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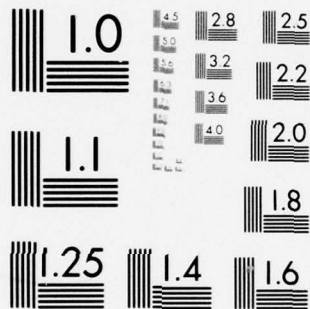
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DEFENSE SYSTEMS MANAGEMENT COLLEGE

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PROGRAM MANAGEMENT COURSE INDIVIDUAL STUDY PROGRAM

PRODUCT IMPROVEMENT PROGRAM (PIP)
FOR M60 TANKS

STUDY PROJECT REPORT
PMC 76-2

Terry L. Alexander
Major, U.S. Army

FORT BELVOIR, VIRGINIA 22060

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DEFENSE SYSTEMS MANAGEMENT COLLEGE

STUDY TITLE:

PRODUCT IMPROVEMENT PROGRAM (PIP) FOR M60 TANKS

STUDY PROJECT GOALS:

To identify and describe the process of developing and fielding product improvements (PI) for M60 tanks. To compare, where applicable, PI acquisitions with major systems.

STUDY REPORT ABSTRACT:

After major systems such as tanks are developed and fielded, improvements are made to the end item. These improvements are the results of advances in technology which have subsequently become available, a change in the threat, safety requirements, improvements in reliability, efforts to reduce costs, and efforts to standardize components of systems. To control these changes the Department of the Army has a formal materiel acquisition process which the developer is required to use. The importance of the Army's product improvement program can be seen by the 490 PI's costing \$739 million which are projected for FY 78.

The M60 tank was introduced into the field in the early 1960's. The Secretary of Defense in his FY 77 report to Congress stated that the M60 would be in use through the year 2000. To date the M60 project manager's office has had an aggressive PI program and will continue it to meet changing needs into the future. The M60A2 tank is presently being "handed-off" to the field. Four battalions have been fielded and four more remain to be equipped. The M60A1E3 (Phase I) program is currently in low rate initial production. The Phase II PI components for the M60A1E3 are in advanced development.

The report considers the process for getting a Product Improvement Proposal (PIP) approved and funded. It further outlines the alternatives available for fielding the PI. Specific examples are used relative to the M60 tank program with some lessons learned in fielding the M60A2.

SUBJECT DESCRIPTORS: Modifications, M60 Tanks, Modification Work Orders, Product Improvement

NAME, RANK, SERVICE	CLASS	DATE
Terry L. Alexander, Maj., USA	PMC 76-2	November 1976

PRODUCT IMPROVEMENT PROGRAM (PIP)
FOR M60 TANKS

Study Project Report
Individual Study Program

Defense Systems Management College
Program Management Course
Class 76-2

by

Terry L. Alexander
Major, U.S. Army

November 1976

Study Project Advisor
Mr. John R. Mathias

This study project report represents the views, conclusions and recommendations of the author and does not necessarily reflect the official opinion of the Defense Systems Management College or the Department of Defense.

EXECUTIVE SUMMARY

The purpose of this study project is to describe the U.S. Army's acquisition process for product improvements to major weapons systems. The need/justification for a product improvement (PI) will fall into one or more of six categories: (1) Safety. (2) New tactical/operational USER requirements. (3) Combat effectiveness (mission oriented). (4) Improved reliability/maintenance. (5) Cost reduction (production/logistics). (6) Standardization/compatibility. Funding requirements are important for two reasons: (1) Even though the commodity command commander can approve Product Improvement Proposals (PIP) which will cost less than \$5 million per year or \$25 million total in 5 years for systems in production, or \$2 million per year and \$10 million in 5 years for systems out of production, DA must still approve the funds through the POM process. (2) PI's may be developed using RDT&E, OMA or Procurement funds depending on which of certain criteria it meets.

After going through the development and testing cycle, the PI can be applied to the major end item. The PI's are generally procured in kit form. If the item is still in production, the PI's can be applied on the production line through engineering change proposals and the configuration management process. For the system which has already been fielded, the PI can be applied through a modification work order (MWO). The MWO may be applied by maintenance units in the field. If

installation of the PI is too complex, time consuming, or requires special equipment, it will be accomplished at a depot.

The M60 tank PI program has three major efforts in progress. The M60A2 tank is being "handed-off" to the field. Four battalions have been equipped and four more will be transitioned from M60A1's to M60A2's. The M60A1E3 program encompasses equipping the M60A1 (RISE) tank with three new items: (1) Passive night sights for the commander, gunner, and driver, (2) Laser rangefinder, (3) Solid-state computer. This program has received authority to proceed with low rate initial production. A Phase II PI program for the M60A1E3 has been initiated. It includes numerous PI's to include a tank thermal sight (TTS). This item, although part of the Phase II program, is being developed separately.

In fielding major PI's such as the M60A2 tank, ILS becomes a critical area during "hand-off." Five areas which should be emphasized are:

- (1) Development Phase Planning
- (2) User Preparation for Receipt
- (3) The Fielding Plan/Fielding Agreement
- (4) The Statement of Quality and Support (SOQAS)
- (5) Developer-User Communication

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SECTION I

GENERAL

Background

As major weapon systems are developed and fielded in the U.S. Army, it is the objective of the developer to provide the user with a piece of hardware that meets his needs as stated in the approved requirements document. In the process of hardware systems acquisitions, the developer has many conflicting goals against which he must make trade-offs. These trade-offs involve such things as state-of-the-art technology vs. proven components, schedule extensions vs. the initial operational capability date (IOC), cost of program to achieve minimum technical performance requirements vs. cost to achieve desired requirements. When the hardware is delivered, it may not meet all of the goals the user prescribed because the state-of-the-art was being pushed too far. However, as time progresses and the weapon system is in use, technology advances to a point which will allow the original design goal to be met. If the user still has a requirement, he can initiate a statement of need for a complete new weapon system or he can improve his existing system. This latter approach, known as product improvement, is a viable alternative which is used rather extensively in the U.S. Army today. This fact is vividly shown in Figure 1 by the growth in the number of product improvements (PI's) and the large amount of money involved in their development and fielding. As further evidence of the importance and

