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MANAGEMENT INFORMATION SYSTEM
FOR ESD PROGRAM OFFICES

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B.S.



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March 1978

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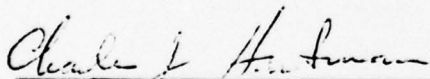
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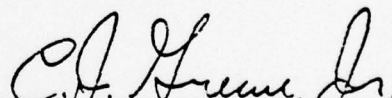
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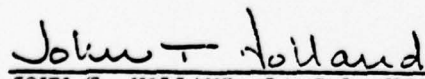
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PREFACE

This report documents the results of the first phase of a three-phase study to identify the System Program Office (SPO) management information needs and to define the requirements for an integrated information system within the ESD system acquisition environment. The second and third phases of this project were not accomplished due to the lack of funds.

Phase 1 was to determine the management information system (MIS) requirements necessary to support SPO needs. Phase 2 was to evaluate government-owned MISs relating to satisfying those requirements identified in Phase 1 and to determine if the data input requirement for the MIS can be satisfied from a previously developed Computer-Aided Design and Specification Tool (CADSAT) data base. Phase 2 also was to recommend whether or not automated linkage is possible between the MIS and CADSAT. Phase 3 was to make recommendations for the implementation of the MIS under several suboptions.

Since this report is based upon only the tasks accomplished during Phase 1, the contents must be evaluated as tentative results. The pursuit of the perceived needs of management personnel documented in this report may or may not yield

tangible benefits. Further work is necessary in this area and should concentrate upon the purpose of existing management information systems and their application to SPO needs, with an emphasis on new management techniques.

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SECTION 1

INTRODUCTION

1.0 Overview

This section presents the purpose, scope and background associated with this report.

1.1 Purpose

The purpose of this project has been to evaluate ESD program office management-information-system (MIS) (1) capabilities and needs and to define the requirements for an integrated information system for ESD program offices.

1.2 Scope

This project has resulted in establishing requirements for an integrated ESD program office MIS which can provide the program director with information concerning project budget and expenditures, schedules, and tracking

(1) NOTE: Three abbreviations are used in this report for the program office management-information-system. These are MIS, mis, and mainsy.

capabilities. The requirements definition of this integrated MIS was developed using a computer-aided analysis technique, and the reports describing this integrated MIS are presented as part of this report (Appendices 40 through 80).

1.3 Project Background

ESD/TOI has been developing a set of automated tools for assisting ESD program office system acquisitions. In addition, ESD staff offices and program offices have developed special purpose data base systems to support their particular system acquisition efforts. The task undertaken in this study was to evaluate the technical nature of the data base management systems employed at ESD and to determine the functional requirements for an integrated MIS which could be used by a majority of ESD program offices for meeting their management and reporting needs.

One point should be remembered when reviewing the requirements definition of the MIS presented in this study. This report summarizes the MIS capabilities envisioned by the ESD staff and program office personnel interviewed. The data base developed represents the definition of requirements that the interviews revealed. Although additional phases associated with this study were planned, they were not

accomplished because of the loss of ESD/TOI project funds allocated to this study. In particular, the MIS design activities would have been accomplished in the later phases of the project. Therefore, the MIS requirements identified herein need additional review before any design and implementation can proceed. In essence, the MIS represented in this technical report is an "ideal" concept as envisioned by the ESD personnel interviewed and as evaluated by the study personnel.

SECTION 2
TECHNICAL APPROACH

2.0 Introduction.

This section describes the technical approach (Figure 2-1) used to determine the management information needs envisioned by several program offices at ESD.

The objective of the effort has been to identify automated MIS requirements which can enable program offices to maintain better cost and schedule control. "Requirements" as used in this report are those specific capabilities to be included in a system. These requirements can be measured and readily tested. The requirements defined at this stage are "ideal"; additional effort is necessary to reduce the requirements to those which can be realistically implemented. An MIS is used in this report to mean any manual, semi-manual, or automated information processing activities in support of management. Management information covers a broad range of areas. For the purpose of this study, the focus was on costs and schedules. A review of other requirements was accomplished to determine the management context in which cost and schedule information is being used.

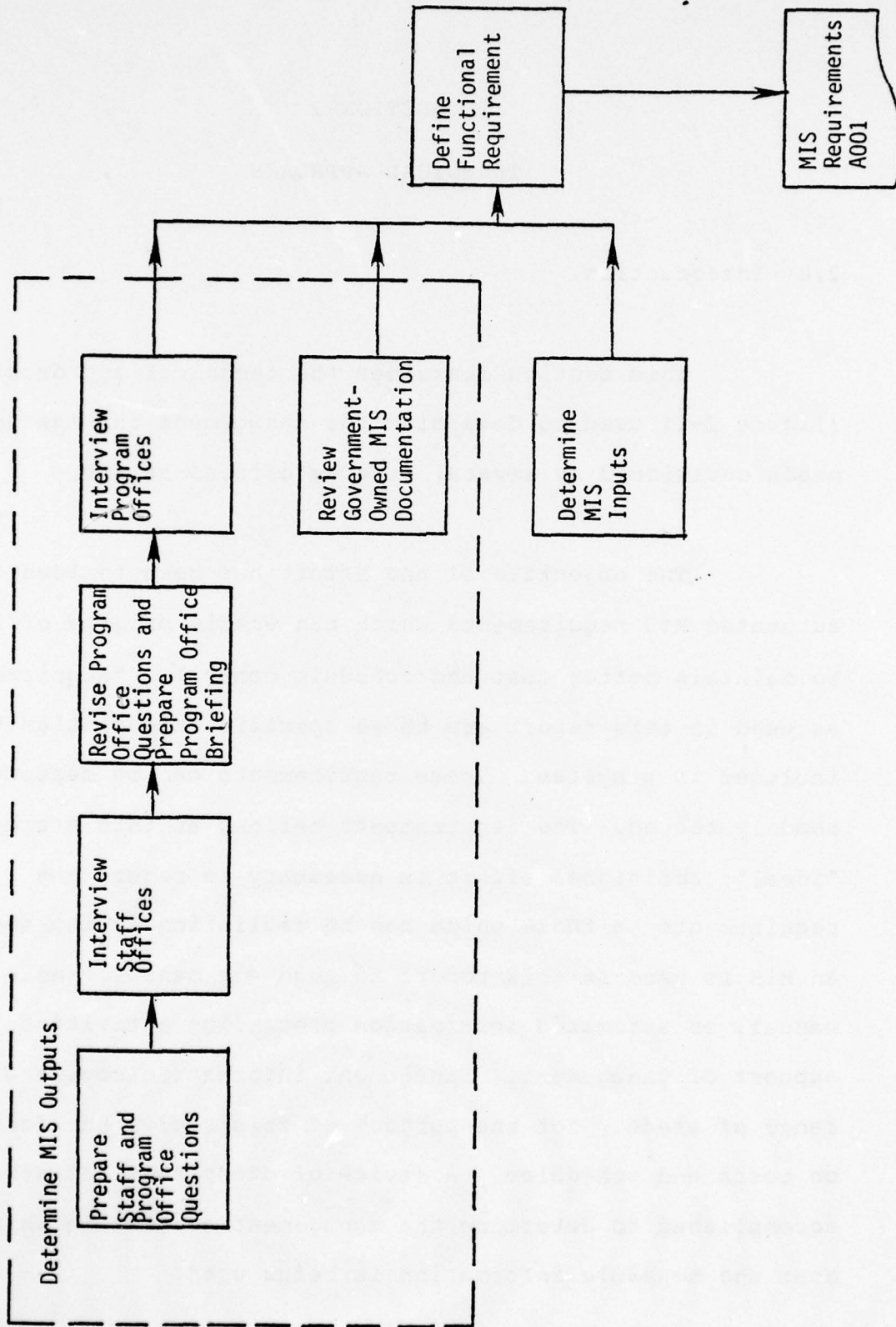


Figure 2-1. Technical Approach

2.1 Determine Management Information System Outputs

The key to an integrated MIS is the representation of both technical and management data in a common data base (not necessarily a single physical data base). Technical and management data necessary for effective control of these projects was determined as a result of interviewing staff and program offices at ESD. The outputs of any MIS that would fulfill the needs of a user must by necessity be a derivative of his informational need. During the course of this study, ESD/TOI identified those staff and program offices which were interviewed. A guideline for the program office interviews was prepared (Appendix 10), and four ESD program offices were interviewed. The results of these interviews are presented in Section 3 and Appendices 20 and 30 of this report.

2.1.1 Prepare Staff and Program Office Interviews

The objective of the staff office interviews was to obtain information about ESD program offices in several areas. The staff offices are capable of identifying the operational environment of the ESD program offices. Inputs from staff offices were used to aid in the program office interviews. Information required from and provided to the program offices by the staff offices was identified.

Since the objectives of the staff and program office interviews were slightly different, a somewhat different interviewing technique was used. While the program office interviews were more guided and structured, the staff office interviews were more informal.

2.1.2 Interview Staff Offices

Staff office interviews covered four general questions:

- o What information is required by program offices in reporting outside the program office?
- o What information is provided to the program offices by the staff offices?
- o What aid and assistance do the staff offices provide to the program offices?
- o What areas of an MIS should the study concentrate upon?

2.1.3 Revise Program Office Questions and Prepare Program Office Briefing

While interviewing the staff offices, the program office interview guideline was revised as new inputs were obtained. Approximately one week after the end of the staff

interviews a final draft of the program office interview guideline (Appendix 10) was completed. At this time a general review meeting was scheduled to solicit comments from TOI and the staff offices interviewed.

A rough draft of a briefing to the selected program offices was prepared a week preceding this review meeting. This briefing was to explain the purpose and scope of the study, and how it was being accomplished. The briefing concentrated on the program director's information requirements.

2.1.4 Interview Program Offices

As mentioned previously, the emphasis of this study was on costs and schedules. Therefore, the program office interviews were organized to address these two areas in detail with the program director and his business management office. As a result of the emphasis on costs and schedules the following categories were identified:

- o Primary Concerns - These concerns include costs and schedule areas in which minimum automation assistance is available.

- Cost
- Schedules
- Data Management

- Planning

o Secondary Concerns - These concerns include areas where the government has developed automated capabilities. However, these capabilities require further development, application, training, and organizational acceptance. These secondary concerns impact several of the primary concerns listed above and have been included in order to aid in understanding the primary concerns, specifically costs and schedules.

- Requirements Analysis

- Requirements Traceability

- Configuration Control

- Clerical Assistance, e.g., automated documentation

In the categories identified by the program office directors, two major areas were investigated:

o Reports currently used

o Information desired but not available

For those requirements identified other determinations were made such as:

o Frequency of need

o Current status of capability (e.g., manual or automated)

o Automation desirability

o Use of the information

o User of the information

The program office's business management personnel were relied upon for detailed information to assist in these determinations.

2.1.5 Review Government-Owned MIS Documentation

In parallel with the preparation for the interviews and during the interviewing, documents of government-owned management information systems were reviewed. The ESD and National Technical Information System (NTIS) automated libraries were searched on the subject of management information. The large number of abstracts identified by the search were reviewed. The relevant documents reviewed are listed in the selected bibliography (Appendix 90).

2.2 Determine MIS Input

MIS inputs were defined which correlated with output data gathered in the interview task. Subsequently, the inputs were further broken down to locate the specific sources of their origin. At this point in the study, the minimization of the quantity of input data was not an objective. Some reduction of the input data was achieved during the course of the MIS requirements definition.

Additional analysis and the reduction of the quantity of input data was planned for in a later phase of this project but was not accomplished due to early termination of this study.

2.3 Define Functional Requirements

The definition of the functional requirements of the MIS began by analyzing the results of the ESD staff and program office interviews. In analyzing the interview data, the information system aspects required by regulations or directives were extracted. In addition, those aspects which the program office directors believe are required for the effective program office management and technical functions were identified. Once all the required and desired management system outputs were identified, a computer data base description of each output was developed. As a separate task, the information which the program offices receive (inputs) was identified and a data base definition of each input was also developed. The relationships between the outputs and inputs was not a primary consideration. At this point in the study, it was the intent to define these independently. The next step was to define the high-level functions which link the inputs and the outputs together. These functions and the input/output definitions at this

stage were characteristically high level functional requirements and represented the high level relationships without consideration or emphasis on implementation aspects. In essence, the data base definition represented only the global functional requirements of the MIS. This approach provided the means of generating a definition of the MIS requirements as revealed by the interview and analysis activities without being troubled with the problems of inconsistencies and incompleteness. More importantly, however, the data base represented a complete repository of all the information identified or associated with the MIS as a result of the interviews and subsequent analysis.

At this point in the study, the process of reducing the global aspects of this MIS definition could proceed. The clarification of the requirements proceeded in an iterative manner. As more refinements were generated, the data base definitions were corrected, and the impacts on other aspects of the MIS were determined and refined. At the conclusion of the initial phase of this study, and as represented in this report, the definition of the MIS requirements represents a range of detailed information from high-level global aspects to intermediate and lower-level functional requirements. This refinement process was a continuing aspect of this phase of the study, and it was an aspect that would have continued into the later phases of this project.

SECTION 3

SUMMARY OF ESD INTERVIEWS

3.0 Introduction

During the course of this project, discussions were held with several ESD staff and program offices to identify the management information requirements which each of these offices believe need improvement. Discussions were held with two ESD staff offices (the Directorate of Acquisition Support, and Technical Integration Division (TOST)) and four divisions within the Comptroller's Office (AC). Four program offices were also interviewed. They were OCN/TRACALS, OCL/PAVE PAWS, DCV/SATIN IV, and YW/E-3A (AWACS). This section summarizes the findings of these separate interviews. A complete description of the interviews is presented in Appendices 20 and 30 of this report.

3.1 TOST Interviews

TOST emphasized the need for standardization of the information exchanged between all agencies and commands involved in the acquisition process. Although liaison personnel have proven to be useful conduits for intra-command

communications, the exchange of information across commands and agency lines needs improvement by standardization of terminology.

From TOST's point of view the information areas of special concern are as follows:

- o Standardization of terminology, Automated Data Processing data elements and computer programs for similar systems in order to enable collection and comparison of cost/schedule data.
- o Common hierarchies for operational requirements, system hardware/parts, system software (Computer Program Configuration Items), functional specialties (Work Breakdown Structure, engineering specification trees, configuration/engineering change proposal accounting, work unit codes, parts breakdown and provisioning lists).
- o Development of efficient, user-oriented optimum repair level analysis and logistics support analysis computer programs
- o Development of realistic life-cycle-cost models

3.2 AC Interviews

The concerns of the four offices interviewed within the Comptroller's Office are similar. Therefore, the results of these interviews are presented collectively for AC rather than individually. From AC's point of view the specific management information concerns for program offices are

estimating, scheduling, budgeting, planning, analyzing, and forecasting.

First, the schedule and cost estimating process should be standardized. A single methodology applied to each program office can provide a savings in the manpower required to generate the estimates, decrease the workload of the staff office, and provide for a better understanding between the program office and the staff personnel. The development of a single methodology facilitates feedback leading to refinements which will increase budgeting accuracy.

Second, determination of tasking and manpower requirements is manually accomplished and needs improved methods.

Third, detailed budgeting methods for annual budget submissions need to be developed, and the budgeting process performed by the staff and program office needs further definition and improvement.

Fourth, not only does the program office need the assistance of computer-aided tools in the preparation of various plans and documents, but there is also a real need for identifying the inconsistencies between various planning

activities. The development of the project planning information should allow for an interface between planning activities, as well as provide the ability to determine the impact of system requirement changes (e.g., on budgets and schedules).

Fifth, the program office should be able to communicate progress to external agencies or other commands.

Finally, the program office should be able to project future problems (e.g., in schedule and cost) in order to make necessary adjustments.

3.3 ESD Program Office Interviews

Four ESD program offices were interviewed during the course of this project. They were OCN/TRACALS, OCL/PAVE PAWS, DCV/SATIN IV, and YW/E-3A. Each of these program offices identified two primary areas of concern: timeliness of cost data received from the contractor, and processing engineering change proposals (ECPs).

First, the cost data available from contractors through CPRs, CSSRs, and CFSRs does not satisfy the program office's informational needs nor the requirements to report

progress to higher command levels. In most cases this data lags weeks behind the real events. A more timely means of transmission and evaluation of contractor cost data is needed.

