DEFENSE INDUSTRY BULLETIN

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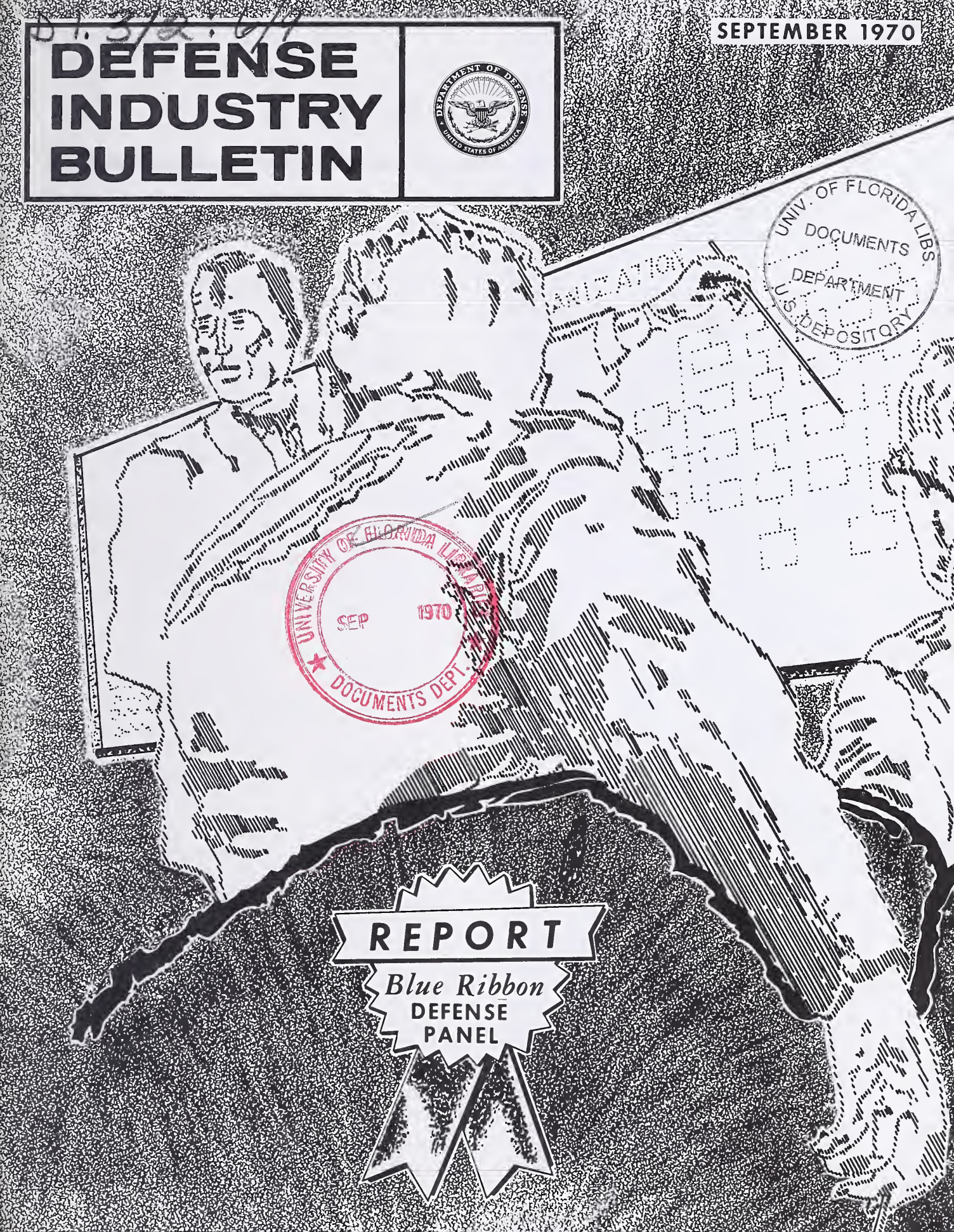

REPORT

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The *Bulletin* serves as a means of communication between the Department of Defense, its authorized agencies, defense contractors and other business interests. It provides guidance to industry concerning official DOD policies, programs and projects and seeks to stimulate thought on the part of the Defense-Industry team in solving problems allied to the defense effort.

Suggestions from industry representatives concerning possible topics for future issues are welcome and should be forwarded to the Editor at the address shown below.

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Experiences in Incentive Contracting

Captain William K. Jones, USAF

The large number of cost and performance tradeoffs inherent in multiple incentive contracts often cause confusion and misunderstanding on the part of both government and contractor personnel. Recognizing the need for clearer communication in such contracts, the Assistant Secretary of Defense (Installations and Logistics) established a special agency under the Air Force to analyze and structure proposed multiple incentive arrangements for the Army, Navy and Air Force, and to conduct research in incentive contracting and related subjects.

This special agency, called DOD Program Office for Evaluating and Structuring Multiple Incentive Contracts (POESMIC), became operational in April 1968 at the Space and Missile Systems Organization in Los Angeles. Shortly thereafter, each military service instituted a policy requiring that all multiple incentive contracts over $5 million be structured with the aid of POESMIC.

(See "Improved Performance is Goal of Multiple Incentive Contracts" by Francis J. Hines, *Defense Industry Bulletin*, January 1969, page 5.)

To date, POESMIC has evaluated or structured over 150 incentive arrangements for the military departments and the National Aeronautics and Space Administration. This article communicates first hand experience on the subject of incentive contracting.

During two and one-half years of working with multiple incentive contracts, POESMIC has seen many types of incentive structures. Most of these structures provided the communication between Government and contractor that is necessary for effective performance on contracts. Others, however, failed to communicate government objectives clearly and would have led to subsequent confusion and misunderstanding on the part of both contracting parties.

The less effective incentive structures contained errors that occurred repeatedly. We have developed a list of the most common errors, analyzed their causes, and studied their adverse implications. This article relates our findings; it discusses the errors that were found to be most prevalent and suggests ways to avoid them.

Implied Value

The cause of most structuring problems is a misunderstanding of the concept of "implied value." An understanding of this concept by contracting personnel will help eliminate many of the mistakes that hamper incentive arrangements.

The purpose of an incentive structure is to communicate the value the Government places on improvements in incentive parameters, such as cost, speed, reliability, and schedule. Because the structure is a guide to the relative value of incentive parameters, the desired contract performance can be determined by the weighting the Government assigns to each parameter. Contracting personnel should, therefore, understand how implied value is related to an incentive structure.

Imagine a Cost Plus Incentive Fee (CPIF) contract with the parameters listed in Table 1 (see page 2). The relative worth or value of performance increases on the incentive parameters is implicit in this table. For example, to determine the worth to the Government of an increase in air speed from 1,200 to 1,250 knots, it is necessary to examine the effect of increases in air speed along with the effect of increases in cost on net fee.

As the contractor increases air speed

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Table 1

Cost Incentive

Target Cost	$100 million
Target Fee	$8 Million
Cost Range of Incentive Effectiveness	$90 Million to $120 Million
Sharing Ratio	80/20

Performance Incentives

	Minimum	Target	Maximum
Air Speed (knots)	1,200	1,250	1,350
Incentive Fee	—$2 million (2%)	0	$2 Million (2%)
Weight (pounds)	25,000	20,000	18,000
Incentive Fee	—$2 Million (2%)	0	$1.5 Million (1.5%)
Altitude (feet)	50,000	55,000	60,000
Incentive Fee	—$3 Million (3%)	0	$1 Million (1%)

Schedule Incentive

Delivery	8 Weeks Late	On Time	4 Weeks Early
Incentive Fee	—$0.5 Million (0.5%)	0	$0.5 Million (0.5%)

Table 2

Air Speed	Implied Value
Increase from 1,200 to 1,250 knots (target)	$10 Million
Increase from 1,250 to 1,300 knots	5 Million
Increase from 1,300 to 1,350 knots	5 Million
Weight	
Decrease from 25,000 to 20,000 pounds (target)	$10 Million
Decrease from 20,000 to 18,000 pounds	7.5 Million
Altitude	
Increase from 50,000 to 55,000 feet (target)	$15 Million
Increase from 55,000 to 60,000 feet	5 Million
Schedule	
Improve from 8 weeks late to 4 weeks late	$1.25 Million
Improve from 4 weeks late to target date	1.25 Million
Improve from target date to 4 weeks early	2.50 Million
Total Performance and Schedule	
Value of increasing from minimum to target	$37.5 Million
Value of increasing from target to maximum	25 Million

capability from 1,200 to 1,250 knots, he is rewarded 0.4 percent (avoids a penalty of 0.4 percent) of target cost for each 10-knot increase. At the same time he is penalized (by the 80/20 sharing ratio) 20 cents of each dollar he spends. By increasing air speed 50 knots, he earns 2 percent additional fee. If he spends an additional $10 million in the effort, he loses 2 percent of target cost for the cost increase. Ten million dollars, then, is the implied value or worth of increasing air speed from 1,200 knots to 1,250 knots: the fee *gained* by improving performance is exactly offset by the fee *lost* by increasing costs. Thus, if a contractor can achieve the improved performance at a cost less than $10 million, his net fee will be increased. In the same way, dollar values can be computed for improvements on all the performance and schedule parameters. Table 2 shows the results of such calculations.

Incentive structures can be used not only to determine the relative worth of different parameters, but also to assess tradeoff relationships among the *non-cost* parameters. For example, a contractor may wish to know how many additional *weeks* he can devote to increasing *air speed* from 1,237.5 to 1,250 knots. Table 1 implies that the 12.5-knot increase is worth 0.5 percent fee. If the contractor is eight weeks late in delivery, he will lose 0.5 percent fee. Thus, the 12.5-knot improvement in air speed is worth an 8-week slip in schedule.

The total available fee pool should be allocated among incentive parameters in accordance with their relative worth, so that a contractor is more likely to make the tradeoff decisions among cost, performance, and schedule that are actually desired by the Government. In this way, no matter how the contractor trades off, he will be rewarded in accordance with how well he achieves the government's goals.

Assume that the Government determined the relative importance of cost, reliability, and schedule on a particular procurement to be 4 to 2 to 1, respectively. If the total fee swing was between 1 percent and 15 percent, then 8 percent would be allocated to cost, 4 percent to reliability, and 2 percent to schedule. This example

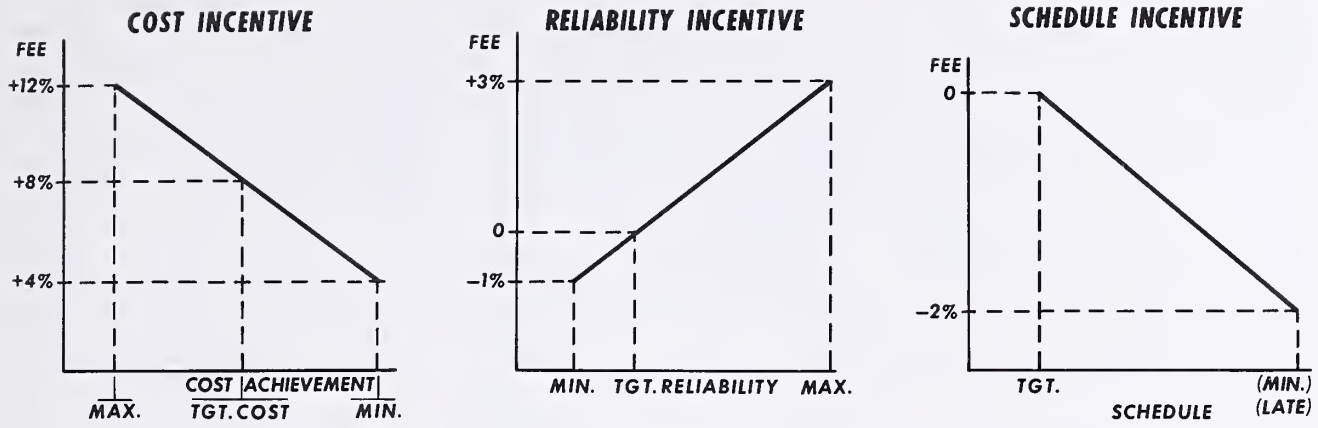


Figure 1.

shows that "fee allocation" means allocating the fee *pool*—it does *not* mean allocating the target fee. The target fee is established on the cost incentive parameter; the non-cost parameters then show how levels of achievement above and below target performance or schedule either add to or subtract from target fee. The target level of achievement for each non-cost parameter, therefore, should correspond to zero fee added or subtracted. Figure 1 illustrates this concept, using the 4 to 2 to 1 weighting described before and assuming a target fee of 8 percent.

Maximum fee should correspond to the maximum worth to the Government and should *not* be the amount considered necessary to motivate a contractor to achieve highest performance. Since contractors all have different motivations, maximum fee may not be large enough to motivate a particular contractor. Motivating him could require more money than the government's estimation of worth would allow. Clearly, the goal of communicating worth takes precedence over the goal of motivation when the two conflict.

The best way to structure incentives is through repeated iteration: after a "trial" incentive arrangement is developed, the implied values of incentive parameters are determined. If any of the implied values are unacceptable, the amount of money placed on the incentive parameters is gradually changed until acceptable values are attained. The Cost-Performance Correlation Method, outlined in Chapter 4 of the 1969 "DOD/NASA Incentive Contracting Guide" is one such iterative scheme.*

Common Errors

The usefulness of incentive contracts is dependent upon the degree of mutual understanding of incentive goals between Government and contractor. There are some practices that adversely affect incentive arrangements by distorting their implied value and by increasing their complexity, thus decreasing the level of mutual understanding. Following is a discussion of these errors.

Improper Ranges of Incentive Effectiveness. The range of incentive effectiveness (RIE) for each incentive parameter, such as cost, speed, reliability, and schedule, is defined as the area that surrounds the target level of achievement, and that is confined by the "minimum" and "maximum" achievement levels. As will be shown later, careful choice of minimum and maximum levels is important, because these points define for the contractor the regions of acceptable cost, performance, and schedule outcomes.

Two definitions are in order. The *minimum* level achievement is defined as the least desirable attainment that is still acceptable to the Government. The *maximum* level of achievements is the most desirable attainment; it is a level that will enhance the overall system and that can be attained by the contractor within his technological capability.

What, then, are the implications of an improper RIE? If the minimum levels on individual parameters are not established in consideration of the overall system, and if the least desirable level is achieved on *all* incentive parameters, the *combined* system may be unacceptable.

Maximum levels are a different matter. Because superior achievement is costly, government contracting personnel must ensure that such achievement is actually needed. For example, if an aircraft altitude capability of 50,000 feet is sufficient to ensure mission accomplishment, it would be unwise to apply incentives to achieve a higher capability. Similarly, incentives should not be applied to accelerate the schedule without first deciding whether improvements in delivery date have value. When several components must be brought together to form a system, early delivery of only one component is valueless. Clearly, incentive dollars should not be placed on high achievement levels that are either unattainable by the contractor or unneeded by the buying agency.

The cost RIE should be the range of *probable* costs and not the range of all *possible* costs. Theoretically, costs can vary infinitely; an incentive arrangement is concerned only with probable outcomes. When the underrun range on the cost incentive is too large, the incentive fee to be paid for low costs

Copies of "DOD/NASA Incentive Contracting Guide" are available from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402, $2 per copy (Order No. 0-364-685).

will be unreachable and, therefore, wasted. Often, these incentive dollars could be applied to the performance or schedule parameters. Effective allocation of fee is particularly important on a CPIF type contract since the maximum fee is usually limited.

Naturally, the size of the RIE is closely related to the nature of the procurement. Complex procurements, such as those involving heat-resistant metals, optical equipment and lasers, which require extensive scientific research, may need broader cost ranges than more common procurement items.

Improper Choice of Target Levels of Achievement. Target achievement levels on the non-cost incentive parameters, *e.g.*, speed, reliability, and schedule, should be chosen before the target cost is established. Target levels should be placed somewhere between the minimum and maximum achievement levels in accordance with procurement objectives. The target level on the cost parameter is then determined, based upon the selected target levels of the non-cost parameters. In other words, contracting personnel will decide how much it will cost to achieve the target levels on the non-cost parameters and then make *that* amount the target cost.

In many cases, contracting personnel feel that symmetry is necessary: they place the target level for all incentive parameters at the midpoint of their respective RIEs. Such a practice can be detrimental to the effectiveness of an incentive structure. If a particular structure incentivizes cost up to 20 percent above target cost, it is not necessary that cost be incentivized down to 20 percent below target since the range of a potential underrun seldom equals the range of a potential overrun. In the case of "rewards only" incentives, the target level is the minimum level; and, in "penalty-only" incentives, the target level is the maximum level.

Complex Formulas. Complicated mathematical formulas for gauging achievement levels and determining fees is a less common but serious problem area. Complex formulas are difficult to understand. Furthermore, unnoticed errors may be included that distort intended results. In many cases, complicated formulas require more interpretive effort than would have been necessary without the formula. Because complicated mathematical formulas increase the chances of error and misinterpretation, they should be assessed carefully for correctness and merit and used in incentive structures only when their value is clearly evident.

Multiple Sharing Ratios. Multiple sharing ratios (also called "step" sharing ratios), within the range of incentive effectiveness, are another common trait of incentive arrangements. Multiple sharing ratios complicate incentive arrangements by changing the implied "value" of performance improvements. When sharing ratios vary throughout the RIE, tradeoff relationships between cost and performance parameters change so that the same increment of increased performance has a different value depending on its cost position. Figure 2 illustrates this concept. Unfortunately, multiple sharing ratios are often applied arbitrarily. In general, the value of a given performance increase is constant; consequently, there should be only one sharing ratio.

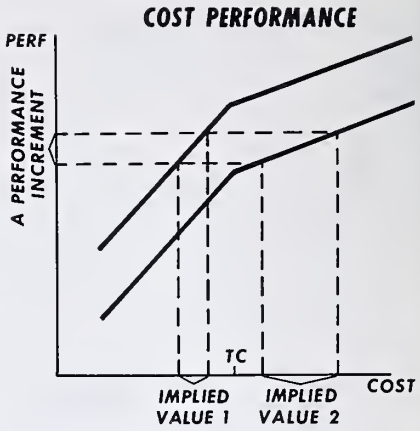


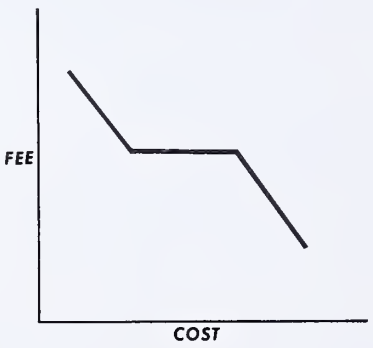
Figure 2.

Cost/Performance Tradeoff (Iso-Fee) Graph

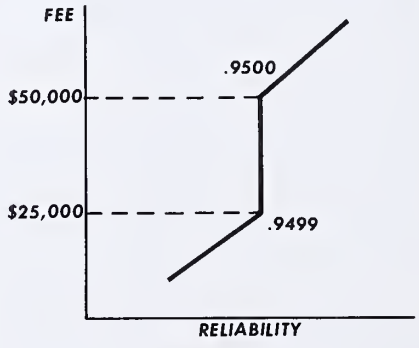
This figure could represent, far example, an incentive arrangement having a 60/40 sharing ratia for costs under target cost (TC) and an 85/15 sharing ratio far costs over target cast.

Graphical Discontinuities. Another problem area is graphical discontinuities, or "flat spots," which often occur on achievement versus fee graphs. There are two types of flat spots—horizontal and vertical. In addition, there is a closely related form called "step functions."

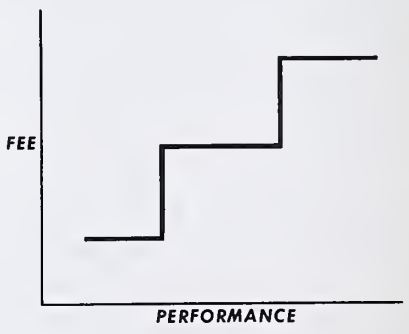
Consider the graphs in Figure 3. *Horizontal* flat spots usually occur on cost incentive parameters (Graph 1).



Graph 1.



Graph 2.



Graph 3.

Figure 3.

These flat spots are areas where the government/contractor sharing ratio is at, or close to, 100/0. Often, flat spots result from an attempt to limit the contractor's risk near target cost. In this situation, contracting personnel are not able to select a target *point,* so a *region* is established within which the actual cost is expected to fall.

Contracting personnel often do not realize the implications of a flat spot on the cost parameter, namely, that it destroys the tradeoff relationships within that area. Along the flat spot there is no penalty for increasing costs, so the value of improved performance and schedule is unlimited.

There is never a logical justification for a horizontal flat spot on the cost incentive parameter. In fact, the area close to target cost provides the greatest opportunity for a meaningful incentive.

Usually, *vertical* flat spots occur on performance parameters (Graph 2). They result from an attempt to define a level of achievement below which the contractor's reward is greatly reduced and above which his reward is greatly increased. Seldom is such a fee jump at one point justified. The vertical flat spot destroys tradeoff relationships because it implies that for a small increase in performance the contractor can spend a great amount of money. For example, within the arrangement depicted on Graph 2, the contractor receives an extra $25,000 for increasing reliability from .9499 to .9500. Assuming that the sharing ratio is 80/20, the contractor can spend $125,000 to increase reliability only 0.01 percent without losing fee.

The third form of graphical discontinuity, *step functions,* is found on both performance and schedule incentives (Graph 3). In many cases, step functions are unavoidable and not harmful, as when they are used for small, discrete levels of measurement. However, when the steps extend over large intervals, they imply that there exist points of infinite value change followed by areas of indifference to improvements.

Step functions also increase the contractor's risk. This is because the contractor receives no increase in profit until an extremely large improvement in performance or schedule achievement is made. For this reason, the contractor may be hesitant to improve performance, if he fears he may not be able to reach the next higher step.

Excessive Parameters. Excessive performance and schedule incentive parameters are characteristic of many incentive structures. There are two causes of excessive parameters. The first is that contracting personnel often attempt to cover all performance contingencies. While thoroughness is desirable, failure on the part of contracting personnel to identify the most critical performance goals and to limit incentive parameters to those goals can lead to undesirable consequences. The second cause is that contracting personnel often use incentives as a vehicle to ensure that single, specified levels are achieved. Clearly, application of incentives to performance and schedule parameters should occur only when a range of acceptable levels has value to the Government.

When confronted with a large number of parameters, contractors have difficulty directing their attention to the most meaningful ones—the ones that truly represent the government's goals. The number of tradeoff decisions becomes enormous. Furthermore, a large number of parameters increases the possibility of suboptimization of individual parameters at the expense of *overall* optimization. Finally, excessive incentive parameters lead to increased administrative expense, since it becomes a difficult and time consuming task to monitor and assess achievement in the many individual areas.

It is often possible to limit the number of parameters by combining many small goals into one that *speaks* for all the others or is a *result* of all the others. Careful consideration of contracting goals will help eliminate unnecessary incentive parameters and, thereby, avoid confusion and suboptimization; and will help eliminate much of the government's cost associated with monitoring and measuring achievement on numerous parameters.

In summary, multiple incentive contracts are important procurement tools which, when properly structured, can effectively communicate government goals. There are misconceptions and common errors, however, that hamper communications. This article has attempted to clear up the misconceptions and to indicate ways to avoid the common errors.

POESMIC's services are available to all DOD and NASA agencies. Assistance in evaluating or structuring incentive arrangements can be acquired by writing: Headquarters, Space and Missile Systems Organization, Attn: SMKPD, Air Force Unit Post Office, Los Angeles, Calif. 90045.

Low Pollution Auto Engine Tested

A lean fuel mixture engine that will cut fuel costs and pollution is undergoing test and development at the Army Tank and Automotive Command (TACOM), Warren, Mich.

A combustion process, labeled Hybrid, that this engine uses combines the unthrottled, efficient operation of the diesel engine with the soft, controlled combustion of the spark ignition engine. The fuel needed to operate the engine at any given horsepower output requirement is injected into each cylinder. The charge within each cylinder is "stratified," with a stoichiometric mixture close to the spark plug and a leaner mixture further away. Complete combustion is achieved at lower temperatures, reducing high temperature production of such pollutants as nitrous oxide. With more complete combustion, less fuel is required. Laboratory engineers estimate that fuel costs can be cut 20 to 40 percent.

The engine will have the capability of using more than one kind of fuel.

To date, the Hybrid combustion principle has been applied only to the Army's ¼-ton M151 jeep, which is powered by a 4-cylinder engine displacing 141 cubic inches.

Tests have indicated that with this process engine emissions already meet proposed Federal exhaust emission standards for 1975. With unleaded fuel and a catalytic reactor, emissions can be reduced to the proposed 1980 levels without any further advances in combustion control.

The engine is expected to be in production by 1975.

Logistics Management Challenges in Weapon System Design

Address by Hon. John S. Foster Jr., Dir., Defense Research and Engineering, at First Annual Summer Meeting of the Logistics Management Advisory Committee, National Security Industrial Association, Absecon, N.J., June 29, 1970. [*This address was read by Vice Admiral Vincent P. de Poix, Dep. Dir., Defense Research and Engineering, in the absence of Dr. Foster who was unable to attend the meeting.*]

I would like to separate my talk this morning into three major parts: first, a brief sketch of future trends in product development—or to say it another way—a description of new Defense Department approaches to the acquisition of major weapon systems; second, some of the more significant problems in achieving our objectives; and third, some of the things which logistic support people can do to help us, and to help themselves, as we design and produce the major defense weaponry of the future.

Let us then begin with the product of the 1970s. It is most important to understand that nothing will improve, nothing will happen to better our future performance, unless we will it so —unless we dedicate ourselves to the job of seeing that it does occur. By the same token, that which is undesirable in the way we now conduct our business will remain with us unless we take positive action to get rid of it. Very simply stated, this means that the product of the 1970s will turn out to be exactly what we consciously make it to be—nothing more, nothing less.

Recently I had an opportunity to talk in Washington about six essential ways to maintain technological leadership in the service of our national goals. I would like to quote one of these six ways now, because it will explain the course of action which I feel we must take. I quote:

> ". . . we must revamp—and thoroughly—the design philosophy in every corner of the Defense Department and defense industry. This task falls within my responsibilities—and there is no other matter about which I feel more strongly. We shall not in the future indulge in the present syndrome of incorporating into every system the most advanced technology, as soon as it seems to be available or merely because it is advanced. We shall ask only for what we really need—the minimum necessary performance—and we shall match, wherever possible, proven technology to that essential, realistic need. We shall insist relentlessly—as a point without peer in our management—that price has as much priority as performance. This does not rule out vigorous pursuit of new technology where that technology is required or can pay its way. And frequently new technology can be used to reduce costs. Yet we must design-to-a-price, a much lower price, or else we will not be able to afford what we need. Defense budgets are going down. The costs of what we need, just our essential needs, are going up. Our only solution is to make cost a principal design parameter. That is how we must define what is best. We have no other choice."

I have quoted from a talk I made some months ago in order to emphasize one of the most fundamental changes we must make in product character for the 1970s—that of treating cost as a major system objective. We have talked about this before, but we haven't really been successful in *doing* it. It is the *doing* that will cause some pain to everyone who gets involved, but especially to the engineering community. It will necessitate self-discipline and dedication of the highest order. It will cause a restructuring of our individual sets of priorities. It will necessitate the development of new capabilities and new points of view. We must learn that the simpler and less expensive products are often the best products—not shoddy goods at all.

Dr. John S. Foster Jr.

Another major change in product character is that each must be adequate and acceptable in terms of mission worth but no more than that. This means that the translation of true operational need into stated operational requirements must also be scrutinized to ensure that we ask for no more than we need in the way of performance. Further, every stated operational requirement must be subject to re-evaluation as the engineering design emerges. It is at this point where, by virtue of actual tradeoff activity, we can evaluate the cost implications of the conversion of each individual stated operational requirement in terms of anticipated opera-

tional hardware. This is where tradeoffs can be meaningfully made—when price tags are attached to requirements, so that the most expensive ones become fully visible.

Another point that needs to be made is that all of us, including the Congress and the general public, must recognize that *total system cost* must go beyond mere acquisition cost and include the cost of ownership until the last operational unit is retired from service. This says that a price tag attached to a stated requirement should always include the total cost of ownership. When this occurs, we will be in a position to make meaningful tradeoffs between development, investment and operational saving, as well as between the desired performance parameters themselves.

