

NAVAL POSTGRADUATE SCHOOL

Monterey, California



THESIS



THE EFFECTS OF WARRANTY LEGISLATION ON PROCUREMENT

by

Sharon K. Reiff

December 1994

Principal Advisor:

Jeffery A. Warmington

Associate Advisor:

Mark Stone

Approved for public release; distribution is unlimited.

19950427 043

DTIC QUALITY INSPECTED 5

REPORT DOCUMENTATION PAGE

Form Approved OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington DC 20503.

1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE December 1994.		3. REPORT TYPE AND DATES COVERED Master's Thesis	
4. TITLE AND SUBTITLE THE EFFECTS OF WARRANTY LEGISLATION ON PROCUREMENT (U)				5. FUNDING NUMBERS	
6. AUTHOR(S) Sharon K. Reiff					
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School Monterey CA 93943-5000				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSORING/MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.					
12a. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution is unlimited.				12b. DISTRIBUTION CODE	
13. ABSTRACT (maximum 200 words) This research reviews the effects of warranty legislation on procurement in the Department of Defense. The intent of the study is to analyze the warranty legislation and policies. Interviews were developed to assess the warranty program. Program Managers and contracting officials in the military and commercial sector were the respondents to the interviews. The conclusions based on this research are that warranty legislation has been successful and is an effective method of centralized quality control. The research also uncovered problems with interpretation of the legislation and internal management controls. Recommendations made to the Directorate of Defense Procurement include: (1) possible procurement policy modification, (2) continuous screening of benefits derived by using warranty cost-benefit analysis, (3) expanding cost-benefit analysis to all major Department of Defense activities, and (4) have existing warranties audited and tracked for future benefit.					
14. SUBJECT TERMS Warranty				15. NUMBER OF PAGES 136	
				16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT UL		

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)

Prescribed by ANSI Std. Z39-18

Approved for public release; distribution is unlimited.

The Effects of Warranty Legislation on Procurement

by

Sharon K. Reiff
Captain, United States Army
B.S., Missouri Southern State College, 1984

Submitted in partial fulfillment
of the requirements for the degree of

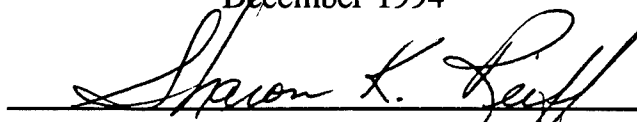
MASTER OF SCIENCE IN MANAGEMENT

from the

NAVAL POSTGRADUATE SCHOOL

December 1994

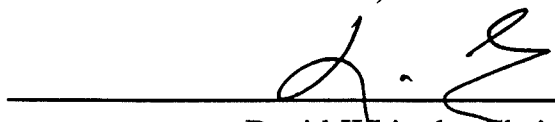
Author:


Sharon K. Reiff

Approved by:


CDR Jeff Warmington, Principal Advisor


Mark Stone, Associate Advisor


David Whipple, Chairman
Department of Systems Management

Accession For	
NTIS GRA&I	☒
DTIC TAB	☐
Unannounced	☐
Justification	
By _____	
Distribution/Avail _____	
Availability Codes	
Dist	Avail and/or Special
A-1	

ABSTRACT

This research reviews the effects of warranty legislation on procurement in the Department of Defense. The intent of the study is to analyze the warranty legislation and policies. Interviews were developed to assess the warranty program. Program Managers and contracting officials in the military and commercial sector were the respondents to the interviews. The conclusions based on this research are that warranty legislation has been successful and is an effective method of centralized quality control. The research also uncovered problems with interpretation of the legislation and internal management controls. Recommendations made to the Director of Defense Procurement include: (1) possible procurement policy modification, (2) continuous screening of benefits derived by using warranty cost-benefit analysis, (3) expanding cost-benefit analysis to all major Department of Defense activities, and (4) have existing warranties audited and tracked for future benefits.

TABLE OF CONTENTS

I. INTRODUCTION	1
A. BACKGROUND	1
B. FOCUS AND SCOPE OF THE RESEARCH	2
C. ASSUMPTIONS	3
D. RESEARCH QUESTIONS	3
E. RESEARCH METHODOLOGY	4
F. TYPES OF WARRANTIES	4
1. Reliability Improvement Warranty (RIW)	4
2. Mean Time Between Failure (MTBF) Warranty	5
3. Mean Time To Repair (MTTR) Warranty	6
4. The Warranting of Technical Data	7
G. THESIS ORGANIZATION	7
II. WARRANTY HISTORY AND LEGISLATION	9
A. INTRODUCTION	9
B. WARRANTY HISTORY	9
C. CURRENT WARRANTY LAW	14
D. SECTION 800 PANEL REPORT	14
E. ACQUISITION REFORM OF WARRANTIES	15
F. THE LATEST LEGISLATION	19
G. SUMMARY	20
III. METHODOLOGY	21
A. OVERVIEW	21
B. APPLICABILITY OF WARRANTIES TO MILITARY WEAPON SYSTEMS	22
C. IDENTIFICATION OF PROGRAM MANAGERS, CONTRACTORS AND LEGISLATIVE OFFICIALS	23
D. EVALUATING THE QUESTIONNAIRES	24
E. COMPARING EVALUATION RESULTS WITH THE ISSUES	24
F. SUMMARY	24

IV. DATA INTERPRETATION AND ANALYSIS	27
A. GENERAL	27
1. Procurement Experience	27
2. Assessment of Value to the Government	29
3. Assessment of the Use of Cost-benefit Analysis as a Risk Management Tool	33
4. Assessment of the Value of a Warranty Waiver	42
5. Assessment of a Correlation of Warranty and Quality	48
B. SUMMARY	50
V. CONCLUSIONS AND RECOMMENDATIONS	53
A. GENERAL	53
B. CONCLUSIONS	53
C. RECOMMENDATIONS	56
D. AREAS FOR FURTHER RESEARCH	57
APPENDIX A. WARRANTY LAW	59
A. CURRENT WARRANTY LAW	59
B. UNITED STATES CODE, TITLE 10, SECTION 2403, 1988. MAJOR WEAPON SYSTEMS: CONTRACTOR GUARANTEES	59
APPENDIX B. FEDERAL ACQUISITION REGULATION	65
APPENDIX C. DEPARTMENT OF DEFENSE POLICY	77
APPENDIX D. UNITED STATES ARMY ACQUISITION POLICY.	89
APPENDIX E. SECTION 800 PANEL REPORT EXCERPT	91
APPENDIX F. WARRANTY HISTORY AND LEGISLATION	95

APPENDIX G. INTERVIEW QUESTIONNAIRE	99
APPENDIX H. INTERVIEW RESPONSES	103
LIST OF REFERENCES	123
INITIAL DISTRIBUTION LIST	125

I. INTRODUCTION

A. BACKGROUND

The Congress passed warranty laws in 1983 and 1984 because of its concern with the quality of workmanship and cost overruns on weapon systems. It was noted:

...that weapon systems often failed to meet their military missions, were operationally unreliable, and had defective and shoddy workmanship, and could endanger the lives of the U.S. troops. (Conahan, 1989, p. 2)

These laws require defense contractors to guarantee that weapon systems will meet performance requirements specifically delineated in their contract. The statutory language however gives the Defense Department two very specific waivers that totally negate the requirement of a warranty.

First, the language allows waivers on warranties on the grounds of national security. And second, on the grounds of cost-effectiveness. DOD must, justify before the Appropriations and Authorizing committees the use of these waivers. The taxpayers' right to see their tax dollars spent wisely is protected by the justification process and the ability of the committees to hold hearings and reject if necessary, any waived warranty. (Hearing, 1984, p. 6)

Currently, warranties are required on weapon systems that have a unit cost of more than \$100,000 or an expected total procurement cost of more than \$10 million.

However, the Secretary of Defense may waive this requirement if it can be shown that the warranty is not likely to be cost-effective. Both Department of Defense and Service regulations require cost-effectiveness analyses of proposed warranties. In addition to cost-effectiveness analyses, Army and Air Force regulations require an assessment of warranties while they are still active and a post warranty analysis to measure the results actually

achieved. A Navy instruction requires annual collection and analysis of actual warranty use and claim information. (Conahan, 1989, p.2)

This legislation is a problem because it was mandated by Congress. The original intent was to protect the troops that used the equipment, and to ensure that the taxpayer's money was wisely spent. Unfortunately, it has also constrained the weapons acquisition process by its own mandate. Program managers that are in a position to perform risk management trade-offs are not granted waivers. This is by virtue of the fact that so few waivers have been approved that a precedent has been set, and consequently few are likely to be approved. Due to this trend, warranties are not being evaluated for the cost-benefit to the Government. These facts were noted in a General Accounting Office Report in October 1989 which cited that out of 92 requests for waivers only seven were granted.

As defense budgets continue to shrink, it is incumbent on everyone affiliated with the weapons acquisition process to ensure taxpayer's dollars are used as economically as possible. Therefore, each of us has a responsibility to scrutinize weaknesses in our procurement practices to make appropriate corrections when warranted.

B. FOCUS AND SCOPE OF THE RESEARCH

The focus of this research is to examine in detail some aspects of warranty issues facing the Department of Defense. This paper evaluates the most recent warranty bill passed by Congress. It also predicts the effectiveness of that bill against the cost-benefit of the mandated warranty requirement. It estimates the effectiveness of the bill's approach to remedy the problems addressed in the Section 800 Panel. Additionally, it identifies the confidence that Program Managers and Contractors have regarding cost-benefit analysis as an effective tool for requesting and receiving a warranty

waiver.

C. ASSUMPTIONS

This thesis assumes that the reader has an understanding of the concept of warranties. Although background information is provided as part of this document, the reader will improve his comprehension of the issues presented here if the primary literature referenced is reviewed. The term "guarantee" shall be synonymous to warranty when used in this thesis.

The research is limited to weapons acquisition programs where warranties are mandated by law. Evaluation concepts used to attain waivers for warranties is the primary focus.

D. RESEARCH QUESTIONS

The primary research question of this study is:
To what extent is the warranty legislation expected to be effective in succinctly and specifically providing relief for the real-world problems which program managers must overcome to successfully structure, implement, and administer warranties?

Specific research questions to be addressed in the study are:

1. How are warranties applicable to military weapon systems as compared to commercial warranties?
2. How does one identify and estimate the value of a warranty to the Government?
3. To what extent are program managers able to request and justify waiving the legislative mandate for warranty inclusion?
4. To what extent do warranties impact product quality in design and manufacturing, materials and workmanship, and performance specifications?

E. RESEARCH METHODOLOGY

The majority of the warranty information and background data were collected through an extensive literature review. The literature search included a computer data base search and a review of all related material located at the Defense Logistics Studies Information Exchange. Other warranty information was gathered by instructional materials and personal interviews with warranty administration executives from the Army Material Command, the Defense Systems Management College, the National Contract Management Association, and the Society of Logistics Engineers.

F. TYPES OF WARRANTIES

The most frequently used warranties may be broken down into two types: commercial and Military. The comparison of these types can be seen in Figure 1. This thesis focuses on the Military type of warranty. There are a number of options in selecting the best warranty for a weapon system. These are defined by their specific purpose for this thesis.

COMMERCIAL	MILITARY
Requirements self-determined	Requirements customer specified
Extensive Market Research	Limited or no market research
Manufacture prior to sale	Manufacture after sale
Factory authorized service	Services performed by user
Orderly user environment	Hectic user environment

Figure 1. Types of Warranties (Brennan, 1994, p. 19)

1. Reliability Improvement Warranty (RIW)

The RIW has been used extensively in the past, particularly for electronic systems. The objective of RIW is to achieve acceptable reliability while providing the

motivation and mechanism for reliability improvement.¹³ RIW relates to the concept of life cycle costs. Life cycle costs can be defined as the total cost to the Government of acquisition and ownership of that system over its useful life. It includes the cost of development, acquisition, support, and, where applicable, disposal. (Defense Acquisition Acronyms & Terms, 1991, p. b-58) The reliability improvement warranty is a basic provision of an acquisition instrument, logically limited to Fixed-Price type contracts with a long-term delivery schedule, which serves to maintain the interest of the seller in the continuous improvement of the field performance and reliability of equipment. (Deburkarte, 1978, p. 22)

The advantage to the customer of this type of warranty coverage is that it provides significant incentive for the contractor to continuously improve the reliability, maintainability and field performance of his equipment. The result of this effort is lower life cycle costs. (Deburkarte, 1978, p. 338)

The contractor can benefit from a RIW because of the increased profit potential. He may also develop a competitive advantage in securing follow-on contracts. Improved design and production techniques, closer control of the design as production continues, and increased understanding of the unit in its operational mode all combine in the favor of a current producer. There is also some potential for gaming of RIWs which can lead a contractor to understate the initial mean time between failure (MTBF) or operating standards in order to provide improvement later. (Deburkarte, 1978, p. 338)

2. Mean Time Between Failure (MTBF) Warranty

This is another type of reliability and maintainability cost reduction incentive. Mean time between failure is defined as the particular interval, the total functional life of a population of an item divided by the total number of

failures within the population. The units of measure may vary by time, rounds, miles, or other events. (Defense Acquisition Acronyms & Terms, 1991, p. B-66)

With the MTBF warranty the contractor guarantees that his equipment will reach and maintain some agreed upon criteria. This type of warranty demands not only a clear understanding of the inherent reliability of the equipment before the warranty can be negotiated, but also requires peak reliability with the first unit delivered. This in turn will tend to drive up the cost of the warranty. (Navy Program Manager's Guide, 1984, p. 3)

3. Mean Time To Repair (MTTR) Warranty

This is another type of reliability and maintainability cost reduction incentive. Mean Time to Repair is defined as: The total elapsed time (clock hours) for corrective maintenance divided by the total number of corrective maintenance actions during a given period of time. This is a basic measure of maintainability. (Defense Acquisition Acronyms & Terms, 1991, p. B-66)

A Mean Time to Repair (MTTR) Warranty, is also know as an Equipment Turn-around Time Warranty. This is a no-fault clause which serves no purpose in the establishment of performance liability, but rather establishes a requirement for the contractor to perform necessary repairs to return a defective or damaged unit to operational condition within a specified time period. (Navy Program Manager's Guide, 1984, p. 3)

Optimal use of this type of a warranty would be for an expensive Line Replaceable Unit (LRU). A Line Replaceable Unit (LRU) is an essential support item removed and replaced at field level to restore an end item to an operationally ready condition. (Defense Acquisition Acronyms & Terms, 1991, p. B-59) An effective Mean Time to Repair Warranty could minimize expensive inventory stocks.

4. The Warranting of Technical Data

This is another type of reliability and maintainability cost reduction incentive. Technical Data are defined as: Scientific or technical information recorded in any form or medium (such as manuals and drawings). Computer programs and related software are not technical data; documentation of computer programs and related software are. (Defense Acquisition Acronyms & Terms, 1991, p. B-111)

Warranting of Technical Data has received renewed emphasis within the Department of Defense in an effort to assure the usability of data acquired in the process of technology transfer in developing secondary production sources of proprietary equipment. Current procedures call for a warranty coverage period of three years, longer than most equipment warranties. During the three years the provider will correct or replace, at no cost to the Government, any data not conforming to the requirement of the contract under which they are acquired. (Rannenbergh, 1984, p. 43)

G. THESIS ORGANIZATION

Chapter II describes a history of DOD related warranties and how successful the legislation is expected to be against the problems identified by the Section 800 Panel. Chapter III describes the methodology used to evaluate the data. Chapter IV provides data interpretation and analysis of this study. Chapter V offers conclusions and recommendations for action and further study.

II. WARRANTY HISTORY AND LEGISLATION

A. INTRODUCTION

This chapter provides background on how the warranty concept was developed and what impact Congressional action has had on the use of warranties within the Department of Defense. A brief history of warranties in the Department of Defense is presented first, followed by current warranty law, and a description of the regulatory policy governing the DOD and Army guidance. Presentation of the Section 800 Panel Report that discusses warranty provision follows. Finally, draft legislation recently passed by the Congress to improve the present laws is addressed.

B. WARRANTY HISTORY

For many years business operated on the principle of "let the buyer beware." Simply stated, this means there were no warranties, either implied or expressed, included with the purchase of durable goods. It was the responsibility of the buyer to determine product quality, reliability, and performance. The buyer needed to make these decisions based on his judgment and at his own risk. If the product failed to perform as advertised, there was little, if any, recourse available to him.

In 1938 the National Conference of Commissioners on Uniform State Law and The American Law Institute started an initiative to develop and disseminate a rather comprehensive codification of commercial contract principles known as the Uniform Commercial Code (UCC). Since its inception, there have been a number of changes to the UCC; it was published in 1957 and again in 1962 as the "1962 Official Edition." The Uniform Commercial Code was one of the first attempts to place responsibility for commercial transactions on the seller. The Code defines the rights and obligations of the buyer and

seller in commercial transactions. (Savage, 1985, p. 13) In the Department of Defense, warranties were not used prior to 1964. Only when they became popular in the commercial marketplace, was the basic concept transferred to the Armed Service Procurement Regulation (ASPR). A regulation on the use of warranties was issued in 1964.

As technology and the complexity of equipment and weapon systems increased, it became evident that some form of contractor warranty would be necessary to ensure that the purchased systems would perform as required. As the volume of equipment and weapon systems being procured increased, warranties were used as a risk management tool for the Government.

In 1965 a consumer advocate, Ralph Nader, began to publicly ridicule the consumer marketplace. He had discovered through intensive investigation that some goods advertised and sold were defective. He formed groups to protect the public interest of individuals in the marketplace. This initiative created the idea that manufacturers' had legal and moral obligations to ensure their products met advertised standards. These actions created interest in Congress. (Legislative Analysis No. 9, 93rd Congress, 1973, pp. 2-3)

In 1973, the Government safeguards included both Federal and state statutes. The statutes apply differently depending on whether the warranted product is a consumer or a commercial product. (Brennan, 1994, p. 36) Commercial products are warranted under the UCC. The Federal statute was the Magnuson-Moss Federal Trade Commission Improvement Act and the state statute was the UCC (enacted by each state except Louisiana).

Under the Magnuson-Moss Act, a consumer product is defined to be any tangible personal property which is distributed in commerce and which is normally used for personal, family, or household purposes. (Legislative

Analysis No. 9, 93rd Congress, 1973, pp. 2-3) Commercial products are goods sold between merchants. However, if a substantial percentage (greater than 10 percent) of the product sales are in the consumer sector, the product becomes classified as a consumer product and is subject to the Magnuson-Moss Act. This act covers the acquisition of defective material including warranty protection against unfair or deceptive acts or practices in commerce.

