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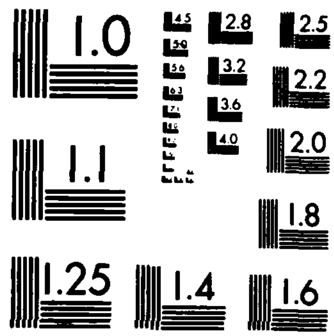

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THE FEASIBILITY OF USING A DATA BASE MANAGEMENT SYSTEM TO AID IN PIECE PART STANDARDIZATION AND SUBSTITUTION

THESIS

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Captain, USAF

AFIT/GLM/LSM/86S-21

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THE FEASIBILITY OF USING A DATA BASE MANAGEMENT SYSTEM TO AID IN PIECE PART STANDARDIZATION AND SUBSTITUTION

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

James E. Fiene, B.S.

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September 1986

Preface

The purpose of this study was to determine the feasibility of using a data base management system to aid in the standardization and substitution of piece parts at the AFLC Depot, AFSC Product Division, and DOD contractor engineering working levels.

An experiment was performed which tested the ability of the DLA Network Characteristic Search System to find screws and bolts in the DOD supply catalog, by using only the fastener's physical description. Although the test file was limited to screws and bolts, the results of the experiment confirm the effectiveness of using a data base management system to aid in the standardization and substitution of piece parts at an engineering working level.

In performing the experimentation and writing this thesis I have had a great deal of help from others. I am deeply indebted to my faculty advisors, Capt Roger Davis and Capt Richard Mabe, for their continuing patience and assistance in times of need. I also wish to thank the numerous people in ASD, HQ CASC, DLSC, and DESC who were so helpful to me during this research effort. Finally, I wish to thank my wife Kathy for her understanding and concern on those many nights and weekends when I was tied to my desk with work. This research effort could not have been completed without her love and support.

James E. Fiene

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Abstract

Part selection for end items and weapon systems in the Department of Defense (DOD) occurs at AFSC Product Divisions, AFLC Depots, and DOD contractor engineering working levels. There is presently no automated method available at the engineer's working level to allow them to interrogate the DOD supply catalog by part description. Without this ability, parts, with characteristics that match those of a part needed for a specific application, cannot be selected from the catalog, and an unnecessary new part may then be added to the catalog.

There are several newly developed data base management systems which have the ability to interrogate the DOD supply catalog by part description. This research investigated the feasibility of integrating one of these systems at AFSC Product Divisions, AFLC Depots, and DOD contractor engineering working levels. An experiment was conducted with the DLA Network prototype Characteristic Search System. The results gathered from the investigation and experiment indicate integration of such a system is needed and practical.

Therefore, a system, with the capabilities of the DLA Network Characteristic Search System, should be integrated at AFSC Product Divisions, AFLC Depots, and DOD contractor engineering working levels.

THE FEASIBILITY OF USING A DATA BASE MANAGEMENT SYSTEM TO AID IN PIECE PART STANDARDIZATION AND SUBSTITUTION

I. Overview

Introduction

Piece parts such as bolts, washers, capacitors, and resistors are the smallest unit parts which make up assembled sub-system components such as servo units, flight computers, landing gear, generators, etc. The number of individually stock listed piece parts in the Department of Defense (DOD) inventory catalog is well into the millions. There are 1.2 million different National Stock Numbers (NSNs) for fasteners alone. Each NSN represents a unique item of supply, and each unique item may have multiple manufacturer's part numbers with which that item was procured at one time or another. Each manufacturer's part number represents a different set of specifications which was qualified individually by the DOD.

There are several data base management systems (DBMS), presently under development, designed to aid in the management of the DOD supply catalog. Some of these systems are already in use by either the Navy, Air Force, or the Defense Logistics Service Center (DLSC). These DBMS have the ability to search for a piece part from the DOD supply catalog by part description.

The purpose of this research is to determine the feasibility of using one of these DBMS at AFLC Depots, AFSC Product Divisions, and DOD contractor engineering working levels to aid in the standardization and substitution of piece parts. A review of the current efforts to control piece part proliferation by the DOD will be presented in order to help determine the feasibility of integrating one of these newly developed DBMS at the engineer's working level.

Problem Statement

Presently, neither the AFLC Depots, AFSC Product Divisions, nor DOD contractor engineering working levels have access to any of the DBMS which have the ability to search the DOD supply catalog by using a part description. As a result, when engineers have determined the physical characteristics of a part needed in a particular application, there is no way to query the DOD supply catalog and determine if a part, with those characteristics, is listed. Without this ability, a new specification may unnecessarily be qualified for the needed item, and a duplicate part may be added to the already voluminous DOD supply catalog.

Experimental Hypotheses

If one of the newly developed DBMS were used, then piece parts, which match the parts needed for the application under consideration, could be identified and procured in lieu of stocklisting a duplicate item.

Justification

A congressional review of the cataloging, standardization, and provisioning of spare parts by the military supply system occurred in 1970. At that time, it was determined that a data base management system, with the ability to search for parts by using only their physical description, needed to be developed in order to keep from double, and sometimes triple, stock listing items of supply. Furthermore, it was recommended that this system be used at all levels of the development and provisioning of DOD weapon systems and parts. At that time, however, the computer hardware and software needed to develop such a system was not available.

Today the technology is not only available, but several systems with the capabilities described are in limited use. The problems, as stated in the congressional report, still exist, and the need for the engineer to use this type of data base management system still exists. Therefore, it is necessary to integrate this capability at these engineering working levels in order to maximize the benefits which can be gained from the use of such a system.

Research Objectives

In order to determine the feasibility of using one of the newly developed DBMS at an engineer's working level, several research objectives have been established. First, determine if the integration of such DBMS at an engineer's working level is practical, when the present methods employed to manage the DOD supply catalog are considered.

Second, investigate the DBMS available which have the capability to interrogate the DOD supply catalog by part description. The purpose of this objective is not only to uncover the various systems in existence with this capability, but also to choose which of these systems to use in an experiment conducted as part of the fourth research objective.

Third, compile a data base of piece parts, and tabulate the physical descriptions for each of the piece parts. This data base will be used as a test file in the experiment conducted as part of the fourth research objective.

Fourth, conduct a test of one of the newly developed DBMS using a test file containing only the physical description of different piece parts. The purpose of this test will be to determine if these new systems can be used by the engineer to match piece parts already in the DOD supply catalog with the piece parts needed in a particular application.

Fifth, the results of the experiment conducted in the fourth objective will be analyzed to determine the "accuracy" (reference page 16) of the system tested.

Sixth, notes taken during the experiment will be reviewed to present any problems, advantages, or anomalies which may effect the ability to use one of these systems at the engineer's working level.

Finally, draw conclusions based on the research conducted about the feasibility of using one of these new DBMS at the engineer's working level to help in the standardization and substitution of the piece parts listed in the DOD supply catalog.

Scope of Research

The piece parts chosen for the experimental part of this research were limited to fasteners, for several reasons. First, fasteners are one of the most complicated of all piece parts to define. They are so highly specialized that there can be more than 20 different characteristics which may have to be defined in order to describe a particular fastener. Because of this highly specialized nature, 1.2 million of the roughly 6 million parts in the DOD supply catalog are fasteners. This is the single largest area where the physical description search capability will have the most profound impact.

Second, it requires a great amount of time to become familiar with a Federal Stock Class and the specifications which different manufacturers use to describe the parts they produce. Therefore, in the interest of time, this experiment was limited to the Federal Stock Classes which this author was most familiar with.

Due to several limitations, the experimental part of this research was restricted to testing only one data base management system, even though several systems were reviewed. These limitations, and the criteria used to choose the system tested, are presented in Chapter III.

II. Literature Review

Introduction

The DOD has been actively interested in controlling piece part proliferation since the mid 1950s (35:8). Several DOD directives have been issued, and many programs have been initiated to insure the maximum use of parts already in the DOD supply catalog. This chapter will describe these directives and programs, and discuss the development of the DBMS which were developed to aid in the management of the DOD supply catalog.

Why Control the DOD Inventory

Based on government industrial surveys, the use of standard piece parts in new design saves $500 - $2,000 per part in documentation cost (35:20). Additionally, historical data indicates that it costs the government between $4,500 and $25,000 to qualify a new part (27). Both of these costs may be avoided by making maximum use of parts already in the inventory system. The life cycle cost of maintaining a single item in the inventory is estimated at $165 per year, provided the item is kept in the inventory for 10 years (27). By multiplying this figures by the six million (22)(35:9) piece parts in the DOD supply catalog, the magnitude of the cost of maintaining this system is estimated to be nearly one billion dollars annually. There is little doubt that steps must be taken to insure piece parts are not double stock listed, and, that maximum use is made of piece parts already in the DOD supply catalog.

Several programs have evolved since the mid-1950s, when the magnitude of this problem was officially realized (35:8). The purpose of these programs is to control piece part proliferation. The first of these programs is the Item Entry Control Program. A follow on program is the Item Reduction Program. The most recent program is the Parts Control Program. All of these programs will be looked at in this chapter in order to understand the magnitude of the parts proliferation problem, and to understand how these programs could benefit from the integration of one of these newly developed DBMS. The first of these programs to be discussed will be the Item Entry Control Program.

Present Methods Used to Control Piece Part Proliferation

Item Entry Control and Item Reduction Programs. The DOD's first attempt to control piece parts proliferation was the Item Entry Control Program. This program was formalized in the early 1960s (35:9-10). It consists of screening an item during the provisioning cycle to insure the part does not already exist in the DOD supply catalog. This does not occur, however, until well into the logistics support cycle of the acquisition of the weapon system. Unfortunately, by that point (15)(19) most of the additional costs associated with adding a unique piece part to the DOD supply catalog have already been incurred (reference page 6).

The present automation of the Item Entry Control Program depends on DOD contractors using the same part numbers when making use of the same part, but for application to a different end item (35:9-10). If the contractor issues a new part number, or if the contractor has never previously contracted with the DOD, the Item Entry Control Program can do little to determine that this is a duplicate part.

Another related method of controlling supply management and logistics support costs is the Item Reduction Program, also initiated to eliminate duplicate piece parts in the system (13)(35:9). The Item Reduction Program is an on going program where by parts in the DOD supply catalog are evaluated to determine if they can be combined with a similar item in the catalog. This program is for items already in the DOD supply catalog and does little to reduce the costs associated with introducing a new piece part into the inventory system (35). If successful, it eliminates the additional inventory costs of listing two items when one would serve both purposes (11)(12)(13).

Today, the Item Reduction Program uses a data base management system which does not have the capability to perform a search for a part in the DOD supply catalog by part description. Hence, only known parts suspected as being duplicates can be evaluated (26)(35:10).

Both the Item Reduction and Item Entry Control Programs in the Air Force are managed by the Cataloging and Standardization Center at Battle Creek, MI. This organization is presently attempting to automate both of these tasks with a data base management system which has the ability to query the DOD supply catalog by part description (reference page 12:D063).

Parts Control Program (PCP). After the Item Entry Control and Item Reduction Programs were initiated, and the magnitude of the piece parts proliferation problem was exposed, it was obvious that parts control needed to be established during the initial phases of the acquisition of weapon systems. Early versions of the PCP have existed since August 1968 (35:21-28). In July of 1977, the PCP was given the full authority that it now holds under DOD Instruction 4120.19. These instructions require the contractor to submit a complete parts list to the government for approval prior to the production of a new weapon system. If any parts, not already listed in the DOD supply catalog, are included on this list, the PCP requires the contractor to submit formal justification for their use. The PCP will allow use of these piece parts only if justification is verified, and if no substitute can be found in the DOD supply catalog (15)(19).

The PCP insures the maximum use of standard piece parts by requiring the use of several Military Standard Handbooks by the contractors. These particular handbooks provide lists of preferred piece parts for use in new design. There are different handbooks to cover different classes of piece parts. MIL-STD-1251A, for example, covers screws and bolts (17).

Conclusions on Attempts to Control Proliferation. Both the Item Entry Control and Item Reduction Programs lack the ability to interrogate the DOD supply catalog by part description. These programs will not achieve their full potential until this capability is acquired.

The effectiveness of the PCP has been substantial. In April of 1971, the first PCP was initiated at the Defense Electronic Supply Center (DESC) on 100 contracts. Cost avoidance to the government and contractors in the first year of the program alone was estimated at $53 million (25)(35:22,29).

There seems to be little doubt that the PCP was long overdue when it was finally adopted. The cost savings continue to mount at a staggering 19 to 1 ratio of program savings to program costs (25)(26).

There are, however, still greater savings to be realized. As mentioned earlier, the PCP does not begin its screening until the contractor provides the Government with the complete parts list. While this action does occur before the weapon system goes into production, it does not occur until after the design of the weapon system is nearly complete. By this time, the contractor may already be committed to using a piece part which is not already in the DOD supply catalog (14)(15)(27)(35).

Many times, the use of a piece part not already listed in the DOD supply catalog is justified, because the performance and design characteristic of a new weapon system may require the use of a new and unique piece part. Sometimes, however, a contractor may just choose to design a component of a sub-system around a contractor preferred piece part which is not listed in the DOD supply catalog (35:23). In these cases, by the time the complete parts list is submitted to the PCP, it may not be feasible to redesign a component in order to suit a similar but slightly different part which is listed in one of the standard parts manuals (16)(35:17-18).

The PCP is very successful for applications where one of the Military Standard handbook standard piece parts (16) can be used with little modification to the proposed design. Unfortunately, however, when a piece part not listed in the DOD supply catalog is justified, the PCP can do little to help match this piece part with any duplicate piece part already in the DOD supply catalog, but listed under a different part number (26)(33).

It may take weeks to manually search for a piece part in the DOD supply catalog (2)(26)(33). This is because there is presently no automated system available which will allow the PCP members to interrogate the DOD supply catalog by part description. Usually the success of attempts to match parts in the catalog with a new part being proposed by a contractor are due to someone in the search loop remembering the part number of a similar piece part listed in the DOD supply catalog. When piece parts not listed in the DOD supply catalog are matched with piece parts already in the catalog, the costs associated with adding a new part to the inventory system are avoided (35:15).

According to John Harbrough, a senior design engineer for Boeing Aerospace Company in Seattle, it can take as little as 30 minutes to write up justification for using a piece part not listed in the DOD supply catalog (27). Weigh this against taking a week to manually search for a substitute from the DOD supply catalog, when it is not even known if a substitute exists, and it is not hard to understand why the design engineer may not always build this type of standardization into a design.

Computerized Piece Part Standardization/Substitution Systems

The original intent of this research was to investigate the feasibility of developing a data base management system which had the ability to interrogate the DOD supply catalog by part description. Using this as a tool, the engineer could easily find piece parts in the DOD supply catalog which had the same physical description as the part needed for a particular application.

This is not a new idea. A Congressional Report submitted to the 91st Congress, 2nd Session proposed such a system in 1970 (35:12-14). At that time, the technology needed to develop this type of automated system was not available (35:12).

This idea has been investigated many times by many different individuals with a need for this capability. In 1977, several engineers at the Sacramento Air Logistics Center were tasked with finding substitute fasteners from within the DOD supply catalog for several older weapons systems (2). After a few weeks of randomly searching the design specifications of fasteners in an attempt to discover possible substitutes, the need for the ability to interrogate the DOD supply catalog by part description became very clear to everyone involved (2). But again, no such system was available.

In the process of conducting research for this thesis, three newly developed DBMS were discovered which have the capability to interrogate the DOD supply catalog by part description. All three of these systems are either managed or can be accessed at the Federal Building in Battle Creek, MI. It was at the Cataloging and Standardization Center (HQ CASC) in Battle Creek where much information was gathered and hands-on experience was gained for this thesis.

HQ CASC. William Crawford, Chief of the Standardization Division for Provisioning Programs at HQ CASC, provided information on several newly developed DBMS having the capability to interrogate the DOD supply catalog by part description. These systems will be covered in detail later in this chapter.

These systems were developed to help DOD inventory managers perform their tasks. However, none of these systems were designed specifically to be used at an engineer's working level (although, there has been a great amount of interest expressed in this idea). There are presently no plans to use any of these new DBMS at the engineer's working level to aid in piece part standardization and substitution.

HQ CASC is in charge of the Item Entry Control Program for the Air Force, but they do not screen piece parts for possible substitutes until well into the provisioning support cycle of a weapon system's life cycle (35:9). This screening occurs well after the Parts Control Program has already screened these piece parts once, and long after over 70 percent of the cost incurred with adding a new piece part to the system has already been realized (15)(16)(26). As stated in the 1970 congressional report, this characteristic search should occur up-front at the design engineer's working level if these costs are to be avoided (35:21-28). Mr. Crawford agreed with this assessment and added that as much as 50 percent of his work load would be eliminated if this type of screening occurred at the engineer's working level (4).

ASD/ENFEM. The idea of of using a DBMS to aid in piece part standardization/substitution was presented to Richard Stewart, Lead Engineer for Fight Equipment Division's Mechan ical Branch, Air Force Aeronautical Systems Division (ASD). He serves as focal point for the Parts Control Program for mechanical piece parts for all of ASD. As custodian for MIL-STD-1515A, Mr. Stewart also serves as focal point for fastener standardization and substitution for the entire DOD.

Mr. Stewart stated that not only did he agree such a system should be integrated at the engineering level, but his office had been independently trying to develop such a system for screws and bolts for over five years (33). His office expressed a great desire to see this type of a system used both by ASD, and possibly by contractors, to help with the many substitution searches performed on a daily basis. These searches are not only for the PCP, but for the general day-to-day requests received by ASD.