Second, ECP review consumes a considerable amount of program office human resources. The number of ECPs being processed is increasing in the program offices interviewed; however, the methods employed in the review process are primarily manual. The ability to track the ECP process and to evaluate an ECP's impact on the established requirements of the system, as well as on cost and schedule, were identified as primary concerns. Automation was viewed as highly desirable.

Finally, one program office (OCN) identified the need for the ability to produce contract documents (Statements of Work, and Specifications) in a more methodical fashion. Information system assistance in this area has been accomplished in some ESD program offices, but has not been addressed on a more global basis within ESD. This need is more apparent in basket program offices such as OCN, where more than one system specification and statement of work is being developed at a given time. However, the need is apparent in all program offices when the development of a

specification or statement of work is initiated. At this time, each ESD program office proceeds with the RFP preparation by a manual process which requires attention to numerous contracting regulations at the same time the program office is attempting to finalize the user's requirements. Assistance in requirements definition and contract document preparation was identified as being an area where information processing can make significant contributions to the ESD acquisition process.

SECTION 4

DISCUSSION OF MIS REQUIREMENTS

4.0 Introduction

This section presents the functional requirements of an integrated MIS for the control of technical and management data within an ESD program office. The MIS requirements were developed using a computer-aided analysis tool. In order to facilitate the understanding of the MIS requirements produced by this analysis tool, this section begins with a brief description of the tool and its report-generation capabilities. Once these general concepts have been introduced, the actual MIS requirements are presented in a series of computer-generated reports with supporting text.

4.1 CADSAT Overview

The MIS requirements associated with this study were defined and analyzed by project personnel employing a computer-aided analysis tool called Logicon Extended CADSAT (Computer-Aided Design Specification and Analysis Tool).

CADSAT is a large computer program package which has evolved from university research (1) concentrating on developing a means for describing information processing systems and for recording and analyzing the descriptions in a machine processable form. In 1973 ESD/TOI initiated an advanced development project to acquire a computer assisted requirements analysis capability which would facilitate the system requirements definition activities in ESD system program offices. CADSAT was acquired as a result of the ESD/TOI advanced development project and has been used experimentally in several ESD program offices, most notably the Joint Surveillance System (JSS) program office. CADSAT was used during the course of this project to define:

- o the functions of the MIS
- o the quantities of data flowing into, within, and out of the MIS
- o the interface points between the MIS and its environment
- o the attributes (values) of the MIS functions, interfaces, and data

(1) University of Michigan has developed software under ESD/TOI contract F19628-76-C-0197 to support CADSAT. Also other related work is performed under the University of Michigan ISDOS Project. The extended version used in this project is a modification developed by Logicon under ESD/OCU contract F19628-76-C-0218 to facilitate applications to large military systems.

The MIS requirements were not entered directly into the computer in their original conceptual form. CADSAT requires that the functional requirements entered into CADSAT computer files be organized into a hierarchical model representing the top down functional breakout of the system being defined. The methodology associated with CADSAT further requires the generation of unique names for each function in the model. In addition, the data flowing into, within, and out of the MIS being defined must be explicitly identified. Once the MIS model was determined, it was entered into CADSAT computer files by following prescribed format conventions and by typing the information into computer files via interactive communication terminals. The MIS requirements files were then utilized by other CADSAT computer programs which analyzed the requirements definition and generated various reports. The process of CADSAT report generation, review/analysis, and updating the computer requirements definition data base continued for several iterations. This methodology provided for visibility into the MIS definition.

CADSAT provides a means of describing information system requirements by the identification of a number of types of objects and the relationships between them. Objects

which are involved in creating, storing, or using the information from the MIS are identified (INTERFACES or REAL WORLD ENTITIES). The physical units by which data enters or leaves the MIS are identified (INPUTS and OUTPUTS). Units of data are described (SETS, ENTITIES, GROUPS, and ELEMENTS) followed by the functions (PROCESSES) which operate on the data. The dynamic aspects of the MIS are described by stating the conditions which trigger events over time and the activities which result from the events (CONDITIONS and EVENTS). Finally, the size of the MIS is described by stating the parameters which define size (System Parameters). Each of these aspects is more fully described in the following paragraph.

The CADSAT MIS requirements definition includes three basic components as illustrated in Figure 4-1. These are the MIS PROCESS structure, MIS data structures, and the relationships between the MIS PROCESSES and data.

First, the MIS functions (1) are organized in a top-down hierarchical manner. That is, the top function (PROCESS) is the management-information-system. Under this PROCESS are other PROCESSES. The hierarchical breakout of PROCESSES (process structure) continues for as many other additional lower PROCESS levels until the functions of the

(1) Note: For the purpose of this study, CADSAT PROCESSES are equivalent to MIS functions

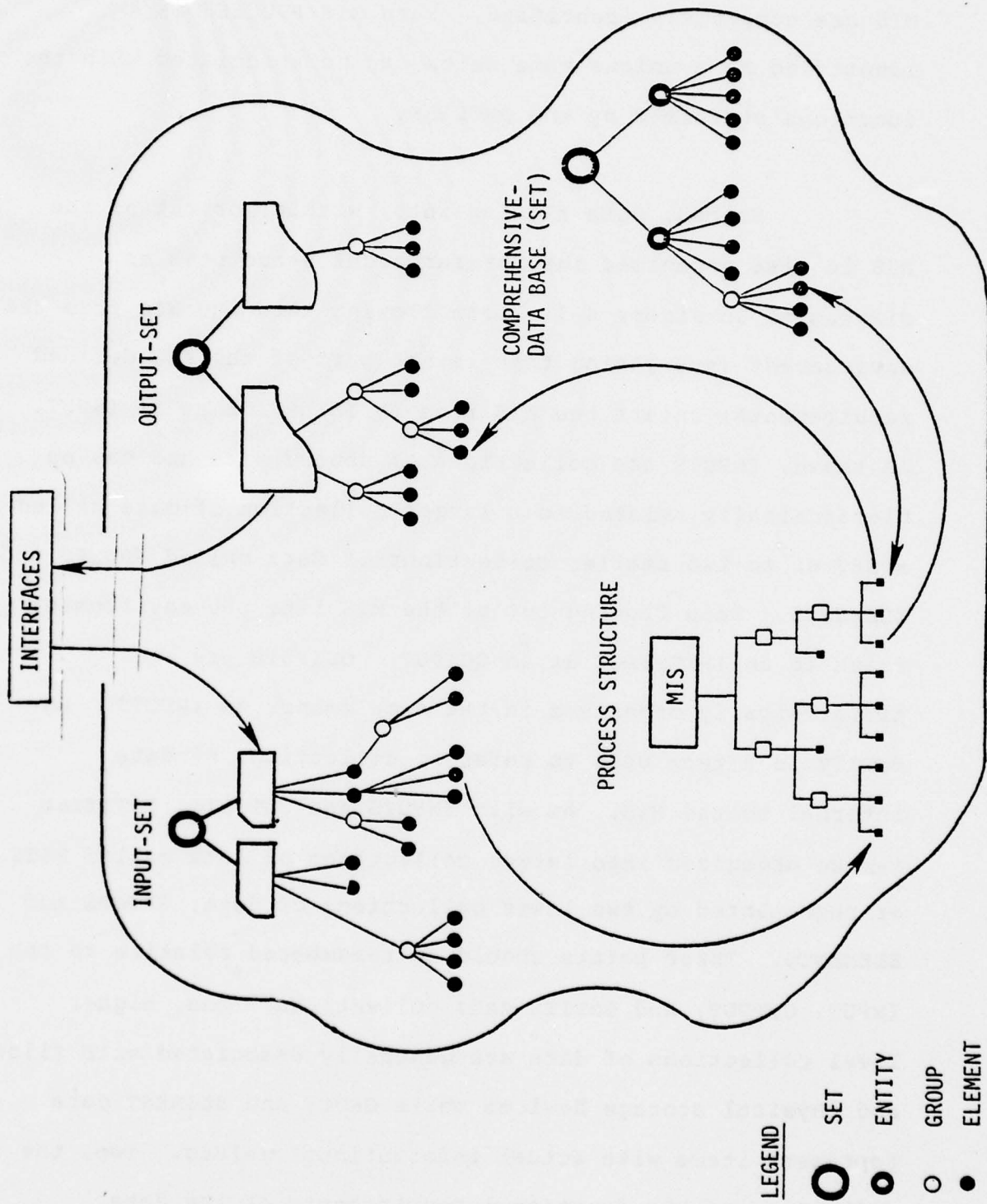


Figure 4-1 Schematic Diagram of CADSAT defined MIS, Structures and Data Flow

MIS are completely identified. Each MIS PROCESS is identified by a unique name which can be associated with the functions performed by the PROCESS.

Second, data flowing into, within, or out of the MIS is also organized into hierarchical structures as diagrammed in Figure 4-1. Data flowing into the MIS from the environment (everything that is not part of the MIS defined requirements) enters the MIS from an INTERFACE as an INPUT. As shown, INPUTS are collections of stored data and may be hierarchically related to a larger collection of data called a SET or to two smaller collections of data called GROUPS and ELEMENTS. Data flowing out of the MIS into the environment exits to an INTERFACE as an OUTPUT. OUTPUTS are hierarchically organized in the same manner as INPUTS. An ENTITY is a term used to refer to collections of data internal to the MIS. As with INPUTS and OUTPUTS, ENTITIES can be organized into larger collections of data called SETS or represented by two lower collections of data, GROUPS and ELEMENTS. Three points should be remembered relative to the INPUT, OUTPUT, and ENTITY data collections. One, higher level collections of data are generally associated with files and physical storage devices while GROUP and ELEMENT data represent items with actual informational values. Two, the definition of the functional requirements of the data

structures (also process structure) proceeds from the top of the hierarchy structure and continues down until the level of detail satisfies the known requirements of the MIS. That is, some branches of these structures will naturally extend beyond the level of detail of other branches in the same structure as the definition of the MIS requirements are identified and entered into the computer files. Third, the relationship between higher levels of PROCESSES more directly corresponds to the higher levels of the data structures.

Finally, the third component of the CADSAT MIS requirements definition includes information which describes the relationships between the PROCESSES in the process structure and the various data sublevels contained in the input, output, and comprehensive-data-base SETS of the MIS. These relationships include linking the PROCESSES which receive/generate the information to INPUTS/OUTPUTS or internal units of information. This effectively defines the data flowing into, within, and out of the MIS as illustrated in Figure 4-1. In addition the dynamic behavior of the MIS is described by identifying the conditions or situations which trigger events and the actions which result in the events. Further MIS descriptions are included to define various MIS parameters such as size and other quantities or qualities of the MIS.

4.2 Overview of CADSAT Report Formats

This section describes five different types of CADSAT report formats. This description will facilitate the understanding of the specific CADSAT MIS reports at the conclusion of this section. Although the reports themselves appear to be complex in nature, they present the MIS requirements in a manner which illustrates the data base in a human readable format. The five types of reports selected are the Process Structure Report, the Formatted Problem Statement Report, the Contents Report, the Data Process Report, and the Name List Report. Each of these reports will be described in general terms in the following subsections. These descriptions provide a brief but detailed understanding of each report format; however, the reader, who desires only an overview of the MIS reports contained in this study, is encouraged to skip this technical discussion and proceed to section 4.3 where the specific reports describing the MIS are presented.

4.2.1 Process Structure Report

The purpose of the process structure report is to present the hierarchy of PROCESSES (functions) defined in the

MIS. This report format is an aid to analysts in maintaining consistency in the MIS process structure using the CADSAT methodology. Since the MIS process structure is defined in a top down approach, the project analyst can review the process structure report to determine that all the PROCESSES have been defined, named correctly and inserted into the hierarchical breakdown at the proper level. The process structure report presents the process structure under three headings: COUNT, LEVEL, and NAME. NAME presents the name of the PROCESS in the structure, LEVEL presents the level number associated in the name corresponding to its position in the process structure, and COUNT presents the position (line) in the report where the PROCESS name is printed out. Each level is indented to further accent the idea of a hierarchical breakout of the MIS. A summary section for the report provides a count (under the COUNT heading) of the number of names presented at a given level (as designated by the LEVEL heading).

4.2.2 Formatted Problem Statement Report

The purpose of the formatted problem statement is to present all descriptive information about any one or more names in the MIS requirements data base. This report presents all information available for all selected PROCESS

names in the data base and its relationships with other objects in the data base. The format of this report is easily understood by observing those included in Appendix 50. A formatted problem statement of all MIS names effectively gives a complete output of the MIS requirements data base.

4.2.3 Contents Report

The purpose of the contents report is to allow the analysts to view the entire data structures (all levels) described in the CADSAT MIS requirements definition data base. The contents report presents a hierarchical breakout of all levels of data below selected data types (ENTITIES, INPUTS, OUTPUTS, SETS). All names which these types consists of are designated as level 2 names. This hierarchical breakout continues to all sublevels until the data structure of the selected data types are completely presented. Each name of the selected data type is identified by a number (1*, 2*, etc.) designating its position in the hierarchical list.

4.2.4 Data Process Report

The purpose of the data process report is to show the interaction between MIS information (data - SETS, INPUTS, OUTPUTS, ENTITIES, GROUPS, ELEMENTS) defined and the

MIS PROCESSES. The report also shows the data dependencies among MIS PROCESSES and possible deficiencies in the descriptions of the MIS PROCESS. The data process report generated for this study presents all the data required for each particular MIS PROCESS. This form of data process report aids in identifying PROCESS names which do not interact with data or are not consistently defined with respect to the manner in which they use data. The data process report focuses on two matrices generated by CADSAT using the MIS requirements definition in the computer.

The first matrix (data process interaction matrix) shows the relationships between data types (SETS, INPUTS, OUTPUTS, ENTITIES, GROUPS, ELEMENTS) on the left hand edge of the matrix (rows) and the MIS PROCESSES which are itemized across the top of the matrix (columns). The relationship of a data type to a PROCESS is identified in the matrix by an entry value (r, u, d, a, f, 1, or 2) at the intersection of a row and column. The legend of these entry values is included in the report listing. The second matrix (data process matrix (incident)) produced in the data process report shows the relationship between each PROCESS to all other MIS PROCESSES based on the information contained in the first matrix. (1) In this square formatted matrix (the rows and

(1) Note: This implies that the second matrix does not indicate all the relationships between the PROCESSES

columns are numbered identically and represent the PROCESSES in the columns of the first matrix) an asterisk(*) at the intersection of a particular row and column of the matrix designates that the PROCESS represented by the row derives or updates some information which is used by the PROCESS represented in the column.

4.2.5 Name List Report

The purpose of this report is to present an alphabetized list (dictionary) of all names in the MIS requirements data base. The name type (ATTRIBUTE, ATTRIBUTE-VALUE, CONDITION, EVENT, INTERVAL, SET, INPUT, OUTPUT, ENTITY, GROUP, ELEMENT, PROCESS, INTERFACE, and others) and the synonyms associated with each name are presented in columns on the report. This report format is easily understood by observing the name list included in Appendix 80.

4.3 Detailed CADSAT Description of the MIS

The purpose of this paragraph is to describe each MIS report included in Appendices 50 through 80. Since the five report types have been described in the preceding paragraphs, the descriptions contained in the following

paragraphs will concentrate on certain key points concerning the MIS.

As stated earlier, the requirements definition of the MIS presented in this study and the CADSAT-generated reports presented in the appendices should be reviewed with the following points in mind. This study represents the results of the definition of the MIS capabilities envisioned by the ESD staff and program office personnel interviewed. The data base developed represents the complete set of requirements revealed by the interviews. The MIS requirements identified herein would need additional review before any design and implementation of a MIS could proceed. In essence, the MIS represented in the following reports shows the "ideal" concept as envisioned by the personnel interviewed and as evaluated by study personnel.