Commercial products warranted under the Uniform Commercial Code may not be as restrictive to the seller. Implied warranties can be disclaimed or annulled in a written warranty statement. A refund is not required. In contrast to consumer products, commercial warranties may be subject to negotiation between the buyer and seller. Once agreed on, the warranty requirement becomes part of the purchase agreement.

Other defenses are available to both the commercial and Government buyers following the acceptance of goods. They are latent defects, fraud, and gross mistakes. A latent defect may be defined as a defect that is "hidden from the knowledge as well as from the sight and which could not be discovered by ordinary and reasonable care or by a reasonable inspection." (Arnavas and Ruberry, 1992, pp. 12-13) Whereas latent defects are comparatively straight-forward when discovered, usually go undisputed, and are otherwise quickly settled between the affected parties, fraud is besieged by a host of cumbersome and time-consuming parameters. Fraud is an intentional perversion of truth for the purpose of inducing another in reliance upon it to part with some valuable thing belonging to him or to surrender a legal right. It is difficult to prove and the burden of proof is on the Government. The Government must prove (1) that Government acceptance was induced by its reliance on (2) a misrepresentation of fact or concealment of a material fact, (3) made with knowledge of its falsity or in reckless disregard of the facts, (4) with intent to mislead

the Government into relying on the misrepresentation, and (5) with resultant damages. (Warranty Guidebook, 1992, pp. 2-3) Gross mistakes are also serious and is referred to as: (a) a major mistake so serious as not to be expected of a reasonable contractor, plus (b) a misrepresentation (by words, conduct, or silence) of a material fact which was made without intent to deceive. (Arnavas and Ruberry, 1992, pp. 12-13)

During the mid-1970s, numerous Government warranties were in use. In addition, a dialogue opened between industry and the Department of Defense concerning warranty issues as newer and more extensive warranty variants were implemented by all the Military Services. The Services supported research studies to evaluate warranty applications, and to develop analysis and implementation tools. By the beginning of the 1980s, the use of warranties in the acquisition of military systems were only selectively applied, and usually required special program office efforts to develop and implement. (Warranty Guidebook, 1992, pp. 2-4)

In 1980, the Air Force issued the first Product Performance Agreement Guide which provided a summary of the features of various warranty forms that could be used in military procurement. The Product Performance Agreement Guide was later revised in 1985. In 1982, the Department of Defense issued a set of guidelines (known as the Carlucci Initiatives) to improve and streamline the acquisition process. (Warranty Guidebook, 1992, pp. 2-4) The guidelines identified warranties as one of the means for achieving desired levels of system reliability and maintainability.

The Congress passed warranty laws in 1983 and 1984 because of its concern with the quality of workmanship and cost overruns on weapon systems. The concern was that weapon systems often failed to meet their military missions, were operationally unreliable, had defective and shoddy workmanship, and could endanger the lives of the U.S. troops.

(Arnavas and Ruberry, 1992, pp. 12-13) These laws required defense contractors to guarantee that weapon systems meet performance requirements specifically delineated in their contract. The statutory language however gave the Defense Department two very specific waivers that totally negate the requirement of a warranty. First, the language allowed waivers on warranties on the grounds of national security, and secondly, on the grounds of cost-effectiveness. The Department of Defense must have justified, before the Appropriations and Authorizing Committees, the use of these waivers. The taxpayers' right to see their tax dollars spent wisely has been protected by the justification process and the authority of the committees to hold hearings and reject, if necessary, any waived warranty. (Streamlining Defense Acquisition Laws, 1993, pp. 2-122)

The Congress delegated the responsibility of executing its acquisition laws to the Secretary of Defense. The Federal Acquisition Regulation (FAR) was prepared, issued, and maintained by the FAR council of which the Department of Defense, General Services Administration, and National Aeronautics and Space Administration are all members. The Office of Management and Budget delegated the administration and execution of the Department of Defense acquisitions to the Military Services. The Services are responsible for issuing implementing rules, regulations, and procedures pertaining to warranties. Procurement activities within the Services are responsible for warranty design and administration activities. The present phase of warranty policy in weapon systems procurement was initiated by Congress in response to rising public concern about performance deficiencies in major programs, and the overpricing of some highly publicized components. Congress took action by enacting Section 794 of the Defense Appropriations Act of 1984. A Department of Defense Guidance Memorandum clarified

intended implementation. Section 794 and the Guidance Memorandum imposed inflexible, omnibus, ambiguous, and potentially burdensome mandates upon both Department of Defense and weapon system contractors. (Streamlining Defense Acquisition Law, 1993, p. 2-122) The ensuing debate regarding warranties focused on the appropriate, efficient, and equitable means of improving weapon system quality. This debate resulted in the replacement of Section 794 with a new tenet--the Defense Procurement Reform Act of 1984, P.L. 98-525--Title 10 U.S. Code, 2403.

C. CURRENT WARRANTY LAW

Title 10, U.S. Code, 2403, was passed in 1984 as part of the Department of Defense Authorization Act of 1985 (Department of Defense Authorization Act, 1985, Pub. L. No. 98-525, 1234(a), 98 Stat. 2492, 2601-2603 (1984)). This statute is located at Appendix A.

A brief summary of the current law is presented for the reader's benefit. The current warranty law states that a major weapon system must be warranted. A major weapon system is one that can be used directly by Armed Forces to carry out combat missions. (Defense Acquisition acronyms and Terms, 1991, p. B-121)

D. SECTION 800 PANEL REPORT

Although Congress had previously passed a warranty provision applicable to the military departments, problems were perceived in its use. In the passage of the previous provision, Congress anticipated that the warranty situation of each contract would be negotiated on an individual basis. Congress determined, however, that the military departments had not been negotiating the warranty provisions in the manner anticipated. Instead, the general approach of the military departments had been to specify a warranty clause and require

that it be included in the contract. The warranty law was never intended to create this type of simplistic, blind, mechanistic approach to defense contracting. (Streamlining Defense Acquisition Law, 1993, p. 2-122)

Congress agreed that there should be enough flexibility to give the Department of Defense authority to craft specific warranties, and to consider the formulation of exclusions or limitations. Exclusions and limitations address situations where a contractor has not designed a system. The Department of Defense should be able to narrow the scope of the warranty clause, if it would be inequitable to apply the full warranty to a contractor with limited design involvement or where warranty costs clearly exceed expected benefits. (Defense Federal Acquisition Regulation Supplement, 46.701-710)

Congress noted that virtually no warranty exemptions had been issued in the years since the previous warranty provision had been passed. It stated that the Committees on Armed Services had never intended to require warranties if they were not cost-effective. Congress also expressed the concern that there had been a lack of communication between the military departments and their field personnel about the appropriate implementation of Congressional warranty language and its inherent flexibility. With the passage of this new warranty provision, Congress believed that the new sections would give the military the inherent flexibility to negotiate guarantees on a case-by-case basis, including the authority to negotiate reasonable exclusions, limitations, and time durations. (Streamlining Defense Acquisition Law, 1993, p. 2-112)

E. ACQUISITION REFORM OF WARRANTIES

As a result of the Department of Defense's build down, Reinventing Government, and Bottom-up Review, initiatives to restructure the acquisition process have been of paramount concern. The Section 800 Panel of the Fiscal Year 1991 National Defense Authorization Act (Public Law 101-510)

mandated the establishment of an advisory panel to codify and simplify acquisition law. In response to that mandate, the Under Secretary of Defense for Acquisition appointed a panel of recognized public and private sector experts in acquisition law and procurement policy. This panel reviewed the various laws governing defense acquisition. A total of 600 statutes were reviewed, and in their report, "Streamlining Defense Acquisition Law," dated 12 Jan 1993, recommendations were made amending, deleting, consolidating or rescinding over 300 of those statutes. (USC, Title 10, Sect 2403, Supplement I, 1989-1990) The effectiveness of warranty provisions were included in the Panel's evaluation. The Section 800 Panel identified three functions of warranties: assure that the Department of Defense receives a product free from design, manufacture, or structural defects; motivate the contractor to produce defect-free products; and ensure the Department of Defense against the risks of repair or replacement. The language was different, but the concept was still for quality defect-free products and reducing the risk to the Government.

The Section 800 Panel's study also showed that program managers tend to view warranties from the perspective of an individual consumer instead of an industrial buyer. In essence, the program manager's belief was that the commercial application of warranties applied to the Department of Defense, and that they offered the same type of consideration to the Government as they did to individuals. In reality, the warranty provisions used by the Department of Defense, while constructed to improve the quality of the weapon systems and minimize defects, had become a nemesis, in that, warranties no longer performed the functions for which they were intended. (USC, Title 10, Sect 2403, Supplement I, 1989-1990)

The Government is paying for a benefit it rarely receives. The benefit is expected to be in the form of insurance to mitigate potentially expensive defects in the

performance or design of major weapon systems. This insurance claim can only be recouped if a warranty provision is vigorously pursued.

It is asserted that insurance is not a manner of escaping the social costs of uncertainty but rather is a means of escaping the potential variation of those costs. That is the forces of uncertainty inflict costs in the manner of a probability distribution with a mean or expected value and a variance. An insured party always pays a premium which includes that mean cost: What he escapes thereby is the variance of the distribution. Hence, the insurance function of warranties does not reduce the costs of uncertainty to DOD: It shifts the risk of extreme deviations onto the contractor. (USC, Title 10, Section 2402, Special Supplement, 1994)

When a warranty claim is pursued, it is usually done through the contractor. This is because if the contractor accepts responsibility then his recourse is to provide the Government with its benefit as stated in the contract. Usually, this is in one of two forms. First, if the weapon system is still in production the contract is adjusted. This is done by the contractor. It is the contractor's responsibility to credit the Government with its benefit. Secondly, if the weapon system is no longer in production the contractor is obligated to provide the benefit to the Government through the Department of Treasury. This is accomplished by a reimbursement to the Department of the Treasury. (USC, Title 10, Section 2402, Special Supplement, 1994) In either case the user receives no direct benefit from the warranty. With the stovepipe structure of the Government, the burden of proof for the defect and redemption of the warranty benefit is so cumbersome that it has not proved to be cost-effective. Although the user identifies the defect in the weapon system, he does not have a full appreciation of how to apply warranty remedies. In addition, there are no

incentives for him or his unit to pursue the correction of the warranted weapon system.

Warranty benefits are further encumbered by numerous clauses in Government contracts that deal with the inspection and acceptance of goods. When a weapon system meets contract specifications, it relieves the contractor of liability for those goods upon the Government's acceptance of the goods. The reason for this application is that once a contract states specifications and the contractor performs the contract based on those specifications it becomes the Government's problem if there are any form, fit, or function deficiencies. Once the contractor performs to the letter of the contract, he is relieved from any further responsibility for ambiguous or defective specifications. The key is the Government's acceptance of the goods. There are three ways a buyer can accept goods: (1) by signifying to the seller that the goods are conforming or that he will accept them in spite of their nonconformity, (2) by failing to make an effective rejection, and (3) by doing an act inconsistent with the seller's ownership. Acceptance of a part of any commercial unit is acceptance of that entire unit. (Black, 1979, p. 115) This has a completely different application in the commercial marketplace.

In contrast with a Government buyer, a commercial consumer has much more flexibility in processing a claim on a warranted item. In the commercial marketplace, when a good is purchased it may be returned with fewer conditions placed on it. For example, the item does not have to be returned to the manufacturer; it can be returned to the place of purchase. The commercial buyer can redeem the warranty benefits from merchants other than the manufacturer or he may return the merchandise to the place of purchase. These conditions make the warranty provisions relatively easy to process. In addition to the ease in which claims are processed, warranty

benefits are received directly. The commercial buyer receives a refund, an exchange for a like item, or an exchange on another item of his liking. None of this is true for the Government. The user who submits a warranty claim, does so on behalf of the Government, and receives no direct benefit for that claim. The contractor's liability is to the Government directly; not to the product user or organization that owns the warranted item and submits the claim.

There is an option that negates the requirement of including a warranty in a contract. This option is in the form of a waiver. When a waiver is being considered, it must always be justified by a cost-effectiveness analysis. Congressional notification is mandated for waiver approval, and authority to grant the approval is held at the Assistant Secretary of Military Departments level. The requirement for congressional notification and waiver authority held at such a high level in the Government stifles attempts to waive the warranty where it would not be cost-effective. (Streamlining Defense Acquisition Laws, 1993, p. 2-116) Thus, the use of waivers to date, has not been fully realized. (Streamlining Defense Acquisition Laws, 1993, p. 2-116)

The recommendation of the Section 800 Panel has been to repeal the statute, allowing the waivers, or requiring a warranty. If the recommendation is not accepted, the Panel suggests that the Government use the waiver option more frequently, and further, that the Government should justify the inclusion of a warranty as a contract requirement. (Section 800 Panel Report, p. 2-117 & 118)

F. THE LATEST LEGISLATION

Congress' response to the Section 800 Panel has been in the form of new legislation. It waived the requirement for the Secretary of Defense to report annually to Congress on each warranty waiver granted during the previous year. It

also mandated that regulatory guidelines be written and implemented to encourage the use of warranties. Concomitantly, they identified appropriate procedural rules designed to simplify the decision making process. This should establish a standard approach for all Military Services with the authority to deviate from established procedures of mandated warranties for weapon systems procurement. Unfortunately, the legislation does not change the level of authorization for approval of a warranty waiver. This requirement, at its lowest level of authorization, is still held at the Assistant to the Secretary for the Service. Holding the authority to grant waivers at such a high level in the bureaucracy creates the mandate for numerous reviews and laborious manhour expenditures to preform cost-benefit analysis and justification for a waiver.

G. SUMMARY

This chapter has traced the history of Government warranties and current warranty provisions. The principle of "let the buyer beware" retains its meaning for the Department of Defense until the statutes are either amended or repealed. In the interim, the use of waivers, although cumbersome, can be effective if the benefit is clearly identified, justified and pursued.

III. METHODOLOGY

A. OVERVIEW

A combination of literature review and personal interviews was conducted in the course of this research. The main sources of literature included the DSMC Warranty Guidebook; Federal Acquisition Regulation (FAR), Subpart 46.7; Defense Federal Acquisition Regulation Supplement (DFARS), Subpart 246.7; United States Army Federal Acquisition Regulation (AFAR), Subpart 46.7; Section 2403, USC, Title 10, Public Law (P.L.) 98-525 of the 1985 Defense Procurement Reform Act; and the Section 800 Panel Report.

In developing the methodology for this research, four critical issues were formulated regarding the legislation and implementation of Warranty Programs. These issues were:

1. How are warranties applicable to Military weapon systems as compared to commercial warranties?
2. How does one identify and measure the best method to estimate the value of a warranty to the Government?
3. To what extent are program managers able to request and justify waiving the legislative mandate for warranty inclusion?
4. To what extent do warranties impact on product quality in design and manufacturing, materials and workmanship, and performance specifications?

This chapter will review each of these issues focusing on the criteria of each critical issue. Once the criteria were clearly identified, measures of effectiveness and performance were selected. The data requirements were identified and the interview questions developed. Each interview was conducted in a non-attribution forum to attain the most comprehensive data. These data were transcribed and prepared for analysis. The analysis consisted of understanding all pertinent policies and taking each question and all responses to that question,

and interpreting the comments and discussing the facts of the case that lead to the conclusions. Each question was evaluated with the others to establish the foundation for the responses for the question. The results were compared with the evaluation criteria to ensure conformity of purpose for the question. Finally, the evaluation report was written and formulated the basis for conclusions and recommendations of this thesis.

B. APPLICABILITY OF WARRANTIES TO MILITARY WEAPON SYSTEMS

In developing this research, the key question was how to compare the intent of mandated warranty legislation to the commercial use of warranties. Interviewing current Army program managers and contracting and legislative officials with programs that had been developed during the time period of the most recent legislation (1985-1994), seemed to be a reasonable approach toward answering this question. This approach provided data which reflected the general level of experiences with the Warranty Program. These personnel had experienced the opportunity to implement the legislation, and to monitor and evaluate the results. To gain this insight, eight Army program managers, eight contractors and one legislative official were asked to take part in this research.

The interview questionnaire was developed with the thesis questions as the primary concern. Interview questionnaires were sent via electronic facsimile to the program managers, contractors, and a legislative official. They were asked to perform any research required to familiarize themselves with the warranty history of their programs and then to answer each of the questions. They were to send the answered questionnaires back so that a follow-up telephonic interview could maximize the transfer of knowledge in each of the areas of concern. Finally, the telephonic interviews were used to clearly define the positions of each individual. These

positions were transcribed and are a part of this thesis.

C. IDENTIFICATION OF PROGRAM MANAGERS, CONTRACTORS AND LEGISLATIVE OFFICIALS

1. Program Managers

The next question was how to identify the program managers, contractors, and a legislative official to evaluate effectiveness of the Warranty Program? The managerial oversight of the Army's programs are the responsibility of the Army Service Acquisition Executive (ASAE). In order to identify the program managers, an assessment of the programs that had been in the acquisition cycle during the time period of 1985-1994 were identified. Each of these program managers were asked to participate in the research project.

2. Contractors

Identifying contractors with experience in the time period the legislation was established was a slightly more difficult challenge. The researcher referred to the "Government Executive," for assistance in identifying the top 200 Government contractors. These contractors were then reviewed for the highest dollar amounts of Army contracts. Once these data were isolated, contacting the contractors was again a challenge. Points of contact were established and the same procedure was utilized to assess their evaluation of the warranty legislation.

3. Legislative Official

The legislative official was identified by his work on the Section 800 Panel Report. His input into the decision making process was expected to conclusively identify the objectives of the legislation and benefits expected from the proposed legislation. A point of contact was identified and the same procedure as above was utilized to assess his evaluation of the warranty legislation.

D. EVALUATING THE QUESTIONNAIRES

An iterative process was used in evaluating the questionnaires. The Dendritic analysis technique was selected as a way of decomposing critical issues to the point where actual data requirements and evaluations could be identified. Each question was designed for a two fold approach. First, the issues were broken down into a test of proportions to determine the overall tendency of the opinions of those interviewed. Second, explanations were evaluated for consistency and clarity of issues. These methods were selected for determining the level of awareness that each professional had in the area of warranty effectiveness. The evaluation of comments was determined by the consistency of the responses.