PRODUCT IMPROVEMENT PROGRAM GROWTH

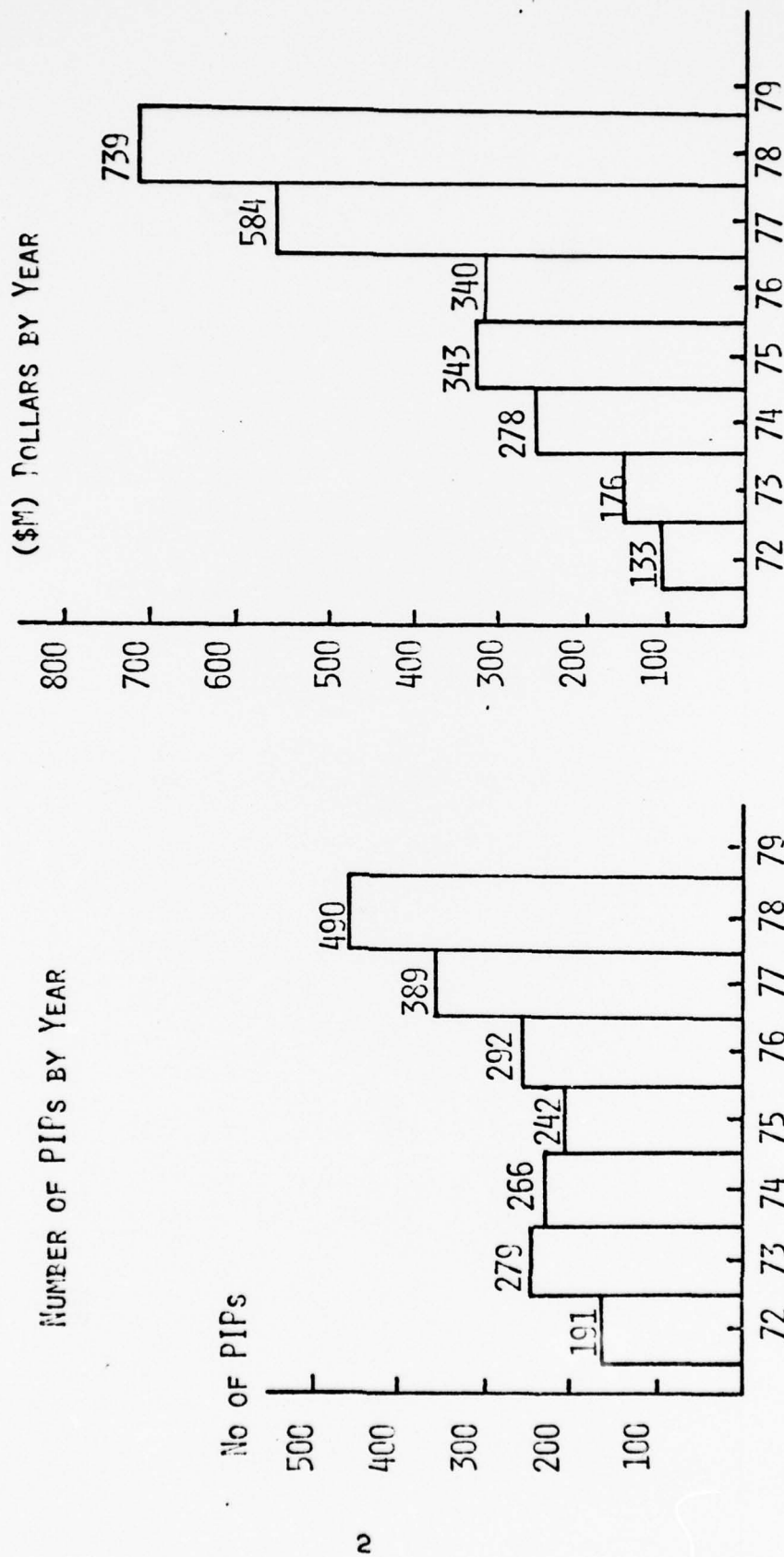


FIGURE 1 (SOURCE: PARCOM PI OFFICE)

visibility being given to PI's, a new office was created within Headquarters, Development and Readiness Command (DARCOM) in 1975. It is appropriately called the Office of Product Improvement and has a staff of eighteen personnel. A Colonel is the head of the office. Army Regulation (AR) 70-15 describes the product improvement program as "the means by which materiel is modified/converted to satisfy user requirements, meet approved performance criteria and/or correct deficiencies found in equipment released to the operational inventory."

Purpose

It is the purpose of this paper to describe the U.S. Army's acquisition process for product improvements to major weapons systems. It will cover the procedure in general terms, but it will also examine one of the major systems in the Army which has a very extensive program of product improvements, the M60 tank. In the FY 1977 Annual Defense Department Report to the Congress, the Secretary of Defense had this to say about the M60 series tanks:

We also plan to proceed with all of the other components of the M60A1 product improvement program, including the thermal imaging night sight. Since M60 series tanks will probably be retained in our inventory through the year 2000, we will continue to examine possibilities for additional improvements.

The M60 program will be used to provide a real world example and to highlight the importance of PI's in the materiel acquisition process. However, it is intended that the paper will also be beneficial to anyone who desires to learn more

about the acquisition process of PI's for any system.

SECTION II
INITIATION OF PI PROGRAM

Requirement

To justify the expenditure of money there must be a proven need. In this regard PI's are no different than a major system. There are six basic categories into which justification requirements for new PI's are placed (2,B-3).¹

1. Safety
2. New tactical/operational USER requirements
3. Combat effectiveness (mission oriented)
4. Improved reliability/maintenance
5. Cost reduction (production/logistics)
6. Standardization, compatibility, other

The first category is self explanatory and is easy to justify because of the high premium placed on safety by the U.S. Army. This is demanded by our society and our moral consciousness. The second class, new tactical/operational USER requirements, is difficult to separate in some instances from the third category, combat effectiveness. It can best be described by a real world example. In the mid 1960's a requirement was developed for a missile firing tank. The concept was to incorporate the Shillelagh 152mm gun/missile launcher into the M60 tank. This same type weapon was also the main armament for the M551 Armored Reconnaissance Airborne Assault Vehicle. This requirement was fulfilled by a PI for the M60 which resulted in

I This notation will be used throughout the report for sources of quotations and major references. The first number is the source listed in the bibliography. The second number is the page reference.

a portion of the fleet receiving a completely redesigned turret that incorporated the 152mm gun/missile launcher. These models are known by their M60A2 designation and are in the field today.

The third category are PI's which affect combat effectiveness (mission oriented). These items will correct deficiencies in the performance envelope of the major system. They may be required because the original item did not meet the performance goals specified by the user, or a reassessment of the threat may require that the performance be significantly increased from that stated in the original requirements document. An example in this group was the requirement to improve the first round hit capability of the M60 due to a reassessment of the threat. The approach taken was to up-grade the tank's fire controls. Two major PI's in this development are a solid state computer and a laser rangefinder.

The fourth area involves the reliability, availability, and maintainability (RAM) of the major end item. These improvements are developed to extend the useful life of items in the inventory. An example of this type of PI for the M60 was the development of a new engine. The original engine, although adequate when the system was fielded, had very little reserve power. As PI's were added to the M60, the weight increased and the engine became overworked. The result was a high failure rate. A new engine was developed to improve the Mean Time Between Failure (MTBF) rate for the propulsion sys-

tem and the end item.

The fifth category of PI's is those which reduce manufacturing or logistic support costs. As can be seen from Figure 2, this category tends to be small in both numbers and in dollars spent. This is possibly because this area would tend to be a low visibility category with the user who is more interested in performance. However, one might keep an eye on this group and expect it to increase in numbers in the future. The rationale for this prediction is the increased emphasis being placed on life cycle costs, and because of an overall dollar shortage, the user is becoming more concerned with logistical costs.

