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A PROPOSAL FOR IMPLEMENTATION OF COMMERCIAL ACTIVITY
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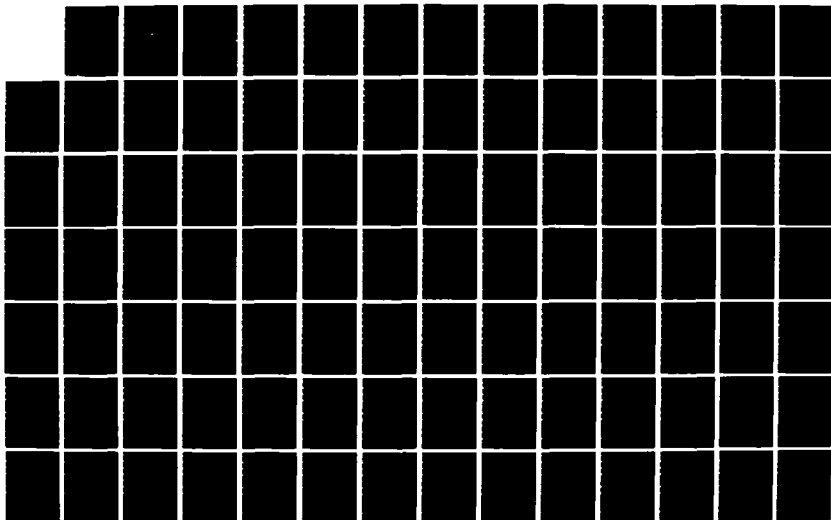
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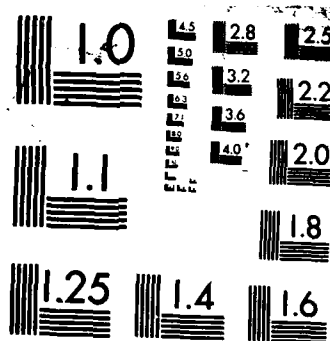
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THESIS

A PROPOSAL FOR IMPLEMENTATION OF
COMMERCIAL ACTIVITY PROGRAM IN REPUBLIC
OF KOREA : ARMY MAINTENANCE DEPOT

by

/Kim, Nak Heung

and

/Kim, Jae Soo

December 1986

Thesis Advisor

Michael G. Sovereign

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The authors believe that the implementation of a CA program in the ROK Army will improve defense budget efficiency (reduce budget requirements) and also generate additional positive effects such as improving combat supportability, increasing total combat power, contributing to national growth, and promoting civil-military relationships. Some limitations and recommendations toward implementing a CA are discussed.

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by

Kim, Nak Heung
Major, Republic of Korea Army
B.A., Korea Military Academy, Seoul, 1976

and

Kim, Jae Soo
Major, Republic of Korea Army
B.A., Korea Military Academy, Seoul, 1977

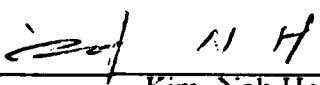
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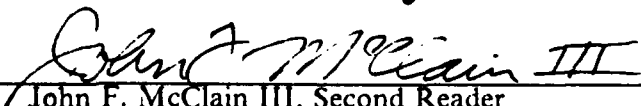
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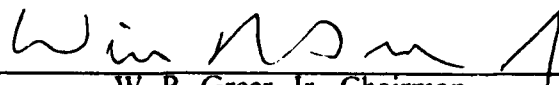

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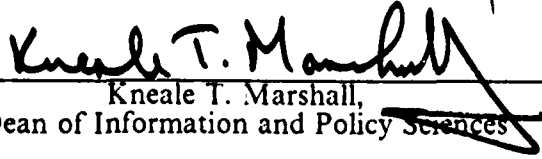

Kim, Jae Soo

Approved by:


Michael G. Sovereign, Thesis Advisor


John F. McClain III, Second Reader


W. R. Greer, Jr., Chairman,
Department of Administrative Sciences


Kneale T. Marshall,
Dean of Information and Policy Sciences



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The authors believe that the implementation of a CA program in the ROK Army will improve defense budget efficiency (reduce budget requirements) and also generate additional positive effects such as improving combat supportability, increasing total combat power, contributing to national growth, and promoting civil-military relationships. Some limitations and recommendations toward implementing a CA are discussed.

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I. INTRODUCTION

In 1955, when the Republic of Korea (ROK) was in chaos following the end of the Korean War, the U.S. set a Governmental policy which addressed competition between Government and private enterprise.

As a democratic free enterprise economic system, the U.S. understood that the private enterprise system is the primary source of national economic strength. In recognition of this principle, it has been the general policy of the U.S. Government to rely on competitive private enterprise to supply the products and services it needs. In the U.S., the Office of Management and Budget (OMB), Congress, the Department of Defense (DoD) and each of the military departments have issued directions that address Contracting-out. The bible for this issue is the OMB Circular A-76, Performance of Commercial Activities.

Within his first two months as President, President Reagan established the President's Council on Integrity and Efficiency (PCIE), whose mission is to reduce and prevent fraud, waste, and abuse. In 1984, the President's Council on Management Improvement (PCMI) was established to stimulate and oversee fundamental and lasting management improvements. [Ref. 1: pp. 6-8] In 1985, PCMI published a generic performance work statement (PWS) and quality assurance surveillance program to improve and simplify management of the A-76 cost comparison process. OMB, in cooperation with PCMI, will consider exempting certain activities from the full cost study requirement and designate them for direct conversion to contract. These could include such activities as motor vehicle maintenance, food service, janitorial service and some automated data processing service centers. [Ref. 1: p. 81]

On the other hand, the ROK military has emphasized the leadership of commanders and the soldiers' mental armament which comes from loyalty. Naturally, there has been strong competition in training tests, combat readiness inspections, and even in large scale mobile exercises which have been the most important factor of unit evaluation. Various evaluation and inspection teams were established to meet the requirements. Every military organization has invested a great deal of their resources and passions to this effort.

After the Vietnam War, the Korean military felt more needs for mental armaments. So the Troop Information and Education (TIE) service branch was founded in ROK DoD to focus on the spiritual education in 1970s.

At the standpoint of resource management, there wasn't a useful ruler or standard for the measure of performance in management, especially in regards to the financial field. For example, there wasn't an efficient way to evaluate the budget spending in terms of cost effectiveness or cost-benefit analysis, quality, timing, externalities, etc. Only through the commanding interest of leaders or soldiers' participation, has economic unit operation been emphasized without any efficient control mechanism.

As the development of the country has continued, the people's way of thinking has changed. Without appropriate systematic management skill or institution, it is impossible to command any unit effectively. In this view point, the newly introduced **Defense Resource Management System** which will be discussed in Chapter II was an inevitable requirement.

A. THESIS OBJECTIVES

The ROK Government needs to promote efficiency and economy in operating Governmental functions. In particular, Korean military organizations have neglected the efficiency issue. Recently some new policies were initiated toward efficiency.

The main purpose of this thesis is to introduce the Commercial Activity (CA) program of the U.S. and examine the possibility of success in the Korean situation. The objectives of the implementation of a CA program in ROK DoD are the following.

First, contribution to operating budget savings. Korean military spending is reaching 6% of GNP. In spite of this high proportion, the goal of **self defense** has not been accomplished. Through the implementation of a CA program it is believed that ROK military can reduce the operating budget and therefore increase capital investments.

Second, increasing combat power. A CA program could save soldiers in the non-combat field. Under the ceiling strength constraint, ROK military can increase combat power by transferring soldiers from the non-combat units to combat units. Also appropriate combat support by private enterprise could raise combat effectiveness.

Third, contribution to national growth. ROK military has used military spending only for military objectives. However, a CA program would allow Government (military) spending to boost commercial industry by providing a new source of funds.

Fourth, promotion of the civil-military relationship. The ROK military organization is currently isolated from the private sector, primarily because of national security issues. But this isolation generates more bad results than good results. Frequent interfaces through the implementation of a CA program will promote the overall relationship between military and civilian sector.

B. THESIS ORGANIZATION

Chapter II provides a brief introduction of ROK Defense Resource Management System. The status quo of the Korean defense industry will also be introduced briefly. Chapter III looks at the Commercial Activity (CA) program. This Chapter consists of the tendency of historical change, steps to contracting-out, cost comparison process, and the result of the CA program. Chapter IV notes some theoretical concepts related to this thesis such as cost concepts, decision-making criteria, cost-benefit analysis, learning curve theory, and make-or-buy decisions.

Chapter V discusses CA program implementation. For the sake of convenience, the ROK Army depot maintenance is selected to discuss the possibility and the impacts of this policy implementation. The first two sections will describe the concepts, roles, and organizational structure of ROK Army maintenance system, and identify the problems of depot maintenance. The current ROK Army depot maintenance system is not likely to support the integrated logistics system. The problems are four-fold: 1) the skewed geographical location of the depots, 2) the limited capacity of depots, 3) the characteristics of monopoly in the functional depots, and 4) the management problems caused by the job rotation program of active military managers (officers). The third section will study the impacts of CA policy implementation, and discuss the benefits and limitations from the implementation. Then the fourth section will explain and illustrate the steps for the program implementation. The fifth section will discuss suggestions about the related issues such as the draft system of military recruiting, fringe benefits, mobilization law, and contract management. The final section will summarize the chapter.

Chapter VI will present conclusions and recommendations based on Chapter V. The CA program will not only promote efficiency within the depot operation, but will

also generate many external effects on both other ROK military organizations and civilian society. These externalities could contribute to the goal of ROK : establishing an advanced welfare state.

II. REVIEWS OF REPUBLIC OF KOREA (ROK) DEFENSE RESOURCE MANAGEMENT SYSTEM

A. GENERAL

In order to provide funding for an increase in capital investment, in July 1983, Republic of Korea (ROK) President Chun issued an executive order requiring the Korean armed forces to reduce the operating expenditure in the nation's defense budget [Ref. 2: p. 3]. The objective of this order was to take initial steps toward improving defense resource management.

While the ROK economy has made excellent progress, defense spending is reaching 6% of GNP or approximately one third of the government budget. This figure is considered high by free-world standards. Despite this high level of spending, the imbalance of military power between the two Koreas remains skewed toward the North as shown Table 1 [Ref. 3: pp. 59-63].

As a means of obtaining greater defense capabilities to balance military power between South and North, the Government of ROK has taken steps to obtain greater efficiency in its use of defense funding. Promoting the efficiency of defense operating expenditures will be the best way to accomplish the objective of self-defense.

Hitch & McKean explain three ways to promote economic efficiency in the military use of resources: "better understanding of the nature of the problem, systematic quantitative analysis of military choice, and improved institutional arrangements." [Ref. 4: p. 218]

This paper focuses on the third way: institutional arrangements designed to promote economic efficiency in the military sector. Hitch & McKean proposed several methods of accomplishing this:

- Stimulating markets within the government, for example, using stock and industrial fund systems;
- Increasing reliance on the private market economy through increased use of contractors;
- Increasing the efficiency of contractors through use of a wide range of contracting methods;
- Facilitating economic calculus within the service by developing more sophisticated budgeting and accounting techniques, and by increased use of operational research groups;
- Decentralization of decision making and increased use of incentives in defense decision making.

TABLE 1
COMPARISON OF MILITARY POWER BETWEEN SOUTH AND NORTH

Contents	ROK	North Korea	Rate
* Man power			
- Regular	622,000	785,000	1 : 1.3
- Reserve Forces	5,780,000	5,170,000	1.2 : 1
* Equipment			
- Artillery	2,800	5,300	1 : 1.9
- Tank	1,200	3,200	1 : 2.7
- Armored Vehicle	800	1,200	1 : 1.5
- Submarine	-	21	
- Destroyer	20	2	
- Naval Vessels	101	537	1 : 5.3
- Bomber/Fighter	450	740	
- Transporter	61	369	
- Total Aircraft	618	1,322	1 : 2.1
* Defense spendings			
- GNP(1983)	\$ 75.3 B	\$ 14.5 B	5.2 : 1
- Defense Budget	\$ 4.34B	\$ 3.4 B	1.3 : 1
- Cumulative total Since 1970	\$ 28.53B	\$ 31.4 B	1 : 1.1

B. OVERVIEW OF THE REPUBLIC OF KOREA DEFENSE RESOURCE MANAGEMENT SYSTEM

U.S. security assistance to the ROK has played an essential role in strengthening the military capabilities of the ROK. In the past, Korea's main focus of defense management was to obtain as many resources as possible. Government policy makers didn't feel the need for advanced management systems and specialists to enhance defense productivity.

In the 1950s and 1960s, arms transfers from the U.S. were made under the Military Assistance Program (MAP); during the subsequent period of ROK Armed Forces Modernization Program (1971-1975), the military capabilities of ROK were greatly enhanced under such U.S. Military Aids Programs as MAP and the Military Assistance Service Fund (MASF).

Since the mid-1970s, U.S. security assistance policy toward ROK has undergone a tremendous change. Assumption of increased responsibility for their own defense made ROK DoD realize the need for a better and more efficient allocation of defense resources. Toward this end, the U.S.'s Planning, Programming, and Budgeting System (PPBS) was studied and introduced. Finally, the Planning, Programming, Budgeting, Execution, and Evaluation System (PPBEES) unique to ROK military needs was developed as shown in Figure 2.1 [Ref. 5: p. 86].

The concept of PPBEES is to design a bridge between the planning and programming phases and to feed back the results of performance evaluations for use in subsequent phases of planning, programming, and budgeting. Under PPBEES, increments to programs were considered in the programming phase and these increments were then translated into line item entries for the traditional budget submission. [Ref. 6: p. 91] This PPBEES system aims to develop a sound Defense Resource Management System by adding the execution and evaluation phases to the previous budget system.

On February 25, 1983, the Defense Budget Revolution Committee was established in order to make an intrinsic improvement in the defense budget system. Its main objective is to establish a rational cyclic process of planning, programming, budgeting, execution, evaluation. [Ref. 6: p. 7] The Budget Revolution Committee selected eight major functions to implement the PPBEES system. [Ref. 2: pp. 17-32]

1. Decision Making Process

a. Basic Concept

The process suggests that the national defense objectives should be translated into budgetary decisions. After identifying alternatives necessary to carry out the mission, cost-effectiveness analysis for defense related programs should be performed in order to determine the priority of alternatives within the given budget constraints.

b. Directions toward Reform

At the beginning stage, each project requires an analysis report to justify its budget request in detail; nonessential projects can thus be eliminated early. For the appropriate force-mix, first, establish the strategy concept to meet the enemy's threat and then decide the resource allocation between each force (Army, Navy, Air Force, Homeland Reserve Forces).

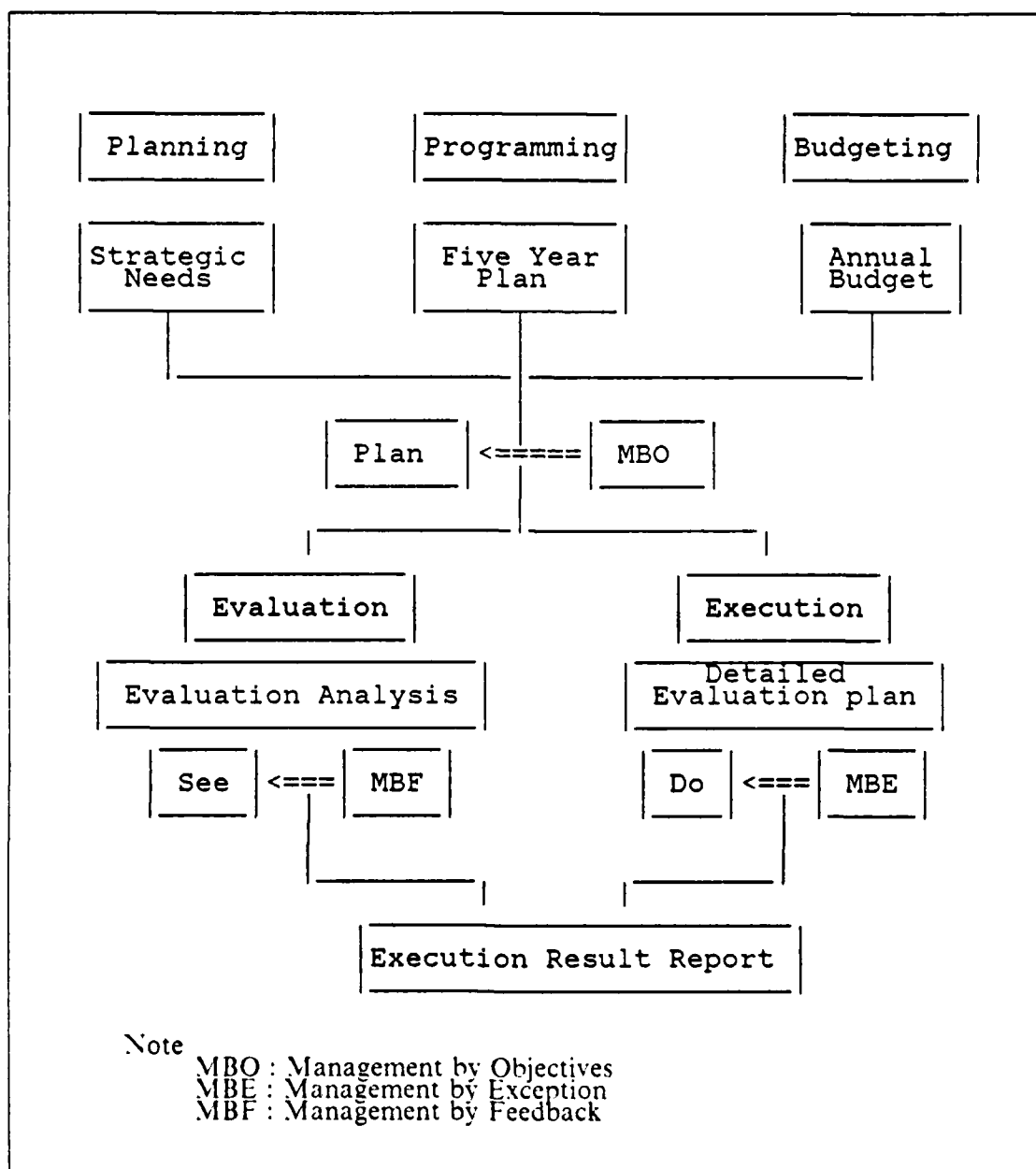


Figure 2.1 The PPBEES System.

In the past, the Korean government had focused on the process of obtaining a budget, therefore, the execution and evaluation phases were not considered in detail. There was no consistency in the management cycle of planning-programming-budgeting. Because of the abstract nature of programming criteria,

planning was not sound. Distribution of defense resources, therefore, was inefficient, and the productivity of the defense budget was very low. [Ref. 2: p. 17]

2. Planning-Programming Process

a. Basic Concept

This proposal explains the process of budget organization. It is important to understand the roles of both long-range and short-term planning in the overall planning scheme. Requests for military forces to meet the strategic and force maintainance programming must be coincident.

b. Directions toward Reform

By integrating the Strength Improvement Plan¹ and Defense Five-Year Program,² the investment budget and operating expenditure could be allocated properly. The adjust and control function of budget programming will be strengthened.

Evaluation of projects can be performed more easily by using uniform documents in the planning, programming, and budgeting process as shown in Table 2. [Ref. 5: pp. 90-91]

It is then possible to manage defense projects more effectively. Each expenditure criteria derived from comparing the performance result of user-level units can be used as guidance for planning and budget organization. [Ref. 2: p. 19]

3. Program Management System

a. Basic Concept

Until now, weapon system procurement programs were performed by ROK DoD according to the Strength Improvement Program. On the other hand, the maintenance and supply support plans were performed by each service department, therefore, there were no responsibility centers for each stage. The Korean military feels that each program must have consistency from beginning to end. For example, the weapon system selection phase, research and development, test and evaluation, production, quality assurance, procurement, deployment, and operation phases, all

¹This plan started after the 8th session of the Korea-U.S. Ministerial Security Conference of August 1975. The principal ingredients of the plan are the increase of military hardware, the expansion of defense facilities and the development of the defense industry. At the beginning stage, the primary fiscal sources were the national defense tax and U.S. financial support and other cooperation. But currently the main source is the national defense tax.

²Based on the Strength Improvement Plan this program is aimed at securing a defense capability to repel north Korean Aggression without the aid of China or Russia. This program called for the attainment of this goal within 5 years, starting from 1975. After the first 5-Year Program, however, every 5 years, new 5-Year Programs have been extended.

