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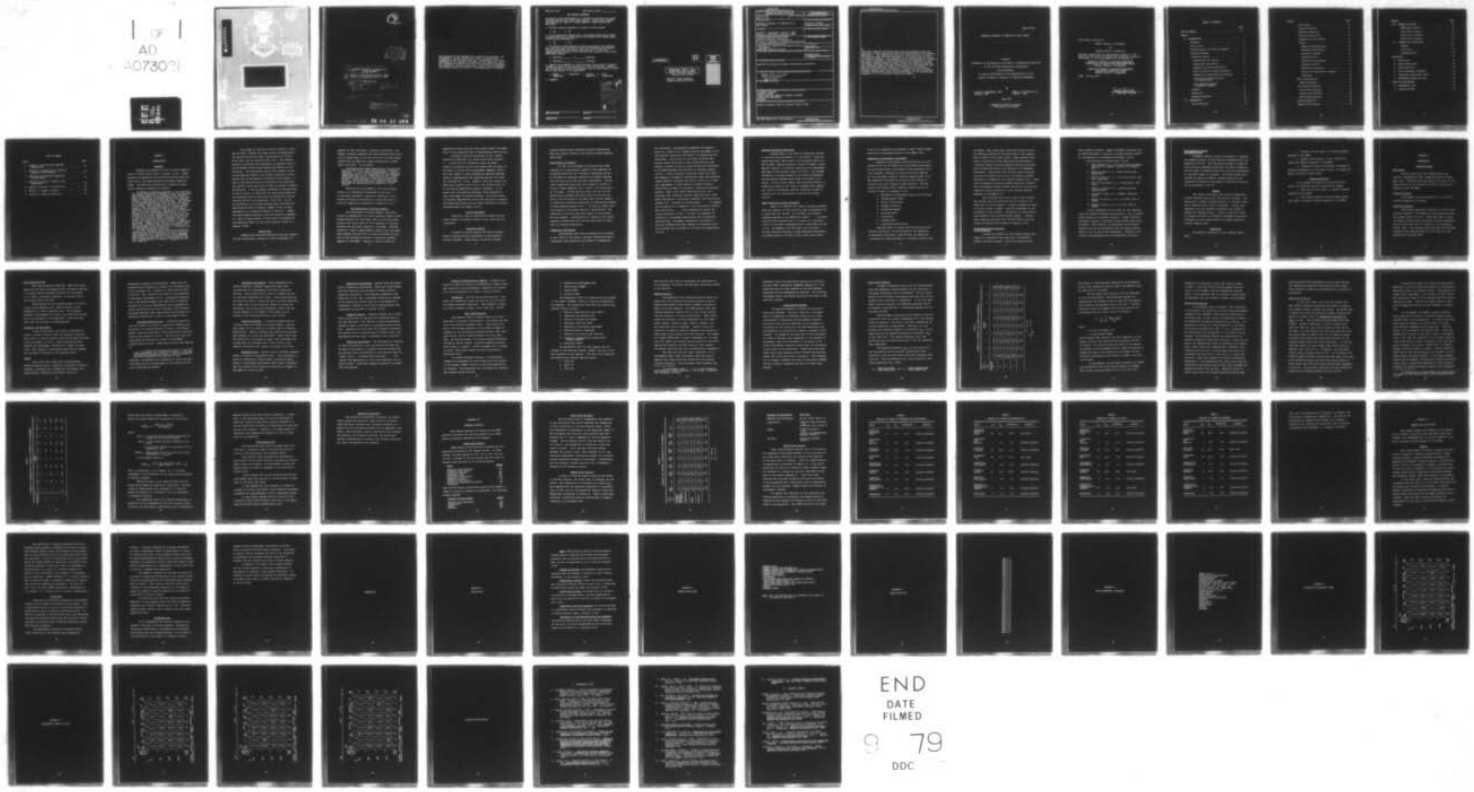

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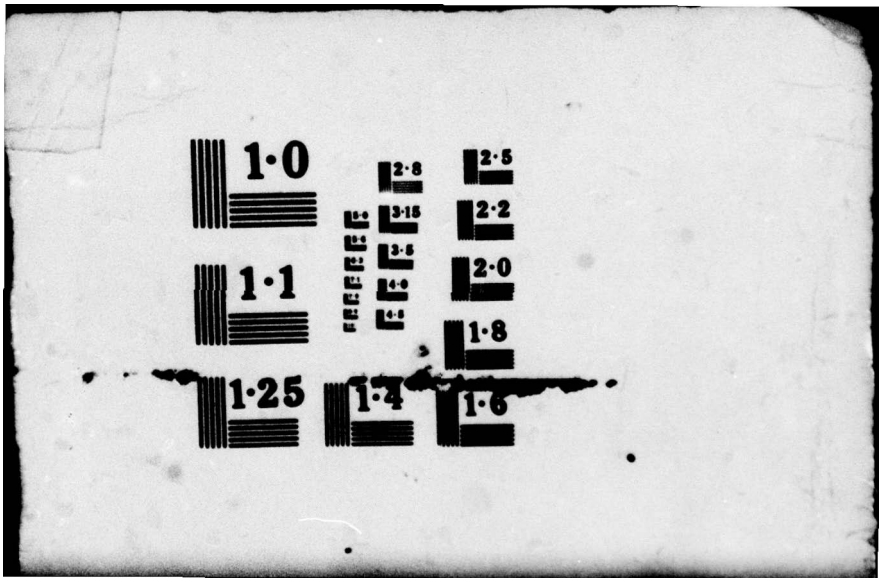
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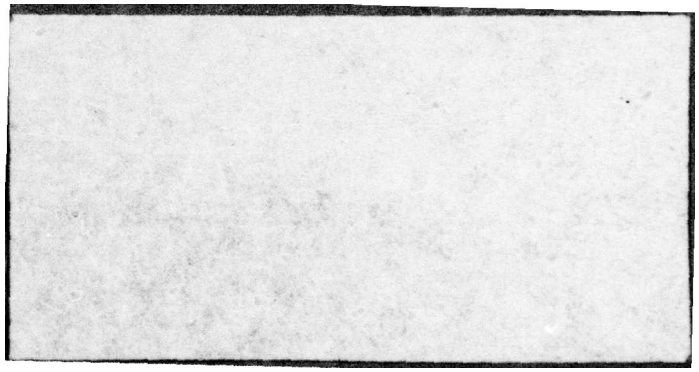

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(10) George S. Sultemeier, Captain, USAF
Dennis D. Underwood, Captain, USAF

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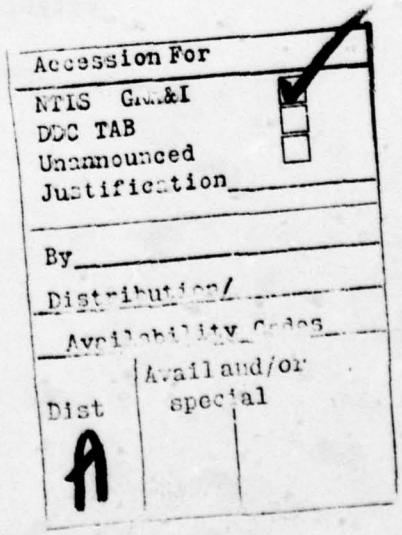

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Each year numerous Air Force contracts are disputed under the provision of the Disputes Clause in the Armed Service Procurement Regulation. The contracting officer's final decision in about 200 disputes each year are appealed to the Armed Services Board of Contract Appeals. The research effort was designed to identify key issues involved in those disputes and to determine if relationships existed between dispute issues and contract disputes. The study concluded that key issues could be identified and that they differed amongst different categories of procurement. It was also concluded that there was a significant relationship between dispute issues and contract category and that knowledge of that relationship should prove beneficial to the contracting community in its litigation prevention efforts.