Mr. Stewart also pointed out one problem with MIL-STD-1515A, which is used by contractors taking part in the Parts Control Program. He noted that not all configurations of the preferred parts, listed in this handbook, are found in the DOD supply catalog. In many cases, one of these non-stock listed configurations may be chosen in lieu of a similar piece part not listed in MIL-STD-1515A, but in the DOD supply catalog. This is not the intent of the PCP. Without the ability to interrogate the DOD supply catalog by part description, the PCP can do little to avoid this situation.

It was agreed that one of these DBMS should be tested to determine if they could be used at an engineer's working level. Mr. Stewart's opinion is that if these systems can perform searches in at least the same time it takes to perform a manual search, and if the results are 70 percent accurate, then his office can easily justify the cost of implementing one of these systems. "Accuracy" was defined as: if a match does exist, then this search will result in identifying the match. The present manual searches are estimated to be only twenty to thirty percent accurate (2)(26)(33).

Newly Developed DBMS

This section discusses three DBMS which have the potential for use in the experimental part of this research effort. Each of these systems have the capability to query the DOD supply catalog by part description.

Innovative Technology Incorporated (ITI). The Technical Logistics Reference Network (TLRN) was developed in 1973 by ITI under a contract to the US NAVY, and has resulted in the cost avoidance of millions of dollars (1)(34). The system was initially designed to help reduce procurement and support costs (34). One of the features designed into this system was called "characteristic search". This capability allows the user to search for parts within the TLRN data base by entering only the defining characteristics of that part.

This characteristic search capability was a gigantic leap over the search capability of both the Department of Defense's Total Item Record System (TIRS) and Data Item Description System (DIDS) data bases (35:6). The DIDS and TIRS data bases are component data bases of the Defense Logistics Agency's Network. The DIDS contains all the known physical characteristics of the items in the DOD supply catalog; the TIRS is a data base management system which can tie into the DIDS and retrieve this data. The TIRS can also tie into several other systems such as the DØ67 which contains interchangeability information for the various parts in the DOD supply catalog. None of these systems has the ability to perform characteristic searches. In fact, the only way to obtain the description of a part in any of these data bases was by entering either a NSN or by entering both the part number and manufacturer's identification code. This means the part must already be known before its description could be obtained.

ITI was able to achieve its search capability by developing a descriptive code to describe items in a given stock class, for each of the 590 (35:9) Federal Supply Classes (34). In 1973, these descriptive codes had to be manually translated and coded into the TLRN using the information contained in the TIRS data base. Due to the great amount of time involved with this manual coding process, only the stock classes the Navy considered important were coded into the TLRN data base (34).

From 1975 to 1981 more and more stock classes were coded into the TLRN. During 1982 and 1983, software was developed which allowed the physical description data in the DIDS data base to be directly translated and coded into the TLRN data base (34). ITI rents this system, to anyone desiring this capability, for $2,000 per month (34).

This system is in use, in small numbers, throughout the DOD. However, none of these terminals are being used at the design engineer's working level as part of the Air Force Item Entry Program, Item Reduction Program, or Parts Control Program (4)(33)(34).

The D063. The D063 computer system is being developed by the Standardization Division at HQ CASC in Battle Creek MI in response to the increasing size of the DOD supply catalog (26). Due to the size, piece parts can no longer be tracked effectively using the Form 211 tracking system. The Form 211 is an 8x5 card containing an item description.

There is one card for each of the nearly six million stock listed items in the DOD supply catalog.

The DØ63 automated the Form 211 tracking system previously used to track NSNs. The DØ63 contains all the same information found on the Form 211. One of the main tasks of this system is to track all the different manufacturer's part numbers which are qualified under a given NSN. This system also tracks substitution relationships between part numbers when these relationships are discovered.

The catalogers at HQ CASC use the DØ63 system to make their initial inputs into the DOD supply catalog. With everyone at HQ CASC having access to the DØ63, all needed coordination and/or changes can be performed directly. This has resulted in a considerable reduction in time and paper work (4)(36).

Several other features are built into the DØ63. One is the ability to tie into both the TIRS and DIDS data bases. This allows for periodic updating of the information contained in the DØ63, DIDS and TIRS data bases.

The DØ63 has also been designed to use the same type of descriptive coding as the TLRN. This allows it to perform physical description searches of items in its data base. At present, though, the software has not been developed allowing the DØ63 to translate NSN descriptions from the TIRS or the DIDS data bases into the descriptive coding used by the DØ63. Once this software is developed, the DØ63 will be able to perform characteristic searches on the entire DOD supply catalog.

The DØ63 is still in a transition period from the Form 211 system. Not all of the Form 211 information has been programmed into the DØ63 data base. Programming the physical description of each NSN into the DØ63 does not occur until the Form 211 information has been programmed into the data base. Several of the smaller Federal Supply Classes have had both their Form 211 information and their physical descriptions fully proqramed into the DØ63. Characteristic searches have been performed on these supply classes to eliminate duplicate NSNs. For electrical wire, a 3Ø percent reduction in NSN's has been achieved as a result of this type of search using the DØ63 (26). For the areas which have this physical description programing complete, it takes a matter of minutes to find a piece part by describing only physical characteristics (26).

There are no plans at the present time to allow remote access to the DØ63 from the different AFSC Product Divisions, or by any DOD contractors. The DØ63 is presently designed for inventory management. The capability exists, however, to add complete DOD supply catalog search and remote access capabilities to the system (26).

<u>The Defense Logistics Agency System</u>. The Defense Logistics Supply Center (DLSC) in Battle Creek, MI has responsibility to assign NSNs to all parts for all services.

DLSC has realized that a system like the TLRN is extremely valuable for inventory control, and has developed a data base management system, called the Characteristic Search System which is part of the Defense Logistics Agency (DLA) Network (6).

The DLA Network System is operational, but not all of the stock classes have been fully programmed into its data base (8)(9)(10). It is presently under going a test program. As part of this program, several remote terminals have been located throughout the DOD. Anyone currently tied into the DLA Network can use this system during the test program (9) (29). Currently DLA's Characteristic Search system is not being used at AFLC Depots, AFSC Product Divisions, or DOD contractor engineering working levels. There have been no plans made to implement this system at the engineering working levels (26).

Conclusions

The time has come to bring piece part standardization and substitution one step further by using one of the newly developed DBMS. The capability of these systems to interrogate the DOD supply catalog by part description is needed in every program designed to control piece part proliferation. It is especially important to have this capability at the AFLC Depot, AFSC Product Division, and DOD contractor engineering working levels where maximum benefits can be realized.

None of the existing DBMS have been specifically developed for use at these engineering working levels. A test should therefore be conducted to determine the feasibility of using one of these systems at the engineering working levels. Valid test criteria for such an experiment will be: 1) can these DBMS perform searches at least as fast as the present one week average; and 2) are these searches at least 70 percent accurate. This much of an improvement seems to be needed to justify the added complexities of integrating one of these systems at the engineer's working level (33).

III. Methodology

OVERVIEW

This chapter describes the methods used to achieve the research objectives presented in the Chapter I. These objectives were designed to verify the hypothesis also presented in Chapter I. This hypothesis states that if one of the newly developed DBMS were used at AFLC Depots, AFSC Product Divisions, and DOD contractor enaineering working levels to interrogate the DOD supply catalog, then parts in this cataloq which match the parts needed for the application under consideration, could be identified.

Objective One

The first objective was to determine the feasibility of integratinq one of the new DBMS at the enqineer's working level. This objective was achieved through a literature review and personal interviews. The intent was to determine if there were any major barriers which may prevent this inteqration from occurring. This review was conducted with two goals in mind.

First Goal. The first goal was to determine if the integration of one of these new DBMS could fit into the structure of the present programs used to help control the size of the DOD supply catalog. This was performed by reviewing the many different programs, regulations, and directives which were established to control piece part proliferation. A congressional report submitted to the 91st Congress, 2nd Session in December of 1970 (35) was used as a foundation for this review.

This report, titled "Military Supply Systems: Cataloging, Standardization, and Provisioning of Spare Parts", recommended the development and integration of an automated system (35:12) equivalent to the one proposed in this thesis. The report presented a plan for the integration of the system within the framework of the various programs, regulations, and directives in effect at that time (35). In 1970, however, the physical size and cost of a system such as this made its development impractical.

Second Goal. The second goal of this objective was to determine if there would be any major opposition to the idea of implementing one of these new DBMS by the individuals who would be effected by this implementation. This was accomplished by personal interviews. These interviews were limited to ASD, HQ CASC, DLSC, and ITI. There was not time to determine who the major players were in each of the acquisition programs for each branch of the service, because each major system acquisition is allowed to tailor their own program (18)(20) (21). It would take an extensive effort to identify all of these individuals. This type of detailed survey may be required, however, prior to the implementation stage of integrating one of these newly developed DBMS.

ASD was interviewed because the author was very familiar with the organization after having worked there for three years as an engineer. Key members at HQ CASC, DLSC, and ITI were interviewed because these are the organizations which have developed the DBMS with the ability to query the DOD supply catalog by part description. If the integration of this type of system occurs in the near future, one of these three systems would have to be used. Since these systems were not specifically designed for use at the engineer's working level, these interviews were necessary to determine if any modification to these systems would be necessary for this integration to occur.

Results of Objective One appear in Chapter II.

Objective Two

The second objective was to determine which of the three DBMS would be used in the experimental part of this research effort. The reasons used to choose or not choose each system will be presented beginning with the DØ63.

HQ CASC. The DØ63 data base management system, located at Battle Creek and managed by HQ CASC, did not qualify for the experiment. This system was primarily designed to automate the AFLC Form 211 method of cataloging parts. As of February of this year, the transition from Form 211 to the DØ63 was still not complete. The policy at HQ CASC is that the descriptive search capability of the system will not be programmed until the transition from form 211 is complete.

Presently, the DØ63 contains the descriptive coding for only a few hundred items (26). These items were coded into the system only to demonstrate the system's capability.

One of the reasons the descriptive search capability of the DØ63 was not automatically added to the DØ63, is that the Form 211 does not contain the detailed descriptions needed to complete the 15 digit descriptive code for an item. Space has been reserved in the DØ63 for this descriptive code, but the information needed to complete the code for a particular item is contained in the TIRS computer operated by DLSC (34). The information contained in the TIRS computer cannot be accessed by the DØ63 until software is developed to interface the two systems.

As of June 1985, this software had not been funded, although, this funding has been planned (26). Once this software is developed, the DØ63 should be a primary candidate for integration at the engineer's working level. It is already set up with a password system to insure data base integrity. Also, remote access to the DØ63 has been incorporated (26). One feature the DØ63 will not have is the capability to lead someone through a physical description search without that person knowing the descriptive code for the particular part needed. This means either the engineer would have tc learn the coding translation for each Federal Supply Class queried, or some type of software would have to be developed to help lead the engineer through the process.

TLRN. The Technical Logistics Reference Network (TLRN) is operated by Innovative Technology Incorporated (ITI) in Virginia. The TLRN has been leased by the Navy for over ten years (34). In 1982 and 1983 this system was re-designed to include the ability to interrogate the entire DOD supply catalog by part description (34). The system is very user friendly, and uses a series of menus and questions which prompt the user for the needed information. Most of these questions can be answered by giving the appropriate physical description of the part being sought. However, some knowledge of the names and codes used to categorize the DOD supply catalog into stock classes is needed to answer some of the questions. These names and codes can be easily obtained by referencing the user manual for the system (34). There are six of these TLRN terminals available at WPAFB OH.

However, this system was not selected for experimentation for two reasons. First, the characteristic search capability of this system is relatively slow when compared to other DBMS. The TLRN can only search for a part one characteristic at a time. This means that if a search is conducted for a three inch long machine screw, one quarter inch in diameter, with a slotted head, the system first compiles a list of all machine screws three inches long. It then searches this list for the ones which are one quarter inch in diameter. Of these it finally looks for the ones with a slotted head (34). The first search pass on this system can take as long as two or three hours. It is not uncommon for a complete search for a part on this system to take as long as five hours. It seemed very unlikely that the experimental part of this research could be completed, on the TLRN system, in the time scheduled.

The second, and most important, reason this system was not chosen for this experiment was that the Defense Logistics Service Center requested the author test and compare the new characteristic search capability of the DLA Network (29). The capability of this system, in terms of speed, was claimed to be much faster than the TLRN system (26)(29). If the DLA Network Characteristic Search System was half as fast as claimed, the experimental part of this research could easily be performed in a timely manner.

DLA Network's Characteristic Search System. The DLA Network Characteristic Search System was developed by DLSC at Battle Creek. At the time of the experiment, its data base was not fully programmed. The system design had been completed, but only half of the parts in the DOD supply catalog had been coded into the data base. This, however, did not cause any problems in the experiment.

The data base used in the experiment contains only fasteners (reference page 5), which fortunately were the first stock classes to be programmed into the DLA system. The largest Federal Stock Classes were coded first, because they gave the best return per dollars spent on the software.

75 percent of the items in the Federal Supply Catalog are contained in only 68 of the 590 Federal Stock Classes (35:9).

DLSC considers the DLA Network System to be in a prototype stage (9:2) and is currently conducting a test of the system. This test includes several access terminals at the Defense Electrical Supply Center (DESC) in Kettering, OH. Access to one of these terminals was granted for this research.

Objective Three

The third objective was to develop an input file comprised of characteristic data for piece parts. This file was used to test the DLA Network Characteristic Search capability. This input file was limited to fasteners (reference page 5: "Scope of Research"). This section will present the methods used to develop this input file.

The method consisted of three steps: 1) Choosing the fastener specification; 2) Choosing one fastener form that specification; and 3) Tabulating the physical description of the fastener chosen. All three of these steps will be covered in detail, but first, an overview covering fastener specifications will be presented.

Fastener Overview. New engineer's are sometimes amazed at the highly specialized nature of fasteners. Aircraft joints can be so critical, that the diameter of fasteners have to be within plus or minus 0.0005 inches of the set diameter or else the joint can not be assured of withstanding design loads (2)(33). A company using one of these special fasteners normally will have to develop a new specification for that particular fastener since machine screws are not normally produced to such close tolerances. This type of justification for special fasteners is very common in not only the aerospace industry, but in any industry where strength and weight are critical factors in the design of a part (16)(17)(35:3-4).

The major reason that this causes a problem is that there has never been a standard format set for fastener specifications (16). Each manufacturer has been free to develop their own format and their own code for their own specifications (16)(17). This means that one cannot compare the part numbers of the fasteners developed by different companies to determine if the parts are the same. Furthermore, most specifications describe a family of fasteners. Appendix B is a typical example of a fastener specification developed by the McDonnell Douglas Corporation. If all the different combinations of diameters and lengths are considered, over 500 different bolts are described by just this one specification. This is a normal situation (16).

Consider the task of taking a given part number of a machine screw produced by "Company A", to determine if it is a duplicate of a machine screw already in the DOD supply catalog. First, one has to order the specification of Company A's machine screw. Once this is received, the physical characteristics of the fastener have to be deciphered from this specification, which may contain the description of five or six hundred different fasteners (16).

Without the ability to interrogate the DOD supply catalog by part description, every other company's part numbers listed in the same supply class as this fastener would have to be screened to determine if there was a duplicate to the fastener in question. To do this, every specification for every part number in the supply class would have to be ordered and the part numbers deciphered into a physical description. Then these physical descriptions would have to be compared to insure that the two fasteners were not the same. This task is not practical when one considers that there are thousands of items listed in the fastener stock classes (22).

This overview was provided so that those not familiar with fastener specifications could better understand the decision criteria used in developing the data base to be used in the experimental part of this research.

Choosing the Fastener Specifications. With over one million fasteners in the DOD supply catalog (22), a method of selection had to be developed. A basic premise for selection was that access to the specification of a fastener selected was needed in order to be able to determine its physical characteristics. Not all the specifications for all fasteners listed in the DOD catalog are available. Furthermore, of the ones available, not all could be ordered within the time frame for this research. If a totally random selection would have been used, it could have taken months to determine if the specification for each of the fasteners chosen was available. To accomplish this research in the time frame available, some type of selection process had to be employed by which only fasteners for which known access to specifications would be chosen. Yet, at the same time, some degree of randomness to the selection process had to be maintained in order to test the system in an unbiased manner (30:250-253).

The solution was in the method engineers use to select a fastener. Most large aerospace companies publish manuals to help their engineers perform this task. MIL-STD-1515A and MIL-STD-1251A are the manuals the DOD publishes for this purpose. These manuals give guidance as to which fasteners to use when one is needed. They also provide the specifications for these fasteners so the engineer can match the characteristics of the fastener needed for a particular application to a part number from one of these specifications. If the specifications chosen for the test file, used in the experiment, were randomly chosen from these manuals, then the population chosen would be a random sampling of fasteners commonly used at the engineer's working level. Choosinq fasteners from these manuals also insured immediate access to the specifications of the fasteners chosen. In addition to the two MIL-STDs used by the Air Force, the fastener manuals of seven major aerospace contractors were also used in the selection (5)(23) (24)(31)(32)(37)(38).

For this experiment, fastener selections from these manuals were limited to bolts and screws in order to make the selection process more manageable. Also, the test file was limited to 50 fasteners due to time limitations of this experiment. It can take several hours to interpret, verify, and tabulate the physical description of a single fastener from a specification, but computer time granted on the DLSC system was limited to four days. Estimates indicated there would only be time to tabulate and test 50 fasteners.