E. COMPARING EVALUATION RESULTS WITH THE ISSUES

The primary consideration in identifying information generated by the evaluation was having a clear understanding of the conclusion supported by the evaluation. Comparing the evaluation results with the initial issues helped to determine specific issues that were not effectively dealt with in the legislative mandate. This also helped develop the conclusions and recommendations by providing insight into what warranty issues were consistent among each of the interviewees.

F. SUMMARY

This study uses the legislative statute enacted in 1985 and the Section 800 Panel's recommendations for legislative change as its foundation. Respondents were asked to offer their experiences of the effects of the legislation on programs they were responsible for. These experiences were evaluated and compared to determine the areas of consistency of issues both positive and negative.

During the field research for this study, Program Managers, Contracting Officers, and Legislative Officials were interviewed. After the interviews were completed, the analysis was performed. The data and results of the analysis will be presented in the next chapter of this thesis.

IV. DATA INTERPRETATION AND ANALYSIS

A. GENERAL

This chapter contains the data interpretation and analysis. It has two major sections: The first section contains the questions followed by the interpretation of the data from the interviews. The second section contains the analysis of the warranty legislation, its interpretation, and its effectiveness for major acquisition programs.

Interview questionnaires were sent to selected personnel who were experienced in how the Government uses warranties for weapon systems acquisition. This encompassed 17 officials who use warranties in their daily business with the Government. Eleven officials replied to the interview for a sixty-five percent response rate.

The interview questionnaire had five major sections: Procurement experience, Assessment of the value of the Warranty Program to the Government versus commercial industry, Assessment of the use of cost-benefit analysis as a risk management tool, the value placed on warranty waivers, and the correlation between the quality of a weapon system and its warranty.

1. Procurement Experience

This section of the interview was used to give the reader some knowledge about the personnel involved in the weapons acquisition process. Specifically, it provides a picture of the array of officials that deal with the Government in terms of their experience and time involved in the procurement process.

a. Question 1

What is your present position and how long have you been in your present position?

b. Interpretation of Responses

The years in present position responses can be grouped into three levels of experience: The first group contained five interviewees and ranged from 1.5 to 5 years of experience. The second group contained four interviewees and ranged from 8 to 12 years of experience. The third group contained two interviewees and they had 20 and 40 years of experience. All 11 officials are involved in program management either on the Government or commercial side of contracting for weapon systems. Each of the interviewees responded that they had worked in Government procurement prior to becoming responsible for a Warranty Program. A review of the warranty managers' job titles indicates that they are involved in the process of procuring or selling equipment with the Government. Job titles included: Program Manager; Acting Division Chief; Chief, Readiness Management Division; Director of Materials; Manager of Contracts; Contract Manager; Chief, Business Management Division; General Counsel, Contract Negotiator, Subcontract Administrator; Manager of Warranty and Maintenance Cost.

c. Analysis

The data indicate that these individuals are well-qualified in terms of experience and job responsibilities to assess the value of a warranty for a weapon system. Four individuals in the first group were Military officers in Program Management. These four had the least experience in acquisition. Among the second and third groups five individuals were prior Military Officers with positions in acquisition management. These experience levels indicate a firm background in Military acquisition procedures and responsible leaders in their respective fields. It can be concluded that their opinions represent informed responses regarding the use of warranties in the program management field.

2. Assessment of Value to the Government

This section covers questions 2, 3, and 4. Their intent is to determine if warranties are valuable to the Government and commercial sector and if they add performance to the weapon system.

a. Question 2

In your opinion, are warranties applicable to military weapon systems?

b. Interpretation of Responses

Responses to this question were received from 11 interviewees. Eighty-two percent indicated that warranties are applicable to military weapon systems. Eighteen percent answered that warranties were not applicable to military weapon systems.

Those responses that stated warranties were applicable were based on the following reasoning: by law warranties are applicable, however prior to 1984, DOD policy was not to incur the added expense of warranties. The warranty mandate has added costs. If properly written and administered, warranties can save the Government costs of repairs beyond what would be expected. The trend for threshold warranties may selectively, and in discrete circumstances, make sense.

The interviewees that indicated warranties were not applicable stated: Warranties are redundant to the myriad of regulations, specifications, and quality assurance requirements which a contractor is forced to accept and comply with in any fixed-price major system purchase. They are inconsistent with purchases in a cost-reimbursement contracting mode. Under cost-reimbursement types, warranty costs become allowable and allocable to the same extent as other costs. Thus, a warranty requirement allows the Government to obtain repairs on a non-fee bearing basis, but it still must bear the target costs and any overrun costs.

Finally, warranty provisions represent a potential cost that must be paid.

c. Analysis

Assessment of the applicability of warranties for the Military weapon systems is that warranties do in fact serve a purpose. Eighty-two percent of respondents indicated that warranties served a purpose, were applicable to Military weapon systems, and that the primary reason for use of a warranty was the legislative mandate. The applicability was qualified by most respondents who stated that if warranties were properly written and administered, they could be applicable.

The original intent of the mandated warranty legislation was to protect the Government from shoddy workmanship, poor materials, and unsafe weapon systems. The findings do not substantiate that improved quality of workmanship, materials or safer weapons are derivatives of this mandate. The applicability is not consistent with the expectation of increased quality. Rather, warranties are being purchased primarily because of the legislative mandate. This is inconsistent with good business practices. Good business practice would indicate that there must be added value in the products if a higher cost is paid. Warranties should be purchased only if there is an economic benefit derived for the Government in terms of risk reduction or in acquiring quality, reliable, and safe weapon systems.

d. Question 3

What purpose does a warranty serve to the Government?

e. Interpretation of Responses

Responses to this question were received from 11 interviewees. Eighty-two percent indicated that warranties serve a purpose for military weapon systems. Eighteen percent answered that warranties did not serve a purpose for

military weapon systems.

The responses that indicated warranties were relevant to the Government acquisition stated: the major purpose is satisfying the statutory requirement to have a warranty. This was the predominant justification.

A warranty provides a degree of protection to the Government. Warranties guard against incurring future costs for defects in materials and workmanship. More complex warranties can also be structured to guarantee product performance in the future and require that the full cost of redesign and hardware/software implementation to achieve the warranted performance be borne by the contractor. The "insurance" that warranties represent may or may not be worth the cost paid for them. The Government must analyze the entirety of a given contract in order to make an informed decision.

A warranty provides the Government with added time to determine/locate specified defects in items which existed at acceptance. Defects can be in material, workmanship, non-compliance with the Technical Data Package (TDP) or failure to meet performance as tested during the warranty period. For the vast majority of systems, warranties are redundant to the myriad of regulations, specifications, and quality assurance requirements that a contractor is forced to accept and comply with in any fixed-price major system purchase. No useful purpose is served to the Government. The Government should not have to shoulder the cost of quality defects in manufacturing and assembly errors. For new systems or when dealing with a contractor with a history of Quality Assurance (QA) problems, it serves as an effective control mechanism. This is the case especially for the infant mortality of new weapons.

The purpose served is to ensure Government rights subsequent to final acceptance and delivery. However, the

inclusion of warranty provisions in production contracts, as opposed to development contracts, is a major error. Warranties used in this manner serve in such instances more as a "service policy" rather than to ensure enhanced design, product reliability, and improved quality. In addition, in production contracts, they are a cost to the Government whether or not cost-effective or required.

"A warranty serves the Government only if it offers economic benefit" according to respondent number 8. The contractor's proposed warranty should be evaluated against alternative means of repair such as U.S. Government organic repair capability at intermediate and depot repair facilities or by contract maintenance and overhaul.

f. Analysis

The nine respondents who felt that warranties served a useful purpose to the Government all qualified their answers. A careful reading of those qualifications may properly lead one to conclude that warranties provide economic benefit to the Government when they are properly structured. Otherwise, they are at best useless, and at worst a benefit to the contractor. The prevalent concern is the misuse of the warranty intent; they are not meant to mitigate the likelihood of wanton contractor negligence, but rather serve as a safety net for all those legitimate unforeseen errors systemic to any multi-dimensional system.

g. Question 4

What purpose does a warranty serve to the commercial section of business?

h. Interpretation of Responses

This question was asked to clarify the purpose for commercial warranties and further, to determine if there was a distinct difference in the purpose for military versus commercial warranties. The overwhelming majority of interviewees indicated that consumers use warranties as a

measure of the quality or reliability of a product. The second most frequent comment was that warranties increased purchaser rights under the Uniform Commercial Code. Four of the respondents said that consumers were protected from the "infant mortality." Infant mortality refers to weapon systems in the early stages of development before they are proven systems with reliability and quality standards. A distinction was made for the interest the Government places in warranties. That distinction was that the Government used warranties to increase its rights over the contractor and above those provided for under the contract.

i. Analysis

The purpose of a warranty in the commercial sector was primarily to measure the quality or reliability of the products and to increase consumer protection under the Uniform Commercial Code. Generally, the commercial sector has more faith in products that the manufacturer warrants. They are more willing to purchase items which are advertised with certain guarantees in quality, workmanship and materials. There is no commercial mandate for warranties, although consumer protection agencies have established liability for those manufacturers that have not provided high quality merchandise.

3. Assessment of the Use of Cost-benefit Analysis as a Risk Management Tool

This section includes questions 5, 6, 7, 10, and 11. Their intent is: (1) to draw a conclusion about the preference in using cost-benefit analysis as a tool, (2) to determine if cost-benefit analysis is used, and if it is performed thoroughly and effectively, and (3) if the expense of a cost-benefit analysis is justified for use as a management tool to assess the value of a warranty.

The technique most valued by the respondents was the cost-benefit analysis. This is consistent with the private

sector's use of management tools. Cost is the driving force for commercial practices, and should be a relevant factor in determining if a warranty is required in Government weapon systems acquisition. Clearly, there are other considerations that must be addressed when the use of a cost-benefit analysis is dictated. The data used in estimating the value must be clearly identified. For Government practices, this includes the Life Cycle Cost of a given weapon system. Often these data are incomplete or insufficient to determine many of these factors. Additionally, the Government lacks adequate data management systems to accurately predict many of these elements.

a. Question 5

Which technique used to estimate the value of a warranty would you rank as the most effective, models or cost-benefit analysis?

b. Interpretation of Responses

These responses varied from the structure of the survey. Some of the respondents indicated other answers. The most popular method of estimating the value of a warranty was cost-benefit analysis. The second most popular were both the cost-benefit analysis and models. A third surprising answer was that there were simply no good methods for collecting and analyzing all the variables that needed to be evaluated to determine the value of a warranty.

The analysis is listed for each alternative:

(1) Cost-benefit Analysis. A thorough cost-benefit analysis can identify the practicality of administering the warranty in the DOD system. The Government should make pure estimates on new starts or collect actual field failure data for fielded systems. It should then compare the cost of contractor warranty repair versus organic repair or commercial maintenance and overhaul contracts.

A problem of real concern is that, within the

Government, any savings which can be shown on paper (whether real or not) can make or break a program. This leads to concern for potential biases, because the agency responsible for the cost-benefit analysis is usually under the control of the Program Manager.

(2) Models. Various models are used to forecast the expected, then a risk analysis is performed. These models can be effective, but are not applied uniformly throughout the Services.

(3) Both. Models and cost-benefit analysis techniques can be employed to estimate the value of a warranty. However, the results of both may not bear any relationship to the ultimate outcome of cost incurred or avoided, because predicting future events or circumstances has obvious limitations. Clearly, this is the case for the major weapon systems where there are a multitude of variables at work at all times.

(4) Neither. Because of poor data bases, they never truly address the conceptual weakness of the warranty in a military environment. Neither adequately consider unmeasurable and intangible negative and positive factors involved in the operation of a warranty (e.g. some people let-up on addressing quality, mistakenly thinking the warranty will do it for them and for the Army). It does not apply uniformly. There is no one technique that is best to estimate the value of a warranty.

c. Analysis

Cost-benefit analysis is one of the most accepted risk management tools used in the commercial sector. There are other models that agencies employ. Those models contain an array of information unique to their systems. The information that appears most frequently are life cycle costs, system effectiveness, and cost-effectiveness.

It is appropriate for the Government to consider

developing a model that contains these elements and others that are unique to military systems. This model could then be tailored to address the specific issues required of particular military operations. Acceptance and approval of an analytical tool appears to be one of the greatest drawbacks to develop or to modify an existing model. Until the analysis is accepted as concrete evidence that a warranty is not cost-effective and approved throughout the chain of command, it is unlikely that any relative value will be placed on performing warranty analysis.

d. Question 6

Are cost-benefit analyses performed effectively?

e. Interpretation of Responses

At forty-six percent, a plurality of the population, indicated that cost-benefit analysis was not performed effectively. Data collection, assimilation and interpretation are variables that consistently vary from program to program. Thus, it is difficult to ensure that the data analyses are comprehensive. Their comments reflect that actual costs of warranties are difficult to ascertain. Benefits are assumed to be automatic, but many (if not most) claims do not meet warranty provisions. Most warranty determination is made by the manufacturer, because he has a better data base. As warranty money is not returned to the user, benefit is also hard to measure.

They are always skewed to show a savings, often using unrealistic but logically sounding assumptions. "Hidden costs" of a modification or retrofit are difficult to account for.

The evidence of so few waivers being granted is documentation that warranties are being required irrespective of their cost-effectiveness. Therefore, it is a waste of resources to perform a cost-benefit analysis.

The next highest response rate was thirty-six

percent. This group suggested that the cost-benefit analysis is the basis for the negotiations of the cost of the warranty. Administration can be cumbersome in developing the quantifiable data necessary to evaluate a cost-benefit analysis (data collection/interpretation).

When the U.S. Army procured initial warranties in the mid-1980's, it was done on the premise that warranties were inherently good. In some instances, the actual occurrences of failure and warranty repair costs were far less than the annual cost of the warranty. This happened in large part due to the failure to implement any constructive cost-benefit analysis, and because the contractor assumed a greater maintenance role than doctrine indicated.

There were two individuals, 18 percent, that did not comment on the effectiveness of cost-benefit analysis.

f. Analysis

Are cost-benefit analyses performed effectively? Are they utilized to determine the necessity of a warranty for a weapon system? When cost-benefit analysis is performed, is the expense for cost-benefit analysis justified by the results of the analysis?

In general, the responses indicated that cost-benefit analyses were performed, but not effectively or independently to assess the value or potential value of a warranty. There was also a general lack of confidence in the data assimilated and used to make predictions. Data collection, assimilation and interpretation are variables that consistently vary from program to program; thus, it is difficult to ensure the data analyses are comprehensive. Actual costs of warranties are difficult to ascertain. This is especially true in a system that has numerous maintenance and accounting requirements. The true cost of a warranty is difficult to estimate with confidence. For accurate estimation it would be necessary to increase the current

information management of assets. This compounds the problem with an increased administrative burden to capture and report those data. In an already downsizing military, the current assets have to be optimized. Administrative functions become a low priority in units where combat readiness is of paramount concern. Cost-benefit analyses used in combination with the systems assessments, and test and evaluation assessments should prove to provide adequate technical information for an assessment of the value of a warranty.

g. Question 7

Are cost-benefit analyses utilized to determine the necessity of a warranty for a weapon system?

h. Interpretation of Responses

Thirty-six percent indicated that cost-benefit analysis was utilized to determine the necessity of a warranty for a weapon system. Forty-six percent expressed that a cost-benefit analysis was not used to determine the necessity of a warranty, because warranties are mandated by law. Eighteen percent had no comment on this question.

The responses overwhelmingly indicated that the primary reason the cost-benefit analysis was performed was to meet the statute. They also indicated that the law is not clearly understood. The statutory requirement for a cost-benefit analysis is tied to the program as an element of milestone exit criteria. The respondents that understood the law indicated such analysis is necessary to support warranty approval for ACAT I programs or to substantiate waivers.

The necessity for a warranty is dictated by statute and implementing regulations, both of which appear to have been misconstrued in execution. Warranties are being purchased without regard to cost, value, or need. The deviation process and the required level of approval, as well as the interpretation given the regulations, are at fault. The current climate influencing the program manager and

contracting officer inhibits the thorough assessment of the value of a warranty.

i. Analysis

Cost-benefit analyses are being performed. There are concerns about the quality of the data being evaluated and the conclusions. The results show that cost-benefit analyses are not being used to determine the necessity of a warranty for a weapon system. The data analyses performed must use complete and consistent data that represent the system and must identify any unique characteristics. If these elements are provided, the level of confidence in the analysis should support the decision.

The decision should be supported once the program manager and contracting officer evaluate the cost-benefit analysis. Political implications, combined with the stringent mandates, dictate that the program manager take a proactive position in the analysis to determine the most reasonable approach and the practicality of a warranty. Political influence must be dealt with to ensure that the analysis is the factor that determines whether a warranty should be purchased. The analysis must provide a convincing basis to support the decision of whether or not to purchase a warranty.

j. Question 10

In your opinion, are thorough cost-benefit analyses performed to evaluate if a warranty is cost-effective?

k. Interpretation of Responses

Thirty six percent responded that thorough cost-benefit analyses were performed to evaluate if a warranty is cost-effective. Forty-five percent indicated that thorough cost-benefit analyses were not performed to determine if the funds expended for warranties were cost-effective. Eighteen percent were not sure if thorough cost-benefit analyses were performed.

The indications were that the cost-benefit analyses that are performed are done by another Command as part of an overall Milestone decision process. They are not done specifically for warranties. Thorough cost-benefit analyses must reflect "real world" environments. Those are difficult to replicate during the weapon system acquisition process.

When the Government requests contractors to develop proposals for weapon system warranties the thoroughness of the cost-benefit analysis is the key factor in deciding upon warranty provisions. The Congressional and Department of Defense oversight for the requirements process, including funding, may require a warranty provision no matter what the cost-benefit analysis may show. Commands that perform the acquisition function usually find it difficult or politically unwise to suggest that a warranty is not worth the projected cost. The cost-benefit analysis assumptions may be complex, and even unknowingly biased about future occurrences, however it remains the preferred tool. Once the decision has been made not to get a waiver, all other considerations are only paperwork exercises.

1. Analysis

The cost-benefit analyses that are being performed are not supporting requests for waivers. The thoroughness of cost-benefit analysis is suspect when its results are not used to support decisions. The indications are that the data are either inconclusive or incomplete otherwise they would be used to justify the use of waivers. If this is the case, then a carefully established method should be developed to identify the parameters that most reflect actual data. Models should be scrutinized to select the one most appropriate for any given weapon system. The data should then be gathered, analyzed, and reported to assist the program manager in making the best decision regarding a warranty.

