ms. Joan L. Sable
DSMC-DRI-R
Commercial: (703) 664-3385
Autovon: 354-3385

or
Mr. Edwin L. Phelps
(NCMA)
Commercial: (703) 379-2900



INDUSTRIAL MODERNIZATION

In a Period of Declining Defense Budgets

Benjamin C. Rush

The Defense Systems Management College and the Project Management Institute (PMI) sponsored a conference for industry and government personnel in April to discuss managing the industrial modernization process. The goal was to identify and prioritize issues and recommend ways to improve quality and productivity in the defense industrial base. The thrust was to look at policy, practice, and education issues affecting industrial modernization. The foundation to achieve this goal was provided with a keynote address by the Deputy Secretary of Commerce, the Honorable Tom Murrin, and by panel presentations on policy considerations and the practice of industrial modernization. Workshops were structured on major programs and practices in the management of industrial modernization.

Conference presenters emphasized that industrial modernization will be a greater challenge in the '90s in light of a declining Department of Defense budget. In this new environment, modernization must be more than new plant and equipment. In the '90s, defense industry modernization will emphasize improved management of resources with continuous improvements to integrated manufac-

Dr. Rush is Director of the Business Management Department, Defense Systems Management College, and was Co-Chairman of a recent conference at the College on managing the industrial modernization process.

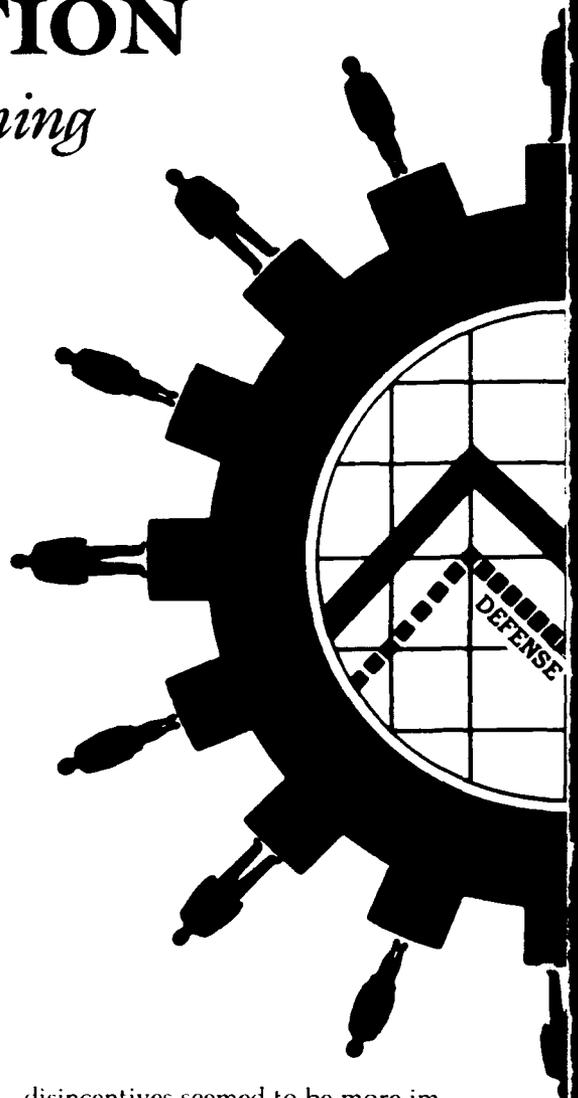
turing, engineering and business processes. The conference looked for key issues from government and industry perspectives.

Workshops of this multifunctional conference addressed topic areas such as program management, impact of tax policy, specific incentives for modernization, implementing total quality management, and using commercial practices. The 10 workshops interrelated to provide the critical issues for modernization. The Department of Defense and the defense industry are improving quality and productivity in this multifunctional approach.

The critical issues are structured around policy, practice and education of modernization as summarized in Figure 1. A discussion follows each of the four policy, three practice, and two education issues.

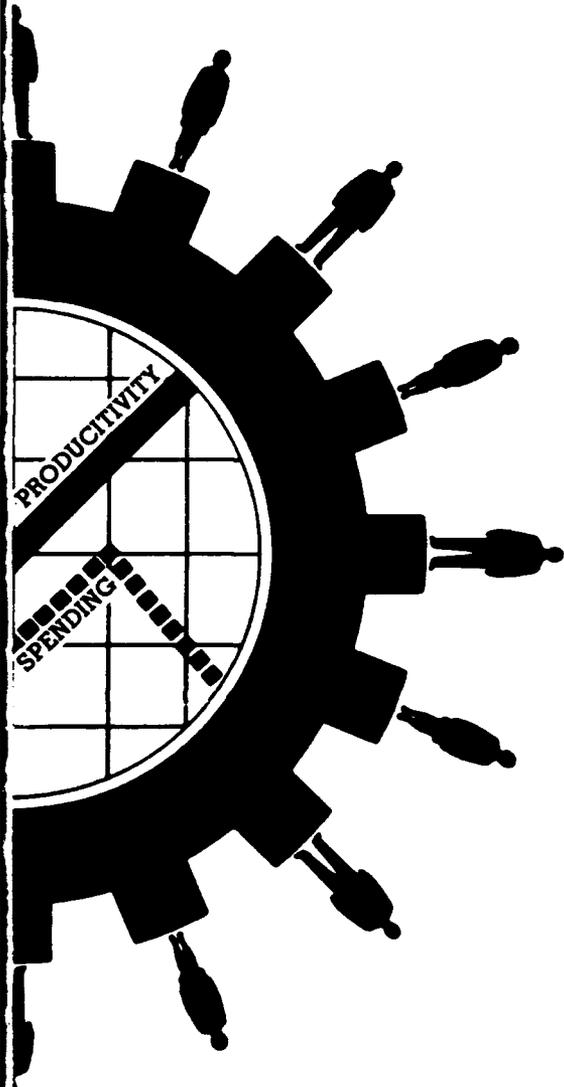
POLICY

Need for Government to Provide Clear Multiservice Objectives and Minimize Disincentives. The policy area, not surprisingly, was primarily involved with the appropriate role of government. The consensus was that the government role in modernization issues is to provide clearer objectives and to minimize the impediments of obtaining these objectives. The intent would be to have multiservice objectives which would prevent separate detail implementing instructions by individual services that divert the intent and delay implementation. The removing of



disincentives seemed to be more important than the providing of new incentives; however, selected incentives are appropriate.

Need for Integrated Strategic Planning for Modernization with Government and Industry Involved. Policy as it impacts needed planning for investment must be integrated between government and industry. Each company's annual investment planning process must be integrated with the Industrial Modernization Incentive Program (IMIP), Mantech, Independent Research and Development (IR&D), and prioritized program requirements as planned by the government.



Design - Greg Caruth

The government must be sensitive to the risk that changing technical processes and fluctuating business bases have on industrial modernization. A Department of Defense strategic acquisition plan that provides a meaningful baseline for long-range planning is required.

Need to Develop Specific Incentives for Investment. While generally the tenor of the recommendations for government involvement in the policy area was for less involvement, there was agreement on the need to develop specific incentives for invest-

ment. The importance of cost of capital in selecting viable investments was recognized. This means that tax policy changes, which would lower the cost of capital, would be a powerful force to increase investment. This integrates tax policy with investment and profit policy and is broader than just the defense industry. Specific tax-policy changes discussed were faster depreciation, favorable capital gains treatment, elimination of double taxation for corporations, and investment tax credits.

Narrowing to the defense industry, incentive programs like IMIP and Mantech are valuable incentive programs and are needed at all tiers. Government should work directly with subcontractors rather than relying on contractual flow down. An important incentive for contractors would be to keep the data rights developed under these programs and to have the ability to sell that data to other government contractors. In the IMIP program a strong product orientation has sometimes been dysfunctional and a greater focus on processes is needed.

This greater focus on process is in accordance with Total Quality Management and will enable getting away from privity of contract problems when there is direct government involvement with subcontractors. Changes in the IMIP program, unlike changes to the policy, can be accomplished without the requirement for legislation. The incorporation of these changes in IMIP will be forthcoming in a new policy.

Need for New, More Appropriate Pricing Strategies. A recurrent theme across a number of the workshops was the need for a new pricing strategy which could be used to replace cost-based pricing. The disincentives of using cost-based pricing is important not only as a detriment to investment but the root cause of inefficiencies in a number of our management systems. The suggestion of commercial pricing is a partial answer. A specific recommendation was to lower the exemption for costing backup data for products with 55 percent commercial to products with 35 percent commercial. This would cover a broader spectrum of products.



Keynote Speaker
The Hon. Thomas J. Murrin
Deputy Secretary of Commerce

PRACTICE

Need to Emphasize the Validation of New Equipment Requirements. An important theme in the conference was the recognition that modernization must be more than simply the investment in new equipment. The need to validate the requirement for new equipment, and to maximize the utilization of the existing plant and equipment before taking on new investment, is in accordance with the principles of Total Quality Management and has been demonstrated as a critical ingredient to successful productivity turn-around situations. This ties with the need to emphasize the role of people management and to know the capability of the organization from a people perspective. Emphasis is needed for improved internal- and external-communications within our organizations to enable effective multifunctional efforts.

The concept of product networks, where industry and government-wide standards are used, is important to improve communications. The development and implementation of these standards must be through joint government-industry participation and not with government contractual requirements.

Need to Focus on Applying Quantifiable Measures to Process Capability and Yield. There is a great need for simple measures of productivity. These must be quantifiable measures of the benefits of modernization. In developing these measures, we need to improve the application of statistical based techniques. Across several of the workshops, the importance of statistical techniques was emphasized and, while the techniques exist, we are lacking in effective application.

A primary concern is the way cost-benefit analysis uses these techniques. We cannot spend more effort in validating our success than we save in the implementation. This has important implications in how we manage the post-implementation aspects of IMIP.

Need to Emphasize Past Performance in Source Selection, Rationalize Specifications and Promote Commercial Solutions. There was extensive discussion regarding implementation of commercial solutions to source selection and pricing. A specific solution was to emphasize past performance in the source-selection process. This past-performance approach is a portion of the Total Quality Management approach of developing long-term relationships with suppliers and selecting suppliers who have quality processes.

EDUCATION

Need for Better Educated Acquisition Work Force in Government and Industry. Our best investment in people is education. Within the acquisition work force, now more than ever, the quality of the education is of critical importance. We need greater emphasis on joint Department of Defense and industry education. This education should be in specific acquisition topics and policies affecting investments such as IMIP. It is important that DOD and defense industry personnel learn and share these ideas in the same classroom. This applies not only to specific programs affecting investment but for the entire subject area of acquisition management. The DOD and defense industry personnel must be educated in the overall acquisition process and

FIGURE 1. MANAGING THE INDUSTRIAL MODERNIZATION PROCESS

INTEGRATED FINDINGS AND RECOMMENDATIONS OF THE WORKSHOPS

Policy

- | |
|--|
| 1. Need for government to provide clear multiservice objectives and minimize discentives. |
| 2. Need for integrated strategic planning for modernization with government and industry involved. |
| 3. Need to develop selected specific incentives for investment. |
| 4. Need for new more appropriate pricing strategies. |

Practice

- | |
|---|
| 1. Need to emphasize the validation of new equipment requirements. |
| 2. Need to focus on applying quantifiable measures to process capability and yield. |
| 3. Need to emphasize past performance in source selection, rationalize specifications and promote commercial solutions. |

Education

- | |
|---|
| 1. Need for better educated acquisition work force in government and industry. |
| 2. Need for greater industry involvement with education and training at all levels. |

WORKSHOP NUMBER AND NAME									
1. Balancing The Industrial Modernization Agenda	2. Preventing The Waste of Human Resources	3. Developing and Validating Capital Needs for Modernization	4. Integrating Statistical Thinking with Other Improvements	5. Balancing Short-term Financial Goals with Long-term Investment Requirements	6. The Industrial Modernization Incentives Program (IMIP)	7. Flowing Policy Down To Suppliers	8. Are Industrial Networks and Product Data Exchange the Future	9. The Use of Multifunctional Development Teams	10. What is Needed in Curricula To Cover Industrial Modernization
●				●	●	●	●		
●		●		●		●	●		
		●			●	●		●	
●				●	●				
	●	●	●		●	●	●	●	
		●	●		●			●	●
●			●		●		●		
	●	●	●	●	●		●	●	●
●	●		●						●

understand the program management functions that integrate across the disciplines.

This is critical to success of multifunctional teams that ensure the optimum relationship between development and production. An area in the education environment that needs greater emphasis is the application of statistical techniques. If statistical-based techniques are essential to optimizing process capability and improving yield, then the need for modernization improvements requires a greater understanding of statistical techniques.

Need for Greater Industry Involvement with Education and Training at All Levels. We have already seen excellent examples of greater industry involvement with education and training at all levels. A number of companies within the defense industry have instituted large training programs that assist their people in understanding their roles in a new, more participative organization. These may vary from understanding in detail how their individual job contributes to the return on investment of the corporation, to providing the statistical education necessary to understand the new statistical process control techniques, to general acquisition education for individuals involved in program management.

An important part of industry involvement is assistance to universities and colleges through cooperative education programs and by providing faculty and grants. Industry involvement in education needs to grow significantly at all levels within industry, with the universities and outreaching to the secondary system.

The conference provided recommendations to a broad cross section of issues which must continue to be examined and resolved. Deputy Secretary Murrin challenged the conference with the question, "What do we need to do in order to ensure that our defense industrial base is the best in the world?" Building on the conference ideas, the challenge continues.

Proceedings of this conference are available by writing the author.

NON-MANDATORY ADVANCED AGREEMENTS

On Allowable IR&D and B&P Costs

*Lieutenant Commander Joseph R. Endres, USN
Dr. James M. Fremgen*

The allowability of independent research and development (IR&D) costs and bid and proposal (B&P) costs for government contracts is the subject of discussion and controversy. Relative to other cost items, the time and attention devoted to these two costs may seem disproportionate to their magnitudes—although costs involved amount to billions of dollars annually.

Contractors argue it is necessary for them to spend money on IR&D and B&P activities to provide new and improved products to customers, including the government, and to ensure adequate competition for government contracts.¹ Government officials accept validity of that argument but question the amounts the government should pay. Ideally, the government would like to fund research and development work to the extent that it supports current and future government requirements. Unfortunately, when such work is being done, it may be impossible to determine what, if any, benefits will result. Similarly, it is advantageous to the government for many contractors to submit bids and proposals for government contracts. It is not clear what the appropriate number and

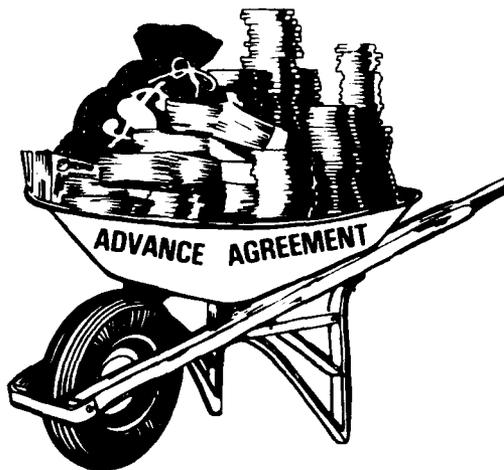
costs of such offers should be. Thus, the government has attempted to establish procedures to determine in advance reasonable amounts of IR&D and B&P costs to be allowed as costs of government contracts.