To select the specifications from these manuals, photocopies were made of all screws and bolts found in all the manuals. A total of 291 fastener specifications were compiled. These photocopies were then shuffled for 15 minutes.

Next, a random number generator on a KAYPRO 2X computer was used to generate a random number stream of 100 whole numbers with values between 1 and 300. The initial seed number used to generate this random number stream was 22.

The procedure used to choose a specification for the test file was as follows: Starting with the first number in the random number stream generated, the corresponding number in the stack, counting down from the top, was chosen and that specification was removed from the stack and added to the test file. Next, the specification in the stack, counting down from the top, which corresponded to the second number in the random number stream was removed from the stack and added to the test file. If a number greater than the number in the stack of remaining specifications was encountered, the number was skipped and the next number in the stream was used. This process continued until 50 specifications were chosen.

Selection of Fasteners. All that had been chosen to this point were the fastener specifications. As noted in the fastener overview, each specification may contain the descriptions for four or five hundred different fasteners, and not all of the fasteners from a specification are listed in the DOD supply catalog. The experiment tests, among other things, the accuracy of the system to find parts in the DOD supply catalog by part description. This means only the fasteners found in the supply catalog could be chosen from the specifications selected in the previous step. One one fastener was chosen from each specification.

This was accomplished by interrogating the DOD supply catalog to determine which fasteners, from each specification chosen, had a National Stock Numbers. This interrogation consisted of using a micro-fiche copy of the Master Cross Reference List (MCRL) (7). The MCRL-1 lists every NSN in the DOD supply catalog by part number and manufacturer's code. If there was only one fastener listed for that specification, then it was chosen. If there was more than one listed, a random number between zero and 99 (zero was used as a one hundred) was generated by a TI-55 calculator. The number generated was counted down the list, and the corresponding dash number was chosen. If the number generated was greater than the number of fasteners listed under that specification, another number was generated until an appropriate number was generated. The corresponding fastener for that specification was then chosen. This process continued until one fastener was identified from each specification.

There were two cases where the specification chosen did not have at least one dash number listed in the DOD supply catalog, and there were seven cases where the part number listed in the DOD supply catalog was not detailed enough to determine which fastener on the specification was indicated by that part number. In these cases, new specifications were selected using the same random number stream generated an the KAYPRO 2X, and the remaining stack of specifications from the previous step. The appropriate dash number was then determined for these new specifications by using the same selection process as used for the other fasteners.

Tabulating the Characteristics. After the appropriate dash numbers were defined for each specification, each specification had to be deciphered to determine the characteristics for that fastener. The characteristics and the NSN for each part were then tabulated (reference Appendix B). The DLSC system uses manual input from a terminal keyboard for characteristics searches. Therefore, no further refinement of the tabulated characteristics was needed. This completed all three steps of this objective. The experiment could now be conducted.

Objective Four

The fourth objective was to conduct an experiment designed to determine how accurately the newly developed DBMS could interrogate the DOD supply catalog by part description. This experiment was conducted using the DLA Network Characteristic Search System, and the test file compiled in the previous objective.

"Accuracy", as defined previously, was the ability to find a part from the DOD supply catalog provided the part does indeed exist. To insure the experiment tested the accuracy of the DLA system, only fasteners listed in the DOD supply catalog were used in the test file. To insure the experiment was testing the ability to interrogate by part description, only the characteristics of the fasteners in the test file were used to help the DLA Network System find the NSNs of these parts.

The procedure used in the experiment is outlined in the DLA Network Characteristic Search On-Line Prototype Users Guide (6). A copy of this users guide has been included in Appendix C. As suggested by this guide, only a few of the questions prompted by this system could be answered on the first search for a fastener. This was to insure that the proper stock class was being interrogated. In the case of fasteners, the difference between a machine screw and a close tolerance screw may be so slight that two different catalogers may classify the same fastener in different stock classes. In a non-experimental situation, the user would generally check all related stock classes when searching for a fastener (4)(28)(29)(38).

In this experiment,if no fasteners were found to match the characteristics given in the first very general search, it was assumed that the fastener being sought had been placed in a different stock class and the search was started over in one of the similar stock classes. For example, if no matches were found in the machine screw stock class, the close tolerance screw stock class was interrogated. If no match were found there, the shoulder screw stock class was interrogated. In no case were more than three different stock classes interrogated before one or more matches were found.

For this experiment, if a stock class was interrogated and one or more matches were found, and if the matches did not include the fastener being sought, then other closely related stock classes were also interrogated to see if the fastener being sought could be matched.

If more than one fastener was matched in the first search of a stock class, and if the fastener being sought was among these fasteners, then additional defining characteristics were added one at a time to the search criteria until either the part being sought was the only remaining fastener or until the search resulted in no matches being found. The latter case may occur when not all information in the DLA data base for a given fastener is accurate, or when the data for a given fastener was not fully programmed and the characteristic being added was missing in the data base. When information was missing, the DLA system assumed the data did not match. In a real non-experimental search for a fastener, the search is normally ended when 10 to 20 candidate fasteners have been located (2)(3)(4)(27)(33). One reason for this is that fastener specifications are so complicated to decipher, it is accepted engineering practice not to authorize the use of a fastener until the specification has been personally interpreted (2)(16)(33).

Notes were taken during the experiment when any notable user-to-system interface problems or benefits were discovered. These notes were taken to help evaluate the usability of the system and will be discussed when the results of this experiment are presented in Chapter IV.

Objective Five

The fifth objective was accomplished by hypothesis testing (3Ø:311). In this test, the null hypothesis (Ho) was that the DLA system was 7Ø percent accurate, and the alternative hypothesis (Ha) was that the accuracy of the DLA system was greater than 7Ø percent accurate. The probability of rejecting the null hypothesis, if it were true, was limited to five percent. This can be seen:

$$Ho: \quad P = 0.70$$

$$Ha: \quad P > 0.70$$

$$\alpha = .05$$

where

Ho = null hypothesis
Ha = alternative hypothesis
P = true accuracy of system
α = probability of rejecting Ho, provided it is true

The test of the hypothesis was accomplished in four steps. The first step was to determine how many times, out of 5Ø, the DLA System's search for a fastener resulted in a match based one the physical description given as search criteria. This value was divided by 5Ø to determine the mean of the sampling distribution (3Ø:311).

The second step was to determine the estimated variance of the accuracy of the system (30:311). Equation (1) was be used for this:

$$\sigma = [[p (1 - p)] / n]^{1/2} \quad (1)$$

where

σ = variance
p = 0.70 (hypothesized accuracy of the DLA system)
n = 50 (number in sample)

The third step consisted of calculating the test statistic (30:311). This was calculated using equation (2):

$$z = \frac{\hat{p} - p}{\sigma} \quad (2)$$

where

z = test statistic
$\hat{p}$ = mean accuracy determined by sampling distribution (reference step one)

The last step was to determine the rejection region for this test (30:311). This rejection region is based on a confidence level of 95 percent. This will insure that the probability of rejecting the null hypothesis is limited to five percent (30:311,886). If the test statistic falls within the rejection region, the null hypothesis will be rejected and the alternative hypothesis will be accepted.

For this comparison, the rejection region is shown by equation (3):

$$z > 1.645 \quad (3)$$

Objective Six

The sixth objective was to analyze the notes taken while conducting the experiment. These notes were taken to help determine the usability of the system at the engineer's workinq level. Any noted problems, advantages, or anomalies, which may have an effect on the ability to use one of the new DBMS at an engineer's workinq level, will be presented.

Summary

This chapter has described the methodoloqy used to achieve the objectives of this research effort. These methods consisted of: a literature reviews to achieve Objectives One and Two; data selection and tabulation to achieve Objective Three; an experiment to achieve Objective Four; a test of hypothesis using the data collected from conductinq this experiment to achieve Objective Five; and a review of the notes taken during the experiment to achieve Objective Six. The next chapter will present the findings and analysis from these objectives.

IV. Findings and Analysis

Introduction

This chapter will present the findings uncovered by the literature review performed to achieve Objectives One and Two, and the analysis and findings of Objectives Five and Six. Objectives Three and Four were used as milestones and had no findings or analysis to discuss in this chapter.

Objective One

The first objective of this research was to determine the feasibility of integrating one of the newly developed DBMS at the engineer's working level. This objective was divided into two goals. The first goal was to determine if the integration, of one of the newly developed DBMS, is practical when the present methods used to manage the DOD supply catalog are considered. The second goal of this objective was to determine if there would be any major opposition to the idea of implementing one of these new DBMS at the engineer's working level.

Results. A House of Representatives report on the Military Supply System, presented to the Congress of the United States in 1970, outlined the methods used to control the DOD supply catalog (35). Furthermore, this report proposed the development and integration of a data base management system with the ability to interrogate the DOD supply catalog by part description (35:12). In 1970 the technology was not available to develop a system with this ability.

Today, nearly sixteen years after House Report No. 91-1718 was submitted, several systems with this capability have been developed. A review of the present methods used to control the DOD supply catalog was conducted. This review was conducted to determine if any significant changes had occurred to the programs described in House Report No.91-1718, and if the integration of one of these new DBMS was still justified. The significant factors discovered by this literature review are presented in Chapter II.

The literature review clearly shows that the integration of a data base management system with the ability to interrogate the DOD supply catalog by part description is still needed at all levels of the Parts Control, Item Reduction, and Item Entry Control Programs. Furthermore, two of the new DBMS with this ability have been developed by the DOD to help in the management of the supply catalog. The third system was developed by Innovative Technology Incorporated (ITI) and is also used by the DOD to help manage the supply catalog.

This literature review determined that although these systems are being used by some of the organizations involved in the Parts Control, Item Reduction, and Item Entry Programs, none of the systems with the this capability are being used at AFLC Depots, AFSC Product Divisions, or DOD contractor engineering working levels. Interviews with several of these organizations indicate that this type of integration is needed, welcomed, and, in the opinion of the individuals interviewed, long over-due. No opposition to the idea of integrating one of these new DBMS at the engineer's working level was discovered.

Objective Two

Objective two was to perform a review of the data base management systems having the ability to interrogate the DOD supply catalog by part description. This review was performed to discover how many systems had this capability, and to choose which of these systems to use in the experiment conducted for Objective Four.

Results. The major findings from this review can be found in Chapter II. There were three systems discovered to have this capability. The Technical Logistics Reference Network developed, owned, and operated by Innovative Technology Incorporated is the only one of these system which has the ability to interrogate the entire DOD supply catalog. This system rents for $2000 per month. However, this system was determined to slow to complete an experiment in the time frame allotted.

The second system discovered to have this capability was the DØ63 at HQ CASC in Battle Creek, MI. This system has the capability to interrogate the DOD supply catalog by part description, but the data base needed to perform these searches has not yet been programmed.

The last system discovered to have this capability was the DLA Network Characteristic Search System. This system is managed by DLSC at Battle Creek, MI. This system is currently in a prototype stage and can interrogate only 75 percent of the DOD supply catalog. However, this system was chosen because the Federal Stock Classes used in this experi ment were among the ones this system could interrogate and because this system was estimated to be the only system which could complete the experiment in the scheduled time frame.

Objective Three

Objective Three was to select and tabulate the data base used as a test file in the experiment conducted in Objective Four. There were no findings or analysis associated with this objective. Completion of this objective was used as a milestone to help determine if the research was continuing on schedule. This objective had to be completed before the experiment in Objective Four could take place.

Objective Four

Objective Four was to conduct a test of one of the DBMS to determine if one of these systems could be used at the engineer's working level. The analysis and findings from this experiment were broken out into Objectives Five and Six. There were no findings and analysis associated with achieving Objective Four. This objective was used as a milestone, as was Objective Three, to indicate whether or not the research was being conducted on schedule.

Objective Five

The fifth objective was to perform a hypothesis test to determine if the DLA Network System is at least 70 percent "accurate". Accuracy was defined as the ability of one of these systems to find a part in the DOD supply catalog by using only the part's descriptive characteristics, provided the part does exist in the catalog. The method used to perform this test of hypothesis is presented in Chapter III.

Results. Appendix B is the tabulated description of the fasteners used as the test file for the experiment conducted. This list was also used to take notes and record the results of each search. The characteristics circled for each of the fasteners are the characteristics which were given to the DLA Network System to perform its searches. The column labeled "MATCH? PLUS X?" is where the results of the search were marked. For the question "MATCH?" either a "yes" or a "no" was entered depending on whether or not the

DLA system was successful in finding the fastener by using the circled characteristics. The question "PLUS X?" refers to the number of additional fasteners determined by the system to also match the characteristics circled.

The definition of accuracy only specifies that the system must find the fastener in question. The accuracy of the system is not effected by the system finding additional fasteners which match these characteristics. The additional fasteners found by the system will be discussed under Objective Six.

Out of the fifty fasteners in the test file, the DLA Network's system was successful in locating 45 of the fasteners (reference Appendix B). Based on these numbers, the sample mean accuracy is:

$$\hat{p} = 45 \;/\; 50 = 0.90$$

The hypothesized accuracy of the system being tested is:

$$p = 0.70$$

Assuming the true accuracy of the system is only 70 percent, the variance expected from the experiment should be:

$$\sigma = [\, [\, 0.70\,(\,1 - 0.70\,)\,] \;/\; 50\,]^{1/2} = 0.0648$$

Hence, the test statistic for this experiment is:

$$z = \frac{0.90 - 0.70}{0.065} = 3.086$$

The rejection region for this test of hypothesis is:

$$z > 1.645$$

The test statistic clearly falls into the rejection region. Therefore, the results of the hypothesis test indicate the experiment conducted provides data to support the alternative hypothesis, that the accuracy of the system tested is greater than 70 percent. The 95 percent level of confidence used in this test of hypothesis insures that there is less than a 5 percent chance that the null hypothesis was incorrectly rejected.

To be truly accurate, the test should be repeated several more times. However, there was only time in this research to find the 50 stock numbers in the data base.

Objective Six

Objective Six was to analyze the notes taken during the experiment to help determine the usability of the system at the engineer's working level. The problems, advantages, and quirks of the system tested are presented under this objective.

Results. One problem noted during the experiment was that not all the characteristics found in the DOD supply catalog matched the characteristics tabulated in the test file. In most cases, this did not effect the ability of the system to find the fastener being sought. Most of the discrepancies were for characteristics not given directly on the fastener's specification. An example of this would be thread lenqth, where the fastener's total length and the lenqth of the unthreaded portion of the fastener were given. To determine the thread length, the the length of the unthreaded portion of the fastener had to be subtracted from the fastener's total length. The discrepancies in these cases tended to be very small, one or two hundreds of an inch, and seemed to depend on the tolerances used in making the calculations.

The main reason this did not have a large effect on the results of this experiment was due to the manner in which the searches were performed. As stated in Chapter III, the method used to perform a search was to use only the most basic defininq characteristics on the initial search for a fastener. Only after this search was successful would further defining characteristics be added to the search criteria. These would be added one at time, and only if they were needed to try to eliminate any additional fasteners matched. In every case, the basic defining characteristics used on the initial search were limited to characteristics given directly on the specifications. In the majority of the cases, when the additional characteristics were added to the search criteria, these were also limited to characteristics *given directly by the fastener* specification.

Using exact dimensions had positive and negative effects on the experiment. Because there is a very low probability that two different fasteners will have all defining characteristics exactly the same, to three decimal places, no more than seven characteristics were ever used to reduce the number of fasteners matched by the system to only the fastener being sought. On the other hand, when dimensions not given directly on the fastener's specification were used as search criteria, a discrepancy of one one hundredth of an inch would result in finding no match.

In 21 cases, the additional fasteners matched by the system could not be eliminated without also eliminating the fastener being sought. In 14 of these 21 cases the additional characteristics needed to further define the fastener were characteristics not given directly on the fastener's specifications. Examination of the DOD supply catalog data base revealed discrepancies between these dimensions in the catalog and the dimensions calculated for the test file. In none of these case were the discrepancies greater than Ø.ØØ3 inches.

In 1 of the 21 cases where the additional matches could not be eliminated without eliminating the fastener sought, a review of the data in the DOD supply catalog resulted in finding a very large error in the fastener's diameter. There was no explanation for this error. This fastener's diameter was given directly on the fastener specification. The the DOD supply catalog was in error by over Ø.25Ø inches.

In the remaining six cases where the additional fasteners matched could not be eliminated without eliminating the fastener sought, it was found that the data in the DOD supply catalog for the fastener sought was not complete. There was missing data. The logic of the search performed by the DLA Network System is such that when a characteristic being matched is not specified by the DOD supply catalog, the system assumes the data does not match. This was also the case in three of the five cases where the fastener sought was not matched at all.

In the remaining two cases, out of the five cases where the fastener sought was not matched at all, a review of the DOD Supply Catalog revealed no record in the DLA Network Characteristic Search System for that fastener. There are two possible explanations for this. One is that this system is still in the prototype staqe and not all of the Item Name qroups can be interrogated by the system. These fasteners may have been listed under one of the smaller Item Name groups which can not, at this time, be interrogated by this prototype system. The second possible reason is that unused items are eliminated from the DOD supply catalog on a continuous basis. The fasteners in question may have been deleted from the system in the time between when the test file was created and the experiment was performed. Neither of these possible reasons were verified.

One of the anomalies of the system is that the Item Name, fastener head style, and fastener drive style, if applicable, are described by code numbers. This did not pose a problem. For this experiment, a list of these codes was borrowed from one of the system users at the Defense Electronic Supply Center where the experiment was conducted. After searching for only ten fasteners, the codes needed were committed to memory and the list was not used for the remaining fasteners.

