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COMBAT ENGINEER EQUIPMENT SUPPORT TO THE AIR ASSAULT DIVISION

BY

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Engineers have the mission to provide combat engineer support to the U.S. Army maneuver forces. These missions fall into five catagories of mobility, countermobility, survivability, sustainment engineering and topography. In these areas, the engineers in support must focus their assets on the needs of the maneuver commander. to maximize the effectiveness of the engineer force structure, engineer units have historically been augmented with equipment to help accomplish their missions. In some cases, engineer equipment scheduled to be placed in the air assault engineer battalion is too heavy. Future force

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COMBAT ENGINEER EQUIPMENT SUPPORT to the AIR ASSAULT DIVISION

AN INDIVIDUAL STUDY PROJECT

by

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ABSTRACT

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Engineers have the mission to provide combat support to the United States Army maneuver forces. These missions fall into the five catagories of mobility, countermobility, survivability, sustainment engineering and topography. In these areas, the engineers in support must focus their assets on the needs of the maneuver commander. To maximize the effectiveness of the engineer force structure, engineer units have historically been augmented with equipment to help accomplish their missions. In some cases, engineer equipment scheduled to be placed in the Air Assault Engineer Battalion is too heavy. Future force structure documents authorize heavier equipment which is not needed. This study will provide a review of the requirement for equipment, the availibility of equipment and some alternatives and suggestions toward what direction the United States Army may wish to procure lighter engineer equipment, not only for the Air Assault Division, but for Airborne and Light Infantry Divisions as well.

TABLE OF CONTENTS

COMBAT ENGINEER EQUIPMENT SUPPORT
to the AIR ASSAULT DIVISION

CHAPTER I

HISTORICAL REVIEW

World War II history books contain numerous accounts of air assault battles. In most cases the reviews pointed out the radical change not in battle tactics but in the method in which the unit traveled to combat. In the early 1960's, the Secretary of Defense, Robert S. Mc Namara, asked the United States Army for a report on the condition of mobility of its units in the field. Mc Namara made it clear he was searching for improved ground tactical performance through bold increases in mobility. He formed the Howze Board, headed by Lieutenent General Hamilton Howze. The board was given the mission to "develop and test the airmobile concept." Numerous tests were conducted. The tests brought out many problems, most stemming from the factor that an air assault places a large number of aircraft into a very small space at the same time. Computerized war games pitted a series of hypothetical air assault units against conventional forces in all kinds of terrain and weather. Predictably, the computers found that in wide open operations such as pursuits, reconnaissances in force, withdrawals, flanking movements, and raids, the airmobile units out performed the regular ground forces. The testing

continued and tactical opinion began to form into two groups: the "Heavies" felt the airmobile units lacked staying power to stand up to regular infantry in hard fights and the "Lights" felt that airmobility would open up the battlefield, force the enemy to deploy to cover all areas at once, providing the airmobile element the advantage of being able to strike at the enemy's weakest, most vulnerable points. Neither side came out on top in the test results. It became more and more clear that the real answer had to be a "mix" of tanks and helicopters as well as all other combat power that could be brought to bear in the combat zone. The aim was to find the best combination. Speed and maneuverability were the obvious variables. In 1962 the Howze Board recommended to the Secretary of Defense that the Army organize several airmobile divisions immediately. One of the most important recommendations was the requirement for complete integration of airmobility into the face structure in balance with other tactical concepts. The basic statement of the Howze Board report is the assertion that a wide variety of airmobile operations is feasible, including air assaults, air calvary operations, aerial artillery support, and aerial supply lines.[1]

On 8 January 1963, Major General Harry Kinnard received a mission from the Army Chief of Staff, General Wheeler, to create an air assault division and test it, to " see how far the army can go- and ought to go- with the airmobile concept." The Army called back to the active list the colors

of the 11th Airborne, which was named the 11th Air Assault Division. The division was slowly formed and went through months and months of tests and evaluations. After several major exercises, conclusions were that on one hand the Air Assault Division had its limitations: its ground mobility was not good, it was vulnerable to armored attack, and it was hindered by bad weather and prolonged operations. The flip side showed a remarkably high tempo of operations and extremely short reaction times. The Division could operate surprisingly well over a large area without a ground supply route, and it could fight in several directions at the same time. Major General Kinnard discovered with such high mobility he could afford to operate with no reserve, shifting his least committed forces to meet contingencies. In a low intensity war, the division would be an excellent unit for controlling large sectors; in a high intensity war it would be unparallelled as a reserve or screening force.[2] The concept had been validated. The 11th Air Assault Division was redesignated the 1st Calvary Division and deployed to the Republic of Vietnam in July 1965.

The 1st Calvary Division was not the only division to use airmobile tactics in their operations during the Vietnam war. Numerous divisions incoporated airmobile techniques into their battle plans. Of all the combat tests conducted during the execution of operatives by divisions in Vietnam, the most important was the idea of the infantry-- helicopter team. A helicopter assault is a complicated matter fraught

with danger and one which requires a high degree of coordination. After air assaults were completed, the troops on the ground were supported and supplied from the air under conditions very little different from the air assault itself. The key to air-ground teamwork was responsiveness. The use of airmobile troops allowed the divisions to maintain contact with the enemy over a wide area and for a relatively long period of time. This superior mobility wore down the enemy.[3]

The conflict in Vietnam was the kind of war that without air mobility, would have become a morass for slow moving foot soldiers who had to fight the jungle far more often than the enemy. The appearance of the helicopter changed the tactical picture, allowing for a continous series of moves rather than a single parachute or ground assault, and it changed the basic nature of these operations from tactical defense to tactical offense. Protected by air superiority and facing an opponent limited in his repertoire of suppporting fires, helicopter borne troops in the Vietnam environment developed rapidly into a highly potent tactical machine. Our divisions in all their major Vietnam battles proved that three-dimentional tactics created advantages of mobility and firepower completely offsetting the enemy's knowledge of the terrain and its ability to mass and disperse rapidly. The essence of military airmobility is the constant capability of the foot soldier to move by air to fight the ground battle. This does not mean simply that

there must be enough aircraft available to provide the lift. As the ground soldier moves by air, his fire support (artillery and other weapons) and combat support (engineers, signal, and intelligence) must be able to move with him having his line of supply following. The command and control system must be geared to a rapidly changing situation involving complicated airspace problems. Even the simplest airmobile operations require very careful coordination between pilots, ground troop leaders and supporting elements. The operations are so fast moving that with the present technology, it is difficult to achieve the highest level of teamwork unless all the members belong to the same unit, being subject to the orders of a single commander. The "Heavies" believe that airmobile units will always be on the fringe of the real battles. We have never seen, even in maneuvers, a fight between two airmobile divisions. Such a battle, under conditions in which both sides would be able to gain local air superiority for short periods of time, would provide a tactical situation defying all accepted rules of land warfare. The idea of a fully airmobile fight shows how wide open to innovation is the future of ground combat. An army corps containing an armored division, a mechanized infantry division, and an air assault division would provide unparalleled power and versatility in combat anywhere to include Europe. As part of the nation's strategic reserve, kept in the homeland for rapid deployment anywhere in the world, an air assault

division has the double advantage of being both strategically mobile (light enough to be moved quickly in available transport aircraft) and tactically mobile (capable of moving entirely by helicopter) to fight the ground battle.[4]

Upon the United States Army's withdrawal from Vietnam, the 101st Airborne Division (Air Assault) redeployed to Fort Campbell, Kentucky where it currently serves as the United States Army's only air assault division.