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CONTRACT DISPUTES: AN ANALYSIS OF KEY ISSUES

A 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

By

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June 1979

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This thesis, written by

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has been accepted by the undersigned on behalf of the faculty of the School of Systems and Logistics in partial fulfillment of the requirements for the degrees of

MASTER OF SCIENCE IN LOGISTICS MANAGEMENT
(CONTRACTING AND ACQUISITION MANAGEMENT MAJOR)
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CHAPTER I

INTRODUCTION

Disputes

Disputes are questions of fact involving opposing views or claims arising under a contract (7:188). These disputes are decided by the Contracting Officer under the provisions of the Armed Services Procurement Regulation (ASPR). The ASPR also provides for a standard contract clause relating to disputes as follows:

> (a) Except as otherwise provided in this contract, any dispute concerning a question of fact arising under this contract which is not disposed of by agreement shall be decided by the Contracting Officer, who shall reduce his decision to writing and mail or otherwise furnish a copy thereof to the Contractor. The decision of the Contracting Officer shall be final and conclusive unless, within 30 days from the date of receipt of such copy, the Contractor mails or otherwise furnishes to the Contracting Officer a written appeal addressed to the Secretary. The decision of the Secretary or his duly authorized representative for the determination of such appeals shall be final and conclusive to the extent permitted by United States law. In connection with any appeal proceeding under this clause, the Contractor shall be afforded an opportunity to be heard and to offer evidence in support of his appeal. Pending final decision of a dispute hereunder, the Contractor shall proceed diligently with the performance of the contract and in accordance with the Contracting Officer's decision.
>
> (b) This "Disputes" clause does not preclude consideration of law questions in connection with decisions provided for in paragraph (a) above; <u>provided</u> that nothing in this contract shall be construed as making final the decision of any administrative official, representative, or board on a question of law [15:7-103.12].

The system for resolving contract disputes, within the Air Force, provides for three levels of determination: the contracting officer level, the Secretary of the Air Force level, and the judicial level (5:1). The disputes procedure originates with negotiation of opposing views or claims between the Air Force Contracting Officer and the contractor. The contracting officer must prepare a final, written decision based on the written contentions of both parties and his own personal knowledge of the dispute. A copy of this decision must be furnished to the contractor who then has thirty days from the date of receipt to appeal the decision. A written appeal, addressed to the Secretary of the Air Force, is filed with the contracting officer by the contractor when he feels that the decision by the contracting officer is not equitable (7:189-190). All of the Secretaries of the Armed Services have authorized the Armed Services Board of Appeals (ASBCA) to act as their representative in appealed disputes (7:193-194). (ASBCA and other common procurement terms are defined in Appendix A.) Each of these avenues of relief must be exhausted by the contractor before he can pursue judicial relief in a dispute (7:205).

Fact or Law

Research has disclosed conflicting opinions concerning what constitutes a question of fact as opposed to a

question of law (4:579-592; 7:188-189; 13:633-654). For example, Birnbaum suggested that most questions which occur are of a mixed type of fact and law and it has been demonstrated that the ASBCA can assume jurisdiction in these cases (4:579-592). As he states:

> The distinction between questions of law and questions of fact is not, and never has been, clear-cut definable, or even readily understandable. There is, apparently, room in the terminology for the following: "pure questions of law," "questions of law," "mixed questions of law and fact," and finally "questions of fact." Most questions of law and even many pure questions of law are obviously related to and dependent upon the determination of questions of fact [4:592].

The decision of the ASBCA is final and binding unless it is subsequently determined by the court ". . . to have been fraudulent, capricious, arbitrary, or so grossly erroneous as necessarily to imply bad faith, or to be not supported by substantial evidence [3:3-4]."

The Directorate of Contract Appeals

The Directorate of Contract Appeals (AFLC/JAB), located at Headquarters, Air Force Logistics Command (AFLC), Wright-Patterson Air Force Base, Ohio, is the sole representative of the Air Force in the litigation of contract disputes that have been appealed to the ASBCA. AFLC/JAB maintains a staff of approximately sixteen trial attorneys whose primary functions are to review and defend the decision of the contracting officer in contractor disputes appealed to the ASBCA. Presently, there are some 200

appealed Air Force cases per year pending before the ASBCA with a total contested value of approximately $300 million.

Although litigation prevention is not a formal objective of AFLC/JAB, the current Chief Trial Attorney ". . . envisions that information about the prime causes of litigation and any new trends could be useful in the hands of the Air Force procurement community [16:2]." The total number of cases processed by AFLC/JAB remained steady at approximately 200 cases per year for the years 1973 through 1977 (1:30). However, since the rules of the ASBCA were revised in 1973 (14:2), the volume of data to be utilized by AFLC/JAB has greatly increased. In one recent case, the pretrial discovery alone consisted of over 7,500 pages of possible evidence. With this volume of workload, AFLC/JAB had little time available to research the trends and analyze the key issues resulting in disputed contracts before the ASBCA (14:2-3).

Problem Statement

There was a need to identify and analyze the key issues leading to disputes between the Air Force and its contractors.

Literature Review

A review of written reports and formal research efforts indicated several approaches to the problem of contract disputes. Additionally, the review included

research efforts which considered contract terminations which are closely related to the dispute problem presently under study.

Terminations for Default

In 1957, the Government Accounting Office (GAO) responded to a Congressional request by the Committee on Government Operations for information concerning actions of the ASBCA on contracts terminated for default between 1953 and 1956 by the three military departments. The GAO report summarized those cases with respect to branch of service, number appealed, dollar amount, and the decision of the appeal. Of key importance here was that the GAO specifically excluded from their study "the greater portion of the activities of the ASBCA which concern appeals of contractors questioning decisions by contracting officers on other disputed matters [6:2]." Nor did the report indicate reasons or key issues leading to terminations. The usefulness of the GAO study with respect to the research was thus reduced. Considerations of reasons or key issues leading to terminations did indicate some areas of importance in contract preparation.

Termination Conversions

Wallschlaeger used those considerations of reasons or key issues in his study of contract terminations and of conversions from termination for default to termination

for convenience. He apparently undertook the research effort as a result of an alleged trend by the ASBCA to convert contract termination for default to terminations for convenience. The results of this study indicated that the key issues resulting in those conversions are very similar in nature to the key issues tentatively identified by the AFLC personnel as precursors to contract appeals (17:16). A trial attorney at AFLC/JAB stated that there was presently no method of determining trends and analyzing issues leading to disputes and that as little as a 10 percent improvement in their ability to predict dispute issues would be useful in planning a litigation prevention program. Some of the issues identified by the trial attorneys were: defective contract specifications, inadequate description of government equipment, and constructive changes (18). According to Wallschlaeger, ". . . it appears that correction of or emphasis in the correction of government deficiencies . . . could substantially reduce conversion decisions [17:16]." In fact, he suggested the correction of government deficiencies such as defective specifications, government cooperation, and waiver of delivery schedule would have reduced the conversion rate by 65 percent and 75 percent in 1973 and 1974 respectively (17:18).