TABLE 2
DOCUMENTS IN PLANNING-PROGRAMMING-BUDGETING CYCLE

Month	Year X-3	Year X-2	Year X-1
JAN FEB	Long Range Strategy and Policy	National Strategic Objective Plan, Research and Development Plan	Military Budget Requirements
MAR	Middle Range Intelligence Estimation	Middle Range Defense Policy	-
APR	-	5 Year Plan Guidance, Strength Improvement Guidance	-
MAY	Strategic objective Guidance, Research and Development Guidance	-	Defense Budget Requirement, Service Improvement Executive Guidance
JUN JULY	-	Service Strength Improvement Requirement	Service Strength Improvement Plan
AUG	-	Service 5 Year Requirement	-
SEPT	Service Strategic Objective Plan, Service Research and Development Plan	-	-
OCT	-	Strength Improvement Plan	Defense Strength Improvement Execution plan
NOV	-	Annual Defense Policy	-
DEC	-	-	National Assembly Authorization and Appropriation

must have consistency. At the first stage, that program which has the highest priority is selected based on its level of investment or contribution to strength improvement (strengthening of war potential). Secondly, a project manager will be selected to improve the efficiency of program execution and management of weapon system organization and logistic support. The manager selected must be accountable and must be given the necessary authority to fulfill these responsibilities.

b. Directions toward Reform

Project management requires approval of high authority at key decision points (milestones). Life cycle cost (LCC) should be considered on an equal basis with system performance, schedule, and logistic supportability. A clear line of authority, responsibility, and accountability for the management of programs should be established. Competition in contracting is also required. [Ref. 7: pp. 36-38]

4. Decentralized Management System

a. Basic Concept

The unit commander has the responsibility for managing the unit's resources such as manpower, funds, materials, and facilities. Complete autonomy in spending on the part of the operational commander is emphasised. First, the commander will be motivated to control costs by establishing his ownership and responsibility to conduct their unit efficiently. Secondly, each soldier will be motivated to find cheaper substitutes, because the remaining funds which result from efficient management could be used for the soldiers' welfare, such as recreation facilities, a library, sport equipment, etc.

By developing a proper accounting report system, it is possible to estimate the performance of each unit and summarize aggregate totals. For example, 1 4 ton jeep operation can be divided into 3 categories according to the following purposes : commanding, operation, and administration. The maintenance cost per vehicle could be compared with that of the same purpose vehicle of other troops, but it is difficult to say that lower cost always means better performance.

b. Directions toward Reform

By strengthening the function of resource management, each unit's commander can assess his unit's assets and make an analysis of the results of his resource spending, which can facilitate economic troop management. To establish the management information system, it is necessary to first develop a new accounting system that can integrate the total resources and adopt the user-centered logistic management which is based on decentralized principles. [Ref. 7: pp. 34-36]

5. Analysis and Evaluation System

a. Basic Concept

This system was established to provide basic data needed in successive planning, programming, and budget compilations. The basic data can be derived from the result of comparative analysis between the required mission performance level and the results of resource spending.

b. Directions toward Reform

The mission performance level and the result of resource spending could be analyzed and evaluated by developing a new accounting system and the establishment of a new auditing policy which is consistent with the concept of resource management. At the stage of programming and budgeting, the previous data of expenditure analysis could be used to make programming decisions as well as budget formation based on performance criteria.

6. Management Information System (Computer-Based)

a. Basic Concept

In order to operate the Defense Resource Management System efficiently, information (demand, procurement, operating-inventory control, performance evaluation...) must be provided at the right time and right place. This system must be computerized to obtain the benefits of speed and accuracy. This system also can assist in decision making for resource allocation.

b. Directions toward Reform

DBMS (Data Base Management System) was established to assist the process of analysis, evaluation and the accurate computation of resource demands. Constructing computer networks among DoD, each division of the Army, Naval theatre commands, and Air Force flying corps will facilitate this process. [Ref. 8: p. 13]

Computerized inventory management of logistic materials and other major resources can facilitate the decentralization of the resource management system, which includes procurement, storage, and distribution procedures. Computerizing the process of 5 year programming, budget organization, and execution, can accomplish the objective of budget revolution in a short time.

7. Resource Management Staff Function

a. Basic Concept

Strengthening the function of the resource management staff is intended to support the decentralized unit management system by properly giving incentives to the units according to their performance.

b. Directions toward Reform

Three separate functions (finance, logistics, and facility engineering) were integrated and the overall management staff controls all resources. The overall management staff is responsible for all resource management in the unit, and so seeks the most economic level of unit operation, prepares the unit's budget, and handles material accounting and fund accounting. [Ref. 2: p. 31]

8. Reorganization

a. Basic Concept

The newly designed Defense Resource Management System is based on the concept of PPBEES (planning, programming, budgeting, execution, evaluation system). Thus, a new organizational structure is needed to support the new procedure. This will require integration, restructuring and reinforcement of the new system to reorganize the current structure to meet the new task.

b. Directions toward Reform

Reorganize the old structure through changes based on an integrated logistic system. A part of the new organization must be a cost and program analysis function which should be accomplished through a special organization manned by professional personnel. [Ref. 2: p. 32]

After introducing the Defense Resource Management System in 1983, ROK DoD has made a concreted effort to implement the system in the ROK military as follows:

- Selection of the sample units according to the type of troops.
- Design of the common structure documents used in the programming and budgeting phases.
- Implementation of the system in the experimental troops.
- Evaluation of the performance results in the experimental troops.
- Amendment and reinforcement in the intrinsic nature of Defense Resource Management System introduced.
- Inspection of the execution of the system.

Finally, from the beginning of 1986, the Defense Resource Management System is being implemented through out the DoD. The Defense Management Accounting System is designed to assist the newly proposed Defense Resource Management System. The objective of this system (procedure) is to provide standardized data for resource management to each level commander. [Refs. 9,10] Accounting information

has two major purposes : decision making and performance evaluation. For example, managers can easily decide the proper disposal time of an equipment by using the accounting information. Regression analysis is one of the common techniques to produce the accounting information.

The Defense Management Accounting System is intended to support not only the decentralized unit resource management system, which is one of the eight major functions of the budget revolution movement, but also the PPBEES which is the main objective of the defense management system.

Until 1984, legal accounting procedures had been used to provide the legal result of resource expenditures. The private sector's accounting theory was adjusted to meet the characteristics of military needs. The analysis of performance and resource spending results can now be obtained through cost analysis.

To accomplish this new accounting procedure, the Budget Revolution Committee adopted the unified accounting system based on the double entry bookkeeping principle. Everything that has any economic value must be recorded and analyzed according to the proposed accounting system. For example, suppose that there is a useful plant on the base; the monetary value of the plant must also be evaluated according to its growth, so annually, or at every prescribed term period, its value must be reevaluated.

Two different kinds of accounting methods are used, according to the type of unit. The corporate accounting system (also called special accounting) is adapted to production, maintenance units and education units. On the other hand, general combat units use a different accounting system from the corporate accounting system. This is called the general accounting system and is similar to U.S. government accounting procedures.

The general accounting system does not permit the concept of depreciation, which is regarded as an expenditure at the time of disposal. Prepayments are also regarded as expenditures not as assets, which make up the capital. In the general accounting system bonus payments are recognized at the point of occurrence, but in the special accounting system, the average of payments is recorded as expenditures in each period. Classification of expenditure as direct and indirect is needed in the special accounting system but not in the general accounting system.

Both of these accounting systems will be used to provide the basic background to estimate in-house cost if the Korean military adopts the Commercial Activity program.

From the beginning of the 1980s, the Korean military has made a lot of effort for improving efficiency in defense spending. These new proposals don't involve external improvement, they only suggest internal change within DoD. The authors' proposal focuses on the close relationship and direct competition with the external environment of the military. For the development of this thesis, the Korean defense industry status will be reviewed briefly.

C. ROK DEFENSE INDUSTRY

1. Introduction

The Republic of Korea has started to build the defense industry required to produce basic conventional weapons for Korea's Armed Forces. The Korean defense industry is now able to produce most of the conventional weapons, armored vehicles, missiles, aircraft, and naval vessels used by ROK DoD, although some slight dependence on foreign sources for certain components remains.

The significant reasons for Korea's defense industry growing so rapidly in a short period of time include the government's initiation and implementation of the entire defense industrialization processes in the planning, financing and manufacturing stages, positive participation of private enterprises, and the United States' technical assistance by means of technical data packages (TDPs), manufacturing licence agreements, and co-productions.

Beginning in the 1980s, Korea has achieved the initial goal of domestic arms production and has developed the production base for more advanced weapons. The Korean defense industry has made a great contribution to the development of Korea's heavy and chemical industries through the spill-over effects of technology in defense manufacturing and quality control techniques.

To maintain Korea's defense industry, even at the lowest profit level, there should be a certain level of production demand. After finishing the domestic military requirements, the best way to operate the defense industry economically is to export or to fill the war reserve stock. But for Korea, exporting defense items or producing for war reserve demand are not easy, because Korea's third country sales (3CS) for items produced under the US technical assistance and licence agreements depend on US restrictions and production for war reserves. It is not realistically possible because of the limited size of the defense budget and urgency of investment on force improvement. However, Korea tries to expand or maintain a constant level of the third country sales

to protect the defense industry from becoming bankrupt. On the other side, the US tends to more tightly control and restrict Korea's export activities and to be reluctant to transfer advanced defense technology to Korea. [Ref. 11]

2. Capability and Problems

Since the Korean Government launched the drive to build its defense industry in the early 1970s, the defense industry has rapidly grown and expanded as a result of the Government's strong and effective control and industry's participation. The United States' technical assistance under the framework of the security assistance program has greatly contributed to improving Korea's defense technologies and the production of conventional weapons in a short period of time.

The Korean defense industry is now able to produce most of its own conventional weapons, armored vehicles, missiles, aircraft, and naval vessels. Korea produces all kinds of infantry weapons and munitions. Therefore, the defense industry now can support almost 100 percent of the domestic needs in conventional weapon systems. Korea's armed forces have almost filled their TOE (table of equipment) requirements for regular forces and only need the additional demand for replacement and reserve forces. Because of no more demand in some weapon systems, some of defense industries have even shut down production lines or are maintaining a very low operational level with negative profits. The average operational rate of the overall defense industry in 1984 was 42 percent, so the defense industry tries to expand the export market. But its efforts for exports have not been successful and perspectives on the future export of defense items is not bright at all because of the United States' tight control and restrictions over Korea's 3CS activities. [Ref. 11]

Korea is now faced with the problem of how to maintain the existing conventional weapon production systems for which there is no more domestic demand and also pursue the development of advanced weapon systems.

The United States has assisted Korea to have a self-defense capability against North Korea's threat not only in the combat forces but also in the production of some defensive weapon systems. Now that Korea almost satisfies its military needs with self-sufficiency, it faces the problem of underutilization of its defense production capacity.

The United States tightly controls the Korea's third country sales for defense items which are produced by U.S. technical assistance or licence agreement. The Korean government should seek other alternatives to solve the problem of

underutilization of its defense industry capacity. This excess capacity will be one of the important factors to consider in the implementation of the Commercial Activity program.

D. SUMMARY

Efficiency in the defense sector is a major key to the overall government efficiency problem. Since the 1970s, the U.S. Military Aid Program has diminished greatly. Korea has felt that they must establish their own state of self defense. As mentioned at the beginning of this chapter, Korea's defense spending exceeds one-third of the government budget.

The Korean military recognizes the need for budget revolution. The Korean military has adopted a newly designed defense resource management system. The objective of Defense Resource Management System is to achieve efficiency in military spending by the use of a newly-designed PPBEES, new staff structure, modern financial accounting techniques, program management system, decentralized management system, analysis and evaluation system, management information system, and a new organizational approach.

In this chapter the authors have reviewed the new Defense Resource Management System completely implemented at the beginning of fiscal year 1986. The authors also reviewed the Korean defense industry status. This background will aid in understanding the main point of this paper : the implementation of a new management concept called contracting-out or the commercial activity (CA) program.

The next chapter will review the U.S. CA programs which started in 1953. This will help decision makers anticipate the problems that will be encountered and point out available solutions. This study will furnish the basis upon which to establish an appropriate CA policy which is congruent with Korean government policy.

III. COMMERCIAL ACTIVITIES PROGRAM

This chapter will describe the policy and procedures of the Commercial Activity Program of the U.S. Government (especially Department of Defense), the result of the program implementation, and the obstacles to implementation.

A. BACKGROUND

In the U.S., the Commercial Activities (CA) policy is currently being promoted by President Reagan as an important way to reduce the deficit through increased efficiency in defense. [Ref. 1] Following is the definition of CA formed in the Office of Management and Budget (OMB) Circular A-76 :

A commercial activity³ is one which is operated by a Federal executive agency and which provides a product or service which could be obtained from a commercial source. A commercial activity also may be part of an organization or a type of work that is separable from other functions or activities and is suitable for performance by contract. [Ref. 12: p. 2]

The U.S. Government's policy of not competing with the private sector was first established during President Eisenhower's Administration. In 1955, the Bureau of the Budget (now OMB) issued Bulletin 55-4 which stated that "the Federal Government will not start or carry on any commercial activity to provide a product or service for its own use if such product or service can be procured from private enterprise through ordinary business channels." Exceptions to that policy, by the head of an agency, were permitted only where it could be clearly demonstrated that it was not in the public interest to procure such product or service from private enterprise. Thus the initial expression of this policy was a philosophical statement that reflected the relative roles of Government and the private sector in a democratic society with a free enterprise system. [Ref. 13: p. 3]

Historical revisions to the program can be summarized as followings:

- BOB Bulletin 55-4 (January 1955): Contract out unless it is not in the public interest to procure commercial product or service from private enterprise. Major emphasis was placed on manufacturing activities. There was no mention of cost.

³See Appendix A : Examples of Commercial Activity

- BOB Bulletin 57-7 (February 1957): Contract out unless it is a Governmental function. Emphasis was placed on services rather than products.
- BOB Bulletin 60-2 (September 1959): General criteria were provided for approving CAs on the basis of national security, relative costs, and a clear infeasibility. However, no cost criteria were narrowly defined.
- BOB Circular A-76 (March 1966): Five criteria, including comparative relative cost, were identified as the basis for exceptions from the policy. The cost criteria required that new Governmental CAs show savings of at least 10% over commercial performance.
- First revision (August 1967): Cost comparisons should be performed before contracting out. Incremental costing would be used in developing cost estimates, rather than full allocation of overhead and indirect costs which contractors are required to use.
- Second revision, OMB Circular A-76 (October 1976): It specified factors to be used for calculating the cost of Government fringe benefits.
- Third revision (March 1979): It defined governmental functions and transformed the policy of reliance on the least costly method of acquiring CAs. A cost differential was introduced favoring continuation of Government performance, and full costing methodology was implemented. It intended to impart balance to the guidelines in response to concern expressed on behalf of Government employees.
- Minor revisions (1980 and 1982): The cost comparison guidelines had been reviewed. [Ref. 14: pp. 78-83]
- Latest OMB Circular A-76 (August 1983): A new threshold was established for which formal cost comparison studies do not have to be performed. Also the definition of inherently Governmental activities was changed. [Ref. 13: p. 1].

Competition for lower cost or higher quality is the seed to improve organizational efficiency, and the pressure of competition is prerequisite to changes in Government CAs. In a competitive environment, commercial or government managers alike would adopt bold and innovative ways to enhance operational efficiency and effectiveness.

B. POLICY OF OMB CIRCULAR A-76

OMB, DoD, and each of the military departments have issued directives, instructions, and regulations that address contracting out. The "Bible" for this policy is OMB Circular A-76. It announces a permanent policy that the government should not compete with private industry and should rely upon private enterprise to supply the required products and services. It establishes Federal policy regarding the performance of these CAs and sets procedures for determining whether CAs should be performed under contract with private sources or in-house using Government facilities and personnel. There are three basic objectives of this policy:

- To Achieve Economy and Enhance Productivity. Competition enhances quality, economy, and productivity. Whenever commercial sector performance of a government-operated commercial activity is permissible, in accordance with this Circular and its Supplement (A-76), comparison of the cost of contracting and the cost of in-house performance shall be performed to determine who will perform the work.

- **Retain Government Functions In-house.** Certain functions are inherently Governmental in nature, being so intimately related to the public interest as to mandate performance only by Federal employee. Those functions are not in competition with the commercial sector. Therefore, these functions shall be performed by Government employees.
- **Rely on the Commercial Sector.** The Federal Government shall rely on commercially available sources to provide commercial products and services. In accordance with the provisions of this Circular (A-76), the Government shall not start or carry on any activity to provide a commercial product or service if the product or service can be procured more economically from a commercial source. [Refs. 12,13: pp. 1,2]

On August 12, 1985, DoD issued a Directive (DoDD 4100.15), "Commercial Activities Program" and on September 9, 1985, the latest version of CA Program Procedures (DoD Instruction 4100.33) was issued to meet the requirements of A-76. The current policy of DoD added the following two points to the policy of A-76:

- To consider the overall mission of DoD and the defense objective of maintaining readiness and sustainability and to ensure a capability to mobilize the defense force and support structure.
- To permit interim in-house operation on a temporary basis if a contractor defaults. [Ref. 15: p. 2]

C. STEPS TO CONTRACT-OUT

The following sub-sections will explain each step in the process for existing in-house CAs, and expansion of a Government CA involving a 30 % increase of either the total capital investment or the annual personnel and material costs. The flow chart of the process⁴ is shown in Figure 3.1 [Ref. 16: p. I-5].

Each base commander has the whole responsibility for the implementation of the CA program. Functional staffs write the Performance Work Statement (PWS) and resource management staff form a specific Task Group⁵ with related special staffs. This task group conducts a management study and decides the most efficient way to perform the function. The contracting office generally performs the function of contract-administration. The CA procedure is delicate and complex. The detailed steps will be explained.

⁴The flow charts for the process of new requirements and for existing contract of a CA are shown in Appendix B.

⁵The Task Group refers to Management Study Groups. It consists of engineering specialists, resource management personnel, accounting experts, and appropriate functional managers.

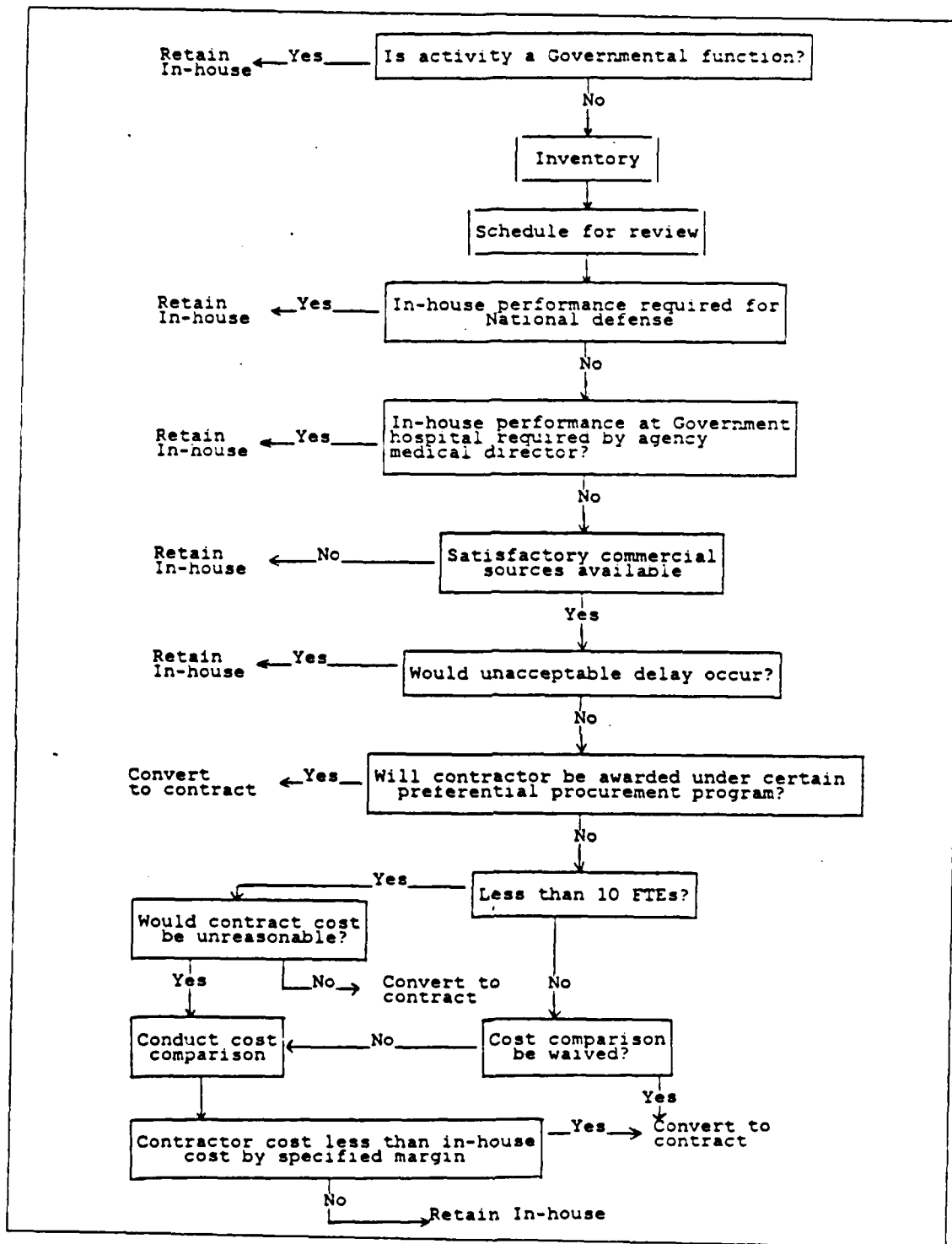


Figure 3.1 Flow Chart for Implementation of A-76 :
Existing Government Activities and Expansions.