Larger contractors are now required to negotiate advance agreements with the government regarding the maximum amount of IR&D and B&P costs allowable in any period. Allowable IR&D and B&P costs for smaller contractors are determined by a standard formula, but the parties may agree the operation of that formula would prove inequitable to the contractor. Hence, the government and the contractor may enter into a voluntary advance agreement regarding maximum amount of allowable IR&D and B&P costs in a period. These voluntary, or *non-mandatory* advance agreements are the focus of this paper. To understand the rationale for, and the prob-

lems associated with, these non-mandatory advance agreements, we will review the history of IR&D and B&P costs in government contracting and explain negotiation of mandatory advance agreements.

Lieutenant Commander Endres is stationed with the Supply Corps, U.S. Navy, Naval Supply Center, Pensacola Naval Air Station, Pensacola, Florida.

Dr. Fremgen is a professor of accounting, Naval Postgraduate School, Monterey, California.



Concepts and Terminology

The Federal Acquisition Regulation (FAR) defines IR&D and B&P costs as follows:

"Independent research and development (IR&D)" means a contractor's IR&D cost that is not sponsored by, or required in performance of, a contract or grant and that consists of projects falling within the four following areas: (1) basic research, (2) applied research, (3) development, and (4) systems and other concept formulation studies.

"Bid and proposal (B&P) costs," as used in this subdivision, means the costs incurred in preparing, submitting, and supporting bids and proposals (whether or not solicited) on potential Government or non-Government contracts. The term does not include the costs

of effort sponsored by a grant or cooperative agreement or required in contract performance.²

Substantially the same definitions appear in Cost Accounting Standard 420, which established rules for accounting for IR&D and B&P costs.³ On the surface, these two categories of costs might appear to be quite different. The IR&D entails investigation and development of new concepts, technologies and products. Its ultimate aim is to discover marketable products and processes. The B&P efforts, on the other hand, are intended to sell products and services. In practice, however, the distinction is not clear. A contractor may have to do significant research to submit a bid for a contract for a new weapon system that will extend the current state of the art. Consequently, these two costs, one for research and the other for marketing, are generally treated together in contracting and accounting laws and regulations.

History

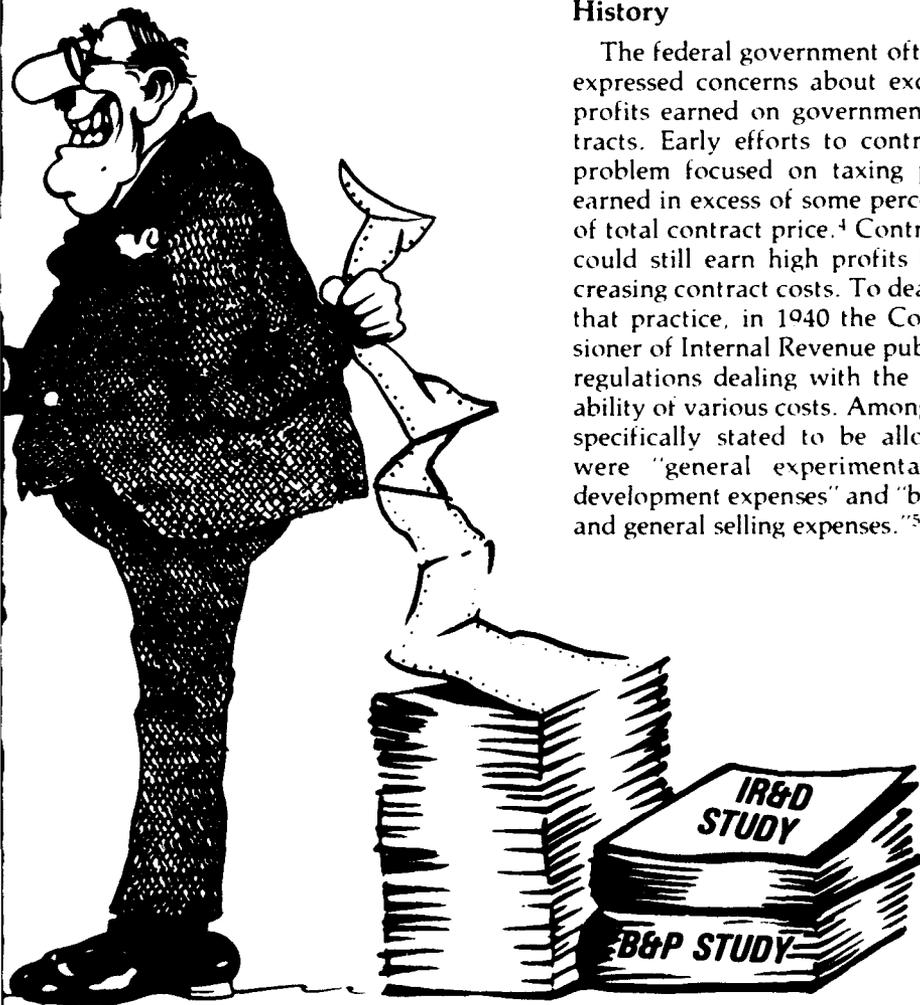
The federal government often has expressed concerns about excessive profits earned on government contracts. Early efforts to control the problem focused on taxing profits earned in excess of some percentage of total contract price.⁴ Contractors could still earn high profits by increasing contract costs. To deal with that practice, in 1940 the Commissioner of Internal Revenue published regulations dealing with the allowability of various costs. Among costs specifically stated to be allowable were "general experimental and development expenses" and "bidding and general selling expenses."⁵ These

regulations were expanded and elaborated in a green-covered pamphlet issued jointly by the War and Navy Departments in 1942. Known as the "Green Book," it provided contract cost guidance during World War II and the early postwar years.⁶

In 1949, the Green Book was replaced by the first edition of the *Armed Services Procurement Regulation (ASPR)*, Section XV, "Contract Cost Principles and Procedures," became the principal guidance on allowable costs. Research and development costs related to a specific contract were allowable; so were bid-and-proposal costs, which were regarded as elements of normal selling expenses. "General research" costs were to get special consideration. Contractors sought to achieve this consideration through negotiations of allowable amounts, allocable to all government contracts; and the government asked contractors to provide annual research plans.⁷

In 1959, the ASPR was revised and the term "general research" was replaced by IR&D. The B&P costs were identified separately and linked with IR&D costs to determine allowable amounts. Larger contractors were now required to negotiate advance agreements for both categories of costs.⁸ Technical nature of IR&D work was to be considered in these negotiations, and the Department of Defense issued guidance about necessary technical evaluation and procedures for conducting the negotiations.⁹

In following years, alternative ways were considered to deal with IR&D and B&P costs. One proposal was to combine all costs of a contractor's technical work into a single category, Contractor Independent Technical Effort (CITE). The Secretary of Defense rejected this because it would combine costs a contractor could control (IR&D and B&P) with others it could not fully control (research and proposals undertaken in response to a government request). Another alternative was to provide direct government support for individual IR&D projects on a case-by-case basis. This was rejected because it appeared to be unworkable administratively. Another suggestion was that IR&D costs not be allowed



as contract costs at all but, rather, be included in the contractor's negotiated profit, much as interest expense had long been included. This idea was abandoned for many reasons including opposition from the defense industry.¹⁰

In 1969, the Congress entered directly into the continuing debate about the appropriate treatment of IR&D and B&P costs. Initially, the Senate inserted an amendment into the Military Procurement Authorization Act for 1970 that would have reduced the aggregate amount paid to contractors as reimbursement for these costs by approximately 20 percent from the preceding year; the House of Representatives did not concur in this amendment. The compromise that became law restricted reimbursement to contractors to "93 percent of the total amount contemplated for use for such purposes out of funds authorized for procurement and for research, development, test, and evaluation."¹¹ This restriction proved difficult to implement and was repealed in the Military Procurement Authorization Act for 1971. This law limited payments for IR&D and B&P to costs of work "relevant to the functions or operations of the Department of Defense." Advance agreements with larger contractors were now required by statute and those agreements had to be negotiated on the basis of technical evaluations of contractors' proposed research programs. The Secretary of Defense was required to submit annual reports to the Congress regarding amounts negotiated and paid to contractors for IR&D and B&P costs.¹² Thus, the law emphasized the importance of advance agreements on amounts to be reimbursed and the relevance of the contractor's work to defense activities.

In subsequent years, the Department of Defense issued instructions and created organizations to establish policy for IR&D and B&P costs and to monitor contractors' technical efforts. The Defense Technical Information Center maintains a data base of contractors' independent research projects, intended to provide government research laboratories and contracting officers with information about research already done. This in-

formation may assist government researchers in their work and should avoid duplication of effort and unnecessary costs.¹³

Mandatory: Advance Agreements

While the principal focus of this paper is on non-mandatory advance agreements regarding IR&D and B&P costs, it is necessary first to consider the policy and practices regarding mandatory advance agreements. Inevitably, these have had an impact on how the government and contractors approach non-mandatory agreements.

In 1969, the Congress enacted a law requiring larger contractors to negotiate advance agreements on the maximum amounts of IR&D costs allowable in any given year. Initially, this requirement applied to all contractors paid more than \$2 million for IR&D and B&P costs in connection with defense contracts subject to the Truth in Negotiations Act during the year immediately prior to that for which negotiations were required.¹⁴ That dollar threshold has been raised several times to reflect general price inflation and, as of October 1, 1989, was increased to \$5.4 million.¹⁵ A single ceiling may be negotiated for an entire corporation and/or separate ceilings may be negotiated with individual profit centers that recovered more than \$675,000 in IR&D and B&P costs in the preceding year.¹⁶ The negotiated ceiling is just that—a ceiling. Allowable costs may not exceed amounts properly allocable to government contracts if that amount is less than the ceiling. While separate ceilings are negotiated for IR&D costs and for B&P costs, the agreement may provide that only the total of the two is a truly binding ceiling. As a practical matter, the contractor may be able to trade off costs in one category for costs in the other.¹⁷

The Federal Acquisition Regulation contains general guidance regarding advance agreements regarding allowability of special or unusual costs whose "reasonableness and allocability... may be difficult to determine."¹⁸ Such advance agreements "may be negotiated either before or during a contract but should be negotiated before incurrence of the costs involved."¹⁹ More specific provisions cover the required advance agree-

ment for IR&D and B&P costs. These provisions require that negotiation of the advance agreement be initiated before the end of the fiscal year to which it applies. As a practical matter, it is probable that some allowable costs will have been incurred before the agreement has been finalized. If negotiations for an advance agreement are not initiated by the contractor before the end of the year, no IR&D and B&P costs shall be allowable for that year. If negotiations are initiated but no advance agreement is reached, the contractor will be allowed no more than 75 percent of the amount that the responsible contracting officer believes would have been allowed in an agreement. The contractor may appeal the decision regarding that amount.²⁰

The Department of Defense is usually the lead agency in negotiating mandatory advance agreements with defense contractors. Responsibility for such negotiations rests with the Tri-Service Contracting Officer (TSCO) designated by the Tri-Service Negotiation Group, composed of members from the three military departments.²¹ Normally, that TSCO would be from the Service that has the largest volume of contract business with a particular contractor. If all three military departments agree, the advance agreement may be negotiated by the cognizant Administrative Contracting Officer (ACO) in the Defense Logistics Agency (DLA).

One of the agency responsibilities that negotiates an advance agreement is to perform a technical evaluation of the contractor's proposed IR&D program.²² This evaluation is accomplished partly through an annual plan for IR&D projects submitted by the contractor and a triennial on-site review conducted by experts from the military department designated by the Technical Evaluation Group (TEG). This group comprises military departments IR&D managers, chaired by an official appointed by the Under Secretary of Defense for Research and Engineering.²³ An important and potentially controversial aspect of this technical evaluation is an assessment of the *potential military relationship* (commonly, *potential military relevance*), or PMR, of the con-

tractor's (IR&D) projects. By law, appropriated funds may not be paid for IR&D or B&P work unless that work "is relevant to the functions or operations of the Department of Defense."²⁴

Some in the Congress had favored restricting payments for IR&D costs to those *directly* relevant to military applications, while others opposed any relevancy test. The compromise criterion is *potential* military relevance. What is potentially related to military interests is a matter of judgment. The Department of Defense IR&D Policy Council provided fairly specific guidance, including examples. As illustrations, materials science research generally has PMR because of the wide range of uses for materials in military programs. Most computer and electronics research has PMR. On the other hand, most energy-related research is presumed not to have PMR unless it is directed toward a specific DOD function. In general, research with direct military applications, particularly for vital or urgent requirements, is assumed to have PMR. Research in support of routine requirements has PMR if it is primarily military related or, even though not primarily military related, it is useful in many military applications.²⁵

In the early 1970s, the General Accounting Office (GAO) issued reports addressing issues related to the concept and the application of PMR to defense contracts. It noted that Public Law 91-441 required a military relationship but provided no criteria for determining it. The GAO noted DOD decided it was not feasible to test all defense contractors' research programs for PMR. Hence, DOD would apply the requirement only to large contractors required to negotiate advance agreements.²⁶ Subsequently, GAO found that DOD personnel were interpreting and implementing the PMR requirement inconsistently because of a lack of uniform criteria.²⁷ Later, GAO conducted an examination to answer questions asked by the Congress in relation to IR&D and B&P costs: one addressed the legality of payments to contractors for such costs in the absence of a technical review to determine PMR. The GAO concluded that the DOD practice of limiting such reviews to con-

TABLE 1. COMPANY FLUCTUATIONS

YEAR	SALES	IR&D/B&P COSTS	RATIO
1987	\$ 8,000,000	\$244,000	3.05%*
1988	13,560,000	400,000*	2.95%*
1989	10,700,000	300,000*	2.80%
1990	9,000,000		

Asterisks in Tables 1 and 2 Show Two Highest Costs and Ratios.

tractors required to negotiate advance agreements was administratively sound. Moreover, Public Law 91-441 did not expressly call for technical review of other contractors. The GAO suggested the Congress might want to clarify the intent of that law.²⁸ No such clarification has been provided.

Formula for Determining Allowable Costs

The current policy regarding maximum allowable IR&D and B&P costs in companies not required to negotiate advance agreements is stated in the FAR:

"Ceilings for allowable IR&D and B&P costs for companies not required to negotiate advance agreements... shall be established by a formula, either on a company-wide basis or by profit centers, computed as follows:

"(i) Determine the ratio of IR&D/B&P costs to total sales (or other base acceptable to the contracting officer) for each of the preceding three years and average the two highest of these ratios; this average is the IR&D/B&P historical ratio;

"(ii) Compute the average annual IR&D/B&P costs (hereafter called average), using the two highest of the preceding three years;

"(iii) IR&D/B&P costs for the center for the current year which are not in excess of the product of the center's total sales (or other accepted base) for the current year and the IR&D/B&P historical ratio computed under (i)

above (hereafter called product) shall be considered allowable only to the extent the product does not exceed 120 percent of the average. If the product is less than 80 percent of the average, costs up to 80 percent of the average shall be allowable.

"(iv) However, at the discretion of the contracting officer, an advance agreement may be negotiated when the contractor can demonstrate that the formula would produce a clearly inequitable cost recover."²⁹

Table 1 shows how this formula would work for a company that experienced considerable fluctuations in sales and in IR&D/B&P costs during the preceding 3 years. Actual sales and cost data are shown for 1987-89 and sales for 1990. The two highest annual costs and two highest ratios are indicated by asterisks.