This, I believe, brings us to a definition, broad as it may be, of product trends for the 1970s. We will no longer try to meet our increasing needs primarily by designing and fielding weapon systems which are increasingly complex and expensive; rather, we will prudently apply our creativity and technological skills in the direction of more system simplification. I am sure there are many who have the impression that it is easy to design a simple system, and most difficult to design a complex one. This might be true if the simple system reflects simple requirements, but a real challenge and real agony lie in translating a complex set of requirements into a simple system—a low-cost system—one which also embodies functional and operational excellence—one which is characterized by high reliability—one which is easy and inexpensive to maintain and to support—and one which can be efficiently and effectively used in its operating environment.

This is the only way we can afford what we need. It's just simply the way it's got to be.

The problem now is how to accomplish these seemingly impossible objectives. Possibly one of the best ways is to insist, particularly in the early stages, on a larger portion of our effort and time in recycling or refining the design to reduce cost and complexity. Expensive solutions are generally the result of first-time-around ideas. Simplified designs, with reduced costs, usually are the result of iterative design simplification efforts.

This brings me to my second broad subject. The composition and scope of today's engineering and scientific community has changed drastically in the last decade or two. The graduating engineer of today has many more fields of specialization in which to pursue his career. The active professional engineer or scientist is under constant pressure to continue his education in parallel with his work, and greater specialization is usually the result.

While this trend is appropriate and necessary to serve many needs of our country, I feel that the challenge and fascination of the field of general engineering or, more specifically of system design, has too often been overlooked. Perhaps this intense specialization has become the norm just when we can least afford it in defense work—just when system complexity seems to be an unfortunate rule rather than a special exception, when system design seems to be driven by the available technology rather than the true need, and decisions are slowed by mountainous documentation.

I believe the difficulty of achieving a simple, cost-effective, functionally excellent product is increased by the seeming disappearance of the "total system designer." For example, it would be difficult to identify clear successors to the Kindelbergers, the Johnsons, the Heinemanns, or the Messerschmitts in today's engineering community. These people, total system designers in every sense of the word, may not have successors, even though we will need them desperately in the 1970s. These are the people who think from the beginning of the operational environment. These are the people who think from the beginning of logistic problems. These are the people who are concerned from the beginning with simplicity, cost, reliability, and all of the interlocking factors which decide whether a system will be good or bad.

So perhaps one of our problems is not only "to revamp our design philosophy," but to recreate a place in the sun for experienced, yet up-to-date people who will make reasoned judgments on total system design. We need creativity and imagination, vision and foresight, dedication and self-discipline. In the process of translating stated operational requirements into usable hardware, the decisions must benefit, not plague, the operating community.

Today, there appears to be too much tendency to pull together a team of specialists—the best technical experts in materials, in structures, in engines, avionics, data handling, etc. This is easy to do and it is often wrong. It can lead to the development of an overdesigned machine—one that is so complex that it can be made to work in the factory but not in the field. It will be a system that requires mountains of paper to describe, thousands of highly trained people to operate and maintain, and will not really suit our needs.

What we need are teams led by professionals in the broad art of basic design of military systems—men who know the strategy, the tactics, the nature of the weapons we have and those we will oppose, men who know the user's environment. Once these factors have been considered to scope the design, these broad-gauge leaders can then properly phase in the efforts of the specialists in each specific area, as they are needed.

To sum up my second point, it seems that we have the monumental task of changing both the *people* and the *environment* in order to achieve our product objectives for the 1970s.

As my third point, I submit that there are two broad areas in which logistic system people must be effective and that, if these areas are not distinctly clear in the minds of the logisticians, we will continue to address inadequately the fundamental design problem. We will continue to overkill with detail planning and overlook basic problem solving.

The formulation of a good logistic support system can be likened to the creation and development of a good engineering design. The system design process breaks down into two basic phases: first, the conceptual phase, including validation; and second, the full scale development phase—the "pick and shovel" phase. In system design, if we attempt prematurely to define detailed hardware, we begin to

lose sight of the major parameters which we are struggling to achieve. For example, if we become engrossed in configuration end-item specifications before a solid configuration has emerged, the fundamental system objectives get lost in detail. I see the same thing happening in the logistic support system profession. The eagerness to define the system in detail has smothered and circumvented the conceptual creativity during the earlier stages, and has defeated the basic purpose of the entire logistic effort.

So I suggest that the first part of the logistics problem is to fix basic product characteristics that will make the system sensible from an operational point of view. The second part is to produce the detail planning, supporting procedures, and policies *after the original configuration has been set.*

This, to me, is the heart of Deputy Secretary of Defense Packard's two references to the logistic support problem in his important memorandum of May 28. I quote the first:

> "Consideration must be given *in development* to all matters necessary in a full operating system. This will include such things as maintenance, logistic support, training, etc."

I now quote the second:

> ". . . where these matters are dependent upon the final production design, *as much of this work as possible should be delayed until the production stage.*"

If these two different task areas can be understood and defined, I feel that the necessary interchange and joint sense of purpose between the engineering design community and the logistics system community can be developed and strengthened.

Engineers must be motivated to consider the operating environment in the same manner as they consider system weight, structural integrity, reliability and system cost. They must realize that the system they produce cannot be evaluated as a good system if, from the logistics point of view, it is too difficult or costly to support. I believe it is extremely important at the outset to set limits on what is considered too difficult, too costly, and to set minimum acceptable characteristics.

Logistics people must likewise be motivated to state their conceptual objectives in a manner and form meaningful to the engineer. When a designer is given a job to do, one of the first things he wants to know is how much time he has. Everything he does from then on may be constrained by time. He is further constrained by many other requirements, some which are adequately defined and often quantified, and others which are loosely described and hazy. The attention which he pays to his constraints is greatly influenced by the degree to which they are clear.

Weight, for example, is a relatively easy problem to address because it lends itself to clear understanding. Where system weight is a requirement, each designer begins his work with his own weight objective clearly in mind, regardless of level of detail. To a lesser degree he has some idea of the requirements for reliability. He knows what the system must do in terms of performance but, when it comes to the operating environment, he may have a hazy idea of what is needed. This then gives the designer a poor basis for performing the vital tradeoffs that must be made with other major system needs.

Logisticians will substantially advance their own cause and actually assist the beleaguered designer by making sure that logistic considerations, introduced in the early conceptual stage, are confined to those which directly contribute to the physical characteristics of the system hardware. By this I mean that the system design people should not be asked during the early development process to attempt a quantification or a detailed definition of spares requirements, of manning requirements that are not a system parameter, of maintenance levels, or of the personnel training problem. Very simply, we must allow the designer time to gather his thoughts and to put his best conceptual effort into the physical configuration of the system itself. This effort, therefore, must be constrained only by those parameters which are truly necessary as inputs to the basic system itself. It's the age-old, horse-sense story of doing first things first.

The best solution to this is to have designers who understand the implications of excessive spares, maintenance, or personnel training so that it is an inherent part of their initial thinking.

Earlier I mentioned the efforts of specialists in the system design. You know that as problems were recognized in such areas as reliability, maintainability, logistics support, safety, etc., the functional managers in DOD rightfully gave special emphasis to these areas. This, in turn, has resulted in the growth of specialist groups in both Government and industry in these areas. New contract requirements have been established but, while not mutually exclusive with respect to one another, the technical efforts to satisfy these requirements are often managed separately and not as a part of the mainstream of engineering. There has been a natural tendency for each of these supporting activities to become an end unto itself, *i.e.*, more and more we seem to get reliability for reliability's sake, etc. We often find that, in effect, the specialists themselves decide on the project effort in that area. This produces a built-in bias *for* complexity and *against* simplification. It is essential that your group recognize this aspect of the problem and the need for appropriate tailoring and timing of logistics efforts in the total system development effort.

Now, there is another reason for the sensible phasing of detailed and exhaustive planning *of any kind.* During the conceptual phase, prior to full-scale engineering development, we are normally in a competitive situation where at least two or three contractors are simultaneously expending research, development, test and evaluation (RDT&E) funds. Premature activity of *any* kind, therefore, may not only necessitate a 50-percent re-do on the part of the winning contractor but the costs associated with premature activity will be multiplied by the number of contractors who are actively engaged in the competition.

By simple arithmetic, if three competitors were accomplishing premature work, and the winning contractor's efforts were only 50-percent usable at a later date, we would reap one-sixth of the total work performed and paid for. I ask you: How mean-

ingful is the detailed logistics plan for the paper avionics for a paper airplane?

Furthermore, because there are a number of people who take the results of premature work seriously, there is often substantial effort and cost to *undo* this work before the *re-do* can start. Is it necessary to add that *we cannot afford this?*

Let me now articulate my first challenge to you. Take a long, hard look at your total mission task. Decide very selectively what comprises the absolute minimum to be accomplished prior to full-scale engineering development and then prior to final production design. Don't feel you're alone in this matter; we in engineering are faced with doing exactly the same thing.

After you have accomplished this painful task, after you have defined that necessary minimum to be accomplished during the conceptual phase, you should then focus your attention and effort upon upgrading logistics design parameters to a degree commensurate with their importance. Herein lies my second challenge. Logistics system requirements must be clearly stated, and where possible quantified, in a "design to" fashion, lest we continue to experience deficiency and unnecessary compromise in supporting and maintaining the operational system.

I hasten to add that it is here that the system design and logistic support people must function together. If there is a single key to the solution of our total problem, it almost has to be the one I have just mentioned: a single-minded, problem-oriented, joint approach by engineers and logistics systems people. I believe we can help with your problem. I know you can help us with ours.

In summary, I would like to restate and emphasize the two challenges that I made earlier: first, that you clearly and distinctly define the two phases of your work, that which must be done *during* the conceptual, and that which can be done *afterwards;* and, second, that you formulate the kind of definition of requirements which the designer can use to influence the hardware.

From my point of view, the design community at large must be convinced that no design is complete and that no system is adequate unless it is operationally effective and unless it is supportable in its ultimate environment. This turns my challenges into a *we* rather than a *you* effort.

I hope and trust that these thoughts will help to keynote this conference and possibly influence the thinking and discussion which will follow.

I have tried to pose challenges to each of you. For my part, I accept the challenge posed to DOD management —to acquire effective weapons at reduced costs. In fact, we share the same challenges.

Logistics—Challenge of the 1970s

Excerpts from an address by Hon. Barry J. Shillito, Assistant Secretary of Defense (Installations and Logistics), at the First Annual Summer Meeting of the Logistics Management Advisory Committee, National Security Industrial Association, Absecon, N.J., June 29th, 1970.

Obviously, at this session, I can't cover all the programs or actions underway or planned by us in logistics to participate in the acquisition process for new products and provide the follow-on support during operational use. But, there are three areas I will discuss, all involved in helping us to live within the defense budget of which maintenance is such a major part—contracting for new products, acquiring planned engineered logistic support for these products, and managing the logistic support. I would also like to kaleidoscopically touch briefly on a number of other present and future efforts.

It is not uncommon knowledge that the defense budget is the most tightly controlled and closely scrutinized of all the major elements of the Federal budget. The Office of the Secretary of Defense, the Bureau of the Budget, and four Committees of Congress are involved in this budget, item by item. Many other committees spend a major portion of their time on matters relating to defense. There are some persons who have argued that our military budget is out of control. I think the facts clearly demonstrate that it is under the severest kind of controls. The Expenditure Authorization for FY 1971 of $71.8 billion reflects the determination of the new management team under Secretary of Defense Laird to pare down the costs of defense wherever and whenever possible, without impairing our capacity to provide for the national security.

Today's budget reductions did not just happen. They resulted from detailed study and analysis of how DOD management systems were built and used, and especially focus on management improvement.

Hon. Barry J. Shillito

The veritable explosion in technology we have experienced in the past will not slow down, but it will be accelerated. Much as we would like to think otherwise, our systems of the 1970s will probably be more sophisticated, more complex, have higher performance levels and be more costly. We must continuously give attention to ensuring that such systems are as simple and as economical as possible while meeting our requirements.

Changes in both the completion of programs and the funding of them will occur as a result of Congressional actions. How to manage these changes will be one of the most important challenges of the decade.

The outside demands of greater visibility as to how we manage will probably increase. These demands will come from the Congress, the General Accounting Office, and from the public and news media. Our credibility will continue to be at issue. The amount of support we get for defense programs will be a direct result of our performance.

To address that portion of contracting for new products which pertains to maintenance, let me refer to the consideration currently being given to the old concept of life-cycle costing. With selected items, the military services are including in their evaluation of a product the initial cost, the life span of the article, and the maintenance costs expected. Articles selected are those where the mean time between failure, the mean time between repair and repair cost (*i.e.*, labor, materials, equipment and facilities) could be reasonably computed. Maintenance, as you know, will play a greater role in determining which item is procured to a greater degree in the future as we better learn how and when to use this technique. It has taken a long time to get this life-cycle cost effort off dead center and I believe it is finally starting to work.

* * * * *

How are we going to get the engineered logistic support for new systems and equipments we must have? We are going to get it the only way we can—through the engineering process, more specifically in the design phase.

Since the Integrated Logistic Support (ILS) directive was issued in 1964, you have heard a lot about the subject and have witnessed ILS growth both in the DOD and industry. However, even today there is not complete acceptance and application of ILS. Comments have been made to the effect that "We have always considered logistic support. Why do we need ILS?" This statement can be refuted when you look at some of the case histories of support problems traceable back to lack of adequate planning in the early acquisition phases.

There have been other statements that ILS has not been specified sufficiently well in RFPs or has been specified in such terms as to result in a corresponding paper effort worth little to either the customer or the contractor. Reviews of RFPs have confirmed these remarks to be true in some cases; however, these evaluations have also revealed excellent examples of these RFPs that did delineate the ILS goals in meaningful terms leading to effective ILS programs.

There is no argument that ILS has a way to go before it reaches the level of logical, sound application. I am the first to admit this. But progress is being made. We do not have to provide the logistician with better tools to do the job, but more importantly, the logistician must establish a rapport and dialogue with the designer and furnish him the logistic support requirements in quantitative terms: something he can understand and design to. Better still, the logistician should be working with the designer to "design out" support needs at every opportunity. We are working with research and engineering people to develop the exchanges and methods necessary to ensure that ILS is phased into the engineering process at the appropriate time and that ILS management takes an active role in design and design reviews. We, of course, must be watchful to ensure that ILS upstream efforts are always worth the cost of such efforts.

Through the DOD-Industry ILS Advisory Committee, chaired by Paul Riley [Deputy Assistant Secretary of Defense (Supply, Maintenance and Services)], industry representatives are helping us in DOD to improve ways to implement ILS and place it in the proper perspective. The Director, Defense Research and Engineering plays a very active role on this committee. . . .This output oriented committee has an aggressive program, and I am very pleased with its progress to date. . . .

But before leaving this subject, I want it known that both Dr. John S. Foster Jr. and I back the ILS concept fully and intend to provide the emphasis needed, and the resources required, to make it work effectively.

We spend approximately $18 billion of our budget on maintenance and, of this, $6 billion, or one-third, can be attributed directly to depot maintenance alone. Considering the hundreds of contractor facilities along with approximately 100 government depot maintenance facilities, it becomes apparent that the management of maintenance in the depot area alone constitutes a substantial portion of the logistic support management problem.

In consideration of the management of the support of weapons and equipments acquired, we have recently revised our policy guidance on the use of contractor and government resources for the maintenance of materiel. This was covered through a re-issuance of DOD Directive 4151.1. Essentially, this re-issuance incorporates changes that will provide for clearer definitions of policy, and it establishes quantitative parameters for use in decision making associated with the distribution of maintenance workloads among contract, organic and interservice sources. The objective is to provide for that distribution which will produce the greatest return for the least cost.

We recently established a Joint Logistics Policy Committee composed of representatives from the Office of the Secretary of Defense, the Joint Chiefs of Staff, Defense Supply Agency, and the four military services, including the Marine Corps. This committee is devoted to defining and isolating problems common to all the military services, then assigning to one of the members the task of solving a particular problem with members of each of the other services assisting. This group is available to assist in improving our joint maintenance efforts with participation by all concerned.

This group has been or presently is concerned with:

- Development of a description of the emergency logistics systems profile for the 1975–1980 time period.
- Comparison of the individual military services and DOD concept of subsistence systems.
- Production of a standard method for documenting the individual military service logistics systems to permit comparison and evaluation.
- Evaluation of telecommunications capabilities for support of the logistics systems now and in the environment of the 1970s.

The $12 billion consumed on maintenance below the depot level is being monitored by The Army Equipment

Record System (TAERS), the Navy Maintenance and Material Management (3–M), the Marine Corps Unified Material Management System (MUMMS), and the Air Force Manual 66–1. These systems are becoming more refined. The data produced, along with the Comptroller's "below depot cost accounting system," should produce the data to allow us to significantly evaluate this area for better utilization and cost effectiveness.

I feel that we are on the road to improved readiness of our weapon systems and equipment by more effective maintenance and reduced costs, but our goals for the 1970s in this area are almost the same as those I outlined last year:

- A more disciplined approach to management on a total cost basis by weapon system.
- Cost consciousness by management at each level of command in the evaluation of alternatives and support decisions.
- Improved planning and programming of maintenance requirements.
- Greater precision in estimating and pricing maintenance requirements.
- Increased participation in the budget and apportionment process.
- Intensified review and analysis of planned and actual program performance.
- Improved data base for life-cycle costing.
- More timely initiation of corrective measures.
- More emphasis on equipment support demand and technical criteria in order to influence reliability and maintainability of both current and future systems.

DSA Has M-Day Openings

Defense Supply Agency has mobilization positions for reserve majors, lieutenant colonels, lieutenant commanders and commanders at many activities. Further information may be obtained by writing to Director, Defense Supply Agency, (Attention DSAHMR), Cameron Station, Alexandria, Va. 22314, or by phoning (202) 694–6081.

Ballute Tested

Phase II testing of the Pilot Airborne Recovery Device (PARD), a discretionary descent system using a hot air balloon to rescue pilots downed in combat, has been successfully completed by the Air Force Systems Command's Aeronautical Systems Division (ASD).

Tests included 10 drops and mid-air recoveries of anthropometric dummies at El Centro, Calif., and jet car ejections at speeds of 50 and 250 knots at the Naval test facilities in Philadelphia, Pa., and Lakehurst, N.J.

After a pilot ejects, his main parachute opens normally. The pilot may, at his discretion, use the PARD, which is a balloon that inflates as air rushes through a hole in the top of the pilot's main parachute. A burner, fed from a butane gas tank strapped to the pilot's back, heats the air flowing into the ballute (balloon-parachute) to 250 degrees Fahrenheit. This provides sufficient lift to halt his descent and allows him to hover out of range of enemy small arms fire. The ballute is pre-set to carry a disabled pilot to 6,000 feet. It can be manually operated to reach an altitude as high as 10,000 feet.

The ballute will keep the pilot aloft for 30 minutes, giving rescue aircraft time to locate him. The rescue aircraft then snatches the flyer in mid-air, and either reels him in or tows him to friendly territory, where he can be released to descend by his main parachute.

Additional drop and sled testing to evaluate reliability has been proposed. The system will also be tested in F–4 aircraft if funds are approved.

Colonel Albert P. Lovelady is the Director of ASD's Life Support Systems Program Office at Wright-Patterson AFB, Ohio.

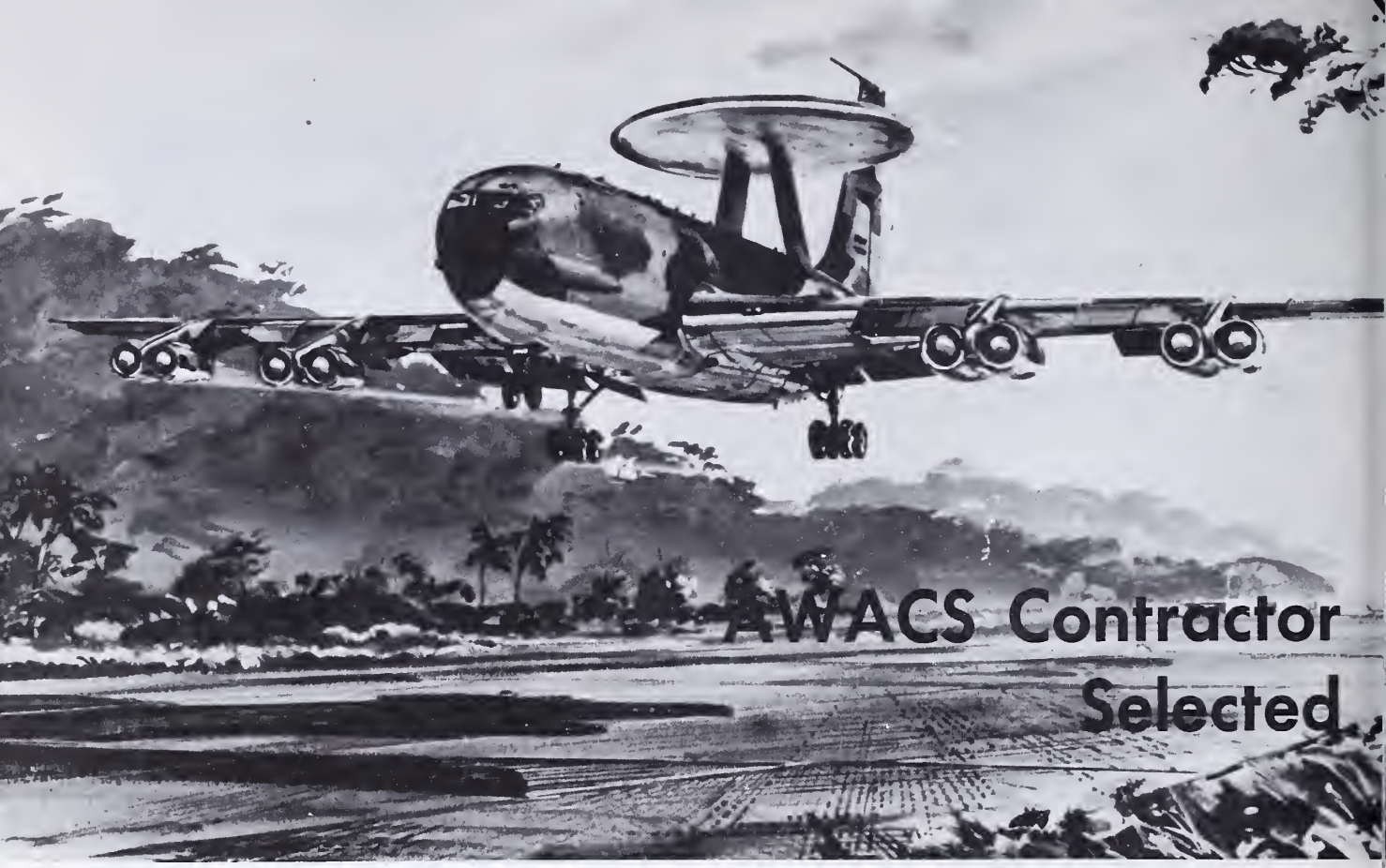
High Altitude Jet Engine Icing Can Be Simulated

Modifications to a high-altitude simulation test cell have made possible tests of large turbofan and turbojet engines under icing conditions.

Previously, large engine icing tests were conducted by flying the engine through natural icing conditions or through a cloud formed by water released from a tanker aircraft. Test conditions were difficult to duplicate. Tests may now be conducted at any desired altitude and Mach number. Water droplet size and concentration can be controlled to produce icing of any desired nature.

A holographic system, consisting of a pulsed ruby laser on one side of the cell and a photographic plate on the other measures the size and number of water droplets in the air flow. Accurate determination of inlet icing conditions is possible. Conditions can be regulated to match test specifications.

The cell is at the Air Force System Command's Arnold Engineering Development Center, Arnold AFS, Tenn.



AWACS Contractor Selected

The Air Force has selected The Boeing Co., Seattle, Wash., as the prime contractor to begin development of the Airborne Warning and Control System (AWACS).

The $169,982,522 cost-plus-incentive contract is for phase one of the AWACS program: development and flight testing of two competitive radars and radomes. Initially, $16.5 million of approved funds were obligated.

The present contract constitutes approval for phase one only. Progression to later phases will be subject to Congressional approval, and will depend on successful demonstrations by Boeing at specified milestones in the program, and on future Defense Department and Air Force decisions.

Phase two of the AWACS program includes full scale development and integration of the total radar and aircraft system; phase three is aircraft production. Phase two, if undertaken, would be under a cost-plus-incentive contract; phase three would be fixed-price-incentive.

Total cost for all three phases of the AWACS program is estimated to be approximately $2 billion. The Boeing Co. is in full compliance with equal employment opportunity requirements of the law.

Phase one includes modification of a 707-type aircraft to carry the AWACS equipment and a crew of 17. Equipment consists of an airborne surveillance radar, beacon tracking, navigation, communications, data processing identification, presentation/display and software systems.

Changes to the 707 airframe include structural strengthening to accommodate the increased weight of the avionics, and the radar antenna rotodome. An elliptical disc 30 feet in diameter, the rotodome will be supported on pylons 10 feet above the fuselage.

Operational capabilities include sustained flight at high speeds, and a minimum on-station time of seven hours, which can be increased by in-flight refueling.

Two competitive surveillance radars, one developed by Hughes Aircraft Co., and the other by Westinghouse Electric Co., will be flight tested. At the end of phase one, one radar will be eliminated, and the other will be integrated with additional AWACS equipment to demonstrate overall system performance.

AWACS is being developed to fulfill two defense requirements: air defense, and tactical command and control. Current continental United States air defenses were designed in the 1950s to counter high altitude subsonic, or slightly supersonic, bombers. Today's threat is composed of a mix of ballistic missiles and bombers. While the primary threat is the missile, the threat of bombers has not diminished. Present Soviet heavy bombers are capable of low-level penetration, and are also capable of launching stand-off air-to-surface missiles. Air defenses presently have minimal capability against these tactics due to limited low altitude overland radar coverage and limited detection range of ground-based radars. Additionally, present ground-based air defense systems are vulnerable to missile attack.

AWACS, according to the Air

Force, will be a key element in the bomber defense modernization program, which also includes Over-the-Horizon Backscatter radar and improved interceptors. The AWACS force should give a survivable wartime command and control system.

In addition, AWACS will extend low level radar coverage and surveillance, and with it, the capability to extend the bomber engagement area well beyond U. S. borders. According to the Air Force, AWACS would also be more effective against some of the current Soviet tactics than present systems. The probability of intercepting and destroying bombers armed with stand-off air-to-surface missiles will be much greater than with present systems.

Finally, AWACS would be less vulnerable to defense suppression in a combined missile/bomber attack because it would not depend on fixed command and control centers such as SAGE (Semiautomatic Ground Environment) and BUIC (Backup Intercept Control). The Air Force estimates AWACS will be much less expensive over its lifetime than the alternative of continued reliance on the SAGE and BUIC systems.

In the tactical air control role, AWACS will provide quick reaction command and control for deployment to any area. Once there, AWACS will provide surveillance and control necessary for air superiority and direct air support of ground forces.

Specific command abilities include:

- Direct command of the offensive battle.
- Direct communication with strike forces.
- Real time display of the disposition of friendly and enemy forces.
- Overland radar capability for detecting enemy forces, and directing friendly forces into combat position.
- Relay of communication transmissions.
- Interrogation of friendly forces by beacon.

Responsibility for overall systems development of AWACS belongs to the Electronic Systems Division, AFSC, L. G. Hanscom Field, Mass. Colonel Kendall Russell is the AWACS program director.

Meetings and Symposia

SEPTEMBER

Laser in Science and Technology Symposium, Sept. 15–16, at the University of Washington, Seattle, Wash. Co-sponsors: Air Force Office of Scientific Research and the University of Washington. Contact: Milton Rogers, Air Force Office of Scientific Research (SREM), 1400 Wilson Blvd., Arlington, Va. 22209. Phone (202) OXford 4–5567.

OCTOBER

Fourteenth Annual **Organic Chemistry** Conference, Oct. 8–9, at Natick, Mass. Sponsor: Chief of Research and Development, Dept. of the Army. Contact: Dr. Louis Long Jr., Head, Organic Chemistry Group, PRL, Army Natick Laboratories, Natick, Mass. 01760. Phone (617) 653–1000 Ext. 2414.