The last category for justifying a PI is standardization, compatibility/other. The other is a catch-all to use when none of the other descriptions seem to fit and a genuine need exists and can be justified. To illustrate standardization/compatibility, let us look at the M88 recovery vehicle. It was fielded with an engine that uses gasoline and was compatible with the M48 series that were standard at the time. However, the M60 tanks which replaced the M48's had diesel engines. The end result was a logistics problem because units needed both gasoline and diesel fuel, and also a training problem in that the track vehicle mechanic had to know the operation of both types of engines. The M88 has the capability of transferring fuel from its tanks to other vehicles. This capability is wasted if it uses a different fuel than the main fleet it supports. To

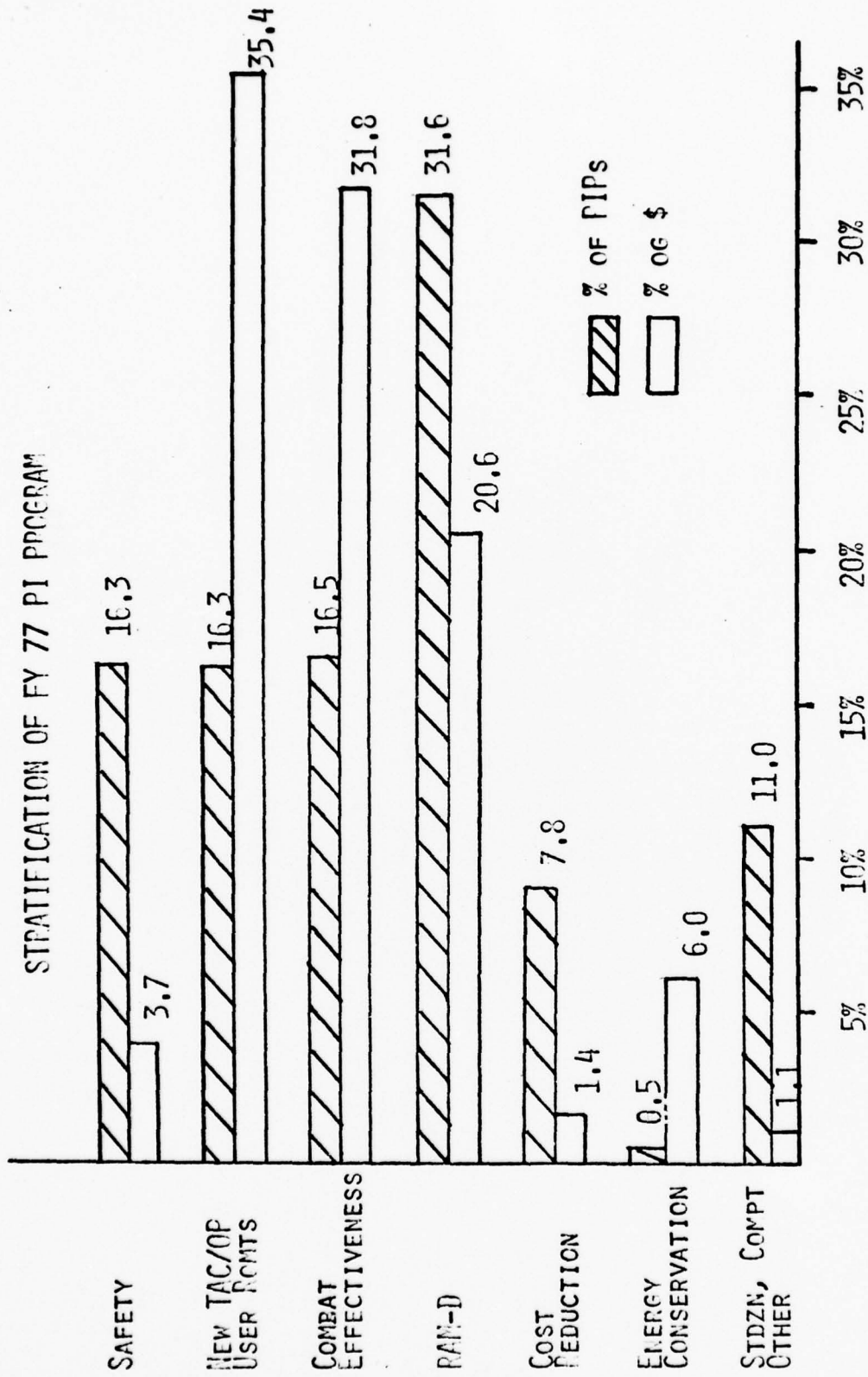


FIGURE 2 (SOURCE: PARCOM PI OFFICE)

meet this deficiency a PI was initiated to replace the M88's gasoline engine with a diesel propulsion unit. This example further illustrates that it is sometimes difficult to place a PI into a single category. The new engine may have been justified under categories five and six. There is, in fact, no requirement to limit a justification to one area.

The initial impetus for a PI will generally come from one of three sources - the user, the developer, or industry. When hardware is fielded, the situation may be viewed as one large operational test. This usage develops a great deal of technical and operational information. The user will constantly be evaluating the hardware and voicing his satisfaction or dissatisfaction. Any dissatisfaction may lead to a requirement to improve a certain component, or a general statement of need in terms of an improved performance envelope. This situation is one which is very similar to the development of a new item of hardware. In fact, it is possible that from a Required Operational Capability (ROC) document for a new system, the product improvement of an existing piece of equipment is the alternative chosen. Existing regulations charge the developer to "initially insure that product improvement of existing materiel is always considered, until proven otherwise, as a feasible alternative technical approach to new development." (2,2-2)

The developer probably initiates more PI's than either of the other two sources. The responsible commodity commands have representatives in the field who are getting first hand data

and channeling it to the appropriate functional agencies and the PM. In the case of the M60 tank, a project manager's office (PMO) has existed ever since the hardware was developed. The PM has the mission in his charter to:

- A. Plan, program, and generate evolutionary and progressive improvements to assigned hardware items.
- B. Exploit breakthroughs in technology to achieve required operational capability, improved combat effectiveness, and/or reduce cost of assigned hardware. (11)

The third source of PI initiatives is industry. For the M60 tank, most will probably come from the prime contractor or one of the sub-contractors for a major component. They are most aware of problem areas or where a cost savings in manufacturing might be achieved.

Even if the developer or industry take the lead, one of the first steps which must be taken is to get user concurrence. In this specific example the user's representative would be the U.S. Army Armor Center (USAARC) at Ft. Knox, Ky. Without USAARC concurrence the proposal would never survive the rigorous review as it went forward for approval. Regulations also direct that the user, Training and Doctrine Command (TRADOC), "prepares as necessary the requirements document (ROC/LOA/LR) for PIP including cost and COEA." (2,2-3) (USAARC is a subordinate element of TRADOC.) Requirements that evolve into a requirements document will most likely fall in the category of increasing the performance envelope. If these circumstances exist, the project is governed by AR 70-1 which is used to con-

trol the acquisition of all new major weapons systems. Since this process is more widely known and understood, it is the intent of this paper to focus more on those cases which fall into the other categories and are controlled by AR 70-15.

The Product Improvement Proposal (PIP) is the formal document that defines the requirement, the proposed change, cost data, etc. A PIP must be prepared for all PI's other than minor or routine changes. The PIP information is submitted on DA Form 3701-R, which is at appendix A. This form is soon to be replaced by a new one, however, the information will essentially remain the same. (10)

The level of authority at which the PIP can be approved is based on monetary thresholds. Figure 3 shows this information as stated in existing regulations. However, in practice today each of the approval authorities has been downgraded one level. (10) Thus at the lower dollar threshold the Commanding General of each commodity command can approve the PIP. This approval, a major hurdle, gets the PI "on the books," but the PM still cannot go on contract because he does not have any money at this point. Although DA Form 3701-R has all the funding data on it, it is not a funding document.

