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ARMY MANAGEMENT VIEWS

EDITED BY

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FOREWORD

COL JOHN R. McLEAN
Commandant,
U. S. Army Management School

The guest speaker program of the U. S. Army Management School is a significant feature of the school's curricula. It has been invaluable in presenting to participants a realistic view of current management concepts, practices, experiences, and thinking. Much material covered by the presentations of our guest speakers is not available in existing published media. To enlarge the audience and increase the potential managerial benefit to be derived from these presentations, it has been the school's policy to publish a representative sampling in annual volumes of **Army Management Views.** The present book constitutes the continuation of this series.

Book 1 of Volume XIII, published earlier this year, was devoted to presentations delivered by guest speakers during the first half of the 1967-1968 academic year. This second book completes the series for that year.

The book is distributed to graduates of all classes of the current and one prior academic year; other Army service schools; guest lecturers referenced therein; and a selected list of government installations and activities.

It is our hope that those who were unable to hear these lectures when presented will derive equally as much benefit from reading this book. We of the school, together with the participants of our courses, are most grateful to the speakers who have shared their ideas and experiences with us.

PREFACE

COL JOHN M. SCHWALJE
Director, Plans and Research
U. S. Army Management School

The articles published in this second book of Volume XIII are adapted for the most part from presentations delivered by guest speakers before classes during the second half of academic year 1967-1968. In addition, in compliance with the school's goal of furthering the advancement of Army management, we have included in this volume several of the essays from the 1968 Advanced Management Essay Contest. Selected essays in future years will be similarly published. Further details on this contest will be found at the beginning of Section II.

We are grateful to our guest speakers for allowing us to prepare manuscripts from their talks and to additionally impose upon their time in requesting their review and approval of these manuscripts before publication. It has been our conviction that a diversity of views reflects that managerial techniques cannot be expected to be the same in all situations. Accordingly, as has been the practice in the past, we have made no attempt to eliminate controversial issues or views.

It is our hope that publication of these articles will serve to help propagate proven managerial experience, as well as promising new managerial thought, within the Army establishment.

Additional copies of this volume and all previous volumes are available through the Defense Documentation Center.

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SECTION I

SELECTED PRESENTATIONS TO CLASSES OF THE U. S. ARMY MANAGEMENT SCHOOL 1967-68

Lieutenant General Bunker became Deputy Commanding General of the Army Materiel Command in April 1964. In early 1962 he had helped develop the organization of AMC and was its first Comptroller and Director of Programs.

In previous assignments he has served as Commandant of the Army Transportation School and Commander of the Transportation Materiel Command.

(This article was adapted from a presentation given by Lieutenant General Bunker at USAMS on 1 May 1968.)

LT. GEN. WILLIAM B. BUNKER

LT. GENERAL WILLIAM B. BUNKER

DEPUTY COMMANDING GENERAL

U. S. ARMY MATERIEL COMMAND

There are a few things I would like to discuss from the point of view of my personal experience in this area. And to begin, I would like to say that there is no question but that the technique (discipline, fad, or what have you) of systems analysis has become of primary importance to all of us in the military over the past several years. It has gotten to the point that we cannot make even the most simple recommendation without supporting it with an elaborate cost effectiveness study.

Some knowledge of the tools of systems analysis and a reasonable proficiency in their use have therefore become essential for a modern military executive. The essential thing to do is to maintain a balanced perspective in regard to the matter — somewhere between the starry-eyed enthusiasm of the true believer and the pragmatic distrust of the old soldier.

As far as our major programs are concerned, the amount of money we are spending in the systems analysis area runs into the millions of dollars. To cite one example, we are currently launching a study costing over 4½ million dollars on a main battle tank; this study seems to be primarily aimed at assuring that such a tank weigh only 46 tons. Four and a half million dollars to determine whether that is feasible seems rather expensive.

I think we have come to appreciate the degree of flexibility these studies can manifest and also their very importance. I am reminded of the time when we first established our system of user inputs in the Army development process after World War II. I remember well that there was a lot of criticism. But then it seems that those of us in the technical services were sitting on the sideline, developing equipment that fascinated ourselves but didn't satisfy the customer.

SYSTEMS ANALYSIS FROM THE MANAGER'S VIEWPOINT

Later we developed a system whereby the customer would be the determining factor as to what the equipment should be. We set up the Combat Developments Command as a representative of the user that would describe what the soldier needs to fight the battle, after which the developing services would develop the needed piece of equipment.

If the Army is to get any of the new equipment it wants, the request must be backed up with a study, which, of course, is of vital importance. And what is the purpose of such a study?

The purpose of a study is to present the pros and cons of the alternatives. All too frequently, it is assumed that a study is just to measure a specific item. But, fundamentally, these studies or analyses are supposed to have at least two alternatives. Yet, all too frequently, the good and bad points of both alternatives are not presented.

More important, we must determine the sensitivity of these pros and cons. This, again, is often overlooked. Just how sensitive is the analysis to the various elements that prove that one alternative is better than the other? In this connection, just recently a group was considering the substitution of a Chinook for a Huey as an assault helicopter; while this group made a good case on the cost effectiveness side, the Chief of Staff was concerned. If we substitute a bigger vehicle for a smaller one, what happens to the vulnerability of the troops? Well, a quite elaborate study was conducted, complete with simulated landing zone operations and flights; the conclusion was reached that vulnerability was doubled when the same operations were carried out with the Chinook as opposed to the Huey.

Then a different study was made, using statistical data from the operations currently being conducted in Vietnam. Here, through a rigorous analysis of regression and correlation, conducted independently in three different statistical analyses by different people, the exact reverse conclusion was reported. Thus, there would be far greater losses with the Huey than with the Chinook.

I made an attempt to find out how these studies were made and to fit them together so that they complemented each other. They do not complement each other in many cases. They only prove that neither

study, pro or con, can be the conclusive basis for the decision that the Chief of Staff wants to make. If either study, by itself, gives him a recommendation for a decision, both studies together seem to indicate not to rely on either study for a decision. And then there may have to be a third way of making the analysis, with a different set of assumptions and a different way of gathering the data, or we may have to go ahead and conduct the operation and see what happens, making a decision on the information previously presented. This illustration emphasizes the importance of sensitivity and degree of risk.

Another important element in these studies is the implication of hierarchical processing. It seems that these studies start way down in the bowels of the organization — in the Combat Developments Command, Army Materiel Command, and other agencies — and are processed gradually until many of them wind up in the form of a briefing in front of the Chief of Staff and Secretary of Defense. As they go higher up the chain of command, they tend to become less and less intelligible and the decision-maker is more and more dependent on the conclusion made on recommendation of the analyst. This I think is a mistake. The decision-maker may not really be making a decision on the problem; he may really be making a decision on the personality of the analyst. And the analyst has not performed his function as an analyst if he is more interested in the decision-maker's opinion of him as an analyst than in the decision-maker's independent judgment of the facts presenting the pros and cons.

We still encounter a tendency toward this type of thing today in connection with some studies. I received one not too long ago in which the analyst said it could be readily proved and then supplied a very long equation without even bothering to define the parameters much less explain the equation. All this did was cause me to be completely distrustful of whatever the equation was supposed to prove.

A serious problem we face today is that of over-refined models along with shallow analysis. Some models are becoming quite exotic, some are becoming unbelievably complex and detailed. The result, in many cases, has been that the basic study cannot really be comprehended by anybody, so that when it goes through the cycle there are constant

revisions and add-ons until it resembles an elaborate computer-controlled inventory program.

Herein lies the difficulty: time is spent making the model, the model is shoved into a computer, so to speak, and the resulting answer then sent to the Pentagon. Now, the model is really only a tool; the analyst is supposed to apply analysis, and that the model doesn't do. The model only gives the information on which the analysis is based. I think it should be an established practice that at least five times as much time be spent on the analysis of the results of computer runs as is spent building a model in the first place. Otherwise you are wasting your time.

Anybody can build a model, and there is always the temptation to make it bigger and bigger as you try to take in the whole world. But as you do this, it becomes less and less intelligible and amenable to analysis, just as an analysis of the whole world becomes completely unintelligible. The model is built to isolate a phenomenon in order to study it, and a zealous effort intended to make the model realistic gets you back to where you were in the first place. Why construct a model which does not increase your understanding?

To trace, briefly, the evolution of economic analysis, we started out years ago in engineering schools with what we called engineering economics. The classic problem for students, as I recall, was for them to figure out how to buy a new generator for a power-generating plant. They would make a forecast of how many kilowatts they were going to need and how much it would cost to produce the power. They would make an analysis and the solution was usually to buy another generator, but then it would be found smaller than they thought it was going to be when they first looked at the problem. In any case, this is the basic type of analysis that is being taught in such courses as the Operations Research/Systems Analysis Executive Course.

Now, as we started to use the techniques of trade-offs in our business, the basic parameters of the situation have changed. It is no longer a matter of unidimensional dollars on both sides of the equation. An effort is being made, by means of so-called cost and budget studies, to keep one of the measures unidimensional, but I submit that even dollars do not remain the same down the line. Thus, a dollar representing part of the pay of an infantry soldier on the front line has no relationship

to the dollar representing the pay of a stevedore unloading a ship in Cam Ranh Bay. They just don't have the same value, and you wouldn't trade one for the other on a one-to-one basis.

So the cost figure may no longer be a nice, fat, homogenized dollar but may contain a lot of diversities and complexities. And we may no longer have a simple trade-off of things that can't in fact be traded off, because in most of the trade-off analyses the things that are looked at are incommensurable.

Today, in engineering economics, we have gradually come into an area that is really one for the behavioral scientist — welfare economics. It makes for interesting reading, for its literature is filled with a great many two-bit words and almost no figures. It concerns a phenomenon that we face today in regard to the problem of poor people in a rich economy.

Now, a problem of choice, such as how to sum the values of everybody in a room filled with students, for example, is difficult because they will all have different value structures and, furthermore, the values are not linear. In the case of one martini before lunch, our values may be precisely the same, but when it comes to two, three, or more martinis before lunch, the value structure takes a rapid plunge; and when it comes to six martinis, there could probably be no more than two drinking them and still have linear value. In any case, these are the types of values that we have to sum in welfare economics.

This is really nearer the problem we have on the effectiveness side of the Army's problem of value, because to the Army the value of one infantryman is nothing. He can't do much by himself. The value of one tank, on the other hand, is pretty high, and when you start to accumulate them, that brings a jump in value, but sooner or later four of them do not make a difference and many even become a liability. At some point, you would rather have another stevedore on the beach than another soldier in the front line.

Thus, our cost effectiveness models constitute complex, multidimensional problems, which often are seemingly impossible for the human mind to fully conceive. We like to draw nice, simple charts, usually two-dimensional. Occasionally someone tries to be brave and will attempt a three-dimensional model. But I have never heard of

anyone brave enough to draw a multi-dimensional model. And all the problems that we are facing are really multi-dimensional problems.

So in systems analysis I feel we are faced with the continuing question of the place of military judgment and experience. I think the fact that there is a multi-dimensional problem means that there is no simple solution to the problem. There is no simple crossover from a point where something tells what the decision is. Rather, it is a complex area in which the decision lies. For the final analysis you weigh most heavily the military judgment of the people who have to make the decision. And if their judgment happens to be wrong, then the answer itself will turn out to be wrong.

In the first place, the analyst generally takes the position that he can make a study and an analysis and come up with a recommendation for, say, the M-16 rifle. All too frequently, what is done is to identify the most effective crossover point. This can lead to considerable embarrassment. The most famous example of which is the TFX, in which case the decision turned out to be the exact opposite of the recommendation.

There is also a difficulty in that the analysis does not clearly state which of the elements of the problem the analysis will answer and which it will not; and that it does not give the consequences these elements may have on the ultimate answer.

We were once asked to make a study as to whether we should specify a twin-engined troop-carrying helicopter for a certain action. This was a problem that remained around for quite some time. This is also a problem with commercial helicopters and rates are conditional on all aircraft being multi-engined. As soon as the state of the art caught up, they took care that there would be no more single-engine passenger-carrying helicopters.

We were asked to analyze, from the cost effectiveness point of view, whether this was the thing to do. It was a laborious exercise, as I recall, that took about one year before we were able to come up with some nice figures. What we basically came up with was that, within the parameters of the problem, the probability of uncertainties, and so forth, there was really nothing to choose from between the two as far as cost effectiveness was concerned.

LIEUTENANT GENERAL WILLIAM B. BUNKER

The study correctly concluded that if there is any military reason for preferring one engine or two, the decision should be made completely and solely on the basis of that one criterion because all the other criteria balance with one another.

With two engines, as opposed to one, or vice versa, what are some of the physiological and psychological reactions when troops are dashed into hillsides or pilots are not being as safe as they should be? What are some possible political repercussions? Does the pilot behave more relaxedly in the instrument condition with two engines than he does with one engine? There are still other phenomena to consider. For example, is there any unusual engine noise at night or in bad weather? Such phenomena are significant for military effectiveness and yet can be outside the scope of the study. Analysts can tell the one who applies military judgment where the rigors of the mathematics of systems analysis can't help.

I recall a study on the general configuration of new mechanized infantry combat vehicles. This study came up with a beautiful conclusion on the basis of a whole series of graphs. But I was to choose a vehicle based on what percentage of the period between 1985 and 1990 we were at war.

Well, military judgment is all very good, but all the analyst said was to guess how many years of war we were going to have. All he really found out from the study was that if nobody gets mad at anybody else, we could build a papier-mache combat vehicle because nobody would shoot at it. This could begin to become expensive, and, depending on whether the enemy were using big guns or little ones, it could get worse. If we were to have one war every 10 years, we might prefer to make them all out of papier-mache and have them all shot up: if we were to have two wars every 10 years, we might want to have them made out of light steel and have only some of them shot up.

Needless to say, the foregoing provides an example of an incorrect basis for military judgment and an improper separation of the elements of the problem. It is just not the right way to go about it.

I think the leverage that military judgment can apply to these studies has got to be clearly kept in mind, starting wtih the assumption, the methodology, and the holes that are left to be filled in. They should

be put there positively and not apologetically. In general, we have the temptation to apply the military judgment factor as we did in the TFX case — apologetically after the fact. No wonder, then, that it is the fellow applying military judgment who is wrong and the analyst who somehow turns out to be right.

In his latest book, **The Discipline of Power,*** Mr. George Ball has something to say about the Pentagon's past relations with the sacredness of these studies. I think this is the trap you have to avoid. The study is not sacred: it presents the pros and cons but does not in fact render the decision. It is not, in other words, scientific decision-making. These studies are analyses, and their purpose is to present analyses, not solutions to problems.

What are some of the challenges of systems analysis?

First of all, in teaching the trade, there is some confusion implanted in students in that they are led to believe that it is simple and non-technical and non-mathematical. Well, it is **not** simple or non-technical or non-mathematical. You could spend the rest of your life studying the various techniques and tools that can effectively be used in this trade. So it is a challenge just to learn this trade.

I am somewhat apprehensive of a principle established last year and which I think constitutes a danger to the Army. It has been said that, because the five-year force structure of the Army meets the threats we may face for the next five years, any introduction of new equipment which increases the cost of the Army and which has been made on the basis of a cost effectiveness study showing that this is an efficient way to spend money, must increase the efficiency of the Army beyond that which has been specified. Therefore, what are we going to give up that is less efficient and will pay for this new equipment?

This is really an example of welfare economics that seemingly defies defeat. It will continue to bowl people over because the cost of some new equipment might do away with, say, an entire artillery corps. Now, there are cost effectiveness studies that show the new equipment to be more efficient. Then, if it is more efficient, we should arm for peace. If peace is established, that's the price we pay. It has not been

*George W. Ball, **The Discipline of Power: Essentials of a Modern World Structure**, Boston: Little, Brown & Co., 1968.

generally accepted and recognized that this piece of logic could completely ruin us.

The study of the infantry weapon is a case in point. A great deal of money was spent on that study. It had lots of figures about relative hit/kill probability, average aiming errors, and so forth; the object was to select a weapon that appeared to be the most efficient. Today, in Vietnam we fire over a half million rounds of well-aimed ammunition every day. If we could say that all the people on the other side were killed by small arms, this would mean that we kill one person for every 10,000 rounds of ammunition.

Now, we have to consider everything: the man, the weapon, the enemy, the weather, the aircraft. Then the whole thing is totaled. The question is, does it make a whole lot of difference which weapon we choose?

I recall our substituting the M-16 for the M-1 rifle. The order had been out to lighten and improve the M-1, which led to the M-14, which in turn led to the M-16. The M-16 was tested by the Combat Developments Command and everybody was happy with it until it got over to Vietnam, where we decided it was a little slow. But what was the real problem? The real problem was that it was no longer an infantryman's rifle. It was a personal machine gun. Only it wasn't really a machine gun. It got dirty and clogged up and was subject to stoppages. All machine guns have stoppages and the M-16 had regular machine gun difficulties.

The difficulty lay in failing to recognize the environmental conditions. If we get too involved in the nitty-gritty of building our model and not enough in analysis, this is the type of mistake that can be made.

Fundamentally, I think the big problem that faces us is that the total operation in which we may be involved in inefficient. In many areas, it may be so inefficient that the relative efficiency of competing decisions is not important.

For example, take the Huey-Chinook case. Only one aircraft in a thousand ever gets hit by a bullet. Under no circumstances do we make our decision on the basis of what happens in one mission in a thousand. We make our decision on the basis of what happens in a greater percentage of the mission.

With that, I would like to conclude this article, in which I have contributed a few thoughts about systems analysis, a trade that will have to be learned by more and more of us but one that will help us immeasurably in our endeavors.■

Gen. Chesarek assumed his present position in August 1967. He had previously been Comptroller of the Army and Assistant Deputy Chief of Staff for Logistics, first in the Materiel Readiness field and then in Programs.

Since his first assignment at Fort Lewis, Washington, his career has taken him from Alaska to Western Europe and to Korea. In addition to serving at various commands throughout the U. S., he has completed several tours at the Pentagon.

(This article was released for publication in July 1968.)

LT. GEN. F. J. CHESAREK

LIEUTENANT GENERAL F. J. CHESAREK
ASSISTANT VICE CHIEF OF STAFF OF THE ARMY

We are fighting a limited war in Vietnam. This type of war is not subject to a standard definition but is defined by the participants through their actions in the field, in the international arena, and on the home front.

The United States fights to prevent the subversion or subjugation of an allied nation and has not, in the process, sought to destroy the nation or nations engaged in the subversion or subjagation effort. We limit our objectives because we do not wish to challenge the great powers supporting the enemy and thus become involved in a direct confrontation with all its likely consequences. At home, our government has chosen to conduct this war without disruption of our everyday life and has not attempted or been required to place the nation's business, industry, and mobilization potential on a wartime footing.

The enemy in the field fights a war with no holds barred. He violates frontiers, ignores the rights of neutral nations, and is governed by no rules save those he himself chooses to enforce. His objective is another nation's demise. His allies are most of the Communist nations in the world who provide the economic support necessary for him to conduct the war.

Limited wars are relatively new to the United States, and we are seeking to learn how to wage them as we fight.

Shortly after Premier Khrushchev enunciated the Soviet Union's concept of "wars of national liberation" in 1962, President Kennedy visited the Pentagon and addressed an assemblage of general officers. His interpretation of the meaning of the challenge called for innovations and imagination in the application of military power to defeat the kind of wars he envisaged would follow in the wake of the Communist declaration.

LIMITED WAR
"STRETCH MANAGEMENT"

LIMITED WAR "STRETCH MANAGEMENT"

The Army first turned toward its Special Forces. These are men trained in guerrilla and psychological warfare, capable of operating alone in small groups far removed from their base areas. We multiplied their size and broadened their scope.

At the same time, we began serious experimentation with the helicopter as a vehicle to deliver combat-ready forces onto the battlefield, as a close-support gunship, and for logistic support for the combat forces.

We also reorganized our division structure to permit independent operations of battalion and brigade as well as division-size packages. Training programs were improved, and we partially reoriented our research and development effort, with more emphasis on counter-insurgency versus the big bang of missiles.

When President Johnson decided to commit ground forces in Vietnam in July 1965, many of our tactical innovations were still in the test stage. The demands created proved once again that war, like necessity, is not only the mother of invention but also acts as a burr under the saddle of decision.

For instance, the rising tempo of action in Vietnam forced us to hasten our decision-making process in regard to the airmobile division which had just completed its field test. We named the test division the 1st Air Cavalry and deployed it along with its 440 aircraft directly into action in Vietnam. Its tactical concepts were soon proved and refined in combat.

The 1st Air Cavalry Division did not have a monopoly on the [illegible] ideas market. Others of our deployed forces have made hundreds of tactical innovations, many of which call for special equipment. In the Delta area, for example, we now have the Riverine Force. It possesses such items as artillery mounted on barges, floating barracks, and heavily armed and armored personnel carrier boats, none of which existed in 1965. An answer to the enemy jungle base area turned out to be a modified version of an old tool, the plow. This one is mounted on a heavy bulldozer with a long, sharp cutting instrument attached — a combination that can fell almost any size tree. Used in conjunction with huge harrows, it has laid bare thousands of acres of the enemy's jungle hideouts and has made highway ambushes more difficult by clearing the roadsides to a width of several hundred meters.

LIEUTENANT GENERAL F. J. CHESAREK

We have flight-tested a new helicopter gunship, the Cheyenne, which carries tremendous firepower of various types, with a 360 degree field of fire and a capability of all-weather flying. It employs the latest technology of television, laser direction finding, and air-ground control. It will be in operation in 1970.

We are mindful, however, that in the final analysis, the soldier with his rifle decides the fate of battle. We are working hard to lighten his load in every respect. We are re-equipping our soldier in Vietnam with lightweight gear from rifles to bandoliers, and, in the process, have taken five to seven pounds off his back. We need to do much better. We are providing him with night vision devices that are ten times better than anything he has had before. We transport him by helicopter to the scene of battle, provide him hot meals while there, and help protect him with unprecedented firepower.

He is also provided the best medical service we have ever had. Within an hour a seriously wounded man is in a field hospital. The mortality rate of casualties reaching hospitals is about 1 percent — a truly remarkable accomplishment. The return-to-duty rate in Vietnam is 67 percent. A number of factors contribute to this, chief among them being rapid evacuation of casualties and advanced surgical techniques, such as blood vessel surgery, resuscitation, and treatment of shock.

Like all wars, the one being fought is different from all others. It is a war without front lines — without key terrain features — without a Remagen bridgehead to seize, a Guadalcanal to assault, or a Pusan perimeter for a valiant stand and a dramatic breakout. We entered the combat arena when our South Vietnamese allies were being overpowered by the enemy. In Communist lexicon, Phase III had begun, and sizable enemy conventional forces were deployed to render the coup de grace.

As allies of the South Vietnamese, we do not control their government, nor do we have a single joint military command in control of all armed forces. At the time of our commitment of military force, we had only advisers in that country and little knowledge of its people. The South Vietnamese government was only ten years old and did not have time to consolidate its power or create an intelligence apparatus to seek out and destroy the Communist underground infrastructure.

LIMITED WAR "STRETCH MANAGEMENT"

Our Army traditionally has used firepower promiscuously as a tactic of reconnaissance and battlefield engagement and, in the absence of good intelligence, proceeded to employ this tactic in Vietnam. We have been charged with using a butcher knife approach, rather than a surgical scalpel. While the differences in approach accentuate the differences between the two situations, we must learn how to shoot the sniper from the church steeple without destroying the church, killing the bishop, and wiping out the whole diocese.

We are far from happy with the results achieved thus far. Many questions that apply to limited war anywhere are still unanswered. What can we do about controlling the free movement of civilians? What can we do about sanctuaries? What can we do to block the support provided to the enemy, both physical and psychological, from external sources? How can we take better advantage of the enemy's obvious limitations? In short, how can we isolate the battlefield? We are urgently addressing these questions. Their resolution will play a major role in determining the length of the conflict.

Some cold facts emerge. Limited war in support of an international commitment is viewed with alarm by most nations removed from the struggle regardless of their ties of friendship or alliance. The fear of ever-expanding use of force, the recognition of the dangers of great power confrontation, and the effect of war on the world economic structure overshadow the importance of fulfilling a treaty obligation and the need to confront the Communist challenge wherever it may surface.

Turning now to our home front, we find limited war a traumatic experience, complicated by modern communications, an affluent way of life, a voracious press and television industry, and the difficulty of articulating the reason why against a national backdrop of domestic introversion, self-interest, and competing priorities.

Our approach to limited war is expensive in both manpower and money. It either draws funds from domestic programs or requires increased taxes. Neither is a popular alternative. Thus, limited war means limited provision of resources – men, money, and materiel. This requires what I call "stretch management" – getting the most benefit from the manpower and funds provided the Army by our government. This task is my primary duty as the Assistant Vice Chief of Staff.

LIEUTENANT GENERAL F. J. CHESAREK

My office is only 15 months old. It was born out of necessity to meet a challenge posed by our Defense Secretary at the time concerning the management of Army resources. When Mr. McNamara took office in 1961, he brought with him a group of young analysts, schooled in the techniques of operations research and systems analysis. While they knew little of military affairs and technology, they knew how to ask questions, dissect problems, and lay out alternatives for analysis. They brought their own kit of tools, and soon we were deep in such matters as cost effectiveness and were becoming familiar with the newest advances in management science made possible by high-speed computers.

While our General Staff system is a good one, it lacked one ingredient — a mechanism to integrate the total effort. We in the Army had a much greater vat of talent than the analysts at Defense level, but we had not concentrated this talent to address the problems we were facing at the headquarters level. In short we provided too little, too late.

We were not faring well in the battle of the budget, which was being reflected in our authorized manpower and equipment levels. We were unsuccessful in selling our strategic concepts and the forces necessary for their execution.

So we set about to create the machinery to do what was required. Since 1962, our population of computers has increased fourfold, the number of officers with graduate degrees is up 50 percent, and attendance at operations research systems analysis schools has increased tenfold.

We have designed sophisticated equations or models for computer solution to help us in our force planning, force accounting, and manpower and logistics control at the headquarters level in Washington. Next year we will provide computerized systems for the division, corps, and army levels to do the same things in the field. We are designing a management information system to correlate and analyze data and to isolate problem areas. Statistics generate some interesting answers, and we must apply judgment as always.

Let me illustrate what I mean. Assuming the average age of the cadets at Sandhurst is 20, in one year they will have aged 5 percent, whereas I at age 54 will have aged only 1.9 percent. The conclusion is

clear: The older we grow, the less we age. In fact, that is a correct conclusion, as everyone past 40 can testify.

We have made many mistakes along this road. We have tried to introduce complex systems too fast and have seen them produce chaos rather than improvement. We have learned the hard way that high-speed computer output is no better than the accuracy of manual input. We have seen great emphasis on cost reduction but little objective measurement of effectiveness.

Machiavelli, in 1513, recognized the root problem. He wrote:

> "It must be remembered that there is nothing more difficult to plan, more doubtful of success, nor more dangerous to manage, than the creation of a new system. For the initiator has the enmity of all who would profit by the preservation of the old institutions and merely lukewarm defenders in those who would gain by the new ones."

I believe we are now on the right road. Today, we have much better data on which to base decisions. This improvement in our data base provides the decision maker with more visibility of our problem areas, which are akin to icebergs. As our data base improves, we can compare the effectiveness of like activities, such as depots, with each other and challenge our commanders to do better. In other words, we can use our improved visibility to further productivity and thus get more product for less input. We have reduced the huge stockpiles of equipment which were the hallmarks of prior wars, although there is a case to be made that this time we have erred on the side of poverty rather than plenty. Our communications have improved to the point of nuisance, as our field commands can attest. We have a much better utilization of our most precious and expensive asset, manpower, than in any prior war.

Of all the problems concerning management on the home front, manpower is the toughest. We operate under a set of rules designed to insure fairness in assignments to Vietnam. All personnel, except generals, who are assigned to Vietnam serve there for one year. Even during the Tet offensive our soldiers were departing on the day their year was up. We also try to assign our career soldiers in the United States or Europe for at least 25 months before reassigning them to Vietnam.

While these policies are good for morale, they are a nightmare for our personnel managers who are trying to provide the qualified junior leadership so necessary to maintain unit esprit and integrity. These young leaders must be highly skilled in their specialty, whether it be infantry, artillery, logistics, or other support function. In Vietnam, our combat forces consist of over eight divisions, most of whom are infantry. In the United States and Europe — our sustaining base — we have ten divisions, eight of which are armor or mechanized. Thus, we have a dual challenge: How do we train junior infantry leaders in the units available to us in our sustaining base? And, conversely, How do we utilize our infantry-oriented career veterans when they return to the sustaining base for further assignment? We must plan on these leaders being returned to Vietnam in about two years, and therefore it is to our benefit to give them an opportunity to "train up" in their basic skills. This requires on-the-job duty in appropriate type units. We have not seen fit to restructure our sustaining base and make it totally Vietnam-oriented because our treaty commitments in Europe, which have our highest strategic priority, require an armor heavy force.

We have done some restructuring of the base, and we are training the best prospects received through the draft to be junior noncommissioned officers. Our officer candidate schools provide us with an adequate number of second lieutenants. These measures, while helpful, do not provide a full solution, and we are seeking innovations to meet the challenge.

Aside from the problem just described, our training program has proved quite successful. In our Army, approximately 500,000 soldiers are people who were drafted to serve two years. We send these young men to camps for basic combat training for a period of eight weeks. They are then enrolled in advanced individual training courses for nine weeks. Those scheduled for Vietnam as individual replacements receive an extra week of special training.

The training is concentrated and the trainee is highly motivated. In a generation which is popularly alleged to be in full retreat from responsibility, we are finding a level of esprit, responsiveness, and intelligence far above anything we have ever experienced before.

LIMITED WAR "STRETCH MANAGEMENT"

As a consequence of these factors, our field commanders are high in their praise of the quality of training being produced, as reflected by the performance of the soldier in the field.

This brief description of limited war in the field, its effects abroad, and its attendant problems of management at home leads toward the obvious question: Where do we go from here?

I should like to cite a few trends which appear to have far-reaching consequences.

Advances in airlift, sealift, and containerization will result in dramatic improvement in transport and sustaining capability. For example, the new C-5A aircraft coming into inventory next year will lift 110 tons of cargo a distance of 3,100 miles. It would have taken only twelve C-5As to conduct the Berlin Airlift of 1948-1949, an operation that required 224 of that day's aircraft. One load of military cargo for the C-5A could be two helicopters, an M60 tank, five armored personnel carriers, and several lorries. In addition, the upper deck will carry two spare crews plus 75 soldiers.

We have begun packaging the paraphernalia of war in special containers to simplify airlift, sealift, and the unloading processes. In effect, we will soon be transporting segments of depots in an orderly fashion. Containerization is one of our fastest growing new industries. It will soon be dictating the configuration of ships, planes, railroad cars, and automated handling equipment. We must reorient our logistical thinking to capitalize on this new and marvelous potential.

These changes suggest that our readiness to meet contingencies in the next three to ten years will be constrained principally by the level of training of the forces to be deployed and the immediate availability of equipment. From a doctrinal and conceptual standpoint, we must further streamline training and logistics methodologies and we must place greater reliance on existing inventories rather than on our production base capability.

Today, we encourage every officer in the Army to be trained in at least two specialties, one within his basic branch, such as artillery or infantry, and the other in some specialized field, such as logistics,

management, or operations research — you can think of many others. Tomorrow, the degree of specialization will probably increase both in scope and in depth.

As I have previously mentioned, an objective in the United States Army stemming back to World War I has been to lighten the load on the back of the infantry soldier. I say objective because we have not yet done nearly enough in this area. I commend this to the attention of you leaders of the future.

Looking just a bit further ahead, a whole new spectrum is unfolding in electronics and communications. For example, there is a high battlefield potential for lasers as a range finder and target designator, for missile guidance, for night vision and battlefield illumination, for communication at short ranges, as a surveying device, and as an identification device. The use of satellites for improved communication opens opportunities and dangers for the leaders of the future.

In the period ahead, I believe the military professional will be called upon to do more with less. His "stretch management" problem will be more severe. New hardware coming into the inventory over the next ten years is terribly expensive and will demand offsets in the form of trade-offs. The future leader will have to refine and use cost/effectiveness trade-offs.

For example, since a helicopter can move people or things ten times as fast as a lorry, its turnaround time is ten times faster, and its flexibility immeasurably better on the battlefield; since it needs no roads, avoids ambushes, and is in instant communication will commanders, what is an appropriate trade-off between helicopters and lorries? How do we relate computers, programmers, and operators to ledgers and clerks? Heavy-lift aircraft to ships and trains? In other words, what is the equivalence of a new item to an old one in terms of mission?

In this trade-off business, we must address total systems, not just pieces, and this requires a much better knowledge of systems than exists today.

Our governments need to know the answers to these questions, because our national resources are not unlimited and many claimants are queued up at the ration counter. Trade-offs have become a tough way of life. They run counter to our natural instinct of being pack rats.

It is in our professional interest that we understand trade-offs and that we develop sound measures to guard against false economy or loss of capability.

You gentlemen are moving toward leadership in a world of fantastic evolution. While I am proud of the leadership of my generation, your problems are more complex, more demanding, and more urgent.■

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Colonel McGovern is a graduate of the Infantry School, Command and General Staff College, National War College, and the Army Management School. He received his master's degree from the University of Miami.

(This article was adapted from Colonel McGovern's presentation at the Army Management School in June 1968.)

COL. RUSSELL D. McGOVERN

COLONEL RUSSELL D. McGOVERN

CHIEF, STUDIES AND ANALYSES DIVISION, OFFICE, CHIEF OF RESEARCH AND DEVELOPMENT, DEPARTMENT OF THE ARMY

DEPARTMENT OF ARMY ORGANIZATION FOR MANAGING OR/SA STUDIES

At first glance, it may appear from Figure 1 that everybody seems to have gotten into the act from the Secretary of the Army down through the major commanders. But all echelons are concerned with operations research and systems analysis studies and need them to support their programs. Whereas operations research and systems analysis, especially in connection with cost effectiveness studies, were once viewed with suspicion in the Department of Army, they have now become a way of life.

Let us see what the various echelons do. At the level of the Army Secretariat, there is a Deputy Under Secretary for Operations Research. His job is to monitor operations research studies from a broad perspective. He is also concerned with the technical quality of studies and the capability of those who perform them. The present incumbent in this position is Dr. Wilbur Payne. The Assistant Secretary of the Army for R&D is concerned with studies having RDT&E implications. He personally approves such operations research studies costing over $100,000.

The organization of the Assistant Vice Chief of Staff's Office reflects its concern with studies. Three of the four offices within the AVCofS's Office are directly involved in studies and studies management. The

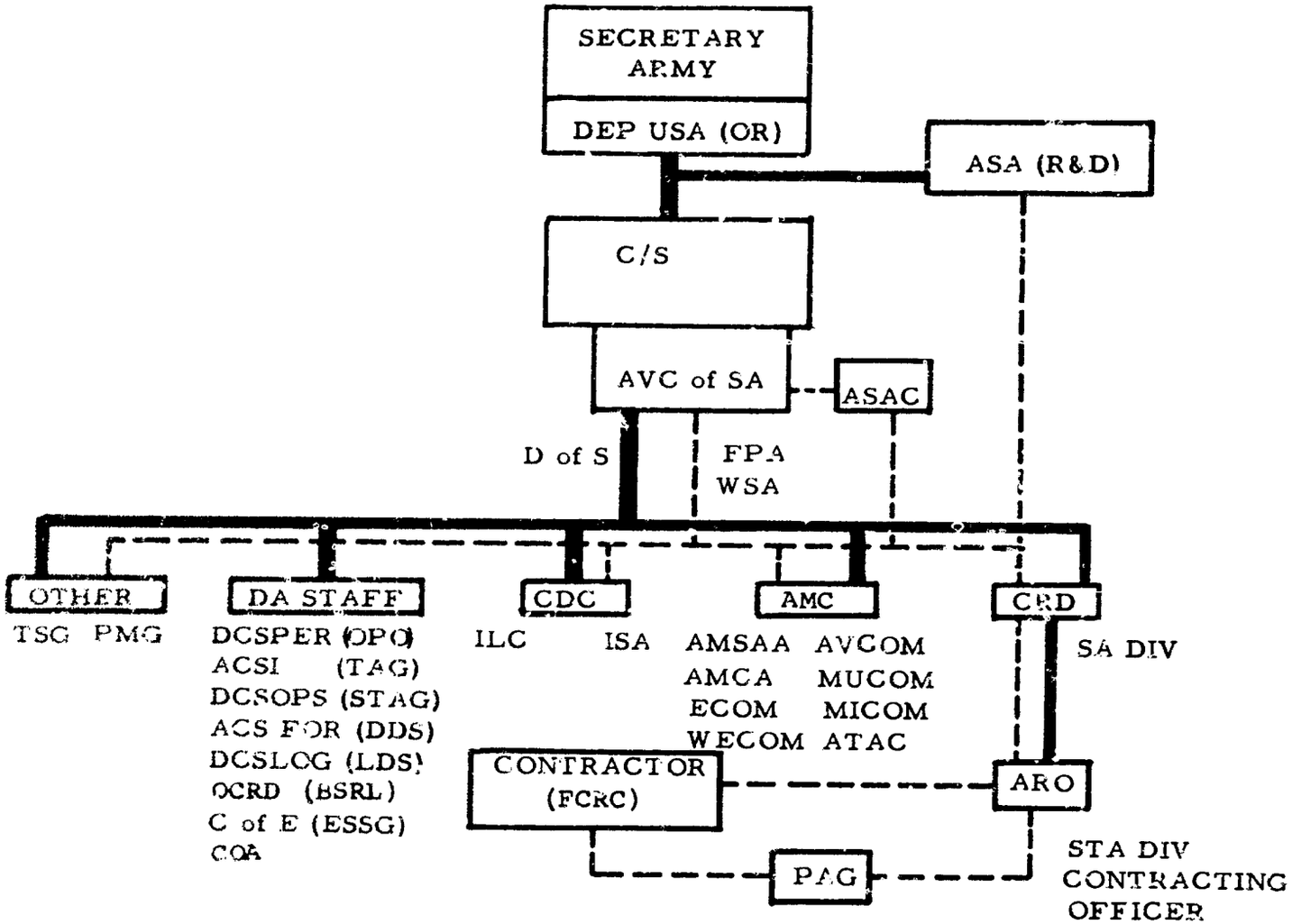

Figure 1. Department of Army organization for operations research and systems analysis.

Director of Studies is the chairman of the Army Studies Advisory Committee (ASAC). He monitors and integrates the DA Study Program and prepares the Army Master Study Program to reflect on-going, planned, and completed studies. He coordinates unprogrammed contract operations research studies that cost $100,000 or less, and does so in conjunction with OCRD or the Comptroller, depending upon the source of funding and the issues addressed by the studies. The Office of Force Planning and Analysis is authorized 42 officers and 18 civilians. Its concern is with studies involving force structure and deployment. The Weapons Systems Analysis Office has an authorized strength of 29 officers and 27 civilians and is concerned with the development and analysis of future weapons systems. These offices interface with the Office of the Secretary of Defense.

The Comptroller of the Army monitors and coordinates management and automatic data processing studies, just as the Chief of Research and Development performs this function with relation to those involving RDT&E. He provides guidance for management studies and recommends actions on proposals to the Assistant Secretary of the Army for Financial Management.

The Chief of Research and Development monitors all activities with RDT&E implications. He reviews and recommends for approval to the Assistant Secretary of the Army for Research and Development all requests for operations research studies of over $100,000 regardless of source of funding. For those studies of less than $100,000 funded by RDT&E funds, he has approval authority. For those funded by O&MA or other funds, he coordinates if they have RDT&E implications. The Chief of Research and Development also evaluates studies and proposals for the Federal Contract Research Centers (FCRC). In the case of operations research, this applies to the Research Analysis Corporation (RAC).

Within each agency of the DA staff there are designated study coordinators. In addition, an agency may have an in-house group to conduct studies or to coordinate the agency-supported efforts. The Office of the Deputy Chief of Staff for Personnel works closely with the Office of Personnel Operations (OPO) for operations research studies. Within DCSPER there is a Director of Personnel Study and Research who con-

ducts some research and, in addition, coordinates personnel and manpower studies in support of DA efforts.

Within the Office of the Assistant Chief of Staff for Intelligence there is a Threat Analysis Group, with an authorized strength of 16 officers and 10 civilians. This group conducts, monitors, and coordinates studies regarding threats to the United States within the purview of the DA. It also monitors threat aspects of studies in support of other Army programs. The Threat Analysis Group also serves as an interface between an agency in the Army Materiel Command and another in the Combat Developments Command to coordinate studies in support of interagency programs.

Within the Office of Deputy Chief of Staff for Operations the study coordinator is primarily concerned with strategic studies and those involving scenarios around which DA studies will be based. The Strategic Studies and Analysis Group (STAG), located at Bethesda, Maryland, with an authorized strength of 62 officers and 54 civilians, has a considerable war gaming capability and additionally performs some operations research and systems analysis. An agency of the Chief of Engineers, the Engineer Strategic Study Group (ESSG), consisting of 12 officers and 30 civilians, located at the Army Map Service, also has a war gaming capability and some operations research and systems analysis supporting ability. It responds primarily to DCSOPS. It is within this agency that the spectrum scenarios were developed.

Within ACSFOR the study coordinator is located in the Directorate of Doctrine and Systems. ACSFOR works closely with Office of Force Planning Analysis in the AVCofS Office, as well as with CDC.

Similarly, in CDCSLOG there is a study coordinator in the Directorate of Doctrine and Systems who monitors studies performed in support of DCSLOG operations. This office works closely with the studies program of the Army Materiel Command.

Within the Office of Chief of Research and Development there is the Behavorial Science Research Laboratory, consisting of 4 officers and 52 civilians. Although primarily oriented toward behavorial science research, it also has an operations research staff that is currently conducting a study in support of the Office of Personnel Operations.

COLONEL RUSSELL D. MCGOVERN

Throughout the AMC, we find many organizations for operations research and systems analysis. At Headquarters AMC and within the Directorate of Major Items, there is a continuing OR/SA study program addressing overall DA logistics systems in the field. At each commodity command there is a staff organized to perform operations research and systems analysis. At the Ballistic Research Laboratory at Aberdeen ,the Army Materiel Systems Analysis Agency (AMSAA), with an authorization of 119 professionals, performs OR studies in support of AMC ongoing programs. There is currently forming the Advanced Materiel Concepts Agency (AMCA) to study problems related to Army materiel and to provide the interface between the DA staff represented by the Threat Analysis Group and the CDC. The Aviation Command, the Munitions Command, the Missiles Command, the Army Tank and Automotive Command, the Electronics Command, and the Weapons Command all have a staff of operations research and systems analysis personnel currently operating. Each plans to almost double in size.

At the Combat Developments Command, studies are the most important product. There are two formal organizations to perform in-house operations research and systems analysis studies, independent of contractors. First is the Institute for Systems Analyses, which is now forming at Fort Belvoir, with an authorized strength of 12 officers and 105 civilians. There is also the Institute for Land Combat, with an authorized strength of 78 officers and 110 civilians, to perform studies for the CDC and to provide the CDC interface with AMC, represented by the Advanced Materiel Concepts Agency, and with the DA Staff, represented by the Threat Analysis Group.

With the aid of Figure 1, I would now like to discuss the organization for the management and monitorship of studies within the DA. The Army Study Advisory Committee, ASAC, is the principal DA advisory group. The chairman, as I mentioned before, is the Director of Studies from the Office of the Assistant Vice Chief of Staff. The ASAC consists of representatives of the Army staff and major commands. Its mission is to review, evaluate, and assign priorities for Army-wide studies in the Army Master Study Program. It is primarily oriented toward those studies supported by the RDT&E Studies and Analyses program element. It meets annually to review and approve the annual Study Program.

MANAGEMENT OF OR/SA STUDIES

The chief of the agency of primary interest in a study is designated the sponsor. The sponsor prepares and initiates study requests. He supervises and monitors study initiation, progress, and completion. It is his job to coordinate with the staff and various commands that have a vested interest in the outcome of the study. He is also responsible to review and evaluate study results and the contractor's performance.

Within the Office of the Chief of Research and Development and, specifically, in the Army Research Office, we find the contracting officer and the contracting officer's representative. The primary role of the contracting officer is to contract for studies performed in support of the RDT&E effort or those paid for by RDT&E funds. The contracting officer's representative is the Chief of the Studies and Analyses Division at the Army Research Office. I am the present incumbent of that position. On behalf of the Chief of Research and Development, the Studies and Analyses Division also monitors all studies performed by RDT&E funds and those conducted by the Research and Analysis Corporation for the Army, regardless of source of funding. The Division also provides military advisors and effects coordination between sponsors and contractors. The Project Advisory Group (PAG) is a study group or steering committee with representation of all interested agencies. Its purpose is to guide study progress from initiation to completion and to provide input to contractors for the progress of the study. More will be said about this group later. An integral part of study management is the reviewing, the recording, and the action taken, based upon the study performance. As mentioned earlier, the sponsor is responsible for these actions as directed by the Army Regulation 1-110.

DEVELOPMENT OF WORK STATEMENTS AND STUDY REQUIREMENTS

I should now like to turn to some specific points relative to the initiation and development of the work statement and study requirement.

The quality of a work statement reflects the degree of planning and thought that has been given to formulation of the study requirement. Development of a study requirement is little different from formulating the mission or purpose of a staff study or operation plan; yet it is amazing how many people overlook, or pay little notice to, this important step.

Many studies have gone from conception to conclusion without the sponsor really ever having a clear idea of the purpose of his study.

The most critical phase of a study effort is a very first step when the sponsor determines exactly what use he will make of the study when it is completed. (Note Figure 2.) Perhaps the point seems so obvious that it is neglected, or perhaps utilization of results in the distant future seems so remote that the author of a work statement finds great difficulty in visualizing it. Nevertheless, if this critical question cannot be answered adequately, the remainder of the study effort will flounder for want of an anchor to hold it in place. Adequate description of the problem will eventually lead to conclusions on which the military sponsor will make decisions or take appropriate action. As he visualizes the kind of results he should expect, the author considers alternative actions that should be addressed. Backward planning is essential.