ENDNOTES

1. Galvin, John R., Air Assault, The Development of Airmobile Warfare, pp. 277-279.

2. Ibid, p. 286.

3. Ibid, p. 296.

4. Ibid, pp. 314-318.

CHAPTER II

AIR ASSAULT OPERATIONS in AIRLAND BATTLE

An Air Assault Division is a unique unit that incorporates Army aviation and infantry units that can be fully integrated with other members of the combined arms team to form powerful and flexible air assault task forces. These combined forces can project combat power throughout the entire depth, width, and breath of the modern battlefield with little regard to terrain barriers. The unique versatility and strength of an air assault task force is achieved by combining the capabilities of modern rotary-wing air craft, which are speed, agility, and fire power with those of the infantry and other combat arms to form tactically tailored air assault task forces that can be employed in low-, mid-, and high- intensity environments.[1]

Air Assault operations are not just air movements of soldiers, weapons and material by aviation units. They are deliberate, precisely planned, and vigorously executed combat operations designed to allow the assault force to strike over extended distances and terrain barriers to attack an enemy when and where it is most vulnerable. An air assault operation is one in which an assault force (combat, combat support and combat service support), using fire power, mobility, and total integration of helicopter assets,

maneuvers on the battlefield under the control of a ground or air command

to engage and destroy enemy forces, or to hold key terrain.

Organization and Missions of Air Assault Forces

An Air Assault Division is currently organized as shown in figure II-1.

The division has the following capabilities and mission.[2]

A. The division is organized, equipped, and trained to conduct the following types of combat missions:

1. Against enemy insurgent and light infantry forces, the division can:

a. Attack to destroy the enemy.

b. Defend, delay, and disrupt the enemy.

c. Perform rear battle.

2. Against enemy tank/motorized forces, the division can:

a. In close or mixed terrain, attack to seize terrain, defend to hold terrain, and delay to disrupt the enemy.

b. In open terrain, conduct limited delay using attack helicopter assets.

c. Perform rear battle.

B. Mission.

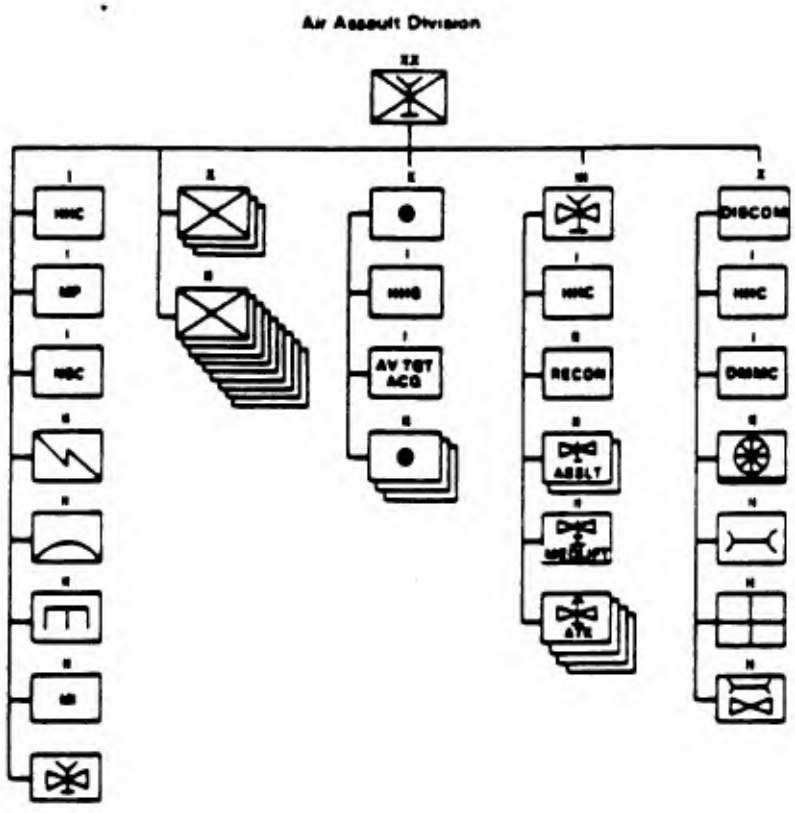
Air Assault Division
XX
HHC
MP
MSC
AV TGT ACQ
RECON
ABN
DIVCOM
HHC
DIVMC

Figure II-1

1. The primary mission of the division is to deploy more rapidly than heavy divisions anywhere in the world to protect US national interests.

2. Specific roles and missions for the division are:

a. Seize and hold via vertical envelopment vital objectives behind enemy lines until linkup with supporting forces.

b. Exploit the effects of nuclear or chemical weapons.

c. Rescue US nationals beseiged overseas.

d. Reinforce forward-deployed forces (if augmented with ground transportation).

e. Serve as a strategic or theater reserve.

f. Conduct large scale tactical raids.

g. Occupy areas or reinforce friendly or allied units beyond the immediate reach of other ground forces.

C. To accomplish these missions, the division:

1. Is capable of rapid strategic deployment by Air Force assets anywhere in the world.

2. Projects sufficient combat power to accomplish the mission assigned.

3. Possesses the tactical mobility to seize objectives and accomplish missions regardless of terrain and environmental conditions.

4. Possesses sufficient combat service support to accomplish the assigned mission.

5. Is easily organized.

6. Is uniquely suited for by-passing obstacles.

Air Assault operations are accomplished by employing an air assault task force (AATF). The AATF is a group of integrated forces tailored to the specific mission under the command of a single headquarters. It may include all or some elements of the combined arms team as depicted in figure II-1.

Engineer Element of the Air Assault Task Force

Air Assault task forces can be organized as a brigade or battalion size force. For most contingencies, a battalion size appears to be the optimum. An engineer platoon would normally be placed in direct support of a battalion size air assault task force. This could grow to company size depending on the mission of the AATF. In many situations, engineers would be attached to infantry units for the duration of long range missions. They would revert to direct support status upon completion of the mission or when communications with their parent headquarters was reestablished.

Engineers in the air assault role must organized to move with the infantry and to provide mobility, countermobility, and survivability construction using light

equipment (chain saws, handtools, etc.), demolitions, natural resources and ingenuity. Light engineer equipment, such as small earth movers or backhoes, may be moved by heavy lift helicopters to support combat operation.

Typical missions for the engineers include:

A. Construction and improvement of landing and pick-up zones (LZ or PZ).

B. Construction of expedient countermobility obstacles using natural materials and demolition.

C. Reinforce natural terrain obstacles with man-made resources (Class IV supplies) and/or demolition.

D. Assist the infantry in digging in.

E. Emplace point mine fields.

F. Breach obstacles, both natural and man-made.

G. Conduct long range raids.

H. Fight as infantry.

ENDNOTES

1. U.S. Department of the Army, Field Manual 90-4, p. 1-1.

2. U.S. Department of the Army, Field Circular 71-101-2, pp. 2-3.

CHAPTER III

THE AIR ASSAULT ENGINEER BATTALION and SUPPORT FORCES

Corps Augmentation

The air assault engineer battalion is the nucleus organization around which a mission specific, tactically tailored force can be built. While this battalion is capable of a full range of engineer support for limited periods, augmentation and reinforcement is required for the sustainment of extended combat operations. Divisional air assault engineers are generally trained in a narrow range of tasks oriented around close combat and countermobility. They rely on augmenting and reinforcing engineer units to accomplish the other required tasks. Usually each contingency operation or tactical mission presents the division engineer with some requirements beyond the capability of his force. The degree to which this holds true is dependent upon the theater, the mission, and the level of warfare. These considerations are part of the risk assessment and planning equation that generate force requirements to be satisfied by "echelon above division" engineers.[1]

Usually augmentation forces fill a specific mission requirement for a short duration. The objective is to fill

the delta between the air assault engineers general capability and a specific mission profile. Augmentation forces generally remain as part of the divisional force structure until the senior engineer headquarters or the parent unit arrives and mission responsibility can be transferred. For example, a division may require airfield maintenance and repair. An augmentation force is then provided from corps resources. The division engineer supervises, controls, and supports the augmentation force until a major follow-on engineer formation arrives to assume control and mission responsibility. This in turn frees the division engineer to concentrate on tasks which are now more important to the battle at hand. Augmentation forces, therefore, fill the immediate needs of maneuver forces until those needs can be met by follow-on forces. Figure III-1 depicts the process by which augmentation may be employed from corps units.[2]

Air Assault Engineer Battalion Force Structure

The air assault engineer battalion is organized with three line companies with men and equipment to provide combat support to the brigade task forces. The Headquarters company is configured to provide some general support to the division and to augment task force support with engineer equipment support. See figure III-2.