Implementation instructions for cost-benefit

analysis should be written to clearly identify appropriate procedures. Pending the results of clear instructions, it will continue to be difficult to assess if the appropriate data have been gathered, evaluated, and reported for decision making.

m. Question 11

In your opinion, is the expense for cost-benefit analysis justified by the results of the analysis?

n. Interpretations of Responses

Fifty-five percent indicated that the expense for a cost-benefit analysis is justified by the results. Thirty-six percent felt that the expense for a cost-benefit analysis was pointless. Nine percent had no comment on this question.

These responses were mixed but focused on data sources and reliability. If the Government contemplates a warranty that will guarantee performance in the future (as opposed to a simple defects and workmanship warranty), then a cost-benefit analysis can serve as a legitimate basis for identifying the value of the approach and alternatives that might be more cost-effective.

Over the life cycle of a major system or component, there is a substantial recurring operation and support cost life cycle saving potential, which will justify such analysis. This is where problems occur. When the results are based on soft data, it is difficult to prove the assumptions. Since the cost of a warranty would far exceed that of a cost-benefit analysis, it does not seem prudent to purchase a warranty that might prove to be ineffective.

Many respondents thought that if the Congress includes specific language that requires a warranty provision for a new complex weapon system, then it is usually pointless to develop a cost-benefit analysis that examines the issue.

o. Analysis

If the data present meaningful information for the program manager to make a decision then ,the expense of performing a cost-benefit analysis is justified. If the analysis is not conclusive, then the program manager must find other data to evaluate. The objectives of the cost-benefit analysis must be clearly defined in order to determine the appropriate information relevant to the decision. A generic cost-benefit analysis will not assess the value of a warranty if the key factors for the equipment and its intended uses are not clearly identified in the analysis.

4. Assessment of the Value of a Warranty Waiver

This section assesses the value of a warranty waiver. What is the frequency of waivers requested; the difficulty in obtaining a waiver; the number of waivers requested, evaluated, and granted; and if a cost-benefit analysis is effective in attaining a waiver.

a. Question 8

In your opinion, is the cost of a warranty regularly evaluated before it is purchased?

b. Interpretation of Responses

Sixty-four percent responded that there is no data evaluation to determine if a warranty would be a wise decision. Twenty-seven percent indicated that warranties were regularly evaluated before they are purchased. Nine percent had no comment on this question.

The basis for these responses are that there are limits to the effectiveness of a warranty evaluation. This is especially true with commercial components, because there is a built-in warranty cost which manufacturers refuse to disclose. Regardless of what the procuring contracting officer or Program Manager promises, they expect to be provided warranty service during the course of the program. Therefore, they will not eliminate commercial warranty

markups. It is part of the negotiations.

There is much confusion over what constitutes an effective evaluation. The statutes require warranties. Purchasing a warranty is usually just assumed to be more valuable. For complex weapon systems, warranty provisions tend to be discussed and analyzed before being solicited from a contractor. Often, contracts are negotiated for products and contract costs which have warranty costs embedded. The cost of a warranty (i.e. real cost) is an "after the fact" consideration.

c. Analysis

This question was designed to illustrate the degree to which the program manager is influenced by a cost-benefit analysis when warranties are a factor in the procurement. Information presented, illustrate that warranties are not regularly evaluated to determine the cost-benefit relationship. This is confirmed by the lack of waivers granted; therefore, it can be presumed that the focus is on fulfilling the mandate rather than evaluating the need for a warranty. A cost-benefit analysis is an additional burden (in terms of manhour cost) to the program manager, if he cannot influence a waiver decision based on the findings. Rarely, are waivers granted based on a cost-benefit analysis; so rather than invest time and effort in them, a program manager will concur with the mandate. This was not the intent of the legislation. The intent was for the program to be scrutinized for the most effective and efficient use of Government funds.

d. Question 9

In your opinion, are waivers sought based on the results of the evaluation?

e. Interpretation of Responses

Fifty-five percent did not believe that warranty waivers were requested on the basis of evaluation. Thirty-six percent indicated that waivers were sought on the basis of

evaluation results. Nine percent did not respond to this question.

There is a lack of understanding in what makes up a sound cost-benefit analysis; therefore, waivers are not sought. The general impression is that waivers will not be approved, so why bother with an evaluation? Once warranty provisions are solicited from a contractor, they are rarely changed. Waivers are rarely approved. The decision to request a waiver is strictly political.

f. Analysis

Waivers are rarely sought. There are two explanations for this: The data revealed that they were not cost-effective. There is a genuine concern about the quality of the analysis. Even if a cost-benefit analysis conclusively shows that the warranty is not cost-effective, the waiver is unlikely to be approved. The indications are that the system is so cumbersome for waiver approvals that it is not responsive to the program manager. The level at which the approval must be granted operates in a different environment than that of the Military hierarchy. This is because the Secretary of Defense may grant a waiver. He is held to the extremely high constraint of having to prepare and forward complete information about the waiver he has approved to the Appropriations and the Authorization Committees. This does not empower the Secretary of Defense to make a decision that he can enforce. The system was designed to have checks and balances; however, it is questionable as to what level is most appropriate for waiver approvals. If a waiver is granted by the Secretary of Defense, it is still an open action until approved by the Appropriation and Authorization Committees. This is clearly a disincentive for approval of a warranty waiver.

g. Question 12

In your opinion, is it difficult to get a waiver approved?

h. Interpretation of Responses

Sixty-four percent indicated that getting a waiver was difficult. Eighteen percent indicated it was not difficult and 18 percent had no comment.

It appears from the comments that most of the respondents think it is almost impossible to get a waiver approved.

The problem within some communities is not necessarily getting a waiver approved, but getting approval from management to request a waiver. This is another political statement about how receptive the Command would be in pursuing an analysis and warranty waiver. This task would be more manageable if a cost-benefit analysis or model was based on sound conclusive data.

It would be very interesting to see the evaluation and justification for pursuing a warranty from the Government's files. It should be a risk-management and cost-benefit analysis that predicts the value or benefit to be gained by the Government. The current statute demands another box be "checked-off" under their procurement requirements, rather than demanding realistic carefully scrutinized decisions by those members of the procurement process that are trained and paid to make these decisions.

i. Analysis

The assumption is that sound conclusive data indicates that a warranty would not be cost-effective. Highlighted among the responses were political statements about how receptive the Command would be in pursuing an analysis and warranty waiver. In most cases, the efforts for attaining warranty waivers were not considered to be a possible alternative. The respondents think it is politically

impossible to get a warranty waiver approved. The difficulty should only be in working through the stringent process. If a Command believes in its product, there should be no mandate for a warranty. The statute was intended to ensure quality material, workmanship, and safe weapons for military personnel. A warranty it should be evaluated to determine if a waiver is appropriate. The issues should not rest on the mandate. If it does not make good business sense to pursue a warranty a waiver should be requested.

j. Question 13

In your opinion, about how many waivers have you seen requested, evaluated, and granted?

k. Interpretation of Responses

The responses to this question were surprising. Forty-five percent have never seen any warranty waivers requested, evaluated or granted. Twenty-seven percent have seen ten waivers requested, and evaluated, but none granted. Twenty-seven percent did not have knowledge of any warranty waivers.

With the number of years of experience represented by the interviewees in this study, it seems unusual to have so few requests for waivers. It seems clear from this study that Congress or the reviewing political officials will not grant a warranty waiver. This is so even when warranties are shown to be costly and ineffective. Granting exemption means going against the law and accepting the risk of criticism. It appears the Congress mistakenly views waivers as a means to ensure quality.

1. Analysis

This question was designed to determine the volume of waivers that had been requested, evaluated, and granted. When the statute was passed in 1985, the majority of respondents were either in their current job or affiliated

with weapon system procurement. It would seem reasonable that upon introduction of a new statute, program managers would identify programs that they felt would not benefit from a warranty. Those programs would then be subjected to a cost-benefit analysis to attain a waiver. Even more surprisingly, is that from this entire group only ten warranty waivers had been requested and evaluated, and none were granted. It appears that since the trend has been for waivers not to be approved, program managers have focused their effort in areas where pay-offs are reasonably anticipated. For whatever reasons, it is clear that program managers are rarely requesting waivers.

m. Question 14

In your opinion, how often are thorough cost-benefit analyses performed to evaluate if a warranty was in fact cost-effective?

n. Interpretation of Responses

Forty-five percent responded that cost-benefit analyses are seldom done to determine if a warranty was cost-effective. Thirty-six percent said they did not know if this was done. Eighteen percent indicated that cost-benefit analyses are performed often to evaluate if a warranty was cost-effective.

The data indicates that in the contracting arena it is done to evaluate if a warranty was cost-effective, and that in the weapon systems procurement side, cost-benefit analyses were done based on statutes. This comment is relevant to the cost-benefit analyses required by milestone exit criteria.

o. Analysis

It is apparent that cost-benefit analyses are being performed by program managers before the contracts are signed. The cost-benefit analyses that are done in conjunction with the program decision reviews rather than to determine the potential effectiveness of a warranty. There is no record of

a cost-benefit analysis that is being performed specifically to evaluate if a warranty provision in a contract was cost-effective. In addition, the administration requirements associated with the assessment of warranties are often cost-prohibitive. The Government's information systems do not record every claim processed or action taken. This would be necessary to accurately estimate the benefit or value the Government received on a warranty.

5. Assessment of a Correlation of Warranty and Quality

This section involves only one question. The question is intended to determine if the populace interviewed believed that warranties were a tool to improve the quality of a weapon system. **a. Question 15**

Would you recommend meeting the intent of legislation of improved quality through a warranty?

b. Interpretation of Responses

Fifty-five percent responded that warranties and quality should not to be correlated as symbiotic. Forty-five percent believed that quality was improved by the use of warranties.

For complex weapon systems, the Government should focus on requirements that cost-effectively cause contractors to design high reliability into their products at the onset of a program. Designing elaborate warranty provisions misses the mark by focusing on the future rather than the present. Spending today's dollars to require the use of high reliability parts and components, infant mortality tests screening, and statistical process controls, is more effective than a warranty. Additionally, the Government can monitor over time the effectiveness that these requirements have on the system reliability. A warranty is a "tool" to apply when appropriate. Reliability improvement warranties can be used

in development contracts, and be provided for as "options" that are priced and exercised unilaterally by the Government subsequent to delivery, and which are related to discrete aspects of performance for discrete functions (at the subsystem or replaceable unit level). A warranty is a reasonable way to ensure good Quality Assurance of performance on a new start system; however, once a system has been fielded and established a good track record, waivers should be sought.

Quality is improved by process control, and Total Quality Management (TQM), not by warranty legislation. Quality is enhanced by component and end item testing to isolate deficiencies and improving the design and production processes, with contract provisions and incentives. You get quality by doing it right. Warranties do not ensure quality. Warranties will not be sold by any military or commercial contractor unless it yields an acceptable profit. In the context of purchasing a commercial product, a warranty may have some marginal impact on quality, because the contractor has total control of the design and the markets he targets. He has an incentive to get it right or he will not be in business long. Warranties are a repair vehicle, not a Quality Assurance enforcement tool or a viable tool to cause redesign, unless it is part of a lot failure under a system type warranty.

The military does not have an effective system to administer and take advantage of the warranties on its equipment. There is no incentive at the user level to track warranties. Warranties, with limitations, often expire before a piece of equipment is received by a unit due to the time spent in depot storage.

Warranties have their place in the acquisition process, but they must be viewed critically from the standpoint of real-world application and value returned for cost incurred.

c. Analysis

The intent of Congress was to ensure that the Government purchased weapon systems that were safe, and made from good materials with quality workmanship. The concern for poor workmanship and materials developed in the late 1970's and early 1980's as referenced in chapter II. There is no doubt that the quality of weapon systems is consistently being measured. This is being accomplished by a number of methods. These methods begin in concept exploration and extend through Production. There are a number of Milestone decisions that must be evaluated. Each of these decisions use cost, schedule, and performance criteria to evaluate if the weapon system meets its requirements as stated in the Mission Needs Statement and the Operational Requirements Document. A number of tests and evaluations are performed during developmental and operational testing that would identify inferior workmanship, material, or design defects. Once a weapon system has reached the production phase, the majority of defects will have been resolved to the program manager's satisfaction. It appears to be prudent to permit the program manager to perform the risk management decision on purchasing warranties. If he has performed an analysis to determine the cost-effectiveness of a warranty, it should be within his scope of authority to approve that decision. The legislative mandate is too restrictive in nature, and it imposes restrictions that it were intended to avoid - the payment for goods or services inconsistent with good business practices.

B. SUMMARY

This chapter has demonstrated through data analysis that assessment of the value of major weapon systems warranties are not being pursued. It is mandated by Federal statutes that all major weapon systems above a certain cost and production threshold have a warranty, unless the cost-benefit analysis

shows that the warranty is not cost-effective and is approved by the appropriate official (the lowest approval level for the military departments is the Secretary of the Department with authority to re-delegate to no lower than an Assistant Secretary). The number of waivers requested is surprisingly small. This is because of the statutory warranty requirement, politically sensitive nature of costly Government contracts, and the requirement that they be approved at such a high level. The intent of the statute is that warranties insure a quality product at a reasonable cost to the Government. The required cost-benefit analysis and waiver request are meant to be additional safeguards against Government waste. In this regard, the fiduciary duty of the program manager is clear; unfortunately, otherwise prudent managers are not making use of waivers as a legitimate cost cutting tool, because the requirements for obtaining waivers are too restrictive, and the cost-benefit analysis that justify them are not standardized. There is no standard for measuring the value of a warranty. The Congressional intent of the warranty statute has been exceeded. Program managers are not empowered to make viable decisions based upon their best judgment without undue consideration of restrictive regulations and perceived political constraints. As an adjunct to this, reliable and standardized cost models have not been fully developed. An overall standard has not been approved for acquisition programs and the authorization for waiver approval level is intimidating at best. This chapter has demonstrated, through data analysis, that the current warranty legislation is too restrictive for prudent use. It unnecessarily imposes an excessive influence over a program manager's ability to fulfill his fiduciary responsibilities.

V. CONCLUSIONS AND RECOMMENDATIONS

A. GENERAL

This chapter will make statements of conclusion to the Thesis Primary and Subsidiary questions. It will also provide recommendations and areas for further research. The researcher will base her conclusions and recommendations on her literature review, interviews conducted, and interview analysis results.

B. CONCLUSIONS

1. Subsidiary Question #1. How are warranties applicable to military weapon systems as compared to commercial warranties?

Warranties, whether for military weapon systems or commercial items, should provide economic benefit. They serve as a safety net for all those legitimate unforeseen errors systemic to any multi-dimensional system. Warranties, while protecting the consumer, place liability on the manufacturer to produce goods that are not inferior in quality or workmanship.

The distinct disadvantage for Military weapon systems warranties is that they are difficult to administer and the organization responsible for the equipment is not directly reimbursed for the faulty item in most cases. In contrast, the commercial warranties may be redeemed directly by the consumer.

2. Subsidiary Question #2. How does one identify and estimate the value of a warranty to the Government?

The optimal tools used for assessment of the value of warranties are through cost-benefit analyses and models. Cost-benefit analysis is the most preferred method. There are problems associated with any method selected. These problems are that the variables for an in-depth assessment vary with each weapon system. The variability and maturity of the data

selected and used may affect the evaluations and conclusions about its value.

There is a great deal of concern about the thoroughness and effectiveness of the cost-benefit analysis. The respondents had concerns about the variability of data required and the independence of the agency performing the analysis. Concern is expressed that warranties are being purchased based on the statutory mandate without regard to the cost, value, or need of the warranty.

3. Subsidiary Question #3. To what extent are program managers able to request and justify waiving the legislative mandate for warranty inclusion?

The requirements to request and justify waiving the legislative statute are clear. A cost-benefit analysis must be performed to determine the value of the warranty. This should include benefits of warranty versus cost to the Government to administer and enforce the warranty, cost for correction or replacement in absence of warranty, and cost to keep warranties in effect.

The process for waivers is attainable but difficult. The requirement for Congressional notification and level of waiver authority stifle attempts to waive the warranty where it would not be cost-effective. (Streamlining Defense Acquisition Laws, 1993, p. 2-116) There is a reluctance to issue warranty waivers. This may result in the purchase of warranties without regard to their cost-effectiveness. (Streamlining Defense Acquisition Laws, 1993, p. 2-116)

4. To what extent do warranties impact product quality in design manufacturing, materials and workmanship, and performance specifications?

The impact of warranties on product quality in design manufacturing, materials, workmanship, and performance specifications are less significant than the numerous evaluations and tests that the weapon system must pass. Once a weapon system has reached the production phase, it has been

thoroughly scrutinized to ensure conformance with specifications, requirements, design criteria, and testing and evaluation to name a few. At each milestone decision, programs are thoroughly assessed to ensure that the critical performance requirements are attained in order to continue to the next acquisition level. The level and number of requirements impact far more on the product quality than the warranty requirement.

5. Primary Research Question. To what extent is the warranty legislation expected to be effective in providing relief for the real-world problems which program managers must overcome to successfully structure, implement, and administer warranties?

The warranty legislation exceeds the purpose for which it was drafted.

The solution to the acquisition problems of the past has been too simply promulgate regulations insisting that whatever problem has occurred never ever occur again. The resulting body of procurement "law" has therefore been evolutionary - rather than the product of a carefully considered, effort to determine how best to manage military procurement. (Cleland, Gallagher and Whitehead, 1993, p. 1.9)

Project managers are not empowered to fully perform their fiduciary responsibility. In this complex political environment, the system of checks and balances is proving costly when we educate, train, and place responsibility for performance with the program manager but neglect to allow him flexibility to perform his duties free of obtrusive restrictions. The objective should be for him to justify why a warranty is necessary and cost-effective; his justification and subsequent recommendations should serve as the primary basis for the warranty decision.

C. RECOMMENDATIONS

1. Performance of a cost-benefit analysis to determine if a warranty is justified for the weapon system.

The objective should be for the program manager to justify if a warranty is necessary and cost-effective. A cost-benefit analysis must be independently supervised, include a standardized model, and justify a warranty before the Request for Proposal (RFP) is released for the production contract.