1. Governmental Function

Determine whether the activity meets the A-76 definition of a Governmental function⁶ --if so, contract performance cannot be considered regardless of related cost and efficiency. [Ref. 12: p. 3]

Each military base first evaluates all activities and functions to determine which are Governmental functions and which are CAs.

2. Inventory

Those activities which are not a Governmental function are CAs and therefore may be performed by Government employees or by contract. These activities must be inventoried. There are two inventory lists: one for activities of 10 or fewer full-time personnel equivalents and one for activities of more than 10 full-time personnel equivalents.

Each base's inventory is updated at least annually to reflect changes to their review schedule and results of reviews, cost comparisons, and direct conversions. [Ref. 12: p. 2]

3. Review Schedule

The CAs on the inventory lists must be scheduled for review. The review for each CA on the list is performed at least once every five years and determines whether the CA will be performed by Government employees or be contracted out. Reviews of CAs that provide inter-service support should also be scheduled by the supporting DoD component (military base). [Ref. 17: p. 3]

4. National Defense

Determine whether or not performance by Government employees is required for national defense. [Ref. 17: p. 3]

DoD has developed the following criteria for rational and consistent determinations of an exemption. The exemption criteria include the following:

- The CA is essential for training or experience in required military skills.

⁶A Governmental function is a function which is so intimately related to the public interest as to mandate performance by Government employees. Governmental functions normally fall into two categories: 1) the act of governing such as criminal investigations or combat support role; 2) monetary transactions and entitlements such as tax collection.

- The CA is needed to provide appropriate work assignments for a rotation base for overseas or sea-to-shore assignments, or
- The CA is necessary to provide career progression in military skills. [Ref. 17: p. 3]

5. Patient Care

Determine if Government performance is required in the best interests of patient care. [Refs. 12,17: pp. 5, 5]

If the agency medical director determines that it is, contracting cannot be considered.

6. Satisfactory Commercial Source Available.

Determine if there is a satisfactory commercial source available for the product or service. [Refs. 12,17: pp. 4, 4]

If the Government has been able to perpetuate a monopoly (such as production of helium), contract performance cannot be considered.

7. Unacceptable Delay or Disruption

Determine if commercial performance would result in unacceptable delay in delivery of the product or service. The delay or disruption must be specific as to cost, time, and performance measures. [Refs. 12,17: pp. 4, 5]

If the delay is significant, contract performance cannot be considered.

8. Process for Cost Comparison

Determine if commercial performance would result in sufficient cost savings to justify conversion to contract performance. [Ref. 16]

This requires:

- Preparation of a performance work statement (PWS) for the activity, and a management study to determine the most efficient method of Government performance [Ref. 17: pp. 9-10].
- Development of an estimate of the cost of the most efficient Government performance, and solicitation of competitive bids or proposal for contract performance. [Ref. 17: pp. 11-12].
- Comparison of the cost of Government most efficient performance with the cost of contract performance, including the cost of contract administration and all conversion costs. [Ref. 16: p. IV-38].

9. Contract Award Decision

Award a contract if the total cost of contract performance is less than Government costs by at least 10 percent of the Government personnel cost. Otherwise cancel the solicitation and continue the Government activity. [Ref. 16]

Under some circumstances the contracts can be awarded without the cost comparison because the other tests cannot be met. An agency may convert an activity to contract without a cost study if:

- the activity involves fewer than 10 full-time equivalent employees [Ref. 17: pp. 9-10],
- the contract will be awarded under a preferential procurement program (such as small business, Federal Prison Industries, handicapped workshops, etc.) [Ref. 17: p. 4], or
- the agency has a documented basis for assuming that contract performance will be less costly; such as experience that the cost of contract custodian services is consistently lower, by 50 percent, than in-house performance [Ref. 16: p. 1-5].

D. COST COMPARISON PROCESS

The completed cost study will provide reasonable estimates of the cost of alternative courses of action. To assure a fair and equitable comparison, in-house cost estimates must be based on the same scope of work provided in the performance work statement and include estimates of all significant and measurable costs.

1. Performance Work Statement

Preparation of the Performance Work Statement (PWS) is critical since it is the basis for the cost comparison. It must be sufficiently comprehensive to ensure that in-house or contract performance will satisfy Government requirements. The PWS should clearly state what is to be done without describing how it is to be done.

The PWS should describe the output requirements of the in-house operation, including all responsibilities and the requirements for facilities, equipment and material. It should also provide performance standards and a quality assurance plan to ensure a comparable level of performance for either an in-house or contract operation. It serves as the basis for determining both contract and Government cost to ensure comparability and equity in the cost analysis. [Ref. 13: p. 109]

2. Management Study

Soon after the PWS is initially developed, the Task Group must complete a management study to determine the most efficient and effective organization for

Government performance of the PWS. The current work-force, materials, equipment and facilities, and procedures will be analyzed and adjusted to appropriate levels.

To be efficient, the activity work-load must be accomplished with as few resources as possible. To be effective, an organization must be able to successfully accomplish the mission at the required standard of performance.

The PWS and the results of the management study are then used to prepare the in-house estimate. The CA management study is mandatory. It seeks to identify essential functions to be performed, determine performance factors and determine organization structure, staffing, and operating procedures for the most efficient and effective in-house performance of the commercial activity. The new Government organization becomes the basis of the Government estimate for the cost comparison with potential contractors. In this context, *efficient* (or cost effective) means that the required level of work-load (output, as described in the performance work statement) is accomplished with as little resource consumption (input) as possible without degradation in the required quality level of products or services. Resources consumed may include personnel, time, dollars, supplies, equipment and energy. Dollar costs are the useful means of combining these resources for comparison as discussed below. Effectiveness compares what an activity or group of people actually accomplishes in relation to an assigned mission. [Ref. 12: p. III-1]

3. Cost Estimations

a. In-house Cost Estimation

The in-house estimate must be based on the same PWS used in the contract solicitation. In addition, it must be developed on the premise that costs which would continue at the same level regardless of the method of performance (in-house or contract) will not be included. When the PWS and resulting in-house cost estimate for an existing Government activity are based on any variation from current operations, e.g., scope of work, staffing, materials or equipment, such variations must be consistent with agency manpower and personnel regulations and must be coordinated with the agency's budget office. The organization which would provide most efficient performance may not be allowed by regulation. If so, the cost should be based only the allowable organization. There are sometimes political problems with the most efficient solution. [Ref. 12: p. IV-2]

b. Contract Cost

When the PWS has been completed, firm bids or proposals will be solicited in accordance with the acquisition strategy. Use of sealed bids with firm fixed-price bids is preferred. However, proposals should be requested for competitive negotiations when this method would be more suitable and is warranted under current procurement regulations with fixed price incentive contracts preferred. It is essential that the invitation for bids or request for proposals provide for a common standard of performance that permits an equitable comparison of Government and contract costs for performing the same work. At this stage, the contract price is still unknown. [Ref. 12: p. IV-3]

E. RESULT OF CA COMPETITION

1. Cost Savings

The DoD reviewed for the Congress all contracts it awarded under the provisions of A-76 between October 1, 1980, and October 1, 1982. The Government retained 45 percent of CAs reviewed because of lower costs. On average, contractors underbid in-house costs by 24 percent as shown in Table 3. [Ref. 18]

Additionally, the in-house work force on average had already reduced their costs by about 7 percent. Thus, the overall savings resulting from the competitive process were in excess of 30 percent.

However, the actual contract cost increased slightly when the Government revised the original estimate because of the changes in the scope of work not reflected in the original estimate and actual wage rate increases. As a result of both cost increases, the actual cost savings decreased slightly to about \$ 250 million (22%). Thus, total savings were about 29%.

In 1983, the Assistant Secretary of Defense (Manpower, Installation, and Logistics) tasked the Logistics Management Institute to find out how winning activities had achieved these cost reductions [Ref. 19: P. 3]. The cost reduction measures among their detailed findings, which Korean industry and in-house management can apply, are discussed in the following subsections.

a. Organizational Changes

Competition forces managers to identify areas in which organizational changes enable them to reduce the number of employees, especially costly supervisors, while at the same time the new structure emphasizes effective personnel placement and

TABLE 3
CONVERSIONS TO CONTRACT COMPARISON OF ORIGINAL COST
ESTIMATES WITH REVISED IN-HOUSE AND ACTUAL COSTS

* Original Cost Estimates	\$ in thousands
- In-house Performance Costs	1,039,033
- Contract Performance Cost	789,838
- Cost Advantage	249,195
- Percent of Cost Advantage to In-house Cost	24 % (31 %)
* Revised In-house Cost Estimates ¹ and Actual Contract Costs to the Government	
- In-house Revised Estimates	1,128,100
- Actual Contract Costs	878,590
- Cost Advantage	249,510
- Percent of Cost Advantage to In-house Cost	22 % (29 %)

¹ Note :

This revised estimate reflects changes in the scope of work not reflected in the original estimate and wage rate increases that would have occurred had the work been accomplished.

optimum use of facilities. As an example, having combined supply, transportation, and procurement functions, contractors are benefiting from a small but stronger cadre of supervisors and a plant layout that enhances material receipt and storage. [Ref. 19]

b. Work Locations

Maintenance activities at large installations typically consist of one main shop and one or more satellite shops. Each of the latter operates within a specific geographic area and requires a separate supervisor to control and schedule its work force. Many successful competitors, however, have consolidated satellite shops into a

central facility, a step that has led to savings in areas such as staffing, supervision, and capital equipment outlays. Satellite shops tend to staff their operations year-round at levels adequate to meet peak work requirements. Centralization alleviates such imbalances between work load and manpower and enables activities to operate with fewer authorized spaces and no reduction in the range of available skills. The satellite shop foreman, freed of supervisory responsibilities, can return to worker status. Usually the level of service remains high. Although generally an effective means for reducing operating costs, consolidation is advisable only when service to the customer will not suffer. In the military, we must also consider the increased vulnerability of a centralized facility. [Ref. 19]

c. Efficient Use of Supervisors and Workers

Working supervisors, those who supervise as well as perform hands-on work, were prevalent among the winning commercial organizations. In-house activities generally took a somewhat different approach. Instead of reclassifying supervisory positions many successful in-house competitors eliminated those positions and redistributed work within the organization. They assigned responsibility for personnel management functions, including employee selection, evaluation, and counseling, to higher management levels and put working-level supervisors in charge of such things as quality control and work scheduling. Line supervisors now have greater span of control over the work force and play a larger role in assuring the quality of its product.

Some supervisors informed workers that they were expected to complete tasks within the specified time, and management implemented a cost accounting system that kept track of the time a worker charged to each assignment. Both commercial and in-house winners relied on multi-skilled workers to accommodate periodic changes in work load. These workers thus broadened their skill base and are better qualified to compete for other positions in the organization. [Ref. 19]

d. Reduced Pay Levels

Many winners reduced operating costs by lowering the average pay grades of workers. In most instances, they took such action after in-house management analysts determined that some positions were staffed by higher grades than necessary. [Ref. 19: p. 5] Historically, management has structured and graded the base operations support work force to ensure that only the most qualified workers were available for a job. The newer practice of assigning tasks to qualified but lower-graded workers maybe more consistent with the spirit and principles of A-76 contracting.

e. Capital Equipment

Recognizing that labor costs account for the largest portion of their operating budgets, winning organizations strive to get the most out of every worker and are therefore acquiring productivity-enhancing assets. Managers at the winning activities are also more knowledgeable about state-of-the-art equipment and its potential for cost reduction. Not all in-house managers are availing themselves of DoD's fast-payback opportunities for productivity-enhancing capital investments. [Ref. 19]

f. Nonadoptable Measures

While in-house activities could implement many of the contractor-specific measures just mentioned, they cannot adapt two others: lower wages, rapid hiring and firing. While in-house activities must comply with a number of personnel management rules governing hiring and firing, contractors do not and therefore can easily adjust personnel levels to accommodate work-load fluctuations. They also can deal more quickly with problem employees. Contractors are able to quickly release poor performers thereby minimizing deadwood on the payroll and motivating the remaining workers, who witness first-hand the consequences of substandard performance. Moreover, because commercial firms enjoy greater flexibility in personnel management, they can take more risks when formulating bids. In-house activities, on the other hand, find it difficult to release a poor performer. Removal requires an inordinate amount of the supervisor's time and frequently results in a series of appeals that can last for months. In addition, despite having fewer positions than they did prior to A-76 competition, in-house management is not able to fill vacancies any faster than before. [Ref. 19: p. 9]

Government activities usually have to use a cumbersome supply system that emphasizes competitive prices, often at the expense of response time. Contractors are willing to pay a slightly higher premium if doing so will result in quick response and timely delivery. A common complaint of in-house winners is that, in the area of vehicle maintenance, they are at the mercy of other organizational elements. They contend that vehicle-support elements schedule routine maintenance with little regard for the using activity's work-load. Contractors, however, take extraordinary care to keep workers equipped, even if it means doing routine vehicle maintenance at night or loading vehicles while others are being serviced. [Ref. 19: pp. 6-7]

A-76 winners have eliminated or modified tasks deemed marginally necessary, but this has not been an easy change. Some CA support personnel have willingly provided service above and beyond standards, and customers have come to expect it. Now, in-house winners must operate much like contractors, working within limited budgets and following a carefully-defined, detailed set of guidelines. Extra services once performed routinely now get done only if they are part of standard operating procedures. This results in less flexibility within the winning organization.

Contractors frequently and enthusiastically use overtime, and employ part-time workers, usually off-duty military personnel⁷ and their dependents. In-house management, on the other hand, seems to labor under the false impression that, except for students, government personnel offices cannot hire part-timers. Additionally, unlike in-house management, contractors are able to establish permanent relationships with specific suppliers for common parts and equipment.

2. Obstacles to Implementation

Most of the cost comparisons which were conducted demonstrated the economy of competitive procurement and resulted in the conversion of Government activity to the private sector. However, several serious obstacles to implementation soon became obvious despite a sincere effort from the Reagan Administration to achieve the cost savings inherent in the procedures.

a. In-house Perspectives

The CA program is highly sensitive because it means there is a chance that existing Government employees will be replaced by commercial contractor personnel. [Ref. 18] Thus, agencies should be provided proper incentives to develop the most efficient organizations for the purpose of the cost study. In addition, employees should be able to appeal erroneous determinations. Incentives must be provided to insure an accurate PWS. There also should be routine reviews of the net effect of contracting out at the agency.

Forcing the in-house cost estimate to include the cost of retirement over a thirty year period for the unfunded liability in the Civil Retirement System while no similar calculation is included for the contractor on the unfunded liability in the Social Security System is inequitable. In addition, there is substantial overcharging for the cost of performing the function in-house for the expenditure for materials and supplies.

⁷This is a special problem, but ROK military code prohibits the military personnel from having secondary jobs.

Costs attributable to the contractor for the cost of contract administration have also undercharged the contractor. The contractors are also inadequately charged for conversion costs in implementing the turnover to contractor performance. [Ref. 13: p. 99]

No cost study is required where there are ten or less full-time equivalent employee positions. The program also requires that where the in-house estimate is flawed and cannot be corrected before the bid submission date, the contract will be given to the contractor without consideration of the in-house bid. The in-house cost estimates should be based on the most efficient and cost effective organization and staffing possible. Incomplete PWSs have led to significantly over-estimated cost savings from contracting out, and 50 percent of the cost comparison studies which included contract administration cost estimates were too low. [Ref. 13: p. 101]

Also when the contractor wins the contract, there is an evidence of opportunism. Because of the quasi rent behavior, the contract price may go up. To prevent the quasi rent behavior, contract type or method should be considered carefully.

b. Perspectives of the Private Sector

Industry does not fear competition. Competition is a way of life in the private sector, and any company that cannot compete goes out of business. First, it is strongly maintained that 75-80% of the CAs have to be continued in-house for *national security* reasons. The decentralization of authority in the U.S. governmental structure makes it exceedingly difficult for any central management agency to control activities in a department or independent agency. The second problem is a result of political pressure. Fortunately, industry is now better organized to deal with such political pressure than in the past. The third major problem is inequitable pressure in cost comparison.

Execution of the contract itself must result in savings of at least 10 percent of the Government's personnel-related costs in performing the activity in-house. In defense contracting costs, all overhead and indirect costs up to the top corporate level must be allocated equally to all Government contracts. By contrast, Government cost⁸ estimates have never included allocation of all overhead and indirect costs. On the other hand in-house activities will recognize an incremental decrease in overhead and

⁸Government overhead costs are usually fixed costs. If the overhead costs are allocated to in-house cost estimation, small portion of those costs can be allocated. However, it could be ignored as a sunk cost.

indirect costs that might occur if the particular function under study is converted to contract performance. This amount is far from full allocation of Government overhead and indirect costs. [Ref. 13: pp. 8-9]

Under a firm fixed price contract, a contractor is required to perform the work in the work statement with no further payment than the ceiling amount. If it costs him more to perform than he anticipated, he loses money. On the other hand, when a Government agency develops an estimate of their costs to perform a function, if the actual costs exceed the estimate, so what? The agency has to have those functions performed, so the money is provided. The personnel and resources are applied and the work gets done. If the contractors fails to meet these work standards he may suffer substantial financial penalties, however, there is no penalty to the Government. [Ref. 20: p. 40]

It is also common practice under a contract to place responsibilities and risks on the contractor that cannot be replicated in the Government environment. For instance, the contractor must assume complete responsibility for all Government equipment that is used in the performance of the contract, even when that equipment is not under his control. In a case where a contractor is operating a motor pool, and responsible for all of the vehicles, a Government employee may check out a vehicle and wreck it. The contractor is required to repair the vehicle, within his firm fixed price.

The contractor must also include the full cost of social security, retirement and unemployment in his costs: the Government (Civil Service) retirement cost factor is grossly understated. In addition, substantial costs are added to the contract cost: there is no cost in the Government estimate for quality control. In negotiated procurements, selecting a high-quality proposal frequently would be higher than the Government cost estimate. [Ref. 20: pp. 40-44]

F. SUMMARY OF CHAPTER

In the late of 1950s, Cyril Northcote Parkinson argued that the number of the officials and the quality of the work are not related to each other at all. He also anticipated that the numbers of officials will rise in total. One interesting thing, stated in his book, is "the recent discovery in a certain field of warfare that the number of the enemy killed varies inversely with the number of generals" [Ref. 21: p. 8]. The competitive enterprise system, characterized by individual freedom and initiative, is the primary source of national economic strength. It has been and continues to be the

general policy of the U.S. Government to rely on commercial sources to supply the products and services the Government needs.

But this policy encounters political, social, and economical motives. The basic concepts remains but the detailed procedures have been revised in accordance with the development of cost accounting methods and changes of political influence.

Misconceptions concerning the program have caused confusion, however, and have seriously impeded its implementation. The A-76 program has been the subject of controversy since its inception three decades ago. Over the years, private businessmen have charged that the cost comparisons are rigged to preserve functions in the government, while Federal employee groups have seen it as a program to *contract out*. [Ref. 18] The military fears that the contract option will limit flexibility, reduce force structure, and create associated risks in responding to wartime exigencies. Although exaggerated, there is some truth in each of those views.

When properly implemented, the A-76 cost comparison process should be an open, fair, and effective process to ensure that government operations are performed well and for a reasonable price. U.S. DoD reported 29% actual savings from CA program from 1979 through 1984. This amounts to \$ 1,012 million. If this program continues to gain momentum, savings up to 30% of total cost can be achieved despite some barriers [Refs. 18,19].