Another anomaly of the system was the manner the system accepts the characteristics for a search. The system would ask a maximum ten questions. Each question represented one characteristic needed to define the item being sought. It may take 20, or more, different characteristics to fully define a fastener. Furthermore, the ten characteristics requested were not the same for each Item Name category. This means that who ever developed the software for the characteristic search of each Item Name category had to decide which ten characteristics to use to best interrogate that Item Name category. This did not cause any problem for this experiment. Although up to ten characteristics could have been defined, in no case were more than seven used in any of the searches performed in this experiment.

A major finding of the experiment is the length of time required to search for a part in the DOD supply catalog by part description. As described in Chapter II, it normally averages a week to manually search for a fastener in the DOD supply catalog when only the characteristics of the fastener are known. Using the DLA Network Characteristic Search capability, all 50 fastener searches were conducted in a 4 day time period. Much of this time was devoted to becoming familiar with the system. The last 35 fastener searches were conducted on the final day of the experiment. It took only 5.5 hours to conduct these 35 searches, or an average of 9.5 minutes per search.

A big advantage discovered while using the DLA Network Characteristic Search System, is that it is part of the DLA Network. Once a national stock number was identified by the system, the DLA Network could be used to access the other systems in the network which contained additional information on the National Stock Number in question. This is an important time saver when a decision to use a part is also based on how many of the parts are there in stock, who manufactures the part, are there other authorized substitutions for the part, or who has management responsibility for the part.

Summary

This chapter has presented the results of the literature review conducted to achieve the first two objective of this research. It was shown that the integration of a data base management system, with the ability to interrogate the DOD supply catalog, is needed at all levels of the Parts Control, Item Reduction, and Item Entry Control Programs. The literature review also indicated that the idea of integrating one of these systems at the engineer's working level would be accepted with no major opposition.

The hypothesis test used to achieve Objective Five shows that the experiment conducted provides evidence to support the conclusion that the DLA Network System is more than 70 percent accurate.

Finally, this chapter reported results of Objective Six by analyzing the notes taken during the experiment. The findings from these notes indicate there are errors in the DOD supply catalog's characteristics data base for fasteners. An explanation was given as to why these errors did not have a greater impact on the outcome of this experiment. Also, it was discovered that the Item Name, fastener head style, and fastener drive style codes had to be known before a search for a fastener could be performed. The notes taken and the outcome of the experiment indicate that this did not pose any real problem. Finally, these notes verified the tremendous speed of the DLA Network System.

The first six objectives of this experiment have been accomplished. The final objective is to draw conclusions as to the feasibility of integrating one of these new data base management system, at the engineer's working level, to aid in piece part standardization and substitution. These conclusions will be presented in Chapter V.

V. Conclusions and Recommendations

Introduction

The final research objective was to draw conclusions based on the findings and analysis of the research conducted. These conclusions are presented in this chapter along with recommendations based on these conclusions. First, a short research summary will be given to help present these conclusions and recommendations as a part of the total research effort.

Research Summary

Background. In 1970 the Armed Services Committee of the House of Representatives of the United States Congress performed a review of the military supply system (35). This committee recommended that the Department of Defense develop the capability to interrogate the DOD supply catalog by part description. Furthermore, this committee recommended that this capability be used at all working levels of the cataloging, standardization, and provisioning processes. In 1970, the technology needed to develop a data base management system, with this capability, did not exist. Today, there are several data base management systems with the ability to interrogate the DOD supply catalog by part description. These systems are being used to help manage the DOD supply catalog.

Problem. Presently, AFLC Depots, ASD Product Divisions, and DOD contractor engineering working levels do not have access to the data base management systems which have the capability to interrogate the DOD supply catalog by part description. Without this ability, effective standardization and substitution of the parts needed for a repair, or in a new design, can not take place at the engineer's working level.

Objectives. The purpose of this research was to determine the feasibility of using one of the new data base management systems, with the ability to interrogate the DOD supply catalog by part description, to aid in piece part standardization and substitution at the engineer's working level. Several research objectives were established. First, determine if the integration of one of the new DBMS is practical when the present methods used to manage the DOD supply catalog are considered.

Second, investigate the DBMS which have the ability to interrogate the DOD supply catalog by part description. The purpose of this investigation was to discover which systems have this capability and to choose one of these systems for the experiment to be conducted in the fourth research objective.

Third, compile a data base of parts and tabulate the descriptive characteristics needed to define these parts.

This data base was used as the test file in the experiment conducted in the fourth research objective.

Fourth, conduct a test of one of the newly developed DBMS to determine if these systems can be used by the engineer to match piece parts in the DOD supply catalog with piece parts needed in a particular application.

Fifth, analyze the data collected from the experiment conducted in objective four, to determine the "accuracy" of the system tested.

Sixth, review the notes taken during the experiment to determine any problems, advantages, or anomalies which may effect the ability to use one of these systems at the engineer's working level.

Finally, draw conclusions, based on the research conducted, about the feasibility of using one of the new DBMS at AFLC Depots, AFSC Product Divisions, and DOD contractor engineering working levels to aid in the standardization and substitution of piece parts.

Summary of Methods. The method used to achieve the first research objective was a literature review. In this review, the Military Supply System was reviewed to determine if any significant changes had occurred to this system in the sixteen years which had passed since the House of Representatives had proposed the development of an automated system.

The method used to achieve the second research objective was also a literature review. This literature review included personal interviews with some of the individuals who use, manage, and have helped design DBMS with the ability to interrogate the DOD supply catalog by part description. It also included some hands-on evaluations of these systems.

The third objective was achieved in three steps. The first step randomly selected fastener specifications from several design engineer handbooks. The second step randomly selected one fastener from each of the specifications selected in the previous step and insured the fastener selected was one of the fasteners listed in the DOD supply catalog. In the final step, specifications were deciphered and the characteristics tabulated for the fasteners selected.

The fourth objective was achieved by performing an experiment on the DLA Network prototype Characteristic Search System. For this experiment, only the defining characteristics for each fastener were entered, by hand, into the DLA Network System using a terminal at the Defense Electronic Supply Center in Kettering, OH.

The fifth objective was accomplished by conducting a hypothesis test. This test was performed at a 95 percent level of confidence. The object of this test was to determine if the data collected from the experiment provided sufficient evidence to support the assumption that the system tested was at least 70 percent accurate.

The sixth objective was accomplished by reviewing the notes taken during the experiment. This review exposed any problems, advantages, or anomalies which may effect the usability of the system tested at the engineer's working level.

Finally, conclusions were drawn about the feasibility of integrating one of the new DBMS at the engineer's working level. This was accomplished by a review of the findings collected form the literature reviews and of the findings and analysis from the experiment conducted.

Conclusions

Objective One. The literature review conducted to achieve this objective resulted in finding that no significant changes had occurred to the Military Supply System since it was reviewed by the House of Representatives in 1970. This literature review supports the conclusions of House Report No. 91-1718 that a data base management system, with the ability to interrogate the DOD supply catalog by part description, is needed at all working levels of the Military Supply System.

The literature review also confirmed that no system with this capability is presently being used by the AFLC, AFSC, or DOD contractors. It was also found that significant benefits would result from integrating this capability at these level. Furthermore, there was no major opposition to integrating one of these systems at the these engineering working levels.

The conclusion reached by this literature review is that the integration of one of these data base management system at the engineer's working level is needed, practical, and long over-due.

Objective Two. The review resulted in discovering three data base management systems with the ability to interrogate the DOD supply catalog by part description. Of these three systems, only Innovative Technology Incorporated's system can presently interrogate the entire DOD supply catalog by part description. The DLA Network Systems can interrogate approximately 75 percent of the DOD supply catalog, and is in the process of adding the capability to interrogate the remaining 25 percent. The DØ63 system at HQ CASC does have this capability, but has not had its data base programmed for this capability.

Of the three systems, the DLA Network System was chosen to perform the experiment because it could interrogate the Federal Stock Classes in the test file tabulated for the experiment, and it was estimated to be the only system which could perform searches fast enough to complete the experiment in the scheduled time frame.

It is, therefore, concluded that if one of these systems were to be integrated at the enqineer's working level some time in the near future, it would have to be either the Innovative Technology Incorporated's or the DLA Network System. When choosing between the two, favor should be given to the DLA Network System, provided it can interrogate the Federal Stock Classes needed, due to the relative quickness of the system.

Objective Three. This objective consisted of choosing and tabulating the data base needed as a test file for the experiment conducted in objective four. There were no findings or analysis associated with achieving this objective. There are also no conclusions drawn form this objective. This objective was used as a milestone to help determine if the research was being conducted on schedule.

Objective Four. This objective was to conduct an experiment to test of one of the new data base management systems. The findings and analyze from this experiment were broken-out into Objectives Five and Six. Objective Four, like Objective Three, was also used as a milestone. No findinqs, analysis, or conclusions were drawn from this objective.

Objective Five. This objective was to conduct a test of hypothesis to determine if the data base manaqement system tested was at least 70 percent accurate. The test of hypothesis, conducted at a 95 percent level of confidence, clearly indicates the experiment conducted provided data to support the assumption that this system is at least 70 percent accurate. Therefore, it is concluded that the DLA Network Characteristic Search System is at least 70 percent accurate.

Objective Six. This objective was to review the notes taken during the experiment to determine if any problems, advantages, or anomalies, which would effect the ability of this system to be used at the engineering working level, exist. This review pointed out that there are errors and missing data in the DOD supply catalog for the Federal Stock Classes on which the characteristic searches for this experiment were performed. However, these errors and missing data had little effect on the outcome of this experiment due to the method by which the searches are normally performed.

The DLA Network System uses alpha numeric codes to define Item Names, fastener head style, and fastener drive type. These codes were easily referenced, and the codes used most often were easily committed to memory in the experiment conducted.

The DLA Network System uses a maximum of ten characteristics as search criteria for a part. With some fasteners requiring in excess of 20 characteristics to be fully defined, it was thought that this would be a problem. It was noted during the experiment, however, that the number of matches found by a search could easily be limited by using very small tolerances in describing the parts being sought. On the other hand, if more matches are sought, in order to have larger selection, this could be accomplished by expanding the limits on some of the less critical defining characteristics used as search criteria.

In the experiment conducted, no more than seven defining characteristics were needed to limit the matches found by the system to only the fastener sought. One reason for this is that only exact dimensions, to three decimal places, were used as search criteria in this experiment.

The average length of time required to perform a search for the last 35 fasteners was 9.5 minutes. This is a tremendous improvement over the one week average it now takes.

Finally, a big advantage of using the DLA Network Characteristic Search System is the fact that the other data bases in this network can be accessed in a manner of minutes, once a characteristic search has found a match. The National Stock Number of the part matched can be used to access the information in these other data bases, when the information in these data bases is needed to help make a final choice of whether or not to use this part for the application under consideration.

The conclusion reached, by the review of the notes taken from this experiment, is that this system would be a tremendous improvement over the present methods used at AFLC

Depots, AFSC Product Divisions, and DOD contractor engineering working levels. Furthermore, it is concluded that there were no problems or anomalies uncovered by this research which would prevent the use of this system at the engineering working level. It has also been concluded that there are major advantages to using the DLA Network Characteristic Search System for the standardization and substitution of piece parts.

Recommendations

This research supports the need for AFSC Product Divisions, AFLC Depots, and DOD contractor engineering working levels to interrogate the DOD supply catalog by part description. Furthermore, the experiment conducted clearly demonstrates the ability of the DLA Network Characteristic Search System to be used by a design engineer to interrogate the DOD supply catalog by part description. It is therefore recommended that a plan of implementation be developed to insure that access to a system with the DLA Network Characteristic Search capabilities is made available to AFSC Product Divisions, AFLC Depots, and DOD contractors working levels.

The research indicates that this problem is common to design engineering working levels throughout the DOD. A more complete follow-on study may be needed to verify this and to refine a plan of implementation to include these other DOD engineering working levels.

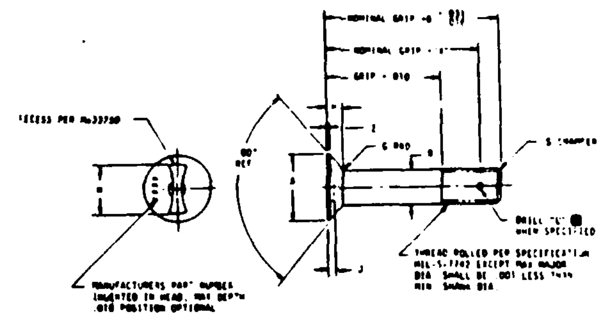
Appendix A: Sample Fastener Specification

STANDARD PARTS MANUAL

BOLTS — **BOLTS**

FLUSH HEAD — SCREW-CLOSE TOLERANCE, 100° MFAC "HI-TORQUE" CRES LONG THREADS 95 KSI FSU — **FLUSH HEAD**

3M123 — **3M123**



APPROVED CALLOUT: CADMIUM PLATED UP TO 450°F	APPROVED CALLOUT: UNPLATED UP TO 1200°F	THREAD	A	D DIA ±.010 BEFORE PLATE	D DIA AFTER PLATE	D DIA UNPLATED	F HEAD REF	E	J	M REF	G RAD ±.010	K	S CHAMFER	:	T	U
3M123-3-★P	3M123-3-★	10-32 UNF-3A	.3813 .3765	.1887 .1881	.1895 .1889	.1895 .1890	.0895 .0785	[illegible]	.045 .042	.300	.019	[illegible]	1/32 X 45°	.15 .01	.257	.070
3M123-4-★P	3M123-4-★	1/4-28 UNF-3A	.5066 .5010	.2487 .2481	.2495 .2489	.2495 .2490	.1284 .1062	[illegible]	.054 .051	.422	.025	.464	[illegible] X 45°	.016 .005	.312	.076
3M123-5-★P	3M123-5-★	5/16-24 UNF-3A	.6335 .6287	.3112 .3106	.3120 .3110	.3120 .3115	.1290 .1330	.001	.304 .067	.490	.031	.531	3/64 X 45°	.015 .005	.359	.076
3M123-6-★P	3M123-6-★	3/8-24 UNF-3A	.7604 .7556	.3737 .3731	.3745 .3739	.3745 .3740	.1670 .1630	.302	[illegible]	.630	.039	.641	3/64 X 45°	.015 .005	.438	.105
3M123-8-★P	3M123-8-★	1/2-20 UNF-3A	1.0130 1.0060	.4987 .4981	.4995 .4985	.4995 .4990	.2160 .2120	.015	.105 .101	.764	.045	.701	3/64 X 45°	.002 .305	.600	.105

OVERSIZE/REPAIR FASTENERS SEE FASTENERS (SECTION 8) (.0156) 3M217 (.0312) 3M218

★

DASH NO.	NOM GRIP	LENGTH 3M123-3	3M123-4	3M123-5	3M123-6	3M123-8
2	.125	.531				
3	.188	.594	.656	.719	.828	
4	.250	.656	.719	.781	.891	
5	.312	.719	.781	.844	.953	1.094
6	.375	.781	.844	.906	1.016	1.156
7	.438	.844	.906	.969	1.079	1.219
8	.500	.906	.969	1.031	1.141	1.281
9	.562	.969	1.031	1.094	1.203	1.344
10	.625	1.031	1.094	1.156	1.266	1.406
11	.688	1.094	1.156	1.219	1.328	1.469
12	.750	1.156	1.219	1.281	1.391	1.531
13	.812	1.219	1.281	1.344	1.453	1.594
14	.875	1.281	1.344	1.406	1.516	1.656
15	.938	1.344	1.406	1.469	1.578	1.719
16	1.000	1.406	1.469	1.531	1.641	1.781
17	1.062	1.469	1.531	1.594	1.703	1.844
18	1.125	1.531	1.594	1.656	1.766	1.906
19	1.188	1.594	1.656	1.719	1.828	1.969
20	1.250	1.656	1.719	1.781	1.891	2.031
21	1.312	1.719	1.781	1.844	1.953	2.094
22	1.375	1.781	1.844	1.906	2.016	2.156
23	1.438	1.844	1.906	1.969	2.079	2.219
24	1.500	1.906	1.969	2.031	2.141	2.281
25	1.562	1.969	2.031	2.094	2.203	2.344
26	1.625	2.031	2.094	2.156	2.266	2.406
27	1.688	2.094	2.156	2.219	2.328	2.469
28	1.750	2.156	2.219	2.281	2.391	2.531
29	1.812	2.219	2.281	2.344	2.453	2.594
30	1.875	2.281	2.344	2.406	2.516	2.656
31	1.938	2.344	2.406	2.469	2.578	2.719
32	2.000	2.406	2.469	2.531	2.641	2.781

DASH NO.	NOM GRIP	LENGTH 3M123-3	3M123-4	3M123-5	3M123-6	3M123-8
33	2.062	2.469	2.531	2.594	2.703	2.844
34	2.125	2.531	2.594	2.656	2.766	2.906
35	2.188	2.594	2.656	2.719	2.828	2.969
36	2.250	2.656	2.719	2.781	2.891	3.031
37	2.312	2.719	2.781	2.844	2.953	3.094
38	2.375	2.781	2.844	2.906	3.016	3.156
39	2.438	2.844	2.906	2.969	3.079	3.219
40	2.500	2.906	2.969	3.031	3.141	3.281
41	2.562	2.969	3.031	3.094	3.203	3.344
42	2.625	3.031	3.094	3.156	3.266	3.406
43	2.688	3.094	3.156	3.219	3.328	3.469
44	2.750	3.156	3.219	3.281	3.391	3.531
45	2.812	3.219	3.281	3.344	3.453	3.594
46	2.875	3.281	3.344	3.406	3.516	3.656
47	2.938	3.344	3.406	3.469	3.578	3.719
48	3.000	3.406	3.469	3.531	3.641	3.781
49	3.062	3.469	3.531	3.594	3.703	3.844
50	3.125	3.531	3.594	3.656	3.766	3.906
51	3.188	3.594	3.656	3.719	3.828	3.969
52	3.250	3.656	3.719	3.781	3.891	4.031
53	3.312	3.719	3.781	3.844	3.953	4.094
54	3.375	3.781	3.844	3.906	4.016	4.156
55	3.438	3.844	3.906	3.969	4.079	4.219
56	3.500	3.906	3.969	4.031	4.141	4.281
57	3.562	3.969	4.031	4.094	4.203	4.344
58	3.625	4.031	4.094	4.156	4.266	4.406
59	3.688	4.094	4.156	4.219	4.328	4.469
60	3.750	4.156	4.219	4.281	4.391	4.531
61	3.812	4.219	4.281	4.344	4.453	4.594
62	3.875	4.281	4.344	4.406	4.516	4.656
63	3.938	4.344	4.406	4.469	4.578	4.719
64	4.000	4.406	4.469	4.531	4.641	4.781

PROCUREMENT SPECIFICATION [illegible]

3M123(CONT.)