2. Implementation instructions to specify under what conditions warranty waivers will be considered for approval.

The program manager must have a degree of confidence that his cost-benefit analysis is complete, and that it conclusively shows that the value of the warranty is not cost-effective. Once this is finalized, it should be clearly discernable as to the appropriate criteria that must be met to proceed with a request for a warranty waiver.

3. Reevaluation of the appropriate level for approval of warranty waivers.

The Assistant Secretary for the Service for Military Departments is the first individual in the chain of command authorized to grant a warranty waiver. This approval level may be too difficult to obtain with the contracting time constraints. The waiver must be approved before the actual contract is signed. It may be more appropriate to initiate the request for a waiver at the time that the Request for Proposal is released.

4. Standardization of a cost-benefit model to determine the value of a warranty that could be tailored to a specific weapon system.

There are a number of cost analysis models that could be adapted. The problem lies in the determination of which model is most appropriate for a given system. Perhaps a system similar to that used for software development could be developed and adapted for the specific program.

D. AREAS FOR FURTHER RESEARCH

1. A standardized model or systemized approach to evaluate the value of a warranty.

A comprehensive study is necessary to evaluate and standardize parameters that will indicate the value of a warranty. A systemic approach will ensure that the evaluation is thorough and is reflective of the true value of the warranty.

2. Develop training programs on warranties for Government weapon systems.

The Government is in need of a standardized process that enables key personnel to evaluate the adequacy of cost-benefit analyses. The most appropriate method is to establish a training program that is comprehensive, and covers the approved models and cost-benefit analyses being used by the Government.

The Government has numerous computerized systems to capture data on weapon systems. Appropriate tools to track, quantify and qualify the value of warranties must be included. Optimizing of training opportunities may be the key to assist the Government in identifying and providing standardized cost-benefit analyses.

APPENDIX A. WARRANTY LAW

A. CURRENT WARRANTY LAW

This appendix is a complete citation of the current warranty in effect. This law originated in the 1984 Congress and was enacted as law in the 1985 Appropriations Bill. Included in this section are each of the three supplements as they pertain to warranty law.

B. UNITED STATES CODE, TITLE 10, SECTION 2403, 1988. MAJOR WEAPON SYSTEMS: CONTRACTOR GUARANTEES

1. United States Code, Major Weapon Systems: Contractor Guarantees

(a) In this section:

(1) the term "Weapon system" means items that can be used directly by the armed forces to carry out combat missions and that cost more than \$100 thousand or for which the eventual total procurement cost is more than \$10, million. such term does not include commercial items sold in substantial quantities to the general public.

(2) the term "prime contractor" means a party that enters into an agreement directly with the United States to furnish part or all of a weapon system.

(3) the term "design and manufacturing requirements" means structural and engineering plans and manufacturing particulars, including precise measurements, tolerances, materials, and finished product tests for the weapon system being produced.

(4) The term "essential performance requirements", with respect to a weapon system, means the operating capabilities or maintenance and reliability characteristics of the system that are determined by the Secretary of Defense to be necessary for the system to fulfill the military requirement for which the system is designed.

(5) The term "component" means any constituent element of a weapon system.

(6) the term "mature full-scale production" means the manufacture of all units of a weapon system after the manufacture of the first one-tenth of the eventual total production or the initial production quantity of such system, whichever is less.

(7) The term "initial production quantity" means the number of units of a weapon system contracted for in the first year of full-scale production.

(8) The term "head of an agency" has the meaning given that term in section 2302 of this title.

(b) Except as otherwise provided in this section, the head of an agency may not after January 1, 1985, enter into a contract for the production of a weapon system unless each prime contractor for the system provides the United States with written guarantees That--

(1) The time provided under the contract will conform to the design and manufacturing requirements specifically delineated in the production contract (or in any amendment to that contract);

(2) the item provided under the contract, at the time it is delivered to the United States, will be free from all defects in materials and workmanship;

(3) the item provided under the contract will conform to the essential performance requirements of the item as specifically delineated in the production contract (or in any amendment to that contract); and

(4) if the item provided under the contract fails to meet the guarantee specified in clause (1), (2), or (3), the contractor will at the election of the Secretary of Defense or as otherwise provided in the contract--

(A) promptly take such corrective action as may be necessary to correct the failure at not additional cost to the

United States; or

(B) pay costs reasonably incurred by the United States in taking such corrective action.

(c) The head of the agency concerned may not require guarantees under subsection (b) from a prime contractor for a weapon system, for a component of a weapon system, that is furnished by the United States to the contractor.

(d) Subject to subsection (e)(1), the Secretary of Defense may waive part or all of subsection (b) in the case of a weapon system, or component of a weapon system, if the Secretary determines--

(1) that the waiver is necessary in the interest of national defense; or

(2) that a guarantee under that subsection would not be cost-effective. The Secretary may not delegate authority under this subsection to any person who holds a position below the level of Assistant Secretary of Defense or Assistance Secretary of a military department.

(e)(1) Before making a waiver under subsection (d) with respect to a weapon system that is a major defense acquisition program for the purpose of section 2432 of this title, the Secretary of Defense shall notify the Committees on Armed Services and on Appropriations of the Senate and House of Representatives in writing of his intention to waive any or all of the requirements of subsection (b) with respect to that system and shall include in the notice an explanation of the reasons for the waiver.

(2) Not later than February 1 of each year, the Secretary of Defense shall submit to the committees specified in paragraph (1) a report identifying each waiver made under subsection (d) during the preceding calendar year for a weapon system that is not a major defense acquisition program for the purpose of section 2432 of this title and shall include in the report an explanation of the reasons for the waivers.

(f) The requirement for a guarantee under subsection (b)(3) applies only in the case of a contract for a weapon system that is in maturer full-scale production. However, nothing in this section prohibits the head of the agency concerned from negotiating a guarantee similar to the guarantee described in that subsection for a weapon system not yet in mature full-scale production. When a contract for a weapon system not yet in mature full-scale production is not to include the full guarantee described in subsection (b)(3), the Secretary shall comply with the notice requirements of subsection (e).

(g) Nothing in this section prohibits the head of the agency concerned from--

(1) negotiating the specific details of a guarantee, including reasonable exclusions, limitations and time duration, so long as the negotiations and time duration, so long as the negotiated guarantee is consistent with the general requirements of this section;

(2) requiring that components of a weapon system furnished by the United States to a contractor be properly installed so as not to invalidate any warranty or guarantee provided by the manufacturer of such component to the United states;

(3) reducing the price of any contract for a weapon system or other defense equipment to take account of any payment due from a contractor pursuant to subclause (B) of subsection (b)(4);

(4) in the case of a dual source procurement, exempting from the requirements of subsection (b)(3) an amount of production by the second source contractor equivalent to the first one-tenth of the eventual total production by the second source contractor; and

(5) using written guarantees to a greater extent than required by this section, including guarantees that exceed those in clauses (1), (2), and (3) of subsection (b) and

guarantees that provide more comprehensive remedies than the remedies specified under clause (4) of that subsection.

(h) (1) the Secretary of Defense shall prescribe such regulations as may be necessary to carry out this section.

(2) This section does not apply to the Coast Guard or to the National Aeronautics and Space Administration.

APPENDIX B. FEDERAL ACQUISITION REGULATION

A. FEDERAL ACQUISITION REGULATION

The Federal Acquisition Regulation Part 46 with each subpart is provided in its entirety for the readers reference to specific regulatory issues regarding warranties. Key factors in Government Procurement are reviewed with the basic document for a clear understanding of the intent of the regulation.

B. FEDERAL ACQUISITION REGULATION

1. The Federal Acquisition Regulation part 46, subpart 46.702 General

(a) The principal purposes of a warranty in a government contract are

(1) to delineate the rights and obligations of the contractor and the Government for defective items and services and

(2) to foster quality performance.

(b) Generally, a warranty should provide--

(1) A contractual right for the correction of defects notwithstanding any other requirement of the contract pertaining to acceptance of the supplies or services by the Government; and

(2) A stated period of time or use, or the occurrence of a specified event, after acceptance by the Government to assert a contractual right for the correction of defects.

(3) The benefits to be derived from a warranty must be commensurate with the cost of the warranty to the Government.

2. The Federal Acquisition Regulation part 46, subpart 46.703 Criteria for use of Warranties

The use of warranties is not mandatory. In determining

whether a warranty is appropriate for a specific acquisition, the contracting officer shall consider the following factors:

(a) Nature and use of supplies or services. This includes such factors as--

- (1) Complexity and function;
- (2) Degree of development;
- (3) State of the art;
- (4) End use;
- (5) Difficulty in detecting defects before acceptance; and

(6) Potential harm to the government if the item is defective.

(b) Cost. Warranty costs arise from--

- (1) The contractor's charge for accepting the deferred liability created by the warranty; and
- (2) Government administration and enforcement of the warranty (see paragraph (c) below).

(c) Administration and enforcement. The Government's ability to enforce the warranty is essential to the effectiveness of any warranty. There must be some assurance that an adequate administrative system for reporting defects exists or can be established. The adequacy of a reporting system may depend upon such factors as the--

- (1) Nature and complexity of the item;
- (2) Location and proposed use of the item;
- (3) Storage time for the item;
- (4) Distance of the using activity from the source of the item;

(5) Difficulty in establishing existence of defects; and

(6) Difficulty in tracing responsibility for defects.

(d) Trade practice. In many instances an item is customarily warranted in the trade, and as a result of that

practice, the cost of an item to the Government will be the same whether or not a warranty is included. In those instances, it would be in the Government's interest to include such a warranty.

(e) Reduced requirements. The contractor's charge for assumption of added liability may be partially or completely offset by reducing the Government's contract quality assurance requirements when the warranty provides adequate assurance of a satisfactory product.

(3) Authority for use of Warranties

The use of a warranty in an acquisition shall be approved in accordance with agency procedures.

(4) Limitations

(a) Except for the warranties in the clauses at 52.246-3, Inspection of Supplies -- Cost-Reimbursement, and 52.246-8, Inspection of Research and Development-- Cost-reimbursement, the contracting officer shall not include warranties in cost-reimbursement contracts, unless authorized in accordance with agency regulations (see 46.708).

(b) Warranty clauses shall not limit the Government's rights under an inspection clause (see Subpart 46.3) in relation to latent defects, fraud, or gross mistakes that amount to fraud.

(c) Except for warranty clauses in construction contracts, warranty clauses shall provide that the warranty applies notwithstanding inspection and acceptance or other clauses or terms of the contract.

(5) Warranty Terms and Conditions

(a) To facilitate the pricing and enforcement of warranties, the contracting officer shall ensure that warranties clearly state the--

- (1) Exact nature of the item and its components and characteristics that the contractor warrants;
- (2) Extent of the contractors warranty

including all of the contractor's obligations to the Government for breach of warranty;

(3) Specific remedies available to the Government; and

(4) Scope and duration of the warranty.

(b) The contracting officer shall consider the following guidelines when preparing warranty terms and conditions:

(1) Extent of contractor obligations

(i) Generally, the contractor's obligations under warranties extend to all defects discovered during the warranty period, but do not include damage caused by the Government. When a warranty for the entire item is not advisable, a warranty may be required for a particular aspect of the item that may require special protection (e.g., installation, components, accessories, subassemblies, preservation, packaging, and packing, etc.).

(ii) If the Government specifies the design of the end item and its measurements, tolerances, materials, tests or inspection requirements, the contractor's obligations for correction of defects shall usually be limited to defects in material and workmanship or failure to conform to specifications. If the Government does not specify the design, the warranty extends also to the usefulness of the design.

(iii) If express warranties are included in a contract (except contracts for commercial items), all implied warranties of merchantability and fitness for a particular purpose shall be negated by the use of specific language in the clause (see clauses 52.246-17, Warranty of Supplies of a Noncomplex Nature; and 52.246-19, Warranty of Systems and Equipment under Performance Specifications or Design Criteria).

(2) Remedies

(i) Normally, a warranty shall provide as a minimum that the Government may

(A) obtain an equitable adjustment of the contract, or

(B) direct the contractor to repair or replace the defective items as the contractor's expense.

(ii) If it is not practical to direct the contractor to make the repair or replacement, or, because of the nature of the item, the repair or replacement does not afford an appropriate remedy to the Government, the warranty should provide alternate remedies, such as authorizing the Government to--

(A) retain the defective item and reduce the contract price by an amount equitable under the circumstances; or

(B) arrange for the repair or replacement of the defective item, by the Government or by another source, at the contractor's expense.

(iii) If it can be foreseen that it will not be practical to return an item to the contractor for repair, to remove it to an alternate source for repair, or to replace the defective item, the warranty should provide that the Government may repair, or require the contractor to repair, the item in place at the contractor's expense. The contract shall provide that the circumstance where the Government is to accomplish the repair, the contractor will furnish at the place of delivery the material or parts, and the installation instructions required to successfully accomplish the repair.

(vi) Unless provided otherwise in the warranty, the contractor's obligation to repair or replace the defective item, or to agree to an equitable adjustment of the contract, shall include responsibility for the costs of furnishing all labor and material to

(A) reinspect items that the Government reasonably expected to be defective,

(B) accomplish the required repair or replacement of defective items, and

(C) test, inspect, package, pack, and mark repaired or replaced items.

(v) If repair or replacement of defective items is required, the contractor shall generally be required by the warranty to bear the expense of transportation for returning the defective item from the place of delivery specified in the contract (irrespective of the f.o.b. point or the point of acceptance) to the contractor's plant and subsequent return. When defective items are returned to the contractor from other than the place of delivery specified in the contract, or when the Government exercises alternate remedies, the contractor's liability for transportation charges incurred shall not exceed an amount equal to the cost of transportation by the usual commercial method of shipment between the place of delivery specified in the contract and the contractor's plant and subsequent return.

(3) Duration of the warranty. The time period or duration of the warranty must be clearly specified and shall be established after consideration of such factors as

(i) the estimated useful life of the item,

(ii) the nature of the item including storage or shelflife, and

(iii) trade practice. The period specified shall not extend the contractor's liability for patent defects beyond a reasonable time after acceptance by the Government.

(4) Notice. The warranty shall specify a reasonable time for furnishing notice to the contractor regarding the discovery of defects. this notice period, which

shall apply to all defects discovered during the warranty period, shall be long enough to assure that the government has adequate time to give notice to the contractor. The contracting officer shall consider the following factors when establishing the notice period:

- (i) the time necessary for the Government to discover the defects.

- (ii) The time reasonably required for the Government to take necessary administrative steps and make a timely report of discovery of the defects to the contractor.

- (iii) The time required to discover and report defective replacements.

(5) Markings. The packaging and preservation requirements of the contract shall require the contractor to stamp or mark the supplies delivered or otherwise furnished notice with the supplies of the existence of the warranty. The purpose of the markings or notice is to inform Government personnel who store, stock, or use the supplies that the supplies are under warranty. Markings may be brief but should include

- (i) a brief statement that a warranty exists,

- (ii) the substance of the warranty,

- (iii) its duration, and

- (vi) who to notify if the supplies are found to be defective. For commercial items (see 46.709), the contractor's trade practice in warranty marking is acceptable if sufficient information is presented for supply personnel and users to identify warranted supplies.

(6) Consistency. contracting officers shall ensure that the warranty clause and any other warranty conditions in the contract (e.g., in the specifications or an inspection clause) are consistent. To the extent practicable, all of the warranties to be contained in the contract should

be expressed in the warranty clause.

6. Pricing Aspects of Fixed-price Incentive Contract warranties

If a fixed-price incentive contract contains a warranty (see 46.708), the estimated cost of the warranty to the contractor should be considered in establishing the incentive target price and the ceiling price of the contract. All costs incurred, or estimated to be incurred, by the contractor in complying with the warranty shall be considered when establishing the total final price. Contractor compliance with the warranty after the establishment of the total final price shall be at no additional cost to the Government.

7. Warranties of Data

Warranties of data shall be developed and used in accordance with agency regulations.

8. Warranties of Commercial Items

If a warranty of commercial items is appropriate, the contracting officer may include a warranty of supplies clause modified for commercial items (see the clause at 52.246-17, warranty of Supplies of a Noncomplex Nature, Alternate I, and 52.246-18, warranty of supplies of a complex Nature, alternate I). More appropriate warranty language may be included if the contracting officer determines that the Government's planned usage of the item is inconsistent with the item's normal usage, or that Government specifications have substantially altered the item. The Government may adopt the contractor's standard commercial warranty if the contracting officer determines it is not inconsistent with the rights that would be afforded the Government under a warranty of supplies clause (see the clauses at 52.246-17, Warranty of Supplies of Noncomplex Nature, and 52.246-18, Warranty of supplies of a Complex Nature) or other terms of the contract.

9. Contract Clauses

The clauses and alternates prescribed in this section may

be used in solicitations and contracts in which inclusion of warranty overage is appropriate. However, because of the many situations that may influence the warranty terms and conditions appropriate to a particular acquisition, the contracting officer may vary the terms and conditions of the clauses and alternates to the extent necessary. The alternates prescribed in this section address the clauses; however, the conditions pertaining to each alternate must be considered if the terms and conditions are varied to meet a particular need.

(a) (1) The contracting officer may insert a clause substantially the same as the clause at 52.246-17, Warranty of Supplies of a Noncomplex Nature, in solicitations and contracts for noncomplex items when a fixed price supply contract is contemplated and the use of a warranty clause has been approved under agency procedures.

(2) If commercial items are to be acquired, the contracting officer may use the clause with its Alternate I.

(3) If it is desirable to specify that necessary transportation incident to correction or replacement will be at the Government's expense (as might be the case if, for example, the cost of a warranty would otherwise be prohibitive), the contracting officer may use the clause with its Alternate II.

(4) If the supplies cannot be obtained from another source, the contracting officer may use the clause with its Alternate III.

(5) If a fixed-price incentive contract is contemplated, the contracting officer may use the clause with its Alternative IV.

(6) If it is anticipated that recovery of the warranted item will involve considerable Government expense for disassembly and/or reassembly of larger items, the contracting officer may use the clause with its Alternate V.

(b) (1) the contracting officer may insert a

clause substantially the same as the clause at 52.246-18, Warranty of Supplies of a Complex Nature, in solicitations and contracts for deliverable complex items when a fixed price supply or research and development contract is contemplated and the use of a warranty clause has been approved under agency procedures.

(2) If commercial items are to be acquired, the contracting officer may use the clause with its Alternate I.