4.3.1 MIS Process Structure Report

The MIS Process Structure (Appendix 40) represents the hierarchical breakout of all PROCESSES (functions) of an ESD program office MIS. As seen in this report, the MIS is broken down into three level 2 PROCESSES: (count 2) user-functions, (count 45) operations-support, and (count 56) mis-maintenance. Each of these level 2 PROCESSES is again

broken down into more subprocesses. Each subprocess further identifies the functions of the PROCESS immediately above and, as stated earlier, the sum of the functions of the PROCESSES at any level in the process structure represents the total functions of the PROCESS at the next higher level. For instance, the MIS, user-functions, reporting-capabilities are (count 4) life-cycle-cost-analysis, (count 9) financial-planning-tracking, (count 14) schedule-planning-and-tracking, (count 20) requirements-analysis, (count 29) traceability-analysis, (count 35) configuration-accounting, (count 36) ecp-impact-analysis, (count 37) problem-tracking, and (count 40) user-requested-nonstd-analyses. Review of the process structure in conjunction with the detailed information contained in the formatted problem statement report (section 4.3.2 and Appendix 50) will provide a complete description of each PROCESS and its functions.

4.3.2 MIS Formatted Problem Statement Report

As discussed earlier, the formatted problem statement report merely dumps all the available information on each object desired in an easily readable format. The report included in this study represents the data known for all the MIS PROCESSES. For example, the PROCESS (function)

for the MIS can be found between lines 1 and 11 of this report (Appendix 50). This section of the report identifies the PROCESS name (management-information-system), synonyms (mainsy, mis), textual description, and the subparts (PROCESSES below the MIS, i.e., subprocesses). In another example, the problem-tracking PROCESS section of the formatted problem statement (lines 393 - 405) is linked to a memo by a CADSAT statement in line 401. The actual memo (problem-tracking-examples) appears between lines 416 and 428. In addition, the problem-tracking PROCESS is a subprocess to the reporting-capabilities PROCESS (line 404)

4.3.3 MIS Contents Reports

A thirty page contents report has been included in this study. This is the contents report for the MIS selected data types (ENTITIES, INPUTS, OUTPUTS, and SETS) as described in section 4.2.3.

The contents report included in Appendix 60 is divided into three SETS: the input-set, output-set, and comprehensive-data-base. The MIS input-set is presented in the first section of the report (level 1: 1*, lines 1 through 200). This section is followed by the output-set (level 1: 2*, lines 1 through 577). The last SET is the

comprehensive-data-base (level 1: 3*, lines 1 through 222). For each of these three sections, the level 1 data types are broken down into additional levels (2,3,4,5,6). The following example demonstrates how to read the contents report. The input-set (1*) can be broken down into ten level 2 INPUTS (lines 1, 55, 100, 132, 151, 167, 184, 198, 199, 200). The system-acquisition-plan-init (INPUT, line 1) is further broken down into thirty (level 3) groups and elements.

INPUTS flow into the MIS from the environment (everything that is not part of the MIS defined requirements) from an INTERFACE. These MIS INPUTS (input-set, 1*) are collections of stored information which are hierarchically broken into successive levels much like the process structure.

The MIS OUTPUTS in this report (output-set, 2*) represent the information which flows from the MIS to the environment (to an INTERFACE). MIS INTERFACES represent all objects which are involved in creating, storing or using the information flowing into or out of the MIS. These may be organizations, persons, or devices belonging to other systems.

Finally, the last SET (comprehensive-data-base, 3*) represents that information which is entirely within the MIS environment. This information is accessed by the MIS PROCESSES in accomplishing its functions.

4.3.4 MIS Data Process Report

As described earlier, the data process report represents the relationships of information (data) in the MIS to the MIS PROCESSES by means of a matrix called the data process interaction matrix. In addition, a second matrix contained in this report (the process interaction matrix (incidence)) shows the relationship of each MIS PROCESS to all other MIS PROCESSES. The remainder of this section will describe some aspects of the two matrices contained in the MIS data process report (Appendix 70).

First, the data process interaction matrix represents the relationships between the MIS information (data - SETS, INPUTS, OUTPUTS, ENTITIES, GROUPS, ELEMENTS) defined and the MIS PROCESSES. The side of the matrix (rows or i) represents the MIS information (data), while the top of the matrix (columns or j) represents the MIS PROCESSES. The matrix is preceded by a complete list of row (data types) and column (PROCESSES) names. The relationship between each MIS

information type and the MIS PROCESSES is identified in the matrix by an entry value (r, u, d, a, f, l, or 2) at the intersection of a row and column. The legend of these entry values is presented immediately above this first matrix in the report. The following three examples demonstrate how to interpret the data process interaction matrix presented in this study (Appendix 70). As seen in this report, the weekly-cost-updates (GROUP, row 24 or i) is received or used by the MIS generate-cfsr function (PROCESS, column 11 or j) according to the entry value (r) in the matrix at the intersection of the row (24) and column (11), page 70-7. In addition, this same GROUP is also received or used by the MIS generate-cpr function (PROCESS, column 10 or j). A third example is the current-cfsr-report-date (ELEMENT, row 31 or i) which is updated by the MIS generate-cfsr function (PROCESS, column 11 or j), page 70-8.

The second matrix presented by the data process report is the process interaction matrix (incidence). This report merely shows the relationships between each MIS PROCESS (as itemized in the columns of the first matrix) to all other PROCESSES in the MIS. (1) In this square formatted matrix the rows and columns represent all MIS PROCESSES. Where an asterisk(*) appears in the intersection of a row and

(1) Note: This implies that the second matrix does not indicate all the relationships between the MIS PROCESSES, but merely those which are exhibited by the first matrix.

column, it means that something derived or updated by a PROCESS on the side of the matrix (row or i) is used by a PROCESS on the top of the matrix (column or j). For instance, something derived or updated by the input-processing-capabilities function (PROCESS, row 33 or i) is used by the generate-network-data function (PROCESS, column 16 or j), page 70-20. (1)

4.3.5 MIS Name List Report

The MIS name list report (Appendix 80) is the final report included in this study. This report merely presents all the names in the MIS (data types, PROCESSES, and others) in alphabetical order. This report is easily understood by observing the name list included in Appendix 80.

(1) Note: The apparent lack of information contained in the MIS interaction matrix (incidence) contained in this report is due to the generation of this type of report by CADSAT as described in the previous note.

SECTION 5

SUMMARY OF RESULTS and RECOMMENDATIONS

5.0 Introduction

This section presents a summary of conclusions and recommendations concerning the requirements for an integrated MIS for ESD program offices.

5.1 Summary of Results

This section presents a list which summarizes the program office MIS needs relative to four areas: cost/budgeting, scheduling, ECP evaluation and control, and plans and contract preparation/control. There is considerable overlap between these areas, as should be expected in an integrated information system. This overlap is evident in the MIS functional requirements presented in section 4 and the appendices. These four areas are summarized in the following subsections.

5.1.1 Cost/Budgeting: Program offices and ESD staff offices emphasized the following cost and budgeting needs:

- developing a standardized cost estimating process

- generating realistic life cycle cost models
- generating the annual budget call submissions
- determining the status of project cost (tracking cost)
- determining the cost impacts of requirement changes and performance deviation (e.g., projected cost adjustments, loss of funds, underruns, overruns)
- projecting future cost problems from analysis of available information
- receiving accurate and timely cost expenditures (labor hour expenditures)
- developing standard terminology between various system acquisitions regarding cost preparation and reporting

5.1.2 Scheduling: Program offices and ESD staff offices emphasized the following scheduling needs:

- developing a standardized schedule estimating process
- determining the status/progress of the project
- determining schedule adjustments resulting from requirement changes and performance deviation.
- projecting future schedule problems from analysis of all available data
- developing standard schedule terminology across similar system acquisitions

5.1.3 ECP Evaluation and Control: Program offices emphasized the following ECP needs:

- determining the impacts of ECPS on system requirements
- determining the status of all ECPS in the program office (ECP tracking)

5.1.4 Plans and Contract Preparation/Control: Program offices and ESD staff offices emphasized the following planning and contract preparation needs:

- developing a standardized approach for defining the functional and component breakouts of systems
- developing a means of assessing the impacts of requirements changes to established plans and documents (Specifications, etc)
- developing a means of identifying the inconsistencies and incompleteness of the system requirements
- ability to produce plans and contract documents in a timely manner (clerical functions)

5.2 Recommendations

5.2.1 Automate a Standardized Cost Method

A consistent analytical methodology to forecast financial requirements of a system is needed. This process can best be accomplished by automating certain aspects of the cost estimating and budgeting activities, and integrating the information into a program office MIS which would be

responsive to the unique requirements of each acquisition, the program office personnel, and the external informational needs of concerned commands and staff agencies.

5.2.2 Provide ECP Support

Although an MIS cannot replace the technical evaluation of an ECP by the analyst, certain features of an automated system can facilitate other activities associated with the ECP evaluation and approval cycle. These features are the ability to maintain accurate tracking histories or records of ECPs handled by the program office and the ability to do impact analysis of an ECP relative to the systems requirements definition.

5.2.3 Provide Management Tracking

There is a general need for many other automated tracking features within the program office. In addition to the ECP tracking function, there are requirements for maintaining records, and reporting on a variety of subjects:

- Manpower planning, control (manpower-schedule)
- Project scheduling, control (milestone-schedule and network-chart)
- Deliverables scheduling, control, reporting (cdrl-schedule)

- ECP evaluation, control, reporting (ecp-impact-analysis and ecp-status)
- System requirements analysis
- Text processing, contract document preparation

5.2.4 Pursue a Prototype Application

In order to proceed beyond this study, it is recommended that some prototype application be pursued with a single ESD program office. A prime target for this prototyping would be the E-3A program office which is one of the largest acquisitions currently employing several MIS functions: weekly cost estimating, CDRL tracking, and data access by the contractor.

5.2.5 Need for Joint Involvement

Finally, the need for an integrated MIS at ESD is closely tied to the activities of the program office and the requirements peculiar to the ESD method of system acquisition. The successful application of any integrated MIS will depend on the interest and capabilities of an ESD support agency or contractor in establishing a prototype MIS. The involvement of a staff office would facilitate the applications of the MIS to other program offices, and remove

this burden from the target program office.

APPENDIX 10

PROGRAM OFFICE INTERVIEW GUIDELINE

1. What are the primary SPO Director decisions?
 - o Criticality
 - o Frequency
 - o Desirability of more or better information
2. What reports/reporting currently supports each decision in item 1, if any?
 - o Formal
 - o Informal
 - o Internal
 - o External
 - o Basis for requirement (AFR, etc.)
3. How is each item in 2 reported?
 - o Detail
 - o Summary
 - o Hard Copy (standard form, letter)
 - o Verbal (briefings)
4. When is each item in 2 reported?
 - o Daily
 - o Monthly
 - o Quarterly
 - o Annually
5. Who is each item in 2 reported to?
6. What is the input for each item in 2?

7. what is the source of input for each item in 2?
- o Contractor
 - o SPO
 - o Other (AFSC, TOST, ACE, ROC, PMD, OEP, etc.)
8. In what form is each input originally?
- o Detail
 - o Summary
 - o Hard Copy (Status Report)
 - o Verbal (briefings)
9. At what level(s) in the decision-making process is the information used?
10. What is the disposition of each item in 6 after the reporting requirement, for which it is used is fulfilled?
- o Disposed of, how?
 - o Filed
 - In what form?
 - How, if form of the information changes?
 - How long is this specified in the authority to be identified in question 1?
11. Which items in 2, if any, are automated?
- o How much?
 - o Where?
 - o Turn-around (from information query to system generated results)?
 - o Is it used?
12. Which items in 6, if any, are automated?
- o How much?

18. Request examples of each item in 1, 2, 6, 14, 16, and
17.

APPENDIX 20

ESD STAFF OFFICE INTERVIEWS

20.0 Discussions were held with the Directorate of Acquisition Support, Technical Integration Division (TOST) and four offices within the comptroller's office (AC).

20.1 One of TOST's primary concerns is minimizing life cycle costs. Part of this concern is an effort to increase management visibility across the life cycle, standardize information reporting, and increase the utility of information collected. TOST's official charter is as follows:

Serves as staff OPR in the areas of reliability, maintainability, availability, system/cost effectiveness, micro-electronics, quality assurance, configuration management, systems analysis, human factors, value engineering, engineering design reviews, computer programs acquisition management, system engineering management, test and evaluation, corrosion control, nondestructive inspection/testing, survivability/vulnerability, electromagnetic compatibility, and for laboratory support to ESD program offices.

TOST emphasized the development of standardization of information across the lines of management. At least four commands are involved in the development and operations of

Air Force systems. These are the implementing, operating (user), training and logistics (supporting-maintenance) commands. While intra-command communications is improved by the usage of liaison personnel, further improvements could be made by standardizing the terminology and processing of management information between the commands.

From TOST's point of view the information areas of special concern are as follows:

- o Standardization of terminology, Automated Data Processing data elements and computer programs for similar systems in order to enable collection and comparison of cost/schedule data.
- o Common hierarchies for operational requirements, system hardware/parts, system software (Computer Program Configuration Items), functional specialties (Work Breakdown Structure, engineering specification trees, configuration/engineering change proposal accounting, work unit codes, parts breakdown and provisioning lists).
- o Development of efficient, user-oriented optimum repair level analysis and logistics support analysis computer programs
- o Development of realistic life cycle cost models

20.2 Within the Comptroller's Office the two divisions and four offices which were interviewed have the following official charters:

- o Programs/Budget Division (ACB): ACBB is responsible for (1) the centralized direction, policy guidance, and

administration of the ESD budget formulation and execution, and (2) the ESD program to enhance the quality and performance of the people working in Business Management.

o Program Management Support Branch (ACBB): Serves as the focal point for policies and procedures affecting Business Management Office activities and organization. Plans, organizes, and administers the ESD training program for enhancing the quality and performance of Business Management personnel. Conducts Staff Assistance Visits to Business Management Offices to improve management practices, solve procedural problems, and promote a "lessons learned" crossfeed within ESD. Provides technical assistance in such areas as scheduling and documentation, supports the Resource Utilization Committee (RUC), and serves as the Secretariat for the Business Management Board. Works closely and in coordination with the Financial Management Branch to insure that the assistance being provided to Business Management Offices is responsive to the requirements of the budget formulation and execution process.

o Financial Management Branch (ACBF) Formulated, justifies, and monitors the execution of the ESD RDT&E, Aircraft Procurement, and Other Procurement Appropriations budgets. Serves as the focal point for the policies and procedures for financing the development and acquisition programs. Analyzes and reports financial trends, problems and financing proposals. Responsible for the Program Objective Memorandum, Annual Call (Budget Update), and presentations for the Hq USAF-Hq AFSC Program Financial Reviews and the ESD Business Management Board.

o Cost Analysis Division (ACC): Responsible for preparation of immediate and long range estimates of development, investment and operating costs in terms of programs and systems. Develops plans, programs, and schedules for the collection, validation, and analysis of cost data. Manage the Cost and Economic Aid Information System. Extends

technical cost estimating assistance to all System Program Offices, and participates in special cost studies parametric and economic analysis, and source selection evaluation studies. Assists with the development and implementation of Command policy for the Cost/Schedule Control Systems Criteria (C/SCSC) programs. Maintains the Selected Acquisition Information System.

o Cost Estimating and Analysis Branch (ACCE): Determines and validates resource implications of alternative courses of action through preparation, evaluation, and documentation of total cost and resources studies in support of planning, programming, and budgeting functions. Prepares resource estimates to support planning before the Systems Program Office (SPO) has been established, provides technical cost estimating assistance for established SPOs and cost analysis of selected ongoing programs. Validates and prepares recommendations concerning the adequacy of the data base methodology, documentation of estimates forwarded to higher echelons. Prepares independent cost estimates, participates in special cost studies and source selection activities as required. Maintains program/project continuity through functional alignment of cost estimating groups.

o Cost Management Systems (ACCI): Supports cost estimating requirements through data analysis and development of generalized cost estimating relationships, cost factors, learning curves, price and wage indices, and specific program studies. Conducts research, develops new or modified existing cost information and data systems, including mathematical models, other computerized systems and tools, data plans and work breakdown structures. Provides analysis of cost information at established milestones in the program life of selected on-going programs and acts as focal point for estimate tracking program. Reviews procurement packages for financial management requirements in conjunction with the Cost

Estimating and Analysis Branch. Collects, classifies, stores and retrieves historical cost data, including SAIMS, data, proposal and other cost reports. Provides Cost Library service to ESD, other AF Commands, and other DOD agencies. Provides focal point for SAIMS, to include Cost Information Reports (CIR) and contractor performance measurement activities. Provides support to SPOs and division staff in the implementation, evaluation, and validation of SAIMS, C/SCSC, MIL STD 881 (WBS), cost models, and other computerized cost estimating or information system. Develops, implements, and monitors command policy, procedures, and methods for Cost Schedule Control System Criteria (C/SCSC) program policy, procedures, and methods for contractor validation exercises. Participates in the command program to develop systems, tools and cost methodology to improve the efficiency and credibility of AFSC's cost analysis capability. Participates in source selection activities as required

20.2.1 The concerns of personnel in the separate Comptroller's Offices were similar. Therefore, the results can be best summarized collectively for AC rather than individually. From AC's point of view the specific management information concerns for program offices are:

- o Estimating
- o Scheduling
- o Budgeting
- o Planning
- o Analyzing
- o Forecasting

20.2.1.1 First, Estimating: Estimates form the basic foundation upon which most decisions are made. Estimates become more important when they form the basis of large resource commitments. Two applicable forms of estimating are schedule and cost estimating.