Funding

Funding must be discussed and viewed from two points. The first is the formal review procedure necessary to have the PIP included in the Army's Program Objective Memorandum (POM) each year and subsequently included in the Five Year Defense Plan

APPROVAL AUTHORITY FOR PIP's

APPROVAL AUTHORITY	END ITEM	
	IN PRODUCTION	OUT OF PRODUCTION
DEPT. OF THE ARMY	<u>GREATER THAN</u> \$5M/YR OR \$25M IN 5 YRS	<u>GREATER THAN</u> \$2M/YR OR \$10 IN 5 YRS
	<u>LESS THAN</u> \$5M/YR OR \$25M IN 5 YRS	<u>LESS THAN</u> \$2M/YR OR \$10M IN 5 YRS
DARCOM		

FIGURE 3

(FYDP). The second area is to discuss the various appropriations of monies which become involved in PIP's. A quick check of DA Form 3701-R shows these appropriations.

A general officer review board meets semi-annually to review all PIP's. This board is chaired by the Assistant Deputy Chief of Staff for Research, Development and Acquisition (ADCSRDA). Membership on the board consists of representatives from the Offices of the Deputy Chiefs of Staff for Logistics (ODCSLOG) and Operations (ODCSOPS), Development and Readiness Command (DARCOM), Training and Doctrine Command (TRADOC), U.S. Army Communications Command (USACC), U.S. Army Security Agency (USASA), Office of the Surgeon General (OTSG), and the Office of the Chief of Engineers (OCE). An observer from the Office of the Assistant Secretary of the Army (Installations and Logistics) also attends the meetings. (2,3-2) The board receives an update on on-going PI programs as well as considering new submissions. For major end items such as the M60 tank, they review the Master PIP which is a consolidation of all PI's, if there are more than one. Since the history of the M60 has been one of continuing PI, it becomes a matter of up-dating the Master PIP to include new proposals. The board's major functions are to provide priorities and funding guidance. Prior to this general officer review board, a similar review will have been held at Headquarters, DARCOM.

POM guidance to the DA staff is provided by a second DA general officer committee - Research, Development, and Acquisi-

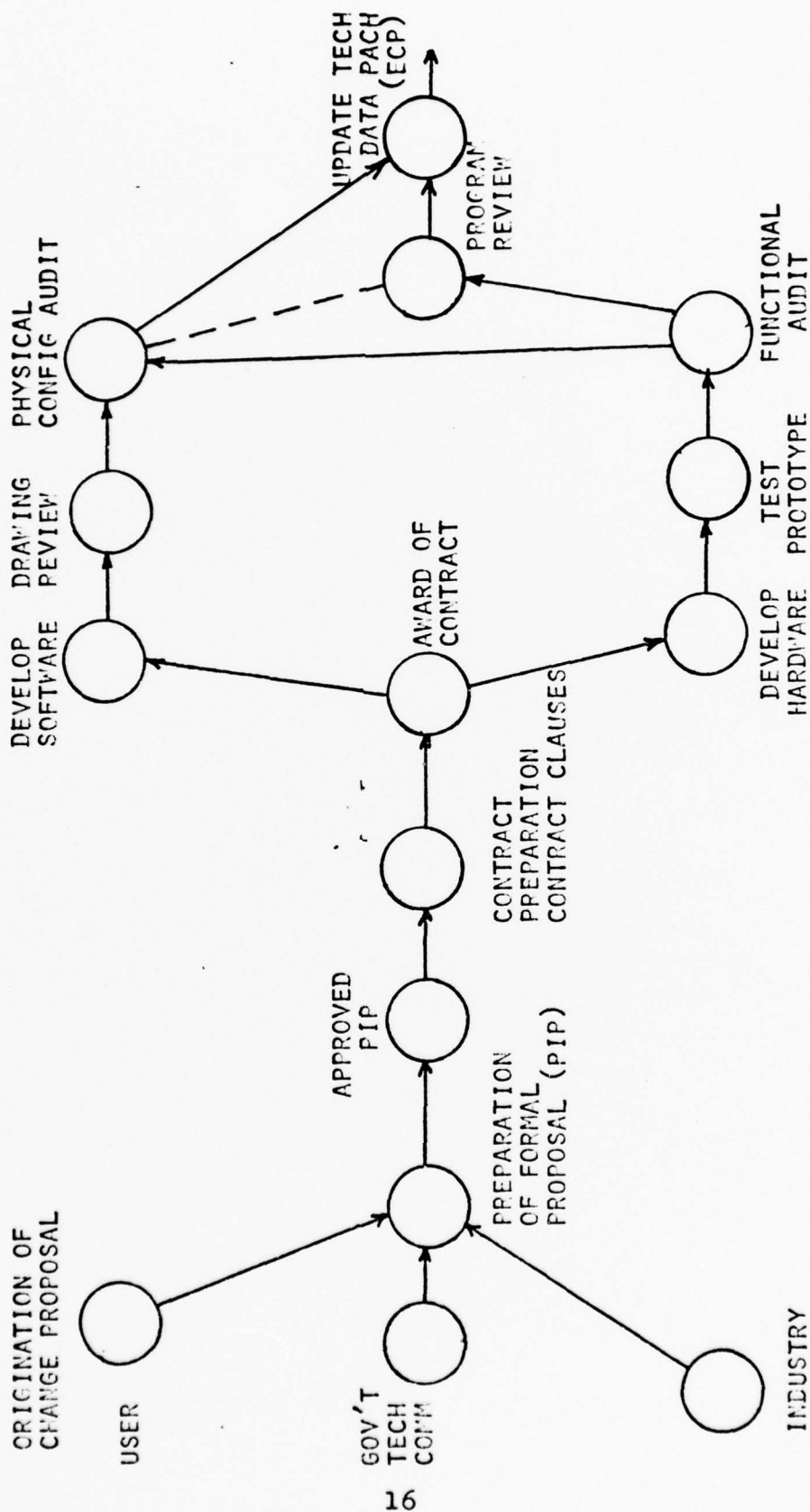
tion Committee (RDAC). Based on the recommendations of the first general officer board, sponsoring agencies are provided the guidance for their POM submissions which are reviewed by the RDAC. The RDAC prefers to consider PI's for an end item ten years into the future, but the proposal must cover at least five years. If the PIP is favorably considered by the RDAC, or as amended, funds are included in the Army POM, FYDP and annual budget submission documents. The request must also go through the DOD/OMB and Congressional budget reviews and Congressional authorization/appropriation process before the PM gets any money so that he can obligate funds by writing a contract.

From the above process, it can be seen that although a PIP for the M60 can be approved by the Commanding General of the Tank Automotive Readiness Command (TARCOM), it still must be approved by DARCOM, DA, DOD and Congress. In this regard, a product improvement is not any different from a major weapons system, except that its visibility most likely is not as great. In the case of the M60 tank, it is a fairly visible system because of the aggressive PI program and the large amounts of dollars involved. The Master PIP may receive a great deal of scrutiny, but some of the individual lower dollar value PI's will not. The planning estimate in the Master PIP for previously approved PI's may not exceed the funding levels in the July FYDP up-date. These funding levels are listed by item or major weapon system.