Now, the historical ratio is 3% ((3.05% + 2.95%) ÷ 2). The average cost is \$350,000 ((\$400,000 + \$300,000) ÷ 2). Multiplying the sales for 1990 by the historical ratio yields a product of \$270,000 (\$9,000,000 × 3%). This amount would be allowable, as it does not exceed 120% of the \$350,000 average cost. However, it is below 80% of \$350,000, or \$280,000. Thus, IR&D and B&P costs up to \$280,000 would be allowed in 1990.³⁰

In Table 2, the formula produces a result that appears to be reasonable in relation to the contractor's recent experience. Consider now an illustration of a rapidly growing contractor.

TABLE 2. GROWING RAPIDLY

YEAR	SALES	IR&D/B&P COSTS	RATIO
1987	\$ 671,119	\$ 38,551*	5.74%*
1988	1,158,114	31,981	2.76%
1989	2,219,239	91,021*	4.10%*
1990	3,576,283		

The following basic data, taken from an actual case, are presented in the same format as in Table 1.

The historical ratio is 4.92% ((5.74% + 4.10%) ÷ 2). The average cost is \$64,786 ((38,551 + 91,021) ÷ 2). Applying the historical ratio to the sales for 1990 yields a product of \$175,953 (\$3,576,283 × 4.92%). According to the formula, however, only \$77,743 would be allowable (120% × \$64,786 average). The contractor's actual IR&D and B&P costs for 1990 totaled \$153,331, well below the product of the current sales and historical ratio but almost twice the amount allowed by the formula. This is the type of case in which a contractor can demonstrate that the formula would produce an inequitable result and, hence, an advance agreement should be negotiated.³¹

An interesting sidelight in connection with the formula was noted in an industry report. The percentage of IR&D and B&P costs in relation to sales that was actually allowed, in the aggregate, to large contractors required to negotiate advance agreements was lower throughout the 1980s than the percentage that would have been allowable (subject to the 120% limit) had the formula been applied to those contractors.³²

Non-Mandatory Advance Agreements: Policy

As noted, the FAR places the burden for initiating negotiations of mandatory advance agreements on the contractor. The same requirement is not specified in cases of non-mandatory advance agreements. The Tri-Service Contracting Officers have adopted the policy of treating non-mandatory advance agreements exactly the same as mandatory agreements. The contractor must initiate negotiations, the contracting officer makes a decision, and the contractor has the right to appeal that decision administratively, as well as to the courts.³³ As noted, most mandatory agreements are negotiated by TSCOs. In contrast, most non-mandatory agreements are negotiated by the cognizant Administrative Contracting Officer (ACO) in the Defense Logistics Agency. It is this agency's policy that is most pertinent to these agreements.

With respect to the responsibility for initiating negotiations, the DLA manual states that, "if the ACO knows that the contractor requires a non-mandatory...advance agreement, the contractor *should be requested* (emphasis added) to submit a proposal within 90 days after the start of the contractor's fiscal year."³⁴ This policy may effectively shift the burden of initiating negotiations to the ACO. At least, it provides a defense for a contractor who never takes the initiative during a given year.

When an ACO receives a request for a non-mandatory advance agreement, he or she forwards it to the financial services element of his or her Defense Contract Administration Services Management Area (DCASMA) for an evaluation. There, a price analyst will analyze the contractor's cost data and other relevant financial information. The price analyst may request audit assistance from the Defense Contract Audit Agency and technical assistance from the DCASMA contract management engineering component. The price analyst and an engineer may assist the ACO in negotiating an advance agreement.³⁵

The DLA manual states the individuality of each non-mandatory advance agreement precludes uniform guidelines. It does identify eight factors that should be considered in negotiations:

(1) The contractor's management of the IR&D/B&P program. Is it properly budgeted, managed and effectively controlled?

(2) The objectives of the IR&D/B&P program. Are the proposed expenditures primarily directed toward developing Government (DOD) products or toward expanding commercial markets?

(3) Contractor's capabilities and technical expertise. Does the contractor possess sufficient technical expertise and staffing to perform the planned IR&D/B&P work along with the contracted work?

(4) Bidding practices of the contractor. Does the contractor bid for contracts within its product line? Does the contractor have the capacity to perform on contracts for which

it bids or does the contractor bid in an indiscriminate manner?

(5) Prior years (sic) sales growth.

(6) Level of prior years (sic) IR&D B&P expenditures and reasons therefore (sic).

(7) Previous products developed, if any.

(8) Current year-to-date expenditures, if any already incurred.³⁶

Note that a potential military relationship (PMR) is not mentioned explicitly in this list of factors, although it might reasonably be inferred from the second factor. Such an inference is not intended by DLA. In a DLA Headquarters memorandum to one of the Defense Contract Administration Services Regions, the DOD policy of not considering PMR in non-mandatory advance agreements is cited; and the guidance in the eight factors listed above is said not to relate to PMR.³⁷

Non-Mandatory Advance Agreements: Issues in Practice

To obtain information about actual workings of the process of negotiating non-mandatory advance agreements and about problems encountered in that process, research was undertaken in two ways. First, interviews were conducted with 36 DOD people involved in these advance agreements. One was on the staff of the Secretary of Defense; 2 in DLA Headquarters; 3 were Tri-Service Contracting Officers, 1 from each military department; 1 from the Tri-Service Evaluation Group; 8 were DLA Region Cost Monitor Specialists; 3 were price analysts in one of the Defense Contract Administration Services Management Areas (DCASMA); 3 were DCASMA engineers; and 15 were Administrative Contracting Officers (ACOs) in various DCASMA's. These people were asked for their understandings of the policy governing non-mandatory agreements, opinions regarding problems in the process, and individual approaches to implementing the policy and dealing with perceived problems.

To provide additional insight into the working of the process, documentation for a sample of 41 completed negotiations of non-mandatory ad-

vance agreements was examined. These cases were taken from files of one DCASMA Contract Management Board of Review. They were selected only from agreements negotiated within the most recent 3 years for amounts greater than \$25,000. All agreements negotiated during those years with a single contractor were examined, and no more than five agreements negotiated by a single ACO were included. The sample deliberately included several agreements in cases in which the contractor had not requested negotiations until at least 3 months after the end of the applicable year. All relevant documents in each case were reviewed to determine basis for the ACO decision.

The objective of this research was to obtain information about the government's administration of non-mandatory advance agreements. The interviewees were government officials, not contractors' representatives. Moreover, amounts involved in the negotiations were incidental to the study. The focus was on the process itself, not on the dollar value of the outcome of that process.

Guidance Available to ACOs

The most detailed guidance available to ACOs is in DLA Manual 8105.1. Most of the applicable section deals with negotiation of mandatory advance agreements, which are usually negotiated by TSCOs, not ACOs. Less than a page is concerned directly with non-mandatory agreements, which normally are negotiated by ACOs. The guidance in this section includes the eight factors mentioned before. In a 1988 change to the manual, guidance also contains the provision noted earlier that the ACO should request a contractor to submit a proposal for an advance agreement if he or she knows that the contractor will require one.³⁸ The ACOs interviewed said before this change they regarded initiation of negotiations for an advance agreement to be the responsibility of the contractor, as it is in cases of mandatory agreements. If the contractor failed to submit a proposal on a timely basis, most ACOs said they considered that evidence of poor management of the IR&D and B&P program by the contractor. Since that

**One major topic
with DOD
personnel
responsible for
negotiation of non-
mandatory advance
agreements was to
interpret and
implement
guidance in DLA
Manual 8105.1.**

1988 change, ACOs indicated the burden of initiating negotiations appeared to have shifted to them, and they felt compelled to negotiate advance agreements *after* the applicable year had been completed if they had not previously undertaken the burden of initiating the process. As mentioned, TSCOs would refuse to negotiate agreements after the year ended. Hence, the ACOs interviewed felt pressed to handle non-mandatory advance agreements in a manner inconsistent with both the policy for mandatory agreements and the practices of other components of DOD.

Government Evaluation

One major topic addressed in the interviews with DOD personnel responsible in some way for negotiation of non-mandatory advance agreements was how they interpreted and implemented the available guidance in the DLA Manual 8105.1. Their comments are discussed below in connection with the eight factors listed in that manual. The first five address technical aspects of the contractor's IR&D and B&P program. The last three focus on financial matters.

1. *Contractor's Management of IR&D/B&P Program.* In general, all government personnel interviewed agreed there were no significant problems related to contractors' management of their IR&D and B&P programs—except for the one noted earlier; that is, late submission of proposals for advance agreements. This problem will be discussed further in connection with the timing of advance agreement negotiations. One pattern in the management of IR&D and B&P programs was noted in a GAO report in 1974. In periods of declining sales, companies tend to shift efforts to IR&D projects with short-term payoff and to B&P projects designed to stimulate new sales.³⁹

2. *Objectives of IR&D/B&P Program.* The DLA guidance specifically asks whether the contractor's proposed expenditures are directed primarily toward defense products or commercial products. On the face of it, this question appears to raise the issue of a potential military relationship (PMR). However, as noted earlier, DLA Headquarters explicitly disavowed such an interpretation. Similarly, the Defense Contract Audit Agency (DCAA) has stated that PMR need not be considered when an advance agreement is not required.⁴⁰ Nevertheless, a majority of the 15 ACOs interviewed said that they did consider PMR in evaluating a contractor's IR&D and B&P program. In every one of the completed negotiation cases examined in the DCASMA files, there was a technical evaluation by a DLA engineer that discussed the PMR of that contractor's program. In most cases, it appeared that the ACO and the price analyst had used PMR in developing the government's negotiating position. Moreover, the engineer's discussion of PMR was commonly cited in the DCAA audit reports. The engineers interviewed explained that, in the absence of more specific guidance regarding a technical evaluation of a contractor's program, they considered PMR simply as a way of being consistent in all of their technical reviews.

3. *Contractor's Capabilities and Expertise.* Almost all ACOs interviewed agreed it was extremely dif-

difficult to assess a contractor's technical expertise. This difficulty was cited as another reason for their attention to PMR. If they could not be satisfied that the contractor had the ability to execute its planned program effectively, at least they could assess whether that program appeared to have potential relevance to defense. They observed the contractor's skill in negotiation was probably as important in determining the amount finally recovered for IR&D and B&P costs as was its technical capabilities. A GAO report made the same observation:

A contractor with an excellent technical program, but an agreeable negotiator, will accept a lower relative ceiling than a contractor with a poorer program and a more aggressive negotiator.⁴¹

4. Previous Products Developed. One obvious approach to evaluating the potential of a contractor's current IR&D and B&P efforts is to examine the quantity, quality, and natures of products or processes developed in prior projects. All interviewees said they viewed this factor as a logical extension of their evaluation of the objectives of the contractor's program and technical expertise. Moreover, most of them indicated they evaluated previous products' PMR as a way of predicting the value of potential future products. Thus, three of the DLA guidance factors related to the technical evaluation of a contractor's proposal for a non-mandatory advance agreement are, in practice, interpreted largely in terms of PMR, official DLA policy notwithstanding.

5. Contractor's Bidding Practices. This factor addresses the focus of a contractor's operations. It asks whether a contractor regularly bids on contracts within its established product lines and capabilities or whether it bids indiscriminately. This question has obvious implications for the reasonableness of the contractor's B&P costs. Two specific interpretations of this bidding-practice factor were noted in interviews. A DLA price analyst said that he used the ratio of contracts won to those bid on but lost as an indicator of a contractor's bidding practices. An unusually

low ratio would suggest poor bidding practices and, hence, excessive B&P costs. A Tri-Service Contracting Officer said his office considered types of contracts on which a contractor bid as indicative of its competitiveness and willingness to assume risk in contracting. A larger proportion of firm-fixed-price contracts, as opposed to cost-reimbursable contracts, was considered to be evidence of better management.

6. Prior Years Sales Growth. The principal deficiency noted in connection with using the formula to determine the ceiling on allowable IR&D and B&P costs is that it may be unfairly biased against smaller, rapidly growing firms. The pattern of prior sales growth is an important indication of whether a non-mandatory advance agreement is appropriate for a particular contractor. Some ACOs interviewed commented the importance of this factor has been diluted in practice by a trend for all contractors not required to negotiate advance agreements, regardless of their prior sales-growth patterns, to be considered eligible for non-mandatory advance agreements.

7. Prior Years IR&D and B&P Expenditures. Amounts expended in the past are reasonable factors to consider in deciding whether a non-mandatory advance agreement is appropriate in a particular case and, if so, in deciding on the ceiling allowable in the future. One Region Cost Monitor Specialist (RCMS) said he advised ACOs in his region to compare the ratio of a contractor's IR&D and B&P costs to sales revenue to the average of that ratio for all contractors required to negotiate advance agreements. That average ratio is published annually in the Secretary of Defense report to the Congress on negotiated advance agreements. This RCMS said that the average ratio was, at least, an indication of what the Tri-Service Negotiation Group regarded as a reasonable level of allowable IR&D and B&P costs. We noted earlier that this actual average ratio in large contractors during the 1980s was lower than the ratio of allowable costs to sales that would result from application of the formula for smaller contractors. The purpose of non-mandatory advance agree-

ments was to deal with cases in which that formula would produce an unfairly low ceiling on allowable costs. An RCMS in another DCAS Region said his region maintained a data base of all non-mandatory advance agreements negotiated in that region during the preceding 12 years. This data permits an ACO to compare a contractor's proposal for allowable costs as a ratio of its sales to the average of that ratio for all other contractors with the same Primary Standard Industrial Classification (SIC) Code.

8. Current Year-to-Date Expenditures. Theoretically, advance agreements should be negotiated before a contractor begins to spend money on IR&D and B&P projects in the current year. As we shall see, that is not typically the case. Some pattern of current spending is commonly available as part of the information to consider in deciding on a non-mandatory advance agreement. If that pattern suggests a substantial growth relative to the average expenditures in the 3 previous years, it supports the argument that the formula would not produce equitable results in that case.

Timing of Advance Agreement Negotiations

As noted, the Federal Acquisition Regulation, Section 31.109, states advance agreements, in general, should be negotiated before incurrence of related costs. Section 31.205-18 of the FAR requires only that mandatory advance agreements on IR&D and B&P costs be negotiated before the end of the year to which they are applicable. No similar requirement is stated in connection with non-mandatory advance agreements, although they are still referred to as *advance* agreements. Tri-Service Contracting Officers have adopted the position that non-mandatory agreements are to be handled in exactly the same way as required agreements. They must be negotiated before the end of the applicable year, and the contractor must take the initiative in proposing an advance agreement. If no negotiations are undertaken before the end of the year, the contractor is entitled to no reimbursement for IR&D and B&P costs that year (or is entitled to substantially less than would other-

wise be allowable if negotiations are initiated during the year, but not completed). The General Accounting Office has supported the TSCO position that non-mandatory advance agreements must be negotiated before the end of the applicable year. It recommended the Services facilitate the negotiation process by using multiyear, rather than annual, agreements.⁴³ The Tri-Service offices plan to convert to a 2-year review and negotiation cycle, starting in 1991. We have seen earlier that almost all non-mandatory advance agreements are actually negotiated by ACOs, not by TSCOs.