Disputes Concerning Warranties

Problem areas in the field of warranties included in contracts were delineated in a 1974 thesis. Noble discussed applicable case briefs in the following areas: burden of proof; implied warranties; notice of breach; latent defects; duration of warranty; warranty by the government; and scope of the warranty clause (12:16-51). He included discussion of lessons learned in the field of warranties and how similar disputed cases might be avoided in the future. To do so would require the contracting officer to become fully aware of the "type of equipment and complexity, cost of the expanded warranty, potential outcome of warranty use, and alternatives to the use of warranty [12:57]."

Small Contractor Claims Procedures

Bednar (3) analyzed the contract disputes procedure from the viewpoint of the relatively small businessman with a claim less than $10,000. He concluded that contract disputes appealed to the ASBCA have become ". . . so formalized and time-consuming that it is unfair and unsuitable [3:21]" to the small businessman with a claim under $10,000 (3:21). He suggested that the chief trial attorney ". . . be given explicit authority to make compromise settlements of claims involving $10,000 or less [3:20]" which would

allow for an expeditious settlement of small claims without waiting for a prolonged decision of the ASBCA (3:21).

Commission on Government Procurement

Research of government contracting policy was conducted in 1972 by the Commission on Government Procurement. One of the many areas investigated by the Commission, contract disputes, was based on case profile data supplied by nine government agencies' contract appeals board (5:4). The Commission evaluated the provisions and clauses of contracts that were frequent dispute subjects. The Commission rank ordered these causative dispute factors as follows in order of frequency (5:72):

1. Statements of Work/Specifications and Drawings
2. Changes/Change Orders
3. Default Terminations
4. Changed Conditions
5. Liquidated Damages
6. Time Extensions
7. Inspections
8. Overhead Costs
9. Options/Price Escalation

Baxa and Hicks (2) stated that factors other than contract provisions, not investigated by the Commission on Government Procurement, might provide the reason for a contractor to seek settlement of a disputed contract from

the ASBCA. They listed other individual factors such as the financial position of the contractor or his indebtedness as shown by his credit rating. These factors could cause a contractor to seek administrative settlement of a contract dispute involving specific contract provisions such as those evaluated by the Commission on Government Procurement. They stated that the real cause of the dispute may be concealed while using the specific contract provision as a symptom of the contract dispute (2:3). Their thesis attempted to discover whether there was a significant relationship between factors outside the contract and selected contract provisions in past contract disputes appealed to the ASBCA (2:9).

They concluded that dollar value of the contract may indicate that the contractor will be willing or at least able to file an appeal. A larger business was found to be more likely to appeal a decision regardless of dollar amount of the contract. Contractors in labor surplus areas tended to more actively pursue appeals. Finally, their research indicated that the more complex the technology the greater the incidence of appeals (2:74).

Relationship Among Variables in the Contract

A study very similar to this research effort was based on an assumption that there was a relationship between variables inherent in Air Force contracts over

which disputes occurred. Newman considered variables such as those identified in profiles of dispute actions studied by the Commission on Government Procurement (10:70).

The variables he selected were (10:13):

1. Major Command (i.e., Air Force Systems Command, Strategic Air Command, Tactical Air Command, etc.)
2. Method of Award (i.e., formal advertising, negotiated)
3. Type of Contract (i.e., firm fixed price, cost plus fixed fee)
4. Kind of Procurement (i.e., construction, service)
5. Party in Interest (i.e., prime contractor, subcontractor)
6. Principal Clause (i.e., changes, specifications)
7. Amount of Contract (i.e., 0 to $50K; $50K to $500K)
8. Amount of Claim (i.e., 0 to $25K; $25K to $100K)

A major assumption of the study was that identification of contract variables would provide a tool to enable early detection of potential disputes. Newman conducted Chi-square analysis to determine relationships among those variables. Unfortunately, he determined the Chi-square analysis was not the appropriate test for those relationships in all but one of the comparisons. Therefore, significant relationships were not discernible (10:21-22).

More Responsive Appeal Procedures Needed

Alexander offered a series of proposals to expedite the appeals procedure to make them more responsive and less expensive (1:61-62). The contracting officer's dilemma of first acting as government negotiator and then as impartial decision maker in dispute actions was cited as a contributor to increased numbers of disputes. He further stated that, through the appeals procedure, judicial decisions have increased due process at the expense of both the contractor and the government (1:28-37).

Summary

The studies cited above have generally approached contract disputes from one of two avenues of concern. One avenue was to attempt an identification of variables inherent in contracts which result in disputes. Second, more responsive and less expensive procedures were sought to improve the disputes process. Clearly, there was a need to increase the body of procurement knowledge by providing information on the issues found to be common elements in contract dispute cases.

Objectives

The specific objectives of this research effort were:

1. Identify the key issues in contract disputes appealed to the ASBCA.

2. Analyze relationships, if any, between key issues and disputes appealed to the ASBCA.

3. Increase the body of procurement knowledge by providing information on key issues found to be common elements in contract dispute cases.

Research Questions

In an attempt to achieve the objectives cited above, the following research questions were posed:

1. What were the key issues in contract disputes appealed to the ASBCA?

2. Were there significant relationships between key issues in contract disputes appealed to the ASBCA?

CHAPTER II

METHODOLOGY

Data Collection

Data Source

The data source for this research effort was located at Headquarters AFLC, Wright-Patterson Air Force Base, Ohio. AFLC/JAB maintained manual card files for the identification of the contracts involved in dispute proceedings before the ASBCA.

Disputes Universe

The disputes universe consisted of all Air Force contracts appealed to the ASBCA.

Disputes Population

The disputes population consisted of all Air Force contracts appealed to the ASBCA that were resolved during the calendar years 1976-1978. These cases were a census of disputes received from contracting officers throughout the Air Force which were not settled at the contracting officer level. The calendar years 1976-1978 were selected because of the ready availability of the data and time limitations to include more.

Data Collection Plan

Data were provided by AFLC/JAB. These data represented all Air Force procurements which ultimately resulted in an appeal before the ASBCA and which were concluded (i.e., denied, sustained, dismissed, or settled) during the calendar years 1976-1978.

Identification of the variables common to the contracts in the population was a major priority in the formulation of a data collection plan. Two variables, category of procurement and issues, were identified as common to the contracts in the population. These two variables were then divided into subcategories.

Categories of Procurement

A scan of the manual card files at AFLC/JAB disclosed a natural division within the category of procurement similar to those divisions identified by Baxa and Hicks (2:22) and Newman (8:13-18). Those subcategories were: Research and Development, Construction, Supply, and Services. The category of procurement comprises the independent variable of interest in the research effort.

Issues

Nine issues were identified as subcategories: Defective Specifications, Inspection and Testing, Financial Problems, Government Acts, Substantial Performance, Premature Default, Defective Cure Notice, Failure of

Preproduction Samples, and Miscellany. These nine subcategories were selected as a result of an interview with a trial attorney (18), a review of a 1969 brief by Gubin (8:411-421), and a review of the Report of the Commission on Government Procurement (5:72). Preliminary investigation of the Contract Appeal Data Card files at AFLC/JAB revealed that the nine subcategories would encompass all issues identified by the trial attorneys. The following paragraphs describe those subcategories which became the dependent variables of interest in the research effort.

