

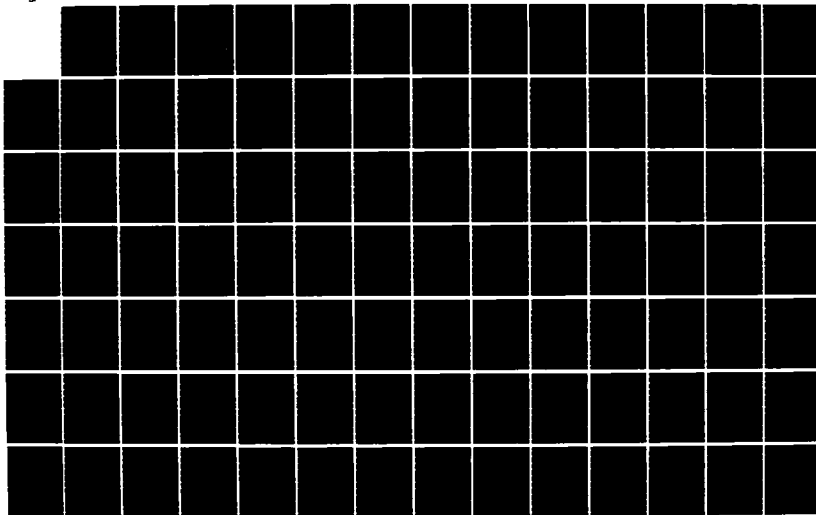
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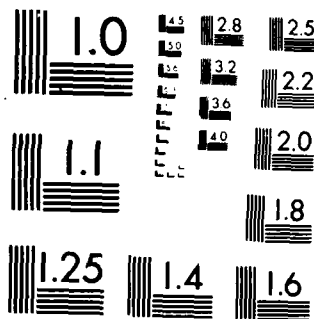
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THE C130 HERCULES ACQUISITION PROGRAM,
A CASE STUDY OF THE POTENTIAL IMPACT
OF A SYSTEM LEVEL WARRANTY APPLICATION

THESIS

Eugene J. Pickarz, Jr.
Captain, USAF

AFIT/GLM/LSP/86S-59

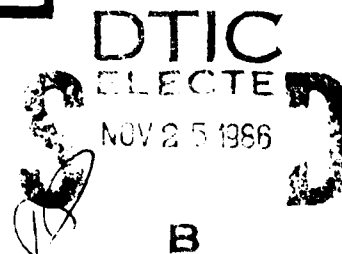
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THE C130 HERCULES ACQUISITION PROGRAM,
A CASE STUDY OF THE POTENTIAL IMPACT OF
A SYSTEM LEVEL WARRANTY APPLICATION

THESIS

Presented to the Faculty of the School of Systems
and Logistics of the Air Force Institute of Technology

Air University

In Partial Fulfillment of the
Requirements for the Degree of
Master of Science in Logistics Management

Eugene J. Pickarz, Jr., B.S.

Captain, USAF

September 1986

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Without data, research is meaningless. My key sources from the Air Force Plant Representative Office at Lockheed Georgia Company, the C-130 Systems Management Division at Warner Robins Air Logistics Center, the C-130 System Program Office in the Aeronautical Systems Division, and the Air Force Contract Law Center, provided support that ensured success from the very start.

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Eugene Pickarz

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Abstract

This study was an attempt to assess the potential impact a systems level warranty could have had on the C-130 production contracts (over the last five years). Specifically, it sought to: (1) identify which types of Government changes or modifications could lead to warranty avoidance by the contractor and (2) attempted to determine what impact operational environments could have had on the C-130 (with a systems warranty). The literature review discusses the basic definition of a warranty and relevant litigation regarding warranty avoidance and breaches. A methodology was devised utilizing an unstructured interview approach to obtain data from the Air Force Plant Representative Office at Lockheed Georgia Company, the C-130 Systems Management Division at Warner Robins Air Logistics Center, and the C-130 System Program Office in the Aeronautical Systems Division. Further analysis of the findings was accomplished by the Air Force Contract Law Center. Benefits from applying a system level warranty to the C-130 were identified to include: (1) Government notification (by the contractor) of new defects, (2) streamlined warranty claims during hostile operations, (3) increased reimbursements for Government repair, and

(4) more definitized procedural instruction for the contractor. Conclusions drawn from the research centered around the need for written agreements to expand warranty coverage, length of warranty coverage, identifying warranty provisions during systems design, measurable and testable essential performance requirements, testing of proposed changes/modifications, increased need for extensive warranty administration and maintenance personnel awareness.

THE C130 HERCULES ACQUISITION PROGRAM, A CASE STUDY OF THE POTENTIAL IMPACT OF A SYSTEM LEVEL WARRANTY APPLICATION

1. Introduction

The thrust of this study was to analyze how Government imposed changes and modifications could have affected a system level warranty application on the C-130 production contract, had such a warranty been in effect. The possible effects operational environments could have had on a system level warranty for the C-130 are also investigated. This thesis is a case study of the C-130 Hercules acquisition program. The C-130 is currently in full-scale production and is scheduled to be so through 1990. The C-130 program was selected as an example of a program in mature full-scale production. System and item management responsibility is currently controlled by the Directorate of Material Management (DMM) at Warner Robins Air Logistics Center (ALC).

The following pages further elaborate on this introduction via a background discussion, a problem statement, a description of research objectives and the research questions. This chapter also reviews pertinent litigation and literature which deals with contractor avoidance of warranties, as a result of buyer imposed changes and/or modifications, to an item under warranty. Chapter II discusses the methodology used in this research.

Chapter III presents the findings of the data gathered from interviews conducted at Warner Robins ALC, the Air Force Plant Representative Office (AFPRO) located at Lockheed Georgia Company, and the C-130 System Program Office located within the Aeronautical Systems Division (ASD) at Wright Patterson AFB, OH. Chapter IV discusses a summary of the findings of the data gathered and the analysis obtained from a legal review by the Air Force Contract Law Center (AFCLC). Chapter V presents the researcher's conclusions and recommendations.

This effort does not attempt to be all inclusive. Rather, it is an effort to consider a "What if?" question in applying a system level warranty to a weapon system which has been produced for many years and is relatively less complex (compared to an F-16 aircraft, for example) in technology. The research here is therefore limited to: (1) Identifying which government imposed changes and modifications to the C-130 Weapon System within the last five years could have affected a system level warranty (had one been in effect) and (2) Identifying the possible effects operational environments could have had on a system level warranty for the C-130.

Background

The weapon system warranty application problem first came about with the passage of the Defense Procurement

Reform Act of 1984 (14). The perception of Congress is that the Department of Defense (DoD) is not getting the level of quality in its weapon systems that it should (4:178). The general issue raised by this perception is that a system level warranty would provide the incentive for contractors to design-in a higher level of quality than is currently received on the weapons systems produced for the DoD. The DoD, therefore, must strive to obtain system warranties in weapon system acquisitions.

Problem Statement

The specific research problem under investigation is: "What Government imposed changes or modifications can permit a contractor to avoid (or annul) a system level warranty, and thereby avoid warranty obligations?" The C-130 program was studied to determine which modifications or changes to the C-130, in the last five years, would have permitted such an avoidance by Lockheed (the producer of the C-130), had a system level warranty been in effect.

Research Objective

The objective of the research is twofold. First, it strives to discover which types of Government imposed modifications or changes could lead to an increased level of perceived contractor risk and subsequent reconsideration of the contract price. Secondly, the research attempts to

determine what operational environments for the C-130 could lead to contractor avoidance.

Research Questions

There are three research questions this thesis investigates:

1. What criteria should be used to determine if a proposed change or modification has the potential for allowing the contractor to avoid the system level warranty (as written)?

2. Would performance guarantees (under a system level warranty) have been workable for the C-130, or would hostile operational environments allow avoidance of a warranty? (Example: Special C-130s modified for the 1982 Iran escape attempt).

3. How should present system level warranties be tailored to preclude contractor avoidance and still protect the Government's interests?

Literature Review

To aid the researcher in assessing the impact a system level warranty could have had in the C-130 production contract, a review of litigation and legal articles was conducted. (It is noted here, however, that due to the relatively recent implementation of the system level warranty requirements, there are no published cases dealing

with system level warranty disputes per se). The search was thus confined to investigating the impacts of changes or modifications on standard warranties (i.e. non-system level) both before and after delivery of warranted items took place. An article published in Military Law Review provides a good overall perspective of a warranty. This article describes a warranty as :

A promise or affirmation given by a seller to a purchaser regarding the nature, usefulness or condition of the supplier or performance of services to be furnished. The principal purposes of a warranty in a Government contract are to delineate the rights and obligations of the contractor and the Government for defective items and services and to foster quality performance. (12:138)

Government procurement agencies possess a power advantage over their civilian counterparts. This is the ability to require changes or modifications prior to delivery and acceptance of the goods contracted for. Due to this characteristic of Government contract law, there are no warranty cases involving a dispute between the Government and a contractor, regarding a breach of warranty as a result of a Government modification or change. The "Changes Clause" found in the Federal Acquisition Regulation describes the contractor's remedy for dealing with Government changes (3:52-142).

The Changes Clause referenced above entitles the contractor to an "equitable adjustment" for the changes or

modifications imposed. The issue of avoidance or breaching an expressed warranty is therefore significant only in the context of warranty breaches after delivery. In reviewing the litigation regarding disputes for warranty breaches after delivery, it is helpful to do so in light of three key general warranty requirements:

1. By a preponderance of the evidence, it [the Government] must prove that the contractor was given requisite notice of a warranted defect.
2. The [existing] defect must result from application of a warranty clause [i.e. within the scope of the warranty provisions.]
3. The defect must occur within the warranty period. (12:140)

Satisfying these requirements is a difficult task. The first requirement is illustrated in "Rentel and Frost, Inc. vs U.S.," (Armed Services Board of Contract Appeals - ASBCA, No. 8966. September 30, 1963). In this case, Government failed to show by a preponderance of the evidence that a valve (which caused damage to a piece of equipment) was defective (11:3880). This inability prohibited the Government from exercising its rights under the warranty clause.

The requirements for notification are, by far, the easiest of the general requirements to meet. "Regarding notification, a written exercise of an option under the

warranty clause implicitly notifying the contractor of the breach is sufficient (12:141)."

Requirement two centers around the necessity that the defect must not only exist; it must also fall within the scope of the warranty provisions. This is where the key implications for this research can be seen, in regards to the effects Government imposed changes or modifications have on system level warranties.

In the course of proving that a defect has triggered a warranty clause, the Government may be required to affirmatively demonstrate that its subsequent actions were not responsible for the problem. When the Government had altered items which became inoperative subsequent to inspection and acceptance, or when the defect may have been caused by improper maintenance, or vandalism, recovery under the warranty clause has been denied. (12:142-143)

The case most often found quoted regarding the effects of modifications and changes on warranty claims was "South Portland Engineering Company vs U.S." (Intermediate Board of Contract Appeals - IBCA Nrs. 770-3- 69 and 771-4-69, December 22, 1969)(13:8033). This case most clearly illustrates an example of a system level warranty problem, in that it involved a warranty for a complete 155 foot fishing vessel. The issue in question was whether work (modifications) accomplished by a contractor other than

the original contractor, should be covered by the previous contractor's warranty. The court found that:

A contractor was entitled to be compensated for repairing parts of a ship he had constructed because the Government had altered the items that had become inoperative subsequent to inspection and acceptance of the vessel. The contractor was required to remedy any defects resulting from faulty materials and workmanship that appeared within a year after acceptance by the Government. Within that period of time, the Government had had adjustments made to some of the ship's systems, which had admittedly been operating satisfactorily until the changes were made. When the altered systems thereafter became inoperative, the Government required the contractor to make the necessary repairs, invoking the warranty provision of the contract. The warranty, however, was not a blanket undertaking to correct at no charge all defects which may arise whether or not created by the contractor. The Government was unable to show that the malfunctioning of the systems was in any way related to the contractor's work. The law regards it as inequitable to treat an altered article as the same article sold, and modification of the contractor's product had vitiated the warranty. (13:8033)

Concerning the "burden of proof" requirement for breach of warranty claims, "C. W. Regan, Inc. and Compudyne Corporation (A Joint Venture) vs U.S." (National Aeronautics and Space Administration Board of Contract Appeals - NASA BCA, Nos. 465-16 and 765-25. July 7, 1967) and "Clinical Supply Corporation vs U.S." (ASBCA Nos. 15466, 15652, 15653. April 26, 1972), set important precedents. In "C. W. Regan, Inc. and Compudyne (A Joint Venture)," the court found that certain hydraulic equipment was found to be defective by reason of contamination (1:6454). The cause of the problem

could not be specifically traced to either the Government or the contractor. As a result, the alleged breach of warranty claim was dismissed due to lack of burden of proof, based on uncertainty of cause. In "Clinical Supply Corporation vs U.S.," the court ruled in favor of the contractor, based on the inability of the Government to support its decision that the delivered goods did not meet stated requirements. This inability resulted from a lack of certified calibration of test equipment and qualifications of test personnel (2:9452). The courts have thus interpreted the scope of warranty clauses very narrowly and disallowed claims outside their scope of coverage (12:141).

The last key requirement pertains to the stipulation that the defect must occur within the warranty period. The specific period of coverage depends on the individual contract provision. There have been numerous court cases surrounding disputes over exact expiration of a warranty period. This research effort did not require extensive study in this area.

In summary, the second key area, determining that a defect must result from a cause covered by the warranty, is of paramount importance for this research effort. The courts have made it clear that a warranted article altered by a buyer becomes a different article than that originally sold by the seller. From this legal precedent, the researcher has hypothesized that a Government imposed change

or modification to a weapon system, which has a system level warranty, could lead a contractor to perceive increased risk and consider the weapon system a "new article" requiring increased contract price.