BOLTS — **FLUSH HEAD**

3M123 (CONT)

APPROVED CALLOUT: CADMIUM PLATED [2] UP TO 450°F	UNPLATED UP TO 1200°F	STRENGTH AT ROOM TEMP MIN (LBS): TENSILE [1]	STRENGTH AT ROOM TEMP MIN (LBS): DOUBLE SHEAR	1200°F [1] TENSILE STRENGTH MIN (LBS)
3M123-3-★P	3M123-3-★	3,255	5,330	2,700
3M123-4- P	3M123-4-	5,820	9,751	4,091
3M123-5- P	3M123-5-	9,210	14,470	6,475
3M123-6- P	3M123-6-	14,250	20,070	10,017
3M123-8-★P	3M123-8-★	25,755	37,156	18,105

ENGINEERING INFORMATION:

[1] THE MINIMUM TENSILE PROPERTIES ARE TABULATED FOR INSPECTION PURPOSES ONLY. DESIGN ALLOWABLES PER MAC RPT 339 AND MIL-HDBK-5 ARE BASED ON MATERIAL FT.

[2] THESE BOLTS ARE INTENDED FOR USE IN NON MAGNETIC APPLICATIONS AT TEMPERATURES NOT EXCEEDING 450°F, AND WHERE AN UNPLATED BOLT IN CONTACT WITH THE STRUCTURE WOULD RESULT IN DISSIMILAR METAL CORROSION

EXAMPLE OF APPROVED CALLOUT: 3M123-4-12

3M123 -4 - 12 BOLT
- NO LETTER = UNPLATED
- P = CADMIUM PLATE
- GRIP PER TABLE
- "-" = UNDRILLED
- D = DRILLED
- DIA PER TABLE

MATERIAL: A-286 - CORROSION AND HEAT RESISTANT STEEL (95,000 PSI SHEAR MINIMUM) AT ROOM TEMPERATURE

FINISH:
3M123-( )-( ) SERIES - NONE (ALL OXIDE AND METAL CONTAMINATES MUST BE REMOVED)
3M123-( )-( )P SERIES - QQ-P-416 TYPE II CLASS 3 (ALL OXIDES AND METAL CONTAMINATES MUST BE REMOVED PRIOR TO PLATING)

3MFR123

SCREW-CLOSE TOLERANCE, 100° HEAD "HI-TORQUE" CRES LONG THREADS 95 KSI FSU

SCOPE: THIS STANDARD ESTABLISHES THE REQUIREMENTS AND PROVIDES AN IDENTIFYING PART NUMBER FOR 3M123 BOLTS, WHICH INCORPORATES TYPE II CADMIUM PLATE AND CORROSION INHIBITING PRIMER APPLIED TO SPECIFIC PORTIONS OF THE FASTENER

THIS CONSISTS OF COATING THE FASTENER IN THE LOCATION, BY THE PROCEDURE AND WITH THE MATERIAL AS DEFINED IN MAC PROCESS SPECIFICATION P.S. 13421. THE INTENDED PURPOSE IS TO REDUCE THE DISSIMILAR METAL CORROSION IN THE FASTENER C'SINK AREA OF DOORS AND REMOVABLE PANELS ON THE EXTERNAL SURFACE OF THE F-4 AIRCRAFT

MATERIAL: CORROSION AND HEAT RESISTANT STEEL. SEE 3M123 DRAWING

HEAT TREAT: SEE 3M123 DRAWING

FINISH: CADMIUM PLATE PER QQ-P-416, TYPE II, CLASS 3 PLUS PRIMER APPLIED TO THE BOLT, PER MAC PROCESS SPECIFICATION P.S. 13421

EXAMPLE OF APPROVED CALLOUT: THE PART NUMBER SHALL BE DERIVED BY SELECTING THE COMPLETE PART NUMBER OF THE REQUIRED BOLT FROM THE 3M123 DRAWING, REMOVING THE "3M" PREFIX AND INSERTING THE "3MFR" OR "3MFRH" AS APPLICABLE AS SHOWN BELOW

HEAD AND SHANK COATED: *3MFR123-4-8P IS DERIVED FROM 3M123-4-8P AND DESIGNATES THE BASIC BOLT, WITH HEAD AND SHANK COATED, AS REQUIRED, FOR APPLICATIONS INVOLVING DOORS AND REMOVABLE PANELS

HEAD COATED ONLY: *3MFRH123-4-8P IS DERIVED FROM 3M123-4-8P AND DESIGNATES THE BASIC BOLT WITH HEAD COATED ONLY, AS REQUIRED, FOR SELECTIVE APPLICATIONS

* PART NUMBER SHALL ALWAYS INCLUDE CODE LETTER "P", DESIGNATING THE REQUIRED TYPE II PLATING.

ALL OF THE PHYSICAL AND FUNCTIONAL REQUIREMENTS OF THE 3M123 DRAWING ARE APPLICABLE TO THE 3MFR123 WITH THE EXCEPTION THAT THE DIMENSIONAL REQUIREMENTS OF THE 3M123 DRAWINGS THAT ARE EFFECTED BY THE COATING ARE APPLICABLE PRIOR TO THE COATING

PROCUREMENT SPECIFICATION MMS7470

Appendix B: Tabulated Fastener Test File

PART NUMBER	FASTENER TYPE	HEAD TYPE	DRIVE TYPE	THREAD TYPE	DIAMETER	HEAD HEIGHT	THREAD LENGTH	LENGTH	GRIP LENGTH	MATCH? PLUS ±?
	HEAD FLAT-FLAT	HEAD DIAMETER	MATERIAL	ULT TEN KSI	SHEAR LOAD	TEN LOAD	FINISH	S HOLE? H OR SH	LOCKING ELEMENT?	NATIONAL STOCK NUMBER
1) AN 509-10R40	D6657	99-101° FLUSH A199	REARSON RGeoss A	.1900-32 NF-3A	.1890 1.860	.080	0.516° 0.420	3.0615 3.0156	2.578 2.547	YES +0
	—	.327 .385	LOW ALLOY STEEL (ST)	125 145	—	—	—	NO	NO	5305-00-151-1550
2) AN7-20A	Ø1847	HEX A150	—	.4375-20 UNF-3A	.437 .433	.266 .234	0.713° 0.610	2.1250 2.0791	1.453 1.422	YES +6
	.627 .615	—	NON CRES ST	—	S 11250	13600	—	NO	NO	5306-00-182-1348
3) AN10-24	Ø1847	HEX A150	—	.6250-18 UNF-3A	.624 .620	.360 .328	1.010° 0.910	2.6719 2.6250	1.7031 1.6719	YES +2
	.940 .928	—	NON CRES ST	—	S 23,000	30100	—	NO	NO	5306-00-151-1464
4) NAS 333 CP14	Ø6657 29294	100° FLUSH A199	A260	.1900-32 UNJF-3A	.1894 .1885	.080	0.457° 0.370	1.562 1.515	1.135 1.115	YES +2
	—	.376 .385	ALLOY STEEL (ST)	160 180	S 2,620	2700	CADMIUM PLATE CD	YES SH	NO	5305-00-803-9107
5) NAS 340 CA23	Ø6657 29294	100° FLUSH A199	REDUCED SOCKET A264	.6250-18 UNJF-3A	.6240 .6230	.270	1.004° 0.910	2.546 2.499	1.572 1.552	YES +0
	—	1.262 1.272	ALLOY STEEL (ST)	160 180	S 29,150	38,000	CADMIUM PLATE CD	NO	NO	5305-00-923-8567
6) NAS 464 P9-89	Ø1847 15903	HEX A150	—	.5625-18 UNF-3A	.5616 .5607	.281	0.697° 0.600	6.231 6.187	5.577 5.547	NO +0
	.877 .865	—	STEEL ST	160 180	S 23,600	11,800	CADMIUM PLATE CD	YES SH	NO	5306-01-055-3783
7) NAS 514 P428-14	Ø6657	99-101° FLUSH A199	PHILLIPS A260	.2500-28 UNJF-3A	.2490 .2460	.106	FULL THREADED	.875 .843	—	YES +3
	—	0.447 0.507	LOW ALLOY STEEL (ST)	125 145	S 2,710	4,520	CADMIUM PLATE CD	NO	NO	5305-00-550-1354
8) NAS 560 CK6-9	Ø6657	99-101° FLUSH A199	PHILLIPS A260	.3750-24 UNJF-3A	.3740 .3710	.159	0.700° 0.600	1.237 1.192	.577 .547	YES +3
	—	.692 .766	CRES (ST)	75	S 11,000	15,100	CADMIUM PLATE (CD)	NO	NO	5305-00-126-5079
9) NAS 588-19	Ø6657 29294	100° FLUSH A199	HI TORQUE A268	.5000-20 UNJF-3A	.4995 .4995	.216 .213	0.781	1.999 1.952	1.178 1.198	YES +0
	—	1.0139 1.0068	STEEL ST	160 180	D 37,300	25,600	CADMIUM PLATE (CD)	NO	NO	5305-00-813-0439

PAGE 1 of 6

PART NUMBER	FASTENER TYPE HEAD FLAT-FLAT	HEAD TYPE HEAD DIAMETER	DRIVE TYPE MATERIAL	THREAD TYPE ULT TEN KSI	DIAMETER SHEAR LOAD	HEAD HEIGHT TEN LOAD	THREAD LENGTH FINISH	LENGTH S HOLE? H OR SH	GRIP LENGTH LOCKING ELEMENT?	MATCH? PLUS I? NATIONAL STOCK NUMBER	
10 NAS 584 -44	Ø6657 29294	99-101° FLUSH (A199)	HI TORQUE (A268)	.2500-28 UNJF-3A	.2495 .2485	.1080 .1060	(.469)	3.250 3.203	2.740 2.760	YES +0	
	—	.5066 .5018	STEEL (ST)	160 180	D 9,300	5,790	APC vm (CD)	NO	NO	5305-00-905-3089	
11 NAS 664 V4	Ø6657 29294	99-101° FLUSH (A199)	HI TORQUE (A268)	.2500-28 UNJF-3A	.1895 .1890	.111	0.425	.691 .661	.250	NO	.690 .660 A260
	—	.5066 MAX	6AL-4V TI	160	—	—	NONE	NO	NO	5305-00-811-6597	
12 NAS 668 V6HT	Ø6657 29294	99-101° FLUSH A199	HI TORQUE A268	.600-20 UNJF-3A	.4995 .4990	.222	0.735	1.125 1.095	.375	YES +0	[illegible]
	—	1.0139 MAX	6AL-4V (TI)	160	—	—	BARE	NO	NO	5305-01-023-5844	
13 NAS 653 V14H	Ø1847 15903	HEX A150	—	.1900-32 UNJF-3A	.1895 .1890	.125 .110	.276	1.166 1.136	.885 .865	YES +3	HEAD [illegible]
	(.376 .367	—	6AL-4V	160	—	—	BARE	YES H	NO	5306-01-144-6272	
14 NAS 657 V5D	Ø1847 15903 B,M	HEX A150	—	.4375-20 UNJF-3A	.4370 .4365	.234 .219	.453	.780 .750	.322 .302	YES +1	
	.690 .679	—	6AL-4V	160	—	—	BARE	YES SH	NO	5306-00-182-9521	
15 NAS 662 C2LER10	Ø6657 06670	99-101° FLUSH (A199)	PHILLIPS A260	.0860-56 UNC-2A	.086	.029 .036	.625 .622	.671 .651	FULL THREAD	NO +1	
	—	.143 .172	CRES ST	—	—	—	PASSIVATE	NO	YES	5305-01-015-4347	
16 NAS 673 V21D	Ø1847 (15903)	HEX A150	—	.1900-32 UNJF-3A	.1895 .1890	.125 .110	.338	1.665 1.635	1.322 1.302	YES +3	
	(.376 .367)	—	6AL-4V (TI)	160	—	—	BARE	YES SH	NO	5306-00-917-4627	
17 NAS 677 V12	Ø1847 27851	HEX (A150)	—	.4375-20 UNJF-3A	.4365 .4370	.234 .219	0.594	1.359 1.329	.760 .740	YES	
	.690 .679)	—	6AL-4V (TI)	160	—	—	BARE	NO	NO	5306-00-364-8863	
18 NAS 1004 -50A	Ø1847	HEX (A150)	—	.2500-28 UNJA-3A	.2495 .2470	.172 .140	.544	4.184 4.154	3.640 3.610	NO	[illegible]
	(.430 .430)	—	CRES ST	140	—	—	PASSIVATE	NO	NO	5306-00-456-7913	

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PART NUMBER	FASTENER TYPE	HEAD TYPE	DRIVE TYPE	THREAD TYPE	DIAMETER	HEAD HEIGHT	THREAD LENGTH	LENGTH	GRIP LENGTH	MATCH PLUS ??
	HEAD FLAT-FLAT	HEAD DIAMETER	MATERIAL	ULT TEN KSI	SHEAR LOAD	TEN LOAD	FINISH	S HOLE? H OR SH	LOCKING ELEMENT?	NATIONAL STOCK NUMBER
19/ NAS1016 -22	01047 18257	HEX A150	—	1.000-12 UNJF-3A	.9990 .9960	.547 .515	1.481	2.871 2.841	1.370 1.360	YES +0
	1.440 1.427	—	CRES (FE)	140	—	—	PASSIVATE	YES SH	NO	5305- 01-080-3778
20/ NAS1102 E3-9	06657	99-101° FLUSH A199	TORQUE SET A267	.1900-32 UNJF-3A	.190	.080	0.478 0.447	.559 .527	FULL THREAD	YES +6
	—	.322 .385	CRES (SE)	160 180	—	3,180	CADMIUM CD	NO	NO	5305- 00-538-7011
21/ LD111-0028 -0417	29294	99-101° FLUSH A199	HI TORQUE A268	.2500-28 UNJF-3A	.2495 .2490	.109	.397	1.474 1.444	1.062	YES +0
	—	.5066 .464	CRES PRIS-BMD (ST)	125	—	—	PASSIVATE	NO	NO	5305- 01-174-6077
22/ LD111-0044 -0332	06657 29294	99-100° FLUSH A199	TORQUE SET A267	.5625-18 UNJF-3A	.5615 .5610	.243	.725	2.740 2.710	2.000	YES +0
	—	1.1400 1.071	CRES PRIS-BMD (ST)	125	—	—	PASSIVATED	NO	NO	5305- 01-194-0625
23/ LD111-0050 -6309	29294	99-101° FLUSH A199	TORQUE SET A267	.1900-32 UNJF-3A	.1895 .1890	.091	.363	.940 .910	.562	YES +6
	—	0.383 0.337	CRES PRIS-BMD (ST)	125	—	—	PASSIVATE	YES SH	NO	5305- 01-105-5057
24/ C7385 -4-11	06657 29294	99-101° FLUSH A199	TORQUE SET A267	.2500-28 UNJF-3A	.2495 .2485	.063	.103	1.1055 1.0755	.6875	YES +8
	—	0.399 0.350	ALLOY STEEL ROCKWELL C46-49	220	D 13,000	4,400	CADMIUM PLATE	NO	NO	5305- 01-054-6264
25/ 3M263 -5-20	06657 29294	99-101° FLUSH A199	HI TORQUE A268	.3125-24 UNJF-3A	.3106 .3120	.133	.467	1.701 1.748	1.240 1.260	YES +3
	—	0.635 0.625	ALLOY STEEL	—	D 20,700	[illegible] 11,050	[illegible] PLATED	NO	NO	5305- 00-288-2413
26/ 3M123 -8-13	29294	99-101° FLUSH A199	HI TORQUE A268	.500-20 UNF-3A	.4995 .4981	.216 .213	.823 .765	1.578 1.625	.802 .922	YES +1
	—	1.0139 1.0068	CRES [illegible]	95 [illegible]	D 37,156	25,755 18,105	—	NO	NO	5305- 01-029-7705
27/ MS21094 -400B	06657 06667	HEX A150	—	.250-28 UNF-3A	.249 .246	.140 .172	.516 .496	.954 1.000	.490 .500	YES +5
	.440 .428	—	ALLOY STEEL ROCKWELL C26-C32	125	D 7,360	4,420	CADMIUM PLATE	NO	PATCH RING	5306- 00-080-9568

