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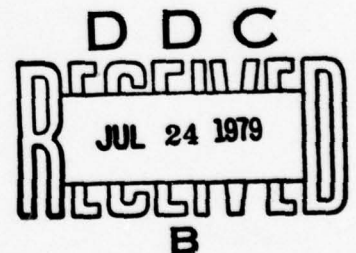
LOGISTIC INCENTIVE STRUCTURES REFLECTED IN
IRREGULAR LOGISTIC PROCEDURES

(SHORT TITLE - INCENTIVE
STRUCTURES FOR IRREGULAR LOGISTICS)

Interim Technical Report
June 1979

by

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FOREWORD

The study of irregular logistic procedures breaks new ground. The subject generally is not reflected in published material. We have searched whole libraries without finding significant material identified with this subject. Yet, we have found relevant material in unexpected places. We believe readers of this interim report may have information which can contribute to improvement of our study. Consequently, we earnestly solicit comments and suggestions.

The Authors

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TABLE OF CONTENTS

	EXECUTIVE SUMMARY	E-1
I	INTRODUCTION TO THE PROBLEM	
1.1	Introduction	1-1
1.1.1	General Approach	1-1
1.1.2	Detailed Approach	1-3
1.2	Definitions	1-4
1.3	Scope of Study in a System/Sub-System Context	i-5
1.3.1	All Complex Hierarchical Systems	1-5
1.3.2	The U.S. Military Logistic System	1-5
1.3.3	Operational Unit	1-8
1.3.4	Individual Operating System	1-8
1.4	Scope of Study in a Behavioral Science Context	1-8
1.4.1	Sociological Aspects of the Analysis	1-8
1.4.1.1	Role	1-9
1.4.1.2	Group Norms and Related Factors	1-9
1.4.1.3	Communication Networks	1-10
1.4.2	Psychological Aspects of the Analysis	1-10
1.4.2.1	Role Theory	1-10
1.4.2.2	Motivational Psychology	1-11
1.5	The Logistic Incentive Structure	1-12
1.5.1	The Situational Context	1-12
1.5.2	The Motivational Context	1-14
II	PERTINENT ASPECTS OF THE MILITARY LOGISTIC SYSTEM	
2.1	General	2-1
2.2	Models Relevant to Timely Demand Satisfaction	2-1
2.2.1	Elemental Logistic System Model	2-2
2.2.2	Composite Military Logistic System Elements	2-2
2.2.2.1	What is Reasonableness in Timely Demand Satisfaction?	2-5
2.2.2.2	What is the Impact of Mobility Requirements?	2-5
2.2.2.3	What is Current Availability on Demand?	2-6
2.2.3	The Military Helicopter Unit and Its Supporting Intermediate Maintenance Activity	2-6
2.2.4	Cybernetic Characteristics	2-9
2.3	The Military Logistic System Legitimation Process	2-10
2.3.1	Authorization Status	2-13
2.4	Prescribing Maintenance Procedures	2-14

III	THE INDIVIDUAL DECISION-MAKING PROCESS	
3.1	General	3-1
3.2	Demands on the Military Logistic System	3-1
3.3	The User Decision Model	3-2
3.3.1	The Decision Points	3-6
3.4	Additional Decision Points	3-12
3.4.1	Hoarding	3-12
3.4.2	Maintenance Short Cuts	3-13
3.4.3	Operation of Equipment with Maintenance Deficiencies	3-14
3.5	Linkage of Contextual Incentive Structure Elements to Outcomes Through Decision Points	3-14
IV	USE OF IRREGULAR PROCEDURES AS A GENERAL SYSTEMIC PHENOMENON	4-1
V	HYPOTHESES	
5.1	Introduction	5-1
5.2	Specific Hypotheses	5-2
5.2.1	Hypotheses With Respect to the Different Types of Irregular Procedures Which May Be Used	5-2
5.2.2	Hypotheses with Respect to the Individual's Ability to Determine the Legitimacy of a Demand	5-3
5.2.3	Hypotheses Concerning the Capability and Willingness of the Military Logistic System to Fill Demands for Items	5-3
5.2.4	Hypotheses Concerning the Role of the Chain of Command in the Use of Irregular Procedures	5-4
5.2.5	Hypotheses Concerning Work Group Norms	5-5
5.2.6	Hypotheses Concerning Individual Incentives and Disincentives	5-6
5.2.7	Hypothesis Concerning Maintenance Short Cuts	5-6
5.2.8	Hypothesis Concerning Hoarding	5-6
5.2.9	Hypotheses Concerning Decision Outcomes	5-7
5.3	General Hypotheses	5-7
5.4	Hypotheses Validation	5-9
	BIBLIOGRAPHY	B-1

List of Tables

Table 1-1	Types of Procedures and Actions Encompassed by the Term "Irregular Logistic Procedures"	1-6
Table 1-2	Pertinent Attributes of the U.S. Military Logistic System	1-7
Table 3-1	Typology of Demands	3-3
Table 3-2	Contextual Typology of Demands	3-4

List of Figures

Figure 1-1	The Incentive Structure Governing the Use of Irregular Military Logistic Procedures	1-13
Figure 2-1	Elemental Logistic System	2-3
Figure 2-2	Relevant Composite Logistic System Characteristics	2-4
Figure 2-3	Generalized Military Helicopter Parts Supply and Repair System: Unit-Level-Intermediate-Level Subsystem	2-8
Figure 2-4	Factors of Interest in the Military Logistic System as a Cybernetic System	2-11
Figure 2-5	The Military Logistic System Legitimation Process	2-12
Figure 3-1	Simplified Model of Individual Initiating Action to Satisfy a Demand for Items and Services	3-5
Figure 3-2	Decision Map for the Use of Irregular Logistic Procedures to Obtain Items or Services to Satisfy Current Demands	3-7
Figure 3-3	Hoarding	3-13
Figure 3-4	Use of Maintenance Short Cuts	3-13
Figure 3-5	Operation of Equipment with Maintenance Deficiencies	3-14
Figure 3-6	Linkage of Contextual Incentive Structure Elements to Outcome Through Decision Points	3-16

EXECUTIVE SUMMARY

BACKGROUND AND OBJECTIVES

1. In 1976 DARPA established a Logistics System Technology Program which included the following objective:

Develop a new set of logistics incentives for quickly and significantly reducing costs while maintaining or improving effectiveness within current logistics procedures.

In pursuing this objective, DARPA has contracted with Kappa Systems, Inc. (KSI) to accomplish a Study of Incentive Structures Reflected in Irregular Logistic Procedures.

2. KSI's study has the objective, in furtherance of DARPA's program, of investigating the nature of the incentive structures reflected in the use of irregular (unauthorized) procedures in the U.S. military logistic system. This is to be accomplished by selecting a single type of unit and conducting an exploratory study of carefully limited scope which can:

- Define the problem
- Establish pertinent specific and general hypotheses
- Test the specific hypotheses using a survey of selected military personnel
- Provide appropriate findings, conclusions, and recommendations.

This Interim Report is required to cover the first two elements above -- definition of the problem and hypotheses.

DEFINITION OF THE PROBLEM

1. Key terms used, the scope of this study in systemic and behavioral science contexts, and the basic concept of the incentive structure governing the use of irregular logistic procedures are presented in Section 1 of the Report. The initial discussion of the concept of the incentive structure emphasizes that every decision to use an irregular procedure results from the impact of situational and motivational factors on the individual decision-maker.

2. Section 2 concentrates on the pertinent aspects of the military logistic system, focusing on military helicopter supply and maintenance as the specific type of unit and activities selected for detailed observation, and including a brief look at phenomena associated with military logistics as a cybernetic system. The characteristics of the

U.S. military logistics system and the conditions in which it operates frequently result in a lack of timely demand satisfaction which creates a powerful motivation for the use of irregular logistic procedures.

3. Section 3 develops human aspects of the incentives behind irregular logistic procedures through a model of the individual decision making processes. Integration of decision points from this model with the incentive structure set forth in Section 1 provides the framework for analysis of a survey on the nature of the incentive structure which is to be administered as the next step of the study.

4. Section 4 of the report briefly notes the parallelism of a number of other large, centralized hierarchial systems to the military logistic system in terms of the existence of irregular procedures necessary to permit the systems to function effectively.

HYPOTHESES. Section 5 presents two types of hypotheses derived from the Definition of the Problem.

1. Specific hypotheses are those applicable in the analysis of supply and maintenance in helicopter units and potentially applicable to other military units, which can be meaningfully tested through the survey. Since this is an exploratory study, it is often necessary to hypothesize under what conditions various patterns will exist rather than hypothesizing specifically what the patterns are. Specific hypotheses fall into the following categories:

- Hypotheses With Respect to Different Types of Irregular Procedures which may be Used.
- Hypotheses With Respect to the Individual's Ability to Determine the Legitimacy of a Demand
- Hypotheses Concerning the Capability and Willingness of the Military Logistic System to Fill Demands
- Hypotheses Concerning the Role of the Chain of Command in the Use of Irregular Logistic Procedures
- Hypotheses Concerning Work Group Norms
- Hypotheses Concerning Individual Incentives and Disincentives
- Hypotheses Concerning Maintenance Short Cuts and Hoarding
- Hypotheses Concerning Decision Outcomes

2. General hypotheses are applicable only to the general subject of irregular logistic procedures, being too broad in applicability for significant testing within the scope of this study.

EXPECTED RESULTS OF THE STUDY. The results of the study will be based on the contents of the interim report and on the information obtained by analysis of the survey data developed in the next (survey) phase of the study. The study results are expected to:

- Help identify those irregular logistics procedures which are essential components of a military logistic system, along with the reasons why they are essential.
- Help identify those irregular logistic procedures which are not an essential part of a military logistic system, particularly those which are on a balance harmful.
- Use knowledge gained to suggest ways to maximize benefit from and to minimize any deleterious effects of the essential irregular logistic procedures.
- Discriminate between those situational and motivational factors which lead to use of both harmful and helpful irregular logistic procedures, so that helpful ones can be encouraged and harmful ones more effectively discouraged.
- Suggest ways in which the study of individual weapons systems can be accomplished to permit modification of the system or its associated prescribed procedures to induce the use of constructive irregular logistic procedures which will enhance operational readiness, and to inhibit the use of harmful irregular logistic procedures which will detract from operational readiness.

SECTION 1

INTRODUCTION TO THE PROBLEM

SECTION 1

INTRODUCTION TO THE PROBLEM

1.1 INTRODUCTION

This introduction describes our general approach to the subject of irregular logistic procedures and briefly previews the contents of this interim report.

1.1.1 General Approach

The subject of irregular military logistic procedures is sensitive, easily triggering strong emotions and preconceptions. Consequently, it is necessary at the beginning to place this study in proper perspective. A study of irregular military logistic procedures could focus on criticizing those who get the job done when the going is rough. These are the people who do not hesitate, as Napoleon put it,

To improvise, replace one commodity by another,
and secure the troops provisions "by hook or by
crook"¹

Or it could focus on criticism of those whose limitations make it vital to use "by hook or by crook." This study engages in neither type of criticism. Rather, it is an analysis of a vital element in the struggle of capable and intelligent men, fighters and logisticians together against what Clausewitz

¹ Van Creveld (1977), p.56

termed "the friction of war"², and its peacetime equivalents.³

The guts of irregular logistic procedures is the attempt by the individual on the spot to overcome, through improvisation and ingenuity, systemic problems which cannot otherwise be resolved. These systemic problems characterize not only military logistics, but also many other endeavors in modern society. There are rogues and scoundrels on the fringes of such activities, as is true in any human operation; but deliberately criminal behavior is neither typical nor a major concern of this study. Of greater interest and concern are the types of irregular procedures that are equally likely to be condemned as "improper"--or condoned as brilliant, innovative, "cutting through red tape". In the nostalgic folklore of "our war"--for those who have been in one--the unit scrounger is remembered as a genuine folk hero. However, stripped of its human color and embellishments, much irregular logistic activity still exists as an irreducible core because of the inexorable systemic requirements of the phenomenon of war.

This study discusses what irregular logistic procedures are, why they are and why some of them must exist both in systemic and human terms. This study very briefly treats the whole logistic system, then concentrates on the incentive structure behind irregular logistic procedures associated with the support of operational helicopter units. The study suggests some things that ought to be done to bring irregular logistic procedures "out of the closet", to make appropriate ones recognized, controlled, and valued tools which can be wielded in a manner that maximizes their contribution to mission accomplishment and minimizes their abuse. As long as irregular logistic procedures remain "in the closet," there will be a tendency for the

²That all warfare consists of an endless series of unexpected difficulties--things that go wrong--is a commonplace, and is precisely what Clausewitz meant when talking about the "friction of war". Ibid., p.231

³These include budget constraints--anticipated and unanticipated--and other bureaucratic hurdles that today's higher level logisticians must face in providing adequate support to operational forces. During peacetime, when money must be saved, logistics support funds are among the most politically and psychologically attractive targets for budget cutters.

authorized supply system to fail to reflect demands for items obtained by irregular means. There also will be a tendency toward maldistribution of items in short supply, and toward warping of planned priorities. These can be significant sources of supply system malfunction. In some cases, attempts already have been or are being made to recognize and utilize measures previously designated as irregular (e.g., the use of controlled cannibalization).

As noted earlier, the purpose of this study is not to be critical of operators and logisticians who use irregular procedures to solve the otherwise unsolvable in carrying out their mission. This study is rather, an attempt to help make their task easier, better defined and understood, and more cost effective in order to help produce greater operational readiness and combat effectiveness.