11. Research Methodology

Research Plan

In order to determine the potential impact a system level warranty may have had on the C-130 program, an investigation was conducted among a select group of logistics experts in the AFPRO at Lockheed Georgia Company (the USAF "Monitor" of the System's production), the C-130 branch of the Directorate of Material Management (DMM) at Warner Robins ALC (the USAF "System Manager"), and the C-130 System Program Office in the Aeronautical Systems Division (ASD) at Wright Patterson AFB, OH (the USAF "Program Manager" of the system). The designated experts of these groups were chosen by a senior official within the relevant organization. The designees were then interviewed and asked for their views on the impact of a system level warranty on the C-130 program, in regards to research questions one through three. The information obtained from these experts was used to determine if there exists some consensus on the types of changes or modifications to major weapon systems which could lead the contractor to perceive more risk, claim avoidance of the warranty provisions and insist on a new contract price.

Population and Sample

For this investigation, there was a well-defined population of three major subgroups. In order to describe

this population, it is necessary to address some functional relationships within the systems acquisition process. The first population subgroup was comprised of the AFPRO personnel responsible for overseeing the production of C-130 aircraft at Lockheed. This AFPRO is one of approximately 25, located at various defense contractor plants throughout the United States. The overall control of the AFPROs is located at Kirtland AFB NM, at the Air Force Contract Management Division (AFCMD). Each AFPRO is responsible for monitoring the day-to-day production of the system(s) and/or its subcomponents. Additionally, AFPRO personnel are charged with negotiating any new changes or modifications (e.g. Engineering Change Proposals) after contract award, with the contractor. Interviews were therefore conducted with designated experts on the C-130 production at the Lockheed AFPRO to provide insight on the impact of system warranties on the contractor (due to Government imposed modifications and changes).

Air Force Logistics Command (AFLC) is responsible for supporting and maintaining weapon systems after they are fielded and operational. AFLC is composed of a number of agencies including five major Air Logistics Centers (ALCs). These ALCs are designated support responsibilities for the many different systems and subsystems in the USAF inventory (and at times, other military services). The ALC located at Robins AFB GA, has the designated responsibility for the

C-130 aircraft. Each ALC is further divided into several functional areas. The area of interest in this research is the Directorate of Material Management (DMM). The DMM is divided into several divisions, but of interest here is the C-130 System Management Branch. This Branch is the heart of the day-to-day program management for the C-130. It is there where the second population subgroup of system management personnel reside and the designated experts were interviewed.

In identifying the last subgroup, a brief functional description of Air Force Systems Command (AFSC) is helpful. AFSC is responsible for the development and procurement of weapon systems for the Air Force inventory. Five major product divisions are the main agencies of AFSC. For this research, the Aeronautical Systems Division's (ASD) C-130 System Program Office (SPO) is a key focal point and comprises the third subgroup. This Office works hand-in-hand with both the ALC and the AFPRO in monitoring the C-130 program. (It is noted however that due to the mature nature of the C-130 program, there are very few individuals who perform the necessary program management tasks for the C-130 SPO).

The target population for this investigation was thus comprised of these three distinct groups. These groups were selected for the research because their job responsibilities

require them to monitor the day-to-day activities of the C-130 program's progress and operation.

The objective in the selection of sample members from these groups was to obtain data from personnel with at least five years experience (or knowledge of changes in the five year span of this study) with the C-130 program and a familiarity with the new system level warranty requirements on new weapon systems. It is important to note that all members interviewed were Government employees. This research did not gather data for a contractor view of the issues in question. The aim was not to obtain a critical number of persons in order to have a valid statistical sample, but rather it uses a purposive sampling procedure to obtain the personnel most familiar with the C-130 program.

The C-130 management personnel at the Lockheed AFPRO comprise the first subgroup and number approximately 50. The AFPRO Detachment Commander was interviewed to identify the best qualified experts to interview for this research. The five most experienced personnel consisted of an AFPRO C-130 Program Manager, a Quality Control Engineer, a Production Engineer, an Administrative Contracting Officer (ACO), and a Senior C-130 Engineer with both structural and electrical engineering backgrounds. These five personnel also qualify as a sufficient sample based on their expertise and familiarity with the C-130 production contract.

The C-130 System Manager (in the DMM at Robins ALC) was interviewed to identify the best qualified "experts" to interview, both from the systems management and engineering areas. There are currently 15 personnel assigned to WR-ALC/HMS which deal with the C-130 weapon system. The three most experienced personnel, including a senior manager with over 25 years operational and staff management experience with the C-130, a senior C-130 engineer, and a C-130 Logistics Management Specialist were selected for the research as the second sample group. These three personnel possess the major portion of the DMM expertise in C-130 program management, and qualify as a sufficient sample.

In addition to the systems management personnel, two Procuring Contracting Officers from the systems buying function within the Directorate of Contracting and Manufacturing were present as the "warranty advisors" the DMM managers use in assessing warranty impacts on their programs. Due to the extremely small size of the C-130 SPO in ASD, only one key individual was selected to be interviewed.

Data Collection Plan

In order to obtain the required data from the sample members to answer the research questions identified in Chapter One, an unstructured interview approach was selected. The individual interviews were guided by the

researcher based on preselected key sub-areas of interest related to the main research questions and the subjects' responses. In addition, a synopsis of the research effort, including the key questions and related sub-areas, was forwarded to each respondent prior to the interviews. The unstructured approach was chosen to promote a free-flowing exchange of views and insight for this research.

The interviews began with a brief explanation of the purpose of the study, and an explanation as to why the subject was selected. Each member was assured of total anonymity regarding their opinions and views. Initially, the overall experience of the subject was assessed by several specific questions pertaining to years of involvement with the C-130 program, grade, etc. The specific questions on system level warranty application for the C-130 centered around the research questions described earlier. In answering research questions one and two (and in determining which changes or modifications could have possibly led to an avoidance situation), the subjects' were given a "tailored" standard system warranty clause developed by AFCLC to assess the change impacts. This "standard" system warranty clause provided the base to evaluate changes or modifications. This clause has been coordinated and adopted by both HQ AFSC and HQ AFLC (the two major buying commands in the USAF) and definitizes the terms of the warranty requirements more comprehensively than the general

system warranty guidance specified in the Federal Acquisition Regulation. The members to be interviewed were initially contacted by telephone to set a convenient time for the interview to take place.

Data Analysis Plan

The overall objective of this research was to identify the types of Government imposed modifications and changes that could effect a system level warranty, and to assess the overall impact in regards to allowing contractor avoidance of the warranty. The above information was obtained from the interviews. Once the interview data was gathered, the results were reviewed by a designated team of attorneys from the Air Force Contract Law Center (AFCLC). This team of experts was selected by the Director of the AFCLC based on level of acquisition law expertise, C-130 program familiarity, and system level warranty knowledge.

Initially, the findings were given to the AFCLC lawyers for review and comment based on the existing warranty clause(s) for the C-130 production contract(s) (the existing warranty clause(s) are located in Appendix B). Once the initial review was completed, the lawyers gave an opinion of the findings, based on what benefits (if any) could have been afforded, had the C-130 production contract(s) required a warranty based on the AFCLC recommended system warranty

clause(s) (the AFCLC system warranty clauses are located in Appendix A).

This legal review provided added validity needed to make the conclusions and suggested recommendations for further research discussed in Chapter V. This review also provided a different perspective on what types of changes and modifications can lead to reconsideration of contract price due to warranty provisions. It further reinforced the importance of legal review in contractual matters.

III. Findings

Introduction

Interviews were conducted with the three subgroup populations referenced earlier. The unstructured interview approach proved to be an effective data gathering tool. A free-flowing exchange of views and ideas resulted from all participant questioning. Initially, all interviewees were assured of non-attribution. The thrust of the interviews centered around the three main research questions presented earlier in Chapter One. These are re-stated below as lead-in for the analysis to follow.

1. What criteria should be used to determine if a proposed change or modification has the potential for allowing the contractor to avoid the system level warranty (as written)?

2. Would performance guarantees (under a system level warranty) have been workable for the C-130, or would hostile operational environments allow avoidance of a warranty? (Example: Special C-130s modified for the 1982 Iran escape attempt).

3. How should present system level warranties be tailored to preclude contractor avoidance and still protect the Government's interests?

Using these research questions as a base, the Air Force Contract Law Center AFCLC proposed system warranty clause(s) were then analyzed to explore several sub-areas related to the research questions. The sub-area breakdown (by question) is listed below (Note: Research Question Three was used as an opportunity for the respondents to "think aloud" to present possible new ideas).

Research Question One Sub-areas

- (a) Organizational channels of evaluation for coordination of proposed changes or modifications (impacted by a system warranty)
- (b) Factors to consider for evaluating changes/modifications (impacted by a system warranty)
- (c) Changes or modifications which had the potential for allowing Lockheed to avoid a system level warranty
- (d) Product testing and its impact on system warranty coverage
- (e) Claims by the contractor [Lockheed] of defects in either the supplies, services or Government Furnished Property/Equipment (GFP/GFE)
- (f) Interim repairs or replacement necessary for the C-130 to allow continued weapon system operations
- (g) Current warranties in effect for the C-130 and claims associated with them

- (h) Air Force Maintenance policies and procedures and their impacts on possible contractor warranty avoidance
- (i) Claims and the "changes clause" for the C-130 production contract

Research Question Two Sub-areas

- (a) Performance requirements in general for the C-130
- (b) "Combat related damages" and their impact on warranty claims
- (c) Aircraft threat technology advances (Surface-To-Air missiles etc...) and their impact on warranty coverage
- (d) Exercising Government warranty claims during hostile operations

The AFPRO View (Det 21 - Lockheed Georgia Company)

Research Question One Sub-areas

Sub-area (a) Organizational Channels of Evaluation for Coordination of Proposed Changes or Modifications (Impacted By a System Warranty).

According to an AFPRO C-130 Program Manager and ACO, the channels of evaluation for proposed changes or modifications are basically the same as those for any program change. WR-ALC is designated engineering change responsibility, and must therefore approve any engineering changes or modifications (whether proposed by Lockheed, Robins ALC, or a user organization within DoD). Production

improvements have been continually sought by Lockheed both in material and manufacturing processes (designated LPCs - Lockheed Production Changes). An LPC must be coordinated by the AFPRO, forwarded to WR-ALC for approval, disapproval, or modification, then the SPO at ASD must negotiate the cost of the impact of the change on the contract. The SPO must be the organization to officially negotiate any changes to the production contract, since the Procuring Contracting Officer (PCO) retains that authority (and the PCO works directly with the SPO rather than the AFPRO). Government imposed changes (example - "blue foam" filler for wing fuel tanks - discussed later in-depth) are forwarded to the ALC (or originated there) up to Lockheed (coordinated through the AFPRO, then the SPO is tasked to negotiate the cost of any changes resulting from the changes/modifications. The three key players: AFPRO, WR-ALC (DMM), and the SPO at ASD work hand-in-hand on any proposed change or modification, including those that could impact a warranty.

Sub-area (b) Factors to Consider for Evaluating Changes/Modifications (Impacted By a System Warranty).

According to a Senior AFPRO C-130 Engineer, (and the consensus of the AFPRO interviewees), there are three main areas to consider for evaluating changes and modifications, regarding a subsequent warranty. First is the impact the change or modification will have on the

overall strength of the aircraft structure. In other words, if you cut a hole to add an access door, the aircraft structural rigidity resulting from the hole cut for it must be questioned. The impact functional changes have must also be considered for aircraft performance. An example here would be the addition of electronic equipment. The impact on performance resulting from increased weight and electrical loading could affect a warranty on the aircraft. Lastly, the ACO interviewed stated that any Government maintenance or repair performed during the warranty period (regardless if performed according to proper procedures) would void subsequent warranty claims.

Sub-area (c) Changes or Modifications Which Had the Potential for Allowing Lockheed to Avoid A System Level Warranty.

From an AFPRC standpoint (new production aircraft vs old aircraft later modified or changed), there were two main changes/modifications that could have impacted a system level warranty. The first of these was the introduction of "blue foam" requirement into the fiscal year (FY) 82 aircraft buy (delivery in FY83). The Air Force (for proposed safety reasons) required Lockheed to begin producing C-130s with blue foam filler in the wing fuel tanks. This type of foam was supposedly designed to eliminate sparks generated from small arms fire punctures to

the tanks (the overall thrust of which was to reduce the probability of explosion). The foam kits were (and still are) furnished to Lockheed as GFP. The AFPRO contacts interviewed felt that these Government imposed changes could give Lockheed the ability to avoid a warranty surrounding problems associated with the wing tanks. Subsequent tear-downs of the C-130 wings have found scorched sections of blue foam, indicating the existence of fire. The Senior C-130 Engineer interviewed expressed a concern for this finding, based on the failure of the foam to suppress all static electrical charges.

The second major change/modification which give rise to possible warranty avoidance lies with the Combat Talon II aircraft. These USAF aircraft (MC-130Hs) are extensively modified (with electronic sensors etc...) C-130s designed to perform highly specialized and diverse mission profiles.

The problem comes after modifications are complete. E-Systems (a subdivision of International Business Machines - IBM) performs the majority of the configuration changes. The consensus of the AFPRO interviewees was that there was no way Lockheed would allow a warranty claim after the Combat Talon II modifications were complete.

The key to the problem was felt to be the fact that ASD awarded two major contracts for the Combat Talon II Program. One contract went to Lockheed (for the main airframe). The second contract went to IBM for the upgraded internal

configurations. Since there are, in effect, two "prime" contractors, Lockheed would in no way warranty their aircraft after IBM was done modifying it. As a result, configuration control is a problem for the AFPRO on Combat Talon II aircraft.