In summary, the A-76 program is an institutional arrangement to promote economic efficiency in the public sector through use of competition. The authors will study how the Korean Government can adopt a similar program. Because many factors (environment, politics, social structure, etc.) in Korea are very different from the U.S., the implementation of the same policy will be difficult. But acknowledging the heavy burden of the defense budget of Korea, Korea needs to improve military efficiency and to reduce defense spending through use of this competition concept in the military.

IV. THEORETICAL CONCEPT

A. GENERAL

As mentioned in the previous chapter, the Commercial Activity (CA) program is based on the cost-comparison concept. Cost-effectiveness analysis provides the fundamental framework for the decision making process. The purpose of this chapter is to review decision making theory as it relates to the CA program.

Decision makers in the public sector need better ways to, one, uncover and select goals that are in the public interest and, two, see that the alternatives selected are implemented properly. In the military sector, improving efficiency is considered as one of the most urgent problems. Because a military organization is a typical public organization, it is very difficult to measure the benefits of a program.

In this chapter, theoretical concepts of decision-making criteria and learning curve theory will be first studied, then cost-effectiveness and cost-benefit analysis will be reviewed. Finally, identification of costs and benefits related to a project will be introduced briefly.

B. THEORY OF EFFICIENCY CRITERIA FOR PUBLIC SECTOR DECISION-MAKING

The fundamental objective of efficiency is to optimize the total economic well-being, or welfare, of members in the society. Unfortunately, it is impossible to measure individual welfare directly. In principle, the criterion must be clearly identified and the optimal alternative is the one which yields the greatest excess of positive values (objectives) over negative values (resources used, or costs). This clear-cut ideal solution is seldom a practical possibility in military problems. Traditionally, non-profit organizations like the military, have available three decision-making criteria for decisions : unanimity, majority voting rule, and the Kaldor-Hicks criterion.

1. Unanimity

Unanimity can be explained by the concept of Pareto Optimality. The Pareto Optimality concept that was formulated by Vilfredo Pareto is the best known social welfare criterion. Pareto argued that any change in the economy is desirable if at least one person (in his own judgement) is better off because of the change and no one else is made worse off by it.

The Pareto Optimality concept is easily extended to any number of goods and persons (population). While this principle may at first seem relatively noncontroversial, if it ever were adopted as the standard for accepting or rejecting public programs, it would severely limit the scope of government action. Most activities undertaken by government reward and penalize various sectors of the population differently. More importantly, the Pareto Optimality criterion would prohibit any project that merely inconvenienced one person regardless of how much it enhanced the welfare of others. [Ref. 22: p. 10]

In summary, the three conditions that correspond to the efficiency problem are related as follows:

- Efficiency in production (choice of factor inputs) : in any two production processes having two production factors in common, the marginal rates of return of each of the factors must be the same.
- Choice of output : the marginal rate of transformation between any two products must be equal to the marginal rate of substitution.
- Efficiency in exchange (distribution of the output) : final output must be distributed so that the marginal rate of substitution between any two products is the same for all consumers of both products. [Ref. 4: p. 133]

But it would be difficult to exaggerate the importance of these conditions, since they involve the basic conceptual framework for all effort to promote efficient use of resources in a general, economy-wide sense. The point here is that competitive market prices do indeed reflect the opportunity costs and the marginal values of individual factors and products.

Most people who understand the concepts of the CA program support the existence of the program, but not the effected Government managers and workers who lost or might lose their jobs. Even though this program provides a 29% cost savings, this criterion, however, does not meet the requirements of Pareto Optimality.

2. Majority Voting Rule

Sassone and Schaffer define the majority rule as follows:

Economic state 1 is to be judged socially superior to economic state 2 if the majority of the members of society prefer 1 over 2 [Ref. 23: p. 9].

The democratic flavor of this criterion suggests that it might be widely acceptable. In fact, it is not often employed. Although we may vote for the representatives in government, we do not usually vote directly on policy issues; the representatives generally make the policy decisions. Realistically, however, one cannot expect voters to be knowledgeable of the hundreds of matters which arise every year.

The procedures of the CA program have been studied and developed through the Congressional hearings and political coalitions. However, conflict between the public and private sectors has continued. Thus a policy decision based directly on voting may not be a well-informed decision and is not always practical.

3. Kaldor-Hicks Criterion

This criterion is sometimes referred to as potential Pareto superiority. Because of the limitation of the Pareto optimality principle, numerous efforts have been made to develop more comprehensive criteria for evaluating programs. The most popular proposal was advanced by Nicholas Kaldor and J. R. Hicks. They argued that a change in the state of an economy was desirable if those who gained by the change would, in principle, compensate those who lost, such that no one was made worse off than before. [Ref. 23: p. 9] Sassone and Schaffer also defined this criteria:

Economic state 1 is to be judged socially superior to economic state 2 if those who gain by the choice of 1 over 2 could compensate those who lost so that, if compensation were paid, the final result would be that no one would be worse off than he would be in state 2 [Ref. 23: p. 9].

The concept of this criterion can be illustrated as shown in Table 4. [Ref. 22: p. 11]

TABLE 4 THE KALDOR-HICKS PRINCIPLE					
	Program 1	Program 2	Gross Gain	Potential Compensation	Net Gain
Person A	0	+15	+15	0	+6
Person B	-3	- 5	- 8	+9	+1

In this case, the state implements programs which increase the welfare of individual A by 15 points, but result in a loss to individual B of 8 points. However, the addition of potential compensation indicates that both individuals will be better off.

C. COST-BENEFIT ANALYSIS

The CA program policy is based on cost comparison. The policy can be regarded as a typical case of the make-or-buy decision. In this kind of policy, cost-benefit analysis could be the fundamental criterion in selecting the best alternative. The remaining portion of this chapter will be devoted to identifying and discussing the useful cost concepts and decision making criteria based on Net Present Value (NPV).

Among noneconomists, cost-benefit analysis and cost effectiveness analysis are often erroneously considered to be *techniques* for appraising public projects. If cost-benefit analysis is to be considered *a technique*, it is at best a loosely defined one. A cost effectiveness analysis is considered to be a special form or subset of cost-benefit analysis distinguished by the extreme difficulty with which project benefits can be identified in terms of dollars. [Ref. 23: p. 2]

1. Cost Concepts

Cost concepts and terms have developed according to the specific needs of accountants, economists, and engineers. In the financial sector, the sacrifice at the date of acquisition is represented by a current or future diminution in cash or other assets, while economists add opportunity cost to this concept. Commonly, the term cost is synonymous with **expense**. In other words, cost is a sacrifice of resources. The term **cost** is modified by such descriptions as direct, indirect, fixed, variable, out-of-pocket, incremental, full, etc.

Measuring cost is sometimes more difficult than one might imagine. Several cost concepts must be recognized in the procedures of a CA program because the objective of the A-76 cost comparison process is to obtain the lowest cost operation that can meet the quality standards the Government defines as being necessary to adequately accomplish the job. First, differential costing methods were adopted in 1967 as the principle of cost estimation for the CA program, followed by full costing methods in 1979.

a. Out-of-Pocket Costs

The term **out-of-pocket costs** refers to costs which involve cash outlays, either immediately or in the future. These costs are also often identified as variable or direct costs. This cost concept is very important in management's decision whether or not a particular venture will at least return the cash expenditures caused by the contemplated business undertaking. [Ref. 24: p. 690] These costs consider only first level indirect variable expenses. Costs such as depreciation, interest, insurance, and taxes are excluded.

b. Differential Costs

Differential costs refer to both cost decrease (decremental costs) and cost increase (incremental costs). This cost concept means the difference in the cost of alternative choices. Incremental costs should refer to the added costs incurred when a project or an understanding is extended beyond its originally-intended goal. Differential cost studies deal with the determination of incremental revenue, and costs, with regard to alternative courses of action. In these studies, variable costs are significant because they usually represent the differential costs. If fixed costs must be increased through a change in the situation, then these costs should also be considered differential costs. [Ref. 24: pp. 669-671]

c. Full Costs

In the manufacturing field, **full costs** represent the sum of the fixed and variable costs of manufacturing a unit of the product. Under these procedures, (called absorption costing, conventional costing, or full costing) both fixed and variable expenses are included in overhead rates. Thus, under this cost concept, depreciation on existing facilities and equipment, upper level management costs, and the costs of support services should also be regarded as a subset of full costs. [Ref. 25: p. 69]

d. Socio-Economic Costs

Socio-economic costs refer to all costs directly or indirectly attributable to a product or service. Additionally, these costs include some non-quantifiables such as employee morale and efficiency, unemployment costs, state and local taxes, and other community and installation benefits. Most of these costs are difficult to accurately measure and record in dollars, thus socio-economic cost might be subject to random interpretation. Figure 4.1 depicts the relationship among these several cost concepts. [Ref. 25: p. 69]

2. Learning Curve

A learning curve, in its basic form, is simply a line displaying the relationship between unit production time and the number of consecutive units of production. Learning curves may be viewed as *internal forecasts* of production output and, as such, are particularly useful in developing bids for new products. Learning curves can be applied to individual learning or organizational learning. [Ref. 26: p. 348]

The learning curve concept was first formulated into theory by T. P. Wright in the 1930's. The purpose was to find the relationship between average direct man-hour

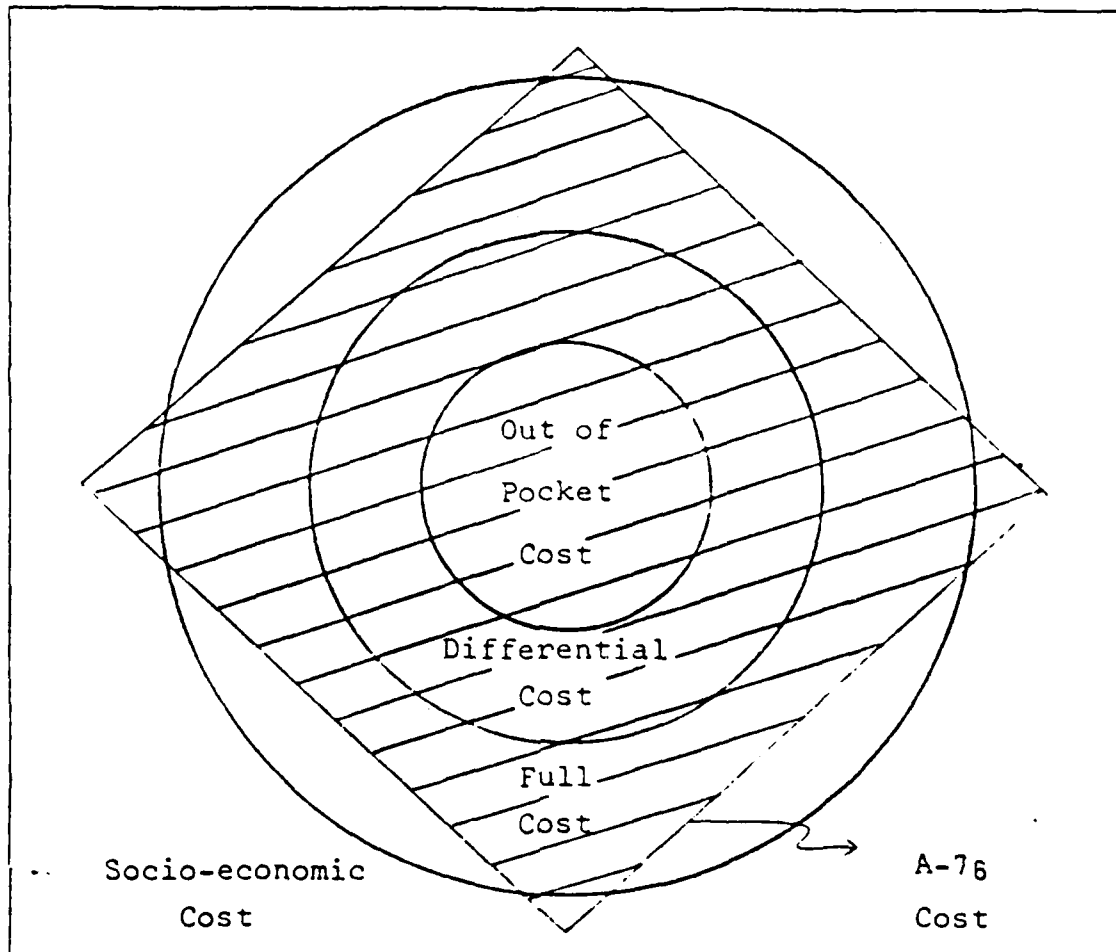


Figure 4.1 Costing Methodology.

costs and the cumulated number of airframes produced. Since then, the theory has been expanded to apply to a variety of fields, such as calculating direct labor hours or estimating (forecasting) production costs.

The Learning Curve may be shown by mathematical expression. The typical expression is

$$Y_x = KX^n$$

where

- Y_x = Number of direct labor hours required to produce the xth unit,
- K = Number of direct labor hours required to produce the first unit,
- X = Sequential unit number,
- $n = \log b / \log 2$,
- b = Learning percentage.

Basically, the learning effects come from the reduction of labor (cost). In recent years, the learning curve has become widely used for corporate strategic planning. Learning means improvement that results from a person repeating the same work and obtaining high skill or efficiency from his or her own experience, changes in administration, equipment, and production design. Learning curve theory is based upon three assumptions:

- The amount of time required to complete a given task or unit of a product will be less each time the task is undertaken.
- The unit time will decrease at a decreasing rate.
- The reduction in time will allow a specific and predictable pattern, such as an exponential function. [Ref. 27: p. 100]

The learning curve is a useful tool to forecast the costs that will be incurred during production; this promotes realistic bids for contracts.

Usually, learning curve theory is used to measure the production costs of new weapons. The learning effects mainly come from repetitive increase in skill and experience. In this view point, the learning curve theory is closely related to the CA program because contractors can use more skilled and experienced manpower than in-house managers, especially under the draft system of the Korean military organization. The length of service of the Korean drafted soldiers varies from two to three years. In highly technical tasks such as depot level maintenance, the soldiers who do not have any maintenance background would have to learn the required skill for more than two years to accomplish the jobs independently, thus it will be difficult to expect them to do highly qualified jobs.

3. Cost-Effectiveness Analysis

Sometimes it is not possible to put a dollar figure on the benefits to be obtained from a particular government program. When this situation occurs, agencies use a truncated version of Benefit-Cost (BC) analysis known as cost-effectiveness analysis.

Cost-effectiveness analysis is, in principle, applicable to any policy question that involves the use of scarce resources. Traditionally, cost-effectiveness studies are used in two different types of situations: (1) to maximize output for a given amount of money, or (2) to minimize costs for a given set of objectives. [Ref. 22: pp. 16-17] In the military sector, procurement or capital investment decisions have been the most common subject of cost effectiveness studies. The method is adaptable to the evaluation of other issues such as strategic policy, tactical doctrine, and the allocation of research and development funds. [Ref. 4: pp. 163-165]

Particularly in the CA program, it usually is not feasible to measure the output or effectiveness of given policy actions in monetary terms. In evaluating a maintenance program, for example, various dimensions of non-quantifiable performance characteristics may be specified, such as service timing, expansion of the industrial base, and quality of the services. Cost effectiveness analysis has been most useful in such cases.

4. Cost-Benefit Analysis

Cost benefit analysis identifies and evaluates the net dollar benefits associated with alternatives for achieving defined public goals. The techniques used in identifying and comparing costs and benefits are almost as numerous as existing analyses. Nevertheless, some principles and guidelines can be stated. [Ref. 23: p. 12] Theoretically cost-benefit analysis uses a decision factor identified as the Potential Pareto Superiority criterion. This concept labels a project as superior if those who gain from the project could compensate those who lose so that none would be worse off by the project. This means that cost-benefit analysis encourage the identification of net benefits from alternatives to aid in the selection process.

In performing cost-benefit analysis, an appropriate decision criterion is required. Many criteria have been suggested as appropriate for evaluating alternative investment projects according to the situation. Among these many criteria, the net present value criterion is considered superior. Following are the common criteria used in cost-benefit analysis. [Ref. 23: pp. 13-24]

a. Net Present Value (NPV)

This method reduces a stream of costs and benefits to a single number in which costs or dollar benefits (projected to occur in the future) are discounted. The major problem associated with using the NPV method is the determination of the proper discount rate. Of course, the higher its NPV, the better the project. [Ref. 23: p. 19]

b. Benefit-Cost Ratio (B/C)

Normally, the benefit-cost ratio is defined in terms of discounted values. Specifically, the benefit-cost ratio gives the benefits per dollar of cost. Thus, the smaller of two projects may have a higher B/C, yet yield a smaller total net benefit. For example, assuming a discount rate of 5%, two projects are compared in Table 5. [Ref. 23: p. 20]

TABLE 5
BENEFIT-COST RATIO

Project	B_0	C_0	B_1	C_1	B/C	NPV
X	0	1	2	0	1.9	0.9
Y	0	5	8	0	1.5	2.6

B_0 = the first year benefits

C_0 = the first year costs

B_1 = the second year benefits

C_1 = the second year costs

Note : A discount rate of 5 % is assumed.

As can be seen, X is judged to be superior to Y on the B C criterion, whereas the situation is reversed by NPV.

c. *Equity*

This criterion addresses the impact of benefits and costs of a project on the individual members of society. In the final analysis, the decision maker must subjectively weigh the NPV of a project against any adverse equity consequences. This will reflect the decision makers' own ethical standards, and maybe political realities as well. This equity criterion is used for the discussion in following chapters. [Ref. 23: pp. 23-24]

5. Identification of Costs/Benefits

The most difficult part of cost-benefit analysis is identification of the costs and benefits. In assessing the costs and benefits of a project, costs and benefits may be classified by several methods. The schemes are useful in identifying effects. Knowledge of the various classificatory schemes can eliminate such problems as double counting. [Ref. 23: pp. 31-32]

a. Internal vs External Effects

In the simple case, the benefits returned by an investment would be the revenues produced. We call these internal effects. In other words, internal benefits are those increases in value produced by the program itself. External benefits are those benefits involuntarily received by others for which they pay nothing. Those effects such as the socio-economic effect of CA programs are neither deliberately produced nor deliberately consumed ; they are often called externalities.

Externalities can be classified into technological and pecuniary externalities by their characteristics. Technological externalities involve changes in real consumption or production opportunities for outsiders. These externalities represent increased social welfare, such as increased industrial base and improved relationship between the military and civilians. Pecuniary externalities refer to the effects associated with financial effects of the project on others, thus it appears as a price change of others. For example, decreases in the price of a product itself, increases in the price of a compliment, decreases in the price of a substitute, decreases in the price of a joint product, or increases in the price of a resources used in production. [Ref. 23]

b. Incommensurables vs Commensurables

According to Sassone and Schaffer, commensurables are those of a material or economic nature, while incommensurables are those involving values beyond the economic. They like to refer to incommensurable as extra-market effects and use intangible to describe quantitative terms that are noneconomic in nature. [Ref. 23: pp. 35-37] In short, incommensurables are the effects which cannot readily be translated into the common denominators that are being used, and intangibles are not measurable. Incommensurables can be treated in cost-benefit analysis several ways:

- Ignore values of incommensurable effects.
- List, or describe, all effects which are not quantitatively evaluated in analysis.
- Identify effects in terms of physical units. [Ref. 4: pp. 183-184]

The second method will be used in the analysis for the implementation of CA program to Korean military.

6. Make-or-Buy Decisions

The objective of a make-or-buy decision should be to best utilize the firms' productive and financial resources. The problem often arises in connection with the possible uses of idle equipment, idle space, and even idle labor. The choice of whether to manufacture an item internally or purchase it on the outside can be applied to a wide variety of decisions that are often major determinants of profitability and that can be significant to the company's financial health. [Ref. 24: p. 674]

Matz emphasizes several considerations faced with a make-or-buy decision. These considerations are:

- Quantity, quality, and dependability of supply of items.
- Cost comparison between make and buy.
- Required capital investment and the timing of cash flows.
- Firm's overall policies.

Determinations of the "cost to buy" and "cost to make" are not simple. "Cost to buy" must include the full cost such as freight, handling, incoming inspection, and inventory carrying cost, not only supplier invoices. "Cost to make" should also include all direct and indirect costs of functions and facilities which are properly allocable to self-manufacture under the full cost concept. [Ref. 24: p. 675] In the short run, just differential costs are significant, however, consideration of the full-cost consideration is recommended for the long-term. At the decision point, decision makers usually use the Net Present Value (NPV) concept. But the NPV indicates the formal monetary summary of only considered cost factors. Decision makers should make sure that the make-or-buy decisions depend more upon the circumstances surrounding that situation.