PART NUMBER	FASTENER TYPE / HEAD FLAT-FLAT	HEAD TYPE / HEAD DIAMETER	DRIVE TYPE / MATERIAL	THREAD TYPE / ULT TEN KSI	DIAMETER / SHEAR LOAD	HEAD HEIGHT / TEN LOAD	THREAD LENGTH / FINISH	LENGTH / S HOLE? H OR SH	GRIP LENGTH / LOCKING ELEMENT?	MATCH? PLUS X? / NATIONAL STOCK NUMBER
28 MS20074 -06-30	Ø1847	HEX A150	—	.375-16 UNC- 3A	.371 .374	.266 .297	MIN .640	3.033 3.080	2.359 2.391	YES +0
	.554 .564	—	STEEL (ST)	—	S 8800	8470	CADMIUM PLATE CD	YES H	NO	5306- 00-763-3318
29 MS9488 -06	Ø1847 06657	HEX A150	—	.164-36 UNJF- 3A	.160 .163	.106 .118	.458° .393	.510 .490	.062 .082	YES +0
	.305 .313	—	CRES MRES (FE)	P_S	—	—	N_S	NO	NO	5305- 00-174-4606
30 MS9508 -37	Ø1847	HEX A150	—	.750-16 UNJF- 3A	.744 .749	.396 .416	1.730° 1.830	4.365 4.385	2.565 2.625	YES +0
	1.052 1.064	—	CRES MRES	P_S (FE)	—	—	N_S	YES H	NO	5306- 00-078-0196
31 MS9783 -27	Ø1847	HEX A150	—	.190-32 UNJF- 3A	.186 .189	.115 .135	0.610° 0.710	1.802 1.922	1.122 1.182	YES +0
	.367 .376	—	CRES (ST) ROCKWELL C32-38	P_S	—	—	N_S	NO	NO	5306- 01-074-6813
32 MS9790 -34	Ø1847	HEX A150	—	.625-18 UNJF- 3A	.620 .624	.334 .354	1.480° 1.580	3.740 3.760	2.190 2.250	YES +0
	.940 .928	—	CRES (T) ROCKWELL C32-38	P_S	—	—	N_S	NO	NO	5306- 01-048-3238
33 MS2195 -3004	Ø1847 SELF LOCKING 06(E7)	HEX A150	—	.190-32 UNF- 3A	.186 .189	.109 .141	.469 ±.7?	.641 .687	.240 .260	YES +2
	.365 .377	—	CRES (ST)	80 48 Fsu	D 2,720	1600	PASSIVATE	NO	YES	5306- 01-097-7890
34 MS9500 -13	Ø1847	HEX A150	—	.190-32 UNJF- 3A	.186 .189	.134 .150	.610° .710	.928 .948	.248 .308	YES +3
	.367 .376	—	CRES (FE)	P_S	—	—	N_S	YES H	NO	5306- 00-781-7203
35 NAS1581 V4R9	06657 29294	99-101 FLUSH A199	TORQUE SET A267	.250-28 UNJF- 3A	.2495 .2485	.063	.403 ±.25	.980 .950	.552 .572	YES +3
		.3504 .3958	6AL-4V TT	—	—	3,700	BME	NO	NO	5305- 01-178-3350
36 NAS1320 -88	Ø1847 15903	HEX A152	—	1.250-12 UNJF- 3A	1.249 1.2471	.640 .625	1.646 REF	7.131 7.161	5.510 5.490	YES +0
	1.801 1.815	—	ALLOY (ST) STEEL ROCKWELL C36-C40	160 180	—	—	CADMIUM PLATE CD	NO	NO	5306- 01-098-6138

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PART NUMBER	FASTENER TYPE	HEAD TYPE	DRIVE TYPE	THREAD TYPE	DIAMETER	HEAD HEIGHT	THREAD LENGTH	LENGTH	GRIP LENGTH	MATCH? PLUS ??
	HEAD FLAT-FLAT	HEAD DIAMETER	MATERIAL	ULT TEN KSI	SHEAR LOAD	TEN LOAD	FINISH	S HOLE? H OR SH	LOCKING ELEMENT?	NATIONAL STOCK NUMBER
37) NAS 1156 -22	29294	99-101° FLUSH A199	TORQUE SET A267	.3750-24 UNJF-3A	0.3731 0.3745	0.160	0.391	1.791 1.751	1.385 1.365	YES +1
	—	.762 .704	CRES (ST)	160	—	14,000	PASSIVATE	NO	NO	5305-00-[illegible]-6959
38) NAS 1161 -3	06676 06657 29294	99-101° FLUSH A199	TORQUE SET A267	.1380-32 UNJC-3A	.1361 .1375	.057	.338	.541 .511	.198 .178	YES +1 [illegible]
	—	.211 .279	STEEL (ST)	160 MIN	—	1,200	—	NO	YES	5305 00-[illegible]-4312
39) NAS 1189 -3P16L	06670	99-101° FLUSH A199	PHILLIPS A260	.1900-32 UNJF-3A	.190	.080	.900 1.000	1.000 .969	FULL THREAD	YES +0
	—	.322 .385	CRES (ST)	160 180	—	2,860	CADMIUM PLATE	NO	YES	5305-01-004-8705
40) NAS 1265 -38D	01847	HEX A150	—	1.000-12 UNF-3A	.9990 .9985	.515 .500	.770	3.190 3.160	2.385 2.365	NO [illegible]
	1.427 1.440	—	6AL 4V TI	—	—	—	BARE	YES SH	NO	[illegible]06-00-0[illegible]-4837
41) NAS 1261 -108D	29294 77851	HEX A150	—	.5625-18 UNJF-3A	.5595 .5985	.281 .296	.511	7.776 7.746	6.740 6.760	YES +0
	.865 .877	—	6AL-4V (TI)	—	—	—	BARE	YES SH	NO	5306-[illegible]-4820
42) NAS 1305 -8D	06657 15903	HEX A150 A152	—	.3125-24 UNJF-3A	.3106 .3120	.156 .171	.469	.994 .954	1.510 .490	YES +13 A150 => ? NO +10
	.492 .502	—	ALLOY STEEL (ST)	160 180	—	—	CADMIUM PLATE	YES SH	NO	5306-00-063-7681
43) NAS 1204 -52	29294	99-101° FLUSH (A199)	PHILLIPS A260	.2500-28 UNJF-3A	.2495 .2481	.160	.316	3.581 3.551	3.250 3.551	YES +0
	—	.449 .507	ALLOY STEEL (ST)	160 180	—	4,520	CADMIUM PLATE	NO	NO	5305-00-680-5429
44) NAS 590 -56	29294	99-101° FLUSH (A199)	HI TORQUE A268	.6250-18 UNJF-3A	.6240 .6226	.269 .272	.953	4.194 4.937	3.510 3.490	YES +0
	—	1.2723 1.2651	STEEL (ST)	160 180	0 58,300	40,900	CADMIUM PLATE	NO	NO	5305-01-059-3593
45) MS 21091 -5006	29294 06670	99-101° FLUSH (A199)	PHILLIPS (A260)	.3125-24 UNF-3A	.3085 .3115	.133	.531	.937 .890	.385 .365	YES +0
	—	.569 .635	ALLOY STEEL (ST)	— [illegible] 826-832	0 11,500	7,100	CADMIUM PLATE	NO	YES	5305-01-049-4017

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PART NUMBER	FASTENER TYPE	HEAD TYPE	DRIVE TYPE	THREAD TYPE	DIAMETER	HEAD HEIGHT	THREAD LENGTH	LENGTH	GRIP LENGTH	MATCH? PLUS X?	
	HEAD FLAT-FLAT	HEAD DIAMETER	MATERIAL	ULT TEN KSI	SHEAR LOAD	TEN LOAD	FINISH	S HOLE? H OR SH?	LOCKING ELEMENT?	NATIONAL STOCK NUMBER	
46 NAS 1802 -6 D45	01847 18257	HEX A150	PHILIPS A260	.3750-24 UNJF-3A	.345 .375	.188 .203	2.732 2.812	2.796 2.844	FULL THREAD	YES +0	
	.492 .502	—	A286 CRES2 (FE)	160 190	—	—	PASSIVATE	YES H	NO	5305- 01-184-7697	
47 NAS 336 C12	29294	99-101° FLUSH A199	100° FLUSH A264	.3750-24 UNJF-3A	.3742 .3733	.160	.641	1.313 1.360	.688	YES +0	
	—	.752 .762	ALLOY STEEL (ST)	160 180	S 10,500	12,700	CADIUM PLATE	YES SH	NO	5305- 00-559-8758	
48 NAS 1207 -37	29294	99-100° FLUSH A199	PHILIPS A260	.4375-20 UNJF-3A	.4370 .4356	.188	.453	2.781 2.750	2.302 2.323	YES +0	
	—	.832 .890	ALLOY STEEL	160 180	—	14,800	CADIUM PLATE	NO	NO	5305- 00-814-8742	
49 MS 9489 -31	01847	HEX A150	—	.190-32 UNJF-3A	.186 .189	.125	0.620 0.700	2.365 2.385	1.685 1.745	YES +0	UNDER ST => NO +5
	.367 .376	—	CRES (FE)	—	—	—	N_s	NO	NO	5306- 01-051-8002	
50 NAS1168 -17	29294 06670	99-100° FLUSH A199	TORQUE SET A267	.500-20 UNJF-3A	.4995 .4981	.215	.735	1.812 1.782	1.052 1.072	YES +0	
	—	.959 1.017	ALLOY STEEL (ST)	160 MIN	—	25,600	—	NO	YES	5305- 00-472-5271	

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Appendix C: Characteristic Search User's Manual

CHARACTERISTICS SEARCH

ON-LINE PROTOTYPE SYSTEM

USERS GUIDE

CHARACTERISTICS SEARCH

TABLE OF CONTENTS

1. OVERVIEW

This system provides the authorized user with the capability of direct access into the DIDS Characteristic Data Base to obtain matching items (NINNs) based upon input through user friendly on-line terminals.

This system requires that the user input the Item Name Code (INC) for the item being searched. If the INC is not known by the user, he will receive instructions on the terminal on how to sign onto the FSC/FSG/INC system to obtain the INC number and also how to sign back on to the Characteristics Search System.

Keying in the INC will bring up a series of up to ten query screens (questions from the computer) which he will answer (if possible). If the INC entered has not yet been loaded to the Characteristics Search System, the user will receive a message to that affect.

NOTE: Initially, only INCs for FIIG A194 (pumps, liquid, general purpose) will be loaded for this prototype system. New FIIGs and their INCs are planned to be added in the future.

The questions for the input INCs have been set up to be as user friendly as possible. The user must answer the first two questions with positive replies to initiate a valid transaction and then should answer as many of the remaining questions as possible.

When the questions have been answered by the user, the computer will code the replies to create a search record and begin the search for items which have characteristics equal to the replies input by the user.

If the computer finds any items which match the criteria supplied by the user, the NIINs for those matches (up to 100 NIINs) will be displayed for the user to view (see output screen CHS MT). The user will then be given options to : begin viewing, start a new search, or stop processing and sign off.

If the user wishes to try and reduce the quantity of matches, he will start a new search for the same INC and answer some of the questions not answered the first time.

If the user wishes to begin viewing he will simply hit the enter key. This will cause the computer to output on the terminal the CHS TR output screen (segment A) identification data and (segment M) clear text characteristics for each NIIN.

If the user wishes to stop processing at any time he will enter option code "Q" to stop processing and sign off.

If the computer finds no matches, output screen CHS NF will be provided on the terminal. This screen will give the user the option of beginning a new search on the same INC or a new INC by entering the INC number in the enter area.

II. DATA AVAILABLE ON-LINE

ELEMENT NAME

Segment A - Identification Data (Modified)

FIIG
INC
CTRL CODE
TYPE II
RPDMRC
DEMIL CODE

Segment M - Clear Text Characteristics

Requirement Statement
Clear Text Reply

III. SIGNING ONTO THE CHARACTERISTICS SEARCH PROTOTYPE

To sign onto the characteristics search program:

1. Sign onto the terminal with usercode/password as usual.
2. Enter CHS (3 positions)
3. Hit the ENTER key (on terminal)

You will receive Screen #1 CHS MM for entering the INC to be searched.

IV. CURRENT CAPABILITIES

After signing onto the characteristics Search System you will be given screen CHS MM and asked if you know the INC.

At this time (during prototype) only the eleven listed INCs for FIIG A194 will be available for search:

1. 14741 Pump, Centrifugal
2. 14791 Pump, Axial Pistons
3. 14792 Pump, Radial Pistons
4. 14860 Pump, Reciprocating, Direct Acting
5. 14862 Pump Unit, Centrifugal - Rotary
6. 17988 Pump Unit, Centrifugal
7. 18181 Pump Unit, Rotary
8. 30409 Pump, Reciprocating
9. 30401 Pump, Rotary
10. 30475 Pump Unit, Reciprocating
11. 31819 Pump Unit, Axial Pistons

New INCs will be added in the future by DLSC on a schedule yet to be developed.

V. SCREEN DESCRIPTIONS AND OPTIONS

A. CHS MM (Begin Search)
B. CHS TA (Transfer Screen)
C. CHS IN (INC Not Loaded)
D. CHS QA (Characteristics Questions)
E. CHS NF (No Items Found)
F. CHS MT (Matching NIINs)
G. CHS TR (TIR NIIN Record)

```
                    D L S C  CHARACTERISTICS ON-LINE SEARCH

        TO BEGIN SEARCHING FOR AN ITEM BY ITS CHARACTERISTICS YOU MUST FIRST
   ENTER THE ITEM NAME CODE (INC).

       IF YOU ALREADY KNOW THE INC FOR THE ITEM THEN ENTER THE LETTER Y IN THE
      SPACE BELOW AND THEN ENTER THE INC IN THE FOLLOWING SPACES AND HIT THE
      ENTER KEY ON YOUR KEYBOARD.

        IF YOU DO NOT KNOW THE INC ENTER THE LETTER N IN THE SPACE BELOW AND
      THEN HIT THE ENTER KEY ON YOUR KEYBOARD.
-------------------------------------------------------------------------------
   DO YOU KNOW THE INC?  Y      (Y=YES, N=NO) OR (Q=QUIT)
              INC=  31819            XMT
```

SCREEN	OPTION	REACTION
CHS MM	INC Known?	
	Y (Yes)	Also enter the INC #. The first question concerning this INC will be displayed.
	N (No)	This will display the transfer instructions (for the FSC/Item name system) and also instructions on how to get back to the Characteristics Search System. Hit the enter key to transfer.
	Q (Quit)	This will sign you off the Characteristics Search System.

```
  YOU WILL BE TRANSFERRED TO THE FSC/ITEM NAME SYSTEM BY PRESSING THE ENTER
KEY ON YOUR KEYBOARD.

  WHEN YOU RECEIVE THE MAIN MENU SCREEN (FROM THE FSC SYSTEM) YOU WILL NEED
TO USE OPTION >SB< (TO INQUIRE ON YOUR ITEM NAME) AND THEN ENTER THE NAME.

  WHEN THE FSC SCREEN RETURNS IT SHOULD SHOW THE ITEMS WHICH MATCH YOUR NAME
AND THE CORRESPONDING INC FOR THOSE NAMES.

  ONCE YOU HAVE OBTAINED THE INC FOR YOUR ITEM THEN CLEAR THE FSC SCREEN AND
ENTER CHS (3 POSITIONS).   THIS WILL RETURN YOU BACK TO THIS PROGRAM.   YOU
MAY THEN BEGIN YOUR SEARCH BY AN INC.

    XMT
```

SCREEN	OPTION	REACTION
CHS TA		This screen will provide information about the transfer to the FSC/Item name prototype and also how to get back to the CHS (Characteristics Search) System. Hit the enter key to transfer. OR Clear the screen and enter CHS to sign back onto the Characteristics Search System.

```
                    DLSC - CHARACTERISTICS SEARCH SYSTEM
   THE INC  00000  IS NOT YET AVAILABLE ON THIS PROTOTYPE SYSTEM.

   DLSC WILL BE ADDING NEW INC'S TO THE SYSTEM IN THE FUTURE IF THE
   PROTOTYPE PROVES TO BE A NEEDED TOOL FOR ASSISTING USERS TO FIND ITEMS.

    TO RETURN TO THE SEARCH PROCESS SIMPLY HIT THE ENTER KEY.
```

SCREEN	OPTION	REACTION
CHS IN	None	Hit the enter key to return to the search process.

```
                    CHARACTERISTICS SEARCH QUESTIONS
    ITEM QUESTIONS FOR INC    31819  PUMP UNIT, AXIAL PISTONS
AAYU
   ENTER THE REPLY CODE FROM THE TABLE WHICH DENOTES INPUT CONNECTION TYPE:

REPLY                          REPLY                          REPLY
CODE      REPLY                CODE      REPLY                CODE      REPLY
 BG   BELL MOUTH                BJ   OCTAGON FLANGE            AH   TRIANGULAR FLANGE
 BH   BUTT WELD                 BC   QUICK DISCONNECT          AM   THREADED INTERNAL
 AA   COMPRESSION TUBE          AD   OVAL FLANGE               AL   THREADED EXTERNAL
 AB   FLARED TUBE               AE   RECTANGULAR FLANGE        AP   UNTHREADED INTERNAL
 AC   SOLDER TUBE               AF   ROUND FLANGE              AN   UNTHREADED EXTERNAL
                                AG   SQUARE FLANGE

       AM      EXAMPLE: >AA<  (COMPRESSION TUBE)




OPTION (C=CONTINUE, R=RETURN TO BEGIN SEARCH SCREEN, S=SEARCH FOR THE ITEM)
    C         XMT     ENTER REPLY ANSWERS ABOVE
```

SCREEN	OPTION	REACTION
CHS QA	C (Continue)	The next query screen question will come up on the terminal.
	S (Search)	The search process will begin on the questions answered at that point.
	R (Return)	The main menu (CHS MM) will come up on the terminal.
	Q (Quit)	Stop processing and sign-off system.