Defective Specifications. A defective specification as an issue in a contract dispute was founded on the principle of an implied warranty in which a satisfactory product would have resulted if the specifications were followed by the contractor (8:412). The Air Force often procured goods and services as a result of government-prepared specifications. These specifications were defined as

> . . . a clear and accurate description of the technical requirements for a material, product, or service, including the procedure by which it will be determined that the requirements have been met [8:412].

Therefore, the contractor was obligated to follow the specifications set by the government or risk having the contract terminated for default.

Inspection and Testing. Most governmental contracts contained a standard inspection clause which included specific requirements to be met by goods and services. This allowed the Air Force to inspect and test all contracts containing the clause. This clause gave the Air Force the right to reject any good or service which did not comply and, if the contractor failed to correct the deficiency, the contract was terminated. Again, the contractor appealed to the ASBCA if the dispute was not settled at the contracting officer level (9:413).

Financial Problems. A financial problem arose as a dispute before the ASBCA for several reasons. The primary reason was the inability to produce due to financial difficulties. However, disputes also arose due to the payment schedule set up by the government. Gubin stated that the contractor, in building an appeal, must have been able to show that the government had a direct cause in the financial difficulty that caused the dispute (8:413-414).

Government Acts. Another issue in contract disputes arose as a result of government action. This occurred as a result of constructive change orders, government-caused delays, or government interference which caused a hardship upon the contract which forced the contractor to appeal to the ASBCA for relief (8:414).

Substantial Performance. Another issue was identified as substantial performance. There was a minor defect which the contractor was directed to correct within a reasonable time period. The contractor appealed to the ASBCA when he felt that a settlement could not be reached at the contracting officer level as to the question of "substantial conformity with contract specification" and "reasonable time period" to correct (8:415).

Premature Default. Premature default was an issue which occurred when the contract was terminated prior to the time specified in the contract or when the government elected to permit continuance of performance past the due date. Disputes also arose when the government terminated the contract prior to the due date or failed to set a new performance due date after a reasonable time (8:416-418).

Defective Cure Notice. The government was required to send the contractor a cure notice which outlined the failures in performance or progress and which stated that the contract would be terminated if such failures were not "cured" (9:417). A dispute also arose when ". . . the 'notice' and opportunity to 'cure' were required, but not given [9:162]." These were commonly referred to as defective cure notices.

Failure of Preproduction Samples. A dispute also arose as a result of failure of preproduction samples which were required to pass governmental inspection and testing prior to the production of a good or service (8:419).

Miscellany. The last issue was miscellany. This broad area covered any issue that did not fit into any of the issues previously identified. Some examples of these were labor problems, weather, acts of God, etc. (8:419).

Data Transformation

The research effort included converting the disputes data, previously filed manually, into mechanized data files to be stored on magnetic disks. Those disks were part of the storage capability of the CYBER 74/CYBER 725 computers at the Aeronautical Systems Division (ASD) computer center, Area B, Wright-Patterson Air Force Base, Ohio. An existing system, the Contract Appeals Management Information System (CAMIS), displayed computer-generated blank forms on a computer terminal equipped with a cathode ray tube. Each manual record was then transferred to mechanized files.

To enable subsequent analysis, the appropriate category of procurement for each dispute case was entered in the remarks ("RMKS") section of the form displayed by the computer. The categories were identified and coded by the research team as follows:

1. Research and Development--RD*

2. Construction--CONST*

3. Supply--SUPP*

4. Services--SVCS*

The appropriate issue in a dispute case was entered in the issues ("ISSUES") section of the form displayed by the computer. The issues were identified and coded by the research team as follows:

1. Defective Specifications--DEF SPECS*

2. Inspection and Testing--I&T*

3. Financial Problems--FIN PROBS*

4. Government Acts--GOV ACTS*

5. Substantial Performance--SUBS PERF*

6. Premature Default--PREM DEF*

7. Defective Cure Notice--DEF CURE NOT*

8. Failure of Preproduction Samples--FAIL PREPROD SAMPLES*

9. Miscellany--MISC*

The appropriate year for each dispute case was entered in the continued remarks ("RMKS2") section of the form displayed by the computer. The years were identified and coded by the research team as follows:

1. 1976--76*

2. 1977--77*

3. 1978--78*

The asterisks were used to distinguish the identifiers of the categories, the issues, and the years from other remarks in the sections.

VENUS Processing

The mechanized files resulting from the above procedure were then available for access through a general-purpose query/update system known as VENUS, available to users of the ASD computers. The VENUS system files were indexed sequential, meaning that the user could interact with the records in a random access manner. CAMIS record format was designed to be key addressable so that ASBCA docket number, contractor name, contract category, and key issue were jointly addressed. Counts of the joint occurrence of specific contract categories and issues by a VENUS query of the records were then obtained. (An example of a sample VENUS query is shown in Appendix B.) An input data file (LAW2) was created from the results of the VENUS queries and stored in the AFLC Honeywell 6000 computer. (An excerpt from that data file is reproduced in Appendix C.)

The data file was then used to generate a 4 x 9 contingency table.[1] That contingency table was used to identify key issues which were associated with specific contract categories. The contingency table procedure was

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[1]A contingency table ". . . is a joint frequency distribution of cases according to two or more classificatory variables [11:218]."

implemented using the Statistical Package for the Social Sciences (SPSS) subprogram, CROSSTABS (Appendix D). The mechanized data file was attached to the SPSS CROSSTAB subprogram and the subprogram was executed. The resulting contingency tables and related statistics were used to perform data analysis.

Data Analysis Methods

The approach selected to analyze the data was a three-level approach. The first level was a Chi-square test of independence to determine whether or not interrelationships or dependency existed between variables. The second level was the comparison of the frequency of occurrences of the issues over the total population with the frequency of occurrences of issues by category of procurement. An assumption was made that if the occurrences of issues in disputes were independent of the category of procurement, then the occurrences of the issues in the various procurement categories would equal the occurrences of key issues in the population. Comparisons which indicated associations between contract category and specific issues led to the third level of analysis. This analysis was an attempt to measure the level of association between the four contract categories and the nine issues under dispute.

First Level Analysis

In order to determine whether or not interrelationships and dependency existed between the two variables, a Chi-square contingency test was conducted. The null hypothesis of the Chi-square contingency table was that the two variables were unrelated or independent. If the null hypothesis could be rejected, the alternate hypothesis could be accepted, asserting that a relationship between the two variables existed.

The Chi-square contingency table (Table 1) was constructed so that the columns represented all of the various issues of disputes. The rows in the table represented the various categories of procurement. Each data cell was divided with observed frequency of occurrence (O_{ci}) in the upper half and the expected frequency of occurrence (E_{ci}) in the lower half. The expected frequency (E_{ci}) was defined as the value that would occur if the two variables were independent.

The expected frequency (E_{ci}) for each given cell was calculated by using the total observations which occurred in that row and column which were associated with that cell. The row proportion (X_c) was multiplied by the column proportion (X_i), where

$$X_c = \frac{\text{total row value}}{\text{total population}} \quad \text{and} \quad X_i = \frac{\text{total column value}}{\text{total population}}$$

TABLE 1

EXAMPLE OF OBSERVED AND EXPECTED FREQUENCIES

O_{ci} / E_{ci}	Issues 1	2	3	4	5	6	7	8	9	
Category 1	3	3	11	5	3	3	3	3	3	37
	7.3	0.7	10.3	6.7	1.4	7.4	0.7	1.6	1.0	.055
2	64	3	47	46	6	14	3	3	7	193
	37.8	3.5	53.7	34.7	7.5	38.8	3.5	8.3	5.2	.287
3	27	3	50	42	9	89	3	20	3	246
	48.2	4.4	68.4	44.5	9.6	49.4	4.4	10.6	6.6	.366
4	38	3	79	29	8	29	3	3	5	197
	38.6	3.5	54.8	35.7	7.7	39.6	3.5	8.5	5.3	.293
	132	12	187	122	26	135	12	29	18	673
	.196	.018	.278	.181	.039	.201	.018	.043	.027	

$$\chi^2 = 147.89$$

$$\chi^2_{c\ .001} = 51.18$$

The product of those marginal proportions was multiplied by the total population value to obtain the expected value for each cell in the table.