The equipment organic to the air assault engineer battalion is shown in figure III-3. The 326th Engineer

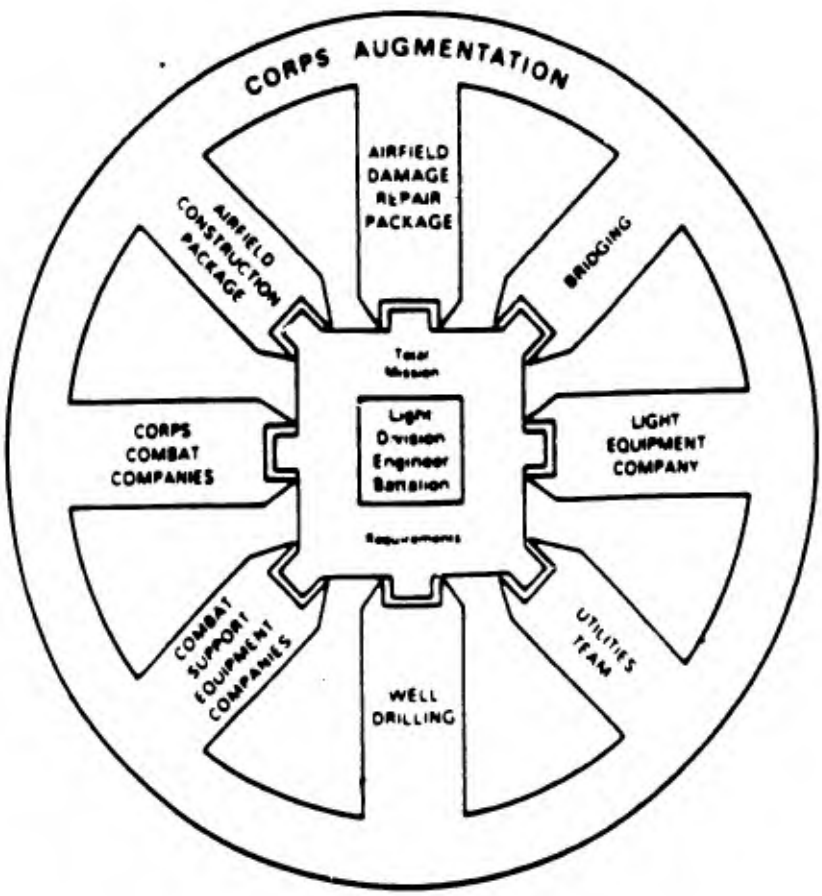
CORPS AUGMENTATION
AIRFIELD DAMAGE REPAIR PACKAGE
AIRFIELD CONSTRUCTION PACKAGE
BRIDGING
Light Division Engineer Battalion
CORPS COMBAT COMPANIES
LIGHT EQUIPMENT COMPANY
COMBAT SUPPORT EQUIPMENT COMPANIES
UTILITIES TEAM
WELL DRILLING

Figure III-1

ENGINEER COMBAT BATTALION, AIR ASSAULT

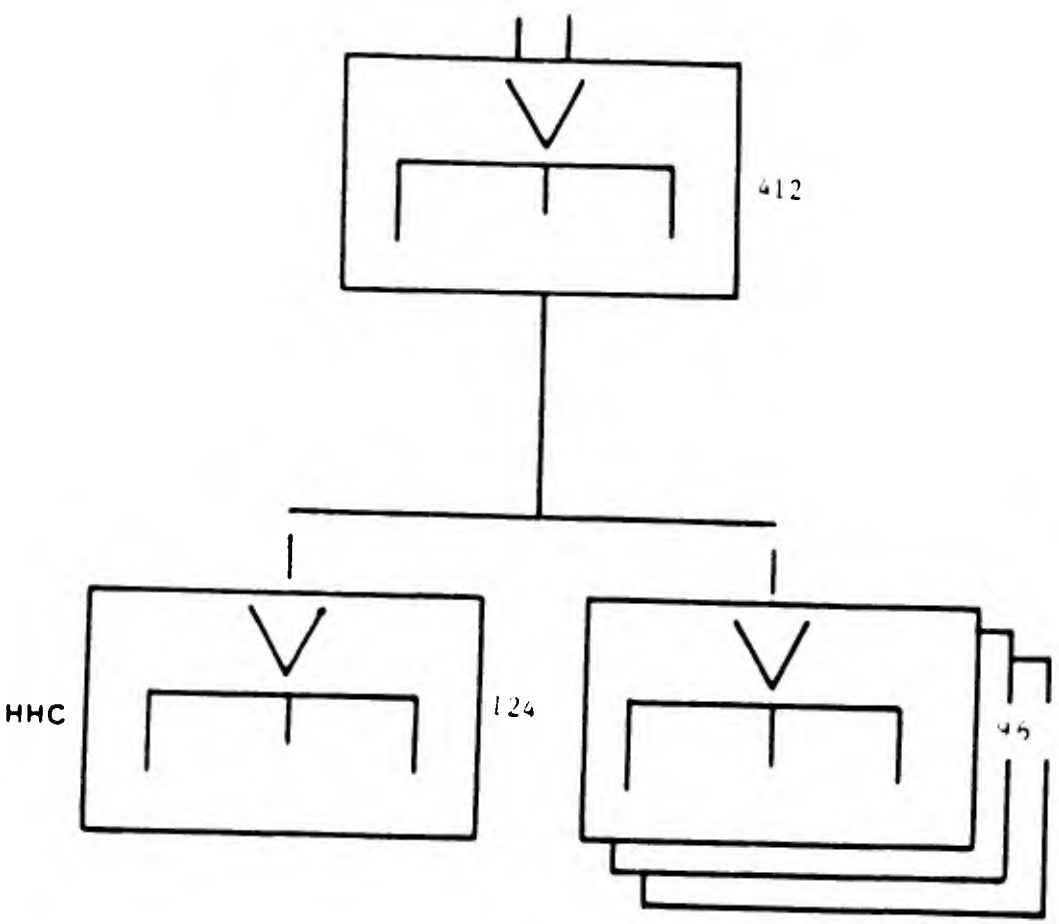

Figure III-2

Battalion (Air Assault) is currently organized under the J series Army of Excellence living table of organization and equipment (TOE) and it will transition through incremental change packages to the objective TOE.

Engineer Equipment Capability	Division Engineers Air Assault En. Bn.	Corps Augmentation Airborne Battalion	Light Equip Co.
Bulldozer D-5	4	15	12
Bulldozer ID-550	8	0	0
Grader	2	9	9
Loader 2.5 CY	3	12	6
Scraper 9 CY	0	9	9
Small Emplacement Excavator	24	18	0
Crane 7.5	1	3	0
Vibratory Roller 5 ton	0	3	3
Sheeps Fool Roller	0	3	3
13 Wheel Roller	0	0	3
Forklift 4000 lb	0	1	1
HMMWV	46	46	7
2.5 ton dump truck	6	0	18
5 ton dump truck	8	8	0

Figure III-3

Engineer Equipment

The air assault engineer battalion is a unique unit supporting a unique division. The division is structured around four maneuver brigades, three infantry and one aviation brigade. The focus is from low-mid to the high spectrum of conflict. The air assault division normally has a large number of operational plans in several regions of the world because of the intended use of air assault as a strategic reserve. Most of the operational plans involve three simultaneously committed infantry brigades. These varied scenarios cause the division to rely upon its agility and swift organic maneuver capability to maintain a dynamic operational tempo throughout the engagement area. The division fights combined arms teams, battalion and brigade task force size elements, on very wide frontages placing emphasis on speed, surprise and the maintenance of a high tempo of operation. These task force frontages can extend up to 100 kilometers for a brigade task force with a depth of 90 kilometers. In many cases the division must perform an economy of force operation where travel by land routes is not possible. In this environment of dynamic operational tempo the engineers are tasked with great responsibiliy. The force must be self-sustaining with the capability to execute missions in a decentralized manner. Furthermore, the equipment must not distract from the fast-paced tempo of the battle.