NOTE: The first two questions will require a positive answer. If the questions are not answered you will receive an error message (near the bottom of the screen) which reads:

****THIS QUESTION REQUIRES A POSITIVE REPLY*****

If you do not wish to answer a question (after answering question 1 and 2) then leave the answer blank and skip that question. This indicates you will accept any value for this question.

There may be more than one question displayed on a screen (if room permits).

```
           DLSC    CHARACTERISTIC SEARCH SYSTEM
      INC= 31819 PUMP UNIT, AXIAL PISTONS

  WE WERE UNABLE TO FIND ANY ITEMS WHICH MATCHED YOUR SEARCH CRITERIA.

  EITHER THERE ARE NO ITEMS OF THIS TYPE ON OUR SYSTEM OR YOU MAY HAVE
INCORRECTLY ANSWERED ONE OR MORE OF THE QUESTIONS ON THIS ITEM.

  TO BEGIN ANOTHER SEARCH ENTER ANOTHER INC IN THE SPACE PROVIDED BELOW.

  TO RETURN TO THE FSC/ITEM NAME PROGRAM ENTER >FSC< IN THE SPACES BELOW.

     INC # OR FSC                  XMT
```

SCREEN	OPTION	REACTION
CHS NF	INC#	NOTE: The user may input the same INC# if he wishes to try and answer more replies or a new INC# for a new search.
	"FSC"	This option will display the transfer screen information for the FSC/Item name system (CHS TA).

```
                  DLSC    CHARACTERISTIC SEARCH NIIN MATCHES
             42 ITEMS MATCHED THE SEARCH TRANSACTION WHICH YOU ENTERED.
005293403 007171138 011601523 006012060 010730082 010380460 006046664 00204441C
000206495 006059357 004100982 010817485 008113746 006535494 000177865 00050820[illegible]
001975126 001521480 000057495 010036721 008880302 007200830 003919163 00008722[illegible]
008194735 005295022 00[illegible]065828 003684357 005745304 008073489 009295325 00360186[illegible]
003720089 003720088 003683015 003683016 005404172 008256601 009579261 00[illegible]41661[illegible]
008093579 002891723



   IF YOU WANT THESE ITEMS PRINTED (INSTEAD OF VIEWING ONE AT A TIME):
       PHONE: DLSC-FBBB       VIA AUTOVON 369-6811,  FTS 372-6811  OR
                              COMERCIAL  616-962-6511 EXT 6811
            TO BEGIN VIEWING THESE ITEMS:  HIT THE ENTER KEY.
            TO STOP THIS TRANSACTION AND BEGIN ANOTHER SEARCH:
                  ENTER R AND ANOTHER INC IN THE AREA BELOW
            TO SIGN OFF:  ENTER Q UNDER OPTION BELOW.
 OPTION    (R=BEGIN NEW SEARCH, Q=QUIT)    NEW INC  STARTING NIIN     XMT
                                            17988     005293403
```

SCREEN	OPTION	REACTION
CHS MT		Hit the enter key to begin viewing the starting NIIN data.
	R (Return)	To begin another search on this INC or if you change the INC# and use option "R" you will receive the first question for the new INC.
	Q (Quit)	To stop this transaction and sign off the system.

NOTE: To view other than the first NIIN displayed, you may change the starting NIIN field to the desired NIIN, and then hit the enter key.

```
                  CHARACTERISTICS SEARCH TIR NIIN RECORD
          NSN/PSCN=   4320/006401307
FIIG    INC          ITEM NAME                         CRTL/ASTS  TYPE  RPDMRC  DMIL
A19400 30475 PUMP UNIT, RECIPROCATING                     N        K              A

           CLEAR TEXT CHARACTERISTICS - SEGMENT M
MRC             RQMT-STMT                          CLEAR TEXT REPLY
ASWT INTAKE CONNECTION THREAD SIZE AND       1.250-11-1/2 NPT
     SERIES/TYPE DESIGNATOR
AAYV DISCHARGE CONNECTION QUANTITY           1
AAYW DISCHARGE CONNECTION TYPE               THREADED INTERNAL
ASAZ DISCHARGE CONNECTION THREAD SIZE        1.000-11-1/2 NPT
     AND SERIES/TYPE DESIGNATOR
AKDJ PRIME MOVER TYPE                        ELECTRIC MOTOR
AAXS PRIME MOVER COOLING MEDIUM              AIR
AAXH PRIME MOVER QUANTITY                    1
AHZX PRIME MOVER HORSEPOWER RATING           0.750
ACDC CURRENT TYPE                            DC
ELEC VOLTAGE IN VOLTS                        230.0
AMPS CURRENT RATING IN AMPS                  ANY ACCEPTABLE
AKNA INCLOSURE TYPE                          PARTIALLY INCLOSED
 SCROLL   N    (N=NEXT, B=BACK, R=RETURN TO BEGIN NEW SEARCH)
 NEW-NIIN      (N=NEXT NIIN, P=PRIOR NIIN, S=SHOW NIINS, Q=QUIT)      XMT
```

SCREEN	OPTION	REACTION
CHS TR		
	SCROLL	
	N (Next)	This option will be used to scroll to the next page of characteristics for this NIIN.
	B (Back)	This option will be used to scroll to the prior page of characteristics for this NIIN.
	R (Return)	This option will be used to return to the begin search screen (CHS MM).
	NEW NIIN	
	N (Next)	This option will be used to get the 1st page of characteristics on the next NIIN #. (Note: This option is used for multiple NIIN matches only.)
	P (Prior)	This option will be used to get the 1st page of the prior NIIN # that was matched.

SCREEN CHS TR (Continued)

SCREEN	OPTION	REACTION
	NEW NIIN	
	S (Show)	This option will be used to display the matching NIINs (CHS MT) for this transaction.
	Q (Quit)	This option will stop processing and sign you off the characteristics search system.

VI. SAMPLE OF CHARACTERISTICS SEARCH TRANSACTION

The following screen samples show a typical search transaction and what the resulting screens will look like.

EXAMPLE TRANSACTION

This sample shows a search transaction for INC 17988 Pump Unit, Centrifugal.

EXAMPLE SCREENS

EXAMPLE A User enters a "Y" (for yes) and then enters the INC # 17988.

EXAMPLE B The first question for INC 17988 is displayed.

The user enters BS (Hydrocarbon fuels/oils) and Option C (continue).

EXAMPLE C The second and third questions for INC 17988 are displayed.

The user enters M (gallons) and then enters 1 to 10 for the numeric gallons (range).

The user does not answer the third question (skip tab by these fields). He enters an S option to begin the search at this point.

EXAMPLE D The matching NIINs are displayed (from the search).

As can be seen there were 8 NIINs that matched the characteristics of hydrocarbon fuels/oils (BS) and between 1 and 10 (gallons per minute) maximum discharge flow rate.

The user decides to answer more questions and cut down the number of matches. Enter an "R" option to return to the begin new search process.

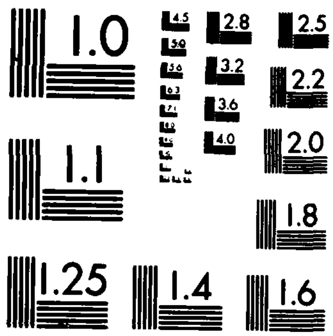
EXAMPLE E The first question for INC 17988 is displayed. The user enters BS again.

EXAMPLE F The second and third questions for INC 17988 are displayed.

The user enters M (for gallons) and a range of 1 to 10 again. The user skips the third question and hits the enter key to continue.

AD-A174 143 THE FEASIBILITY OF USING A DATA BASE MANAGEMENT SYSTEM TO AID IN PIECE PA (U) AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH SCHOOL OF SYST J E FIENE 2/2

UNCLASSIFIED SEP 86 AFIT/GLM/LSM-86S-21 F/G 5/2 NL



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

EXAMPLE G The fourth question for INC 17988 is displayed.

The user enters F and then enters 15.0 to 28.5 (range) for total head, and then enters "S" option to begin searching at this point.

EXAMPLE H The matching NIINs are displayed.
NOTE: This time there are only 2 matched NIINs. This is because the user has answered the fourth question and specified 15 to 28.5 feet for total head, and only 2 NIINs fall within that range. The user hits the enter key to begin viewing the first NIIN.

EXAMPLE I The first matching NIIN (005293403) is displayed showing the first page of (Segment M) characteristics. To scroll to the next page of characteristics on this NIIN the user enters N in the scroll field for page 1 and page 2.

EXAMPLE J The third page of NIIN 005293403 is displayed.

NOTE: The last line shown under characteristics has **** NO MORE DATA FOR THIS NIIN****. This indicates that all the characteristics on this NIIN have been displayed.

The user enters N next to the new NIIN field (to indicate they wish to see the next NIIN).

EXAMPLE K The first page of the next NIIN (010730082) is displayed.

The user enters S next to the new NIIN field (to indicate they wish to see the NIINs again).

EXAMPLE L The matching NIINs are displayed again.

EXAMPLE A

```
                D L S C  CHARACTERISTICS ON-LINE SEARCH

     TO BEGIN SEARCHING FOR AN ITEM BY ITS CHARACTERISTICS YOU MUST FIRST
ENTER THE ITEM NAME CODE (INC).

    IF YOU ALREADY KNOW THE INC FOR THE ITEM THEN ENTER THE LETTER Y IN THE
    SPACE BELOW AND THEN ENTER THE INC IN THE FOLLOWING SPACES AND HIT THE
    ENTER KEY ON YOUR KEYBOARD.

     IF YOU DO NOT KNOW THE INC ENTER THE LETTER N IN THE SPACE BELOW AND
    THEN HIT THE ENTER KEY ON YOUR KEYBOARD.
------------------------------------------------------------------------------
 DO YOU KNOW THE INC?  Y     (Y=YES, N=NO) OR (Q=QUIT)
             INC-  17988          XMT
```

EXAMPLE B

```
                     CHARACTERISTICS SEARCH QUESTIONS
        ITEM QUESTIONS FOR INC   17988  PUMP UNIT, CENTRIFUGAL
 ACKL
          ENTER THE REPLY CODE FOR THE MEDIA FOR WHICH THE ITEM IS DESIGNED:

 REPLY                         REPLY                              REPLY
 CODE       REPLY              CODE         REPLY                 CODE        REPLY
  AB   AIR                      HA    GYCERINE                     CP    OXYGEN, LIQUID
  AC   ALCOHOL                  BS    HYDROCARBON FUELS/OILS       EX    PHOTO DEVELOPER
  DV   ALKALI SOLUTION          EU    HYDROCHLORIC ACID            CO    PROPANE
  AF   AMMONIA                  BU    INGESTED LIQUIDS             EY    RADIOACT LIQUID
  EN   BLEACHING LIQUIDS        FS    INSECTICIDES                 FW    REFRIGERANTS
  EP   BRINE                    DT    LIQUID                       EZ    SEWAGE
  AR   BUTANE                   WD    LITHIUM BROMIDE              FA    SODIUM HYDROXIDE
  EO   CALCIUM SALT SOLUTION    EV    METHANOL                     FB    SODIUM PHOSPHATE
  AS   CARBON DIOXIDE           LW    METHYLENE CHLORIDE           FC    SULFURIC ACID
  BB   ETHYLENE GYLCOL          EW    NAPHTHA                      WC    WATER, DISTILLED
  ER   FERROUS SULFATE          CF    NITRIC ACID                  DH    WATER, FRESH
  GX   FOAM                     CJ    NITROGEN, LIQUID             DL    WATER, SALT
  ES   FREON                    CL    OIL

       BS      EXAMPLE: >ACC       (FOR ALCOHOL)
OPTION (C=CONTINUE, R=RETURN TO BEGIN SEARCH SCREEN, S=SEARCH FOR THE ITEM)
    C          XMT      ENTER REPLY ANSWERS ABOVE
```

EXAMPLE C

```
                       CHARACTERISTICS SEARCH QUESTIONS
        ITEM QUESTIONS FOR INC    17988  PUMP UNIT, CENTRIFUGAL
AMYV    ENTER THE REPLY CODE FROM THE TABLE WHICH DENOTES UNIT OF MEASUREMENT
   FOR "MAXIMUM DISCHARGE FLOW RATE" FOR YOUR ITEM:

REPLY
CODE          REPLY
M     GALLONS PER MINUTE
E     LITERS  PER MINUTE                    M              EXAMPLE:   >M<

      ENTER THE NUMERIC VALUE OF MAXIMUM DISCHARGE FLOW RATE:
1               TO  10                 EXAMPLE: >15.0       < TO >           <   OR
                                                >15.0       < TO >20.0       <

AHZX    ENTER THE NUMERIC VALUE OF THE PRIME MOVER HORSEPOWER RATING:
             TO                     EXAMPLE: >10.0      < TO >       <   OR
                                             >10.0      < TO >10.5   <



OPTION (C=CONTINUE, R=RETURN TO BEGIN SEARCH SCREEN, S=SEARCH FOR THE ITEM)
    S          XMT      ENTER REPLY ANSWERS ABOVE
```

EXAMPLE D

```
                    DLSC   CHARACTERISTIC SEARCH NIIN MATCHES
                 8 ITEMS MATCHED THE SEARCH TRANSACTION WHICH YOU ENTERED.
005293403 007171138 011601523 006012060 010730082 010380460 006046664 002044410





     IF YOU WANT THESE ITEMS PRINTED (INSTEAD OF VIEWING ONE AT A TIME):
        PHONE: DLSC-FBBB     VIA AUTOVON 369-6811,  FTS 372-6811  OR
                             COMERCIAL  616-962-6511 EXT 6811
              TO BEGIN VIEWING THESE ITEMS:  HIT THE ENTER KEY.
              TO STOP THIS TRANSACTION AND BEGIN ANOTHER SEARCH:
                   ENTER R AND ANOTHER INC IN THE AREA BELOW
              TO SIGN OFF:  ENTER Q UNDER OPTION BELOW.
OPTION    (R=BEGIN NEW SEARCH, Q=QUIT)    NEW INC  STARTING NIIN     XMT
  R                                        17988     005293403
```

EXAMPLE E

```
                    CHARACTERISTICS SEARCH QUESTIONS
       ITEM QUESTIONS FOR INC    17988  PUMP UNIT, CENTRIFUGAL
ACKL
          ENTER THE REPLY CODE FOR THE MEDIA FOR WHICH THE ITEM IS DESIGNED:

REPLY                        REPLY                            REPLY
CODE      REPLY              CODE       REPLY                 CODE       REPLY
 AB   AIR                     HA   GYCERINE                    CP   OXYGEN, LIQUID
 AC   ALCOHOL                 BS   HYDROCARBON FUELS/OILS      EX   PHOTO DEVELOPER
 DV   ALKALI SOLUTION         EU   HYDROCHLORIC ACID           CO   PROPANE
 AF   AMMONIA                 BU   INGESTED LIQUIDS            EY   RADIOACT LIQUID
 EN   BLEACHING LIQUIDS       FS   INSECTICIDES                FW   REFRIGERANTS
 EP   BRINE                   DT   LIQUID                      EZ   SEWAGE
 AR   BUTANE                  WD   LITHIUM BROMIDE             FA   SODIUM HYDROXIDE
 EQ   CALCIUM SALT SOLUTION   EV   METHANOL                    FB   SODIUM PHOSPHATE
 AS   CARBON DIOXIDE          LW   METHYLENE CHLORIDE          FC   SULFURIC ACID
 BB   ETHYLENE GYLCOL         EW   NAPHTHA                     WC   WATER, DISTILLED
 ER   FERROUS SULFATE         CF   NITRIC ACID                 DH   WATER, FRESH
 GX   FOAM                    CJ   NITROGEN, LIQUID            DL   WATER, SALT
 ES   FREON                   CL   OIL

       BS        EXAMPLE: >AC<        (FOR ALCOHOL)
OPTION (C=CONTINUE, R=RETURN TO BEGIN SEARCH SCREEN, S=SEARCH FOR THE ITEM)
     C           XMT      ENTER REPLY ANSWERS ABOVE
```

EXAMPLE F

```
                    CHARACTERISTICS SEARCH QUESTIONS
       ITEM QUESTIONS FOR INC    17988  PUMP UNIT, CENTRIFUGAL
AHYV    ENTER THE REPLY CODE FROM THE TABLE WHICH DENOTES UNIT OF MEASUREMENT
    FOR "MAXIMUM DISCHARGE FLOW RATE" FOR YOUR ITEM:

REPLY
CODE       REPLY
 M    GALLONS PER MINUTE
 E    LITERS  PER MINUTE                     M              EXAMPLE:  >M<

      ENTER THE NUMERIC VALUE OF MAXIMUM DISCHARGE FLOW RATE:
 1.0           TO  10.0               EXAMPLE: >15.0       < TO >            <  OR
                                               >15.0       < TO >20.0        <

AHZX    ENTER THE NUMERIC VALUE OF THE PRIME MOVER HORSEPOWER RATING:
                TO                  EXAMPLE: >10.0      < TO >            <  OR
                                             >10.0      < TO >10.5        <


OPTION (C=CONTINUE, R=RETURN TO BEGIN SEARCH SCREEN, S=SEARCH FOR THE ITEM)
     C           XMT      ENTER REPLY ANSWERS ABOVE
```