Sub-area (a) Product Testing and Its Impact on System Warranty Coverage.

Product testing was felt to have a direct impact on warranty coverage. The general consensus was that not enough product testing was being accomplished. Government testing requirements have not changed virtually at all during the period this study encompasses (five years). There was a feeling, however, that there should have been more testing done by Lockheed. An example was premature cracking of flap skins encountered on several new Coast Guard C-130Hs.

The flap skin problem originated with the FY83 aircraft buy (delivery in FY84). Lockheed claimed there was a shortage of titanium (the flap material called for in the aircraft specification). A request was made by Lockheed to substitute a .050" thick aluminum alloy for the titanium. This change was approved by Warner Robins ALC. A key point here is that there is no evidence of product testing by Lockheed for the suitability of the aluminum material. According to a senior AFPRO structural engineer, titanium is

roughly three times as strong as aluminum. The question then can be asked, "why didn't Lockheed start [and test] with .075" thick alloy?"

New Coast Guard aircraft began experiencing cracks in the newly designed aluminum flaps. It was determined that the unique mission profiles the Coast Guard flies (requiring numerous slower, flaps-down flight - at low level), heavily stressed the aluminum flaps. The cracking occurred with as little as 190 flight hours on the aircraft. Subsequent Engineering Design Analysis has discovered that the material used was in fact, .040" thick alloy (versus .050" as called for in the specifications). The final outcome of this discrepancy is still to be resolved.

There are many engineering costs related to the C-130 production in common (non-customer specific configurations) configuration areas. These costs are spread over a "pool" of various costs. Based on the number of aircraft purchased, each customer pays 1/36th (there are 36 C-130s produced each year) of the pool for each aircraft. Based on FY86 cost estimates, in the Engineering Testing Segment of the "common pool," approximately \$269,145 will be paid by the USAF to Lockheed for engineering testing in FY86. Further breakout of this figure follows.

FY86 Lockheed Engineering Manyear requirement (Testing).....	80
Estimated Total C-130 Aircraft to be Purchased	16

AFPRO Negotiated Direct Engineering Labor Rate
..... \$19.66/Labor Hr

AFPRO Negotiated Engineering Overhead rate
..... 131.5% (of Total Labor Costs)

Lockheed Productive Manhours/Year..... 1680

Common Pool Percentage to be Paid.16/36th (.44)

Computations

$8.0 * .44 = 3.52$ Total Manyears

$3.52 * 1680 = 5913.6$ Total Manhours

$5913.60 * \$19.66 = \$116,261.38$

$\$116,261.38 * 131.5\% = \$152,883.71$

$\$152,883.71 + \$116,261.38 = \$269,145$

It should be noted that this is only one element to consider in the cost of testing engineering changes. This study does not purport to be a total "cost analysis". The above analysis serves to show that a significant amount is involved in the testing issue. The Senior Engineer interviewed expressed a concern with the question of whether we [the USAF] are getting our money's worth in the testing area for LPCs (Example - flap skins).

Though product testing is fairly stable in the C-130 program, the AFPRO personnel interviewed were concerned with the testing issue. The "fixes" recommended by Lockheed regarding the flap skin, centered around (1) users repairing the flaps in-house with stainless steel patches (2) users repairing the flaps in-house with a Lockheed supplied kit

(at a cost to the Government) and (3) Lockheed repairing them at their plant.

Sub-area (e) Claims by the Contractor [Lockheed] of Defects in Either the Supplies, Services or Government Furnished Property/Equipment (GFP/GFE).

According to an AFPRO C-130 Program manager, there have been several instances of warranty avoidance by Lockheed, based on the existence of nonsuitable GFP/GFE. Table 1 outlines the warranty claims that were disallowed by Lockheed in FY85, based on the fact that the discrepancies were related to GFP/GFE.

TABLE 1

Disallowed Warranty Claims FY85/FY86 (Based on Existence of Nonsuitable (GFP/GFE) (6-10)

<u>ITEM</u>	<u>CLAIM #</u>	<u>USER ID</u>
Oil Cooler Flap Indicator	84002	Coast Guard
SKE Coder-Decoder	85003	Deleware ANG
Transceiver	85004	Deleware ANG
APX-72 Transponder	85005	Deleware ANG
TACAN Control Panel	85006	Deleware ANG
Receiver-Transmitter Unit	85017	Deleware ANG

- Continued -

TABLE 1 - Continued

Disallowed Warranty Claims FY85/FY86 (Based on
the Existence of Nonsuitable GFP/GFE) (6-10)

<u>ITEM</u>	<u>CLAIM #</u>	<u>USER ID</u>
Torquemeter Indicator	85021	Deleware ANG
Rate-Of-Climb Indicator	85022	Deleware ANG
TD Amplifier	85031	Deleware ANG
Encoder Altimeter	85032	Deleware ANG
Receiver-Transmitter Unit	85033	Deleware ANG
Receiver-Transmitter Unit	85035	Deleware ANG
Control, Transponder	85037	Deleware ANG
Intercomm Control	85038	Deleware ANG
Receiver-Transmitter Unit	85002	Deleware ANG
Valve, Manifold	85039	Deleware ANG
Shoe, MLG Lower	85040	Deleware ANG
Shoe, MLG Lower	85047	Deleware ANG
Show, MLG Lower	85048	Deleware ANG
Selector, Mode	85041	Deleware ANG
Indicator, Attitude	86011	Deleware ANG
Control, Transponder	85042	Deleware ANG
Control, Transponder	85043	Deleware ANG
Receiver-Transmitter Unit	85051	Deleware ANG

- Continued -

TABLE 1 - Continued

Disallowed Warranty Claims FY85/FY86 (Based on the Existence of Nonsuitable GFP/GFE) (6-10)

<u>ITEM</u>	<u>CLAIM #</u>	<u>USER ID</u>
Receiver-Transmitter Unit	86002	Deleware ANG
Cooler, Oil	86005	Deleware ANG
Tachometer, Indicator	86006	Deleware ANG
Relay, Ignition	86009	Deleware ANG
Receiver-Transmitter Unit	86013	Deleware ANG

Though the information listed in Table 1 is not all inclusive (for the complete five year span of this study) it does serve to point out two important AFPRO findings. First, the provisions of the current warranty on new production aircraft prohibit users from submitting claims unless the aircraft are immediately placed into service after AFPRO acceptance. As a result, the majority of successful claims were from using organizations in the Air Reserve Forces (ANG and AFRES) and the Coast Guard. Combat Talon II aircraft for example, are not operational until over a year after they leave the Lockheed Georgia plant. The second factor is that Lockheed is quick to note which components/sub-assemblies are GFP/GFE and disregard warranty liability for these items.

Regarding claims by Lockheed of incoming defective GFP/GFE for production, there were two cases cited by the

AFFRO interviewees. First was the engine oil coolers (which had defects in manufacture) and second was the engine belly pans (which are closely tied to the oil cooler problems). The defective oil coolers (and the belly pans) caused a production scheduling problem due to the resulting shortage of serviceable components. The mature nature of the C-130 program has resulted in very few problems with defective material in general.

Sub-area (f) Interim Repairs or Replacement Necessary for the C-130 to Allow Continued Weapon System Operations.

"Interim repairs/replacements" have been necessary for the C-130 to allow continued weapon system operations. The single instance cited of this (in the last five years) was the cracked flap skins referenced earlier. Coast Guard aircraft involved required patching with stainless steel to maintain operational readiness for many of the Coast Guard aircraft.

Sub-area (g) Current Warranties in Effect for the C-130 and Claims Associated with Them.

The current warranty given by Lockheed on new production aircraft, provides for six months coverage of any defects encountered for materials and workmanship (with provisions for latent defects). To date, Lockheed has been

very responsive to warranty claims under this warranty. A key point to note is when the warranty period begins.

Under the current warranty agreement, the AFPRO accepts new aircraft on behalf of the Government at the point a DD Form 250 is executed. If the aircraft is immediately placed into operational service (example - ANG and AFRES) the Government benefits from the warranty. In the case of Combat Talon II aircraft, however, the modifications by E-Systems take almost one year after the AFPRO initially accepts the aircraft via DD Form 250. The result is that the Lockheed warranty has long expired before the aircraft becomes operational in the field. In this situation, the Government does not benefit from the warranty coverage and the costs associated with the warranty are lost. Claims against this warranty have centered around user organizations which could place the aircraft into operation immediately after AFPRO acceptance.

Sub-area (h) Air Force Maintenance Policies and Procedures and Their Impacts on Possible Contractor Warranty Avoidance.

Air Force maintenance procedures are specified in Time Compliance Technical Orders (TCTOs). The TCTOs in effect upon delivery are specified in the individual production contract. Though procedures are specifically defined in TCTOs, according to the Senior C-130 Engineer

interviewed, they are written to express the "intent" of the procedures. This allows user organizations to use tools, stands etc... that differ from those Lockheed uses in production. The AFPRO interviewees felt that if an aircraft was under warranty and the Government Agency repaired it, the warranty would be voided.

Sub-area (i) Claims and the "Changes Clause" for the C-130 Production Contract.

During the study period covered (last five years) warranty claims against Lockheed have not been disposed of pursuant to the "Changes Clause". According to the AFPRO personnel interviewed, changes to the system are well coordinated, integrated into production, and documented. The actual number of changes/modifications integrated into production in the last five years has been negligible. This is primarily due to the mature nature of C-130 production.

Research Question Two Sub-areas

Sub-area (a) Performance Requirements in General for the C-130.

On the question of performance requirements (with respect to performance warranties), AFPRO personnel felt that the extensive and varied mission profiles for the C-130 would prohibit enforceable performance warranties. The aircraft now produced must pass flight testing requirements;

but that is about the extent the performance issue can be pressed. According to a C-130 ACO, the more limitations/requirements you place on the aircraft, the easier it is to void the warranty. Additionally, it would be difficult to prove (i.e. enforce) the Government claims that a warranty claim for performance was valid. In the words of the ACO, "you would need a flight data recorder of a magnitude that doesn't exist today." According to the AFPRO Program Manager interviewed, we [the USAF] buy the aircraft based on faith in the flight testing and in the design that meets the test requirements. The overall consensus was that you couldn't write a warranty that would cover all possible performance parameters, and if you could, the Government could never afford it's cost.

Sub-area (b) "Combat Related Damages" and Their Impact on Warranty Claims.

"Combat related damages" were not felt by AFPRO personnel to pose any significant problems. If damage was a result of direct fire, the contractor wouldn't be held liable. In the case of a latent defect in workmanship that was encountered during combat operations, the AFPRO ACO felt that the Government would have the right to place a claim against the warranty. Defects resulting from operating the aircraft outside the established design parameters would be

difficult to prove and enforcement of the Government's warranty claim almost impossible.

Sub-area (c) Aircraft Threat Technology Advances
(Surface-To-Air Missiles etc...) and Their Impact on
Warranty Coverage.

Advances in aircraft threats (AAA and SAMS etc..) and their potential impact on warranty coverage was also discussed with the AFPRO interviewees. The consensus was that in peacetime there are so few instances that it really isn't considered important. Most important is the fact that if the Government loses a C-130 to a SAM, its's too bad. It's simply written off as a loss. Lockheed would never be held liable for such a loss.

Sub-area (d) Exercising Government Warranty Claims
During Hostile Operations.

The process of submitting warranty claims for damages sustained in hostile environments were not felt to be a problem. The ACO interviewed stated that if a valid claim was to be pursued, it would follow normal channels. The specific circumstances surrounding the claim and damages would have to be carefully analyzed.

Research Question Three - Tailoring Future System Level Warranties.

The suggestions the AFPRO personnel had to improve and tailor system level warranties centered around three areas. The first of these was for the Government to take a more aggressive role in evaluating production changes (LPCs) as they arise. verification of the changes must be sought and well documented. These two tasks must be done before we accept the changes. The second recommendation posed by the AFPRO personnel was to try and tie that warranty to a usage factor (say flight hours) versus time (six months). This would make the warranty more useful to the Government (in their opinion). The third and last recommendation was to establish the start of the warranty from initial date of operational use instead of from the date of DD 250 acceptance at the AFPRO. This recommendation is impacted by the contractual provisions associated with two prime contractor for the Combat Talon II aircraft. Requiring an aircraft manufacturer to guarantee it's product after another vendor (which it did not have control over) extensively modified the aircraft was viewed as an unfair request to ask of the contractor.

The Air Logistics Center View (DMM)

Research Question One Sub-areas

Sub-area (a) Organizational Channels of Evaluation
for Coordination of Proposed Changes or Modifications
(Impacted by a System Warranty).

The viewpoint of the ALC respondents was that the channels of evaluation for the effect changes/modifications would have on a system level warranty were not of significant importance. The thrust of the System Management at the ALC was described as primarily for modifications and changes implemented long after a new aircraft warranty would expire. The changes/modifications implemented were described as being done to older aircraft that have been in the field for many years.

For those changes which are later integrated into new aircraft production, the coordination/review process is extensive. Once the requirement is determined to have new production implications, extensive engineering evaluation is accomplished. The aircraft change/modification then goes through a lengthy configuration analysis and coordination from the System Management Division level up through Air Staff level. The change/modification then must undergo a review by the contractor to determine the cost of engineering out the old design(s) and engineering in the new ones.