D. SUMMARY

Public decision making processes use cost-benefit analysis as a basic tool. The U.S.'s OMB circular A-76 also emphasizes the concept of cost comparison. Nowadays, the basic concept of the Commercial Activity program tends to the socio-economic concept. At the beginning stage of A-76, the cost comparison used just out of pocket cost, and then differential costing method was preferred to out of pocket cost, and now they are trying to use the full costing method. Some professionals argue that the most important thing which decision makers should consider is the socio-economic effects of each decision. Currently, the basic cost concepts used in the A-76 program have been changing toward the socio-economic costs. The U.S. Congress and DoD have held public hearings to recognize the socio-economical impact (benefit) of the program. The incommensurable and external impact of the CA program could be explained as a shadow price. Also the majority voting rule applied through the political process may determine the effects of the CA program.

Contractors could use more skilled and experienced labor than military organizations in some functions. The enlisted soldiers, in Korea, finish their defense

responsibility in 2 or 3 years,⁹ so the techniques of soldiers cannot be fully developed in such a short period of service time. Possibly at the end of the service period, they could reach the required level of skills. The learning curve theory may be used to explain the cost reduction factors.

Generally the net present value concept is applied to the decision making process. At this point, the issue of contracting-out or not is similar to the **make-or-buy** decision.

In this chapter, welfare criteria and various cost concepts were discussed, and cost-effectiveness and cost-benefit analysis were reviewed. We also examined several forms of decision making problems and the problem of the cost and benefits identification associated with projects.

The next chapter will discuss the main purpose of this paper : implementation of contracting out in the Korean Army maintenance depot.

⁹Service time is partially determined on the basis of the military training hours during school (college or university) time. Every 2 credit-hours at military training per semester contribute a deduction of one month from the basic 30 months (up to a maximum of 6 months deduction).

V. DISCUSSION

A. GENERAL

As mentioned earlier, the ROK Government has been spending around 6% of its GNP for defense, and feels that there must be efficiency in military spending. However during the 1970s, the arms race between ROK and North Korea became serious and the question of efficiency was put on the back-burner. Furthermore, some farsighted military officers argued that military spending should contribute not only to military requirements of strength improvement and modernization but also to national development. This innovative idea has been partially realized in recent years.

The purpose of this chapter is to discuss the implementation effects of U.S. Commercial Activity (CA) policy in Korea. ROK Army depot maintenance is presented as a typical example of a CA currently done by in-house management and workers. The Korean military has adopted a new accounting system as well as resource management system. This new accounting system could provide the practical basis for CA concept implementation even though there are some barriers to use of the cost data for the cost comparison. Korean defense industry status and some theoretical concepts were previously discussed for the purpose of providing the background of this chapter.

The discussion will now shift to reviewing the Korean Army maintenance system and identifying those problems of the maintenance system directly related to depot maintenance performance. This chapter will also discuss the effects of implementation as well as issues related to the CA program. Finally, possible alternatives to overcome the barriers to implementation will be reviewed and hypothetical cost data from a depot maintenance group will be studied to translate the data into in-house cost for the comparison. Conclusions and recommendations will be made in the next chapter.

B. REVIEW OF ROKA MAINTENANCE SYSTEM.

1. Maintenance Concepts and Significance.

Maintenance is one of the several functional elements which make up the military logistic system. As such it should work toward the goal of the logistic system. The overall objective of maintenance is to support the combat readiness and effectiveness of the military by sustaining weapons and equipment in a mission-ready condition as effectively, responsibly, and economically as feasible.

Maintenance interrelates with the other functional areas of logistics -those of supply, transportation, services, and facilities- in the accomplishment of the logistics mission. Maintenance is not done for the sake of maintenance, but rather for the benefit of the overall system which support the soldiers in the field. Essentially, maintenance is any action taken to retain material in a serviceable condition or, if it is unserviceable, to restore it to a serviceable condition. It includes the functions of inspecting, testing, servicing, repairing, overhauling, rebuilding, modifying, renovating, and calibrating. [Ref. 28: p. 4-1] The scope of maintenance functions, therefore, ranges from simple preventive maintenance services performed by the equipment operator to complex operations performed in fixed shop facilities.

2. Maintenance Role in Integrated Logistics Support System

The Integrated Logistics Support (ILS) System is an iterative approach to the management and technical activities. The main focus of ILS is to integrate every element of logistics so as to provide supportability and optimal operational cost during the life cycle of each piece of equipment. Nowadays, the decision maker's concern for ILS is serious and much effort is devoted to reducing spending through the ILS approach. The ROK Military is also currently emphasizing the role of maintenance in developing the ILS concept.

3. Organizational Structure of ROK Army Maintenance

The ROK Army maintenance system can also be derived from the logistics support system. The ROK Army organizational structure for logistics support and maintenance functions as shown in Figure 5.1 is similar to the U.S. Army structure. [Ref. 29]

Since its establishment, the ROK Army has adopted the U.S. Army's organizations as well as weapons and equipment. Since adopting the U.S. Army system (including Field Technical manuals), there have been only minor changes in the ROK Army system while the U.S. system has been changed greatly. For instance, the 7th U.S. Division has a direct support maintenance battalion within the division and an additional maintenance company from a higher echelon to provide general support to the division.

Only at and above the division level does the Korean Army organize units which only perform maintenance functions such as maintenance battalions of the Logistic Support Command. Below the division level, maintenance functions are usually performed by users, several unit maintenance personnel, and maintenance

MAINTENANCE LEVEL	DONE BY WHOM?	ORGANIZATION
User Maintenance	Operators	Combat Unit (Company/Battalion)
Unit Maintenance	Maintenance personnel/Sections	Table of Organization and Equipment Unit (Regiment/Battalion)
Field Maintenance	Maintenance Sections	Division Combat Service Support Units (Ordinance/Communication Support units)
Facility Maintenance	Maintenance Companies	Maintenance Battalions of Logistic Support Command
Depot Maintenance	Functional Maintenance Depots	ROK Army Logistics Command

Figure 5.1 ROK Army Maintenance and Logistics Support System.

sections or platoons which are one part of division combat service support units such as the ordnance support unit and the communication support unit.

a. Maintenance System

The ROK Army maintenance structure consists of maintenance by the user, unit, field level, facility unit, and depot. The U.S. Army divides the maintenance system into the 3 levels of unit, intermediate and depot. The unit level maintenance of the U.S. Army is the sum of the user and combat unit maintenance of ROK Army, and U.S. intermediate maintenance refers to the combination of ROK Army field level and facility unit maintenance. Following is the description of each level of maintenance according to current ROK Army Regulations [Ref. 29]

(1) *User Maintenance.* Operators of equipment or weapons and the crew perform this user maintenance, which includes daily inspections, lubrication, fueling, and minor parts replacement. It also includes scheduled maintenance. The main purpose of this maintenance is to prevent critical failure during operations.

(2) *Unit Maintenance.* Unit maintenance sustains material readiness, and is performed by the combat unit maintenance personnel. Every unit equipped with heavy weapons and equipment such as artillery or tank units, possesses a small section headed by a non-commissioned officer with several maintenance personnel.

The unit maintenance functions normally include inspections, lubrication, preserving, tightening, minor adjustment, and replacement of easily accessible parts. The unit maintenance level also includes preventive maintenance. The basic purpose and direction of unit maintenance is to maintain equipment and weapons in a state of readiness for the combat forces.

(3) *Divisional Field Maintenance.* Each divisional combat service support unit has maintenance groups (platoon and section) and some of these are integrated into the ordnance support unit. These organizations work mainly for maintenance channeled between combat units and facility or depot level maintenance activities. Normally, only minor repairs and replacements are performed.

(4) *Facility Maintenance.* Facility level maintenance is done by functional maintenance companies from the maintenance battalions of the Logistics Support Command, which supports several corps according to geographical location and the combat service support plan. The functional maintenance companies provide general support in assigned functional areas such as communication or engineering equipment. These services are not just for a specific division but for the assigned corps. The facility level maintenance companies provide technical and supply support for divisional field maintenance. At this facility level, maintenance functions conducted by the companies also support the supply system through repair of equipment and components.

Facility maintenance units will be able to organize teams to support specific systems; for example, tank teams, communication and electronic teams, or artillery teams. The facility maintenance companies also possess the mobility necessary for close combat support. Normally, facility maintenance performs the functions of diagnosis, adjustment, alignment, repair, replacement of modules and end items.

(5) *Depot Maintenance.* There are several depots such as combined supply depots, storage depots, and the three functional maintenance depots as shown in Figure 5.2. [Ref. 30]

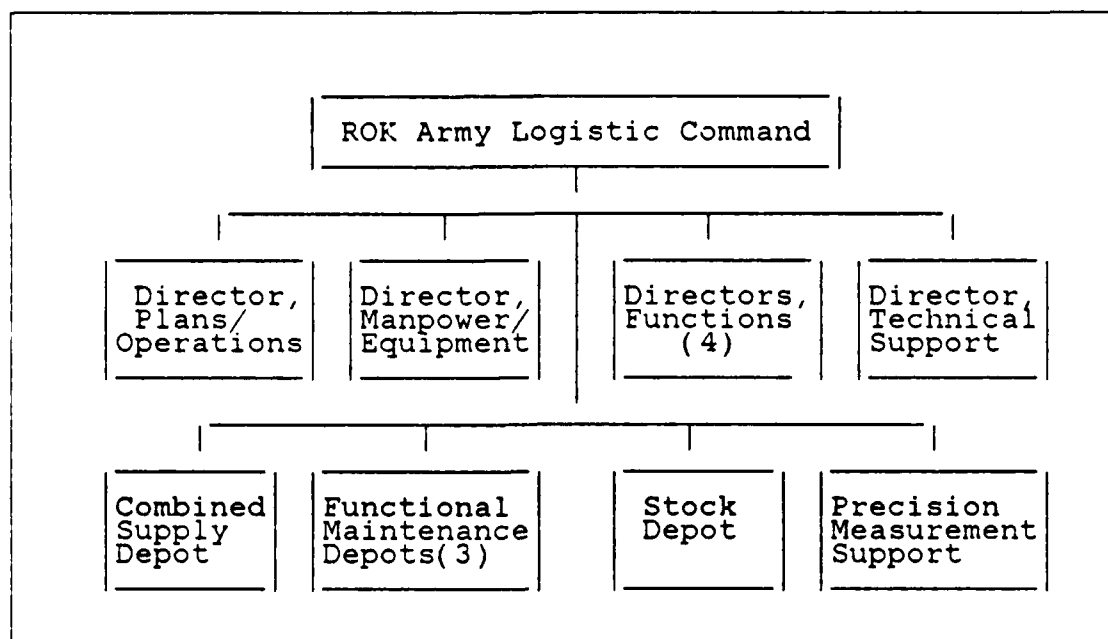


Figure 5.2 Organizational Chart of ROK Army Logistics Command.

The functional depots consist of one depot that is normally responsible for fire and maneuver equipment, while the other two deal with communication and electronics, and chemical equipment.

The primary function of depot maintenance is supporting both the combat forces and other depots for inventory management. For the support of the combat forces, depot maintenance operations furnish backup to facility maintenance units and assistance in technical training during peace time and war. Depot maintenance operations also serve as a source of combat ready material from equipment which has been rebuilt and modified.

Depot maintenance capabilities and capacity are based on the workload generated by those weapon systems and materials that are essential to the completion of the Army's primary roles and missions. Several maintenance factories within a maintenance depot each perform their unique job assignment. Depot maintenance jobs consist of complicated factory adjustment, complex equipment repair and modifications, and overall reconstruction. [Ref. 30]

b. Contractor Maintenance

After their establishment, Korean military forces received U.S. military doctrines and technical manuals as well as equipment and weapon systems. Initially, the technological level of military maintenance exceeded that of private industries, thus the ROK military required U.S. maintenance support performed at U.S. military bases in Korea or other foreign bases, or direct foreign contractor maintenance. Radar and aircraft maintenance has been traditionally accomplished by foreign manufacturing companies. [Ref. 31: Provision 6. 1-1-2]

Korea started to develop its own heavy industry and chemical industry during the early 1970s, and a complex electronics industry since the late 1970s. The technology of the Korean private sector has now exceeded the level of the military system. The result of this development of the private sector defense industry is that industrial technology has jumped ahead of that of the military sector except in such areas as aircraft maintenance and new technology weapon systems imported and deployed recently from more industrially advanced countries. At the divisional level, contractor maintenance is currently used through the competitive process shown in Figure 5.3 [Ref. 9: p. 150].

Items (equipment) repaired by contractors are those for which the Army maintenance system has no sufficient or appropriate maintenance capability, plus new items guaranteed for a specific period of time by the manufacturer. Some medical equipment and computer systems are examples of items for which the ROKA has no capability. Other items such as new howitzers and radio sets are repaired through guarantee provisions which state that the contractor (producer) must provide maintenance support during the guarantee period. In response, the contractor (producer) normally establishes mobile maintenance teams; otherwise the divisional combat service support units collect and ship the failed items directly to the contractor.

Thus, the Korean contractor maintenance principle is to retain maintenance functions in-house unless the military has insufficient maintenance skills or capability. Divisional and facility level maintenance can be considered as inherently military activities because these maintenance personnel and units follow the maneuver plan of combat troops and are capable of mobile maintenance during field training or probable war. However some depot level maintenance activities can be classified as commercial activities. The problems of depot maintenance activities will be studied in the following section.

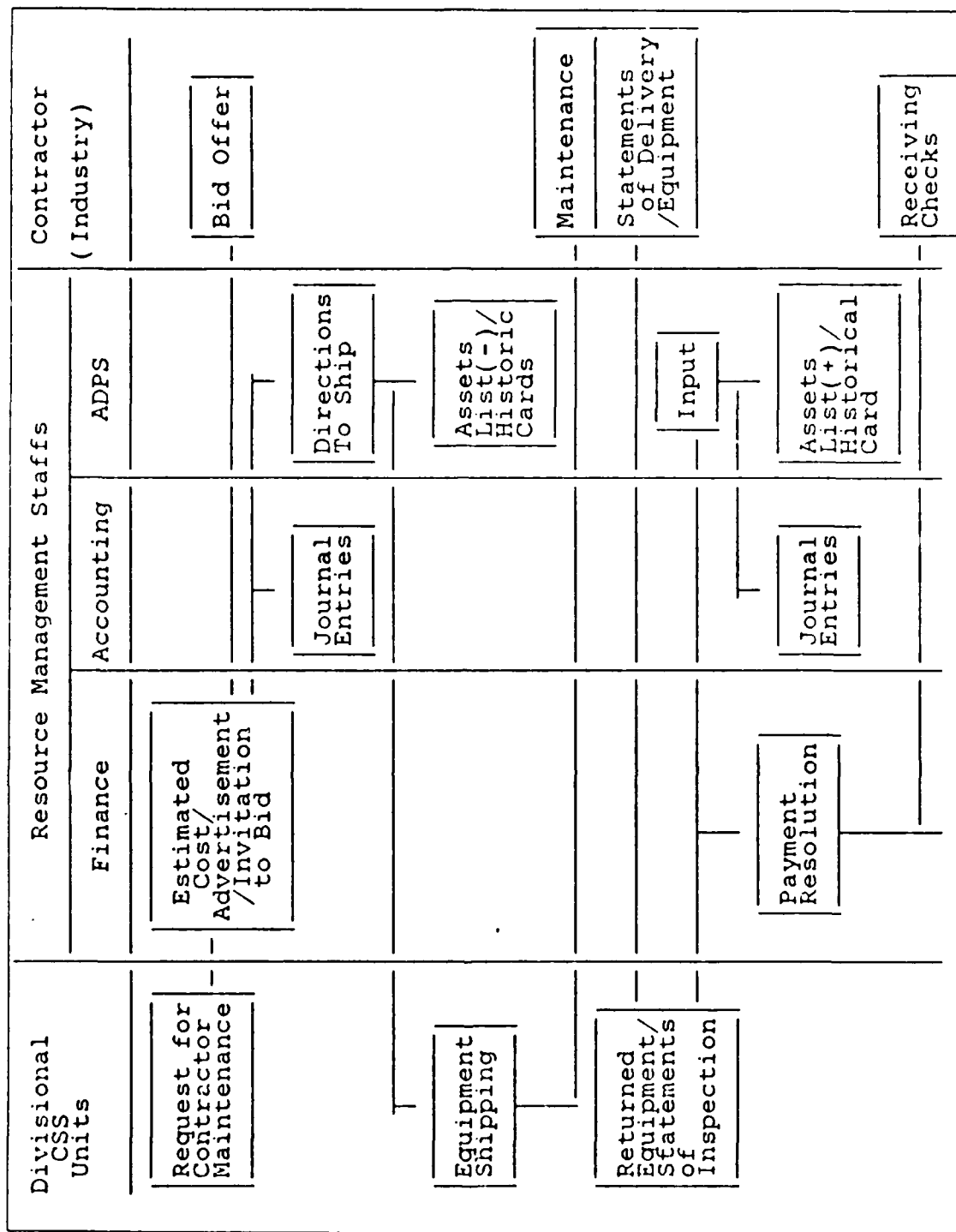


Figure 5.3 ROK Army Divisional Contractor Maintenance Information System.

4. Problems in ROK Army Maintenance System

As stated previously, maintenance activity is one of the subsets of logistics. The commanding officers have had more and more concern with maintenance activities because their weapon systems are becoming increasingly complex and mechanized. Increased complexity means that more maintenance skill is needed to meet the the Army' requirement for combat readiness and normal operations. The maintenance system must be well organized, well trained, and efficiently operated to fulfill its important role in support of the overall logistics system. For reasons of national security, the maintenance systems's deficiency will not be studied; only those problems of maintenance activities that closely relate to this paper will be discussed briefly.

a. Combat Supportability and Depot Location

For close combat support, maintenance organizations below the division level must have sufficient capacity to maintain all equipment and weapon systems. Unfortunately, Korean Army maintenance depends heavily on depot or facility level maintenance, and only some minor repairs and replacement of parts are performed in divisional maintenance organizations. So, to evacuate a piece of equipment or a weapon system, the time interval for collection and waiting for shipment must be taken into account, as this period directly affects repair lead time.

Regarding ROK Army troop deployment, over 80% of the total units are located in the area north of the Han-River, while the depots are located in the southeast part of the peninsula. Thus, the transportation costs become a significant factor of the total maintenance cost. In the U.S. Army, intermediate maintenance battalions (direct support and general support) are capable of repairing their own equipments and weapon systems. [Ref. 32] One of their important maintenance concepts is "first replace and second repair", namely they first replace the failed item before shipping it to a depot level organization. However the shortage of substitution equipment and long waiting time for the depot level maintenance prevent the ROK Army from developing this important combat supportability concept.

b. Lack of Maintenance Capacity

Below the division level, unit maintenance capability is very limited. Most complex maintenance actions must be evacuated to a higher level, so the facility and depot level maintenance work-loads are heavy. Furthermore, the ROK Army is in a period of transition from old-fashioned equipment and weapon systems to new, excellent ones which are procured directly from the Korean defense industries. Old

equipment and weapon systems, after being repaired, are supposed to be delivered to the reserve forces, so the depots have an additional heavy work-load.

The ROK Army is reducing the authorized personnel strength of each unit to establish additional combat units while the Table of Organization and Equipment for each unit remains constant. The establishment of new combat forces is another factor increasing the work-loads on depot maintenance, as new maintenance facilities (organization) have not been established to meet the maintenance needs of these troops. After arriving in the depot facility, the failed item must wait for a long time in the queue. Strictly speaking, this issue is related to combat supportability as discussed previously and it is possible to solve these problems altogether.

c. Efficiency Problems of Monopoly

Military organizations have been considered as consuming groups which inherently do not pay attention to efficiency. Currently, however, the efficiency-seeking tendency is great in the Korean military sector. Units compete with other same or similar units through performance competition. But the depots do not compete with each other because they are functionally organized and one depot's jobs are completely different from the others. The depots are monopolistic organizations to the user units. The authors believe that it is difficult to give motivation and incentives to depot management and workers because of the intrinsic nature of the military organization and their own monopolistic character.

Furthermore, depot maintenance uses a lot of civilians employed by the military. Many of them are retired non-commissioned or warrant officers, and they have low incentives compared to those of private industry or even to the active duty military officers. The main reason for this low incentive is because of the nature of government civilian employment. Since the boss is a military officer, he meets difficulties in punishing or firing the workers with low productivity.

d. Management Problems

The managers and directors of the depots are mainly active duty military officers. The job assignment term of the managers is from one to two years. It is difficult to say that most of them are familiar with the complexities of maintenance management. In the highly technical area of complex maintenance, the advantage of experience or technical knowledge may significantly impact the results of managers' supervision. Thus the managers may emphasize the comparison of planned scheduled maintenance and actual maintenance hours, or budget costs and actual costs, while the quality of products and technical supervision are ignored.