Solid Mechanics 1970—Lightweight Structures Symposium, Oct. 13–14, at the Army Materials and Mechanics Research Center, Watertown, Mass. Sponsor: Army Materials and Mechanics Research Center, Watertown, Mass. Contact: Joseph I. Bluhm, Chief, Theoretical/Applied Mechanics Research Laboratory, Army Materials and Mechanics Research Center, Watertown, Mass. 02172.

Sixteenth **Design of Experiments in Army Research, Development and Testing** Conference, Oct. 21–23, at the Army Logistics Management Center, Fort Lee, Va. Sponsor: Army Research Office—Durham. Contact: Dr. Francis G. Dressel, Mathematics Division, Army Research Office—Durham, Box CM, Duke Station, Durham, N.C. 27706. Phone (919) 286–2285 Ext. 75.

Special International **Engineering Geologists** Symposium, Oct. 22–23, at the Mayflower Hotel, Washington, D.C. Sponsor: Army Research Office—Durham. Contact: Dr. William Van Royen, Dir., Division of Environmental Sciences, Army Research Office—Durham, Duke Station, Durham, N.C. 27706. Phone (919) 286–2285 Ext. 52.

Biodynamic Models and Their Applications, Oct. 26–28, at Dayton, Ohio. Co-sponsors: Aerospace Medical Research Laboratory and the National Research Council, National Academy of Sciences. Contact: 6570 Aerospace Medical Research Laboratory (MRB), Wright-Patterson AFB, Ohio 45433. Phone (513) 255–3602.

Approximation Theory and Related Topics and Their Applications, Oct. 26–30, at the University of Maryland, College Park, Md. Sponsor: Air Force Office of Scientific Research. Contact: Major Phillip Callas, Air Force Office of Scientific Research (SRMM), 1400 Wilson Blvd., Arlington, Va. 22209. Phone (202) 694–5262.

First Western Space Congress, Oct. 27–29, at Santa Maria, Calif. Sponsor: Vandenberg Scientific and Technical Societies Council. Contact: B. Z. Woods, Exhibits Chairman, P.O. Box 1134, Santa Maria, Calif. 93454.

NOVEMBER

Twelfth **Liquid Propulsion** Meeting, Nov. 17–19, at the Stardust Hotel, Las Vegas, Nev. Sponsor: Joint Army, Navy, Air Force, and National Aeronautics and Space Administration Interagency Propulsion Committee. Contact: T. M. Gilland, Chemical Propulsion Information Agency, Johns Hopkins University, Applied Physics Laboratory, 8621 Georgia Ave., Silver Spring, Md. 20910. Phone (301) 589–7700.

Security Seminar Set for Mid-September

The Sixteenth Annual American Society for Industrial Security Seminar will be held September 15–17 at the Sheraton Boston Hotel, Boston, Mass.

Keynoting the session on Defense Department security will be Joseph J. Liebling, Deputy Assistant Secretary of Defense for Security Policy.

For further information and registration forms for the seminar, contact William D. Wright Jr., American Society for Industrial Security, 2000 K Street NW, Room 404, Washington, D.C. 20006, phone (202) 338–7676.

BIBLIOGRAPHY

RESEARCH REPORTS

Organizations registered for service may obtain microfiche copies of these documents without charge from:
Defense Documentation Center
Cameron Station
Alexandria, Va. 22314

All organizations may purchase microfiche copies (65¢) or full-size copies ($3) of the documents (unless otherwise indicated) from:
Clearinghouse for Federal Scientific and Technical Information
Department of Commerce
Springfield, Va. 22151

All orders to the Clearinghouse must be prepaid.

Adhesion Bonding. Defense Documentation Center, Alexandria, Va., April 1970, 140 p. AD–704 525.

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GOVERNMENT PRINTING OFFICE PUBLICATIONS

These publications may be purchased at the prices indicated from:
Superintendent of Documents
U.S. Government Printing Office,
Washington, D.C. 20402

Selling to Navy Prime Contractors. Provides guidance and information for business concerns seeking subcontracting opportunities with Navy prime contractors. Includes a directory of prime contractors, contacts within the company and items produced by the company. 1969. 98 p. D201.2: Se4/2/970. $1.00.

Defense Supply Procurement Regulation, Revision No. 1, Dec. 5, 1969. Revision No. 1 to the 1969 edition of the Defense Supply Procurement Regulation. 1969. 29 p. D7.6/5: 969/rev. 1. 30¢

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DEFENSE PROCUREMENT CIRCULARS

Distribution of Defense Procurement Circulars is made automatically by the U.S. Government Printing Office to subscribers of the Armed Services Procurement Regulation (ASPR).

Defense Procurement Circular No. 78, May 13, 1970. (1) Contracting With Small Business and Labor Surplus Area Concerns/Defense Manpower Policy No. 4 (A) Memorandum from the Assistant Secretary of Defense (Installations and Logistics). (B) Small Business and Labor Surplus Area Concerns. (2) ASPR Manuals and Supplements. (3) Postponement of Use of Defense Organizational Entity Standards (DOES) Code. (4) Transportation, Consignment and Marking Instructions. (5) Status Report of Defense Procurement Circulars.

[Editor's Note: Item 5 of DPC 78 rescinds DPCs 60 through 64, and 67, due to expiration or incorporation into the 1969 edition of the Armed Services Procurement Regulation. DPCs 1 through 59 were rescinded Jan. 2, 1969.

Item 5 also lists those portions of DPCs 65 and 66, and 68 through 77, remaining in effect until incorporated into the ASPR or until specifically canceled.]

Defense Procurement Circular No. 79, May 15, 1970. (1) Cost Principles —Application of Section XV to Fixed Price Contracts.

ABOUT PEOPLE

DEPARTMENT OF DEFENSE

Brig. Gen. (selectee) William T. Meredith, USAF, is now Dir., Real Property Maintenance, Office of the Asst. Secretary of Defense (Installations and Logistics).

Brig. Gen. James D. Kemp, USAF, is the new Commander, Defense General Supply Center, Defense Supply Agency, Richmond, Va.

J. Edward Timmins Jr. has been named Comptroller, Defense Communications Agency, Arlington, Va.

DEPARTMENT OF THE ARMY

Maj. Gen. Leo B. Jones is the new Asst. Dep. Chief of Staff for Logistics, Office of the Chief of Staff of the Army. Also in the Office of the Chief of Staff, **Brig. Gen. Darrie H. Richards** has been designated Dep. Chief of Staff for Logistics (Supply and Maintenance).

Maj. Gen. William C. Gribble has been named Dep. Chief of Research and Development.

In the Military Traffic Management and Terminal Service, **Brig. Gen. Otis E. Winn, USAF,** has been appointed Dep. Commander, and **Capt. Jack Bishoff, USN,** has been named Asst. Commander.

Brig. Gen. (selectee) George A. Rehb will be the Dep. Dir. of Military Construction, Office of the Chief of Engineers, Washington, D.C.

Brig. Gen. (selectee) Richard W. Swenson is now Commander, Army Communications Systems Agency, Army Materiel Command, Fort Monmouth, N.J.

Brig. Gen. (selectee) Arthur S. Hyman is now Commander, Institute of Land Combat, Combat Development Command, Fort Belvoir, Va.

Col. Robert J. Bennett has been appointed Chief of Staff, Safeguard System Command, Hq., Army Missile Command, Huntsville, Ala.

Col. Frank P. Clark is the new Commander, Rock Island Arsenal, Ill.

Col. David William Einsel Jr. has assumed command of the Harry Diamond Laboratories, Washington, D.C.

Col. Henry F. Grimm Jr. was assigned recently as Dep. Chief of Staff for Test and Evaluation, Army Test and Evaluation Command, Aberdeen Proving Ground, Md.

Col. William J. Lynch is Commander, Army Research Office, Durham, N.C. He has been succeeded in his former position as Asst. Dir. of Army Research and Commander, Army Research Office, by **Col. Norman R. Rosen.**

Dr. George E. Schafer is the new Chief Scientist and Technical Dir. of the Army Electronic Proving Ground, Fort Huachuca, Ariz.

Lt. Col. Harvey L. Arnold has been designated Dir., Army Engineer Reactor Group, Fort Belvoir, Va.; Chief, Nuclear Power Div., Office of the Chief of Engineers; and Asst. Dir., Div. of Reactor Development and Technology, U.S. Atomic Energy Commission.

Lt. Col. John A. Callanan has been named Dir., Nuclear, Biological, and Chemical Material Testing, Hq., Army Test and Evaluation Command, Aberdeen, Md.

Lt. Col. Ernest D. Peixotto is now Dir., Army Engineer Waterways Experiment Station, Vicksburg, Miss.

DEPARTMENT OF THE NAVY

Adm. (selectee) Ralph W. Cousins has been designated Vice Chief of Naval Operations.

Other new appointees in the Office of Chief of Naval Operations include: **Vice Adm. Benedict J. Semmes,** Dep. Chief of Naval Operations (Fleet Operations and Readiness); **Vice Adm. (selectee) Ralph Weymouth,** Dir., Navy Program Planning; **Rear Adm. Kent L. Lee,** Dir., Office of Program Appraisal; and **Rear Adm. William H. Livingston,** Dir., Air Surface and Electronic Warfare.

Rear Adm. William J. Moran has been named Commander, Naval Weapons Center, China Lake, Calif.

Capt. Henry E. Davies Jr. has been designated Commander, Naval Ordnance Missile Test Facility, White Sands Missile Range, N.M.

Capt. Robert F. Reilly is now the Commander, Atlantic Area, Military Sealift Command, Brooklyn, N.Y.

DEPARTMENT OF THE AIR FORCE

Maj. Gen. James M. Keck is the new Dep. Dir. of Operations, Office of Dep. Chief of Staff, Plans and Operations, Hq., USAF, replacing **Maj. Gen. Joseph J. Kruzel** who retired.

Brig. Gen. Robert E. Hails, Dep. Chief of Staff for Maintenance, Air Force Logistics Command, Wright-Patterson, AFB, Ohio, has been promoted to the rank of major general.

Brig. Gen. Walter R. Hedrick Jr., Dir. of Space, Dep. Chief of Staff for Research and Development, has retired.

Col. Robert F. Trimble is the new Dir., Procurement Policy, Office of Dep. Chief of Staff, Supply and Logistics, Hq., USAF. He replaces **Brig. Gen. James O. Lindberg** who retired.

New assignments in the Air Force Systems Command include: **Col. William C. Schwitzgebel,** Asst. Dep. for Space Communications, Space and Missile Systems Organization, Los Angeles, Calif.; **Col. Robert H. Spencer,** System Program Dir., Over the Horizon System Program Office, Electronics Systems Div., Hanscom Field, Mass.; **Col. Robert P. Daly,** Dep. for Engineering, Aeronautical Systems Div., Wright-Patterson AFB, Ohio; and **Col. Algernon G. Swan,** Commander, Air Force Special Weapons Center, Kirtland AFB, N.M.

Col. John D. Peters, Dir., Civil Engineering, Air Force Systems Command, Andrews AFB, Washington, D.C., has been promoted to the rank of brigadier general.

Blue Ribbon Defense Panel Reports

In July 1969, President Richard M. Nixon appointed a Blue Ribbon Panel to study and report on the organization and management of the Defense Department. The panel reported its findings and recommendations to the President and Secretary of Defense on July 1, 1970.

The Defense Industry Bulletin staff has excerpted and condensed portions of the report thought to be of most interest to industry readers. The executive summary, printed in full, indicates the broad coverage of the full report.

Publication of these excerpts does not imply that the panel's findings and recommendations are established DOD policy.

The entire Report to The President and the Secretary of Defense on the Department of Defense by the Blue Ribbon Defense Panel, July 1, 1970, is available by mail from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402; price, $2.25; order number D 1.2/B62/970. At press time, the publication was also available at the Government Printing Office's main and Pentagon book stores.

Appendices to the report on the following subject areas to be published separately are:

- Mechanisms for Change--Organizational History.
- Missions and Functions, Washington Headquarters Staff.
- Functional Analysis—Washington Headquarters Staffs.
- Personnel Data and Trends in Staff Sizes.
- Major Weapon Systems Acquisition Process.
- Operational Test and Evaluation.
- Supply, Maintenance and Transportation.
- Telecommunications.
- Automatic Data Processing.
- Audit Procedures.
- Conflicts of Interest.
- Comparisons of DOD, NASA and AEC Acquisition Processes.
- Correspondence Control and Mail Distribution in Washington Headquarters.
- Joint Chiefs of Staff Decision Making.

The Blue Ribbon Defense Panel was appointed by the President and the Secretary of Defense in July 1969, and given the following broad Charter, with instructions to submit its Final Report by July 1, 1970:

The general scope of the Panel is to study, report and make recommendations on:

(1) The organization and management of the Department of Defense, including the Joint Chiefs of Staff, the Defense Agencies and the Military Services, as it affects the Department's mission performance, decision-making process, the command and control function and facilities, and the coordination with other governmental departments and agencies, with emphasis on the responsiveness to the requirements of the President and the Secretary of Defense.

(2) The Defense research and development efforts from the standpoints of mission fulfillments, costs, organization, time and interrelation with the scientific and industrial community.

(3) The Defense procurement policies and practices, particularly as they relate to costs, time and quality.

(4) Such other matters as the Secretary may submit to it from time to time.

It is important to note that, while the Charter is very broad as to the Panel's function in the fields of structure, organization, and operating procedures of the entire Department of Defense, it excludes considerations of broad national policy. The Panel has endeavored to hew closely to this line.

While the members of the Panel have considered carefully the entire report, this does not necessarily mean that there is complete agreement with every detail of each recommendation or statement. Except where otherwise noted, however, there is agreement with the substance of every important conclusion and recommendation. The nature of the general agreement and the extent of incidental disagreement are those to be expected when members of a Panel individually have given serious thought to a major and complex problem, and have sought to achieve a joint resolution in furtherance of the Panel's task as a deliberative body.

[There were] concurring statement by Dr. George Stigler, and dissenting statements by Mr. Robert C. Jackson and Mr. Wilfred J. McNeil.

Gilbert W. Fitzhugh, Chairman

Executive Summary

The purpose of this summary is to provide a quick review of the six-chapter report resulting from the year-long study by the Blue Ribbon Defense Panel. The Panel's report offers recommendations in a number of areas including organization, management of materiel resources, management procedures, personnel management and conflicts of interest. This summary covers the major recommendations of the Panel in the area of the organization of the Defense Department and several of the more significant recommendations in the other areas.

As a result of its examination of the Defense Department, the Panel found that:

- Effective civilian control is impaired by a generally excessive centralization of decision-making authority at the level of the Secretary of Defense. The Secretary's ability to selectively delegate authority and decentralize management, while still retaining personal authority on major policy issues of the Department, is seriously inhibited by the present organizational structure.
- The President and the Secretary of Defense do not presently have the opportunity to consider all viable options as background for making major decisions, because differences of opinion are submerged or compromised at lower levels of the Department of Defense.
- There are too many layers of both military and civilian staffs, and staffs are too large in the Office of the Secretary of Defense (OSD), the Military Departments extending down through the field commands, the Joint Chiefs of Staff and the Unified and Component Commands. The results are excessive paper work and coordination, delay, duplication and unnecessary expense.
- The present arrangement for staffing the military operations activities for the President and the Secretary of Defense through the Joint Chiefs of Staff and the Military Departments is awkward and unresponsive; it provides a forum for inter-Service conflicts to be injected into the decision-making process for military operations; and it inhibits the flow of information between the combatant commands and the President and the Secretary of Defense, often even in crisis situations.
- The Joint Chiefs of Staff could more effectively perform their important statutory role as principal military advisors to the President and the Secretary of Defense if they were relieved of the necessity of performing delegated duties in the field of military operations and Defense Agency supervision.
- The present combatant command structure does not facilitate the solution of many serious problems which materially affect the security of the nation. For example, recent advances in technology require much closer coordination in planning for and employing the forces of the Continental Air Defense Command and the Strategic Air Command than can reasonably be expected with two separate commands. Also, the present Unified Commands do not bring about unification of the Armed Forces, but rather are layered with Service component headquarters and large headquarters' staffs.
- There is substantial room for improvement and greater integration of management throughout the supply, maintenance and transportation systems of the Department. The most critical need for improved effectiveness is in the support of the Unified Commands.
- There is no organizational element within OSD with the capability or the assigned responsibility for objectively making net assessments of U.S. and foreign military capabilities.
- There is no adequate organizational element within OSD that is charged with the responsibility for long-range planning for the structuring and equipping of forces or for other similar purposes.
- No formal mechanism exists within OSD to assure adequate coordination among the various elements of the Department.
- The present functional assignments of Assistant Secretaries of the Military Departments contribute to duplication between the efforts of the Military Department Secretariats and the Service military staffs, and also

Panel Members

Gilbert W. Fitzhugh.
Chairman of the Board,
Metropolitan Life Insurance Co.

Dr. Martha E. Peterson
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Mrs. Leona P. Thurman, Attorney

William Blackie,
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George Champion, President,
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William P. Clements Jr.,
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John M. Fluke, President,
John Fluke Manufacturing Co., Inc.

Dr. Marvin L. Goldberger,
Professor of Physics,
Princeton University

Robert C. Jackson, Chairman,
Teledyne Ryan Aeronautical

Lane Kirkland, Secretary-Treasurer, AFL-CIO

Hobart D. Lewis, President,
Readers Digest Association, Inc.

Wilfred J. McNeil, Director-Advisor, Fairchild-Hiller Corp.; President, Tax Foundation

Dr. Ruben F. Mettler, President,
TRW, Inc.

Lewis F. Powell Jr., Attorney

Dr. George J. Stigler, Professor
of American Institutions,
University of Chicago.

Claude Young,
Office of Commissioner,
Professional Football.

Dr. Peterson found it necessary to resign from the panel due to the pressure of her duties as President of Barnard College. Dr. Goldberger resigned due to illness.

between the Military Department Secretariats and OSD.

- The policies of the Department on development and acquisition of weapons and other hardware have contributed to serious cost overruns, schedule slippages and performance deficiencies. The difficulties do not appear amenable to a few simple cure-alls, but require many interrelated changes in organization and procedures.
- Operational test and evaluation has been too infrequent, poorly designed and executed, and generally inadequate.
- Procurement procedures do not sufficiently reflect the national need to maintain an adequate, but not excessive, industrial base.
- The promotion and rotation systems of the Military Services do not facilitate career development in the technical and professional activities, such as research and development, procurement, intelligence, communications and automatic data processing.
- The acquisition and retention of officers and enlisted men in the Armed Services are becoming increasingly difficult for a number of reasons, including (1) personnel policies with respect to compensation, promotion and retirement, and (2) the negative attitude of segments of the public.
- While policies on equal employment opportunity for military and civilian personnel and for contractors appear adequate, implementation responsibilities and functional assignments are fragmented and diffused and have impaired the achievement of effective results.
- The statutes and regulations regarding conflicts of interest are ambiguous, conflicting, and inequitable, and are not uniformly enforced.

To effect substantial improvement in these conditions, the Panel makes the following recommendations:

1. The functions of the Department of Defense should be divided into three major groupings:

(a) Military Operations, including operational command, intelligence, and communications (herein called Operations);

(b) Management of personnel and materiel resources (herein called Management of Resources); and

(c) Evaluation type functions, including financial controls, testing of weapons, analysis of costs and effectiveness of force structures, etc., (herein called Evaluation).

2. Each of these major groups should report to the Secretary of Defense through a separate Deputy Secretary. Appointees to these three positions should be drawn from civilian life, and should rank above all other officers of the Department of Defense except the Secretary. One of the three should be designated principal deputy. The General Counsel, the Assistant to the Secretary of Defense (Atomic Energy), the Assistant Secretary of Defense (Public Affairs), and the Assistant to the Secretary of Defense (Legislative Affairs) would continue to report directly to the Secretary of Defense. The staff of the Office of the Secretary of Defense should not exceed 2,000 people.

3. The Deputy Secretary of Defense for Management of Resources should be delegated responsibility for the following functions:

(a) The Military Departments, which should continue under the immediate supervision of their Secretaries;

(b) Research and Advanced Technology;

(c) Engineering Development;

(d) Installations and Procurement (a modification of the present Installations and Logistics);

(e) Manpower and Reserve Affairs;

(f) Health and Environmental Affairs;

(g) Defense Supply Agency; and

(h) Advanced Research Projects Agency.

There should be an Assistant Secretary of Defense for each of the functions (b) through (f) inclusive, who reports and provides staff assistance to the Secretary of Defense through the Deputy Secretary of Defense (Management of Resources). The position of Director, Defense Research and Engineering should be abolished, and his functions reallocated between the Assistant Secretary of Defense for Research and Advanced Technology and the Assistant Secretary of Defense for Engineering Development.

Functions (g) and (h) should continue to be constituted as Defense Agencies, each under the immediate supervision of a Director.

The Advanced Research Projects Agency should be delegated the responsibility for all research and exploratory development budget categories. Funds for such research should be budgeted directly to this Agency, and the Agency should be authorized to assign or contract for work projects to laboratories of the Defense Department or in the private sector, as appropriate.

4. The Deputy Secretary of Defense for Operations should be delegated responsibility for the following functions:

(a) Military Operations;

(b) The Unified Commands;

(c) Operational Requirements;

(d) Intelligence;

(e) Telecommunications (and Automatic Data Processing);

(f) International Security Affairs;

(g) Defense Communications Agency; and

(h) Civil Defense Agency (if Civil Defense is to be retained in the Department of Defense).

Three new major Unified Commands should be created:

- A Strategic Command, composed of the existing Strategic Air Command, the Joint Strategic Target Planning Staff, the Continental Air Defense Command, and Fleet Ballistic Missile Operations;
- A Tactical (or General Purpose) Command, composed of all combatant general purpose forces of the United States assigned to organized combatant units; and
- A Logistics Command, to exercise for all combatant forces supervision of support activities, including supply distribution, maintenance, traffic management and transportation.

No Commander of a Unified Command should be permitted to serve concurrently as Chief of his Military Service.

The responsibilities now delegated to the Joint Chiefs of Staff by the Secretary of Defense to serve as military staff in the chain of operational command with respect to the Unified Commands, and all other responsibilities so delegated which are related to military operations and the Unified Commands, should be assigned to a single senior military officer, who

should also supervise the separate staff which provides staff support on military operations and the channel of communications from the President and Secretary of Defense to Unified Commands. This officer should report to the Secretary of Defense through the Deputy Secretary of Defense (Operations). This senior military officer could be either the Chairman of the Joint Chiefs of Staff, as an individual, not ex-officio, the Commander of the Tactical Command, or some other senior military officer, as determined by the President and the Secretary of Defense.

There should be an Assistant Secretary of Defense for each of the functions (c) through (f), inclusive, who reports and provides staff assistance to the Secretary of Defense through the Deputy Secretary of Defense (Operations). The Defense Communications Agency and the Civil Defense Agency would each be under the immediate supervision of a Director.

All intelligence functions of the Department of Defense and all communications functions should report to the Secretary of Defense through the Deputy Secretary of Defense for Operations.

5. The following steps should also be taken:

(a) To provide the staff support on military operations, and the channel of communications from the President and the Secretary of Defense to the Unified Commands, an operations staff, separate from all other military staffs, should be created.

(b) The responsibilities now delegated to the Joint Chiefs of Staff by the Secretary of Defense to serve as military staff in the chain of operational command with respect to the Unified Commands, and all other responsibilities so delegated which are related to military operations and the Unified Commands, should be rescinded; and consideration should be given to changing the title of the Chief of Naval Operations to Chief of Staff of the Navy.

(c) All staff personnel positions in the Organization of the Joint Chiefs of Staff and in the headquarters military staffs of the Military Services which are in support of activities, such as military operations, which are recommended for transfer to other organizational elements, should be eliminated.

(d) The Organization of the Joint Chiefs of Staff should be limited to include only the Joint Chiefs of Staff and a reconstituted Joint Staff limited in size to not more than 250 officers augmented by professional civilian analysts as required.

(e) The Unified Commanders should be given unfragmented command authority for their Commands, and the Commanders of component commands should be redesignated Deputies to the commander of the appropriate Unified Command, in order to make it unmistakably clear that the combatant forces are in the chain of command which runs exclusively through the Unified Commander;

(f) In consolidating the existing area Unified Commands into the Tactical Command, major organizational and functional advantages will be obtained by:

- Merging the Atlantic Command and the Strike Command;
- Abolishing the Southern Command and reassigning its functions to the merged Atlantic and Strike Commands;
- Abolishing the Alaskan Command and reassigning its general purpose function to the Pacific Command and its strategic defense functions to the Strategic Command; and
- Restructuring the command channels of the sub-unified commands.

(g) The responsibilities related to civil disturbances currently delegated to the Army should be redelegated to the Tactical Command; and

(h) The Unified Commanders should be given express responsibility and capability for making recommendations to the Deputy Secretary of Defense for Operations, for operational capabilities objectives and for allocations of force structures needed for the effective accomplishment of the missions assigned to their Commands.

6. The Deputy Secretary of Defense for Evaluation should be delegated the responsibility for evaluation and control-type activities, including:

(a) Comptroller (including internal audit and inspection services);

(b) Program and Force Analysis (a modification of the present Systems Analysis Unit);

(c) Test and Evaluation;

(d) Defense Contract Audit Agency; and

(e) Defense Test Agency.

There should be an Assistant Secretary of Defense for each of the functions (a) through (c) inclusive, who reports and provides staff assistance to the Secretary of Defense through the Deputy Secretary of Defense for Evaluation.

The Defense Contract Audit Agency should be continued as a Defense Agency, under the immediate supervision of a Director.

A Defense Test Agency should be created to perform the functions of overview of all Defense test and evaluation, designing or reviewing of designs for test, monitoring and evaluation of the entire Defense test program, and conducting tests and evaluations as required, with particular emphasis on operational testing, and on systems and equipments which span Service lines. The Defense Test Agency should be under the supervision of a civilian Director, reporting to the Secretary of Defense through the Deputy Secretary of Defense for Evaluation.

7. The number of Assistant Secretaries in each of the Military Departments should be set at three, and except for the Assistant Secretaries (Financial Management), they should serve as senior members of a personal staff to the Secretaries of the Military Departments without the existing limitations of purview imposed by formal functional assignments. The Assistant Secretary (Financial Management) should become the Comptroller of the Military Department, with a military deputy, as in the current organization in the Department of the Navy.

The Secretariats and Service Military Staffs should be integrated to the extent necessary to eliminate duplication; the functions related to military operations and intelligence should be eliminated; line type functions, e.g., personnel operations, should be transferred to command organizations; and the remaining elements should be reduced by at least thirty percent. (A study of the present staffs indicates that the Secretariats and Service staffs combined should total no more

than 2,000 people for each Department).

8. Class II activities (Army), Field Extensions (Air Force), and Commands and Bureaus (Navy), all of which are line, rather than staff in character, which are now organizationally located under the direct supervision of staff elements in the headquarters military staffs of the Services, should be transferred to existing command-type organizations within the Services.

9. The Defense Atomic Support Agency should be disestablished. Its functions for nuclear weapons management should be transferred to the operations staff under the Deputy Secretary of Defense for Operations, and its weapons effects test design function should be transferred to the Defense Test Agency.

10. The administration functions presently assigned to the Assistant Secretary of Defense (Administration) should be assigned to a Director of Pentagon Services, reporting to the immediate office of the Secretary of Defense. He should be responsible for operating the facilities and providing administrative support for the Washington Headquarters.

11. A Net Assessment Group should be created for the purpose of conducting and reporting net assessments of United States and foreign military capabilities and potentials. This group should consist of individuals from appropriate units in the Department of Defense, consultants and contract personnel appointed from time to time by the Secretary of Defense, and should report directly to him.

12. A Long-Range Planning Group should be created for the purpose of providing staff support to the Secretary of Defense with responsibility for long-range planning which integrates net assessments, technological projections, fiscal planning, etc. This group should consist of individuals from appropriate units in the Department of Defense, consultants and contract personnel appointed from time to time by the Secretary of Defense, and should report directly to him.