In the original design of the Army of Excellence organization, the air assault engineer battalion was scheduled to receive nine armored combat earthmovers (ACE) to replace a vast quantity of other engineer equipment. See figure III-4.

Armored Combat Earthmover (ACE)

Army of Excellence	Current (Required) Organization
9-Armored Combat Earthmovers (with 9 operators, 12F)	3-Graders 4-D5B Medium Bulldozers 8-JD550 Light Bulldozers 8-5 ton dump trucks 6-2.5 ton dump trucks 8-15 ton tilt bed trailers 4-5 ton tractors 4-25 ton low bed trailers (with 21 operators;15-62E and 6-12B)

Figure III-4

At first glance, an examination reveals that the trade off in the number of pieces of equipment and the number of operators is a vast improvement over current fielding. No one will argue the fact that the ACE is a force multiplier that can quickly provide protection for tanks, artillery, infantry fighting vehicles, missile systems and

command posts. It is tough enough to live and fight with the infantry, and it is fast enough to move with armored formations. In addition, it is compact enough to fly with airborne forces and sail with seaborne forces. However, its utility with the air assault division is neglegible. The ACE has a net weight of 36,000 pounds (see appendix 1). Though it may be strategically deployable, it is not tactically deployable.

The ACE is not functional within the air assault division. It is non-transportable with organic divisional aviation assets. The unique contingency missions of the air assault division dictate that the equipment be moved rapidly by "inter-theater" aviation assets C141, C5A/B to the initial staging base (ISB) and all subsequent moves to the forward operating base (FOB) and forward with "intra-theater", C-130, or divisional aviation assets. Intra-theater moves with the ACE tie you to existing road and airfield facilities. On arrival at the ISB or FOB, the force can quickly "rig"the sectionalized or light engineer equipment for air assault operations to move forward with the maneuver units, not dependent on the existing road network or forward air field facilities.

An example of the ACE with the air assault division is one in which selection of a piece of equipment for "heavy" forces was applied across the board for light forces without a detailed analysis to the impact on the ability to fight. In the case of the small emplacement excavator (SEE),

there was compatability with light force organization because its weight of 16,000 pounds (see appendix 2) met the lift criteria for the divisional aviation assets. See figure III-5 for organization changes. Even though the SEE met the weight constraints for airlift,there is concern whether it is the right price of equipment for air assault engineers. or for that matter any other light engineer force structure. The selection process for the SEE was the same as for the ACE. It was deemed what is good enough for the "heavy" forces will work in the "light" forces.

Small Emplacement Excavator (SEE)

	Army of Excellence (Required)	Current Organization
HHC	9 SEE(with 9 operators, 62J)	3 Scoop loaders(with 3 operators, 62J)
3 Line Co.	6 SEE(with 6 operators, 62J)	3 JD410 backhoes(with 3 operators, 62J)
Total	27 SEE(with 27 operators, 62J)	12 Loader/Backhoes(with 12 operators, 62J)

Figure III-5

Deployability criteria is very important. The air assault division must have the capability to rapidly build-up

supplies and equipment within the FOB by self-deployment with CH-47D and UH-60 aircraft, air assault by C-130, use of combat delivery system heavy drop of Class I, III, IV, V and the use of Air Force bladder C130's for Class III. Logistically, the division must support around the FOB for 36-48 hours by airlines of communication. This, in conjunction with air assault operations, intensifies the operational tempo. The air assault division is a fighting force of 15,000 men and women that are machine intensive. It is a division that must be strategically and tactically mobile with significant combat capability. Therefore, we must employ/design a better way to select the engineer equipment that will provide at least adequate support in battle.

ENDNOTES

1. Michael G. Kuehn, LTC. Engineers in Support of Light Forces. p. 58.

2. Ibid, p. 59.

3. U.S. Department of the Army. Field Manual 90-4. Appendix D. p. D-2.

CHAPTER IV

EQUIPMENT SELECTION PROCESS

The United States Army material selection and acquisition process is a sequence of events and phases of program activities and decisions leading to efficient and effective fielding of fully supportable systems responsive to validated Army requirements. Each phase and event is tailored to meet individual characteristics of each program. Once the need is approved, the process is continued through successful completion of development, production, and deployment of the systems.[1] See figure IV-1.

One item that needs examination is the valid Army requirement. The term "Army requirement" is misleading in that it covers a broader arena than there is an actual need for. This misnomer is demonstrated in the case of the Armored Combat Earthmover (ACE). It was perceived that there was an Army need for the ACE, thus the ACE's were to be procured for all combat engineer units that currently had bulldozers (and other earthmoving equipment) without conducting a detailed examination of each units mission and possible need for such equipment. The result was a distribution fielding plan that would send ACE's to nearly every type of combat engineer unit. It is obvious that doctrine had been examined: however, there was little

SYSTEM ACQUISITION P³I CYCLE [2]