- Schedule estimating is the expenditure of project resources in terms of time.
- Cost estimating is the expenditure of project resources in dollars and cents.

Most estimating is currently done on a manual basis by each program office in conjunction with the AC staff offices. To a great degree this will always be true. However, the difficulty of this task can be greatly decreased through the use of automated estimation procedures. The estimating algorithms used by AC and the program offices should be further identified and analyzed for integration into a MIS. This provides several benefits:

- Decrease in program office estimating work load
- Decrease in AC staff office work load
- Better understanding between program offices and the AC staff office, since AC will be using the same integrated set of estimating algorithms tailored to the needs of the particular program office.

20.2.1.2 Second, Scheduling: Once the initial estimates are derived as described above, the program office prepares a program schedule. During the pre-contract phase the program office updates the program schedule to include more accurate and pertinent information. In most acquisitions, the program office includes the program schedule in the procurement package for the contractors review. This schedule represents the governments desires or requirements, and the contractor prepares his schedule for government review and approval based on the information contained in the governments pre-contract schedule.

20.2.1.3 Third, Budgeting: It is extremely difficult to separate the activities associated with scheduling from those of budgeting. The schedule is theoretically translated into actual cost (budgeted requirements) of the human and material resources necessary to accomplish the tasks over the life of the acquisition cycle. However, ESD budget requirements are prepared and presented in annual requirements (slices) from the total estimated budget requirements which usually extend over many years and funding allocations. The program direction may require adjustment to reflect authorized funding or changes in funding allocations as determined and

directed above the ESD level. The ESD budgeting process is primarily accomplished on a manual basis by each program office with assistance from the comptroller's office. Although the uniqueness of each project requires the technical input from the program office, the capability to define a budgeting process for acquiring and assimilating budget information, and the generation of budget reports can be accomplished and administered by a single ESD organization. This method has been an established approach in private industry where corporate departments, large and small, prepare estimates in a prescribed manner and submit the information for inclusion in the corporate budget process. In many instances the department interactively updates its estimates directly into corporate computer files which also provides the capability for automatically allowing report capabilities at many levels above the original level of the updated departmental budget estimates.

20.2.1.4 Fourth, Planning: The initial planning activities of estimating, scheduling, and budgeting are accomplished in the early conceptual and validation phases of the acquisition cycle and adjustments to these issues continues throughout the acquisition cycle. However, when these time and money issues are approved, the planning relative to the system being acquired is initiated. Numerous planning documents are

prepared in response to the Program Management Directive (PMD) and other directives. Some of these are the Program Management Plan (PMP), personnel support planning documents, procurement plan (PP), determinations and findings (D&F), integrated logistics support plan (ILSP), computer resources integrated support plan (CRISP), environmental assessments, test and engineering master plans (TEMP), request for proposal (RFP) including statements of work and system specifications, and source selection plans and source selection criteria.

The entire planning function associated with the composite information in these plans constitutes the governments' intent and desires in the acquisition of a system. Since each of these plans are developed and maintained primarily by manual methods, the informational threads between the various plans are difficult to accurately maintain. An impact made in one planning area makes a high demand of program office resources to analyze and adjust associated plans, briefings, and documentation.

20.2.1.5 Fifth, Analyzing: As described above planning is a continuous process which must reflect changes necessitated by events, and the program office must constantly respond to external events which are a results of governmental and

contractor initiated inquiries or impacts during the system acquisition process. The program office must perform various studies on an on-going basis in order to monitor the acquisition process. In addition, the program office must assimilate quantities of information from the contractor. The results of this analyses is presented in various reports, reviews, and presentations made to the program manager and higher echelons. Most of the analysis performed by the program office is manual and many types of automation would be greatly useful in this area. These include rather simple cross referencing computer programs for the WBS, CPR, CFSR, and CIR to much more complex computer programs with analysis and alternative algorithms for resource scheduling and allocation.

20.2.1.6 Finally, Forecasting: Not only must the current status of a projects progress be ascertained by various analysis activities, but also forecast must be made of the future status of the project. Early problem recognition and reporting and tradeoff analysis allow the program office to make the necessary adjustments and reduce risks which could impact the progress of the project. As is true with analysis, this is mostly a manual task; this work could be aided by many automated tools. Any automation in the financial areas would ultimately aid in forecasting.

APPENDIX 30

ESD PROGRAM OFFICE INTERVIEWS

30.0. Discussions were held with four ESD Program Offices: OCN/TRACALS, OCL/PAVE PAWS, DCV/SATIN IV, and YW/E-3A. This appendix details the concerns of each program office interviewed.

30.1 OCN/TRACALS (Traffic Control Approach and Landing Systems)

TRACALS is a multi-project office (basket program office) with 12 major projects and is managed by a single program office director. Each project is headed by a program manager and many are projects in the multi-million dollar category. Most of the contracts are fixed price incentive and one is a level of effort contract. The OCN program director's main concern is the timeliness of cost data. Cost information such as the CPR runs almost two months behind the real events. This needs to be changed so that cost data is received by the program director within two weeks of the actual end of the month. Technical problems, however, need to be reported within two days of the problems observance.

A secondary concern that the TRACALS program director experiences is the impact of engineering change proposals (ECPs). ECPs occur about twice a week and require an analysis and response to several important issues within approximately thirty days. Questions of primary concern are:

- o Does the ECP constitute a change in scope?
- o Is the ECP cost and time effective?
- o How does the proposed change benefit the government?

Similarly, when a new requirement is levied on a program office there seems to be little anticipation of the impact, on the current system requirements. In order to assess the impact an evaluation of the task and budget has to be performed to determine if the change can be made without impacting the requirements of existing resources. If the impact can not be absorbed by existing resources, additional resources must be defined and accommodations made to the acquisition process. Although there is no requirement to report change statistics, a capability to track the history of all changes to the requirements would facilitate the ECP change evaluation and change procedures. At present configuration control is primarily a manual process and each

program within the TRACALS program office has one or more configuration managers who perform this task on a full or part time basis as required. A requirement that is rather unique to a basket type program office is the continuous generation of procurement specifications which is accomplished in OCN about twice a year. A single procurement must be supported by two full time typists for a period of about three months and may incorporate as many as five or six revisions.

30.2 OCL/PAVE PAWS (Phased Array Warning System)

PAVE PAWS is a single 48 month procurement requiring the coordination of both military and non-military support agencies. Again, the program director's main concern is the timeliness of cost data. Information in the CPRs and the CFSRs runs at least thirty days behind the real events and is practically outdated. The currency of the reports needs improvement. PAVE PAWS experiences difficulty in knowing the status of the funds and schedules relative to governmental support agencies involved in the acquisition. The status of the disposition of funds as allocated by various agencies is practically non-existent. There is a real need for timely reporting by all support agencies outside the jurisdiction of the program office.

Informational support should be achieved along a similar basis to that of the reporting requirements of ESD contractors. This would allow the program office which is responsible for monitoring funds expenditures and schedules the ability to receive all the necessary information to accurately assess the program status.

A secondary concern of the PAVE PAWS program director is handling engineering change proposals. ECPs have occurred at a rate of two per month over the past fourteen month period and have been increasing at a rate of two or three a month over the past six months. This trend is expected to continue for another six months. Each ECP requires the support of ten PAVE PAWS specialist over a thirty day period. A program office configuration manager, one cost manager, and eight technicians are involved in each ECP action. This task group must address the following issues for each ECP:

- o Does the ECP constitute a change in scope?
- o Is it a change to a necessary system requirement?
- o Will it result in a cost and/or schedule impact?
- o Will it result in a system performance impact?
- o Was the original system requirement not feasible?

30.3 DCV/SATIN IV (SAC Automated Total Information Network)

SATIN IV is a program for developing an integrated SAC command-wide digital record communications system to meet SAC's requirements for command-control and support data transmission into the 1990s. A primary concern of the program office director is in trying to balance actual cost and schedules with budget allocations. His major endeavor is to keep the funding for each fiscal year in line with the allocated budget. In order to accomplish this task he must also plan for possible budget cuts, be prepared to assess the impact, and provide for program adjustments as necessary. Another important part of his job is preparing and presenting numerous briefings for higher reviews. Again, a major problem is the timeliness of contractor information (CPRs). This information needs to be available on a weekly basis to the program office. It must detail the contractor's man hour expenditures.

Another major concern of the program director is engineering change proposals. ECP analysis is, as was true for PAVE PAWS, a very complex process, since each ECP must be evaluated against all program functions and often impacts another government agency. In addition, this program office has a need and has developed an in-house capability to trace

requirements, not only back to the system specification, but all the way back to the documents which describe the requirements. This capability is significant in evaluating the impact of each ECP.

30.4 Yw/E-3A AWACS (Airborne Warning and Control Systems)

AWACS is a multi-billion dollar program to provide a survivable airborne air surveillance capability and command, control and communications functions. There are some 140 program office personnel and some 45 MITRE personnel augmenting the program office resources. The E-3A aircraft has been in the production phase for some time. Cost, schedules and the timeliness of information are again the major issues which concern the AWACS program office director. In a program office the size of AWACS, production phase information on cost and schedules must be acquired and analyzed in a timely manner.

First, Costs: Timely cost information is needed on a weekly basis. The CPR system was built for E-3A by MITRE and there was no history or trend analysis in the original version. The statistical algorithm to forecast the bottom line has also been changed. However, the E-3A CPR system has more error checks than the base version and has the

capability of doing computer generated graphics using CALCOMP plotters. The CPR comes from the contractor broken down functionally by WBS. The CPR system does not do any analysis of costs based on indices, i.e. analysis of the cost performance index and schedule performance index. A functional flow of the E-3A's current CPR system is illustrated in Figure 30-1.

Second, Schedule: Schedules should be tracked simply and concisely so projected problem areas can be addressed before they cause schedule slips. At present, E-3A is using a government owned data base management system (VENUS) for data manipulation of a milestone data base. The milestones and schedule data comes from the contractor as a data item deliverable on a monthly basis and the information is entered into the VENUS data base. The analysis sections and report generation capabilities are augmented with program office developed FORTRAN programs. The system is used mainly in the batch (over-the-counter) mode. The prime contractor is now using the data base through an interactive terminal.

Of the some 2000 milestones in the VENUS data base, about 65 to 80 milestones are processed each week. Of these 40 to 50 are revisions indicating overdue deliverable and 25 to 40 are new deliverable milestones which are to be entered.

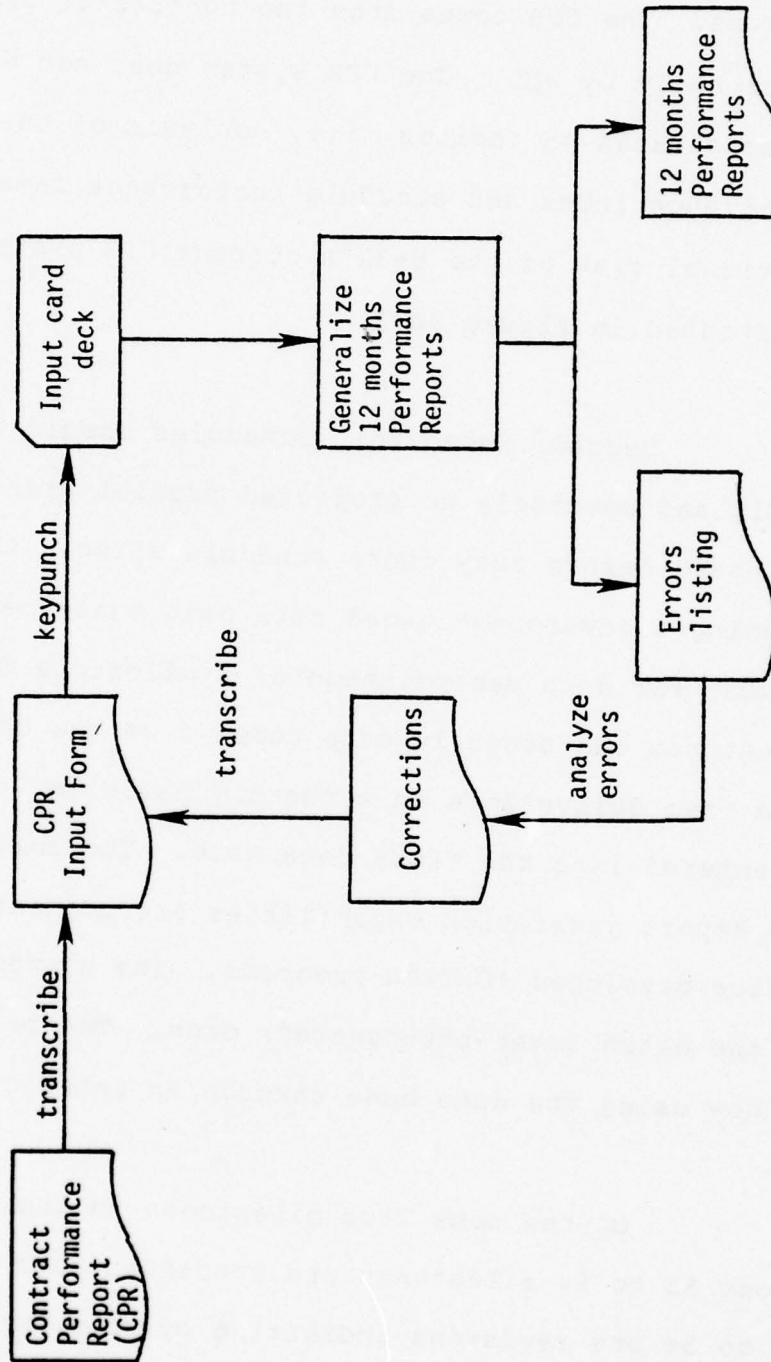


Figure 30-1. E-3A CPR System, Functional Flow

Milestones are added to the schedule for any areas of high technical or cost risks. A PERT type network was used for the first E-3A. Presently Gantt charts by WBS are created by the program office from the VENUS data base outputs.

Turnaround for the schedule report is about 24 hours, due to computer time scheduling and partially due to the inability for VENUS to produce a long series of reports quickly. VENUS was developed for laboratory use and does not include the processing options or documentation to be useful beyond its current use by the AWACS program office. In general it is a simple query and update system and its marginal documentation makes it difficult for training purposes.

The program director's second concern is engineering change proposals. ECPS occur at a rate of three to six a week. Engineering change proposals, changes in user requirements, and contractor performance monitoring must be managed on a strict basis. This process is accomplished primarily on a manual basis and ensures that the system will meet the performance specifications within the proposed cost. Configuration Control coordinates the analysis and review process of ECPS to ensure completeness in the analysis and review as accomplished by program office and MITRE technical staff.