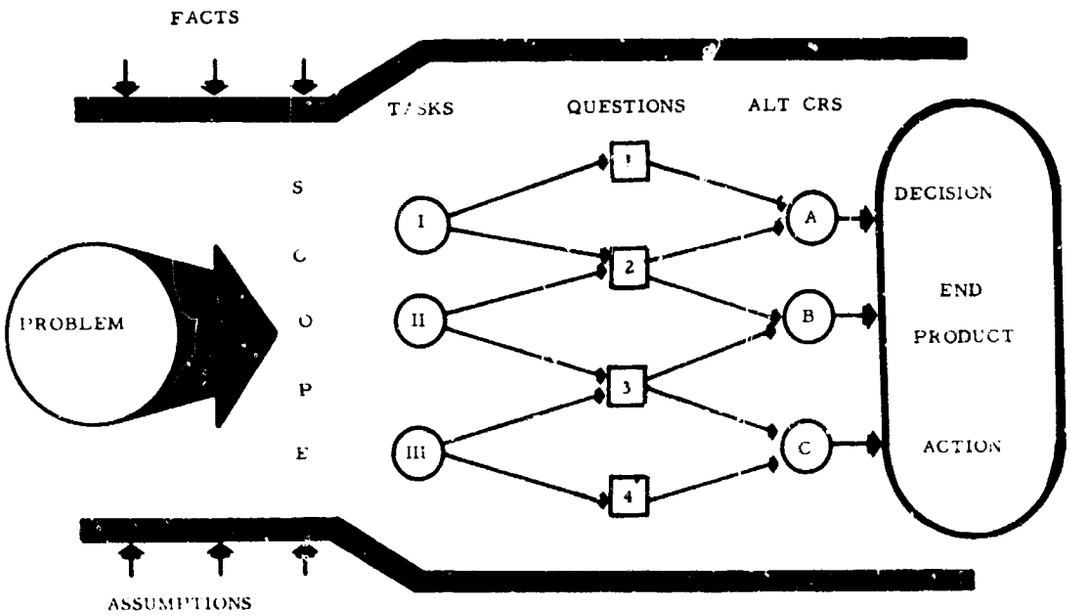

Figure 2. Development of study requirement and work statement.

He visualizes the form in which those alternatives will be presented to him. Consideration of these alternative courses of action demand that specific questions be answered. The answers to these questions will lend relative weight to considerations of the alternatives as they are presented. These questions are answered by summary and analysis of facts

and assumptions through analytical techniques. It is here that the analyst makes his contributions to the study. The study sponsor must be equipped to appreciate how the answers are obtained and how much weight he can give them in support of the alternative course to be presented. Many answers can be obtained in advance by the sponsors through literature search. It is at this stage of developing the work requirement that much duplicatory effort can be avoided. A thorough search of the scope of past or on-going studies that bear on the subject, will do much to aid the sponsor in knowing what he needs to know and, equally important, will make him something of an expert on what has been done in the field.

Numerous agencies exist to aid the drafter of a study proposal in this regard. The Army Study Documentation and Information Retrieval System (ASDIRS), located adjacent to the Army Library in the Pentagon, has a complete listing and copies of studies that have been included in the Army Master Study Program as well as others. The Defense Documentation Center (DDC) has an extensive file of thousands of studies that have been conducted for the DOD and provides an outstanding bibliographic service to summarize past studies in any given area. The Army Research and Development Information System (ARDIS) also has records of on-going and completed studies that can contribute to this purpose. Various staff agencies publish inventories and bibliographies of work that has been done to support their agencies such as the DCSPER Quarterly Inventory. The Defense Logistics Studies Information Exchange (DLSIE), located at Fort Lee, Virginia, also offers a bibliographic service for logistic studies. In addition, there is the Army Master Study Program produced by the director of studies. Most offices maintain local files as well. Too often we receive proposals with the statement that a thorough literature search has been made and there is no record of duplicative studies. At times one is inclined to assume that the literature search has been made in the author's desk drawer.

Because all critical questions cannot normally be answered in a single operation, the work is usually divided into tasks. The results of these tasks should answer the critical questions that the author of the proposal is not able to answer prior to initiating the study. Proper execution of each of these tasks, of course, relies upon the use of data,

facts, and realistic assumptions. Their use is guided by objective criteria and regarded in a setting that is necessary and sufficient for the real issues to be addressed. The criteria, data, facts, and assumptions, of course, must be made available by the sponsor of the study to the contractor and analyst who are to do the work. The criteria will set the standards and limit the scope of the study, and the facts and assumptions must be available in order to insure that the analysis will be realistic.

With these steps and considerations carefully thought out and included in the requirements, the problem can be placed in the proper perspective. The problem will now be projected in the desired direction and the scope delineated clearly by appropriate facts and assumptions that address essential issues. Until all of the conditions are satisfied, one cannot say that a work statement truly represents what is desired to be done. Unfortunately, there are times when a chief prescribes a general area that someone ought to take a look at. Indians busily form a committee that designs a camel instead of a horse or a bassett hound instead of a beagle. A technically sound but misdirected study is a waste of precious resources in high demand. If requirements are vague, we must have the courage to go back to the chief to have them clarified or we should return to him with our interpretation for approval.

Once the study proposal or work requirement has been prepared as thoroughly as the author can, the work statement or proposal is submitted for approval in accordance with AR 1-110. If it is an RDT&E funded study, it will be submitted to the Office of the Chief of Research and Development and go specifically to the Studies and Analyses Division. The work statement will be reviewed to check its feasibility as to whether the study can be accomplished by OR SA methods. It will be also checked for duplication of effort, funding availability, and contractual consideration.

CONTRACTING FOR PROCUREMENT

The contracting sequence is shown in Figure 3. Based on submission of the work statement and approval for contracting, potential bidders are solicited to submit proposals and bids for consideration. At this stage of development, the contracting officer is the man in authority, for

it is he who is finally responsible for selection of the contractor to perform the work. There are two general categories of contracts for studies: open bid and sole source contracts. Open bids are solicited by advertising in professional and industrial publications or trade journals, such as the **Commerce Weekly**, or by mailing invitations to submit bids. Normally, 15 to 20 contractors will be contacted to submit proposals for consideration.

A. SOLICIT PROPOSALS

1. Open Bid or Sole Source
2. Briefings (Clear Work Statement)
3. Funding
4. Review Bids
   Sponsor & Contracting Officer
5. Selection

B. ANNUAL STUDY PROGRAM

1. Review Proposals
2. Consolidate, Submit to ASAC
3. ASAC Review
4. Contract Negotiation

Figure 3. Contracting sequence.

If the study is quite involved, it may be possible that briefings will be held to orient the contractors as to what is desired and to insure that the work statement is understood. One can readily see the importance of defining the scope of the work to be done by preparing a clear and comprehensive work statement. This will be the basis for orienting contractors to submit proposals. It will guide them in their estimate of cost and evaluation of their types of skills needed to perform the work. I want to emphasize that during the course of orienting prospective contractors, available or proposed funding levels will not be divulged. Each contractor must make his own estimate of how much he feels the effort will cost him and add his profit.

Reviewing the bids and proposals is a joint effort between the sponsor and the contracting officer. Frequently the sponsor will form an ad hoc committee consisting of representatives of interested agencies. They will select the potential contractors on a priority basis considering the degree of responsiveness and estimated quality of work of each bidder. The contracting officer will make the final decision aided by the priorities

assigned by the sponsor. The criteria for selection is to choose the lowest cost-responsive bidder. I emphasize that the sponsor should not be aware of the cost of contractor's proposals nor should be discuss relative costs with potential contractors. This is the purview of the contracting officer who awards contracts based on responsiveness and cost.

Sole source contracts are restricted to those agencies that have a particular expertise in an area to be addressed when that fact can be definitely established. We have an annual study program that depends upon sole source or open contracts. Open contracts are those where tasks can be added without going through the complete negotiating cycle. Sometime in the late fall, each staff agency and major command is solicited to submit proposals or work statements that define studies anticipated for the next year. Study proposals are reviewed by the Office, Chief of Research and Development, to select those appropriate for RDT&E funding. These are consolidated and submitted to the Army Study Advisory Committee (ASAC) for consideration. The ASAC reviews these proposals and determines the priorities and acceptability of each. It, in turn, prepares a consolidated program for the Army Master Study Program.

For work year 1969, the senior ASAC met in May and established priorities of effort for the coming year. This work plan is presently being negotiated with the Research Analysis Corporation. There are two open contracts presently in force at the Army Research Office. One is with the Research Analysis Corporation. The Research Analysis Corporation (RAC) is an outgrowth of the Operations Research Office (ORO) which was founded in 1947. RAC has also been designated an FCRC, that is, a Federal Contract Research Center. Federal Contract Research Centers are not-for-profit organizations that have a special relationship with the Department of Defense. They are allowed to keep classified files and are supported on a relatively constant funding level. The open contract is renegotiated annually. Individual tasks or projects can be added to the contract without contract renegotiation. Another open contract with the Army Research Office is with the Stanford Research Institute (SRI). This particular contract primarily supports DCSOPS in studies pertaining to the strategic defense posture, air and ballistic missile defense, Nike-X

employment, command control and communications, and national entity survival.

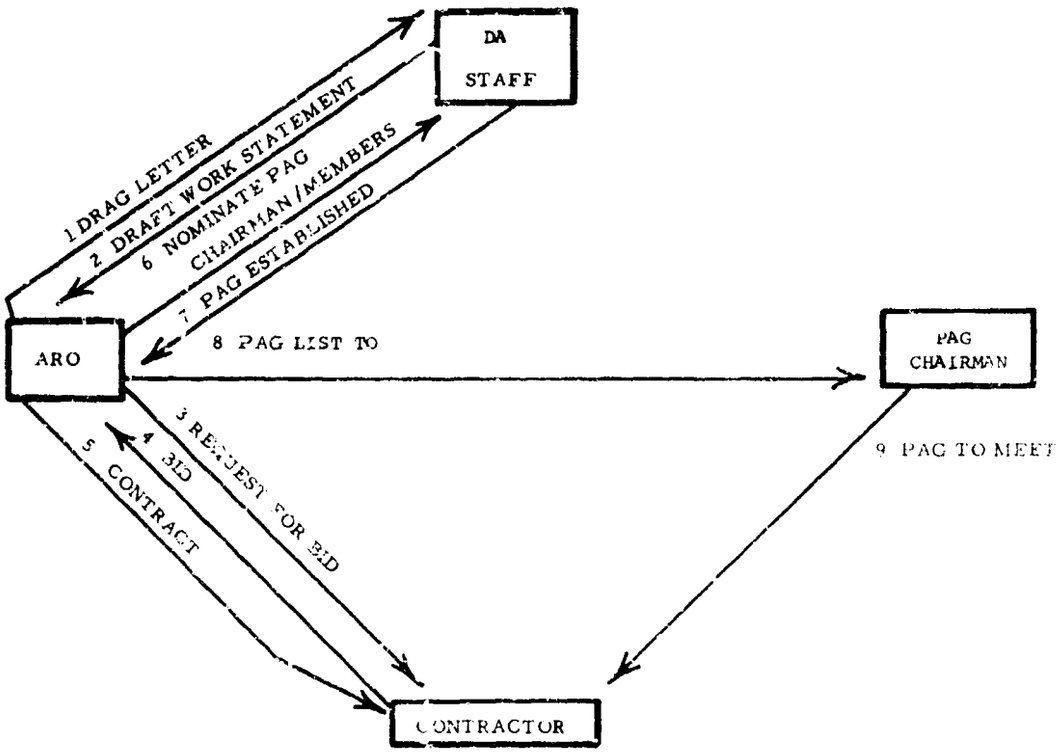

Figure 4. Processing study request.

Figure 4 shows some general procedures for processing study requests between agencies of the DA staff, the Army Research Office, and the contractor. The study request is sent from the DA staff agencies to ARO. When accepted, the request is sent to contractors for bid. The bid is received and the contract is let. The DA staff agency sponsoring the study is requested to nominate a chairman for the Project Advisory Group (PAG) that will monitor the study. The sponsor is also asked for nominees for membership to the PAG. The PAG is then selected based on submissions from each interested staff agency. The roster of PAG members is sent to the PAG chairman to begin interaction with the contractor.

Separate commands have open contract relations with research organizations much as the Army Research Office does with RAC and SRI. At the present time, CDC has open contracts with Booz-Allen, Tech Operations Incorporated and their representative CORG, H.R.B. Singer,

and the Planning Research Corporation. These contractors develop a background of experience and expertise and thus compile a comprehensive file and accumulation of data. They also establish close working relations with staff members and learn to know the desires of the Army and be most responsive to them. There are limitations on these organizations, however, in that they are constantly under scrutiny and criticism by Congress and are subject to imposed Congressional ceilings. There are certain management problems inherent in them as well.

MANAGEMENT OF INDIVIDUAL STUDIES

Individual study management is performed primarily by the Project Advisory Group (PAG). The PAG is a steering committee or a stag study organization with operations research and systems analysis assistance. The PAG provides the official link or dialogue between the sponsor and the contractor. It also provides informal but official coordination between the staff. It is organized with a chairman, members, observers, consultants, a secretary, and a military advisor.

The chairman is the project officer. He should be selected because he is the action officer to follow up on the results of the study for the sponsoring agency. He should be in the grade of colonel or GS-15 or higher. The members of the PAG should be true representatives of the agency to which they belong. Their primary duty in that agency should involve questions and requirements to be addressed by the study.

The military advisor is the contracting officer's representative and he will probably be a member of the Studies and Analyses Division of OCRD. There are also representatives from the Assistant Vice Chief of Staff and the Deputy Under Secretary of the Army for Operations Research.

The responsibility of the PAG is to insure that the study is developed, conducted, reviewed, terminated, and acted upon in the proper terms of reference. Its role is to insure that the study is most responsive to Army requirements. It is also to see that the military objectives are translated into research objectives so that the contractor can respond directly to military requirements.

MANAGEMENT OF OR/SA STUDIES

(It is here that I feel the OR/SA Executive Course offered by the Army Management School is most valuable to studies management in the Army. Participants' knowledge of Army field operations and requirements can be coupled with the appreciation they gain of operations research and systems analysis techniques. They should be equipped to understand how the data, facts, and assumptions used in studies can be made parallel to the real world.)

A mathematical simulation can be developed into an awe-inspiring computer run, but it will be worthless if the parameters used in the simulation and the values assigned to them are not truly representative of the real world. I am sure one can appreciate the importance of the PAG familiarizing itself with the problems and methodology used by the research personnel. The PAG should also learn what technical facilities are available to the contractor and the importance of their use to the contract.

The chairman of the PAG, like the chairman of any study group, arranges for and prepares the agenda, and he must do this in sufficient time for the members and the contractor to be ready to discuss the important issues at the meetings. The chairman convenes and chairs the PAG and prepares the minutes. The minutes are the official recorded guidance of the study project. The chairman reviews and evaluates the study's results, briefs the sponsor, who is his boss, and prepares a contractor evaluation. Members provide facts, assumptions, and guidelines for input to the study and they represent their parent agencies and keep them informed of the study progress.

Members submit agency comments and minority positions when they are indicated.

The military advisor is the OCRD contracting officer's representative. He is there to insure that the Army gets its money's worth. He assists both the sponsor and the contractor and facilitates good working relations and dialogue between the sponsor and the contractor.

Dialogue is absolutely essential to the success of the study and it must be established early. Poor studies usually point to lack of dialogue. Like artillery support, it must be close and continuous. Mutual understanding is needed between the analyst and the Army staff. It should be a shirt-sleeve relationship with the contractor treated like a staff

member with needed information made available to him in a timely and complete manner. Visits, memoranda, and phone calls are required frequently, on a daily to weekly basis. PAG meetings are the official convening of the members although decisions should not wait until the PAG meets. These may be described as in-process reviews such as we have in the various stages of hardware development. The minutes of the meeting are the official record of proceedings and decisions. They should be prepared so that critical decisions, changes, and so forth are officially recorded.

Figure 5 shows the recommended format for PAG minutes. I believe it is obvious that the minutes could not be prepared properly unless all concerned have carefully thought through their own roles and responsibilities toward proper study progress.

1. STUDY OBJECTIVES AGREED TO BY THE CONTRACTOR AND THE PAG AT THE LAST MEETING
2. PROGRESS MADE BY THE CONTRACTOR TOWARD THE ACCOMPLISHMENT OF STUDY OBJECTIVES
3. DISCUSSION
4. STUDY OBJECTIVES AGREED TO BY THE CONTRACTOR AND THE PAG FOR THE NEXT SCHEDULED MEETING
5. SUMMARY OF EACH PAG MEMBERS'S STAFF POSITION
6. CONCLUSION
7. RECOMMENDATION
8. TENTATIVE DATE FOR NEXT PAG MEETING

Figure 5. PAG minutes format.

The input of data, facts, and assumptions for the study begins at the very outset of the study progress itself. The first stage of input exchange is problem definition. An agreement on the problem definition between the contractor and the study group must be made as soon as possible. The same applies to a clear definition of the tasks that will be undertaken to support the problem solution. The PAG should be dedicated to identifying the problem and tasks and providing input just as if it were a group performing an Army staff study.

Documentation involved in studies management tells the story of the study progress and also comprises the final results. It consists of reports and publications, guidance, software, and records of the management of the study. Software may consist of computer programs, tapes, card decks, and other related equipment for documentation. Guide

books and instructions will accompany software to describe how the programs and related accessories are to be used.

The PAG formally reviews the study documents and comments on the results. It should not wait until a study is completely finished to do so. Informal reviews are made throughout study progress and corrective action taken when necessary to insure that the study stays on the track.

Formal evaluation of the study is made in accordance with AR's 70-31 and 1-110. The sponsor should submit an evaluation of the study and contractor within 30 days following completion of the study. Actions taken as a result of the study are left to the Army. It is here where the analyst and the Army part company. Contractor recommendations could possibly be solicited on an informal basis but they are not appropriate as an integral part of the study.

Let me review the milestones or phases of study management for the supervision of an OR/SA contract study.

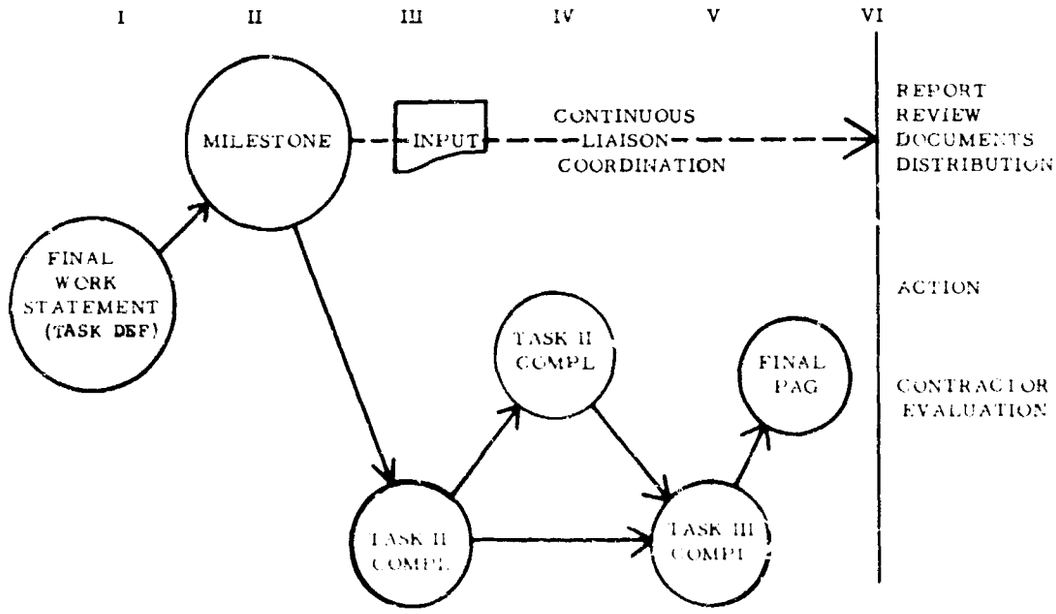

Figure 6. Study phases in milestone management.

In Figure 6 we see six phases indicated by Roman numerals across the top. Note that in the first phase, the final work statement and task definitions are made. It is absolutely essential that the work statement

and the definition of the tasks be made as early as possible in the study effort. Regardless of how good the work requirement prepared by the author, there are certain agreements that will have to be made between the analyst and the advisory group to insure that there is mutual understanding on all issues and that the requirements are necessary and sufficient.

Phase II has been designated a milestone. This might be a meeting shortly following the first one in which each party has gone back to do a bit more thinking and to firm up the issues to guide the study along a well directed track. All must understand what role each is to play in the study project. Phases III, IV, and V represent a completion of specific tasks that have been defined earlier. They are interrelated and in some cases interdependent. The completion of these tasks in some sequence or concurrently will lead to the final study product, at which time the PAG reviews the completed effort. I would like to also point out that during the entire course of the study there is input by the members of the PAG and continuous coordination between PAG members and between the PAG and the analysts. At phase VI a line is drawn to show the reports, reviews, documents, and distribution action to be taken as a result of the study. Evaluation of the contractor and the work itself is the responsibility of the Project Advisory Group or the Army, and not the contractor.

SUMMARY

In summary, I would like to make a final appeal for an understanding of the importance of problem definition. This is essential early in the study phases and must be clearly defined and understood by all concerned.

Study requirements must be carefully scrutinized for their potential and for the capabilities and limitations of OR SA techniques. One should ask the question, Can operations research and systems analysis solve the problem? Perhaps they cannot.

There must also be some appreciation of the methodology to be used. What can operations research and systems analysis do that a good staff study could not?

Is there a need for the study? It it really necessary or could we get along without it? I can cite several examples where this question was

not seriously asked for even one or two years after the study was initiated.

The effectiveness of the PAG or the project officer relies on many things. We must have proper membership or the proper personnel designated to do the job. Requirements must be anticipated. How is the study to be used? There must be close continuous cooperation and dialogue between the sponsors and the contractors. There must be timely, accurate, and critical reviews to insure that the study stays on the track and that it meets the objectives for which it was designed. Study evaluation must be critical and useful. ■

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His publications include papers on transportation system engineering, high temperature structures, and engineering aspects of high temperature materials.

(This article was adapted from Dr. Diamant's presentation of 12 June 1968 at the Army Management School.)

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Introduction

At first blush, a review of transportation systems at an Army Management Course may seem to be at odds with the general subject matter and intent of the other discussions presented to this group. If the subject of my paper were military transportation, this obviously would not be the case. However, a discussion of civilian transportation system characteristics will provide an interesting background to military system considerations. The transportation systems are extremely complex in the multitude and variety of their component elements. They involve large fleets of equipment, stationary facilities, numerous operators of all kinds, and complicated operating procedures. The system analysis procedures which are being used to design transportation entities and serve as a basis for the decision-making processes that result in the implementation of such systems are similar to those used in the military technology. In fact, modern techniques of system analysis, which are being used with increasing frequency in planning processes for transportation systems, are derived from methods and procedures which were developed fairly recently in the context of military or space programs.

As distinct from their military counterparts, transportation systems occupy a rather unique position in our relationships, as engineers or scientists, with them. This arises from the fact that, unlike in other situations, most of us are thoroughly familiar from firsthand experiences with the problems, if not the intricacies, of transportation systems. To a certain extent, we all possess some expertise in this area. But we gain this not as a result of professional interest or study, but simply as

a result of living with and within an environment populated with various forms of transportation systems. While, on the surface, this may seem helpful, it in fact tends to becloud the significant aspects of the systems, which results in overcomplicating the simple solution to transportation problems or, on the contrary, oversimplifying our view of very difficult situations.

Therefore, this discussion will briefly describe some of the complexities of typical transportation systems. We will use some examples to illustrate how classical techniques of system analysis can be applied to the study of and search for solutions to some transportation concerns of great current interest. These examples will be drawn from a study project on high-speed ground transportation which we are currently undertaking for the U. S. Department of Transportation. This work supports the activities undertaken by the Department of Transportation in response to the high-speed ground transportation legislation passed in 1965. In the context of our studies, the immediate application of our analysis is tied in with the improvement of transportation conditions in the Northeast. As is well known, the U. S. Department of Transportation has devoted a considerable amount of interest to transportation problems in the northeast corridor. In particular, the laborious process for getting the first high-speed trains running between Boston and New York and Washington has been prominently displayed in the daily press. However, these developments represent only a first step in developing better transportation services in the area. Where possible, my discussion will focus on the broader planning problems which must be confronted in developing the kinds of facilities and services that will meet the area's needs during the next 20 to 50 years.

The Transportation Problem

It is a characteristic of transportation systems, and to no small measure of many other socially oriented systems, that no unique view exists of their nature, their problems, the methods of solution, the need for such solutions, and the impact which any adopted solution is likely to have on the rest of society. Therefore, an attempt to sort out these different views should be made before embarking on a discussion of the methods and procedures which might be used in dealing with such

problems. Traditionally, transportation was viewed either as a class of engineering problems or a particular branch of economics. We are all familiar with many engineering accomplishments and endeavors relating to transportation. Bridges and tunnels, and railroad tracks, and traffic management have been activities of heavy engineering concentration. The design and construction of transportation structures and conveyances have been a mainspring of engineering development through the ages. Witness the Roman highways, the railroads of the 19th century, and so forth. More recently, the growth of our urban society, with its unique and new transportation problems, has spurred the development of new forms of engineering with particular application to traffic control and management. It is in this context that the first applications of operations research methods were applied to the movement of vehicles and pedestrians. However, it is clearly a narrow and fallacious view to describe transportation solely as an engineering problem.

On the other hand, for some time the economic view of transportation has held sway in many quarters. While it is true that the economics of the systems, including the financing aspects and the problems of profitable operation, are vital to the existence of any type of transportation form, this limited view tends to ignore the jurisdictional, sociological, and technical aspects of the system.

It would seem that one of the critical conceptual problems that must be dealt with in approaching transportation considerations is the manner in which these various and often conflicting needs can be brought together and considered simultaneously. It is fashionable at this time to describe any comprehensive approach to a problem of many facets, such as we find in transportation, as a system-oriented view. It is quite obvious that this view does not presume to uncover aspects of the problem that were until now hidden, nor does it presume to suggest that the solutions and decisions to be made as a result of this view could not have been otherwise obtained. What the systems approach to transportation problems does suggest is that the complexity and multiplicity of interests involved require a systematic approach for its understanding and for finding solutions when needed. Through the process of system analysis, we intend to include in our study as many of the

influencing factors as is possible. We try to reflect the objectives of the planner, the user, and the community at large, and, at the same time, try to be responsive to the constraints which shape not only the transportation systems that surround us but also those which we are creating. In effect, the system analysis of the transportation system attempts to meld the technological, economic, jurisdictional and, if possible, sociological factors which must be considered in any real-world problem.

Human, economic, jurisdictional, and technical constraints are observed in whatever solution is evolved to a given transportation problem. As an example of what is meant by these terms, let us consider the process whereby transportation systems of some magnitude, such as might be encountered in the northeast corridor, are developed. It is clear from the outset that the questions that must be answered in making the decision for the system involve a selection of the technology, or facilities to be developed, the location within the area to be serviced, and the means — financial and otherwise — which are necessary to implement the decision. But when the decision-maker is confronted with a multiplicity of alternatives from which he is expected to choose that which best meets his objectives, the process of selection or the criteria used become more complicated than might first appear. Thus, it is not possible to select transportation systems strictly on the basis, say, of the costs involved in buying and installing the proposed service. Also, careful attention must be given to the impact the given choice may have on the economics of the region and on those who would directly or indirectly become users of the service. When considering the cost of operating the system and the returns to the operator, it is important to recognize that each of the possible alternatives will have a definite impact on less obvious aspects of the economy, which is as important as the impact of daily receipts and disbursements associated with the operation of the system.

When, in addition, the investment in the major transportation venture may pursue some lofty objectives — beyond those of merely providing a desired transportation service as would be the case when the investment to be made in the new system may be designed to assist the sluggish or stagnant economy of a region — the social and economic consequences of the choice made become inexorably connected with the

selection and decision-making processes. Moreover, this process is complicated by the necessity to base the selection on the existence of numerous constraints. These include constraints on the availability, extent, and nature of the financing available for developing the system. Often, jurisdictional restrictions which may limit or force the location and nature of service to the actual design of the system must also be dealt with. It is well known that questions of passenger safety and service reliability have significant design consequences. No less important, from the standpoint of the system design, are the constraints imposed by the need to provide passenger comfort and convenient service in order to acquire and maintain the necessary patronage for rendering our venture profitable or self-sustaining, as the case may be.

Clearly, then, the transportation planner is confronted with a veritable maze of requirements, constraints, objectives, and technological choices. They all represent various facets of what we know as transportation systems. The job then is to apply systematic procedures, some of which are derived from classical system analysis techniques, to help organize the problem in some rational way, thereby allowing us to identify the meaningful answers, if any, to our problem.

The same family of parameters apply to many kinds of transportation systems. As we well know, the development or improvement of transportation facilities and services is a major problem confronting most metropolitan areas in this country, and for that matter, in the world. The problems of regional or national transportation are no less urgent in this country than they are in many of the developing new nations. While the level and type of service which are needed differ from case to case, the problems and the end objectives are fairly closely related in all the senses. Figure 1 attempts to put in perspective three of the major types of systems that are of interest from a planning viewpoint. This table presents a succinct view of transportation systems on the urban, regional, and national scale. The geography or locale within which the system would operate, as well as the interfaces it must effect with other modes of transportation, are indicated. These will have as significant an impact on the form and operation of the system as the particular hardware characteristics and the facilities which are being utilized. The table also indicates broad policy and economic objectives which

SYSTEM DESIGNATION	LOCAL	MODAL INTERFACES	ECONOMIC OBJECTIVES	ECONOMIC SECTORS AFFECTED	SOCIO-POLITICAL OBJECTIVES	HARDWARE CHARACTERISTICS	NETWORK CHARACTERISTICS
NATIONAL	AGGREGATE OF REGIONS	INTERNATIONAL SYSTEMS, LOCAL FEEDERS	NATIONAL & INTERNATIONAL DEVELOPMENT	LARGE INDUSTRIAL, AGRICULTURAL & TOURIST SECTORS	DEVELOPMENT OF INDUSTRIAL-POPULATION PATTERNS	LONG RANGE, LOW FREQUENCY, FREIGHT EMPHASIS, HIGH SPEED	LOW CONNECTIVITY
REGIONAL	AGGREGATE OF STATES, COUNTIES	ALTERNATE MODES, URBAN MODES	REGIONAL ECONOMIC & INDUSTRIAL GROWTH	SPECIALIZED INDUSTRY & AGRICULTURE, SOME LABOR FORCE	REDEVELOPMENT OF DEPRESSED AREAS, INDUSTRIALI-ZATION OF AREA	SHORT RANGE, MODERATE SPEED, MODERATE FREQUENCY	INTERMEDIATE CONNECTIVITY
URBAN	METROPOLITAN OR MEGALOPOLIS AREAS	ALTERNATE MODES, REGIONAL MODES, COLLECTION/ DISTRIBUTION MODES	LOCAL AREA AND URBAN SECTOR ECONOMIC/ INDUSTRIAL GROWTH	AREA INDUSTRY, BUSINESS AND LABOR FORCE	URBAN REDEVELOPMENT PLANNED URBAN EXPANSION	SHORT RANGE, LOW SPEED, HIGH DENSITY, HIGH FREQUENCY NO FREIGHT	HIGH CONNECTIVITY

Fig. 1. Various forms of transportation systems.

could be used in the planning or development stage of such systems. Also indicated are potential socio-political objectives which could be exercised at the highest level of government in the planning stage of such systems. Finally, the table suggests which economic sectors are affected by the quality of the service being provided and, in the last column, typical network characteristics which dictate the form of the transportation service to be provided are indicated. The meaning of the term "connectivity" in this instance suggests the ability of direct access from one point of the network to any other. High connectivity implies the ability to reach any point directly from any other point in the network. Obviously, this is the case with many urban transportation systems, but the degree to which this can be accomplished diminishes as the geographic scale within which the systems operate becomes greater. While one may still reach most major cities in the country from any other major urban area, the ability to physically transport oneself directly without intermediate stops or transfers is much more restricted as the size and, therefore, the economic and population importance of the cities in question decrease.

Methods in Transportation System Analysis

Let us examine now, at least conceptually, what elements must be considered in the analysis of the transportation system. At this stage,

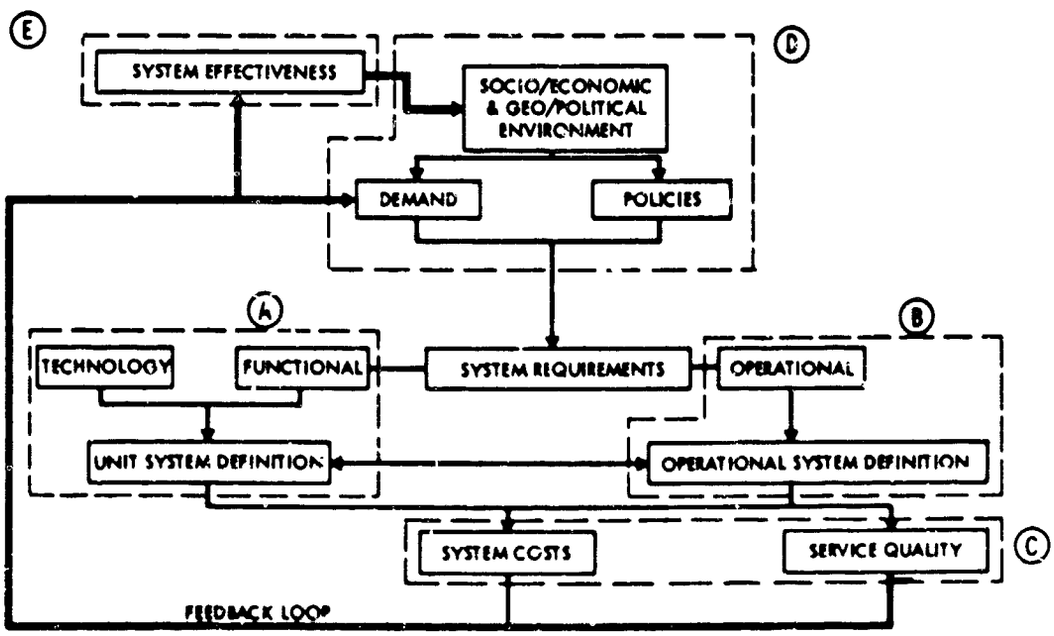


Fig. 2. Schematic of system engineering interactions.

we are most interested in identifying the relationship between the various aspects of the system and, in particular, any feedback loops which might affect the analysis at any stage, with the results of studies which would normally take place at a later time or at a different point in our endeavors. In order to make this discussion more understandable, refer to Figure 2.

The process generally starts with a definition of the social and economic environment in which the transportation system will be designed to operate. The environment as it now exists and any projections we can make on its growth will indicate a certain demand for the system. As we will see, the mere presence of a new or improved transportation system will have a side effect of modifying that demand. We are all familiar with the situation in many of our urban areas where the construction of extensive highways or freeway systems has resulted in significant increases in the utilization of these facilities beyond the best expectations of the planners. The demand for the system will generally be projected in terms of trips per year, or day, and if possible will reflect seasonal variations and diurnal fluctuations if they are significant. It is clear that such variations are important considerations in planning when one considers, for instance, the fact that in 1967 the seasonal fluctuation in trans-Atlantic airline passengers resulted in a difference of a factor of 4 between the lowest average number of daily trips in February as compared with the peak daily loads at a height of the vacation season in August.

In addition, one frequently has to consider governing policies and constraints which dictate the development for the purpose of the transportation system. These may range from such critical issues as providing transportation in economically-deprived areas to restraints on the location of the transportation system lines We are also familiar with many aspects of the latter, as a result of controversies which arise during the planning stage of freeways and highways in urban areas. Additional governing policies which must be considered may reflect the ability to raise funds for the venture, and the interest rates to be paid in the time span over which the capital would have to be recovered. Also, one may include here policy decisions of vital interest regarding the profit nature of the system and, as is becoming increasingly clear

in many forms of public transportation, the need and extent for public subsidy.

All of these considerations, which in Figure 1 are shown in box D, give rise to what we might call the system requirements. From these, technological and operational consequences evolve which best meet these requirements. On the one hand, as is shown in box A on the left in Figure 2, the system requirements result in a definition of technology at the unit level. What do we mean by this? We use these terms to indicate to some extent it is possible to convert the system requirements into a limited definition of the kind of transportation hardware and/or facilities that would best meet the objectives and policies which resulted in the requirements for the system. For instance, in one case, this unit analysis may result in a decision to develop a high-speed mass transit system of the railroad type. The unit definition would simply yield a description and a specification of the vehicles, tracks, stations, underground support facilities, and, if electrified, the power distribution system.

However, this description, as we can well imagine, is not sufficient to determine how well the chosen technology meets the operational system requirements. In order to do this, one must determine the operational characteristics of the system as shown on the right side of Figure 2. This includes a definition of the schedules and frequency of service, the network over which the system would operate, the fleet sizes, and all other operational features of the selected system.

Naturally, neither the definition of the operational characteristics shown in box B on the right in Figure 2, nor the definition of the unit system, shown in box A on the left side of Figure 2, can take place separately. In fact, the search for the technology and its associated operational policies must go hand in hand in order to determine the best combination to meet the requirements of the system. Both the definition of the unit technology as well as that of the operational characteristics of the system contribute to the definition of the total system cost. On the other hand, the same elements of our analysis allow us to construct a definition of the service quality to be provided by our system. By this we mean the ability of the system to provide safe, comfortable,

and convenient service to its patrons. We know, however, that the demand for the system is a strong function of both the costs to the passenger and the service quality which the transportation system provides. For instance, as a service gets to be more expensive in terms of the passenger fare, the demand for it decreases. On the other hand, even if the cost for the service is relatively high, if its quality is appealing to the public, the demand increases. The histories of the airlines and railroads in this country in the last 20 years are classical examples of this interplay. For this reason, the output of the analysis A and B in Figure 2, which is shown in box C, feeds back through a loop directly into the demand definition from which stem the requirements for the system.

The figure also indicates the need for a system effectiveness measure in the analysis. By this, we mean some criterion for judging the goodness of the system as we have defined it, both in terms of the hardware which it uses and the cost and quality of the service which it provides. Unless such a measure is used in the analysis, it is sometimes hard to recognize when a given solution is indeed the best, and it is difficult to see the extent to which it meets the broad socio-economic and political conditions or objectives of the environment. The question of the effectiveness of a transportation system, however, is a rather complex issue, difficult to define even from a conceptual standpoint. This, unlike the situation in most military systems, is typical of one of the major conceptual problems confronting the design of many socially oriented systems.

We have noticed from this discussion that full consideration of a transportation system with all of its implications is a problem which involves simultaneous study and analysis of many facets, as well as a consideration of significant feedback loops. We may designate a problem of this kind as a coupled one. While it is relatively easy, from a conceptual viewpoint, to discern what the coupling is, the manipulation of such problems with a view of obtaining some real numbers to help in the decision-making process is rather difficult. To make the solution possible, it is necessary to uncouple the problem in order to allow that successive solutions be evolved which provide a simple way for reflecting the results of any given stage of the analysis in a subsequent one. A typical approach of this kind is shown in Figure 3. In this case, it is

suggested that the feedback loops be considered only at discrete points after completing each stage of the analysis. For instance, one may evolve a set of policies and demand requirements which would give rise

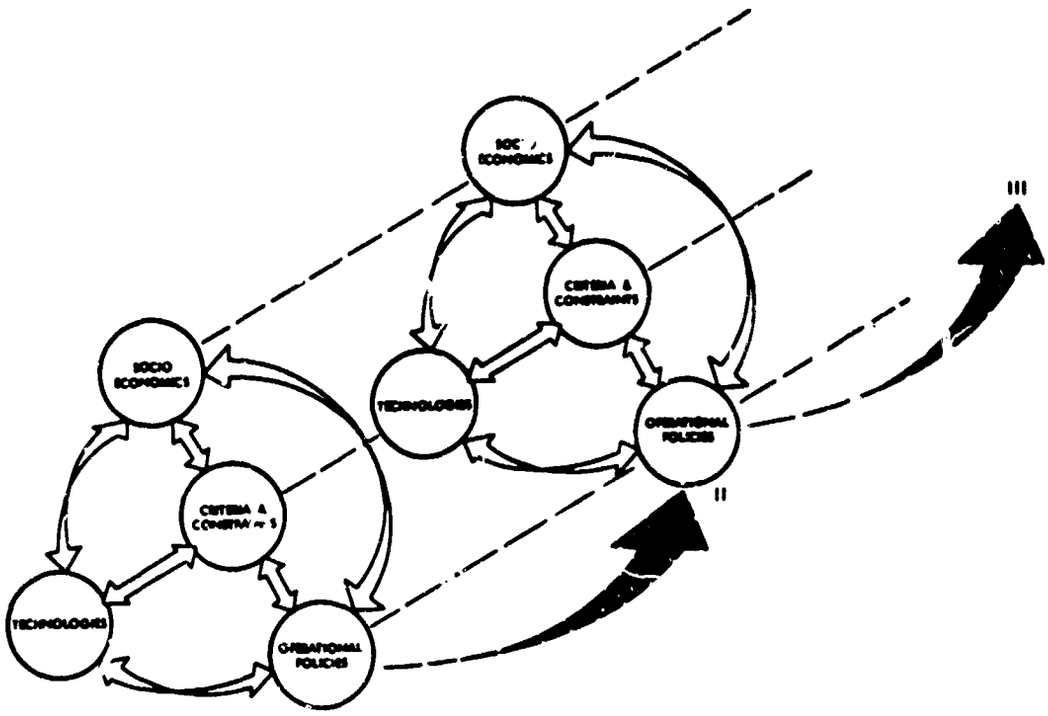


Fig. 3. Sequential (iterative) evaluation process.

to the system requirements of our Figure 2 and eventually to a description of a transportation system, in terms of both technology and operational features. This may be considered as stage one in our Figure 3. At that point, the impact of the design service on the demand and policies governing the system could be reassessed and, if necessary, the full analysis cycle can be resumed in order to determine what, if any, changes to the defined system and its operations would result from the improvement in our understanding of the demand and the impact of revised policies.

Northeast Corridor

The northeast corridor is a good example of the kind of complex system analysis which is necessary in advance of the commitment of major financial resources for the development of far-reaching transportation facilities. The study is concerned with the determination of major alternatives in transportation services and facilities to serve the

needs of the northeast during the next 20 to 50 years. The corridor encompasses an area stretching from Massachusetts through Virginia and from the Atlantic coastline, inland for a distance of some 100 miles. The area has been selected for this analysis as a result of the heavy concentration and population industry and commerce within a relatively small geographical region. Being one of the most settled segments of the country, it is also in the throes of a major transportation problem which has gradually developed as the demands on the system have exceeded its capacity. This situation is true in all modes of transportation including ground and air. The hardships experienced by the railroads which serve the area as well as the congestion of highway and air lanes during frequent periods of high demand, are well known.

The general approach pursued in this analysis is to determine a set of alternative developments in services or facilities as a result of a predicted demand for expanded transportation. The impact, or feedback, which such alternatives might have on the economics and population of the region is to be taken into account. The selection of these alternatives is to be coupled with a search for possible and/or desirable financing and management possibilities whereby these potential transportation developments could come into being. A schematic of the general approach is shown in Figure 4.

The study envisions seven different tasks. The first involves a selection of systems and services which would constitute the transportation alternatives that would be selected for final evaluation by a decision-making body. The study recognizes the presence within the region of extensive and well established transportation systems, such as railroads, highways, and air lanes. Any change or improvement in the transportation picture must take into account the existing facilities and whatever natural developments they might see during the period of interest for this study. As a result, the search for systems and services envisions that each major alternative for the region could consist of a possible mix of three major ingredients. The first of these would be changes and improvements in the types of services that are now available to the public. In this category, we might include such developments as improved operation of railroads along major transportational links in the area. These improvements might encompass better schedules, quicker

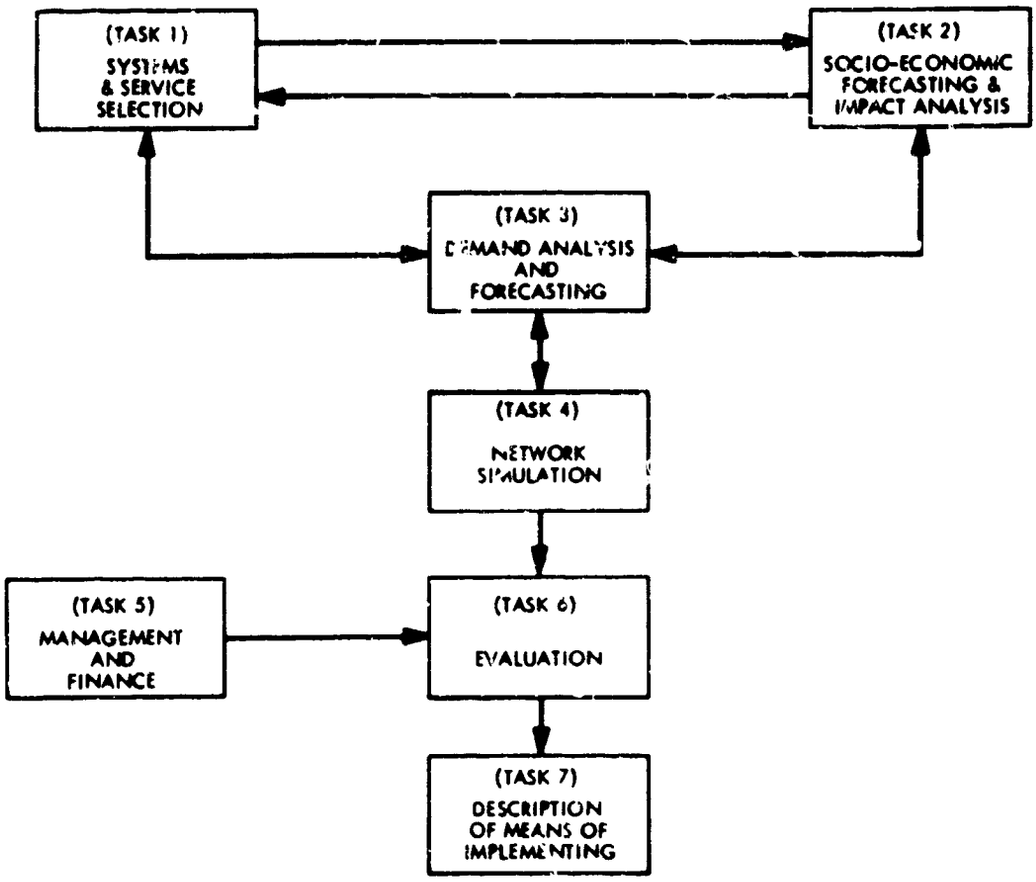


Fig. 4. Schematic of northeast corridor project.

trips, more reliable arrival times, and so forth. The second major ingredient in the system and service selection is conceived to be derived from improvement in existing facilities. These might include such possibilities as additional highways, expanded use of existing highways, modifications of existing air routes, airport, or railway facilities. The proposed demonstration of high-speed rail service between Washington, New York and New York Boston, which would make use of the new electric train, the Metroliner and the new turbine-driven train, are examples of such improvement in facilities. Lastly, the analysis envisions that technological developments presently available and to be expected during the years to come will contribute a third major ingredient into the mix of possible candidate systems and services. Some of these possibilities will be reviewed shortly.