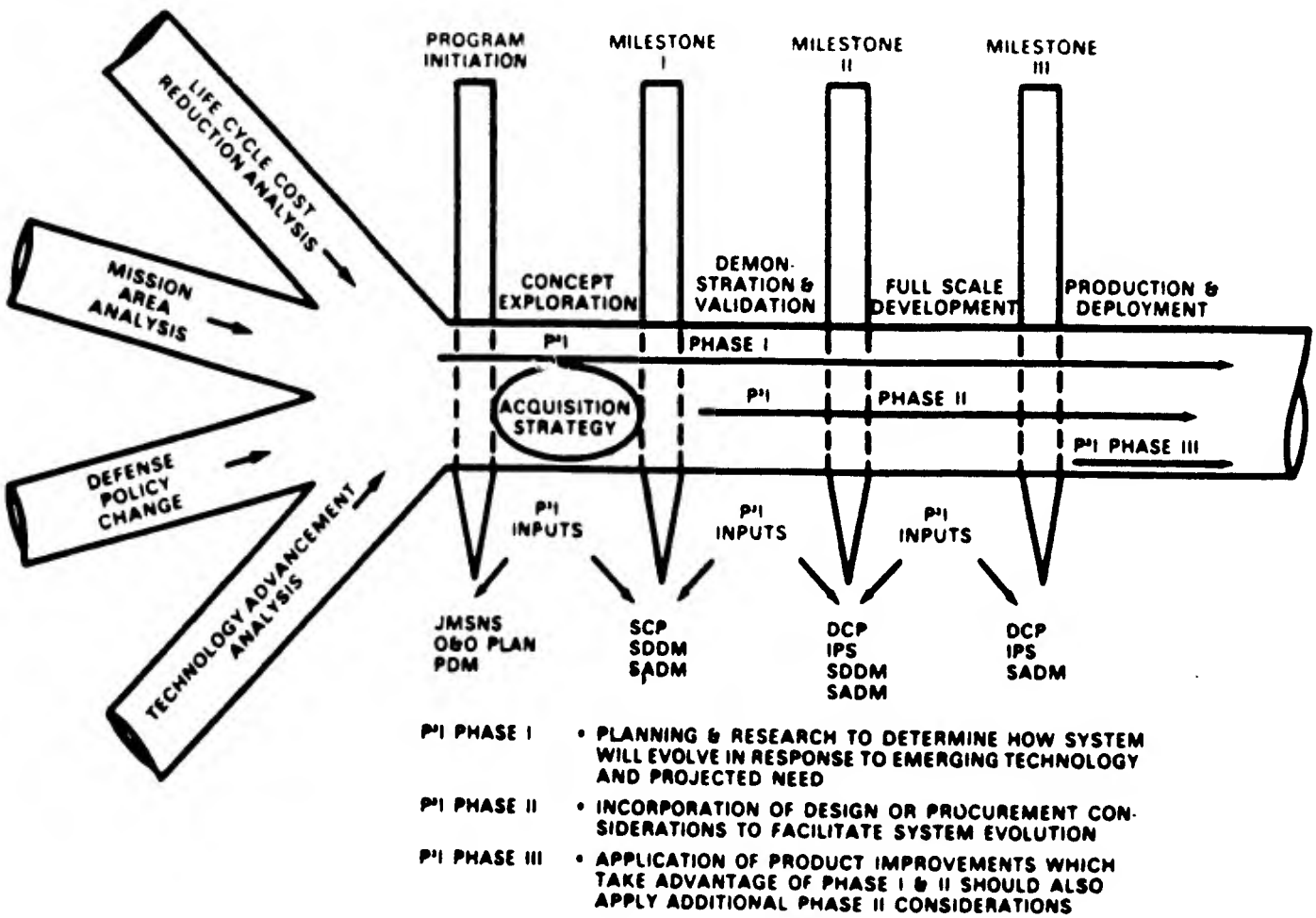

Figure IV-1

evidence that how we fight at every level was ever considered. An examination of tactics can be misleading element in establishing an Army requirement since every combat commander may have a different battle plan, resource management plan and method of execution in mind. However in the combat engineer support realm, an examination of tactics may have some merit. The primary business of combat engineers is providing support to maneuver forces. Usually this support will fall into two catagories--manpower intensive or equipment intensive.

Eight combat arms commanders in the grades of O-5 thru O-7 were interviewed in an attempt to determine which of these two catagories might be more prevalent on the battlefield. Their preferences were split evenly. However, there was a trend that indicated a preference by armor and mechanized infantry commanders for equipment over manpower. This appears to be a statement of the obvious since it requires large pieces of equipment to support tanks and armored fighting vehicles. The light infantry commanders tended to be in favor of manpower over equipment because of the mindset that equipment weighs more than men and therefore the equipment will take up more airframes, thus adding up numerous total airframes to move a maneuver task force. However, it was the opinion of one light maneuver commander that given more equipment, (light and more mobile) the engineers could maximize their work output rather than having to rely totally on manpower to provide long, arduous,

exhausting hours of labor to accomplish their mission. The purpose of this study is not to compare man versus the machine but rather to show the need for a complimentary mix of men and equipment and that it is feasible that the proper ratio could be determined.

The key argument for light and mobile equipment for combat engineers who support light forces (airborne, air assault, etc.) is that it is essential for the expedient execution of their mission which is crucial in their support role. A former commanding general of the 101st Airborne Division (Air Assault) felt that if a piece of equipment could not fly inside of, or be externally carried underneath a CH-47D helicopter, it did not belong in the division. That argument has a lot of merit. If the helicopter (UH60 and/or CH47D) is the primary means used to carry such a division to battle, and if we believe the historical examples outlined in Chapter I, and we follow the doctrinal statements described in Chapter II, then it seems it should be the accepted way to conduct business.

Some of the recommendations by the Howze Board stated:

- complete integration of airmobility into the force structure

- high tempo of operations and quick reaction time

- supported and supplied by air under conditions very little different from combat air assaults

- tactically mobile (capable of moving entirely by helicopter) to fight the ground battle

- organized to move with the infantry

Even though the Howze Board recommendations are somewhat dated, each one stated is still a valid and integral part of the method in which the Air Assault Division currently operates.

Comparing the desires expressed by the light maneuver commanders with the Howze Board's recommendations, and doctrinal thesis, it is apparent that a commander's tactics play an important role in how we fight, no matter how manpower or equipment intensive the combat support is.

ENDNOTES

1. Army War College. Army Command and Management. p. 17-12.

2. Ibid. p. 17-12.

CHAPTER V

ALTERNATIVE PROCUREMENT PROCESS

Nondevelopmental Items (NDI) are systems available from a variety of sources requiring little or no development effort by the United States Army. NDI's include materials developed and in use by other U.S. military services or Government agencies, and material developed and in use by other countries, as well as commercially available material. The acquisition process for a NDI is not a separate process, but a tailoring of events within the material acquisition process and should be one of the first alternatives considered for solution to a material need.[1]

The acquisition process for Nondevelopmental Items is one the United States Army has used for some time. The procurement of nondevelopmental weapons and weapon systems is becoming increasingly attractive to the services in the face of escalating developmental costs and schedules, rapid obsolesence and tight budgets. The United States Army recently signed one of the largest military contracts ever awarded for $4.2 billion for the Mobile Subscribe Equipment (MSE) communications system. This sent a clear message of a dynamic shift toward the acquisition of existing nondevelopmental equipment.[2]

Given a string of costly developmental delays and outright cancellations, a reform-minded congress and imminent budget reductions, hardly anyone doubts that the Army and, to a lesser extent the other services, will steer more agressively toward NDI procurements. Advocates of the shift see it as an alternative to long and costly developmental cycles, and what some insiders call a "research and developmental merry-go-round."[3]

The United States Army Corps of Engineers has procurred heavy consruction equipment through the NDI program for some years. Consequently, this would not be a new idea to be introduced, but one that's continued use is desired. In the past, low bid has been the most accepted method of procurement by governmental bodies. However as costs of equipment, parts, fuel, grease, and labor have increased significantly over the years, many governmental bodies have taken a harder look at the costs generated by equipment beyond the initial low bid procurement price. One alternative method to low bid contract would be a request for proposal solicitation process as used in the construction arena. This would allow for prospective providers to submit their proposals based on initial specifications. Then the governmental agency would review the initial proposals for adequacy by two separate technical and financial evaluation panels. Based on each panels distinct evaluation government management can then compare and evaluate and then clarify any shortcomings. The process

then returns the submittals to the solicitors with any changed or updated specifications and any clarification of misunderstood issues and request a "best and final" proposal. From those who return a final proposal, the contract award is based upon the most qualified and the best quality for the fairest price. Complete maintenance agreements and parts availability worldwide may be written into the specifications to insure that during the life cycle of the contract that the equipment can be properly maintained. Studies by one commercial manufacturer show that during its normal course of work, a track-type tractor will consume in 10,000 hours of operation what is equivalent to 90% of its original list price value in parts alone.[4] This percentage can and will vary significantly in accordance with the quality of the product and operating conditions. The possible 90% figure alone shows the significance of costs generated by the product after procurement.

One major area that shows the significance of costs as a result of low bid process is maintaining a fleet of equipment of several different brands. The costs involved are:

1. Cost of parts inventory

2. Cost of storage space required, parts ordering, shipping and related administration

3. Cost of mechanic and operator training and efficency

4. Cost of parts availability and machine downtime

These costs are recognized and have been avoided by equipment standardization programs implemented by some governmental buying agencies. These standardization programs have been accomplished most effectively by procurring equipment on a fleet buy basis versus buying each family of equipment individually on a low bid basis. The United States Navy and the United States Army have used this method of buying equipment most recently on the Navy's Diego Garcia project, and the Army's Airborne/ Air Assault engineering equipment requirements. See Appendix 3. The United States Navy has gone as far as standardizing their equipment for over twenty years.[5]

Our government is concerned with keeping the United States industrial base healthy. NDI allows the armed services to procure necessary equipment from experienced manufacturers. Civilian contractors have been purchasing commercial construction equipment for many years.

An option that appears to be appealing and cost effective would be the short term leasing (with possible option to purchase) of specialized engineer equipment. Many operational contingencies require uses of certain types of equipment that may not be required in other plans or areas of operation. It may be a prudent move to develop specialized skills in equipment procurement and contracting at engineer brigade and battalion level. These personnel with the necessary skills could work with the normal installation procurement office in establishing liason with

potential equipment providers. Then based on the intelligence information and command directives, actions can be placed in motion to lease the required equipment for the anticipated duration of the mission to include the necessary training and maintenance support packages mentioned previously.