The Chi-square test statistic (χ^2) was developed in the following manner. The difference between the observed and the expected values in each cell was squared and divided by the expected value of the cell. Then the resulting values were summed over all the values of the contingency table to arrive at the χ^2 statistic,

$$\chi^2 = \sum_{c=1}^{4} \sum_{i=1}^{9} \frac{(O_{ci} - E_{ci})^2}{E_{ci}}$$

where,

c is the row number, and

i is the column number.

The Chi-square test statistic was then compared to a Chi-square critical value obtained from Chi-square statistical tables. The critical value was based on the degrees of freedom for the contingency table, where the degrees of freedom are equal to the product of the number of rows, minus one, multiplied by the number of columns, minus one (11:223-224).

In the example, the Chi-square statistic for Table 1 was calculated to be 147.89 with 24 degrees of freedom. The critical value was found to be 51.18 at the .001

probability of obtaining a value that large or larger (19:366). Since the value of the Chi-square test statistic, in the example, greatly exceeded the critical value, it was concluded that the variable, dispute issue, was dependent upon the variable, category of procurement.

Second Level Analysis

In the second level of analysis, the frequencies of occurrence of an issue (O_{ci}) in the various procurement categories were compared to the expected frequencies of occurrence (E_{ci}) of that issue in the population (Table 1). The comparison was made by subtracting E_{ci} from O_{ci}. To establish a criterion for identification of a key issue, the following procedure was used. If the occurrences of the issues were truly independent of the category of procurement, the difference between the expected and the observed frequencies would tend to be zero. Since the Chi-square test demonstrated almost no probability of independence, those values which demonstrated a dependent relationship would not tend to cluster about the mean of the differences but would fall in the tails of a normal distribution. Under the assumption of normally distributed differences, it was determined that issues which could be identified as key issues would be those which exceeded one standard deviation from the mean. Negative values and those values within one standard deviation from the mean

were eliminated from consideration as key issues because the research was primarily concerned with those issues which exhibited a positive relationship with a category of procurement.

Third Level Analysis

In the third level, data from the disputes file were further analyzed to determine the degree of association between contract category and issues. The method used to measure the level of association between variables was based on a concept known as proportional reduction in error (11:225). The following analogy demonstrates that concept. Assume an experiment in which a subject must guess the color of a ball before drawing it from one of two urns. The urns contain only black and white balls and the player knows in advance that urn "A" contains twenty-five white and seventy-five black balls and that urn "B" contains seventy white and thirty black balls. If the subject were astute, he would always guess "black" prior to drawing a ball from urn "A". Conversely, he would guess "white" prior to drawing from urn "B". If the subject continued to guess and draw, he would be wrong some of the time, but he would be correct more often than wrong because he would always guess the color which occurred most frequently in each urn. By using this technique, he would reduce the proportion of erroneous guesses over the long run.

As previously stated, the concept of proportional reduction in error was used as the basis for the measure of association used in the research effort. That measure consisted of the improvement in the ability to predict which key issues were likely to be encountered once the contract category was known. Data in the example (Table 2) were used to demonstrate the use of such a measure of association.

In the example, an attempt was made to predict which issue would be found in a contract dispute record randomly drawn from the population. If nothing were known about contract category, one would choose that issue occurring most frequently in the population. That frequency, 149, was found in the seventh issue. Since that comprised 22.1 percent of the total issues in the population, in the long run, prediction of the seventh issue as a key issue would be correct 22 percent of the time and in error 78 percent of the time. Assume that in a second example, contract category is known. A better prediction would then be that issue containing the largest cell frequency within the known category. If the known category were the third category, the prediction would be the third issue, since it occurs most frequently in that category. A measure of association between nominal level variables[2]

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[2]A nominal scale of measurement uses numbers merely as a means of identifying groups to which objects belong (11:4).

TABLE 2

EXAMPLE OF FREQUENCIES OF ISSUES BY CATEGORY OF PROCUREMENT

Category	Issue 1	2	3	4	5	6	7	8	9	
1	3	3	11	5	3	3	3	3	3	37
2	5	3	3	29	8	29	79	3	38	197
3	9	42	89	50	3	3	20	27	3	246
4	7	3	3	14	6	46	47	3	64	193
	24	51	106	98	20	81	149	36	108	673

which shows the extent of improvement in predictive ability is called lambda and is defined by (19:175-176):

$$\text{lambda}_{i \cdot c} = \frac{\Sigma \max f_{ci} - \max f_i}{N - \max f_i}$$

where,

$\Sigma \max f_{ci}$ is the sum of the largest frequencies of issues for each given category,

$\max f_i$ is the largest marginal frequency of an issue,

N is the total number of occurrences in the population, and

$\text{lambda}_{i \cdot c}$ means prediction of an issue given prior knowledge of a category.

In the example (Table 2),

$$\text{lambda}_{i \cdot c} = \frac{(11 + 79 + 89 + 64) - 149}{673 - 149} = .042$$

This is interpreted, in the example, as a 4.2 percent improvement in the prediction of key issues given knowledge of contract category.

Analysis of data in the research effort was conducted using lambda as a measure of association. Possible values of lambda range from a maximum of 1.0 (perfect predictive ability) to a minimum of zero (no improvement in predictive ability).

The researchers used the 10 percent improvement in predictive ability suggested by the trial attorney as the criterion for identifying a significant level of association

between dispute issues and contract categories. In addition, it was determined that the value of knowledge of historical levels of association would be enhanced if it could be shown that the levels of association for each year also met the criterion. Therefore, the lambda measure of association was computed and compared for each of three years in the population.

Study Assumptions

The time period under study (calendar years 1976-1978) was of sufficient length to yield valid data pertaining to the objectives of the research effort.

The contracts under consideration represented a cross-section of Air Force contracts consisting of various types, sizes, and categories of procurement in which the parties could not reach an agreement at the contracting officer level.

It was assumed that any data missing from the Contract Appeal Data Card occurred at random because of human error at the data input stage.

It was assumed that the assignment of codes for category of contract and dispute issues remained consistent throughout the transformation of data to mechanized files.

It was further assumed that any errors in transcription of data from the manual card files to the mechanized files were totally random human errors.

Research Limitations

The existence of additional variables, not quantifiable, caused the population under study to be biased. These additional variables may ultimately determine if a decision by the contracting officer will be appealed to the ASBCA. These variables, such as abilities of the contracting officers, the contractor policies, the social and economic ramifications of decision, and economic realities, may affect the decision to be appealed.

CHAPTER III

RESEARCH FINDINGS

This chapter presents the results of the VENUS queries of the data file and the findings of the three levels of analysis conducted in the research.