A significant problem that has been encountered during the integration of the new change/modification into production is in the area of a "certified design." DoD acquisition personnel have been striving to eliminate sole-source procurements and foster competition. Many times a modification contract (that later leads to a new aircraft production change) is awarded to a contractor other than the main airframe contractor. To facilitate later production integration, data rights, drawings etc... are purchased. The problem comes when the data, specifications etc... are given to the prime aircraft vendor to integrate into new production and the "data" is described as "inadequate." The result is extensive re-engineering and design costs. This is one area which has continually caused problems despite extensive Government review.

Sub-area (b) Factors to Consider for Evaluating Changes/Modifications (Impacted by a System Warranty).

The system management view of warranty consideration factors centered on three key areas. First was the altering of the physical structure of the aircraft. Extensive structural configuration changes can impact both strength and performance of the aircraft. The second major factor cited was the case of operating the aircraft outside of the limits it was designed for. The case of abuse of a weapon system is applicable here. The third and final

factor cited, centers on the question of where the change or modification is, and its relationship to the overall aircraft. According to the Senior C-130 Engineer interviewed, if the Government changes or modifies an area of the aircraft, the areas affected would be exempt from future warranty claims. The key problem would be the ability to trace the exact cause of the defect.

Sub-area (c) Changes or Modifications Which had the Potential for Allowing Lockheed to Avoid System Level Warranty.

The ALC interviewees cited three key changes / modifications that could give Lockheed the potential to avoid a system level warranty, had one been in effect. Their opinion was primarily based on the knowledge gained from the current warranty given by Lockheed on the C-130 aircraft. The first change/modification was the introduction of "blue foam" in the FY 83 delivered aircraft. This modification (as described earlier) was designed to improve survivability from small arms fire which struck the wing tank area of the C-130. The consensus was that defects resulting from any changes or modifications in the wing tank areas would be unrecoverable under warranty as a result of the blue foam requirements.

The second major change/modification was for the Combat Talon II aircraft modification. Here the feeling was that

Lockheed could avoid their warranty liability, but the modified areas should be covered by a warranty with IBM. The respondents stated that the Combat Talon II aircraft is a much different weapon system than the basic airframe provided by Lockheed, based on its diverse mission profiles. They felt there would be no major problem with warranty coverage assuming the dual prime contractor relationship was given consideration and thought out by the SPO at ASD, and provided for in the contract.

The last change/modification felt to give rise to warranty avoidance was an addition of "strakes" to the aft section of the aircraft fuselage. These strakes are a type of airfoil attached to the sides of the aft section to redirect airflow turbulence. The idea was originated by the Air Force and a prototype was designed and implemented. The overall goal is to reduce drag and increase fuel efficiency. Later however, Lockheed joined in as a joint designer for the engineering of a strake to integrate into new production aircraft. There was an instance of one of the Lockheed installed strakes falling off an aircraft in-flight. Later investigation revealed that Lockheed had modified the prototype design for the production aircraft. The Systems Manager interviewed felt that Lockheed has been very responsible to the re-design efforts but possibly could claim the Air Force was partially responsible for the fault. Final disposition of the strake claim was still pending.

Sub-area (d) Product Testing and Its Impact on
System Warranty Coverage.

The respondents felt that product testing has not changed to any extent during the last five years for the C-130. When asked about the change to aluminum flap skins material, the Senior Engineer stated that only a stress analysis was conducted and at that time that was deemed sufficient. The interviewees stated that product testing for new aircraft is determined between the SPO and Lockheed.

Sub-area (e) Claims by the Contractor [Lockheed]
of Defects in Either the Supplies, Services or Government
Furnished Property/Equipment (GFP/GFE).

Contractor claims of defects in GFP/GFE related to the C-130 were not well known to the ALC personnel interviewed. They stated they had heard of some problems but did not take an active role in tracking defective GFP/GFE. If questions arise regarding defective GFP/GFE that an ALC has procured, the AFPRO coordinates with the respective Item Manager. Monitoring of the defective products is closely tracked by the SPO and the AFPRO.

Sub-area (f) Interim Repairs or Replacement Necessary
for the C-130 to Allow Continued Weapon System Operations.

The respondents identified three instances of "interim repairs or replacements" that have been (or will be) necessary to allow continued weapon system operation. The first of these was for approximately 20 aircraft that had aluminum nuts in areas where the specifications called for steel nuts. This was a potential stress problem but does not pose an immediate safety threat. These defects will be corrected in the next Programmed Depot Maintenance (PDM) cycle for the aircraft involved. Since the probability of immediate failure was deemed to be fairly low and the cost was negligible, the Air Force will absorb the cost of this change. The second repair was on the vertical stabilizer on approximately 20 aircraft. This was a quality problem and will also be corrected in the next PDM cycle. While it too does not pose an immediate threat, it does identify another deviation from the specifications. Both the above identified problems were noted during an audit of Lockheed production during the November 85 - January 86 timeframe. The last interim repair noted by the ALC personnel was the reskin of the flaps with stainless steel versus aluminum. Since this was discussed earlier, it is only mentioned here.

Sub-area (g) Current Warranties in Effect for the C-130 and Claims Associated With Them.

The ALC respondents stated that Lockheed has been very conscientious in honoring warranty claims and correcting latent defects. The current warranty is six months after the DD 250 is executed by the AFPRO. The Senior System Manager did state that they have had some difficulty in successfully filing latent defect claims based on difficulty in proving the defects were latent. Specific claims were said to be closely monitored by the AFPRO.

Sub-area (h) Air Force Maintenance Policies and Procedures and Their Impacts on Possible Contractor Warranty Avoidance.

The general consensus among the ALC respondents was that Air Force maintenance policies and procedures would negatively impact a warranty. The general idea was that whatever area(s) we [the Government] work on and/or modify would become exempt from subsequent warranty claims. It was stated that many times it is simply more cost (and time) effective to do repairs in the field versus send it to Lockheed for warranty repair. Keeping airplanes flying was viewed as the primary goal instead of paperwork.

Sub-area (i) Claims and the "Changes Clause" for the C-130 Production Contract.

Claims under the "changes clause" for the C-130 production contract were not known by the ALC interviewees. They felt this question would be best answered by the AFPRO.

Research Question Two Sub-areas

Sub-area (a) Performance Requirements in General for the C-130.

Performance requirement guarantees for the C-130 were felt to be totally unworkable, according to the ALC interviewees. The Senior System Manager stated there were 22 different configurations for the C-130 in the field. This fact, coupled with the diverse mission profiles the C-130 must fly make "fixed requirement(s)" warranty provision(s) infeasible. The integration of different avionics, different weight etc... make establishing the specific performance requirements necessary within a warranty impossible. The PCOs present stated that if such a warranty provision could be written either (1) we [the Government] couldn't afford to buy it or (2) no contractor would accept a contract with such stipulations.

Sub-area (b) "Combat Related Damages" and Their Impact on Warranty Claims.

The question of combat related damages in operational environments brought to light a view that had not been mentioned by other subgroups. This was the fact that the C-130 can be called upon to operate in not only hostile (combat) operational environments, but also in the hostile (environmental) environments. The impact of warranties here is in the area of corrosion damage. According to the Senior Systems Manager, aircraft in a hot, dry desert climate (i.e. Saudi Arabia), may corrode little to none. Aircraft in wet, humid climates (i.e. Guam) however, begin corroding almost the instant they arrive. This corrosion (hostile environmental elements) can be a significant contributor to warranty risk for the contractor. With respect to combat sustained damages, the consensus was that the contractor would not be liable.

Sub-area (c) Aircraft Threat Technology Advances (Surface-To-Air Missiles etc...) and Their Impact on Warranty Coverage.

Technology advances in aircraft threats (improved SAMs etc..) were felt to not impact a system warranty application. If the Government loses an aircraft to a threat, it loses its right to claim warranty coverage.

Sub-area (c) Exercising Government Warranty Claims
During Hostile Operations.

Given that damages sustained in a hostile environment were not combat related, warranty claims would be handled as any other warranty claim, according to the ALC respondents. This opinion followed earlier views by interviewees.

Research Question Three - Tailoring Future System Level Warranties.

The ALC respondents provided a unique view on the tailoring of system level warranties. There were two key ideas presented. First, they felt that designing in maintainability and reliability parameters would enable subsequent tailoring of warranty provisions (Example - Mean Time Between Failure rates). The second idea (from the systems management perspective) was related to data collection (for current systems in the field). The consensus was that tracking system maintenance history accurately and managing the data efficiently is paramount to later stating new requirements for warranty item coverage. According to the Senior System Manager, unless you know where the problem areas have been on existing systems, you can't tailor new system warranty coverage to incorporate areas which could be corrected by warranty provisions.

System Program Office View

Research Question One Sub-areas

Sub-area (a) Organizational Channels of Evaluation for Coordination of Proposed Changes or Modifications (Impacted by a System Warranty).

The SPO Program Manager interviewed felt that due to the many different C-130 programs managed (Coast Guard, Foreign Military Sales (FMS), Marine Corps etc...), the channels of evaluation needed for proposed changes or modifications was very dependent on the particular user involved. Though the ALC Systems Managers and AFFRO personnel still remained vital links in the coordination process, the "other" reviews depended on the specific program affected by the proposed change/modification. Though complex, the coordination process posed no major problems for the SPO.

Sub-area (b) Factors to Consider for Evaluating Changes/Modifications (Impacted by a System Warranty).

The consideration factors for evaluating changes / modifications identified by the SPO respondent, centered around two areas. The first of these were the structural parameters of the aircraft. The question here was whether or not a change/modification would effect the physical configuration of the airframe. The Manager cited the case of a "stretched" C-130 to increase payload capacity (a

similar concept was applied to the C-141). In short, if the structure is modified, the warranty on that structure is in question. The second factor cited was the impact of the change on the performance of the aircraft. If a modification will hinder performance, the warranty is in question. The reader should note that these considerations were similar to those of other respondents.

Sub-area (c) Changes or Modifications which had the Potential for Allowing Lockheed to Avoid a System Level Warranty.

The Program Manager interviewed stated there were two major changes/modifications that could allow Lockheed to avoid a warranty claim. The first was the integration of "strakes" on the aircraft (described earlier). The interviewee went on to explain that Warner Robins ALC designed a modification kit initially, gave a kit to Lockheed and told them to design it into the new production aircraft. Though a "joint production design effort", this would still give rise to possible warranty claim avoidance, since the Government implemented the initial prototype design and told Lockheed to implement the new addition to the airframe. The second change/modification cited, was the E-Systems modifications on Combat Talon II aircraft. Though the interviewee felt Lockheed had every right to claim avoidance of a warranty after the E-Systems modifications,

ne did feel that IBM should be liable. When asked if the implementation of "blue foam" could lead to warranty avoidance, the interviewee said that, in his opinion, it would not have any impact.

Sub-area (d) Product Testing and its Impact on System Warranty Coverage.

Product testing was again described as virtually unchanged over the last five years. The majority of any changes are not thoroughly tested. This is due primarily to the fact that the C-130 is a proven system and therefore, requires little testing. The "testing" now performed is mainly of the system check-out type. In general, Lockheed does little testing for the C-130. For this study, testing was viewed as having little impact.

Sub-area (e) Claims by the Contractor [Lockheed] of Defects in Either the Supplies, Services or Government Furnished Property/Equipment (GFP/GFE).

The oil cooler problem cited earlier by the AFPRO respondents was also mentioned by the SPO Program Manager as an example of defective GFP impacting production [and therefore potentially the warranty]. The problem stemmed from the fact that the Government was (and still is) having problems obtaining a good vendor for the oil coolers. The interviewee stated that many times Lockheed repairs the

defective GFP/GFE, rather than hold up production. Those permissions to repair must go through the SPO.

The ALC was described as another type of "vendor", from which GFP/GFE is purchased. If a "trend" of defects is noted by the SPO and/or the AFPRO, the item manager is contacted and the manufacturer is tracked back to locate the cause. There are currently "preferred vendor items" for the C-130. These can be either "sole-source" or a limited number of vendors which have proven products. When asked why the ALC Systems Managers didn't seem concerned with tracking the GFP/GFE, the Program Manager stated that the close monitoring of GFP/GFE is through the vigilance of the SPO and the AFPRO.

Sub-area (f) Interim Repairs or Replacement
Necessary for the C-130 to Allow Continued Weapon System
Operations.

When questioned regarding "interim repairs or replacements" for continued weapon system operation, the Program Manager explained that the C-130 is bought to a Government specification, not to a Statement of Work. This was described as a key point, because if defects or poor designs result from production, and the end product meets the specification, the Government "buys it". The cracked flap skin problem was then discussed, and the bottom line was, that since Warner Robins ALC approved the change to

aluminum [with little or no testing], and Lockheed [supposedly] built to the specifications approved, the Government absorbed the correction of the problem. As mentioned earlier however, further investigation of the flap skin problems revealed that Lockheed used material which failed to meet the approved specification change. As a result, the SPO is pursuing a workmanship claim under the latent defects clause. The Program Manager emphasized that proven designs and engineering must be worked out to establish a "sound specification".

Sub-area (g) Current Warranties in Effect for the C-130 and Claims Associated with Them.

The current warranty (as described earlier) is for six months on workmanship and materials (with provisions for latent defect claims). According to the Program Manager, there have been numerous claims under the warranty and Lockheed has been very responsive to warranty claims in general.

Sub-area (h) Air Force Maintenance Policies and Procedures and their Impacts on Possible Contractor Warranty Avoidance.

Current Air Force Maintenance procedures and policies were described by the SPO respondent as definitely impacting a warranty. The feeling expressed was that if the

Government tamper with, say, a "black box component" during the warranty period, we void the warranty. Possibly we would even void the aircraft warranty if key components (sub-assemblies etc...) are repaired/tampered with. Maintenance procedures in general were identified as key areas for warranty avoidance by Lockheed. He felt that maintenance personnel in the field are not geared to deal with the requirements posed by enforcing a systems level warranty.