(3) If it is desirable to specify that necessary transportation incident to correction or replacement will be at the Government's expense (as might be the case if, for example, the cost of a warranty would otherwise be prohibitive), the contracting officer may use the clause with its Alternate II.

(4) If a fixed-price incentive contract is contemplated, the contracting officer may use the clause with its Alternate III.

(5) If it is anticipated that recovery of the warranted item will involve considerable Government expense for disassembly and/or reassembly of larger items, the contracting officer may use the clause with its Alternative IV.

(c) (1) the contracting officer may insert a clause substantially the same as the clause at 52.246-19, Warranty of Systems and Equipment under Performance Specifications or Design Criteria, in solicitations and contracts when performance specifications or design are of major importance; a fixed-price supply, service, or research and development contract for systems and equipment is contemplated; and the use of a warranty clause has been approved under agency procedures.

(2) If it is desirable to specify that necessary transportation incident to correction or replacement

will be at the Government's expense (as might be the case if, for example, the cost of a warranty would otherwise be prohibitive), the contracting officer may use the clause with its Alternate I.

(3) If a fixed-price incentive contract is contemplated, the contracting officer may use the clause with its Alternate II.

(4) If it is anticipated that recovery of the warranted item will involve considerable Government expense for disassembly and/or reassembly of larger items, the contracting office may use the clause with its Alternate III>

(d) The contracting officer may insert a clause substantially the same as the clause at 52.246-20, Warranty of Services, in solicitations and contract for services when a fixed-price contract for services is contemplated and the use of a warranty clause has been approved under agency procedures; unless a clause substantially the same as the clause at 52.246-19, Warranty of Systems and Equipment under Performance Specifications or Design Criteria has been used.

(e) (1) The contracting officer may insert a clause substantially the same as the clause at 52.246-21, Warranty of construction, in solicitations and contracts when a fixed-price construction contract (see 46.705(c)) is contemplated and the use of a warranty clause has been approved under agency procedures.

(2) If the Government specifies in the contract the use of any equipment by "brand name and model," the contracting officer may use the clause with its Alternate I. **(FAR part 46, subpart 702-710 pp. 18921-18925)**

APPENDIX C. DEPARTMENT OF DEFENSE POLICY

A. DEFENSE FEDERAL ACQUISITION REGULATION

The Federal Acquisition Regulation Part 246 with each subpart is provided in its entirety for the readers reference to specific regulatory issues regarding warranties. Key factors in Government Procurement are reviewed with the basic document for a clear understanding of the intent of the regulation.

B. DEFENSE FEDERAL ACQUISITION REGULATION

1. 246.701 Definitions

Acceptance, as defined in FAR 46.701 and as used in this subpart and in the warranty clauses at FAR 52.246-17, Warranty of Supplies of a Noncomplex Nature; FAR 52.246-18, Warranty of Supplies of a Complex Nature; FAR 52.246-19, Warranty of Systems and Equipment Under Performance Specifications or Design Criteria; and FAR 52.246-20, Warranty of Services, includes the execution of an official document (e.g., DD Form 250, Material Inspection and Receiving Report) by an authorized representative of the Government.

Defect, as used in this subpart, means any condition or characteristic in any supply or service furnished by the contractor under the contract that is not in compliance with the requirements of the contract.

2. 246.702 General

Departments and agencies shall establish procedures to track and accumulate data on warranty costs.

3. 246.703 Criteria for use of Warranties

The use of warranties in the acquisition of weapon systems is mandatory (10 U.S.C> 2403) unless a waiver is authorized (see 246.770-8).

(b) Cost. Contracting officers may include the cost of a warranty as part of an item's price or as a separate contract line item.

4. 246.704 Authority for use of Warranties

The chief of the contracting office must approve use of a warranty, except in acquisitions for--

- (1) Weapons Systems (see 246.770)
- (2) Commercial supplies or services (see FAR 46.709);
- (3) Technical data, unless the warranty provides for extended liability (see 246.708)
- (4) Supplies and services in fixed price type contracts containing quality assurance provisions that reference MIL-I-45208, Inspection System Requirement, or MIL-Q-9858, Quality Program Requirements; or
- (5) Supplies and services in construction contracts when using the warranties that are contained in Federal, Military, or construction guide specifications.

5. 246.705 Limitations

(a) Warranties in the clause at 252.246-7001, warranty of Data, are also an exception to the prohibition on use of warranties in cost-reimbursement contracts.

6. 246.706 Warranty Terms and Conditions

(b)(5) Markings. Use MIL Standard 129 Marking for Shipments and Storage, and MIL Standard 130, Identification Marking of U.S. Military Property, when marking warranty items.

7. 246.708 Warranties of Data

Obtain warranties on technical data when practicable and cost-effective. Consider the factors in FAR 46.703 in deciding whether to obtain warranties of technical data. Consider the following in deciding whether to use extended liability provisions--

- (1) The likelihood that correction or replacement

of the nonconforming data, or a price adjustment, will not give adequate protection to the Government; and

(2) The effectiveness of the additional remedy as a deterrent against furnishing nonconforming data.

8. 246.710 Contract Clauses

(1) Use a clause substantially the same as the clause at 252.246-7013, Rights in Technical Data and Computer Software, and there is a need for greater protection or period of liability than provided by other contract clauses, such as the clauses at--

(i) FAR 52.246-3, Inspection of Supplies-- Cost-Reimbursement;

(ii) FAR 52.246-6, Inspection-- Time-and-Material and Labor-Hour;

(iii) FAR 52.246-8, Inspection of Research and Development-- Cost-Reimbursement; and

(iv) FAR 52.246-19, Warranty of Systems and Equipment Under Performance Specifications or Design Criteria.

(2) Use the clause at 252.246-7001, Warranty of Data, with its Alternate I when extended liability is desired and fixed price incentive contract is contemplated.

(3) Use the clause at 252.246-7001, Warranty of Data, and with its Alternate II when extended liability is desired and a firm fixed price contract is contemplated.

9. 246.770 Warranties in Weapon System Acquisitions

This section sets forth policies and procedures for use of warranties in contracts for weapon system production.

10. 246.770-1 Definitions

As used in this section--

(a) At no additional cost to the government means--

(1) At no increase in price for firm fixed price contracts;

(2) At no increase in target or ceiling price for fixed price incentive contracts (see also FAR 46.707); or

(3) At no increase in estimated cost or fee for cost-reimbursement contracts.

(b) Design and manufacturing requirements means structural and engineering plans and manufacturing particulars, including precise measurements, tolerances, materials and finished product tests for the weapon system being produced.

(c) Essential performance requirements means the operating capabilities and maintenance and reliability characteristics of a weapon system that the agency head determines to be necessary to fulfill the military requirement.

(d) Initial production quantity means the number of units of a weapon system contracted for in the first program year of full-scale production.

(e) Maturer full-scale production means follow-on production of a weapon system after manufacture of the lesser of the initial production quantity or one-tenth of the eventual total production quantity.

(f) Weapon system means a system or major subsystem used directly by the Armed Forces to carry out combat missions.

(1) the term includes, but is not limited to, the following (if intended for use in carrying out combat missions)--

- (i) Tracked and wheeled combat vehicles;
- (ii) Self-propelled, towed and fixed guns, howitzers and mortars;
- (iii) Helicopters;
- (iv) Naval vessels;
- (v) Bomber, fighter, reconnaissance and electronic warfare aircraft;
- (vi) Strategic and tactical missiles including launching systems;
- (vii) Guided munitions;

(viii) Military surveillance, command, control, and communication systems;

(ix) Military cargo vehicles and aircraft;

(x) Mines;

(xi) Torpedoes;

(xii) Fire control systems;

(xiii) Propulsion systems;

(xiv) Electronic warfare systems; and

(xv) safety and survival systems.

(2) The term does not include--

(i) Commercial items sold in substantial quantities to the general public (see FAR 15.804-3(c)); or

(ii) spares, repairs or replenishment parts;

or

(iii) related support equipment (e.g., ground-handling equipment, training devices and accessories, ammunition), unless an effective warranty would require inclusion of such items.

11. 246.770-2 Policy

(a) Under 10 U.S.C. 2403, departments and agencies may not contract for the production of a weapon system with a unit weapon system cost of more than \$100,000 or and estimated total procurement cost in excess of \$10 million unless--

(1) Each contractor for the weapon system provides the Government written warranties that--

(i) the weapon system conforms to the design and manufacturing requirements in the contract (or any modifications to that contract),

(ii) The weapon system is free from all defects in materials and workmanship at the time of acceptance or delivery as specified in the contract; and

(iii) the weapon system, if manufactured in mature full-scale production, conforms the essential performance requirements of the contract (or any modification

to that contract); and

(2) The contract terms provide that, in the event the weapon system fails to meet the terms of the above warranties, the contracting officer may--

(i) Require the contractor to promptly track necessary corrective action (e.g., repair, replace, and/or redesign) at no additional cost to the Government;

(ii) Require the contractor to pay costs reasonably incurred by the Government in taking necessary corrective action; or

(iii) Equitably reduce the contract price; or

(3) A waiver is granted under 246.770-8.

(b) contracting officers may require warranties that provide greater coverage and remedies than specified in paragraph (a) of this subsection, such as including an essential performance requirement warranty in other than a mature full-scale production contract.

(c) When the contract includes an essential performance requirement warranty, the warranty must identify redesign as a remedy available to the Government.

(1) The period during which redesign must be available as a remedy shall not end before operational use, operational testing, or a combination of operational use and operational testing has demonstrated that the warranted item's design has satisfied the essential performance requirements.

(2) When essential performance requirements are warranted in contracts with alternate source contractors, do not include redesign as a remedy available to the Government under those contracts until the alternate source has manufactured the first ten percent of the eventual total production quantity anticipated to be acquired from that contractor (see 246.770-5).

12. 246.770-3 Tailoring Warranty Terms and Conditions

(a) Since the objectives and circumstances vary

considerably among weapon system acquisition programs, contracting offices must tailor the required warranties on a case-by-case basis. The purpose of tailoring is to get a cost-effective warranty in light of the technical risk, or other program uncertainties, while ensuring that the Government still acquires the basic warranties described in 246.770-2. Tailoring shall not be used as a substitute for acquiring a warranty waiver.

(1) Tailoring may affect remedies, exclusions, limitations, and duration provided such are consistent with the specific requirements of this section (see also FAR 46.706).

(2) Clearly relate the duration of any warranty to the contract requirements and allow sufficient time to demonstrate achievement of the requirements after acceptance.

(3) Tailor the terms of the warranty, if appropriate, to exclude certain defects for specified supplies (exclusions) or to limit the contractor's liability under the terms of the warranty (limitations).

(4) Structure broader and more comprehensive warranties when advantageous or narrow the scope when appropriate. For example, it may be inappropriate to require warranty of all essential performance requirements for a contractor that did not design the system.

(b) DOD policy is to exclude any terms that cover contractor liability for loss, damage, or injury to third parties from warranty clauses.

(c) Ensure acquisition of subsystems and components in a manner which does not affect the validity of the weapon system warranty.

13. 246.770-4 Warranties on Government-Furnished property

Contracting officers shall not require contractors to provide the warranties specified in 246.770-2 on any property

furnished the contractor by the Government, except for--

- (a) Defects in installation;
- (b) Installation or modification in such a manner that invalidates a warranty provided by the manufacturer of the property; or
- (c) Modifications made to the property by the contractor.

14. 246.770-5 Exemption for Alternate Source Contractor(s)

Agency heads may exempt alternate source contractor(s) from the essential performance warranty requirements of 246.770-2(a)(1)(iii) until that contractor manufactures the first ten percent of its anticipated total production quantity.

15. 246.770-6 Applicability to Foreign Military Sales (FMS)

(a) The warranty requirements of 246.770-2 are not mandatory for FMS production contracts. DOD policy is to obtain the same warranties on conformance to design and manufacturing requirements and against defects in material and workmanship as it gets for U.S. supplies.

(b) DOD normally will not obtain essential performance warranties for FMS purchasers. However, where contracting officer cannot separately identify the cost for the warranty of essential performance requirements, the foreign purchase shall be given the same warranty that the United States gets.

(c) If an FMS purchaser expressly requests a performance warranty in the letter of acceptance, the Government will exert its best efforts to obtain the same warranty obtained for U.S. equipment. Or, if specifically requested by the FMS purchaser, obtain a unique warranty.

(d) The costs for warranties for FMS purchasers may be different from the costs for such warranties for the

Government due to factors such as overseas transportation and any tailoring to reflect the unique aspects of the FMS purchaser.

(e) Ensure that FMS purchasers bear all of the acquisition and administrative costs of any warranties.

16. 246.770-7 Cost-benefit Analysis

(a) In assessing the cost-effectiveness of a proposed warranty, perform an analysis which considers both the quantitative and qualitative costs and benefits of the warranty. Consider--

(1) Costs of warranty acquisition, administration, enforcement, and user costs, and any costs resulting from limitations imposed by the warranty provisions;

(2) Costs incurred during development specifically for the purpose of reducing production warranty risks;

(3) Logistical and operational benefits as a result of the warranty as well as the impact of the additional contractor motivation provided by the warranty.

(b) Where possible, make a comparison with the costs of obtaining and enforcing similar warranties on similar systems.

(c) Document the analysis in the contract file. If the warranty is not cost-effective, initiate a waiver request under 246.770-8.

17. 246.770-8 Waiver and Notification Procedures

(a) The Secretary of Defense has delegated waiver authority within the limits specified in 10 U.S.C.2403. The waiving authority for the defense agencies is the Assistance Secretary of Defense (Production and Logistics). The waiving authority for the military departments is the Secretary of the department with authority to redelegate no lower than an Assistance Secretary. The waiving authority may waive one or more of the weapons system warranties required by 246.770-2 if--

(1) the waiver is in the interests of national

defense; or

(2) the warranty would not be cost effective.

(b) Waiving authorities must make the following notifications or reports to the Senate and House Committees on Armed Services and Appropriations for all waivers--

(1) Major weapon systems. For a weapon system that is a major Defense acquisition program for the purpose of 10 U.S.C. 2432, the waiving official must notify the Committees in writing of an intention to waive one or more of the required warranties. Included an explanation of the reasons for the waiver in the notice. Ordinarily provide the notice 30 days before granting a waiver.

(2) Other Weapon Systems. For weapon systems that are not major Defense acquisition programs for the purpose of 10 U.S.C. 2432, waiving officials must submit an annual report not later than February 1 of each year. List the waivers granted in the preceding calendar year in the report and include an explanation of the reasons for granting each waiver.

(3) Weapon Systems Not in Mature Full-Scale Production. Although a waiver is not required, if a production contract for a major weapon system not yet in mature full-scale production will not include a warranty on essential performance requirements, the waiving officials must comply with the notice requirements for major weapon systems.

(c) departments and agencies shall issue procedures for processing waivers, notifications, and reports to Congress.

(1) request for waiver shall include--

(i) A brief description of the weapon system and its stage of production, e.g., the number of units delivered and anticipated to be delivered during the life of the program;

(ii) Identification of the specific warranty or warranties required by 246.770-2(a)(1) for which the waiver

is requested;

(iii) the duration of the waiver if it is to go beyond the contract;

(vi) the rationale for the waiver (if the waiver request is based on cost effectiveness, include the results of the cost-benefit analysis);

(v) A description of the warranties or other techniques used to ensure acceptable field performance of the weapon system, e.g., warranties, commercial or the guarantees obtained on individual components; and

(vi) Exercise date of the warranty option, if applicable.

(2) Notifications and reports shall include--

(i) A brief description of the weapon system and its stage of production; and

(ii) Rationale for not obtaining a warranty.

(3) Keep a written record of each waiver granted and notification and report made, together with supporting documentation such as a cost-benefit analysis, for use in answering inquiries. (DOD 246.701 pp. 24810-24814)

APPENDIX D. UNITED STATES ARMY ACQUISITION POLICY

A. UNITED STATES ARMY FEDERAL ACQUISITION REGULATION

The United States Army Federal Acquisition Regulation Part 46 with each subpart is provided in its entirety for the readers reference to specific regulatory issues regarding warranties. Key factors in Government Procurement are reviewed with the basic document for a clear understanding of the intent of the regulation.

B. ARMY 46.770: QUALITY ASSURANCE

1. 46.770-1 Definitions

(c) Authority to designate which features of a weapon system are its essential performance requirements and to subsequently modify, supersede or cancel such requirements is delegated to the Heads of Contracting Activity (HCA's), without authority to redelegate. See Warranty Guidebook, Defense Systems Management College, Fort Belvoir, VA 22060-5426, for information on selection of essential performance requirements. [AL 92-4, 4/24/92; AL 93-3, 3/31/93]

2. 46.770-5 Exemption for Alternate Source Contractor(s)

Requests for exemption shall be signed by the HCA and forward to the address in 1.290(b)(1) prior to award of the contract. AMC organizations shall forward such requests through Headquarters, AMC. [AL 92-4, 4/24/92]

3. 46.770-7 Cost-Benefit Analysis

(c) Document the results of the analysis in the Business Clearance Memorandum. If it is uncertain whether a cost-effecting warranty can be obtain, and time does not permit further analysis, obtaining a waiver, or making the required notifications prior to contract award, the contract may be awarded if--

(i) The contract provides that the warranty may be

deleted from the contract and an equitable adjustment obtained, and

(ii) An award on such a basis has been approved by the Head of the Contracting Activity. This approval authority shall not be redelegate. [AL 92-4, 4/24/92]

4. 46.770-8 Waiver and Notification Procedures

(a) Request for waiver shall be signed by the Head of the Contracting activity and shall be submitted with supporting justification (through Headquarters, AMC for AMC organizations to the addressee in 1.290(b)(1) at least 45 days prior to the anticipated award date. Contract award will not be made until the waiver is approved and Congressional notification (when required) is complete.

(c)(1) (S-90) each request for waiver will include the information required by DFARS 246.770-8(c)(1) plus:

(i) Identification of all warranty costs and procedures used to evaluate cost-effectiveness. This should include benefits of warranty vs cost to Government to administer and enforce warranty, cost for correction or replacement in absence of warranty and costs to keep warranties in effect.

(ii) The efforts made to negotiate a modified warranty, i.e., tradeoff of contractor liability or duration of warranty period to reduce cost.

(iii) Warranties obtained on individual components where the entire system is not under warranty. If warranties were not obtained, provide rationale.