In general, the ACOs in the Defense Logistics Agency have adopted a policy of negotiating non-mandatory advance agreements for any year that has not been finalized. The ACOs interviewed said they tended to overlook the word advance in these agreements and to focus instead on the possibility of inequitable cost recovery under the formula. In one of the cases examined in the DCASR files, a contractor negotiated required advance agreements with a TSCO for the preceding 3 years. In its fourth preceding year, no advance agreement was required and none had been requested by the contractor. Now, however, the DCAA was conducting a final overhead rate determination for that fourth prior year. Auditors advised the contractor that no costs in excess of those determined under the formula would be allowed. The contractor then requested a non-mandatory advance agreement with the cognizant ACO. The ACO agreed and finally determined allowable costs more than 50 times the amount computed in accordance with the formula.

This DLA policy is supported by two memoranda from the Office of the Under Secretary of Defense for Research and Engineering to DLA in 1978. Both dealt with disputes involving specific contractors, but their guidance is clearly worded to indicate policy position. The first memorandum states:

If the only reason for disallowing the Bid and Proposal cost is the technicality that an agreement can no longer be negotiated in "advance" we believe

Perhaps the most significant official ruling regarding non-mandatory agreement negotiations was issued by the Armed Services Board of Contract Appeals in 1980.

the intent of the cost principle—allowance of reasonable costs—is not being realized.⁴³

The other memorandum contained the following assessment of the circumstances in the particular case and policy guidance similar to that above.

"d. The DCAA auditor and ACO both believe the costs for 1977 and 1978 are reasonable, and they would have accepted the costs except for the technicality that an advance agreement was not negotiated.

"In this instance, we do not believe the intent of the cost principles covering IR&D/B&P costs is being realized. It was never intended that reasonable costs should be disallowed. When these cost principles were written it was recognized that the formula would not always provide reasonable results, particularly, where small, fast growing companies were involved. It was for this reason that the advance agreement provision was included. It was never contemplated that this provision would, itself, become a roadblock to accepting reasonable costs."⁴⁴

Clearly, this policy guidance impelled ACOs to ignore the requirement for advance agreements, while TSCOs continued to enforce it. Contractors, understandably, have reacted to this inconsistency in practices by going to the ACOs for non-mandatory agreements. In 1988, a DCASMA raised the issue directly. It noted the FAR provided guidance for negotiating advance agreements. Yet, other guidance permitted, or even appeared to encourage, after-the-fact advance agreements. The DCASMA suggested that, if the latter practice is considered appropriate, the FAR should be changed accordingly.⁴⁵ This suggestion was endorsed favorably by higher management within the DCAS Region,⁴⁶ but no action has been taken.

Dynatrend Case

Perhaps the most significant official ruling regarding non-mandatory agreement negotiations was issued by the Armed Services Board of Contract Appeals (ASBCA) in 1980. Dynatrend, Inc., was a rapidly expanding small business, a classic example of a case in which the formula method of cost recovery might produce inequitable results for the contractor. Dynatrend did not request negotiation of an agreement until 3 months after the close of the applicable fiscal year. The ACO in this case refused to negotiate a non-mandatory advance agreement and insisted on applying the formula, even though both the DCAA auditor and the DCASMA price analyst suggested that allowance of higher costs would be appropriate. In his final decision, the ACO argued that Dynatrend had failed to demonstrate that use of the formula would produce a clearly inequitable result. In a conference with the company, the ACO expressed the view that there were no circumstances under which deviation from the formula was acceptable. His position was based directly on the appropriateness of a non-mandatory agreement and not on the technicality that the contractor had not requested it on a timely basis.

The ASBCA overturned the ACO's final decision. It concluded that Dynatrend's B&P costs were reasonable and that the cost recovery allowed under the formula was clearly

inequitable. Moreover, it found that the ACO's exercise of discretion in the case was "arbitrary, capricious" and "an abuse of discretion." It went on to say that "the ACO's position constituted an egregious violation of the intent of the regulation and DOD policy."⁴⁷ With such strong condemnation of the action of one of their fellows, ACOs understandably may be reluctant about refusing to enter into non-mandatory advance agreements and insisting on application of the formula instead.

Subsequent to the ruling in the Dynatrend case, one Defense Contract Administration Services region published guidance for its ACOs to follow in negotiating non-mandatory advance agreements. It advised a liberal approach to negotiating agreements after the end of the applicable year. With respect to the question of deciding whether the formula would produce inequitable results and, hence, negotiations were called for, however, it was more cautious. It said that the ACO should decide on the equity of formula-based cost recovery on the basis of the criteria in DLAM 8105.1 and "should not treat the facts of the Dynatrend case as any strict guideline which must be followed," as "that decision does not limit your discretion on this matter."⁴⁸ The Dynatrend case had not ended debate on the issue.

Conclusions

Clearly, all parties to the government contracting process agree that IR&D and B&P costs are essential elements of business operations and that reasonable amounts should be allowed and reimbursed to contractors by the government. The critical issue lies in determining what is a reasonable amount in a particular situation. The required advance agreements for larger contractors and the formula applicable to others were efforts to deal with that issue in an orderly manner, without excessive administrative costs. The possibility of inequitable (or inadequate) reimbursements resulting from use of the formula is a real one, especially in cases of rapidly growing companies. Hence, the non-mandatory advance agreement is an appropriate escape clause in such cases. While this study

***Whether a project
has a potential
military
relationship, or a
contractor has
technical
capability to
complete a
proposed project or
perform on a
contract, will
always be subject
to human
judgments and
possible disputes.***

revealed no evidence that current handling of non-mandatory agreements has created major problems or requires major changes, some fine-tuning would appear desirable to bring more order to the process.

One helpful change would be to eliminate the inconsistencies in practice between DLA and Tri-Service offices. Policies with respect to the timing of, and the criteria for, negotiations of non-mandatory agreements should be consistent among all contracting officers, regardless of which DOD component they represent. The Tri-Service Negotiation Group meets regularly to discuss and resolve problems related to IR&D and B&P negotiations. Representatives of DLA ought to participate regularly in those meetings. Their participation should facilitate efforts toward greater con-

sistency. As an example, DLA might wish to adopt the Tri-Services' plan to conduct advance agreement reviews and negotiations on a 2-year cycle, instead of annually.

Then, too, additional guidance to contracting officers and contractors would help to enhance consistency in negotiations between different contracting offices and different companies and to minimize disputes. The following specific actions are recommended:

1. There should be an explicit policy statement regarding the timing of negotiating "advance" agreements. A reasonable policy would be to adopt the requirement applicable to mandatory agreements; that is, the contractor must submit a proposal, with supporting cost and technical data, prior to the end of the year to which the agreement would be applicable.

2. There should be an explicit policy statement regarding the applicability of a potential military relationship (PMR) to projects in companies seeking non-mandatory agreements. At present, the law might reasonably be interpreted either way. Section 31.109 of DLA Manual 8105.1 seems to say that PMR should be considered in evaluations of the objectives of a contractor's IR&D and B&P program. Other administrative guidance within DLA, however, says the opposite. In practice, ACOs regularly consider it anyway. One policy should be stated unequivocally and followed consistently in negotiations.

3. Clearer criteria for DCASMA engineers' evaluations of the technical quality of contractors' programs should be stated. In the absence of such criteria today, these engineers tend to focus on PMR. If that is not intended, other specific guidance is needed. The Tri-Service Technical Evaluation Group collects and disseminates technical information about contractors' projects. Similar information about contractors negotiating with DLA would provide some *de facto* technical guidance to engineers and to ACOs.

None of these recommended changes would eliminate the need for personal judgment in individual

cases. Whether a particular project has PMR, or a particular contractor has the technical capability to complete a proposed project or perform on a contract, will always be subject to human judgments and to possible disputes.

The process can never be reduced to the automatic operation of some algorithm, but it can be improved.

Endnotes

1. Aerospace Industries Association, *Maintaining Technological Leadership: The Critical Role of IR&D/B&P*, September 1989.

2. *Federal Acquisition Regulation*, Section 31.205-18(a).

3. 4 CFR, Part 420.30(a)(2) and (6).

4. Vinson-Trammell Act, 48 Stat. 503, 1934.

5. Treasury Decision 5000, 1940.

6. *Explanation of Principles for Determination of Costs Under Government Contracts*, War Department and Navy Department, April 1942.

7. C. E. Deardoff, "Historical Evolution of Independent Research and Development," Office of Under Secretary of Defense for Research and Engineering, January 1981.

8. *Armed Services Procurement Regulation*, Department of Defense, 1959.

9. DOD Instruction 4105.52, "Uniform Negotiations for Reimbursement of IR&D Costs," June 28, 1960.

10. *Allowances for Independent Research and Development Costs in Negotiated Contracts: Issues and Alternatives*, U.S. General Accounting Office Report B-164912, February 1970. Interest expense, *per se*, is still an unallowable cost. However, an imputed cost of money allocable to facilities capital is now an allowable contract cost. (FAR, Section 31.205-10).

11. Public Law 91-121, Section 403, 83 Stat. 204, 1969.

12. Public Law 91-441, Section 203, 84 Stat. 904, 1970.

13. *Independent Research and Development Users' Manual*, Defense Logistics Agency Manual 4185.11, January 1988.

14. Public Law 91-441, *op. cit.*

15. *Federal Contracts Report*, Vol. 52, August 14, 1989, p. 338.

16. *Federal Acquisition Regulation*, Section 31.205-18(c)(1).

17. *Ibid.*, Section 42.1007.

18. *Ibid.*, Section 31.109(a).

19. *Ibid.*, Section 31.109(b).

20. *Ibid.*, Section 31.205-18(c)(1).

21. DOD Instruction 3204.1, "Independent Research and Development," December 1, 1983.

22. *Federal Acquisition Regulation*, Section 42.1005.

23. DOD Instruction 3204.1, *op. cit.*

24. Public Law 91-441, *op. cit.*

25. Department of Defense, IR&D Policy Council, "Guidelines for Determination of 'Potential Relationship to a Military Function or Operation' for IR&D Projects," July 15, 1983.

26. *Implementation of Section 203, Public Law 91-441, on Payments for Independent Research and Development and Bid and Proposal Costs*, U.S. General Accounting Office Report B-167034, April 17, 1972.

27. *Payments for Independent Research and Development and Bid and Proposal Costs*, U.S. General Accounting Office Report B-167034, April 16, 1973.

28. *In-depth Investigation into Independent Research and Development and Bid and Proposal Costs*, U.S. General Accounting Office Report B-164912, August 16, 1974.

29. *Federal Acquisition Regulation*, Section 31.205-18(c)(2).

30. This illustration is taken from the *Contractor Overhead Monitoring Course* by P. Stein. Air Force Institute of Technology, May 1988.

31. The data for this illustration are taken from the Dynatrend case, argued before the Armed Services Board of Contract Appeals in 1980 (Dynatrend, Inc., ASBCA 23463, 80-2 BCA, p. 14,617). The actual years involved were 1975-78. This case will be discussed further later.

32. Aerospace Industries Association, *op. cit.*

33. *Federal Acquisition Regulation*, Section 42.1008.

34. *Defense Logistics Agency Manual 8105.1*, Section 31.109-4(i), December 11, 1984.

35. *Ibid.*

36. *Ibid.*

37. Chief, Financial Services Division, DLA Headquarters, "Non-Mandatory Independent Research and Development (IR&D)/Bid and Proposal (B&P) Advance Agreements," January 21, 1986.

38. *DLA Manual 8105.1, op. cit.*

39. *In-depth Investigation into Independent Research and Development and Bid and Proposal Costs, op. cit.*

40. *DCAA Contract Audit Manual*, Defense Contract Audit Agency Manual 7640.1, July 1988.

41. *Implementation of Section 203, Public Law 91-441, op. cit.*

42. *Payments for Independent Research and Development and Bid and Proposal Costs, op. cit.*

43. Office of the Under Secretary of Defense, Research and Engineering; Memorandum for Ray Dellas, Executive Director, Contract Administration, DCAS; April 11, 1978.

44. Office of the Under Secretary of Defense, Research and Engineering; Memorandum for the Deputy Director, Contract Administration Services, Defense Logistics Agency; November 30, 1978.

45. Defense Contract Administration Services Management Area, Santa Ana; Memorandum to Defense Contract Administration Region, Los Angeles; March 30, 1988.

46. Defense Contract Administration Services Region, Los Angeles; Memorandum to Defense Logistic Agency; June 2, 1988.

47. Dynatrend, Inc., ASBCA No. 23463, July 25, 1980, 80-2 BCA, p. 14,617.

48. Defense Contract Administration Services Region, Philadelphia; Memorandum on Bid & Proposal (B&P) and Independent Research and Development (IR&D) Costs Non-Mandatory Advance Agreements; August 24, 1982.

The Process of PROJECT MANAGEMENT

Eddie Smith
Dr. Charles J. Teplitz

When properly applied, techniques of project management comprise a powerful business tool applicable to nearly every functional area within virtually any industry. Analysis of the project management process reveals benefits to be realized and obstacles to be overcome at every phase of the project cycle.

Before a project can start, a careful review is required to determine if the program and the organization can be managed appropriately through a project-oriented management style.

At start-up, the project team, goals and guidelines are established. During the project, monitoring and mid-course corrections are required to assure on-time, cost-effective completion.

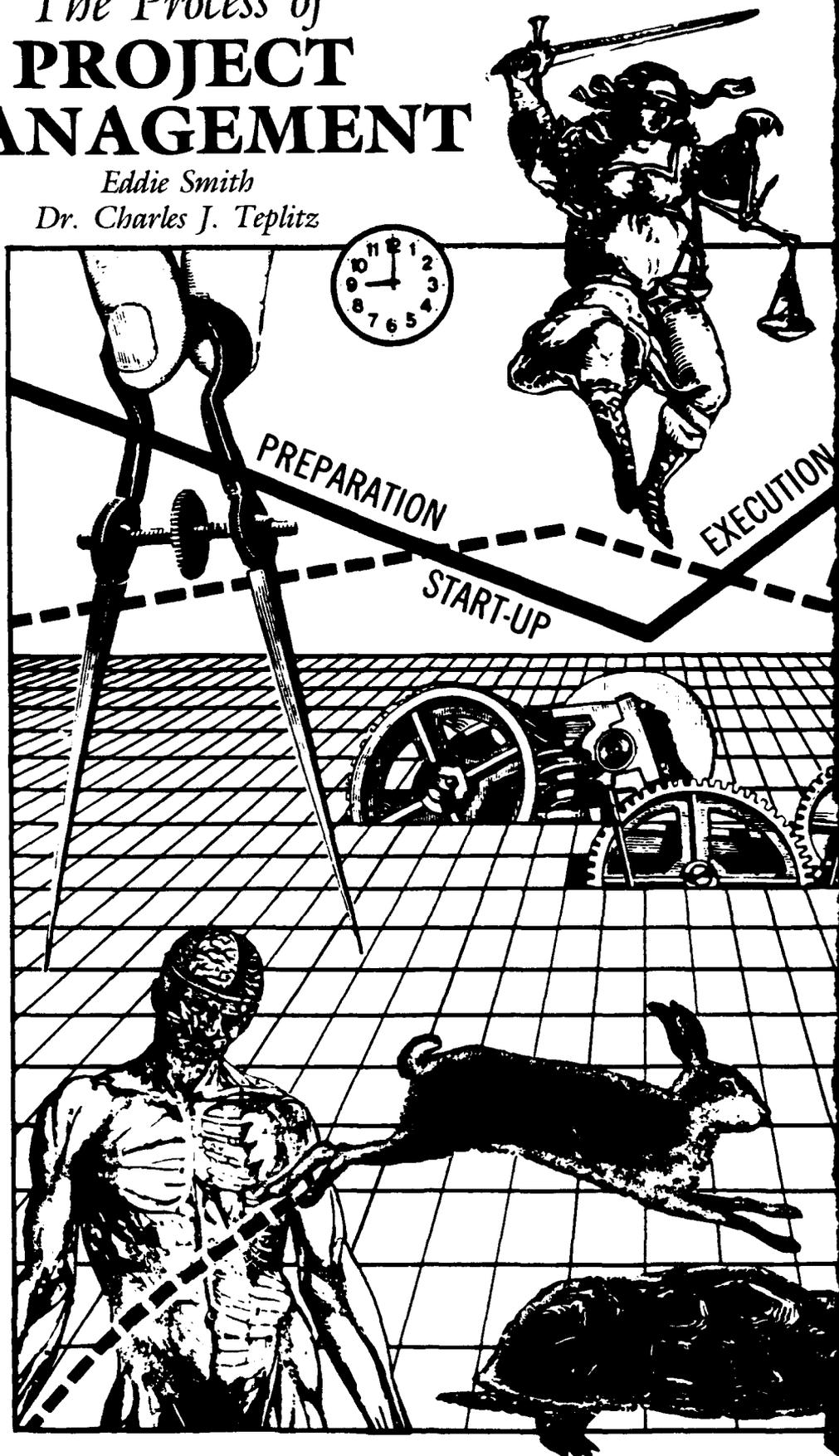
In this paper, we present an overview of fundamental requirements to successful project management. The discussion parallels the chronological sequence of activities experienced in any actual project: preparation, start-up, execution, and conclusion. The paper concludes with general caveats of project managers.