APPENDIX 40

CADSAT MIS PROCESS STRUCTURE

process structure

count level name

- 1 1 management-information-system
- 2 2 user-functions
- 3 3 reporting-capabilities
- 4 4 life-cycle-cost-analysis
- 5 5 development-cost-estimating
- 6 5 operations-cost-estimating
- 7 5 optimum-repair-level-analysis
- 8 5 maintenance-cost-estimating
- 9 4 financial-planning-tracking
- 10 5 generate-cpr
- 11 5 generate-cfsr
- 12 5 generate-estimated-costs
- 13 5 generate-cssr
- 14 4 schedule-planning-and-tracking
- 15 5 generate-cdrj-schedule
- 16 5 generate-network-data
- 17 5 generate-milestone-schedule
- 18 5 generate-manpower-schedule
- 19 5 generate-ecp-status
- 20 4 requirements-analysis
- 21 5 requirements-relation-analysis
- 22 6 hierarchical-analysis
- 23 6 functional-control-analysis
- 24 6 data-flow-analysis
- 25 5 requirements-evaluation
- 26 6 system-performance-analysis
- 27 6 system-completeness-assessment
- 28 6 system-consistency-analysis
- 29 4 traceability-analysis
- 30 5 requirements-design-trace
- 31 5 requirements-product-trace

process structure

count	level	name
32	5	requirements-test-trace
33	5	design-test-trace
34	5	product-test-trace
35	4	configuration-accounting
36	4	ecp-impact-analysis
37	4	problem-tracking
38	5	generate-problem-status-report
39	5	generate-problem-impact-report
40	4	user-requested-nonstd-analyses
41	3	input-processing-capabilities
42	4	command-processing
43	4	data-acceptance-checking
44	4	data-conversion
45	2	operations-support
46	3	user-modes
47	4	batch
48	4	interactive
49	3	output-formatting
50	4	standard-report-generation
51	4	plotter
52	4	gantt-chart-generation
53	4	network-chart-generator
54	3	data-access-security-control
55	3	text-processing
56	2	mis-maintenance

level	count	level	count	level	count
1	1	2	3	4	18
6	6	3	6	5	22

APPENDIX 50

CADSAT MIS PROCESS DESCRIPTIONS

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35 ecp-impact-analysis,
36 problem-tracking,
37 user-requested-nonstd-analyses;
38 user-functions;
39 user-modes,
40 output-formatting;
41 selected-acquisition-report
42 comprehensive-data-base;
43

44 process life-cycle-cost-analysis;
45 synonyms are: licycoan;
46 description;
47 The life cycle cost analysis function processes all development,
48 production, operations, and maintenance cost data and projects
49 total life cycle costs. It includes a capability to make
50 hypothetical changes to parameters to evaluate cost impacts.;
51 keywords: analyzed;
52 generates: life-cycle-cost-report;
53 subparts are: development-cost-estimating,
54 operations-cost-estimating,
55 optimum-repair-level-analysis,
56 maintenance-cost-estimating;
57 part of: reporting-capabilities;
58 utilizes: generate-estimated-costs;
59

60 process development-cost-estimating;
61 synonyms are: decoes;
62 description;
63 The development cost estimating function includes costing of all R&D,
64 design, development, and production.;
65 part of: life-cycle-cost-analysis;
66

67 process operations-cost-estimating;
68 synonyms are: opcoes;

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69 part of: life-cycle-cost-analysis;
70
71 process optimum-repair-level-analysis;
72 synonyms are: oprolean,
73               orla;
74 keywords: analyzed;
75 generates: opt-repair-lev-anal-report;
76 part of: life-cycle-cost-analysis;
77 derives: allocation-cost-dollar-value
78         repair-description,
79         component-item-record,
80         end-item-depot-record;
81 derives: share-of-cost-dollar-value
82         repair-description,
83         component-item-record,
84         end-item-depot-record;
85 derives: percent-of-total-time
86         repair-description,
87         component-item-record,
88         end-item-depot-record;
89 derives: opt-repair-lev-anal-report
90         comprehensive-data-base;
91 derives: number-of-units
92         component-item-record;
93 derives: minimum-cost-value
94         repair-description,
95         depot-cost-dollar-value,
96         intermediate-cost-dollar-value,
97         discard-cost-dollar-value;
98 derives: minimum-cost-alternative
99         repair-description,
100        depot-cost-dollar-value,
101        intermediate-cost-dollar-value,
102        discard-cost-dollar-value;

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103 derives: life-cycle-cost-report
104 using: comprehensive-data-base;
105 derives: intermediate-cost-dollar-value
106 using: minimum-cost-alternative,
107 facility-cost,
108 component-item-record,
109 end-item-depot-record,
110 repair-description,
111 inventory-cost,
112 initial-training-cost,
113 life-cycle-period;
114 derives: discard-cost-dollar-value
115 using: minimum-cost-alternative,
116 life-cycle-period,
117 component-item-record,
118 end-item-depot-record,
119 repair-description,
120 order-packing-shipping,
121 force-basing;
122 derives: depot-cost-dollar-value
123 using: minimum-cost-alternative,
124 facility-cost,
125 component-item-record,
126 end-item-depot-record,
127 repair-description,
128 initial-training-cost;
129
130 process maintenance-cost-estimating;
131 synonyms are: macoes;
132 part of: life-cycle-cost-analysis;
133
134 process financial-planning-tracking;
135 synonyms are: fipltr;
136 description;
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137 The financial planning and tracking function performs all tasks related
 138 to financial, budget, and costing with the exception of processing
 139 data being entered into the MIS. The function is used by a program
 140 office planning a system acquisition, planning for specific contract
 141 efforts, tracking of development/production contracts, and
 142 financial forecasting.;

143 subparts are: generate-cpr,
 144 generate-cfsr,
 145 generate-estimated-costs,
 146 generate-cssr;
 147 part of: reporting-capabilities;

149 process generate-cpr;

150 synonyms are: gecp,
 151 gencpr;
 152 keywords: analyzed;
 153 generates: cost-performance-report;
 154 part of: financial-planning-tracking;
 155 utilizes: standard-report-generation;
 156 derives: budgeted-cost-work-performed
 157 using: weekly-cost-updates;
 158 derives: cost-performance-report
 159 using: comprehensive-data-base;

161 process generate-cfsr;

162 synonyms are: gecf,
 163 gencfs;
 164 keywords: analyzed;
 165 generates: contract-funds-status-report;
 166 part of: financial-planning-tracking;
 167 uses: comprehensive-data-base,
 168 weekly-cost-updates;
 169 updates: current-cfsr-report-date;
 170 updates: previous-cfsr-report-date;

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171 updates: unliquidated-commitments;
172 updates: accrued-expenditures;
173 derives: dollar-units;
174 derives: contract-funds-status-report;
175 derives: accrued-expend-plus-commit;
176 derives: total-costs;
177 derives: forecast-billings;
178
179 process generate-estimated-costs;
180 synonyms are: geesco;
181 keywords: analyzed;
182 generates: weapon-system-budget-estimate,
183 selected-acquisition-report;
184 part of: financial-planning-tracking;
185 utilized by: life-cycle-cost-analysis;
186 derives: weapon-system-budget-estimate
187 using: comprehensive-data-base;
188
189 process generate-cssr;
190 synonyms are: gencss;
191 keywords: analyzed;
192 generates: cost-schedule-status-report;
193 part of: financial-planning-tracking;
194 derives: cost-schedule-status-report
195 using: comprehensive-data-base;
196
197 process schedule-planning-and-tracking;
198 synonyms are: scplantr;
199 description;
200 The scedule planning and tracking function performs all tasks related to
201 program office schedule planning and projected schedule impact analysis.
202 It also uses contractor data to obtain schedule status and projections.;
203 subparts are: generate-cdr1-schedule,
204 generate-network-data,
    
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205 generate-milestone-schedule,
206 generate-manpower-schedule,
207 generate-ecp-status;
208 reporting-capabilities;
209
210 process generate-cdr1-schedule;
211 synonyms are: gecdsc;
212 keywords: analyzed;
213 part of: schedule-planning-and-tracking;
214
215 process generate-network-data;
216 synonyms are: genech;
217 keywords: analyzed;
218 part of: schedule-planning-and-tracking;
219 derives: schedule-data
220 using: comprehensive-data-base;
221
222 process generate-milestone-schedule;
223 synonyms are: gemisc;
224 keywords: analyzed;
225 part of: schedule-planning-and-tracking;
226
227 process generate-manpower-schedule;
228 synonyms are: gemasc;
229 keywords: analyzed;
230 part of: schedule-planning-and-tracking;
231
232 process generate-ecp-status;
233 synonyms are: geeccst;
234 keywords: analyzed;
235 part of: schedule-planning-and-tracking;
236
237 process requirements-analysis;
238 synonyms are: rean,
    
```

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239 reqana;
240 subparts are: requirements-relation-analysis,
241 requirements-evaluation;
242 part of: reporting-capabilities;
243 utilized by: ecp-impact-analysis;
244

245 process requirements-relation-analysis;
246 synonyms are: rerean;
247 description;
248

249 The requirements relational analysis performs the type of analysis
250 presently performed by CADSAT prior to initialization of system
251 development and used during development/production to identify
252 additional requirements impacted by ECPs.;
253 keywords: analyzed;
254 subparts are: hierarchical-analysis,
255 functional-control-analysis,
256 data-flow-analysis;
257 part of: requirements-analysis;
258 uses: system-specifications;
259 derives: cadsat-reports;
260 derives: logicon-cadsat-reports;
261

262 process requirements-evaluation;
263 synonyms are: regeva;
264 description;
265 The requirements evaluation function is performed on a single
266 specification which has already undergone requirements relational
267 analysis. It determines the completeness, consistency, and
268 performance adequacy.;
269 subparts are: system-performance-analysis,
270 system-completeness-assessment,
271 system-consistency-analysis;
272 part of: requirements-analysis;

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273 process system-performance-analysis;
274 process synonyms are: sypean;
275 description;
276 The system performance analysis function determines the consistency
277 between performance requirements and enables the determination of
278 performance impacts resulting from possible requirement changes.;
279 see-memo: system-performance-memo;
280 keywords: analyzed;
281 part of: requirements-evaluation;
282 memo system-performance-memo;
283
284 synonyms are: sypeme;
285 description;
286 The analysis of performance requirements is essential prior to
287 development and during development to determine the impact of
288 requirements changes. CADSAT can be used to determine other related
289 requirements but cannot be used to evaluate things such as computer
290 timing or sizing impacts. The type of performance analysis that is
291 required is typically obtained from a system functional simulator. It
292 is anticipated that the data to drive the simulator will be extracted
293 directly from a CADSAT data base.;
294 applies to: system-performance-analysis;
295 process system-completeness-assessment;
296
297 synonyms are: sycoas;
298 description;
299 The system completeness assessment function performs user defined
300 checks on the specification data base to determine if all of the
301 relevant information is present for each item.;
302 see-memo: system-completeness-example;
303 keywords: analyzed;
304 part of: requirements-evaluation;
305 uses: system-specifications;
306

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307 derives: cadsat-reports;
 308 derives: logicon-cadsat-reports;
 309
 310 memo system-completeness-example;
 311 synonyms are: sycoex;
 312 description;
 313 the problem of determining if a specification is complete is two-fold:
 314 determination of whether the user has identified all required
 315 capabilities and determination of whether all identified capabilities
 316 have been fully specified. Only the later problem can be addressed
 317 by an MIS. For example, suppose that the system is an air
 318 surveillance system with the FAA providing flight plans. The
 319 development of this system requires complete specification of all
 320 external interfaces: data content, format, frequency, and volume
 321 of data. Another example might be the identification of the data
 322 reduction function which does not use any data nor is tied to the
 323 performance of any other functions. The problem is that systems
 324 engineering failed to identify the data collection or recording
 325 functions (the functions which provide the source data) and the
 326 maintenance/training functions which make use of the resultant
 327 data reductions.;
 328 applies to: system-completeness-assessment;
 329
 330 process system-consistency-analysis;
 331 synonyms are: sycoan;
 332 description;
 333 the consistency analysis function consists of developing a CADSAT
 334 data base and the performance of most of the other requirements analyses
 335 functions.;
 336 part of: requirements-evaluations;
 337 uses: system-specifications;
 338 derives: cadsat-reports;
 339
 340 memo consistency-analysis-examples;

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375 conacc,
376 condoc;
377 analyzed;
378 generates: config-change-status-report;
379 part of: reporting-capabilities;
380 utilizes: text-processing;
381 derives: config-change-status-report
382 using: comprehensive-data-base;
383
384 process ecp-impact-analysis;
385 synonyms are: eciman;
386 keywords: analyzed;
387 part of: reporting-capabilities;
388 utilizes: requirements-analysis,
389 traceability-analysis;
390 uses: system-specifications;
391 derives: technical-requirements-impact;
392
393 process problem-tracking;
394 synonyms are: protra;
395 description;
396 The problem tracking function maintains status of all problems that have
397 been identified by the program office or contractors. The function
398 assures accountability and traceability of both potential and real
399 problems which may impact costs, schedules, or technical performance of
400 the system.;
401 see-memo: problem-tracking-examples;
402 subparts are: generate-problem-status-report,
403 generate-problem-impact-report;
404 part of: reporting-capabilities;
405
406 process generate-problem-status-report;
407 synonyms are: geprstre;
408 keywords: analyzed;

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409      part of:      problem-tracking;
410
411      process
412      synonyms are:  geprimre;
413      keywords:      analyzed;
414      part of:      problem-tracking;
415
416      memo
417      synonyms are:  prtrex;
418      description;
419      Example 1: It would include the identification of all inconsistencies
420      or inadequacies in the specifications as they are identified. This
421      technique would assume that these problems do not get lost and are
422      incorporated in future spec configuration changes.
423      Example 2: It would include the identification of all test failures or
424      deficiency reports produced by program office/contractor personnel
425      during development test and evaluation or software verification and
426      validation.;
427      applies to:    problem-tracking;
428
429      process
430      synonyms are:  dabaqu,
431                  usrenoan;
432      description;
433      A specialized query capability is required which enables the user
434      to generate specialized reports and to obtain current values
435      for selected data base elements.;
436      keywords:      analyzed;
437      part of:      reporting-capabilities;
438      derives:       special-report-data;
439
440      process
441      synonyms are:  dainacch,
442                  inprca;
443
444      generate-problem-impact-report;
    
```

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443 analyzed;
 444 configuration-change-dates,
 445 contract-description,
 446 contract-performance-data,
 447 projected-system-maint-data,
 448 system-acquisition-plan-init,
 449 system-acquisition-plan-update,
 450 task-description,
 451 system-specifications;
 452 command-processing,
 453 data-acceptance-checking,
 454 data-conversion;
 455 user-functions;
 456 comprehensive-data-base;
 457 db-task-description
 458 task-description;
 459 db-system-acquisit-plan-update
 460 system-acquisition-plan-update;
 461 db-system-acquisit-plan-init
 462 system-acquisition-plan-init;
 463 db-projected-system-maint-data
 464 projected-system-maint-data;
 465 db-contract-performance-data
 466 contract-performance-data;
 467 db-contract-description
 468 contract-description;
 469 db-configuration-change-dates
 470 configuration-change-dates;
 471

472 process operations-support;
 473 synonyms are: opsu;
 474 description;

475 Operations support provides all special functions required to support
 476 the users data entry and retrieval. It includes batch/time share option

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477 special output formatting capabilities, and text processing (required to
 478 handle RFP packages and spec writing).;

479 subparts are: user-modes,
 480 output-formatting,
 481 data-access-security-control,
 482 text-processing;
 483 part of: management-information-system;
 484

485 process user-modes;
 486 synonyms are: usemod,
 487 usmo;
 488 keywords: analyzed;
 489 subparts are: batch,
 490 interactive;
 491 part of: operations-support;
 492 utilized by: reporting-capabilities;
 493

494 process output-formatting;
 495 synonyms are: oufo,
 496 outfor;
 497 subparts are: standard-report-generation,
 498 plotter,
 499 gantt-chart-generation,
 500 network-chart-generator;
 501 operations-support;
 502 utilized by: reporting-capabilities;
 503

504 process standard-report-generation;
 505 synonyms are: strege;
 506 keywords: analyzed;
 507 part of: output-formatting;
 508 utilized by: generate-cpr;
 509 uses: special-report-data;
 510

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plotter;

511 process
512 keywords: analyzed;
513 generates: plotted-schedules;
514 part of: output-formatting;
515 uses: schedule-data,
516 cdrj-schedule,
517 milestone-schedule-data;
518 derives: plotted-schedules;
519