Sub-area (i) Claims and the "Changes Clause" for the C-130 Production Contract.

According to the SPO respondent, while there have been warranty claims avoided by Lockheed by citing tampered components/repairs etc... these were felt to be rare cases. As a rule, Lockheed was said to repair "no matter what" (as long as the claim was within the six month period). There were no incidents cited when the "changes clause" was cited to avoid warranty liability.

Research Question Two Sub-areas

Sub-area (a) Performance Requirements in General for the C-130.

Performance requirements in general were described by the Program Manager interviewed as being "included in the Government specification" that Lockheed builds to. Several

performance requirements were specified in an amended warranty clause (P00007)(Appendix C), but the overall impact on the warranty provisions was negligible. He further stated that the C-130 has proved its airworthiness over the years and the specification currently in effect covers what DoD wants the aircraft to do.

At the current stage of the C-130 program(s), the interviewee stated that the Government doesn't need to buy a warranty [in excess of what is provided by Lockheed], because the system has proven itself. Performance qualifications were described as possible to definitize, but very costly. In general, it was posed that in the early stages of a weapon system's development, performance specifications should be specified and warranted. However, once the system is "proven" and a "build to specification" concept is implemented, the "performance" becomes indigenous to the specification.

Sub-area (b) "Combat Related Damages" and Their Impact on Warranty Claims.

Operational environments were viewed as not posing a major problem for performance guarantees. The Program Manager stated that the C-130 program is mature enough that the Government should know what it wants the aircraft to be able to do [and hence what operational environments it must fly in.] Therefore, combat environments are simply one of

many possible for the C-130. Performance guarantees were viewed as being enforceable, because the specification we require Lockheed to build to, takes into account the "combat environment." The caveat was cited however that "obvious" combat damage (bullet holes etc...) from hostile fire voided any warranty liability.

The respondent also stated that latent defects (example - flap skins) would probably surface in combat (due to unusual stresses on the aircraft). With this in mind, it is the Program Manager's opinion that defects etc... arising during hostile operation could still be valid claims under a warranty (if the aircraft did not sustain hostile fire damage - bullet holes etc...)

Sub-area (c) Aircraft Threat Technology Advances
(Surface-To-Air Missiles etc...) and Their Impact on
Warranty Coverage.

Advances in aircraft threat technology were not viewed as an important factor impacting a system level warranty. The current warranty on the C-130 only incorporates "what we need the airplane to do," according to the Program Manager interviewed. If threats to the aircraft advance beyond what the aircraft is capable to defend against, that is simply too bad. The specification called for can only account for what is known. Changing threats, after a warranty is given do not have bearing here.

Sub-area (d) Exercising Government Warranty Claims
During Hostile Operations.

Damages sustained in a hostile environment, given that they were not directly combat related (bullet holes etc...), were described as being handled the same as in peacetime. In other words, only the normal problems inherent with warranty claims would be applicable.

Research Question Three - Tailoring Future System
Level Warranties.

Regarding the tailoring of system warranties, the Program Manager cited three major areas of concern. First, many times we [the DoD] are forced to fix something that breaks due to necessity (mission requirements). Under the current C-130 warranty (and many others), once the Government repairs something under warranty, the warranty is voided. Additionally, the Government is not reimbursed for its costs to repair the items. Efforts must be made to allow repairs of necessity and provide reimbursement for the Government repair costs. This will avoid paying "twice" for the repairs.

The second area was that the maintenance personnel (and organizations) in the field must change their mode of operations. This means that the maintenance community must gear up to administer (enforce) the warranties obtained.

Items under warranty must be easily identified and provisions made to allow contractor repair of the item(s).

The final area mentioned was to maintain a prime-subcontractor relationship between contractors for major modifications. The Lockheed - IBM relationship for the Combat Talon II aircraft has caused much confusion. The end loser in any litigation will be the Government. A warranty claim under a dual-prime contractor relationship causes nothing but confusion for later administration of the contract and program management.

IV. Analysis of Findings

Introduction

The findings presented in Chapter Three were reviewed by a team of Air Force Contract Law Center (AFCLC) lawyers (hereafter referred to as simply AFCLC). This review was twofold. First, it sought to provide comment on the respondents' discussion, based on the current warranty clauses (which can be found in Appendices B-D) in the C-130 production contracts. Secondly, it gave insight as to what benefits could have been afforded by having a full system level warranty (similar to the AFCLC clauses presented in Appendix A) on the C-130 contracts.

It is interesting to note that On 21 November 1985 the C-130 contract was amended (P00007) to include several systems level warranty type provisions (Essential Performance Requirements etc...) for the DoD Designated C-130s (the amended warranty clause can be found in Appendix C). The Foreign Military Sales (FMS) and U.S. Coast Guard (USCG) retained the original warranty provisions in the unamended contract (the original warranty clause can be found in Appendix B). Combat Talon II aircraft (and earlier Combat Talon I aircraft) warranty provisions have only the airframe warranty provided by Lockheed (which expires prior to completion of reconfiguration by E-Systems). There no warranties whatsoever for the Combat Talons after delivery

to operational units. The only warranties exist between the prime contractor (IBM) and IBM's subcontractors (E-Systems etc..)(see Appendix D for the subcontractor warranty provision which is applicable).

Research Question One Sub-areas

Sub-area (a) Organizational Channels of Evaluation for Coordination of Proposed Changes or Modifications (Impacted By a System Warranty).

The findings in this areas were felt to be sufficient. AFCLC found the channels of coordination referenced to be thorough, appropriate, and the mature nature of the Program has kept those who "need to know" well informed. AFCLC did agree with the ALC respondents that complete "reprocurement data" has been a historical problem. The feeling expressed was that the Government should be able to recover excess costs incurred as a result of "incomplete data" by exercising its rights under the theory of "consequential damages". To date, however, the Government has not extensively exercised these rights in this manner.

Sub-area (b) Factors to Consider for Evaluating Changes/Modifications (Impacted By a System Warranty).

In general, these findings centered around the following areas:

- * Impacts of changes on overall structural strength

- * Impacts of functional changes on aircraft performance
- * Impacts of changes which could lead to operating the aircraft outside its design limits
- * Government maintenance or repairs performed during the warranty period

AFCLC agreed on the respondents' evaluations regarding these general areas, with the exception of the last factor cited, regarding Government performed maintenance. This was an area which AFCLC expounded on. It will be discussed in more detail under Research Question One, Sub-area h. Simply put, the existing warranty clauses specifically give the Government the right to perform maintenance and receive compensation (within limits). AFCLC felt the other three factors cited were conclusive enough.

Sub-area (c) Changes or Modifications Which Had the Potential for Allowing Lockheed to Avoid A System Level Warranty.

The instances cited by the respondents can be summarized as below and the AFCLC comment on each will be discussed.

Summary of Changes/Modifications with
warranty Avoidance Potential

- * Introduction of "Blue Foam" in Wing Fuel Tanks
- * Combat Talon Aircraft Modification

* Introduction of "Strakes" to New Production Aircraft

AFCLC agreed with the respondents (ALC and AFPRO) that the "blue foam" requirements could lead to a warranty claim disagreement. According to AFCLC, "the problem would rest with the party with the burden to prove." The Government has the burden (in this case) to show that the defect was caused by something other than the blue foam. The losing party in a case where it is difficult to prove the nature of the cause, is the one who has the burden of proof. (The reader should note this follows legal precedent as explained on pages seven and eight of this thesis). The impact of GFP/GFE and the contractor's equipment continually gives rise to this question surrounding subsequent warranty claims. According to AFCLC, "that interface area is a grey area, and has the potential for us not being able to satisfy what we feel is a valid claim by not being able to clearly demonstrate that it was his [the contractor's] "thing" and not what we had him connect to it, which caused the failure".

The Combat Talon configurations of the C-130 was an example of multiple prime contractors on one type aircraft. ALC respondents claimed this "modification" would give Lockheed the option of avoidance (especially since the [Lockheed] airframe warranty expires long before E-Systems delivers a completed Combat Talon aircraft). AFCLC

explained that multiple prime contractors on an individual aircraft is not unique. There were two key reasons cited for this contractual approach.

First, having more than one prime contractor gives the Government "privity" with additional contractors. This is done to maintain control of the additional contractors performance and guarantees. Regarding the GFP/GFE issue, the USAF has kept privity of contract with engine suppliers for over 50 years. Therefore, engines have traditionally been supplied to prime contractors as GFP. Considering the extensive modifications performed by E-Systems, it is logical (though problematic) to have IBM as a prime. Warranty coverage by Lockheed is only for those areas of the airframe not modified by E-Systems.

AFCLC explained that the multiple prime relationship is used extensively in the B-1 Bomber production. Rockwell International is the prime contractor for the basic airframe and serves as "integrator" of the other prime contractors' production elements. Boeing is prime for the offensive avionics, AIL Eaton is prime for the defensive avionics, and General Electric is prime for the engines. Thus, there are four prime contractors involved. According to AFCLC, this gives the Government extensive control over the contractors, but it could lead to future problems for warranty claims once all the systems are integrated. Aside from the privity

question, the second major reason the Government uses multiple primes is to reduce cost.

If the contract for Combat Talon aircraft had only Lockheed as prime, with IBM serving as a subcontractor, the cost per aircraft would be significantly greater. This is due to the additional management responsibility delegated to the one prime. Managing a contract costs the contractor money, and the more sub-contracts he manages, the more cost passed to the Government. The warranty claim problems associated with multiple prime agreements are inherent in the management decisions to have more than one prime contractor.

The strike modification referenced could have led to warranty avoidance, according to AFCLC. The best way to handle this problem is provided for in the current warranty clause (P00007)(Appendix C) but is not applicable in the original clause (pre P00007)(Appendix B). This is the "Limitations and Exclusions" segment of the clause (the full clause can be found in Appendix C) which states:

(2) The said warranties do not apply to any failures or defects caused by negligence or failure of Government personnel to operate and maintain aircraft delivered hereunder in accordance with procedures contained in the applicable technical manuals, or by changes made or equipment installed without Contractor's written agreement that such change or installation will not impair its warranty obligations. (Appendix C)

The key is the portion which deals with "changes made or equipment installed without Contractor's written agreement". According to AFCLC, the best remedy for the Government to preclude future avoidance would be to have Lockheed sign a written agreement which specifically identifies the strakes as not impairing Lockheed's warranty obligations. Under the original clause (Appendix B) this option would not be available. In the current situation however, there is no written agreement. Had Lockheed integrated the strakes into production according to the USAF design, the Government would have "bought it" and the reworking cost would be borne by the Government. However, since Lockheed deviated from the Government's design, they should bear the cost of the reworking (and they are doing so). Changes integrated are best handled via written agreement or else they may be excluded from warranty obligation.

Sub-area (d) Product Testing and Its Impact on System Warranty Coverage.

The costs of the flap skin problem encountered would have to be borne by the Government, had Lockheed produced according to the ALC approved specification. However, since the specification was deviated from, Lockheed should bear the costs of the repairs. A better way would have been to require a test plan to be submitted by Lockheed which stated exactly what had (or would be done) to test the feasibility

of the proposed Lockheed change. This plan (and its later results) could then be analyzed to determine if the proposed change was acceptable or not. AFCLC agreed that engineering changes proposed by Lockheed should be closely scrutinized by the Government, regardless of the maturity of the production.

Sub-area (e) Claims by the Contractor [Lockheed] of Defects in Either the Supplies, Services or Government Furnished Property/Equipment (GFP/GFE).

The inherent problems with integrating GFP/GFE into production was discussed earlier. The finding that only those users who place the new aircraft immediately into operation were able to file useful warranty claims is further discussed under sub-area (g) - "Current Warranties in Effect of the C-130 and Claims Associated with Them". AFCLC was a bit surprised however, that the Systems Management Division at the ALC was not kept abreast of defective GFP/GFE claims.

Sub-area (f) Interim Repairs or Replacement Necessary for the C-130 to Allow Continued Weapon System Operations.

The key interim repair that AFCLC commented on was the cracked flap skin problem. The ramifications of this finding was previously discussed. The important point was that had Lockheed used the approved substitute material, the

Government would be without claim. The other repairs noted by the ALC respondents (improper nuts etc...) were found to be justified claims and the corrective actions noted were concurred with by AFCLC.

Sub-area (g) Current Warranties in Effect for the C-130 and Claims Associated with Them.

The current warranty(ies) in effect for the C-130 were viewed by AFCLC with a mixed feeling as to their usefulness. The 1985 modified version (P00007)(Appendix C) while it more specifically identified several aspects of the warranty coverage, did little to strengthen the overall warranty provided by Lockheed. It appears that new clauses were written to fill the requirements of the Congressional warranty statutes. The issue of "perceptions" is of paramount importance in this decision. The overall thrust of Congress in passing more stringent warranty requirements was for the DoD to not conduct "business as usual". In other words, the new language of system level warranties (Essential Performance Requirements etc...) was viewed as mandatory for all warranties. Hence the "new" clause was incorporated, though it added no additional benefit.

The original warranty clause (Appendix B), which still applies to the USCG and FMS sales, was described by AFCLC as "meaty." This is due to the general, yet extensive coverage provided by the clause. This clause states that "...all

supplies furnished under this contract will be free from defects in material and workmanship and will conform with the specifications and all other requirements of this contract..." [emphasis added]. "All other" and "with the specifications" are very general and binding phrases.