13. A Coordinating Group should be established in the immediate office of the Secretary of Defense. The responsibilities of this Group should be to assist the Secretary of Defense and the Deputy Secretaries of Defense in coordinating the activities of the entire Department in the scheduling and follow-up of the various inter-Departmental liaison activities; to staff for the Secretary the control function for improvement and reduction of management information/control systems needed within the Department and required from Defense contractors; and to assure that each organizational charter of the Office of the Secretary of Defense is of proper scope and coordinated and in accordance with the assigned responsibility of the organization. The responsibility for the Department's Directive/Guidance System, currently assigned to the Assistant Secretary of Defense (Administration), should be assigned to this group. The coordinating group should be headed by a civilian Director, who should also serve as executive assistant to the Secretary of Defense.

14. The Army Topographic Command, the Naval Oceanographic Office and the Aeronautical Chart and Information Center should be combined into a unified Defense Map Service reporting to the Secretary of Defense through the Deputy Secretary of Defense for Management of Resources.

15. A new development policy for weapon systems and other hardware should be formulated and promulgated to cause a reduction of technical risks through demonstrated hardware before full-scale development, and to provide the needed flexibility in acquisition strategies. The new policy should provide for:

(a) Exploratory and advanced development of selected sub-systems and components independent of the development of weapon systems;

(b) The use of government laboratories and contractors to develop selected sub-systems and components on a long-term level of effort basis;

(c) More use of competitive prototypes and less reliance on paper studies;

(d) Selected lengthening of production schedules, keeping the system in production over a greater period of time;

(e) A general rule against concurrent development and production efforts, with the production decision deferred until successful demonstration of developmental prototypes;

(f) Continued trade-off between new weapon systems and modifications to existing weapon systems currently in production;

(g) Stricter limitations of elements of systems to essentials to eliminate "gold-plating";

(h) Flexibility in selecting type of contract most appropriate for development and the assessment of the technical risks involved;

(i) Flexibility in the application of a requirement for formal contract definition, in recognition of its inapplicability to many developments;

(j) Assurance of such matters as maintainability, reliability, etc., by means other than detailed documentation by contractors as a part of design proposals;

(k) Appropriate planning early in the development cycle for subsequent test and evaluation, and effective transition to the test and evaluation phase; and

(l) A prohibition of total package procurement.

16. The effectiveness of Program or Project Management should be improved by:

(a) Establishing a career specialty code for Program Managers in each Military Service and developing selection and training criteria that will insure the availability of an adequate number of qualified officers. The criteria should emphasize achieving a reasonable balance between the needs for knowledge of operational requirements and experience in management;

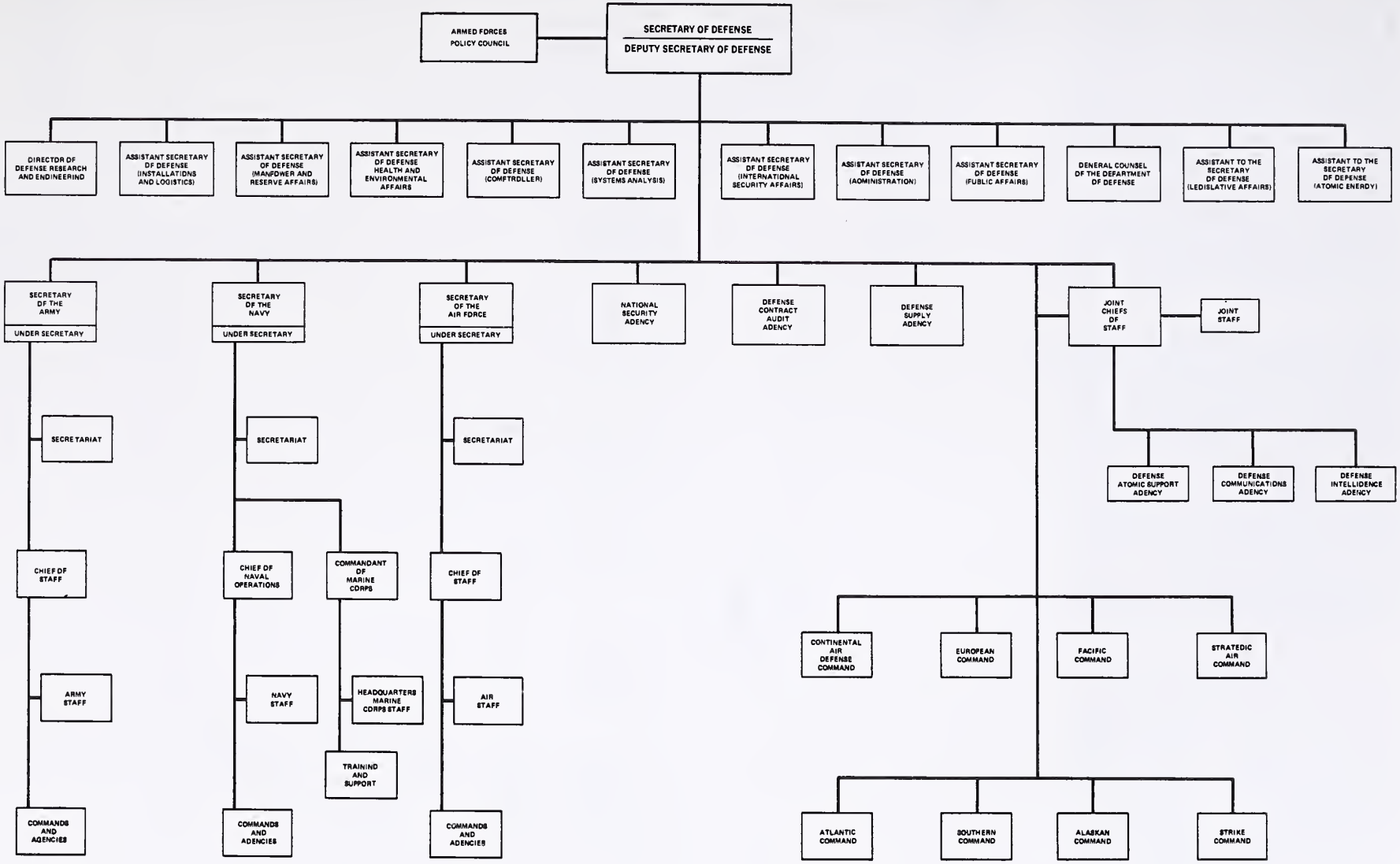
(b) Increasing the use of trained civilian personnel as program managers;

(c) Providing authority commensurate with the assigned responsibility and more direct reporting lines for program managers, particularly those operating in matrix organizational arrangements; and

(d) Giving the program manager directive authority, subject to applicable laws and regulations, over the contracting officer, and clarifying the fact that the contract auditor acts in an advisory role.

17. Increased use should be made of parametric costing techniques for developments and procurements to improve the quality of original and subsequent estimates, and to help offset the difficulties of estimating the costs

DEPARTMENT OF DEFENSE (PRESENT)



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18. A separate program category[1] should be established for test and evaluation, especially operational testing, and the responsibility for overview of all Defense test and evaluation efforts should be assigned to the Defense Test Agency.

[1] *Program categories are those categories of activities used for internal planning and management in the Department, e.g., strategic offensive forces, strategic defensive forces, research and development, intelligence, etc.*

19. Specialist careers should be established for officers in such staff, technical and professional fields as research, development, intelligence, communications, automatic data processing, and procurement.

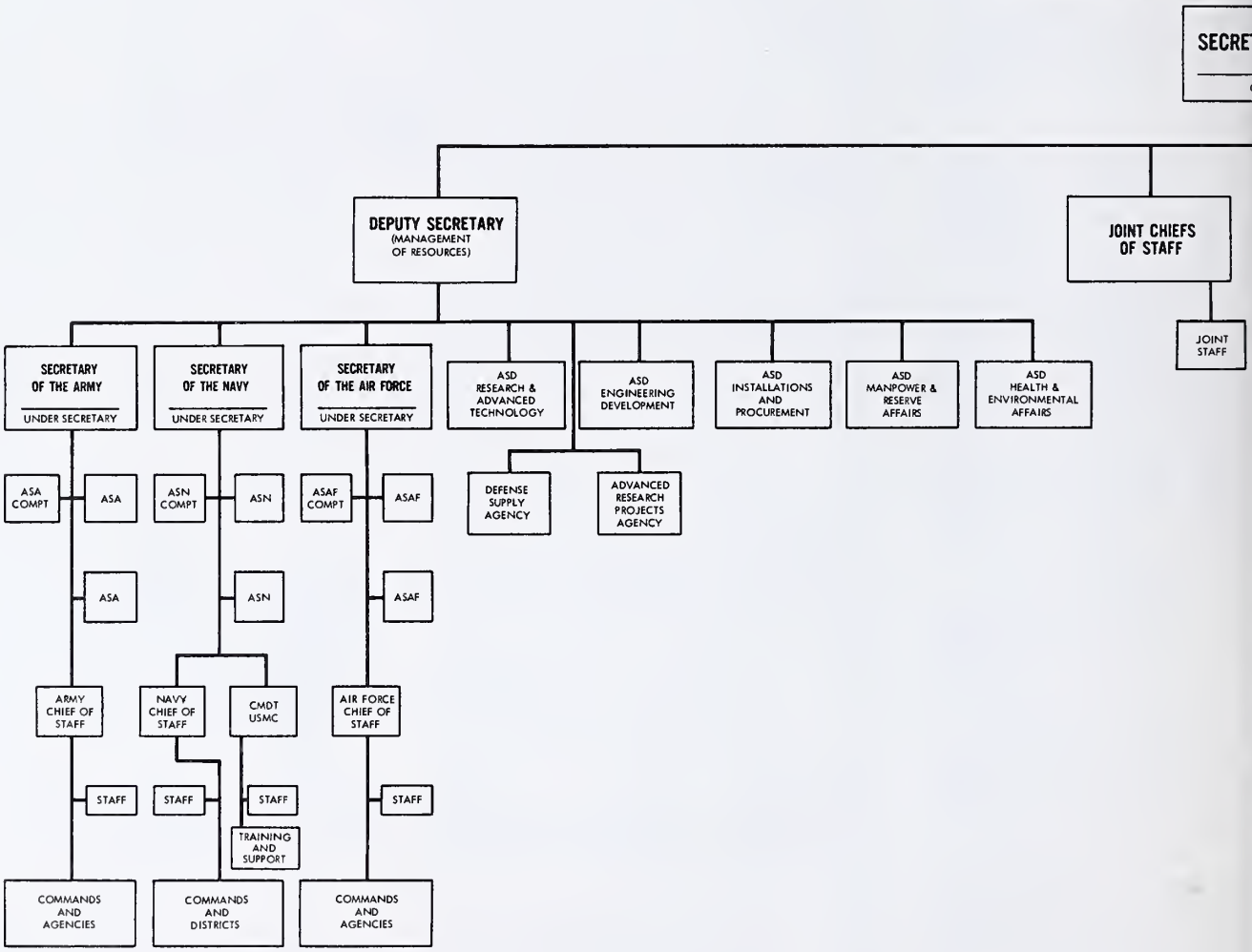
20. In order to improve the process of acquisition and retention of military personnel, the Executive Branch should develop, and submit to the Congress for its consideration as necessary, a total military personnel program which coordinates and reconciles all the separate considerations, particularly including: (1) military compensation and retirement, (2) personnel policies on promotion and rotation, and (3) acquisition programs, such as Reserve Officers Training Corps.

21. The duration of assignments for officers should be increased, and should be as responsive to the requirements of the job as to the career plan of the officer. Officers continued on an assignment for this reason should not be disadvantaged in opportunity for promotion.

22. Executive Orders and Department of Defense Directives with respect to matters of equal employment opportunity for Department of Defense military personnel, civilian em-

DEPARTMENT OF DEFENSE

PROPOSED BY BLUE RIBBON DEFENSE PANEL



ployees and contractors, as set forth in the existing comprehensive programs for insuring equal opportunity, should be administered from a sufficiently high organizational level in the Department to assure effective implementation, and the procedures for assessing penalties for non-compliance should be reviewed and clarified.

23. The Secretary of Defense should recommend clarifying changes in conflict of interest statutes, should amend the regulations to clarify them, and should make certain administrative changes to insure uniform enforcement.

Organization

In approaching its task, the Panel became increasingly aware that no single organization or set of procedures would be adequate for the Department of Defense for all times. The organization and procedures of the Department must be sufficiently flexible to respond to a changing environment and evolving objectives.

Certain principles which guide organizational and procedural objectives do remain constant. First among such principles is the requirement for effective civilian control of the Defense establishment. Under the Constitution, civilian control is exercised through the combined efforts of both the Executive and Legislative Branches. Its effectiveness, however, depends in large measure on the capability of the Secretary of Defense to insure consistency of Department operations with policy, to surface the viable alternatives on major issues, and to maintain a high degree of visibility to himself, the President and the Congress of the functioning of the national Defense establishment.

Effective control of the military es-

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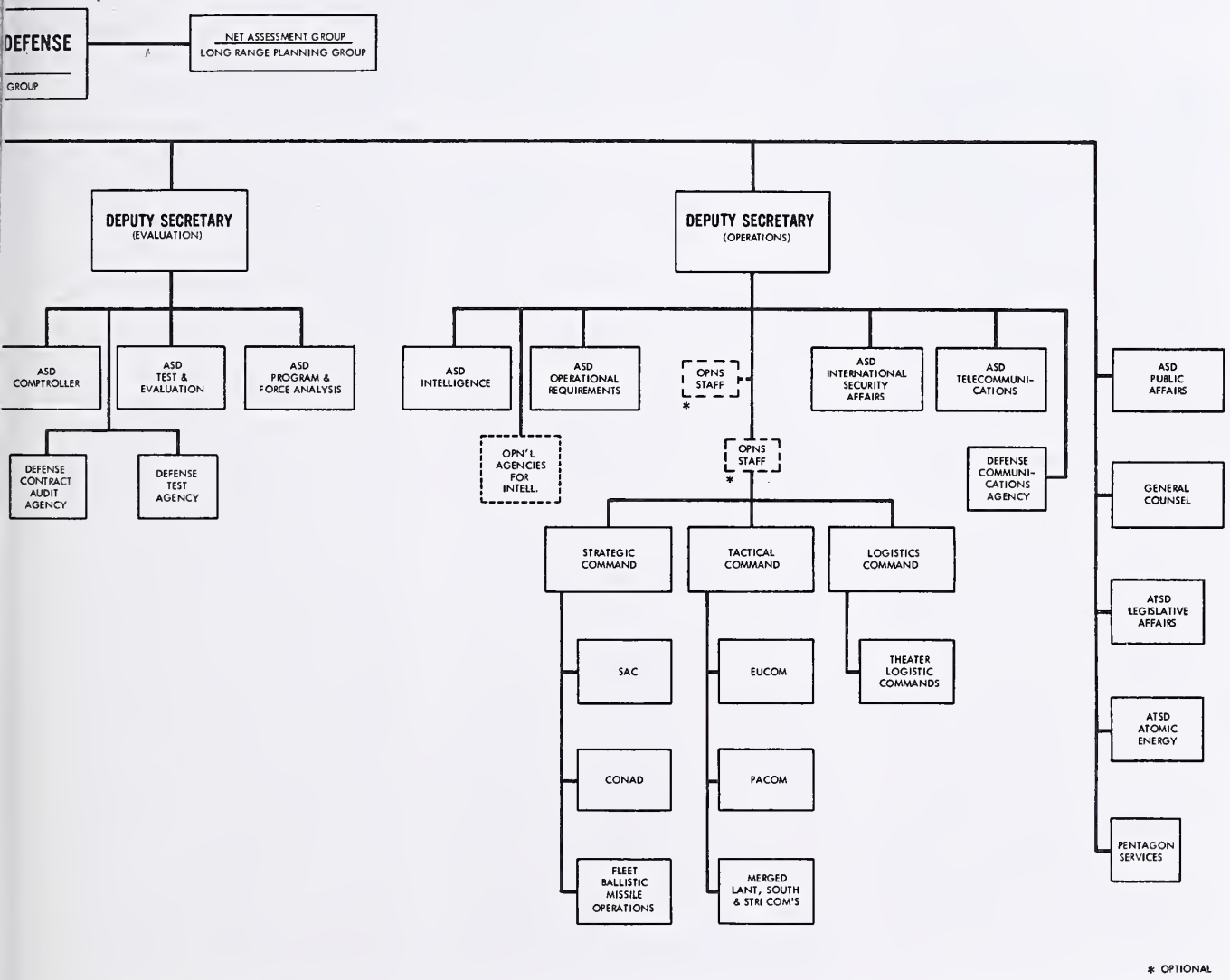

tablishment by the Secretary is required not just for the purpose of insuring the supremacy of civil authority. While the President and the Secretary of Defense must have the benefit of professional military advice based on careers of military training and experience, unified control is essential to provide the Nation with maximum security at minimum costs, and to insure that military strategy, force structure and operations are consistent with national policy.

Despite the broad authority vested in the Secretary of Defense by the National Security Act of 1947, as amended, experience demonstrates that in practice, the tools available to the Secretary to exercise effective control of the Department are seriously deficient.

* * * * *

The fundamental principles of the National Security Act of 1947, as amended, are still sound. Although experience indicates the desirability, and even the necessity, for some substantive changes, many of the deficiencies evident in the operation of the Department could be remedied by more faithful application of the concepts on which the Act is premised.

The Department of Defense is too large, and encompasses too many complex and diverse activities to respond to over-centralized management. Some logical division of activities must be made to facilitate management and control. However, achieving such division by radical reorganization would probably solve few, if any, of the basic conflicts which now exist; its effect would be more likely to relocate the organizational points at which divergent interests lock in controversy. There is also the danger that valuable morale factors rooted in tradition might be destroyed rather than controlled, or eliminated rather than redirected toward useful objectives.

A drastic restructuring would also inevitably risk serious disruptions of uncertain degree and duration in the operational capabilities and readiness of our military forces. In view of the current and foreseeable state of world affairs, only the most crucial need could justify acceptance of such risks.

* * * * *

Management of Materiel Resources

The modern history of military organizations and operations demonstrates that the materiel support of the forces is of ever-increasing relative importance, and presents complex defense management problems.

Advances in science and technology comprise the initiating source of this trend. Weapons, communications, transportation—all have been affected significantly by revolutionary advances in the state-of-the-art; and each advance has been accompanied by great increases in complexity of development, acquisition, maintenance, operation and in cost.

In short, modern military organizations have become "hardware" oriented and dependent. Military hardware requires an increasing amount and proportion of total defense resources, aggravating a host of inseparable, associated management problems.

Materiel management in the Department of Defense can be divided into two distinct overall areas of activity. The first is acquisition related, and includes functions associated with research, development, test and evaluation, and procurement. The second phase is post-procurement, and includes supply, maintenance, and transportation.

The most severe problems in the acquisition of materiel occur when production is dependent on new development, not with off-the-shelf procurements.

Military hardware development programs continue to be plagued by the now familiar symptoms of trouble:

(1) Major cost growths or overruns;

(2) Schedule slippages; and

(3) Failures in performance.

Uncertainty is inherent in the nature of programs which involve advances in technology, and this uncertainty makes it inevitable that some degree of cost growth, delays and short-falls in desired performance will occur in some programs. The frequency and magnitude of such problems which have been experienced, however, surpass significantly those which can be attributable to unavoidable causes. It is clear that a substantial portion of the acquisition problems must be attributed to management deficiencies.

The problems—and resulting deficiencies—in hardware development programs are clearly too myriad and complex to yield to any single solution, but a combination of changes in policy and procedures can achieve significant improvements in costs, time, and performance. . . .

Research and Development

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There is no adequate or coherent planning for investments in advancing the technological base. Responsibility and management for conducting such research are widely fragmented among and within the Military Services and the Defense Agencies. Research funds so allocated have not always been spent on militarily-relevant technology, nor are all militarily-relevant areas of technology appropriately considered in the allocation of research funds.

Existing organization and procedures inhibit the degree of control on research and exploratory development work and of the expenditures necessary to insure proper application. The funds allocated to advancing the technological base are not sufficiently identifiable and auditable to support value judgments as to their sufficiency. There is no adequate mechanism to assure that funds appropriated for research and exploratory development are not diverted to advanced, or engineering development categories, or to operational systems developments. The overemphasis on mission justification for research and development allocations and funding creates additional incentives for such diversions.

There is no adequate mechanism to evaluate the performance of the numerous research groups. The dissipation of research, exploratory development and management and support categories of R&D funds on unproductive work in contractor and in-house laboratories, sometimes to support a preconception or position of the organizational element contracting for the research, occurs all too often.

Based on the foregoing observations, it is concluded that R&D to advance the technological base should be constituted as a separate program and subject to a continuing intensive review to insure that all funds are allocated to militarily-relevant research and that all militarily-relevant areas of technology are given due consideration in fund allocations. Further, Defense research policy should be separated by assignment of responsibility from other development policy. The primary objective should be to insure that technology will be available when needed to meet Defense requirements.

Recommendations

Research and Development to advance the technological base should be constituted as a separate program, under the staff supervision of the Assistant Secretay of Defense (Research and Advanced Technology). It should be subject to continuing intensive review to insure that available funds are allocated to militarily-relevant research and that all militarily-relevant areas of technology are considered in fund allocations.

The responsibility for control of Defense research designated to advance the technological base and the appropriated funds therefor should be assigned to the Advanced Research Projects Agency (ARPA). Further, ARPA should be directed to:

(a) Allocate its R&D among qualified performers;

(b) Assure by review the relevance of all projects and appropriateness of fund allocations;

(c) Evaluate the effectiveness of all its R&D participants; and

(d) Develop and submit for approval to the Deputy Secretary of Defense (Management of Resources) an annual Research Objective (RO) statement which would be a companion document to the Operational Capability Objectives developed by the Unified Commands and which would provide the Secretary of Defense an information base to determine the overall defense capability objectives.

Advanced, Engineering, and Operational Systems Development

A major problem with the requirements process occurs at its very beginning. The originating command often lacks the capability for operational validation which should be prerequisite to transmittal to higher Headquarters. The application of military judgment to requirements is essential, but not sufficient in itself. Operational validation should be based on a thorough analysis of the assigned mission and the present or programmed means for accomplishing it in the predicted threat environment. . . . There is no doubt that the overall requirements process could be improved greatly by specifying that operations analysts study requirements at the point of origin. In this way, those requirements reaching higher headquarters should have greater validity.

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Each Service has a large section in its Headquarters staff which has the sole function of translating the broadly-stated requirements received from field commands into more specific statements of their desires for new or improved weapons and other materiel. These staff elements also determine informally the relative priority of the requirements for new and improved weapons. In recent years, there has been a noticeable tendency for the formal requirements documents to become quite specific, and to be stated increasingly more in terms of engineering specifications rather than in terms of the performance or operational results being sought.

Even when the engineering specifications are properly matched to the performance requirements, the detailed engineering specifications limit the engineering alternative available to the developer because of the reluctance of the acquisition authority to consider change, thereby imposing on the development a rigidity which can cause delays, additional costs, and often the application of older technology than the current state-of-the-art would permit. In other instances, the specifications have the result of demanding products which are clearly beyond the state-of-the art or which require developmental efforts beyond those necessary to perform the prescribed mission. Inept or obsolete specifications also occur too frequently, and in some instances, products developed which satisfy the imposed engineering specifications will not perform the mission intended.

There is an apparent inability of Service staff elements to divorce themselves from their own Service interests in establishing priorities for requirements. It is evident that the needs of the user in the field often take second place to weapons developments considered most important to the particular Service for the protection or expansion of its assigned roles and missions.

The mission of the combatant forces should determine their required operational capbilities, which should be the principal factor in initiating development. This can be accomplished only if the combatant commands possess the capability to analyze their missions, determine their operational capabilities, deficiencies and potential deficiencies, and state their requirements in a meaningful way.

Recommendations

The Strategic, Tactical and Logistics Commands should be assigned the responsibility to develop, and submit to the Deputy Secretary for Operations, Operational Capability Objectives relating to their assigned missions. For this purpose, each Command and major sub-command Headquarters should be organized to include an operations analysis element.

For each Operational Capability Objective which is validated by the Deputy Secretary for Operations, the Deputy Secretary for Management of Resources should require one or more of the Military Departments to prepare and submit a development plan aimed at satisfying the Operational Capability Objective.

Advanced Development

Advanced Development, which includes all projects for development of hardware for experimental test, is the essential link between advances in the technological base achieved in Research and Exploratory Development, and the incorporation of improved capabilities in new weapons developments. In recent years, paper studies and analyses have often been substituted for essential hardware development and testing. As a result, uncertainties which could be eliminated or reduced are carried over into engineering development or operational systems develop-

ment, where unresolved technical problems are significantly more expensive and troublesome to remedy. In addition, new technology which would improve weapons capabilities is often lost in the process.

Increased emphasis on and funding of Advanced Development to yield various forms of prototype equipment, which can be tested prior to commitment in a weapon system, is essential. Prior to approval of initiation of Engineering or Operational System Development, test results of all major advances in the technological base considered for incorporation should be available.[2]

Engineering, Operational Systems Development

For purposes of special management control, Engineering Development and Operational Systems Development of major systems (defined as requiring total R&D financing in excess of $25 million or requiring a total production investment in excess of $100 million) are subjected to special procedures. . .

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During the contract definition phase, the technical and design approaches to the systems development contained in the proposal of a prospective contractor are often exposed to other prospective contractors, so that potentially better and/or less costly features of each proposal can be considered by other prospective contractors for incorporation in or adaptation to their own proposals. Industry generally considers this practice to constitute unethical conduct on the part of the Government, particularly since it has no counterpart in non-government business transactions. The potential inherent in this practice for its use by government personnel to influence the ultimate selection of a contractor is obvious.

The scope of a Request for Proposal (RFP) and the responses thereto in a major systems development, as prescribed, and as practiced until recently, are illogically broad. The central purpose of the contract is concerned with engineering development, a matter of considerable technical uncertainty. To expect and to require through Contract Definition that a contractor have the capability even to identify all end items of the system, let alone develop detailed specifications for each, in an advanced technological product, and concurrently to prepare reliable predictions in detail on the maintainability, reliability, and the requirement for operations training to use the product, is unreasonable. Experience proves this procedure impractical, and the many peripheral matters included during Contract Definition tend to obscure the critical issues of technical design and competence, as well as multiplying the cost of preparing and reviewing the proposals.

The mandatory requirement for a formal Contract Definition has a serious impact on the entire development process. While there are cases where the contract definition process is useful, there are others in which there is no logical need for the exercise. Contract Definition is both time consuming and costly. Twelve-to-eighteen months can be devoted to paper preparation and review with little, if any, actual development work going on, and the cost to the Department for a Contract Definition exercise can exceed one hundred million dollars. Such a procedure should be required only on a case-by-case basis, rather than on a mandatory basis presently prescribed in Department of Defense Directive 3200.9.

There are also problems involved in the source selection process. Past experience indicates that both weighted and raw scores on responses to RFPs tend to be very close in major source selections. In some instances, contractors reverse positions in going from raw scores to weighted scores, but even then the competitors tend to be almost equal. In this situation, it appears that, generally, the unweighted factors, such as cost and past performance, have a large and perhaps controlling impact on the final selection. Apparently, the large number of peripheral technical elements included in the ratings is the major factor which normalizes the scores of the competitors. Reduction of the number of elements rated would focus attention on the more fundamental considerations, and would give a broader perspective of the relative technical merits of each contractor's proposal.

The systems development approach continues to accumulate in one program a dangerously high magnitude of risks, from both cost and technology standpoints. Development problems connected with one or two of the many critical components of the system can cause schedule slippages which occasion enormous cost consequences. Even in the absence of major technical difficulties, an accumulation of changes in a variety of components, each relatively small in cost, can have a total cost impact of great magnitude.

This emphasis on developing all elements for the system as part of a single development project, as contrasted to selected subsystem and component development, also has the effect of reducing the number of development actions and raising the level of commitment for each development contracted. Among the more far-reaching consequences is that competition is limited to a few large contractors on most major development projects. In addition, because subcontractors for sub-elements of the system are often tied to a specific prime contractor, there is the potential of inadequate flexibility to obtain the best qualified developer for each sub-element of the system.

The prescribed procedure for major systems development places heavy emphasis on fixed-price type contracts, apparently on the assumption that technical risks have been minimized by previous efforts. Fixed-price type contracts have been equated, in effect, with competition. This competitive pricing during Contract Definition has led to significant underpricing in numerous development contracts. As a result, cost overruns have been frequent and substantial. The concentration of risks in a single contractor is often out of proportion to the contractor's financial structure and capability, and can result in the Department of Defense being faced with either permitting a default on a critical program, or of salvaging the particular company with payments not clearly required under the terms of the contract.