At this point it is necessary to examine the types of these dollars to better understand DA Form 3701-R and the planning which the PM must do early in the program. There are two phases in the process of developing and fielding PI's. The first includes all those actions up through the testing and approval of the PI. (Figure 4) The second phase is the procurement of the item or kits and the application to the major end item. (Figure 5) In phase I, Research, Development, Test and Evaluation (RDTE) or Operational and Maintenance (OM) funds might be used. PI's which will increase the current performance envelope of the end item are considered as being development in nature and will be funded with RDTE monies. This is the category which was described earlier as being controlled by AR 70-1. If the PI is developed to correct known deficiencies, vis-a-vis the existing requirements document, it is considered developmental in nature and is funded by RDTE appropriations. All other efforts in phase I are financed by some category of Operational and Maintenance Funds for the Army. (OMA). (Figure 6)

Phase II involves the production of the new item or kits and the application to the end item, the M60 tank. When the PI is to be installed on an item in production and/or it is for a type classified investment component or assembly, procurement funds will be used. Included in these procurement costs are first destination charges, initial spares, and tooling or materiel production start-up costs. OM stock funds will be

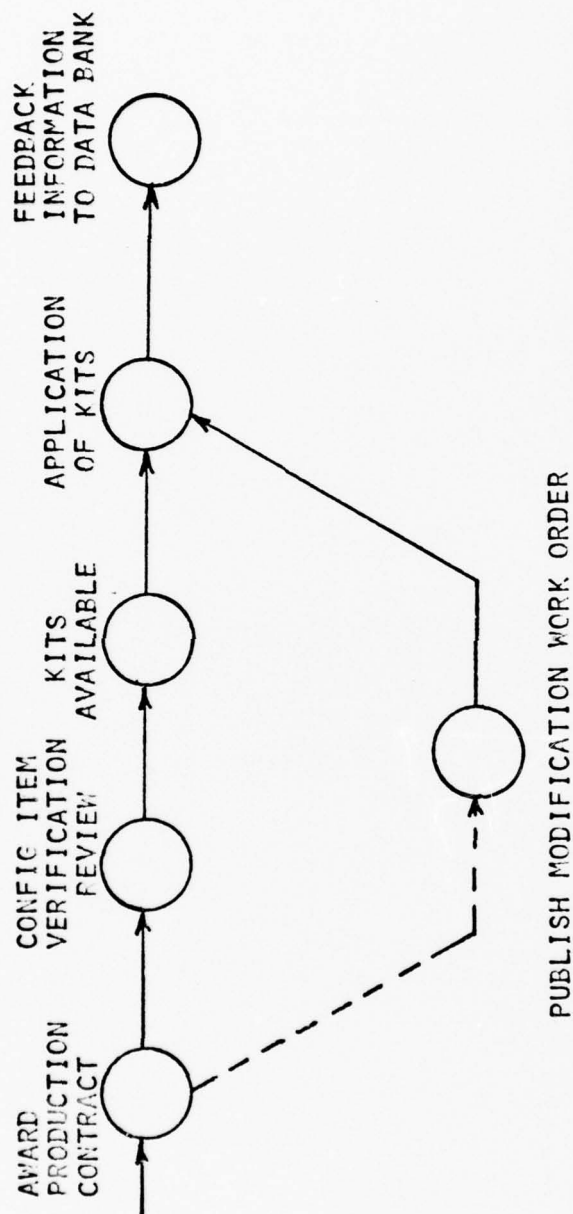
PRODUCT IMPROVEMENT LIFE CYCLE (PHASE I)



(SOURCE: PARCOM PI OFFICE)

FIGURE 4

PRODUCT IMPROVEMENT LIFE CYCLE (PHASE II)



(SOURCE: DAPCOM PI OFFICE)

FIGURE 5

PRODUCT IMPROVEMENT APPROPRIATION REQUIREMENT

PHASE I	PHASE II	
ENGINEERING	PROCUREMENT	APPLICATION
RDTE	-	-
PA	PA	-
OMA	-	OMA
7M	-	7M
7S	-	7S
	ASF	-

(SOURCE: DARCOM PI OFFICE)

FIGURE C

used to procure those kits or materiel which will be used to reconfigure expense type end items. The cost of applying the PI to the end item is OMA funded. The specific OMA category varies according to where the modification is made. These application options will be discussed later.

SECTION III
DEVELOPMENT AND FIELDING

General

The development of PI's follows the general phases of the materiel acquisition process as do major systems. However, because of the wide variety of PI's, when viewed from such variables as complexity, cost, urgency, technical risk, etc., each program is tailored taking these items into consideration. Generally after the PI is engineered, prototypes are installed on the end item and are subjected to testing. This may include the full range from contractor demonstrations through DT/OT III.

M60A1E3 Tank Program

The M60A1E3 tank is a program to apply three PI's to the M60A1 (RISE)* tank. They include:

- (1) Passive night sights for the commander, gunner, and driver
- (2) Laser rangefinder
- (3) Solid-state computer

The development started in calendar year 1973. In the period since then it has gone through qualification testing, DT I and II and OT II. At a Development and Acceptance In-Process Review (DEVA IPR) approval was given to go into low rate initial production (LRIP). Using units from the LRIP there is both a DT III and OT III scheduled prior to the initial operational capability (IOC) date in May 1979.

* Reliability Improved Selected Equipment

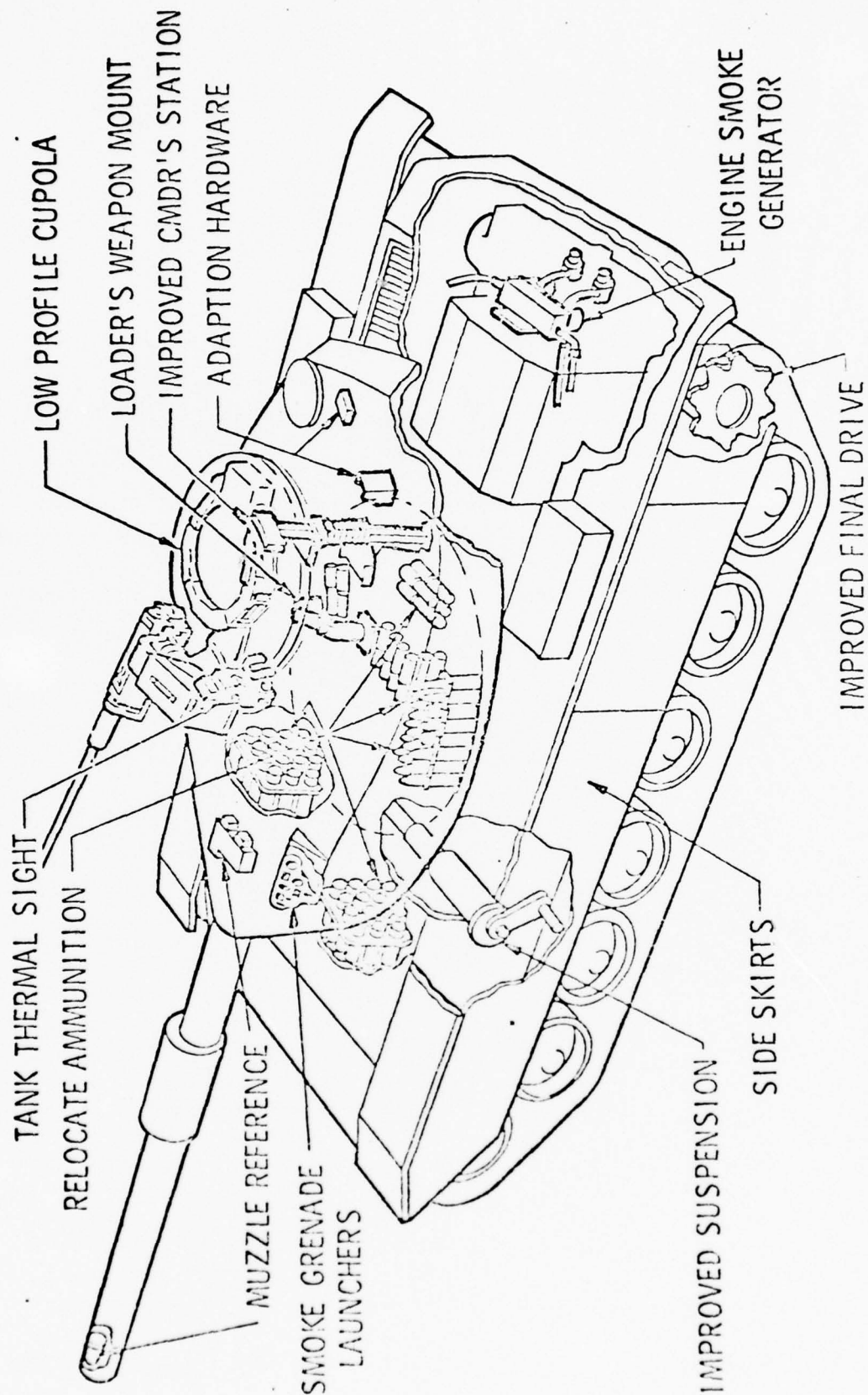
M60A1E3 (Phase II)