Some military officers tend to avoid an assignment as maintenance managers, because they believe those jobs are not career enhancing.

5. Summary

As weapon systems became more complex, the maintenance role in logistics has become more important than any other sector. The logistics aspect of war has been changed into a material competition concept, which was proved in recent warfare between Iran-Iraq and in the Falklands war. In this respect, maintenance will be more and more important as a parameter of logistics. Korea recognizes the significance of logistics and has developed a new management system which improves cost reductions through life cycle costing, improved reliability and maintainability, and other similar methods.

In terms of efficiency, ROK Army depot maintenance has many problems. Long lead times caused by geographic separation of forces in the field affects the availability of equipment and weapon systems. Internal problems such as low incentives and low quality work of the depot maintenance activities are the major problems. These problems are related to the effectiveness issue as well as to combat supportability, which is the major function of combat service support facilities.

C. EXAMINING THE IMPLEMENTATION OF THE COMMERCIAL ACTIVITY PROGRAM FOR DEPOT MAINTENANCE.

The initial concept of U.S. CA programs was contracting-out of CAs which were performed in government facilities, but this concept has been updated to encourage competition between in-house and contractor performance. The ROK Army also uses contractor maintenance, but the concept is not coincident to the U.S. CA program. The ROK Army uses the contractors only when the Army does not have the capability to repair the affected equipment in-house.

In Chapter III, we realized that the U.S. military saved approximately 30% of the given budget through the CA program. The ROK Army could also find many commercial activities to which this program can be applied to save on expenditures. Depot maintenance is selected by the authors of this paper because it has all the characteristics and fundamental commercial activities conditions requisite for a successful CA program.

1. Conditions Needed to Implement the CA Program

First, some depot maintenance functions are not inherently government functions because they are not related to the close combat support operation. The next

condition is that the private sector possesses sufficient capacity and capability to perform the activities. Without the private sector there can be no competition. Korean private industry has acquired more advanced technology than the military organization and the number of companies which have these capabilities is sufficient to encourage full competition. Furthermore, the defense industry has big problems with excess capacity caused by the government's excess investment. The Korean government is responsible for the problem and guidance to solve that problem. The third condition is an appropriate accounting system to estimate governmental costs incurred by the in-house operations.

The cost comparison process is the fundamental process in a CA program. These cost estimation techniques must be based on a dependable cost accounting system. ROK Army has already implemented the Defense Resource Management and Accounting Systems to measure the performance of each unit. However, the cost accounting system is not sufficiently well developed or advanced for use directly in cost estimation and comparison in a CA program because the systems lack the historical or standard cost data. The depot accounting system is not perfect for deriving the cost data, because fringe benefits of government employees (such as transportation discounts, access to military exchanges at tax free price, medical insurance, and free tuition for children up to high school etc.) are not taken into account as elements of cost. However, minor changes and amending, plus political and economical analysis will make it possible to apply the cost estimations.

2. Impacts of CA Policy Implementation

a. Advantages

(1) *Use of Idle Capacity of Defense Industry.* Even though Korea has experienced a serious problem in the idle capacity of the defense industry, Korea needs to maintain this industrial base for the procurement of surge defense materials. Even though the demand for the defense material is limited in peace time, the ROK Government needs to maintain the production capacity in readiness for the possible outbreak of war.

On the other hand, the maintenance work-load is continuously increasing even in peace time as discussed earlier. Also, consider the greater need for maintenance of equipment during war. It may be impossible to support the resupply requirements. The CA program helps not only the defense industry by using the excess production capacity but also benefits the combat troops during both peace and war time by expanding the maintenance capacity of combat units.

(2) *Contributions to Strength Ceiling Problem.* ROK military are limited by the strength ceiling which is issued by United Nations Command in Korea. The CA program can reduce the number of soldiers in service functions and thereby reinforce the combat forces. The establishment of new or modernized combat forces requires more combat soldiers. In establishing these units, the number of men per squad of infantry troops, or per gunnery section in a firing battery, was reduced to support the new requirements. This has created a serious problem in operating a gunnery section with the reduced crews in peace time. Additionally the new coordination between the active and reserve soldiers is an another difficulty to overcome during mobilization exercise training and war.

Generally, CA programs can contribute to the solution of strength ceiling problems by shifting more personnel into the combat forces. In the U.S., the ratio of civilian defense employees to soldiers is very high compared to that of the ROK. The U.S. military also has a military strength ceiling, and solves the problem by using government employees and contractors for many logistic support functions.

(3) *Enhancing Combat Readiness.* A sole source for maintenance is very vulnerable in war time. All facilities and mechanics could be eliminated by one air-bombing. Since the ROK Army maintenance depot is concentrated in one place, the vulnerability is more serious. A CA program can reduce this vulnerability by introducing additional multi-lateral sources. Commercial enterprises could use their own facilities in appropriate places, which can provide the dispersion effect and reduce the supply response time because of the shorter transportation distance and other efficiencies of free economic competition.

(4) *Improving Troop Morale.* Under the draft system, the ROK military commanders have a lot of difficulty raising and maintaining troop morale. Each commander uses their own unique leadership in addition to institutional actions to improve the morale. Usually, soldiers lose their interests in military life mainly because they suffer from a high work-load. Not only soldiers who live in military barracks but also officers and non-commissioned officers, perform many many duties. In this perspective, the CA programs may reduce their work-load. The soldiers could get more spare time (to get back to an ordinary daily schedule) and could have renewed interests in military life.

(5) *Socio-Economic Effects.* Korean military organizations are normally isolated from the private sector because of national security issues. Many military officers believe that the loyalty of the military to the nation is greater than that of any other group or organization. That is one of the big misconceptions of military leaders. The military is considered separate from the general society. As an example of this isolation, the Korean proverb states, "three persons are walking on the street, one is a man, one is policeman, and the other is a soldier." In spite of using over 30% of the national budget, military budgets do not well consider the socio-economic effects of military expenditures. Spending criteria have only been established for the military objectives. If Korean military budget planners were to consider the socio-economic impacts of military spendings, the spending could contribute much to raising the Gross National Product and the development of industrial technology. Frequent correspondence and contact between military organizations and other facets of society could perhaps promote the relationship.

The private companies in Korea usually like public work, because the Government usually funds with cash. The private companies that engage in a government contract can expect exact cash inflows. Many have healthy and constant cash inflow. Even though the profit margin is lower than any other investment, the companies prefer Government contracts. For this reason, lower bid offering is possible. In other words there may be a trade-off between steady cash and a lower bid price.

All these advantages which could be obtained from the CA program are related to efficiency. Transferring soldiers to combat forces raises the total combat power, which is the primary objective of military organizations. Supposing that only active duty personnel made up the combat forces, the strength ceiling might become adequate or exceed the requirements for sufficient combat power against any North Korean invasion. The basic concept of the CA program, **competition**, refers directly to efficiency and yields better quality work, technical development, and creative mental attitudes and thinking toward the near future of our country. Also, competition generates potential cost savings because of more competitive labor rates and lower overhead costs. ROK Army maintenance depots currently do not have any competitors or potential competitors within the military. Finally, the socio-economic effects

encourage a national level of efficiency instead of on only one side. These advantages could all be integrated into the main objective of the CA program: **efficiency in government expenditures.**

b. Disadvantages

As a general rule, the net effect of competition will be positive, while in the short run, there could be some disadvantages and problems that will be discussed as follows.

(1) *Contractor Control in War Time.* It is clear that military personnel are much easier to control than civilian contractors. In war time the control issue is even more significant. Strikes by workers of the private companies in peace time also may hurt combat supportability.

(2) *Loss of Government Employee Jobs.* Temporarily, some government employees may lose their jobs, which will create social and political problems. Military personnel may also lose assignment positions and the rotation plan of assignment will be unbalanced.

(3) *Higher Cost Recognitions in the Short Run.* Contracting-out may generate more budget cost recognition in the first or second years because contractors need new facilities and equipment which may produce duplication. The U.S. program of Government Furnished Property (GFP) can provide some ideas to reduce these duplications. In the short term perspective, the CA program needs more early spending.

(4) *Military Security Problems.* Contracting-out means that civilians have more access to military affairs which could be classified secret, confidential, or even top secret. In some areas such as new bomb or aircraft maintenance, the maintenance function may contain some security aspects, but most of the maintenance work-load could be categorized as unclassified jobs. Indirect access opportunities will be enhanced by the CA program; the vulnerability caused by increasing the number of people with access to military affairs will be larger. Generally, the task of security forces will be heavier and more complex; probably more security forces will be needed for appropriate security activities.

3. Limitations and Barriers

a. Lack of Management Groups

For the performance of the Defense Resource Management System above the division level, the ROK Army, established additional management staffs consisting

of previously existing financing, accounting, computer, and management staffs. [Ref. 33] The CA program of the U.S. needs highly educated specialists in the engineering, accounting, management, and contracting fields. It is difficult to say that the ROK Army management staffs presently have enough capacity or sufficient knowledge to carry out management studies and in-house cost estimations, because these new staffs have just transferred from current Army branches. The management staffs consist of officers whose staff specialty is planning management¹⁰ (500).

b. Non-adoptable Factors in the Accounting System

In the U.S. CA program, cost comparison procedures are complicated and difficult to understand by non-accounting officers. Even if the ROK Army started to use a new accounting system, it is nothing but the first step of a corporate accounting system. Accurate cost allocation and identification of cost objectives are very difficult. Especially difficult is the allocation of fringe benefits of labor costs. The major problem is the draft system which prevents cost estimators from accurately calculating the labor cost of the conscript soldiers.

c. Resistance of Commanders

As in the U.S. military example, it is clear that ROK Army commanders don't like losing their power base in numbers of soldiers. In a power centered organization, the number of soldiers contributes directly to the power of that commander, even though he controls the contractors, because his influence over them cannot be the same as on his soldiers. Initially, the U.S. CA program ordered its commanders to contract-out if there were enough commercial sources and if the project is identified as CAs. However, the U.S. faced a lot of barriers in implementing the program, because military commanders did not want to reduce the number of their soldiers, which was a symbol of their power base. The concept has now been changed to perform management studies and cost comparisons. Only when in-house costs are lower than contractor costs estimations, could it remain in-house. This encourages commanding officers to strive for greater in-house efficiency.

d. Mis-perceptions about Cost Concepts

ROK Army commanders usually consider only out-of-pocket costs of the operation. The most important idea about the budget formulation process is the advanced concept that the budget is not just a consumption of funds. Decision makers

¹⁰100 : Personnel, 200 : Intelligence, 300 : Operation, 400 : Logistics, 500 : Planning Management.

must know that a budget has its own feedback effects. Military spending is not just a consumption function but also has a significant effect on the national economy. If a producer of one weapon system could get the maintenance contract, maintenance activities could improve their own performance by knowing the weakness of the weapon system. Similarly, through contracting-out, the entire industry gains by enhanced production and maintenance activities and knowledge. This will therefore raise the overall quality level and reduce life cycle maintenance requirements. In this perspective, The CA program can be the pioneer of the feedback effect in military spending.

D. DIRECTIONS AND SUGGESTIONS FOR IMPLEMENTATION

As discussed in the previous section, the CA program can provide many anticipated effects which ultimately could be integrated into a policy enhancing the efficiency of the national economy. This program, as a national level of policy, requires some sequential steps. Appropriate laws must be passed to provide the fundamental legal authority. According to these laws, the ROK DoD could issue the necessary directives, instructions, and regulations to implement the program in military organizations.

1. Tentative Execution Plan

It would be very difficult and confusing if all military bases above the division level were to simultaneously execute this program from the beginning. The ROK DoD must schedule tentative phase-in plans from which the program could be expanded gradually.

2. Setting an Example

a. Management Team Formulation

For the first stage, setting up a centralized management study system is recommended. The ROK DoD and each service agency would establish several management teams in its own headquarters. These teams will be assigned to higher priority CA programs. The priority could be determined by the following considerations: 1) the impacts to combat supportability, 2) the scale of the budget, 3) the existence of sufficient competitors in the commercial sector and, 4) the general possibility of budget saving.

As a task force, each management team will be assigned to a selected base and study the assigned activities with the base commanders. The team members could

be selected from qualified military personnel¹¹ or from civilian specialists if needed. To provide local operational knowledge, temporary expertise could also be solicited from personnel at the base. Their task will be to develop the performance work statement, cost estimation, contracting affairs, inspections and result reports. After finishing one job assignment, the team could be transferred.

b. Cost Estimations and Comparison

ROK Army Headquarters will notify certain activities that they have been selected for the study of cost comparisons, then give the selected organizations one or two years to prepare for the cost estimation. During the given time period, the commander or manager of the activity will continue to try to enhance efficiency because, after the given period of time, he can retain these activities as in-house performance when in-house performance is cheaper than contractor performance.

Cost comparisons must be done with several years' costs because the contract cost to the Government tends to be higher in the first year because of the set-up costs and contract administration costs. The scheduled work-loads can be used to estimate the costs of both in-house and the contractor in the maintenance depot. Depending on the characteristics of the activity, the period of time required for cost comparison could be changed. In the U.S., three years is considered basic and additional years can be added for cost comparison.

(1) *Cost Estimation Example in a ROK Army Maintenance Depot.* Korean depots use a job order costing system,¹² the purpose of which is to calculate the production costs and then to use them as a product price for work to be done. The Defense Resource Management System requires an exact price for each item used in the military. Minor adjustments in this job order costing system are needed to use it for CA cost comparison. The salaries of enlisted personnel must be adjusted on the basis of the total costs which would include costs of food, clothes, shelter, etc. For the officers, non-commissioned officers, and civilian employees fringe benefits must be added to labor costs.

¹¹Korean military has invested much money for the officer education program since the late 1970s. Many officers have master's or doctorate degrees in many fields. Korean military is trying to utilize their knowledge effectively in appropriate positions.

¹²An example of current ROK Army depot job order costing is introduced in Appendix C.

First, all costs incurred must be divided into fixed and variable costs, so the cost estimation for the second and third year will be possible, and labor related cost selection is necessary to calculate the fringe benefits. The Korean Defense Management Accounting System is helpful for the cost estimation.

Assume that \$393,758 is estimated to rebuild 133 trucks in year Y-1.¹³ This amount is obtained from the most efficient year's performance among historical (predetermined period) maintenance unit costs. The depot cost calculation shows that \$ 129,501 of the \$393,758 are variable costs, while \$ 264,252 are fixed costs.¹⁴ Labor related costs are 35 % of the total costs to rebuild 133 trucks. Rebuild costs for a three year period are calculated for the cost comparison. Table 6 shows the ways to calculate the total costs of in-house performance.

For convenience, the inflation rate and the fringe benefit rate are fixed at 5 % and 15 %, respectively. The pre-planned work-load of the tank maintenance group are 140 trucks in year Y, and 125 and 145 trucks in the successive years. The calculations are made under the assumption of no change in salary rate (constant dollars), because the average salary rate is in steady state in the long run. The Korean military has enough history to show a steady state in the constant dollar salary rate. If the group is in the beginning state, the salary steps will go up without any retirement of higher salary step personnel. But in the steady state, one employee retires and another enters into the steady state.

(2) *Additions and Deductions to In-house Costs.* In-house performance costs should be adjusted to reflect the cost of capital and one-time new start cost if they exist. The cost of capital is not an outlay cost but an imputed cost, and represents the opportunity cost for the Government's investments tied up in capital assets. When considering a shift from contractor to in-house performance in case of cost increase or problems of contractor performance after awarding the contract, one-time new start costs such as training, transportation, installation, and recruiting costs should be added to basic in-house performance costs.¹⁵ The training costs in school organization should

¹³See Table 7 in Appendix C.

¹⁴This distinction of variable and fixed cost can be derived from regression analysis using monthly data. Even though there would exist some limitation to convert to yearly cost estimation, the data is more reliable than past yearly data because the Korean military just started to use the Defense Resource Management System and the Defense Resource Management Accounting System. This example is introduced in the last part of Appendix C.

¹⁵The total for the new starting costs is to be spread evenly over the next five years in U.S. cost estimation.

TABLE 6
IN-HOUSE COST ESTIMATION OF ROKA MAINTENANCE DEPOT.

Costs Contents	Standard (133 Trucks)	Year Y (140 Trucks)	Year Y + 1 (125 Trucks)	Year Y + 2 (145 Trucks)
1. Variable Costs	129,506	136,328	121,721	141,197
2. Fixed Costs	264,252	264,252	264,252	264,252
3. Total Costs	393,758	400,580	385,973	405,449
4. Labor related Costs (35 %)	137,815	140,203	135,091	141,907
5. Fringe Benefit (15 %)	20,672	21,030	20,264	21,286
6. Total labor Related Cost	158,487	161,223	155,355	163,193
7. Non-Labor Related Costs	255,943	260,377	250,882	263,542
8. Additional Costs	-	-	-	-
9. New Total Costs	414,430	421,600	406,237	426,735
10. Inflation (5 %)	414,430	421,600	426,549	470,475
11. In-house Cost for Cost Comparison : \$ 1,254,572				
10. Estimated Budget Spendings (Current Dollar) : \$ 1,318,624				

also be considered. For example, the initial or retraining costs of a mechanic could be added to indirect costs, if required. Schools could provide the training cost data per student for the estimation of the indirect costs. These items could be included as the 8th item in Table 6 as additional cost. These costs were not included in the above example (Table 6).

(3) *Contractor Performance Costs.* The contractors' bid cost should be opened after estimation of in-house performance costs. The ROK Army could use the U.S. cost comparison format.¹⁶ Contractor performance cost should also be adjusted to reflect any income or expenditure to be experienced by the government if the service is provided by a contractor. The cost of capital on government furnished property (GFP) is computed and must be added to the contractor's bid costs.

c. Contract-out (if the contractor cost is lower than in-house cost)

After award to the contractor, the commercial activity's management responsibility is transferred to the management staffs of the troops (installation). The ROK Army management team must then go to the next installation where another CA will be performed. If some special technical aid is needed, the base commander can ask Army Headquarters for task force support.

3. Preparing (Secure and Train) the Needed Personnel

As the CA plan is implemented, ROK Army Headquarters must secure the needed personnel to perform CA duties in all bases and, if needed, appropriate training. Appropriate positions must be established for the director of commercial activity (DCA). Contracting officers also must be assigned to the management staff. Functional managers should be trained to do required jobs such as writing performance work statements, auditing, inspecting, reporting, etc.

a. Director of Commercial Activity (DCA)

Each installation which carries out the CA program needs a program director. In the U.S., the DCA is positioned under the authority of the supporting command. The DCA has the entire responsibility for the CA affairs, and is mainly filled by civilian (not military) personnel. In the U.S.'s 7th Infantry Division, the DCA reports to the Directorate of Resource Management who is under the control of the Garrison Commander.

The ROK Army can designate the DCA to the division level of the installation. A ROK Army division normally has a resource management staff officer who has 4 sections; general management, finance, accounting, and ADPS. The DCA should be positioned within the resource management staff to do CA inventory and establish a special committee which organizes, and supports the management team. Also they will support functional managers to write accurate Performance Work Statements and specifications.

¹⁶See Appendix D : Cost Comparison Format (U.S.)

b. Contracting Officers.

Contracting involves a legal agreement between two parties: buyer and seller. The term **contracting officer** means the person executing this contract on behalf of the Government and other officer or civilian employees who are properly-designated contracting officers. The term includes, except as otherwise provided in the contract, the authorized representative of a contracting officer acting within the limits of his authority. [Ref. 34: p. 88]

As defined in the above statement, the contracting officer's task is very important and delicate. Therefore, professional contracting officers will be needed to implement the CA program. The ROK Army has contracting officers, but it is a part of the career rotation of finance officers. The need for professional contracting officers will be even greater than now. Contracting officer representatives (COR) are also very important to the contractor operation. Normally, some members of the personnel or logistics staff are responsible for ensuring that the contractor accomplishes the tasks for which he is being paid. The COR's influence and power rests upon how well the PWS has laid out requirements, standards and the surveillance plan. A training program for CORs should be considered as well as one for contracting officers.

4. Decentralizing the Program Execution Authority

After a predetermined period stated in the tentative plan, the CA program could be implemented in all organizations. The lowest level which can execute a CA program could be established as the division level. During the predetermined period, each division must secure and train the needed personnel. The shortest way to do this is through reinforcement of existing management staffs. The cost savings from the CA program should be considered as one of the important criteria in troop evaluation as well as officer's performance evaluation. This will motivate all commanders and related staffs to do their best in budget savings.