At this point, we can refer again to Figure 4. Notice that the selection of services and systems is envisioned to be closely coupled with the impact it may have on the social and economic aspects of the region which has to be serviced, Task 2. The present social and economic

framework, as well as that forecasted for the years to come, is expected to provide a strong forcing function on the selection of the systems and services. We can envision this by recognizing the close coupling between existing industrial and commercial complexes and the requirements which they make or the constraints which they impose on the development of new transportation services.

Finally, it may be seen from Figure 4 that the selection of the systems and services is affected by, and in turn affects, the demand for the service. The demand, as might be expected, is in turn determined by the socio-economic framework of the region, as well as by the service which is provided. For instance, the income levels and income distribution within a given locality will have a strong effect on the patronage of a proposed system, just as the fare and the quality of the service which that system will provide will determine to a large extent the number and distribution of its users.

In order to evaluate the improvements and other consequences on the general transportation picture in the region, the results of the systems and service selection are utilized in a subsequent task — number 4 — wherein the proposed services are being studied in a network simulation which takes into account the utilization of all transportation facilities, existent as well as proposed, within the region. This simulation allows a quick evaluation of the number of users, the total utilization of the system, and its revenues.

The results of this analysis, coupled with the output of a parallel study in which management and financing approaches are being determined, are then used in Task 6 for an evaluation of the candidate systems. It is assumed that those candidates which pass the evaluation criteria are further defined in Task 7 wherein the means for implementing such systems are being considered. These plans might include techniques and approaches for raising the necessary capital for developing the system, and the development of enabling legislation, and zoning regulations where required, as well as the more classical formulations for engineering implementation plans.

Typical Study Data

The previous discussion suggests the multiplicity of parameters which must be taken into account in a large system analysis of this kind.

These include not only the obvious technological and geophysical parameters, but also a multitude of policy, economic, human factor, and sociological descriptors. Figure 5 suggests the broad scope of the data which must be manipulated in this type of analysis. We notice that, in

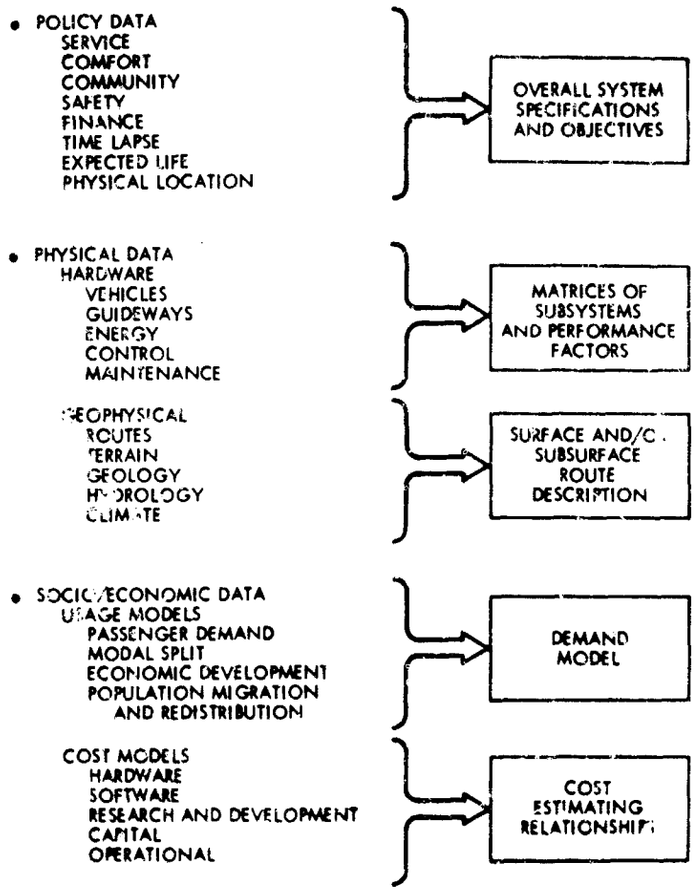


Fig. 5. Study data.

general, data is required in five major categories. To begin with, overall system specifications and objectives must be defined. These may fall, generally, in the category of policy data which would provide some indication of desired levels of service, comfort, community reaction or acceptance of interference, safety objectives, financing constraints, time lapse for the development of the system, the expected life for facilities and moving equipment, and some general idea of the physical location of the system.

The next group of data describes the kinds of hardware systems which might be considered in the analysis. This is an assemblage of

physical data describing available vehicles, guideways, both in their physical makeup as well as their performance. In addition, forms of providing energy, control, and maintenance of the system must also be described.

The third major category of data relates to the surface and/or subsurface route descriptions. This is fundamentally a package of geophysical data. It includes a description of possible routes, the terrain to be encountered on these routes, the geology which might be necessary for consideration in the construction of surface or subsurface facilities, the hydrology, and the climatic constraints.

The fourth type of data category required for the analysis is socio-economic in character. It includes the set of models which describe the demand for the service by passengers and industry. In addition, it may contain models that describe the complex processes whereby a passenger or shipper elects one form of transportation over another when more than one mode is available between any two given points. These are known as modal split models which are obviously necessary to describe the competitive posture of the proposed system as against other systems available in the area. In addition, the socio-economic data may include forecasts of economic and population distribution and development within the area.

The last group of data required for the analysis is made up of cost information. This is generally provided in the form of cost estimating relationships which attempt to describe costs of significant system elements in terms of critical parameters which determine them. For instance, cost estimating relationships for hardware could be presented in terms of the performance, weight, reliability, or expected life-time of a given unit. These costs, when appropriate, must also include provisions for the necessary research and development stages which would lead to the availability of equipment. Of equal significance are the capital costs, including the capital recovery program. Obviously, other cost relationships must include the operational charges, both for equipment as well as for the necessary labor.

What about the kinds of hardware systems that are available for an analysis or search for transportation systems and services? These may cover the gamut ranging from all forms of air transportation

through various developments of conventional automotive systems to the more exotic and advanced concepts of high-speed ground transportation.

		RATIONALE*		CLASS NAME	CLASS DESCRIPTOR
CONTINUOUS CAPACITY		• ANY SYSTEM WHICH EMPLOYS AN ESSENTIALLY CONTINUOUS AND UNBROKEN SUCCESSION OF CAPACITY, – CLASSICAL EXAMPLE IS THAT OF A MOVING BELT.		CONTINUOUS CAPACITY SYSTEM	CCS
BATCH CAPACITY	DOOR TO DOOR	• AUTOMATION OF CONVENTION HIGHWAYS AND VEHICLES		AUTOMATED HIGHWAY SYSTEMS	AHS
		• MULTI-MODAL VEHICLES USING SEPARATE AND NEW AUTOMATED GUIDEWAYS FOR INTER-CITY PORTION OF TRIP.		MULTI-MODAL SYSTEMS	MMS
		• PASSENGER CARRYING VEHICLE IS FERRIED ON INTERCITY PORTION OF TRIP		AUTO-FERRY SYSTEMS	AFS
	STATION TO STATION	• GUIDEWAY ENCLOSURE	• GUIDANCE & SUPPORT		
		DEPENDENT	CONTACT AND/OR GENERATED	TUBE-INHERENT SYSTEMS	TIS
		INDEPENDENT	ROLLING/SLIDING CONTACT	ROLLING SLIDING SYSTEMS	RSS
		INDEPENDENT	GENERATED	TRACKED LEVITATED SYSTEMS	TLS

*ANY SPECIFIC SYSTEM IS TO BE CLASSIFIED IN THE APPLICABLE CLASS NEAREST THE TOP OF THE TABLE

Fig. 6. Classification of high-speed ground transportation systems.

Figure 6 is a succinct breakdown of possible ground systems to be considered for regional transportation. The systems have been divided into two major categories: continuous and batch capacity systems. In the first group are contained systems which could provide transportation that is essentially available at all times to the passenger. Classical examples of such systems are found in the family of moving belts or people movers that are seen in many airports and in some shopping areas. Such devices, by their very nature, would be found to be most desirable for use in cases of heavy demand for service over short distances and at relatively low speeds.

But in the batch capacity type of systems, we can distinguish two major classes — the door-to-door systems and the station-to-station alternatives. The door-to-door alternatives are fundamentally techniques for better utilization of the privately-owned automobile. We can distinguish

three stages in the development of such systems. In the first and least sophisticated, we can envision the transportation of automobiles on railroad cars which would allow the effortless travel over long distances while still retaining advantages of the automobile at the origin and destination of the trip. Such systems are designated as auto-ferry systems. As a next step in development, we may envision the utilization of the automobile along separate and automated guideways. Such facilities would make it possible to freely use the automobile at the origin and destination for street travel, while allowing rapid and safe transportation between urban areas without the restrictions of schedule which are imposed by the auto-ferry systems. Such concepts are best grouped in the category of multi-model systems. Finally, with sophisticated technology, particularly in the area of control, we can envision development of the systems which would allow automobiles to be driven on specially automated highways fully within the control of some centralized mechanism. These developments are fundamentally distinguished from the multi-model systems in that they require the least modification to the typical hardware but also the development of the most sophisticated electronic subsystems. Obviously, because of the required sophistication in technological development, these systems are farthest down the road.

In the second category of batch capacity systems, the station-to-station concepts are developments along the traditional lines of railway service. That is, they emphasize scheduled service for mass use on fixed guideways. One can distinguish three general types of hardware possibilities in this area, depending on the type or need for a guideway enclosure and the manner in which the system is supported on the track. In some developments the systems are required to operate within a tube in order to be able to attain high speeds which would be otherwise impossible, or uneconomically achievable on the surface. Such configurations are designated as tube inherent systems. In other cases, systems are expected to operate on tracks and be supported much in the manner of present railways or monorails on metallic wheels. These configurations fall in the category of rolling and/or sliding systems. Finally, when the metallic wheel is replaced by some other form of support and guidance, such as is found in the case of air cushion vehicles, the systems are designated as tracked levitated systems.

The most realistic example of such a hardware concept is the air cushion vehicle, a test model of which has been successfully operated in France. These devices operate by blowing a cushion of air against a hard concrete track which serves to support as well as guide the vehicle. Propulsion is achieved by various means, either electric or by propellers and fans. Some of the test models have been operated with thrust provided by small rocket motors.

Within each of these classes of transportation systems, the analyst may find a variety of concepts proposed and in some instances taken to some stage of development. Some of the wide possibilities available for the study are shown in Figure 7. In this matrix an attempt has been made to show representative concepts within each of the suggested classes of transportation, and the guideways, vehicles, and energy sources that have been proposed for each of these systems are also indicated when made available by the proponents of the systems.

Techniques for System Analysis in Transportation

Up to this point we have attempted to show the complexity of the transportation systems problem and the multiplicity of data which is available and necessary for performing a meaningful analysis. What about the tools which are available and can successfully be used in performing this analysis? Obviously, classical techniques of operational analysis can be used to describe the operations of such systems, the flow of goods and vehicles along certain lines in the network, and so forth. Econometric analysis is the mainstay of the development of demand models and economic impact models. These will not be discussed here. Instead, a brief review will be given of some techniques of optimization which have been successfully applied to various aspects of the transportation systems design problem.

The reason for looking toward techniques of optimization as a main tool in the analysis can be found in the fundamental need to be able to objectively assess the merits of each candidate system that is being investigated. This objectivity, which will be useful for a non-biased comparison of candidate systems, can be attained by evaluating them at their best under the given circumstances, requirements, constraints and objectives. The question which might be asked at this point is,

CLASS	SPECIFIC CONCEPT	GUIDEWAY			VEHICLE				ENERGY		
		STRUCTURE	TRACK	OTHER	STRUCTURE	SUSPENSION	PROPULSION	OTHER	SOURCE	DISTRIBUTION	OTHER
CCS CONTINUOUS CAPACITY SYSTEMS	TEX-TRAIN			WAYSIDE MOTORS	NO SIDES OR CEILING		FRICTION DRIVE				
MMS MULTI-MODAL SYSTEMS	STARRCAR	HALF TUNNEL	SLOT						BATTERY AND THIRD RAIL		
AFS AUTO FERRY SYSTEMS	RROLLWAY		WIDE GAGE	HI SPEED SWITCH		FLANGELESS WHEELS		GUIDANCE BY VERT. AXIS WHL'S. ONE SIDE ONLY			
TIS TUBE INHERENT SYSTEMS	GVT	DOUBLE TUBE CROSS VALVES		GUIDEWAY SPRING SUSPENDED			PNEUMATIC PLUS GRAVITY				
RSS ROLLING SLIDING SYSTEMS	UNITED AIRCRAFT				AIRCRAFT TYPE	GUIDED AXLE CG TRANSLATION	GAS TURBINE MECHANICAL DRIVE				
TLS TRACKED LEVITATED SYSTEMS	AEROTRAIN		INVERTED "T"			FLEX. SKIRT OPEN PLENUM		PROPELLOR			

Fig. 7. Matrix of high-speed ground transportation subsystems.

Under what conditions are such optimizations possible? It must be realized that the optimization can take place at various levels; in some cases, it is possible to find the optimum state of the hardware system, while in other cases, the concept of an optimum state only makes sense when the entire operational system is considered. For instance, if one were to consider the optimum speed of a railway system, it is highly unlikely that this could be found merely by a study of the hardware systems, since it is obvious that higher speed requires higher costs and that the optimum, from the cost standpoint, would be found at zero speed. In this case, an optimum can only be found by considering the entire operational picture of the system.

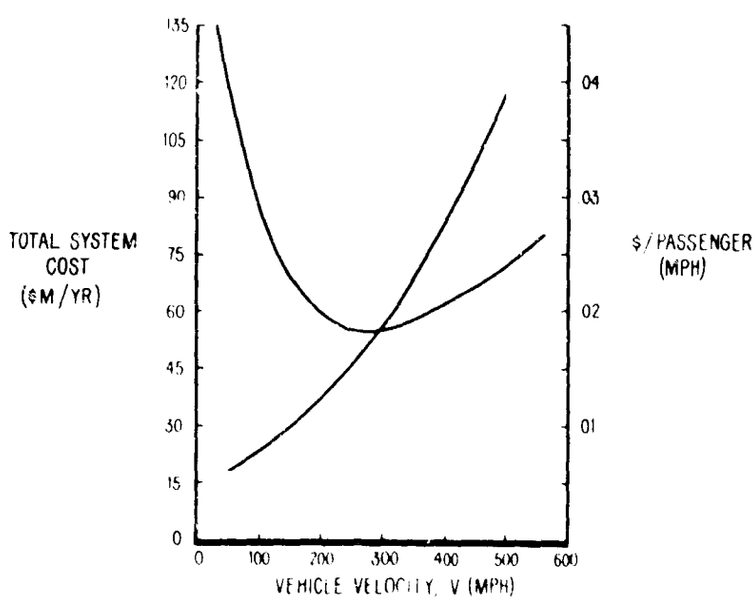


Fig. 8. System cost as a function of velocity.

In other instances, it is quite reasonable to expect that optimum states of the hardware systems can be determined. A case of this type is illustrated in Figure 8, which depicts the total cost of a tube system in terms of the operating velocity. In this case, since the vehicle is traveling in a tube which is buried below the surface in a tunnel, a conflict develops between the cost of the tunnel and the cost of the driving energy. From an energy standpoint, the tube of largest diameter is most desirable, while from a construction cost standpoint, the tunnel of smallest diameter is the cheapest. When the two costs are combined, it is found that a minimum cost exists and, as illustrated in Figure 8,

this occurs somewhere in the vicinity of 200 mph. The constantly rising line in that figure suggests the increasing energy cost associated with increasing energy speed in a tunnel of fixed diameter.

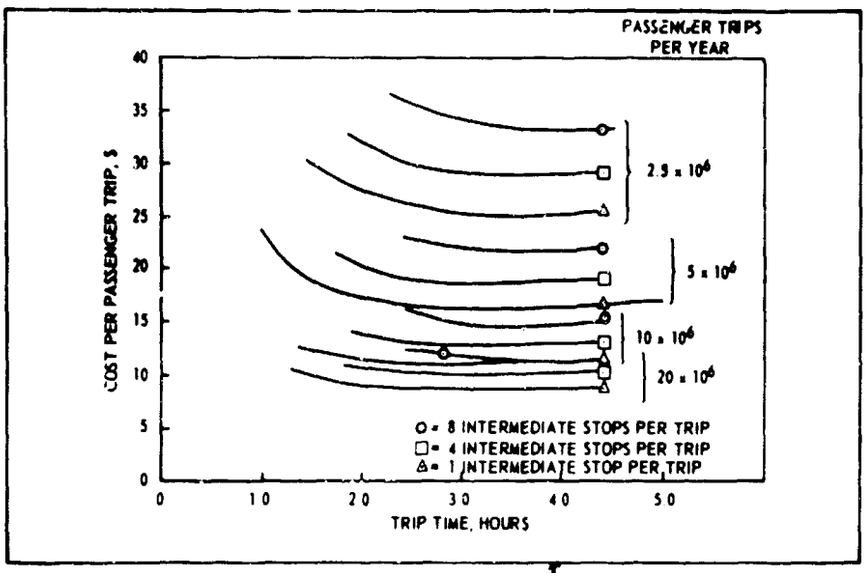


Fig. 9. Optimum cost/benefit relations.

Another example of the results of an optimization study is shown in Figure 9, which presents the results of calculations made for tracked air cushion vehicle systems. In this case, the analysis considered the design of the entire system including vehicle and guideway. The optimum state of the system was sought at minimum cost including the acquisition and operating charges. Figure 9 shows the results for a large variety of conceivable design for a wide range of passenger trips per year and for a range of intermediate stops between origin and destination. The costs per passenger trip are plotted against the trip time in hours. It is seen that the best cost and or best design is a function of the patronage of the system, as well as the number of intermediate stops. However, for any given case, no strong optimum is discernable as the speed of the vehicle is increased and the trip time is cut from 5 hours to 1 hour. These results are all illustrative and do not represent an actual system. Results of a greater engineering interest can also be obtained in the same analysis, as shown in Figure 10. These results show for each of the cases studied in Figure 9, the increase in vehicle weight associ[illegible] different operating speeds as well as certain parameters of [illegible] suspension subsystem

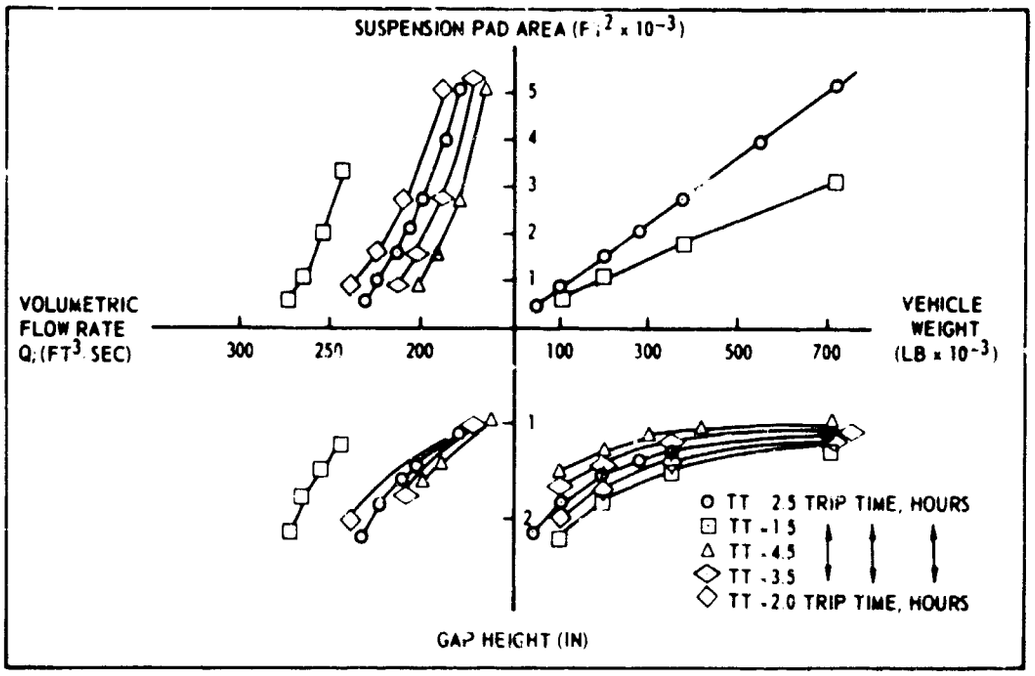
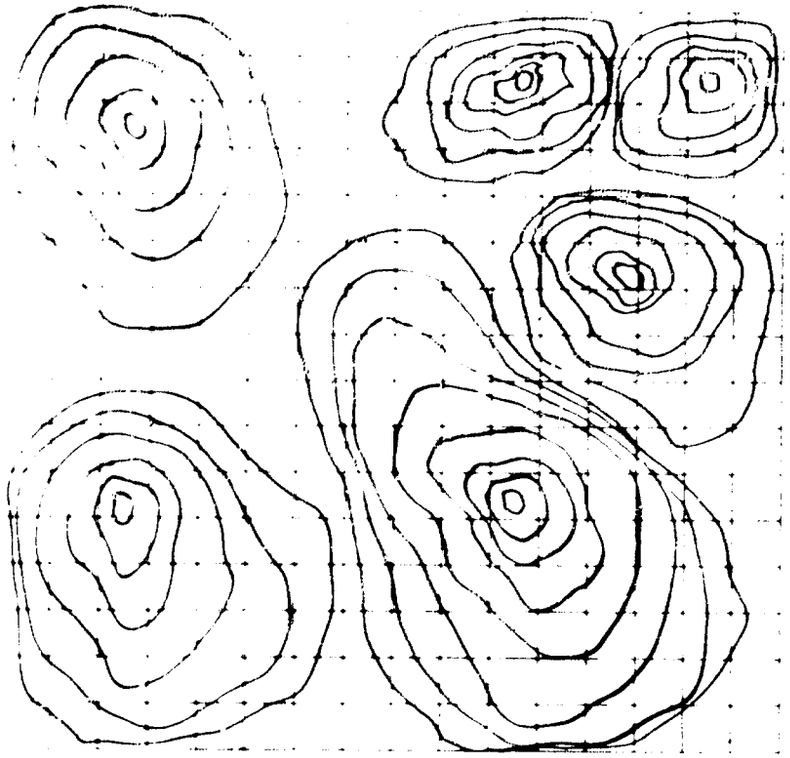


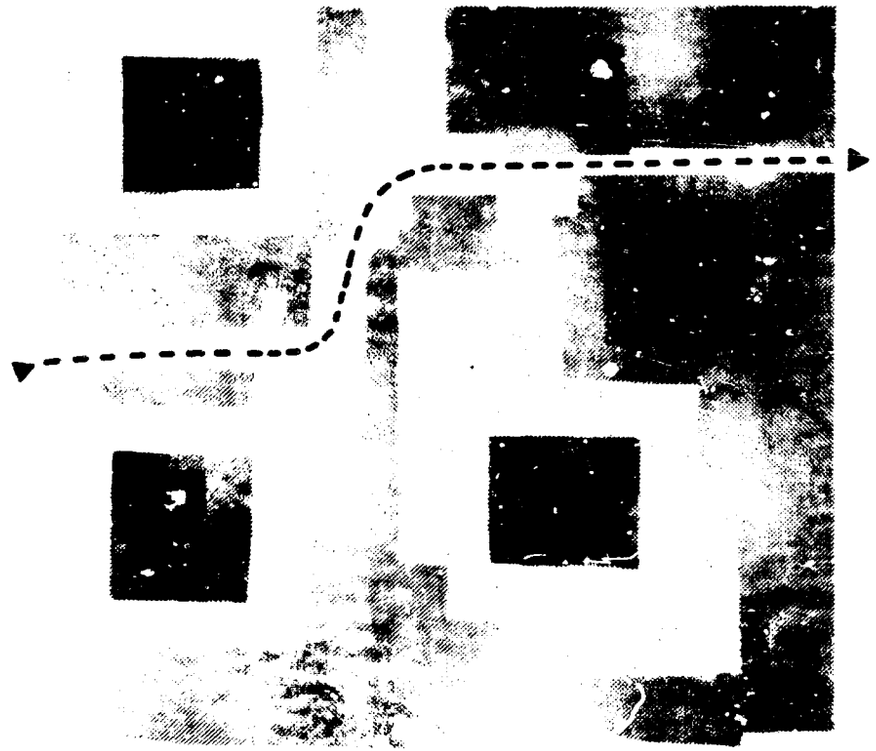
Fig. 10. Vehicle design parameter.

Another example of the problem whose application of optimization procedures can be effectively used is illustrated in Figure 11. In this case, the question of interest was related to finding an optimum route between several interconnecting points in a network. The optimum is defined strictly as that which results in a minimum cost for acquisition. To solve the problem, it is necessary to compile the costs of acquisition, construction, and other implementation charges associated with such a route. An illustration of such data is shown in Figure 11. The composite of all cost factors involved which are shown on the right can be described in terms of contour lines as shown on the map on the left side of the figure.

Figure 12 depicts this method's application to a fictitious case. The problem in this case was the optimum routing between three points, as indicated on the map. Fictitious cost contour lines are plotted, as is a forbidden area which might suggest some urban development or heavy industrial concentration through which the routing cost would be so prohibitive as to make the area impenetrable for transportation. The thick dark lines indicate the minimum cost routes between the three points which were calculated.



COST SURFACE CONTOURS



COMPOSITE OF

Fig. 11. Route location example.

ROUTE LOCATION

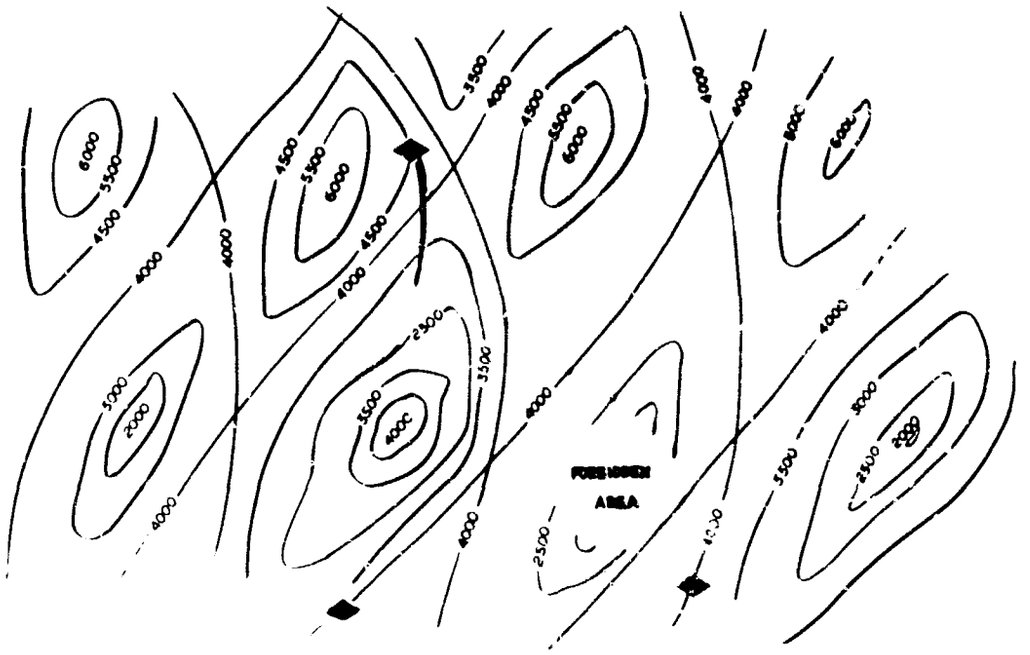


Fig. 12. Problem of optimum routing between three points.

Conclusions

An attempt has been made to review the extensive catalog of issues and questions which must be addressed in the system analysis of large transportation problems. The discussion has tried to emphasize not only the complexity and multiplicity of alternatives and facets of the problem, but also the need for objectivity in performing the analysis. It is only through the development and use of techniques which allow an unbiased consideration of all factors involved in the selection process that meaningful recommendations can be made by the analyst to the decision-making body. Obviously, for the analysis to be meaningful, a decision-making body must make known, in time, the policies and constraints which would govern its eventual selection of the recommendations. The major contribution which system analysis techniques can make in this involved process is to find a way to integrate all of the aspects of the problem into a single package and to assure that all questions and all alternatives have been properly dealt with. While this is desirable, we find that in many cases the complexity of the approach required and or the lack of data or tools necessary to carry

through the analysis have prevented its use. It is also true that in some instances the uncertainties associated with analyses of these kinds and the lengthy periods of time required to develop a good understanding of the transportation alternatives have forced the decision into more conventional, pragmatic, and politically-dictated channels.

We can only hope that a broader recognition of the potential of the application of system analysis techniques to mass social problems will in time bring about the acceptance of more rational alternatives in the decision-making machinery. ■

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(This article was adapted from Dr. Stockfisch's presentation at the Army Management School in June 1968.)

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Despite a strong injection of intellectual endeavor into Defense Department decision-making and management at the level of the Office of the Secretary of Defense through the promulgation of the Planning, Programming, and Budgeting System (PPBS) and the use of its associated cost effectiveness analysis, only limited progress appears to have been made by way of applying these tools to address systematically the subject of the planning, designing, and structuring of general purpose forces. The greatest impact of the intellectual approach to decision-making has occurred with regard to strategic forces. The Army and the Marine Corps and tactical air forces have remained relatively untouched by the potential impact of cost effectiveness analysis and operations research, which have constituted the hallmark of Defense Department management during the past seven years.

One should not commit the error of assuming that several significant decisions which affected the size and capability of our ground forces, and hence our conventional war capability, provide evidence that the new approach has had or will have a strong, permanent impact by way of injecting more rationality into the process. The expansion of the Army and the increase in the number of Army divisions and tactical air wings in 1961, and the associated increases in materiel procurement, were a result of broad national policy changes which implied that conventional war capability should be increased; and on this ground, they could have occurred even if cost effectiveness analysis had never been heard of.

Two important qualitative changes affecting the land forces were results of actions initiated in the Office of the Secretary of Defense, and both of them have probably had a salutary impact upon the effectiveness of the forces committed to Vietnam. These changes were the crea-

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tion of the Air Mobile Division, along with the procurement of the additional helicopters to enhance the mobility of all ground units, and the actions which led to the procurement of the M-16 rifle. Although these decisions may have derived strong support from analytical or cost effectiveness endeavors, it is useful to recount something about the process that actually transpired regarding both of them in addressing the question of what the future may hold for the contribution of operations research and systems analysis to general-purpose force planning.*

There was in the Army an articulate but not very powerful group of officers who advocated increased and imaginative uses of aircraft, particularly helicopters. However, their advocacy was kept in check within the Army by desires to avoid a major political confrontation with the Air Force on roles and missions and to avoid strife between different factions within the Army, lest an expanded procurement of expensive aircraft jeopardize the development and procurement of tanks, artillery, and other equipment. Consequently, the Army's actual requests for aviation were modest relative to claims regarding the effectiveness of aircraft.

Into this unstable equilibrium the Secretary of Defense injected some question-raising which instructed the Secretary of the Amy to examine systematically and imaginatively the Army's aircraft requirements.** The establishment and deliberations of the Howze Board, its recommendations, the creation of the provisional 11th Air Assault Division, its conversion to the 1st Air Mobile Division, and the 1st Air Mobile Division's deployment to South Vietnam all followed within slightly more than three years.

The rationale for the decisions which led to the present Army force structure, with particular reference to aviation, was based on only the crudest sort of cost effectiveness considerations. In a large part, events

*These two changes were not the only ones affecting general-purpose forces which also involved the Office of the Secretary of Defense. Pertinent to land forces was the question-raising that led to increasing forward-area air-defense capability by means of the Vulcan Chapparel programs. The choice of equipment and character of programs affecting tactical air were importantly influenced by OSD. Finally, the strategic rapid deployment capability—through airlift, sealift, and pre-positioning—was markedly influenced by the Secretary's question-raising and decisions.

See "Memorandum for the Secretary of the Army," April 19, 1962, and "Memorandum for Mr. Stahr," April 19, 1962, published in **Hearings before the Subcommittee on National Security and International Operations, U. S. Senate, Part 2, September 27 and October 27, 1967 (Government Printing Office: 1967), pp. 125-127.

themselves determined these decisions. The impact of these decisions was to provide a more effective Army. But it also created a much costlier Army. The net result, in terms of cost effectiveness or efficiency, remains open at this time. It can only be determined by very careful evaluation of South Vietnam operations. Related issues that will have to be faced in the next several years regarding the post-Vietnam force structure will be particularly sensitive in the relationship among branches and services. These issues include the respective roles of fixed wing aircraft (operated by both the Air Force and the Marine Corps) and more sophisticated helicopters (as exemplified by the Army's Cheyenne), and the role of aircraft relative to non-aircraft weapon systems (artillery, tanks, and other ground combat and support vehicles). Intertwined with these questions are the merits and demerits of alternative operational tactics, such as search and destroy as opposed to clear and hold. A few of the opening shots in this forthcoming doctrinal war have already been fired by a retiring Marine Corps general officer who warned that the Marines will have to guard against other services after Vietnam is over.* Thus, the excitement, anxiety, heat, and bureaucratic in-fighting that these issues promise to create within defense circles during the next several years should match Vietnam in all but the latter's sanguinary aspects. It is to be hoped that analysis may be substituted for emotion, conflicting judgment, and political compromising as the means of resolving these vital questions.

The M-16 rifle was a different story. A series of studies and field tests, stemming from the pioneering ORO-sponsored SALVO experimental work in the 1950's, suggested that small-caliber small arms were more effective infantry weapons than larger-caliber systems. The Army in the late 1950's, however, chose to procure the 7.62-mm systems, as exemplified by the M-14 rifle, which differed from the World War II M-1 by virtue of having a 20-round box magazine instead of an 8-round clip. One of the candidates at that time was the M-16 (then the AR-15). The M-14 rifle decision was reversed in 1963 by suspension of further M-14 contracts, which followed from question-raising initiated in the Comptroller's Office of the Secretary of Defense in 1962. Reluctantly, as an interim measure, the Army committed itself to a limited buy of M-16's to equip Special Forces and airborne troops while it studied the small

*See New York Times, May 19, 1968, p. E-5.

arms subject further and sought to develop on a crash basis a weapon of its own conception which was designated the SPIW (Special Purpose Infantry Weapon). It should also be noted that initial procurement of the M-16 was delayed by some changes made in the original AR-15: they include the addition of a bolt-closure device which had a limited utility but which increased cost, a barrel twist change which reduced the system's lethality, and an ammunition propellant change which reduced the weapon's reliability. In brief, the intrusion of the Secretary of Defense into the subject of small arms was deeply resented in Army circles. There was apparently no strong faction in the Army that was willing to advocate a different approach to small arms, as was the case with aviation.*

But again, events dictated by Vietnam overtook prior decisions and forced new ones. The first Army troops committed to Vietnam were Special Forces and airborne troops, who were equipped with M-16's acquired through the interim buy. The relative merits of semi-automatic and fully automatic rifles in dealing with an enemy equipped with fully automatic AK-47's were apparently too evident to miss when actually confronted with the prospect. (The same point, however, followed from both prior OSD paper studies and Army field experiments.) Without consulting either the Infantry Agency or CDC Headquarters (let alone CINCPAC or USARPAC or the Army Staff), the Commander in Vietnam in early 1966 requested additional M-16's to equip all U.S., as well as some South Vietnamese, forces.**

What conclusions regarding the structuring of land forces may be drawn from the Army OSD decision-making as related to air mobility and small arms? On the whole, they are not favorable. In both areas, OSD—employing the cost effectiveness approach—was a catalyst. In the case of air mobility, a vigorous faction within the Army reacted in a positive way, which brought about an implementation of change. However, the final decisions on the margins (where efficiency is essentially

*For further discussion of the M-16 decision-making process, see "The Army's Rifle Procurement and Distribution Program," Committee on Armed Services, U. S. Senate, May 31, 1967; for a treatment of technical changes affecting the system, see "Report of the Special Subcommittee on the M-16 Rifle Program," Committee on Armed Services, House of Representatives, October 19, 1967.

**Currently, it is planned to equip the rest of the ARVN with the weapon, thus phasing out their M-1 rifles and carbines and BARs.

achieved) remain to be made. The future decision-making process may end up being divisive both within the Army and, especially, between the services, particularly with regard to air mobility and airborne fire support. In the case of small arms, much divisiveness has already occurred within the Army despite events playing their powerful role. Also, there remain some major small arms questions related to machine guns and grenade launchers, including the relative mix of grenadiers and riflemen in small infantry units. Thus, the changes made in the critical areas of air mobility and small arms (however fortuitous they may have been for the conduct of operations in Vietnam) were the product of a large element of chance and good fortune.

The really interesting question that these experiences in force planning suggest is: what may the future hold? The general answer is that unless some basic changes are made in the way both military planners and the military analytical community study and approach land forces problems, decision-making will contain an uncomfortably large element of capriciousness and chance.

It may appear rash to make such an assertion in the face of the fact that the military departments (particularly the Army) support extensive studies and conduct much technical testing designed to pass as cost effectiveness analysis in the Pentagon dialogue. However, most of the effort either is conducted as a tool of political advocacy or is poorly conceived from a methodological viewpoint. These two deficiencies reinforce each other in such a fashion as to ensure that truth will not be pursued and uncovered in a detached way. As for ourselves, since we are a group of scientists and operations analysts, let us focus on the methodological problem.*

It should first be noted that cost effectiveness analysis achieved its greatest impact in the area of strategic force structure design. This subject has two important characteristics. First, the performance of a strategic force structure is dominated by a few weapon systems whose respective individual performances in turn are dominated by technical characteristics, such as warhead yield, CEP, system reliability, and hardness of one's own systems and the enemy targets. Second, the effective-

*There is also a "political" problem, which cannot be treated here. Essentially, it is the subject of bureaucratic behavior involving the effort of "bureaus" or operating line agencies to seek autonomy and independence from higher decision makers.

ness criteria are relatively simple, if not monistic, i.e., assured destruction in terms of enemy casualties which have a high economic content, such as population or manufacturing value added. The subject of strategic force structure design (embracing all systems) thus lends itself nicely to modeling and its associated computer simulations. Fortunately for man's survival, but unfortunately for the cause of scientific treatment of the subject, there is no body of human experience which permits verification or refutation of the findings of strategic war models. At best, one can only apply scientific methodology to strategic systems by verifying and ensuring through operational testing that such inputs as the CEP and reliability used in the modeling are in fact the relevant ones. Beyond this, the justification for the intellectual approach rests on the belief that the modeling ensures that decisions will be internally consistent.

For general-purpose forces and, especially, land forces, there is no dominance of large system performance by a few technical equipment items. Nor is large system performance described by a few unambiguous effectiveness criteria. Ground forces are essentially combined arms teams—from infantry companies through battalions to divisions and entire field armies.* Such groupings are very highly organized. (This is an ancient and vital necessity, since the nature of the business is to get large numbers of men to do things which entail a high risk of getting killed or injured.) The constituent parts of these organizations are highly interdependent. Finally, the performance of equipment (and, in turn, the impact of technology) is especially sensitive to the limitations and strength of men—particularly large numbers of men**—and the organizing capacity of planners and decision-makers which permits the development of new tactics.

Despite these differences between ground forces and strategic forces, the main thrust of contemporary cost effectiveness analysis, as extended to ground and tactical air forces, has been to try to apply model building

*It might even be argued that an infantry platoon, with its weapons squad containing machine guns and recoilless rifles, is also a combined arms team. Clearly, a company containing platoons with the above weapons, plus mortars and heavier antitank (or assault) weapons in its weapons platoon, qualifies as a combined arms organization.

**Thus ground forces do not have the advantage (or luxury) of being highly selective in choice of personnel in the manning and operation of weapons, as does, for example, the Air Force.

and its associated computer simulations as they have been developed for strategic analysis. . variety of models have been developed which have the following major characteristics. First, they are two-sided simulations of combat. Second, the two-sided equality of the simulation lends itself to — if not necessitates — specifying kill ratios or derivations of kill ratios as the principal effectiveness criteria. In this fashion, the exercise has much in common with the simulations treating strategic war. Finally, technical performance characteristics of weapons (as they are specified for engineering and procurement purposes) are the principal (if not the sole) numerical inputs for weapon and system performance. In varying degrees, target acquisition, terrain masking, logistic or weight limitations, ground or soil bearing, troop stress and tension, and other constraints may be introduced so as to "degrade" equipment performance in some fashion. Terminal ordnance effects (about which there is great uncertainty) are also employed when appropriate and are duly obtained for most weapons from a single source: the Army's Ballistics Research Laboratory. In accordance with current sophistication, most of these simulations are stochastic or probabilistic, despite the fact that there may be a poor or non-existent empirical basis for specifying the higher moments of the relevant frequency distribution (to say nothing of the first moment). Thus we have a hierarchy of models designed to treat the range from small units (e.g., the Carmonette model) to units as large as entire divisions (e.g., the Eagle model); models have also been designed to treat categories of weapons ranging from tank and antitank through artillery to aircraft and antiaircraft systems.

What have been the results of this rash of model building and computer simulations? By and large, nothing useful. Most frequently, the analytical results have not been credible. In some cases, systems advocated by the Army have not shown up well. In those instances (after additional replications) the models are rejected. In other instances new systems do show up well. Generally, when they do, it is not surprising, because if one goes back to the technical or engineering inputs one finds that Blue's specified system (which has not yet been developed) has better technical performance characteristics such as speed, range, rate of fire, and so forth than Red's or Blue's existing system. (Usually, the object of the exercise is to justify a new R&D

program.) But the issue of how much better the proposed system will be remains murky, because no one is confident that the superior technical performance characteristics can be transformed into an operational effectiveness advantage. That is, the kill ratios are still not credible. Systems analysts in the Office of the Secretary of Defense, playing their antecedent comptroller's role, are especially alert to this point. Thus their skepticism, combined with their position in a higher headquarters, prevails in such a fashion that little comes of the service's attempt to play the cost effectiveness game.

And it is a game. Although it has the facade of science and intellectual rigor, it is not science but a new brand of metaphysical advocacy. The reason is not hard to find. Combat models and computer simulations such as those previously described do not yield scientific knowledge or, for that matter, any kind of knowledge. Rather, they generate hypotheses about relative system effectiveness. As hypotheses they are either right or wrong. But whether they are right or wrong can only be established by an independent test. That test should be either an experiment, conducted under conditions that simulate as far as possible operational or field conditions, or a statistical test which draws upon data available from past actions and battles. Very little such operational testing or statistical analysis is done in our military establishment. Until it is done, there will be inadequate or irrelevant data as inputs for those simulations which are conducted. Nor will there be any confrontation of theories (and models) with independent tests — a practice which is necessary in any respectable scientific endeavor.

The attempt to formulate models for large, complex ground forces systems is questionable on further methodological grounds. As noted previously, ground forces are composed of highly inter-dependent subsystems. Moreover, they are highly organized. A mathematical characteristic of very highly interdependent systems is that there is **a priori** no distinction between independent and dependent variables. Yet decision-making (and indeed the concept of causation) implies that there are independent variables which, when manipulated, will produce desired effects on dependent variables. The analytical task becomes one of identifying self-contained subsets of relationships which can be treated independently of the larger interdependent system. If, in fact, there is

some degree of sparseness in the quality of interdependence characterizing the larger system, the larger system can be tackled in such a way that meaningful cause-and-effect relationships can be identified.*

Thus, for example, we know that the effectiveness of armor is critically dependent upon infantry, if only to protect one's tanks from enemy infantry employing shaped or plastic charges or gasoline-filled pop bottles. In turn, the effectiveness of one's infantry depends critically on the quality of its small arms. Thus, in a sense, the effectiveness of tanks may also depend on the effectiveness of small arms. However, it does not follow that it is necessary to develop a model (and to conduct an experiment) which simultaneously treats small arms and tanks. Tanks and small arms can be evaluated separately. Further, unambiguous and economical field experimentation will likely require that they be separately treated.

This point, of course, is implicitly recognized in much current model building which does separate out major systems for analytical scrutiny—e.g., tank versus tank or antitank. However, the two-sided quality of such simulations and the focus on kill ratios couch the model in terms of a combined arms operation. Other important contributing combined arms elements are either ignored or aggregated; the effectiveness criteria as expressed in terms of kill ratios cannot themselves be directly verified or measured by independent tests or experiments. Such efforts are thus poor forms of "partial equilibrium" analysis. They may have a facade of generality (or "realism"); but they are incapable of being subjected to the gamut of scientific rigor, including independent tests. Furthermore, since the action, unlike that of the strategic war model, is not heavily dominated by technical performance of equipment items, such simulations are additionally suspect. It is strongly urged for these reasons that they be discarded for the time being as a bad scientific joke.

What is the alternative? The answer lies in taking seriously, and taking intellectual advantage of, the fact that ground forces are combined arms organizations. Moreover, it is vital to recognize the further fact that a man's performance dominates equipment performance, rather than the other way around.

*See Herbert A. Simon, Causation, **International Encyclopedia of the Social Sciences**, Vol 2 New York: Macmillan, 1968, pp 352-353

The two facts lend themselves to the notion that purposeful, controlled field experimentation provides a means of evaluating single systems one at a time. Thus, target systems can be designed to simulate realistically what riflemen, machinegunners, and grenades will likely be confronted by in combat. From actually shooting at such targets, one can measure hits and near misses as a function of time. If enough such field testing is done, we would have adequate data to provide the basis for decision-making which would ensure both the best selection of small arms and knowledge on how best to use small arms in various tactical situations. The same sort of work could be done with crew-served weapons, and to address critical parameters of tank design. Field tests can also be run to measure critical variables affecting the effectiveness and design of reconnaissance, antiaircraft, and aircraft systems, including tactical air. Not only would a better basis be provided for selecting from among current options, but also such a process would restore some sanity to the business of specifying the technical performance characteristics for new systems that developers might create.