Phase 1: Preparation

The project-management cycle begins before the project commences. While the project is a concept and the company is deciding what resources, if any, should be dedicated to it, pro-

Mr. Smith is Deputy Project Engineer at Rohr Industries, San Diego, California.

Dr. Teplitz is Professor of Operations Management, University of San Diego School of Business, and Director of its Institute for Project Management. He is a certified Project Management Professional through the Project Management Institute.



ject management must make several key decisions.

The first decision revolves around appropriateness of the project-management approach to the program in question; it must be remembered that to properly utilize the "project management" approach, the project must be definable. There must be a goal to achieve and a way of measuring the progress toward, and ultimate achievement of, that goal. Although many processes lend themselves readily to some project management technique, often they are not truly "projects" and treating them as such would be a mistake.

For example, a simple activity like baking brownies can be diagrammed on a CPM (critical path method) chart, with each of the tasks involved and interrelationships mapped to determine the quickest or least expensive preparation method. This activity should not necessarily be treated as a project (and not because of the magnitude of the endeavor). If the goal is to produce a single batch of brownies, this could be considered a project; if the requirement is to produce 5,000 brownies for a once-in-a-life-time banquet, this would be a candidate for project management. But, if the organization is a bakery, and the objective is to make brownies every day for the foreseeable future, project management would be an inappropriate management technique.

Recurring or continuous processes have different managerial and business implications than do projects and should be structured and controlled differently from projects if the best results are to be achieved.

Internal Environment

Similarly, management must determine if the company's internal environment is conducive to applying project management to the task in question. Because the project approach often crosses traditional lines of authority and requires a different mental attitude toward business, the organization structure and the specific personnel involved become key considerations. For a project to succeed, involved departments must work well together, with a good deal of flexibility and with a greater concern for achieving goals as a team

than for protecting or enlarging personal empires. Management must look at this issue objectively and decide whether the team will work together well enough to justify the inevitable disruptions to the *status quo*. Clearly, changes to organizational charts and compensation practices are not justified for a handful of minor projects, but these changes are often needed if a substantial number (or size) of programs are to be performed successfully.

There are other environmental considerations to review. For example, if a particular project requires a high degree of interaction between groups located in different buildings or cities, a major facilities modification might be in order. Many companies lack the conference space necessary to hold interdisciplinary meetings on a regular basis. These companies often select a project management orientation whenever possible so that each project team can be physically located together, with the workers only periodically meeting with the supervision (and/or peers) from their own areas of expertise. Conversely, many companies must forego benefits of project management because they lack managerial talent to lead many small projects.

Finally, to make a fair assessment of the desirability of a particular task as a project, management must perform some level of cost/benefit analysis. Costs of making needed changes in personnel, procedures, facilities, etc., must be considered in light of benefits expected. In addition to reductions in time and cost, expected benefits include reduced risk, greater management visibility and control, and an organization ready to perform major programs better in the future.

In general, project orientation is advantageous for discrete, one-time tasks, like building a bridge or developing the next-years product model. Issues described above mean that management must clearly define what is to be done and how. Addressing these issues will provide a clear picture of program objectives and constraints, and leave management ready to progress to the next phase of managing the project: the start-up.



Design Greg Caruth

Phase 2: Start-up

The first step in the project start-up is to organize. The structure defined during the preparation phase must be translated into an operational framework. In structuring the organization, management must determine necessary staffing requirements to perform the project, necessary office space must be provided, and other required resources must be identified and their acquisition arranged; e.g., laboratory facilities, secretarial and clerical support. It may be necessary to create new procedures or instill a new philosophy for some departments. If required, this should be done at this time, not later when a conflict may arise. It should be done by the highest level of management possible so that everyone sees this as a strategic plan for the future instead of fueling power struggles between departments.

After a straw-man organizational chart is drafted, people must be selected to fill positions. The personnel assignments may begin while the structure is being developed because the quantity and qualifications of available workers will often dictate modifications to the organizational plan. Selections should be based, at least in part, on the ability of project teams to work together and on special project requirements. Special attention is called for whenever manpower requirements have one person assigned to more than one project. This avoids conflicts of interest and instills confidence in each project manager that the required support will be available at the appropriate time.

Budgets and Schedules

The next task is the one most often associated with project management techniques: establishing budgets and schedules. Appropriate CPM and Gantt charts are made and necessary PERT analyses are performed. A detailed Statement of Work is generated so that, in aggregate, there is a clear description of the task to be accomplished. This enables management to establish a more tangible concept of the risks involved with the project and to identify areas of concern. It helps establish a degree of accountability for program success.

Along with developing all of the tools and definitions, this is the time to document schedules and requirements for accountability and future use. In analyzing progress, and later for budgeting subsequent projects, it is critical to have the original project scope documented so that added tasks or changes can be accommodated in terms of budget and sequencing.

A fairly critical item often overlooked is the definition and documentation of when the project will end. This can and must be done in terms of time (develop a new model for next spring), budget (perform a million dollar research program), or milestone (build a bridge). Occasionally, a project team is disbanded too soon and the program is turned over to a maintenance department without skills or resources to finish the job properly. Often, a project is not terminated when it should be, requiring the project team to manage the ongoing task, which is an improper utilization of company resources. Since distinctly different requirements are placed on a project team, a properly structured and staffed team should be used for projects only.

As start-up decisions are finalized and documented, the project shifts into the primary phase, the reason for performing the other phases, the execution phase of the project, in which the project objectives are achieved.

Phase 3: Execution

Although the project manager steps down from being the major (or perhaps only) decision-maker on the project to overseeing efforts of a large and diverse team, it is during the project execution phase that actual management of the project becomes critical. The project manager must avoid the trap of merely tracking the project or just reacting to developments along the line and, instead, be active in directing the project. The effort must be to overcome organization inertia and initiate needed tasks in a timely manner. Every effort must be continually assessed to ensure only necessary tasks are done and that everyone is still working toward project objectives.

The project manager must know everything happening and keep in mind requirements to meet if the project is to succeed. As milestones are achieved, the project manager must shift tasks to and fro, rearranging the schedule to use the program slack where it becomes needed and creating more slack whenever tasks can be completed early. During earlier phases, the project manager knows there will be variations from the expected completion times. It won't matter if the manager predicts variations and allows for variations if the progress of project elements are not monitored. Changes must be made along the way to direct the project back toward successful completion of ultimate objectives.

In addition to variances in performing the required tasks, the project manager frequently is presented with changes in the desired product after the project is underway. Whether the customer is the actual purchaser of the product or is the directing group or manager within the company, these changes are common and must be dealt with carefully. If the project manager has a properly laid-out course and has maintained control of team progress, it is a relatively straightforward job to analyze project modifications necessary to effect the change and, from these, estimate cost and schedule implications of the change. Obviously, the more uncertainty existing over the project goals and current status, the more futile it becomes to attempt such a trade-off study.

Other Sources

It is common for the project manager to be presented with potential opportunities from sources other than the customer: from within the project environment. For example, suppliers and subcontractors and internal contacts often will offer suggestions to improve the product or reduce its cost, or offer a lower price in return for a shift in scheduling. Again, the project manager must be fully aware of the program status to determine desirability of these proposals. A poorly considered change could jeopardize the project for a relatively minor savings. The ultimate case of this type of trade-off study occurs when a go-no-go deci-

sion is considered once the project is underway. In this case, cancellation charges are weighed against the cost to complete the project along with the completed project's expected benefits. Usually, if this option is being discussed, the project manager must have a clear grasp of the task remaining to have hope of saving the project.

Besides knowing project status, the manager must analyze the progress in a broad perspective. It is not sufficient to know that it is possible to complete the project on schedule and within budget. Judgments must be made and trends looked for. Steps should be taken to prevent problems that appear to be developing and to take full advantage of good fortune. If a project has consumed most available slack early in the program, with questionable tasks remaining, it may be necessary to look for alternatives which, though more costly, are to the overall advantage of the project and company. On the other hand, as it becomes obvious that a task will be completed early, upper management should be informed so that the people and resources can be used wisely when available. Thus, the project manager must analyze the project's progress, prepare contingencies where appropriate, and initiate formal recovery plans or schedule necessary shifts.

At this point, we arrive at the final phase of project management: concluding the project.

Phase 4: Concluding The Project

When the project is completed, the final project management phase must be performed. Concluding the project should include a thorough cost/benefit analysis, not only assessing actual costs versus original estimates, but analyzing the management. Was the project properly handled? How disruptive were organizational and personnel changes put in place at project inception? Should the project have been performed by one of the functional departments instead, with other disciplines serving as consultants where required? Sometimes, the benefits of using project management can be measured in dollars but usually this is left to the collective subjective judgment of management.

Delivery of the final product does not necessarily signal the end of the team. Certain things must be documented: cost associated with the project, status of tasks to be given the group responsible for the sustaining effort, and reports or analyses to be supplied later.

The "view from the palace" is usually rosy...there is a real danger of losing touch with the program.

Finally, the project and management must be reviewed to find long-term implications for the company. Personnel should be assessed as well as analytical and managerial techniques employed. Standards used for estimating should be reviewed; some will be substantiated whereas others may need adjustment for the next project. Communications throughout the project should be evaluated to make sure that anyone surprised by project developments can be better informed on future programs. There always is a strong inclination to "clean house" and devote every energy to the next project but, if the follow-up phase of project management is performed adequately, each successive project can benefit from prior program experience, leading to superior project management.

Caveats

The project manager must be aware of potential pitfalls. A few merit special consideration. The foremost trap, which encompasses the others to some degree, is the "ivory palace" mentality. The "view from the palace" is usually rosy so if the project manager becomes too distant from the work, physically or emotionally, there is a real danger of losing touch with the program. Often, a great deal of time can go by with the project manager reviewing memos and updating charts and

graphs without realizing what is happening on the project. Many times this results in disaster. The project manager must stay in the workplace to maintain a true picture of the project.

The project manager must keep in perspective the limitations of analytical tools being used, like networking techniques, because they are based on assumptions that may or may not be true. The computer phrase "garbage in, garbage out" applies to any analytical model: If underlying estimates are grossly inaccurate, the model's conclusions cannot be any better.

Beyond Manager's Control

Some variables are beyond the manager's control. Labor agreements made elsewhere in the company restrict the flexibility of that resource for all projects and, occasionally, disputes will suddenly eliminate it completely for a time. Likewise, suppliers and subcontractors can be manipulated only indirectly, and customer requests often must be accepted *per se*.

Projects often represent development of a new product or process, and technology constraints present a major consideration. Often, technological advances are exponential or exhibit huge economies of scale, such as in the electronics industry. Occasionally, each level of gain is predictable, requiring the same time or effort to achieve as previous levels. Sometimes the law of diminishing returns applies, with each advancement significantly more difficult to achieve. Clearly, there is a high level of risk in scheduling a project based on undeveloped technology, or counting on state-of-the-art equipment to perform as advertised. Schedules often are missed because "the computer went down."

Finally, the project manager must always identify areas requiring attention most and act accordingly. It is imperative to differentiate between critical problems and those most loudly demanding attention. This again points back to being aware of project goals and status, to acting and managing rather than tracking and reacting.

MINI SHOULD COST WITH KEY INDICATORS

*Mrinal K. Mukherjee
James G. Gleason*

In the commercial atmosphere, industry and their suppliers work together toward a common objective of marketing the product at the most advantageous price to increase consumer demand. Production cost is reduced and thus generates an even greater consumer demand and profit.

This "profit motive" generally is not present in Department of Defense procurement. The quantities of particular items of defense hardware are determined and budgeted in advance. If funds are saved through cost-reduction efforts they will likely be reprogrammed to buy other needed items or services. The defense contractor who improves his efficiency and reduces his costs does not benefit in added sales or profit. In fact, as costs are reduced, profits are often reduced because of the DOD cost-based method of determining profit.