Fixed-price contracting requirements also create additional pressures for rigid and frozen design and performance specifications which, in turn, restrict the flexibility of the developer

[2] *See Operational Testing and Evaluation, page 32.*

to make engineering trade-offs. This factor inhibits the developer's capability to achieve the best product.

In addition, the prescribed process by its very terms contemplates a high level of concurrency of development and production which, in practice, has proved to be fraught with propensities for cost growths, schedule delays and performance failures.

In practice, the prescribed process for major systems development produces an unwarranted reliance on paper analysis during Concept Formulation and Contract Definition. A review of major systems developments clearly indicates that although there had been a proliferation of studies in Concept Formulation, the necessary technology to proceed with Engineering Development frequently had not been accomplished through Exploratory and Advanced Development programs. Assumptions that all technical problems can be foreseen prior to the commencement of Engineering Development have proved to be wrong. Repeated experiences demonstrate that technical uncertainty is inherent in the Engineering Development process and that paper studies alone cannot enable government or industry to forecast all of the problems that will arise. Since it has been assumed that the technical risk is low in the development, it is not surprising that cost estimates, based on paper analyses rather than tested hardware, have proved to be unreliable. This marked tendency to substitute paper analysis for hardware development has serious adverse consequences.

From the review of major weapon system acquisitions, a major revision of policy is required to: (1) introduce flexibility in selecting the strategy or technique to be used for any given system development; (2) place more emphasis on hardware development during Concept Formulation to reduce technical risks; (3) undertake incremental development of subsystems and components independent, in the initial stages, from major system developments; and (4) introduce multiple decision points during the development and acquisition of new systems.

If more emphasis and direction is given to the advancement of the technological base as previously recommended, then the flow of technology would come from a broad base of research through exploratory and advanced developments into component and subsystem developments and subsequently into new system developments or modification programs to existing systems. This approach would both minimize technical risk and increase the number of options available to satisfy Operational Capability Objectives of the Commands.

Recommendations

A new development policy for weapon systems and other hardware should be formulated and promulgated to cause the reduction of technical risks through demonstrated hardware before full-scale development, and to provide the needed flexibility in acquisition strategies. The new policy should provide for:

(a) Exploratory and advanced development of selected subsystems and components independent of the development of weapon systems;

(b) The use of government laboratories and contractors to develop selected sub-systems and components on a long-term level of effort basis;

(c) More use of competitive prototypes and less reliance on paper studies;

(d) Selected lengthening of production schedules, keeping the system in production over a greater period of time;

(e) A general rule against concurrent development and production, with the production decision deferred until successful demonstration of developmental prototypes;

(f) Continued trade-off between new weapon systems and modifications to existing weapon systems currently in production;

(g) Stricter limitations of elements of systems to essentials to eliminate "gold-plating";

(h) Flexibility in selecting type of contract most appropriate for development and the assessment of the technical risks involved;

(i) Flexibility in the application of a requirement for formal contract definition, in recognition of its inapplicability to many developments;

(j) Assurance of such matters as maintainability, reliability, etc., by other means than detailed documentation by contractors as a part of design proposals;

(k) Appropriate planning early in the development cycle for subsequent test and evaluation, and effective transition to the test and evaluation phase; and

(l) A prohibition of total package procurement.

Department of Defense Directive 3200.9, Initiation of Engineering Development, should be rescinded.

Research and Development undertaken to satisfy specific military materiel requirements should be under the staff supervision of the Assistant Secretary of Defense (Engineering Development).

The Advanced Research Projects Agency (ARPA) should be required to provide a formal technical risk assessment on all proposed new systems prior to the approval of the Development Concept Paper (DCP).

Special Problems in Acquisition of Navy Ships

The problems found to exist in the major weapon systems acquisition process, generally, are as applicable to the acquisition of Navy ships as to other weapon systems. In addition, however, Navy ship procurement and construction suffer from several unique problems.

The most sigificant differences in Navy ship procurement derive from the fact that the Navy Department is the only customer which buys from its suppliers the types of ships involved. An aircraft manufacturer has potential customers in the Air Force, the Navy, the Army and numerous private air carriers, but the constructors of aircraft carriers and submarines must sell to the Navy, or no one.

As a consequence, the procurement process for Navy ships, even more than in other procurements, must reflect a concern for the existence of a sufficiently broad industrial base to provide competition for such procurements.

The procurement of ships involves a construction process more than a production process. Accordingly, economies of scale are not as readily available as in other major weapon systems acquisitions. While prototyping may not be as feasible for entire ships as for other weapon systems, there is a potential for improvement in the Navy ship acquisition process through

prototyping of sub-elements.

In recent years, the emphasis has been heavily weighted toward designing into each ship approved for construction the greatest total capability possible. This reflects inadequate consideration in the requirement process for the trade-off advantages of a larger number of ships of less individual capability as compared to fewer ships of maximum individual capability.

Minor Weapons Development

Although Defense management emphasis is heavily focused on major system development, the far more numerous "minor" engineering developments account for approximately three times the level of expenditure associated with major systems. Subsequent procurements do not change the proportion; for when RDT&E and procurement funds are combined, expenditures for "minor" systems are also approximately three times those for major systems.

Although the formal process prescribed for major system development is optional for other engineering developments, the pattern of concept formulation, contract definition and development, and indeed, the entire systems concept, has largely permeated the "minor" weapons and systems developments. There is one notable exception to the major systems process, and that is the absence of high-level management attention to "minor" developments until things really go badly.

In large measure, minor system developments experience the same problems and exhibit the same symptoms that are found in major systems. Some problems, however, are peculiar, either in character or degree, to minor developments. Among these problems is the inadequate level of technical and managerial competence of Defense personnel assigned to operate the minor developments process.

The pay is low by industrial standards for jobs of comparable responsibility, billets are limited and opportunities for professional growth and diversity are inhibited by the requirements of the job. The Government engineer on a small system may write technical sections of the RFP, evaluate the proposals, prepare the work statement for the winner, provide technical direction for the development effort, write the test specifications, perform the engineering tests and provide technical guidance to management, all single-handedly.

Management of the acquisition process is not a career specialty for military officers. In smaller programs, they are often, if not usually, untrained in business methods and technology. They are well versed in the operational aspects of the equipment, but their background and experience often make them ill at ease with cost/time/performance trade-offs and with their industrial counterparts and their problems. There is evidence that the Services do not have adequate skills to evaluate the capability of potential suppliers, particularly in the manufacturing area.

Recommendation

In concert with the new development policy recommended for major weapons systems, the same increased flexibility of techniques should be provided for minor systems.

Procurement of Proprietary Items

The broad spectrum of items procured by and for the Department of Defense extends from the smallest and most commonplace items to the most sophisticated and complex systems. In this process, private innovators make a very significant contribution. The individual items or components, procured separately or as part of subsystems, are or were once the products of an innovator. It must be recognized that the traditional incentives which lead people to invest their time, talent, and resources in inventing improved products in competition with others (called proprietary items[3]), are responsible in no small part for the technological process of our Nation in both domestic and military areas.

Even though the Department recognizes and stresses the importance of private innovation in introductory policy statements in the Armed Services Procurement Regulation (ASPR) sections on Patent Rights and Rights in Data, the spirit of the policy is often not apparent in the implementation of procurement practices.

Procurement practices presently in use throughout the Department of Defense and other agencies which buy for the Department (e.g., General Services Administration) often tend to establish "negative incentives" for the private innovator to enter the Defense market. Suppliers are often selected and contracts awarded primarily on the basis of price alone, with less than adequate regard for quality, reliability, delivery schedule, improvement of products, or maintenance of production (or innovative) capacity. Reverse engineering, that is preparing the necessary data to manufacture the product by examining the product itself, is used by the Government to establish new suppliers purely to maintain the assumed necessity of having more than one competitive source. Adverse disclosures by manufacturers and suppliers of catalog items frequently are needlessly required by data acquisition practices. In summary, the basic problem with respect to procurement practices for proprietary items is the deviation of procurement practices from the policy of encouraging innovation, and the belief by Government buyers that it is their duty to force a price competition.

A significant concern with respect to patents is the increasing number of instances in which the Department of Defense takes ownership of patents developed on contract, rather than acquiring license rights for government use, with the contractor retaining the rights for commercial use. To attract the fullest competition of the best qualified companies, the Department's patent policy should require only the granting to the Government of a non-exclusive, royalty-free license under patents for inventions made in the performance of the contract, and not a license under background patents of the contractor. A policy of

[3] *The following definition was taken from "Webster's Third New International Dictionary":* PROPRIETARY ITEM—an item that is protected by secrecy, patent, or copyright against free competition as to name, composition, or process of manufacture. *In common parlance, the term is often used to refer to an item developed by a manufacturer at his own expense and offered by him as a standard item for sale to a large number of customers.*

seeking rights in background patents or the taking of title to inventions by the Government, tends to discourage the best-qualified companies from accepting or, in some cases, competing, for contracts. This results in the Department of Defense having to accept less qualified companies, and the strong possibility of reduced competition for its contracts. This does not result in achieving the Department's principal objective, which should be to obtain the best results at the desired time and at the most reasonable price.

The Department's data policy provides very limited protection for previously-generated proprietary data. The Department's data policy must enable it to perform its missions in the most effective and economical manner consistent with its long-term needs, and in a manner which most effectively maintains the technological base upon which it depends, while taking full advantage of the incentives of the competitive free enterprise system.

It is important for the Government to undertake a rededication and re-establishment of adherence to its oft-stated policies for motivating and protecting the private innovator. The Department of Defense should recognize and reverse certain trends within its components which are having the effect of stifling the initiative to invent or innovate. The Department should also recognize that, while obtaining only that proprietary information essential to accomplishing Government purposes, the price should be commensurate with the value of the information received.

Recommendation

The stated policy of the Department of Defense to provide incentives to encourage private innovators' participation in the development of defense products should be reaffirmed and promulgated. The reaffirmation of policy should be supplemented by directives:

(a) To improve procurement practices by requiring the submittal of bid samples in the procurement of catalog items;

(b) With respect to patent rights, to define "Subject Inventions": as

(1) Those inventions originally conceived pursuant to the research and development work specifically called for by a Government contract; and

(2) Those inventions conceived prior to the award of a Government research and development contract which have not been reduced to practice constructively or actually prior to said award, and are first actually reduced to practice pursuant to the research and development work specifically called for by the contract; and acquire for the Government a royalty free non-exclusive license in patents based on Subject Inventions, for Governmental purposes; and

(c) With respect to Rights in Data, to obtain only that proprietary data essential to accomplishing Governmental purposes other than manufacture or reprocurement, and to establish new basic categories of data rights:

(1) Unlimited—including publication rights;

(2) Limited—prohibited for reprocurement or manufacture, and

(3) Production—right to use (license) for procurement and manufacture.

Program Management

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Top Defense management attention is frequently given only to those developments with high public visibility. The concentration of top Defense management attention on these selected major systems has permitted program management for less visible major systems and for minor developments to continue to flounder. Significantly, recently undertaken corrective action has been directed at major high-cost and controversial programs. Unfortunately, there are far too many development programs for each to be addressed on an ad hoc basis. Basic directives must be modified and ground rules must be devised for program management in general if the fundamental weaknesses of program management are to be eliminated.

The weaknesses of program management have been increasingly aggravated by the growing breadth of responsibility and complexity of tasks of the Program Manager. With the increased application of the systems concept of development, Program Managers find themselves responsible for administering a fixed-price contract for development of a product to detailed design specifications in which they are permitted little flexibility for technical trade-offs. In systems developments, a Program Manager is also likely to be given responsibility which encompasses a span of sub-elements involving a wide variety of disciplines and technological skill, the aggregate of which he may well be inadequately trained to handle.

A shift in emphasis toward separate component developments, as previously discussed, could result in a more feasible scope of management for the Program Manager, and thereby contribute more to the elimination of program management weaknesses than would any particular change in the organization of reporting relationship of the project management.

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Management Systems

During the past decade, the trend in government contracts for developments has shifted markedly from cost-plus-fixed-fee toward fixed-price contracts, many of which have embodied incentive features. On the surface, this trend would appear to diminish the required level of detailed management by the Defense Department of Contractors' activities. Paradoxically, however, the same period has been marked by a multiple increase in the number and detail of management control systems contractually imposed by the Defense Department.

A number of factors evidence the excessiveness of the existing level of management control systems. For example, the sheer volume of reporting requirements exceeds, by a substantial margin, the review capability of managers within the Department of Defense. More significantly, the increase in management control systems has not cured the cost overrun or schedule delay problems. A reduction in management control systems would both reduce the reporting load imposed on industry by that portion which is duplicative or serves no useful purpose, reduce the cost to the Department, and improve the effectiveness of management control.

This problem has been formally recognized and acknowledged since 1966, when the Department initiated a management systems control project, and established an office under the Assist-

ant Secretary of Defense (Comptroller) as the central responsibility within the Department for this area. In 1968, sound policy guidance was issued and two Department of Defense Instructions to implement that guidance were published.

Despite the issuance of policy statements and the assignment of specific responsibility for the control of development of management control systems for use in the acquisition process by the Department of Defense, there has been little standardization or reduction in the number of management control systems contractually applied. So many management control systems now exist that the process of review and analysis, to determine what should be the revisions and consolidations and/or cancellations of the thousands of existing management control systems documents, consumes an inordinate amount of time. . . .

Recommendation

The Secretary of Defense should establish a small staff within the Coordinating Group reporting to him and assign it the responsibility of effecting both a major improvement and reduction in the control and information needed for management within the Defense Department and, in turn, of its defense contractors. This should be done by specifying what is required, not dictating how to manage. Immediate top-level support to follow the current management system control project through to its successful conclusion should be one of the first actions. Included in this action should be direction to implement Instructions 7000.6, "Development of Management Control Systems Used in the Acquisition Process," and 7000.7, "Selection and Application of Management Control Systems in the Acquisition Process," with the control responsibility specified therein for the Assistant Secretary of Defense (Comptroller) reassigned to the Coordinating Group.

Cost Estimating

Studies reveal that on the average, cost estimates on major systems developments have probably improved in relative accuracy over the past fifteen years. So many variables affect the evaluation of cost estimates, however, that confidence in such a conclusion must be qualified. In any event there is much room for improvement.

Cost estimating for development programs has apparently been too widely credited in the Defense Department, in industry, in the Congress and by the public with a potential for accurate prediction which is belied by the inherent technical uncertainties in developments. The precise problems which may be encountered in the process of attempting to convert a technological or scientific theory or experiment into practical, producible application cannot be foreseen with accuracy. It should be axiomatic that one cannot place a price on an unknown; yet, the increased resort to fixed-price contracts, the use of pre-contractual cost estimates as a firm baseline for measuring performance throughout the life of the system, and the shock reaction which is forthcoming when cost overruns or growths are experienced, all evidence an unwarranted degree of confidence in cost estimates.

The inherent limitations on cost estimation imposed by technological uncertainties cannot be completely overcome. Other factors, however, also contribute to the inaccuracies of cost estimates. The understandable incentives to sell a development program, either to senior decision makers in the Executive Branch or to Congress, can influence cost estimates to be on the low side. Contracting policies and procedures also have a tendency to suppress the level of cost estimates. The cost estimates must be used as a basis for requesting and justifying authorizations and appropriations. In addition, the competitive pressures on prospective contractors during Contract Definition, as previously discussed, leads to overoptimistic proposals which support the original cost estimates rather than take into account the possible effects on costs of the inherent uncertainties.

"Parametric" cost estimation techniques offer the potential for improved planning of cost factors. These parametric techniques require the analysis of historical data to establish some broad gauge such as cost per pound for component units of the program being evaluated. The broad nature of the product of this type of analysis precludes detailed comparison with the estimated program costs developed from its elements, but the difference in gross totals can indicate a probable range of magnitude of the costs of contingencies. The Department has, to some extent, recognized a significant portion of their potential. The use of the parametric approach to cost estimation is, of course, a clear acknowledgement of the inherent limitations and imprecision of any cost prediction methods.

Whatever method or methods of cost estimating are used, the availability of a data base on previous programs is essential, and the extent of availability of such data in usable form is a limiting factor on the potential accuracy of cost predictions. Efforts are being made to collect systematically and preserve such data on contemporary developments. Only time will provide an improved data base for projection.

The potential accuracy of cost estimates also varies according to the time period in which it is made, relative to the phase of the development program. Cost estimates made early in the concept formulation phase cannot be expected to yield the accuracy which is possible for such an estimate made after the first stage of actual development.

Cost estimating capabilities also fluctuate with the relative complexity of developments. They are most difficult and least credible for complex operational system developments.

While every effort should be made to improve cost estimation capabilities through compilation of a more extensive data base, wider use and more reliance on parametric techniques and a continuous effort to achieve objectivity in estimation, the most fundamental problems associated with cost estimation cannot be resolved without a general recognition and acknowledgement of the inherent limitations of cost estimates for development programs.

For this reason, the original cost estimates should be considered only as the initial baseline and as more knowledge is gained these estimates should be revised and a new substantiated baseline established. This approach should be incorporated into the Selected Acquisition Reports (SARs) used within the Department and by Congress.

Recommendations

The management cost information needed within the Department and for visibility to Congress on major weapon systems acquisitions should be improved by recognizing the evolutionary nature of cost baseline estimates. Estimates should be reevaluated at each significant milestone of development.

Increased use should be made of parametric costing techniques to improve the quality of original and subsequent estimates, and to help offset the difficulties of estimating the cost of unknowns.

Industry Weaknesses

A review of the defense development process would be incomplete without a discussion of the role of industry and its share of the responsibility for the problems within the process.

One serious weakness of industry is the tendency toward overresponsiveness to every expressed or implied desire of Department of Defense personnel. Overresponsiveness should not be substituted for the exercise of responsibility. As a management team member, it is the responsibility of industry to point out to the Department the true nature of acquisitions and developments as seen by industry. For example, the following are areas in which industry has demonstrated an overresponsiveness on specific developments:

(1) Unquestioned acceptance of inefficient and unnecessary management control system requirements and related data items.

(2) Failure to point out the potential risks associated with the inherent technical uncertainties in the development of a specific weapon system.

(3) Overoptimistic cost estimates and, in some cases, unwarranted buyins.

(4) Unquestioned acceptance and, in some cases, promotion of overly sophisticated design solutions to satisfy the stated requirements.

Industry has also demonstrated reluctance to have a continuous meaningful dialogue on certain procurements by communicating to the government Program Manager potential major technical, cost or schedule problems as soon as they are first identified.

Another weakness originates in the possible belief by a contractor that he has obtained his contract wholly or in part through political favoritism or pressure; this can seriously undermine the authority of the Program Manager. The degree to which the Program Manager's authority is undermined does not depend on whether or not there was, in fact, a political motivation in the selection of the contractor, but on whether the contractor believes such was the case.

Some existing practices contribute to beliefs by contractors and by the public that political influence can and does affect the selection of contractors. It is and has been customary for the Executive Branch to provide members of the Congress with 24 hours notice of contract awards in their States or Districts, as the case may be, prior to the public announcement of the contract award. Frequently, therefore, contractors and the public learn of the contract award from a Senator or Congressman prior to the public announcement. This gives rise to an inference, however much belied by the facts, that the political officeholder making the announcement of the contract award had some influence on the selection of the contractor.

Potentially, the most serious weakness is the trend of the demonstrated reluctance by industry, whether justified or not, to commit resources to defense business. If this trend continues, the Nation's defense posture will be seriously weakened, as a dedicated industrial capability is essential to maintaining that posture.

Many of the recommendations in this report are specifically addressed to making a substantial improvement in the overall defense procurement environment. Even though the environment is largely controlled by the Government, industry must also assume a more responsible role if the full potential for improvement in the environment is to be realized, and the rising cost of weapon systems stemmed.

Recommendations

Individual contractors should accept a more responsible role as management members of a defense development team, and provide the Government with the benefit of greater objectivity in the contractor's independent evaluation of a proposed development.

The practice of providing the members of the Congress 24-hour advance notice of contract awards should be discontinued. Such members should be notified concurrently with public announcement of contract awards.

Defense Laboratories

The purposes of Defense Laboratories are to: (1) maintain national competence in areas of technology peculiar to military needs; (2) provide a technological capability for quick response to unpredictable needs and opportunity; (3) provide a working interface between military commanders and planners on the one hand and the technological community on the other; and (4) act as advisors in the Defense RDT&E contract program.

Overall, the productivity of Defense in-house laboratories appears low compared to the very substantial investments in them. This is particularly true with respect to Army Laboratories, and those Army Laboratories connected with arsenals appear least productive.

Consolidation of laboratories and centers to achieve a more nearly matched functional alignment with the scope of normal problem areas is very badly needed. Efforts at consolidation are being made, but the rate of progress is far too slow. . . .

The Defense Laboratories and test centers suffer from a rigid personnel system which inhibits qualitative improvements to the technical staffs and fails to promote or move the more competent people into leadership positions. . . .

The Defense Laboratories and test centers, in addition to their in-house work, actually manage about 15 percent of the Defense Research and Development work done on contract. This circumstance presents a conflict-of-interest problem. The laboratories as developers are in competition with private contractors, and are also managers of the contracts under which their competitors operate. There is an inclination on the part of some laboratories to show favor to products "invented here" and to view

very skeptically any products "not invented here." The R&D laboratories are located far down in the organizational structure within organizations which have much broader responsibilities than just R&D. There is no R&D chain of command from bench to the policy level. Consequently, close monitorship to control the "not-invented-here" attitude is impossible.

Recommendations

The Advanced Research Projects Agency (ARPA) and the Defense Test Agency (DTA) should be directed to make a joint review to determine which in-house defense laboratories and test and evaluation centers are essential to research and development needs of the Department with the goal of eliminating the nonessential ones, and consolidating (across Services) the remainder.

A procedure should be authorized by Statute whereby all or a part of the proceeds from the disposal of existing defense laboratories or centers can be used for construction of a new facility or expansion of an existing one which such construction or expansion has been authorized by Congress.

Close attention should be given to the possible advantages of having some of these laboratories and centers government-owned but contractor-operated.

Operational Testing and Evaluation

Everyone seems to agree that Operational Testing and Evaluation (OT&E) is very important; however, there are siginificant differences of opinion as to what it encompasses, what its proper objectives are, and what organization and methods are necessary to accomplish it most effectively.

It has been customary to think of OT&E in terms of physical testing (under various designations such as operational suitability testing, employment testing, service testing, or field experimentation). It is essential to recognize that the primary goal of OT&E is operational evaluation, and that while operational testing is very important it is only one method of evaluation. To be effective, OT&E must be a total process, using all appropriate methods of evaluation, which spans the entire cycle of a system from initial requirement until it is phased out of the operational forces. If OT&E were limited to physical testing, it would lose much of its opportunity to contribute to decisions on whether to produce a system, and would seldom be able even to influence the system's characteristics and capabilities in any major way.

Much OT&E does, however, involve physical testing and, therefore, it is important to distinguish between "functional" testing and "operational" testing.

Functional testing (often called engineering testing) is done to determine how well various systems and materiel meet design and performance contractual specifications—in other words, whether they meet technical requirements.

By and large, functional testing in and for the Department of Defense appears to be well understood and faithfully executed. Serious policy deficiencies are not apparent, and such failures in functional testing as occur can be primarily attributed to lack of technical competence, oversight, or procedural breakdowns. Functional testing is not considered to be a major problem area.

Operational testing, on the other hand, is done to determine to the extent possible whether such systems and materiel can meet operational requirements. It must provide advance knowledge as to what their capabilities and limitations will be when they are subjected to the stresses of the environment for which they were designed (usually combat). Operational testing must take into account the interface with other systems and equipment, tactics and techniques, organizational arrangements, and the human skills and frailties of the eventual users.

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Currently, there is no effective method for conducting OT&E which cuts across Service lines, although in most actual combat environments, the United States must conduct combined operations. The interactions among Services become extremely important during combat, and critical military missions transcend Service boundaries and responsibilities (for example Close Air Support, Reconnaissance, and Air Supply). Because of the lack of joint OT&E, it is not only very difficult to detect certain kinds of deficiencies and to predict combat capability in advance, but it is also difficult to make decisions relating to overall force composition.

Funding throughout the Department of Defense has been and continues to be inadequate to support much necessary OT&E. Also, the funding of OT&E is confused, both at the OSD level and within the individual Services, and neither in OSD nor in any Service is there a single agency responsible for insuring that OT&E is adequately funded. In fact, there is no agency that can even identify the funds that are being spent on OT&E.

Funding within the individual Services differs substantially. In general, however, OT&E funds are difficult to identify because they come from several budget categories such as RDT&E and Operations and Maintenance (O&M). Because funds earmarked for OT&E do not have separate status in the budget, or in program elements, they are often vulnerable to diversion to other purposes.

It seems evident that separate program elements for OT&E must be established within the Services if OT&E is to receive the financial support required, and prohibitions provided against diversion of OT&E funds. Even then, OSD must assume the responsibility of insuring that the Services budget adequately for OT&E.

Recommendations

A separate program category should be established for Test and Evaluation.

The responsibility for overview of Defense test and evaluation effort should be assigned to the Defense Test Agency. In addition, the Agency should be responsible for design or review of test designs, performing or monitoring of tests, and continuous evaluation of the entire test and evaluation program.

Procurement

The complex and dynamic Defense procurement environment and the associated procurement process are characterized by a variety of significant and increasingly serious problems.

Statutory Framework

The basic statute controlling procurement by the Department of Defense, except of land, is the Armed Services Procurement Act of 1947, as amended, now codified and incorporated in Title 10, Chapter 137 of the United States Code.

The Armed Services Procurement Act is at variance with the realities of Defense procurement and adds considerably to the overhead costs of the Department of Defense. The Act stipulates that procurement contracts are to be made by the use of formally advertised contracting methods, but to this general rule the Act provides 17 conditions of exception under which negotiated contracts may be used.

The priorities established by this statute do not reflect the realities of Defense procurement. Actual Department of Defense procurement needs are such that only 10 to 12% of the Defense procurement dollars is spent through the method of formally advertised procurement which is established in the statute as the general rule.

When a contract for procurement of goods or services is negotiated, it must be under the authority of one of the 17 statutory exceptions to the general rule and such actions, as noted, involve 88 to 90% of the dollars involved in Defense procurement actions. When a contract is negotiated, the statute prescribes that the procuring agency must prepare a Determination and Finding (D&F) documenting the conditions and circumstances and justification for utilization of the particular exception to the general rule for procurement. The D&F must be attached to the copy of each negotiated contract, which must be filed with the General Accounting Office. The Determination and Finding is also required by statute to be kept on file in the office of the officer making the D&F for a period of six years.

The consequence of the statutory prescriptions and the D&F requirements place the officers of the Department of Defense in the position of being required to document and explain why they are using the most appropriate procurement method rather than an inappropriate one. The preparation, review, submission and filing of the required D&Fs demand and receive a significant amount of personnel effort including that of the various Secretaries and Assistant Secretaries of each Military Department.

Although the Armed Services Procurement Act is the principal statutory authority for Defense procurement, it is by no means the only statute governing such procurement. There are approximately 40 separate statutes which affect Defense procurement. These statutes cover such diverse matters as budgeting and accounting, small business, freedom of information, assignment of claims, adjudication of claims, limiting contracts to available appropriations, extraordinary contracting authority for national defense needs, degree of finality and judicial review of agency decisions on contracts, performance bonds, renegotiation, labor standards on public contracts, anti-kickback provisions, convict labor, Buy American, conflict-of-interest, and procurement of supplies made by prisoners and the blind.

In certain respects, the procurement laws are dated; that is, they do not take into account legitimate and useful techniques developed and put into use subsequent to the passage of the procurement laws. For instance, the law accords no recognition to the variety of incentive-type contracts which have emerged in recent years.

Armed Services Procurement Regulation

The principal Department of Defense procurement regulation is the Armed Services Procurement Regulation, commonly referred to as "the ASPR," which is to implement the provisions of the Armed Services Procurement Act, other statutes relating to procurement, Executive Orders, Bureau of Budget circulars and, as appropriate, judicial decisions. The provisions of the ASPR are applicable to the procurement of all Department of Defense materiel and services which obligate appropriated funds, except transportation services procured by transportation requests, transportation warrants, bills of lading and similar transportation forms.