EXAMPLE G

```
                    CHARACTERISTICS SEARCH QUESTIONS
         ITEM QUESTIONS FOR INC    17988  PUMP UNIT, CENTRIFUGAL
AHYX   ENTER THE REPLY CODE FROM THE TABLE WHICH DENOTES UNIT OF MEASUREMENT
  FOR THE TOTAL HEAD RATING OF YOUR ITEM:

REPLY
CODE       REPLY
F          FEET
M          METERS                        F          EXAMPLE:  >F<

ENTER THE NUMERIC VALUE FOR TOTAL HEAD(SUM TOTAL OF DISCHARGE & SUCTION LIFT)
15.0        TO  28.5            EXAMPLE: >55.2    < TO >           <  OR
                                         >55.2    < TO >60.0       <

OPTION (C-CONTINUE, R-RETURN TO BEGIN SEARCH SCREEN, S-SEARCH FOR THE ITEM)
    S          XMT      ENTER REPLY ANSWERS ABOVE
```

EXAMPLE H

```
                 DLSC    CHARACTERISTIC SEARCH NIIN MATCHES
               2 ITEMS MATCHED THE SEARCH TRANSACTION WHICH YOU ENTERED.
005293403 010730082

     IF YOU WANT THESE ITEMS PRINTED (INSTEAD OF VIEWING ONE AT A TIME):
         PHONE: DLSC-FBBB       VIA AUTOVON 369-6811,   FTS 372-6811   OR
                                COMERCIAL   616-962-6511 EXT 6811
                TO BEGIN VIEWING THESE ITEMS:  HIT THE ENTER KEY.
                TO STOP THIS TRANSACTION AND BEGIN ANOTHER SEARCH:
                      ENTER R AND ANOTHER INC IN THE AREA BELOW
                TO SIGN OFF:  ENTER Q UNDER OPTION BELOW.
  OPTION     (R-BEGIN NEW SEARCH, Q-QUIT)    NEW INC   STARTING NIIN     XMT
                                              17988     005293403
```

EXAMPLE I PAGE 1

```
                    CHARACTERISTICS SEARCH TIR NIIN RECORD
          NSN/PSCN=    4320/005293403
FIIG    INC          ITEM NAME                         CRTL/ASTS   TYPE   RPDMRC   DMIL
A19400 17988 PUMP UNIT, CENTRIFUGAL                       N          K

             CLEAR TEXT CHARACTERISTICS - SEGMENT M
MRC              RQMT-STMT                             CLEAR TEXT REPLY
AHYV MAXIMUM DISCHARGE FLOW RATE                  1.25 GALLONS PER MINUTE
AHYW DISCHARGE PRESSURE                           NOT RATED
AHYX TOTAL HEAD                                   27.0 FEET
AHYY SUCTION LIFT                                 20.0 FEET
AHYZ OPERATING SPEED AT RATED CAPACITY            7500.0 REVOLUTIONS PER MINUTE
ACKL MEDIA FOR WHICH DESIGNED                     HYDROCARBON FUELS AND OILS
AHZA PUMPING ELEMENT OPERATING POSITION           HORIZONTAL
AHZE CENTRIFUGAL PUMP DESIGN                      AXIAL FLOW
AHZF CENTRIFUGAL PUMP IMPELLER QUANTITY           1
AHZG CENTRIFUGAL PUMP IMPELLER SUCTION            SINGLE
     TYPE
AAYD STAGE QUANTITY                               1
AHZH SELF-PRIMING FEATURE                         NOT INCLUDED
AENC PUMP QUANTITY                                1
 SCROLL   N    (N=NEXT, B=BACK, R=RETURN TO BEGIN NEW SEARCH)
 NEW-NIIN       (N=NEXT NIIN, P=PRIOR NIIN, S=SHOW NIINS, Q=QUIT)      XMT
```

EXAMPLE I PAGE 2

```
                    CHARACTERISTICS SEARCH TIR NIIN RECORD
          NSN/PSCN=    4320/005293403
FIIG    INC          ITEM NAME                         CRTL/ASTS   TYPE   RPDMRC   DMIL
A19400 17988 PUMP UNIT, CENTRIFUGAL                       N          K

             CLEAR TEXT CHARACTERISTICS - SEGMENT M
MRC              RQMT-STMT                             CLEAR TEXT REPLY
AAYT INTAKE CONNECTION QUANTITY                   1
AAYU INTAKE CONNECTION TYPE                       THREADED INTERNAL
ASWT INTAKE CONNECTION THREAD SIZE AND            0.250-18 NPT
     SERIES/TYPE DESIGNATOR
AAYV DISCHARGE CONNECTION QUANTITY                1
AAYW DISCHARGE CONNECTION TYPE                    THREADED INTERNAL
ASAZ DISCHARGE CONNECTION THREAD SIZE             0.250-18 NPT
     AND SERIES/TYPE DESIGNATOR
AKDJ PRIME MOVER TYPE                             ELECTRIC MOTOR
AAXS PRIME MOVER COOLING MEDIUM                   AIR
AAXH PRIME MOVER QUANTITY                         1
AHZX PRIME MOVER HORSEPOWER RATING                0.066
ACDC CURRENT TYPE                                 DC
ELEC VOLTAGE IN VOLTS                             17.0
 SCROLL   N    (N=NEXT, B=BACK, R=RETURN TO BEGIN NEW SEARCH)
 NEW-NIIN       (N=NEXT NIIN, P=PRIOR NIIN, S=SHOW NIINS, Q=QUIT)      XMT
```

EXAMPLE J

```
                    CHARACTERISTICS SEARCH TIR NIIN RECORD
            NSN/PSCN=    4320/005293403
 FIIG    INC          ITEM NAME                         CRTL/ASTS   TYPE   RPDMRC   DMIL
A19400 17988 PUMP UNIT, CENTRIFUGAL                         N          K

             CLEAR TEXT CHARACTERISTICS - SEGMENT M
 MRC           RQMT-STMT                            CLEAR TEXT REPLY
AMPS CURRENT RATING IN AMPS                       ANY ACCEPTABLE
AKNA INCLOSURE TYPE                               EXPLOSION PROOF ENCLOSURE
ADZC ENVIRONMENTAL PROTECTION                     DUST-IGNITION PROOF
AENK COOLING METHOD                               AIR TO AIR COOLED
**** NO MORE DATA FOR THIS NIIN ****





 SCROLL       (N=NEXT, B=BACK, R=RETURN TO BEGIN NEW SEARCH)
 NEW-NIIN  N   (N=NEXT NIIN, P=PRIOR NIIN, S=SHOW NIINS, Q=QUIT)       XMT
```

EXAMPLE K

```
                    CHARACTERISTICS SEARCH TIR NIIN RECORD
            NSN/PSCN=    4320/010730082
 FIIG    INC          ITEM NAME                         CRTL/ASTS   TYPE   RPDMRC   DMIL
A19400 17988 PUMP UNIT, CENTRIFUGAL                         N          4      3        A

             CLEAR TEXT CHARACTERISTICS - SEGMENT M
 MRC           RQMT-STMT                            CLEAR TEXT REPLY
AHYV MAXIMUM DISCHARGE FLOW RATE                  2.7 GALLONS PER MINUTE
AHYW DISCHARGE PRESSURE                           270.0 POUNDS PER SQUARE INCH GAGE
AHYX TOTAL HEAD                                   15.0 FEET
AHYY SUCTION LIFT                                 4.130 FEET AND
                                                 4.370 FEET
AHYZ OPERATING SPEED AT RATED CAPACITY            2376.0 REVOLUTIONS PER MINUTE
ACKL MEDIA FOR WHICH DESIGNED                     HYDROCARBON FUELS AND OILS AND
                                                 WATER, FRESH
AHZA PUMPING ELEMENT OPERATING POSITION           HORIZONTAL
AHZE CENTRIFUGAL PUMP DESIGN                      MIXED FLOW
AHZF CENTRIFUGAL PUMP IMPELLER QUANTITY           1
AHZG CENTRIFUGAL PUMP IMPELLER SUCTION            SINGLE
     TYPE
AHZH SELF-PRIMING FEATURE                         NOT INCLUDED
 SCROLL       (N=NEXT, B=BACK, R=RETURN TO BEGIN NEW SEARCH)
 NEW-NIIN  S   (N=NEXT NIIN, P=PRIOR NIIN, S=SHOW NIINS, Q=QUIT)       XMT
```

EXAMPLE L

```
                    DLSC    CHARACTERISTIC SEARCH NIIN MATCHES
                  2 ITEMS MATCHED THE SEARCH TRANSACTION WHICH YOU ENTERED.
005293403 010730082




        IF YOU WANT THESE ITEMS PRINTED (INSTEAD OF VIEWING ONE AT A TIME):
           PHONE: DLSC-FBBB      VIA AUTOVON 369-6811,  FTS 372-6811   OR
                                 COMERCIAL  616-962-6511 EXT 6811
                 TO BEGIN VIEWING THESE ITEMS:  HIT THE ENTER KEY.
                 TO STOP THIS TRANSACTION AND BEGIN ANOTHER SEARCH:
                       ENTER R AND ANOTHER INC IN THE AREA BELOW
                 TO SIGN OFF:  ENTER Q UNDER OPTION BELOW.
   OPTION    (R=BEGIN NEW SEARCH, Q=QUIT)    NEW INC   STARTING NIIN     XMT
     R                                        17988     010730082
```

IV. CURRENT CAPABILITIES

After signing onto the Characteristics Search System you will be given screen CHS MM and asked if you know the INC.

The following Item Names are available for search as of 01/28 86.

ITEM NAME	INC	FIIG
ADAPTER, CONNECTOR	15091	A03910
ADAPTER,CABLE CLAMP TO CONNECTOR	30415	A10100
AMPMETER	16450	A310A0
BEARING, BALL, ANNULAR	00014	A044A0
BEARING, WASHER THRUST	13211	A045A0
BEARING,SLEEVE	13205	A045A0
BOLT, SHOULDER	04905	A003A0
BOLT,MACHINE	01647	A003A0
BOLT,SHEAR	15903	A003A0
BRUSH, ELECTRICAL CONTACT	00302	A01500
BUSHING,SLEEVE	13225	A045A0
CABLE ASSEMBLY, POWER, ELECTRICA	00485	A07700
CABLE ASSY,RADIO FREQUENCY	00666	A07700
CABLE ASSY,SPECIAL PURPOSE ELECT	00782	A07700
CABLE, POWER, ELECTRICAL	00232	A07700
CABLE, SPECIAL PURPOSE, ELECTRIC	16423	A07700
CAPACITOR, FIXED, GLASS, DIELECT	00024	A010A0
CAPAC.,FIXED,METALLIZED,PAPER-PL	31959	A010A0
CAPACITOR,FIXED,CERAMIC DIELECTR	00027	A010A0
CAPACITOR,FIXED,ELECTROLYTIC	00028	A010A0
CAPACITOR,FIXED,MICA DIELECTRIC	00025	A010A0
CAPACITOR,FIXED,PAPER DIELECTRIC	00023	A010A0
CAPACITOR,FIXED,PLASTIC DIELECTR	00026	A010A0
CIRCUIT BREAKER	02136	A030A0
CLAMP,LOOP	17532	A13700
CONNECTOR, PLUG, ELECTRICAL	01538	A039A0
CONNECTOR, RECEPTACLE, ELECTRICAL	15293	A039A0
CONTACT,ELECTRICAL	00443	A322A0
CRYSTAL UNIT,QUARTZ	00136	A059A0
FILTER ELEMENT, FLUID	32634	F24020
FILTER, BAND PASS	00209	A047A0
FILTER, RADIO FREQUENCY INTERFER	00765	A047A0
FUSE, CARTRIDGE	00248	A01700
GASKET	04522	A032A0
GEAR, BEVEL	05433	A27000
GEAR, HELICAL	05434	A27000
GEAR, SPUR	05466	A27000
GROMMET, NONMETTALLIC	33739	A25400
HTG. ELEMENT, ELECT., NON IMM. T	29437	A01900
HOSE ASSEMBLY,NONMETTALIC	20311	A081A0
INSERT, SCREW THREAD	11444	T376-5
KNOB	02223	A041A0
LAMP, INCANDESCENT	00737	A07900
LEAD, ELECTRICAL	04581	A07700
LENS,LIGHT	29939	A075A0
LIGHT, INDICATOR	00150	A035A0

IV. CURRENT CAPABILITIES

After signing onto the Characteristics Search System you will be given screen CHS MM and asked if you know the INC.

The following Item Names are available for search as of 01/08 86.

ITEM NAME	INC	FIIG
METAL BAR	30975	A11100
MOTOR, ALTERNATING CURRENT	00530	A271A0
NUT, PLAIN, HEXAGON	01857	A031A0
NUT, PLAIN, ROUND	15677	A012A0
NUT, SELF-LOCKING, HEXAGON	05277	A021A0
NUT, SELF-LOCKING, PLATE	05280	A031A0
PACKING, PREFORMED	04521	A022A0
PIN, STRAIGHT, HEADLESS	02390	A012A0
PIN-RIVET, THREADED	29343	A040A0
PLUG, MACHINE THREAD	03201	A208A0
POWER SUPPLY	00740	A29500
PUMP UNIT, AXIAL PISTON	31819	A19400
PUMP UNIT, CENTRIFUGAL	17988	A19400
PUMP UNIT, CENTRIFUGAL, ROTARY	14882	A19400
PUMP UNIT, RECIPROCATING	30475	A19400
PUMP UNIT, ROTARY	18181	A19400
PUMP, AXIAL PISTON	14731	A19400
PUMP, CENTRIFUGAL	14741	A19400
PUMP, RADIAL PISTON	14792	A19400
PUMP, RECIPROCATING	30403	A19400
PUMP, RECIPROCATING, DIRECT ACTING	14860	A19400
PUMP, ROTARY	30410	A19400
RELAY, ELECTROMAGNETIC	32512	A03300
RESISTOR, FIXED, COMPOSITION	00126	A001A0
RESISTOR, FIXED, FILM	05311	A001A0
RESISTOR, FIXED, WIRE WOUND	20010	A001A0
RESISTOR, VARIABLE, NONWIRE WOUND	23716	A002A0
RESISTOR, VARIABLE, WIRE WOUND	29715	A002A0
RIVET, BLIND	00954	A040A0
RIVET, SOLID	00661	A040A0
SCREW, CLOSE TOLLERANCE	25294	A003A0
SCREW, EXTERNALLY RECEIVED BODY	01952	A003A0
SCREW, SELF-LOCKING	05570	A003A0
SCREW, CAP, SOCKET HEAD	16282	A003A0
SCREW, MACHINE	05557	A003A0
SCREW. SHOULDER	22846	A003A0
SEAL, PLAIN ENCASED	04214	A022A0
SETSCREW	06672	A003A0
SHIM	10349	A002A0
SPACER, RING	24307	T37700
SPACER, SLEEVE	13207	A045A0
SPRING, HELICAL, TORSION	04228	T251-B
SPRING, HELICAL, COMPRESSION	04226	T251-A
SPRING, HELICAL, EXTENSION	04227	T251-A
SWITCH, PRESSURE	02206	A048E0
SWITCH, PUSH	00406	A05300

IV. CURRENT CAPABILITIES

After signing onto the Characteristics Search System you will be given screen CHS MM and asked if you know the INC.

The following Item Names are available for search as of 01/06 86.

ITEM NAME	INC	FIIG
SWITCH, ROTARY	02134	A052B0
SWITCH, SENSITIVE	00399	A05300
SWITCH, THERMOSTATIC	00451	A048B0
SWITCH, TOGGLE	00184	A05300
TERMINAL, LUG	00746	A02CE0
TERMINAL, STUD	00687	A006E0
TRANSFORMER, POWER	32456	A058A0
TRANSFORMER, RADIO FREQUENCY	00777	A058A0
TUBE ASSEMBLY, METAL	21923	T393-D
TUBE, BENT, METTALLIS	32507	A004A0
TUBE, MATTALLIS	21973	A004A0
VALVE, CHECK	05487	A046E0
VALVE, GLOBE	05485	A046E0
VALVE, SAFETY RELIEF	05488	A046E0
VOLTMETER	16449	A310A0
WASHER, FLAT	13393	A033A0
WAVEGUIDE ASSEMBLY	00305	A073A0

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Part selection for end items and weapon systems in the Department of Defense (DOD) occurs at AFSC Product Divisions, AFLC Depots, and DOD contractor engineering working levels. There is presently no automated method available at the engineer's working level to allow them to interrogate the DOD supply catalog by part description. Without this ability, parts, with characteristics that match those of a part needed for a specific application, cannot be selected from the catalog, and an unnecessary new part may then be added to the catalog.

There are several newly developed data base management systems which have the ability to interrogate the DOD supply catalog by part description. This research investigated the feasibility of integrating one of these systems at AFSC Product Divisions, AFLC Depots, and DOD contractor engineering working levels. An experiment was conducted with the DLA Network prototype Characteristic Search System. The results gathered from the investigation and experiment indicate integration of such a system is needed and practical.

Therefore, a system, with the capabilities of the DLA Network Characteristic Search System, should be integrated at AFSC Product Divisions, AFLC Depots, and DOD contractor engineering working levels.

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