The Phase II PI's shown in Figure 7 vividly represent numerous PI's that are combined into a PIP. The one item shown in this figure, the tank thermal sight (TTS), although a Phase II PI, is being developed separately and funded using RDT&E monies. To illustrate the management dynamics of PI programs, the TTS is presently scheduled for its DT/OT II at the same time as the M60A1E3 DT/OT III mentioned above. It is the intention of the PM to recommend that the TTS DT/OT II be redesignated DT/OT III and be conducted at the same time as the M60A1E3 tests. (12,31) This would condense the program and save money while accelerating the IOC date for the TTS. The one thing which must be understood is that because of varying complexity and risks associated with each of the Phase II PI's, they need not all follow the same program. Some may have a minimum of testing before being fielded, others may never be fielded, and the rest may go through the full range of developmental testing.

Application

After a favorable decision at a Production Validation IPR, it becomes the PM's task to get the fleet modified. There are several alternatives in accomplishing this task. Most PI's are procured in kit form. If the PI and its installation are not too complex, a modification work order (MWO) is issued and the item is installed in the field. Change 3 to AR 750-1 defines two types of MWO's, mandatory and other.

PRODUCT IMPROVEMENTS



(SOURCE: FMO, MCO TD)

FIGURE 7

Mandatory MWO's must be completed within one year of the MWO being issued. The money for the application of these MWO's comes from OMA funds. At present these funds are held in one big pot at DARCOM and are parceled out to the field commands when the work is accomplished. (10) This process has the advantage that the developer insures money is available for application and secondly, that it is used for that purpose and not some other requirement which the field commander deems more appropriate. The kits are purchased with procurement funds and distributed to the field once as a free issue.

If the end item is still in production it is necessary to apply the PI to the production line items also. This situation is easier to control because of the one central location of installation. Also only one type of funds is involved. Procurement monies are used to fund the end item purchase which through the process of engineering change proposals (ECP) and configuration management will include the approved PI in the technical data package.

The alternative to applying the kit in the field, for those end items already produced, is to install it at a depot. This course of action becomes necessary when the field units do not have the skills or tools necessary to do the job. The size of the task may also be such that it would unduly overburden the workload of field support units. One area that must be considered, if the task is a major one to be accomplished at a depot, is the requirement for major modifications to the

facilities or tooling and equipment. This approach would also use OMA funding. It is currently planned to make the M60A1E3 conversions for fielded systems at the depot. (12,31)

M60A2 Tank Deployment

The M60A2 tank is presently being deployed to the field. All of these tanks were produced/modified on the tank production line in Warren, Michigan. At present one battalion in CONUS has been transitioned from M60A1's to M60A2's and three in Germany. To better understand the process of fielding or "handing off" this item, it is interesting to address the lessons learned to date. (12,115)

- (1) Development Phase Planning
- (2) User Preparation for Receipt
- (3) The Fielding Plan/Fielding Agreement
- (4) The Statement of Quality and Support (SOQAS)
- (5) Developer-User Communication

Development Phase Planning. Planning for fielding and logistical support should begin prior to DT/OT II. Emphasis should be given to highlight the difference between the new item and the one it is to replace. These differences should be used to orient the fielding effort.

User Preparation for Receipt. The user must prepare to receive the product as it is being developed. The developer must actively assist the user and should insure that the user can meet his logistical support responsibilities before fielding the new item.

The Fielding Plan/Fielding Agreement. This plan must be based on published distribution guidelines. It should be developed shortly before DT/OT III and address each integrated logistical support (ILS) aspect in detail. The fielding agreement should be written as a contract between the developer and user. It should at least cover the following areas:

- (1) Time frame for hand-off
- (2) Distribution requirements for gaining units
- (3) DARCOM hand-off organization, facilities, and support requirements
- (4) DARCOM-User relationships and inter-responsibilities
- (5) Statement of quality and support

The Statement of Quality and Support (SOQAS). "This is a written statement of warranty which addresses coverage, mechanisms for replacement, and the means for insuring demands are properly recorded by the supply system. The developer should be aware that as the SOQAS expands in scope, the user tends to use it as a secondary supply source." (12, 119)

Developer-User Communication. Project Hand-off provides an immediate feedback of problems. When there is a mutual trust and a feeling of competent management exists, a positive result will be achieved.

SECTION IV
LOGISTICAL IMPLICATIONS AND CONSIDERATIONS

General

The lessons learned which have just been presented show the importance of addressing logistical considerations early. The M60A2 probably represents the extreme case of PI impacts on the existing logistics system. Since the M60A2 is essentially an M60A1 chasis with a different turret, it comes close to the situation of introducing a new system. However, if its logistical impacts are understood, it then becomes a task of scaling down and tailoring the problems to smaller, less complicated PI's.

Integrated Logistics System (ILS)

Special tools and test equipment are items which must be identified early enough so they are available to be used in the testing program. A mean-time-to-repair (MTTR) value is not too meaningful if the maintenance personnel did not use the tools and/or test equipment necessary to do the repair. Another reason to use these items in the test program is to verify their adequacy or identify deficiencies early enough to allow them to be procured and issued with the major item. This equipment is not limited to the field units, but must include depot requirements which are necessary to their overhaul and repair programs.

Initial spare parts which go into the supply support for the item are bought with procurement funds with the item/kits.

The estimates of the usage of repair parts is based on contractor and government testing which identifies failure rates for components and subsystems. These values are important because they become the basis for the initial prescribed load lists (PLL) and authorized stockage levels (ASL) in the field units. The initial provisioning procurements for the M60A2 covered 1231 lines. (12,97) The distribution of initial spares has two impacts for the PM. First he has competing requirements for the production line - kits for MWO application and spares for PLL's and ASL's. Secondly, he must get the PLL's and ASL's to the units before the equipment. Along with this is the requirement to get spares into the supply system so that subsequent unit requisitions can be filled from the National Inventory Control Points (NICP). With the initial, partial fielding of M60A2 battalions in CONUS and Germany, certain spares are having to be controlled at the NICP level. (12,99) While it is projected that sufficient spares are available to meet the anticipated failure rates, there are not sufficient spares to fill all units PLL/ASL requirements. The result will be a higher non-operational rate - supply (NORS) value due to the impact of order and shipment times.