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The principal deficiencies with the ASPR are as follows:

1. The ASPR contains a mixture of procurement policies, practices and procedures which obscures procurement policy, making it difficult to identify, interpret and to comply with.

2. The complexity of the ASPR structure is unrealistic in that its provisions and prescribed practices are difficult, if not impossible, to use within the highly stratified organization administering Defense spending programs, particularly in view of the various procurement personnel grade levels responsible for compliance with the ASPR.

3. The ASPR is in a continuous process of change, a fact which impedes the timely processing of procurement actions, and consumes an inordinate and expensive amount of time of the procurement personnel responsibile for compliance with the ASPR.

The ASPR is expanded and supplemented by each Military Department, the Defense Supply Agency and the Defense Contract Audit Agency by means of their separately developed and maintained procurement regulations.

From a substantive standpoint, the ASPR gives minimum emphasis to the need for maintaining an adequate industrial base, although the Armed Services Procurement Act gives policy recognition to this consideration with a specific exception (No. 16) to the general rule requiring advertised bids.

In addition to the complex framework of procurement regulations, there is an abundance of Department of Defense and Military Service directives, instructions, memoranda and other guidance material, including circulars, handbooks and guides, which have a pronounced impact on Defense procurement. These documents deal with organization and management, and administrative policy concepts and procedures. Procurement personnel must be governed in practice by these constraints, as well as by the procurement family of regulations.

The Department of Defense directive and guidance system results in an avalanche of paper instructions which are duplicative, overlapping and sometimes contradictory. There is no evidence of a concentrated attempt to reduce the number and scope of the directives and guidance, or to make these documents consistent and har-

monious. The need for assessment and review is conspicuous.

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Recommendations

The Secretary of Defense should recommend to the Congress and to the existing commission on Government-wide procurement that the Armed Services Procurement Act and other applicable statutes be amended to reduce or eliminate the requirement for Determination and Findings on all negotiated contracts, to reflect the practicalities of Defense procurement needs and activities which result in most Defense procurements being accomplished by other than formally advertised methods, and also to reflect the various new types of contracts developed in recent years.

The Armed Services Procurement Regulation (ASPR) and the ASPR Committee System should be reviewed with the objective of formulating a more efficient managment organization for incorporating changes into the ASPR and with the view toward reduction in the volume and the complexity of the ASPR.

In the implementation of procurement policy, due regard should be given to the need for an adequate, but not excessive, industrial base.

Improvement should be effected in the acquisition, training and retention of procurement personnel, with emphasis on a promotion system for contract negotiators which will not necessarily remove them from negotiating activities.

Industrial Mobilization Base

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It is imperative that a viable industrial mobilization base be established and maintained. However, it does not now exist under the concept of Department ownership of industrial plants and plant equipment. The Department should reexamine its present holdings and, as a matter of urgency, develop and implement a plan to assure that emergency production of high priority war materiel can be initiated quickly and effectively. This can be achieved in many cases only by maintaining an active production life.

The Department continues to buy plant equipment and provide it to contractors on the theory that it is cheaper to maintain ownership of the equipment than to allow the contractors to charge it off to the contracts.

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Adequate information is not available to determine the full costs to the Department of maintaining ownership of industrial plant equipment; to procure, provide to a contractor for a specific contract, reclaim and store at the end of the contract, and maintain inventory records to permit its reuse when needed. However, it is apparent that the Department is not doing an effective or economical job under the present concept.

Recommendations

The Department of Defense should consider buying and providing industrial plants and equipment to contractors only when it can be clearly shown to be to the economic advantage of the Government or when it is essential to the Department's plan to provide a viable industrial mobilization base. Contractors should be encouraged to provide necessary industrial plants and plant equipment, and should be permitted to charge off peculiar plant equipment against specific contracts.

A program should be initiated for the Department of Defense to divest all plant equipment where ownership cannot clearly be shown to be to the economic advantage of the Government.

A plan should be developed and implemented to assure that emergency production of high priority war materiel can be initiated quickly and effectively.

The responsibility for maintaining an inventory and control of Department-owned equipment should be assigned to the Assistant Secretary of Defense (Installations and Procurement).

Logistics

It is clear that significant military logistics improvement can be achieved through efficient, coordinated exploitation of new technologies in the areas of transportation, communications, automatic data processing (ADP), and Integrated Procurement Management. To date, however, the full potential of these new technologies has not been realized, nor will they be realized in long-range logistics programs that are presently proposed by most of the Military Services.

Supply, Maintenance and Transportation

The potential for increased efficiency and improved effectiveness by standardizing or integrating logistics management and activities has long been recognized. Efficient, coordinated exploitation of new technologies in the areas of transportation, communications and automatic data processing offer increasing rewards in effectiveness of logistics support and cost savings.

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Because the impact of logistics integration has fallen primarily on the procurement and initial inventory management phases, the resulting improvements in effectiveness of support of Unified Commands in the field have been minimal compared to the improvements which are possible. The benefits of standardized and integrated logistics have not been extended overseas to any appreciable extent. Defense Supply Agency responsibilities do not extend overseas. Overseas logistics management is currently the responsibility of four organizational units,—one in each Service—each of which has many elements. Because of inherent and continuing differences among these organizations, the Unified Commander must accommodate different terminologies, different measures of logistics performances and, most unfortunately, different degrees of readiness.

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There is a close interrelationship between the degree of logistics integration and the use of automatic data processing.

Automatic Data Processing. A distinguishing mark of the decentralized and fragmented supply system in the Defense Department is the proliferation of Automatic Data Processing (ADP) systems and programs which are largely incompatible, both intra-Service and inter-Service. This results not only in weaknesses in inventory management and distribution imbalances, but in high and increasing costs of ADP software for a variety

of ADP programs to accomplish the same types of functions. The aggregate costs—and confusion—resulting from the development and periodic upgrading, as advanced computers are required and acquired, of ADP programs for each class of supplies by the DSA, the four Military Services and the theater logistics commands, with minimal compatibility, critically impact on the Department's effectiveness, efficiency and economy. The long-range logistics programs under consideration by most of the Military Services will not remedy this problem.

Maintenance. Maintenance is the ultimate consumer of all technical supplies and materials acquired by the Department of Defense for support of military hardware—a consumption which amounts to approximately five billion dollars annually. Investment in industrial tooling, equipment and facility capability to support this maintenance function accounts for approximately another one billion dollars annually. About one-third of all Department of Defense personnel are involved in the maintenance function.

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Transportation. All of the Services have extensive organic[4] transportation resources, and each of the Military Departments is the "single Manager" for some "common user" transportation service.

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The "common user" activities are the Military Airlift Command (MAC), for which the Air Force is Executive Agent; the Military Sea Transportation Service (MSTS), for which the Navy is Executive Agent; and the Military Traffic Management and Terminal Service (MTMTS), for which the Army is Executive Agent.

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In summary, the logistics system of the Department of Defense is decentralized and fragmented in functional assignment. However, this is not critical in such activities as procurement and the initial warehousing phase (excluding a part of wholesale supply, retail supply, maintenance, traffic management and transportation). Efforts of the Congress and the Office of the Secretary of Defense to improve efficiency and effectiveness of the other activities through standardization of procedures and approaches have achieved very limited improvements. As a consequence, the current inventory management, distribution, maintenance, and transportation systems are needlessly inefficient and wasteful, and even more important, fall far short of the potential for effectiveness of support of combatant commanders.

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Integration of supply, maintenance and transportation functions for the support of Unified and Specified Commands can substantially improve the effectiveness of logistics support while at the same time achieving greater efficiency and economy. A unified vertically-oriented supply and transportation system, including maintenance, should be organized for support of all combat forces, both those overseas and those held in the United States ready for oversea deployment. With a vertical system, integrated from Continental United States through theater management, items could be moved from the United States to overseas commands without financial transactions, and as easily withdrawn in necessary redistribution actions, since supplies in the United States and all theaters, within a given supply class, would all be accounted for within the same stock fund or working capital fund.

Effective logistics integration will require an advanced computerized control and information system, without which the resultant system would be that of a confederation with subdivisions so loosely connected that few of the benefits of union could be achieved. There are significant disparities among the levels of sophistication of ADP systems the Services have achieved to date. The Air Force, with experience at a relatively high level of technical sophistication, has planned a highly advanced systems concept for the 1970s. The Navy, with a wholesale control system in some ways more advanced than the system the Air Force seeks to replace, is designing an advanced logistics system. With reasonable effort, these systems can be brought together. The Army, however, is in the process of implementing a system that is in some ways less advanced than the one the Air Force seeks to replace. In developing a logistics ADP system with common elements for all Services for those functions to be shared, the first step is to stop all current development and procurement activity not necessary for support of near-term operations. In view of the practical problems connected with an integration of these logistics functions, a phased approach is clearly necessary.

Recommendations

The responsibility for providing supply distribution, maintenance and transportation services to the combatant forces in Unified and Specified Commands under the Strategic and Tactical Commands should be assigned to the unified Logistics Command.

The Logistics Command should be assigned the traffic management and terminal management functions now allocated to the Military Traffic Management and Terminal Service (MTMTS), the Military Sea Transportation Service (MSTS) and the Theater Traffic Management agencies.

The Military Airlift Command and Military Sea Transportation Command both should be assigned to the Logistics Command.

The Logistics Command should be directed to develop, under the policy guidance of the Assistant Secretary of Defense (Telecommunications), an ADP logistics system to encompass supply distribution elements that can be shared among the Services, and all development and procurement activity toward separate ADP logistics systems not essential to support of near-term operations should be suspended.

[4] *Assigned as integral equipment of the using command.*

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Development Concept Paper

A second major process by which allocation of resources is managed is the Development Concept Paper (DCP), although the DCP is also used for management in the utilization phase.

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When applied to major systems, the DCP has many advantages as a management tool. For general effective use in this area, however, it will require the acquisition and training of personnel in the preparation of DCPs, in order to attain an acceptable standard of quality, which does not now appear to exist. The DCP will continue to be only a tool for management and its limitations should be recognized. Potentially, it could foster an ad hoc management approach for each major development, which could obscure the necessity for structuring and maintaining an overall organization which is effective and efficient. It can also foster a tendency to establish a direct reporting relationship between Program managers and senior decision makers in OSD in each individual case, that, in the aggregate, can overtax the feasible span of control of the senior decision makers.

The application of the DCP format and procedure to research and development areas beyond major system developments portends a degree and span of centralized control by Defense Research and Engineering which is infeasible for efficient management. Major developments have such significant cost consequences that decisions must be reserved to the Secretary of Defense; decisions on lesser programs can more safely be delegated if organization is structured so as to permit precise designation of accountability and maintenance of visibility. Program approval and review can be managed through effective use of the Planning, Programming, and Budgeting System (PPBS). Extension of the DCP process beyond major system developments could seriously overlap the management potential of the PPBS and result not only in needless duplication, but also in overmanagement at top levels.

Recommendations

The Development Concept Paper should not be employed as a management tool for areas of research and development other than major systems developments.

Selected Acquisition Report

The Selected Acquisition Report (SAR) system is a management tool for reporting in detail the original and current estimates of program costs, schedule and performance to top management, and for measuring changes in these factors. The SAR is applied to major development systems.

Efforts are in progress to collect actual contractor costs through the Bureau of the Budget approved Cost Performance Report, to be used in connection with SARs. To date, efforts to collect accurate data for the SARs have reportedly not been very successful.

The basic approach to the SAR is the establishment of a baseline of estimated costs, schedules and technical performance, and the subsequent measurement of the present status against this baseline. Unfortunately, both in concept and in actual practice, baseline reporting in the SAR has led to distorted and unreal use of figures, and a misplacement of management emphasis.[5]

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The SAR approach ascribes an importance and prophetic accuracy to estimates that simply do not exist. Estimates must be recognized for what they often are—educated guesses as to what the future holds. The SAR has tended to shift the objective from that of producing the best possible weapon to that of maintaining a set cost and schedule regardless of what experience and later events show to have been the wisest course.[6]

[5] *See Cost Estimating Section, page 30.*

[6] *See Recommendation following Cost Estimating Section on page 31.*

Recommendation

The Selected Acquisition Reports in their present formats should no longer be used as management tools.

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Telecommunications

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Office of the Secretary of Defense and the Joint Chiefs of Staff. Overall policy guidance and management of telecommunications matters is now widely diffused throughout several elements of the OSD staff, largely as a result of the functional design of the organization.

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At best, the fragmented responsibilities in the Office of the Secretary of Defense generate difficulty in coordinating all of the individual considerations which may arise in an issue, even on such an issue as a discrete weapon system. The problem is greatly magnified when dealing with a commodity or service such as telecommunications which, by the nature of its universality throughout the Department requires corporate management to optimize costs and mission effectiveness.

Within the Joint Chiefs of Staff (JCS), as within OSD, the responsibility for the overview of telecommunications matters is fragmented throughout several functional offices. And, of course, the Director of DCA reports through the JCS to the Secretary of Defense.

Research and Development (R&D). The basic responsibility for R&D efforts lies with the Director of Defense Research and Engineering (DDR&E). The Director of the Defense Communications Agency (DCA) exercises management direction over those R&D activities of the Military Departments which directly relate to the Defense Communications System (DCS). The Military Departments directly manage all other R&D efforts under the guidance of DDR&E. The R&D is either carried out in the Defense laboratories, or under contracts generally administered by them.

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Management

The most obvious weakness of the organization structure is the absence of unitary management at the top

level to assure effectiveness and efficiency from an overall Department of Defense mission point of view, rather than from an individual Military Department's point of view.

OSD is the only level of the management structure with overall Department of Defense perspective which can be given sufficient authority to assure appropriate standardization, compatibility and inter-operability among DCA and the Military Department elements of telecommunications, while protecting the integrity of the mission requirements of the individual combat, contingency and support commands. It is the only level in a position to objectively balance mission capability and cost. This level should be restructured, and staffed with appropriate expertise to provide effective staff management from a total Department of Defense point of view of (1) all telecommunications resources and (2) all operations and engineering matters relating to telecommunications.

In June 1970, a position of Assistant to the Secretary of Defense (Telecommunications) was established. This ATSD(T) was assigned broad, consolidated functions and responsibilities in the telecommunications area in response to the problems created by the lack of single management from the OSD level. The responsibilities assigned to the ATSD(T) are consistent with the conclusion of the Panel.

Recommendations

The responsibility for defense telecommunication activities should be under the staff supervision of the Assistant Secretary of Defense (Telecommunications). The Assistant Secretary of Defense (Telecommunications) should be directed to review all defense communications activities with the goal of eliminating inefficient duplication; specifically, for example, those telecommunications activities of the existing Air Defense Command (ADC) which can be effectively merged into other telecommunications operating activities of the Military Departments. The Assistant Secretary of Defense (Telecommunications) should also be directed to assure that each major element of the telecommunications community in the Department generates professionally planned and managed education, training and career development programs for its engineers, researchers and managers, both civilian and military.

The responsibility for all existing and future defense long-haul transmission systems, regardless of their current or intended use, should be assigned to the Defense Communications Agency as part of the Defense Communications System, except those vehicular and air transportable types when held as contingencies or while in temporary deployment for active combat support. In addition, the Defense Communications System (DCS) should be redefined so as to include base, post, camp and station telecommunications in the United States and garrison (permanent) type installations overseas. The DCA should also be assigned the fiscal control of DCS elements. The communications and electronics officers of the Unified Commands should be under the operational and technical supervision of the Defense Communications Agency.

The Air Force Ground Electronics Engineering Installation Agency (GEEIA) and the telecommunications activities of the Strategic Air Command (SAC) should be merged into the Air Force Communications Service (AFCS).

Automatic Data Processing

During the next decade, computer systems will undoubtedly continue to develop at a rapid rate. It is anticipated that the larger computer systems in 1980 will have as much as 100 times the capacity of the largest system today, and that the medium-scale computer, which is the backbone of the Defense Department's system today, will be substantially replaced by a combination of the new, larger computers and small, desk-type computers.

Another major change will result from telecommunications between computer and computer users. Indications are that most computers will be on-line with teleprocessing capability by 1980. At the present time, the majority of the Department's computers cannot be used in this mode.

The challenge which the Department continues to face is that of design and development of standard Department-wide ADP systems. The history of ADP development clearly shows the need for and benefit of progressive standardization, at least for compatibility. Standard systems were first introduced at the Command level, and were followed by the development of Service-wide systems. Today's primary challenge is at the Department of Defense level.

For example, at the present time, the Army is developing a system which encompasses the Army Logistics Command function. The Air Force is currently working on an Advanced Logistics System, which performs the same functions as the Army system. The Navy is planning a redesign and updating of their Uniform Automatic Data Processing System, which supports their key logistics functions. Many of the modules of these systems perform almost identical functions, such as warehousing, shipping and receiving, inventory control, etc. Software programming for each of these is costly and each independent modernization step taken on the many separate programs involves unnecessary duplication and appears to lock in more tightly the incompatibilities of the various systems. This same observation applies to other functional areas, such as personnel management systems and base level management.

Hardware and Software System Design Capability

The Department is almost completely dependent on hardware manufacturers for system design[7] for hardware and software. Those individuals within the Department who are competent in system design are scattered among the various components of the Department and their efforts are directed primarily to other activities such as development of application programs or information systems. The lack of in-house system design capability necessitates placing a substan-

[7] *Systems Design—Hardware. This activity includes the design of the overall computer hardware system. This design consists mainly of the selection among equipment available from commercial suppliers including independent peripheral manufacturers. This activity will establish the necessary interfaces required to interconnect the equipment available from*

tial load of system design work on potential vendors as a condition of responding to Requests for Proposals. This condition has a tendency to limit response to the larger suppliers, and, even within this group, to those suppliers who assess their competitive position as being very high. The net effect inhibits competition for hardware procurements.

The lack of an in-house capability for hardware system design deprives the Department of the potential for improved efficiency and lower costs to be obtained from selection among separately priced elements of a computer system available from commercial suppliers, including independent peripheral manufacturers. This lack of capability also prevents the Department from promoting a higher degree of separate pricing and increased competition through the development by manufacturers of hardware elements with a broader interface capability. The potential losses from this lack of in-house capability will increase as the unbundling trend in the private sector continues. It is becoming increasingly important for the Department to have a capability to develop interface standards. In the continued absence of such a capability, the Department will be unable to keep its ADP policy sufficiently flexible to anticipate and take advantage of continuing changes in the ADP field.

There is no significant software systems design capability in the Department. Such capability as exists is widely dispersed and focused on narrow spectrums, usually tied to specific applications. As a consequence, no effective mechanism exists for development of more flexible languages, compilers, executive monitors, data storage and retrieval software, operating systems, translators and liberation programs, etc. Current practice makes the Department highly dependent on hardware manufacturers for design of systems software. The manufacturers have no incentive to provide increased flexibility to the Department which might increase the Department's independence of the supplier's particular machine and increase Department-wide compatibility of ADP programs.

Justification and Selection of ADP Equipment

The justification and selection of computers by the Department of Defense is controlled by procedures intended to assure that the computer is used for beneficial applications, and that the selection process provides the necessary capability at the lowest cost and promotes competition between vendors. The Assistant Secretary of Defense (Comptroller) and each of the Military Departments has prepared documents which establish these procedures.

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A major difficulty involved in the justification and selection process is the time required to complete the process and the difficulty of predicting the workload with sufficient accuracy to select the ADP system which most adequately meets the requirements over the life span of the equipment. The vast majority of estimates are lower than the actual workload by the time the system is operational, and this causes the system to be too small to perform all the required functions.

Perhaps the most serious flaw is that all this work is done to determine the best computer system for one particular process. If a broader approach were taken, an entirely different computer system might be able to accomplish that process and many others also on a more efficient basis at no increase in cost.

In many cases, the selection is made by personnel who have no first-hand knowledge of the workload, but depend entirely on the description of the applications.

This process has caused the Department some difficulties in the past, and in several cases the computer equipment selected by this process has been too small to carry the workload for even the first year. There is general agreement among Department personnel that the procedures are too complex and time consuming, and limit competition between vendors.

The elapsed time between the preparation of the first documentation describing a computer requirement and the installation of the equipment varies between a minimum of two years and a maximum of six or more years. This time is used in the preparation of the justification documents, the system specifications, soliciting bids from vendors, evaluating proposals from vendors, and obtaining equipment. Often it is necessary to repeat one or more of these steps.

The computer workload is a dynamic and changing requirement and often by the time the computer has been installed, the workload is much larger and significantly different from the one anticipated at the time the computer procurement began. The time required to change the documentation is almost as long as the initial preparation. Therefore, often the requirement is not updated during the procurement cycle and the system effectiveness may not be as high as it could have been. If the Department is to have effective and efficient computer support of its missions, the time delays in obtaining computer support must be greatly reduced.

The current procedures result in major inefficiencies within the Department. The long delay times in obtaining new or replacement equipment result in equipment being kept long beyond its useful life. The determination of useful life should be based on the cost of performing work on the equipment, not on the age of the equipment.

Another major effect of the present procedures is the installation of several small and medium scale comput-

different suppliers. It is not anticipated that the Department will design its own hardware.

Systems Design — Software. This activity includes the design of basic systems software; i.e., Compilers, Executive monitors, Data Storage and retrieval software, "liberation programs," etc. It does not include applications programs or information systems.

In-House Capability. In-House capability to perform a function or task does not necessarily mean that the work be totally performed by Department employees but that some of the Department's employees must be able to perform the task. Where work is contracted to outside sources, the Department must have sufficient depth to evaluate the work of the contractor and make selections among alternatives.

ers in the same geographical area. There are several locations which have over 50 computers. These multiple computers can result in costs which are as much as five times larger than would be necessary if a few large computers were used in a shared time operating mode.

If the Department had a system design capability, as previously discussed, the requirement for equipment could be stated in terms of the equipment's performance characteristics, rather than the specific planned application. The justification would be of the system, not of the individual equipment acquisitions, and the system could include many specific applications by today's terms.

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Recommendations

The responsibility for defense automatic data processing should be under the staff supervision of the Assistant Secretary of Defense (Telecommunications). The Assistant Secretary of Defense (Telecommunications) should: (a) take the necessary steps to enable the Department to develop an in-house capability for ADP hardware systems and software systems design needed for proper management; (b) review proposed ADP activities and monitor and evaluate on-going activities with respect to effectiveness of the utilization of resources; (c) test through model programs the feasibility of computer services/centers which could standardize and centralize the ADP system by functions (such as the major Commands) and/or geographically, with the intent of determining both short- and long-range ADP capability objectives; and (d) develop a training program for ADP specialists and a career plan for ADP personnel.

The procedures governing the justification and selection of computers should be revised to require a statement of ADP equipment capability as opposed to specification of intended application of the equipment.

Contract Studies

The purpose of contract studies is to provide a capability to the Department of Defense which is not available internally, either because it requires scarce or special skills required infrequently in any Departmental organizational element, or because independence and objectivity are a special concern. Those organizations who regularly provide contract studies frequently provide a transmission belt for ideas and information across the echelons of defense organizations.

Accurate information on the nature and extent of contract studies within the Department is difficult and often impossible to obtain. Large numbers of contract studies are performed for various elements of the Department of Defense by both profit making and not-for-profit private research organizations. There are, however, no central records of the studies that are done. . . .

There is no effective control of contract studies within the Department. While each study must be justified to get funding, there does not appear to be, at any point, an effective mechanism for establishing a relative need for the study, or for determining the extent to which the subject area has been studied previously. It appears from reviewing completed studies that many of them are not objective analyses to provide inputs to the decision process, but are rather performed to support positions known to be held by the contracting organizations.

The procedures used by the Department of Defense to contract for studies do not provide adequate safeguards to assure that the Department receives value for its expenditures. A study contract does not generally contain a stipulation as to the quality of the study to be made. The organization that wants to contract for a study works with a contracting officer, usually not a part of the organizational element wanting the study, and provides the information and justification required for the contracting. After the contract is let, the element for which the study is being done provides a technical representative who represents the contracting organization in the substantive areas of the contract study. The contracting officer and the technical representative frequently have little communication after the contract is let. The technical representative often is not consulted before periodic payments are made to the contractor. Most technical representatives are not familiar with contracting procedures, and even if they see that the contractor is not performing and will not produce a satisfactory product, they do not know what to do to protect the Department's investment.

Contracts for analytical studies tend to be let on the same basis as hardware production contracts. There is considerable evidence that they experience many of the same problems. The low bidder is not always the best equipped to make the desired analysis. One major requirement should always be an objective analysis, but often contracts are let to contractors who have a direct interest in the outcome. By bidding low, they buy information which is used to obtain an advantage in a subsequent competition for hardware or software production. The contracting officers make too little use of their authority to exclude study contractors from subsequent production contracts.

The Federal Contract Research Centers (FCRCs) are a group of special nonprofit organizations created during and since World War II. Each has a special relationship with some agency of the Federal Government. . . .

There is little doubt that each FCRC was, when created, the most effective or expedient means of providing certain required capabilities to the Department of Defense. However, both the needs of the Department and the character of some of the FCRCs have changed substantially. The Panel believes that this is an appropriate time to reassess the special relationship of each FCRC and its Departmental sponsor.

Recommendations

The Secretary of Defense should delegate to the Deputy Secretary for Evaluation the authority to establish and enforce Department of Defense policies and procedures which make it possible to account for all contract studies to reduce duplication, assure relevance, and enhance quality. Specifically, the Deputy Secretary for Evaluation should:

(a) Establish procedures to review and validate requirements for contract studies.

(b) Establish a central control record of contract studies to include

subject, purpose, cost, significant findings and an assessment of the quality of the work and the utility of the product.

(c) Establish procedures for contracting for studies to provide adequate safeguards to assure that the Department gets a product that is relevant and responsive to the requirement; assure a close working relationship between the contracting officer and the technical representative; and develop criteria for selecting contractors that will assure competent and objective support to the Department.

(d) Review each Federal Contract Research Center sponsored by the Department of Defense to determine on an individual basis which should be continued with substantially their present form and mission, which should undergo significant changes, and whether any may have outlived their usefulness as FCRCs. The study should also develop the means to make collective FCRC capabilities more widely available to Department of Defense sponsors.

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Equal Employment Opportunity Compliance in Defense Contracts

Executive Order (EO) 11246, "Equal Employment Opportunity," was issued on 24 September 1965 and amended by EO 11375 in October 1967. Among its provisions are regulations (Part II) which require that government contractors and subcontractors take affirmative action to ensure that applicants are employed and that employees are treated during employment without regard to their race, color, religion, sex or national origin. This obligation applies to the entire company, and not just to the facility involved with the specifically contracted item.

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The aspect of the Department's Contracts Compliance program which causes the most concern is the apparent conflict of the Equal Employment Opportunity and the procurement missions within Defense Contract Administration Services (DCAS). Procurement officers appear to view the contract compliance requirement as a hindrance in performing their primary procurement function. Since the contracts compliance program is essentially an audit function, the apparent conflict seems to be in the fact that the procurement people are auditing themselves. This conflict could be reduced by relieving the procurement people of the potential trade-off decision which might compromise the Equal Employment Opportunity requirements.

There are additional means, of course, of advancing the general objectives which underlie the Equal Employment Opportunity Contracts Compliance Order. There should be equal opportunity for employment for all races by contractors producing for the Department of Defense, but it is just as important that all persons have an equal opportunity, regardless of race, to be employers who contract with the Department of Defense. Procurement policies should not show preference to prospective contractors either on the basis of race, size or age of the prospective contractor as a business entity, among those capable of performing the needed service or supplying the needed materiel.

Recommendations

The Equal Employment Opportunity policy direction and guidance responsibility within the Defense Department should be under the staff supervision of the Deputy Secretary for Evaluation. A restudy and clarification of the requirement of the Office of Federal Contract Compliance and the penalties for noncompliance for the guidance of the Defense Contract Audit Agency and Defense Contractors should be obtained.

The implementation of the contract compliance program within the Defense Department should be assigned to the Defense Contract Audit Agency (DCAA). In order to fulfill its assigned annual review of contractors' facilities, additional professional and clerical personnel should be assigned to DCAA.

Procurement policies should be so formulated as to insure that there is no impediment to participation by prospective contractors with the capability to perform, regardless of the race or size of the prospective contractor, or the period which the prospective contractor has been in business.