In general, the existing clauses provide for warranty repairs done by the contractor, whereby all parts and labor will be provided either at the Contractor's plant or the place of final delivery. This could be a problem if the aircraft is unable to fly. There would then be no way to get it to the Contractor's plant (or possibly, the place of final delivery). The Government then cannot get labor costs recovered for the repairs. If the Government repairs the defect due to mission requirements, only the cost for the parts is reimbursed by Lockheed. The modified clause also specifies more procedural actions (who is expected to do what, and when, should a dispute arise).

In respect to the Combat Talon Aircraft however, the current warranty is virtually useless, according to AFCLC. The Lockheed warranty expires long before delivery of a completed Combat Talon aircraft takes place. The portion of the modified clause which deals with exclusions could be better utilized in this case. The modifications performed by E-Systems could be "included" in the warranty via a written agreement. AFCLC did state however, that this would be an unlikely occurrence. The clause could be modified to

allow the aircraft to meet many of the "performance requirements" called for in the specification, once E-Systems completed modifications. As discussed earlier, the only user organizations who benefit from the current warranties are those who place the aircraft into immediate use. The organizations found to do so included primarily the USCG and FMS purchased aircraft. The overall feeling by AFCLC was that the current warranty period in general was of such a short duration that the Government received little benefit from it. AFCLC felt that extension of the warranty period (especially regarding Combat Talon aircraft) was needed to cover a period beyond operational delivery. They recommended that Lockheed propose the cost of varied periods of warranty coverage (for example, 12 months and 18 months). This would enable the Government to better assess the costs of warranty coverage and the associated perceived contractor risk. A longer warranty would then allow any defective material or workmanship to be discovered in order to benefit from the warranty.

Sub-area (h) Air Force Maintenance Policies and Procedures and their Impacts on Possible Contractor Warranty Avoidance.

AFCLC took exception with the respondents' views that the Government maintenance/repairs would void warranty obligations. There have been instances of contractors

attempting to claim that only they could perform maintenance/repairs to keep a warranty valid. According to AFCLC, this simply is not acceptable. In peacetime, it's possible for us to wait for a technical representative to respond. The urgency dictated by a wartime scenario, however, makes it imperative that the Government have the capability to repair in-house.

The bottom line was that as long as we abide by the technical manuals and procedures, the warranty is not voided simply because Government personnel performed the work. In the instance where the work was improperly performed, only in those areas effected could warranty obligations be avoided by Lockheed. Regarding burden of proof, the Government has the burden to show that the discrepancy was within the scope of the warranty coverage and Lockheed has the burden to show it was not within the scope of the warranty. If the question of "mishandling" by the Government arises, again, the burden is on Lockheed to prove it. In short, AFCLC felt the respondents did not correctly interpret the Government's warranty rights regarding maintenance and repairs of the system.

Sub-area (i) Claims and the "Changes Clause" for the C-130 Production Contract.

AFCLC stated that warranty claims and disputes surrounding the "Changes Clause" is a real concern and does

arise periodically. Since the mature nature of the C-130 production did not generate disputes of this nature (during the period covered by this study) further comment from AFCLC was unnecessary.

Research Question Two Sub-areas

Sub-area (a) Performance Requirements in General for the C-130.

The respondents' views regarding workable performance requirements were mixed (AFPRO and ALC respondents felt they would not be workable and the SPO interviewee felt they would be). (The reader should note the 12 Essential Performance Requirements listed in Appendix C). AFCLC agreed with the SPO however, that performance guarantees would be workable for the C-130. AFCLC stated that the key to Essential Performance Requirements was that they be "measurable" and "testable". For example, Essential Performance Requirement (a), from Appendix C, calls for "Take-off over 50 foot obstacle, sea-level - 5,500 feet". According to AFCLC, you could only fail that requirement once and you could have a significantly damaged aircraft (and crew). The point was made that performance requirements must be measurable in order to be enforceable and cost effective. An example was given of a draft fighter engine contract clause which initially called for two pages of performance requirements. After AFCLC questioned the

Government engineers on the measurability and usefulness of the items listed, they were reduced to two essential performance requirements (one regarding thrust at sea-level and one for fuel economy). Long lists of performance requirements can result in excessive (and wasted) warranty costs. Excessive limitations/requirements can also lead to future warranty avoidance due to burden of proof requirements mentioned earlier. It is thus very hard to prove an untestable performance requirement was not met.

Sub-area (c) Aircraft Threat Technology Advances
(Surface-To-Air Missiles etc..) and Their Impact on Warranty
Coverage.

The views on "combat related damages" were generally concurred with by AFCLC. Combat related damages are an exclusion. Therefore, if we give prima facia evidence that we were operating the aircraft within technical order limits, a specified mission profile, and there is no apparent combat damage (bullet holes etc...), it would be Lockheed's burden to prove the damage was combat related and the exclusion applied.

AFCLC felt that it was the intent of Congress to require warranties for weapon systems to operate in peacetime and "combat simulated" environments. If a weapon failed due to combat damage it should be excluded. They did feel that a combat situation alone did not exclude warranty

coverage. The case of the Maverick missile was given as an example.

AFCLC went on to explain that Mavericks are very expensive. We just don't fire many of them. One performance requirement in particular states that they should fire 95% of the time you pull the trigger. You wouldn't be able to test that until an actual combat situation. This is because we only test fire eight Mavericks a year. Even though the eight fired in peacetime testing meet the requirement, if a war breaks out and we fire 200, with only 40% firing (due to a loose wire later discovered), we should be able to claim them under the warranty. Combat really did not have anything to do with the defect. The aircraft were not shot up. The application of "common sense" and the circumstances surrounding the claim were felt to be the key to valid, enforceable warranty claims in a wartime scenario.

Sub-area (c) Aircraft Threat Technology Advances
(Surface-To-Air Missiles etc..) and Their Impact on Warranty
Coverage.

AFCLC felt that few within the Government would ever attempt to enforce the warranty due to a loss of aircraft from missiles etc... They felt the contractor perceives more risk from Congressional pressure. This stems from the possibility of heavy media coverage that the "Government is

receiving junk from contractors". The contractor then would fear that pressure would be applied for everyone to submit warranty claims (whether valid or not). This type of risk poses a much larger threat and is impossible to anticipate.

Sub-area (d) Exercising Government Warranty Claims During Hostile Operations.

AFCLC said that warranty claims under hostile operations should not be a problem. Under the existing clauses, rapid remedy of defects which arose in combat would be handled by exercising the "Changes Clause". Under this clause, the Government would direct Lockheed to fix the problem immediately. At a later time, the "equitable adjustment" question would be resolved and the applicability of the warranty clause would be determined. In other words, if the defect was later determined to be related to something that should have been right all along, we would have the right to modify the contract (regarding the repair of the defect under the Changes Clause) and claim under the warranty clause.

Research Question Three - Tailoring Future System Level Warranties.

AFCLC agreed with the AFPRO respondents that the Government must continually scrutinize contractor proposed changes. They further explained that extensive quality testing in the early aircraft design is essential to "shake

out" potential problem areas. later contractor modifications/changes should be accompanied by a test plan which should explain how the item will be tested to simulate "real world" conditions.

The duration of the warranty period was described as needing to be reasonably long enough to be able to identify defects. The six month period (for Combat Talon aircraft) was simply not enough. The suggestion to tie the warranty period to a usage factor (flight hours for example) was viewed as unworkable. This is due to the need for a factor which must be tied to something routinely recorded. For example, jet engines have a recording mechanism which records engine operating time. An instrument of some type must be able to track the usage of the item under warranty. An engine does not know when a "flight hour" begins or ends. A manual method of recording usage (as long as it is routinely and religiously accomplished) could be acceptable, as long as Lockheed knows that is how it will be tracked and agrees to it.

Tying the beginning of warranty coverage to date of operational use (versus date of DD 250) was seen as a way of devising a more useful C-130 warranty. The inherent problem of multiple prime contractors regarding subsequent warranty claims could still lead to disagreements however. Performance requirements could be tailored to cover only those requirements which would apply to C-130 aircraft after

delivery by E-Systems. Another option would be to extend the Lockheed warranty for the entire reconfiguration period and beyond. This would cover any defects identified (though not caused) by E-Systems during reconfiguration. This could be broken down by period of coverage. For example, the first six months of coverage could be one price and the next nine months another price. The contractor perceived risk would then be factored in accordingly. The bottom line was that the aircraft must be in the fleet before we can identify any defects.

AFCLC felt the ALC respondents' views in designing in maintainability and reliability would greatly enhance tailoring subsequent warranty provisions. In fact, AFCLC stated that they now require warranty provisions to be incorporated into the initial Research and Development requirements for new weapon systems. This is done to eliminate any future "surprise" factor when system warranties are required on new production contracts. System warranties are therefore incorporated into the design phase of new acquisitions.

The SPO opinion that many times the Government pays twice for repair of an item (once under the initial warranty cost and once when the Government repairs a warranted defect and is not reimbursed) was confirmed by AFCLC. Many times the Government fails to exercise its rights under the individual contract. Improvements could be made on the

existing C-130 warranties to provide more cost reimbursement to the Government. These changes, related to labor cost reimbursements were addressed earlier.

The second SPO idea for maintenance personnel (and organizations) in the field to increase their awareness of warranty requirements was totally concurred with by AFCLC. AFCLC felt that for system warranties to be cost effective and protect the Government's rights as they were designed to do, administration and awareness of warranties in general must improve. The multiple prime dilemma addressed by the SPO was discussed earlier and is not repeated here.

Benefits From a Full Systems Level Warranty

AFCLC stated that the C-130 program could have benefited from a full systems level warranty, though only to a small degree. The extra costs which would be associated with many of the requirements might not have been cost effective, given the mature nature of the program and the proven design of the C-130. There were basically four benefits cited.

The first benefit was that the contractor would be directed to notify the Government if they became aware of any defects that were not yet noticed by the Government. This would eliminate the possibility of incentivizing the contractor to keep from identifying a defect "hoping a problem never occurred". This would aid in protecting the Government's interests and aircrews.

Secondly, the full system level warranty would state that the contractor must:

....promptly comply with any timely written direction from the Contracting Officer to correct or partially correct a defect, at no increase in the contract price. If it is later determined that an alleged defect is not a defect subject to these warranties, the contract price will be equitably adjusted. (Appendix A)

This additional provision aids prompt correction of defects. In a wartime scenario, time wasted arguing over whether a defect was under warranty or not simply can't be tolerated. This provision in essence says, "Fix it now, if the defect is not determined later to be warranted, you will be compensated." It streamlines the warranty claim procedure.

The third benefit lies in more definitized and specific procedural guidelines for the contractor [and the Government]. The system level warranty specifically says who will do what, and when a dispute arises. It further delineates other responsibilities. While these procedures are stated in Federal Regulations, the system level warranty clauses put them right up front for the contractor to see (in the contract itself).

The last benefit AFCLC cited in favor of a system level C-130 warranty, was that the clause would provide for Government reimbursement for parts and labor on any necessary or time constrained Government repair/replacement. This right would also apply, regardless of the location

where the repair/replacement took place. This simply expanded the Government's rights which were somewhat constrained under the current warranty clauses.

V. Conclusions and Recommendations

Conclusions

This research effort has led to several conclusions:

1. Modifications and changes performed by the Government have the potential to allow warranty avoidance by the contractor. This is due to the provisions for "Limitations and Exclusions" which are included in all warranty clauses. The Government should ensure that written agreements are signed by the contractual parties, which clearly state that the changes or modifications will not impair the contractor's warranty obligations. This will also help alleviate some problems inherent in multiple prime contractor produced weapon systems.
2. Warranty duration should be carefully evaluated by the Government. Having the contractor propose different lengths of warranty coverage will aid in assessing perceived contractor risk. The duration should also be long enough to allow operational personnel to be able to discover warranted defects (other than latent ones).
3. Warranty provisions should be considered during initial design (or during modification/change design), instead of as an "afterthought". This will alleviate the "surprise" element for the contractor and ensure the contractor is totally aware of what is expected of him and his product.
4. Essential Performance Requirements are workable on weapon system acquisitions. They must be carefully

evaluated however to ensure they are "measurable" and "testable". Excessive warranted performance requirements only result in excessive warranty cost.

5. Proposed changes or modifications (by either the contractor or the Government) must be carefully tested and evaluated. The flap-skin, strakes, and blue foam instances cited, all support the necessity of this conclusion. The maturity of the weapon system should not be a factor to delimit this requirement.

6. Warranty administration and awareness by maintenance personnel (and organizations) must be expanded. The Government's warranty rights and remedies must be explained to those who maintain today's weapons systems to avoid unsuccessful warranty claims.

Recommendations for Future Research

1. An attempt should be made to assess a "contractor's" view of how Government changes and modifications can lead to system level warranty avoidance. This research effort centered on the "Government's" view using the C-130 as a base. A similar "what if" analysis could be done on other existing weapons systems to assess both a "Government" and "Contractor" perspective.

2. A future study could assess the impact of unsuccessful systems level warranty claims, based on untestable or unmeasurable "Essential Performance Requirements".

3. Further research should be conducted to assess the impact of hostile environments in warranty claims. This could be done during the Vietnam era, for example, to determine how successful the Government was (if at all) in successfully exercising a warranty clause on combat aircraft/weapons systems.
4. Additional research should explore the exclusion of Government performed maintenance/repair from warranty coverage. The problems associated with disputes arising from Government mishandling could also be addressed.
5. Additional research should be conducted to identify and evaluate any previous trends where past warranties expired prior to the Government deploying a weapon system to the field.

Appendix A: Air Force Contract Law Center Suggested Systems

Level Warranty Clauses

WARRANTY OF WEAPON SYSTEMS UNDER 10 U.S.C SS2403 (JAN 1985)

(a) Definitions.