520 process
521 synonyms are: gachge,
522 gnchge;
523 keywords: analyzed;
524 part of: output-formatting;
525 uses: schedule-data,
526 cdrj-schedule,
527 milestone-schedule-data;
528 derives: gantt-chart;
529 gantt-chart-generation;

530 process
531 synonyms are: pechge;
532 keywords: analyzed;
533 part of: output-formatting;
534 network-chart-generator;
535 process
536 synonyms are: daacseco;
537 description: data-access-security-control;
538 The data access control function controls individual user access to
539 data in the MIS data base to prevent unauthorized reading or writing of
540
541 eof;
542 keywords: analyzed;
543 part of: operations-support;
544

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545 process
546     synonyms are:  tepr;
547     keywords:      analyzed;
548     part of:       operations-support;
549     utilized by:   configuration-accounting;
550
551 process
552     synonyms are:  mismai;
553     description;
554     The maintenance function provides all capabilities necessary to modify
555     the maintenance, document the MIS, recover from user errors, and recover
556     from environmental problems (operating system crashes, communications
557     noise, etc.);
558     keywords:      analyzed;
559     part of:       management-information-system;
560     uses:          comprehensive-data-base;
561     updates:       comprehensive-data-base;
562
563 eof eof eof eof

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APPENDIX 60

CADSAT MIS DATA DESCRIPTIONS

AD-A056 103

LOGICON INC LEXINGTON MA
MANAGEMENT INFORMATION SYSTEM FOR ESD PROGRAM OFFICES.(U)
MAR 78 F COKER, L JOHNSON, D SMITH

F/G 9/2

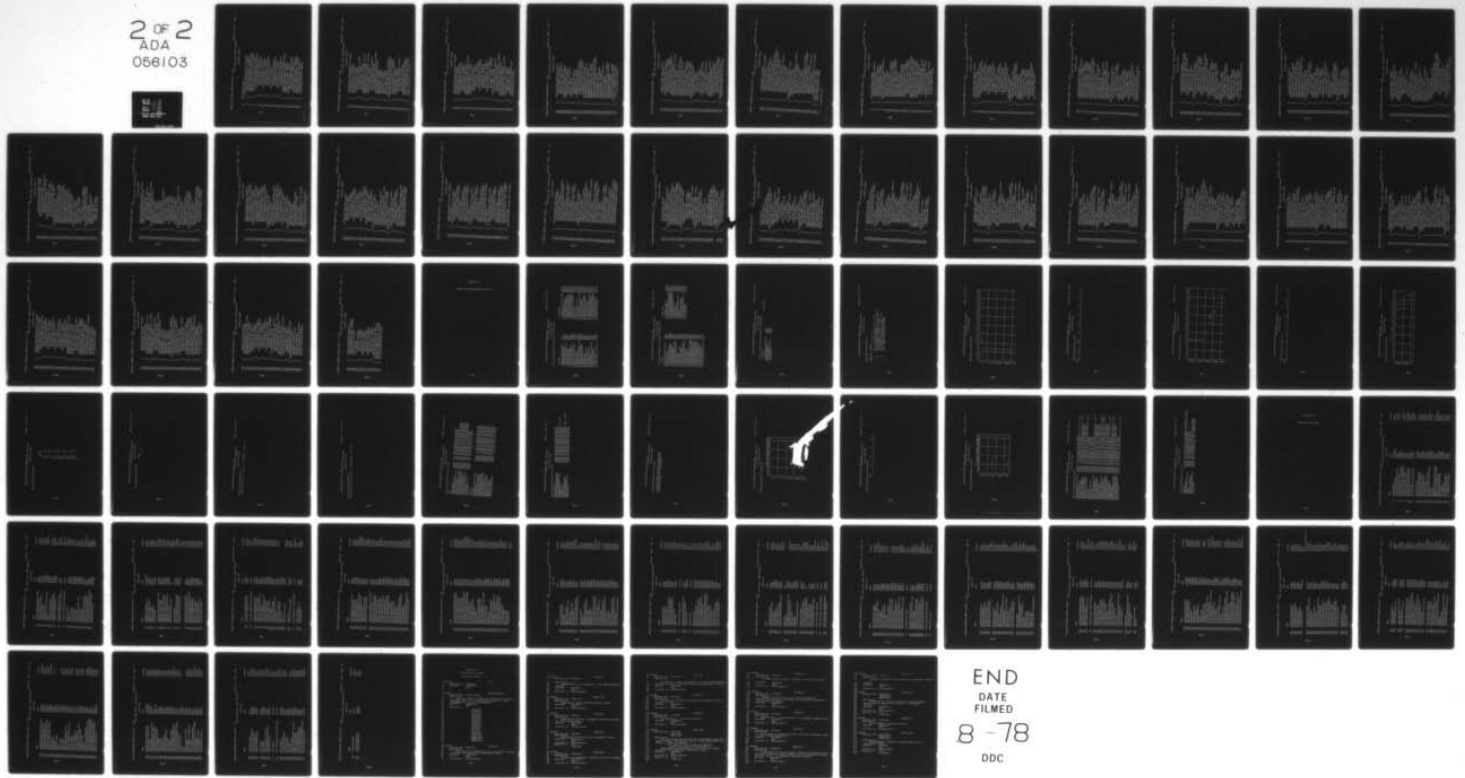
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UNCLASSIFIED

ESD-TR-78-132

NL

2 OF 2
ADA
056103



END
DATE
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contents report

1* 1 input-set (set)

2 system-acquisition-plan-init (input)

3 contract-funding-for-fy (element)

3 contract-appropriation (element)

3 appropriation-identification (group)

3 funding-authorized-to-date (group)

3 contract-funding-profile (group)

4 unliquidated-commitments (group)

5 actual-to-date (element)

5 projected-by-period (group)

5 at-completion (element)

4 accrued-expenditures (group)

5 actual-to-date (element)

5 projected-by-period (group)

5 at-completion (element)

4 total-costs (group)

5 actual-to-date (element)

5 projected-by-period (group)

5 at-completion (element)

4 forecast-billings (group)

5 projected-by-period (group)

5 at-completion (element)

3 budgeted-cost-work-scheduled (group)

3 undistributed-budget (group)

3 production-vs-rdte (element)

3 program-name-number (group)

4 contract-program-name (element)

4 contract-number (element)

3 estimated-unpriced-work (element)

3 contract-budget-baseline (element)

3 bcws-six-months-forecast (group)

3 bcws-period-forecast (group)

3 prime-item-quantity (element)

contents report

33	3	est-cost-auth-unpriced-work (element)
34	3	estimated-price (element)
35	3	estimated-ceiling (element)
36	3	funds-carry-over (group)
37	3	forecasted-work (group)
38	4	not-yet-authorized-work (group)
39	4	all-other-work (group)
40	4	forecast-subtotal (group)
41	3	approved-design-to-cost-goal (group)
42	3	weapon-system-name (element)
43	3	production-planning-schedule (element)
44	3	line-item-budget (group)
45	4	line-item-description (element)
46	4	eight-year-budget (group)
47	4	total-budget-at-completion (element)
48	3	dcp-thresholds-breached (group)
49	3	dod-component (element)
50	3	system-symbol (element)
51	3	designation (element)
52	3	nomenclature (element)
53	3	popular-name (element)
54	3	mission-and-description (element)
55	2	system-acquisition-plan-update (input)
56	3	contract-funding-for-fy (element)
57	3	contract-appropriation (element)
58	3	funds-carry-over (group)
59	3	forecasted-work (group)
60	4	not-yet-authorized-work (group)
61	4	all-other-work (group)
62	4	forecast-subtotal (group)
63	3	estimated-unpriced-work (element)
64	3	contract-budget-baseline (element)
65	3	authorized-baseline-changes (group)
66	3	prime-item-quantity (element)

contents report

67	3	est-cost-auth-unpriced-work (element)
68	3	estimated-price (element)
69	3	estimated-ceiling (element)
70	3	units-accepted-to-date (group)
71	4	number-planned (element)
72	4	number-accepted (element)
73	3	quantities-delivered (group)
74	3	approved-design-to-cost-goal (group)
75	3	development-contracts (group)
76	3	production-contracts (group)
77	4	company-name (element)
78	4	initial-contract (group)
79	5	initial-price (element)
80	5	initial-quantity (element)
81	4	current-contract-price (group)
82	5	target-price (element)
83	5	ceiling-price (element)
84	5	current-quantity (element)
85	4	price-at-completion (group)
86	5	contractor-estimate (element)
87	5	government-estimate (element)
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89	4	line-item-description (element)
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95	3	major-subcontractor (group)
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103	4	contract-start-date (element)
104	4	contract-type (element)
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106	3	contract-type-number (group)
107	4	contract-type (element)
108	4	contract-number (element)
109	3	contractor (group)
110	4	company-name (element)
111	4	company-address (group)
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118	3	management-reserve (group)
119	3	manpower-period-forecast (group)
120	3	maintenance-repair-cost (group)
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122	3	work-breakdown-structure-items (group)
123	3	wbs-description (group)
124	3	initial-target-cost (element)
125	3	negotiated-cost (element)
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127	3	share-ratio (element)
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143	3	wbs-description (group)
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3	3	program-title (element)
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10	3	contract-type (element)
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186	3	target-profit (element)
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188	3	estimated-price (element)
189	3	share-ratio (element)
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248	3	designation (element)
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446	3	orla-item-description (group)
447	3	current-cost-dollar-value (element)
448	2	orla-cost-element-output (output)
449	3	system-name (element)
450	3	element-life-cycle-cost (group)
451	4	element-name (element)
452	4	intermediate-maintenance (group)
453	5	cost (element)
454	5	percent (element)
455	4	depo -maintenance (group)
456	5	ccst (element)
457	5	de cent (element)
458	4	discard-maintenance (group)
459	5	cost (element)
460	5	percent (element)
461	4	split-maintenance (group)
462	5	cost (element)
463	5	percent (element)
464	2	orla-depot-mult-support (output)
465	3	report-page-number (group)
466	4	current-page-number (element)
467	4	total-number-of-pages (element)
468	3	report-date (group)
469	3	support-equipment-desc (element)
470	3	work-unit-code (group)
471	3	depot-cost-dollar-value (element)
472	3	number-of-units (element)
473	3	orla-item-numbers (group)
474	3	orla-item-description (group)
475	3	demand-time (element)
476	3	mean-time-to-test (element)

contents report

477	3	required-time (element)
478	3	percent-of-total-time (element)
479	3	share-of-cost-dollar-value (element)
480	3	allocation-cost-dollar-value (element)
481	3	total (group)
482	2	orla-economic-anal-report (output)
483	3	report-page-number (group)
484	4	current-page-number (element)
485	4	total-number-of-pages (element)
486	3	report-date (group)
487	3	orla-item-numbers (group)
488	3	orla-item-description (group)
489	3	repair-description (group)
490	4	mean-time-between-deliveries (element)
491	4	mean-time-to-test (element)
492	4	available-time (element)
493	4	demand-time (element)
494	4	required-time (element)
495	4	mean-time-between-failures (element)
496	4	non-repairable-component-rate (element)
497	4	component-weight (element)
498	4	component-repair-cycle-time (element)
499	4	repair-rates (group)
500	4	component-average-maint-time (element)
501	3	variable-value (element)
502	3	orla-cost-elem-desc (element)
503	3	depot-cost-dollar-value (element)
504	3	intermediate-cost-dollar-value (element)
505	3	discard-cost-dollar-value (element)
506	3	total (group)
507	2	orla-end-item-resume (output)
508	3	equipment (group)
509	4	equipment-name (element)
510	4	equipment-number (element)

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contents report

511	4	equipment-type (element)
512	4	equipment-description (element)
513	3	utilization (element)
514	3	equipment-description (element)
515	3	current-maintenance-policy (element)
516	3	maintenance-analysis-results (element)
517	3	maintenance-recommendations (element)
518	3	maintenance-notes (element)
519	2	orla-input-data-printout (output)
520	3	report-page-number (group)
521	4	current-page-number (element)
522	4	total-number-of-pages (element)
523	3	report-date (group)
524	3	repair-description (group)
525	4	mean-time-between-deliveries (element)
526	4	mean-time-to-test (element)
527	4	available-time (element)
528	4	demand-time (element)
529	4	required-time (element)
530	4	mean-time-between-failures (element)
531	4	non-repairable-component-rate (element)
532	4	component-weight (element)
533	4	component-repair-cycle-time (element)
534	4	repair-rates (group)
535	4	component-average-maint-time (element)
536	3	variable-value (element)
537	2	orla-intermediate-mult-support (output)
538	3	report-page-number (group)
539	4	current-page-number (element)
540	4	total-number-of-pages (element)
541	3	report-date (group)
542	3	support-equipment-desc (element)
543	3	work-unit-code (group)
544	3	intermediate-cost-dollar-value (element)

contents report

545	3	number-of-units (element)
546	3	orla-item-numbers (group)
547	3	orla-item-description (group)
548	3	demand-time (element)
549	3	mean-time-to-test (element)
550	3	required-time (element)
551	3	percent-of-total-time (element)
552	3	share-of-cost-dollar-value (element)
553	3	allocation-cost-dollar-value (element)
554	3	total (group)
555	2	orla-math-sensitiv-anal-report (output)
556	3	report-page-number (group)
557	4	current-page-number (element)
558	4	total-number-of-pages (element)
559	3	total (group)
560	3	report-date (group)
561	3	repair-description (group)
562	4	mean-time-between-deliveries (element)
563	4	mean-time-to-test (element)
564	4	available-time (element)
565	4	demand-time (element)
566	4	required-time (element)
567	4	mean-time-between-failures (element)
568	4	non-repairable-component-rate (element)
569	4	component-weight (element)
570	4	component-repair-cycle-time (element)
571	4	repair-rates (group)
572	4	component-average-maint-time (element)
573	3	variable-value (element)
574	3	minimum-cost-value (element)
575	3	depot-cost-dollar-value (element)
576	3	intermediate-cost-dollar-value (element)
577	3	discard-cost-dollar-value (element)

contents report

3*	1	comprehensive-data-base (set)
	2	db-configuration-change-dates (entity)
	3	engineering-change-proposal (group)
	4	change-number (element)
	4	change-descriptive-title (element)
	4	change-cost (element)
	4	x-mini-board-date (element)
	4	comments-required-date (element)
	4	y-mini-board-date (element)
	4	config-control-board-date (element)
	4	procuremnt-officer-letter-date (element)
	4	tech-agreement-letter-date (element)
	4	contract-change-date (element)
	4	engineering-opr (element)
	4	configuration-control-opr (element)
	4	procurement-opr (element)
	4	logistics-opr (element)
	4	change-notes (element)
	2	db-contract-description (entity)
	3	contract-identification (group)
	4	contract-number (element)
	4	contract-start-date (element)
	4	contract-type (element)
	3	contract-initial-price (group)
	3	contract-type-number (group)
	4	contract-type (element)
	4	contract-number (element)
	3	contractor (group)
	4	company-name (element)
	4	company-address (group)
	3	at-completion-costs (group)
	4	at-completion-budgeted (group)
	4	latest-revised-estimate (element)
	4	at-completion-variance (group)

contents report

34	3	bcws-period-forecast (group)
35	3	bcws-six-months-forecast (group)
36	3	management-reserve (group)
37	3	manpower-period-forecast (group)
38	3	maintenance-repair-cost (group)
39	3	manpower-six-months-forecast (group)
40	3	work-breakdown-structure-items (group)
41	3	wbs-description (group)
42	3	initial-target-cost (element)
43	3	negotiated-cost (element)
44	3	contract-target-price (element)
45	3	contract-target-price (element)
46	3	contract-gen-admin-rate (element)
47	3	functional-task-category (group)
48	3	target-profit (element)
49	3	contract-ceiling-price (element)
50	3	contract-modification-data (entity)
51	2	db-identification (group)
52	4	contract-number (element)
53	4	contract-start-date (element)
54	4	contract-type (element)
55	3	adjusted-contract-price (group)
56	4	adjusted-target-price (element)
57	4	adjusted-ceiling-price (element)
58	3	negotiated-contract-changes (element)
59	3	adjusted-target-cost (element)
60	3	work-breakdown-structure-items (group)
61	3	wbs-description (group)
62	3	functional-task-category (group)
63	3	manpower-six-months-forecast (group)
64	3	manpower-period-forecast (group)
65	3	negotiated-cost (element)
66	3	contract-target-price (element)
67	3	contract-ceiling-price (element)