* * * * *

Industrial Relations

The labor and union-relations policies of the Department of Defense, both as to its own employees and its relations with the policies of employers with whom the Department has procurement or other contracts, are determined primarily by the policies applicable to the entire Executive Department of the Federal Government.

As this is such a vast field, and as it is not peculiar to the Department of Defense, the Panel did not study it in depth. However, to present a rounded picture, a few comments seem called for.

First, it is obvious that the Department of Defense could not operate efficiently without the whole-hearted cooperation of its own employees and the employees of its contractors. It must also do its part to maintain good relations with unions, whether they represent their own employees, employees of their contractors, or other employees whose cooperation is essential to the operations of the Department—such as transportation and construction workers.

Second, the Department of Defense is involved in such a large percentage of the contracts entered into by the Federal Government that the Department's actions and attitudes have an important bearing on the relationships with labor of the Government as a whole. If it wants the cooperation of labor—working people and their unions—as it must, it is necessary, in turn, for it to be sensitive to the attitudes of labor.

Third, while the Department of Defense must operate under the terms of legislative mandates, executive orders of the President, rulings of the Comptroller General and others, it has the responsibility to point out to the appropriate authority any circumstances which seem to call for changes in existing procedures.

Recommendation

The Department of Defense, although not expected to act as enforcement agency of national labor laws, should support any appropriate action that would permit more flexibility in such matters, so that contracts could be withheld from companies that have been determined by appropriate authority to have flagrantly, deliber-

ately, and repeatedly violated expressed national labor policy. At the same time, the Department should not use its contracting powers to help or hurt any party involved in a union representation question, a collective bargaining agreement, or an inter-union dispute.

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Military Industrial Complex

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The Panel has not been asked to examine the level of military expenditures, nor is it qualified by composition or study to offer advice on this critical matter, but we believe it is our responsibility to comment on other interfaces between the Department of Defense and defense industry that have given rise to concern, namely: (1) the need for effective civilian control; (2) the size of profits under defense contracts; and (3) conflicts of interest.

(1) The most important of these is the need for effective civilian control, so that any tendency of a "military-industrial complex" to expand beyond the levels necessary for the security of the country can and will, in fact, be curbed. The recommendations in this Report considered this concern and were aimed at reassuring that the decision-making powers are in the hands of the duly constituted civil authorities in the Legislative and Executive Branches of the Federal Government.

(2) Concern with the military-industrial complex often appears to be founded on a belief that defense contractors make large profits, and that the desire for profits leads them to press for ever larger defense budgets.

Some years ago, there were instances of excessive profits on defense contracts. However, the rate of profits has been declining and there are now instances where profits are abnormally low or non-existent. In recent years, the only conclusion that can be reached from available evidence is that no charge of generally excessive profitability can be supported. Furthermore, renegotiation requirements applicable to defense contracts afford reasonable protection against possible excessive profits.

Profits, which constitute the principal incentive for industrial organizations, cannot be effectively adjusted to influence the level of competition for defense business by an approach based only on the average profits of large contractors or small contractors. The approach must deal both with the level of profits for all industry necessary to compete for capital, and the level of profits in each particular industrial field.

To formulate such a policy will not be easy; but the attainment of the objective can never be reached unless the first step is taken, which is to make the adjustment of incentives for industry to compete for defense business a continuing consideration in forming overall defense policy. In addition, of course, there must be careful monitoring of the profit level on individual contracts to make sure that the levels are not generally higher than necessary to attract the number of contractors, large and small, needed to fulfill the requirements.

To keep the whole subject in perspective, it is important to note that the amounts paid for research, development, and procurement are large in dollars, but still represent only a portion of the total defense budget. Even within this portion, profits are a relatively small proportion of the costs—less than 10%. Too much attention to profits can divert attention from the much larger elements of costs, quality, and performance. Costs other than profits can vary much more than the entire amount of defense profits, depending on the productivity of defense contractors and the effectiveness of their management and of the management of the Department of Defense. Implementation of the recommendations made in these latter areas can, it is believed, result in large savings over a period of years, and at the same time produce improvements in quality and performance.

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STRATCOM Forms CEEIA

The Army Strategic Communications Command (STRATCOM) has announced the formation of a subordinate command, the Communications-Electronics Engineering Installation Agency (CEEIA). CEEIA will provide centralized management and control of STRATCOM's global communications-electronics engineering and installation activities.

A–SCAN Permits Low Visibility Aircraft Landings

A helicopter landing guidance signal system is under development and test by the Army Electronics Command's Avionics Laboratory, Fort Monmouth, N.J. Called A-SCAN, the purpose of the system is to enable safer low visibility landings in small areas.

The airborne portion of A-SCAN includes a radio receiver and a transmitter for interrogating distance measuring equipment. The receiver includes a data processor to make the computations required for the final information outputs to the pilot.

The system uses three ground based units. A localizer guidance unit transmits microwave signals in a lateral sweep across the desired sector. One of two needles on a course deviation indicator in the cockpit tells the pilot when he is on the right horizontal approach path. A glide slope guidance unit "fires" radio signals over a vertical sector to establish the reference for the descent path. Derived data is indicated on the deviation indicator by a second needle, and shows the pilot his position in respect to the desired descent path. If the aircraft is approaching the landing site below the minimum safe angle, the pilot is warned by an alarm, such as a flashing light or a buzz. The third ground based unit is distance measuring equipment which tells the pilot how far he is from the landing site. The airborne transmitter sends signals to the distance measuring equipment, which sends them back to the aircraft. The time interval between the transmission and reception of the signals aboard the aircraft determines distance.

The A-SCAN system is capable of providing reliable course guidance with approach angles up to 15 degrees or more, contrasting with conventional 2- or 3-degree systems. Because the pilot can select the desired glide slope, the A-SCAN system can also be used with fixed wing aircraft.

DEFENSE PROCUREMENT

Contracts of $1,000,000 and over awarded during the month of July 1970.

DEFENSE SUPPLY AGENCY

2—The Defense Personnel Support Center Philadelphia, Pa., issued the following contract for men's wool gabardine overcoats:
Abate Clothing, Inc., Atlantic City, N.J. $1,201,783. 47,008. DSA 100–71–C–001.
Pembroke, Inc., Egg Harbor City, N.J. $3,544,500. 150,000. DSA 100–71–C–0002.
—Shell Oil Co., New York, N.Y. $1,704,003. JP–4, Com Jet A–1, 115/145, 100/130 and and MIL–L–22851A Type II fuels, and defueling and reservicing aircraft at various Eastern and Midwest airports. Defense Fuel Supply Center, Alexandria, Va. DSA 600–70–D–1738.
—The City of El Paso—International Airport, Tex. $1,412,420. JP–4, Com Jet A–1, 115/145, MIL–L–22851A Type II fuels, defueling and reservicing. Defense Fuel Supply Center, Alexandria, Va. DSA 600–70–D–1751.
—The Defense Fuel Supply Center, Alexandria, Va., issued the following contracts for various quantities of fuel oil and gasoline for use in Delaware, the District of Columbia, Indiana, Kentucky, Maryland, Ohio, Tennessee, Virginia and West Virginia:
Texaco, Inc., Long Island City, N.Y. $1,580,844. DSA 600–70–D–2130.
Sun Oil Co., Philadelphia, Pa. $1,027,-763. DSA 600–70–D–2127.
Shell Oil Co., New York, N.Y. $1,119,-953. DSA 600–70–D–2121.
Mobil Oil Corp., New York, N.Y. $1,-572,665. DSA 600–70–D–2107.
Gulf Oil Corp., Houston, Tex. $3,598,-868. DSA 600–70–D–2097.
American Oil Co., Chicago, Ill. $1,887,-792. DSA 600–70–D–2071.
7—John R. Hollongsworth Co., Phoenixville, Pa. $1,485,015. 1,990 generator sets. Defense General Supply Center, Richmond, Va. DSA 400–70–C–6287.
10—Lester D. Lawson and Co., Long Beach, Calif. $2,098,311. 122,208 ration supplement sundries pack cases. Dowell and Co., Modesto, Calif. Defense Personnel Support Center, Philadelphia, Pa. DSA 13H–71–C–B001.
16—The Defense Personnel Support Center, Philadelphia, Pa., awarded the following contracts:
Blue Star Foods, Inc., Council Bluffs, Iowa. $1,624,832. 2,183,661 5½ oz. cans of beef with spiced sauce and 2,650,080 5½ oz. cans of beef steak. DSA 13H–71–C–Z028.
Oregon Freeze Dry Food, Inc., Albany, Ore. $1,827,495. Freeze dry components for 2,640,064 long range patrol food packets. DSA 13H–71–C–Z027.
17—Tony Downs Foods Co., St. James, Minn. $1,108,466. 2,949,120 11½ oz. cans of beef slices and potatoes with gravy. Madelia, Minn. Defense Personnel Support Center, Philadelphia, Pa. DSA 13H–71–C–Z024.
—Waller Petroleum Co., Inc., Baltimore, Md. $3,476,575. Various quantities of oil and gasoline for use in Mid-Atlantic states. Defense Fuel Supply Center, Alexandria, Va. DSA 600–70–D–2135.
20—Richard Wynn Enterprises, Inc., Knoxville, Tenn. $1,474,382. 822,000 Navy light blue utility jumpers. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–71–C–0024.
21—Putnam Mills Corp., New York, N.Y. $1,029,212. 1,185,000 linear yards of water repellent mildew resistant cotton duck cloth. Marion, N.C., and Spartanburg, S.C. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–71–C–0085.
—Gibraltor Fabrics, Inc., Brooklyn, N.Y. $1,822,712. 277,008 ponchos. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–71–C1–0090.
23—Atlantic Richfield Co., Philadelphia, Pa. $1,258,362. Petroleum products. Defense Fuel Supply Center, Alexandria, Va. DSA 600–71–D–0002.
24—Rock River Woolen Mills, Brownwood, Tex. $1,424,032. 240,000 moth-proofed wool bed blankets. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–71–C–0104.
27—Union Oil Co. of Boston, Revere, Mass. $1,518,637. Petroleum products for use the New England area. Defense Fuel Supply Center, Alexandria, Va. DSA 600–71–D–0117.
28—International Paper Co., New York, N.Y. $1,028,523. 2,879,914 fiberboard boxes with sleeves. Georgetown, S.C., and San Jose, Calif. Defense Personnel Support Center, Philadelphia, Pa. DSA 13H–71–C–Z045.
29—Gibraltor Fabrics, Inc., Brooklyn, N.Y. $1,822,712 (contract modification). 277,008 ponchos. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–71–C–0090.
31—Dow Chemical Co., Midland, Mich. $1,-201,051. 154,458 gallons of White defoliant for the Air Force. Defense General Supply Center, Richmond, Va. DSA 400–71–D–0028.
—American Oil Co., Chicago, Ill. $1,038,860. 8,375,000 gallons of No. 2 fuel oil for the Army and Air Force. Defense Fuel Supply Center, Alexandria, Va. DSA 600–70–D–2071.

CONTRACT LEGEND

Contract information is listed in the following sequence: Date—Company — Value — Material or Work to be Performed—Location of Work Performed (if other than company plant) — Contracting Agency—Contract Number.

DEPARTMENT OF THE ARMY

1—Union Carbide Corp., New York, N.Y. $2,-442,731. 500,000 batteries. Charlotte, N.C. Army Electronics Command, Philadelphia, Pa. DA–AB05–71–C–4311.
—Page Aircraft Maintenance, Inc., Fort Rucker, Ala. $27,500,519 (contract modification). Maintenance of 1,100 rotary and fixed wing aircraft at Fort Rucker and Fort Stewart, Ga. Contracting and Purchasing Office, Fort Rucker, Ala. DA–BC01–69–C–0003.
—Western Electric Co., New York, N.Y. $2,186,051 (contract modification). Training coordination and planning in key personnel courses, Greensboro, N.C. Army Safeguard System Command, Huntsville, Ala. DA–HC60–69–C–0010.
2—RCA, Moorestown, N.J. $3,118,310 (contract modification). Two mobile MPS–36 radar instrumentations. White Sands Missile Range, N.M. DA–AD07–68–C–0015.
—Philco-Ford Corp., Palo Alto, Calif. $1,750,000. Upgrade two satellite communications stations. Camp Roberts, Calif., and Fort Dix, N.J. Army San Francisco Procurement Agency, Oakland, Calif. DA–AG05–70–C–0929.
6—URS Systems Corp., San Mateo, Calif. $1,797,586. Technical service and operations for data processing softwear (combat service support). Fort Hood, Tex., and Falls Church, Va. Army Mobility Equipment Research and Development Center, Fort Belvoir, Va. DA–AK02–71–C–0001.
8—American Dredging Co., Philadelphia, Pa. $1,598,758. Dredging in Newark Bay adjacent to Elizabeth, N.J. Army Engineer District, New York, N.Y. DA–CW51–71–C–0003.
9—Connolly-Pacific Co., Long Beach, Calif. $2,388,500. Construction of a detached breakwater off the entrance to Ventura Marina, Calif. Army Engineer District, Los Angeles, Calif. DA–CW09–71–C–0003.
—Foundation Co. of Canada Ltd., Ingram Contractors, Inc., and Atlantic Tug and Equipment Co., (joint venture), Harvey, La. $1,647,000. Removal of sunken vessels and other obstructions to navigation in the New Orleans harbor. Army Engineer District, New Orleans, La. DA–CW 29–71–C–0005.
10—Mosser Construction Inc., Fremont, Ohio. $6,695,415. Construction of flood protection system along the Sandusky River near Fremont, Ohio. Army Engineer District, Buffalo, N.Y. DA–CW49–71–C–0008.
—Westinghouse Electric Corp., Birmingham, Ala. $1,146,335. 32 unit substations for Safeguard electrical systems. Chicago, Ill., Pittsburgh and Sharon, Pa., and South Boston, Va. Army Engineer District, Huntsville, Ala. DA–CA87–71–C–0002.
—Devault Contracting Co., Inc., Kimberton, Pa. $1,041,590. Construction of approximately one mile of levee, with miscellaneous concrete structures. Nichols, N.Y. Army Engineer District, Baltimore, Md. DA–CW31–71–C–0007.
13—Bell Helicopter Co., Amarillo AFB, Tex. $3,885,973. Repair of 91 UH–1 series crash damaged aircraft. Army Aviation Systems Command, St. Louis, Mo. DA–AJ01–68–D–0056.
15—W.D. Jeffrey Construction Co., Fort Smith, Ark. $1,095,210. Construction of bank stabilization revetments and dikes along the Arkansas River, Faulkner, Perry and Pulaski Counties. Army Engineer District, Little Rock, Ark. DA–CW03–71–C–0003.
16—The Safeguard System Command, Huntsville, Ala., issued the following contract modifications:
Global Associates, Oakland, Calif. $1,-858,363. Logistic support at Kwajalein Missile Range, Marshall Islands. DA–HC60–70–C–001.
IBM Corp., Gaithersburg, Md. $1,274,-249. Preliminary ballistic missile defense software development for data processing system. DA–HC60–70–C–0052.
—Hensel-Phelps Construction Co., Burlingame, Calif. $4,075,000. Construction of the Grandad Creek bridge. Dworshak dam

and reservoir, Clearwater County, Idaho. Army Engineer District, Walla Walla, Wash. DA–CW68–71–C–0017.

—**Novo Corp.**, Berkely, Calif. $3,039,741. Container stuffing services for the Oakland Army Base, Calif. Directorate of Procurement, Western Area, Military Traffic Management and Terminal Service, Oakland, Calif. DA–HC23–71–D–0001.

—**Martin-Zachery Constructors**, Honolulu, Hawaii. $1,487,083 (contract modification). Construction of additional cinesextant facilities, Kwajalein Atoll, Marshall Islands. Army Engineer District, Honolulu, Hawaii. DA–94612–ENG–00411.

17—**A.D. Roe Co., Inc.**, Louisville, Ky. $1,363,670. Construction of access facilities, including interpretive center, comfort stations, overlooks, and water and sewage plants, Green River Reservoir, Taylor and Adir Counties, Ky. Army Engineer District, Louisville, Ky. DA–CW27–71–C–0007.

—**J. P. Cullen and Son Corp.**, Janesville, Wis. $1,193,508. Relocation of roads, railroads, utility lines, site grading and drainage in preparation for acid plant construction, Army Ammunition Plant, Joliet, Ill. Army Engineer District, Chicago, Ill. DA–CA23–71–C–0002.

21—**B.G. Danis Co.**, Dayton, Ohio. $2,323,878. Construction of a two-story building for a computer science center, Wright-Patterson AFB, Ohio. Army Engineer District, Louisville, Ky. DA–CA27–71–C–0003.

23—**Litton Systems, Inc.**, Van Nuys, Calif. $6,428,000. Development, manufacture and test of Air Defense Guided Missile System prototypes, AN/TSQ–73. Salt Lake City, Utah, and Van Nuys. Army Missile Command, Huntsville, Ala. DA–AH01–71–C–0012.

—The Army Aviation Systems Command, St. Louis, Mo., issued the following contracts for maintenance support, modifications, maintenance and repair of crash-damaged aircraft in the Republic of Vietnam:

Dynalectron Corp., Fort Worth, Tex. $8,029,657. DA–23–204–AMC–04022(T).

Lear Siegler, Inc., Oklahoma City, Okla. $7,434,147. DA–23–204–AMC–04023.

Lockheed Aircraft Corp., Midwest City, Okla. $3,225,765. DA–23–204–AMC–04024.

24—**Raytheon Co.**, Andover, Mass. $1,999,987 (contract modification). Engineering services for the Hawk missile. Bedford and Andover, Mass., and White Sands Missile Range, N.M. Army Missile Command, Huntsville, Ala. DA–AH01–70–C–0195.

—**Sunrise Construction, Inc.**, Las Vegas, Nev. $1,306,000. Construction of a squadron operations facility, Nellis AFB, Nev. Army Engineer District, Los Angeles, Calif. DA–CA09–71–C–0006.

—**Associated Contracting and Building Co.**, Lorraine, Ohio. $2,466,000. Construction of a reinforced concrete pumping station (three pumps and intake structures), Central and Southern Florida Flood Control Project, Glades County, Fla. Army Engineer District, Jacksonville, Fla. DA–CW17–71–C–0015.

27—**Human Resources Research Organization**, Alexandria, Va. $1,500,000. (contract modification). Continuation of research and scientific studies in support of the Human Resources Research Program. Army Research Office, Alexandria, Va. DA–HC19–70–C–0012.

—**H.B. Zachry Co.**, San Antonio, Tex. $2,071,189. Construction of flood control channel improvements and flood walls along approximately 2.1 miles of the San Antonio River, Bexar County, Tex. Army Engineer District, Fort Worth, Tex. DA–CW63–71–C–0004.

—**Johnson-Green Co.**, Ann Arbor, Mich. $14,721,441. Construction of a 10,200 foot dam, 420 foot spillway and 120 foot concrete deck bridge, Alum Creek Reservoir Project, Delaware County, Ohio. Army Engineer District, Huntington, W. Va. DA–CW69–71–C–0014.

28—**M.F. Goerdt Construction Co.**, and **J.F. Brennan Co., Inc.** (joint venture), Dubuque, Iowa. $2,495,113. Construction of approximately 4 miles of new levee and flood wall, Dubuque. Army Engineer District, Rock Island, Ill. DA–CW25–71–C–0007.

29—**Varo., Inc.**, Garland, Tex. $2,766,003. Image intensifier assemblies, 25mm. Army Electronics Command, Fort Monmouth, N.J. DA–AB07–C–0012.

—**Penner Construction Co.**, Denver, Colo. $1,114,200. Construction of an armament and electronics building, arming and disarming pad, automotive maintenance shop, ground support equipment shop and storm drainage system, and widening of taxiway, Buckley Air National Guard Base, Aurora, Colo. Army Engineer District, Omaha, Neb. DA–CA45–71–C–0011.

—**Pace Corp.**, Memphis, Tenn. $2,488,000 (contract modification). M127A1 parachute signals. DA–AA21–70–C–0381. $1,549,680 (contract modification). M159 White Star Cluster signals. DA–AA21–70–C–0382. Memphis and Camden, Ark. Picatinny Arsenal, Dover, N.J.

—**Raytheon Corp.**, Bedford, Mass. $8,690,639 (contract modification). Engineering development and definitization portion of the augmented advanced development of the SAM–D missile system. Bedford and Orlando, Fla. Army Missile Command, Huntsville, Ala. DA–AH01–67–C–1955.

—**Kisko Co., Inc.**, St. Louis, Mo. $1,509,136 (contract modification). Metal parts for 105mm cartridge cases. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA–AA09–70–C–0083.

—The Army Engineer Division, Huntsville, Ala., issued the following contracts:

Ralph M. Parsons Co., Los Angeles, Calif. $1,103,006 (contract modification). Preparation of standard design and site adaptation of the design for the Missile Site Radar site, Grand Forks, N.D., and checking shop drawings. DA–CA87–68–C–0001.

ITE Imperial Corp., Philadelphia, Pa. $1,244,428. Switchgear reactors and resistors for Safeguard site electrical systems. Philadelphia and Chalfonte, Pa. DA–CA87–71–C–0009.

—**Western Electric Co.**, New York, N.Y. $3,975,956 (contract modification). 369,610 integrated circuit packages. Motorola, Inc., Phoenix, Ariz., WE Co., New York, N.Y., and Texas Instruments, Inc., Dallas, Tex. $7,852,370 (contract modification). Phase I of the Safeguard Ballistic Missile Defense System (Aug. 1. through Sept. 30, 1970). Martin Marietta Corp., Orlando, Fla., Raytheon Co., Bedford, Mass., WE Co., Greensboro, N.C.; GE Co., Syracuse, N.Y.; and other subcontractors. Safeguard Systems Command, Huntsville, Ala. DA–HC60–68–C–0017.

30—**Chandler-Evans**, West Hardford, Conn. $1,092,000. Overhaul of fuel controls on 400 UH–1 engines. Army Aviation Systems Command, St. Louis, Mo. DA–AJ01–70–D–0088.

31—**Western Electric Co.**, New York, N.Y. $75,000,000. Continued research and development of the Safeguard Ballistic Missile System. New York, N.Y., and Burlington, N.C.; Martin Marietta Corp., Orlando, Fla.; Raytheon Co., Bedford, Mass.; McDonnell-Douglas, Santa Monica, Calif.; IBM Corp., Morris Plains, N.J.; GE Co., Syracuse, N.Y.; General Research Corp., Santa Barbara, Calif.; and other subcontractors. DA–HC60–71–C–0005. $3,195,900. FY 1971 research, development, test and evaluation training effort in the areas of training aids, engineering, task and skill analysis for the Safeguard Ballistic Missile System. WE Co., New York; Raytheon Co., Bedford, Mass.; GE Co., Syracuse, N.Y., and Huntsville, Ala.; Systems Development Corp., Santa Monica, Calif.; and other subcontractors. DA–HC60–69–C–0010. Safeguard System Command, Huntsville, Ala.

—**Bell Helicopter Co.**, Fort Worth, Tex. $35,845,413. OH–58A helicopters and related data. Hurst, Tex. Army Aviation Systems Command, St. Louis, Mo. DA–AJ01–68–C–1699.

—**Great Lakes Dredge and Dock Co.**, Baltimore, Md. $3,839,680. Dredging two anchorages in the Hampton Roads Project, Va. Army Engineer District, Norfolk, Va. DA–CW65–71–C–0002.

—**Electro Space Corp.**, Westbury, N.Y. $8,014,454. AN/PRC–77 radio sets and RT–841/PRC–77 receiver transmitters. Procurement Div., Army Electronics Command, Philadelphia, Pa. DA–AB05–68–C–0034.

—**Ford Motor Co.**, Dearborn, Mich. $2,020,510. Engineering support services for the M151, M718 and M825 vehicle series. Army Tank Automotive Command, Warren, Mich. DA–AE07–71–C–0009.

—**Engineered Devices, Inc.**, Agawam, Mass. $1,778,400 (contract modification). 156 Model 30C fire trucks. Army Mobility Equipment Command, St. Louis, Mo. DA–AK01–70–C–7988.

—**Olin Corp.**, East Alton, Ill. $2,113,398 (contract modification). 81mm illuminating projectiles, M301A3. Army Ammunition Procurement and Supply Agency, Joliet, Ill. DA–AA09–70–C–0108.

DEPARTMENT OF THE NAVY

1—**Hughes Aircraft Co.**, Culver City, Calif. $24,403,000 (contract modification). Incremental funding for AN/AWG–9 airborne missile control systems. Canoga Park, Culver City, Los Angeles and El Segundo, Calif., and Tucson, Ariz. Naval Air Systems Command, Washington, D.C. N00019–70–C–0207.

6—**Submarine Signal Div., Raytheon Co.**, Portsmouth, R.I. $1,347,653. Refurbishment of AN/BQS–13 detecting-ranging sonar. Naval Ship Systems Command, Washington, D.C. N00024–70–C–1403.

—**Westinghouse Electric Corp.**, Washington, D.C. $1,863,779. Poseidon gas generators. Sunnyvale, Calif. Naval Strategic Systems Project Office, Washington, D.C. N00030–70–0200.

—**Massachusetts Institute of Technology**, Cambridge, Mass. $2,550,000. Research and development for computer systems. Office of Naval Research, Washington, D.C.

—The Naval Air Systems Command, Washington, D.C., issued the following contracts:

Garret Corp., Phoenix, Ariz. $2,500,000. Services and materials to conduct a product support program for T–76 engines. N00019–70–C–0362.

Kollsman Instrument Corp., Elmhurst, N.Y. $4,671,890. AAU–21/A altimeter encoders and associated equipment. Elmhurst and Syosset, N.Y. N00019–70–C–0574.

Texas Instruments, Inc., Dallas, Tex. $2,276,656. Guidance sections for Shrike missiles. N00019–70–C–0606.

Honeywell, Inc., Minneapolis, Minn. $1,040,000. AN/APN–171(V) altimeter sets. N00019–70–C–0517.

Canadian Commercial Corp., Ottawa, Canada. $2,808,368. Engineering services for T400–CP–400 engines. Longueuil, Canada. N00019–70–C–0403.

—**Whittaker Power Systems Corp.**, Primos, Pa. $1,199,342. 1,149 P.U. 656/M.A.C. generating systems, ancillary equipment and supporting data for MRC–83 and MRC–87 radio equipment. Hq., Marine Corps, Washington, D.C. M00027–70–C–0165.

7—The Naval Air Systems Command, Washington, D.C., awarded the following contracts:

Ryan Aeronautical Co., San Diego, Calif. $8,980,000 (contract modification). BQM–34E aerial target systems. N00019–69–C–0693.

McDonnell Douglas Corp., Long Beach, Calif. $59,504,992. TA–4J aircraft. Palmdale, Calif. N00019–70–C–0236.

Raytheon Co., Lexington, Mass. $10,709,787 (contract modification). Sparrow missile guidance and control units. Lowell, Andover, Waltham and Bedford, Mass., Bristol, Tenn., and Oxnard, Calif. N00019–69–C–0358.

McDonnell Douglas Corp., St. Louis, Mo. $35,905,984. F–4E aircraft. N00019–70–C–0559. $27,248,004. F–4J aircraft. N00019–70–C–0099. $121,598,473. RF–4E aircraft. N00019–70–C–0536. $3,681,000 (contract modification). Long lead time items for F–4E and RF–4C aircraft. N00019–69–C–0521.

8—**Martin-Marietta Corp.**, Middle River, Md. $1,129,000. Component parts for the ZAP

weapon system. Naval Ordnance Laboratory, Silver Spring, Md. N60921-70-C-0088.

9—**Westinghouse Electric Corp.**, Baltimore, Md. $1,572,000. Design, development, test and evaluation of proposed modification to the Mk 48-0 torpedo and Mk 27-0 target. Lansdowne, Md. Naval Ordnance Systems Command, Washington, D.C. N00017-70-C-1216.

—**Fine and Salzberg, Inc.**, Norfolk, Va. $2,377,683. Construction of a correction center, Naval Station, Norfolk, Va. Commander, Atlantic Div., Naval Facilities Engineering Command, Norfolk, Va. N62470-69-C-0857.

—**Vitro Laboratories**, Silver Spring, Md. $10,316,000. Engineering services for system integration, testing and logistics for the Poseidon fleet ballistic missile program. Naval Strategic Systems Project Office, Washington, D.C. N00030-71-C-006.