(iv) Actions taken to preclude waivers on future procurements. {AL 92-4, 4/24/92}

APPENDIX E. SECTION 800 PANEL REPORT EXCERPT

A. SECTION 800 PANEL

The Section 800 Panel was convened to review Acquisition regulations and determine how best to streamline acquisition in the Government. The goal of efficiency and effectiveness done at the minimum dollar cost while preserving our Democratic perception to the public. Chapter two of the Section 800 Panel is provided in its entirety for the readers reference to specific regulatory issues regarding warranties and the Section 800 Panel's conclusions and recommendation. Key factors in Government Procurement are reviewed with the basic document for a clear understanding of the intent of the regulation.

B. CONCLUSIONS OF SECTION 800 PANEL

In a memorandum the Headquarters Air Force Materiel command, directorate of Program Support, noted that the overall intent and purpose of the warranty statute is working, but problems have been identified. It believes that the requirements for congressional notification and waiver authority have stifled attempts to waive the warranty where it would not be cost-effective. The AF Materiel Command Program Support directorate also noted that the Air force submits few request for waivers because of this difficult process. It contends that the approval of waivers at a lower authority level, the Head of the Contracting Activity, for instance would allow for more waivers where the warranty is not cost-effective. An acquisition staff analyst of AF Materiel Command argues that while the intent of the statute is valid, "the implementation is severely lacking." To improve this situation, he recommends improving the guidance for conducting warranty cost-benefit analyses. He further contends that the cost of the warranty only provides a marginal benefit, and the

relationship of the warranty to the specifications is often unclear. The analyst believes that the "existing FAR warranty clauses and correction of defects clauses, along with latent defects and performance provisions are often adequate to preclude the need for a special weapon systems warranty clause," and recommends that the law be amended to raise the contractor liability limits so that the contractor bears more of the risk of the warranty.

The Navy also agreed with the conclusions reached by the study performed for the Office of the Under Secretary of Defense for Acquisition. The Navy noted that half of its major buying commands had supported a total repeal of this statute while the other half supported an amendment to permit flexibility in the application of future warranties. The Navy took the position that this statute should be repealed. On the other hand, the Army did not agree with the study's conclusions. It contends that warranties offer tangible and intangible benefits, including promoting "product quality improvements which make costly warranty repairs unnecessary." The Army contends that although there are significant problems with the current administration of warranties, they do serve a valid purpose.

the Inspector General of the Department of Defense (DODIG) commented that it believes that this law is serving its intended purpose, is still relevant, has not created inefficiencies, and is required for the continuing financial and ethical integrity of the DOD procurement process.

C. RECOMMENDATIONS AND JUSTIFICATION OF THE SECTION 800 PANEL

Repeal 10 U.S.C. 2403 requiring contractor guarantees on major weapons systems.

The Panel recommends that this section be repealed. Although the DODIG and the Army have commented that this

statute is serving its intended purpose, the results of the two studies cited above and the other numerous comments received show significant problems in the administration and effectiveness of weapon system warranties in every branch of DOD. The problems the Services are experiencing not only cause serious administrative burdens on the Government but can make the warranties of very limited value, because the Government is not always able to make successful warranty claims. Also, the reluctance of DOD to issue warranty waivers fosters the use of warranties without regard to their cost-effectiveness.

The Panel believes that warranties would be much more effective if the law permitted more flexible implementation and tailoring to program specific needs. In this way, the Services could purchase effective warranties or make other arrangements when warranties would not be cost-effective. By this recommendation, the Panel is not suggesting that warranties unnecessary in all cases, but that they should be used only when appropriate. The Panel recommends that clear, specific guidance should be included in the regulations governing purchase of warranties and issuance of waivers.

As an alternative, the Panel recommends that this section be revised to address problems associated with its implementation.

In 1984, Congress had noted that the military departments were not negotiation warranty provisions but mandating their inclusion in procurement contract. Even though congress had stated that it intended waivers to be given if the warranties would not be cost-effective, virtually no waivers had been issued. It also found that the regulatory implementation of the provision should provide better guidance to the field personnel. It is clear from the comments received that the problems that congress noted at he passage of this statue in 1984 appear to still exist today, and the flexibility Congress

attempted to build into the statute has not solved these problems. The Panel believes that waivers must be more readily available in the acquisition process for those instances where a warranty would not be cost-effective. To this end, the Panel recommends that the approval of waivers be at a much lower level. Vesting the waiver authority in a lower level official will help expedite waiver approval. The Panel also agrees that SOS should promulgate a policy statement supporting the use of waivers when a warranty would not be cost-effective and should actively encourage the use of waivers in any further implementation or guidance.

The Panel believes that the warranty program must be improved if it is to be used with any measure of cost-effectiveness. The Panel concurs that the measures suggested in the AFLMC study would greatly improve the present warranty administration system. The Panel also agrees with the Office of the Deputy Assistant Secretary of the Air Force for Acquisition that warranties should be limited to major weapon systems. These two suggestions should focus the administration system on those large contracts where warranties would be most effectively employed. While the Panel still believes that the best course of action would be to repeal this statute, the above recommendations, if accepted, can make significant improvements to the statute as drawn.

APPENDIX F. WARRANTY HISTORY AND LEGISLATION

A. PROPOSED WARRANTY LAW

This appendix is a complete citation of the proposed warranty statute currently in committee. This law originated in the House in 1993, the Senate approved it in 1994, and was set to Congressional Committee in 1994. It is expected to be passed by the Congress as stated in paragraph B.

B. PROPOSED WARRANTY LEGISLATION

1. United States Code, Title 10, Section 2402, Special Supplement, July 4, 1994. (House Version 1587) Printed as reported not as passed

Contractor guarantees regarding weapon systems.

(a) Repeal of requirement for report on waivers.--subsection (e) of section 2403 of title 10, United States Code, is amended--

(1) by striking out "(1)" and

(2) by striking out paragraph (2).

(b) Provisions to be addressed by regulations.-- subsection (h) of such section is amended--

(1) by redesignating paragraph (2) as paragraph (3); and

(2) by inserting after paragraph (1) the following new paragraph (2):

"(2) the regulations shall include the following:

"(A) Guidelines for negotiating contractor guarantees that are reasonable and cost-effective, as determined on the basis of the likelihood of defects and the estimated cost of correcting such defects.

"(B) Procedures for administering contractor guarantees.

"(C) Guidelines for determining the cases in which it may be appropriate to waive the requirements of this section".

2. United States Code, Title 10, Section 2402, Special Supplement, July 4, 1994. (Senate Version S 2207) Printed as passed

(a) Repeal of requirement for report on waivers.--subsection (e) of section 2403 of title 10, United States Code, is amended--

(2) by striking out paragraph (2).

(b) Provisions to be addressed by regulations.-- subsection (h) of such section is amended--

(1) by redesignating paragraph (2) as paragraph (3); and

(2) by inserting after paragraph (1) the following new paragraph (2):

"(2) the regulations shall include the following:

"(A) Guidelines for negotiating contractor guarantees that are reasonable and cost-effective, as determined on the basis of the likelihood of defects and the estimated cost of correcting such defects.

"(B) Procedures for administering contractor guarantees.

"(C) Guidelines for determining the cases in which it may be appropriate to waive the requirements of this section".

3. United States Code, Title 10, Section 2402, Per John Etherton, 17 AUG 94

This legislation is in Conference Committee now. Mr. John Etherton stated he believed that the Senate would recede to the house language. The difference in the House and Senates version is (e)(1), the reporting requirement as stated below:
(e)(1) Before making a waiver under subsection (d) with respect to a weapon system that is a major defense acquisition program for the purpose of section 2432 of this title, the Secretary of Defense shall notify the Committees on Armed Services and on Appropriations of the Senate and House of Representatives in writing of his intention to waive any or all of the requirements of subsection (b) with respect to that system and shall include in the notice an explanation of the reasons for the waiver.

(2) Not later than February 1 of each year, the Secretary of Defense shall submit to the committees specified in paragraph (1) a report identifying each waiver made under subsection (d) during the preceding calendar year for a weapon system that is not a major defense acquisition program for the purpose of section 2432 of this title and shall include in the report an explanation of the reasons for the waivers.

APPENDIX G. INTERVIEW QUESTIONNAIRE

Interview of Attitudes Toward Warranties
in the Department of Defense

Your interview will be treated as confidential.

Please review and comment on each interview question. Answer each question to best describe your opinion of using warranties in weapon system acquisition.

This is a Naval Postgraduate School student thesis interview. Your help is appreciated. Please return this interview questionnaire to CPT Sharon Reiff at FAX number 408-656-2138. Results will be presented in the thesis titled: Warranty Legislation Effectiveness. For further information regarding this questionnaire contact CPT Reiff at 408-647-9151.

1. How long have you been in your present position?_____
2. In your opinion, are warranties applicable to military weapon systems?
 - a. ☐ YES
 - b. ☐ NO
3. What purpose does a warranty serve to the government?
Explain:
4. What purpose does a warranty serve to the commercial sector of business?
Explain:

5. Which technique used to estimate the value of a warranty would you rank as the most effective?

- a. ☐ Models
- b. ☐ Cost-benefit analysis
- c. Explain:

6. Are cost-benefit analysis performed effectively?

- a. ☐ YES
- b. ☐ NO
- c. Explain:

7. Are cost-benefit analysis utilized to determine the necessity of a warranty for a weapon system?

- a. ☐ YES
- b. ☐ NO
- c. Explain:

8. In your opinion: Is the cost of a warranty regularly evaluated before it's purchased?

- 1. ☐ YES
- 2. ☐ NO
- 3. Explain:

9. In your opinion: Are waivers sought based on the results of the evaluation?

1. ☐ YES
2. ☐ NO
3. Explain:

10. In your opinion: Are **thorough** cost-benefit analyses performed to evaluate if a warranty is cost-effective?

1. ☐ YES
2. ☐ NO
3. Explain:

11. In your opinion: Is the expense for Cost-benefit Analysis justified by the results of the analysis?

1. ☐ YES
2. ☐ NO
3. Explain:

12. In your opinion: Is it difficult to get a waiver approved.

1. ☐ YES
2. ☐ NO
3. Explain:

13. In your opinion: About how many waivers have you seen requested, evaluated, and granted?

1. Number requested:
2. Number evaluated:
3. Number granted:
4. Comment:

14. In your opinion: How often are thorough cost-benefit analyses performed to evaluate if a warranty **was** in fact cost-effective?

- a. Often ____
- b. Seldom ____
- c. Explain:

15. Would you recommend meeting the intent of legislation of improved quality through a warranty?

- 1. ____ YES
- 2. ____ NO
- 3. Explain:

If you have additional comments about this interview please feel free to comment.

APPENDIX H. INTERVIEW RESPONSES

The appendix contains the questions followed by the responses. The responses were recorded with a number that was established in sequence with its receipt. The numbers represent a respondents answers and is consistent throughout the document. Identification of each respondent has been negated with the exception of their title, and years of experience as referenced.

a. Question 1

What is your present position and how long have you been in your present position?

b. Responses:

1. Acting Division Chief, 10.5 years
2. Chief, Readiness Management Division, 1.5 years
3. Director of Materials, 5 years
4. Program manager, 2 years
5. Manager of contracts, 20 years
6. Program manager, 4 years
7. Director of Government business relations, 40 years
8. Chief, Business Management Division, 3 years
9. Program manager, 8 years
10. Contract Negotiator, 12 years
11. Manager of warranty and maintenance cost, 10 years

c. Question 2

In your opinion, are warranties applicable to military weapon systems?

d. Responses:

1. Yes, by law they are applicable, but they do not really make sense.
2. Yes, it enables the Government to save on the cost of repairs beyond what would be expected. This is the newer trend with threshold warranties.
3. Yes and NO, the answer depends on the contract type

employed by the Government. Under cost-reimbursement types, warranty costs become allowable and allocable to the same extent as other costs, and thus a warranty requirement allows the government to obtain repairs on a non-fee bearing basis, but still must bear the target costs and any overrun costs. Under fixed price contracts, a warranty requirement can result in obtaining "no cost" repairs and is particularly useful in avoiding expenses associated with latent defects that may surface after substantial quantities are acquired. Warranty provisions clearly have their place as a part of the requirements for a major weapon system, but technical requirements that require reliability to be designed into a product have an equally important role. All warranty provisions represent a potential cost that must be paid for. One area of real concern is warranty shelf life (i.e. warranty starts upon acceptance of the item but lapses before use if the item is stored or "shelved" for an extended period of time).

4. Yes, for combat systems.

5. Yes, prior to 1984, DOD policy was not to incur the added expense of warranty. Added expenses of warranty are: Acquisition cost, O&S Cost, record keeping, tracking the products through depots and tactical units in the U.S. and OCONUS, periodic testing to evaluate the product warranty, transportation, and administration. The stated congressional purpose was to obtain the same warranty as a John Deer Tractor.

6. Yes, if properly written and administered.

7. Yes, selectively and in discrete circumstances.

8. Yes.

9. Yes.

10. No, Warranties are redundant to the myriad of regulations, specifications, quality assurance requirements, etc. which a contractor is forced to accept and comply with in any fixed

price major system purchase. Obviously warranties are inconsistent with purchases in a cost-reimbursement contracting mode.

11. Yes

e. Question 3

What purpose does a warranty serve to the Government?

f. Responses:

1. Frankly, the major one is satisfying the statutory requirement to have a warranty. To the extent we can use the warranty for leverage, we do. In a limited number of cases we have successfully recovered substantial benefit. But warranties are clearly a benefit to contractors because they limit their liability. For instance they establish time limits on their responsibility. Before the warranty, we would have required full correction of welding errors or other similar problems almost indefinitely -- whenever a significant defect in material, workmanship or design was found.

2. It enables the Government to save the cost of repairs beyond what would be expected. This is the newer trend with threshold warranties.

3. A warranty provides a degree of protection to a customer. In their most common form, warranties guard against incurring future costs for defects in materials and workmanship. More complex warranties can also be structured to guarantee product performance in the future and require that the full cost of redesign and hardware/software implementation to achieve the warranted performance be born by a contractor. Therefore, the "insurance" that warranties represent may or may not be worth the cost paid for them. The Government must undertake an analysis of the circumstances of a given contract in order to make an informed decision.

4. For the vast majority of systems and warranties, no useful purpose is served to the Government.

5. A warranty does provide the Government with added time to determine/locate specified defects in items which existed at acceptance. Defects can be in material, workmanship, non-compliance with the Technical Data Package or failure to meet performance as tested during the warranty period and to have the defects repaired or replaced. Sometimes, warranties are confused with service contracts. For example, Sears would warranty a washing machine for 90 days for defects in material and workmanship. A performance warranty is not available (i.e. Sears does not guarantee that your washing machine will wash 25 loads of clothes every day and that the cloths will be clean.) Sears does offer to sell the consumer an extended warranty at added cost whereby Sears will send a service technician to your house to repair or replace any specified defective or worn part which prevents the washing machine from washing in its customary fashion during the extended warranty period. This "extended warranty" is in effect a "service contract". Most commercial computer companies, (e.g. , IBM etc) sell a service contract with the hardware. Most buyers, industry, government, non-profits, etc., procure these service contracts. Most renew them. Use - buyer is entitled to use the product without patent infringement claims by others. If there is a patent or other intellectual property right claim by others, seller will defend the claim at its expense and will clear the claim promptly and/or obtain the right for Buyer (and its customers) to use the product free and clear or will replace the product or will compensate Buyer. Intended use or application may be guaranteed by Seller if the product is designed for a particular use which is specified in detail. In many cases, it is not practical to specify all the conditions of intended use nor to pay the costs of testing for that use and a warranty is specifically excluded for this purpose.

6. It can save O & M dollars.

7. The purpose served is to ensure Government rights subsequent to final acceptance and delivery. However, I believe the inclusion of warranty provisions in production contract, as opposed to development contracts, is a major error since they serve in such instances more as a "service policy" rather than to ensure enhanced design, product reliability, and improved quality. In addition, in production contracts, they are a cost to the Government whether or not cost-effective or required.

8. The positive response must be qualified to state that a warranty serves the Government only if it offers economic benefit. The contractors proposed warranty should be evaluated against alternative means of repair such as US Government organic repair capability at intermediate and depot repair facilities or by contract maintenance and overhaul.

9. For new systems or when dealing with a contractor with a history of Quality Assurance problems, it serves as an effective control mechanism.

10. Warranties are redundant to the myriad of regulations, specifications, quality assurance requirements, etc. which a contractor is forced to accept and comply with in any fixed price major system purchase. Obviously warranties are inconsistent with purchases in a cost-reimbursement contracting mode.

11. If properly structured, it can provide a means for the government to obtain reimbursement for repairs during the "break in period" associated with a new piece of equipment. The government should not have to shoulder the cost of quality defects in manufacturing, assembly errors etc.

g. Question 4

What purpose does a warranty serve to the commercial section of business?

h. Responses:

1. Originally, I suspect they were established to limit their liability for fixing or correcting their products. They also assisted their dealer networks by directing consumers back to the "authorized dealer" for after market work. Today they have grown into a marketing/sales tool. Customer satisfaction tool.
2. I am not sure. I look upon them for my own personal home use as protection against infant mortality.
3. A warranty is always recognized by the commercial consumer as a source of protection against incurring future costs for a product once bought at least during some defined time frame. Consumers use them as a measure of the quality or reliability of a product.
4. Warranties provide assurance to customers that products meet expected quality standards. They also provide manufacturers with valuable information on product "infant mortality" rates.
5. Commercial warranties usually specifically exclude warranties of merchantability, and damages including consequential damages, indirect damages, punitive damages, direct damages, etc.
Material and workmanship defects existing at time of delivery/acceptance which are discovered within a stated time (typically 90 days - 6 months) and promptly reported to Seller upon discovery (typically, within 30 days) are warranted to be repaired or parts replaced.
6. Guarantee of product reliability or performance.
7. In the commercial sector, warranties serve to limit, rather than increase, purchaser rights under the uniform commercial code. This is a distinct difference from the Government's intention, which is to increase its rights over and above those provided for under the contract.
8. Commercial warranties serve to offer the consumer a "hook"

by which to differentiate one suppliers product from a like product furnished by a competitor. When commercial warranties are separately priced, such as extended warranties on automobiles, it must be assumed that the cost risk of buying the warranty is greater than the risk of warranty repair. In effect the warranty sale becomes a separate profit center. Competing commercial contractors do not drive service which yields continual profit/loss.