VENUS Query Results

VENUS queries of the data file revealed that the population consisted of 481 dispute records. Of those records, 156 were decided in 1976, 164 in 1977, and 161 in 1978. Included in the 481 records were 626 issues of dispute which occurred in the following pattern:

Issue	Number
Defective Specifications	129
Inspection and Testing	2
Financial Problems	186
Government Acts	121
Substantial Performance	22
Premature Default	132
Defective Cure Notice	3
Failure of Preproduction Samples	20
Miscellany	11

When the 481 dispute records were queried with respect to number of issues by category of procurement, the following pattern emerged:

Category of Procurement	Number
Research and Development	14
Construction	185
Supply	238
Services	189

First Level Analysis

The Chi-square test of independence was conducted on the contingency table which described the frequencies of joint occurrences of the nine dispute issues and the four categories of procurement in the population (Table 3). The Chi-square test statistic which resulted from that analysis was $\chi^2 = 156.63$ (Appendix E) with 24 degrees of freedom. The Chi-square critical value was found to be 51.18 with a .001 probability of obtaining a value that large or larger. Since the test statistic greatly exceeded the critical value, there appeared to be a statistically supportable relationship between the variables, dispute issues and category of procurement. Independence was thus rejected, thereby asserting that a dependence between the two variables existed.

Second Level Analysis

In order to identify dispute issues as key issues in contract disputes, the second level of analysis was conducted. The frequencies of occurrence of an issue (O_{ci}) were compared with the expected frequencies of occurrence (E_{ci}) of that issue in the population (Table 3) using the methodology established in Chapter II. Those issues which exhibited a significant positive relationship to specific categories of procurement were:

TABLE 3

OBSERVED AND EXPECTED FREQUENCIES OF OCCURRENCE

O_{ci} / E_{ci}	DEF SPECS	I&T	FIN PROBS	GOV ACTS	SUB PERF	PREM DEF	DEF CURE	FAIL SAMP	MISC	
Category										
Research & Development	0	0	10	4	0	0	0	0	0	14
	2.9	0.0	4.2	2.7	0.5	3.0	0.1	0.4	0.3	.022
Construction	64	1	47	46	5	14	1	0	7	185
	38.1	0.6	54.9	35.7	6.5	39.0	0.9	5.9	3.3	.296
Supply	27	0	50	42	9	89	1	20	0	238
	49.0	0.7	70.7	45.9	8.3	50.2	1.2	7.6	4.3	.380
Services	38	1	79	29	8	29	1	0	4	189
	38.9	0.6	56.1	36.5	6.6	39.9	0.9	6.0	3.4	.302
	120	2	186	121	22	132	3	20	11	626
	.206	.003	.297	.193	.035	.211	.005	.032	.018	1.00

$\chi^2 = 156.63$

$\chi^2_c = 51.18$

Category of Procurement	Key Issue
Research and Development	No key issues (Table 4)
Construction	Defective Specifications and Government Acts (Table 5)
Supply	Premature Default and Failure of Preproduction Samples (Table 6)
Services	Financial Problems (Table 7)

Third Level Analysis

Since the Chi-square analysis led to the assertion of a dependent relationship between the two variables and key issues were identified, the research team advanced to the third level of analysis. Using the lambda measure of predictability developed in Chapter II, it was determined that the ability to correctly predict dispute issues was improved 12.7 percent by the prior knowledge of category of procurement (Appendix E). Since that value exceeded the 10 percent criterion previously identified, it was determined that a significant level of association between the two variables, dispute issues and category of procurement, existed.

To improve the usefulness of the information concerning association of variables, the lambda measure of association was computed for disputes in each of the three years in the population. The lambda values for the years

TABLE 4

RESULTS OF ISSUES TO RESEARCH AND DEVELOPMENT

Issue	O_{ci}	E_{ci}	Difference	Remarks
Defective Specifications	0	2.9	-2.9	Failed criterion
Inspection and Testing	0	0.0	0.0	Failed criterion
Financial Problems	10	4.2	5.8	Failed criterion
Government Acts	4	2.7	1.3	Failed criterion
Substantial Performance	0	0.5	-0.5	Failed criterion
Premature Default	0	3.0	-3.0	Failed criterion
Defective Cure Notice	0	0.1	-0.1	Failed criterion
Failure of Preproduction Samples	0	0.4	-0.4	Failed criterion
Miscellany	0	0.3	-0.3	Failed criterion

TABLE 5

RESULTS OF ISSUES TO CONSTRUCTION

Issue	O_{ci}	E_{ci}	Difference	Remarks
Defective Specifications	64	38.1	25.9	Key issue
Inspection and Testing	1	0.6	0.4	Failed criterion
Financial Problems	47	54.9	-7.9	Failed criterion
Government Acts	46	35.7	10.3	Key issue
Substantial Performance	5	6.5	-1.5	Failed criterion
Premature Default	14	39.0	-25.0	Failed criterion
Defective Cure Notice	1	0.9	0.1	Failed criterion
Failure of Preproduction Samples	0	5.9	-5.9	Failed criterion
Miscellany	7	3.3	3.7	Failed criterion

TABLE 6

RESULTS OF ISSUES TO SUPPLY

Issue	O_{ci}	E_{ci}	Difference	Remarks
Defective Specifications	27	49.0	-22.0	Failed criterion
Inspection and Testing	0	0.7	-0.7	Failed criterion
Financial Problems	50	70.7	-20.7	Failed criterion
Government Acts	42	45.9	-3.9	Failed criterion
Substantial Performance	9	8.3	0.7	Failed criterion
Premature Default	89	50.2	38.8	Key issue
Defective Cure Notice	1	1.2	-0.2	Failed criterion
Failure of Preproduction Samples	20	7.6	12.4	Key issue
Miscellany	0	4.3	-4.3	Failed criterion

TABLE 7

RESULTS OF ISSUES TO SERVICES

Issue	O_{ci}	E_{ci}	Difference	Remarks
Defective Specifications	38	38.9	-0.9	Failed criterion
Inspection and Testing	1	0.6	0.4	Failed criterion
Financial Problems	79	56.1	22.8	Key issue
Government Acts	29	36.5	-7.5	Failed criterion
Substantial Performance	8	6.6	1.4	Failed criterion
Premature Default	29	39.9	10.9	Failed criterion
Defective Cure Notice	1	0.9	0.1	Failed criterion
Failure of Preproduction Samples	0	6.0	-6.0	Failed criterion
Miscellany	4	3.4	0.6	Failed criterion

1976, 1977, and 1978 were 13.3 percent, 13.6 percent, and 10.3 percent, respectively (Appendix F). For each of the three years the lambda value exceeded the 10 percent criterion thus indicating a significant level of association between the independent and dependent variables.

CHAPTER IV

SUMMARY AND CONCLUSIONS

This chapter presents the summary of the findings of the research, conclusions that were drawn from those findings, and recommendations for further research in the area of contract disputes appealed to the ASBCA.

Summary

Nine issues common to contract disputes were identified in Chapter II: Defective Specifications, Inspections and Testing, Financial Problems, Government Acts, Substantial Performance, Premature Default, Defective Cure Notice, Failure of Preproduction Samples, and Miscellany. In the first level of analysis, the Chi-square test established a statistically supportable relationship between the variables, dispute issues and category of procurement.

In the second level, Defective Specifications and Government Acts were found to be key issues associated with the Construction category of procurement. Premature Default and Failure of Preproduction Samples were found to be key issues associated with the Supply category of procurement. Only one issue, Financial Problems, was identified as a key issue in the Services category of procurement.