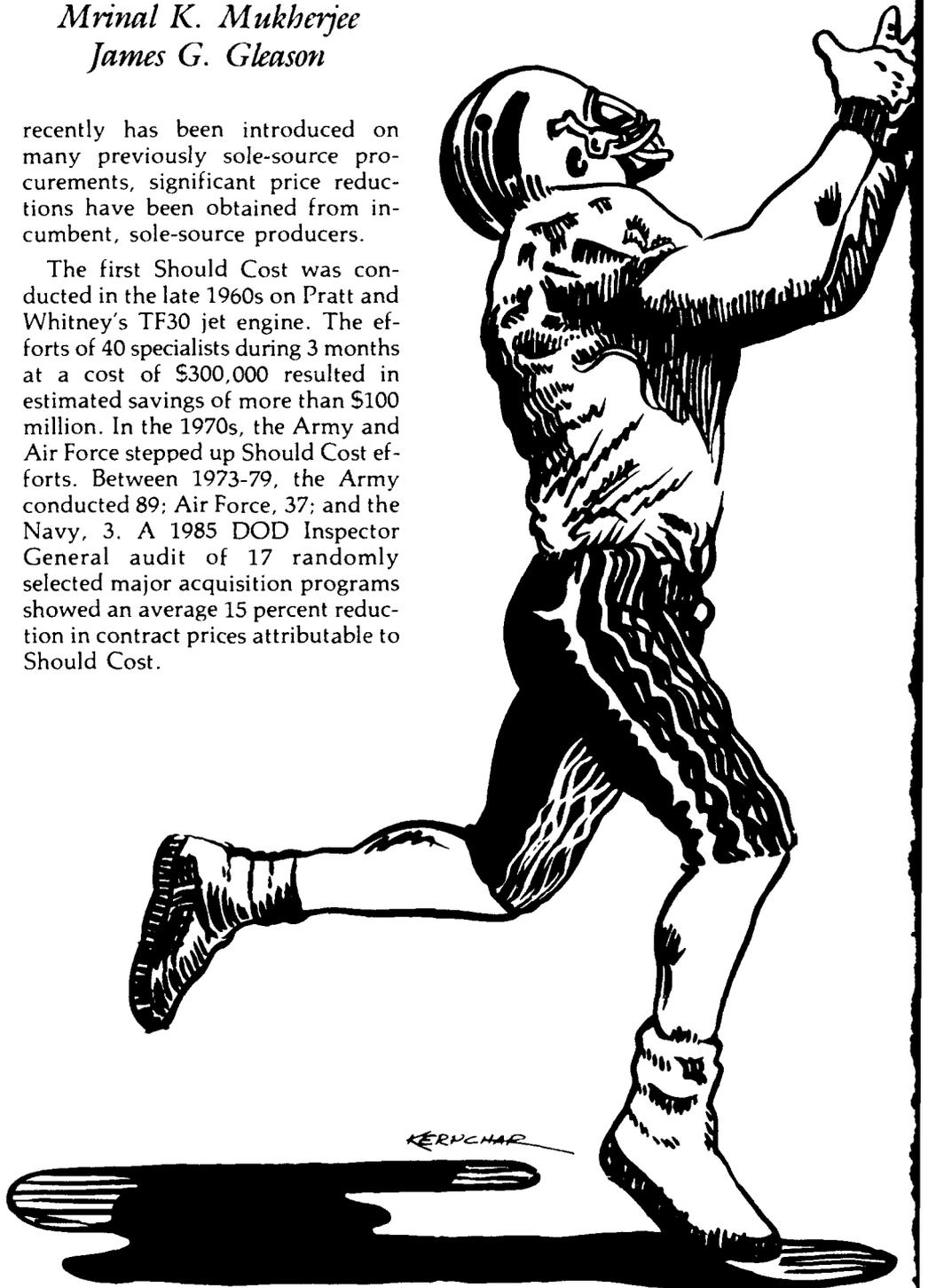
In the environment described above, where there is a lack of incentive to reduce cost, the need for Should Cost (SC) evolved. The SC purpose is to identify and quantify potential areas of improvement in the contractor's manufacturing operation and to negotiate reasonably expected improvements into the contract price. Perhaps the best evidence of the potential for dramatic cost reductions might be the fact that as competition

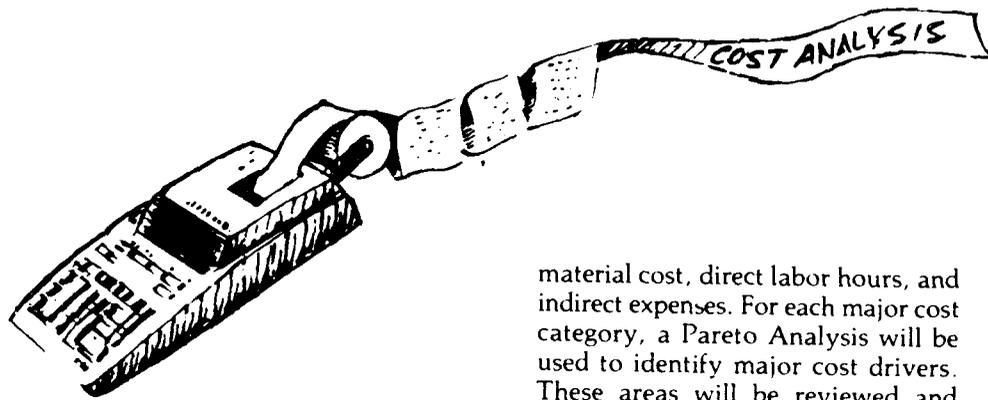
recently has been introduced on many previously sole-source procurements, significant price reductions have been obtained from incumbent, sole-source producers.

The first Should Cost was conducted in the late 1960s on Pratt and Whitney's TF30 jet engine. The efforts of 40 specialists during 3 months at a cost of \$300,000 resulted in estimated savings of more than \$100 million. In the 1970s, the Army and Air Force stepped up Should Cost efforts. Between 1973-79, the Army conducted 89; Air Force, 37; and the Navy, 3. A 1985 DOD Inspector General audit of 17 randomly selected major acquisition programs showed an average 15 percent reduction in contract prices attributable to Should Cost.

Mr. Mukherjee, P.E., is assigned to the Defense Systems and Programs Office, Office of the Assistant Secretary of Defense (PC&I).

Mr. Gleason serves in the Office of the Deputy Chief of Staff for Procurement, Army Materiel Command.





Present Problems

The Should Cost as currently applied requires a dedicated team of price analysts, contract specialists, auditors, design and industrial engineers and quality assurance specialists. The number of personnel involved has been as high as 60, and length of the assignment as long as 1 year for major programs. The success of the Should Cost is measured by the short-term and long-term negotiated improvements beyond what a contractor has experienced prior to the study. To a great extent, the level of success depends upon expertise of team members. Availability of skilled professionals necessary to do the job is a serious problem for the Department of Defense.

A Should Cost study also can create problems for the contractor. The Should Cost Team spends hours at the contractor's plant which can disrupt his routine. Contractors are required to allocate much time interfacing with government personnel.

Army and Air Force statistics show the average Should Cost study amounts to about \$264,000, and argue this outweighs benefits. The Mini SC with Key Indicators is an approach that minimizes disadvantages and maximizes Should Cost benefits.

Mini SC Approach

Objectives of this approach are to involve fewer professionals, focus on major cost drivers, and get more "bang for the buck."

The Mini SC Team could have as few as one specialist each from procurement, manufacturing/industrial engineering, and quality assurance. The production cost can be divided into the major cost categories of

material cost, direct labor hours, and indirect expenses. For each major cost category, a Pareto Analysis will be used to identify major cost drivers. These areas will be reviewed and compared to industry norms to identify the greatest potential for improvement.

Review Process

Material Cost. The contractor should be required to submit the proposed bill of material by descending total dollar value for each part. This will allow the Should Cost Team to identify quickly which parts to review. Generally, 20 percent of the part numbers will cover 80 percent of the cost. Only a small sampling of the remaining part numbers need to be reviewed.

When reviewing the selected part numbers, attention should be focused on the following key indicators: extent of competition, make or buy analysis, subcontract negotiation decrement, comparisons to previous buys, and attrition rates. Evaluation of these indicators and comparisons with the general industry norms will allow the Should Cost team to focus review to areas with the greatest potential payback. Description of review process with the indicators and associated average industry norm, where applicable, is presented in Chart 1.

Direct Labor Hours

The contractor should be required to submit a breakdown of factory direct labor hours by work center with his proposal. The high labor hour content work centers should be selected for review. Generally, 80 percent of the hours can be covered by a review of 20 percent of the work centers. When reviewing the selected work centers, attention should be focused on the following key indicators: plant/workplace layout, material handling system, manufacturing methods and processes, and work measurement system.



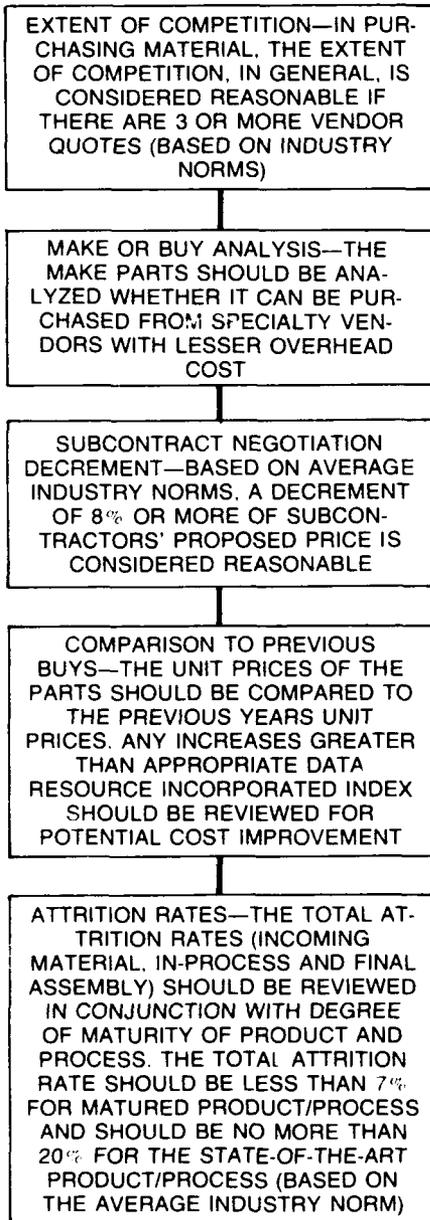
The description of the review process with the indicators and the associated average industry norm (where applicable) is presented in Chart 2.

Indirect Expenses

The contractor's indirect expenses should be listed in descending dollar order. Major expenses generally will include indirect labor, depreciation and payroll expenses. Again, 20 percent of the items generally will cover 80 percent of dollars.

CHART 1.

REVIEW MATERIAL COST FOR SELECTED PARTS

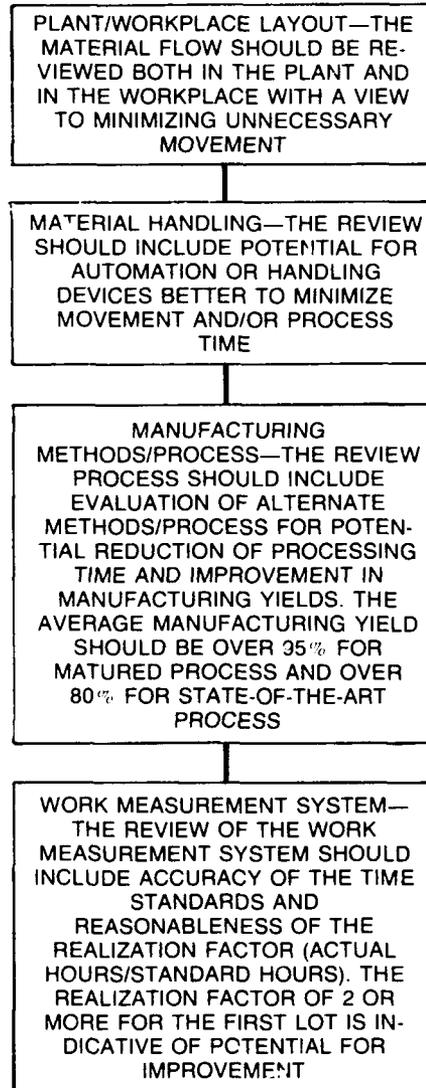


When reviewing each of the major expenses, the following are examples of key indicators that should be evaluated and compared to industry norms in direct to direct headcount ratio, depreciation trends, and ratio of payroll expenses to direct labor costs. The evaluation will indicate which areas have the greatest potential for improvements.

The review of major cost categories described above, in general, comprise more than 70 per-

CHART 2.

REVIEW DIRECT LABOR HOURS FOR SELECTED WORK CENTERS

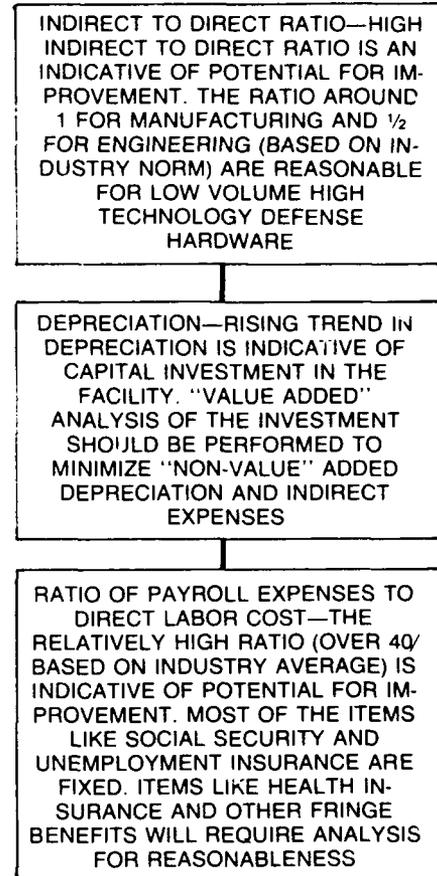


cent of the total production cost. The average industry norms for indicators were developed from the discussion with Department of Defense Should Cost specialists and data from industries. Values are the industry average and many differ for the type of product, process and production quantity.

The Mini Should Cost approach with key indicators should not be perceived as the substitute for traditional SC. Mini Should Cost has limitation regarding the span and depth of coverage compared to extensive Should Cost. The approach, which may be used as an alternative to the conventional SC in the ap-

CHART 3.

REVIEW MAJOR INDIRECT EXPENSES



propriate situation, offers significant advantage since it needs less manpower for a brief period, thus, has fewer management problems. The Mini Should Cost study required nominal administrative and logistic support and can be used effectively for major and non-major systems with minimum lead time.

During the time of budgetary constraints, this approach will facilitate wider acceptance and application of Should Cost by Department of Defense procurement managers, which should enhance economy and efficiency of defense industrial bases.

References

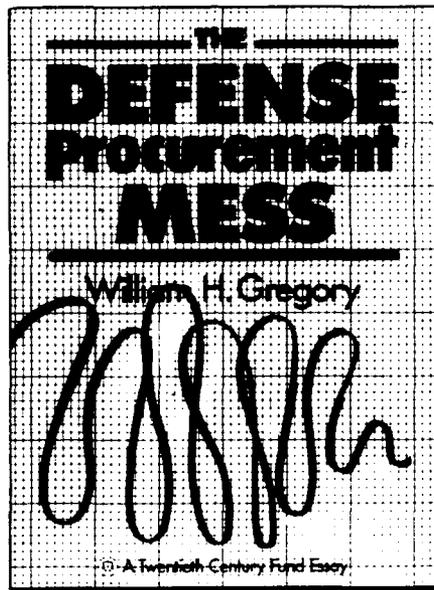
1. Comptroller General's report to the Congress, *Feasibility of Applying the "Should Cost" Concept to the Government Procurement*, 1970.
2. The DOD Inspector General Audit Report, *DOD "Should Cost" Program* (September 1985).

THE DEFENSE PROCUREMENT MESS

This book by journalist William H. Gregory, editor-in-chief of *Aviation Week and Space Technology* for almost three decades, is based on formal interviews, informal conversations, briefings, presentations, speeches, etc., at the Pentagon, military bases, airfields and factories. Some information comes from reports and articles. In addition to the people quoted directly, views are presented of field and flag-rank military officers, military officers and civil servants in program management, corporate chief executive officers, Washington representatives, investment analysts, bankers and others. The author interviewed many Americans, and the viewpoints are included of people from foreign countries.

Based on findings and analyses, Gregory concludes our weapon system acquisition programs are in trouble because their ills have been misunderstood and, possibly, distorted. To solve the problem, the Department of Defense (DOD) and the Congress have assumed strong roles. Reforms imposed by them have resulted in overmanagement of weapons acquisition programs and in lengthening development and production phases of programs. Overmanagement has deflected the acquisition process from its basic objective; i.e., getting systems and equipment to the American forces in the field as quickly and cost effectively as possible. Even though delays cause problems, Gregory recognizes it is of paramount importance that our defense systems and equipment perform properly when placed in service, and be technically superior to weapons fielded by potential adversaries.