1.1.2 Detailed Approach

The object of this interim report is to provide:

- A definition of the problem for development of the incentive structure leading to the use of irregular military logistic procedures. This is done in systemic terms for those aspects of the military logistic system which provide the environmental framework for the use of irregular logistic procedures. It is done in behavioral science terms using a model of the individual and his/her decision process for examination of behavioral and military incentive factors.
- Specific and general hypotheses with respect to irregular logistic procedures and the incentives behind them.

The report is divided into five sections:

- Section 1 provides the introduction, basic definitions, and scope of the study in system/subsystem and behavioral science contexts. The basic incentive structure leading to the use of irregular logistic procedures is then outlined.
- Section 2 concentrates on the pertinent aspects of the military logistic system, using abbreviated system models and flow charts to examine the problems of timely demand satisfaction, the definition of what constitutes legitimate demands on the system, and the development of maintenance procedures. This section includes a brief look at phenomena associated with military logistics as a cybernetic system.

- Section 3 develops the human aspects of the incentives behind irregular logistic procedures. This section first amplifies the description of demands on the logistic system to enhance clarity in model development. It then develops a model of the individual, indicating the external inputs and internal behavioral factors which operate to produce the decision to use irregular logistic procedures. This section focuses on the detailed decision process, and associates the decision points identified with pertinent elements of the incentive structure developed in Section 1.
- Section 4 briefly notes the parallelism of a number of other large, centralized hierarchical systems to the military logistic system in terms of the existence of irregular procedures necessary to permit the system to function effectively.
- Section 5 develops the hypotheses, specific and general, concerning the incentive structure leading to the use of irregular logistic procedures. The specific hypotheses are to be tested through a survey which constitutes the next phase of this project.

1.2

DEFINITIONS

An essential first step in discussing the potential incentive structure for use of irregular logistic procedures is to specify operational definitions of key words.

Incentive/Disincentive--an inducement affecting performance such as fear of punishment or expectation of reward offered to an individual or group to stimulate behavior. A reward or punishment which does not motivate or that has already been fulfilled would not constitute an incentive.⁴

Logistic support--the supply of definite quantities of physical means and services for activities that consume them, in order that the activities be maintained at specified present or future rates.⁵ It encompasses that range of activities defined (in JCS Pub. 1) as Combat Service Support (CSS).⁶ This study, however, places primary emphasis on two aspects of CSS: supply and maintenance. Helicopter logistic support, in this study, refers to supply and maintenance of parts, components, assemblies, tools, and other items perceived as necessary to the combat operability of military helicopters.

⁴Guilford and Gray (1970), p. 56.

⁵Morgenstern (1951), p.2.

⁶"The assistance provided operating forces primarily in the field of administrative services, chaplain service, maintenance, medical service, military police, supply, transportation, and other logistical services."

Military logistic system--the military organization and the associated personnel, installations, equipment, and procedures which provide logistic support in accordance with appropriate directives.

Demand--a claim for items or services to be supplied within a specified time frame. In the context of this study, a demand is thus used in the economic sense and should not be confused with other common uses of the term such as a direct order or an imperious request. A demand includes a requirement to perform a procedure (e.g., to adjust a tolerance).

Legitimate Demand--a legitimate demand on the military logistic system as used in this study is a demand for an item/service authorized for issue for an authorized purpose from an authorized source.

Irregular military logistic procedures--procedures for providing logistic support which are either specifically forbidden or are not authorized when other procedures to attain the same end are specifically prescribed. Irregular logistic procedures encompass both the use of nonstandard logistic procedures and the misuse of standard logistic procedures. To constitute irregular military logistic procedures, either the goods or services obtained must be of military system origin, or the use to which they are put must be military related. Table 1-1 provides examples of such procedures.

1.3 SCOPE OF STUDY IN A SYSTEM/SUBSYSTEM CONTEXT

The scope of irregular logistic procedures and the incentives behind them addressed in this study encompasses four systemic levels.

1.3.1 All Complex Hierarchical Systems

The first level is the use of irregular procedures as a general systemic phenomenon in all complex hierarchical systems concerned with centrally controlled furnishing of supplies and/or services in response to decentralized demand requirements.

1.3.2 The U.S. Military Logistic System

The second level is the use of irregular logistic procedures as it occurs in the U.S. military logistic system. A broad typological description of military logistic procedures is presented in Table 1-2. The three underlined subcategories of maintenance, supply and time urgency of material readiness are those of primary importance in this study. While other categories receive some consideration, a detailed focus on them is outside the scope of this study.

Table 1-1

TYPES OF PROCEDURES AND ACTIONS ENCOMPASSED BY
THE TERM "IRREGULAR LOGISTIC PROCEDURES"

1. Taking items without authority
2. Unauthorized cannibalization
3. Intentionally submitting incorrect documents to obtain items or services
4. Unauthorized stockpiling of items
5. Unauthorized fabrication of parts
6. Unauthorized exchanges or use of items or services
7. Obtaining items or services from unauthorized (including nonmilitary) sources
8. Use of unauthorized maintenance procedures, including unauthorized levels of maintenance
9. Unauthorized operational use of equipment with maintenance or other deficiencies
10. Use of personnel for unauthorized purposes
11. Conversion to unauthorized purposes of authorized items or services
12. Use of gifts or favors such as liquor rations to facilitate one of the above

Table 1-2

PERTINENT ATTRIBUTES OF THE U.S. MILITARY LOGISTIC SYSTEM

Major Category	Sub Category ¹	Characteristic Variations
Type of logistic operations	<u>Maintenance</u>	Level of maintenance (organizational, direct support, depot)
	<u>Supply</u>	Level of supply (organizational, direct support, depot)
	Construction	Level of construction (in terms of magnitude, complexity)
	Transportation	Type (long haul, short haul, air, land, sea, etc.)
	Procurement	Types (competitive of various types, sole source)
	Other	As appropriate
Environmental Attributes	<u>Time Urgency of Materiel Readiness</u>	Minutes or hours vital (combat)--Time less urgent (garrison, operational units)--Time relatively immaterial (garrison, depot storage)
	Materiel Degradation	Frequent performance degradation of materiel loss (combat in unfavorable physical environment)--Indefinite preservation (controlled environment storage)
	Constraints on Logistics Support Facilities	Maintenance, storage, other operations in the open or under tentage--to operations in modern, well-equipped, permanent structures
	Constraints on Materiel Resupply	Isolated locations with periodic hazardous resupply missions to locations proximate to relatively inexhaustible resupply
Attributes of Materiel	Complexity	Thousands of interacting parts (helicopter or ship) to single part (bayonet)
	Cost	Hundreds of millions of dollars to a few cents
	Maintenance Requirements	Requires constant skilled preventive maintenance and repair activity--to requires minimal care (e.g., occasional cleaning, oiling)
	Equipment Density	High (one per individual or few individuals, such as small arms, trucks, field radios)--to low (tank retrievers, aircraft carriers, BMEWS radars)
Commonality	Service Commonality	Common to all Services, common to a group of Services, or Service unique.
	Component Commonality	Major item commonality (e.g., common air frame or engine), parts commonality (e.g., "X", parts commonality), other pertinent commonalities (e.g., mission commonality)

¹The underlined subcategories are those of particular pertinence to this study.

1.3.3 Operational Unit

The third level is the use of irregular logistic procedures as it occurs at the company, battalion/squadron and direct support or equivalent levels of military helicopter logistic support (principal focus of this study). Helicopter units were chosen as constituting a technologically advanced, high priority system common to all four Services.

1.3.4 Individual Operating System

Irregular logistic procedures can also be considered as they apply to individual operating systems (e.g., a specific weapons system). Considerations such as the specifics of designed maintenance procedures and the instructions for their use are involved at this level. This level of irregular procedures is recognized but not treated in technical detail in this study.

1.4 SCOPE OF STUDY IN A BEHAVIORAL SCIENCE CONTEXT

Two behavioral sciences, sociology and psychology, are essential to the understanding of the incentive structure behind irregular logistic procedures. After the brief discussion below, no special effort is made to differentiate military, sociological, and psychological perspectives. The models in Sections 2 and 3, however, provide a degree of natural differentiation into military system models (Section 2) and a human behavioral model (Section 3).

1.4.1 Sociological Aspects of the Analysis

The sociological dimension of the study examines the individual in the organizational setting (work group or unit). The factors (such as expectations, norms, values) which motivate individuals to use irregular procedures are based upon individual perceptions of the self, the group, the organization and the overall society. The entire spectrum of irregular logistic procedures is influenced by sociological factors. Three sociological perspectives are of particular interest in analyzing irregular logistic procedures.

1.4.1.1

Role

Briefly, pertinent role behavior may be explained in terms of:

- Prescribed role--written description of position
- Perceived role--what the individual wants to do in the position
- Performed role--what the individual actually does in the position.

The analysis of military role behavior is complex because: an individual role may consist of many activities; multiple roles may be incorporated into a single office; and multiple roles may be held by a single person. These roles can lead to role conflicts which affect the use of irregular logistic procedures. These role conflicts may be categorized in either of two ways. Intra-role conflict occurs within a single role when an individual is pressured by conflicting expectations from others (as when a supply sergeant must respond to a commander who wants an item, and a supply system S4/G4 (at a higher headquarters) who wishes to deny the item). Inter-role conflict occurs when an individual's hierarchical role (e.g., supply sergeant) is in conflict with an informal role (as just another member of a company). Different incentives operate upon the individual, depending upon his/her perceptions and performance of his/her role(s) in the organization.

1.4.1.2

Group Norms and Related Factors

In the military as elsewhere we must consider the individual's need to affiliate with a group. The attractiveness of a group, the pressures to conform, and the expectations and attitudes towards other groups and organizations are elements which, to varying degrees, influence individual and group behavior in different situations. Groups in the military will have norms--group expectations--relating to what is considered as appropriate conduct with respect to irregular logistic procedures. This group perspective is essential to a comprehensive analysis of incentives for the use of irregular procedures.

1.4.1.3

Communication Networks

The final perspective of concern in the incentive structure leading to irregular logistic procedures involves communication networks. Communication which flows up and down a hierarchical ladder is part of a formal network of communication, as opposed to an informal network in which communications flow in all directions. Formal communication networks include both command and technical (functional) communication chains. Informal networks include both task oriented and nontask oriented (e.g., friendship) communication chains. Communication through all channels produces feedback to the individual which is of motivational importance. Communication through these different chains may be conflicting or reinforcing. This communication furnishes emotional and social conflict or support which may strongly affect the individual incentive structure toward use of irregular logistic procedures.

1.4.2

Psychological Aspects of the Analysis

Two perspectives on psychology--role theory (discussed as a sociological perspective in paragraph 1.4.1.1) and motivational psychology--provide insight into the use of irregular logistic procedures.

1.4.2.1

Role Theory

Role theory emphasizes the patterns of behavior dictated by the individual's perception of the various roles in interaction with the environment. Socialization processes are particularly important in this perspective since it is through socialization that the serviceman (or any member of a large organization) develops expectations of behavior consonant with the assigned role. Irregular logistic procedures can be partially explained, under some circumstances, as the logical result of the process of acquiring and maintaining such roles. For example, the expectation that a military officer will place his/her military mission above all other values is developed during the early stages of a career. This expectation tends to impel the individual to accept the use of irregular logistic procedures rather

than risk failure, regardless of any specific benefits which may accrue to the individual as a result of success. Similarly, the expectation that the individual will be responsible for the welfare of "buddies in the unit, inculcated during basic training, helps to explain the altruistic elements in the use of irregular logistic procedures for unit welfare purposes.

Not all irregular logistic procedures result from adherence to an adopted role; some behavior can be traced to role conflict. An example is the use of irregular procedures to avoid the paperwork associated with prescribed procedures. As one individual discussing her experience as a military helicopter crew chief exclaimed:

That's what is frustrating: when you're a crew chief, you expect to work on helicopters, not be a secretary!⁷

In this instance, the use of procedures which would avoid filling out forms should be triggered by the individual's perception that paperwork is not properly part of a crew chief's functional role.

1.4.2.2

Motivational Psychology

Motivational psychology, in contrast to role theory, emphasizes the specific rewards and sanctions (incentives and disincentives) derived from pursuing a particular behavior. It implicitly assumes that some form of cost/benefit analysis, on either a conscious or subconscious level, is performed by the individual as a determinant of behavior. Motivational psychology is particularly useful in explaining irregular logistic procedures which occur as a result of either rational choice or self-centered motivation. For example, the use of an irregular logistic procedure to obtain many types of items for personal welfare usually involves the weighing of the risks of getting caught and punished against the benefits of a higher standard of living for the individual. Similarly, the use of irregular procedures to improve a unit's short-term operational capabilities can find one potential explanation in terms of a

⁷Reconnaissance Research, 9 April 1979

unit commander's drive to demonstrate superiority over peers during the short time available in command positions. Under certain conditions, including combat, various emotional stimuli may intervene in the cost/benefit analysis implicit in motivational psychology. Thus, the stress derived from the conflict between the goals of achieving a military objective and staying alive can impel individuals to make use of logistic procedures which they would avoid or even condemn under other circumstances.

Motivational psychology can also be used to explain irregular logistic procedures which occur when the initiator of the procedure derives little or no benefit from the items and services obtained. In such circumstances, the use of the procedure itself may lead directly to a valued goal. For example, the individual who wishes to enhance personal status as an unit scrounger may do so through the scrounging of items that someone else may need. The reputation of being an effective scrounger, rather than the items procured through scrounging, represents a "selfish" interest in making use of an irregular logistic procedure. Similarly, the irregular loan of military supplies without apparent concern for personal or unit gain may either reflect the traditional expectation of interdependence among servicemen or be a manifestation of a desire to "buy" friendship through cooperation.