Such an expanded process of intellectually rigorous field evaluation would not directly answer all questions related to force structure design. For example, the relative mix of armor, infantry, specialized infantry (e.g., airborne and amphibious) and artillery, and tactical air is a question which is sensitive to "scenarios" and such other matters as the mix of forces that is wanted in active versus reserve units, which in turn is sensitive to both cost and rapid strategic deployment capability. But here there is another source of data: 5,000 years of experience with wars involving the use of general-purpose forces, with recent and current wars generating rich and enormous amounts of operational data in which a wide variety of force mixes have been employed. Whereas field experimentation permits and requires fine grained comparisons between like systems, historical data permit the testing of more aggregative models. By the use of multiple regression and other statistical techniques one can get rough estimates of partial productivities and refute or verify that the products of important elements of combined arms aggregations are what advocates claim.

An emphasis on field or operational testing and rigorous use of historical data will not guarantee that major tactical innovations comparable to the German creation of the Panzer concept will always be discovered. (However, there is nothing in the current approach which will guarantee such outcomes either.) But it is likely that, by revealing the full capabilities and limitations of existing weapons and support systems, the chances are better that such discoveries can be systematically made. Finally, more relevant operational data and better empirical knowledge of the structural and causal relations affecting smaller subsystems (and submodels), will provide a firmer base upon which to build the larger fine-gained models. In brief, what is proposed is necessary to inject sufficient empiricism to transform cost effectiveness analysis to a scientific endeavor from speculative philosophy.

One may wonder what these proposals have to do with structuring general-purpose forces. The problem of structuring land forces is overwhelmingly that of equipping men. Instead of programming and buying wings of Minuteman missiles or Polaris submarines with land forces, one equips men with rifles, machineguns, and grenade launchers. One also buys artillery tubes and missiles, antiaircraft weapons, tanks, and helicopters. There is a large assortment of communications, surveillance, and target-sensing equipment, as well as trucks and jeeps, construction equipment, and generators. Finally, one buys tactical air to support land forces or to do unpleasant things to the other fellow's land forces. (This latter effect also includes tactical interdiction.) The very diversity of these equipment and major subsystems (including the highly varied mixes in which they have been employed) permits extensive and intensive operational evaluation through field testing. The large variety of mixes of major force elements employed in actual operations lends itself to statistical testing.

Success or failure in land warfare has overwhelmingly turned on discovering interesting new combinations of diverse equipment and systems. Luck has often played a role in such discoveries. But history also suggests that their frequency was importantly a function of knowing what the operational strengths and weaknesses of equipment and major systems were. Making acquisition of such knowledge a purposeful endeavor should ensure that force structure planning, as well as the

formulation of R&D strategies, could be conducted more on the basis of knowledge and less on the basis of advocacy and counterassertion. ■

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He assumed command of Fort Dix in Dec. 1967. Before that, he was Deputy Commanding General and, later, Commanding General of the Seventh Army Support Command.

(This article was adapted from Gen. Collins' presentation at the Army Management School on 4 Apr. 1968.)

MAJ. GEN. KENNETH W. COLLINS

MAJOR GENERAL KENNETH W. COLLINS
COMMANDING GENERAL
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FORT DIX, NEW JERSEY

My remarks will encompass some of the problems that I encountered in the management of the Fort Dix installation during the first four months that I was in command.

First, so that we are all thinking on the same wave length, let me give a brief thumbnail sketch of Fort Dix and the principal missions we perform.

Fort Dix and Missions

Fort Dix is located in central New Jersey and covers 33,000 acres. Our post population, including civilians, is approximately 50,000. The post is practically bisected down the middle by McGuire Air Force Base. Our primary mission is training: Basic combat, advanced individual, and combat support. Our current trainee population is 18,600 in all phases of training. In addition, we have a complete United States Army Personnel Center, with a reception station, oversea replacement station, and a transfer station. The reception station has the mission of receiving the new trainees, conducting their initial processing, and shipping them to the various basic training units. The oversea replacement station processes personnel to overseas assignments in both Europe and Southeast Asia. The transfer station processes personnel for separation from the Army. I will cover management problems in the Personnel Center in more detail later.

We have a Special Processing Detachment under the Special Troops commander and a stockade under the supervision of the Provost Marshal. I will also cover these two activities in more detail later. Walson Army Hospital is at Fort Dix. This modern 9-story medical facility has a 500-bed capacity, 175 of which are filled with Vietnam casualties.

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Additional missions include support to ARADCOM units in the New York-Philadelphia air defense sector; responsibility for ARADCOM maintenance shops at Edison, N. J. and an aircraft maintenance shop at Lakehurst, N. J.; and Engineer R&U support to Army reserve and recruiting centers throughout New Jersey and Parts of New York. In addition, we provide support to 26 ROTC units.

Facilitywise, we are in fairly good shape for normal operations. There has been an excellent MCA construction program since 1963 and, with the completion of a brigade complex this coming December, all permanent party and most of the trainee units will be housed in modern construction. However, there is still a considerable amount of World War II construction which is currently in use and, from the looks of things, will continue to be used for some time to come. We have 2,500 sets of government quarters on the reservation.

The first subject I will discuss is the funding operation — better known as the Fort Dix poverty program.

Funding Operations

While still learning where to hang my hat, I was hit with the information that we did not have enough money to operate for the next two months. In October the post had been notified that it must reduce expenditures by $2.5 million during the remainder of the calendar year. The Program and Budget Advisory Committee sat down, rolled up their sleeves, and went to work on how we could live with this drastic reduction. This involved an analysis of past performances, a comparison of requirements versus availability, and the establishment of priorities which would permit continued support to all missions at a reduced funding rate. The point of this is that no course of action should be adopted without permitting the major activity directors an opportunity to state the impact on their particular functional area. The net result is that a workable solution is developed by the people who are most knowledgeable as to the requirements. The solution probably will not satisfy all concerned, but it is the best expression of the capability of the entire installation to support its missions. Naturally, our solution of this immediate problem was one of reduced funding support to all areas.

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Funding operations at installation level are characterized by four major areas: civilian pay, contractual services, supplies and equipment, and Engineer R&U projects. The first two, civilian pay and contractual services, are fairly well established fixed costs and must be funded for; therefore, this leaves the supply and equipment area and R&U projects to absorb any shortfall of funds. The members of the Program and Budget Advisory Committee determined the amount of availability of funds for each major area and established the cost ceiling level under which the activities would be required to operate for the two-month period. In order to come anywhere near reaching the levels established, it was necessary to take some pretty drastic measures. These included the following:

(1) Placing a freeze on the hire of new civilian employees, even for replacement losses.

(2) Issuing supplies and equipment only on a selective basis, to include necessary items for the health and welfare of the command.

(3) Placing $80,000 of engineer R&U projects already out for bid in a deferred status until after the first of January.

(4) Deferring the initial issue of field jackets to new receptees.

(5) Deferring the seven-day-per-week operation that was to have commenced at the transfer station until after first of December.

(6) Reducing the funding support to ARADCOM activities in their proportionate share of the shortfall of funds.

(7) In general, placing the use of appropriated funds in all operations on an emergency requirement basis only.

We did manage to stay alive. However, it was not an easy task and there was a general tightening of all belts throughout the installation. Some additional funds were finally made available, but we actually saved about $½ million.

With the advent of 1968, we had very little opportunity to sit back and relax. General Woolnough visited Fort Dix in early February. He reaffirmed the information that there was an extremely critical shortage of budget program 2100 money throughout CONARC and he expected no additional funds to be made available. Budget program 2100 is the mission budget program of an installation. It supports all training and operations. We found that we had to go through, again, the same

procedure as followed with the cut in funds just discussed. The Program and Budget Advisory Committee met again and analyzed all requirements versus availability. A complicating factor was that we were told to continue to support our civilian personnel requirements and not to resort to any reduction in force action. Our problem was this: we had $25 million available in the annual funding program for budget program 2100. Our costs through January of 1968 totaled $19 million, which left us a balance of $6 million. All activities computed the minimum dollar requirement to support the civilian workforce to the end of the fiscal year, based on the continued hire freeze and the non-replacement of losses.

The dollar amount required left us a balance of $12,000 to support all other financial requirements. You know what you can get for $12,000. The other requirements — supplies, equipment, and contractual services — required an additional $5 million to support minimum essential operations to the end of the fiscal year. A critical look was then taken at this $5 million unfinanced requirement. It was determined that, by continuing the emergency-type operations which we had adopted during the previous famine, the basic dollar unfinanced requirement would be $3.4 million for emergency costs only, with the requirement for the additional $1.6 million still remaining valid.

The procurement of all non-essential supplies and equipment, although on inventory in the stock fund, is continuing to be held by the stock fund because of the shortage of funds. This presents warehousing problems for my G-4. Again, our only recourse was to put all actions into effect for operating on an emergency level. We knew, too, that there were not enough funds available to support even this level of curtailed operations. We submitted to first Army an impact statement, setting forth our program and calling their attention to the critical position which Fort Dix had with the budget program.

We know that similar problems exist throughout all of CONARC. So, in this respect, we are not alone in our misery. At this stage of the game, though we have been promised additional funds, the only other recommendation that my comptroller is able to provide is, "Pray for money!" Our entire funding problem is one which we will be unable to solve completely ourselves, despite the strict economy measures taken.

(Let us hope that the President's supplemental budget gets favorable and expeditious handling.) The main point I want to emphasize is that managers at the installation level must be constantly aware of dollar requirements for their activities and must be quick to react when a "tightening of the belt situation" arises. The impact statements which are provided to the next higher authority have to be based on the best judgment and ability of all activity directors.

Special Processing Detachment and The Stockade

Next I would like to discuss the SPD (Special Processing Detachment) and its "partner in crime," the stockade. The SPD, under the special troops commander, has grown like Topsy over the past few years. Any soldier picked up as AWOL in New York State or New Jersey is assigned to the SPD at Fort Dix. In 1966 it was handling an average workload of 100 AWOLS per month. Their average workload of elimination board cases totaled 17 per month. By August of 1967, this workload more than tripled. Last December it had increased to a point where an average of 400 AWOLS were being processed per month, with a backlog of over 250 elimination board cases that had built up. The total assigned strength was now over 900 on the morning report and still rising. Needless to say, the type of personnel received by the Detachment was causing an impact on another activity of the installation, namely, the Post Stockade. The stockade, with a normal capacity of 620, was beginning to bulge at the seams with a population of over 800 prisoners. More on the stockade as soon as I finish relating the problems we encountered at the SPD.

A large build-up in the Detachment is the type of problem that must be solved internally by an installation with local available resources. With the lack of sufficient personnel in the Detachment to process the constantly increasing rate of AWOL's backlogs had developed and something had to be done, quickly. The initial step was the establishment from in-house assets of a provisional company with a strength of 12 officers and 68 enlisted men. In addition, two JAG officers and 12 full-time counselors were assigned to the Courts and Boards Section of Special Troops for the preparation and conduct of court-martial and elimination board proceedings.

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A management survey was conducted to develop and establish procedures and methods which would assist the Detachment in its processing requirements. Our immediate objective was to reduce the existing backlogs in court-martial and elimination board cases and to establish methods which would give the Detachment the capability of handling what is now the normal workload of over 400 cases per month. Some of the procedures which were developed are as follows:

(1) The commander of Special Troops was given the authority to cut assignment and reassignment orders on personnel, including direct access to OPO, DA. This was previously accomplished by my Adjutant General. The new arrangement expedited the processing of personnel.

(2) Equipment, such as magnetic typewriters, which would handle workload of a repetitive nature, was procured.

(3) Prisoner interviews are conducted at the Post Stockade in conjunction with those conducted at the Detachment. This policy eliminated the need for considerable guard details.

(4) Status cards and records were developed for the simplification of administrative processing.

(5) Authority was received for the military police in New York City to issue transportation requests to return AWOLS of less than 30 days directly back to their units rather than transport them to Fort Dix.

Let me give a brief summary of the results of our overall program. The Special Court-Martial Section of Special Troops is hearing cases on a six-day week schedule, with the two JAG officers acting as summary court-martial. So far this year, the section has processed 725 court-martial cases and 260 elimination actions. The Special Processing Detachment has been reduced in population from over 900 men to its present strength of 690. In addition, the time spent in pre-trial confinement has been reduced to well below the overall Army average. Since February of this year, the Detachment has doubled its output and is now capable of handling its workload on a daily basis. I sincerely hope that the Special Processing Detachment problem is solved permanently, but I have some doubts. The overstrengths which most CONUS installations have enjoyed throughout the past year are rapidly awindling through levies and more levies in Vietnam. This is beginning to cause us problems in

all activities at Fort Dix. Short term overstrength personnel have filled a very necessary requirement for us in many areas.

As I previously mentioned, the Special Processing Detachment Workload had a direct effect on the Post Stockade. Our stockade was constructed during World War II and consists of a complex of wooden buildings clustered with a barbed wire enclosure and attendant guard towers. The stockade has a rated capacity of 620 prisoners, based on 72 square feet per man. An analysis of our population over the past four years makes it obvious that we are presently unable to provide this footage per man. Impressive as these population figures are, they do not tell the story completely. Attendant to the increase in prisoners has been an acceleration in the turnover rate. This compounds the control and administrative problems with which we must deal on a daily basis. We are turning over 50% of our stockade population each month. If we were unable to do this we could not cope with the numbers problem. The prisoner population at Fort Dix is one of the largest at any CONUS installation, ranking second only to Fort Leavenworth. From a management point of view, an obvious question is, What action have we taken with the stockade problem?

(1) On occasion, we utilize all available space without regard to the recommended custody grades.

(2) We make extensive efforts to extend clemency to those confinees showing any promise of rehabilitation.

(3) We expedited board proceedings to eliminate from the Army those recalcitrants who could not be expected to respond to rehabilitation.

(4) We organized a provisional guard company to handle prisoners outside the stockade.

(5) We prepared and submitted a modification TOE which will provide a stockade complement of 13 officers, 3 warrant officers, and 516 enlisted men. This is opposed to the presently authorized complement of 3 officers, one warrant officer, and 244 enlisted men.

(6) As a temporary expedient I am using elements of a STRAF MP battalion to assist in running the stockade

There have been some major and deleterious effects resulting from the inordinate overpopulation and accompanying workload. The Post

Stockade correctional treatment plan, which is outlined in AR 190-2 and is tailored to each individual confinee and his unique problem, has been seriously hampered by the sheer numbers and turnover of prisoners. The physical structure of the stockade, because of its age, is constantly in need of maintenance, particularly with respect to plumbing. As a result of the manpower demand for the Vietnam conflict, school-trained confinement personnel are in short supply. We have been forced to utilize custodial personnel with no previous experience. Despite the magnitude of our problems, we are getting the job done. When Matt Dillon retires, I'm ready to take over.

I have cited the problem of the Special Processing Detachment and the Post Stockade because they serve to show the utilization of what I believe are good management procedures, with no increase in available resources.

The Personnel Center

Another critical area which I would like to discuss is the Personnel Center. The Personnel Center is basically a receiver and mover of people—into the Army — to overseas — and out of the Army.

The Reception Station, where all new personnel are processed into the Army, has consistently received two to three thousand more personnel per quarter than programmed. If we had used the programmed data as the basis for requisitioning necessary clothing and supplies (mainly, the initial issue of clothing items), we would have been far short of meeting this basic necessity. Generally, the solution of this problem has been obtained through daily phone calls to CONARC and DA for the current data. The actual numbers of personnel received have not had too great an impact on the training mission of the post, because CONARC has been informing us as to exactly how many of our basic training companies to fill each week and the strength of each company. If the input into our reception station per week is greater than this number, then we are directed to ship the overstrength to another training center in CONUS.

In the Oversea Replacement Station, we tend to experience the opposite side of the picture — planning for workloads that do not materialize. However, we must make plans to handle the projected loads, and last January they more than materialized. We are currently staffed to

process 13,000 overseas, replacements per month but last January we processed 23,000. It was necessary to utilize the barracks space of out-of-cycle training companies to handle a peak load. However, no matter what the load may be, it requires a very close liaison and coordination with the Eastern Military Traffic Management Terminal service for the allocation of necessary spaces on aircraft. This is most necessary to assure that no large backlog develops at the overseas station, and the terminal service is most cooperative and flexible in providing additional shipping spaces.

The Personnel Center operation is a problem of, Just what do you plan for? and, How do you handle the load when it appears at the front gate? Let's say that it takes a constant grasp of the current situation and a great amount of swift reaction by all activities to meet each challenge and to get the job done.

Training

My last topic of discussion is training, the primary mission of Fort Dix. I bring this subject up because it shows not only the gyrations that my staff must go through to accommodate all phases of this mission, but also to show the impact on the training units and the expansion and contraction stages that they go through. At Fort Dix, we have four training brigades — two basic combat, one advanced individual, and one combat support. A year ago, the Advanced Individual Training Brigade was a two-battalion unit with a weekly input of one company. It is now a four-battalion unit with a weekly input of two companies. The Combat Support Training Brigade also increased a year ago from a two-battalion unit with a workload of 2,700 trainees to a five-battalion unit with a workload of 5,880 trainees. However, it is presently reduced to three-battalion unit with a strength of 2,790. You can well imagine the backing and filling that goes on with such fluctuating training requirements. The two basic combat training brigades recently increased from five to six battalion each, with a total of 60 training companies. At present, we are filling six companies per week at 230 men per company, or a weekly input of 1,380 trainees. In June we are scheduled to fill seven companies per week at 220 men per company, or a weekly input of 1,540 trainees. We have just been informed that this may not take place.

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In addition to these normal training missions, we are required to establish a reading course program. We are in the process of establishing Project Transition for training military personnel for civilian work. I am still trying to rationalize this program with my recruiting effort. No new assets have been provided for either program. Resources are being stretched thin in all areas, but we are still called upon to produce more and more missions.

At installation level we must manage, and we must stay loose. The class I installation is where all of the necessary resources — men, money, materiel, and facilities — must be massaged, manipulated, and welded together in order to accomplish a given mission. In my mind, this requires practical management, where the requirements must be reviewed on a day-to-day basis so that the fullest utilization of all available resources can be obtained. We must always look for better ways to do things. Your personnel must know their jobs and take positive action to accomplish their tasks.

In spite of our problems, I do feel that we at Fort Dix are by positive management accomplishing our primary mission in a highly satisfactory manner. The young men who have completed their training are the finest in the country today. It gives me much personal satisfaction to know that these men, who represent the vast majority of our youth, are combat-ready, highly motivated, confident of their weapons, physically fit for the rigors of the battlefield, and enthusiastically eager to make their contributions in serving their country ■

Gen. Wright graduated from West Point in 1940 and received a Master of Business Administration Degree from the University of Southern California in 1956. He has also successfully completed advanced management courses at the National War College, the University of Pittsburgh, and the Army Logistics Management Center.

He has served in programming and analysis positions in both the Office of the Deputy Chief of Staff for Logistics and the Office of the Chief of Staff. He assumed his present position in July 1967.

(This article was adapted from a presentation given by Gen. Wright at the U. S. Army Management School on 16 May 1968.)

MAJ. GEN. JOHN M. WRIGHT, JR.

MAJOR GENERAL JOHN M. WRIGHT, JR.

COMMANDING GENERAL, U.S. ARMY INFANTRY CENTER, AND COMMANDANT, U.S. ARMY INFANTRY SCHOOL

I welcome the opportunity to discuss management at Fort Benning. But I should stress, right at the beginning, that I do not have an article prepared for me by my comptroller or my staff. This obliges me to discuss my job as I see it, and I think that installation management is something that I am well qualified to discuss.

Before I can talk about the size of our management job or the problems involved in it, I should give some impression of what we do at Fort Benning. The obvious starting place is the mission, since that defines pretty specifically what resources we get, and how we apply them, and also governs everything we do at the installation.

Quite simply stated, or at least as we at Fort Benning define it, our mission is to produce the finest combat infantrymen in the world. Thus, as I see it, our job is to ensure that all the efforts of the people at Fort Benning — all of our resources, in fact — are applied toward producing just that: the finest infantrymen in the world. That is really what Fort Benning is all about.

Let me now give some indication of the size of the management task. I would like to do this by using a few numbers to show the magnitude of operations at Fort Benning. I think this is necessary in order that some of our management problems might be appreciated as derived from the very size of our operations.

SIZE OF MANAGEMENT TASK

First we can measure size in terms of people. At Fort Benning we have approximately 50,000 soldiers, we employ about 10,000 Department of Army civilians, we have some 40,000 dependents of military

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personnel, and we have around 11,000 retired personnel with their dependents. Thus, our supported population is about 110,000 people.

Let's look at the job in terms of area, which is certainly an important part of the management job, since we must ensure that every acre on the installation is used most effectively for the accomplishment of our mission. Our reservation encompasses 285 square miles, which is not nearly what we really need to accomplish our mission most effectively. But we have additional leased lands which total 335 square miles, so that our overall training area is 620 square miles.

Let's look at the job in terms of a few financial figures. Our monthly military pay is 13 million dollars; our monthly civilian pay amounts to 3 million dollars; commercial accounts add up to another 3 million dollars; our total disbursements run about 22 million dollars a month. In fiscal year 1968, our procurement program, which was one of the largest of any installation in the United States, ran 36 million dollars. Our total disbursements for fiscal year 1968 were 296 million dollars.

There are, no doubt, still other ways of getting across the idea of size. We have 14,000 telephones on the post, and we are now trying to get the money to put in more switching capabilities and more centrals so that we can have still more telephones. We consume 3 million loaves of bread a year, 12 million pounds of meat, 2 million gallons of milk -- and that's a lot of groceries! On the installation we have 5,700 military vehicles whose annual use amounts to 25 million miles. This, of course, requires large motor pool and maintenance facilities and, of course, very careful management.

Still other measures of the size of the operation are our 10 separate craft shops, 7 libraries, 6 theaters, 23 chapels, and one 9-hole and two 18-hole golf courses. (One of the biggest management headaches we have is paying for the operation of these golf courses.)

MAJOR SUBORDINATE ACTIVITIES

All of the items I mentioned were simply for the purpose of providing background and a certain frame of reference. Let me turn now to some of the activities that are going on at Fort Benning. I would like to discuss what each of the major subordinate activities directly below the installation level is doing.

MAJOR GENERAL JOHN M. WRIGHT, JR.

First, the U. S. Army Infantry School is one of our major activities. Day in and day out, we have a student load of 10,000. We will graduate 60,000 students from various courses this year. We have Allied students from 57 different nations. There are 22 different courses in all, conducted for 250 classes at the Infantry School, requiring presentation of 2,400 different instructional problems.

Another major activity is the U. S. Army Training Center, Infantry, where we conduct basic training. Every Friday we graduate from basic training 880 soldiers; and while those 880 are graduating, 880 more are being processed at the reception station, with their eight-week training scheduled to start the next Monday morning.

Also a major activity is the 197th Infantry Brigade which, besides being a STRAF unit, has as one of its primary functions that of supporting the activities of the Infantry School. Although I have already been using a lot of superlatives, I do not hesitate to say that this unit is the largest infantry brigade in the U. S. Army.

The 10th Aviation Group trains aviation units for deployment to Vietnam and also carries out aviation transition training. As you would expect, it is one of the largest tactical aviation units in the U. S.

Lawson Army Aviation Command operates our Army airfield at Fort Benning. Its 8,200 foot runway can take the largest airplanes in the world and the field controls some 200,000 take-offs and landings each year, which makes it one of the busiest airports in the U. S.

Martin Army Hospital is a modern 900-bed facility. Ten percent of its patients are Vietnam returnees requiring hospitalization. The birth rate at our local hospital is running at about 2,000 babies a year.

The Center Troop Command is still another of our major activities. Here we assign personnel directly involved in support-type duties for operation of the center itself and operation of Fort Benning as an installation. Here we find all the Military Police companies, the bands, Engineer units, and maintenance units required for post operation. Most of the personnel assigned at Fort Benning as part of the station complement are assigned to the Center Troop Command, which is an organization of some 7,500.

Also at Fort Benning we have the Combat Developments Command Infantry Agency. This is the agency responsible for the development of infantry doctrine and materiel; it determines how the infantry will be structured, how it will be equipped, and how it will fight.

Also there is the Army Materiel Command's Infantry Board, which is responsible for testing all new infantry weapons.

MANAGEMENT PHILOSOPHY AND CONCEPTS

Now, I have used a lot of figures, but my purpose has simply been to tell enough about Fort Benning so that there might be a better appreciation of the management problems involved. There are, of course, a certain number of things that have to be done in order to manage any installation. I imagine you would find them pretty much the same if you were to analyze the management functions that have to be performed. Looking at the entire management job as a whole pie, I think one could say that the commander carves out that portion of the pie corresponding to the amount of work he is going to do. Having determined what the commander's own portion is going to be, that leaves the rest of the pie for everybody else in the installation headquarters.

I think it is appropriate, here, to mention the management philosophy of another installation commander that I know. It so happens that he is a good friend of mine, one for whom I have the greatest admiration and respect. He is a man who gets into considerable detail in the management of his installation, so that he has carved out for himself about 80 percent of the management pie. The remaining 20 percent of the pie is the part that his staff has to deal with.

At Fort Benning, on the other hand, we carry out our management functions a little differently. Of course, every commander is conditioned by his own experiences and background, and my own have led me to take an approach to the command and management problem that differs from that of my colleague.

Let me say that my own portion of the management pie is about 15 percent. The remaining 85 percent falls to my Chief of Staff. In this connection, I should stress that this headquarters is a big operation and we have the usual directors. But if anybody were to ask me the difference between the Director of Personnel and the G1, or between the Director of Intelligence and the G2, I really could not say. We do, though, have

the G1, G2, G3, G4, and Comptroller, as well as all the other special staff people, responsive to the Chief of Staff, who is the only one I look to.

I think it is important to note that, if that portion done by my Chief of Staff were only 20 percent, as in the case of the other post, and that done by me represents 15 percent, then 65 percent would be unaccounted for. However, we must account for the whole pie. In so doing, I want to outline the things that interest me as far as management is concerned. I should add that I probably put in as many hours on my 15 percent of the management pie as my counterpart puts in on his 80 percent. I think it is a question of apportionment of one's time and effort.

I would like to limit my discussion mainly to the philosophy and some of the concepts I follow as an installation commander rather than go into a lot of specifics and details. I really want to discuss how the management job looks to me personally without trying to convince anyone that my way of going about the management job is the only way to do it.

As can be imagined, I receive a great many directives — which require action — from my headquarters up the line. I have not mentioned those headquarters, but they complicate my life a little, because as Commandant of the Infantry School, I am responsible directly to the Commanding General of the U. S. Continental Army Command. And as Commanding General of The Infantry Center I am responsible to the Commanding General, Third U. S. Army. Sometimes I find it hard to determine which hat I am supposed to be wearing at any one time, and this adds to my management problems.

When I do get a directive from either of my higher headquarters, the first thing I do is ask myself a very simple question. Is there anybody in my headquarters subordinate to me who has the capability of taking the action required? If the answer is yes, then I am through with that piece of paper This may suggest why I am concerned with only 15 to 20 percent of the pie and give some explanation for our headquarters organization and functions at Fort Benning.

There are a number of reasons why I apply such a technique. One is that one day someone subordinate to me is going to have to command Fort Benning or carry out some other important assignment. I think that one way to develop young officers and the people on the staff is to give

them any action they are capable of handling so that only a very few actions have to stop in my office.

Now, in theory, this may lead to 0 instead of 15 percent of the management pie as far as my own management activity is concerned. But the fact of the matter is that if one of these papers gets into my office and onto my desk and I have to look at it, I will usually have some ideas or questions on it and will probably provide some guidance. And if it is important enough to get to my desk on the way down, it is important that I see it on the way up. If it is not consistent with what I have in mind, then I become involved in it to the extent of giving further guidance to the staff so that the action is completely consistent with my concept of management and allocation of resources.

I try to have a relationship with my Chief of Staff much the same as my relationship with my co-pilot. I do quite a bit of flying, but I reserve for myself all the important decisions regarding it. I have a warrant officer who has been flying with me since I was a student pilot; he knows all my limitations, and I feel quite confident with him. But I make all the important decisions about a trip and leave the lesser decisions to him. I decide where we go and when I want to get there; my pilot does the planning. He determines if weather will permit flight, starts the engine, maintains the radio contacts, and does all of the other things that must be done.

It is pretty much the same with the Chief of Staff. I try to keep my mission in mind. I have always been mission-oriented, and if it looks like we are deviating in any direction or amount, I give guidance to the Chief of Staff. But when it comes to solving our problems, the Chief of Staff has a staff and he works out those problems with them. He then tells me what the solution is, and if it makes sense, then we are ready to go on to the next problem.

As far as my relationships with the rest of the staff are concerned — and here I refer to the G1, G2, G3, G4, and the Comptroller, my relationship with them is, in a sense, more social, because I would not tell any of them to do anything. I tell the Chief of Staff and he would have whoever is responsible do it. If the Chief of Staff, who meets with the staff every morning and knows what is going on, is to guide his staff and

keep everybody coordinated, he could not remain very effective if I were to give instructions directly to any member of the staff.

So I can say categorically that I hardly ever tell a staff officer to do anything. In fact, only very rarely would I, as installation commander, tell the Chief of Staff to do anything. If I were to do this, I would immediately deny myself the benefits of thorough staff actions and the application of the sound judgment of specialists. What I try to do is to ask questions that will demand study and coordination through the staff, so that when recommendations come back to me related to the question that I asked, by approving the action we may change emphasis because the staff convinced me that this was the best course of action.

What I am saying is that if I were to tell the Chief of Staff or any member of the staff to do anything, then I make the decision alone without the benefit of very highly qualified and very capable experts taking a look at the problem first. In sitting at the top and seeing some problem coming up such as, for example, a deficiency in resources, I think it is a very dangerous thing for the commander to say, "Well, do something like this." I just would not run the risk. So I let the staff answer the questions rather than just read personal directives from me.

I think I have made it clear to the people at Fort Benning that if a commander is as blessed as I am with a staff as capable as the one I have, then the commander ought to let that staff, under the direction of the Chief of Staff, run the installation. Now, in many areas I have had more experience than my staff, and I try to contribute my experience much in the same way that I expect my staff to contribute their experience. It just happens that I am older than most of them, I guess, but as a consequence of that I have had experiences that some of them haven't had. So I visualize my position as providing guidance where I think it will contribute to the solution that the staff has come up with. Some might call this delegation. I am not sure.

After all that I have said, I would make the observation that I still keep a very tight rein on all operations at Fort Benning. I think I know what is going on; I think I know every area that demands my personal attention. Again, this is a credit to my Chief of Staff, with whom I spend about an hour every morning. He himself meets with the installation staff from about 0730 to 0800 each morning. He is still in that meeting

when I get to work, which is around 0800, and sometime between 0815 and 0845 every morning he comes in and spends about an hour telling me all the tragedies of the night before, the latest budget guidance from Third Army and CONARC, and the most recently added mission to be carried out from available funds. We commiserate, I ask a few questions or give a few suggestions, and wish him good luck. He calls a meeting with his program budget advisory committee, and, together, they thrash the problems around all day before approving a message going back to the Third Army or CONARC.

I do not wish to slight the functioning of the program budget advisory committee (PBAC), to which I give a great deal of attention and which is made up of the G1, G2, G3, G4, and Comptroller, and headed by the Chief of Staff. There is also the junior PBAC, which is made up of the budget and management officers in the offices of the principal staff assistants. Toward the close of the fiscal year, the junior PBAC is in formal meetings almost constantly. And at Fort Benning we insist on formal meetings, because only at formal meetings can we ensure that there is thorough coordination and consideration of resource problems.

We started out this year with a program that required 91 million dollars for an actual operating program while our funding program was 74 million dollars. With that amount of unfinanced requirements we have had our problems all through the year. As the year goes by, obviously the unfinanced requirements continue to diminish, because there isn't time to execute the programs that could have been executed had we [illegible] the total financing at the beginning of the year. But all of these manipulations are done by the program and budget advisory committee.

With the foregoing as a kind of summary, I hope that I have given a general idea of how I spend my time and the way management looks to me as the Commanding General. As a final thought, I would like to say that I am thankful many times over not only that I have good people but also that I have enough confidence in them to enable me to command a very large installation without a worry in the world.

Since graduating from West Point in 1940, Col. Chandler has accumulated extensive experience in such military specialties as post commander, organization and training officer, chief of staff, and public affairs officer.

Col. Chandler is one of the first graduates of the Army Management School, having completed the Command Management Course in FY 56.

(This article was adapted from Col. Chandler's presentation at the Army Management School on 2 Apr. 1968.)

COL. HOMER B. CHANDLER, JR.

COLONEL HOMER B. CHANDLER, JR.
DEPUTY CHIEF OF STAFF
U. S. ARMY TRAINING CENTER
& FT. LEONARD WOOD
FORT LEONARD WOOD, MISSOURI

Sizing Up the Chief of Staff's Job

About a month ago, I was called into the chief's office and handed a slip of paper. On this paper were essentially the following instructions:

A. Present a description of the role of Chief of Staff in directing, coordinating, and controlling key staff officers.

B. Give a brief outline of the principal program directors' jobs and their relationship to each other.

C. Explain the concept followed at our installation in the allocation and management of resources with an account of the Program Budget Advisory Committee's function.

D. Indicate your philosophy of management.

I told the chief the requirements ought to be a snap for him to fulfill. At that time, he stated that the task was mine and would consist of a presentation at the Army Management School. Well, installation staffs probably vary, one from the other, just about as much as installations vary in number. Consequently, when I was asked to address the Army Installation Management Course on the subject of the management of an installation general staff, I spent many soul-searching hours in attempting to arrive at a logical presentation that would not be too parochial in nature and yet would not be so generalized as to be meaningless. In other words, I feel somewhat like the young wife who suddenly finds herself pregnant and is about to attend a scheduled meeting of her womens' club. She doesn't want to describe in great detail her discomfiture with morning sickness, since each mother there could probably top her story. Nor does she feel she can get away with a general

MANAGING AN INSTALLATION GENERAL STAFF

statement such as, "I'm expecting," since that would only lead to the question, "so?" Her mental dilemma, therefore, must have been somewhat like mine was. Of one thing only we both were sure — we had been had!

Before I can discuss any facet of our General Staff operation or management, certain basic factors must be known. The first, and one of the most important in the production of goods or services of any nature, is, where are we going to operate? Most everyone has an excellent idea of the location of the state of Missouri, so let's just pinpoint Fort Leonard Wood within the state itself. Our area of operation is about 130 miles south and west of St. Louis along U. S. Highway 66, previously known as the Lincoln Highway. The Training Center is therefore located in the northern regions of the Ozark foothills, generally in south central Missouri. Our climate is midwestern, moderated by a rather southerly location.

The following is our mission:

(1) Establish and operate an effective training program in basic combat, advanced individual and engineer specialist, and unit training.

(2) Provide command and logistical support to assigned or attached units.

(3) Provide training and logistical support to National Guard and Reserve units satellited on the installation.

Now that we have established our base of operation, we should examine the mission of the installation. This mission is applicable to the training and support forces specifically, but since the General Staff administers to both agencies, it becomes primary guidance to our program directors.

Next to consider is the scope of operations that our directors, the General Staff, influence. In short, what sort of center is Fort Leonard Wood? It consists of five training brigades, a Basic Combat Training Committee group that serves the 2d and 3d Basic Training Brigades, an Army hospital of 500-bed capacity, special troops, a reception station, and a combat engineer battalion. Generally this is a typical training center; differences basically exist in subjects taught. Fort Leonard Wood is the only center that offers advanced individual training in strictly engineer military specialties.

What is our population and in what categories? As shown in the table below, we are a community of over 40,000, most of which are students, that is, trainees, or are trainers.

POPULATION:	TOTAL MILITARY	31,640
	TRAINEES	20,570
	CIVILIAN EMPLOYEES	4,430
	DEPENDENTS	8,660

So much for basic background relating to our directors. Perhaps next to examine are the tasks assigned to each. I will discuss only the major areas that each coordinates directs, or supervises, since the details of all jobs for which they are tasked cover a published document of over 80 pages.

The Director of Personnel

Our first director, then, is the G1 — the individual responsible for the development, execution, review and analysis of support services, command administration, and welfare services. Regarding the internal divisions of this director's section, of special interest, perhaps, is the Civilian Personnel Office, which has recruited and now administers to over 3,000 civilian employees within the command. As the supervisor of the CPO, the G1 must coordinate with all the other program directors as well as major commanders, since our civilian work force is spread out into every nook and cranny of the post.

Two other divisions that merit consideration are the Morale and Personal Services Division and the rather newly established Army Community Services. In the first instance, considerable funds are involved (about $25,000 to $30,000 annually for youth activities and around $200,000 for the Central Post Welfare Fund). The second case does not involve funds so much as good will, morale, and assistance of a semi-official nature. We are progressing quite well in establishing a "one-stop" service for families both arriving and departing. Already temporary billeting services, family housing, a household goods loan department, Army Emergency Relief, and family counseling services are consolidated under the service director who, in turn, is responsible to the G1.

MANAGING AN INSTALLATION GENERAL STAFF

The supervision of the Special Staff agencies that are responsible to the G1 — the Adjutant General, Provost Marshal, Chaplain, Special Services, Post Exchange — is quite normal to any installation and command. It may be of more interest, therefore, to review some of the old facilities still operated by these agencies and compare them to the new.

Our old chapel buildings are still serving full congregations. As a matter of fact, we have seven such buildings still in use. Our chapel attendance can honestly be termed excellent. It might be that our weekly shipment of graduates to the Far East inspires some soul-searching.

We have four new chapels in operation.

In the Post Exchange area, a World War II-type PX branch building has been replaced by a permanent-type building. In the Special Services field, our Post Field House, which is rather old, has largely been replaced by new buildings. New buildings are constructed as each new regimental, that is, brigade, area is completed.

To round out the G1 area insofar as morale and personal services are concerned, for both the troops and dependents we have a 500-bed multimillion-dollar hospital; a large, modern 7-days-a-week commissary, which has the eye appeal of a modern supermarket; a Post Exchange of the general department store type; and a new 32-lane bowling alley. All these are located conveniently within what we refer to as a community shopping center.

Now, all of the mentioned facilities were not constructed this past year, or even during the past two years. Many were constructed through use of nonappropriated rather than appropriated funds, as the table below shows:

2 EM swimming pools	$370,000	PX gas station	$ 34,900
Another PX gas station	$ 97,000	Showers, dressing rooms, skating rink	$ 6,300
Bowling alley	$550,000	New theater	$705,000
Golf course	$ 36,000	Sauna bath	$ 20,000
Swimming pool	$134,000	Latrine	$ 12,000

However, regardless of the source of funds and the ultimate using agency, the coordination of the program directors was essential from the earliest planning phase to the ribbon-cutting day when the site went into full operation. In the event no item in the above table has caused

some speculation, I call attention to: "Latrine, Colyer Park — $12,000". This is perhaps the fanciest and most elaborate latrine in all of the Ozarks at that price — but, seriously, this park and its picnic area are utilized by literally hundreds of trainees and their families every week of the year. This sort of facility becomes essential during the course of a normal day.

Director of Operations & Training

Let me discuss next the organization of our Operations and Training Office.

Among its units, the Fifth Army Training Aids Center is actually a Headquarters, Fifth U. S. Army, activity located at Fort Leonard Wood and supported by us under the rather generalized supervision of the G3. Training aids support, however, is given to all installations in the Fifth Army area, as well as National Guard and Reserve units.

The Operations Division deals with our TOE units, such as the 5th Engineer Battalion, and the Training Division, of course, is very much involved with the training brigades — rather routine tasks, although the personnel in these divisions would probably never concur that any part of a training center can be routine.

The function of the G3 as a director in the normal sense of the word falls to the share of the Program and Management Division and the Reserve Components Division. Somewhat to be expected at our training center, the major share of our annual funding program is directed into the area of primary interest to the G3. For example, of a total AFP of 33 million dollars, 26 million is earmarked for training activities. Consequently, the Program and Management Division is a most important office within G3. Although not involved with large amounts of funds, the Reserve Components Division at various times of the year must coordinate support requirements for quite a few Reserve component units. For example, we anticipate that this summer we will receive 487 company-size units for training, involving some 17,500 personnel. Moreover, during FY 68 we will have supported for weekend training over 80 other units. As a director, the G3 must support these Reserve requirements with funds, and coordinate training supervision with brigade and other major unit personnel.

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All of what I have discussed is typical of any G3 program director at any training center. What, then, makes ours different? Earlier in this article, I stated that we are the only center that possesses Engineer advanced individual training brigades.

Take the 1st Brigade for example. Graduates from this unit are strictly basic engineers, and two of their typical operations are constructing and emplacing panel bridging and making assault river crossings. If you can think of any phase of basic engineering training — from obstacles to demolitions to plain pick-and-shovel construction — the 1st Brigade does it. Needless to say, most of the graduates proceed to the Far East area.

Considerably different, the 4th Brigade is our engineer specialist training unit. By the word "specialist" I mean special equipment that is by and large limited to engineer troops.

Many of the trainees who have operated large earthmovers have assisted in airfield and port construction in Vietnam.

Other courses of training concern the old familiar bulldozer and crane, which operate at what we call the million-dollar hole, which gets its name from the total cost of some 100 cranes that are used in training. As might be expected, one class digs the hole and the next fills it up. Otherwise, Fort Leonard Wood might well end up as one big hole.

Just as a matter of interest, I should mention a special item of equipment — the rock-crushing machine. This machine, along with asphalt plant training, has permitted us legally — or perhaps slightly illegally, in some cases — to improve our on-post roads, parking areas, recreation facilities, extensive troops trails, and training sites.

Finally, before leaving the G3 field, let me point out our new building that functions as both classroom and TV center. From this central location, closed-circuit TV is transmitted periodically to all brigades. The initial equipment and its installation cost in the neghborhood of half a million dollars. Currently, educational TV is supplied over six channels to 81 classrooms involving over 400 sets.

Director of Logistics

The next program director, the G4, is all-important at many installations and in many commands. On the basis of the amounts contained

in the Annual Funding Program, in our case he is certainly on a par with the G3. Within his section, there are Procurement, Budget and Programs, and Maintenance and Supply Divisions. These three really cover a multitude of sins.

The table below shows the special staff agencies which the program director must coordinate.

DIRECTOR OF MAINTENANCE	DIRECTOR OF SUPPLY
POST TRANSPORTATION	POST SIGNAL
POST QUARTERMASTER	FAMILY HOUSING
POST SURGEON	DENTAL SURGEON

POST ENGINEER

I say "coordinate" because he certainly does not command the Post Surgeon or the Dental Surgeon.

What we are really concerned with here is the major support element of the command with the exception of morale and welfare. The actual monetary amounts involved would be meaningless, since those of most commands could be a great deal more or a great deal less. But, generally, most installations will contain a grouping very similar to ours.

Now let us view the results of our logisticians' efforts. One 16 million dollar complex consists of a brigade barracks area containing not only billets but mess halls, supply rooms, headquarters, PX facilities, dispensaries, chapel, and classrooms. This, of course, represents MCA funding, but the cooperative effort of our people in the G4 field and district engineers, local contractors, labor unions, and all others involved with this major construction effort has brought the installation commander and his G4 program director very much into the act in successful completion and utilization by our brigades. We have two such areas completed, with plans approved for three more in the not too distant future.

In 1959 and 1960, family housing areas of a permanent type were completed. The officers' section overall can accommodate 650 families. We have 2,600 enlisted quarters, six elementary schools, and one junior high school on post.

We haven't neglected our bachelor officers, for we have permanent accommodations for over 200 officers. Other facilities of the improved World War II type exist as well and are being utilized at present. We have, however, adopted a most liberal policy in permitting bachelors who so desire to live off post and draw rental allowances. All in all,

we expend almost 2 million dollars a year in the operations and maintenance of military family housing, the sums being about equally divided between the two subdivisions.

Now, from time to time I have quoted dollar figures. It is impossible in this day and age to avoid the subject, and those involved with management at any level know this to be very true. So, before we even consider at all the last of our General Staff sections, specifically our program coordinator, the Comptroller, I would like to demonstrate the overall financial impact our installation has upon the state of Missouri and for the most part, on south central Missouri.

ANNUAL PAYROLL	$ 82,900,000
ANNUAL PURCHASES	$ 35,900,000
PERMANENT CONSTRUCTION (SINCE 1956)	$111,490,000
TAXES TO STATE OF MISSOURI (ANNUAL)	$ 800,000
FEDERATION CONTRIBUTION TO SCHOOLS (ANNUAL)	$ 1,150,000

This represents quite a hunk of cash, particularly when you consider that, except for the third item, this is an annual affair. Not indicated above, but also important, is another 2 million dollars in expenditures for goods and services by the officer and NCO open messes, and this definitely is a very local affair.

The Comptroller

You will note I have referred to our Comptroller as the program coordinator rather than a program director.

You might assume that his Program and Budget Division functions as the principal program coordinator. This is not true, for it is the Comptroller himself who performs that function. The division in question services only the comptroller section in establishing programs and operating the budget allocated to support the section.

There are two other divisions worth noting. The Data Processing Service Center was established in mid-1964, and has been expanding ever since. Currently, our equipment is quite old and not nearly as sophisticated as that to be found in the Washington area. We are, however, scheduled to receive IBM 360 machines during the final quarter of this fiscal year being the first installation in the Fifth Army area to

receive modern equipment. At this time, we run everything possible through our processing center and intend to continue to expand as equipment and funds become available.

The Internal Review Division should never be overlooked by any command. In management by exception, this is one of the key agencies that will turn up the exceptions. In short, if this division yells "tilt," it's time to take a long hard look. This agency conducts audits of our numerous nonappropriated and private association fund accounts on a semiannual or annual basis, as directed by the commander. The size of the fund is not the only determining factor as to frequency of audit. A great deal depends on the experience and training of the custodian, and on the past history and volume of transactions during the year.

As the commander's principal program coordinator, the Comptroller heads a working committee consisting of the G1, G3, G4, and Post Surgeon. This group reviews periodically the funds available under the Annual Funding Program to determine the status of obligations, mission changes, if any, the current funding direction from higher authority, and a host of other factors which require reevaluation of commitments to various programs. In most cases, differences are resolved at this working level and fund switching, as authorized by regulations, is accomplished or decided upon. Then the working group meets with the Chief of Staff, the chairman of the program Budget Advisory Committee. Residual differences, if any, are brought to his attention for resolution and final recommendations to the commander are established. Lastly, the committee meets with the Commanding General for the final decisions concerning their recommendations. Generally, a united front is presented at these meetings, since all bargaining or differences should have been resolved before. Meetings with the commander logically should be relatively brief after the annual program has been established, since the group routinely meets once a quarter and as required when major changes are directed by higher headquarters. Frequently a major change in direction does occur so that the commander himself must examine resources in quite some detail prior to announcing command policy. The whole point is that programming, management, and review is a constant activity at any installation throughout the year. It is not something that is done only during certain months, so that at other times everyone can

forget it. It is true that the programmed budget is not changed every day or even every week, but the frequency of change as warranted by review might surprise you.