Technical data in the form of operator's manuals, technical manuals, etc. must be distributed with the equipment. These also need to be written early and reviewed in draft form during the testing phase, as early as DT/OT II. These publications are needed to carry on the initial training programs

as the equipment is being introduced.

Training for the introduction is a phased build-up. It starts as early as DT/OT I and must be thoroughly coordinated between developer and user. The first training programs will be for the personnel involved in DT/OT I & II. These are generally conducted by the contractor at his facility. Before DT/OT III the TRADOC service school must modify its existing courses or develop new courses if necessary. The units involved in OT III should be trained in these courses. This training need not be for 100% of the new unit, but can be done on a selected basis. The cadre trained in the service school can train the remainder of the unit if large numbers of people are involved. The OT III for the M60A2 involved a full tank battalion at Ft. Hood, Texas. A selected cadre was trained at Ft. Knox and they in turn trained the remainder of the battalion. The service school must then continue to include these new courses in their skill producing military occupational specialty (MOS) programs. These people must then be assigned to the units that are to receive the new equipment first. A failure to carry through such a program will result in a shortage in the field. This was emphasized when the Commanding General in Europe refused to take any more M60A2's until he got more turret mechanics who were qualified to repair the M60A2. To assist the gaining unit in making the transition to the new hardware, New Equipment Training Teams (NETT) are employed. They provide assistance to the unit in setting up a

training program and conduct some training with its own members.

SECTION V

SUMMARY OF CRITICAL AREAS

1. A sound justification of the need based on one or more of the six categories is required to get a PI going.
If the need or idea did not originate with the user, his acceptance must be obtained early in the process.
2. The program must be well thought through and planned early so that the necessary categories of funds can be programmed.
DA Form 3701-R is an aide in this process, but the decisions still must be made as to when and how the PI will be applied.
3. Funds control for MWO applications is retained at Hq., DARCOM and disbursed to the field when the kits are applied.
This provides a central control for the PI applications and provides a more positive check on insuring funds are available at the required time.
4. In fielding major PI's such as the M60A2 tank, the ILS aspects take on the same major and dominating importance as the fielding of a new system. The lessons learned by the M60 Tank Development Project Manager's Office in this area fall into five areas.
 - (A) Development Phase Planning
 - (B) User Preparation for Receipt
 - (C) The Fielding Plan/Fielding Agreement
 - (D) The Statement of Quality and Support (SOQAS)
 - (E) Developer-User Communication

APPENDIX A - DA Form 3701-R

1 April 1975

PRODUCT IMPROVEMENT PROPOSAL/PROJECT		
1. PROPOSAL/PROJECT NO.	2. END ITEM TO BE IMPROVED	3. UNIT
5. DATE SUBMITTED		
6. DATE CHANGED		
7. SUBMITTED BY	8. SPECIFIC COMPONENTS TO BE IMPROVED (If components are common to other end items, list such end items)	
9. DESCRIPTION OF IMPROVEMENT		
10. ESSENTIALITY OF IMPROVEMENT		
11. TYPE OF IMPROVEMENT <input type="checkbox"/> a. CORRECTS KNOWN DEFICIENCIES IN ROC, LOA OR LR CRITERIA <input type="checkbox"/> d. ASSURES CREW OPERATOR SAFETY <input type="checkbox"/> b. CAUSES CHANGE IN PREVIOUS ROC, LOA OR LR CRITERIA <input type="checkbox"/> e. PREVENTS DAMAGE TO EQUIPMENT <input type="checkbox"/> c. DOES NOT CHANGE EXISTING PERFORMANCE CRITERIA <input type="checkbox"/> f. REDUCES PROCUREMENT OR LOGISTICAL SUPPORT COST		

Use additional sheets for continuation - properly identified.

DA FORM 3701-R, 1 Mar 75

EDITION OF 1 MAR 71 IS OBSOLETE

For use

Figure C-1. DA Form 3701-R.

AR 70-15

PROPOSAL PROJECT		PAGE ONE
		OF PAGES
3. UNIT COST	4. LIN (SB 700-20) OF END ITEM	
<p>Comments are comments to other end items. List such end items on separate page; also indicate NSN and unit cost of each component.)</p>		
<p>OPERATOR SAFETY</p> <p>TO EQUIPMENT</p> <p>MENT OR LOGISTICAL SUPPORT COST</p>		
<p><input type="checkbox"/> g. PROVIDES NEW OR IMPROVED ENVIRONMENTAL POLLUTION OR NOISE ABATEMENT FEATURES.</p> <p><input type="checkbox"/> h. OTHER (Specify)</p>		

For use of this form, see AR 70-15; the proponent agency is ODCSRDA.

C-1. DA Form 3701-R.

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APPENDIX A (continued)

1 April 1975

PRODUCT IMPROVEMENT PROPOSAL PROJECT NO.		SUBMITTED BY										
12. MILESTONE ACTIVITY LEGEND (Insert alpha identifier in appropriate year column on line A below.) A - FIRST PHASE BEGINS (B1a/b) B - REDESIGNED PROTOTYPE COMPLETED (B1a/b) C - PROTOTYPE FABRICATED (B1a/b) D - TRAINING OF TEST & EVAL PERS BEGINS (B1a/b) E - MODIFIED EQUIP TECH TNG COURSES BEGIN (B3d) F - PRODUCTION ENGINEERING INITIATED (B2a/b) G - PROTOTYPE TESTING & EVAL COMPLETED (B1a/b) H - PIP ADOPTED (MWO ECO PUBLISHED) I - RECONFIG MAT INTRODUCTION LTR DISPATCHED (I3d) J - FIRST FIX APPLIED TO PRODUCTION ITEMS (B3a/b/h) K - PROC OF MOD KITS, NEW COMPONENTS BEGINS (B3M) L - PROCUREMENT OF TOOLS/EQUIP REQUIRED TO PERFORM RECONFIG OR FOLLOW-ON LOG SUPPORT BEGINS (BI) M - FIRST ITEM TRANSPORTED TO RECONFIG SITE (B3h)												
13. WHEN PHASE I BEGINS, IS: END ITEM IN PRODUCTION? COMPONENT IN PRODUCTION?		<table border="1"> <tr> <td>YES</td> <td>NO</td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> </table>	YES	NO					1 APPROPRIATION	2 FUNDS REQUIRED IN PRIOR FISCAL YEARS	3 CURRENT FY _____ FUNDED UNFUNDED	BUD FUNDED
YES	NO											
14. A. MAJOR MILESTONES (See milestone/activity legend.)												
B. DESCRIPTION OF RECONFIGURATION (See AR 70-15.) 1. PHASE I ACTIONS (Select 1a or 1b(1)/(2)/(3).) a. DEVELOPMENTAL TYPE FIX REQ FOR ITEM IN OR OUT OF PRODUCTION (Item may be PROC or ASF) b. NON-DEVELOPMENTAL TYPE FIX REQUIRED FOR: (1) PROC REPLENISHED ITEM IN PRODUCTION (2) PROC REPLENISHED ITEM OUT OF PROD (3) ASF REPLENISHED ITEM IN OR OUT OF PROD		*RDE *PROC HARDWARE LINE *OMA (728017) *OMA (728012)										
DURATION OF ACTIVITY DESCRIBED IN 1a OR 1b(1)/(2)/(3)												
2. FIX REQUIRES PRODUCTION ENGINEERING PRIOR TO ENTERING PHASE II AND ITEM IS a. PROC REPLENISHED OR b. ASF REPLENISHED		*PROC HARDWARE LINE *OMA (728012)										
DURATION OF ACTIVITY DESCRIBED IN 2a OR 2b												
3. PHASE II ACTIONS a. FIX (PER ECO) WILL BE APPLIED DURING PRODUCTION (1) TO PROC PROCURED ITEM (2) TO ASF PROCURED ITEM		**PROC HARDWARE LINE **ASF										
DURATION OF ACTIVITY DESCRIBED IN 3a(1) OR 3a(2)												
b. FIX (PER MWO) WILL BE APPLIED TO EXISTING ITEMS (1) PROCUREMENT OF KITS, COMPONENTS, PARTS, ETC. (a) FOR PROC ITEMS (b) FOR ASF ITEMS		**PROC HARDWARE LINE **ASF										
DURATION OF ACTIVITY DESCRIBED IN 3b(1)(a) OR (b)												
* FUNDED BY MATERIEL DEVELOPER ** FUNDED BY RESPONSIBLE NATIONAL INVENTORY MANAGER *** FUNDED BY RESPONSIBLE STORE												