1.5 THE LOGISTIC INCENTIVE STRUCTURE

Figure 1.1 presents the general concept employed in this study to describe the incentive structure governing the use of irregular military logistic procedures. When a specific demand for items or services is presented to an individual, his/her decision as to whether or not to use irregular logistic procedures is governed by an incentive structure consisting of situational factors, motivational factors, and the interaction between the two.

1.5.1 The Situational Context

The situational context includes the military logistic situation, the specific demand, and the applicable irregular procedures.

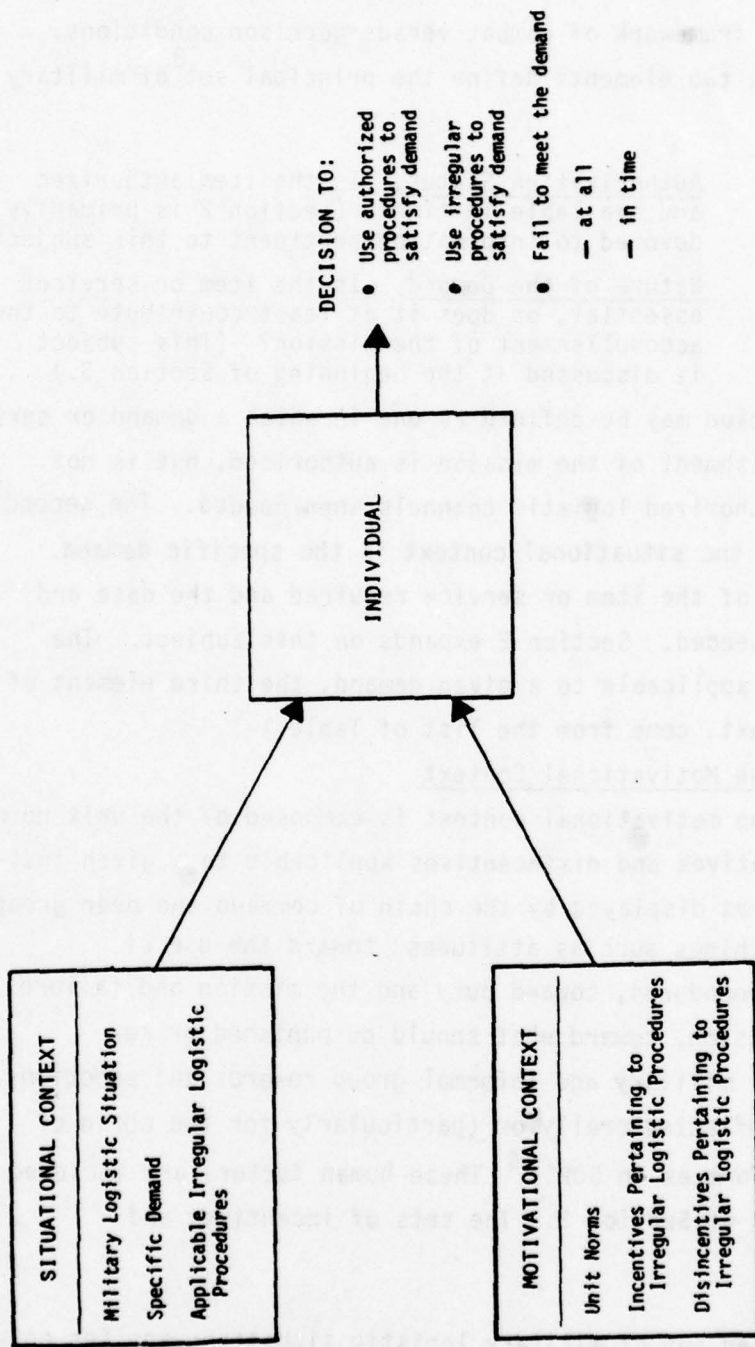


Figure 1-1. The Incentive Structure Governing The Use of Irregular Military Logistic Procedures

The military logistic situations considered in this study are set in the framework of combat versus garrison conditions. Within the framework, two elements define the principal set⁸ of military logistic situations.

- Authorization Status. Is the item authorized and available in time? (Section 2 is primarily devoted to information pertinent to this subject.)
- Nature of the Demand. Is the item or service essential, or does it at least contribute to the accomplishment of the mission? (This subject is discussed at the beginning of Section 3.)

For example, a situation may be defined as one in which a demand or service essential to accomplishment of the mission is authorized, but is not available through authorized logistic channels when needed. The second element listed under the situational context is the specific demand. This demand consists of the item or service required and the date and time by which it is needed. Section 2 expands on this subject. The irregular procedures applicable to a given demand, the third element of the situational context, come from the list of Table 1-1.

1.5.2 The Motivational Context

The motivational context is composed of the unit norms and the sets of incentives and disincentives applicable to a given individual. The unit norms displayed by the chain of command and peer groups are human factors, (things such as attitudes toward the use of irregular logistic procedures, toward duty and the mission and failure to accomplish the mission, toward what should be punished or rewarded through formal military and informal group rewards and sanctions). These norms may be reflected orally or (particularly for the chain of command) in written form as in SOP's.⁹ These human factors are included in the considerations of Section 3. The sets of incentives and

⁸As an example, another set of military logistic situations applies only in the case of procedural short cuts to specified maintenance procedures. This set differentiates between prescribed procedures which are difficult, complex, and lengthy and those which are easy, short, and simple. (See paragraph 3.4)

⁹Standard Operating Procedures

disincentives applicable to a given individual are discussed in Section 3. Section 3 uses a model of the individual and his/her decision process to develop the motivational context and its interaction with the situational context.

SECTION 2

PERTINENT ASPECTS OF THE MILITARY LOGISTIC
SYSTEM

SECTION 2

PERTINENT ASPECTS OF THE MILITARY LOGISTIC SYSTEM

2.1 GENERAL

Of particular interest in this section are three functions of the military logistic system:

- Timely Demand Satisfaction. The function of supplying an item or service, considered by the logistic system to constitute a legitimate demand, by the time it is needed by the user to meet operational requirements.
- Demand Legitimation. The function of defining what constitutes a legitimate (authorized) demand on the logistic system.
- Prescribing Maintenance Procedures. The function of developing the procedures to be followed in accomplishing maintenance of weapons systems or other operating systems.¹

For these functions, this study focuses on those aspects most relevant at the level of helicopter units and their proximate maintenance support units.

2.2 MODELS RELEVANT TO TIMELY DEMAND SATISFACTION

Logistic system models relevant to timely demand satisfaction are covered as follows:

- An elemental logistic system model (para. 2.2.1)
- Composite military logistic system elements (para. 2.2.2)

¹By other operating systems is meant any type of equipment oriented system not considered a weapons system; e.g., a portable generator which is used for general power supply purposes.

- Pertinent aspects of military helicopter units and their direct support maintenance and supply organizations (para. 2.2.3).
- Relevant cybernetic characteristics of interest in military logistic systems (para. 2.2.4).

2.2.1 Elemental Logistic System Model

The elemental logistic system of interest in the analysis of timely demand satisfaction as it affects incentives for irregular logistics is a simple one, as illustrated in Figure 2-1. It is a system designed to permit a user (e.g., a mechanic in an operational unit) to register a demand for supplies or services and have that demand satisfied by a source of supply (for materiel or services). This system is quite simple in concept, but provides the basis for subsequent more complex models.

2.2.2 Composite Military Logistic System Elements

The elemental logistic system represents the system as it goes from a single user to an organizationally adjacent single supplier. The system, in practice, goes from the user in the field through many intermediate logistic organizations to the procurement office or arsenal which is the ultimate military supplier. Figure 2-2 illustrates this process and indicates some of the types of logistic organizations characterizing these composite logistic chains. If intermediate logistic organizations can meet the demand from resources on hand, they are the source of supply for materiel or services to the user making the demand. If any of the logistic intermediaries need an item to replenish stock depleted in the process of functioning as a source of supply to those below them, they are the user to whatever higher logistic organization serves as their source of supply. When one of these logistic intermediaries cannot meet the demand from resources at hand, it functions merely as a relay station for demands and, as appropriate, monitors further transmission and demand satisfaction. If every valid demand

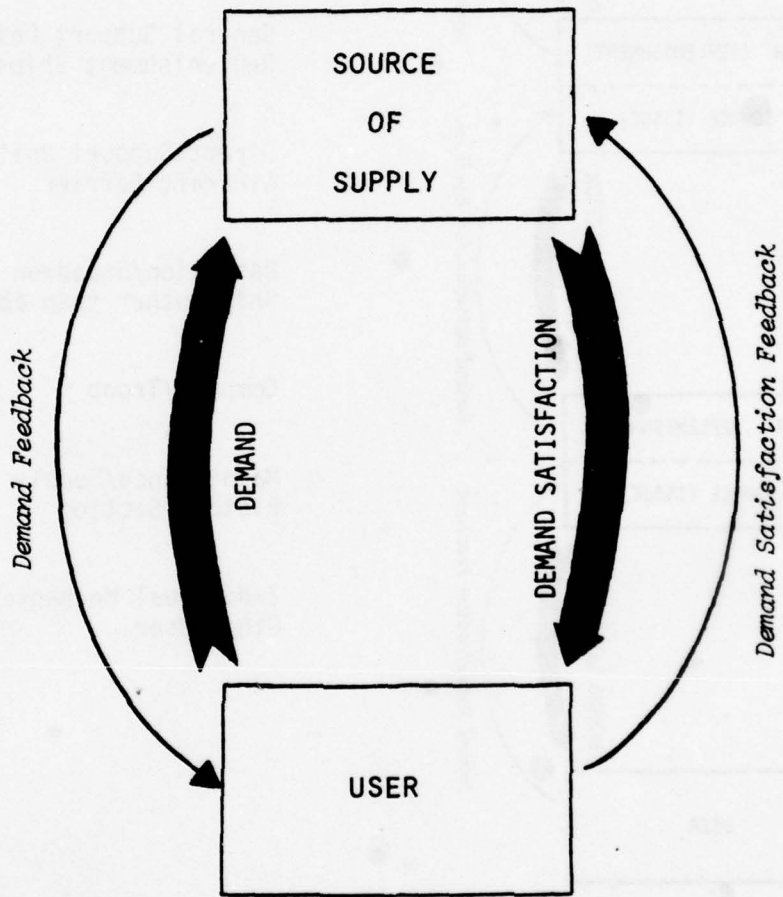


Figure 2-1. Elemental Logistic System.

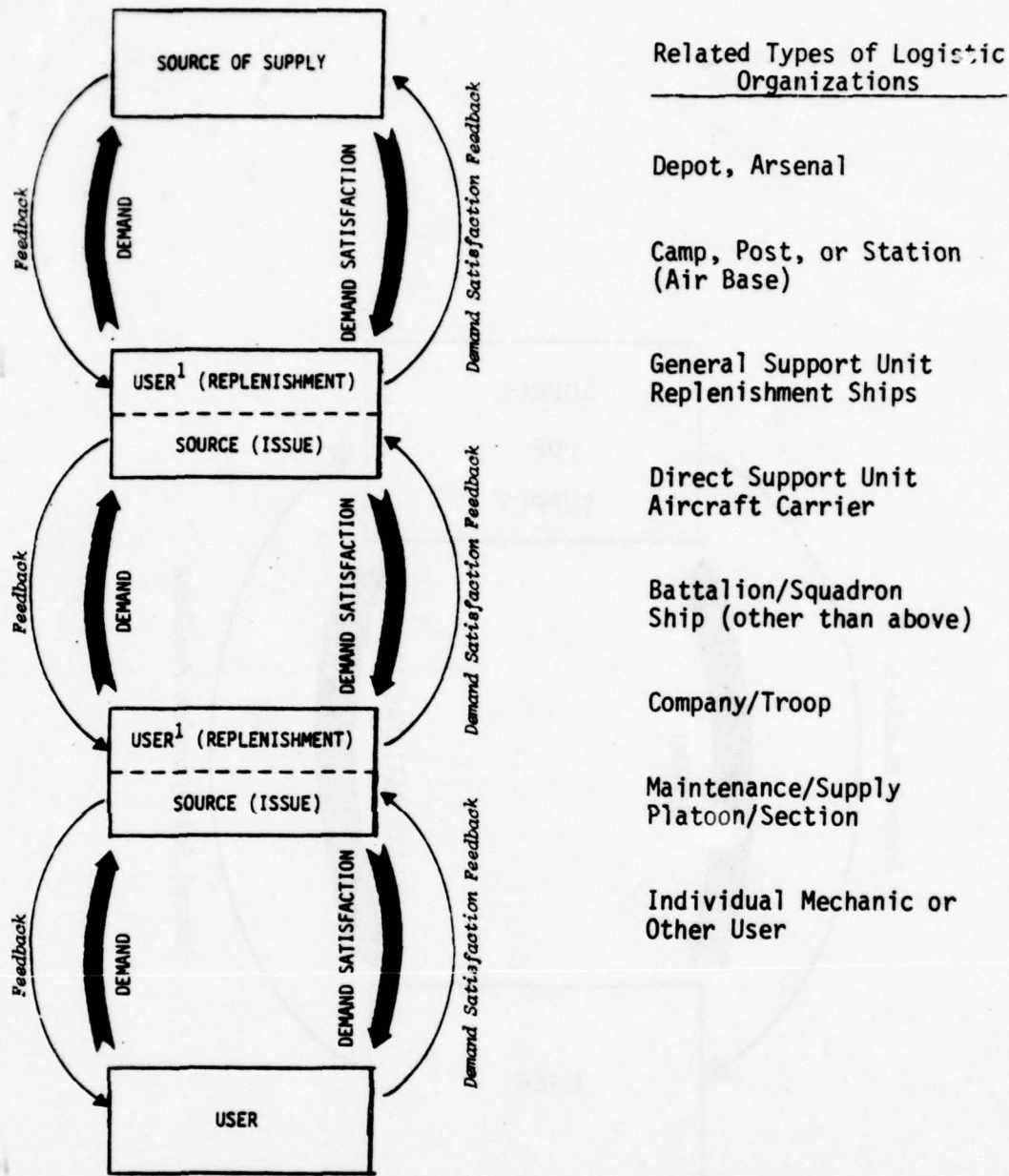


Figure 2-2. Relevant Composite Logistic System Characteristics

¹ Intermediate organizational levels (of which there may be several more than shown here) satisfy demands from lower organizational levels from within their own resources, then make demands on higher organizational levels to replenish their resources. Intermediate logistic levels function only as relay and monitoring stations when they cannot meet demands from available resources.

by every user could be satisfied by the applicable source of supply at the time the user needs the item or service, there would be no valid need for most irregular logistic practices. But the "friction of war" (which includes frequent changes in plans and situations forced by imperfect knowledge of enemy capabilities, as well as the element of surprise) and other factors create systemic problems that prevent timely satisfaction of many demands. Three aspects of these systemic problems are of interest in this respect.