Philosophy of Management

Basically, my philosophy of management is a modification of management by exception -- examine both the very good and the very bad closely to determine the cause, if possible. However, if never required to prove its worth, an activity or agency becomes complacent, reactionary, and uninspired. Consequently, even if time permits only a fast look-see, all should receive the attention of the commander himself or certainly his chief of staff.■

Colonel James N. Jean received his bachelor's and master's degrees from Indiana University and the University of Rochester, respectively. He is also a graduate of the Infantry School, Armored School, Command and General Staff College, and National War College.

In July 1964, Colonel Jean took command of the 57th Ordnance Group at Kaiserslautern, Germany, and reorganized it into the 57th Ordnance Brigade in June 1965. In July 1965, he was assigned to the Supply and Maintenance Agency at Orleans, France, where he served as Chief of the Plans Division for one year. He assumed command of the Army Missile Support Command in August 1966.

In October 1966, operation of Redstone Arsenal was transferred to the Directorate of Arsenal Support Operations of the Army Missile Command, and Colonel Jean became its first Director and Deputy Post Commander.

(This article was adapted from Colonel Jean's presentation at the Army Management School in June 1968.)

COL. JAMES N. JEAN

COLONEL JAMES N. JEAN

DIRECTOR OF ARSENAL SUPPORT OPERATIONS AND DEPUTY POST COMMANDER, HEADQUARTERS, U. S. ARMY MISSILE COMMAND REDSTONE ARSENAL, ALABAMA

My prime mission as Deputy Post Commander of Redstone Arsenal is to provide support services to the installation. These support services may be grouped into two categories, first, the post, camp, and station type which are inherent to any Army installation command; and, second, other types which directly support the missions of the organizations located at Redstone Arsenal. And it is this mission of providing these support services that I wish to discuss, along with some of the management techniques utilized to assure their accomplishment.

First, however, I feel it necessary to provide a background of Redstone Arsenal.

The installation commander of Redstone Arsenal is Major General Charles W. Eifler, by virtue of being Commanding General of the U. S. Army Missile Command (MICOM). We have the organizational relationship of a class II activity of the Army Materiel Command (AMC), the latter being the parent organization, located at a class II installation.

Under AMC is the MICOM, which utilizes the directorate organization. I am the Director of the Directorate of Arsenal Support Operations (DASO) and also Deputy Post Commander. DASO is the organization which provides support services to the complex.

I also want to mention that the support service provided to NASA's George C. Marshall Space Flight Center (MSFC) are furnished in accordance with a formal agreement between NASA (National Aeronautics and Space Administration) and Department of Army, as directed by General Eisenhower when he was the President of the United States. We are also

MANAGEMENT OF SUPPORT ACTIVITIES AT REDSTONE ARSENAL

presently formalizing an agreement with the Sentinel Systems Command, SENSCOM.

Now, I have been talking about support services, so let us look at them in broad terms. The Directorate of Arsenal Support Operations provides administrative, logistical, and technical support and services to all elements of the MICOM, and to the Missile Munitions Center and School (USAMMCS), MSFC, SENSCOM, the Huntsville Division of the Corps of Engineers, and others, including the large government-owned, contractor-operated plants of Rohm & Hass Chemical Corporation and the Thiokol Chemical Corporation. The "others" also include three lessees who rent facilities on the installation. They are the Stauffer Chemical Company, the General Analine and Film Corporation, and the Olin Mathison Chemical Company.

The support services have been divided into categories: the administrative and logistical, which, broadly, are the installation type, and the technical or national mission type. These technical or national missions have been assigned to the DASO in accordance with the MICOM policy of consolidating all support services into one organization.

Real Estate Management

Real estate management is the responsibility of my Post Engineer. It includes management of approximately 40,000 acres of real estate, 2,400 buildings and structures, 300 miles of roads, 62 miles of railroad and the RSA airfield. Almost 15,000 acres is leased to cattle farmers for hay crops and cattle grazing. Direct monetary return is about $25,000 per year, but the main value is realized by maintenance of the property in presentable military fashion. This additional value is estimated at $140,000 a year.

Regarding roads, we are continually working with appropriate federal agencies, the Bureau of Roads, and state and local officials in attempts to improve the road network on and adjacent to the Arsenal.

Utilities

The Post Engineer provides utility services to all tenants on the installation. Electric power is purchased from the Tennessee Valley Author-

ity, at a very reasonable cost, substantially less than a penny per kilowatt-hour. We buy about 30 million kilowatt-hours per month.

We use coal, gas, and fuel oil in producing steam in our complex of boiler plants. We have the largest coal-fired unit within the Department of the Army.

Three water plants provide a combined capacity of 43,000,000 gallons of industrial water per day, of which 9,000,000 are further treated to become domestic water. Supply is somewhat taxed during periods of testing rocket and guided missile motors and space vehicle boosters. Our raw water is taken from the Tennessee River, Wheeler Dam Reservoir, which forms the southern boundary of the installation.

Supply

Supply responsibility extends to all organizational elements at Redstone Arsenal, except NASA's George C. Marshall Space Flight Center. This includes base, medical, and quartermaster supply as well as specialized supply items. More than 70% of our effort consists of providing non-stockage list items. We buy lasers, chemicals and propellants, small computers, and specialized photographic equipment for research and development activities at Redstone Arsenal. In fact, recently we purchased four goats for an R&D Test.

In the supply area we maintain an operative inventory that exceeds $2,500,000, which is financed through the Army Stock Fund. As the stock fund is a revolving account, customers are charged for services rendered, thereby replenishing the fund. Last year we did over $23,000,000 in business through the Retail Stock Fund.

A word of caution, however, as our supply efforts are not to be confused with the Supply & Maintenance Directorate's "Worldwide Warehouse Without Walls," for we provide only those supplies for operating the arsenal, as well as those special-order types utilized in research and development and local maintenance of missiles and related equipment.

Communications

Redstone Arsenal has one of the largest communications systems in the Department of Army and encompasses telephone and teletypewriter

services, as well as various radio nets, inter-communications systems, and television facilities.

We still operate the Arsenal Telephone Exchange serving some 21,000 instruments, although on 1 February 1968 our telephone service was converted to common carrier, the Southern Bell Telephone Company. This company has leased five acres of arsenal land and is completing construction of a Southern Bell building on government land.

Three types of television services are provided: a community television system consisting of facilities to receive commercial broadcasts and distribute them over a TV cable system, primarily to the family housing areas; an educational closed circuit system provided to USAMMCS whereby signals may be distributed to classrooms for training purposes; and a closed-circuit system for the research and development directorate to provide monitorship of tests where dangerous conditions preclude direct human observation.

Transportation

Transportation is a problem at Redstone, as we are scattered over a large area. We have a fleet of approximately 1,600 vehicles (sedans, buses, trucks, wreckers, etc.) of which 289 are assigned to the AMMCS. These provide regular taxi or bus service to most points on the installation, call service for points not serviced by the regular system, as well as staff assigned vehicles.

Our air section does a thriving business with a dozen military aircraft, ranging in size up to one C-54. We have rail facilities utilizing a fleet of 4 locomotives, 28 cars, and a rail crane. Although no military transportation services are provided by water, we do have the RSA and Marshall Space Flight Center docks on the Tennessee River which provide access to barges.

Medical Services

We presently operate a 56-bed U. S. Army Hospital, accredited by the American Medical Association for a three-year period, and a 21-chair Dental Clinic. In addition, we have aggressive Occupational Health and Preventive Denistry Programs. CONARC, through Third Army Head-

quarters, has funded the military portion of our medical services and is scheduled to take over the entire program.

Maintenance

Maintenance support is provided on more than 70,000 items of equipment, from office machines to entire missile systems. Much of our effort in this area is to keep the missile systems of the Missile School such as the Pershing missile system, in a constant state of effectiveness for training purposes. For the past two years the school operated around the clock, but has now dropped back to two shifts. Naturally, this accelerated training kept our maintenance people busy.

National Mission Accounting

In addition to performing installation finance and accounting functions, my Finance and Accounting Center is also responsible for national mission accounting for all RDT&E, PEMA, and O&MA appropriations for the development, procurement, and field support of missiles. The Center also accounts for the Wholesale Army Stock Fund for the procurement of missile repair parts.

Maintenance Evaluation & Procedures Shop

We operate a Maintenance Evaluation and Procedures Shop in support of the maintenance engineering program relating to the Army's guided missile and rocket systems. We send teams of specialists into the field for modification work orders, to assist the field personnel in modification and maintenance at the missile site. We have had teams in Vietnam, Korea, and Europe in recent weeks.

Computation Services

The Computation Center provides electronic computation services through utilization of three 1401, three 1460, three 7010, and one 7094 IBM computer systems. The 7094 is used for scientific purposes, while the others are primarily commercial. In addition, we also have three analog computers utilized extensively for Nike-X as well as our own R&D Directorate.

SUPPORT ACTIVITIES AT REDSTONE ARSENAL

Manufacturer of Prototype Missile Components

Our mechanical shops, located in the Post Engineer area, fabricate and manufacture prototype missile components and have for quite some time provided assistance in the research and development of missiles and space vehicles. This work consists of operating a foundry, a precision machine shop, a missile model shop, a sheet metal shop, and similar shops required for fabrication of prototype missile components, for test and evaluation purposes.

Patent Center

The Patent Center provides legal and engineering advice and assistance in matters pertaining to inventions, patents, and other proprietary rights that would be of interest to the government. We also monitor the patent rights clause of contracts.

Now, that you have an idea of the types of support services we provide, let's look at some of the management techniques I utilize.

Organizational Structure

First, let's look at the DASO oganizational structure at the staff level. I have 12 major staff assistants. Under these staff assistants are approximately 40 division chiefs. Through these, I manage the efforts of 3,000 civilians and several hundred military.

The Control Office performs comptroller-type functions except finance and accounting, which is the responsibility of the F&A Officer. The assistants — Dental Surgeon, Post Surgeon, Post Engineer and Assistant for Communications — often found under the S-4 or Assistant for Logistics, have been established as separate staff elements. Then we have the technical mission organizations for Computation and Patent Service.

Several functional areas have counterparts at the AMICOM staff level. These counterparts exercise MICOM staff supervision over DASO with respect to installation-type activities except where the staff responsibility is specifically assigned to DASO.

As an example, the Comptroller and Director of Programs, MICOM, exercises staff supervision and technical control over the Finance and Accounting Center with DASO having operational responsibility. On the

other hand, DASO is assigned staff and operational responsibility for MICOM command security, printing control, and medical activities and is the staff advisor to the Commanding General in these areas. In relation to this staff, I utilize a program advisory committee. Each senior staff officer is a member of this committee. They operate directly under the Deputy Director, who calls meetings as required. We have our weekly staff meetings each Tuesday morning, with a half-day review and analysis quarterly. As to individual contact, I have a definite open door policy whereby any manager may come to me, just as I go directly to him.

Management Indicators

We recently initiated a system of management or perfomance indicators, which establishes goals or objectives and compares performance against these goals. Many of the areas in which we have devised indicators contain significant potential for management improvement. This potential can be revealed by a system for establishing objectives, measuring performance against objectives, analyzing the results, and initiating corrective action. We now have 43 major management and performance indicators and it is likely we will develop more than 100.

For example, in the operating civilian personnel area, one of our major indicators is the number of personnel action documents (SF 52's) processed per month.

Secondary indicators in this area given by breaking down the major indicators (processing time of SF 52's) into categories, i.e., promotions new hires, transfers, and reassignments. If a major indicator indicates a problem, a secondary indicator may pinpoint the need for corrective action.

Work Measurement System

Another management technique or tool which I utilize is the DASO Work Measurement System. This system employs the conventional technique of identifying work units at the lowest organizational level and developing statistical standards based upon the direct man-hours expended in producing these work units.

In addition, through a proration and factoring formula, the bulk of all overhead man-hours are directly related to the work unit production

Therefore, the system provides a composite work unit and standard for each organizational segment and permits the tracking of workload trends and, in addition, a more accurate determination of manpower requirements than we were previously able to document.

After identifying the basic work unit and establishing standards, workload data are reported from each of the organizational segments. The data are transcribed onto punch cards and processed on the IBM 7010 computer, from which a monthly report is generated. To conform with the schedule X of manpower survey fame, the print-out perpetually shows the latest 12-month period. Technicians review and analyze the monthly data, identifying problem areas and initiating various actions to ascertain the validity of the findings. Once the cause of the problem has been established, I then have a firm basis for initiating corrective action, such as re-allocation of resources.

Salable Services — Cost Distribution

The final technique or concept which I wish to discuss is unknown from any of my previous knowledge of post business. It is called the Cost Distribution System. First, just what is meant by cost distribution and why is it necessary that we have such a system? The Directorate of Arsenal Support Operations is an Army Industrial Fund operation, and most of the effort expended is in the performance of services identified as base operations. The Army Industrial Fund is a revolving-type fund which must recoup its expenditures. Since these base operation activities are not directly funded, the cost incurred must be entirely paid for or distributed to the receiver of the services. Therefore, the Cost Distribution System provides for the distribution of our actual cost to our customers on an equitable basis. So, basically, you might say that I begin the year without any funds and I seek to end the year without any.

The Directorate of Arsenal Support Operations is currently operating with a budgeted performance cost of about $45 million. About 10% of this amount is funded for programmed missions of the DASO, such as rifle and pistol matches, military training TDY, minor construction and alteration under $25,000, general-purpose capital equipment, demilitarization, property disposal, family housing, as well as a sub-allotment

from Third Army, for operation of the U. S. Army Hospital, direct sub-orders from MICOM directorates and program managers, and MSFC reimbursable direct work. These are for such activities as maintenance procedures, fabrication of test items, computation services, and MSFC construction and cable projects.

The remaining 90% are primarily costs incurred in the performance of operation and maintenance of facilities activities such as finance and accounting, preservation of order, welfare services, repairs and utilities, fire protection, field or support maintence of equipment, supply, communication, transportation, commissary, and troop mess activities.

This 90% of $40 million plus of costs incurred by my directorate are not directly relatable to either DASO mission funds or specific orders. They are rather in the nature of "overhead" community-type activities, and must be distributed in some manner to the benefiting customer.

AR 37-110 on AIF accounting provides only the following guidance: "From the standpoint of allocating overhead costs to individual jobs or services, when required, any generally accepted method may be used provided it meets the test of reasonable accuracy as well as simplicity."

The system used at the DASO for distribution of overhead type costs has been designed to the maximum extent possible to relate the "billings" to each customer to the benefits received and to inform the customer as to what he is paying for.

There are four major steps in the system:

First, the costs incurrent by each organization or cost center of DASO are identified as three basic types:

(1) General and administrative costs - costs which are incurred in the general administration and staff supervision of all DASO organizations. They are principally the Office of the Director, the Control Office and offices of the major staff assistants.

(2) Division overhead costs - costs which are incurred by an operating division for administration and supervision not directly relatable to the performance of any single function, such as the Production Control and Services Office of the Post Engineer.

(3) All other costs - costs incurred by operating divisions which are directly incurred in the performance of specific functions, such as distribution, maintenance and repair of the water system, operation of

the telephone exchange, maintenance and repair of buildings, family housing, etc.

Second, all other costs are, in turn, identified to the customer in two ways:

(1) Job orders received from the customers. These orders may be for DASO directly-funded missions, MICOM directorate sub-orders, or certain Operation and Maintenance of Facilities activities such as installation and removal of intercoms where the cost incurred may vary according to the customers desires.

(2) Salable services. Some 87 services have been established by the DASO for distribution of costs to customers for services provided, for which a unit of measure relates to the benefits received. Such services are maintenance and repair of buildings, based on square feet occupied; operation of telephone exchange, based on telephones assigned; and salary and wage administration, based on spaces authorized.

Third, since costs incurred either by job orders or salable services are identified to all benefiting customers, some of these costs will obviously be identified to DASO itself. For example, the costs of operating the telephone exchange includes telephones assigned to DASO. The DASO is not directly funded for its own support, and, therefore, these costs become a third type of overhead known as secondary overhead.

Fourth, we have now identified general and administrative costs, division overhead costs, secondary overhead costs, job order costs, and salable services costs. The distribution of these costs to benefiting customers is as follows:

(1) Salable services: by unit price, which includes the cost of producing each unit **plus** a share of division overhead **plus** a share of general and administrative overhead **plus** a share of secondary secondary overhead.

(2) Job orders: by actual incurred cost **plus** a share of division overhead **plus** a share of G&A and secondary overhead.

Unit prices and job order overhead rates are predetermined based on projected workload and costs. Monthly reviews of actual unit costs and actual overhead rates are made and adjustments made in each to assure minimum variance between actual costs and "billings" to customers by the end of the fiscal year. Incidentally, this system is on a computer

and takes less than two hours per month to distribute unit costs. This system provides valuable managerial data on utilization of resources and, or course, facilitates the DASO planning and programming functions and the current allocation of resources to various organizations. Also, for the customer, this system provides data that enable better planning and programming and promote the development of more realistic support requirements. With the unit price on a service being known, the customer can relate this price to his available funds and mission support requirements, helping him to ask for only those services that are absolutely necessary.

Again, of course, the end objective of this system is to have our selling price equal our actual cost, so that recoupment of funds and actual cost are in balance, on an annual basis. To date we have enjoyed a high degree of success, balancing out each 30 June within a few thousand, or occasionally a few hundred dollars, of the $45 million we have spent.

To conclude, in case you had not detected it from my tone, I like Redstone Arsenal and think I have a tremendously interesting job.■

Colonel E. M. Sleeker graduated from college in 1936 and was commissioned a Second Lieutenant, Infantry-Reserve, from ROTC. He also is a graduate of the Advance Course at the Armor School, the Command and General Staff College, the Armed Forces Staff College, and the Army War College.

During World War II, Colonel Sleeker served in Europe as Division G-4 and Division Trains Commander with an armored division. Since then he has served as Budget Officer in a G-4 Section; Commanding Officer of a tank battalion; Chief of a U. S. Military Mission in Iran; Chief of Staff of an armored division; and Executive Officer, Office, Comptroller of the Army, Headquarters, Department of the Army. He became Deputy Commander and Chief of Staff, Military District of Washington, in July 1967.

COLONEL E. M. SLEEKER

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CHIEF OF STAFF

MILITARY DISTRICT OF WASHINGTON

WASHINGTON, D. C.

I want to discuss the management functions of the General Staff of an intermediate command called the Military District of Washington (MDW). But before I cover what we do at MDW, I would like to pass on to you a famous quotation attributed to Sydney Smith, who was an English clergyman, wit, and writer. He was ordained in the Church of England in 1794, and his works have been compared to those of Swift and Voltaire. Smith's quotation, which is generally accepted as the origin of phrase, "A square peg in a round hole", goes like this, and I quote: "If you choose to represent the various parts of life by holes upon a table of different shapes — some circular, some triangular, some square, some oblong — and the persons acting these parts by bits of wood of similar shapes, we shall generally find that the triangular person got into the square hole, the oblong into a triangular, and a square person has squeezed himself into the round hole. The officer and the office, the doer and the thing done, seldom fit so exactly that we can say they were almost made for each other."

You and I as managers have the responsibility of putting the right peg in the right hole. The problem of putting round pegs in round holes faces us every day.

In my presentation I will give you a short history of the Military District of Washington and explain its mission. Then I will explain how we manage our resources, give you some personal thoughts on the Program Budget Advisory Committee's functions, and finally some of my views on management techniques.

GENERAL STAFF MANAGEMENT FUNCTIONS IN AN INTERMEDIATE COMMAND

GENERAL STAFF MANAGEMENT FUNCTIONS

The origin of the Military District of Washington can be traced to 1921, although in earlier days it was known as the "District of Washington," which included the District of Columbia, Fort Myer, Fort Hunt, and Fort Washington. Fort Hunt and Fort Washington had been established along opposite sides of the Potomac River, below Alexandria, Virginia, during the 1800's for the defense of the City of Washington. Fort Washington, located on the Maryland side of the river, is now a national shrine. Fort Hunt on the Virginia side of the river is now maintained as a recreational area and historical landmark by the National Park Service.

When the District of Washington was dissolved in 1927, the Commanding General of the 16th Brigade in Washington was made responsible for the conduct of military ceremonies and the discipline and military appearance of Army personnel in the District of Columbia. In 1939, the 16th Brigade was transferred from the area, and a special organization called the Washington Provisional Brigade was established. It was from this brigade that the Military District of Washington evolved.

The Military District of Washington was created officially on 5 May 1942 to meet two requirements. The firs was the need for a well-organized and responsible defense of the nation's capital. The second was to meet the long-standing need for a headquarters responsible for performing the numerous services required by the War Department at the seat of government.

During World War II, MDW grew and gradually was assigned more functions and responsibilities. It underwent further reorganization to facilitate its performance as a service command. The Army Band and the Army School of Music became part of the organization, and the supervision of Army Post Exchanges in the District was transferred to MDW. One of its biggest housekeeping jobs was that of servicing the newly-built Pentagon building. This task was accomplished through the establishment of the Army Headquarters Commandant, who is a member of the MDW staff. With the cessation of hostilities at the end of World War II, MDW continued its mission of service and housekeeping activities and its participation in ceremonies in the Washington area.

Now, for a geographical description of the present-day Military District of Washington. The command stretches along both sides of the Potomac River from a point about 40 miles northwest of Washington down

the river to Chesapeake Bay. The area encompasses the District of Columbia; the Virginia counties of King George, Prince William, Stafford, Westmoreland, Arlington, and Fairfax (not including Fort Belvoir) and the separate city of Alexandria; and the Maryland counties of Calvert, Charles, Montgomery, Prince George's, and St. Mary's. It is not a very large area — just 3,562 square miles. It's an enclave in the heart of the First Army area, which is a little unusual.

Since World War II, many organizational changes have taken place within MDW but they primarily have been only refinements. The missions and functions are essentially the same as they were some 20 years ago. The Military District of Washington is known to the American public primarily as the Army ceremonial organization which provides crack units, personnel, and equipment for such occasions as inaugural parades, state and military funerals, guarding the Tomb of the Unknown Soldier, arrival and departure ceremonies for visiting heads of state, and other special functions. It has many other less glamorous functions, which are often completely overlooked by the civilian bystander. MDW has the same functions as a Zone of Interior Army with one exception. We do not have the reserve component responsibility. MDW, in essence, is a miniature CONUS army. The Commanding General of MDW is charged with supervising and supporting all Army troop units and Class I activities physically located within his geographical area MDW also provides support for Army Class II installation and activities in the area; for tenant and satellite units and activities; and for many units and personnel of other Army commands, other military departments, and even other agencies of the government. For example, the White House motor pool is an organization of MDW.

As far as security is concerned, we have the normal security missions of any major command in addition to some that are peculiar to the Washington area. We also are responsible for certain contingency operations in the Washington area. The plans are classified, of course; however, it can be said the first Federal troops to be called out in an emergency in Washington are MDW troops.

At the seat of government, we have many support activities. For instance, we have a lot of housekeeping chores. The Pentagon is just one of thirteen buildings where the Army is the predominant tenant.

Some of the other buildings are the Tempo A, B, and C complexes outside the walls of Fort McNair; the NASSIF building at Bailey's Crossroads; Tempo 7, which houses the Chief of Engineers and the Army Materiel Command at Washington National Airport; and the old Post Office Building. Our Headquarters Commandant, in addition to the headaches at the Pentagon, has a few other buildings for which he is responsible. When you consider that the Air Force, Navy, Department of Defense, and other agencies are in these buildings, then you will realize that we have to be responsive to their needs and desires, as well as to those of our own service. We also have housekeeping and maintenance responsibilities for certain ARADCOM and STRATCOM sites which are geographically located in our area.

Major installations under Military District of Washington's jurisdiction are Fort Myer, Cameron Station, Davison Army Airfield, Fort McNair, and Arlington National Cemetery.

Major units in MDW are: the 1st Battalion, 3d Infantry (The Old Guard); the United States Army Band and Chorus; and Headquarters Company, U. S. Army, which is one of the largest headquarters companies anywhere. There are over 1,700 people in that one company. It is composed of Army enlisted personnel who work at the Pentagon Building and the various Department of Defense staff offices. We also have the Headquarters Company, U. S. Army Women's Army Corps, which is located at Fort Myer. In addition, we have the United States Army Service Center for the Armed Forces and the Civilian Employees Health Service which are located in the Pentagon. The United States Army Service Center for the Armed Forces processes all the passport applications for military and Department of Defense civilian personnel. It also processes ID cards and issues Pentagon parking stickers. At Cameron Station, we have what is called the Joint Household Goods Shipping Office. Movements of all household goods for all the military services in the metropolitan Washington area is handled by this office. Last year, there were over 90,000 shipments in and out of the Washington area. We also have our normal installation garrison commands. At Fort McNair, the post is becoming the military college center for higher learning. The National War College, the Industrial College of the Armed Forces, and the Inter-American Defense College are located there.

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Like any other intermediate command, we conduct training in accordance with guidance and requirements established by CONARC. The Commanding General of the Military District of Washington has general court-martial jurisdiction over all Army personnel in the Washington area whose commander does not have that jurisdiction. The Commanding General also is assigned general court-martial jurisdiction over the worldwide Army attache system. If an Army officer or enlisted man on attache duty in Moscow or anywhere else gets into serious trouble, ' comes back to MDW for his general court-martial.

MDW is a major subordinate command of CONARC, the same as First Army, Third Army, Fourth Army, Fifth Army, and Sixth Army. The reason for our existence, however, as I have said, is to provide housekeeping and other support for Headquarters, Department of the Army. As a consequence, we receive myriad calls direct from the Pentagon using a "quick fire line" rather than the command channel through CONARC. We do keep CONARC advised of what goes on over the quick line. And we do have the prerogative of telling DA to go through command channels if we want to, but MDW rarely exercises it. As a matter of fact, we get along fine with the people in the Pentagon building.

Now that I have discussed the history and physical characteristics of MDW, I want to discuss how we are organized. Like any other major command, we have a standardized organization. MDW has a General Staff and a Special Staff. In addition, we have the Ceremonies and Special Events Office and the U. S. Army Headquarters Commandant which you won't find in any ZI army. The reason they are in our organization is quite obvious.

I will now describe what each one of our General Staff officers does, and then I will discuss the Program Budget Advisory Committee. I'll start with the Comptroller, who is the man with the checkbook. He handles the money, but his job is not quite that simple. In MDW, he is responsible for budgeting, accounting, internal review and auditing, management engineering activities, financial analysis, and statistical reporting.

The Comptroller is the staff and technical supervisor for the Command's finance accounting and data processing operations at Fort Myer, where we have a large Automatic Data Processing Center. He is also

the principal staff officer for the Army Program System. The Comptroller also maintains liaison with CONARC and other DA agencies on matters of finance. He is responsible for keeping on top of the latest trends and methods in his staff area.

The Deputy Chief of Staff for Personnel works with people. We are relatively small people-wise as well as geographically. Presently we have around 4,000 military personnel and about 2,700 civilians assigned to MDW activities. There are others attached to us for administrative purposes, but they don't belong to us. Roughly, then, we have about 6,700 people in our various activities and installations.

DCSPER advises and assists the command on all personnel matters. He is responsible for manpower control, Women's Army Corps, personnel advisory services, morale services, Special Services, welfare, safety, general educational development of military personnel, nonappropriated fund activities, Army Community Services activities, and headquarters interior space management for the command. He also serves as program director for the personnel and services portion of the operating program and budget. We differ from some commands in that DCSPER is not responsible for the assignment and handling of military personnel. That is done by our Adjutant General.

DCSPER supports the VIP arrangements for state and other military funerals at Arlington Cemetery in coordination with our Ceremonies and Special Events Office. He also administers the civilian personnel program, and the training and employment program for disadvantaged and handicapped workers. We are involved in five of these programs on a year-round basis. MDW also participates in the Youth Opportunity Campaign during the summer months. This program operates under the policy guidance of the Vice President of the United States.

The Deputy Chief of Staff for Intelligence has the normal security and counterintelligence responsibilities. Chemical, biological and radiological detection activities also are his responsibility. He provides missions for the supporting Intelligence Corps groups operating in the command. In each geographical area of the United States, there are Intelligence Corps groups which support the commands. We have one that supports us. Details of their work is classified, so I won't discuss it. We probably have a little more liaison work in our intelligence field

than you would find in cities like Chicago, Los Angeles, or some other place because of our location in the Washington area. We maintain liaison with the Secret Service, the National Capital Park Police, the Capital Police, and the Metropolitan Police. The District of Columbia is not under one police force. There is certain land in the district that is National Park land with the Park Police having jurisdiction over it. Capitol Hill has its own police force under the control of Congress which has jurisdiction over the Capitol Building and the Senate and House Office Buildings. The Secret Service has jurisdiction over the White House and certain other areas. Metropolitan Police have what is left of Washington itself, and then each suburban area has its own force. It does require quite a lot of coordination, which would not occur in the average city.

The Deputy Chief of Staff for Operations and Training is the principal staff officer responsible for contingency planning, military operations, organization of TO&E units, and training and schooling of military personnel. He also manages the command's marksmanship program. CBR training and operations are another segment of his duties. He has staff supervision for the aviation operations at Davison Army Airfield, which is located at Fort Belvoir, and the Pentagon Heliport, which is located on the Pentagon grounds.

Army aircraft regularly transport military and civilians VIP's from the Pentagon to Andrews Air Force Base, and provide life-saving airlift capabilities for community emergencies. There is rarely a month in the summer which passes when we don't pluck a stranded swimmer from a rock in the Potomac River. We rescued five last summer. In addition to its community relations aspects, rescuing overventuresome swimmers is good training for our pilots.

The other general staff officer in MDW is the Deputy Chief of Staff for Logistics. He has a big job, since logistics in MDW is a $100 million a year business. He has to plan and supervise all the logistic operations in MDW. DCSLOG is responsible for staff supervision over the operation and maintenance of some 400 motor vehicles, the maintenance of all aircraft at Davison Army Airfield, and the communications for special Army activities. DCSLOG also has responsibility for a signal unit, which is organized specifically for the purpose of supporting ceremonial activities in the Washington area. The unit's special van-mounted equipment

is used during ceremonies involving visiting heads of state, and at torchlight tattoos. It often provides the sound pickup for the news media during special events. It also provides complete photographic coverage for every Army honor ceremony conducted in the Washington area. The unit provides color photos which go into a book given to the recipient, or to the family if it is a posthumous award, for all Medal of Honor awards ceremonies. The unit also provides a color photo book to each head of state who visits Washington showing the military ceremonies in which he participated.

DCSLOG also manages the command's three commissaries, one of which is the biggest grocery store in the world. MDW's annual commissary business last year was over $32 million and should be more than that this year. The big store, the Cameron Station Commissary, is selling about $1¼ million a month and over $15 million a year. MDW's second largest commissary is the one at Fort Myer and its sales are running between $900,000 and $1,000,000 a month. It is located in an old stable on the post. With its physical facility, I don't understand how they do so much business. The high volume of business is attributable to the large active duty and retired military population in the area. The commissary at Fort McNair is averaging only $450,000 a month, so it ranks a poor third in sales.

Our DCSLOG also has staff supervision over the physical improvement of Arlington National Cemetery. South Post of Fort Myer is gradually being taken over by Arlington National Cemetery. After President Kennedy was buried there, the number of interments in Arlington National Cemetery skyrocketed. About a year and half ago, the Army found it necessary to put certain restrictions on burials in Arlington. And, as Arlington National Cemetery is expanded, facilities must be constructed on the North Post of Fort Myer to replace the facilities that are torn down on South Post to make room for cemetery expansion. The cemetery eventually will extend out to the highway which goes by the Pentagon Building.

I won't discuss the Special Staff. They do the same things you would normally expect of a special staff.

Now to discuss what I do in the organization. My duties as Chief of Staff are obvious. Since MDW does not have a separate Deputy

Commander, I wear two hats as both the Deputy Commander and the Chief of Staff. Whenever General O'Malley is on leave, I become the Commander of the Military District of Washington. One of my jobs is Chairman of the Program Budget Advisory Committee. I might add that General O'Malley finds a vast amount of his time taken up with ceremonial duties. He and I normally operate with him being the "outside man" and me being the "inside man." He often is required to be at the cemetery for a ceremonial wreath-laying at the Tomb of the Unknown Soldier or at the Kennedy grave. General O'Malley normally represents the President of the United States as the host at these ceremonies involving high officials. Whenever he has to particpate in ceremonies, he goes out and I stay and manage the store.

I am also responsible to the Commander for the planning and execution of all ceremonies and special events. I have a Ceremonies & Special Events staff in my immediate office to assist in this responsibility. In FY 66, there were 6,455 ceremonies and in FY 67, it increased slightly to 6,572 ceremonies. The ceremonies include parades and reviews, military funerals, wreath-laying ceremonies, and arrival and departure of heads of state or prime ministers. So far this year, we have had 48 arrivals or departures of a head of state or prime minister. MDW's parades and reviews include the retirement ceremonies for all Army personnel in the Washington area who desire it as well as those normally held on all military installations.

Now I would like to talk about funerals. In FY 66, there were 4,000 funerals; then it dropped to 3,817 in FY 67; and so far this year, there have been 1,996. The decrease is the result of the new policy on burial in Arlington National Cemetery which became effective in February 1967. To be eligible now for burial in Arlington National Cemetery, you must either die on active duty; be a retired member of the Armed Forces; or be a veteran who has been elected to a high federal office, appointed to the Supreme Court, or to a Cabinet position.

MDW has already started planning the inaugural parade for next 20 January. The Commanding General of the Military District of Washington is always the Chairman of the Military Participation Committee for the inaugural parade. Within our Ceremonies and Special Events

Office, a staff consisting of a lieutenant colonel, a captain, and a sergeant, are currently working on plans for the parade. Even though certain changes may have to be made, there are certain basic things that have to be arranged in advance because of the required lead time. Because of the sensitive nature of the inaugural parade, the planning committee works out of my office and the Commanding General is briefed often on its progress.

To properly perform our missions and responsibilities, the staff prepares an annual operating program, which is updated monthly. The Command Operating Program of MDW states objectives, policies, priorities, and manpower and funding guidance. It also provides a basis for measuring our accomplishments and use of resources. In regard to resources, it also shows which resources are available and required to accomplish our overall missions. The Program Budget Advisory Committee, of which I am the Chairman, is similar to what you would find in any command anywhere. The committee consists of me and the heads of the General Staff sections, which I have already discussed — the Comptroller, the DCSPER, the DCSINTEL, the DCSO&T, and the DCSLOG — and we have one officer from the Special Staff, the Command Surgeon.

Specifically, the committee is responsible for the following:

1. Analyzing the program and budget guidance from higher authority (CONARC and DA), together with internal requirements of the Command, and advising on development of the Command Operating Program, Command Operating Budget, and the Budget Execution Review.

2. Reviewing Command Operating Program objectives, resource requirements, and probable resource availability in order to insure that they are consistent and balanced within and among major activities.

3. Insuring proper coordination of the Command Operating Program by reviewing the operating schedules and the program and schedule changes to insure the maintenance of balance during the actual year of program execution.

4. Reviewing and making appropriate recommendations to the Commanding General on the proposed annual funding program, which is distributed to our subordinate commands.

5. Reviewing and making recommendations on new programs and policies, and revisions of existing programs which necessitate substantial changes in the contemplated expenditure of current fiscal year funds.

6. Analyzing important policy changes received either from CONARC or DA, as well as changes proposed by MDW staff agencies to determine what impact they have on the program.

7. Recommending budgetary or financial actions which will increase the efficiency of the Military District of Washington and its subordinate installations.

As chairman of the Program Budget Advisory Committee, I try to insure that the committee develops a plan for the programming and subsequent utilization of resources in a manner which is the most efficient and the most economical. We also have what we call a junior or working Program Budget Advisory Committee. On these working group committees we have tried to put representatives who are best informed and best equipped technically to deal with our financial problems. The committee at the working group level actually performs the pick-and-shovel work. All of its work must, of course, be reviewed by the principal staff.

I try to make sure we have a reasonable balance in personnel, supplies, and services, and that the budget we present to the Commanding General is the best one as far as utilization of resources is concerned. In addition to the Command Operating Program, the Command Operating Budget, and the Budget Execution Review, our Program Budget Advisory Group develops and coordinates a monthly Financial Management Report, which is presented to me, as Chief of Staff, and then to the Commanding General for approval prior to its submission to CONARC. This Financial Management Report summarizes all existing and potential financial problems, explains any significant deviations or changes in programs, presents a phased obligation rate, and indicates any reprogramming required for the balance of the year. This report keeps CONARC advised of the status of all unfinanced requirements.

That, in essence, is what we do in the Military District of Washington. I don't think it is much different from what you do at your home station. We sometimes have unexpected problems which have to be

solved in a hurry, but we seldom have any real trouble. We receive the finest cooperation from CONARC and from DA that you can imagine. The best example of this was the weekend when Senator Kennedy was buried. In order to support that mission we had to pay some people overtime even though it was right at the end of the fiscal year and our overtime funds were exhausted. We contacted CONARC, and they said to go ahead and pay the overtime. They took care of it for us. CONARC appreciates our peculiar position with respect to unusual requirements. Of course, we don't get any more than our fair share. We have to live with shortages like everybody else. They also send their manpower survey people to MDW to cut our spaces just like they cut yours.

My personal views on operating a management system in a headquarters or comptroller shop are as follows:

1. The simpler you keep it, the better off you are. One of our biggest problems is making something really complicated. I think more harm has been done to the management system in the Army from having technicians write directives and generalists or laymen failing to review them before they are published. Certainly an accountant understands accounting language, but the instructions that we have to give out are to the average soldier or the average GS-9 who does not have a technical degree. If we can write a directive in layman's language and keep it simple, we won't have any trouble.

2. Another view of mine on what contributes to a lot of mistakes is that too many people are asking for too much information. Proponents seldom do anything with the information after they get it. It often is put in a file cabinet and never looked at again. I think the information required at each level of activity should be only the minimum required for that manager to control and operate his program. There is no need to ask for every piece of information just because somebody may ask a question about it. You should keep the reports and other informational data down to what you actually need to operate. You have too much information coming to you if you have to put it in a file cabinet because you can't digest it.

3. Another management view of mine concerns accuracy. If you have minimal information on which decisions are made, you must

have some type of check and controls to insure that the data on which decisions are based are accurate. You may be familiar with the mistake made by a punch card key puncher who hit the wrong key and 6,000 of a certain item were shipped to Vietnam instead of the requested 60. Accuracy is important. It takes continuous checking, plus good training of your personnel, to achieve accuracy.

4. My last management view concerns timely information. If your information is historical data, it won't do you any good in your operations. I have been stationed in places where reports were required for decisions affecting the last quarter of the fiscal year, but the reports arrived three months after the end of the fiscal year. That is another reason for keeping the system simple and requiring only minimum essential data. If this is done, the reports will arrive on time and with the necessary information.

The above are my personal views on operating a management system in a headquarters or comptroller shop. Simplicity with accuracy is the key. ■

Mr. Allen is a graduate of the U. S. Military Academy and the Army War College. He retired from the Army in the grade of Colonel in 1963, and since then has been Deputy Under Secretary of the Army (Manpower), Acting Assistant Secretary of the Army (M & RA), and Acting Deputy Assistant Secretary of the Army (M & RA).

(This article was adapted from Mr. Allen's presentation at USAMS on 20 June 1968.)

MR. ARTHUR W. ALLEN, JR.

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DEPUTY ASSISTANT SECRETARY OF THE ARMY (MANPOWER AND RESERVE AFFAIRS)

I. OFFICE OF THE ASSISTANT SECRETARY OF THE ARMY FOR MANPOWER AND RESERVE AFFAIRS

Public Law 90-168, the Act known as the "Reserve Forces Bill of Rights and Vitalization Act," became effective on 1 January 1968. Its major import for the purposes of my presentation was to establish an Assistant Secretary of each of the departments whose principal duty is "the overall supervision of manpower and reserve component affairs of the Department of the Army."

The establishment of these responsibilities at the Assistant Secretary level, whereas formerly they had been at the Deputy Under Secretary level; the added emphasis on the Reserve Affairs responsibility; and the increasing importance over the last few years of the application of systems analysis techniques to manpower management problems — these and other factors made some reorganization necessary. Our organization, just recently approved, is shown in Figure 1.

You will note that there are three primary assistants to help with the responsibilities: First, the Deputy for Personnel Management and Training, the position I am filling, is responsible for military and civilian personnel policies and management, education, individual training, and personnel research — the retail, personal aspects of manpower management. Second, a Deputy for Manpower and Forces, responsible for procurement, distribution and utilization of manpower and for force structure and readiness — these you will recognize as the wholesale, the more or less impersonal aspects of manpower management. Third, a Special Assistant for Reserve Affairs, who is charged with keeping himself and

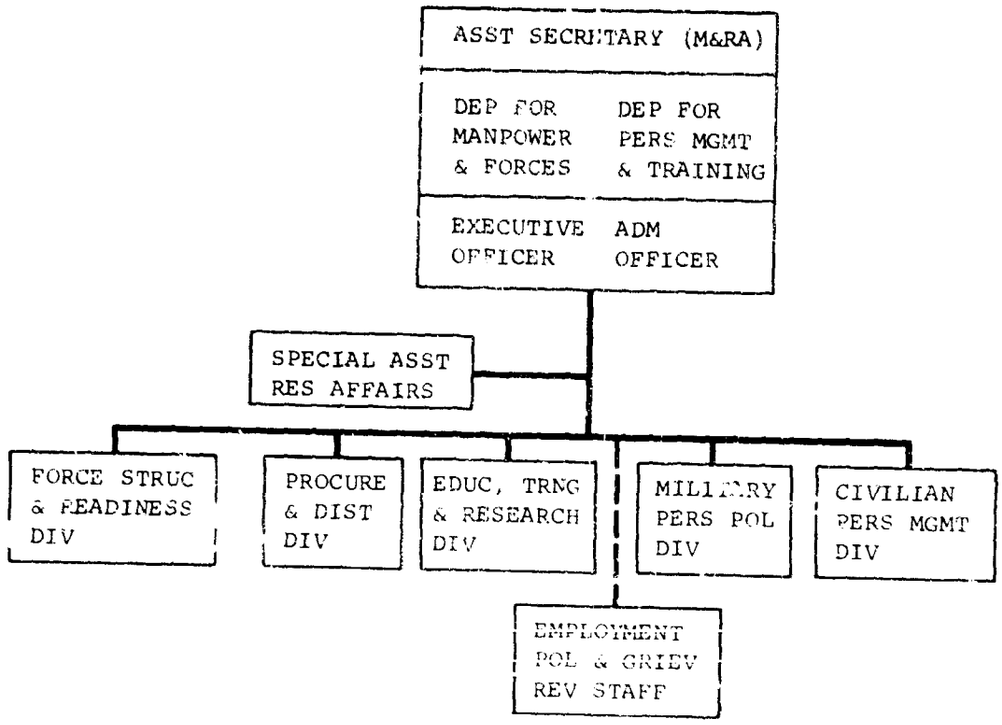
ASST SECRETARY (M&RA)
DEP FOR MANPOWER & FORCES
DEP FOR PERS MGMT & TRAINING
EXECUTIVE OFFICER
ADM OFFICER
SPECIAL ASST RES AFFAIRS
FORCE STRUC & READINESS DIV
PROCURE & DIST DIV
EDUC, TRNG & RESEARCH DIV
MILITARY PERS POL DIV
CIVILIAN PERS MGMT DIV
EMPLOYMENT POL & GRIEV REV STAFF

Fig. 1.

the Assistant Secretary fully informed on all aspects — not just personnel, but logistics, training and operations, as well — of the National Guard, U. S. Army Reserve, and the ROTC program.

In addition to these senior civilian assistants, there is a Colonel Executive Officer and a small number of relatively senior action officers, organized into the divisions shown on the bottom line in Figure 1. Almost a part of the office, because of its close relationship with us, is the Employment Policy and Grievance Review Staff, about which I will say more later.

The mission of the Assistant Secretary of the Army (Manpower and Reserve Affairs) is set forth in General Orders No. 1, 1 January 1968. "Subject to the direction and control of the Secretary of the Army, he is authorized and directed to act for the Secretary within the following listed fields of responsibility: manpower management; National Guard, Reserve and ROTC Affairs; personnel management; education and individual training, human factors research (in coordination with the ASA (R&D)); employment policy and employee-management relations; morale and welfare; and civil rights and equal opportunity. He is responsible for the exercise of direction and supervision over matters pertaining to the formulation, execution, and review of policies, plans, and programs within his functional areas including the establishment of objectives and appraisal of performance."

I will now briefly cover each of the divisions giving their principal functions. The first two divisions shown in the organizational chart (Figure 1) were the Force Structure and Readiness Division and the Procurement and Distribution Division. These have not been formed yet and for the time being their two main functions are split: Manpower has distribution and the Division of Education, Training and Research handles procurement. Present organization is as shown in Figure 2.

Manpower Division

The Manpower Division is our largest "Division" being authorized five officers. As in any line organization the division's personnel make the initial examination and maintain an account of the formal actions, memoranda and letters which pertain to their areas of interest and which are transmitted among the officers of the Secretary of Defense the Army staff and the Army Secretariat.