"Acceptance," as used in this clause, means the execution of an official document (e.g., DD Form 250) by an authorized representative of the Government by which the Government assumes for itself, or as an agent of another, ownership of existing and identified supplies, or approves specific services rendered, as partial or complete performance of the contract.

"Correction," as used in this clause, means the elimination of a defect.

"Defect," as used in this clause, means any condition or characteristic, in any supplies or services furnished by the Contractor under the contract, that is not in compliance with the requirements of the contract.

"Supplies," as used in this clause, means the end items furnished by the Contractor and related services requirements under this contract. Except when this contract includes the clause entitled "Warranty of Technical Data", supplies also means "data."

(b) Specific Warranties. The contractor hereby warrants--

(1) Design/Manufacturing Conformance Warranty.

For*....., that line items(s), will conform to all design and manufacturing requirements specifically delineated in this contract (including but not limited to all specifications and statements of work), and in any amendments thereto. Design and manufacturing requirements include, but are not limited to, all structural and engineering plans and manufacturing particulars, including, but not limited to, precise measurements, tolerance, materials, processes and finished product tests for the item being produced.

[*Specify time periods(s) for duration of warranty.]

(2) Material and Workmanship Warranty.

For*....., that line item(s) at the time of delivery, are free from all defects in materials and workmanship.

[* Specify time period(s) for duration of warranty.]

(3) Essential Performance Warranty.

For*, that line item(s)will conform to the essential performance requirements for such item(s) as specifically delineated in this contract and in any amendments thereto. For purposes of this warranty, the essential performance requirements are delineated as follows:

For line item _____:
[delineate performance requirements]
For line item _____:
[delineate performance requirements]

[*Specify time period(s) for duration of warranty.
If line item has no essential performance requirements (e.g., pure build-to-print), delete this paragraph.]

(4) Other Performance Warranty:

For*, that line item(s)and each component thereof conform to all other performance requirements for such items delineated in this contract and any modifications thereto.

[Specify time period(s) for duration of warranty.
If a warranty is not desired on the other performance requirements, delete this paragraph.]

(c) Contractor's obligations.

(1) The Contractor's warranties under this clause shall apply only to those defects discovered by either the Government or the Contractor during the period specified (as applicable) in (b)(1), (b)(2), (b)(3), and/or (b)(4) above.

(2) If the Contractor becomes aware at any time before acceptance by the Government (whether before or after tender to the Government) that a defect exists in any supplies or services, the Contractor shall (i) promptly correct the defect or (ii) promptly notify the Contracting Officer, in writing, of the defect, using the same procedures prescribed in paragraph (c)(3) of this clause.

(3) If the Contracting Officer determines that a defect exists in any of the supplies or services accepted by the Government under this contract, the Contracting Officer shall promptly notify the Contractor of the defect, in writing within....[Contracting Officer shall insert the specific period of time in which notice shall be given to

the Contractor; e.g., "30 days after delivery of the nonconforming supplies;" "90 days of the last delivery under this contract;" or "90 days after discovery of the defect." Upon timely notification of the existence of a defect in accepted supplies or services, the Contractor shall submit to the Contracting Officer, in writing within.....[Contracting Officer shall insert period of time] a recommendation for corrective actions, together with supporting information in sufficient detail for the Contracting Officer to determine what corrective action, if any, shall be undertaken. When, pending completion of corrective action to eliminate a defect, the Contracting Officer determines that an interim repair or replacement is necessary to maintain continued weapon system operation, the Contracting Officer may direct the Contractor, in addition to and concurrent with the development of recommendation and corrective action, to provide immediate interim repairs or replacements as necessary to allow continued weapon system operation.

(4) The Contractor, notwithstanding any disagreement regarding the existence of, or responsibility for, a defect, shall promptly comply with any timely written direction from the Contracting Officer to correct or partially correct a defect, at no increase in the contract price. If it is later determined that an alleged defect is not a defect subject to these warranties, the contract price will be equitably adjusted.

(5) The Contractor shall also prepare and furnish to the Contracting Officer data and reports applicable to any correction required under this clause (including revision and updating of all other affected data called for under this contract at no increase in the contract price.

(6) In the event of timely notice of a decision not to correct or only to partially correct, the Contractor shall submit a technical and cost proposal within....[Contracting Officer shall insert period of time] to amend the contract to permit acceptance of the nonconforming supplies or services in accordance with the revised requirement, and an equitable reduction in the contract price shall promptly be negotiated by the parties and be reflected in a supplemental agreement to this contract.

(7) Any supplies or parts thereof corrected or furnished in replacement and any services reperformed shall also be subject to the conditions of this clause to the same extent as supplies or services initially accepted. The warranties, with respect to these supplies, parts, or services, shall be equal in duration to those set forth in paragraph (b) of this clause, and shall run from the date of delivery of the corrected or replaced supplies.

(8) If the Government returns supplies to the Contractor for correction or replacement under this clause, the Contractor shall be liable for transportation charges up

to an amount equal to the costs of transportation by the usual commercial method of shipment from the place of delivery specified in this contract (irrespective of the f.o.b. point or the point of acceptance) to the Contractor's plant and return to the place of delivery specified in this contract. The Contractor shall also bear responsibility for the supplies while in transit.

(d) Remedies available to the Government.

(1) The rights and remedies of the Government provided in this clause--

(i) Shall not be affected in any way by any terms or conditions, of this contract, concerning the conclusiveness of inspection and acceptance;

(ii) Are in addition to, and do not limit, any rights afforded to the Government by any other clause of this contract; and

(iii) Shall survive final payment.

(2) Within [Contracting Officer shall insert period of time] after receipt of the Contractor's recommendations for corrective action and adequate supporting information, the Contracting Officer, using sole discretion, shall give the Contractor written notice not to correct any defect, or to correct or partially correct any defect within a reasonable time at [Contracting Officer shall insert locations where corrections may be performed].

(3) In no event shall the Government be responsible for any extension or delays in the scheduled deliveries or periods of performance under this contract as a result of the Contractor's obligations to correct defects, nor shall there be any adjustment of the delivery schedule or period of performance as a result of the correction of defects unless provided by a supplemental agreement with adequate consideration.

(4) This clause shall not be construed as obligating the Government to increase the contract price.

(5) (i) The Contracting Officer shall give the Contractor a written notice as required in paragraph (d)(5)(ii) below, specifying any failure or refusal of the Contractor to - -

(A) Present a detailed recommendation for a corrective action as required by paragraph (c)(3) of this clause;

(B) Correct defects as directed under paragraph (c)(4) of this clause; or

(C) Prepare and furnish data and reports as required by paragraph (c)(5) of this clause.

(ii) The notice shall specify a period of time following receipt of the notice by the Contractor in which the Contractor must remedy the failure or refusal specified in the notice.

(6) If the Contractor does not promptly comply with the Contracting Officer's written notice in paragraph (d)(5)(i) of this clause or if the Contracting Officer elects not require the Contractor to take full corrective action under (d)(2) above, the Contracting Officer may by contract or otherwise--

- (i) Correct the supplies or serviced; or
- (ii) Replace the supplies or services, and if the Contractor fails to furnish timely disposition, instructions, the Contracting Officer may dispose of the nonconforming supplies for the Contractor's account in a reasonable manner, in which case the Government is entitled to reimbursement from the Contractor, or from the proceeds, for the reasonable expenses of care and disposition as well as for excess costs incurred or to be incurred;
- (iii) Obtain applicable data and reports; and
- (iv) Charge the Contractor for the costs reasonably incurred by the Government.

(7) The Contractor shall be liable for the reasonable cost of disassembly and/or reassembly of larger items when it is necessary to remove the supplies to be inspected and/or returned for correction or replacement.

(e) Exclusions.

(1) The Contractor shall not be responsible under this clause for the correction of defects in Government-furnished property, except for defects in installation, unless the Contractor performs, or is obligated to perform, any modifications or other work on such property. In that event, the Contractor shall be responsible for correction of defects that result from the modifications or other work on such property.

(2) Except as otherwise specified in this contract, combat damage is not covered by these warranties to the extent the defect in the question is proximately caused by such combat damage.

(f) Limitations.

(1) These warranties will not, in any way, be voided by any Government performed repair accomplished in accordance with standard Military Service maintenance procedures, of any item, or component thereof, covered by these warranties.

(2) The warranty provisions of this clause do not cover liability for loss, damage, or injury to third parties, nor do they cover consequential damages.

(3) All implied warranties of merchantability and "fitness for a particular purpose" are excluded from any obligation under this contract.

(g) Price of Warranties.*

(1) It is agreed that, with respect to the following line items the amounts indicated represent the portion of the contract price attributable to warranties under this clause:

Line Item	Total Price of All Warr- anties Under This Clause	Portion Attrib- utable To Design Manufac- turing Warranty	Portion Attrib- utable To Mater- ial/Work- mansnip Warranty	Portion Attrib- utable To Essen- tial Per- formance Warranty	Portion Attrib- utable To Other Perform- ance Warranty
....	\$ _____	\$ _____	\$ _____	\$ _____	\$ _____

(2) In the event any amendments or other changes to this contract affect Contractor's costs of warranty compliance, the contract price, and price reflected in (g)(1) above, will be equitably adjusted, upward or downward, in accordance with the "changes" clause of this contract.

[*This paragraph may be used when the warranty is not a separately priced line item]

(h) Resolution of Conflicts in Warranty Requirements. In the event a requirement under the Design/Manufacturing Conformance Warranty conflicts with a warranted performance requirement, the Contractor shall promptly inform the Contracting Officer of such conflict and, at no increase in contract price, provide the Contracting Officer with any design/manufacturing or other changes necessary to ensure compliance with warranted performance requirements. Upon Contracting Officer approval of such proposed changes, they shall, unless otherwise directed by the Contracting Officer, be implemented, at no increase in contract price, for all affected supplies or services purchases under this contract.

[This optional paragraph is appropriate for use where the contractor has responsibility for item design.]

(End of Clause)

ALTERNATE 1 (JAN 1985). For those contracts in which it is not desired to specifically identify all Design/Manufacturing Requirements and/or all Essential Performance requirements. Either one or both of the

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THE POTENTIAL IMPA.. (U) AIR FORCE INST OF TECH
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following alternatives to paragraphs (b)(1) and (b)(3) may be used.

(1) Design/Manufacturing Conformance Warranty.

For*,....., that line items.... will conform to all design and manufacturing requirements specifically delineated in this contract and in any amendments thereto. Such specifically delineated design and manufacturing requirements shall be deemed to include all such requirements specified in the Statement of Work, specifications and other provisions of this contract and any amendments thereto, but do not include any design or manufacturing provisions expressly stated to be a goal or objective, provided that, unless the word "goal" or "objective" is expressly used in connection therewith, it shall be deemed a requirement subject to this clause. Design and manufacturing requirements include, but are not limited to, all structural and engineering plans and manufacturing particulars, including but not limited to, precise measurements, tolerances, materials, processes and finished product tests for the items being produced.
[* Specify time period(s) for duration of warranty.]

(3) Essential Performance Warranty.

For*..... that line items will conform to the essential performance requirements for such item(s) as specifically delineated in this contract and in amendments thereto. For the purposes of the essential performance warranty, the "essential performance requirements" referred to are all those performance requirements delineated in the Statement of Work, specifications and other provisions of this contract and any amendments thereto. Such "essential performance requirements" do not, however, include any performance provision expressly stated to be a goal or objective, provided that, unless the word "goal" or "objective" is expressly used in connection therewith, it shall be deemed a requirement subject to this clause.

[*Specify time periods(s) for duration of warranty.]

ALTERNATE II (JAN 1985). If a fixed - price incentive Contract is contemplated, add a paragraph substantially the same as the following paragraph (d)(8) to the basic clause:

"(8) All costs incurred or estimated to be incurred by the Contractor in complying with this clause shall be considered when negotiating the total final price under the Incentive Price Revision Clause of this contract. After establishment of the total final price, Contractor complies

with this clause shall be at no increase in the total final price. Any equitable adjustments made under paragraph (c)(6) of this clause shall be governed by the paragraph entitled "Equitable adjustments Under Other Clauses" in the Incentive Price Revision Clause of this Contract."

Appendix B: Original C-130 Warranty Clause(s) (Prior to 21 November 1985 and Still Applicable for Coast Guard and Foreign Military Sales Aircraft after 21 Nov 1985)

552M. WARRANTY OF SUPPLIES

(a) Definitions.

(1) Acceptance: The work "acceptance" as used herein means the execution of the Acceptance Block and signing of a Form DD 250 by the authorized Government representative.

(2) Supplies: The work "supplies" as used herein means the end item furnished by the Contractor and any related services required under this contract. The work does not include technical data.

(b) Warranty. The Contractor warrants that at the time of acceptance all supplies furnished under this contract will be free from defects in material and workmanship and will conform with the specifications and all other requirements of this contract; provided, however, that with respect to Government-furnished property, the Contractor's warranty shall extend only to its proper party, the Contractor's warranty shall extend only to its proper installation, unless the Contractor performs some modification or other work on such property, in which case the Contractor's warranty shall extend to such modification or other work.

(c) Remedies.

(1) Right to Corrective or Replacement Action. In the event of a breach of the Contractor's Warranty in paragraph (b) above, the Government may, at no increase in contract price, (A) require the Contractor, at the place of delivery specified in the contract (irrespective of the f.o.b. point or the point of acceptance) or at the Contractor's plant, to repair or replace, at the Contractor's election, defective or nonconforming supplies, or (B) require the Contractor to furnish at the Contractor's plant such materials or parts and installation instructions as may be required to successfully accomplish the required correction. The Contractor shall also prepare and furnish to the Government data and reports applicable to any correction required under this clause (including revision and updating of all affected data called for under this contract) at no increase in the contract price. When correction or replacement is required,

and transportation of supplies in connection with such correction or replacement is necessary, transportation charges and responsibility for such supplies in transit shall be borne by the Government.