Mr. Acker, our reviewer, serves in the Research Directorate at the Defense Systems Management College.



William H. Gregory
(Lexington Books, 1989, 220 pp.,
\$19.95 cloth bound,
ISBN 0-669-20807-8)

According to the author, the patriotism that once distinguished the defense business from all others has been submerged. Government managers and contractors struggle with financial issues, separate from real needs of the military. Generals, admirals and contractors feel the media has been acting irresponsibly, if not disloyally, with constant references to waste, fraud and abuse. The military and the defense industry complain that the Congress has caused some problems in its hearings and press handouts. The author believes legislation complicates regulations governing military procurement and introduces contradictions or vagueness.

Gregory found that the DOD and industry resent "congressional micromanagement"; that the Congress is immersing itself in details of weapons selection and program management, rather than performing its role of policy review and ensuring the cost of each weapon is held in check.

Gregory found that the military-industrial complex is not functioning harmoniously. It is only through the experience and efforts of a handful of veteran military and civil servants, along with a tested industrial cadre, that weapons acquisition programs have been able to function as well as they have been. Program managers have been fighting an overwhelming burden of paperwork, second-guessing, and bureaucratic layers. Unfortunately, many of the people who conducted successful acquisition programs are disappearing from the scene through retirement and disenchantment.

In this current turmoil, the program manager has been submerged and the time to develop and field a new weapon has been stretched out. Gregory believes the "eclipsed" program managers are not the root cause of the acquisition mess. Rather, program managers are a symptom and a symbol of the fact that the government doesn't trust its own people or those in industry to carry out assigned work.

The author places primary blame for the defense procurement mess on micromanagement. Other causes are overregulation, overspecification, vacillation on funding for systems/equipment of critical importance, adversarial relationships in the defense establishment, exceedingly complex contractual terms, and contractors and the military mesmerizing themselves with overly optimistic cost estimates for developing and fielding weapons.

Gregory is convinced that this country will muddle along with the way it initiates weapons requirements until the electorate demands strategic ingenuity from its leaders. If the military continues to make more demanding requirements, and in-

(Continued on page 44)

COST VARIANCE IN ACQUISITION

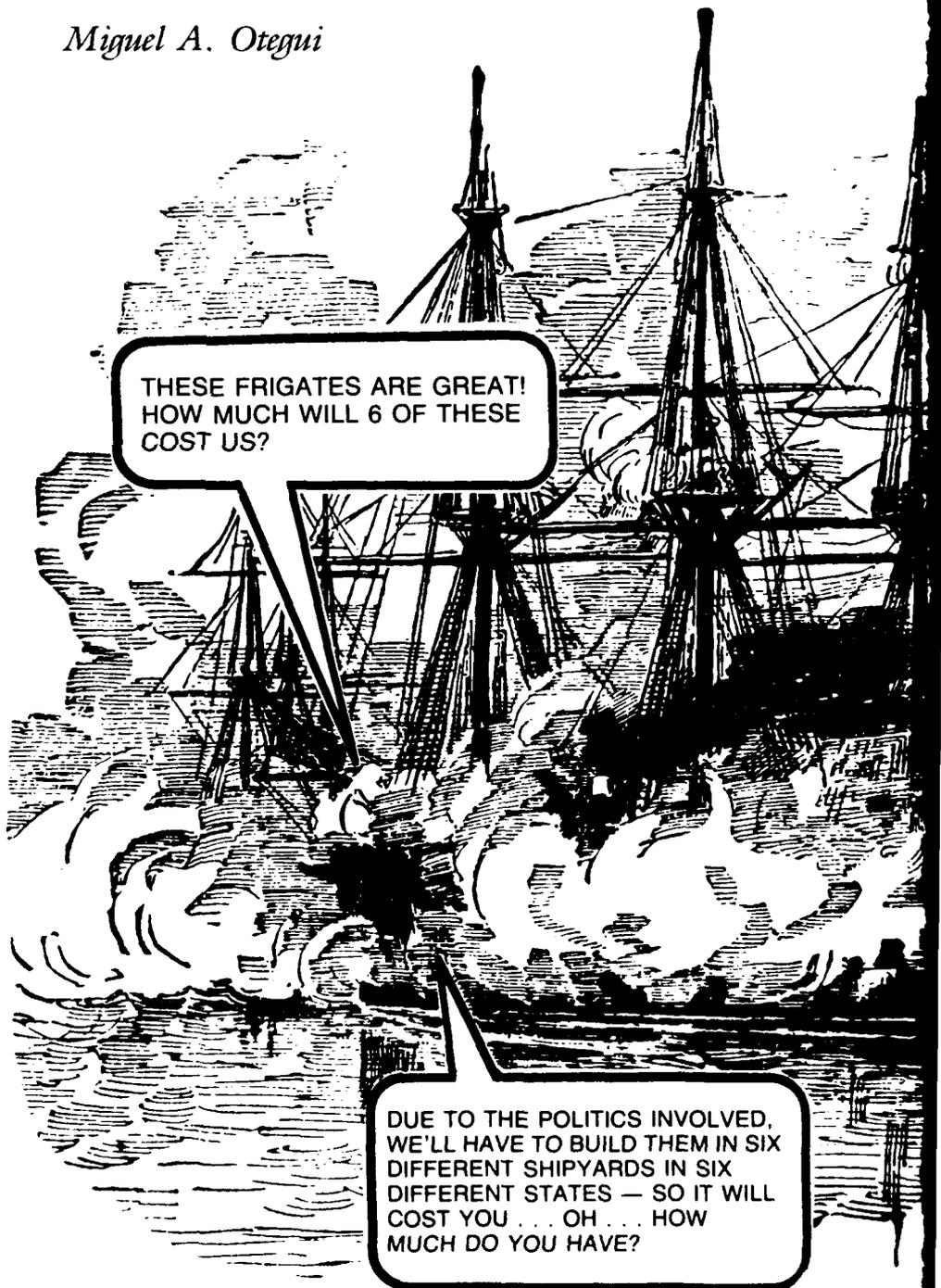
Descriptive Analysis of SAR Cost Data

Miguel A. Otegui

Since the dawn of the republic, the acquisition of weapons and equipments for the Armed Forces of the United States has been perceived as plagued by various problems which in the end resulted in significant increases in their cost. This perception today is shared by the media and a majority of literature dealing with defense procurement. The perception, however, is based mostly on anecdotal evidence which, by accumulating selected instances of cost increases, seems to support the idea of a process out of control and inefficient.

In this paper, using well-defined data and rigorous methodology, I attempt to analyze this issue and quantify its negative aspects in a more objective way. It is beyond the scope of this writing to analyze procurement of military weapons from the days in 1794, when the Navy experienced cost growth in the procurement of its frigates,¹ to the latest reports on cost growth in the procurement of stealth bombers. Instead, I concentrate on analysis of the data contained in reports currently submitted to the Congress. Cross-section analysis of

Mr. Otegui, a former Head of the Aircraft Procurement Budget Branch, Office of the Comptroller, Headquarters, Naval Air Systems Command, is Director, Navy Ranges and Field Activity Resources Management Division, Headquarters, Naval Air Systems Command. The research for this study was largely completed during his assignment last year as a Visiting Research Fellow with the Defense Systems Management College.



these reports is considered to give a better indication of the existence and causes of cost growth in procuring DOD weapon systems than can be provided by anecdotal description.

Definitions, Data, And Methodology

Cost growth is a connotation-laden term needing careful definition. As commonly used, it implies existence of an estimate fulfilled at a cost higher than anticipated: the unstated connotation is that, somehow, the original estimate was right, and that increases to that estimate (cost growth) reflect inefficiency in the procurement process. A more precise terminology would see the difference in cost between the original and the current estimate of a given program as cost variance, since occasionally acquisition programs are completed at a cost lower than originally estimated. Cost variance carries no *a priori* implication of inefficiency, even when the variance is an in-

TABLE 1. DISTRIBUTION OF SAMPLE SAR PROGRAMS

	ALL OTHER*	AIRCRAFT	MISSILES	SHIPS
ARMY	5	3	2	
AIR FORCE	10	6	1	
JOINT ³	1		4	
NAVY	3	10	4	12
Total	19	19	11	12

*ALL OTHER includes combat vehicles, space and communications systems and components, and ordnance.

crease: the variance may well be—and, in fact, often is—the result of efficiency-neutral events or conditions. Thus, while aware that we are referring to what, in everyday parlance, is labeled cost growth, I will use cost variance, as used in the Selected Acquisition Report (SAR), to describe the difference between the original and the current estimate of cost of any given weapon system or systems.

The SAR is one means the Congress uses to control the expenditure of public funds in the acquisition of DOD major weapon systems. The report provides, in a single document, key indicators of cost, schedule, technical, operational, and contractual data and information for specific weapon systems. The report is used by the Congress in its budget hearings and oversight, and constitutes a comprehensive source of consistent and reliable information for the Government Accounting Office, the Congressional Budget Office, and the Department of Defense. The report is required by Section 2432, Title 10, of the United States Code, and its coverage, format, and content are governed by Department of Defense Instruction (DODI) 7000.3 and DODI 7000.3G. The SAR reports are required for practically all major defense acquisition programs.² Cost variance is documented in Section 13 of the SAR and can result from changes in events, procedures or processes in weapon system procurement. Listed in the specific order in which they should be computed, cost variance results from changed economic, quantity, schedule, engineering, estimating, other, and support assumptions or events.

This study contains data from 61 SAR reports submitted in December 1988 in support of the Fiscal Year 1990 budget estimates. Two criteria were used in selecting the reports to include in the study: (1) the data to be used (Cost Variance section of the SAR report) were to be unclassified; and (2) the financial data in this section would contain, as a minimum, 2 years of procurement funding already presented to the Congress. In this fashion, the criteria ensure that the data are non-controversial and safe to use from the security classification standpoint, and mature enough from the point of view of the accuracy of the estimates that generated it. At the same time, the criteria allow a large sample, both in terms of number of programs and dollars involved, to ensure representativeness for a cross-sectional study.

Table 1 categorizes these 61 programs.

Section 13 of the SAR contains data in then- and constant-year dollars; thus, the study used constant year values that already included the effect of economic change. Since the base year for constant-year dollars for various programs is not the same, conversion to a common-base year was necessary to permit meaningful aggregation of these values across the different acquisition programs. Accordingly, all data were converted to a base of FY 1988 dollars by application of the DOD procurement deflator.⁴ A purist may argue that deflators for the parent appropriations should have been used. A common deflator was chosen for its ease of application, assuming the resulting minor inaccuracies would not be material for the study results.



TABLE 2. COST VARIANCE IN SELECTED FY 1990 SAR PROGRAMS

	Initial Estimate (millions)	Current Estimate (millions)	Cost Variance (millions)	(percent)
ARMY	\$49,413.0	89,935.2	40,522.2	82.0
AIR FORCE	139,759.0	215,843.9	76,084.4	54.4
JOINT	20,097.0	25,710.0	5,613.0	27.9
NAVY	160,142.6	247,743.8	87,601.2	54.7
Totals	\$369,411.6	\$579,232.9	\$209,820.8	56.7

Cost Variance In FY 1990 SAR Programs

Using this methodology, the data show a sizeable cost variance exists from the initial to current (December 1988) estimates, shown by Table 2:

The data in Table 2 would seem to support a simplistic assumption of cost growth to the casual observer. Data show that the initial estimate was exceeded by more than 56 percent. Thus, purchasing power the cost variance for these 61 programs wasted (\$209.8 billion) almost would have run the entire DOD for 1 year

FIGURE 1. COST VARIANCE, SAMPLE FY 1990 SARs

BREAKDOWN BY CATEGORY

SUPPORT (12.2%)
\$25.5B

OTHER (1.6%)
\$3.4B

ESTIMATING (4.8%)
\$10.0B

ENGINEERING (14.3%)
\$30.0B

SCHEDULE (4.7%)
\$9.9B

QUANTITY (62.4%)
\$131.0B

(the FY 1988 DOD budget was \$283.2 billion). Further analysis of the data, however, ascribes this cost variance to several categories that indicate the cost changes, by and large, respond directly to changes in the military need those programs are to fulfill. Accordingly, the changes should be measured in terms of the military effectiveness they bring out and not in assumed inefficiency in acquisition. Figure 1 provides insight into this question.

The Figure 1 data illustrate the difference between cost growth and variance in cost discussed before. Cost of an acquisition program cannot be thought of as a fixed amount unrelated to the quantity of weapons procured with that amount: An increase in the quantity procured should naturally entail an increase in total cost. Along the same lines, engineering changes that incorporate additional capabilities into the system should hardly be considered cost growth; neither should the cost of additional support or spares necessitated by the increased number of equipment supported. By and large, cost variances in the acquisition of weapon systems are explained (almost 90 percent) by events and processes that add military value to the programs. Correction of errors in preparation of estimates, or changes in estimates' assumptions or techniques (the estimating category) must be accounted for when the estimate is changed, but are not indicative of growth in cost or inefficiency. Basically, schedule is the only, if relatively small, variance of cost category that seems to impact negatively the cost of acquisition programs.

Schedule Variance and Its Cost

In analyzing the impact schedule change has in the acquisition of DOD programs, the first step is determining the extent and scope of this phenomenon among programs, services and commodities. Tables 3 and 4 address that question.

Placing these parameters into perspective brings interesting facts to light. As an absolute number, the \$4.243 billion increase in aircraft cost (schedule) is a significant amount; 4.26 percent of the total cost variance seems to be significant. Along these lines, the \$3.719 billion and 15.3 percent schedule variance for missiles seem more significant. However, if we consider, as we should, that increases in quantity, engineering, and support represent the cost of military value added to the programs, the schedule variance represents only an almost negligible (in statistical terms) increase of 1.71 percent of the current total estimated cost of the sample programs. Schedule variance accounts for 1.57 percent of the total cost of the sample aircraft; 4.07 percent of the total cost of the missiles; a negative .12 percent of the cost of ships; and 2.08 percent of the cost of other programs.

Missile programs seem to be affected most by schedule changes, in terms of percentage of the cost variance and percentage of total cost. Cross-tabulation of missile data by Service provides grounds for a reasonable explanation. As seen in Table 5, missiles procured to fill the military needs of more than one Service (joint) suffer schedule variances which, as a percent of total cost variance, are almost twice as large as those procured for a single Service.