E. RELATED ISSUES

1. Draft System

Since the foundation of its Armed Forces, the ROK has used the draft system for soldiers, while officers and non-commissioned officers are professional personnel. The Government only pays some spending money to enlisted personnel. So in the ROK DoD budget, the salary of the enlisted men is very small. In cost comparisons, the in-house cost estimation must include the enlisted men's salary, but it is difficult to

use existing salary levels directly. Considering the equity effects of the CA program, the opportunity cost concept should be applied to calculate the labor costs of enlisted men.

2. Fringe Benefits

Fringe benefits are an important factor in calculating labor costs. The ROK Military provides many kinds of extra benefits beyond salary. Pension programs, tax-exempt goods purchasing, transportation discounts, medical insurance, discounted access to recreation facilities, housing aid, and education expenditure subsidies are typical benefits. It is very difficult to measure all these benefits in monetary terms and it is difficult to say that every individual receives the same amount of fringe benefits.

Fringe benefits can be expressed as a certain proportion of labor costs, which will vary according to the individual's rank, number of dependents, and salary steps. So, if the CA program will be implemented, application of fringe benefits in cost estimation will be a major political level issue. In other words, the decision-maker will be responsible for determining the appropriate allocation of fringe benefits to direct labor costs.

3. Mobilization Law

ROK mobilization law provides the legal authority to mobilize civilian industries or private property and estates in war time. Every registered corporation has an emergency planning director included in its top functional staff. These positions are filled with retired military officers. The main purpose of this system is to prepare mobilization readiness in peacetime and to execute this plan during nationwide exercises or in case of war. [Ref. 31: Provision 1-4-1, 1-4-2]

An appropriate amendment of this law is necessary to ensure the continuous combat support by the contractors in war time. In the future, the aspects of conflict in the Korean peninsula will be characterized by total war. There would not be any front line or rear area. The entire population would defend their own company or homeland. With this view point, the appropriate amendment of mobilization law will be necessary in executing the CA program.

4. Contract Management and Administration

a. Government Property

Government property provided to contractors is often important in the performance of a government contract. Such property may be provided for use in government contract performance, because of the government's need for

standardization, economy, stabilization of sources, broadening the industrial base, and other factors that support the national interest. [Ref. 34: pp. 129-133] When the Government furnishes the property directly from its stores, it is called Government Furnished Property (GFP) and when contractors purchase property to perform government contract, it is called Contractor Acquired Property. These two categories are covered under the general heading of government property.

In execution of the CA program, government property can be used for any of the following reasons: ensuring proper security, standardization, or increasing competition through allowing small businesses to compete using limited investment. For depot level maintenance, the ROK Army can furnish the facilities and equipment to contractors to avoid a performance vacuum during the transition time. GFP may be especially useful in increasing competition because the Korean industrial base may not provide sufficient competitors in some sectors.

b. Contract Types

Generally, government contracts are categorized into two types: fixed-price and the cost reimbursement. The fixed-price contract usually stipulates a firm price, however, under some circumstances, it may leave the final price open for later adjustment. Under a fixed price contract the contractor guarantees the performance of the contract. On the other hand, the cost-reimbursement contract is selected when the cost of work cannot be adequately detailed for the contractor to guarantee performance; therefore, the contractor can only promise his best efforts.

Depot level maintenance requires exact performance or guarantees instead of contractors' best efforts. To determine whether to contract-out or not, government agencies need exact cost estimation before performance. A fixed-price type contract is appropriate for maintenance contracts. Maintenance work itself is not the same as a production process of one product. Every item's maintenance costs vary according to the equipment's condition. From this view point, the contractor would not be willing to take a firm fixed-price arrangement. But as depot level maintenance is not minor repairs, but usually means the overhauling, rebuilding, or modification of an equipment, the variation in cost between several items should be very small. This means that a firm fixed-price contract is possible for depot maintenance. For the purpose of encouraging the contractors, fixed price incentive contracts which are designed to improve the contractor's performance in the area of costs, quality, and the delivery schedule could be used. The most popular version of this type contract is a

fixed-price incentive fee contract. Given the small risk to contractors in a depot maintenance contract, a fixed-price incentive fee contract is reasonable.

F. SUMMARY OF CHAPTER

The overall maintenance concept plays a vital role in assuring that military forces are equipped with weapon systems that are capable of performing in accordance with design and mission. By implementing the CA program, maintaining a private industrial capacity fully qualified in the repair of military weapon systems and equipment enhances the overall maintenance capacity of the ROK military, and provides an extremely important base from which to expand during periods of conflict.

The cost comparison is the most important part of the CA program. But the cost comparison could be subjective rather than objective, because an accurate cost estimation is not possible. The cost savings, in the U.S., advocated by the proponents of contracting-out, have been substantiated as reasonable estimates by both GAO and OMB. However, these estimates can't tell the whole story and do not account for all costs related to that project. For instance, calculation of fringe benefits and conversion costs are very subject to political interpretation.

Generally, in the U.S., the effect of the CA programs' implementation is estimated positively. Korea has almost same economic structure as the U.S. and can expect additional effects such as improving combat power under the strength ceiling system, improving the relationship between civilian and military organizations, and contribution of military spending to national economic growth.

ROK Army maintenance depots have a lot of problems concerning efficiency, combat supportability, and capacity. By contracting-out or competition between in-house and private industry, these problems could be eliminated or reduced. The significant contributions of this program are to enhance the operational rate of the defense industry and then to make the national industry healthier.

The military commanders must realize that contract work-forces play an important part of the total force structure, because civilians can also fight against North Korea with the outbreak of a war. Thus they must realize that they can enhance the combat power base through contracting-out.

VI. CONCLUSION AND RECOMMENDATIONS

In the U.S., for more than three decades the Federal Government has been involved in an effort to more efficiently meet its needs for commercial goods and services. The CA program falls within the exclusive jurisdiction of the Executive Branch of the Federal Government. Over the years, the policy, espoused in OMB Circular A-76 to reduce the cost of Federally operated CAs has been evolving. Originally a program to contract-out all Government-oriented commercial functions, the current initiative promotes the achievement of increased productivity both through cost competitions with the private sector and in-house efficiency reviews. [Ref. 1: pp. 71-75] In some states in the U.S., even the operation of jails are performed by private firms, as the Government searches for better efficiency and productivity.

It is very difficult to calculate the exact savings from this policy, but the U.S. OMB estimates that the average savings has been between 25% to 30% when the least-cost operation, in-house or contractor, was selected.

U.S. DoD has more difficulty in performing this policy than any other branch of the Federal Government, since DoD has more to consider to implement this policy. In particular, the criteria of CA is more obscure in the DoD field. However, DoD agencies reported \$501 million in savings from studies completed since 1979. [Ref. 1]

On the other hand, the ROK military has concentrated heavily on an armed race with North Korea. With the development of defense industries in the late 1970s, Korea can afford to think of efficiency in military spending. As a result, Present Chun ordered to seek more efficient ways to reduce operating expenditures and raise capital investments.

The newly started Defense Resource Management System focuses on this point. By giving every soldier ownerships and incentive, productivity and efficiency can be promoted. Fortunately this new Defense Resource Management System forces the use of an accounting system in the military. Also, the structural organization was changed to meet the needs of management. One more merit is the introduction of computer based information systems. At the divisional level, many computer hardware systems was installed in late 1985, and the needed personnel were trained and assigned to these areas. All these developments can facilitate the implementation of the CA program in the Korean military organization.

Currently, it is not possible to implement the CA program throughout the entire military organization. Korea needs more qualified personnel and time to adjust mentally to these new circumstances. Korea must review the U.S.'s management history first and then implement this policy. In the first stages, it is more important that the military and government employees recognize the existence of their competitors.

This CA program would help integrate the military and civilian sectors. The Korean military organization is currently isolated completely from the rest of society. Isolation of the military organization develops social, or even political problems. This isolation has effected the economic sector. For example, military personnel have had many difficulties finding jobs after retirement.

In this paper, the authors selected the depot maintenance function as an example for discussion. As discussed in a previous chapter, the ROK military maintenance system has a lot of difficulties. Depot maintenance in particular also has problems in several fields. Thus, many advantages could be anticipated from implementing the CA program in the depot maintenance function.

In addition to raising efficiency in the military sector, contracting-out of the depot maintenance function can generate more additional benefits. For example, reducing operational budget spending (and thereby allow increasing capital investment), enhancing the military readiness base in peace time, raising the operational rate of the defense industry, contributing to national economic growth, and promoting the relationship between the military and civilian sectors. Besides depot maintenance, the ROK military can consider several other functions such as food services on bases as the first stage of implementation. It depends highly on whether it is a CA or not, but this CA criteria is also very subjective. By considering the overall environment, decision makers could make the decision whether it is a CA or not. From this view point, the depot maintenance function could be a good example of that argument.

The most important consideration (effect) that could be obtained from CA program implementation is to promote the total combat power. The operating expenditures will be reduced from the CA program within the given budget and the number of active soldiers in combat units will be increased under the strength ceiling circumstance. Usually combat power is regarded as the number of soldiers, equipment and weapon systems in a combat area. But under the CA program, active soldiers

could be assigned to combat units and civilians could be placed in the jobs left by the soldiers. The ROK can secure and maintain enough personnel power compared to North Korea.

The authors suggest the following sequential steps to implement a CA program in the ROK military:

- 1) Preparing appropriate law(s) to provide legal authority in execution.
- 2) Preparing and issuing directives, instructions, and regulations in DoD.
- 3) Establishing tentative execution plans.
- 4) Utilizing task forces (centralized management) at the beginning stage.
- 5) Securing and training needed personnel
- 6) Decentralizing the execution of the CA program to divisional level.

In cost estimation and comparison, the differential cost concept is advisable at the beginning stage. According to the execution results, cost comparison techniques could be developed to best fit the Korean situation.

Finally, decision makers have to have an appreciative eye of national dimensions. Narrow-minded thinking implies that military spending may be increased by the CA program simply because a civilian's salary is higher than a soldier's. But the CA program can generate a lot of external effects on both military organization and civilian society, and these externalities can contribute much to the final goal of the national policy: **establishing an advanced welfare state.**

APPENDIX A

EXAMPLES OF COMMERCIAL ACTIVITY IN U.S.

AUDIOVISUAL PRODUCTS AND SERVICE

- Photography (still, movie, aerial, etc.)
- Photographic processing (developing, printing, enlarging, etc.)
- Film and videotape production (script writing, direction, animation, editing, acting, etc.)
- Microfilming and other microforms
- Art and graphics services
- Distribution of audiovisual materials
- Reproduction and duplication of audiovisual products
- Audiovisual facility management and operation
- Maintenance of audiovisual equipment

AUTOMATIC DATA PROCESSING

- ADP service (batch processing, time-sharing, facility management, etc.)
- Programming and systems analysis, design, development, and simulation
- Key punching, data entry, transmission, and teleprocessing services
- System engineering and installation
- Equipment installation, operation, and maintenance

FOOD SERVICE

- Operation of cafeterias, mess halls, kitchens, bakeries, dairies, and commissaries
- Vending machines
- Ice and water

HEALTH SERVICE

- Surgical, medical, dental, and psychiatric care
- Hospitalization, outpatient, and nursing care
- Physical examinations
- Eye and hearing examinations and maintenance and fitting of eyeglasses and hearing aids
- Medical and dental laboratories
- Dispensaries

- Preventive medicine
- Dietary services
- Veterinary services

INDUSTRIAL SHOPS AND SERVICES

- Machine, carpentry, electrical, plumbing, painting, and other shops
- Industrial gas production and recharging
- Equipment and instrument fabrication, repair and calibration
- Plumbing, heating, electrical, and air conditioning services including repair
- Fire protection and janitorial services
- Refuse collection and processing

MAINTENANCE, OVERHAUL, REPAIR, AND TESTING

- Aircraft and aircraft components
- Ships, boats, and components
- Motor vehicles
- Combat vehicles
- Railway systems
- Electronic equipment and systems
- Weapons and weapon systems
- Medical and dental equipment
- Office furniture and equipment
- Industrial plant equipment
- Photographic equipment
- Space systems

MANAGEMENT SUPPORT SERVICES

- Accounting and financial services
- Engineering and technical services
- Information services

MANUFACTURING, FABRICATION, PROCESSING, TESTING, AND PACKAGING

- Chemical processing
- Composites and plastics processing

- Liquid, gaseous, and chemical products
- Lumber products
- Communications and electronics equipment
- Rubber and plastic products
- Optical and related products
- Sheet metal and foundry products
- Machined products
- Construction materials
- Test and instrumentation equipment

OFFICE AND ADMINISTRATIVE SERVICES

- Library operations
- Stenographic recording and transcribing
- Word processing, data entry, typing services
- Mail/messenger
- Translation
- Management information system, products and distribution
- Financial auditing and services
- Compliance auditing
- Court reporting
- Material management
- Supply services

OTHER SERVICES

- Laundry and dry cleaning
- Mapping and charting
- Architect and engineering services
- Geological surveys
- Cataloging
- Training (academic, technical, vocational, and specialized)
- Operation of utility systems (power, gas, water, stream, and sewage)
- Laboratory testing services

PRINTING AND REPRODUCTION

- Facility management and operation

- Printing and binding (where the agency or department is exempted from the provisions of Title 44 of the U.S. Code)
- Reproduction, copying, and duplication
- Blueprinting

REAL PROPERTY

- Design, engineering, construction, modification, repair, and maintenance of buildings and structures; building mechanical and electrical equipment and systems; elevators; escalators; moving walks
- Construction, alteration, repair, and maintenance of roads and other surfaced areas
- Landscaping, drainage, mowing and care of grounds
- Dredging of waterways

SECURITY

- Guard and protective services
- Systems engineering, installation, and maintenance of security systems and individual privacy systems
- Forensic laboratories

SPECIAL STUDIES AND ANALYSIS

- Cost benefit analyses
- Statistical analyses
- Scientific data studies
- Regulatory studies
- Defense, education, energy studies
- Legal litigation studies
- Management studies

SYSTEMS ENGINEERING, INSTALLATION, OPERATION, MAINTENANCE, AND TESTING

- Communications systems (voice, message, data, radio, wire, microwave, and satellite)
- Missile ranges
- Satellite tracking and data acquisition
- Radar detection and tracking
- Television systems (studio and transmission equipment, distribution systems, receivers, antennas, etc.)

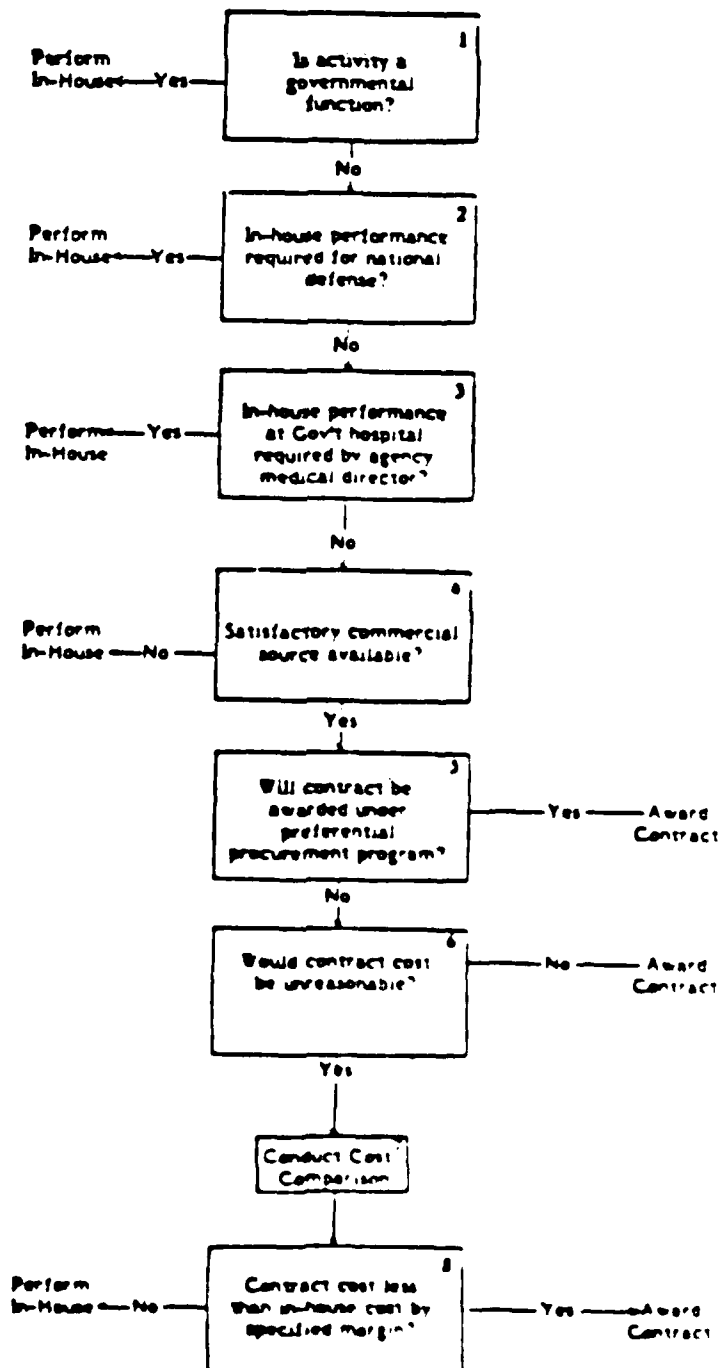
- Recreational area
- Bulk storage facilities

TRANSPORTATION

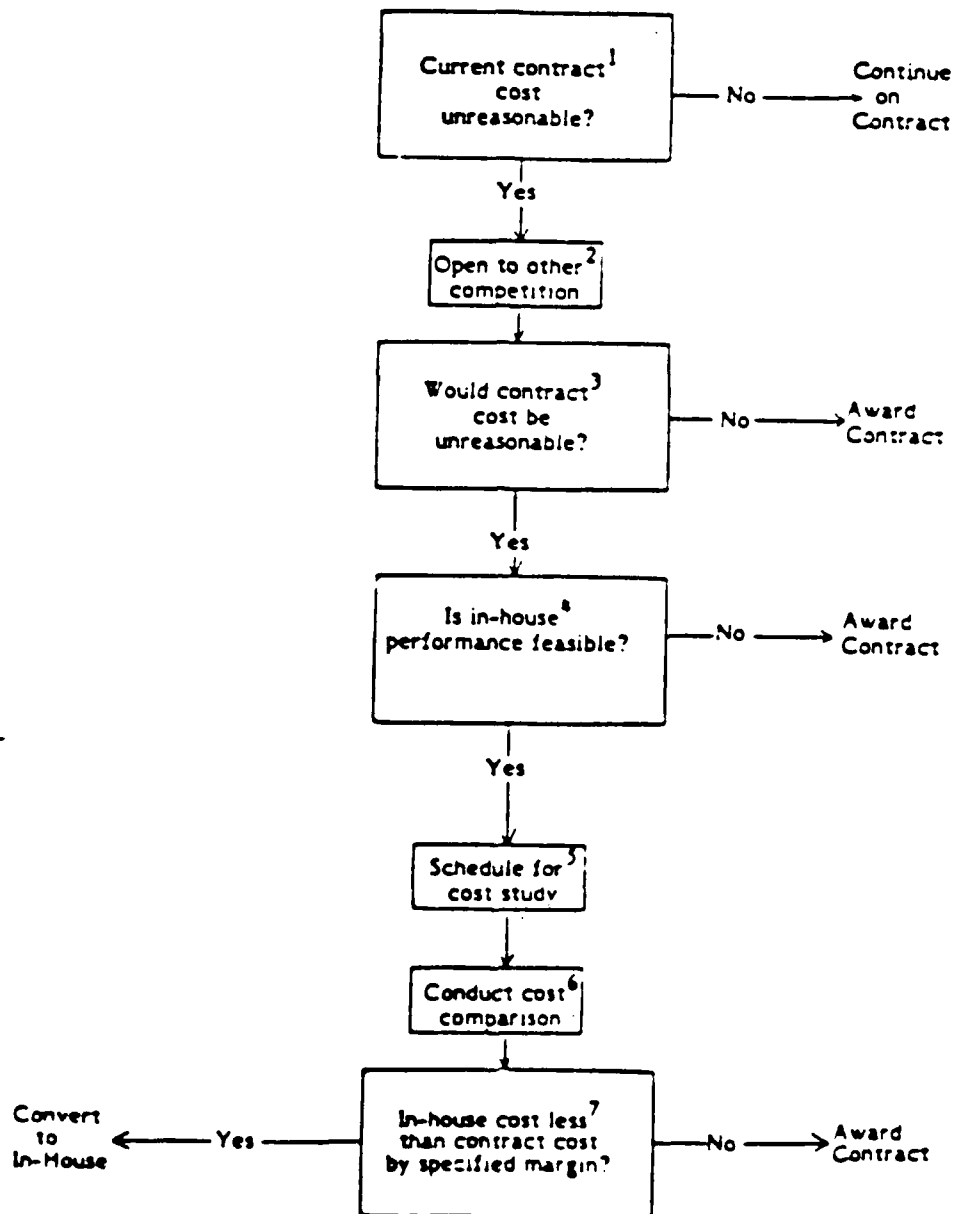
- Operation of motor pools
- Bus service
- Vehicle operation and maintenance
- Air, water, and land transportation of people and things
- Trucking and hauling

APPENDIX B FLOW CHARTS OF IMPLEMENTATION OF A-76

I. NEW REQUIREMENT OF A CA



2. EXISTING CONTRACT OF A CA



APPENDIX C

AN EXAMPLE OF CURRENT ROK ARMY DEPOT JOB ORDER COSTING

1. ORGANIZATION CHART OF VEHICLE MAINTENANCE GROUP

The Vehicle maintenance group is one subset in ROK Army Xth maintenance depot. The Group has 5 departments: Light Vehicle, Engine, Transmission, Service, and Heavy Vehicle Department. Each department operates its own headquarters and supply section, and 3 to 8 functional sections.