The third level of analysis employed another contingency table procedure to determine the degree of association between dispute issues and categories of procurement both for the population and for the individual years within the population. For both the population and the individual years, the lambda measure of association for nominal level variables indicated a significant level of improvement in the prediction of an issue in a contract dispute as a result of prior knowledge of the category of procurement. For the population, lambda indicated a 12.7 percent improvement in ability to make a successful prediction of dispute issue given the category of procurement. For the years 1976, 1977, and 1978, lambda indicated an improvement of 13.3 percent, 13.6 percent, and 10.3 percent, respectively.

Conclusions

There was a statistically supportable relationship between contract issues and category of procurement. Such a relationship may be of value to contracting personnel in establishing a future litigation prevention program. In addition, knowledge of the key issues which were associated with specific categories may direct the attention of those personnel to contracts where litigation prevention efforts would be most successful.

The improvement in ability to predict dispute issues identified in the research may be especially

valuable. Although a minimum of 10 percent improvement was used to establish a level of significance, it should be recalled that prior to this research effort there was no established method for predicting or analyzing disputes. Therefore, the predictive ability identified takes on much greater significance as it establishes, for the first time, an ability to support such predictions.

The number of disputes for the past six years and the level of association determined by the research effort both for the population and the individual years remained fairly constant. That relative stability should prove valuable to the procurement community as it attempts to reduce the number of disputes appealed to the Armed Services Board of Contract Appeals.

It should be noted that the disputes procedures described in this research effort have been subsequently changed by the Contract Disputes Act of 1978. This procedural change, however, has no effect on the key issues identified herein.

Recommendations

It is recommended that further research be conducted in the area of contract disputes. Although key issues were identifiable, no determination of causalty was possible with this research design. If the cause of the occurrence of a key issue in a specific contract

category could be determined, the ability to prevent future litigation would be greatly enhanced. An analysis of typical contract documents for each of the categories of procurement may disclose inherent weaknesses in standard contract clauses which lead to future disputes.

In addition, the scope of the current research did not include analysis of decisions, dismissals, or settlements of disputes in the research population. An analysis of these results of disputes may provide information which could impact on future contractual endeavors by the Air Force.

APPENDICES

APPENDIX A

DEFINITIONS

ABSCA--Armed Services Board of Contract Appeals. A quasi-judicial, administrative board with delegated authority from the Secretaries of the Armed Services to hear and rule on questions of fact in contract disputes (2:80).

Changed conditions--environmental conditions or locations that are changed in relation to their original description in the contract (2:80).

Constructive changes--covers the situation where the contracting officer failed to issue a change order when he should have issued one under the contract (7:50).

Contracting officer--the person who, by virtue of his position or by appointment, has been authorized to enter into and administer contracts on behalf of the government (2:81).

Government furnished equipment--an article provided in a government contract whereby the government is required to furnish material under a contract (7:55).

Statements of work/specifications and drawings--the detailed descriptions of the work effort contracted for and how it is to be accomplished as well as how the output of the effort is to function (2:81).

APPENDIX B

SAMPLE VENUS QUERY

```
COMMAND:LOGIN.
COMMAND:ATTACH,FIL2,SUPFORM,CY=2
COMMAND:ATTACH,DICT,SUPFORM,CY=3,ID=A780324,SN=ASD,MR=1.
COMMAND:ATTACH,PROCFIL,VENPROC,ID=VENUS,SN=ASD.
COMMAND:BEGIN,VENUS.
?RECORD,1647,FIL2,40.
?DICTIONARY.
?COUNT,WHERE,RMKS:RD#*#,AND,ISSUES:FIN PROBS#*#.
 QUALIFYING RECORD COUNT = 10
?COUNT,WHERE,RMKS:SUPP#*#,AND,ISSUES:PREM DEF#*#.
 QUALIFYING RECORD COUNT = 89
?FINISH.
COMMAND:LOGOUT.
```

Note: FIL2 and SUPFORM were the permanent file names of the Disputes Population.

APPENDIX C

INPUT DATA FILE

```
1000 3 5 1 76
1010 3 5 1 76
1020 3 5 1 76
1030 3 6 1 76
1040 3 6 1 76
1050 3 6 1 76
1060 3 6 1 76
1070 3 6 1 76
1080 3 6 1 76
1090 3 6 1 76
1100 3 6 1 76
1110 3 6 1 76
1120 3 6 1 76
1130 3 6 1 76
1140 3 6 1 76
1150 3 6 1 76
1160 3 6 1 76
1170 3 6 1 76
1180 3 6 1 76
1190 3 6 1 76
1200 3 6 1 76
1210 3 6 1 76
1220 3 6 1 76
1230 3 6 1 76
1240 3 6 1 76
1250 3 6 1 76
1260 3 6 1 76
1270 3 6 1 76
1280 3 6 1 76
1290 3 6 1 76
1300 3 6 1 76
1310 3 6 1 76
1320 3 6 1 76
1330 3 6 1 76
1340 3 6 1 76
1350 3 6 1 76
1360 3 6 1 76
1370 3 6 1 76
1380 3 6 1 76
1390 3 6 1 76
1400 3 7 1 76
```

APPENDIX D

SPSS SUBPROGRAM, CROSSTABS

```
@100$$S,J :,8,16;;,16
@105$:IDENT:WP1308 SULTEMEIER/UNDERWOOD 79A
@112$:SELECTA:79A70/SPSSFILE
@115RUN NAME;CROSSTABS
@120VARIABLE LIST;CAT,ISSUE,NO,YEAR
@121VALUE LABELS;CAT(1)R&D (2)CONST (3)SUPPLY (4)SERVICE/
@122;ISSUE(1)DEF     SPECS (2)I & T (3)FIN     PROBS
@123;(4)COV ACTS (5)SUB     PERF (6)PREM    DEF
@124;(7)DEF CURENOTICE (8)FAIL    SAMPLES (9)MISC/
@125;YEAR(76)1976 (77)1977 (78)1978
@128INPUT MEDIUM;CARD
@130N OF CASES;626
@135INPUT FORMAT; FREEFIELD
@138CROSSTABS;TABLES=CAT BY ISSUE BY YEAR
@150OPTIONS;1
@155STATISTICS;1,4
@160READ INPUT DATA
@165$:SELECTA:LAW2
@170FINISH
@175$:ENDJOB
```

APPENDIX E

POPULATION CONTINGENCY TABLE

CAT BY ISSUE

CAT	ISSUE / COUNT / ROW PCT / COL PCT / TOT PCT	1.IDEF ISPECS	2.I & T	3.FIN PROBS	4.COV ACTS	5.SUB PERF	6.PREM DEF	7.DEF CURE NOTICE	8.FAIL SAMPLES	9.MISC	ROW TOTAL
1. R&D		0	0	10	4	0	0	0	0	0	14
		0.	0.	71.4	28.6	0.	0.	0.	0.	0.	2.2
		0.	0.	5.4	3.3	0.	0.	0.	0.	0.	
		0.	0.	1.6	0.6	0.	0.	0.	0.	0.	
2. CONST		64	1	47	46	5	14	1	0	7	185
		34.6	0.5	25.4	24.9	2.7	7.6	0.5	0.	3.8	29.6
		49.6	50.0	25.3	38.0	22.7	10.6	33.3	0.	63.6	
		10.2	0.2	7.5	7.3	0.8	2.2	0.2	0.	1.1	
3. SUPPLY		27	0	50	42	9	89	1	20	0	238
		11.3	0.	21.0	17.6	3.8	37.4	0.4	8.4	0.	38.0
		20.9	0.	26.9	34.7	40.9	67.4	33.3	100.0	0.	
		4.3	0.	8.0	6.7	1.4	14.2	0.2	3.2	0.	
4. SERVICE		38	1	79	29	8	29	1	0	4	189
		20.1	0.5	41.8	15.3	4.2	15.3	0.5	0.	2.1	30.2
		29.5	50.0	42.5	24.0	36.4	22.0	33.3	0.	36.4	
		6.1	0.2	12.6	4.6	1.3	4.6	0.2	0.	0.6	
COLUMN TOTAL		129	2	186	121	22	132	3	20	11	626
		20.6	0.3	29.7	19.3	3.5	21.1	0.5	3.2	1.8	100.0

CHI SQUARE = 156.62934 WITH 24 DEGREES OF FREEDOM SIGNIFICANCE = 0.
LAMBDA (ASYMMETRIC) = 0.20103 WITH CAT DEPENDENT. = 0.12727 WITH ISSUE DEPENDENT.