2.2.2.1 What is Reasonableness in Timely Demand Satisfaction?

If the user could only be "reasonable" and wait until the logistic system could respond, one could design a system that would take care of all military logistic requirements on a preplanned basis. This could theoretically be done under peacetime conditions with thoroughly tested equipment and ample budgetary resources if logistic "reasonableness" could be given priority over operational requirements. But, in peacetime, budget resources are limited and operational requirements cannot always take second priority. In war, both history and logic confirm that, all else being equal, battles are won by those commanders who can cause their fighting troops and logistic support systems to fulfill the most "unreasonable" demands. This is a matter of using a maximum of effort, initiative, and ingenuity. Many irregular logistic procedures are essential tools in being able to fulfill such "unreasonable" but vitally necessary demands.² Most experienced operators and logisticians can also, however, point to instances where operational users over-rated the urgency or time-sensitiveness of their needs, producing demands which might properly be called truly unreasonable. "Monday morning quarterbacking" is often involved, however, in making such judgments. There will always be a marginal judgment area in this respect.

2.2.2.2 What is the Impact of Mobility Requirements?

No military force could move if every one of its units carried with it in the field all items for which the unit might have a need.

² Van Creveld points out that the near success of the Wehrmacht in the Soviet Union in World War II was due less to the excellence of their preparations--the logistic problems were staggering--than to "the determination of troops and commanders to give their all, to bear the most appalling hardships and to make do with whatever means were given to, or found by, them." Van Creveld (1977), p. 175.

This is a truism particularly reinforced by the increasing complexity and diversity of equipment characteristic of modern armed forces. This problem will be dealt with in more detail in Appendix A³ to the Final Report and receives unique coverage in Marshall, The Soldier's Load and the Mobility of a Nation (1950).

2.2.2.3 What is Current Availability on Demand?

Complex military equipment often involves tens of thousands of parts, most of them required very infrequently, many of them being costly. Given peacetime budget constraints (see note 3, p. 1-2), many demands in peacetime will not be satisfied when desired, no matter how efficient the logistic system and the planning for its use. As will be discussed in more detail in Appendix A to the Final Report, there is in general up to a 40 percent probability that an item will not be immediately available from the supply chain when requisitioned at the retail level.⁴ For example, from mid-1975 to mid-1977 the probability that a naval air item would not be available when requisitioned averaged 30-40 percent; for high priority Navy Closed Loop Aeronautical Management Program (CLAMP) items this probability averaged 16-30 percent.⁵ Even in wartime, economics, mobility considerations, and other factors will require that the system stock only to meet "average" demands. Consequently, it cannot meet the peaks in demands for stocked items nor the demands for unstocked items (items for which a low probability of having a demand occur is projected, or for which the cost is excessive considering the anticipated frequency of demands).

2.2.3 The Military Helicopter Unit and Its Supporting Intermediate Maintenance Activity

Figure 2-3 provides a generalized model of pertinent aspects of the repair and parts supply processes for military helicopters at the

³Appendix A to the Final Report will contain a brief historical commentary on the development of logistic systems which illustrates the continuity of many such logistic problems into modern times.

⁴Considering both demand satisfaction and demand accommodation for all items. This varies by Service and type of items.

⁵U.S. GAO, Letter to the Secretary of the Navy of 9 August 1978, ref. LCD-78-230.

unit and intermediate maintenance activity levels. This model brings system conceptualization to the working level of military logistics. Although the model emphasizes repair parts, comparable processes exist for special parts, end items, expendables, and maintenance services. It should be noted that the model is a composite of procedures existing in the various Armed Services; in reality, each Service varies in procedures and unit designations. For the purpose of the study, "helicopter unit" could represent an Army helicopter unit or a Navy, Marine, or Air Force helicopter squadron; an "intermediate maintenance activity" could represent a Navy Special Aircraft Service Shop (SASS), an Army intermediate maintenance unit, or an equivalent Air Force maintenance squadron.

The logistic system depicted in Figure 2-3 is activated when a unit-level helicopter mechanic receives a demand in terms of deficiencies in the operating capabilities of the helicopter to which he/she is assigned. The mechanic converts this demand for maintenance action into a demand on the parts supply system for the supply or repair of necessary parts. These repaired or replacement parts must normally be furnished within a specified time to permit meeting operational readiness requirements for the helicopter. The mechanic is thus in this case the primary user of the parts or repair services which the logistic system must supply.⁶

After receiving approval from the immediate supervisor (where appropriate) the mechanic transmits the demand for parts to the unit or section technical supply or parts clerk by verbally explaining his/her needs and priorities and often by hand-carrying the broken part as supporting evidence. The transmission medium is thus simple face-to-face contact between the mechanic and the source of supply--in this case, the technical supply or parts clerk. Feedback in this simple system is also accomplished by face-to-face contact between the user and the source of supply.

If the parts clerk can satisfy the requirement from existing stock, he/she does so. The parts clerk then becomes a user of parts, since the supply allowance stock has been incrementally depleted. The parts clerk submits a demand (with NCO or supply officer authorization, when necessary)

⁶As opposed to the aircraft crew, who may be considered the direct beneficiary of the parts or repair services in the case of aircraft repair.

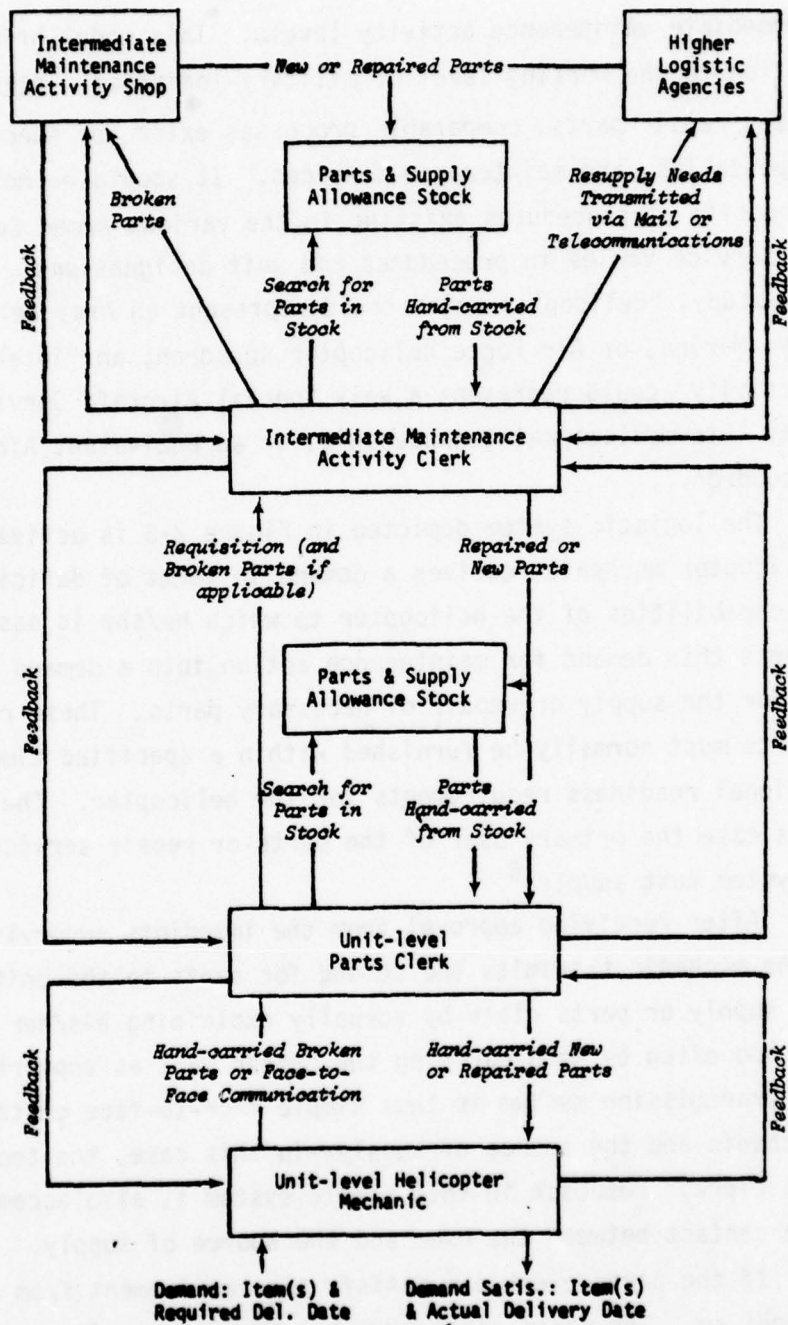


Figure 2-3. Generalized Military Helicopter Parts Supply and Repair System:
Unit-Level - Intermediate-Level Subsystem

on the next higher supply source for replenishment of the stock.

If the technical supply or parts clerk cannot satisfy the initial demand placed by the mechanic, the clerk effectively becomes a demand relay station by forwarding the demand to the source of supply. In this situation, the clerk may hand-carry the broken part and a written requisition for the item to the unit's intermediate maintenance activity (IMA). The IMA clerk responds by obtaining the required parts from IMA stock or, if the part is not available, by transmitting the demand through higher logistic system channels. If the demand is for repair services, the IMA clerk may hand-carry the broken part to the IMA repair shop. The shop, after completing repairs, returns the part through the IMA and parts clerks to the mechanic. If the demand is for replacement parts not available at the IMA level, the IMA clerk transmits the demand via ADP support systems, radio, mail or telephone to an office higher in the logistic hierarchy. Such offices may include a Defense Logistic Agency facility, an aviation supply office, a depot, or a parts control center, depending on the nature of the part and the varying procedures of the individual services. Feedback to and from the higher level logistic facility may be transmitted electronically or by mail.

2.2.4 Cybernetic Characteristics

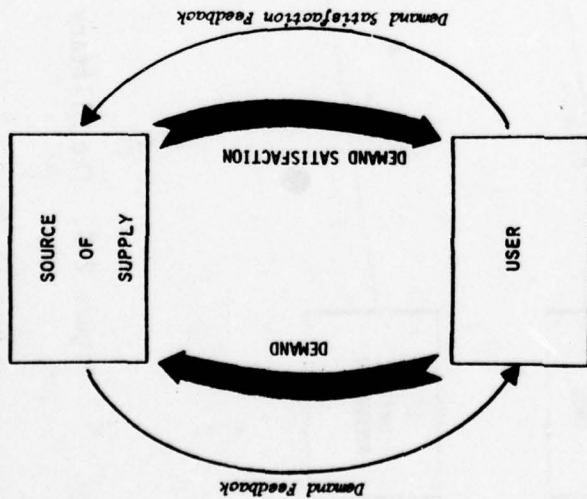
A military logistics operation can be viewed as a self-steering cybernetic system attempting to respond to a series of constantly shifting goals. These goals are defined by the constantly changing operational requirements (demands) for personnel, supplies and services created by both planned usage and the "friction of war." As a goal-seeking system, the logistic support system depends for its functioning upon a constant stream of information concerning its performance in order to define its relationship to (distance from) its goals. Goals (defined by demands on the logistic system) are externally derived and constantly changed. These changing goals are often beyond the predictive (or tracking) capabilities of that system or any other system to which it has access.

This basic cybernetic structure is reflected in Figure 2-4. In terms of the performance of the military logistic system under stringent operational conditions (especially combat), the characteristics of three cybernetic variables cited in Figure 2-4 will frequently be unfavorable. This will result in an inability of the system to provide timely demand satisfaction without some compensatory mechanism. Many irregular logistic procedures can be interpreted as attempts at self-correction or compensation by the system components. This perspective can be helpful in understanding the incentives for irregular logistic procedures. Looking at irregular military logistics from this viewpoint suggests that systemic incentives towards irregular procedures can be expected in any system similar to a military logistic operation, regardless of other psychological, sociological, and administrative incentives and disincentives in effect. As discussed in detail in Section 4, we can see such problems, for example, in military recruiting systems, in communist economic systems, in government social services systems, and in large-scale centralized industrial and commercial enterprises in Western economies.