9. For a company with an effective QA program in place, it is a way to bump-up the profit margin.

10. In the commercial environment, warranties often establish or preserve the rights of the customer relative to the acceptability and quality of the product purchased.

11. It provides a tool similar to that described for the military during the early periods of operation as well as a means of cost containment. Most warranties are structured around the direct maintenance and labor cost and the cost of replacement parts.

i. Question 5

Which technique used to estimate the value of a warranty would you rank as the most effective, models or cost-benefit analysis?

j. Responses:

1. Neither, because of poor data bases.. "garbage in - garbage out" and they never truly address the conceptual weakness of the warranty in a military environment. That is, of having a warranty in the first place on a weapon system. Neither do they adequately consider unmeasurable and intangible negative and positive factors involved in the operation of a warranty. Some people let up on addressing quality, mistakenly thinking the warranty will do it for them and for the Army. It doesn't.

2. Cost-benefit analysis: With the approach you look at the mean time between failure and cost of what type of repair and

say this is what it would cost the Government w/o a warranty.

3. Both models and cost-benefit analysis techniques can be employed to estimate the value of a warranty. However, the results of both may not bear any relationship to the ultimate outcome of cost incurred or avoided because predicting future events or circumstances has obvious limitations. Clearly, this is the case for the major weapon systems where there are a multitude of variables at work at all times.

4. Cost-benefit analysis (for combat systems) - because warranty provisions specify the parameters for warranty claims (many of which cannot be accommodated in tactical situations). Actual warranted failures cannot be predicted with modeling. Cost-benefit would provide a better measure of warranty value.

5. Sears Roebuck model.

6. Cost-benefit analysis. It can scope the practicality of administering the warranty in the DOD system.

7. There is no one technique that is "best" to estimate the value of a warranty.

8. The cost-benefit analysis would appear to be the most useful tool. The Government should make pure estimates on new starts, or collect actual filed failure data for fielded systems and compare the cost of contractor warranty repair versus organic repair or commercial maintenance and overhaul contracts.

9. Cost-benefit analysis, within the Government. Any savings which can be shown on paper (whether real or not) can make or break a program.

10. I am not familiar with either technique as we do not estimate the value or cost of the warranty provided to the Government. The warranty, in our primary production contract, provides that the contract does not contain any direct or contingent costs associated with the warranty; What we refer to as a no-cost warranty. In this case, I think you could

equate no-cost with worthless.

11. Models. We use reliability and Defense Management College models to forecast the expected, then a risk analysis is performed.

k. Question 6

Are cost-benefit analysis performed effectively?

1. Responses:

1. No, I haven't personally seen any that were effective. I have seen several that were terrible.

2. Yes, they are the basis for the negotiations of the cost of the warranty.

3. Yes, given that they are based on certain assumptions.

4. No, Actual costs of warranties are difficult to ascertain. Benefits are assumed to be automatic, but many (if not most) claims do not meet warranty provisions and most warranty determination is made by the manufacturer. As warranty money is not returned to the user, benefit is also hard to measure.

5. I do not have this information.

6. Yes, sometimes - back to administration and practicality.

7. No, I do not believe such analyses are even performed - either before or after the fact. I believe that the evidence of so few waivers to date is documentation of the fact that warranties are being required irrespective of their cost-effectiveness.

8. Yes, When the U.S. Army procured initial warranties in the mid 1980's this was done on the premise the warranties were inherently good. In some instances, the actual occurrences of failure and warranty repair costs were far less than the annual cost of the warranty. This happened in large part due to the failure to implement any constructive cost-benefit analysis.

9. No, They are always skewed to show a savings, often using unrealistic but logically sounding assumptions.

10. I am not familiar with either technique as we do not estimate the value or cost of the warranty provided to the Government.

11. No, "hidden Costs" of a modification or retrofit are difficult to account for.

m. Question 7

Are cost-benefit analysis utilized to determine the necessity of a warranty for a weapon system?

n. Responses:

1. Warranties on weapon systems are required by law -- we run the analysis before/while negotiating a contract to see if the warranty is "cost-effective". Because the models are so poor and there is very little data, the answer almost always forces a contracting officer to negotiate a "no cost warranty". That probably isn't what was intended but that is the practical reality. In one major truck program (\$1-\$2 Billion) the model dictated no more than a \$14.00 per truck warranty cost. Above that the model said, a warranty would not be cost-effective. There were several models on vehicles running from \$26K to \$70K. The contractor looked at the risk of having to replace one high cost component (possible random failures) as a significant issue.

2. Yes, they are required by "law" so they are used.

3. Yes, but again they have limitations.

4. No, They are required by law and so written into contracts. Cost without warranties are unknown. Cost of warranties are therefore unknown. Because they are required by law, why spend money doing cost-benefit analysis?

5. I do not have this information

6. Yes, sometimes - is administration practical? There are no "real" savings.

7. The necessity for a warranty is dictated by statute and implementing regulations, both of which in my view have been

misconstrued in execution. I think warranties are required without regard to cost, value, or need. The deviation process and the required level for approval, as well as the interpretation given the regulations, are at fault... as well as the current climate influencing the exercise of contracting officer discretion.

8. Yes, such analysis is necessary to support warranty approval for ACAT I programs or to sustain waivers.

9. No, while benefit analysis are performed for this purpose, the real reason for determining the necessity of a warranty is always political.

10. No response

11. No, It is usually based on past experience with similar systems.

o. Question 8

In your opinion, is the cost of a warranty regularly evaluated before it is purchased?

p. Responses:

1. Yes, in all cases, both on weapons systems and non-weapons systems, we require an evaluation. There are limits to how effective that can be (i.e. with commercial components there is a built in warranty cost), but the manufacturers refuse to disclose the amount. Further, they refuse to trust us, either with the data or with an elimination of the warranty. Regardless of what the procuring contracting officer or Program Manager promise, they expect to be required to give warranty service somewhere along the line during the course of the program and, therefore, will not eliminate commercial warranty markups.

2. Yes, it is part of the negotiations.

3. For simple straight forward purchases, a warranty is usually just assumed to be more valuable to have than not have. For complex weapon systems, warranty provisions tend to be discussed and analyzed before being solicited from a

contractor; But, once requested, rarely is the Government prepared to change them.

4. No, required by law. Contracts are negotiated for products and contract costs have warranty costs embedded.

5. I do not have this information.

6. No.

7. No, more often than not, there is no empirical data to support any such analysis; No one technique whereby one can do so, no historical cost experience to evaluate, and no inclination to be influenced by the result - whatever that might indicate.

8. Yes, it is not a business clearance approval requirement in our Acquisition Center.

9. No, within the Government cost of a warranty (i.e. real cost) is really an "after the fact" consideration.

10. No.

11. No, based on my experience as an advisor to the aircraft engine warranty sub board, representative for the Army, Navy, and Air Force clearly indicated that there was/is much confusion over what constitutes effective evaluation.

q. Question 9

In your opinion, are waivers sought based on the results of the evaluation?

r. Responses:

1. Generally no. The general impression, whether deliberate or not was waivers wouldn't be approved so why bother?

2. Yes, only two were granted at our organization.

3. Once warranty provisions are solicited from a contractor, they are rarely changed. Waivers are rare.

4. Yes, sought, but to my knowledge none have been approved.

5. I do not have this information.

6. Yes, sometimes, if good analysis has been done.

7. No, the deviation process does not work.

8. Yes, The frequency of waiver requests and rate of approval

or disapproval for all systems/components procured is unknown.

9. No, The decision to go for a waiver is strictly political.

10. No.

11. No, Because there is a lack of understanding in what makes up a sound cost-benefit analysis, waivers are not sought; However, other considerations for seeking a waiver might be - mature, proved designs - provision that place undue burdens on the user.

s. Question 10

In your opinion, are thorough cost-benefit analysis performed to evaluate if a warranty is cost-effective?

t. Responses:

1. Yes.

2. Yes, these are done by another Command as part of an overall "ASARC" system requirements. They would be examining warranty costs as one item. They are not done specifically for warranties.

3. Whether any cost-benefit analyses performed are thorough or not usually does drive the decision to include warranty provisions when the Government requests contractors to propose weapon systems. The Congressional and DOD oversight for the requirements process, including funding, may require a warranty provision no matter what a cost-benefit analyses may show. Commands performing the acquisition usually find it difficult or politically unwise to suggest that a warranty is not worth the projected cost. The cost-benefit analyses assumptions may be complex, not easily understood, and even perhaps optimistic about what may occur in the future.

4. No. they are required by law. Costs are hidden, benefits difficult to predict with respect to operational effectiveness. Operational effectiveness is specified in the contract - how does warranty impact that?

5. I do not have this information

6. Yes, sometimes, cost-benefit analyses must reflect "real

world" environments.

7. I don't know.

8. Yes.

9. No, once the decision has been made not to get a waiver, all other considerations are only paperwork exercises.

10. No.

11. No.

u. Question 11

In your opinion, is the expense for cost-benefit analysis justified by the results of the analysis?

v. Responses:

1. No, it is a waste of money.

2. Yes, These are done by another Command as part of an overall "ASARC" system requirements. They would be examining warranty costs as one item. They are not done specifically for warranties.

3. It depends. If the Congress includes specific language that requires a warranty provision for a new complex weapon system, then it is usually pointless to develop a cost-benefit analysis that examines the issue. On the other hand, if the Government contemplates a warranty that will guarantee performance in the future (as opposed to a simple defects and workmanship warranty), then a cost-benefit analysis can serve as a legitimate basis for identifying the value of the approach and even perhaps identifying alternatives that might be more cost-effective.

4. No, Results are based on uncertain costs and impact on life cycle costs are unknown.

5. I do not have this information

6. Yes, sometimes, if done right.

7. I would think so, but only if use is made of the information.

8. Yes, Over the life cycle of a major component or airframe there is a substantial recurring operation and support cost

life cycle saving potential that will justify such analysis.

9. No, Once the decision to award a contract with warranty clauses has been made, this is just a paperwork drill.

10. No.

11. Yes, since the cost of a warranty would far exceed that of a cost analysis, it doesn't seem prudent to sign up or purchase a warranty that might prove ineffective.

w. Question 12

In your opinion, is it difficult to get a waiver approved?

x. Responses:

1. Yes, it appears to be almost impossible.

2. Yes, only two at our organization have been approved by DA.

3. Yes, all waivers are difficult because they represent a reduction in requirements that neither the Acquisition Command nor the contractor are willing to admit also reduce costs. Warranty waivers are no different.

4. Yes, as far as I know, none have been approved.

5. I do not have this information.

6. I don't know.

7. Its virtually impossible to get a waiver.

8. No, it should not be difficult if supported by an effective cost analysis. The frequency of waiver request and rate of approval/disapproval is unknown.

9. Yes, the problem within our community is not necessarily getting a waiver approved, but getting approval from management to go for a waiver.

10. No.

11. Yes, although most comments I have heard from the military community indicate it is difficult. I believe this task would be more manageable if an analysis/study/model is based on sound conclusive data.

y. Question 13

In your opinion, about how many waivers have you seen requested, evaluated, and granted?

z. Responses:

1. None, none, none.
2. I haven't seen any granted or requested. I understand 2 have been granted to us. I'm not sure how many were requested.
3. None, none, none. Discussions have certainly taken place on how advisable it would be to tackle the waiver process but they usually don't get far.
4. 7, 7, 0. Even when warranties are shown to be costly and ineffective, granting exemption means going against the law and accepting risk of criticism.
5. I do not have this information.
6. No experience.
7. None, to explain this would fill a volume.
8. I don't know. We do not have access to the data base to respond to this question. We have not processed waiver requests.
9. 0,0,0, It could and should be done for a mature system with no history of significant QA problems.
10. No comment.
11. 1, 0,0, While not involved in the waiver, we were informed of it.

aa. Question 14

In your opinion, how often are thorough cost-benefit analysis performed to evaluate if a warranty was in fact cost-effective?

ab. Responses:

1. Don't know anymore. When I was still a Procurement contracting Officer it was done "often".
2. Often, Cost-benefit analysis are done with weapon system procurement due to the "law".

3. I don't know how often this is done.
4. Seldom, even when warranties are shown to be costly and ineffective. Granting exemption means going against the law and accepting risk of criticism.
5. I do not have this information
6. Seldom, "is it practical to administer"?
7. No comment.
8. We are in the EMD stage and have not procured a warranty.
9. Seldom, Paperwork drills.
10. No comment.
11. Seldom, since my experience has been that the government does not fully exercise its rights under the terms of a given warranty, it would seem preposterous to go through the expense of a cost-benefit analysis when it is immediately evident.

ac. Question 15

Would you recommend meeting the intent of legislation of improved quality through a warranty?

ad. Responses:

1. You improve quality by improving the design and production processes, specifications up front or component testing as well control and vehicle testing, etc,etc. You get quality by doing it right. In a commercial product, the contractor has total control of the design and the markets he targets. He has an incentive to get it right or he won't last. In the military environment -- despite contractor claims they should be trusted -- history shows the same factors or forces simply do not apply.
2. Yes, the warranty time gives our repair/replenishment group time to analyze the actual repair parts that need to be purchased versus the theoretical projections. This allows more accurate projections.
3. Yes, for complex weapon systems. The Government should focus on requirements that cost-effectively cause contractors to design high reliability into their products at the outset

of a program. Designing elaborate warranty provisions misses the mark by focusing on the future rather than today. Spending today's dollars to require the use of high reliability parts and components, infant mortality test screening, statistical process control, etc. is more effective than a warranty. Additionally, the government can monitor over time the effectiveness that these requirements have on the system reliability. Weapon systems that have reliability designed into them will simply fail less often in the future and lower the frequency and severity of warranty covered repairs.

4. No, warranties do not ensure quality. contract provisions and incentives ensure quality, along with contractor "taming" and dedication for all concerned.

5. No, quality is improved by process control and improvement - TQM - not buy legislation - not by warranty.

6. Yes, we want quality and dollar saving - warranty is a "tool" to apply when appropriate.

7. Yes, but I would recommend that reliability improvement warranties be used in development contracts, and be provided for as "options" that are priced that could be exercised unilaterally by the Government subsequent to delivery, and which are related to discrete aspects of performance for discrete functions (at the subsystem or replaceable unit level).

8. No, Quality should be effected in the initial design, qualification, and prime/vendor production. Warranties will not be sold by any military or commercial contractor unless it yields an acceptable profit. There is no apparent reason to think that warranties have anything to do with enhancement of quality. Warranties are a repair vehicle, not a QA enforcement tool or a viable tool to cause redesign, unless part of a lot failure under a system type warranty.

9. Yes, a warranty is a reasonable way to ensure good QA

performance on a new start system; However, once a system has been fielded and established a good track record, waivers should be sought.

10. In the context of purchasing a commercial item, a warranty may have some marginal impact on quality and should be used as a factor in any competitive source selection. In the purchase of any major weapons system, I do not believe that a warranty will have any impact on quality.

11. No, I do not feel the military, specifically the Army, has an effective system to administer and take advantage of the warranties it has on equipment today. There is no incentive at the user level to track warranties and complete the necessary paperwork. Warranties, with limitation, often expire before a piece of equipment is received by a unit due to the time spent in depot storage.

LIST OF REFERENCES

Arnavas, D. P. and Ruberry, W. J., *Government Contract Guidebook*, p. 13-12.

Black, H. C., M. A. *Black's Law Dictionary*, p. 330, St Paul Minnesota West Publishing Company, 1979.

Brennan, J. R., *Warranties planning, analysis, and implementation*, p. 36, McGraw-Hill, Inc., 1994.

Brennan, J. R., *Weapon system Warranties Workshop for AMC*, Society of Logistics Engineers, p. 19, Jun 1994.

Cleland, D. I., Gallagher, J. M., and Whitehead, R. S., *Military Project Management Handbook*, p. 1.9, McGraw-Hill, Inc., 1993.

Committee on Armed Services United States Senate, Ninety-eight Congress, second session, Warranties on Weapon Systems, p. 6, Feb 28, 1984.

Conahan, F. C., *Report to the Secretary of Defense, DOD Warranties, Effective administration Systems Are Needed to Implement Warranties*, p. 2, United States General Accounting Office Report to the Secretary of Defense, Sep 1989.

Deburkarte, E. E., *RIW as a Practical LCC Procurement Technique*, Transactions, p.22, 1978.

Glossary for Defense Acquisition Acronoymys and Terms, p. B111, Department of Defense, Sep 1991.

Government Contracts Report, Federal Acquisition Regulation, Defense Federal Acquisition Regulation, Army Quality Assurance.

Kuenne R. E., Richanbach, P. H., Riddell, F. R., and Kaganoff, R., *Warranties in weapon system procurement*, Westview Press Boulder & London, p. 17, 1988.

Navy Program Manager's Guide, U.S., Naval Material Command, p. 3, 1984.

Proposals to Regulate Consumer Warranties and Expand the Powers of the FTC, Legislative Analysis NO. 9 93rd Congress, pp. 2-3., July 17, 1973.

Rannenber, J. E., *Warranties in Defense Acquisition: The concept, the Context, and the Congress*, p. 43, Dec 1984.

Savage, R. W., *Aviation warranties; The cost and risks*, p. 13., Sep 1985.

Sullivan, B. E., "The Section 800 Report... Streamlining Defense Acquisition Law," *Army RD&A Bulletin*, p. 8, Jan-Feb 1994.

United States Code Title 10, section 2403, 1988, 1. d. (1) &(2).

United States code, Title 10, Section 2402, Special Supplement, July 4, 1994. (House version 1587) printed as reported not as passed.

Warranty Guidebook, Defense Systems Management College, p. 3-9, Oct 1992.

INITIAL DISTRIBUTION LIST

	No. Copies
1. Defense Technical Information Center Cameron Station Alexandria, Virginia 22304-6145	2
2. Library, Code 52 Naval Postgraduate School Monterey, California 93943-5101	2
3. Dr David V. Lamm, Code SM/LT Department of Systems Management Naval Postgraduate School Monterey, CA 93943-5000	5
4. CDR Jeffery A. Warmington, Code SM/WR Department of Systems Management Naval Postgraduate School Monterey, CA 94943-5000	1
5. Professor Mark Stone, Code SM/ST Department of Systems Management Naval Postgraduate School Monterey, CA 93943-5000	1
6. Defense Logistics Studies Information Exchange U. S. Army Logistics Management Center Fort Lee, VA 23801-6043	2
7. CPT Sharon K. Reiff c/o Marvin Hodson 1114 Grove Street Carthage, MO 64836	1