The two-to-one ratio in the percentage of cost variance attributable to schedule variance holds also for the percentage of total cost attributable to schedule variance. While not true in each case, aggregate numbers seem to indicate that accommodating unique Service requirements into a joint effort requires interfaces and produces delays reflected in costly schedule slippage. This hypothesis, however, does not explain why schedule variances for Service missiles are so much larger (as per-

TABLE 3. COST VARIANCE (IN MILLIONS) BY COMMODITY AND CATEGORY

	SHIPS	MISSILES	ALL OTHER	AIRCRAFT	TOTAL VARIANCE
QTY	47,586.8	10,141.3	23,445.1	49,828.8	131,002.0
SCH	-140.4	3,719.5	2,058.1	4,243.5	9,880.7
ENG	1,626.2	2,255.4	3,498.2	22,589.0	29,968.8
ESTM	-4,741.1	5,260.6	8,328.8	1,214.0	10,062.3
OTHER	913.1	233.5	105.2	2,156.9	3,408.8
SUPPORT	1,519.1	2,611.5	1,827.3	19,540.3	25,498.2
TOTAL VARIANCE	46,763.7	24,221.8	39,262.7	99,572.5	209,820.8

TABLE 4. PERCENT OF TOTAL COST VARIANCE OF EACH COMMODITY BY CATEGORY

	SHIPS	MISSILES	ALL OTHER	AIRCRAFT
QTY	101.76	41.87	59.71	50.04
SCH	-0.30	15.36	5.24	4.26
ENG	3.48	9.31	8.91	22.69
ESTM	-10.14	21.72	21.21	1.22
OTHER	1.95	0.96	0.27	2.17
SUPPORT	3.25	10.78	4.65	19.62

TABLE 5. COST VARIANCE, MISSILES, IN ABSOLUTE NUMBERS AND AS PERCENTAGE OF TOTAL VARIANCE

	(in millions)					
	QTY	SCH	ENG	ESTM	OTHER	SUPPORT
Services	9737.2	2230.1	1584.5	1949.7	88.9	2490.2
Joint	404.1	1489.3	671.0	3310.9	144.7	121.4
	(percent)					
	QTY	SCH	ENG	ESTM	OTHER	SUPPORT
Service	53.85	12.33	8.76	10.78	0.49	13.77
Joint	6.58	24.25	10.93	53.91	2.36	1.98

cent of total variance cost and as percent of total current cost) than for non-missile programs. One only can speculate this disparity is due to conditions peculiar to production or acquisition processes of missiles. The possibility exists that cost sensitivity to schedule changes is related negatively to unit cost of the program, or positively (a likely colinearity suggests itself here) to the yearly quantity of procurement. An inquiry along these lines, however, cannot be pursued with the data employed by this study: A longitudinal study of unit cost flyaway data appears to be necessary to make this determination.

Conclusions

Analysis of FY 1990 SAR data indicates the major cause for increase in the estimated cost of weapon

systems is from the addition of military value (quantities and capabilities) to the original estimate. The analysis indicates that schedule-related cost variance, the one element of cost variance that is not related to military value, may have different values depending on commodity. Further inquiry into reasons for this disparity foster new insights into programmatic issues that could contribute to more efficient weapon systems acquisition.

Endnotes

1. For an account of how the first buy of six Navy frigates was, for political reasons, divided into six shipyards in six different states and suffered mismanagement, schedule delays, and cost overruns, see Smelser, Marshall. *The Congress Funds the Navy*, Indiana: University of Notre Dame Press, 1959.

2. Includes major defense acquisition programs defined in Section 2430, Title 10, United States Code and DoD Directive 5000.1 and DoD Instruction 5000.2. It includes other acquisition programs with an estimated total costs of either \$200.0 million in research and development costs or \$1 billion in procurement cost (both in FY 1980 constant dollars). Waivers to the reporting requirement may be obtained if system configuration or estimated costs is not reasonably firm.

3. "Joint" indicates more than one Service funding is involved.

4. *National Defense Budget Estimates for FY 1988/1989*, Office of the Assistant Secretary of Defense (Comptroller), May 1987, Table 5-4, p. 52.

ACKER

(Continued from page 39)

dustry knowingly commits to deliver a never-never land, Gregory believes the game will go on.

"Because of the way federal budgeting works, because of the inherent uncertainty of weapons development, because of the stiff competition for a place in the budget sun, more waste, fraud, and abuse pitfalls will be dug," Gregory states. When a program acquires individual identification in the budget, it stands "unshielded in the sun." Five years or more into the future, that program's reputation will rise or fall on the estimates submitted and approved (or disapproved) during the annual congressional appropriations process. When there is a cost overrun on a weapons program—whether it is a result of incompetent management, an unrealistic requirement, a calculated risk to force a significant technical breakthrough, or simply a case where no reliable cost estimate was possible to start with—the outcome is the same. Actual costs exceed estimates and chagrin follows. Sometimes, to make up the difference, other weapons programs are robbed of funding, or terminated. The author believes that industry, the

military, defense secretaries and the Congress must swallow their self-interest and recognize it is almost impossible to make precise estimates of the development and production costs of advanced weapons.

Gregory is convinced the prime objective of weapons acquisition is to get effective weapons and equipment to our military forces as quickly as possible. Unfortunately, this has been overshadowed by deeply rooted ills. Reform has brought little change because no regulation can legislate perfection or prevent mistakes, or stop greed and desperation. Excess regulation, scandals and finger-pointing have produced an atmosphere of mistrust between government managers and contractors, and a shift of focus from acquisition research to detective work, audits and prosecutions. It might be cheaper in the long run to place the focus on efficiency in weapons acquisition rather than on crime and scandals.

In summary, the author provides two fundamental choices in dealing with our defense acquisition system, namely, (1) more supervision and regulation, and (2) simplicity in management. He warns there are

risks involved in both, but if the United States does not take new measures soon, the defense industry may be overwhelmed by its inertia and unable to keep pace with fast-changing technology that is the future of our survival as a nation.

I believe the public may view Gregory as someone swimming against the tide. The series of procurement scandals that rocked the Pentagon, and the congressional charges of "waste, fraud and abuse" in the defense acquisition system have led the public to the conclusion that more regulation and oversight are needed. Marcia Bystryn, acting director of The Twentieth Century Fund, which commissioned Gregory to write this book, believes this is the conventional wisdom but, she adds, "all too often the conventional wisdom is simply conventional, not wisdom."

The book will further the reader's understanding of complex, yet critical issues. It is a timely, first-class literary effort and it should be read by everyone in the Congress, the Department of Defense, and the defense industry having an interest in improving weapons acquisition management and assuring our future as a free country.

TQM PRINCIPLES

TQM refers to the quality of management, the quality of human behavior, the quality of work being done, the quality of the work environment, the quality of the product and the quality of service.

The "voice of the customer" will drive all operations in the company.

The means (methods, systems, and resources) to improve quality are the primary focus of top management and results are indicative of the success of the management system.

Change should be promoted amid order while order is preserved amid change.

Each process must have a single individual held accountable for the success, operation and improvement of the process and its data.

Measures are worthless if they do not contribute to further improvement.

Quality processes depend on quality data. Written procedures, work instructions, drawings, etc., must be 100 percent correct.

Accepting an evil such as waste and attempting to mitigate its effects by automation is a sure way to become less profitable.

Process and product improvement are directly related to personal improvement. Self-improvement is each employee's most important job.

The quality of a person's life is directly proportional to his/her commitment to excellence.

Our competitors have equal access to all available tools and skills. What gives us the edge is how we implement those tools and skills.

Customer satisfaction is directly related to, and the result of, employee satisfaction.

Everyone must participate in improvement efforts. The person performing the job is the best one to prove it.

Those who ask the tough questions are well on the road to making the right decisions. Therefore, all employees are empowered and encouraged to ask tough questions.

Only when everyone knows their jobs, and when they are trained and flexible to move quickly to different jobs, is very little supervision required.

Everything received from external and internal suppliers must not require rework, data reentry, or any waste of time because it's difficult to use as received.

Quality can be managed only when customers and suppliers are partners. The supplier should be regarded as an extension of the customer's process.

Improvement of Quality is directly related to improvement of profitability.

—Jack Cohen
St. Charles, Missouri

THE PAC DILEMMA

Captain Raymond C. Wilson, USA

As program manager of the U.S. Army Battalion S1 Program, I constantly hear that Personnel and Administration Centers (PACs) are broken. But are PACs really broken? I contend that PACs do a remarkably good job in providing personnel service support when you consider "the PAC dilemma."

Background

Since the concept of Consolidating Administration at Battalion Level (CABL) was adopted by the Army in 1976, the PAC has been criticized for providing unresponsive service to company commanders and first sergeants. Each year complaints about the PAC surface during Inspector General visits as well as Command Sergeant Major and Commander conferences. All their complaints about PACs can be grouped into three categories (or elements): *organization, automation, and procedures.*

Dilemma

Simply stated, PACs have insufficient resources to do the required work in time. This forces commanders to use "shadow clerks" (infantrymen, artillerymen, etc.) to assist.

Captain Wilson is Program Manager, U.S. Army Battalion S1 Program, a joint U.S. Army Soldier Support Center and U.S. Total Army Personnel Command initiative at Fort Stewart, Georgia. A graduate of the Adjutant General Officer Advanced Course, the Combined Arms and Services Staff School, and the Army Command and General Staff College, Captain Wilson attended the Contractor Performance Measure (CPM) Course, Defense Systems Management College.



Photo by Richard Mattox

Problems

At the heart of this dilemma are problems causing the system to fail. These problems existed when CABL was adopted in 1976 and are present today.

The biggest organizational problem is insufficient manpower in the administrative structure. We don't have enough personnel clerks to man our PACs. While the average PAC is

authorized seven clerks, it is forced to operate with fourteen clerks because of the workload. This means that 50 percent of PAC clerks are not school-trained personnel specialists.

Another organizational problem is that a mail clerk is required in every battalion; yet, there are few mail clerk authorizations. The time involved in sorting mail, handling accountable mail, maintaining locator

files, readdressing and returning undeliverable mail, is too much for a part-time job. Ineffectual mail handling procedures have a negative effect on troop morale.

Insufficient battalion typing power is an automation (hardware) problem. The PAC does not have resources to complete all letters and memorandums a commander generates while providing for soldiers. One TACCS device per battalion is not enough hardware to perform all of the PAC's peacetime functions.

Lack of Standardization

An automation (software) problem is the lack of standardization for most administrative actions in the PAC. Automated programs have traditionally been developed locally by PAC personnel and not shared with anyone outside their organization. In recent years, using these home-grown automated programs in our PACs has impeded the acceptance of standardized TACCS software developed by HQDA. Many PAC supervisors are more comfortable with software they developed in the PAC than with software developed for them by programmers in Washington, D.C.

Services with a big typing demand (awards, evaluations, personnel actions, legal actions) push excess workload down to the companies for accomplishment. This creates another automation problem in that it establishes a need for some automation capability at company level. Placing a computer at company level, however, runs counter to the objective of CABL, which was to free commanders and first sergeants from paperwork tasks to train their companies.

Poor or non-existent instructions create a procedural problem. In many cases, three to five regulations are needed to complete one action. Guidance given in one publication often contradicts guidance in another. Supplementation of these regulations by higher headquarters further complicates this problem by causing misunderstanding for PAC clerks.

Excessive Specialization

Excessive specialization within the PAC is another procedural problem. This causes a clerk to know only his

*The PACs should
not have to resort
to using "shadow
clerks" to
accomplish their
mission. What are
the Army options?*

or her area of expertise. However, cross-training is impractical in most cases. The workload doesn't allow the luxury of switching clerks around. Self-study is impractical. The PAC clerks work 10 to 12 hours a day as it is. There are a few clerks willing to spend extra hours to pursue this course of learning.

Another procedural problem is that the S1 position in the battalion has a high turnover rate. Most officers remain in that position less than 1 year. The S1 officer usually has the specialty of the battalion to which assigned. As a result, S1 officers rarely receive formal training in PAC operations.

Compounding the procedural problem, PAC supervisors usually do not have prior PAC experience when assuming PAC leadership. Many are trained in the Personnel Service Center (PSC) and placed in a PAC after promotion to sergeant first class.

Assessment

Considering all organizational, automation and procedural problems that PACs face daily, my assessment is that PACs do a remarkably good job in providing personnel service support. Soldiers usually receive their pay, promotions, evaluations, and awards in a timely manner.

However, there is something fundamentally wrong with the way PACs are forced to do business. The PACs should not have to resort to using "shadow clerks" to accomplish their mission. What are the Army's options?

Options

The first option is to leave the PAC alone and do nothing. However, there is a price for doing nothing. The annual cost of maintaining an average seven "shadow clerks" in each of our battalions exceeds \$100 million. With this option, PACs maintain the *status quo*.

The second option is to disband the PAC and return to company-level administration. This requires a force structure increase of more than 5,100 clerks and the fielding of more than 5,300 computers for an initial cost of \$116 million. The cost for maintaining these clerks at company level will exceed \$100 million a year. There is no return on our investment with this option.

The third option is to adopt the Battalion S1 Program Army-wide. Initial cost for implementing this program is \$47 million (the price of 1,555 clerks and 3,355 computers). We can maintain these clerks at battalion level for \$31 million a year. By returning more than 3,500 soldiers to the field, we see an initial return on investment of 54 percent and a recurring return on investment of nearly 70 percent with this option.

Program

What is the Battalion S1 Program? It is the Army's initiative to piece together an optimum S1 organization with the necessary automation and procedural tools to "fix the peacetime PAC."

Since August 1986, this program has used prototype battalions at Fort Stewart, Ga., to develop automated and non-automated work savers.

Company and PAC functions are reviewed continually for elimination, streamlining, transfer to higher levels or automation.

Using software designed by soldiers, specifically for use on TACCS, the Battalion S1 Program is proving that much of the Army's administrative burden at battalion- and company-level can be eased by automation. To date, more than 30 software modules have been developed, tested and refined at Fort Stewart and exported Army-wide.

Additional commercial workstations were added to each TACCS unit at Fort Stewart. This enhancement is designed to maximize user accessibility to all software modules now available on TACCS. The optimum number of additional workstations for each battalion is four (three in S1 and one in S3).

Prototyping of non-automated efforts resulted in manual leave and military award processing, new single-source regulations, and an

*The Battalion S1
Program is proving
much of the
Army's
administrative
burden at
battalion- and
company-level can
be eased by
automation.*

organizational redesign. A unit support cell was created within the PAC to do the heavy typing workload in support of company commanders and first sergeants. Using this concept, one unit support clerk, using a dedicated workstation and boilerplate software, performs unit-level typing for up to six companies. The mission of the unit support clerk is to provide commanders and first sergeants with typed correspondence within 24 hours.

Solution

If commanders use all of the organizational, automation and procedural tools available through the Battalion S1 Program, the average PAC can function efficiently in peacetime with 10 people and one enhanced TACCS (four added workstations). Success of the Battalion S1 Program is well documented in the 24th Infantry Division at Fort Stewart where the need for "shadow clerks" has been reduced dramatically.



**FROM THE DSMC
PROGRAM MANAGER
STAFF**

**WARM THANKS
TO OUR
READERSHIP
FOR YOUR
SUPPORT**

*Season's
Greetings*

**AND BEST
WISHES FOR
A SUCCESSFUL
NEW YEAR!**

VISION OF SUCCESS

To provide our customers, men and women in uniform, with superior products and services, when required, at a cost representing value to our stockholders—the taxpayers.

VALUES AND GUIDING PRINCIPLES

American citizens, our principal customers and stakeholders, deserve the best national defense possible at a cost they are willing to pay and able to afford.

Quality, as defined in its broadest sense by the customer, must be the primary discriminator in all we do.

Customers, both the recipients of our work and ultimate users of our products and services, as well as our taxpayers, must be the focus of all we do. Satisfying their wants and needs is our first priority.

People are the most important ingredients in our process. Success depends on their skills, capabilities, motivation, alignment and pride in themselves and their work.

Integrity must never be compromised. It is the basis for any successful transaction and the key to any successful long-term relationship.

The Congress represents our citizens and deserves our full cooperation in providing value to them.

Contractors and Suppliers, an integral part of the process, are expected to provide superior technology and superior quality products and services at a cost representing value to the taxpayer. In return they should receive a reasonable return for their investments and efforts.