2.3 THE MILITARY LOGISTIC SYSTEM LEGITIMATION PROCESS

The military logistic system legitimation process defines those items of materiel and services which are authorized for issue, to whom, and for what purpose. Figure 2-5 presents a simplified version of the process. Of particular interest in this process are the following:

- The number of items, including expendables, components and parts, which may be authorized for a unit with technologically sophisticated equipment such as helicopters, will run into the thousands or tens of thousands.
- Authorization for some items may be difficult for the individual to determine accurately at the unit level because:
 - Authorization may come from different levels.
 - Authorization for different types of items may come from separate directives.



Cybernetic Characteristics of Interest		
Cybernetic Quantitative Factors	Magnitudes Characteristic of Logistic Model	Impact on Likelihood of Meeting Goals
Load	High to Low	Inverse (i.e., "high" reduces likelihood of success)
Lead	High to Low	Positive (direct)
Lag	High to Low	Inverse

Other factors such as gain and the associated error function may impact, but they are of less pertinence than the following three:

Load, in terms of information, constitutes the extent and speed of changes in demands which the system is designed to satisfy. It is a measure of the saturation of the system; i.e., of the time varying amount and complexity of the demand. The higher the time averaged amount and complexity of the demands, the higher the load will be. Generally combat will tend to increase the load, often for critical items to the point of overstressing the system.

Lead is the amount of change in requirements between demand submission and demand satisfaction. It is a measure of the expected demand increment incurred during the time period between ordering and response. The "friction of war" tends to create unpredictable changes in the amount of lead required.

Lag is the expected time differential between user request and source-to-user response. The creation of excessive lag is particularly characteristic of the "friction of war."

Figure 2-4. Factors of Interest in the Military Logistic System as a Cybernetic System.

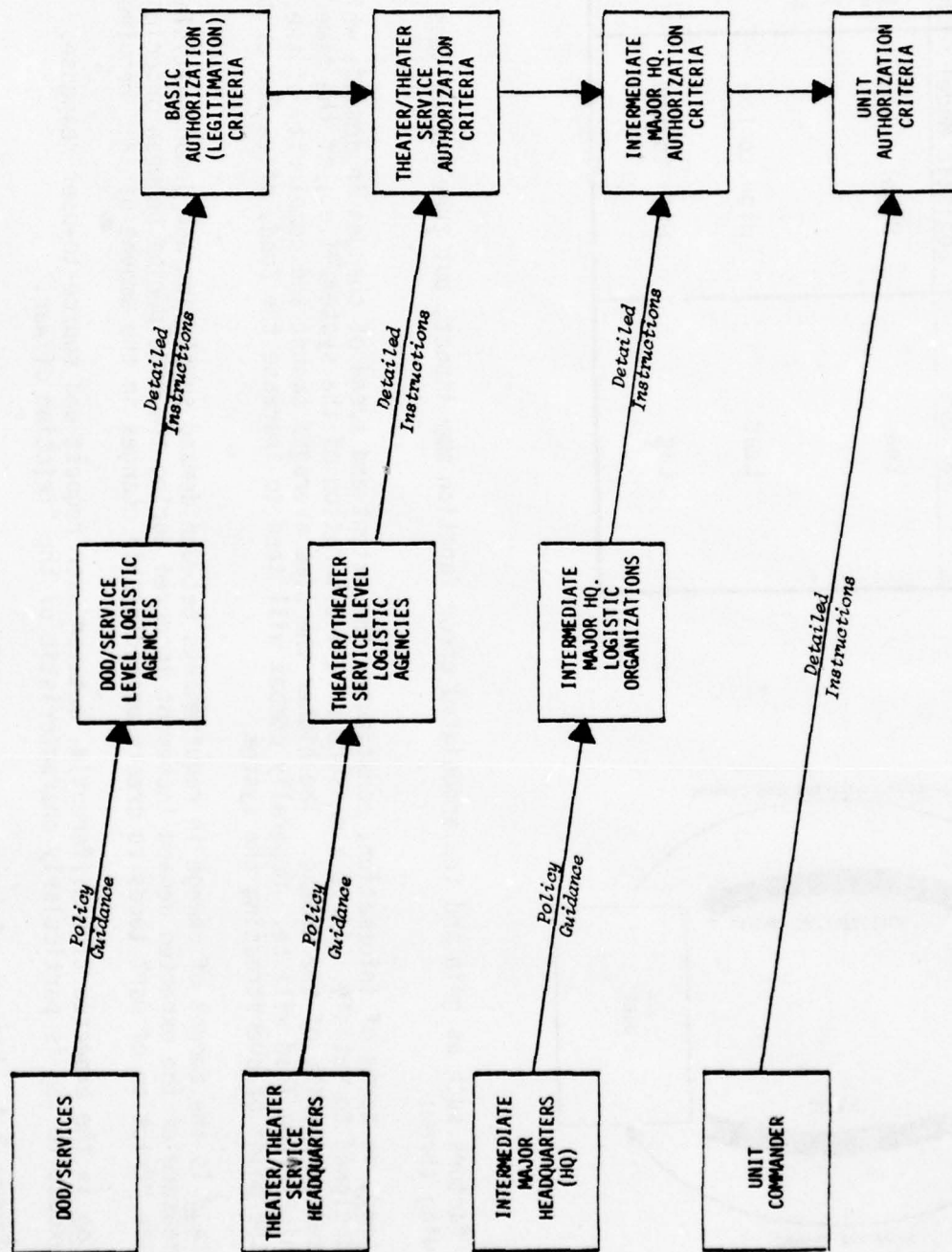


Figure 2-5. The Military Logistic System Legitimation Process.

- These directives may be different in form (e.g., supply manuals supplemented by SOP's supplemented by other types of correspondence).
- Not all items are covered by established authorization standards, particularly in combat. With reference to Vietnam, Heiser (1974) noted, "There is a need to establish standards of living for troops early in a campaign. Once the standards have been decided on, they should be binding on all troops of all services... In the absence of such criteria, every unit will establish its own standards, usually high; and constantly strive to upgrade them..."⁷

For a user, a legitimate demand is considered as one that will be filled by his/her source of supply. In an operational environment it is relatively easy, using equipment manuals, supplementary documents such as SOP's or memoranda, and frequent contact with technical supply personnel for a unit mechanic or maintenance NCO to learn what he/she can get from his/her technical supply section. That technical supply section has a similar relationship with its source of supply. For less frequently used, or less directly mission-oriented types of items, the uncertainty factor may rise.

A disadvantage of this approach is that the users inherit the errors of all of those above them in the supply chain. If someone in a theater service depot erroneously indicates an item is not authorized for issue, users at unit level will be scrounging for the item. Of course, if the unit users erroneously assume a demand is legitimate, they will be disabused of the notion as soon as they present the demand to their source of supply.

2.3.1 Authorization Status

Authorization status, as mentioned earlier, is one of the elements which defines the principal set of military logistic situations. Three alternatives exist for authorization status:

- An item or service is authorized and can be furnished when needed.

⁷ pp. 259, 260.

- An item or service is authorized but cannot be furnished by authorized procedures when needed.
- An item or service is not authorized.

A user faced with a demand implicitly or explicitly arrives at an authorization status for the needed item or service. This is an important step in the decision to use a prescribed or irregular procedure in meeting the demand for the item of service.

2.4 PRESCRIBING MAINTENANCE PROCEDURES

Paragraph 2.2 in discussing the problem of timely demand satisfaction dealt with demands for items or services by a user on a source. There is another type of demand for a service which does not get presented to a source of supply by a mechanic acting as a user. This is the demand for the use of a maintenance procedure by the individual mechanic, which leads to a particular kind of irregular procedure--the maintenance shortcut. The individual involved uses a procedure of his/her own invention, or learned from some other individual, but differing from the prescribed maintenance procedure. This short cut will normally be used because it saves time and/or effort, but if done by someone who does not fully understand what he/she is doing, it can jeopardize safety. Some of these short cuts are unquestionably improvements, and if submitted as suggestions may become the prescribed procedures. Others are of less indisputable merit. All short cuts to prescribed logistic procedures, until submitted as suggestions and approved, qualify as irregular logistic procedures (albeit benign ones if there is no sacrifice in quality of results--particularly flight safety).

To provide background for use of such shortcuts, it is useful to note briefly certain aspects of the process used in developing and prescribing authorized maintenance procedures.

- The procedures are developed by a relatively few personnel of high technical qualification.

- The procedures must often cover many long, complex involved processes.
- The procedures are used by many personnel, many of whom are highly qualified technically, many of whom display considerable initiative, almost all of whom would rather do anything shorter, quicker, and simpler.
- The suggestion feedback--modification process by its nature tends to have a time lag of many months at best.

SECTION 3

THE INDIVIDUAL DECISION-MAKING PROCESS

SECTION 3

THE INDIVIDUAL DECISION-MAKING PROCESS

3.1 GENERAL

Given the information on the military logistic system presented in Section 2, simplified models of the individual and his/her decision-making process provide a basis for introducing sociologically and psychologically oriented elements into the analysis. The individual is confronted with information and with demands in the form of requirements for items and/or services, normally with a required delivery date or hour.¹ These demands come from several potentially competing sources including the military chain of command, technical (i.e., logistic) channels, social channels, on-site beneficiaries of the acquisition of military items or services, and direct observation of the environment by the individual. In each case the individual must decide whether to satisfy the demand using regular logistic procedures, whether to satisfy the demand using irregular logistic procedures, or whether to fail to satisfy the demand.

3.2 DEMANDS ON THE MILITARY LOGISTIC SYSTEM

Irregular military logistic procedures are initiated by an individual's decision to use such procedures as a means of satisfying a specific demand for items or services. The role of the demand in initiating the decision process makes it important to define more fully what is meant by "demand." A two-fold system of classification (set of typologies)

¹This delivery date and hour may be imprecise, such as "as soon as possible," or "first thing in the morning," or, for less urgent demands, "sometime this week."

is useful for this purpose. The first typology of interest, Table 3-1, indicates what items or services the demands being considered in this study are designed to obtain. This is a limited subset of the full range of demands to which the logistic system must respond. The second typology, Table 3-2, classifies demands by the operational contexts in which a demand can be made. This typology was cited briefly earlier in paragraph 1.5 as a mediating factor in the incentive structure behind irregular logistic procedures.

3.3 THE USER DECISION MODEL

The organizational structure of the military provides the environment in which the decision is made to use irregular logistic procedures once a demand has been received. Interpersonal, group and intragroup relationships are all involved, and all impact on the individual's decision-making process. Figure 3-1 provides a model of the individual user's process of initiating action to satisfy demands. The individual user is the person responsible for deciding how to satisfy a demand. In this study the user may be a mechanic, a supply clerk, or a superior in the chain of command who assumes responsibility for deciding how the demand will be satisfied. Figure 3-1 indicates five channels of communication furnishing the individual with information including demands²:

- Command Channels--the hierarchical military operations organizational structure for the helicopter units being studied.
- Technical Channels--the corresponding hierarchical military logistic organizational structure.
- On-site Beneficiaries--the individuals whose operations or environment will be affected by the demand (helicopter crew for helicopter maintenance; tent-mates for installation of a wooden tent floor). The same individual may be both the user and an on-site beneficiary, or an on-site beneficiary and a member of a peer group.

²The information provided, includes all elements of the situational and motivational contexts described as part of the incentive structure leading to use irregular logistic procedures (paragraph 1.5). Most or all of this information has been provided prior to the occurrence of a given demand, and is resident in the individual's memory.

Table 3-1

TYPOLGY OF DEMANDS

1. Demands for End Items. End items are complete assemblies such as helicopters, rifles, shoes, or major components such as radios. These are subject to irregular acquisition through misappropriation, misrepresentation, connivance, or simple failure to comply with authorized procedures. They may be borrowed from other units using other than authorized procedures. They may also be obtained from nonmilitary sources in some cases.
2. Demands for Parts and Components. These are parts of end items. In addition to the irregular procedures which apply to end items, parts and components may be obtained by cannibalization.
3. Demands for Services From a Higher Source of Supply. These may be maintenance services (of principal interest in this study) or other services such as laundry or graves registration. They can be obtained irregularly by misrepresentation, connivance, or simple failure to comply with authorized procedures.
4. Demands for Services Provided by The User. These may be as simple as tightening a bolt. This type of demand is subject to the use of "short cuts" or other procedural modifications deemed to save time and effort without jeopardizing safety or mission accomplishment.
5. Demands for Use of Equipment. The irregular logistic procedure normally associated with this type of demand, is the use of a piece of equipment when, by prescribed maintenance standards, it should be considered inoperable.

Table 3-2

CONTEXTUAL TYPOLOGY OF DEMANDS

1. DEMANDS FOR ESSENTIAL ITEMS/SERVICES

Demands for items/services necessary to mission accomplishment. These are demands which must be satisfied in order to prevent a direct impact on the ability of units or individuals to accomplish their mission effectively. These demands are mostly related to support of weapons systems or other types of operating systems. (For example, demands for parts such as helicopter transmissions which must be furnished in order to prevent a reduction in operational readiness of the helicopter unit).

2. DEMANDS FOR CONTRIBUTORY ITEMS/SERVICES

Demands for items/services potentially contributing to mission accomplishment. These are demands for items or services which may be beneficial to mission accomplishment, but are not essential to it. They usually involve some element of increasing creature comforts for the troops, but may also increase efficiency of support operations or otherwise bear more directly on the mission. Often their principal impact on helping the mission is through improving human performance by raising morale, reducing fatigue, or creating better working conditions. (For example, demands for wooden tent floors, cubicles in Quonset huts, or concrete work pads in temporary field maintenance facilities).