The Light Vehicle and Heavy Vehicle Departments produce finished products, and ship the products to the supply depot. The Engine and Transmission Departments repair the failed items and produce the parts or semi-finished goods of which some are shipped to the supply depot while others are sent to the Assembly Section of the Light Vehicle Division. The Service Department supports all the other departments in the vehicle maintenance group. The organizational chart of Vehicle Group is shown Figure C.1.

2. HYPOTHETICAL COST DATA DURING NOVEMBER, 1985

The vehicle maintenance division of a ROK Army functional maintenance depot provided following hypothetical data¹⁷ for November, 1985. Job 101 (K-300 5.4 ton : 10) started in November, 1986, and finished during November. Job 102 (K-100 1.4 ton Jeep : 5) started in November, but not yet finished.

a. Direct Materials

101 : \$ 3,200, # 102 : \$ 1,600, # 101-1 : \$ 2,800,
102-1 : \$ 1,400, # 101-2 : \$ 1,600, # 102-2 : \$ 1,200

¹⁷The hypothetical data are derived from the *ROK Army Managerial Accounting System* [Ref. 10]. The authors revised the values of costs on the basis of realistic observation while the allocation rates are adopted from the reference. The monthly cost data shown in section 4 are simulated observations for illustration of technique.

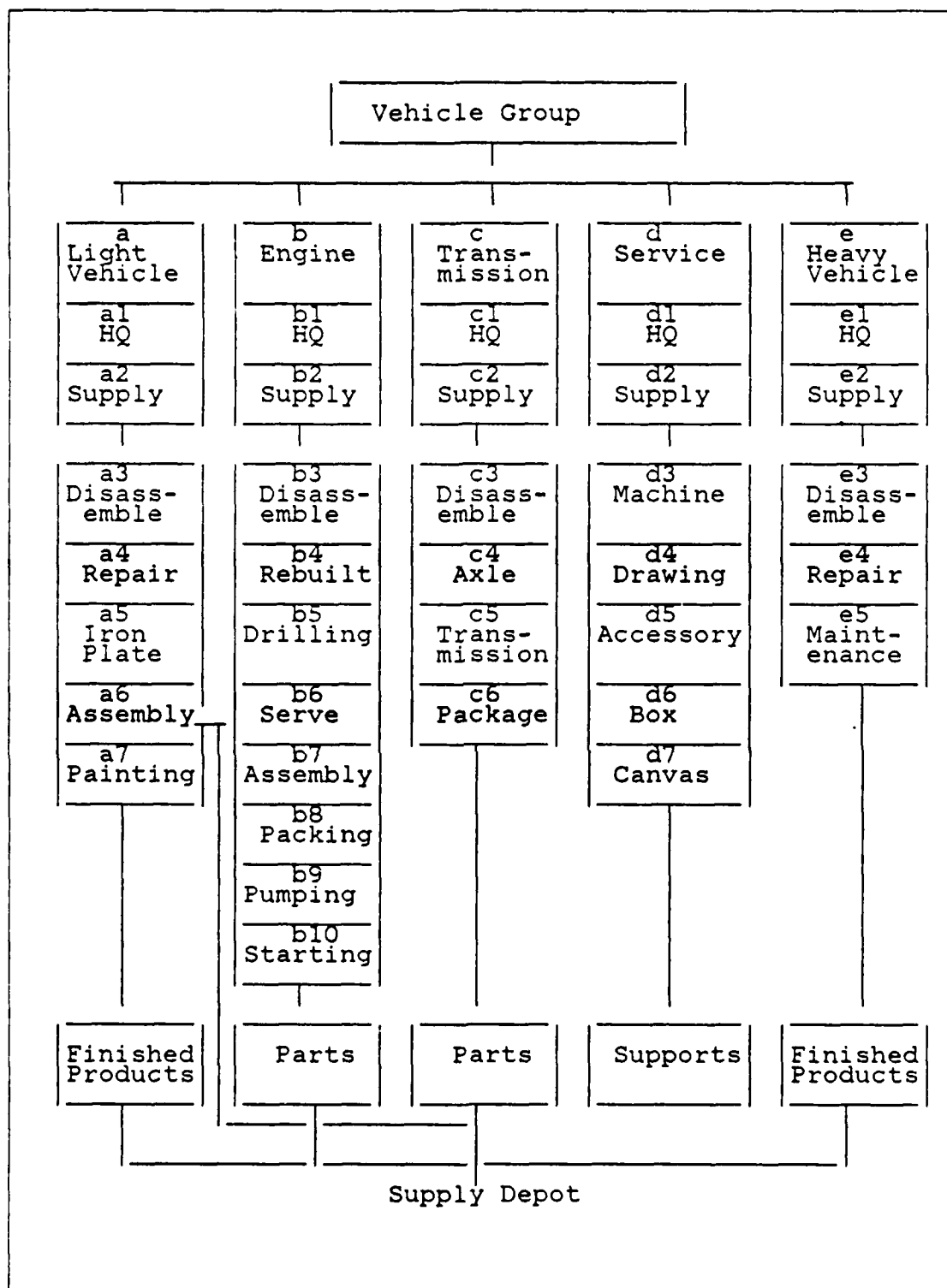


Figure C.1 The Organizational Chart of Vehicle Division.

b. Direct Labor Hours of Departments (Factories)

The rate of direct labor per hour is S 1.40.

1. Direct Labor Hours of Light Vehicle Department

Jobs	a3*	a4	a5	a6	a7	Total
101	500	400	500	400	300	2,100
102	200	200	250	100	70	820
Total	700	600	750	500	370	2,920

* Note : The a3 means the disassemble section of the light vehicle department. See Table C.I.

2. Direct Labor Hours of Engine Department

Jobs	b3	b4	b5	b6	b7	b8	b9	b10	Total
101-1	400	500	300	450	500	200	300	400	3,050
102-1	70	100	80	90	200	100	150	200	990
Total	470	600	380	540	700	300	450	600	4,040

3. Direct Labor Hours of Transmission Department

JOBS	c3	c4	c5	c6	Total
101-2	300	200	250	150	900
102-2	200	100	150	120	570
Total	500	300	400	270	1,470

4. Direct Labor Hours of Service Department

Jobs	d3	d4	d5	d6	d7	Total
101	50	70	80	60	70	330
102	40	50	50	30	20	190
101-1	60	70	60	30	40	260
102-1	50	50	40	40	30	210
101-2	40	20	30	10	10	110
102-2	30	30	10	10	20	100
Total	270	290	270	180	190	1,200

5. Direct Labor Hours for Each Job Order

	101	102	101-1	102-1	101-2	102-2
Dept a	2,100	820			-	-
Dept b	-	-	3,050	990	-	-
Dept c	-	-			900	570
Dept d	330	190	260	210	110	100
Total	2,430	1,010	3,310	1,200	1,010	670

c. Indirect Maintenance Costs

1. Light Vehicle Department

Accounts	Total	a3	a4	a5	a6	a7	a1	a2
Ind Mat	1,200	200	160	200	280	160	120	80
Ind Lab	960	160	120	160	200	120	80	120
Dept OH	800	10%	20%	20%	10%	10%	10%	10%

2. Engine Department

	TOT	b3	b4	b5	b6	b7	b8	b9	b10	b1	b2
Ind M	820	80	120	60	140	120	80	60	40	80	60
Ind L	1,200	140	120	80	160	200	180	60	80	60	120
Dept OH	250	10%	15%	5%	5%	10%	15%	10%	5%	15%	10%

3. Transmission Department

	Total	c3	c4	c5	c6	c1	c2
Ind Mat	560	60	80	120	120	80	100
Ind Lab	620	80	100	60	160	140	80
Dept OH	600	5%	10%	20%	30%	15%	20%

4. Service Department

Accounts	Total	d3	d4	d5	d6	d7	d1	d2
Ind Mat	540	80	60	80	100	120	40	60
Ind Lab	540	60	80	40	80	80	120	80
Dept OH	800	10%	15%	10%	5%	10%	20%	30%

5. Home Office Expense

The home office expenses of the maintenance depot HQ and staff offices are \$ 10,000.

6. Other Costs

Supported service cost (SS) : \$ 400

Electric and water fares (EW) : \$ 800

Depreciation Expense (DEP) : \$ 1,200

7. Department HQ and Supply Section Cost Allocation Base

(1) *Allocation Rates for Department Headquarters Sections' Costs.* The allocation rates of HQ section costs to production sections could be determined on the basis of square feet of buildings or the number of employees of each production sections within each department. The rates, as shown below, could be described in the standard operating procedures (SOP) of the departments.

Light Vehicle	a3	a4	a5	a6	a7	Total
Allocation Rate	20%	30%	25%	15%	10%	100%

Engine	b3	b4	b5	b6	b7	b8	b9	b10	Total
Rate	15%	10%	15%	10%	15%	20%	10%	5%	100%

Transmission	c3	c4	c5	c6	Total
Allocation Rate	20%	20%	35%	25%	100%

Service	d3	d4	d5	d6	d7	Total
Allocation Rate	20%	10%	15%	25%	30%	100%

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A PROPOSAL FOR IMPLEMENTATION OF COMMERCIAL ACTIVITY
PROGRAM IN REPUBLIC OF KOREA ARMY MAINTENANCE DEPOT
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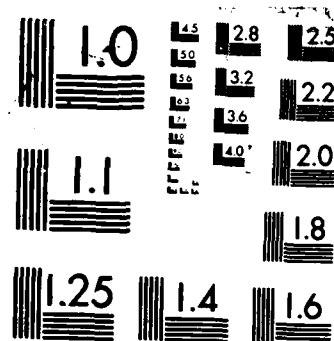
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(2) *Allocation Rates for Supply Sections' Costs.*

The allocation rates of supply sections could be also determined on the basis of the number of employees or machine hours of production section, and described in department SOP.

Light Vehicle	a3	a4	a5	a6	a7	Total
Rate	20%	10%	15%	25%	30%	100%

Engine	b3	b4	b5	b6	b7	b8	b9	b10	Total
Rate	5%	10%	20%	15%	10%	15%	10%	15%	100%

Transmission	c3	c4	c5	c6	Total
Allocation Rate	25%	35%	20%	20%	100%

Service	d3	d4	d5	d6	d7	Total
Allocation Rate	30%	25%	15%	10%	20%	100%

8. *Cost of Production Sections*

The costs of production sections such as Drilling or Rebuilt Sections will be allocated to each job order on the basis of direct labor hours.

9. *Allocation Rate for Home Office Expense and Other Cost*

The home office expense and other cost will be allocated on the basis of the total amounts of both direct material and direct labor costs.

3. COST ALLOCATIONS TO EACH DEPARTMENT

a. Department Headquarters and Supply Sections Cost Allocation

1. Light Vehicle Department

	Total	a3	a4	a5	a6	a7	a1	a2
Section Dept OH	2,160 800	360 ⁰ 80 ¹	280 160	360 240	480 80	280 80	200 80	200 80
TOT	2,960	440	440	600	560	360	280	280
HQ Supply	-	56 ² 56 ³	84 28	70 42	42 70	28 84	(280) -	(280) -
Total	2,960	552	552	712	672	472	-	-

⁰ Section Indirect Cost = Section Indirect Materials + Section Indirect Labor
= 200 + 160 = S 360

¹ Department Overhead x Allocation Rate = 800 x 10% = S 80

² HQ Section Costs x Allocation Rate = 280 x 20% = S 56

³ Supply Section Costs x Allocation Rate = 280 x 20% = S 56

2. Engine Department

	Total	b3	b4	b5	b6	b7	b8	b9	b10	b1	b2
Sect Dept OH	2,040 1,000	220 100	240 150	140 50	300 50	320 100	260 150	120 100	120 50	140 150	180 100
TOT	3,040	320	390	190	350	420	410	220	170	290	280
HQ Supply	-	43 14	29 28	44 48	29 42	43 28	58 42	29 28	15 42	(290) -	(280) -
TOT	3,040	377	447	290	421	491	510	277	227		

3. Transmission Department

	Total	c3	c4	c5	c6	c1	c2
Section Dept-OH	1,180 600	140 30	180 60	180 120	280 180	220 90	180 120
Total	1,780	170	240	300	460	310	300
HQ Supply	-	62 75	62 105	108 60	78 60	(310) -	(300)
Total	1,780	307	407	468	598	-	-

4. Service Department

	Total	d3	d4	d5	d6	d7	d1	d2
Section Dept OH	1,080 800	140 80	140 120	120 80	180 40	200 80	160 160	140 240
Total	1,880	220	260	200	220	280	320	380
HQ Supply	-	64 114	32 95	48 57	40 38	48 76	(320) -	(380)
Total	1,880	398	387	305	338	452	-	-

b. Headquarters and Supply Sections' Cost Allocation to Job Orders

Section	Total	101	102	101-1	102-1	101-2	102-2
a3	552 ⁴	394	158	-	-	-	-
a4	552	368	184	-	-	-	-
a5	712	475	237	-	-	-	-
a6	672	538	134	-	-	-	-
a7	472	382	89	-	-	-	-
b3	377	-	-	321	56	-	-
b4	447	-	-	372	75	-	-
b5	290	-	-	229	61	-	-
b6	421	-	-	356	70	-	-
b7	491	-	-	351	140	-	-
b8	510	-	-	340	170	-	-
b9	277	-	-	185	92	-	-
b10	227	-	-	151	76	-	-
c3	307	-	-	-	-	184	123
c4	407	-	-	-	-	271	136
c5	468	-	-	-	-	293	175
c6	598	-	-	-	-	332	266
d3	398	74	59	88	74	59	44
d4	387	93	67	93	67	26	40
d5	305	90	56	68	45	34	11
d6	338	113	56	56	75	19	19
d7	452	167	48	95	71	24	48
Total	9,660	2,694	1,088	2,701	1,072	1,242	863

⁴ \$ 552 x (500 hrs / 700 hrs) = \$ 394

c. Calculation of Home Office and Other Cost Allocation Rates

Job Orders	Direct Material	Direct Labor	Total	Allocation Rate
101	3,200	3,402	6,602	26%
102	1,600	1,414	3,014	12%
101-1	2,800	4,634	7,434	29%
102-1	1,400	1,680	3,080	12%
101-2	1,600	1,414	3,014	12%
102-2	1,200	938	2,138	9%
Total	11,800	13,482	25,282	100

d. Home Office and Other Cost Allocation to Related Jobs

	101	102	101-1	102-1	101-2	102-2	Total
HO	2,600 ⁵	1,200	2,900	1,200	1,200	900	10,000
SS	104 ⁶	48	116	48	48	36	400
EW	208	96	232	96	96	72	800
DEP	312	144	348	144	144	108	1,200
ToT	624	288	696	288	288	216	2,400
Total	3,224	1,488	3,596	1,488	1,488	1,116	12,400

⁵ Home Office Expense = $10,000 \times 26\% = \$ 2,600$

⁶ Supported Services = $400 \times 26\% = \$ 104$
 Electrics and Water Fee = $800 \times 26\% = \$ 208$
 Depreciation Expense = $1200 \times 26\% = \$ 312$

e. Job Order Costs Allocation Summary

	Total	101	102	101-1	102-1	101-2	102-2
D-Mat	11,800	3,200	1,600	2,800	1,400	1,600	1,200
D-Lab	13,482	3,402 ⁷	1,414	4,634	1,680	1,414	938
Ind	9,660	2,694	1,089	2,701	1,020	1,242	862
HO	10,000	2,600	1,200	2,900	1,200	1,200	900
Other	240	624	288	696	288	288	216
Total	47,342	12,520	5,590	13,731	5,640	5,744	4,116
Parts	-	19,475	-	(13,731)	-	(5,744)	-
FG	31,995	31,995	-	-	-	-	-
WIP	15,347	-	5,591	-	5,640	-	4,116

⁷ Direct Labor Cost = $2430 \text{ hrs} \times \$ 1.40/\text{hr} = \$ 2,694$

f. Cost of Maintenance During November

Cost of Maintenance

Direct Cost

Direct Materials	\$ 11,800	
Direct Labor	13,482	\$ 25,282

Indirect Cost

Manufacturing Overhead	9,660	
Home Office (Depot)	19,660	19,660

Other Costs

Supported Services	400	
Electrics and Water	800	
Depreciation	1,200	2,400

47,342

Ending Work in process	15,347
------------------------	--------

Cost of Finished Goods Maintained (K-300 5/4 ton : 10)	31,995
--	--------

4. REGRESSION ANALYSIS OF HISTORICAL MAINTENANCE COST

As shown Table 7 monthly cost data could be obtained from the vehicle group of the ROK Army Maintenance depot on the basis of the same job order costing method.

Regression analysis as shown in Table 8 provides the fixed cost (\$ 22,021) and variable cost (\$974/unit) estimated to rebuild the K-300. This fixed and variable cost could be used to estimate the in-house cost on the basis of estimated work-load.

TABLE 7
MONTHLY COST DATA DURING 1985

Month 1985	Number of Vehicle Maintenanced	Maintenance Cost
1	7	\$ 28225
2	10	32383
3	12	33726
4	13	34927
5	14	35231
6	16	37645
7	9	31302
8	8	29336
9	13	34025
10	12	33976
11	10	31995*
12	9	30987
Total	133	\$ 393758

Note : See 3.f. in previous page for this value.
Other values are simulated observations for
illustration of technique.

TABLE 8
REGRESSION ANALYSIS OF MONTHLY COST DATA

The regression equation is
Cost = 22021 + 974 Vehicles

Predictor	Coef	Stdev	t-ratio
Constant	22020.5	586.6	37.54
Vehicle	973.77	51.57	18.88

s = 458.1 R-sq = 97.3% R-sq(adj) = 97.0%

Analysis of Variance

SOURCE	DF	SS	MS
Regression	1	74831280	74831280
Error	10	2098431	209843
Total	11	76929696	

APPENDIX D COST COMPARISON FORMAT (U.S.)

IN-House vs. Contract Performance

In-house Performance Costs	Performance Periods				Total	Reference
	1st	2nd	3rd	Add'l		
1. Personnel Cost						
2. Material & Supply Cost						
3. Other Specifically Attributable Cost						
4. Overhead Cost						
5. Additional Cost						
6. Total In-house Costs	—	—	—	—	—	
Contract Performance Costs						
7. Contract Price						
8. Contract Administration						
9. Additional Costs						
10. One-time Conversion Costs						
11. Gain or Loss on Disposal/Transfer of Assets						
12. Federal Income Tax (Deduct)	()	()	()	()	()	
13. Total Contract Costs	—	—	—	—	—	
Decision						
14. Conversion Differential					—	
15. Total (Line 13 & 14)					—	
16. Cost Comparison (Line 15 minus line 6)					—	
Do the cost comparison calculation only for the total column. Positive result on line 16 supports Decision to accomplish function in-house						
17. Cost Comparison Decision (check block)	/	/	/	/	/	Accomplish In-house Accomplish by Contract
In-house Estimate Prepared By:	Name/Title/Organization			Signature	Date	
In-house Estimate Reviewed By:	_____			_____	_____	
Cost Comparison Accomplished By:	_____			_____	_____	
Cost Comparison Reviewed By:	_____			_____	_____	
Decision Approved By:	_____			_____	_____	

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