contents report

68	3	changes-since-as-of-date (group)
69	2	db-contract-performance-data (entity)
70	3	weekly-cost-updates (group)
71	4	cost-item (element)
72	4	item-type (element)
73	4	actual-cost (element)
74	4	projected-cost (element)
75	3	weekly-technical-updates (group)
76	4	task-number (element)
77	4	revised-task-status (element)
78	3	cfsr-remarks (element)
79	3	latest-revised-estimate (element)
80	3	management-reserve (group)
81	3	weekly-schedule-updates (group)
82	4	descriptive-name (element)
83	4	task-schedule-element (element)
84	4	revised-schedule-element (element)
85	2	db-projected-system-maint-data (entity)
86	3	equipment-type (element)
87	3	repair-description (group)
88	4	mean-time-between-deliveries (element)
89	4	mean-time-to-test (element)
90	4	available-time (element)
91	4	demand-time (element)
92	4	required-time (element)
93	4	mean-time-between-failures (element)
94	4	non-repairable-component-rate (element)
95	4	component-weight (element)
96	4	component-repair-cycle-time (element)
97	4	repair-rates (group)
98	4	component-average-maint-time (element)
99	2	db-system-acquisit-plan-init (entity)
100	3	contract-funding-for-fy (element)
101	3	contract-appropriation (element)

contents report

102	3	appropriation-identification (group)
103	3	funding-authorized-to-date (group)
104	3	contract-funding-profile (group)
105	4	unliquidated-commitments (group)
106	5	actual-to-date (element)
107	5	projected-by-period (group)
108	5	at-completion (element)
109	4	accrued-expenditures (group)
110	5	actual-to-date (element)
111	5	projected-by-period (group)
112	5	at-completion (element)
113	4	total-costs (group)
114	5	actual-to-date (element)
115	5	projected-by-period (group)
116	5	at-completion (element)
117	4	forecast-billings (group)
118	5	projected-by-period (group)
119	5	at-completion (element)
120	3	budgeted-cost-work-scheduled (group)
121	3	undistributed-budget (group)
122	3	production-vs-rdte (element)
123	3	program-name-number (group)
124	4	contract-program-name (element)
125	4	contract-number (element)
126	3	estimated-unpriced-work (element)
127	3	contract-budget-baseline (element)
128	3	bcws-six-months-forecast (group)
129	3	bcws-period-forecast (group)
130	3	prime-item-quantity (element)
131	3	est-cost-auth-unpriced-work (element)
132	3	estimated-price (element)
133	3	estimated-ceiling (element)
134	3	funds-carry-over (group)
135	3	forecasted-work (group)

contents report

136	4	not-yet-authorized-work (group)
137	4	all-other-work (group)
138	4	forecast-subtotal (group)
139	3	approved-design-to-cost-goal (group)
140	3	weapon-system-name (element)
141	3	production-planning-schedule (element)
142	3	line-item-budget (group)
143	4	line-item-description (element)
144	4	eight-year-budget (group)
145	4	total-budget-at-completion (element)
146	3	dcp-thresholds-breached (group)
147	3	dod-component (element)
148	3	system-symbol (element)
149	3	designation (element)
150	3	nomenclature (element)
151	3	popular-name (element)
152	3	mission-and-description (element)
153	2	db-system-acquisit-plan-update (entity)
154	3	contract-funding-for-fy (element)
155	3	contract-appropriation (element)
156	3	funds-carry-over (group)
157	3	forecasted-work (group)
158	4	not-yet-authorized-work (group)
159	4	all-other-work (group)
160	4	forecast-subtotal (group)
161	3	estimated-unpriced-work (element)
162	3	contract-budget-baseline (element)
163	3	authorized-baseline-changes (group)
164	3	prime-item-quantity (element)
165	3	est-cost-auth-unpriced-work (element)
166	3	estimated-price (element)
167	3	estimated-ceiling (element)
168	3	units-accepted-to-date (group)
169	4	number-planned (element)

contents report

170	4	number-accepted (element)
171	3	quantities-delivered (group)
172	3	approved-design-to-cost-goal (group)
173	3	development-contracts (group)
174	3	production-contracts (group)
175	4	company-name (element)
176	4	initial-contract (group)
177	5	initial-price (element)
178	5	initial-quantity (element)
179	4	current-contract-price (group)
180	5	target-price (element)
181	5	ceiling-price (element)
182	5	current-quantity (element)
183	4	price-at-completion (group)
184	5	contractor-estimate (element)
185	5	government-estimate (element)
186	3	line-item-budget (group)
187	4	line-item-description (element)
188	4	eight-year-budget (group)
189	4	total-budget-at-completion (element)
190	3	dcp-thresholds-breached (group)
191	3	program-highlights (group)
192	3	reverences-to-other-sections (group)
193	3	major-subcontractor (group)
194	4	company-name (element)
195	4	company-address (group)
196	3	changes-since-as-of-date (group)
197	2	db-task-description (entity)
198	3	task-number (element)
199	3	descriptive-name (element)
200	3	abreviation (element)
201	3	task-description-text (element)
202	3	person-in-charge (element)
203	3	earliest-start-date (element)

contents report

204	3	latest-start-date (element)
205	3	desired-completion-date (element)
206	3	required-completion-date (element)
207	3	task-duration (element)
208	3	skill (group)
209	4	skill-type (element)
210	4	skill-level (element)
211	4	skill-hours (element)
212	3	special-people (group)
213	4	person-id (element)
214	4	person-hours (element)
215	3	special-facilities (group)
216	4	facility-id (element)
217	4	facility-hours (element)
218	3	prerequisit-tasks (group)
219	2	db-level-a-specification (entity)
220	2	db-level-b-specification (entity)
221	2	db-level-c-specification (entity)
222	2	db-test-specification (entity)

APPENDIX 70

CADSAT MIS DATA-PROCESS MATRICES

data process report

the rows are data names, the columns are process names.

row names	column names
1 selected-acquisition-report	1 management-information-system
2 comprehensive-data-base	2 user-functions
3 life-cycle-cost-report	3 reporting-capabilities
4 allocation-cost-dollar-value	4 life-cycle-cost-analysis
5 repair-description	5 development-cost-estimating
6 component-item-record	6 operations-cost-estimating
7 end-item-depot-record	7 optimum-repair-level-analysis
8 share-of-cost-dollar-value	8 maintenance-cost-estimating
9 percent-of-total-time	9 financial-planning-tracking
10 opt-repair-lev-anal-report	10 generate-cpr
11 number-of-units	11 generate-cfsr
12 minimum-cost-value	12 generate-estimated-costs
13 depot-cost-dollar-value	13 generate-cssr
14 intermediate-cost-dollar-value	14 schedule-planning-and-tracking
15 discard-cost-dollar-value	15 generate-cdrj-schedule
16 minimum-cost-alternative	16 generate-network-data
17 facility-cost	17 generate-milestone-schedule
18 inventory-cost	18 generate-manpower-schedule
19 initial-training-cost	19 generate-ecp-status
20 life-cycle-period	20 requirements-analysis
21 order-packing-shipping	21 requirements-relation-analysis
22 force-basing	22 requirements-valuation
23 budgeted-cost-work-performed	23 system-performance-analysis
24 weekly-cost-updates	24 system-completeness-assessment
25 cost-performance-report	25 system-consistency-analysis
26 dollar-units	26 traceability-analysis
27 contract-funds-status-report	27 configuration-accounting

data process report

the rows are data names, the columns are process names.

row names	column names
28 accrued-expend-plus-commit	group
29 total-costs	group
30 forecast-billings	group
31 current-cfsr-report-date	element
32 previous-cfsr-report-date	element
33 unliquidated-commitments	group
34 accrued-expenditures	group
35 weapon-system-budget-estimate	output
36 cost-schedule-status-report	output
37 schedule-data	set
38 cadsat-reports	output
39 logicon-cadsat-reports	output
40 system-specifications	input
41 config-change-status-report	output
42 technical-requirements-impact	output
43 special-report-data	entity
44 db-task-description	entity
45 task-description	input
46 db-system-acquisit-plan-update	entity
47 system-acquisition-plan-update	input
48 db-system-acquisit-plan-init	entity
49 system-acquisition-plan-init	input
50 db-projected-system-maint-data	entity
51 projected-system-maint-data	input
52 db-contract-performance-data	entity
53 contract-performance-data	input
54 db-contract-description	entity
55 contract-description	input
56 db-configuration-change-dates	entity
28 ecp-impact-analysis	process
29 problem-tracking	process
30 generate-problem-status-report	process
31 generate-problem-impact-report	process
32 user-requested-nondt-analyses	process
33 input-processing-capabilities	process
34 operations-support	process
35 user-modes	process
36 output-formatting	process
37 standard-report-generation	process
38 plotter	process
39 gantt-chart-generation	process
40 network-chart-generator	process
41 data-access-security-control	process
42 text-processing	process
43 mis-maintenance	process

data process report
the rows are data names, the columns are process names.

row names	column names
57 configuration-change-dates	input
58 plotted-schedules	output
59 cdrj-schedule	entity
60 milestone-schedule-data	entity
61 gantt-chart	output

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data process report

data process interaction matrix

(i,j) value	meaning
r	row i is received or used by column j (input)
u	row i is updated by column j
d	row i is derived or generated by column j (output)
a	row i is input to, updated by, and output of column j (all)
f	row i is input to and output of column j (flow)
1	row i is input to and updated by column j
2	row i is updated by and output of column j

data process report

data process interaction matrix

	1	2	3	4	5	6	7	8	9	0	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	4	
26	i																												
27	i																												
28	i																												
29	i																												
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46	i																												
47	i																												
48	i																												

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data process report

data process interaction matrix

	1	2	3	4	5	6	7	8	9	0	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	4		
51	i																																			
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data process report

data process interaction matrix

24	1	1
25	1	1

+-----+

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data process report

data process interaction matrix

*** matrix empty for rows 26 thru 50 and columns 41 thru 43

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data process report

data process interaction matrix

*** matrix empty for rows 51 thru 61 and columns 41 thru 43

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data process report

data process interaction matrix analysis

```

data
----
cadsat-reports          (output) (row 38) not generated by any process
logicon-cadsat-reports (output) (row 39) not generated by any process
technical-requirements-impact (output) (row 42) not generated by any process
db-task-description    (entity) (row 44) derived, but not used by any process
db-system-acquisit-plan-update (entity) (row 46) derived, but not used by any process
db-system-acquisit-plan-init (entity) (row 48) derived, but not used by any process
db-projected-system-maint-data (entity) (row 50) derived, but not used by any process
db-contract-performance-data (entity) (row 52) derived, but not used by any process
db-contract-description (entity) (row 54) derived, but not used by any process
db-configuration-change-dates (entity) (row 56) derived, but not used by any process
cdrj-schedule          (entity) (row 59) not derived by any process
milestone-schedule-data (entity) (row 60) not derived by any process
ganttt-chart          (output) (row 61) not generated by any process
    
```

processes

```

-----
management-information-system (column 1) does not interact with any data
user-functions                (column 2) does not interact with any data
development-cost-estimating  (column 5) does not interact with any data
operations-cost-estimating   (column 6) does not interact with any data
maintenance-cost-estimating (column 8) does not interact with any data
financial-planning-tracking  (column 9) does not interact with any data
schedule-planning-and-tracking (column 14) does not interact with any data
generate-cdrj-schedule       (column 15) does not interact with any data
generate-milestone-schedule (column 17) does not interact with any data
generate-manpower-schedule  (column 18) does not interact with any data
generate-ecp-status         (column 19) does not interact with any data
requirements-analysis        (column 20) does not interact with any data
requirement-evaluation       (column 22) does not interact with any data
system-performance-analysis (column 23) does not interact with any data
    
```

data process report

data process interaction matrix analysis

problem-tracking	(column 29)	does not interact with any data
generate-problem-status-report	(column 30)	does not interact with any data
generate-problem-impact-report	(column 31)	does not interact with any data
user-requested-nonstd-analyses	(column 32)	derives something, but does not use anything
operations-support	(column 34)	does not interact with any data
user-modes	(column 35)	does not interact with any data
output-formatting	(column 36)	does not interact with any data
standard-report-generation	(column 37)	uses data, but does not derive or update anything
network-chart-generator	(column 40)	does not interact with any data
data-access-security-control	(column 41)	does not interact with any data
text-processing	(column 42)	does not interact with any data

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data process report
Process interaction matrix (incidence)

the rows and columns are process names from above.
an asterisk in (i,j) means that something derived
or updated by process i is used by process j.

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data process report

process interaction matrix (incidence)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	1																						
2		1																					
3			1																				
4				1																			
5					1																		
6						1																	
7							1																
8								1															
9									1														
10										1													
11											1												
12												1											
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18																		1					
19																			1				
20																				1			
21																					1		
22																						1	
23																							1

LOGICON EXTENDED CAUSAT version 3.2r1
Air Force ESD / RADC Multics

data process report

process interaction matrix (incidence)

24	i	i	i	i	i
25	i	i	i	i	i

LOGICOM EXTENDED CAUSAT version 3.2r1
AIR Force ESD / RADC Multics

data process report

process interaction matrix (incidence)

	1	1111111112	2222222223	3333333334	444
26	1	1	1	1	1
27	1	1	1	1	1
28	1	1	1	1	1
29	1	1	1	1	1
30	1	1	1	1	1
31	1	1	1	1	1
32	1	1	1	1	1
33	1	* * * * *	1	1	1
34	1	1	1	1	1
35	1	1	1	1	1
36	1	1	1	1	1
37	1	1	1	1	1
38	1	1	1	1	1
39	1	1	1	1	1
40	1	1	1	1	1
41	1	1	1	1	1
42	1	1	1	1	1
43	1	* * * * *	1	1	1

data process report

process interaction matrix analysis

management-information-system	(row/col	1) no interaction, but has subparts
user-functions	(row/col	2) no interaction, but has subparts and is part of a process
reporting-capabilities	(row/col	3) no successors for this process
life-cycle-cost-analysis	(row/col	4) no interaction, but has subparts and is part of a process
development-cost-estimating	(row/col	5) no interaction, but is part of another process
operations-cost-estimating	(row/col	6) no interaction, but is part of another process
maintenance-cost-estimating	(row/col	8) no interaction, but is part of another process
financial-planning-tracking	(row/col	9) no interaction, but has subparts and is part of a process
generate-cpr	(row/col	10) no successors for this process
generate-cfsr	(row/col	11) no successors for this process
generate-estimated-costs	(row/col	12) no successors for this process
generate-cssr	(row/col	13) no successors for this process
schedule-planning-and-tracking	(row/col	14) no interaction, but has subparts and is part of a process
generate-cdrj-schedule	(row/col	15) no interaction, but is part of another process
generate-milestone-schedule	(row/col	17) no interaction, but is part of another process
generate-manpower-schedule	(row/col	18) no interaction, but is part of another process
generate-ecp-status	(row/col	19) no interaction, but is part of another process
requirements-analysis	(row/col	20) no interaction, but has subparts and is part of a process
requirements-relation-analysis	(row/col	21) no interaction, but has subparts and is part of a process
requirements-evaluation	(row/col	22) no interaction, but has subparts and is part of a process
system-performance-analysis	(row/col	23) no interaction, but is part of another process
system-completeness-assessment	(row/col	24) no interaction, but is part of another process
system-consistency-analysis	(row/col	25) no interaction, but is part of another process
traceability-analysis	(row/col	26) no interaction, but has subparts and is part of a process
configuration-accounting	(row/col	27) no successors for this process
ecp-impact-analysis	(row/col	28) no interaction, but is part of another process
problem-tracking	(row/col	29) no interaction, but has subparts and is part of a process
generate-problem-status-report	(row/col	30) no interaction, but is part of another process
generate-problem-impact-report	(row/col	31) no interaction, but is part of another process
user-requested-nonstd-analyses	(row/col	32) no predecessors for this process
input-processing-capabilities	(row/col	33) no predecessors for this process
operations-support	(row/col	34) no interaction, but has subparts and is part of a process

data process report

process interaction matrix analysis

user-modes	(row/col 35)	no interaction, but has subparts and is part of a process
output-formatting	(row/col 36)	no interaction, but has subparts and is part of a process
standard-report-generation	(row/col 37)	no successors for this process
plotter	(row/col 38)	no successors for this process
gant-chart-generation	(row/col 39)	no successors for this process
network-chart-generator	(row/col 40)	no interaction, but is part of another process
data-access-security-control	(row/col 41)	no interaction, but is part of another process
text-processing	(row/col 42)	no interaction, but is part of another process