3. DEMANDS FOR NONCONTRIBUTORY ITEMS/SERVICES

Demands for items of no benefit to mission accomplishment. These are demands for items or services which, for the purpose intended by the demand, will not improve mission capability--and may even reduce it. (For example, demands for tools intended to be taken home for personal use, or demands for use of a repair shop to service personal vehicles.)

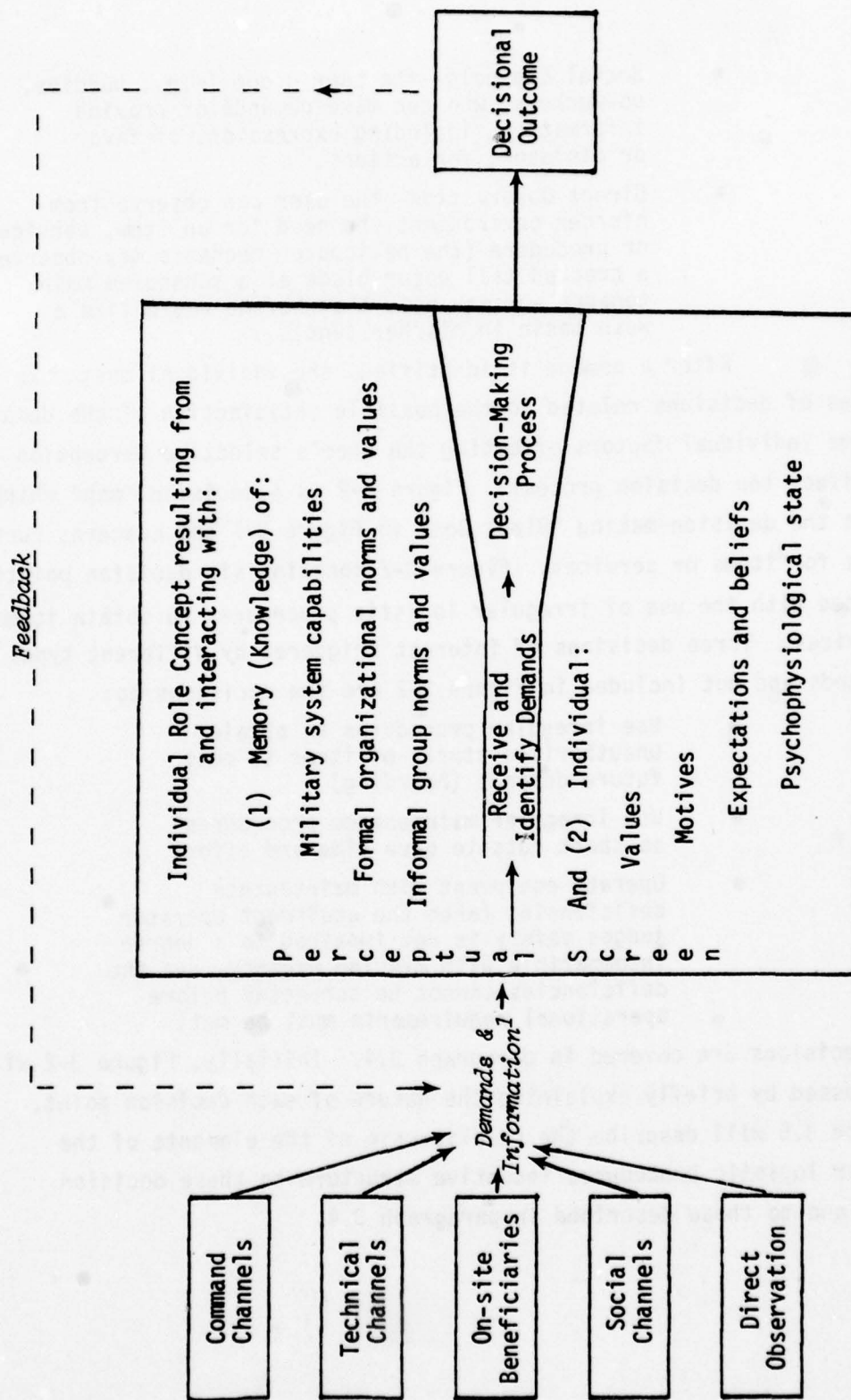


Figure 3-1. Simplified Model of Individual Initiating Action to Satisfy a Demand for Items and Services

¹ "Information" includes pertinent information on all elements of the incentive structure.

- Social Channels--the peer group (e.g., buddies, co-workers) who can make demands or provide information, including expressions of favor or disfavor, for actions.
- Direct Observation--the user can observe from his/her environment the need for an item, service, or procedure (the helicopter mechanic may observe a cracked tail rotor blade at a scheduled maintenance--or may note that he/she would like a wash basin in his/her tent).

After a demand is identified, the individual must make a series of decisions related to the possible satisfaction of the demand. The same individual factors affecting the user's selective perception also affect the decision process. Figure 3-2 is a decision "map" which expands the decision-making "Black Box" in Figure 3-1 and concerns current demands for items or services. Figure 3-2 contains six decision points concerned with the use of irregular logistic procedures to obtain items or services. Three decisions of interest triggered by different types of demands and not included in Figure 3-2 are the decisions to:

- Use irregular procedures to obtain unauthorized stocks of items to meet future demands (hoarding)
- Use irregular maintenance procedures as short cuts to save time and effort
- Operate equipment with maintenance deficiencies (when the equipment operator judges safety is not impaired to a degree incompatible with mission urgency, and the deficiencies cannot be corrected before operational requirements must be met)

These decisions are covered in paragraph 3.4. Initially, Figure 3-2 will be discussed by briefly explaining the nature of each decision point. Paragraph 3.5 will describe the relationship of the elements of the irregular logistic procedures incentive structure to these decision points, and to those described in paragraph 3.4.

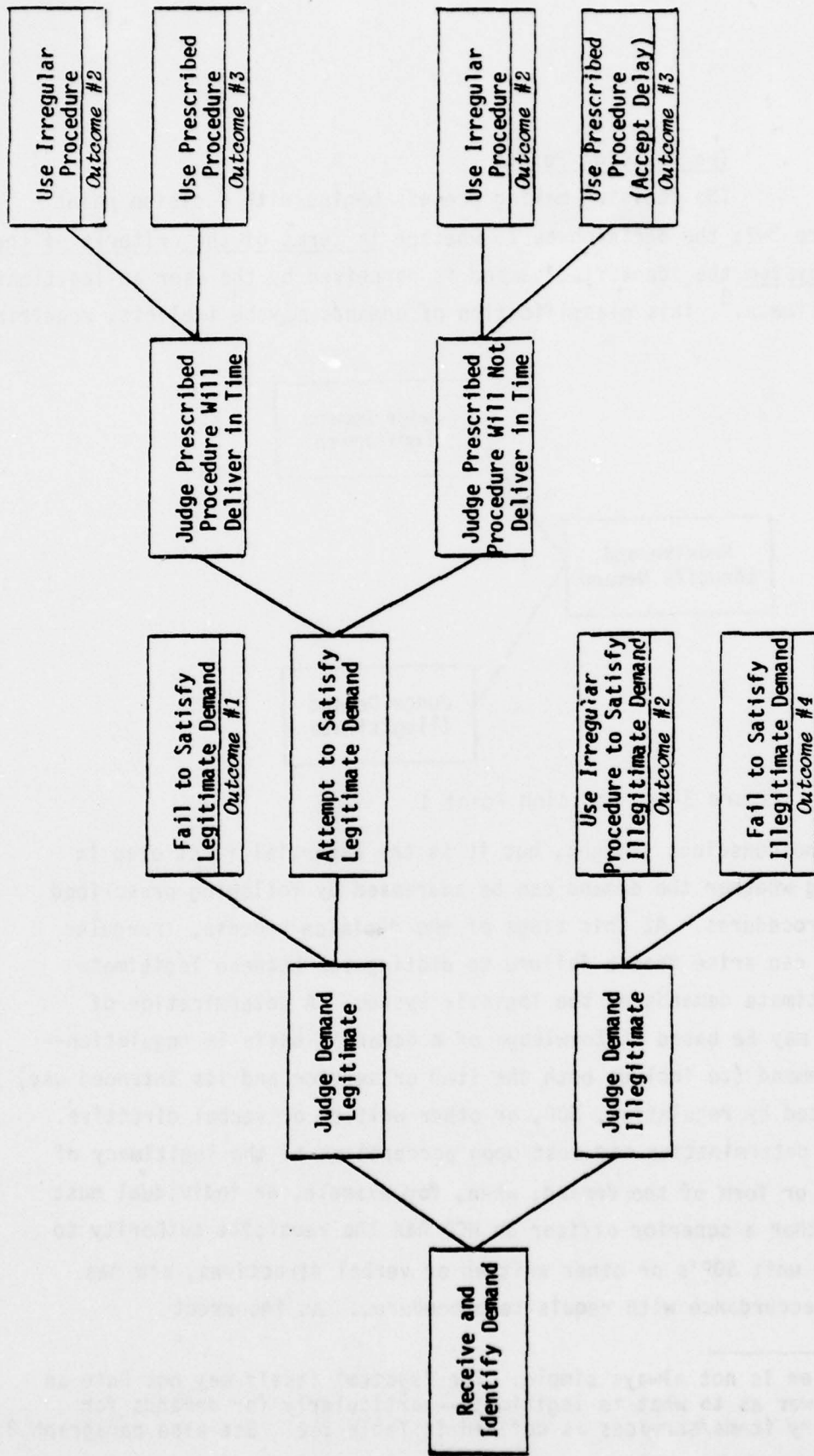


Figure 3-2. Decision Map for the Use of Irregular Logistic Procedures to Obtain Items or Services to Satisfy Current Demands

3.3.1 The Decision Points

The decision-making process begins with decision point I of Figure 3-2; the decision as to whether in terms of the criteria of the logistic system the identified demand is perceived by the user as legitimate or illegitimate.³ This classification of demands may be implicit, requiring

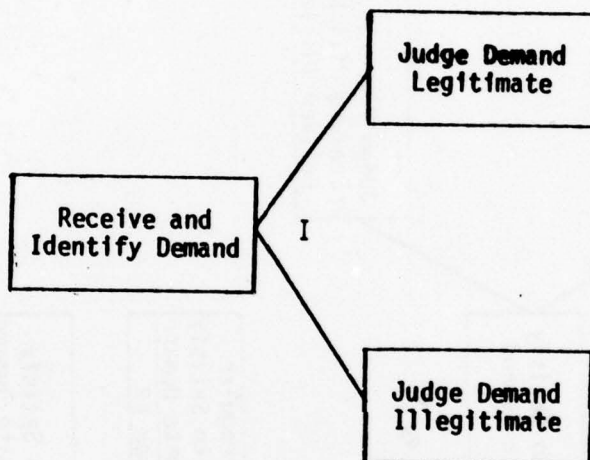


Figure 3-2a, Decision Point I

little or no conscious thought, but it is the essential first step in determining whether the demand can be addressed by following prescribed logistic procedures. At this stage of the decision process, irregular procedures can arise from a failure to distinguish between legitimate and illegitimate demands on the logistic system. A determination of legitimacy may be based on knowledge of a demand's basis in regulation--that the demand (to include both the item or service and its intended use) is authorized by regulation, SOP, or other written or verbal directive. Or, such a determination may rest upon perceptions of the legitimacy of the source or form of the demand, when, for example, an individual must decide whether a superior officer or NCO has the requisite authority to override unit SOP's or other written or verbal directives, and has done so in accordance with requisite procedures. An incorrect

³This problem is not always simple. The "system" itself may not have an agreed answer as to what is legitimate--particularly for demands for contributory items/services as defined in Table 3-2. See also paragraph 2.3.

determination by the user that a demand is legitimate will not result in an irregular logistic action unless the source of supply makes the same error. But an incorrect determination by the user that a demand is illegitimate is likely to lead to an unnecessary irregular logistic procedure.

Decision Point II is reached when an individual has identified a demand as a legitimate one--one that the military logistic system is intended to satisfy. The individual must now decide whether or not to satisfy the demand. Under certain conditions individuals may decide not to satisfy the demand for reasons having to do with

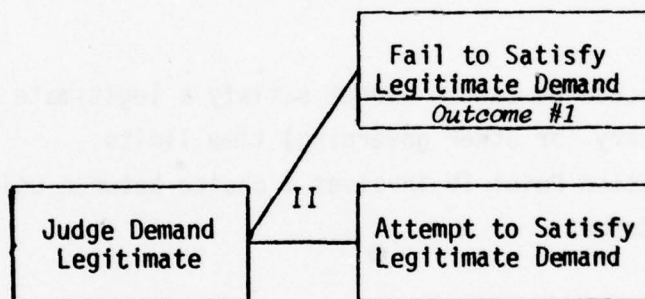


Figure 3-2b, Decision Point II

personal animosities or disgruntlement. This situation would normally exist when unit morale is poor and, for example, the individuals involved are in the Service or in a specific assignment against their will. Otherwise, if a user decides not to fulfill a legitimate demand, even before timeliness of demand satisfaction is considered, it is likely to be due to work overload and established priorities. In this situation, an individual may reject legitimate lower priority demands in order to concentrate on higher priority actions.