APPENDIX F

CONTINGENCY TABLES BY YEAR

YEAR VALUE = 76. 1976

CAT	ISSUE	1.DEF SPECS	3.FIN PROBS	4.COV ACTS	5.SUB PERF	6.PREM DEF	7.DFF CURE NOTICE	8.FAIL SAMPLES	9.MISC	ROW TOTAL
1. R&D	COUNT	0	5	1	0	0	0	0	0	6
	ROW PCT	0.	83.3	16.7	0.	0.	0.	0.	0.	2.8
	COL PCT	0.	6.5	3.1	0.	0.	0.	0.	0.	
	TOT PCT	0.	2.4	0.5	0.	0.	0.	0.	0.	
2. CONST	COUNT	11	19	10	1	4	0	0	3	48
	ROW PCT	22.9	39.6	20.8	2.1	8.3	0.	0.	6.3	22.6
	COL PCT	31.4	24.7	31.3	12.5	8.3	0.	0.	75.0	
	TOT PCT	5.2	9.0	4.7	0.5	1.9	0.	0.	1.4	
3. SUPPLY	COUNT	9	19	14	6	37	1	7	0	93
	ROW PCT	9.7	20.4	15.1	6.5	39.8	1.1	7.5	0.	43.9
	COL PCT	25.7	24.7	43.8	75.0	77.1	100.0	100.0	0.	
	TOT PCT	4.2	9.0	6.6	2.8	17.5	0.5	3.3	0.	
4. SERVICE	COUNT	15	34	7	1	7	0	0	1	65
	ROW PCT	23.1	52.3	10.8	1.5	10.8	0.	0.	1.5	30.7
	COL PCT	42.9	44.2	21.9	12.5	14.6	0.	0.	25.0	
	TOT PCT	7.1	16.0	3.3	0.5	3.3	0.	0.	0.5	
	COLUMN TOTAL	35	77	32	8	48	1	7	4	212
		16.5	36.3	15.1	3.8	22.6	0.5	3.3	1.9	100.0

CHI SQUARE = 65.23007 WITH 21 DEGREES OF FREEDOM SIGNIFICANCE = 0.0000
LAMBDA (ASYMMETRIC) = 0.20168 WITH CAT DEPENDENT. = 0.13333 WITH ISSUE DEPENDENT.

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CAT	ISSUE / COUNT / ROW PCT / COL PCT / TOT PCT	1. IDEF ISPECS	2. I & T	3. FIN PROBS	4. COV ACTS	5. SUB PERF	6. PREM DEF	8. FAIL SAMPLES	9. MISC	ROW TOTAL
1. R&D		0	0	2	3	0	0	0	0	5
		0.	0.	40.0	60.0	0.	0.	0.	0.	2.5
		0.	0.	4.7	5.5	0.	0.	0.	0.	
		0.	0.	1.0	1.5	0.	0.	0.	0.	
2. CONST		21	1	8	19	0	5	0	2	56
		37.5	1.8	14.3	33.9	0.	8.9	0.	3.6	27.7
		47.7	100.0	18.6	34.5	0.	11.6	0.	40.0	
		10.4	0.5	4.0	9.4	0.	2.5	0.	1.0	
3. SUPPLY		7	0	11	17	2	29	6	0	72
		9.7	0.	15.3	23.6	2.8	40.3	8.3	0.	35.6
		15.9	0.	25.6	30.9	40.0	67.4	100.0	0.	
		3.5	0.	5.4	8.4	1.0	14.4	3.0	0.	
4. SERVICE		16	0	22	16	3	9	0	3	69
		23.2	0.	31.9	23.2	4.3	13.0	0.	4.3	34.2
		36.4	0.	51.2	29.1	60.0	20.9	0.	60.0	
		7.9	0.	10.9	7.9	1.5	4.5	0.	1.5	
COLUMN TOTAL		44	1	43	55	5	43	6	5	202
		21.8	0.5	21.3	27.2	2.5	21.3	3.0	2.5	100.0

CHI SQUARE = 61.53234 WITH 21 DEGREES OF FREEDOM SIGNIFICANCE = 0.0000
LAMBDA (ASYMMETRIC) = 0.24615 WITH CAT DEPENDENT. = 0.13605 WITH ISSUE DEPENDENT.

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CAT	ISSUE / COUNT / ROW PCT / COL PCT / TOT PCT	1.DEF ISPECS	2.I & T	3.FIN PROBS	4.COV ACTS	5.SUB PERF	6.PREN DEF	7.DEF NOTICE	8.CURE FAIL SAMPLES	9.MISC	ROW TOTAL
1. R&D		0	0	3	0	0	0	0	0	0	3
		0.	0.	100.0	0.	0.	0.	0.	0.	0.	1.4
		0.	0.	4.5	0.	0.	0.	0.	0.	0.	
		0.	0.	1.4	0.	0.	0.	0.	0.	0.	
2. CONST		32	0	20	17	4	5	1	0	2	81
		39.5	0.	24.7	21.0	4.9	6.2	1.2	0.	2.5	38.2
		64.0	0.	30.3	50.0	44.4	12.2	50.0	0.	100.0	
		15.1	0.	9.4	8.0	1.9	2.4	0.5	0.	0.9	
3. SUPPLY		11	0	20	11	1	23	0	7	0	73
		15.1	0.	27.4	15.1	1.4	31.5	0.	9.6	0.	34.4
		22.0	0.	30.3	32.4	11.1	56.1	0.	100.0	0.	
		5.2	0.	9.4	5.2	0.5	10.8	0.	3.3	0.	
4. SERVICE		7	1	23	6	4	13	1	0	0	55
		12.7	1.8	41.8	10.9	7.3	23.6	1.8	0.	0.	25.9
		14.0	100.0	34.8	17.6	44.4	31.7	50.0	0.	0.	
		3.3	0.5	10.8	2.8	1.9	6.1	0.5	0.	0.	
COLUMN TOTAL		50	1	66	34	9	41	2	7	2	212
		23.6	0.5	31.1	16.0	4.2	19.3	0.9	3.3	0.9	100.0

CHI SQUARE = 62.50110 WITH 24 DEGREES OF FREEDOM SIGNIFICANCE = 0.0000
LAMBDA (ASYMMETRIC) = 0.22137 WITH CAT DEPENDENT. = 0.10274 WITH ISSUE DEPENDENT.

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