Given the likelihood of major cuts in the defense budgets, it seems certain that each of the services will face mounting pressure from Congress to make cost-effective procurements of nondevelopmental items whenever practical. According to Department of Defense sources, formal changes in federal acquisition regulations will soon streamline NDI competitions and procurement even more.[6]

ENDNOTES

1. Army War College. Army Command and Management. p. 17-13.

2. James Kitfield, "Is NDI the Answer?" Military Logistics Forum, January/February 1986, p. 17.

3. Ibid, p. 17.

4. Caterpillar Tractor Company, Equipment Standardization and Commonality Study, 1986, p. 1.

5. Ibid, p. 2.

6. Kitfield, p. 20.

CHAPTER VI

AVIATION FACTORS CONCERNING EQUIPMENT SELECTION

Once the decision has been made on the type of equipment that is needed based on a concept based requirement analysis, the question of size and weight becomes the issue. Currently, the two helicopters used by the United States Army for transport capability are the UH-60 Blackhawk and the CH-47D Chinook. The UH-60 can carry a crew of three, plus fourteen combat loaded soldiers or an external load of 6,000 pounds or less. In addition, a combination of less external load and some number of passengers can be accomplished. The CH-47D helicopter carries a crew of four, and it can handle a maximum of thirty-one combat loaded soldiers or 26,000 pounds externally loaded cargo. A combination of externally and internally loaded cargo and/or personnel can be accomodated. The helicopter thus becomes the key ingredient to sizing the engineer equipment in support of air assault of air assault or other light forces. The CH-47D is the workhorse when it comes to hauling engineer equipment around the battlefield. The air assault engineer battalion can currently lift all of its equipment including the Type II equipment mentioned in Chapter V (See Appendix 3), with the CH-47D. This makes the battalion and its equipment highly mobile. One problem that

does exist, however, is that the engineer battalion is not the only customer that has the need for the CH-47D for haul missions. Thus, a great improvement would be the existence of engineer equipment light enough to be carried by the UH-60 Blackhawk. The main issue then becomes the efficiency ratio of work production of the comparable equipment. The United States Army's original direction, as stated in Chapter III, was to replace lighter, more mobile equipment with the heavier Armored Combat Earthmover. At a net weight of 36,000 pounds, this would prevent any helicopter in the Army inventory from being able to transport it into an area of operation. This would be in direct conflict with the requirement for all equipment to be tactically mobile and able to maintain the high tempo of operations with the requirement for quick reaction time.

The UH-60 Blackhawk helicopter is the current medium lift helicopter in the Army inventory, and it is scheduled to remain so through at least the year 2000. The CH-47D is scheduled to be replaced by the CH-47E to be fielded into the Army inventory in the early 1990's. The CH-47E is currently scheduled to be issued to the 101st Airborne Division (Air Assault) during 1992. This improvement will enhance the lift capability of the heavy lift helicopter by 4000 pounds giving a maximum external load capability of 30,000 pounds. The CH-47E is expected to continue to be the Army's heavy lift helicopter through the year 2015.[1] See figure VI-1 for comparision. Using this information, light

engineer equipment procurement can be examined through the year 2015.

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OPERATIONAL COMPARISON OF CH-47D AND CH-47E

	CH-47D	CH-47E
ENDURANCE	2.7 HRS	5.5 HRS
PAX	33	46
FUEL	1,030 GAL	2,034 GAL
RANGE	330 NM	740 NM
ENGINE	712 (4,500 SHP)	713 (5,000 SHP)

CONDITIONS	CH-47D	CH-47E	% INCREASE
SLSTD	25,516 LB	28,000 LB	10
2,000-70°F	22,000 LB	26,000 LB	19
4,000-95°F	15,700 LB	20,750 LB	24

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USAAVNC

Figure VI-1
41

ENDNOTES

1. Interview with LTC Michael Schlonager, FISO, Office of the Deputy Secretary of Army for Research and Development, Pentagon, Washington D.C. 11 Febuary 1988.

CHAPTER VII

AVAILABLE EQUIPMENT SOURCES

There exists a vast resource pool of engineer euipment that can be procurred through the nondevelopmental items program. There is in existence today numerous manufacturers that produce quality commercial construction equipment, many of which produce equipment light enough and strong enough to meet the air assault specifications and requirements. Several firms produce equipment light enough to be externally loaded under the UH-60 helicopter as well as the CH-47D. This study contains information solicited from four major equipment manufacturers for the purpose of examining the number of possibilities that exist on the commercial market. The equipment specification sheets and other information contained in Appendixes 5 through 8 all meet the lift specification requirements for air assault equipment. Some minor modifications, such as welding sling points to structural members of the equipment, would have to be performed to allow the commercial equipment to be externally loaded. These procedures have been accomplished in the past.

Several manufacturers are currently working issues with the air assault and airborne divisions to help evaluate their equipment to determine their adequacy for the light forces. Ford New Holland currently has two pieces of light

equipment deployed with an air assault unit out of the continental United States with the purpose of evaluating all aspects of specifications and requirements. Pictures of this equipment being load tested at Fort Campbell, Kentucky, on 5 December 1987 are located at Appendix 5. Another manufacturer, Caterpillar Tractor Company, has developed a prototype fast track bulldozer titled the "30-30". Caterpillar developed this prototype because they understood the Army's requirement for a faster bulldozer, and they were willing to take the risk of developing one to see if it will meet the needs of our light engineers in support of our light forces. The mobile-track bulldozer is a quieter, faster system than our current bulldozer, and it has enhanced survivability. Its current weight is approximately 30,000 pounds, and it can travel at 30 mph; thus, the origin of the name "30-30". It has a 170 horsepower dozing capability with minimum track slippage. This prototype item is currently undergoing digging testing. Specification sheets should be released in April, 1988. A picture is located at Appendix 4.

At present, the "30-30" Caterpillar tractor is too heavy for the air assault force to use; however, it is currently being evaluated for use with airborne forces. In addition, a separate operation to reduce weight and install sling points is being conducted. Once the CH47E has been fielded in 1990-92, the current "30-30" model may qualify for lift.

CHAPTER VIII

EQUIPMENT MAINTAINABILITY

A major key to success for engineer units can be the turn-around time to get a piece of equipment back to performing its mission. Lengthy down time can and will determine success or failure of a mission. The ultimate objective is to have highly trained maintenance personnel, easy to maintain equipment, proper tools and manuals and a responsive repair parts inventory.

The U.S. Army currently has a system that provides reasonably trained mechanics, a great number of different types of equipment, adequate tools and manuals and a heavy and large repair parts inventory. Keeping quality mechanics and trying to streamline a repair parts system when so many different types of equipment are on hand are difficult challenges. The Army has dealt with this problem for many. many years.

An alternative solution to this probelm could be to use the existing systems that the same manufacturers who produce our equipment have set up to support their commercial civilian customers. In essence, the U.S. Army should become one of the customers and use the established system.

Examining the same four manufacturers mentioned in Chapter V and shown in Appendixes 5 through 8, it was

discovered that each of those firms has manufacturing plants, parts dealerships and maintenance depots worldwide. An example map location for one firm is shown at figure VIII-1. By having worldwide access, deploying unit could establish contact with a parts dealership in any area of the world and use that source for repair parts already on hand at the designated location. If the necessary parts are not available, the dealer representative could have them shipped from another major outlet. Most all manufacturers advertise 94% parts availability within twenty-four hours and 98% within 48 to 72 hours.[1] The point at hand is an already established system that has computerized networks. Dealer support also includes maintenance capability at major depots. From the preventive maintenance that keeps the equipment on the job to the emergency repairs that cut downtime to a minimum, the commercial dealers want to make sure that their promise of productivity is kept. Those promises are kept and backed by the service technicians who are thoroughly trained in the most advanced techniques for keeping equipment in top operating condition in all climates and conditions worldwide.