Decision Point III involves the judgment (based on past experience, informal advice, or formal query of the source of supply) that

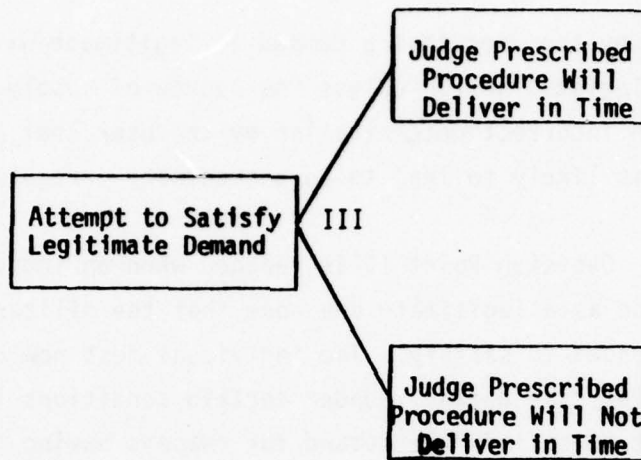


Figure 3-2c, Decision Point III

regular logistic procedures can or cannot satisfy a legitimate demand within operationally necessary (or other governing) time limits.

Decision Point IV involves a choice between using prescribed and irregular procedures.

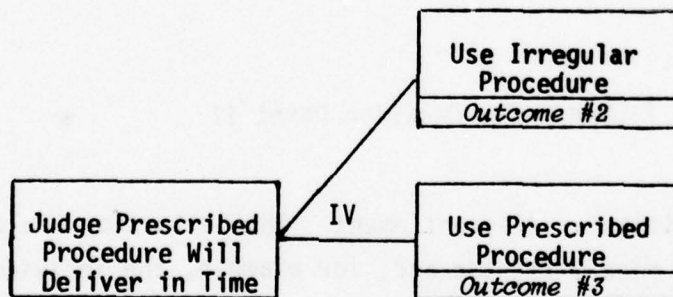


Figure 3-2d, Decision Point IV

In this decision, there is not a significant operational reason to justify use of irregular procedures. Certain behavioral incentives could bring about a decision to use irregular procedures in this case; for example, to avoid

paperwork, or to enhance one's peer group reputation as a scrounger.

Decision Point V involves the choice most clearly invoking operational necessity as the justification for use of irregular military logistic procedures. The mission will suffer if irregular procedures are not used.

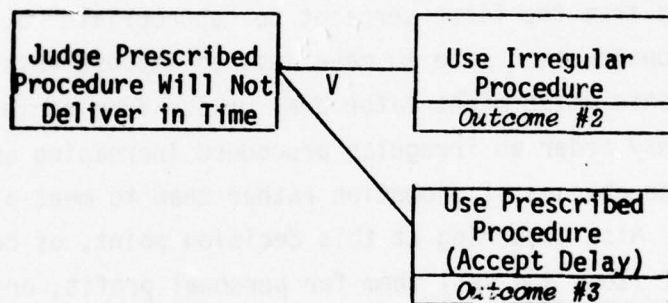


Figure 3-2e, Decision Point V

Decision Point VI involves the decision to satisfy an illegitimate demand. In this case, any decision to satisfy the demand involves irregular procedures, since the demand is one that the supply

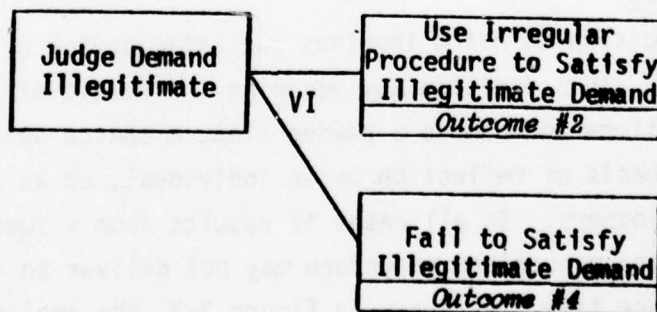


Figure 3-2f, Decision Point VI

system has specified as "not to be filled". Many such demands, rather than being self-oriented actions purely for personal gain, may be instances in which an individual is encouraged, or instructed by a superior to undertake to improve the welfare of other individuals or the unit. For example, an individual might use diesel fuel to lay the dust on a road or helicopter pad when the use of diesel fuel for this purpose was strictly forbidden. Or an individual might be a member of a group under instructions from the first sergeant to "appropriate" building material from a construction site to make desired improvements to billets--improvements which might later draw praise from senior officers. A unit commander may order an irregular procedure increasing unit readiness in order to enhance chances of promotion rather than to meet a significant operational need. Also occurring at this decision point, of course, are decisions to steal items and sell them for personal profit, or other similar actions oriented purely for personal gain.

3.4 ADDITIONAL DECISION POINTS

Three additional decision points not included in the decision process of Figure 3-2 reflect demands other than for an item or service currently desired. They are, however, included within the scope of the study. These decisions relate to hoarding, maintenance short cuts, and operation of equipment with maintenance deficiencies.

3.4.1 Hoarding

The decision to hoard involves the anticipation of a future demand for an item. This decision may occur as the result of a specific incident (e.g., failure to receive a needed item, a chance opportunity to hoard), on the basis of reflection by an individual, or as the result of a stimulus from others. In all cases it results from a judgment, made or imposed⁴, that the prescribed procedure may not deliver an item when needed at some future time. As shown in Figure 3-3, the choice, once that

⁴For example, an individual's superior may impose such a judgment on him/her.

judgment has been reached, is either to accept the likelihood of an unsatisfied demand for the item in the future, or acquire unauthorized stocks of the item.

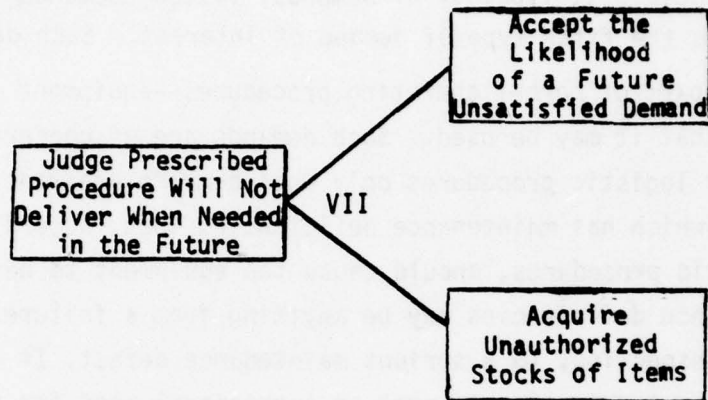


Figure 3-3. Hoarding

3.4.2 Maintenance Short Cuts

The general system for prescribing maintenance procedures was described in paragraph 2.4. The demand involved is a demand for a mechanic to perform a maintenance procedure. The decision to use an unauthorized short cut for such a procedure will occur as the result of an individual conceiving or learning of a shortcut. As indicated in Figure 3-4, the individual may decide to use the prescribed procedure in such cases. Or the individual may use initiative and employ the short cut without waiting for it to be authorized.

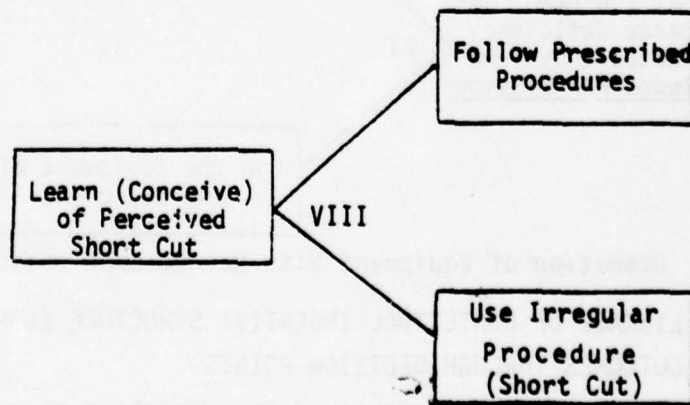


Figure 3-4. Use of Maintenance Short Cuts

3.4.3 Operation of Equipment With Maintenance Deficiencies

Table 3-1, Typology of Demands, listed "Demands for Use of Equipment", as the fifth type of demand of interest. Such demands are, of course, a part of normal operating procedures--equipment is furnished to units so that it may be used. Such demands are of concern in addressing irregular logistic procedures only when demands are made for the use of equipment which has maintenance deficiencies that, according to prescribed logistic procedures, should cause the equipment to be deadlined. Such maintenance deficiencies may be anything from a failure to perform a scheduled inspection, to a serious maintenance defect. If the deficiency cannot be corrected in time to meet an operational need for the equipment, and the need is urgent, the decision shown in Figure 3-5 must be made. Especially in time of war, this may be a significant and relatively frequent decision. The operator of the equipment (e.g., the pilot of a helicopter, the driver of a truck) or a superior in the chain of command must weigh the risks to the crew and the equipment (if the equipment is used with the maintenance deficiencies) against the risks to the unit and its mission (if the equipment is not used).

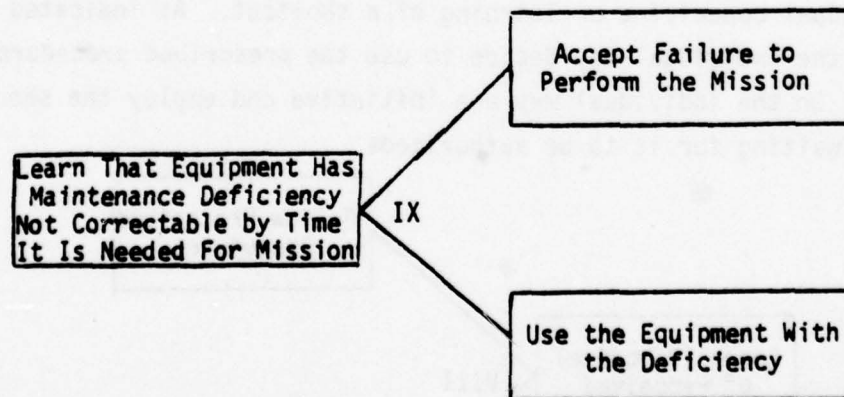


Figure 3-5. Operation of Equipment With Maintenance Deficiencies

3.5 LINKAGE OF CONTEXTUAL INCENTIVE STRUCTURE ELEMENTS TO OUTCOMES THROUGH DECISION POINTS

The contextual elements of the incentive structure leading to

the use of irregular logistic procedures as outlined in Section 1 included:

- Military Logistic Situation
- Specific Demand
- Applicable Irregular Logistic Procedures
- Unit Norms
- Incentives pertaining to Irregular Logistic Procedures
- Disincentives Pertaining to Irregular Logistic Procedures

These elements provided the contexts in which the individual decided among four outcomes:

- Use authorized procedures to satisfy demand
- Use irregular procedures to satisfy demand
- Fail to meet the demand:
 - at all
 - in time

This section (Section 3) has provided the decision model which is the basis for indicating how the contextual elements of the incentive structure interact to produce the outcomes listed above.

Among the six contextual elements, the specific demand is unique in that it is the element which, by its occurrence, triggers the whole decision process. This demand may be for an item or service, now or anticipated for the future; or, in one of the decisions treated (paragraph 3.4.3) the demand may be for conduct of operations using equipment with maintenance deficiencies. Thus the specific demand enters the model as input and is not unique to any one decision point.

The other five contextual elements of the incentive structure apply selectively to the decision points of the basic model and those for the additional three decisions of paragraph 3.4, as shown in Figure 3-6. The last six decision points may lead directly to an irregular logistic procedure. Decision points I and III may lead indirectly to irregular logistic procedures by incorrectly channeling the decision process through decision points VI and V respectively.

Elements of Incentive Structure Decision Points	CONTEXTUAL ELEMENTS						OUTCOMES			
	Military Logistic Situation		Type of Irregular Procedure	Unit Norms	Incentives for Irregular Log. Proc.	Disincentive for ILP	Use Prescribed Logistic Procedures	Use Irregular Logistic Procedures	Fail to Meet the Demand at All	Fail to Meet Demand in Time
	Nature of Demand	Authoriza-tion Status								
I. Legitimacy of Demand (Legitimate Demand) Satisfy vs Fail to Satisfy				X			X			
III. Judge Whether Prescribed Procedure Will Satisfy in Time										
IV. Irregular vs. Prescribed Procedure on Time			X				X			
V. Irregular vs Prescribed Procedure Late			X				X			X
VI. Irregular vs Fail to Satisfy (Illegitimate)			X				X		X	
VII. Hoard vs Likelihood of Future Shortage			X							X*
VIII. Prescribed Procedure vs Maintenance Short Cut				X			X			
IX. Operate Deficient Equipment vs Abort Mission			X				X		X	

* In the future.

Figure 3-6. Linkage of Contextual Incentive Structure Elements to Outcome Through Decision Points.

SECTION 4

USE OF IRREGULAR PROCEDURES AS A GENERAL SYSTEMIC PHENOMENON

SECTION 4

4.1 USE OF IRREGULAR PROCEDURES AS A GENERAL SYSTEMIC PHENOMENON

The discussion to this point has been of irregular military logistic procedures. The incentive structure of Figure 1-1 and the models of Sections 2 and 3, however, do not require much modification to apply to many other systems. These systems involve relatively large organizations with procedures centrally prescribed. Resources are furnished primarily from centralized sources to satisfy demands. These resources are used to achieve operational objectives (frequently urgent in nature) which involve overcoming local obstacles which are not subject to detailed prediction. Some possible examples include:

- Military recruiting systems. Attempts by military recruiters to meet quotas in the face of centrally determined qualification standards produce periodic complaints as some recruiters either promise what they cannot deliver or seriously circumvent qualification requirements. But short of such undesirable recruiting irregularities, there are a number of exercises in ingenuity which a recruiter can use to maintain his recruitment quota. He can help a potential recruit correct his deficiencies or obtain waivers for them, or help find acceptable alternatives to the recruit's preference of enlistment options.
- The socialist economies of the Soviet Union and other Communist countries. These economies have been unable to operate at the local level except through the services of unauthorized, normally illegal "expeditors." Tolkach¹ is as characteristic of the Soviet economy as is central planning. It involves both essential expediting and cutting of red tape and misuse for personal profit.