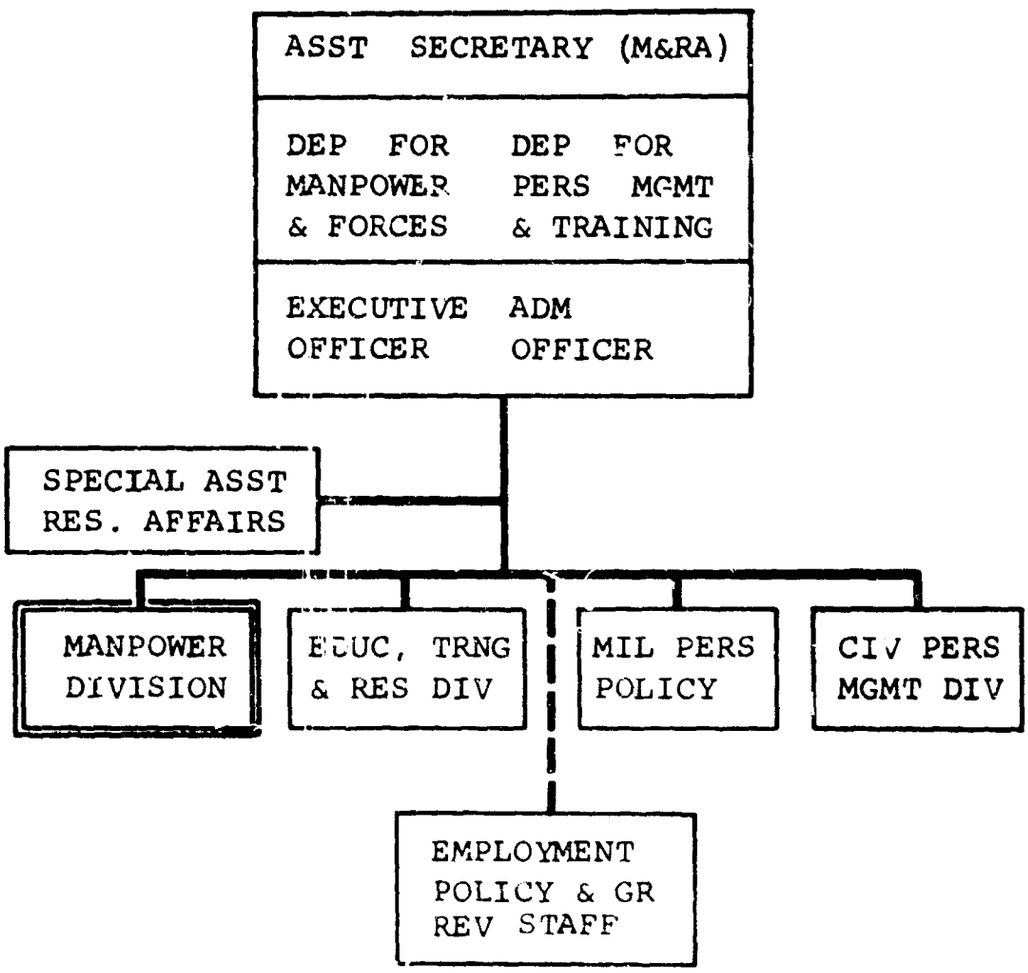
ASST SECRETARY (M&RA)
DEP FOR MANPOWER & FORCES
DEP FOR PERS MGMT & TRAINING
EXECUTIVE OFFICER
ADM OFFICER
SPECIAL ASST RES. AFFAIRS
MANPOWER DIVISION
EDUC, TRNG & RES DIV
MIL PERS POLICY
CIV PERS MGMT DIV
EMPLOYMENT POLICY & GR REV STAFF

Fig. 2

In the area of "forces" it reviews and makes recommendations concerning major force structure change proposals; the manpower authorizations to fill the force structure; the costs and trade-offs involved; and the readiness capabilities and deployability of current and planned forces. In this regard the Manpower Division works actively with personnel from the office of the Assistant Vice Chief of Staff, the Assistant Secretaries of the Army for Financial Management and Installations and Logistics and occasionally the General Counsel.

Some of these considerations might be broken down as follows:

Military structures: Division forces; special mission; general support; allocation of structure between active Army and Reserves (according to strategic operations analysis enemy threat logistical considerations).

Authorizations to fill structure: Geographic considerations; balance of payments; enemy threat; CONUS reinforcing capabilities; budget formulation.

Deployability: Readiness requirements; force activations and deactivations; phasing and scheduling.

DA mobilization and demobilization plans; force and MPR accounting; ADP systems and models.

Civilian force requirements CONUS and overseas: Naitonal and foreign national.

Education, Training & Research Division

The Education, Training and Research Division is a two-man office which was formed during a reorganization in April 1967.

This Division monitors studies in progress both at DA and OSD level, usually passing the monitorship to another division of the office when the study results are implemented. The military Quadrennial Pay Review, the Hubbell Group, would be a case in point. So long as it remains a study, it will be in this Division; when legislation has been passed, it will go to the Military Personnel Management Division.

The Division of Education, Training and Research handles such diverse actions as Project One Hundred Thousand, Project TRANSITION,

and police recruiting — three highly active areas of intense political interest.

Here are the major functional areas of the Education, Training and Research Division, with some of their respective fields of interest:

Education: U. S. Military Academy, senior colleges, the Haines Board, middle management education.

Training: Officer Candidate School, Defense Language Institute, the individual soldier, qualitative standards.

Research: Quadrennial pay review, computer-assisted instruction, human factors research.

Military Personnel Policy Division

The personnel management functions cover the entire spectrum of activities from the "womb to the tomb." I say this partly in humor but there is more truth than poetry in the statement. For example, we review and approve Army policy with regard to medical care for both the serviceman and servicewoman and dependents. Since our medical care includes obstetrics, the starting point of my personnel management responsibilities is self-evident. At the other end of the spectrum rest my responsibilities in the personnel field, as they pertain to Army mortuary services and cemeteries. (I should hasten to point out that mortuary and cemetery operations are the responsibility of ASA(I&L)).

Personnel management relates to collective policies which govern the privileges, entitlements, and services applicable to all Army personnel. It also relates to policies which govern particular groups such as aviators and others entitled to special pay or individuals whose responsibilities or character of service require they be given special consideration or attention. In this respect I cite our pro-pay and the variable reenlistment bonus which were designed to help the Army retain hard skills or expensively trained soldiers. I would venture a guess that there are very few Army policies directly affecting the serviceman that do not

come through this office. In many cases the Assistant Secretary is the final approving authority, in others he reviews and recommends action to Mr. Resor. At OSD, Mr. Fitt's office monitors service-wide policies in the same way that we deal in Army personnel policies.

The other portion of the primary responsibility assigned to the ASA (M&RA) by Public Law 90-168 is the "overall supervision of . . . reserve component affairs of the Department of the Army." This is a very broad responsibility covering all of the activities which affect the Reserve components in any way. Put another way, the law gives the Assistant Secretary the responsibility and authority to act for the Secretary of the Army in such a way as to insure that personnel, facilities, equipment, and other support is provided to and used by the Army Reserve components in a manner which will insure that training and mobilization requirements are met.

While ASA(FM) and ASA(I&L) retain their budgetary and logistical functions pertaining to the Reserves, this office must coordinate and monitor those actions which affect the Reserves. A good example of the complexity of this responsibility is the fact that this office served as the single point of contact in the Army Secretarial for all actions pertaining to the recent mobilization. Representatives of the Army Staff and the Assistant Secretary regularly met with the Secretary of the Army to keep him apprised of the situation, to give him our recommendations, and to obtain his decisions. Mr. Fitt, Mr. Brehm's counterpart in the Department of Defense, also was kept advised of our progress. This office continues to monitor the readiness of the recently mobilized reserve units.

Civilian Personnel Management Division

So far I have been talking about military personnel and military functions. Under the provisions of General Orders 1, which was issued on the first of January this year, the Assistant Secretary is authorized to act for the Secretary of the Army in all matters pertaining to civilian personnel management. He directs and supervises the formulation, execution, and review of civilian personnel management policies, plans, and programs. There is a fundamental difference between these responsibilities for Army civilian personnel policy and the responsibilities for Army military personnel policy. In both areas, the Department is subject to existing statutes and DOD instructions and directives, but our

civilian personnel management program is, in addition, subject to requirements established by the Civil Service Commission As you know, the Civil Service Commission is charged with the basic responsibility for establishing civilian personnel policy in the Executive Branch of the Federal Government. Our civilian personnel policies must conform to those contained in the Federal Personnel Manual and regulations issued by the Commission.

As might be imagined, the responsibility for civilian personnel management in the Army covers our total civilian work force. It includes all categories of civilian personnel, regardless of the classification we might be using. Some of the major civilian personnel programs cover white-collar and blue-collar personnel in CONUS and overseas; U. S. citizens and foreign nationals; appropriated fund and non-appropriated fund personnel; and direct-hire and indirect-hire personnel.

The responsibilities for requesting the approval of civilian executive level positions, for approving long-term training for civilian executives, and for recommending awards which require approval by the Secretary are exercised through boards and committees. The Assistant Secretary is Vice-Chairman of the Civilian Executive Personnel Board and I am a member of that Board and Chairman of the Executive and Professional Development Committee and the Incentive Awards Board. Our staff also includes an assistant for civilian personnel matters who reviews and makes recommendations concerning civilian personnel actions which are submitted for approval by the Army staff. We look to the Director of Civilian Personnel in ODCSPER for Army-wide staff direction of our civilian personnel management program.

Employment Policy and Grievance Review Staff

A further function of our office relates to the Employment Policy and Grievance Review Staff which carries out mainly administrative and quasi-judicial functions concerning civilian employees. This unit is comprised of a Director and Deputy, six personnel technicians, and a clerical-administrative support group of five persons.

This Staff has the responsibility for appeliate review of appeals to the Secretary of the Army from civilian employees of the Department

who have been subjected to adverse action — essentially suspensions, demotions, or removals — by their employing activities. Also reviewed by this Staff are complaints of discrimination based on race, color, religion, sex, or national origin. The actual decision in both types of case are by delegation, signed by me in my capacity as the Department's Equal Employment Opportunity Officer. A panel of top civilian executives, representative of the entire Headquarters, has been established to assist the Staff in the review process. Three members are selected from the panel, upon call, to serve in an advisory capacity.

These cases evoke a great deal of outside interest, including inquiries from such sources as the White House, the Congress, and veteran, labor, and minority group organizations. Correspondence with these sources represents a substantial part of the Staff's activity.

Consideration of the formal appeals has a two-fold purpose: first, to resolve the matter insofar as it affects the individual employee, and to make him whole if in fact he has been the victim of management error or dereliction. Since many of the personnel actions are far-reaching in their impact on employee careers, the importance of this review cannot be over-emphaized.

But the process of review of discrimination complaints and adverse actions serves another significant purpose. We consider the process to be a window on the operation of the entire civilian personnel management program of the Army, revealing to us how the policies and elements of that program are being administered at operating levels. In review of these cases we get real insight into the treatment of employees generally, and the climate of employee-management relations. I mentioned a moment ago that where we discover error, we attempt to make an employee whole, but we are also mindful of the implications of those errors on management practices generally, and wherever appropriate we go beyond the individual case to effect improvement in the overall climate.

In only a very limited number of cases have we been able to identify racial or religious discrimination as such. But in a much larger proportion of such complaints, we have found deficiencies in civilian

personnel management which violated the Department's policies or regulatory requirements and could have created the appearance of discrimination to an aggrieved member of a minority group. In calendar year 1967, for example, over 60% of the discrimination complaints filed with the Department resulted in some form of corrective action. Where such action has been required, we have continued to monitor the organization in which the complaint arose, often requiring periodic reports as to the effectiveness of action taken.

II. DEVELOPMENTS IN FORCE STRUCTURE, MANPOWER, AND MATERIEL MANAGEMENT

In a recent talk at the Army War College, Secretary Resor addressed himself to certain developments in Army management methodology which have occurred during the past three years. I would like to share some of his comments with you because I believe them to be really pertinent to this discussion.

In the last three years, since we first committed large forces in Vietnam, the active Army has grown from 16 1 3 to 19 1 3 divisions. its strength has grown from 970,000 to 1,570,000 men. Its annual budget has grown from $12 billion in fiscal year 1965 to over $25 billion in the coming fiscal year. This growth has been achieved with the call-up of only 17,400 reserves in units. These rapid and costly changes have forced the development of new managment techniques to deal more quickly and systematically with the varied issues which such changes typically raise.

During the buildup we have had to address again and again such issues as:

- How many divisions should the Army contain? and
- How many men should the Army have?

These are complex issues. Each involves manpower, training, readiness and cost, cutting across the whole range of Army staff functions. Each demands the assembly and analysis of large amounts of data and the resolution of many subsidiary problems. And in the end, as we all know, these issues involve elements which will defy objective analysis and which must be resolved by subjective judgment, calling for the

simultaneous weighting of military requirements, international commitments, human and financial capabilities, and domestic political factors.

We have made improvements both in organization and in methodology. Organization has been affected because the issues required work by every major division of the Army Staff. Normal staff procedure would be to designate one major staff division as the proponent with the responsibility to coordinate and integrate the efforts of all participating elements of the Staff. We found that this approach did not achieve the type of integrated analysis which was necessary. At the same time, adequate analysis of these complex issues required increasing use of new and improved management information systems and heavy reliance on automatic data processing. To achieve the integrated analysis needed and to infuse the effort with the new methods of data gathering and analysis, we established a new office of the Assistant Vice Chief of Staff within the office of the Chief of Staff. This new office has significantly improved the Army's ability to address the major issues concerning forces, manpower, equipment and readiness; to develop logical solutions in a rational manner; and to present them clearly and logically to the Secretary of Defense.

Methods have improved both through the evolution of the overall systematic approach and through improved analysis of problem elements. As is known, the Secretary of Defense uses as a major management technique a series of documents which lay out the major issues and the pertinent facts, propose policies, provide a vehicle for comments by the Joint Chiefs of Staff and the Services, and constitute the decision documents finally approved by the Secretary of Defense. Examples of such documents are the Draft Presidential Memoranda, which are concerned with force issues and levels of support, and the Development Concept Papers, which were instituted within the last year to deal with decisions on the development and procurement of major new items of equipment.

The role of the Draft Presidential Memoranda has changed over the last two years. Previously they served primarily to record the force decisions made by the Secretary of Defense during the budget cycle. Now they are prepared in draft early in the calendar year, immediately after the Joint Chiefs of Staff submit their annual force recommendations

and well before the budget decision process begins. Drafts distributed to the Joint Chiefs of Staff and the Services for comment provide the basis for exchanges of views on the issues for decision. When approved by the Secretary of Defense, each document contains a record not only of his explicit decision but also of the facts and the rationale on which the decision was based. Decision documents of this type insure that major decision areas receive orderly, comprehensive, and explicit consideration and that areas of agreement and difference are identified so that remaining issues can be dealt with systematically.

Let me illustrate the contribution of improved analysis or problem elements by describing how it has improved our ability to address the four basic recurring issues mentioned earlier. First, the issue of the number of divisions which the Army should contain. A basic problem here is in breaking down and accounting for our forces so that we can tell precisely what forces we want to have and ensure that they are balanced, manned, and equipped. The number of divisions alone is not a precise determinant of force structure unless we have a systematic way of describing what is in a division and what additional forces it takes to sustain that division in combat.

The Secretary of Defense specifies the number of Army divisions, armored cavalry regiments, separate artillery battalions, and other major combat units authorized for the Army. These are recorded in the Department of Defense Five-Year Defense Program. The Army Staff decides from this beginning what additional combat and service support units are needed to fill out the force structure. The complete list contains literally thousands of units.

Before the Vietnam buildup the force planning system operated without an effective constraint on the total size of the force. Manpower requirements, justifications, and authorizations were handled quite separately from the force structure, which provided only a very general framework within which to make manpower decisions. The Army manned as many units of its structure units as possible with its authorized active duty personnel and paid reservists. It placed the remaining units in an unmanned category. In the annual budget requests equipment requirements for unmanned units were consolidated with those for

manned units, and the procurement justification was based upon buying for both.

This system had several shortcomings. There was no adequate mechanism for insuring a balance among the various elements of the force or among structure, manpower, and equipment. Although the logistics guidance authorized equipment and support for a certain number of divisions, without a precise description of both a division and its supporting forces, there was no mechanism for ensuring that the Army budget provided enough funds to equip a complete, balanced force structure. Finally, without a clear understanding of total resource requirements, we could not set priorities or evaluate and choose among alternatives.

The open-ended force structure also created artificial readiness problems. The detailed force structure was frequently modified to record actions taken by commanders in the field or to make improvements recommended by Staff studies. While the individual changes were usually small, their cumulative effects on the requirements for certain types of equipment or personnel were often significant. Even though there was no intent to reorganize until the resources became available, the Army would have a "shortage" as soon as the requirements were recorded. The instantaneous creation of a shortage by the stroke of a pen was not real However, this fact was buried in the details of day-to-day management, and when the Army assessed its readiness, the "shortages" appeared to be very real indeed.

Part of the problem was that decentralized decisions were not supported by a management information system which we could use to assess the cumulative significance of individual decisions. Calculation of equipment and manpower requirements was laborious and largely not reproducible. The Army is made up of thousands of units, varying in size from 2-man detachments to 17,000-man divisions. Each has an authorization document which details all unit equipment by item and all unit personnel by branch or occupational specialty and by rank or grade. To add up its total needs for a particular item of equipment or a particular type of specialist, the Army Staff had to screen each authorization document by hand. To do this just once a year for the annual budget request was a monumental task. To keep a running

account of changes was impossible. During the buildup to support the Vietnam conflict, changes in structure and in unit authorization documents occurred so fast that we could not even keep an audit trail. Total force structure requirements for equipment items and people became moving targets, even through the budget season. The Army's books lagged the real world by months. Personnel training plans and material procurement plans were difficult to synchronize, a problem compounded by the one- to three-year lead time for generating trained people and building new equipment.

Correction of these problems had to avoid a completely rigid force structure and to allow changes to be made in response to the requirements of field commanders. On the other hand, we had to have some type of management system to keep the program internally balanced. As a minimum, we needed to automate the requirements calculations. We are doing this with a new automated force basis, the Force Accounting System, and new automated tables of organization.

But to resolve the basic problem we needed a way to define the total requirements for people and materiel, so that we could use these totals as broad controls within which decisions as to the units not specified in the Five-Year Defense Program could be decentralized to provide reasonable flexibility.

To define the total force structure a simple concept was developed: the total manpower strength of all the Army's units when manned at full wartime strength, as specified in the unit authorization documents. We call this the structure space strength of the Army, and it is the overall force structure control.

The structure space strength total has many advantages. By definition it accounts for all units in the Army. It is easy to visualize. When we want to increase the size of the Army, we can now use planning factors in a meaningful way to tell us how many spaces we need to make a balanced addition of, say, a division plus its support forces. Also we can estimate how long it will take to get such a force addition ready and how much it will cost. The automated information and computational systems mentioned earlier make this feasible.

MR. ARTHUR W. ALLEN, JR.

Another needed step was to divide the total force structure into meaningful, mission-oriented groupings. We established a Force Classification System under which every unit is placed in one of three main classifications: Division Forces, Special Mission Forces, and General Support Forces. These groupings enable us to perform such management tasks as identifying how much of the structure is available for deployment and how much is required in the Continental United States to support the deployable forces and maintaining balance if major force level changes are required.

Turning to the issue of the strength of the Army, we find that the Force Classification System provides an excellent framework for analysis of our manpower requirements. The Division Forces account for over half the manpower requirements. Under Special Mission Forces we analyze the manpower needed for such semi-fixed missions as theater air and missile defense, nuclear missile systems, such as Pershing and Sergeant, and maneuver units for the defense of Alaska and the Canal Zone. General Support Forces include the logistics support base and the training establishment in the Continental United States. The size of the General Support Forces is essentially a direct function of the size of forces in the other two classifications.

Individuals constitute a fourth major classification in the analysis of manpower needs. This classification includes trainees, students, patients, and transients. The last category deserves special mention. A major improvement in manpower management has been the recognition of the principle that a separate "transient" allowance is needed for the number of men moving between units rather than charge these men against the strength of either the losing or the gaining units. This is particularly significant during the current period when the Army has 400,000 military personnel in areas where the normal tour is only one year. The practical effect is illustrated by the fact that the current transient authorization is approximately 100,000 spaces, the strength equivalent of about 2 division forces — enough men to draw all divisions down in strength by 15 percent if the transient load had to be absorbed uniformly by the active Army division forces.

SUPERVISION OF MANPOWER AND RESERVE COMPONENT AFFAIRS

In summary, over the last three years the Army's ability to address issues in the fields of force structure, manpower, and materiel has improved significantly. Management concepts and techniques now under development promise still further improvement. Such improvement is essential if we are to have adequate tools to deal with the hard choices imposed by the increasing cost of military preparedness.■

General Reed assumed his present position in October 1967. His previous research and development background includes assignments as member of the Requirements Planning Branch, R&D Division, Office of the Joint Chiefs of Staff; Assistant Director of Developments, OCRD; Deputy Director, Plans and Programs, OCRD; Army Member, Mutual Weapons Development Team, U. S. Mission to NATO; and Staff Officer, R&D Division, Office of ACofS, G4.

He graduated from the U. S. Military Academy in June 1941 and received a master's degree in International Relations from Georgetown University in 1952. He is also a graduate of the Army War College (1960) and the Command and General Staff College (1944).

(This article was adapted from General Reed's presentation at the U. S. Army Management School on 6 June 1968.)

BRIG. GEN. WILSON R. REED

BRIGADIER GENERAL WILSON R. REED

COMMANDING GENERAL, U. S. ARMY AUTOMATIC DATA FIELD SYSTEMS COMMAND, FORT BELVOIR, VIRGINIA

Ten years ago, in March 1958, I had the good fortune to attend the Army Management School under its former name, "Army Command Management School." I say "good fortune," because I was the G-3 of the 9th Division, and within six weeks of my return to Fort Carson we were directed to institute the Army Command Management System. Well, I became the oracle and, due to the course I had had, we installed a system that saved money, reduced the number of crises, and greatly improved the efficiency of operations of the entire post. Best of all, the people responsible for operations were able to recapture their authority from the comptroller—a glorious result in any case!

In this article I would like to discuss both Army management and automatic data processing.

ARMY MANAGEMENT

Good management is an art. I hesitate to estimate the ratio of art to science in management, but I suspect it is rather high. As an art, it consists of the ability to make the proper decision on the basis of inadequate information. As a science, it consists of the cycle of planning, programming, budgeting, supervision of execution, and review and analysis. Its hallmarks are contract definition, PERT charts, progress reports, five-year programs, budget analyses, performance appraisals, and the like.

As a practicing manager, I want to give you a work-a-day definition of management. AN OUTFIT DOES WELL WHAT THE BOSS IS INTERESTED IN! While this is not the best English, it is a fairly adequate definition. Note that it describes a group of people organized and motivated

MANAGEMENT AND AUTOMATIC DATA PROCESSING

to accomplish, on time and to a prescribed standard, the objectives set by their leader, in accordance with his priorities. I think it is a good definition of management. Let me illustrate with a few examples.

When he was chief of staff, General Maxwell Taylor was greatly interested in planning and strategic thinking. As a result, he founded the present approach to our strategy. General George Decker was the Army comptroller before becoming the chief of staff. He was interested in planning, programming, and budgeting. As a result, he established the management system that we use in the Army today. A third example is my old division artillery commander, who had never been with a truck unit before. He had us collecting all the nails on the post to save the horses and there wasn't a horse within miles.

These examples illustrate that you can't separate the man from management. I hope it also suggests that all management is not good. We must all resist the temptation to ride hobby horses — whether it be a matter of the artillery commander's nails or the Secretary of Defense's cost effectiveness.

I'm sure you have heard of the five M's of Management: Money, Manpower, Materiel, Machines, and Methods. I submit that we manage only two things — People and Time. Everything else is in a supporting role.

We have all known for years the role of the leader in managing people. We've also known how difficult was his job in managing time. There is now some help for him in this area. Which brings me to the next part of my article:

DATA PROCESSING

Commanders base their decisions on information or data, such as personnel statistics, POL stockage, maintenance statistics, ammunition levels, combat information, and so on. Other things being equal, the commander with the greatest amount of accurate data at his command has the greatest competitive edge over his rivals, be they friendly or enemy.

The concept of data processing involves the manipulation of facts and figures, according to a pre-arranged plan, to produce new and more

desirable information. The practice of data processing ranges from mental arithmetic to machine solution of complex scientific or engineering problems, but it always involves three operations:

1. INPUT — The gathering and introduction of information to be analyzed.

2. PROCESSING — The manipulation of this data according to plan.

3. OUTPUT — The production of results in a useable form.

A data processing system, then, is a group of people and machines organized to gather data, manipulate and analyze it, and provide it to the organization.

My command has been working days (and many nights) to develop systems to automate data processing for field commanders, from the artillery forward observer to the army commander. I have some winners running on several tracks, and I'm going to discuss them. But before I do, since I am likely to show my enthusiasm for my work, I would like first to make a declaration of personal conviction:

There is no cheap, easy, or comfortable way to be prepared to deter or to defeat calculated and determined aggression aimed at our destruction. The battles must be fought by men in person on the contested fields; they cannot be conducted by computers. A front line cannot be held by television cameras; radar cannot substitute for scouting and patrolling. In short, man's personal involvement in war has not been relieved by technology; his mind and muscle are augmented but not supplanted by the machine; his morale, determination, and will are not duplicated by any electronic circuit now in existence or likely to be developed.

With that thought in mind, let's take a look at battlefield data automation.

BATTLEFIELD DATA AUTOMATION

On the battlefield, mobility and frequent movement are a way of life; communications are seldom ideal; the weather is either overhead or underfoot. None of these conditions apply to the usual computer installation with its tile floor, filtered air-conditioning, and AT&T communications. Therefore, further state-of-the-art development is needed

before data automation can be used as fully on the battlefield as in non-tactical situations.

While data processing in the field is similar to general-purpose data processing for business and scientific applications, there are two added dimensions of great significance. First, the equipment must be rugged enough to withstand the rigors of a battlefield environment. Mobility over rugged terrain and exposure to extremes of temperature and humidity (as well as sand and dust) require equipment more complex mechanically than commercial computers, although they may otherwise be the same. Second, the equipment must be useable by soldiers who are primarily fighting men, not full-time computer technologists. It takes some tough equipment to withstand the guy with a long screwdriver performing "provocative" maintenance!

Since the potential for useful applications of data automation on the battlefield is enormous, the Army has under way a major effort to accelerate the process of putting these machines on wheel sand designing them to survive in a tactical environment. The Army has a concept to exploit the technology, a project to develop and introduce automation within the field army, and a specific organization for this task.

The concept is to automate selected data processing functions in tactical organizations, achieving maximum standardization through the system approach. The project is entitled Automatic Data Systems within the Army in the Field (ADSAF). The organization is the Automatic Data Field Systems Command (ADFSC).

My unique organization was established in August 1965 as the agency through which both the U. S. Army Combat Development Command and the U. S. Army Materiel Command discharge their responsibilities for this project. Thus, my activities cover a wide spectrum from the user aspects of concept formulation and tactical requirements, through the technical aspects of development and production, to the fielding of equipment. ADFSC is staffed as a management agency, with the actual design and development being done on contract. The coordination channels, shown in Figure 1, are streamlined to a major degree, since my charter provides wide latitude in dealing with the various Department of the Army staff agencies and elements of the Office of the Secretary of Defense.

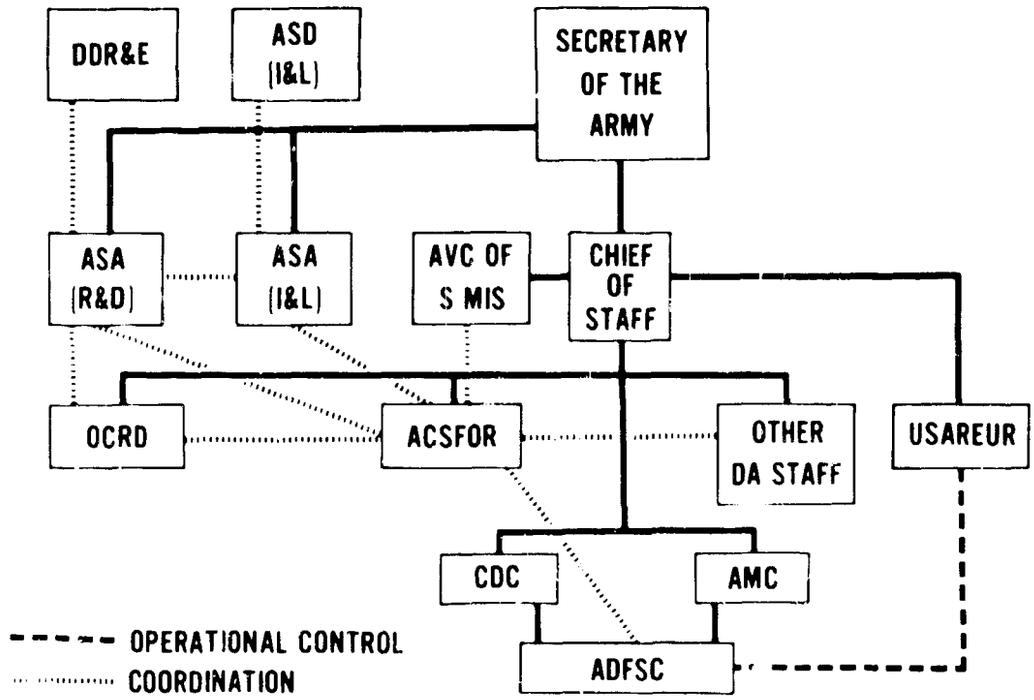

Figure 1. ADSAF management channels.

Three basic systems make up the ADSAF project:

- The Tactical Fire Direction Systems (TACFIRE), for control of supporting artillery fires;
- The Combat Service Support System (CS_3), for control of the logistical and administrative support of the army in the field;
- The Tactical Operations System (TOS), for control of the maneuver elements.

In the early planning, it was decided to approach development of the three systems separately, since one system to serve all tactical functions would be a monster to manage both in development and in operation. Further, the three categories of tactical functions were in different stages of development. To illustrate, TACFIRE functions were well defined and we now have entered into operational development, whereas in CS_3 and TOS, with their ill-defined user requirements, we are fielding a limited quantity of commercial hardware in a user environment, primarily to evaluate concepts and firm up requirements before proceeding with the development and production of oprational systems.

MANAGEMENT AND AUTOMATIC DATA PROCESSING

TACFIRE

The objectives of the TACFIRE systems are:

- Increased accuracy;
- Better and more rapid use of target information;
- Faster reaction times;
- Greater efficiency in:

  Determination of fire capability

  Allocation of fire units to targets.

Achievement of these objectives should just about double artillery effectiveness. The TACFIRE system will comprise a completely integrated system of computers located at battalion, division artillery, and corps artillery level within the army in the field after 1971. These system complexes will provide for receipt, storage, processing, display, retrieval, control, generation and dissemination of orders, information, and intelligence essential for the conduct of field artillery fire support.

The computers at battalion and division artillery will have capabilities to perform the following additional functions:

1. Maintain current status information for all fire units including their mission, location, weapon strength, and the types and quantities of ammunition available.

2. Prepare a complete fire plan and schedule, including recommendations for the number of fire units, the number of rounds, the types of ammunition and fuses, and the specific time when each target is to be attacked.

3. Maintain accurate updated records on artillery targets.

4. Perform analysis of targets and recommend number of fire units, rounds, and type of fuse to defeat the targets.

5. Compute the ballistic solution and produce a recommended fire order to attack the target.

6. Permit survey information centers at division artillery to disseminate survey control, recompute survey information, establish common grids, maintain trig lists, and perform artillery survey computations.

7. Accept meteorological messages and automatically update all data accordingly.

Figure 2 is a schematic which illustrates TACFIRE in operation.

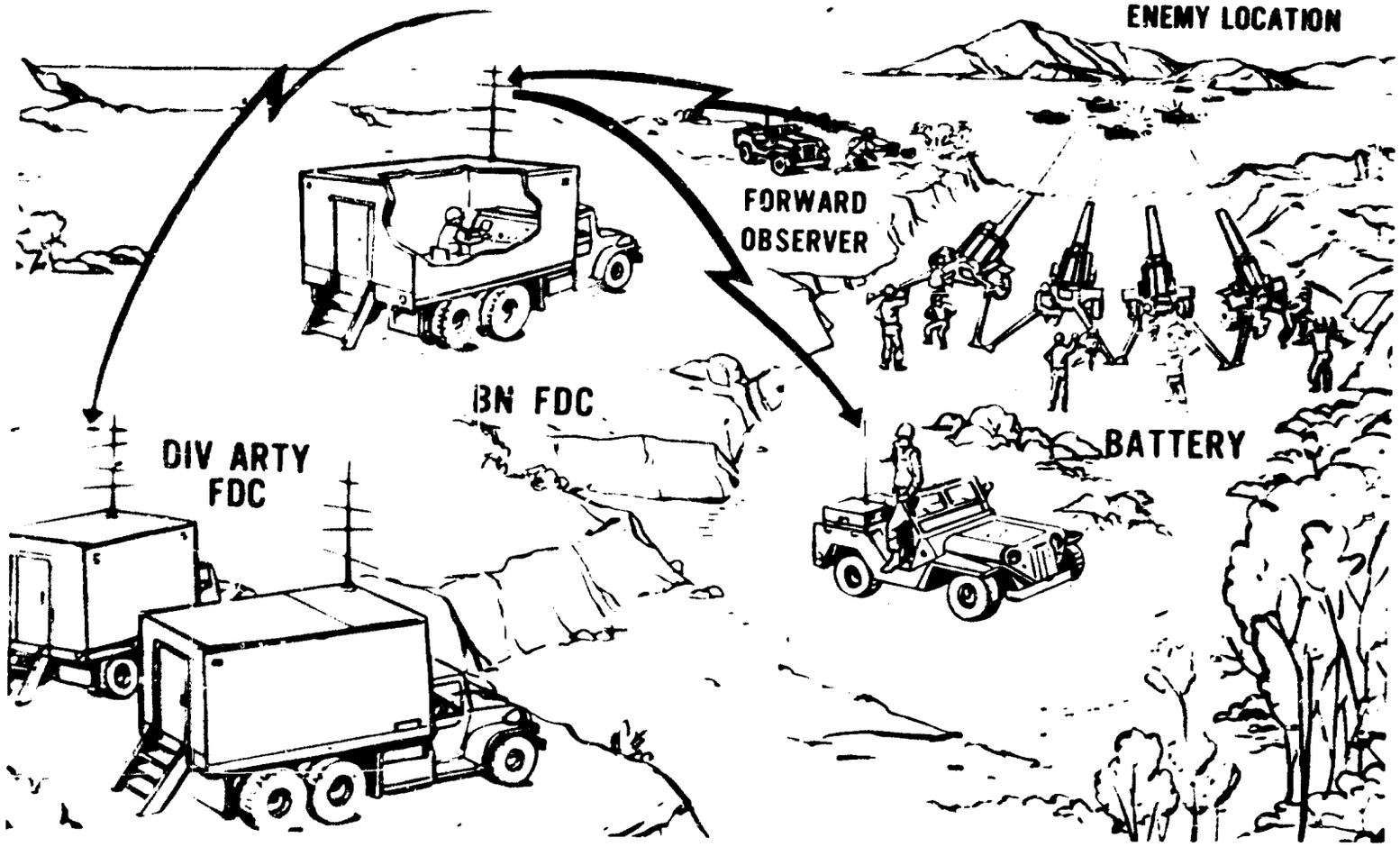

Figure 2. TACFIRE in operation.

MANAGEMENT AND AUTOMATIC DATA PROCESSING

The forward observer has a message entry device enabling him to set up a fire request message in digital form for transmission by tactical wire or radio to a computer at the battalion fire direction center. This computer will analyze the target, compute a ballistic solution, and produce a recommended fire order. Target location will be displayed on a tactical map and the fire order on a control console in the van. Upon approval by the fire direction officer for attack on the target, the computer solution will be sent in digital form to battery display units at the firing batteries for execution.

A printed record made at each echelon of incoming and outgoing messages will facilitate reverting to manual procedures if this becomes necessary. All mission firings are reported automatically to the computer at the division artillery fire direction center, where the data is recorded.

TACFIRE has behind it eight years of study and hardware and software design effort. We recently completed a five-month competitive contract definition and on 8 December 1967 we entered into a total package procurement contract with Litton to initiate development of a TACFIRE system. Of the three ADSAF systems, TACFIRE is the most advanced and is expected to ease the way considerably for the other two systems.

TACTICAL OPERATIONS SYSTEM

The second major system of ADSAF is the Tactical Operations System (TOS). The system is being designed as an on-line, near real-time, militarized ADP system to be fielded at division, corps, and army levels within the army in the field about 1975. This system will use equipment identical to that procured for TACFIRE to the maximum extent. The ultimate Army TOS will provide tactical commanders with an automated information gathering, processing, and dissemination system required for the timely and accurate handling and processing of the large volume of intelligence, operations, and fire support coordination data which must be considered in making tactical decisions.

The objective of TOS is to increase effectiveness in command and control, planning speed and accuracy, reaction time, use of intelligence, and allocation of forces to tasks.

Five functional areas will be implemented on an experimental basis as a part of the TOS USAREUR program. These are: enemy situation,

friendly unit information, effects of enemy nuclear strikes, nuclear fire support, and enemy order of battle.

Use and expansion of the developmental system in Seventh Army through 1969 will provide for limited test and evaluation of the tactical operations system (TOS) concept. It will also contribute to definition of the standard militarized system to be fielded by the Army starting in 1974. Design experience and user evaluation derived from this experiment will be important sources of data for Army-wide TOS. After we have proved out a system, we plan to add the following functional areas: tactical air reconnaissance, aircraft availability, aircraft locations, weather, critical supply shortages, bridging materials, roads, truck transportation availability, tactical troop movements, fire support coordination line, barriers, chemical contamination, and area damage control.

Concurrently, a CONUS-based effort (TOS-75 study) will identify additional user areas for automation for Army-wide TOS. At the present, it looks as though there will be a total of 30-35 functional areas on TOS.

TOS consists of a central computing center (CCC) located at the signal center nearest to the echelon which it supports. The CCC is fed by four remote station data terminals (RSDT) which are the local information processing points for data. Information is put into and received from each RSDT by eight user input output devices (UIOD) located with the users of the system. The user will usually be located within the tactical operations centers at army, corps, and division level. One of the objectives of the development of the TOS in Europe is to determine the optimum locations of the UIODs within the TOS.

The interim commercial hardware being used for the TOS USAREUR experiment consists of a central computing center (CCC) with remote station data terminals (RSDT) and user input output devices (UIOD), all produced by the Control Data Corporation. The CCC (model 3300 computer) is in a four-van configuration as shown in Figure 3. The CCC also has five magnetic tape units and the usual printer, card-reader, and card punch. The van location may be anywhere that provides access to the communications system. Thus, this group of vehicles would not be added to the congestion in a command post, but is more likely to be with the signal unit.

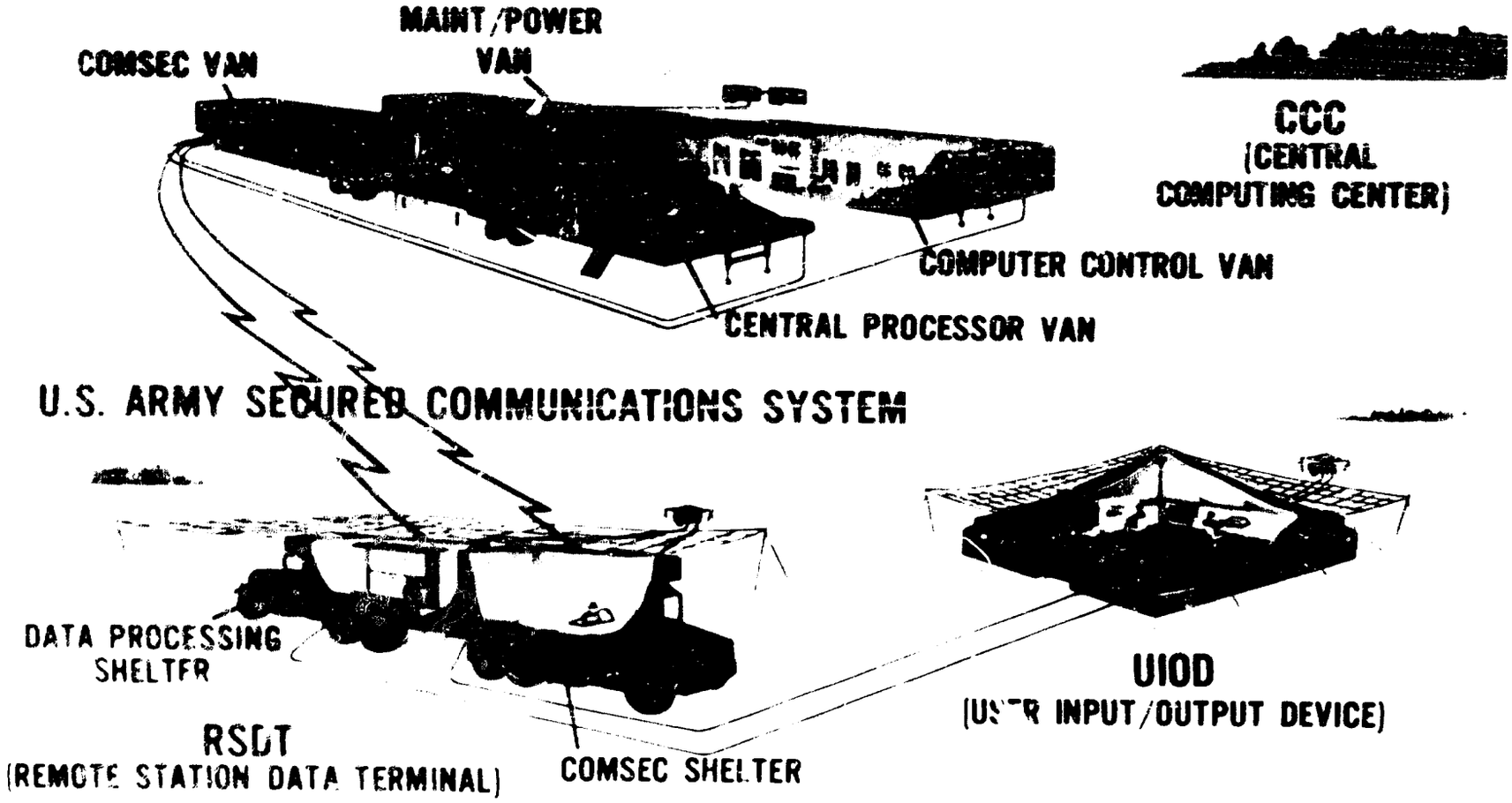

Figure 3. Central computing center.

The RSDT is composed of a CDC 1700 computer, typewriter, controller, and COMSEC equipment. The RSDT stores the messages as they are prepared for transmission, or when received, encrypts and decrypts the data, and acts as a multiplexer so that all eight users can share one communication line to the CCC.

The UIOD consists of two desk-top devices — a typewriter station which will be used mainly for receipt of messages and an entry and display station used for input of messages. The UIODs are connected to the RSDT by 300-foot cables.

Essential information is entered onto the screen of the video display (UIOD), where it is visually verified and then transmitted to the RSDT. These computers forward the information to the higher-level CCC where the information updates the master data base. The information can then be retrieved by any user of the system at any echelon.

One important manner of data retrieval in the system is the standing request for information. The user prestates his requirements for information, and when that type of information is received, the CCC automatically forwards it to the user.

COMBAT SERVICE SUPPORT SYSTEM

The third of our major systems is the Combat Service Support System (CS_3). It is being designed to meet the requirements, both in peacetime and wartime, for a standard data processing system to handle automation on the widest possible range of functions associated with personnel, administration, logistics, and comptroller activities.

The objectives of the CS_3 system are:

- Increased responsiveness of logistics personnel, and administrative support to tactical commanders,
- Maximum use of available resources;
- Reduced inventories and personnel requirements;
- More rapid response to information requirements of higher authority;
- Reduced administrative workload of tactical commanders.

The CS_3 system will pull together logistics and personnel records into centralized computers. Through remote inquiry stations, the commander and his staff will be directly connected with the data center and

have immediate access to needed support or logistics information.

The various functions to be programmed for the computers when assigned at specific Army levels of command are listed in Table I.

TABLE I. CS$_3$ FUNCTIONS

FUNCTIONS	DIV SPT CMD	CORPS/ARMY SPT BDE	FASCOM
UNIT READINESS	√	√	√
MATERIEL READINESS	√	√	√
MAINTENANCE SERVICES	√	√	√
LOGISTICS ADMIN	√	√	√
ARMY WIDE TRANSPORTATION	√	√	√
STOCK/INVENTORY CONTROL (INCL AMMO)	√	√	√
PERS MGT, STRENGTH AUTH, REPT & ASGMT	√	√	
MILITARY PAY (CAMPS INTERFACE)	√	√	
MILITARY POLICE SERVICE	√	√	
MED SVC & REGULATING	√	√	
CASUALTY REPORTING	√	√	
GRAVES REGISTRATION	√	√	
NBC DAMAGE CONTROL		√	√
REQUIREMENTS ANALYSIS			√

The CS$_3$ equipment configuration which has been selected and approved by the DA and the DOD for testing and evaluation at corps and division levels is on IM 360/40 computer system mounted in four specially designed vans, as illustrated in Figure 4. Transceiver and inquiry stations are at remote locations. At a later stage in the development, consideration will be given to utilizing militarized equipment such as that being developed for TACFIRE. The CS$_3$, like other ADSAF systems, will utilize standard Army tactical communications.