Figure C-1—Continued.

(low.)

(MMO ECO PUBLISHED)

INTRODUCTION LTR DISPATCHED (B3d)

LIED TO PRODUCTION ITEMS (B3a/b/c)

KITS, NEW COMPONENTS BEGINS (B3M1)

OF TOOLS/EQUIP REQUIRED TO PERFORM
REPAIR ON LOG SUPPORT BEGINS (120)

TRANSPORTED TO RECONFIG SITE (B3N)

N - FIRST FIX APPLIED TO INVENTORY ASSETS (B3b(2) (4))

O - FIRST FIX APPLIED TO USER OWNED ASSETS (B3b(4))

P - FOLLOW ON TECH ASSISTANCE INITIATED (B3c)

Q - MASS PRINTING OF TECH PUBS INITIATED (B3c)

R - REPAIR PARTS STOCKAGE REQUIRED FOR FOLLOW ON SUPPORT INITIATED (22)

S - LAST FIX COMPLETED

[illegible]

STORY MANAGER

***FUNDED BY RESPONSIBLE STORAGE OPERATOR.

Figure C-1—Continued.

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APPENDIX A (continued)

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1 April 1975

PRODUCT IMPROVEMENT PROPOSAL PROJECT NO.		SUBMITTED BY				
		1	2	3		8
		APPROPRIATION	FUNDS REQUIRED IN PRIOR FISCAL YEARS	CURRENT FY		
				FUNDED	UNFUNDED	FUN
I. TOOLS/EQUIP REQUIRED TO PERFORM RECONFIGURATION OR FOLLOW ON MAINTENANCE (SEE NOTE 4.)		** PROC				
		** OMA (732207)				
g. REPAIR PARTS STOCKAGE REQUIRED FOR FOLLOW-ON SUPPORT SUBSEQUENT TO RECONFIGURATION						
(1) PROC PRINCIPAL		** PROC				
(2) PROC SECONDARY ITEMS		** PFCC				
(3) ASF ITEMS		** ASF				
h. TRANSPORTATION COSTS GENERATED IN ACCOMPLISHING PHASE II APPLICATION EFFORT						
(1) ON NICP CONTROLLED INVENTORY ASSETS		** OMA (728010)				
(2) ON NON-NICP CONTROLLED INVENTORY ASSETS		LOCAL FUNDS				
(3) ON USER HELD ASSETS		USER FUNDS				
		TOTAL				
15.		AGGREGATE TOTAL				
		RDTE				
		PROC				
		OTHER				
		KITS				
		OMA				
		721111				
		728012				
		732207				
		732897				
		738017				
		ASF				
		LOCAL USER				
		TOTAL				
16. REMARKS						
<p>*FUNDED BY MATERIEL DEVELOPER **FUNDED BY RESPONSIBLE NATIONAL INVENTORY MANAGER ***FUNDED BY RESPONSIBLE S</p>						

Figure C-1—Continued.

APPENDIX A (continued)

1 April 1975

PRODUCT IMPROVEMENT PROPOSAL PROJECT NO.		SUBMITTED BY				
		1	2	3		8
		APPROPRIATION	FUNDS REQUIRED IN PRIOR FISCAL YEARS	CURRENT FY		
				FUNDED	UNFUNDED	FUN
(2) APPLICATION TO NON-STOCK FUND OWNED ASSETS						
(a) ASSET LOCATED IN NICP CONTROLLED INVENTORY						
1. MECHANICAL SKILLS REQUIRED		** OMA (732207)				
2. STORAGE WAREHOUSE SKILLS REQUIRED		*** OMA (721111)				
(b) ASSET LOCATED IN CONUS NON NICP INVENTORY						
1. DEPOT LEVEL SKILLS REQUIRED		** OMA (732207)				
2. BELOW DEPOT LEVEL SKILLS REQUIRED		LOCAL FUNDS				
(c) ASSET LOCATED IN NG/USAR INVENTORY		OMNG OMAR				
(d) ASSET LOCATED IN OCONUS INVENTORY						
1. OCONUS MECHANICAL SKILLS REQUIRED		LOCAL FUNDS				
2. CONUS DEPOT LEVEL SKILLS REQUIRED		** OMA (732207)				
3. STORAGE WAREHOUSE SKILLS REQUIRED		LOCAL FUNDS				
(3) APPLICATION TO STOCK FUND OWNED ASSETS						
(a) MECHANICAL SKILLS REQUIRED		** ASF				
(b) STORAGE/WAREHOUSE SKILLS REQUIRED		*** OMA (721111)				
DURATION OF ACTIVITY DESCRIBED IN 3b(2) OR 3b(3)						
(4) APPLICATION TO PROC OR ASF ASSETS HELD BY USERS						
(a) ASSET IN HANDS OF ACTIVE ARMY USER (CONUS)						
1. DEPOT LEVEL SKILLS REQUIRED		** OMA (732207)				
2. BELOW DEPOT LEVEL SKILLS REQUIRED		USER FUNDS				
(b) ASSET IN HANDS OF ACTIVE ARMY USER (OCONUS)						
1. OCONUS DEPOT LEVEL SKILLS REQUIRED		LOCAL FUNDS				
2. CONUS DEPOT LEVEL SKILLS REQUIRED		** OMA (732207)				
3. OCONUS BELOW DEPOT LEVEL SKILLS REQUIRED		USER FUNDS				
(c) ASSET IN HANDS OF NG/USAR USER		OMNG OMAR				
DURATION OF ACTIVITY DESCRIBED IN 3b(4)						
c. PRINTING OF TECH PUBS GENERATED BY ANY OF THE ABOVE ACTIONS (FINAL MANUSCRIPTS ONLY)		* OMA (738017)				
DURATION OF ACTIVITY DESCRIBED IN 3c						
d. TRAINING GENERATED BY THE RECONFIGURATION		* OMA (732897)				
DURATION OF ACTIVITY DESCRIBED IN 3d						
e. TECH ASSISTANCE GENERATED BY THE RECONFIG		* OMA (738017)				
DURATION OF ACTIVITY DESCRIBED IN 3e (SEE NOTE 3)						
* FUNDED BY MATERIEL DEVELOPER		** FUNDED BY RESPONSIBLE NATIONAL INVENTORY MANAGER		*** FUNDED BY RESPONSIBLE		

Figure C-1—Continued.

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