¹The Soviet name for the irregular procedures essential to the operations of their economy.

- The social services of the United States (including such programs as Medicare and food stamps). These services can often achieve their objectives only through irregular actions. Problems such as local eligibility interpretations, allowable costs, and conflicting jurisdictions and regulations exist in such profusion and variety that the welfare system can bog down when no one takes irregular actions to cut through red tape. Concurrently, these same conditions provide opportunities for illegally or improperly profiting from the welfare system. These opportunities invite a rash of "nonmission-relevant" irregular activities which can produce large-scale waste and misapplication of funds.
- Large-scale centralized industrial and commercial enterprises in Western economies. Examples range from banking to manufacturing industries to hotel and fast-food chains.

In all these systems there is a common thread with military logistic systems: for the system to operate effectively at the local level, there must be a certain degree of irregular logistics as a red-tape-cutting, self-compensating element of the system; but this need for irregular procedures to make the system effective facilitates the use of irregular procedures by individuals or groups who wish to take advantage of the system for their own benefit. The challenge for all such systems is to differentiate the constructive irregular procedures from the detrimental ones; to make provision for the constructive procedures and make them more effective; and to minimize the detrimental procedures.

SECTION 5

HYPOTHESES

SECTION 5

HYPOTHESES

5.1 INTRODUCTION

This section contains two types of hypotheses. Specific hypotheses are those applicable in the analysis of supply and maintenance in helicopter units, and may be applicable to other military units. General hypotheses are applicable only to the general subject of irregular logistic procedures, being too broad in applicability for significant testing within the scope of this study. Some specific hypotheses may be very broadly stated, while some of the general hypotheses may be more narrowly stated. The basis for differentiation is applicability--specific hypotheses can be meaningfully tested in the context of helicopter unit supply and maintenance; general hypotheses cannot. For example, the hypothesis that, "Of the irregular logistic procedures considered in this study¹, some are considered helpful and some harmful to unit effectiveness", although rather broadly stated, is a specific hypothesis because it can be meaningfully tested within the context of helicopter units in this study. The hypothesis that, "Each type of logistic operation² will have its own characteristic set of irregular procedures, some of which are shared with other types of logistic operations" is more narrow and specific in focus, but is a general hypothesis because it cannot be subject to meaningful testing within the scope of this study.

¹As listed in Table 1-1.

²As listed in Table 1-2.

The hypotheses presented in this section are based on the definition of the problem; on discussions with military consultants and other military personnel; and on the reconnaissance research conducted as a part of this study. The reconnaissance research consisted of several controlled group discussions with active duty and retired personnel selected as representative of the types of personnel to be surveyed in the next (survey) phase of the study.

5.2 SPECIFIC HYPOTHESES

The specific hypotheses postulated as applying within the scope of this study are listed below.

5.2.1 Hypotheses with Respect to the Different Types of Irregular Procedures which may be Used³.

It is hypothesized that:

- A. Of the irregular logistic procedures considered in this study, some will be considered helpful to unit effectiveness.
- B. Among the groupings of individuals surveyed, (e.g., differentiated by rank, type of job, or degree of job satisfaction) there will be different patterns of irregular procedures considered helpful and irregular procedures considered harmful to unit effectiveness.
- C. More types of irregular procedures will be considered helpful under combat conditions than under garrison conditions.
- D. Fewer types of irregular logistic procedures will be considered harmful under combat conditions than under garrison conditions.
- E. There will be a consensus that if they never used irregular logistic procedures, personnel in combat would be able to perform their duties less than adequately.
- F. There will be a consensus that if they never used irregular logistic procedures, personnel in garrison would be able to perform their duties less than adequately.

³As listed in Table 1-1

In the process of testing the above hypotheses, it is expected that specific information will be developed as to which irregular procedures are of particular concern in helicopter operating units and in the support of these units by intermediate maintenance activities, and why these procedures are of concern.

5.2.2 Hypotheses with Respect to the Individual's Ability to Determine the Legitimacy of a Demand.

It is hypothesized that:

- A. Among the groupings of individuals surveyed, different groups will reflect differing degrees of difficulty in determining what items are authorized by the logistic system.
- B. Most individuals surveyed will seldom have difficulty in determining the legitimacy of demands for items necessary to mission accomplishment.
- C. Most individuals surveyed will seldom or never have difficulty in determining the legitimacy of demands for items of no benefit to mission accomplishment.
- D. Most individuals will more often have difficulty in determining the legitimacy of demands for items potentially contributing to mission accomplishment in combat than for other types of demands⁴.

5.2.3 Hypotheses Concerning the Capability and Willingness of the Military Logistic System to Fill Demands for Items.

It is hypothesized that:

- A. Most individuals surveyed will at some time have been refused issue of or authorization to requisition items which they felt to be necessary or potentially contributing to mission accomplishment, both in garrison and combat.
- B. Most individuals surveyed feel that the logistic system has been unable to furnish authorized items when needed at least 25% of the time for items necessary or contri-

⁴Types of demands as listed earlier in Table 3-2.

buting to mission accomplishment, both in garrison and in combat.

- C. Most individuals surveyed feel that in combat they are justified in using irregular procedures often or always when the logistic system is unable to deliver a needed and authorized item by the time it is needed.
- D. Most individuals surveyed feel that in garrison they are justified in using irregular procedures at least sometimes when the logistic system is unable to deliver an unauthorized item by the time it is needed.

In the testing process for the above hypotheses, it is expected that useful information will be obtained on perceived characteristics of the logistic system.

5.2.4 Hypotheses Concerning the Role of the Chain of Command in the Use of Irregular Procedures.

It is hypothesized that:

- A. When mechanics use irregular logistic procedures, it will often be in response to instructions from military superiors.
- B. When mechanics use irregular logistic procedures, it will seldom be on their own initiative, or in response to requests from others outside the chain of command.
- C. When individuals use irregular logistic procedures without being told to do so by their superiors, in both combat and garrison they will perceive that their superiors will almost always know that they have done so.
- D. For items necessary or contributing to mission accomplishment, when individuals use irregular logistic procedures in combat without being told to do so by their superiors and their superiors are aware of it, the superiors will normally condone the act and will in many cases praise them for it.
- E. For items necessary or contributing to mission accomplishment, when individuals use irregular logistic procedures in garrison without being told to do so by their superiors and their superiors are

aware of it, the superiors will either ignore or condone the act.

- F. When an individual uses an irregular logistic procedure in response to instructions from military superiors, groupings by rank of the individuals surveyed will differ in terms of where they think responsibility is placed in practice.
- G. Most individuals surveyed (for all ranks) will feel that when an individual uses irregular logistic procedures in response to instructions from military superiors, the responsibility should reside with the military superior.

It is expected that in the process of testing the above hypotheses detailed information will be developed in terms of specific perceptions and attitudes of different groups within the population being surveyed.

5.2.5

Hypotheses Concerning Work Group Norms

It is hypothesized that:

- A. Perceived work group norms will fall into patterns which differ among types of units and Services.
- B. Perceptions of work group norms related to irregular logistic procedures will fall into patterns which differ by military rank of individuals surveyed.
- C. Perceptions of work group norms related to irregular logistic procedures will fall into patterns which differ according to the degree of job satisfaction of those individuals being surveyed.
- D. Work groups that display norms which reflect a highly responsible attitude towards duty and teamwork will tend to encourage the use of irregular logistic procedures.
- E. Perceived work group norms favoring the use of irregular logistic procedures will be stronger in combat than in garrison.

- F. Work groups which encourage the use of irregular logistic procedures will reflect a highly responsible attitude towards duty and teamwork.

The testing of these hypotheses will provide sufficient information to permit an assessment in considerable detail of variations in relevant perception of unit norms.

5.2.6 Hypotheses Concerning Individual Incentives and Disincentives

It is hypothesized that:

- A. Different patterns of incentives and disincentives perceived as influential by individuals will be associated with different states of authorization for items or services (i.e., not authorized, authorized and available in time, or authorized but not available in time).
- B. Among the groupings of individuals surveyed (grouped by rank, type of job, or degree of job satisfaction) there will be different patterns of incentives and disincentives.
- C. The developed patterns of incentives and disincentives will link those encouraging the use of irregular logistic procedures with those reflecting responsible attitudes toward military duties (including mission accomplishment).

The testing of these hypotheses will be done in such a manner as to provide information with respect to more than 24 potential incentives and disincentives.

5.2.7 Hypothesis Concerning Maintenance Short Cuts

It is hypothesized that:

- A. Individuals surveyed will feel that unauthorized short cuts can be used less often in garrison than in combat to make helicopter maintenance faster or easier without reducing the quality of the results.

Additional information pertinent to maintenance short cuts will be developed in the course of testing the hypotheses concerning incentives and disincentives.

5.2.8 Hypothesis Concerning Hoarding

- A. A pattern of attitudes will be identified

that indicates a net influence for most individuals which is conducive to hoarding parts to prepare for future requirements.

5.2.9 Hypotheses Concerning Decision Outcomes

It is hypothesized that the patterns of incentives, disincentives, and work groups norms will reflect a net influence in favor of:

- A. Attempting to satisfy a legitimate demand (decision point II).
- B. Using prescribed procedures when it is believed that they will satisfy the demand for an authorized item or service in time (decision point IV).
- C. Using an irregular procedure when it is believed that the prescribed procedures cannot satisfy the demand for an authorized item or service in time (decision point V).
- D. Failing to satisfy an illegitimate demand unless it is for an item considered essential or contributory to mission accomplishment (decision point VI).
- E. Using irregular procedures to prepare for future needs for authorized items (decision point VII).
- F. Taking maintenance short cuts when they are perceived as saving time and effort without reducing the quality of the results. (decision point VIII).
- G. Accepting the use of equipment with maintenance deficiencies in combat when it is essential to the mission (decision point IX).

5.3 GENERAL HYPOTHESES

The following are general hypotheses not subject to testing with the data obtained in this study. It is hypothesized that:

- A. The specific hypotheses as tested for helicopter units and their backup maintenance support units apply generally for supply and maintenance to other operational military units and their backup logistic support units.
- B. Each type of logistic operation⁵ will have its own

⁵As listed in Table 1-2.

characteristic set of irregular procedures, some of which are shared with other types of logistic operations.

- C. The military logistic system cannot for any type of logistic operation meet all essential demands in time without use of irregular logistic procedures.
- D. Environmental conditions⁶ may in some circumstances impact strongly on the use of irregular logistic procedures, especially with respect to demands related to human welfare.
- E. As a general rule, decreases in complexity of equipment will decrease the necessity for the use of irregular logistic procedures.
- F. As a general rule, decreased requirements for maintenance in equipment will decrease the requirement for the use of irregular logistic procedures.
- G. As a general rule, decreased density of equipment will increase the requirements for use of irregular logistic procedures.
- H. Human welfare/creature comfort related uses of irregular logistic procedures are fostered by the high U.S. expectations concerning appropriate standards of living for troops in the field.
- I. Most irregular logistic actions are based on constructive attitudes reflecting a desire to contribute to mission accomplishment (including provision for troops welfare).
- J. Use of irregular procedures is essential to effective operation of all complex, centralized hierarchical organizations⁷.
- K. The study of individual operating systems (such as a specific tank, artillery, or aircraft system)⁸ can indicate principle sources of irregular logistic procedures used with that system (or that are likely to

⁶As listed in Table 1-2.

⁷As described in paragraph 1.3.1.

⁸As discussed in paragraph 1.3.4

be used with that system in the case of developmental systems); and further, that such study can produce improvements in the system or in prescribed procedures associated with the system that will increase operational readiness and reduce negative impacts from the use of irregular logistic procedures.

5.4 HYPOTHESES VALIDATION

The survey which will be conducted as the next phase of this study will consist of six types of questions designed to provide empirical data to test the hypotheses in Section 5. Demographic questions and job satisfaction questions divide the military population into components. These components will be analyzed to see if they have separate incentive structures. The other four types of questions concern:

- The Military Logistic Environment. These questions will concern primarily the relationship of the military environment to irregular procedures, secondarily some incentives and disincentives associated with the military chain of command.
- Social Psychology. These questions concentrate on sociological and psychological incentives and disincentives associated with the use of irregular logistic procedures under different authorization status (authorized and available in time, authorized but not available in time, not authorized).
- Types of Irregular Logistic Procedures. These questions are concerned with the utility of (or harm caused by) various types of irregular logistic procedures under combat and garrison conditions as perceived by the system users.
- Unit Norms. These questions are concerned with unit norms both in terms of peer groups and the military chain of command.

Thus, once the survey is completed, data will be available permitting analysis of the incentive structure. This analysis will link the contextual elements of the incentive structure to decision outcomes through the different decision points of the model of the individual's decision process. This analysis will provide the basis for findings and conclusions oriented towards practical logistic problems.

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This Interim Report defines the basic concept of the incentive structure for the use of irregular (unauthorized) logistic procedures in the military. It analyzes the irregular logistic procedure phenomenon from military, behavioral science, and systemic viewpoints. The report concentrates on pertinent aspects of the military logistic system and individual decision-making, moving from generalized models to the model of the individual mechanic as a decision-maker in a military helicopter unit. The report proposes that some irregular procedures are necessary for the effective functioning of		

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20. Abstract (continued)

the military logistic system (and of similar large, complex hierarchial systems). It concludes with a set of hypotheses to be tested through survey research.

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