The major milestones required in the DA schedule for the CS$_3$ have been met up through the award of the hardware contract, which

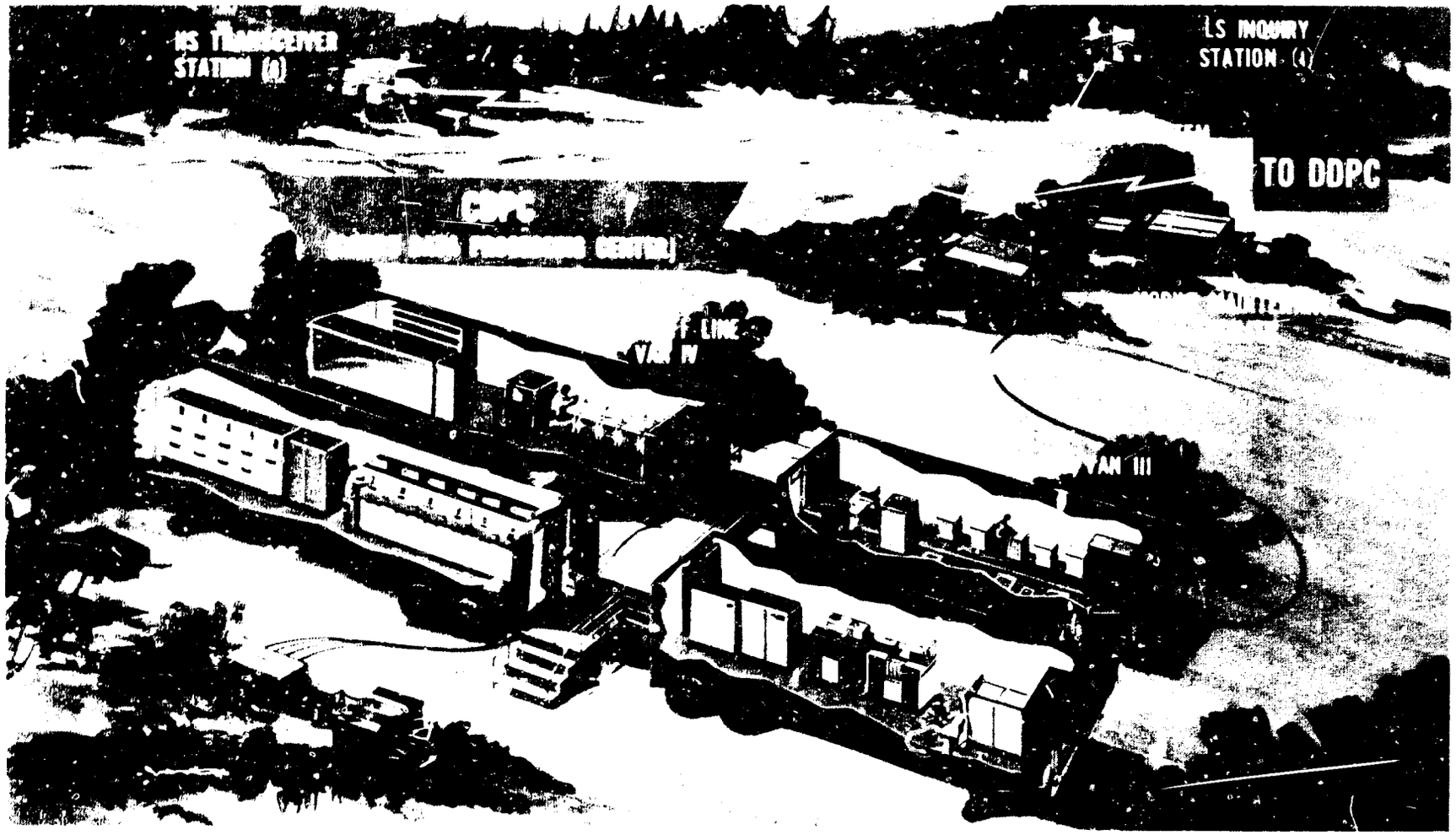

Figure 4. IBM 360/40 computer system.

was executed last May. The III Corps at Fort Hood, Texas, with its two armored divisions, has been selected to perform the test and evaluation of this system. The CG, III Corps is the test director and ADFSC provides the technical support. CONARC has activated the ADP Detachment at Fort Hood and CS_3 training started in January 1968. Hardware delivery to Fort Hood started in May and should be finished by mid-summer 1968 for initiation of system testing.

INTERIM AUTOMATION PROJECTS

So far, I have discussed the three fairly ambitious systems in the Army's blueprint for the 1970's. I would like now to describe a few interim automation projects for the army in the field which are paying off today. Each of the current endeavors bears some relation to the three follow-on systems of the ADSAF project.

The first is the militarized, "ruggedized" FADAC — the Field Artillery Digital Automatic Computer. It is a predecessor to TACFIRE, weighs about 225 pounds, but is capable of performing only technical fire control, with a limited survey capability.

Although the artillery is the primary customer, the FADAC has also been adapted for topographic survey computations, vehicle diagnostics, measurements from photographic imagery, satellite controls and tracking, meteorological reduction, and a number of other uses.

Another very different automated project, the DSU GSU computer system, is a small-scale, low-cost bookkeeping machine computer (NCR 500 with peripheral equipment) of commercial design, mounted in two standard Army semitrailer vans. It is used for the automation of repair parts supply inventory accounting procedures in direct and general support units. It is capable of maintaining the records of up to 30,000 authorized stockage list line items and the processing of up to 20,000 unit requests monthly.

Another interim project is the Quick Reaction Inventory Control Center (QRICC), designed to provide CONUS-based units which are readily available for oversea deployment to support contingency operations. The operating programs of the QRICC will be based on the CS_3 design and will utilize CS_3-type ADP hardware. All equipment will be

van-mounted, including the communications terminals and remote transceiver stations. This capability is to be available not later than January 1969.

THE FUTURE OF ARMY TACTICAL ADP

Where is the Army going with tactical ADP?

That is a big question, and it deserves a big answer. I'm not going to try to qualify myself as a soothsayer, but I think that if we start with a common data base and develop a common viewpoint, we can sketch the outlines of a reasonable answer.

I believe it was President Lincoln who said, "If we can determine whence we have come and where we are, perhaps we can discern whither we are tending". In the context of whence we have come and where we are, a few statistics spanning the last 18 years are listed in Table II.

TABLE II. GROWTH OF ADP

ITEM	1951	1968
ANNUAL SALES	0	$3 BILLION
COMPUTERS	10	40,000
APPLICATIONS	10	1,000
PROFESSIONALS	1,000	750,000
FEDERAL EXPENDS	$10 MILLION	$2 BILLION

It has been said that, if aerospace technology had progressed at the rate of ADP technology, John Glenn would have made his historic flight eight years over the Wright Brothers made theirs at Kitty Hawk.

While I am not going to dwell on any forecast of technological advances in ADP hardware, the figures in Table III may be of interest.

I believe that by 1978 we can reasonably expect computers to be inexpensive, powerful, fast, reliable, small, easy to communicate with by means of user-oriented languages, and able to communicate with human beings through a wide variety of formats, including speech and graphics.

While these statistics are impressive, at best they show only the quantitative impact of the computer on society. Yet we know that the automation of operations in such areas as banking, inventory control.

logistics in the armed services, engineering design, and air defense are not merely increasing efficiency but have brought basic transformations both in the methods by which operations were conducted and in the organizations themselves. These are qualitative changes.

TABLE III. FORECAST TECHNOLOGY ADVANCES '68-78

CENTRAL PROCESSING UNIT	1968	1978	CHANGE
SPEED	100	1000	INCREASE
COST	10	100	REDUCTION
RELIABILITY	100	1000	IMPROVEMENT
MEMORY			
SPEED	10	100	INCREASE
COST	10	100	REDUCTION
INPUT/OUTPUT AND DEVICES			
GRAPHICS	100	1000	IMPROVEMENT
SPEECH	100	1000	IMPROVEMENT
USER LANGUAGES	100	1000	IMPROVEMENT

The technology of ADP itself is entering a new and explosive phase of development. It has been estimated that the annual rate of improvement in computers is such that every 3.8 years they improve by a factor of 10. So they improve by a factor of 100 in 7.6 years, and by a factor of 1000 in 11.4 years. It is a widely held belief that whenever a technological innovation produces quantitative improvements by more than a factor of 10, it usually has a revolutionary impact on its environment. Yet this is precisely the scale of improvement that we are forecasting for the computer every four years!

What does all this portend for the future of tactical ADP in the Army? For obvious economic reasons we are not going to have a revolution every four years in Army organization and equipment. The sub-systems we are now developing TACFIRE TOS and CS are to be introduced in the 70-75 timeframe. So let us focus on the timeframe of Army 85, some three ADP generations later. I will avoid the chicken or egg argument as to whether operational requirement or technological capability has the greater influence on organization and equipment, by assuming simply that both are with us.

By 1985 we will have available light, fast, rugged machines that can perform any task we give them. There will be a variety of memories, speeds, and capacities to meet every requirement for combat operations as well as resources management. Input/output devices will be the major advancement insofar as Army applications are concerned. Communicating with the soldier in text, diagram, sketches, pictures, graphs, overlays, DA forms and even the spoken word will be possible. Phones, cathode ray tubes, typewriters, digital plotters, etc., will be widely distributed and easy to use, permitting us to give the computers a multitude of tasks not now possible, and to receive a response in time to influence action and decision.

The follow-on to TACFIRE will so improve the capabilities of fire support, and the ease in handling it, that by 1985 we will no longer need all of the intermediate headquarters for its control and maneuver. The battalion and division artillery headquarters could disappear, and the fire units and batteries could be controlled from the FSCC at division headquarters. Incidentally, with the greatly increased capabilities of firepower, this vastly improved possibility for its control, and the improved mobility of ground forces, it is possible to arrive at a new concept of ground combat, one in which the maneuver elements concentrate and maneuver to take advantage of the firepower, rather than the firepower supporting the scheme of maneuver.

The follow-on TOS will be able to integrate the input from all sources, men and sensors, and provide combat displays in real time. At that point, fire support and maneuver could be so closely coordinated that it would truly be an integrated combat system, and TOS and TACFIRE become subsystems in a single tactical command and control system.

A CSS-type system will be able to carry the integrated supply system so far forward into the battle area that the line between wholesale and retail supply becomes fuzzy, and many supplies could move from factory to user without intermediate stops. By this time, we will be thinking of operations (TOS and TACFIRE) and resource management (CSS) as two sections of a single pipeline moving to the front. I view this as but an extrapolation of present trends made possible by improved data handling and command and control techniques. I remember a couple of decades ago when new programs were measured in the Pentagon against a

simply stated formula: Does it put blood on the enemy's shirt? We may yet get back to that in a real sense when we are able to view the supply system as starting at the factory and ending only with delivery, at the last few hundred feet, to the enemy by the combat soldier.

Command and control will have a heyday. I recently had the privilege of hearing one of our distinguished former chiefs of staff discourse on his experiences as a corps commander in World War II. At one point he stated that when a battle was going on, he never made the mistake of sticking around his CP; he always went out to where the action was to get his information fresh and firsthand. While I applaud the leadership, I suspect that at base it reflected the inadequacies of the combat information flow in the corps. By 1975 the corps CP will have such a superior information display that it will be foolish for the commander to separate himself from it. But picture, if you will, the situation in 1985: The combat commander, in the vicinity of the action by aerial transport, with an iO device the size of a table-model TV set, able to call up at any time any information available at the CP. The possibilities for influencing the action are enormous and the where-the-action-is commander would again be in his element. Since we are talking about 17 years from now, some of our present officers could be such a commander.

If all this may leave some people feeling a little nervous, it is simply that, on the ascending curve of science and technology, there are no comfortable plateaus on which we can pause and relax. So I will conclude this article with the challenge of management in the public arena.

If we are not to be an after-the-fact nation, we must have an attitude of action rather than reaction, of decision rather than deferral. In our day-to-day operation, we must exercise our leadership to make the decisions needed for tomorrow's capability as vigorously as past leadership made the decisions for today's capabilities.

If we stump as hard internally for our programs as we complain afterwards to others about why someone else caused us to fail, then our successes should outnumber our failures.

We cannot always be right, but right or wrong, the nation's safety rests with us. In the words of a British prime minister of a century ago, "Applaud us when you think we are right, criticize us when you believe us wrong, but, for God's sake, let us get on with the public's business."

Mr. Raymond C. Chase, Jr. received a Bachelor of Science degree from the University of New Hampshire. He has served in a civilian capacity with the U. S. Marine Corps; the Navy Department; and various elements of the Department of the Army, including Watertown Arsenal, the Office of the Chief of Ordnance, the Army Materiel Command, the Office of the Deputy Chief of Staff for Personnel, and the Office of the Deputy Chief of Staff for Logistics.

(This article was adapted from Mr. Chase's presentation at the Army Management School on 17 May 1968.)

MR. RAYMOND C. CHASE, JR.

MR. RAYMOND C. CHASE, JR.

CHIEF, ARMY COST REDUCTION & MANAGEMENT IMPROVEMENT DIVISION, OFFICE OF MANAGEMENT ANALYSIS, OFFICE OF THE DEPUTY CHIEF OF STAFF FOR LOGISTICS DEPARTMENT OF THE ARMY

There is general recognition of the important role that we can and should play in the Cost Reduction Program. Indeed, the degree of Army success in this Department of Defense-wide undertaking is directly dependent upon good management at every level of command.

Before getting into the specifics of the Army's efforts in the Cost Reduction Program, however, it might be helpful to briefly review the background of the program.

The Secretary of Defense initiated the Cost Reduction Program in 1962 as a matter of the highest priority. It was established in response to the late President Kennedy's instructions to develop the force structure necessary to our military requirements without regard to arbitrary budget ceilings, and to procure and operate this force at the lowest possible cost

The importance of getting the maximum return for the defense dollar has been emphatically reaffirmed by President Johnson. As evidence of his personal support of the program, the President has participated each year in cost reduction activities by presenting awards to outstanding contributors to the program. Further, at the President's direction, the cost reduction effort has been extended to all departments and agencies of the executive branch of the government. This has been done through the medium of Bureau of the Budget Circular A 44.

Army Regulation 11-20 provides for Army implementation of the Cost Reduction Program on a worldwide basis. Emphasizing top-level interest, the Secretary of the Army and the Chief of Staff have expressed

their personal support of the program and have requested that increased emphasis on cost reduction be maintained.

The Army mechanism for administration and management of the Cost Reduction Program follows the existing organizational pattern of the Department of the Army. The Secretary of the Army has designated the Assistant Secretary of the Army for Installations and Logistics as the focal point within the Secretariat. The Chief of Staff is assigned overall responsibility for execution of the program. The Deputy Chief of Staff for Logistics has been designated to "act for the Chief of Staff" as Program Manager. The Army Cost Reduction and Management Improvement Division, established under the Office of Management Analysis, assists the Program Manager in coordinating and administering the program. Other members of the Army staff have been assigned specific responsibilities consistent with their basic functions. Additionally, each major command and agency has a Cost Reduction Coordinator to administer the program in that command.

The system adopted for management of the program features what we call area monitors. As a means of insuring effective, integrated management of the many facets of the Cost Reduction Program, OSD has established 20 areas of emphasis. In turn, Army has subdivided one area, General Management Improvements, into five sub-areas to provide responsible management and maximum participation in the program.

The Cost Reduction areas are assigned to DA staff agencies for monitorship. Here again, such assignments parallel the functional responsibilities established under the formal headquarters organization. For example, the Chief of Research and Development is responsible for value engineering.

The focus of effort in the program is on achieving savings in three ways. First, in buying only what is needed to achieve balanced readiness through improvement of requirements determinations, making better use of inventories and eliminating goldplating, that is, the "nice to have" but nonessential features in equipment. Second, by buying at the lowest sound price through stimulating greater price competition, through direct purchase breakout, and by increasing multi-year buying where practical. Third by reducing operating costs through terminating

unnecessary operations and facilities, simplifying paper work, standardizing procedures, and reducing the cost of operations and maintenance.

In order to qualify for reporting under the Cost Reduction Program, savings must result from a new, improved, or intensified management practice or action. Further, savings which result from deferment of procurement, a reduction in the approved force structure, or actions which adversely affect materiel readiness or combat capability are not reportable.

Various control techniques are utilized in the program. Monetary goals are employed to fix responsibility for the achievement of savings and to provide the basis for subsequent measurement of progress. Every effort is made to assure that the goals are realistic yet challenging. Army goals approved by the Secretary of Defense are subdivided and reassigned to major commands and staff agencies on the basis of their potential for effecting or directing action to achieve savings. Progress against assigned goals is reported quarterly to the Program Manager through command channels, and savings are validated by the U. S. Army Audit Agency concurrent with reporting. The Inspector General assists in assuring compliance with the regulatory requirements of the program.

The Army can justifiably take pride in its cost reduction accomplishments. In every year since the inception of the program it has exceeded its assigned goals. Our savings have come from all levels of the Army and are the result of many actions, both large and small. Savings realized in FY 1968 from actions taken during that year amounted to $342.7 million, or 146 per cent of the $235 million realized savings goal. The total three-year (FY 68-70) savings effect of these actions is estimated at $632.6 million against the $489 million three-year effect goal.

Experience under the program has focused attention on things that must be done to insure its success.

First, we must make certain that cost reduction does, in fact, receive top priority emphasis at every level of organization. This requires the personal leadership of each manager. He must see to it that the Cost Reduction Program is understood and emphasized throughout his entire

organization so that the total staff is involved in the identification of potential savings actions.

Secondly, we must recognize that cost reduction cannot be left to chance. It requires planning, as does every other managerial function. It was noted earlier that DA area monitorship assignments parallel functional responsibilities established under the formal headquarters organization. This arrangement is based on the premise that efforts to reduce costs should be made an integral part of day-to-day management, rather than be treated as a separate and distinct process. In line with this premise, it is essential that the cost reduction "ingredient" be built into each management action and properly documented to permit its being identified as "new, improved, or intensified."

Next, we must insure that all qualifying actions are reported. Savings can come from a variety of sources such as the Work Simplification Program, Work Measurement Program, Suggestion Program, Zero Defects Program, and other management improvement type programs. We want all savings which qualify, regardless of source. In this connection, no claims are made that the management actions and resultant savings would not have occurred were it not for the Cost Reduction Program. On the contrary, it is recognized that the Army has always been cost-conscious and its history reflects a wide variety of improvement programs and savings efforts. Thus, while the Cost Reduction Program has stimulated personnel to do more questioning of existing practices, and pay more attention to the element of cost, the credit for many savings actions rightfully belongs to other undertakings.

The important thing, however, is that the Army receive credit for all qualifying savings, regardless of source. While not formalized in writing, one objective of the Cost Reduction Program is to demonstrate to Congress and the American people that we are seriously attempting to control costs wherever possible. Everyone is aware of the stigma of wasteful spending that has been attached to the government for many years. There are few programs that offset this image of waste-making as effectively as the Cost Reduction Program.

Yet there is good reason to believe that savings resulting from many new, improved, or intensified management actions are never reported. Basically, the problem stems from the fact that the action, when

taken, is not considered in terms of its cost reduction implications by the initiating organization. The solution, of course, is to view all actions from a cost reduction standpoint, and to specifically identify and document those which might produce reportable savings.

It might be well at this point to briefly mention "at variance" actions. These are the actions in the case of which program officials and Army Audit Agency representatives disagree as to their validity or reportability. Many generalities have been made about savings rejected by auditors, but all too frequently these generalities were not converted into specifics. The auditors do not have any authority to reject an action. It is the program officials rather than the auditors who determine whether an action will be forwarded. If there is an honest disagreement over whether an action qualifies, it is the responsibility of the program official to forward the action, the audit opinion, and a rebuttal thereto for resolution at a higher echelon. Unless this is done, there is no basis for program personnel to complain about audit invalidations.

Before concluding, I would like to mention two additional points. First, the Cost Reduction Program, which was initially set up as a five-year program, has now been established as a permanent and integral part of the Defense management system. Second, the Secretary of Defense directed that the program be broadened through the establishment of additional mangement improvement areas which will be measured on the basis of performance rather than dollars saved. Eleven areas were established in the first phase of the program expansion. An additional 12 phase II areas are currently being implemented, with reporting to commence in the second quorter, FY 1969. Several other areas are being considered for inclusion in the program. In reality, this "broadening" of the Cost Reduction Program entails the establishment of an additional new program which will measure in detail the performance of functions and activities on a Defense-wide basis and highlight areas in need of improvement.

The Cost Reduction Program, as well as the newly established Management Improvement Program, will hold many new challenges in the future. This includes the generation of new and imaginative ideas

which are essential to the attainment of program objectives. The responsibility for insuring the Army's continued success in the program is shared by every member, military and civilian, of the Army team.

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In his present position, Mr. Hambley is responsible for the Army's Work Simplification and Zero Defects Programs and for the dissemination of management doctrine and application.

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(This article was adapted from Mr. Hambley's presentation at the Army Management School in May 1968.)

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It is a distinct pleasure to present the two management improvement programs for which I am the Department of the Army program manager — the Army Work Simplification Program and the Army Zero Defects Program. These two programs are assigned by Army Regulations as responsibilities of the Comptroller of the Army, who has assigned them to the Director of Management, Review and Analysis, who in turn has assigned them to his Management Education and Improvement Division Chief, who has assigned them to me. I am the Indian at the bottom end of the chain of commmand and responsibility, which, I suppose, gives me some degree of license to present these programs as they appear at the HQ DA working level.

In the larger context, both the Army Work Simplification Program and the Army Zero Defects Program are part of the overall management improvement effort in the Army. In fact, during the late 1940's and 1950's, there was a separate program titled the Army Management Improvement Program, which was under the staff supervision of the Comptroller of the Army. It was merged into the Cost Reduction Program in 1961 although some of its sub-elements survived as separate entities. In 1968, the Cost Reduction Program itself was broadened to encompass certain selected management improvement areas and was

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retitled the Army Cost Reduction and Management Improvement Program. This latter, however, bears no relationship except in title to the earlier Army Management Improvement Program.

These changes are rather confusing, especially to old-timers who remember the earlier Management Improvement Program and have not followed its convolutions through the recent years. Suffice it to say that today the Army has a Cost Reduction and Management Improvement Program which is essentially a reporting program, and it has a number of separate operating programs in the management improvement field. These include Work Measurement, Work Simplification, Zero Defects, the Army Suggestion Program, and others, each of which contributes in its own special area to the overall goal of improving the Army's management of its resources.

Getting back to my own area, I first want to discuss work simplification. This term is often confusing because it has two meanings in the Army. In one context, work simplification is a tool used principally by Army management analysts and management engineers in what is known as methods engineering, a subfield of industrial engineering. As such, it includes a number of sophisticated and rather complex techniques that management analysts and management engineers have developed to study and improve operational methods. I will not cover this context of work simplification, since it is considerably broader and more technical than the Army Work Simplification Program.

In contrast with work simplification as a management analysis and management engineering technique, the Army Work Simplification Program is essentially a training program. Its aim is a simple one — to teach first-line supervisors some easily mastered and easily applied techniques they can use to improve their own operations with little or no outside assistance.

Thus, in this second context, work simplification can be characterized as a do-it-yourself methods improvement program for supervisors, encompassing the several techniques taught in the program.

In class I installations and activities, the Work Simplification Program is usually under the staff supervision of the comptroller. In Class II installations and activities, the program is usually handled by the management engineering organizations. AR 1-65, Work Simplification, is

the governing regulation for the program, which is set forth in detail in DA Pamphlet 1-52, "Techniques of Work Simplification."

The Army Work Simplification Program is a relative old timer among Army programs, having been developed in 1952. At that time, its originators surveyed all of the techniques and methods then being used in the fields of industrial and management engineering. After considerable thought, they selected five basic techniques for inclusion in the program. These are: Work Distribution, Flow Process Charts, Work Count, Motion Economy, and Layout Studies. They then set up a program of instruction which combines classroom and laboratory instruction together with a required work simplification project. This has remained the basic framework of the overall Army Work Simplification Program to the present day.

The first of the five basic techniques taught in work simplification courses is called work distribution. Here, the supervisor is taught how to develop task and activity lists and a work distribution chart for his organization. With these tools, the supervisor can analyze the division of work within his organization. He can see which of his employees are overloaded and which have too little work, what unnecessary work is being done and by whom, what job elements could be combined or rearranged for better efficiency, and the like. Work distribution is an extremely useful technique for any foreman who has workload and manpower problems.

The flow process chart, which is the second work simplification technique, is taught to first-line supervisors to enable them to plot the flow and sequence of work within their work units. This chart presents a graphic picture of what happens in a work procedure. Like a road map, it is a simple device for visualizing and describing chronologically each step of detailed procedures that are often too long and complicated to be described in words. Using flow process charts, the supervisor can readily identify steps that can be combined, simplified, or changed for greater efficiency in his operations.

Work count is the third basic work simplification technique. It is a means for determining the effect of the volume of work operations upon the methods and procedures being studied. The supervisor is taught how to identify representative tangible evidence of productive

effort (work units) and means to count these work units as they cross strategic points in their operations, e.g., when work comes in, when it goes out, when it goes into storage, and when a process is completed. By taking this work count information, the supervisor can do better scheduling, balance out his workloads, locate bottlenecks, demonstrate personnel needs, and stimulate interest and competition among his employees.

The fourth work simplification technique, motion economy, derives from the work of Frederick W. Taylor, the founder of modern management engineering. The objective of motion economy is to find the best work method, eliminating wasteful and useless effort by a worker. The supervisor is taught the various rules of motion economy and how to apply them in studying the operations of his employees. Using them, he can evaluate fatiguing motions, rearrange individual work areas, substitute mechanical for manual methods, and the like.

Layout studies, the fifth work simplification technique, involve the functional arrangement of equipment and personnel to develop the maximum degree of economy and effectiveness in operations. The supervisor prepares a plan or sketch of his work area. In the work simplification class, he is taught how to analyze his layout in terms of the rules of physical layout. His analysis will typically show ways in which his work area can be rearranged for greater efficiency.

From the description of the five basic work simplification techniques, it should be apparent that a supervisor who has been trained in work simplification is well equipped to analyze and develop improvements in the operations of his work unit. In fact, the Army Work Simplification Program requires that every supervisor taking the course must complete an installable work simplification improvement in order to receive credit for the course. In this manner, we are assured that the supervisor can successfully apply the techniques he has just learned.

The use of the term "installable work simplification improvement" is based on experience. We have found that supervisors will sometimes come up with legitimate improvement ideas which show use of the work simplification techniques but which, for engineering or budget reasons, cannot be installed immediately. In order to avoid penalizing these su-

pervisors the program criterion here is that a work simplification improvement must be accepted by the supervisor's superior as being a desirable and practical idea, capable of being installed when conditions permit — in other words, a legitimate work simplification improvement.

In judging the effectiveness of an installation's Work Simplification Program, three factors require attention. One of these is the need to have a good instructor who believes in the Work Simplification Program. Too often, teaching the work simplification courses is assigned to a junior staff member who has limited experience and background in the field and who is himself not firmly convinced of the program's effectiveness. When this happens, the program suffers. There is a significant motivational element in work simplification training. The instructor has to motivate his students to use the work simplification techniques as well as teach them what the techniques are. He needs both a background in work simplification techniques and a dedication to the program if it is to succeed.

The second factor is the need for command support. It is obvious that if the commander sees the benefits of work simplification and openly supports the program, supervisors will take more interest in it.

The third factor is the need to make certain that supervisors who complete the formal instruction (classroom laboratory) phase also complete their work simplification improvement projects. This requires a vigorous follow-up by the work simplification instructor and the students' supervisors. The problem is illustrated by these statistics: in FY 68, 7,168 persons completed the formal work simplification training while only 5,094 persons completed their work simplification improvements. This is a sizable loss These persons do not get credit for completion of the work simplification training and the Army does not get the benefits of their work simplification improvements. We need to improve our performance in this area.

What benefits come from work simplification programs? For one, it is obvious that many work simplification improvements will have cost reduction implications. In fact, our experience indicates that better than 60% of these work simplification improvements ultimately qualify for reporting under the Cost Reduction and Management Improvement Program. (The remainder do not have auditable savings Of course, funds

saved by work simplification improvements are available for reprogramming by the commander for other priority needs.

In addition, many work simplification improvements qualify for consideration under the Army Suggestion Program. Supervisors are encouraged to submit their work simplification improvements to their local suggestion program, and a sizable number of supervisors have received cash awards for these improvements.

Improved supervisory morale is another area of benefit that results from a good work simplification program. Most supervisors can think of ways to improve their operations but do not know how to systematically work out their ideas and put them into practice. This source of frustration is eliminated after supervisors complete a work simplification course, because they now have the techniques they need for this purpose. In installation after installation, it has been shown that where effective work simplification programs have been put into operation, supervisory efficiency and morale have been improved.

Thus, work simplification programs typically have several payoffs — to the commander in helping him to increase his organizational efficiency and to meet his Cost Reduction and Management Improvement Program goals; to the individual supervisor in terms of personal and job satisfaction, plus cash awards from the Army Suggestion Program; and to the supervisor's work unit in terms of more efficient and effective operations.

The accomplishments of the overall Army Work Simplification Program — and the real justification for its existence — can perhaps be shown most easily by these facts from the FY 68 program:

- 7,168 persons trained in work simplification courses, Army-wide.
- 5,094 accepted work simplification improvements.
- $7,695,225 in estimated first-year savings from work simplification improvements.
- $1,510 in average savings per improvement.
- 29.56 instructor man-years used in FY 68 work simplification programs. Estimated first-year savings from work simplification improvements per instructor man-year were $260,326.

These accomplishments, I think, speak for themselves.

MR. WILLIAM A. HAMBLEY, JR.

I would like to move now to the Army Zero Defects Program, which is a newer and perhaps more controversial management improvement program. Zero Defects originated in 1962 at the Martin Marietta Company, Orlando, Florida. This company was working on a Pershing missile contract when it was requested to finish the contract ahead of schedule. To do this, it was necessary to eliminate a number of inspection operations. In turn, the Martin Marietta management went to their employees with a Zero Defects campaign to improve the quality of work so that the inspections could be eliminated without loss of performance. The campaign was an outstanding success, and Zero Defects was thus launched on the American scene.

After observing the success of that initial Martin Marietta program, the Army Missile Command set up its own program in 1964. Shortly thereafter, its parent command, the Army Materiel Command, adopted the program. In 1965, General Harold Johnson, the Army Chief of Staff, approved the program for implementation Army-wide. It was inaugurated in late 1965 and now is an active program in every major Army command throughout the world. In fact, the concepts of ZD have now been extended to Vietnam as part of an Army management improvement program called Project MACONOMY. Considered in total, it is accurate to say that ZD is a significant factor in the work setting for most of our several million military and civilian personnel.

AR 11-30, which sets forth the Army Zero Defects Program, defines Zero Defects as a program for motivating individuals, both military and civilian, to produce defect-free work and for instilling in personnel the pride of craftsmanship. It is a positive-oriented program, emphasizing the prevention of errors rather than their detection. The program's objectives can be summed up simply: to motivate Army personnel — military and civilian alike — to do the job right the first time.

Zero Defects techniques are regarded as an extension of proven Army leadership methods. In this sense, there is nothing new about ZD. Since armies began, the better military (and civilians) leaders have lived and practiced the ZD concept as their personal leadership standard. These leaders may not have used the term "zero defects," but they have shown by their example that they want their organization to perform with perfection. They have motivated their subordinates to accept Zero

Defects as their standard of performance — and they have seen the results in the development of pride of individual craftsmanship and accomplishment among their people and the more efficient operation of their units.

What, then, does a Zero Defects Program do? Basically, it takes these elements of leadership and wraps them up into one special program. It gives them visibility and emphasis. It helps a commander by showing his people what his standards are — Zero Defects. And it works for the commander by motivating his personnel to act on their own initiative to improve their workmanship toward Zero Defects.

Zero Defects in the Army is a commander's program. It is not the comptroller's or the quality assurance chief's or the personnel man's or anyone else's. It works for the commander when he gives it attention, and it suffers when he does not. Because Zero Defects is a commander's program, its application is Army-wide, not limited to one phase of Army activities or to one area.

Analysis of the first three years of the Army Zero Defects Program shows a number of areas where Zero Defects has worked especially well. These are in manufacturing, maintenance and supply, finance and accounting, administration, automatic data processing, production and shop operations, and in troop unit activities connected with unit readiness. Conversely, the most difficult areas for Zero Defects application seem to be in the professional and technical fields.

We support ZD because we know the program pays off. With austere resources last year, the estimated first-year savings were over $2,000,000 Army-wide. These were achieved through Error Cause Removal suggestions. And these tangible benefits are only a small part of the total benefits of the program. We know that where commanders are supporting good Zero Defects Programs, we have better employee morale, reduced costs, improved communication between management and employees, better utilization of resources — and a better Army.■

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He joined the AMC in 1962, where his position calls for staff supervision of management improvement programs for nine subordinate commands. He was formerly with the Office of the Quartermaster General, where he was responsible for staff supervision of similar programs in the Army depot system.

(This article was adapted from Mr. Walukonis's presentation at the Army Management School in May 1968.)

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While I assume that some are familiar with the Army's Work Measurement Program, a brief review of what work measurement is would not be amiss. Essentially, work measurement, as described in DA Pamphlet 1-50, tells how long it should take to do a certain amount of work or perform a service or a task. It has as its aims:

—Increased effectiveness and economy in the use of resources, such as facilities, manpower, materials, and equipment by improving methods, distribution, conditions, layout, and procedures.

—To provide current and reliable data for: manpower evaluation, program analysis, the development of standard cost accounting systems, scheduling and controlling work, and the development of budgets.

It is hoped that readers under whose functions work measurement is included will see the overall value of the program. Further, those having direct responsibility for work measurement may recognize why their programs may not be working and perhaps take corrective action. Finally, it is hoped that all will obtain an appreciation of the program.

Until 1962, there was a trend of peaks and valleys every two years in command support of work measurement. Since 1962, however, the trend has been steadily upward. In that year a Presidential Order on Work Measurement was issued. Following on this, both the Bureau of the Budget and the Department of Defense really moved out on work

THE WORK MEASUREMENT PROGRAM

measurement. Later that year, a study was made of the Army's use of work measurement with resultant increased activity in the program.

Prior to 1962, work measurement in the Army was generally thought of as performance analysis or performance measurement. What was usually meant here were measurements based on statistical data alone. However, with the advent of the "new look" six years ago, the exclusively statistical approach to performance measurement has been de-emphasized. Instead we have tried to emphasize the improvement of methods and systems prior to the actual measurement of work.

In 1963, the Defense Integrated Management Engineering Systems, abbreviated to "DIMES," was originated. This system was first emphasized in the industrial areas and subsequently in the quasi-industrial areas in AMC. Such activities as the arsenals, depots, and proving grounds saw much DIMES activity. In 1965, DIMES received emphasis in CONARC and in overseas installations, first in the support areas and subsequently in the mission areas. In the Army Materiel Command, DIMES was extended command-wide, so that we have but one work measurement program, which is DIMES. As can readily be seen, the program has a very broad scope.

We try not to use the term "work measurement" too often, as it tends to connote emphasis on the means and not the ends sought. We thought in 1962 that this term would sell; however it, like the term "performance analysis," has not gone over too well.

About the time DIMES was beginning, we developed the Warehouse Gross Performance Measurement System (WGPMS). This is a system for depot operations which essentially involves the development of gross standards, as they are sometimes called. In the receiving and shipping area, for example, we have approximately 16 standards covering all work. Further, the work units tie into the Army management structure codes. This makes the composite standards relatively easy tools for supervisors to use in making resource decisions in the chain of command. Heretofore the stacks of minute, very accurate standards have not really been of much assistance to the supervisor in making decisions as to the number of personnel, quantities of work units and materials required, production time, and the like. So WGPMS represents a breakthrough in terms of service to the first line supervisor in the application

of standard times. The WGPMS concept is currently being extended to the National Inventory Control Points, where we will first break down the operations and then establish gross standards.

I am sure that most people realize that the potential for work measurement applications lies primarily in class II organizations such as in AMC rather than in other parts of the Army. However, there are certain areas of the Army's class I installations where a significant number of functions can be covered by work measurement techniques.

I can give some indication regarding the current status of work measurement throughout the Army and make some comparison with AMC to give some idea as to where the action is. In AMC we have some 470 analysts who have been trained in work measurement. By this I mean that they have taken an eight-week DOD course which covers methods and standards and a pre-determined time system for establishing standards. These specialists have covered more than half of AMC's population.

On the other hand, the total number of people in the entire Army who have been trained to conduct work measurement is just over 600, so that one can see where most of the work measurement analysts are. The potential for coverage in AMC is 70 to 75%. In CONARC, due to its size, the potential is greater in numbers of people than in AMC. About 60% of the CONARC population has been determined to be amenable to some form of work measurement. However, the staffing hardly permits this in CONARC, since they have less than 100 trained people to do the job.

AMC's return on its investment of 470 people, as reported quarterly, has been at a rate of $5.40 return for every dollar expended. Over the past five years, savings have amounted to more than $33,000,000. This is really not a great deal of money compared to the intangible benefits to be gained from the use of work measurement data in the determination and control of resources.

All other organizations of the Army, as well as AMC, submit an annual report to the Comptroller of the Army on the total strength, the potential coverage, the actual coverage, and the staffing for work measurement. All told, the applicable areas represent more than 164,000 people in CONARC, which is a sizable group of people. The

actual coverage under all types of standards is around 35,000. So the actual coverage of personnel is under one quarter of the potential.

Today, the problem is not one of measuring the work; we have, over the years, devised a technique to measure most work. It is simply a matter of determining the discipline that we want in the standard. If we settle for minimum discipline, we can cover just about everybody.

A very fruitful area for consideration, in CONARC, is laundries. I have done some traveling for DA over the years, and this is one of the areas that has always interested me. There are about 9,000 people operating laundries in the Army, and, according to estimates of the people who are qualified in work measurement to make the judgment, about 8,000 of these can be covered by a disciplined work measurement approach such as engineered standards. I have found in my visits that, in general, equipment and layout, as well as the products worked on, are very much the same. So here is an extremely fruitful area.

There are other areas with programs that are pretty much built in. I refer in particular to the Repairs and Utilities areas. There is a potential coverage in CONARC of 35,000 people in these areas. Of this potential, only about 50% are under standards.

Now, to cover all of the potentially coverable areas in CONARC would require about 700 people according to the DA staffing standard. I'll discuss this staffing ratio in just a moment. However, there are only about 100 people in the program at the present time.

As for future work measurement developments in the Army, the big problem is the matter of production planning and control. This is where the emphasis will be in the future, not only in AMC but throughout the Army. This represents the second phase of project DIMES, to which I have already referred.

We will also be working in the area of correlating manpower and workload. ACSFOR currently has an effort under way in which your organizations have already contributed to a survey. We don't know yet what ACSFOR is going to do with the data received, which was essentially concerned with information regarding the use of work measurement data in determining manpower requirements.

MR. ALBERT J. WALUKONIS

A study is being conducted in AMC by the Comptroller and Director of Programs and the Director of Personnel and Training on the relationship between workload and resources. This study is called WARCAT, which is an acronym for Workload and Resources Correlation Analysis Technique. They recently brought in a contractor to consider the possibility of relating these factors at the command level; the contractor has since made some surveys and is now working up a presentation for the commanding general.

We will also be concerned with such things as materiel usage standards as related to the development of time standards and inventory control.

In terms of staffing the work measurement function, there is a staffing guide provided by DA. It is now a part of AR 1-50, and it says that we need one analyst for every 100 people to be covered by engineered-type standards and one analyst for every 400 people to be covered by other type standards. We don't advocate that our commander hire his total requirements at the outset. We advocate rather that he build this staff slowly with well qualified people. We have run into the problem where staffs have been built too quickly; we do insist that the spaces for the program come from within the organization.

In work measurement, the organization is often built around personalities; I suppose that sometime this is inevitable. We have work measurement functions located in some unlikely installation organizational elements, but the program works because it has persuasive, competent, and hard working personnel.

In AMC, and in its subordinate commands, the work measurement function is in the Management Systems and Data Automation Directorate at each headquarters level. The Director reports directly to the commanding general. In AMC's depots and in CONARC's field organizations, work measurement, for the most part, is in the Management Engineering Division, where it is a part of the comptroller's function. The comptroller reports to the local commander.

The matter of establishing priorities for work measurement coverage is the commander's responsibility. Too often, he doesn't exercise this responsibility. The program often proceeds without his influence, and what happens is that those areas are attacked which are the easiest

to cover and which result in the least benefit. But it is the commander's responsibility to see that effort is expended in the most fruitful areas.

As I've said earlier, we still have the serious problem of implementing production planning and control systems. There is not much point in having a work measurement program if the data is not integrated into the other systems, i.e., the manpower and cost systems. From 1962 until today we have had our share of problems with the program, but we have the measurement job done at least. Now we are at the point where we must ask ourselves what we are to do with the standards. We may not have taken the time to properly sell it to the people who have systems that interface with work measurement.

Part of the answer to the problem of making work measurement useable is to be found in the model system. By this I mean designing a system to interface with the manpower and cost systems. Concurrence in the systems should be obtained from the manpower and comptroller elements before even the first work measurement standard is set.

Another part of the answer to the problem in using the work measurement data is supervisory participation and acceptance. A commander can readily get his supervisors to participate in the program by virtue of his position. However, the supervisors must be induced to readily apply it in their everyday management. Acceptance is gained by supervisors being convinced of work measurement's value to them as a management tool.

A word should be said about a commander's implementation of the work measurement program at the installation level. A commander usually serves for two or three years. When assuming command of an installation he is faced with satisfying the requirements for a work measurement program. Often he finds little in the way of a program. He may elect to take his chances and do nothing about the program except perhaps to ask for resources. He may win his gamble and not be criticized for shortcomings regarding work measurement. However, he has had to forego the benefits of work measurement in carrying out his mission. An answer to the quandary is to insure continuity of the work measurement program by a strong civilian executive assistant. In this way the problem need only be solved once.

MR. ALBERT J. WALUKONIS

It was not my intention to try to sell work measurement in this short article. I don't think it has to be sold, particularly. You know this if you have a successful program of your own.

I will close with quotations which illustrate Army command thinking on work measurement. General W. C. Westmoreland, now Chief of Staff of the Army, declared on 27 April 1963: "There is no substitute for a sound work measurement program, tailored to the specific needs of each work area . . ." and ". . . within each operating activity a system must be devised for measuring performance in terms of realistic indicators of productivity." Paul R. Ignatius, now Secretary of the Navy, stated on 4 February 1964: ". . . you must establish a standard, a means of measuring performance against it, and then take corrective action as necessary. This is the manager's job in business. It is also the commander's job in the military organization whether in a tactical or a nontactical unit . . . This isn't anything that a commander can delegate . . . if the commander doesn't do these things, in my opinion, he is not commanding or managing his efforts."

In his present capacity, Col. Davis is responsible for developing policies and procedures affecting the morale and welfare of active-duty members of the Armed Forces and their dependents.

Col. Davis has an expansive service background in the personnel and manpower field, having served with the DA General Staff in the Office of the G1, and in the Office of the Deputy Chief of Staff for Personnel, from 1945 to 1966.

(The study mentioned in this article has been reviewed by the Deputy Secretary of Defense and referred, together with a study on alternative methods of financing military family housing, to the Assistant Secretary of Defense (Installations and Logistics) for joint consideration and development of appropriate programs by that office and the offices of the Assistant Secretary of Defense (Manpower and Reserve Affairs) and Assistant Secretary of Defense (Comptroller).

(This article was adapted from Col. Davis' presentation at the Army Management School on 28 June 1968.)

COL. STEVE G. DAVIS, USAR (RET.)

COLONEL STEVE G DAVIS, USAR (RET.)
ASSISTANT DIRECTOR OF PERSONNEL
ACTIVITIES AND FACILITIES,
OFFICE OF THE ASSISTANT SECRETARY
OF DEFENSE
(MANPOWER AND RESERVE AFFAIRS)

I appreciate the opportunity to contribute an article on family housing; however, in a way I feel like a patient who tries to tell the doctor what the doctor should do to cure the patient's ills. I do not pretend to be a housing expert, but I would like to share some reflections about housing for military personnel that are matters of continuing concern to those of us in the manpower and personnel area.

You are probably aware of a memorandum from the Deputy Secretary of Defense to the service secretaries and the assistant secretaries of defense, dispatched in late March of 1968, in which it was noted that a re-examination should be made of certain of the policies and practices followed in the management of military family housing. Let me quote:

"The Assistant Secretary of Defense for Manpower and Reserve Affairs, together with the Manpower secretaries and Personnel chiefs of the services, should study the existing criteria for determination of family housing requirements as set forth in DOD instructions 4165.45 and recommend any necessary or desirable revisions."

Further: "The Assistant Secretary of Defense (Comptroller), together with the Financial Management secretaries, should examine alternative methods of financing the new construction of family housing units; and recommend a thorough analysis, including recommendation of feasible funding sources, ranging from appropriated funds to private financing."

MILITARY FAMILY HOUSING— RE-EXAMINING SOME POLICIES AND PRACTICES

Finally, it was requested that a report on these matters be made to the Deputy Secretary by 1 July 1968.

The Office of the Deputy Assistant Secretary of Defense (Military Personnel Policy) received the assignment as it relates to housing requirements and established an inter-service study group composed of personnel representatives of the Army, Navy, Air Force, and Marine Corps to consider this matter. The Family Housing policies of the DOD were examined in some depth by this group. Requirements, assets, qualitative aspects of family housing, and programming procedures of the DOD and the services were all looked into.

In addition to looking at these important areas of departmental policy, the study group thought it advisable to comment on related matters that affect the human aspects of family housing policy. These matters include architectural definitions of military family housing as compared to civilian housing, the adequacy of basic allowances for quarters to provide family housing in the civilian community, and the staff relationships in the management of family housing.

I would like to briefly discuss this study, first giving an indication of manpower and personnel wants and then discussing some of the conclusions relating to these wants. I ask that you bear in mind that the study is written from manpower and personnel viewponts, as desired by the Secretary; it does not necessarily incorporate the thoughts of the logistician, who may indeed disagree with some of the positions taken in the study.

First, what are the manpower and personnel wants with regard to family housing? 1) Consideration of the housing needs of all military personnel; 2) establishment of a housing eligibility for personnel in grade E-4 with six years' active service commitment; 3) increased minimum floor space; 4) military housing with an increased number of bedrooms or equivalent; 5) elimination of housing adequacy determination by the occupant; 6) determination of the inadequacy of the home-to-installation one-half hour allowable travel time; 7) simplified housing survey procedures; 8) personnel sample techniques to determine off-post housing assets; 9) the use of service-wide factors by grade for marital and dependency rates; 10) a variable basic allowance for quarters; 11) staff

policy and procedural responsibility for housing assignment and eligibility matters.

This, then, in brief, is what the personnel people want, all based on the desire to improve living conditions for military families and to simplify housing administrative procedures. I would now like to discuss these matters in a little more detail, but not necessarily in the order in which I enumerated them.

The present DOD policy objective of primary reliance on the community for adequate economic housing for married career military personnel allows for the programming of government-owned housing to satisfy the housing needs of those eligible married personnel who must reside on an installation because of military necessity, and for those eligible military families for whom the community cannot furnish housing determined adequate by DOD standards. While in theory this policy objective may provide adequate housing for all eligible married personnel at some future time, it excludes from consideration the family needs of a significant segment of the military population, that is, the E-4's who are married and have less than 4 years of active military service. The very fact that this group of military personnel is not eligible for housing does not mean that they and their families do not need housing or military recognition in procuring housing.

In the civilian community, the President and Congress are giving major attention and resources to providing adequate housing for low-income civilian families. Under the guidance for this policy for civilian families, it now appears particularly inappropriate for DOD to continue a policy objective that fails to explicitly recognize the existence of low-income military families. The annual housing survey includes personnel in the lower grades, but they are not represented in the eligible requirements presented for programming. The total number tabulated in the survey does, however, indicate the competition of these personnel for community housing.