(2) Right to Equitable Adjustment. If the Government does not require correction or replacement of defective or nonconforming supplies or the Contractor is not obligated to correct or replace by reason of paragraph (f) below, the Government shall be entitled to an equitable reduction in the price of such supplies.

(d) Notification. Except as the notification period may be extended by paragraph (e), the Contractor shall be notified in writing of any breach of the warranty in paragraph (b) above within six (6) months after acceptance of nonconforming supplies. Within forty-five (45) days thereafter, the Contractor shall submit to the Contracting Officer a written recommendation as to the corrective action required to remedy the breach. After the notice of breach, but not later than forty-five (45) days after receipt of the Contractor's recommendation for corrective action, the Contracting Officer may in writing direct correction or replacement as set forth in paragraph (c) above, and the Contractor shall, notwithstanding any disagreement regarding the existence of a breach of warranty comply with such direction. In the event it is later determined that the Contractor did not breach the warranty in paragraph (b) above, the contract price will be equitably adjusted.

(e) Corrected or Replaced Supplies.

(1) Any supplies or parts thereof corrected or furnished in replacement pursuant to this clause shall also be subject to all the provisions of this clause to the same extent as supplies initially delivered. The warranty with respect to such supplies or parts thereof shall be equal in duration to that set forth in (b) above and shall run from the date of delivery of such corrected or replaced supplies.

(2) With respect to such supplies, the period for notification of a breach of the Contractor's Warranty in paragraph (d) shall be six (6) months from the furnishing or return by the Contractor to the Government of the corrected or replaced supplies or parts thereof, or, in correction or replacement is effected by the Contractor at a Government or other activity, for six (6) months thereafter.

(f) Inability to Correct. the Contractor shall not be obligated to correct or replace supplies if the facilities, tooling, drawing, or other equipment or supplies necessary to accomplish such correction or replacement have been made

unavailable to the Contractor by action of the Government. In the event that correction or replacement has been directed, the Contractor shall promptly notify the Contracting Officer in writing of such non-availability.

(g) All implied warranties of merchantability and "fitness for particular purpose" are hereby excluded from any obligation contained in this contract.

(h) The rights and remedies of the Government provided in this clause are in addition to and do not limit any rights afforded to the Government by any other clause of the contract.

(DAR 7-105.7(b) and ASP/PMI, 1 Oct 81

Appendix C: Current C-130 Warranty Clause (Excluding Combat Talon, Foreign Military Sales, and Coast Guard Aircraft) after 21 November 1985

"40. SELECTION OF WARRANTY PROVISIONS

At such time as the Government considers peculiar conditions related to each individual option buy as stated in Special Provision 2, OPTIONS, subparagraph (g), the Government may select or not select and negotiate an equitable adjustment for one of the following warranty provisions:

a. For FMS and U.S. Coast Guard -- Special Provision 552M, 'Warranty of Supplies' or

b. For DOD Weapons Systems (i.e., U.S. Air Force, U.S. Air National Guard/Air Reserve Forces, U.S. Marine Corps), the following provision:

WARRANTY OF WEAPON SYSTEMS UNDER 10 U.S.C. 2403 (JAN 1985)

(a) Definitions

(1) Acceptance: The word "acceptance" as used herein means the execution of the Acceptance Block and signing of a Form DD 250 by the authorized Government representative.

(2) Supplies: The work "supplies" as used herein means the end item furnished by the Contractor and any related services required under this contract. The work does not include technical data.

(b) Warranty

The Contractor warrants that at the time of acceptance all supplies furnished under this contract will be free from defects in material and workmanship, will conform to the design and manufacturing requirements specifically delineated in paragraph (b)(i) hereof (or in any amendment to this contract), and will conform to the essential performance requirements specifically delineated in paragraph (b)(ii) hereof (or in any amendment to this contract) provided, however, that with respect to Government-furnished property, the Contractor's warranty shall extend only to its proper installation, unless the Contractor performs some modification or other work on such

property, in which case the Contractor's warranty shall extend to such modification or other work.

(i) Design and Manufacturing Requirements

Such requirements are those specified in Detail Specification ER/S-7103M dated 2 April 1984, as amended by Lockheed letter L84H1131 dated 15 May 1984, and, with the exception of the following Essential Performance Requirements under paragraph (ii), below, do not include any design or manufacturing characteristic expressly stated to be estimated, a goal, an objective, or a guide. Manufacturing requirements do not include "how to" information.

(ii) Essential Performance Requirements

Guaranteed performance of the airplane at 155,000 pounds, take-off gross weight with an operating weight 136,419 pounds on a standard day as defined in MIL-C-5011A shall be as follows:

- | | |
|---|--------------|
| (a) Take-off over 50 foot obstacle, sea level | 5,500 Feet |
| (b) Take-off ground roll, sea level | 4,000 Feet |
| (c) Landing over 50 foot obstacle, at 130,000 pounds landing weight, sea level | 2,550 Feet |
| (d) Landing ground roll at 130,000 pounds landing weight, sea level | 1,500 Feet |
| (e) Rate of climb at sea level with maximum continuous power, 4 engines, 155,000 pounds, landing gear and flaps retracted | 1,800 Ft/Min |
| (f) Service ceiling, maximum continuous power 4-engines 147,000 pounds | 27,500 Feet |
| (g) Rate of climb at sea level with one engine inoperative, maximum continuous power, 3-engines, 147,000 pounds | 1,050 Ft/Min |
| (h) Service ceiling with one engine inoperative, maximum continuous power, 147,000 pounds | 19,000 Feet |

- (i) Power off stalling speed at 150,000 pounds weight in the take-off configuration, V ST 113 knots EAS
- (j) Power off stalling speed at 130,000 pounds weight in the landing configuration V SL 98 knots EAS
- (k) Cruising speed at a weight of 100,000 pounds at 25,000 feet with maximum continuous power 330 knots EAS
- (l) Maximum range with 45,858 pounds of fuel and 32,723 lbs. of payload at long range cruise at the maximum continuous power cruise ceiling, 4,382 pounds MIL-C-5011 reserve fuel 2,750 N. Mi.

(c) Remedies

(1) Right to Corrective or Replacement Action.

In the event of a breach of the Contractor's Warranty in paragraph (b) above, the Government may, at no increase in contract price, (a) require the Contractor, at the place of delivery specified in the contract (irrespective of the f.o.b. point or the point of acceptance) or at the Contractor's plant, to repair or replace, at the Contractor's election, defective or nonconforming supplies, or (b) require the Contractor to furnish at the Contractor's plant such materials or parts and installation instructions as may be required to successfully accomplish the required correction. The Contractor shall also prepare and furnish to the Government data and reports applicable to any correction required under this clause (including revision and updating of all affected data called for under this contract) at no increase in the contract price. When correction or replacement is required, and transportation of supplies in connection with such correction or replacement is necessary, transportation charges and responsibility for such supplies in transit shall be borne by the Government.

(2) Right to Equitable Adjustment.

Except as provided in (f) below, if the Government does not require correction or replacement of defective or nonconforming supplies, the Government shall be entitled to an equitable reduction in the price of such supplies.

(d) Notification.

Except as the notification period may be extended by paragraph (e), the Contractor shall be notified in writing of any breach of the warranty in paragraph (b) above within six (6) months after acceptance of nonconforming supplies. Within forty-five (45) days thereafter, the Contractor shall submit to the Contracting Officer a written recommendation as to the corrective action required to remedy the breach. After the notice of breach, but not later than forty-five (45) days after receipt of the Contractor's recommendation for corrective action, the Contracting Officer may in writing direct correction or replacement as set forth in paragraph (c) above, and the Contractor shall, notwithstanding any disagreement regarding the existence of a breach of warranty comply with such direction. In the event it is later determined that the Contractor did not breach the warranty in paragraph (b) above, the contract price and any other affected provisions of this contract will be equitably adjusted.

(e) Corrected or Replaced Supplies.

(1) Any supplies or parts thereof corrected or furnished in replacement pursuant to this clause shall also be subject to all the provisions of this clause to the same extent as supplies initially delivered. The warranty with respect to such supplies or parts thereof shall be equal in duration to that set forth in (d) above and shall run from the date of delivery of such corrected or replaced supplies.

(2) With respect to such supplies, the period for notification of a breach of Contractor's Warranty in paragraph (d) shall be six (6) months from the furnishing/return by the Contractor to the Government of the corrected or replaced supplies or parts thereof, or, if correction or replacement is effected by the Contractor at a Government or other activity for six (6) months thereafter.

(f) Inability to Correct.

The Contractor shall not be obligated to correct or replace supplies if the facilities, tooling, drawings, or other equipment or supplies necessary to accomplish such correction or replacement have been made unavailable to the Contractor by action of the Government unless such facilities, tooling, drawings, or other equipment or supplies are made available within a reasonable period of time. In the event that correction or replacement has been directed, the Contractor shall promptly notify the Contracting Officer in writing of such non-availability.

(g) Limitations and Exclusions

(1) The warranties set forth in (b) above do not apply to combat damage, acts of God, or acquisition for FMS, U.S. Coast Guard or NASA, nor shall the Contractor be liable for loss, damage or injury to third parties.

(2) The said warranties do not apply to any failures or defects caused by negligence or failure of Government personnel to operate and maintain aircraft delivered hereunder in accordance with procedures contained in the applicable technical manuals, or by changes made or equipment installed without Contractor's written agreement that such change or installation will not impair its warranty obligations.

(3) The said warranties will not be subject to demonstration prior to delivery and acceptance of any aircraft ordered hereunder unless such demonstration is authorized and funded under the clause hereof entitled "Changes".

(n) Revision of Warranties

The Essential Performance requirements set forth in (b)(ii) above are for the baseline C-130H, version code 18B identified in (b)(i) above, as adjusted in the configuration peculiars order to reflect model variation as follows:

* (To be filled in as a result of peculiars negotiation

(i) In no event shall Contractor's liability to the Government under this clause exceed *(to be completed as a result of peculiars negotiation.

(j) All implied warranties of merchantability and "fitness for a particular purpose" are hereby excluded from any obligation contained in this contract.

(k) The rights and remedies of the Government provided in this clause are in addition to and do not limit any rights afforded to the Government by any other clause of the contract."

*NOTE: If implemented, sub-paragraphs (h) and (i) above will be completed in the definitive configuration peculiars orders.

Appendix D: C-130 Warranty Clause Applicable for
Combat Talon Aircraft

28. SUBCONTRACTOR WARRANTIES

In addition to any other warranty rights and remedies provided by this contract, the contractor shall (i) assure that all subcontractor warranties/guaranties, expressed or implied, applicable to the accessories, equipment and parts installed in or provided as a part of the (end item) purchased under this contract are fully available to, and for the benefit of, the Government for the lifetime of such warranties and (ii) promptly notify the PCO in writing upon acquisition of such warranties specifying the details thereof, such as the type of warranty, equipment warranted and duration thereof. Upon notification by the PCO the contractor shall enforce these warranties on behalf of the Government consistent with the PCO's direction and the terms of the applicable warranty so long as such warranties shall remain in effect.

The rights and remedies of the Government provided in this clause are in addition to and do not limit any rights afforded to the Government by any other clause of the contract. The Government specifically retains its rights under the "Correction of Deficiencies" and "Inspection" clauses hereof and this clause shall in no way abrogate the Government's rights thereunder.

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VITA

Captain Eugene J. Pickarz, Jr. was born on 10 August 1955 in Santa Monica, California. He graduated from high school in St. Louis, Missouri, in 1973. After enlisting in the USAF in 1975, he attended the University of Maryland, European Division, from which he graduated Summa Cum Laude and received the degree of Bachelor of Science in Management, in May 1979. He received a commission in the USAF through OTS in 1980. He has served as a Signal Collection Operations Technician in the DoD Joint Operations Center-Chicksands, in England (enlisted) and Executive Support Officer in both the 4018th Combat Crew Training Squadron and 7th Supply Squadron, Carswell AFB, Texas. He assumed command of the 2853rd Air Base Group Headquarters Squadron, Robins AFB, Georgia in October 1983, after completing Squadron Officers School in residence. He then served as a Contracting Officer in the Directorate of Contracting and Manufacturing, Warner Robins Air Logistics Center, from August 1984 until entering the School of Systems and Logistics, Air Force Institute of Technology in May 1985.

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This study was an attempt to assess the potential impact a systems level warranty could have had on the C-130 production contracts (over the last five years). Specifically, it sought to: (1) identify which types of Government changes or modifications could lead to warranty avoidance by the contractor and (2) attempted to determine what impact operational environments could have had on the C-130 (with a systems warranty). The literature review discusses the basic definition of a warranty and relevant litigation regarding warranty avoidance and breaches. A methodology was devised utilizing an unstructured interview approach to obtain data from the Air Force Plant Representative Office at Lockheed Georgia Company, the C-130 Systems Management Division at Warner Robins Air Logistics Center, and the C-130 System Program Office in the Aeronautical Systems Division. Further analysis of the findings was accomplished by the Air Force Contract Law Center. Benefits from applying a system level warranty to the C-130 were identified to include: (1) Government notification (by the contractor) of new defects, (2) streamlined warranty claims during hostile operations, (3) increased reimbursements for Government repair and (4) more definitized procedural instruction for the contractor. Conclusions drawn from the research centered around the need for written agreements to expand warranty coverage, length of warranty coverage, identifying warranty provisions during systems design, measurable and testable essential performance requirements, testing of proposed changes/modifications, increased need for extensive warranty administration and maintenance personnel awareness.

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