—**General Electric Co.**, Schenectady, N.Y. $47,374,000. Design and furnishing of nuclear propulsion components. Naval Ship Systems Command, Washington, D.C. N00024-69-C-5154.

—The Naval Aviation Supply Office, Philadelphia, Pa., issued the following contracts:

Sikorsky Aircraft Div., United Aircraft Corp., Stratford, Conn. $2,200,013. Dynamic drive components for CH-53A/D aircraft. N000383-69-A-3900-1668.

Airesearch Manufacturing Co., Torrance, Calif. $1,670,000. Central air data computers for modification of F-4B aircraft. N00383-69-A-3901-0122.

10—**Lockhead Aircraft Corp.**, Burbank, Calif. $30,000,000. (contract modification). Incremental funding for the S-3A weapon system. N00019-69-C-0385. $3,200,000. RP-3D aircraft. N00019-70-C-0158. Naval Air Systems Command, Washington, D.C.

—The Naval Strategic Systems Project Office, Washington, D.C., issued the following contracts:

Lockheed Missile and Space Co., Sunnyvale, Calif. $34,277,882. Tactical engineering services in support of the fleet ballistic missile weapon system. N00030-71-C-0014. $3,259,500 (contract modification). Operational systems development program for the Poseidon missile. N00030-66-C-0186. $10,703,200. Fleet ballistic missile technical engineering support services. N00030-71-C-0011.

Lockheed Aircraft Corp., Sunnyvale, Calif. $120,000,000. Poseidon missile production. Sunnyvale and Magna, Utah. N00030-71-C-0069.

13—**General Atronics Corp.**, Philadelphia, Pa. $1,940,827. 470 AN/SRN-12 receivers, engineering services, repair parts and data. Naval Electronics Command, Washington, D.C. N00039-70-C-0558.

—**Motorola, Inc.**, Scottsdale, Ariz. $3,534,000. Short/long range integrated control system. Naval Air Systems Command, Washington, D.C. N00019-70-C-0569.

14—**McDonnell Douglas Corp.**, Long Beach, Calif. $3,691,000 (contract modification). Long lead time items in support of FY 1971 procurement of TA-4J and A-4M aircraft, and supplemental support of FY 1970 A-4M procurement. Naval Air Systems Command, Washington, D.C. N00019-69-C-0390.

—**Intercontinental Manufacturing Co.**, Garland, Tex., $1,480,768. Mk 82 Mod 2 bomb bodies. Naval Ships Parts Control Center, Mechanicsburg, Pa. N00104-70-C-A167.

15—The Naval Ship Systems Command, Washington, D.C., issued the following contracts:

Sperry Rand Corp., Syosset, N.Y. $2,340,000. 14,500 mandays of technical assistance for the overhaul of Benjamin Franklin (SSBN 640) class nuclear-powered fleet ballistic missile submarines. N00024-71-C-5031.

General Dynamics Corp., $60,500,000 (contract modification). Preparation, and overhaul, refueling and C-3 Poseidon conversion of USS Casimir Pulaski (SSBN 633) and USS Stonewall Jackson (SSBN 634). Groton, Conn. N00024-69-C-0214 PZ09.

Bath Iron Works Corp., Bath, Maine. $19,293,876. Modernization and repair of the USS Dale (DLG 19), USS Richmond K. Turner (DLG 20) and USS Halsey (DLG 23). N00024-68-C-0226 PO17.

—The Naval Air Systems Command, Washington, D.C., issued the following contracts:

Hughes Aircraft Co., Culver City, Calif. $7,576,645 (contract modification). Long lead time items for AN/AWG-9 airborne missile control systems. N00019-70-C-0207.

Kaman Aerospace Corp., Bloomfield, Conn. $2,547,611 (contract modification). Long lead time items for conversion of UH-2A/B helicopters to HH-2D configuration. N00019-70-C-0051.

—**National Steel and Shipbuilding Co.**, San Diego, Calif. $1,757,930. Regular overhaul of the USS Thomaston (LSD 28). Supervisor of Shipbuilding, Conversion and Repair, Eleventh Naval District, San Diego, Calif. N62791-70-B-0506.

—**Texas Instruments, Inc.**, Dallas, Tex. $1,264,941. Manufacture and test of guidance sections for Shrike guided missile, AGM-45-7. Naval Purchasing Office, Los Angeles, Calif. N00123-71-C-0201.

16—**Grumman Aerospace Corp.**, Bethpage, N.Y. $6,600,000 (contract modification). Modification of A-6A aircraft to KA-6D configuration. Bethpage and Stuart, Fla. N00019-70-C-0458. $12,300,000 (contract modification). Long lead time items in support of FY 1971 F-14A aircraft procurement. N00019-69-C-0422.

17—**James E. Roberts Co.**, Oakland, Calif. $1,269,000. Construction of temporary lodging facilities, Naval Air Stations, Alameda and Lemoore, Calif. Naval Facilities Engineering Command, Washington, D.C. N62474-70-C-0730.

20—**Bendix Corp., Baltimore**, Md. $10,304,116. 3 year contract for WRC-1 communications equipment, parts, services and data. Naval Electronic Systems Command, Washington, D.C. N00039-70-C-0059.

21—**United Aircraft Corp.**, East Harford, Conn. $4,292,706 (contract modification). TF-30-P-412 aircraft engines. Naval Air Systems Command, Washington, D.C. N00019-70-C-0208.

—**Gall and Landau Construction Co. and Braund, Inc., and SS Contractors, Inc.**, (joint venture), Seattle, Wash. $3,444,500. Construction of 200 family housing units, Naval Shipyard, Bremerton, Wash. Naval Facilities Engineering Command, Washington, D.C. N62476-70-C-0052.

22—**Grumman Aerospace Corp.**, Bethpage, N.Y. $6,700,000 (contract modification). Long lead time items for the A-6A aircraft program. Naval Air Systems Command, Washington, D.C. N00019-69-C-0075.

—**Aero Corp., Lake City**, Fla. $1,507,204 (contract modification). Progressive rework on P-2 series aircraft. Naval Air Systems Command, Washington, D.C. N00019-69-C-0136.

—**IBM Corp.**, Gaithersburg, Md. $1,252,194. Furnishing of mass storage media units for computer systems. Naval Ship Systems Command, Washington, D.C. N00024-71-C-1007.

23—**Hyundai America Corp.**, Agana, Guam. $6,660,800. Construction of 271 family housing units, Naval Complex, Guam. Naval Facilities Engineering Command, Washington, D.C. N62766-70-C-0056.

—**Radiation, Inc.**, Melbourne, Fla. $1,685,563. Design, fabrication and installation of C-band sensitivity improvement antennae modification for the USNS Arnold and USNS Vandenberg. Naval Regional Procurement Office, Los Angeles, Calif. N00123-71-C-0054.

—The Naval Air Systems Command, Washington, D.C., issued the following contracts:

Lockheed Aircraft Corp., Burbank, Calif. $4,379,869. Technical management of computer software equipment, implementation of revisions and improvements and maintenance of the overall P-3C aircraft computer program. N00019-70-C-0493. $3,700,000 (contract modification). Long lead time items for FY 1971 P-3C aircraft procurement. N00019-70-C-0158. $1,763,871. Conversion of P-3A aircraft to EP-3E configuration. N00019-70-C-0631.

RCA, Camden, N.J. $1,123,333. Operation and maintenance of the Atlantic Fleet Range Facility, Roosevelt Roads, P.R. N00019-71-C-0048.

24—The Naval Ship Systems Command, Washington, D.C., issued the following contracts:

Westinghouse Electric Corp., Pittsburgh, Pa. $11,542,083 (contract modification). Design and furnishing of nuclear propulsion components. N00024-69-C-5101 P014.

North American Rockwell Corp., Anaheim, Calif. $1,349,000. FY 1971 operation and engineering support of the Mk 2 Ships Inertial Navigation System (SINS). N00024-71-C-5017.

—**Grumman Aerospace Corp.**, Bethpage, N.Y. $9,000,000 (contract modification). Modification of E-2A aircraft to the E-2A/APS-111 configuration. Naval Air Systems Command, Washington, D.C. N00019-68-C-0542.

—**Hughes Aircraft Co.**, Culver City, Calif. $9,000,000. Mk 3 guidance system electronic assemblies and associated components for the Poseidon weapon system. El Segundo, Calif. Naval Strategic Systems Project Office, Washington, D.C. N00030-71-C-0047.

—The Naval Facilities Engineering Command, Washington, D.C., awarded the following contracts:

Everett S.M. Brunzell Corp., Reno, Nev. $3,570,000. 190 family housing units, Naval Air Station, Lemoore, Calif. N62474-70-C-0635.

Leadership Housing System, Inc., Newport Beach, Calif. $2,141,762. 102 family housing units, Camp Pendelton Marine Corps Base, Calif. N62473-70-C-0029.

27—**Control Data Corp.**, Bethesda, Md. $3,621,000. Engineering services to support equipment for fleet ballistic missile system training. Naval Strategic Systems Project Office, Washington, D.C. N00030-71-C-0002.

—The Naval Ship Systems Command, Washington, D.C., awarded the following contracts:

Computer Sciences Corp., Falls Church, Va. $1,145,000. Data processing and analysis related to fleet maintenance support, overhaul and readiness for the maintenance and material management system. N00024-69-C-5220.

General Dynamics Corp., Groton, Conn. $29,838,750. Preparation for and accomplishment of the overhaul, refueling and Poseidon C-3 missile conversion of the USS Von Steuben (SSBN 632). N00024-68-C-0320. $2,092,869. Preparation for the overhaul of the USS Pargo (SSN 650). N00024-71-C-0203.

Sperry Rand Corp., Syosset, N.Y. $1,387,756. Program of shipyard technical services related to the second overhaul of the navigation subsystem aboard the USS George Washington (SSBN 598), USS Patrick Henry (SSBN 599) and USS Robert E. Lee (SSBN 601). Charleston Naval Shipyard, S.C., and Puget Sound Naval Shipyard, Bremerton, Wash. N00024-71-C-5001.

North American Rockwell Corp., Anaheim, Calif. $4,284,608. Testing, repair and modification of 931 Mk 2 Ships Inertial Navigation System (SINS) instruments. N00024-71-C-5013.

28—**J.W. Bateson Co.**, Arlington, Va. $8,923,000. Construction of a library and education center, Naval Academy, Annapolis, Md. Naval Facilities Engineering Command, Washington, D.C. N62477-68-C-0083.

—**Coneen Construction Corp.**, El Cajon, Calif. $2,395,000. Construction of temporary lodging facilities, Naval Air Stations, Miramar and North Island, and Naval Station, San Diego, Calif. Naval Facilities Engineering Command, Washington, D.C. N62473-70-C-0104.

—**North American Rockwell Corp.**, Anaheim, Calif. $3,400,000. Inspection, repair, modification and testing of 1,850 Mk 2 Ships Inertial Navigation System (SINS) instruments and training equipment with associated components. Naval Ship Systems Command, Washington, D.C. N00024-71-C-5012.

29—**Litton Systems., Inc.**, Van Nuys, Calif. $7,205,000. Direct air support central system, including digital data, communications and display equipment. Naval Electronic Systems Command, Washington, D.C. N00039-70-C-3548.

—**Singer-General Precision, Inc.,** Glendale, Calif. $5,345,000. Mk 113 Mod 8 fire control systems. Naval Ordnance Systems Command, Washington, D.C. N00017–70–C–1214.

—**Collins Radio Co.,** Newport Beach, Calif. $1,729,056. KG–40 key generators. Naval Electronic Systems Command, Washington, D.C. N00039–71–C–0206.

—**General Electric Co.,** Cincinnati, Ohio. $1,245,108. Retrofit kits for conversion of T–58–GE–8B engines (H–46, H–3 and H–2 helicopters) to –8F configuration. F34601–70–A–0962–GB40. $2,205,667. Retrofit kits for J–79–GE–10 engines for F–4 series aircraft. F34601–70–A–1018–GB40. Naval Aviation Supply Office, Philadelphia, Pa.

30—The Naval Ship Systems Command, Washington, D.C., issued the following contracts:

Sperry Rand Corp., Charlottesville, Va. $1,262,194. 10 periscopes, adapters, engineering services, associated technical data and onboard repair parts. N00024–71–C–5053.

Sperry Rand Corp., Syosset, N.Y. $2,214,190. Inspection, repair and modification of 1,690 Mk 3 navigation subsystem components, related data and reports. N00024–71–C–5004.

—The Naval Air Systems Command, Washington, D.C., issued the following contracts:

Grumman Aerospace Corp., Bethpage, N.Y. $8,000,000 (contract modification). Long lead time items to support FY 1971 EA–6B aircraft procurement. N00019–70–C–0458.

General Electric Co., Utica, N.Y. $2,087,695 (contract modification). AN/AYA–8 data processing systems for P–3C aircraft. N00019–70–C–0124.

31—The Naval Facilities Engineering Command, Washington, D.C., awarded the following contracts:

Ivey's Plumbing and Electrical Co., Inc., Kosciusko, Miss. $1,093,823. Installation of air conditioning for the airmen's dormitories, Keesler AFB, Miss. N62467–70–C–0498.

Fox-Sadler Co., Inc., Virginia Beach, Va. $1,018,212. Construction of Bachelor Officer's Quarters, Fleet Anti-Air Warfare Training Center, Dam Neck, Va. N62470–70–C–1162.

DEPARTMENT OF THE AIR FORCE

1—The Military Airlift Command, Scott AFB, Ill., issued the following contracts for domestic cargo air transportation services in support of the AFLC LOGAIR system:

Saturn Airways, Inc., Oakland, Calif. $6,185,265. F11626–70–C–0043.

Airlift International, Inc., Miami, Fla. $4,599,669. F11626–70–C–0042.

Universal Airlines, Inc., Ypsilanti, Mich. $12,389,675. F11626–70–C–0044.

Overseas National Airways, Inc., Jamaica, N.Y. $10,875,907. F11626–70–C–0045.

—**Pan American World Airways, Inc.,** New York, N.Y. $85,158,700. Services for the operation and maintenance of the test facilities of the Eastern Test Range, Patrick AFB, Fla. Air Force Eastern Test Range, Patrick AFB, Fla. F08606–68–C–0040.

—**Emerald Maintenance, Inc.,** Sandpoint, Idaho. $1,060,000. Maintenance and operation of the Kodiak tracking station, Alaska. Alaskan Air Command. F65517–69–C–0005.

—The Aerospace Defense Command, Ent AFB, Colo., issued the following contracts:

Systems Development Corp., Santa Monica, Calif. $4,800,000. Computer program updating and development of a system training program. F05604–70–C–0008. $2,128,565. Computer program updating and development of system training programs for major air commands and foreign countries. Santa Monica, Offutt AFB, Neb., Hickam AFB, Hawaii, Langley AFB, Va., Elmendorf AFB, Alaska, National Guard Bureau, Washington, D.C., and foreign countries. F05604–70–C–0009.

General Electric Co., Syracuse, N.Y. $9,975,690. Operation, maintenance and logistics support of spacetract sensor sites. Syracuse, Shemya AFS, Alaska, and Diyarbakir, Turkey. F05604–70–C–0012.

ITT Arctic Services, Inc., Paramus, N.J. $36,092,377. Services and material for the operation, maintenance and logistic suport of BMEWS, operation and maintenance of the microwave communications facility at "J" site, and logistic supply support for Thule AB, Greenland. F04606–69–C–0555. $24,900,042. Operation, maintenance and logistic support of DEW line, North Atlantic radio system, and BMEWS north submarine cable terminal. Alaska, Canada, Greenland, Iceland, Great Britain and New Jersey. F04606–69–C–1108.

—The Armament Development and Test Center, Eglin AFB, Fla., issued the following contracts:

Vitro Corp. of America, Valparaiso, Fla. $11,299,508. Maintenance and operation of the Armament Development and Test Center range facilities. F08635–71–C–0071.

Martin Marietta Corp., Orlando, Fla. $1,246,943. Air munitions components. F08635–70–C–0221.

—**Automatic Sprinkler Corp. of America,** Carrollton, Tex. $1,461,895. 750-pound bomb fin assemblies. Ogden Air Materiel Area, AFLC, Hill AFB, Utah. F42600–70–C–0268.

—The Space and Missile Systems Organization, AFSC, Los Angeles, Calif., issued the following contracts:

Lockheed Aircraft Corp., Sunnyvale, Calif. $5,553,202. An advanced data system for a satellite control facility. F04695–67–C–0176.

The Boeing Co., Seattle, Wash. $6,543,776. Design, development, integrated test operations and evaluations for Minuteman missiles. F04701–70–C–0137.

—**Curtis-Wright Corp.,** East Paterson, N.J. $3,430,840. Helicopter flight simulators. Aeronautical Systems Division, AFSC, Wright-Patterson AFB, Ohio. F33657–70–C–1097.

—**Overseas National Airways, Inc.,** Jamaica, N.Y. $7,841,580. Domestic cargo air transportation services in support of the Navy's QuickTrans system. Military Airlift Command, Scott AFB, Ill. F11626–70–C–0046.

2—**Fairchild-Hiller Corp.,** St. Augustine, Fla. $2,072,725. Inspection and repair as necessary, and modification of C–130 Hercules aircraft. St. Petersburg-Clearwater International Airport, Fla. Warner-Robins Air Materiel Area, AFLC, Robins AFB, Ga. F09603–70–C–1542.

—**General Dynamics Corp.,** Fort Worth, Tex. $35,000,000. Long lead time effort to implement the F–111F program. Aeronautical Systems Division, AFSC, Wright-Patterson AFB, Ohio. F33657–70–C–1130.

—The Oklahoma City Air Materiel Area, AFLC, Tinkler AFB, Okla., issued the following contracts:

Lear Siegler, Inc., Oklahoma City, Okla. $1,890,340. Contractor field teams to perform corrosion control and modification on C–141 aircraft. F34601–70–D–3564.

Dynalectron Corp., Fort Worth, Tex. $2,445,000. Contractor field teams to perform corrosion control on B–52, KC–135 and other aircraft. Anderson AB, Guam, and Kadena AB, Okinawa. F34601–70–D–3563.

6—**Lockheed Aircraft Corp.,** Marietta, Ga. $24,340,385. Wing modification of C–130 Hercules aircraft. Warner-Robins Air Materiel Area, AFLC, Robins AFB, Ga. F09603–68–C–2530.

—**Koppers Co., Inc.,** Baltimore, Md. $1,387,208. Noise suppressor system for F–4 aircraft. Aeronautical Systems Division, AFSC, Wright-Patterson AFB, Ohio. F33657–69–C–1195.

—**Thiokol Chemical Corp.,** Brigham City, Utah. $12,856,393. Minuteman III stage III motors. Space and Missile Systems Organization, AFSC, Los Angeles, Calif. F04701–70–C–0182.

—**ARO, Inc.,** Arnold AFS, Tenn. $45,100,000. Management, operation and maintenance of the Arnold Engineering Development Center, and research, development, test and evaluation programs. Arnold Engineering Development Center, Arnold AFS, Tenn. F40600–71–C–0002.

7—**General Dynamics Corp.,** Fort Worth, Tex. $1,098,000. Operation, maintenance and improvement of the radar target scatter facility in obtaining characteristic radar data of signal return from various aerospace vehicles. White Sands Missile Range and Holloman AFB, N.M. Missile Development Center, AFSC, Holloman AFB, N.M. F33657–69–C–1028.

8—**Lockhead Georgia Co.,** Marietta, Ga. $2,706,724. Development, activation and operation of a ground data processing system to process maintenance and logistics data recorded on-board aircraft. Procurement Division, Wright-Patterson AFB, Ohio. F33600–70–C–0262.

9—**General Motors Corp.,** Indiannapolis, Ind. $13,150,825. T–56–A–14 turboprop engines, support equipment and data. Aeronautical Systems Division, AFSC, Wright-Patterson AFB, Ohio. F33657–70–C–0222.

10—The Aeronautical Systems Division, AFSC, Wright-Patterson AFB, Ohio, issued the following contracts:

The Boeing Co., Seattle, Wash. $7,500,000. Research and development of a short range attack missile (SRAM). AF33(657)–16548.

United Aircraft Corp., East Hartford, Conn. $3,098,720. Fabrication and testing of borsic/aluminum composite turbofan blades for TF–30 series engines. F33657–70–C–0624.

—**McDonnell-Douglas Corp.,** Tulsa, Okla. $2,335,869. Modification, and inspection and repair as necessary of B–52 aircraft. Oklahoma City Air Materiel Area, AFLC, Tinker AFB, Okla. F34601–69–C–4368.

—**Sylvania Electric Products Inc.,** Waltham, Mass. $2,217,075. Supplies and services in support of the Minuteman ground electronics system. Space and Missile Systems Organization, AFSC, Los Angeles, Calif. F04701–70–C–0187.

13—The Space and Missile Systems Organization, AFSC, Los Angeles, Calif., issued the following contracts:

General Electric Co., Philadelphia, Pa. $1,260,000. Research and development of the Mk 12 reentry vehicle. AF 04–694–975.

Lockheed Aircraft Corp., Sunnyvale, Calif. $3,245,207. Research and development of the Air Force Satellite Control Facility. F04701–70–C–0068.

—**General Dynamics Corp.,** Fort Worth, Tex. $1,260,000. Spare parts for the F–111 aircraft. Sacramento Air Materiel Area, AFLC, McClellan AFB, Calif. AF33(657)–13403.

14—**Teledyne CAE,** Toledo, Ohio. $1,500,000. Component improvement program for the J–69–T–25/29/41A series aircraft engines. Aeronautical Systems Division, AFSC, Wright-Patterson AFB, Ohio. F33657–70–C–0757.

15—**RCA,** Moorestown, N.J. $1,531,600. Depot level maintenance and supply support for radar equipment at various installations. Eastern Test Range, AFSC, Patrick AFB, Fla. F08606–70–C–0043.

—**Philco-Ford Corp.,** Palo Alto, Calif. $9,490,272. Engineering support for the Satellite Control Facility. Space and Missile Systems Organization, AFSC, Los Angeles, Calif. F04701–70–C–0029.

16—**Lockheed Aircraft Corp.,** Marietta, Ga. $7,461,570. Spare parts for C–5A aircraft. Detachment 31, San Antonio Air Materiel Area, AFLC, Marietta, Ga. AF33(657)–15053.

17—**Itek Corp., Inc.,** Sunnyvale, Calif. $4,792,381. Airborne radar receivers and related test equipment. Aeronautical Systems Division, AFSC, Wright-Patterson AFB, Ohio. F33657–70–C–0383.

20—**Lockheed Aircraft Corp.,** Marietta, Ga. $50,000,000. C–5A aircraft. Aeronautical Systems Division, AFSC, Wright-Patter-

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son AFB, Ohio. AF33(657)-15053.

21—The Aeronautical Systems Division, AFSC, Wright-Patterson AFB, Ohio, awarded the following contracts:

Lockheed Aircraft Co., Sunnyvale, Calif. $5,200,000. Development of a sensor system for C-130 gunship aircraft. F33657-70-C-1200.

Cessna Aircraft Co., Wichita, Kan. $2,830,073. Spare parts and aerospace ground equipment for A-37B aircraft. F33657-70-C-0018.

22—**Collins Radio Co.**, Cedar Rapids, Iowa. $1,006,239. Aerospace ground equipment for integrated dual flight director/rotation go-around systems. Oklahoma City Air Materiel Area, AFLC, Tinker AFB, Okla. F34601-69-2462.

23—**Westinghouse Electric Corp.**, Baltimore, Md. $1,280,000. Modification kits for AN/FPS-7 radar system. Sacramento Air Materiel Area, AFLC, McClellan AFB, Calif. F04606-70-C-0947.

—**Sperry Rand Corp.**, St. Paul, Minn. $3,760,000 (contract modification). Design and development of a Minuteman weapon system computer. Space and Missile Systems Organization, AFSC, Los Angeles, Calif. F04701-69-C-0111.

24—**North American Rockwell Corp.**, Anaheim, Calif. $65,689,000. FY 1971 production of guidance and control systems for the Minuteman III weapon system. Space and Missile Systems Organization, Los Angeles, Calif. F04701-69-C-0194.

—**McDonnell Douglas Corp.**, Long Beach, Calif. $3,500,076. Logistic support for the C-9A aircraft. San Antonio Air Materiel Area, AFLC, Kelly AFB, Tex. F41608-68-C-0001.

27—**AVCO Corp.**, Greenwich, Conn. $2,080,888. Fabrication and testing of Mk IIC Minuteman II reentry vehicle. Wilmington, Mass. Space and Missile Systems Organization, AFSC, Los Angeles, Calif. F04701-69-C-0242.

—The following contracts were awarded by the Aeronautical Systems Division, AFSC, Wright-Patterson AFB, Ohio:

General Electric Co., Cincinnati, Ohio. $2,000,000. Component improvement program for J-79-19 engines for F-104S aircraft for the Military Assistance Sales Program. F33657-70-C-1175.

General Dynamics Corp., Fort Worth, Tex. $72,418,771. F-111 aircraft. AF33(657)-13403.

Cutler-Hammer, Inc., Farmingdale, N.Y. $3,278,824. Components, spare parts and aerospace ground equipment for AN/APX-83(V) airborne radar systems. F33657-70-C-1004.

28—The Aeronautical Systems Division, AFSC, Wright-Patterson AFB, Ohio, issued the following contracts:

Texas Instruments, Inc., Dallas, Tex. $6,360,000. Guidance kits for air munitions. F33657-71-C-0041.

XYZYX Information Corp., Reseda, Calif. $1,065,000. Job performance aids in English and Vietnamese applicable to C-123K and CH-47A aircraft, training aids and materials, and services. F33657-71-C-0061.

29—**RCA**, Arlington, Va. $2,499,000. Rental of data processing equipment, Wright-Patterson AFB, Ohio. 2740th Air Base Wing, Wright-Patterson AFB, Ohio. F33600-71-F-0051.

30—**Massachusetts Institute of Technology**, Cambridge, Mass. $10,800,000. Research and development of advanced electronic systems for various DOD agencies. Lexington, Mass. Electronic Systems Division, AFSC, L. G. Hanscom Field, Mass. AF19628-70-C-0230.

—The Aeronautical Systems Division, AFSC, Wright-Patterson AFB, Ohio, issued the following contracts:

Oshkosh Truck Corp., Oshkosh, Wis. $2,005,420. Fire fighting trucks. F33657-71-C-0047.

The Boeing Co., Seattle, Wash. $6,750,000. Research and development of the short range attack missile (SRAM). AF33(657)-16584.

31—**Federal Electric Corp.**, Paramus, N.J. $20,494,080. FY 1971 operation and maintenance of the Western Test Range technical facilities, Vandenberg AFB, Calif. Space and Missile Test Center, AFSC, Vandenberg AFB, Calif. F04697-67-C-0001.

—The Space and Missile Systems Organization, AFSC, Los Angeles, Calif., issued the following contracts:

Aerojet-General Corp., Sacramento, Calif. $8,000,000. Fabrication and delivery of Minuteman III missile stage II motors, and associated support equipment and data. F04701-70-C-0141.

Collins Radio Co., Dallas, Tex. $1,052,625. Communications electronics systems for the Air Force Satellite Control Facility. F04695-67-C-0137.

Martin-Marietta Corp., Denver, Colo. $7,880,000. Design, development, fabrication and delivery of Titan IIIC boosters and associated aerospace ground equipment. F04701-70-C-0202.

"Instant Bridge" Investigated by Army

An air-inflatable bridge strong enough to support a 20-ton tank has been demonstrated for the Army.

Under a contract with the Mobility Equipment Research and Development Center, Fort Belvoir, Va., Goodyear Aerospace Corp. produced a 1/20th-scale model of the bridge. A bridge capable of spanning a 90-foot length would weigh 5,000 pounds, and fit, folded, on a 2½-ton truck.

Urethane-coated polyester fabric, constructed in two layers of integrally woven cloth, the bridge gains rigidity when inflated. Because of the low pressure—15 pounds per square inch—the bridge can maintain rigidity, even if punctured, with a portable compressor.

In use, the transporter truck would back to a crossing point and anchor the top pleat of the bridge. The truck would then move away, unfolding the bridge. Once the bridge is inflated, the truck would then position the structure using a boom and hook.

Engineers estimate unpacking, inflation and emplacement would take approximately 30 minutes, with the same amount of time used to deflate and repack the bridge.

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