A typical 18th Airborne Corps scenario may call for some element of the corps to deploy to an area depicted in figure VIII-2. After a quick examination, one can see that commercial dealerships have been available to service the customer on demand. A major weight and bulk savings can be realized if all the numerous items or unit prescribed load

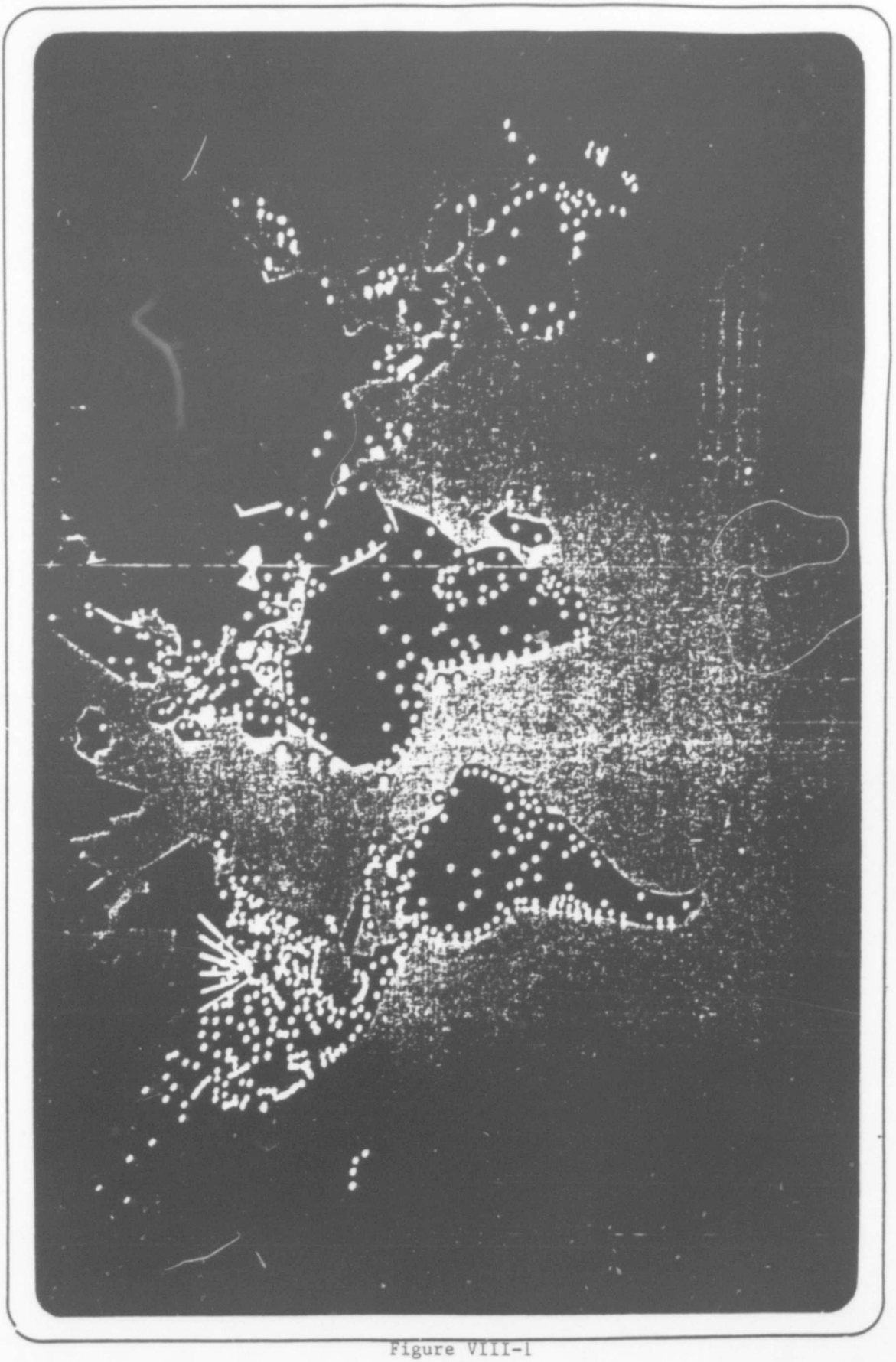
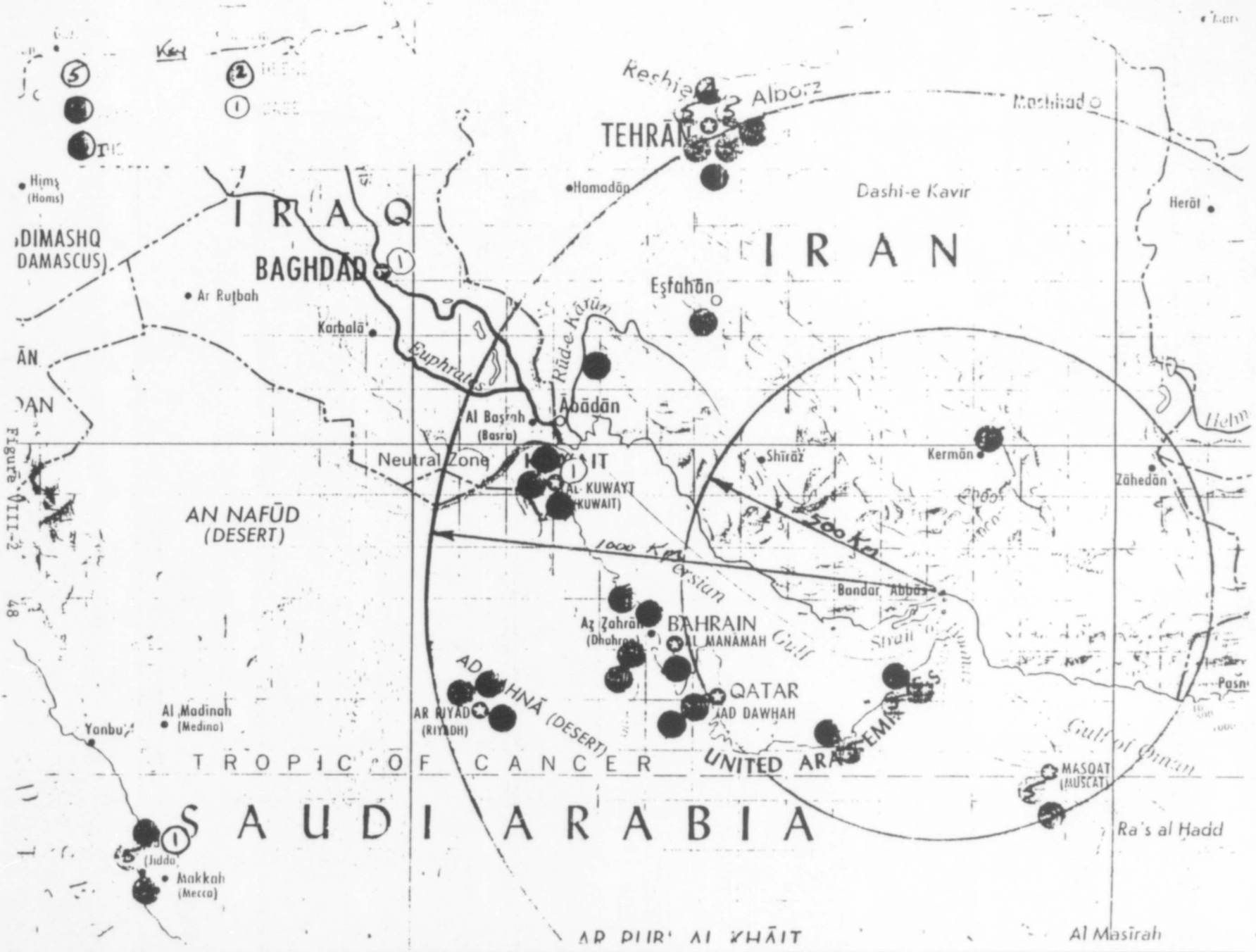