From a purely humanistic viewpoint, it would appear that those with the least ability to acquire housing should be given priority for available community housing. If the housing allowance for enlisted personnel in the gades being discussed, were in such proportions that it would pay for housing which meets the standard set for adequacy, the

present policy would be less harsh. This is not the case, however, and these grades are not represented in the military housing deficit.

This situation requires that a serious young man seek housing in the less desirable area of the community so that his family can survive on the small total of his salary and the Dependents' Assistance Act allowance. Commanders are tempted to alleviate the situation by providing military housing in the form of houses and trailers usually declared inadequate. Unfortunately, in too many cases this solution merely transfers the less desirable environment from the community to the military installation.

The housing needs of the lower-grade personnel must be acknowledged. This recognition is a separate issue from any rationale altering the existing criteria establishing eligibilty for the military control of adequate housing, as there are strong and very valid considerations for not extending housing eligibility to these grades. Experience has indicated the inability to obtain sufficient adequate housing for currently eligible personnel; creating a vast group of new eligibles without providing additional housing could spread this serious morale problem from its present concentration among the first-termers to include the career force as well.

While the granting of such privileges to all military personnel is desirable, there are realities to be considered in the light of current conditions. By providing for the career force, we at least offer the first-termers a glimmer of hope for a better situation should they choose a military career. In the report of the Secretary of the Navy's retention task force, it was concluded that it was economically unsound to provide these entitlements to all military personnel. We, of course, agree with this position. In the same report, however, it was recommended that regulations be changed to permit personnel who become career-designated to be eligible for these entitlements. Entitlement would be based on the members requiring sufficient service obligation to be considered as career-designated. Career designation would be extended to include those pay grade E-4 personnel with less than four years' service who have acquired a six-year active duty commitment, that it, active duty plus the obligation to perform active duty that would total six years. This, of course, if approved, might be a valuable retention tool. It would

permit entitlements by acquiring the necessary service obligation. This appears to be a logical extension of our present policy.

As a result of these considerations, the study recommends that: (1) eligibility for military family housing dependents' travel, household effects shipment, and dislocation allowance be extended to E-4 personnel with less than four years' service, who have acquired the six-year active duty commitment; (2) the necessary criteria and legislation changes to accomplish this purpose be developed; and (3) existing policy objectives be revised to recognize the needs to consider the requirements for family housing generated by non-career family households as well as requirements generated by career family households.

In examining the qualitative aspects of housing requirements as set forth in DOD Instruction 4165.45, consideration was necessarily given to the current standards of construction, net floor areas, and qualitative housing. While recognizing that this is clearly an area of primary cognizance for agencies other than Manpower or Personnel, the humanistic aspects dictated some observations. The existence of some quality deficiencies in military family housing are recognized by all concerned — the Services, the Department of Defense, and the Congress, as well as the military occupant. This awareness of quality deficiencies is evidenced in part of the several service-conducted studies, and in continuous DOD efforts to improve quality standards, working closely with other government agencies. The awareness of Congress is evidenced in comments made during recent hearings on housing appropriations. There appear to be three primary causes for quality deficiencies in military housing for eligible personnel. These causes are: 1) Cost limitations; 2) Space-bedroom limitations; and 3) Inadequate long-range installation planning.

The first and major cause of deficiency appears to be cost limitations, which were initially unrealistic in some areas and which have not been updated for several years. As a result, the services have to sacrifice quality in order to stay within these cost limitations. The cutting of corners resulted in certain deficiencies. Some of these might be construed to be housing constructed of poor material, increasing the need for future maintenance; town houses and row houses built on installations where the land availability and local architecture dictated the construction of

single homes and duplexes; units stacked together to save utilities and land costs without adequate provision for privacy, parking areas, play areas, open recreation areas, or sidewalks; and units built with minimum site improvements, causing drainage and other geographical problems.

DOD has taken some actions to prevent such quality deficiencies in the future. These actions include the recommendation for approving changes in the maximum average costs from $17,500 per unit to $19,500 per unit within each department. In addition, the new legislation does not include cost of the 5-foot line within the cost ceiling, nor cost ceilings by grade, as did the previous limitations. Further, DOD assured the House Sub-Committee on Military Construction Appropriation that quality would not be compromised in the future.

Unfortunately, the raising of cost ceilings per unit has not eliminated the possibility of quality control problems in the future. There are indications from contract negotiations on some housing projects that the $19,500 ceiling may already be too low, and no provision is made for adjusting the ceilings as construction costs increase. Very shortly, the services may be in the same position they were with the $17,500 ceiling. Either quality corners must be cut or construction must be delayed while authorization to exceed the ceiling is requested from Congress. During this consideration, the construction costs will be increasing and the services will be faced with the same dilemma. Until such time as the present system of attempting to build within cost ceilings which become insufficient shortly after being imposed, is changed, the cost sales will continue to be the major cause of qualitative deficiencies.

The second major cause of qualitative deficiency is the space-bedroom limitations. First, the serviceman requiring more than four bedrooms must now look to the community for housing, unless he is assigned to an installation which has an older model five-bedroom house. Five-bedroom houses are not now authorized nor are they being constructed. Second, as stated by a former DCSPER of one of the services, "It is indeed difficult to find houses built in civilian communities today which lack a spare room, or a den, or a rumpus room. It is equally difficult to find government housing which has them." A guest, family, or recreation room should be added; this should represent low cost in comparison to the value, comfort, and flexibility enjoyed by the military family. Third,

current authorizations make no special provisions for senior enlisted grades. Most installations attempt to provide better accommodations for senior enlisted men by assigning them to enlisted quarters having the best facilities. However, it is time that the senior enlisted personnel receive due consideration in legislation and DOD regulations governing their family housing.

Finally, the current net floor area limitations have resulted in some rooms being too small for the purposes intended. As one occupant stated after looking over the size of rooms and closets, "These quarters had to be designed by a bachelor." To alleviate the space-bedroom limitation problem, the following actions appear warranted and should receive consideration: the present guidelines for construction of public quarters and the determination of adequacy based on bedroom requirements should be re-considered as primary recommendations to provide a home to an individual of comparable size and quality as would be occupied in the community by a civilian in a comparable salary and responsibility status. The study group considered these comparisons and other housing data and developed a recommended net minimum floor area generally commensurate with current maximum limits and slightly below those of civilian town houses.

In the study, a chart is included which shows 2,100 square feet for a general (4 bedrooms); 1,750 square feet for a colonel's single quarters (5 bedrooms); 1,550 square feet for a lieutenant colonel's single quarters (3 bedrooms); 1,450 square feet for a major's (W-4) single quarters (3 bedrooms); 1,150 square feet for a company-grade warrant officer's duplex (2 bedrooms); 1,120 square feet for E-7, E-8, and E-9 senior enlisted personnel (2 bedrooms); 1,080 square feet for E-6's, E-5's, and E-4's with 6 or more years' active-duty commitment (four-plex, 2 bedrooms). Of course, the number of bedrooms in each instance would be controlled by the number of dependents. For example, if besides husband and wife, there are two of one sex and two of the other, at least one of whom is over 6 years old, there is a requirement for three bedrooms. If in such a situation, none is over 6 years old, this would also require three bedrooms. If one dependent is over 6 years old and the other two are of opposite sex, there is a requirement for 4 bedrooms; four more dependents would require 5 bedrooms. There is consideration

given in the study that all of the bedrooms be of sizes larger than those now authorized, commensurate with the recommendation that there be an increase in overall minimum floor space.

The third major cause of quality deficiencies has been the lack of long-range plans regarding family housing at military installations. The policy of depending on the civilian community to fill housing needs has resulted in the construction of military housing filling a small percentage of the actual needs. The lay-out of military housing at most installations, therefore, gives the appearance of inadequate site plans. The current trend in civilian housing is that of the community concept, where developers set aside land for shopping centers, recreational areas, and schools in their master plans. Legally, a similar concept should be adopted in planning future construction for military housing. A related matter on the determination of qualitative requirements is the method prescribed by the DOD for determining the units by the number of bedrooms required at an installation. DOD instruction states that installation experience factors, not service-wide experience factors, will be used. The appropriateness of this procedure is questionable, since the housing is seldom built for the current population at an installation and the services cannot base all their personnel assignments on the number and ages of dependents. Installation experience factors are only as valid as their relationship to service-wide experience factors. Admittedly, the use of service-wide factors would not preclude future imbalances of requirements vs. assets at individual installations, but at least use of service-wide factors would be logical and would simplify the determination of requirements procedures.

In view of these considerations, it is recommended in the study that a DOD interservice committee be formed to more fully review the qualitative standards of military housing. Pending the establishment of such a committee, consideration should be given to proposals including legislation as required to increase the net minimum floor area as suggested, eliminate the housing-unit cost ceilings or provide for automatic increases in accordance with a specified cost index, and change the enlisted category in the current legislation to NCO and senior NCO categories for suitability criteria as relates to maximum allowable housing cost and location.

Under the present procedure relating to determination of the

adequacy of community assets, the allowable housing cost exceeds the basic allowance for quarters for various grades from $5 to $30 with a mean of approximately $23. In addition to the obvious inequity of the maximum allowable housing cost between some grades, there are other disadvantages affecting all concerned personnel. By permitting personnel living off post to pay an average of $23 additional housing cost before declaring a home to be inadequate, the DOD is subjecting this group, in effect, to a lower standard of living than it is their counterparts who are residing on an installation in adequate government quarters. The question of how much above the current BAQ should be the acceptable housing cost appears to beg the question of how much inequitable treatment will be accorded this group. The basic allowance for quarters has been established by Congress to provide, in part, money to service members for housing costs when government quarters are not furnished. Since the BAQ figures are assumed to be acceptable to Congress, they should be considered a fair and equitable figure to peg housing costs. Housing costs that exceed the established BAQ should be categorized as non-acceptable costs to the service members. By such a policy, discrimination against a segment of the military population would be eliminated and suitable housing assets would be better defined in terms of actual costs. The study, therefore, makes such a recommendation.

Existing policy states that the community support units must be located within reasonable distance from the installation to prevent imposition of a hazard or hardship on military personnel. The existing critera establish a maximum of one-hour commuting time during rush hours. Using this maximum, military personnel would spend 10 hours a week commuting during a 3-year tour, a total of 60 days or 1,440 hours in his automobile going to and from work. This is equal to 36 work weeks or 70% of a work year, which appears unreasonable. Accordingly, it is recommended that the authorized travel time be reduced by 30 minutes. The right of each individual service member to reside in the community wherever he may desire is recognized; however, the final determination of his housing as a military asset should be evaluated against acceptable and uniform standards, not necessarily in conformance with the occupant's personal evaluation

The individual living in off-post rental housing can be assumed

competent in describing his home in terms of space, location, and other elements or criteria now used to determine the adequacy of on-post housing. A qualified individual reviewing this survey completed by an off-post respondent can accurately assess whether the particular quarters are adequate or inadequate. Space criteria standards should be used in this analysis along with other DOD-established qualitative criteria. In this manner, a more adequate inventory can be made of actual assets in the civilian community. Present substandard assets could be reduced or eliminated. It is true that some military personnel choose to live in substandard off-post quarters. In the majority of these cases, the family budget rather than the personal desire of the individuals concerned is the controlling factor. The effect is that we are reporting a higher percentage of our personnel as adequately housed, when in reality they are not, and it gives the appearance that our personnel are living better than they are actually living in real life.

By reporting the actual percentage of our personnel who are inadequately housed we will: 1) eliminate inadequate assets from our inventory; 2) provide a realistic picture of the housing situation of our personnel; and 3) provide additional support for better pay.

The administrative procedures involved in the conduct of the annual housing surveys currently required are complex and expensive in terms of manpower utilization. Some reduction in the complexities and costs of these procedures should be made. We have made some recommendations in this regard. In developing this portion of the study, particular consideration was given to the critical analysis of current DOD procedures made by the General Accounting Office and the Battelle Memorial Institute. Each of these studies concluded that the procedures are unnecessarily complex and costly. The requirement to administer a family housing questionnaire to the head of every family occupying on-post quarters and to receive responses from at least 85% of others in each major personnel category, appears excessive and unnecessary to maintain an acceptable degree of housing information accuracy. Information regarding on-post quarters is readily available from post records, and further information from their occupants does not appear needed. Accordingly, this group should not be required to fill out a family housing questionnaire. The administration of the questionnaire among a scientifically designed

sample of the heads of military families residing off post would provide information which could be applied to the entire off-post family housing group with a high degree of accuracy and at substantially less cost and disruption of command.

Today's basic allowance for quarters ranges from $105 for the E-4 with over 4 years' service to $201 for generals with dependents; and from $70.20 to $160.20 for the same grades without dependents. These rates were effective as of 1 January 1963, based on housing cost data obtained in 1960; thus, the rates are eight years old. Assuming housing cost and BAQ were the same in 1960, steady increases in housing expenses within the continental U. S. have made current BAQ rates inadequate to provide suitable family housing for eligible members living on the economy.

The escalation of housing expenses, while following general trends in the American economy, applies unevenly across the U. S. This results in the greatest financial hardship for military members who must compete for adequate housing in metropolitan areas or areas heavily impacted with military personnel. A joint service study sponsored by the Department of the Air Force was concluded in 1967. This study resulted in a proposal to authorize payment of a supplemental allowance for quarters in the U. S. This proposal is not new, and it would essentially retain present BAQ rates as a base and then add on a supplemental allowance based on actual expenses by locality. Such a variable allowance would allow eligible members to secure adequate housing comparable to their civilian peers regardless of location. This proposal proved far less costly than increasing BAQ rates across the board using FHA medium figures, as proposed at one time by former Secretary McNamara, and no more costly than increasing BAQ rates across the board using the consumer price indexes as proposed at another time by Secretary McNamara. In addition to providing an attractive cost factor, the variable housing allowance would only put money in the pockets of those in need, and then in just that amount required to bring the members' housing standard up to that enjoyed by their peers in a particular locality. It is considered that the variable housing allowance would be more feasible, more economical, than either constructing government units or leasing them. The impact of the report of the First Quadrennial Review of Military Compensation

(Hubbell Pay Proposal) on family housing, must naturally be considered; this study does not fully pursue this subject. It is apparent, however, that inequities of housing cost between areas with low and high cost of living rates cannot be resolved any better by the "straight salary" approach than it can by the current standard BAQ method.

Finally, the staff management concept for family housing. The staff responsibility for family housing matters varies slightly among the services; however, some aspects of centralized control are generally followed or are being developed in each service. There can be no question that centralized control of this important function is both necessary and desirable. It should be noted, however, that the centralized purpose-oriented management concept in family housing was initially recommended by the DOD Advisory Panel on Military Family Housing Policy and Practices. In a report dated 15 November 1961, the advisory panel stated that the Secretary of Defense established the Office of the Deputy Assistant Secretary of Defense (Family Housing) within the Office of the Assistant Secretary of Defense (Installations and Logistics) to provide closely integrated control, direction, and administration of the Department of Defense Family Housing Program. This office should function in accordance with policy guidelines established by the various Assistant Secretaries of Defense and their functional areas of responsibility. In the later implementation, the centralized purpose-oriented concept of family housing management in the specialized staff areas of the manpower and personnel chiefs at OSD and the service departments was in fact absorbed by the logisticians. At best, the personnel chiefs have now been relegated to a coordination role; this, notwithstanding the fact that they maintain a primary interest in the assignment and utilization policies and procedures. Accordingly, it is recommended that a defined policy sphere of responsibility be identified and sent to the manpower personnel chiefs specifically in the areas of family housing assignment and eligibility for both policies and procedures. The policies would be developed by the manpower personnel chiefs and implemented by installations and logistics operators through the family housing management system. Exceptions to policies or requirements for new policies would be referred to the manpower personnel chiefs by installation and logistics agencies. Such a management system would preserve the

advantages of the centralized family housing management system, while gaining the additional advantage of drawing upon the wealth of experience and expertise of the personnel administrators at all levels.

This, then, is the heart of the study that has been prepared from a personnel viewpoint. As I mentioned earlier, this study has not yet been transmitted to the Deputy Secretary of Defense; and the Assistant Secretary of Defense (Manpower and Reserve Affairs) has yet to look it over. As I also mentioned earlier, many of the proposals that I have suggested may very well not be in accord with the thinking of the logisticians. I do, however, appreciate the opportunity of presenting them in this article.

SECTION II

ANNUAL ESSAY CONTEST SPONSORED BY THE FUND FOR THE ADVANCEMENT OF MANAGEMENT IN THE ARMED FORCES

The Fund for the Advancement of Management in the Armed Forces is a nonappropriated fund activity at the U. S. Army Management School. It was formed in 1967 to conduct an annual essay contest to promote the advancement of management in the Armed Forces by encouraging military and civilian members of the Department of Defense to conduct research and write on the areas of general and functional management.

The Fund is managed by a council of five members elected by and from among active members of the Fund, in accordance with the constitution of the Fund, as approved by the Commanding General of the U. S. Army Engineer Center and Fort Belvoir. Membership is open to all commissioned officers and civilian personnel (GS-11 and above) assigned to the U. S. Army Management School.

The council is authorized to accept grants and donations, including but not limited to, donations from individuals attending courses presented by the U. S. Army Management School, within the limitations prescribed by applicable regulations. All funds received, less minor administrative expenditures, are expended in the form of cash awards to winners of the contest.

The contest is open to military (reserve, active duty, or retired status) and civilian members of the Army, Navy, Air Force, and Marine Corps except personnel assigned or attached to the U. S. Army Management School.

In the initial contest held in 1968, 10 prizes were awarded for the best essays submitted. The winner of First Place received $200; winner of Second Place received $150; and winner of Third Place received $75. The seven next best essays were awarded prizes of $25 each.

Essays are judged on the basis of originality in research and writing and the extent to which they make a worthwhile contribution to the advancement of management in the Armed Forces. Each essay is submitted under a nom-de-plume, with the real name and address of the competitor inclosed in a sealed envelope bearing the nom-de-plume on the outside, the envelope to be opened only after all essays have been judged.

Plans are now being developed for the 1969 contest. It is anticipated that submissions will closely parallel those for 1968, i.e., entries must bear a post mark of not later than 30 September, with winners to be announced not later than 31 December 1969. Additional information can be obtained by writing to the Fund for the Advancement of Management in the Armed Forces, U. S. Army Management School, Fort Belvoir, Virginia 22060.

Mr. Claytor W. Allred, GS-13, began his Civil Service career at Tooele Army Depot in 1942. His career has been interrupted only once — by his military service during World War II. He received his B.S. degree in Speech and Education and his M.S. in Education (Psychology) from Utah State University.

(This article was submitted to the Fund for the Advancement of Management in the Armed Forces and was selected as one of the winning essays.)

Mr. Claytor W. Allred, left, holds the letter notifying him that he has been judged one of the winners in the 1968 essay contest sponsored by the Fund for the Advancement of Management in the Armed Forces. With him are Col. O'Neal (center) and Mr. Mooberry, Commander and Comptroller, respectively of Tooele Army Depot.

MR. CLAYTOR W. ALLRED
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The Army Authorization Documents System calls for the creation, approval, and maintenance of tables of distribution and allowances (TDA) prescribing the organizational structure and the manpower and equipment requirements and authorizations to perform specific support missions in noncombat elements. The objective is to insure that within manpower, equipment, and budgetary constraints, Army elements are organized and maintained in the best possible posture to execute their assigned missions. The system recognizes that a continuous refinement of current and projected requirements and authorizations of manpower and equipment is essential in a dynamic activity, but also recognizes that control is necessary.

This discussion will be limited to the accomplishment of the details of those changes (MTDA) to TDA's involving reorganization. More particularly, it will be concerned with the work necessary to accomplish the unit organizational structure on the detailed TDA in paragraph and line detail. This involves a determination of need and justification for changes

A CASE FOR COMBINATION

in organization, numbers of personnel, and/or titles and grades of personnel. Normally these three aspects of the TDA are studied by personnel from three different elements, Management Engineering, Manpower Management, and Civilian Personnel. Therein lies the reason for this discussion.

Traditionally in the Department of the Army, position classification has been a Civilian Personnel Office function. For many years manpower management and organizational and functional reviews were both functions of the Management Engineering Division. However, in recent years the manpower management function has been separated and enlarged into a Manpower Management Office in most installations and activities. The net result is that the Management Engineering Division studies the organization and functions of an element, the Manpower Management Office studies its staffing, and the Civilian Personnel Office classifies the positions involved. While most of the resulting determinations may be implemented locally, some of them must be referred to a higher command for provisional approval before they are implemented. All of them are subject to post audit and final approval by the Department of the Army.

This means that each element has to be studied by three different persons or groups for three different purposes, all of which must be integrated into the TDA. At this depot we have tried to approach this situation on a systematic basis. Going on the grounds that each position must be reviewed during each fiscal year, we have developed an integrated schedule keyed to a position classification audit of each element. Thus the cycle of organizational and functional reviews performed by the Management Engineering Division begins in April for the coming fiscal year. In most cases the manpower study performed by the Manpower Management Office is conducted about two to three months later, and the position classification audit is conducted about a month after the manpower study. The last group of position classification audits of regular elements is scheduled to begin in May, so that they may be completed during the fiscal year.

The team concept is used throughout these studies to attempt to resolve any controversies before any and all of them are submitted for

final approval. In addition to the three parties mentioned above, the team consists of the manager involved in each case, and a personnel management assistant, to assure that employee-management aspects are considered properly and adequately. For the more routine situations this plan and schedule has worked very well. However, in those cases where the organization had to be submitted to higher authority for prior approval, it has not always been possible to maintain the schedule. This situation resulted from two things. First, in order to make a complete submission, it was necessary for all elements to participate in formulating the presentation, even though in the normal course of events the studies of the latter two elements involved were not scheduled until later. In actual fact, they could only make their portions of the study on a tentative basis pending final approval of the proposed organizational change.

The second thing which sometimes upset the schedule was that in some cases, the approval was not forthcoming for several months or, in a few extreme cases, was never received at all. Recent changes which eliminated the necessity of submitting all requests to higher authorities for approval and the actions involved in their processing of them, have done away with most of the problems which once existed in this area.

Another factor which interfered with the planned schedule was that unscheduled changes kept popping up. In our original plan we recognized that there would be instances of this and tried to build some flexibility into the system to allow for them. We knew from past experience that higher authority would mandate some changes, that new regulations or changes in missions or workload would require others, and that the commander might desire still others. However, we placed a control valve on such requests by saying that no action would be taken on unscheduled requests unless the commander so directed. Even in these cases we still had the opportunity to change the schedule for the element being studied so that, in effect, the unplanned study could be considered as the scheduled study.

At any rate, for the first time we were in a position to complete studies of all elements for all purposes during a fiscal year. Each of the three organizations concerned was able to contribute its particular talents to a team effort which resulted in more satisfactory organization, staffing, and classification than we had had previously. However, as well as this

arrangement has been working, it still leaves much to be desired. Try though we may, we have not been able to tie up all the loose ends completely, nor to hold to the schedule as closely as we would like.

The prime reason for this is that three staff elements must be involved, each for its own separate purpose. Regardless of how well these people work together or how hard they try to coordinate their efforts, the fact still remains that the manager concerned must work with three different elements before the study of his element is completed. Sometimes this involves backtracking so that people from the staff elements are studying him in one way or another for a good portion of the year.

Having lived with this situation for over 16 years, responsible for one or more aspects of it, and closely acquainted with the other aspects, I have come to the conclusion that there must be a better way. I think there is a strong case for combination of these functions. So why don't we do it? The best answer I seem to be able to get to that question is that decisions have been made to do it the way it is being done. However, I think the involved managers at all levels should take another good look at the setup. After all, one of our prime responsibilities as managers is to figure out ways of getting the job done better, quicker, cheaper, and easier.

One obvious approach to the problem which would result in all of these things is to combine the three staff elements into one. Call it what you may, place it wherever it is most appropriate, but let this one element perform all of the functions now being performed by three elements. Aside from the benefits to be derived from accelerating the study schedule and interfering less with the operations, this combination should result in a need for fewer study analysis. It is true that the new breed of analyst required for this job probably would not fit into any existing Civil Service series, but, after all, that is why series are created — to describe jobs.

The part of this proposal which upsets most people is that of pulling position classifications out of the Civilian Personnel Office. After all, "it has always been there." Looking at it objectively, though, the Civilian Personnel Office's prime concern lies with "people problems." If the

Civilian Personnel Officer could concentrate on serving people and their problems, he should be able to enhance and strengthen his program. This is exceedingly important in a time of growing union problems. With the "position function" becoming more and more allied with the TDA, the CPO is no longer in a position to exercise complete control over his function as he has in the past.

This concept of placing these three functions under one element is not entirely new or unique. Aside from my own experiences, I will admit to have been swayed by various studies and articles relative to the placement of these functions in business and industry. Some concepts go even further and include standards in this element. Frequently the element is called industrial engineering. Such a setup envisions determining what work is to be done, what kind of an organization is needed, what functions are involved, what the workload will be, how long it takes to accomplish a work unit, how many people it takes to accomplish the planned workload, and how much they should be paid. However, after considering all of these possibilities carefully, I think it would be best to combine only the elements I have been discussing.

This means that one person (or a group in the case of large or complex elements) normally would make only one study of an element during any one fiscal year to determine and obtain approval of its organization and functions, its staffing, and the classifications of its jobs. This person could become intimately acquainted with the elements to which he was assigned, could process all the paperwork involved, and could serve as a focal point for any subsequent discussions or problems which might arise on what had been done. So that he would not tend to stagnate in any one assignment or to become prejudiced in any one direction, he could be rotated among elements from year to year. In this way he would gain a well-rounded knowledge of the installation or activity.

Because there is such a wide variation in the size of Army installations and activities, the size of the staffs of the elements concerned varies greatly. However, I believe that, regardless of the number of people involved, this combination will result in a saving of personnel space. As I have stated previously, it will also benefit the managers by causing less disruption of their operations and far less time when a study is made. Differences of opinions among the three types of analysts would

be eliminated, and the manager could call on one person to help with his organization and staffing problems.

One of the prime reasons why some people do not subscribe to this plan is that they think it will place too much power in the hands of one person representing one element. One view of the present concept is that it provides independent checks and balances designed to protect individual employees and to give managers several independent sources of technical advice. The thing which this viewpoint fails to reckon with is that each of these independent sources can be concerned only with those functions for which it is responsible. We recognize that there is an interrelationship which we try to provide for in exercising our team concept, but, in the final analysis, each staff element concerned must stay pretty close to its own area of functional responsibility.

Consider, then, an analyst trained to be familiar with all three aspects of this situation. Such a person could study an operation once with all aspects in mind, could discuss them with the personnel management assistant and the manager, and could present one complete package for review and approval. The checks and balances would still exist, because, besides the manager of the element concerned, there would still be the manager over him and the commander who would be in a position to review and concur with or approve the final results. Thus, the combined analyst would be in a position to provide maximum service but would not be the only or final authority on the results. Granted, there will be differences of opinion and decisions still will have to be made to resolve controversial issues. However, it has been established that the more people there are involved in any one communications situation, the more complex the interrelationships may become, and the more possibilities there are for differences of opinion. This proposal would reduce this probability significantly.

This proposal is intended to cover the situation at installations and activities only. It is not intended that it apply to the elements responsible for these functions at higher levels of command. This proposal covers operational aspects of the problem and not higher authority management of the systems and programs involved. Depending on the number of personnel and the number of organizational elements involved at any

one installation or activity, the strength and organization required for the performance of this combined function would vary greatly. In smaller activities, only a few people would need to be assigned. In very large activities, the organization might involve several branches, probably established on the basis of the organizational elements which they served. Again, while it would be desirable to have each analyst become an expert in his assigned area of study, it would be desirable also to rotate the analysts periodically to broaden their knowledge and experience as well as give new experience and thinking to the managers concerned.

The question then arises as to where this new element should be located organizationally. Again, that depends a lot on the size of the element. If it were small, it could be set up as a branch in one of the existing elements. It could be created as a division under the senior manager responsible for personnel, administrative, or comptrollership activities. If it were large enough it might even be considered as a separate directorate or element under a separate senior manager. In any event, it should be so located and organized as to be in a position to make independent studies and recommendations (subject to the concurrences and approvals mentioned above). It should not be in a position where personnel with other interests can influence or direct its findings and recommendations in other than factual and regulatory directives. Thus, regardless of how this element is organized or where it is located, it should be able to operate as independently as possible so that it theoretically can make unbiased recommendations. Such an element would provide one point of contact with higher authority agencies for the activities concerned.

If the TDA is to be maintained on a current status during this dynamic period in which we are operating, it is imperative that the organizations and people responsible for the various functions involved be as closely coordinated as possible. I believe the best solution to this is to place them in one organizational element with that prime function in mind. I believe this will result in the improved creation and maintenance of TDA's; better and more timely MTDA's; the more timely accomplishment of organizational and functional reviews, manpower surveys, and position classification audits, with less disruption of operations; establishment of a uniform contact for all personnel and elements involved in

any way with TDA's; and, very probably, the capability of any installation or activity to perform these functions and provide these services with fewer personnel than are being used for this purpose now.

This is my case for combination. It does represent a departure from the current concept and arrangement. However, management improvement is concerned with finding and trying new or improved ways of doing business. I think this combination is worth trying. Who wants to be the first to try it?■

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Mr. John P. Mendez, left, one of the winners in the 1968 essay contest of the Fund for the Advancement of Management in the Armed Forces, is presented with a check by Col. David B. Conard, Deputy Commanding Officer of the U. S. Army Topographic Command.

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From Frederick W. Taylor's first approaches to scientific management methods to the most recent developments in decision-making models and heuristic analysis, management has been bombarded with countless inventive concepts for improving operational efficiency. In fact, it is becoming increasingly difficult to pick up a management journal without seeing an article expounding phenomenal results from the application of some new concept. From this literature a general tendency regarding this application is evident. Each, originally conceived to combat the rising costs of a particular area of industrial endeavor, and proven successful within this intended confinement, is propagated as a new and radically different approach to reduce costs in all areas. Perhaps the best example of this hypothesis, and the subject of this study, is value engineering.(1)

This concept was originally developed by Laurence D. Miles as a purchasing technique to systematically reduce production costs by identifying the basic functions of product components and seeking substitutes to perform these functions at lower costs. Mr. Miles first defined the value engineering concept as "a philosophy implemented by the use of a specific set of techniques, a body of knowledge, and a group of learned skills. It is an organized creative approach which has for its purpose the efficient identification of unnecessary cost, i.e., cost which provides neither quality nor use nor life nor appearance nor customer features."(2) Although his clarification of cost appears to be directed at hardware, and all of the case examples in his book *Techniques of Value Analysis and Engineering* are hardware applications, he makes no attempt to establish this as a limiting criterion. Nor does he illustrate how value

VALUE ENGINEERING—AN EVALUATION

engineering can be applied to other cost areas. In essence, the possibility of extended application is left as a gray area, with the only concern being hardware.

A more precise definition was attempted when the concept was initiated in the Department of Defense. DOD Handbook H-111 defines value engineering as "an organized effort directed at analyzing the functions of defense hardware with the purpose of achieving the required function at the lowest overall cost."(3) However, the narrative following this definition indicates that it is more of a guide for the application of value engineering than a definition of a concept. It is made clear that value engineering could be practiced in areas other than hardware, but, considering potential savings and available resources, it would not be economical to make this extension.

When funneled into the Army Cost Reduction Program, value engineering received a more elaborate definition. Here, it is considered as "a systematic effort directed at analyzing the function of systems, equipment, facilities, procedures, methods, and supplies for the purpose of achieving the necessary function at the lowest overall cost."(4) This definition makes no restrictions; in fact, it advocates the entire range of organizational application.

Certainly the transition in the definition of value engineering, from a problem-solving approach for reducing the cost of hardware to an all-inclusive process for cost reduction, exemplifies the apparently inevitable trend of expanding applicability. Thus, it is not surprising to find today's management literature pushing the application of value engineering into all areas of industrial endeavor, from physical processes, systems, procedures, and methods to manpower requirements and management practices.(5)

This transition is subtle, almost evolutionary, and apparently correlated to the fundamentals of human behavior; but, more important, it establishes a new perspective upon which to evaluate a concept's contributions to the study of management. The point is that the merit of a concept is normally measured in terms of the savings realized in its individual applications,(6) and not by its particular philosophy in comparison to the management process theories. It is said that value engineering "must be recognized as a new, complementary concept

added to our scientific management common body of knowledge."(7) If this is true and value engineering is philosophically unique, founded on original postulates which are universal in management practice, then the trend of expanding application is a valid and desirable result.

The elimination of unnecessary cost is generally acknowledged in definition as the purpose of value engineering. This is accomplished by identifying cost areas, conducting studies which define and weigh various alternatives, and concluding with recommendations as to specific courses of action. Although the proponents of value engineering literature are careful to stipulate that it is not a decision-making function, it obviously has most of the ingredients of a rational decision-making process. Edward Litchfield states that decision-making "in its rational deliberative, discretionary, and purposive form . . . is performed by means of the following sub-activities:

A. Definition of the issue
B. Analysis of the existing situation
C. Calculation and delineation of alternatives
D. Deliberation
E. Choice"(8)

A value engineering study includes all but the final sub-activity, choice, which encompasses the authority necessary for making the decision. It is hopeful that a value engineering study and choice are cause-effect relations; that is, the study dictates the choice with no further deliberation required. In this respect, value engineering is in the category of many other concepts which seek to reduce irrationality and nonrationality to negligible factors. Work simplification, operations research, management engineering, and work design, to name a few, are also centered about more precise ways of describing choices confronting management. Therefore, to recognize value engineering as an original and refined additive to the management theories, there must be a delimitation with respect to these other concepts.

Operations research has been defined as "the application of scientific methods, techniques, and tools to problems involving the operations of a system so as to provide those in control of the system with optimum solutions to the problems."(9) Since an organization is considered to be a system, (10) and the latest definition of value engineering includes

analyzing the functions of systems, there appears to be no difference in the scope of application of these two concepts. By definition, they can be applied to any area of organizational activity. This is expected, as it merely reflects the hypothesis of expanding application. Accordingly, work simplification, defined as an "organized application of common sense to finding better and easier ways of doing work,"(11) places no limits on application.

After selection of the problem, the methodology of value engineering advocates a "systematic effort" directed along a five-phase approach: informative; speculative; analytical; planning and execution; and, presentation.(12) When distilled to basic logic, this is nothing more than a restatement of the sub-activities defined in the rational decision-making process. "Informative" is the analyzing of the existing situation; "speculative" and "analytical" are the calculation and delineation of alternatives; "planning and execution" is deliberation; and, "presentation" replaces the choice. The same similarities are present in the descriptive approaches of work simplification (select the job, record the job details, analyze the job details, develop the improvements, and install the new method) and operations research (define the problem, select the required facts, generate and analyze the data by constructing a model and varying the input, identify the optimum solutions, and recommend actions). The selection of adjectives and semantical terms should not obscure the inherent characteristics of the traditional problem-solving methodology. These approaches are only phraseological alliterations of the fundamental process of ratiocination. More than fifty years ago John Dewey stated it simply as "what is the problem, what are the alternatives, and which alternative is best."(13)

Several disciplines are advanced within the framework of value engineering methodology. One of these, brainstorming, is significant in the "speculative phase." The Army Cost Reduction Program (AR 11-20) states that "no cost reduction action can be labeled value engineering unless the action includes . . . brainstorming to determine what else will do the job." This technique attempts to overcome the familiar mental blocks in creative problem-solving by approaching a problem from all possible angles. It is an extension of heuristical theory, which is neither restricted to nor intended to be limited to value engineering. The fact

that value engineering has adopted brainstorming does not imply a unique quality. Any intelligent and rational analyst is similarly disciplined when seeking solutions to a problem. This discipline is observed by the study of heuristics, and can be traced back to the Greek mathematician Pappus. Heuristical literature, in attempting to understand the process of problem-solving, defines the use of analogy, auxiliary, generalization, specialization, decomposition, and recomposition in relating problem areas to known factors. In reference to this, the Italian mathematician Bernard Balzano (1781-1848) said: "I do not think at all that I am able to present here any procedure of investigation that was not perceived long ago by all men of talent."(14) Neither value engineering methodology nor its adopted discipline of brainstorming invalidates this statement.

Another discipline which plays an important role in the philosophy of value engineering is "value-orientation." Four prevailing value factors are discussed in DOD Handbook H-111, of which two (use value and cost value) are used as criteria for selecting the highest-value alternative. Use value is stated in terms of operating requirements or functional characteristics. This means identifying and defining the function of the subject under study. The DOD handbook clarified this in stating that "by function is meant the purpose or objective."(15) Work simplification philosophy states that determining the purpose is the first requirement in analyzation. This is also basic to industrial engineering or any other practice of operational investigation.

Cost, the second value consideration, is stated in terms of dollars and represents the actual cost involved with the subject under study. Like use value, the consideration of cost is not original with value engineering. "Industrial engineering theory in determining total cost and developing optimum cost applied to functions or products certainly considers all of the elements associated with costs."(16) Apparently the value-orientation discipline constitutes a theoretical discussion of value properties superimposed on commonly used and accepted factors for selecting the least-cost alternative. This does not complement or supplement the practice of rational decision-making.

One final discipline, which is getting increased usage in reference to value engineering methodology, is scientific method. Value engineering

has even been defined as "a functionally oriented scientific method"(17); however, recognitions of this type have prompted some to report that, "with few exceptions, the notions of science and scientific method held by the writers are unable to withstand critical examination."(18) There is no argument to the term, which requires the collecting of data through observation and experiment and the formulation and testing of a fundamental hypothesis, but it is doubtful if value engineering accomplishes this. The application of value engineering is in solving independent problems. These solutions have never produced a fundamental hypothesis regarding management theory which has been universally tested for validity.

By reducing the methodology and inherent disciplines to their essential characteristics, the credence of value engineering philosophy as an original doctrine in management theory is revealed as a tenuous interpretation. It amounts to little more than eclecticism of currently practiced and accepted postulates. However, the conception and acceptance of value engineering, and its growth rate in the industrial community, indicate an environment not only susceptible to but in need of such a concept. This raises the question as to what value engineering has to offer which has not been offered before.

Although value engineering has been affected by the expansion of application tendency, it was originally conceived to fill a gap created by the shortcomings of an earlier concept called product design. This concept is defined as "the determination and specification of the parts of a product and their interrelationships so that they become a unified whole, satisfying all the requirements in a condition of balanced effectiveness."(19) Balanced effectiveness considers function, production, commerce, and use values in achieving a unification of design measurable by human value. Action is effective when it accomplishes a goal, and the goal of product design is a marketable item which will yield a profitable return on investment. Therefore, if a design meets its functional objective and is too advanced for production techniques, it is not effective. Likewise, if both function and production are satisfied and the product has no use value, it is not effective.

Although effectiveness is a major consideration, product design fails in the circumspection of efficiency. In this respect, an efficient action is

defined as one in which the unsought consequences are trivial. The increasing costs of materials and hardware components can no longer be considered as trivial in comparison to labor and overhead costs. Value engineering, in recognition of this, has adapted the dimension of efficiency to the analyzation of hardware. In doing so, the theories and techniques previously applied by management to decisions affecting labor and overhead costs have been incorporated to make similar decisions about hardware. This does not constitute an original philosophy, complementary to management theory; it establishes a new application for the existing principles and techniques of the rational decision-making process.

Even with the extraordinary growth rate, including the international recognition, that value engineering has enjoyed, there is a frequent complaint by those attempting to institute value engineering that management acceptance of a program is often difficult to obtain. It is indicated that "there is something wrong in the relationship between management and value engineering,"(20) but this realization is usually interpreted as a lack of understanding or cooperation on the part of management. The implied conflict is dichotomous; that management, influenced by the usual psychological reactions accompanying the threat of change, perfers the traditional or empirical judgement factors in lieu of a more exacting approach. This, no doubt, has merit; however, it must be realized that progressive management has been using formulated approaches in the areas of labor and overhead costs for years. Management was indocirinated to the methodology and associated philosophy of value engineering long before the conception of value engineering. It just wasn't being applied to hardware. Here perhaps, is the real issue confronting management acceptance. The value engineering concept is being sold as a new, original, and distinctive approach to cost reduction; an approach that can be universally applied to any area of industrial endeavor; and one that will revolutionize the art of management practice; and management receives value engineering as a rehashing of old material.

The point is that the juxtuposition of decision-making methodology and philosophical interpretations of value with value engineering has served to obscure and misconstrue its true worth, that of adding the di-

mension of efficiency to hardware analysis. This not only increases the problem of management acceptance, but also creates an additional problem concerning application. In an effort to become universally accepted, the proponents of value engineering literature have created a paradox regarding the expansion of application. The statement that one of the "misconceptions concerning the DOD value engineerng program" is that it "applies only to hardware"(21) creates a myth. Since the hardware application is the only aspect that establishes value engineering as an original entity, any divorcement from this application will result in a loss of identity. Expansion of application, therefore, is not a valid and desirable tendency.

In its rational and purposive form, decision-making represents an important aspect of entrepreneurship. It is definable in terms of not only authority and responsibility but also methodology. In this respect, decision-making is an organizational system composed of independent subsystems. These subsystems are determined by application in accordance with the formal organization, whether it is oriented by function, product, or any other structural method. To be both effective and efficient, the subsystems must not duplicate responsibility by extending application beyond the limits imposed by the intended organizational structure. Unfortunately, this is exactly what is happening with value engineering. It is organizationally located to abet the decision-making subsystem for incoming and outgoing hardware(22) and is being applied to all areas of organizational endeavor.

If value engineering is to function as an entity, a concept to augment a decision-making subsystem, it must be delineated from other similar concepts in accordance with its distinctive application — and this application is hardware. As an entity, value engineering cannot overlap other similar concepts already in practice. It must be completely independent of the application of management engineering, industrial engineering, and operations research. This means that the tendency for expanding application must be reversed; that the proponents of value engineering literature must recognize that it is not a new concept added to the scientific management common body of knowledge, and that flamboyant statements advocating its extension into other fields are detri-

mental to its efficient and effective functioning and contradictory to the only essential quality of the concept.

In summary, this study has illustrated that the value engineering philosophy and methodology amounts to little more than eclecticism of commonly accepted management principles; that the true worth of value engineering is in adapting the dimension of efficiency to hardware analysis; that the attempts to propagate value engineering as a new and original philosophy, complementary to the scientific management theories are detrimental to its acceptance and obscure its true worth; and that expansion of application beyond the limits of hardware analysis creates inefficiency and confusion in the decision-making system of an organization. This is not intended to be a pernicious discourse on value engineering but, rather, a constructive discussion of the myths and fallacies which are perpetrated in value engineering literature. John Stuart Mill once said to "accept no doctrine either from ourselves or from other people without a rigid scrutiny by negative criticism; letting no fallacy, or incoherence, or confusion of thought, step by unperceived; above all, to insist upon having the meaning of a word clearly understood before using it, and the meaning of a proposition before assenting to it; these are the lessons we learn from ancient dialecticians." If these lessons are followed, the proponents of value engineering literature must refrain from esoteric statements and become more exacting with respect to the value engineering position in management theory. This is the initial and significant step in eliminating the problem of management acceptance and in preventing duplication of responsibility in the decision-making systems of organizations.

NOTES

(1) Both L. D. Miles and the DOD consider the terms "value engineering" and "value analysis" as synonymous. This study, likewise, will make no distinction; however, the term "value engineering" will be used exclusively, as is the common practice in the DOD.

(2) Laurence D. Miles, **Techniques of Value Analysis and Engineering**, New York: McGraw-Hill Book Company, Inc., 1961, p. 1.

(3) Department of Defense Handbook H-111, Value Engineering, March 1963, p. 2.

(4) Army Regulation 11-20, Army Cost Reduction Program, July 1967, p. G1.

(5) A synopsis of all the literature advocating the extension of value engineering into other areas is not within the scope of this study. If the reader desires a brief introduction to these facets of application, the **Proceedings of the 1967 National Conference of the Society of American Value Engineers** is recommended. This is published by the Robert J. Mayer & Company of Chicago and includes the following articles: "A Value Engineering System and Process Analysis," "VA-Functional Ideal System Technique," "Value Analysis of Management Practices," "The Neglected Value Engineering Application: Data Processing," and "Value Analysis Looks at Software."

(6) For an example of this type of measurement see "Yardstick for Value Engineering" in the **Proceedings of the 1966 National Convention of the Society of American Value Engineers.**

(7) Chris Rand, "Value Analysis Objectives and Development Programs in Selected Scandinavian Industries," **SAVE Proceedings**, Volume II (1967), p. 202.

(8) Edward H. Litchfield, "Notes on a General Theory of Administration," **Administrative Science Quarterly**, Vol. I, No. 1, June 1956, p. 6.

(9) Maurice F. Ronayne, "Operations Research: A Keystone," **Systems & Procedures**, Vol. II, No. 3, Issue 43, September 1960, p. 23.

(10) Although the interpretation of organizations as systems has recently been getting increased attention, Chester Barnard in his book **Functions of the Executive**, was one of the first to make this recognition. He defined a formal organization as "a system of consciously coordinated activities or forces."

(11) Department of the Army Pamphlet 1-52, **Techniques of Work Simplification**, December, 1967, p. 3.

(12) **Value Engineer Officer's Operational Guide**, EP 11-1-3, November 1967.

(13) John Dewey, **How We Think**, New York: D. C. Heath & Company, 1910, Chapter 8.

(14) G. Polya, **How to Solve It**, New York: Doubleday Anchor Books, Doubleday & Company, Inc., 1957, p. 58

(15) **Handbook H-111**, p. 6.

(16) A. R. Pennell, "The Second Effort," **SAVE Proceedings,** Vol. ..., 1967, p. 41.

(17) Carlos Fallon, "The All-Important Definition," American Management Association, Series Number 81, 1964, p. 9.

(18) Dwight Waldo, **The Administrative State,** Ronald Press, 1948, p. 15.

(19) Richard Felver, "Product Design," **Industrial Engineering Handbook,** New York: McGraw-Hill Book Company, Inc., 1956, p. 7-122.

(20) Lech Czerwinski, "Value Engineering-Management: Present State of Affairs," **SAVE Procedures,** Vol. I, 1966, p. 261.

(21) "Notes from the Seminar-In-Sound," **Systematic Cost-Reduction through Value Analysis,** New York: Privacasting Company, Industrial Value Service, Inc., 1964.

(22) Value engineering is generally organized as a sub-activity to purchasing and production design functions. See DOD Handbook H-111 for examples of organizational assignment.■

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