Figure VIII-1


Key
TEHRĀN
Alborz
Mashhad
Hamadān
Dashi-e Kavir
Herāt
Hims (Homs)
DIMASHQ (DAMASCUS)
I R A Q
BAGHDAD
I R A N
Ar Ruṭbah
Karbalā'
Euphrates
Eşfahān
Rūd-e Kārūn
Ābādān
Al Baṣrah (Basra)
Neutral Zone
AL KUWAYT (KUWAIT)
Shīrāz
Kermān
Zāhedān
AN NAFŪD (DESERT)
500 Km
1000 Km
Persian Gulf
Bandar Abbās
Az Zahrān (Dhahran)
BAHRAIN
AL MANAMAH
Strait of Hormuz
AD DAHNĀ (DESERT)
AR RIYAD (RIYADH)
QATAR
AD DAWHAH
UNITED ARAB EMIRATES
Gulf of Oman
Al Madīnah (Medina)
Yanbu'
TROPIC OF CANCER
MASQAT (MUSCAT)
SAUDI ARABIA
Ra's al Hadd
Jidda
Makkah (Mecca)
AR RUB' AL KHĀIT
Al Masīrah

lists (PLL) and direct support maintenance units authorized stockage level (ASL) did not have to be deployed with the units. The arrangements and agreements for maintenance support can be established in the original procurement contract, and they can be modified as needed throughout the life of the contract.

Another fact is recognized when one realizes why the dealerships are located worldwide. There is already commercial construction equipment made by United States manufacturers all over the world. In a contingency operation, this would allow for possible host nation support of construction equipment. The deploying forces having the same type of equipment would allow not only for possible repair parts through "cannibalization" but also would provide an equipment resource that our operators and mechanics would already be trained on. In a report dated 1981, figures showed that there were numerous quantities of small dozers, graders, loaders and scrapers located in the region. Those figures are shown in figure VII-3.

Light Equipment in the Middle East

Iran	1854 units
Saudi Arabia	1444 units
Iraq	1405 units
Oman	795 units
Israel	455 units
Egypt	87 units

Figure VIII-3

The real meaning of these numbers and their impact on a mission can only be appreciated when compared to the alternatives and to the other manufacturers that also have equipment in the region. Most manufacturers are in the unique position of being able to offer significant cost savings resulting from excellent product support and from high level of parts commonality and interchangeability across the wide product line of construction equipment.

The objective of this system is a high tempo of operations with quick reaction time. If units are to be tactically mobile to fight the ground battle, innovative ways to lighten the load and streamline the operations must be discovered. Contracted maintenance support through well established world-wide organizations may be an answer.

ENDNOTES

1. Interview with Mr. James McCormack, Caterpillar Inc., Fort Bragg, N.C., 14 December 1987.

CHAPTER IX

EQUIPMENT TESTING PROGRAM

An area that historically has been a problem to the United States Army has been the inability to accurately test its equipment to establish whether or not it performs as required. The Army currently does not have a program that allows a civilian manufacturer to enter into an agreement in which it could provide equipment for testing and evaluation at no cost to the government.

A system that may have some merit in this respect and which deserves a closer examination is the United States Air Forces' Management and Equipment Evaluation Program (MEEP). MEEP is designed to get more effective and economical equipment for the United States Air Force. Under field conditions, the program is set up to evaluate potentially more effective and economical practices, techniques, plans, tools and equipment. It functions as the main point of contact between the United States Air Force and industry in respect to the evaluation of transportation and civil engineering equipment, practices and procedures. This program works on the "try before you buy" concept.[1]

In the Management and Equipment Evaluation Program the manufacturer enters a bailment agreement in which the firm agrees to lend the United States Air Force a piece or pieces

of equipment for a specified period of time, usually a minimum of six months, to be evaluated in comparison with present methods and tested at different sites and in various climate conditions. If the equipment is determined to be economical and effective, then the Air Force rewrites their requirement specification or develops new specifications. The normal procurement process is then entered.

The Management and Equipment Evaluation Program is currently being used effectively by the United States Air Force, and it is popular with both the military and the civilian contractors. It deserves to be examined in regards to establishing a similar program by the U.S. Army. In keeping with major defense budget cuts, cost-effective procurement procedures are desirable. This program, or one like it, may be one tool that could help streamline procurement for the United States Army even more.

ENDNOTES

1. U.S. Department of the Air Force. Air Force Regulation 77-5, p. 1-1.

CHAPTER X

CONCLUSION

Combat engineers bring an added critical capability to the battlefield. Engineer forces that are well trained and equipped provide a combat multiplier that can make the difference for a positive outcome in a battle.

There is an understandable difference between "heavy" and "light" forces, not only in their methods of fighting, but also in their requirements for resources that are necessary to conduct combat operations. The platform used to get the soldier to battle seems to be the key ingredient, whether that be a fixed wing aircraft for the airborne troopers, helicopters for the air assault soldiers, tanks and armored personnel carriers for the mechanized forces or on foot for the light infantry warriors. A close examination of what the unit mission is and of the method in which the unit goes to combat must be evaluated prior to making any decisions on what types of material resources must be acquired to help facilitate the successful completion of the mission. Today's material acquisition process forces us to decide on a certain type of material or piece of equipment and purchase it in mass quantities to get cost discounts. It is then distributed to all the forces without any or very little regard to the types of units they

are or to their specific missions. The United States Army Corps of Engineers must avoid the "bigger is better" and the "more personnel" pitfalls. To follow either rationale will price the engineer force structure out of business. To counter this line of thinking, to have knowledge of the effective use of terrain and the use of proper resources to strengthen or reinforce the terrain is the greatest asset any combat engineer could have to help influence the outcome of a battle whether it be in any one of the five areas of combat engineer support (mobility, countermobility, survivability, sustainment engineering and topography).

As it has been stated previously, equipment requirements vary from unit to unit based upon their methods of fighting. Hence, it seems logical that the United States Army should develop an equipment procurement policy that is responsive to the needs of the forces within the total structure. It is said that the Concept Base Requirements System (CBRS) is the focal point of our procurement system. An argument in point is that in today's budget constrained, reduction environment, our services have a dollar based requirement system. In view of this, our procurement actions must produce the highest possible quality and efficient equipment for the lowest amount of money.

How do we build the book on equipment procurement? We must examine our mission and the resources available. We must establish innovative and responsive testing/evaluation and procurement procedures. Then we must insure that we get

the highest possible quality item within the constraints of the established monetary budget and within the contractually specified time.

Combat engineers are at a watershed. They are combat multipliers that can add strength, depth and flexibility on the battlefield. Engineer units are valued when needed; otherwise, they are often viewed as cumbersome and deliberate. They have a heavy resource reliance to manpower, material and time. Engineer improvements historically have been at a stutter step. Management must forge new engineer architecture. Plans for more compact units with higher ratios of lighter, more productive equipment to manpower must be realized. There must be a reduction of overhead to arrive at a total greater productivity. In addition, the Corps must establish greater integration with the Army field structure and the methods used to fight.

As a part of the nation's strategic reserve, kept in the homeland for quick deployment anywhere in the world, an air assault division (or any other airborne or light infantry division) has the double advantage of being strategically mobile (light enough to be moved quickly in available transport aircraft) and tactically mobile (capable of moving entirely by helicopter to fight the ground battle). In both the United States and the Soviet Union, airborne and air assault troops comprise the first line of

the strategic reserve. If we intend to be ready to fight, we must insure that all units are properly outfitted.

We can hope, as men have hoped before, that war will not be visited again; however, in the meantime, it will continue to be the responsibility of each of the United States services to maintain their combat readiness. In order to remain prepared for any future conflict, avoiding the old mistake of preparing to fight the last one over again, it is essential to maintain a constant focus on the balance between firepower, mobility and combat support. This means that in this era it must be recognized that ground warfare has become three-dimensional and that airmobility is a critical factor on the battlefield. The combat soldiers of the future will take the high ground by air assault![1]

ENDNOTES

1. Galvin. John R., Air Assault, The Development of Airmobile Warfare, p. 318.

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