APPENDIX 80

CADSAT MIS NAME LIST

name list

	name	type	synonym
1	abbreviation	element	abrevi
2	accounting-office	interface	accoff
3	accrued-expend-plus-commit	group	acexplco
4	accrued-expenditures	group	acexp
5	acquisition-cost-elem-desc	element	accoelnu
6	acquisition-cost-elem-numbers	group	accoel
7	acquisition-cost-elements	group	accoit
8	acquisition-cost-items	group	accowbit
9	acquisition-cost-wbs-items	group	actrco
10	acquisition-training-cost	group	actcos
11	actual-cost	element	accowope
12	actual-cost-work-performed	group	acwp
13	actual-to-date	element	
14	adjusted-ceiling-price	element	adcepr
15	adjusted-contract-price	group	adcopr
16	adjusted-target-price	element	adtaco
17	adjusted-target-price	element	adtapr
18	all-other-work	group	alotwo
19	allocation-baseline-dif	element	albadi
20	allocation-cost-dollar-value	element	alcodova
21	ama-code	element	amacod
22	analyzed	keyword	
23	appropriation-identification	group	appide
24	approved-design-to-cost-goal	group	apdetocogo
25	approved-program-date	element	apprda
26	approved-program-value	element	apprva
27	as-of-date	element	asofda
28	at-completion	element	atcom
29	at-completion-budgeted	group	atcoba
30	at-completion-costs	group	atcoco
31	at-completion-variance	group	atcova

name list

	name	type	synonym
32	authorized-baseline-changes	group	aubach
33	authorized-signature	group	autsig
34	authorized-work-subtotal	group	auwosu
35	autovon-tprefix	element	autpre
36	available-time	element	avativm
37	base-year-cost-dollar-value	element	bayedova
38	batch	process	
39	bcws-period-forecast	group	bcpefo
40	bcws-six-months-forecast	group	bcsimofa
41	breakdown-sequence-numbers	element	brsenu
42	budget-at-completion	element	bac
43	budget-estimate-cost-var	group	buatco
44	budgeted-cost-work-performed	group	buescova
45	budgeted-cost-work-scheduled	group	bcwp
46	cadstat-reports	output	bucowope
47	category	element	bcws
48	carl-schedule	entity	bucowosc
49	ceiling-price	element	cadrep
50	cfst-remarks	element	catogo
51	change-cost	element	cdrsch
52	change-descriptive-title	element	ceipri
53	change-notes	element	cfem
54	change-number	element	chacos
55	changes-since-as-of-date	element	chdeti
56	characteristic-description	group	chanot
57	characteristic-variances	group	chanum
58	ci-manufactures-identification	group	chsiasofoa
59	ci-manufactures-part-number	group	chades
60	command-processing	process	chavar
			cimaid
			cimapanu
			compro

name list

	name	type	synonym
61	commanders-office	interface	comoff
62	comments-required-date	element	coreda
63	commercial-area-code	element	coarco
64	committed-funds	group	comfun
65	company-address	group	comadd
66	company-name	element	comnam
			cona
67	component-average-maint-time	element	coavmati
68	component-item-fsn-nc	element	coitfsnc
69	component-item-record	group	coitre
70	component-life-cycle-period	element	colicype
71	component-projected-cost	element	coprco
72	component-repair-cycle-time	element	corecyti
73	component-weight	element	comwei
74	comprehensive-data-base	set	codaba
			codaba
75	computed-items	entity	comite
76	config-change-status-report	output	cochstre
77	config-control-board-date	element	cocoboda
78	configuration-accounting	process	codo
			conacc
			condoc
79	configuration-change-dates	input	cochds
80	configuration-control-opr	element	cocoop
81	consistency-analysis-examples	memo	coanex
82	contract-appropriation	element	conapp
83	contract-budget-baseline	element	cobuba
84	contract-ceiling-price	element	cocepr
85	contract-change-date	element	cochda
86	contract-compliance	element	concom
87	contract-cost-variances	group	cocova
88	contract-description	input	condes

name list

	name	type	synonym
89	contract-funding-for-fy	element	cofufofy
90	contract-funding-profile	group	coauwo
91	contract-funds-status-report	output	cofuwr
92	contract-gen-admin-rate	element	cofustre
93	contract-identification	group	cogeadra
94	contract-initial-price	group	conide
95	contract-modification-data	input	coinpr
96	contract-number	element	comoda
97	contract-performance-data	input	connum
98	contract-program-name	element	copeda
99	contract-start-date	element	coprna
100	contract-target-price	element	costda
101	contract-type	element	cotapr
102	contract-type-number	group	contyp
103	contract-work-authorized	group	cotynu
104	contractor	group	cowoau
105	contractor-estimate	element	contr
106	contractor-signature	group	conest
107	company-name	element	
108	cost	element	
109	cost-dollar-values	group	
110	cost-item	element	codova
111	cost-performance-report	output	dolval
112	cost-schedule-status-report	output	cosite
113	cost-variance	group	copere
114	costs-at-completion	group	cpr
115	cpr-baseline	output	coscstre
			cssr
			cova
			coatco
			cprbas

- - -

name list

	name	type	synonym
116	cpr-functional-categories	output	cpfuca
117	cpr-manpower-loading	output	cpmalo
118	cpr-problem-analysis	output	cppran
119	cpr-work-breakdown-str	output	cpwobrst
120	cum-todate-actual-work-perf	group	cutoacwope
121	cum-todate-budgeted-cost	group	cutobuco
122	cumulative-bcws	group	cumbcw
123	cumulative-cost-variance	group	cucova
124	cumulative-costs-to-date	group	cucotoda
125	cumulative-schedule-variance	group	cutoco
126	cumulative-variance	group	cuscva
127	cumulative-work-performed	group	cumvar
128	cumulative-work-scheduled	group	cuwope
129	current-budgeted-cost	group	cuwosc
130	current-cfsr-report-date	group	cubuco
131	current-contract-price	element	cucfreda
132	current-cost-dollar-value	group	cucopr
133	current-estimated-date	element	cudova
134	current-estimated-perform	element	cuesda
135	current-maintenance-policy	element	cuespe
136	current-page-number	element	cumapo
137	current-period-actual	element	cupanu
138	current-period-costs	group	cupeac
139	current-quantity	group	cupeco
140	current-variance	element	curqua
141	data-acceptance-checking	group	curvar
142	data-access-security-control	process	daacch
143	data-conversion	process	daacseco
144	data-flow-analysis	process	datcon
145	db-configuration-change-dates	process	daflan
146	db-contract-description	entity	dbcochds
		entity	dbcondes

name list

	name	type	synonym
147	db-contract-modification-data	entity	dbcomoda
148	db-contract-performance-data	entity	dbcopeda
149	db-level-a-specification	entity	dbleasp
150	db-level-b-specification	entity	dblebsp
151	db-level-c-specification	entity	dblebsp
152	db-projected-system-maint-data	entity	dbprsymada
153	db-system-acquisit-plan-init	entity	dbsyacplin
154	db-system-acquisit-plan-update	entity	dbsyacplup
155	db-task-description	entity	dbtrasdes
156	db-test-specification	entity	dbtessspe
157	dcp-thresholds-breached	group	dcthbr
158	definitized-work	group	defwor
159	demand-time	element	demtim
160	demonstrated-performance	element	demper
161	depot-cost-dollar-value	element	decodova
162	depot-maintenance	group	depmai
163	depot-maintenance-study-report	output	demastre
164	descriptive-name	element	desnam
165	design-test-trace	process	dctetr
166	designation	element	design
167	desired-completion-date	element	decoda
168	development-contracts	group	devcon
169	development-cost-estimating	process	decoes
170	development-estimate	element	devest
171	development-estimated-date	element	deesda
172	discard-cost-dollar-value	element	dicodova
173	discard-maintenance	group	dismai
174	division-address	element	divadd
175	division-name	element	divnam
176	dod-component	element	doluni
177	dollar-units	element	dolunit

name list

	name	type	synonym
178	earliest-start-date	element	eastda
179	ecp-impact-analysis	process	eciman
180	ecp-status	entity	ecpsta
181	eight-year-budget	group	eiyebu
182	element-life-cycle-cost	group	ellicyco
183	element-name	element	elenam
184	end-item-depot-record	group	enitdere
185	end-item-fsn-nc	element	enitfsnc
186	end-of-period-actual-cum	group	enofpeaccu
187	engineering-change-proposal	group	ecp
188	engineering-opr	element	enchpr
189	equipment	group	engopr
190	equipment-description	group	equipm
191	equipment-identification	element	equdes
192	equipment-name	group	equide
193	equipment-number	element	equnam
194	equipment-type	element	equnum
195	escalated-cost-dollar-value	element	egutyp
196	est-cost-auth-unpriced-work	element	esdova
197	estimated-ceiling	element	escoaunwo
198	estimated-over-under-cost	element	estcei
199	estimated-price	group	esovunco
200	estimated-unpriced-work	element	esunwo
201	expendability-category-code	element	excaco
202	facility-cost	group	faccos
203	facility-hours	element	fachou
204	facility-id	element	facid
205	field-replacement-percent	element	firepe
206	financial-planning-tracking	process	fipltr
207	force-basing	group	forbas
208	forecast-billing-projected	group	fobipr

name list

	name	type	synonym
209	forecast-billings	group	forbil
210	forecast-subtotal	group	forsub
211	forecasted-work	group	forwor
212	functional-control-analysis	process	fucoan
213	functional-task-category	group	futaca
214	funding-authorized-to-date	group	fuautoda
215	funds-carry-over	group	fucaov
216	gantt-chart	output	gancha
			gnacha
			gachge
			gnchge
217	gantt-chart-generation	process	geanad
			gecdsc
218	general-and-administration	group	gecf
219	generate-cdrj-schedule	process	gencfs
220	generate-cfst	process	gecp
			gencpr
221	generate-cpr	process	gencss
			geecst
222	generate-cssr	process	geesco
223	generate-ecp-status	process	gemasc
224	generate-estimated-costs	process	gemisc
225	generate-manpower-schedule	process	genech
226	generate-milestone-schedule	process	geprimre
227	generate-network-data	process	geprstre
228	generate-problem-impact-report	process	govest
229	generate-problem-status-report	process	hian
230	government-estimate	element	indcod
231	hierarchical-analysis	process	inicon
232	indenture-code	element	incoelde
233	initial-contract	group	incoelnu
234	initial-cost-elem-desc	element	incoel
235	initial-cost-elem-numbers	group	
236	initial-cost-elements	group	

name list

	name	type	synonym
237	initial-cost-items	group	incoit
238	initial-cost-wbs-items	group	incowbit
239	initial-price	element	inipri
240	initial-quantity	element	iniqua
241	initial-target-cost	element	intaco
242	initial-training-cost	group	intrco
243	input-processing-capabilities	process	dainacch inprca
244	input-set	set	
245	interactive	process	
246	intermediate-cost-dollar-value	element	incodova
247	intermediate-maintenance	group	intmai
248	inventory-cost	group	invcos
249	item-name	element	itenam
250	item-type	element	itetyp
251	latest-revised-estimate	element	larees lre
252	latest-start-date	element	lastda
253	lcc-initial-cost-detail	output	lcincode
254	lcc-recurring-costs-detail	output	lcrecode
255	lcc-recurring-costs-summary	oi	lcrecosu
256	level-a-specification	input	leasp
257	level-b-specification	input	lebsp
258	level-c-specification	input	lebsp
259	level-of-repair-anal-report	output	leofreanre lorar
260	level-of-repair-program	output	leofrepr
261	level-of-repair-status-report	output	lorp leofrestre
262	level-of-repair-summary-report	output	lorst leofresure
263	life-cycle-cost-analysis	process	licycoan

name list

	name	type	synonym
264	life-cycle-cost-items	group	licycoit
265	life-cycle-cost-report	output	licycore
266	life-cycle-cost-wbs-report	output	licycowbre
267	life-cycle-period	group	licype
268	line-item-budget	group	liitbu
269	line-item-description	element	liitde
270	logicon-cadsat-reports	output	locare
271	logistics-opr	element	logopr
272	lora-support-equipment	group	
273	maintenance-analysis-results	element	maanre
274	maintenance-cost-estimating	process	macoes
275	maintenance-notes	element	mainot
276	maintenance-recommendations	element	mairec
277	maintenance-repair-cost	group	mareco
278	maintenance-repair-level-code	element	mareleco
279	major-subcontractor	group	majsub
280	management-information-system	process	mainsy
			mis
281	management-reserve	group	manres
			mare
282	manpower-period-forecast	group	mapefo
283	manpower-requirement-at-completion	group	mareatco
284	manpower-schedule	entity	mansch
285	manpower-six-months-forecast	group	masimofa
286	manufacturers-identification	element	manide
287	manufactures-part-number	element	mapanu
288	material-requirement-list-repl-percent	element	marelirepe
289	mean-time-between-deliveries	element	metibede
			mtbd
290	mean-time-between-failures	element	metibefa
			mtbf
291	mean-time-to-test	element	metitote

name list

	name	type	synonym
292	milestone-description	element	mttt
293	milestone-schedule	group	mildes
294	milestone-schedule-data	entity	milsch
295	milestone-variances	group	miscda
296	minimum-cost-alternative	element	milvar
297	minimum-cost-dollar-value	element	micoal
			micodova
			mincost
298	minimum-cost-value	element	micova
299	mis-maintenance	process	mismai
300	mission-and-description	element	miande
301	mmsr-control	element	mmscon
302	mmsr-control-number	element	mmconu
303	multiple-support-equipment-rpt	output	musuegrp
304	narrative-backup	output	narbac
305	negotiated-contract-changes	element	necoch
306	negotiated-cost	element	neco
307	net-funds-required	group	nefure
308	network-chart-generator	process	pechge
309	next-higher-assembly-desc	group	nehiasde
			nha-desc
310	nomenclature	element	nomenc
311	non-repairable-component-rate	element	norecora
312	not-definitized-work	group	nodewo
313	not-yet-authorized-work	group	noyeauwo
314	noun-name	element	nounam
315	number-accepted	element	numacc
316	number-of-items	element	nuofit
317	number-of-units	element	nuofun
318	number-planned	element	numpla
319	office-primary-responsibility	group	ofprre
			opr

name list

	name	type	synonym
320	office-prime-respon-symbol	element	ofpresy
321	operational-characteristics	group	opecha
322	operations-cost-estimating	process	opcoes
323	operations-support	process	opsu
324	opt-repair-lev-anal-report	output	opreleanre
			orlar
325	optimum-repair-level-analysis	process	oprelean
			orla
326	order-packing-shipping	group	orpash
327	order-shipping-time	group	orshti
328	orla-cost-elem-desc	element	orcoelde
329	orla-cost-element-output	output	orcoelou
330	orla-depot-mult-support	output	ordemusu
331	orla-economic-anal-report	output	orecanre
332	orla-end-item-resume	output	orenitre
333	orla-equipment	group	orlequ
334	orla-input-data-printout	output	orindapr
335	orla-intermediate-mult-support	output	orinmusu
336	orla-item-description	group	oritde
337	orla-item-numbers	group	oritnu
338	orla-items	group	orlite
339	orla-math-sensitive-anal-report	output	ormaseanre
340	orla-variable-items	group	orvait
341	output-formatting	process	oufo
			outfor
342	output-set	set	
343	overhaul-condemnation-percent	element	ovcope
344	packing-shipping-cost	group	pashco
345	part-numbers	group	panu
346	part-numbers-items	group	part-nos
347	percent	element	panuit

name list

	name	type	synonym
348	percent-of-total-time	element	peoftoti
349	performance-parameter	element	perpar
350	period-of-completion	element	peofco
351	person-hours	element	perhou
352	person-id	element	perid
353	person-in-charge	element	peinch
354	phone-number	element	phonum
355	plotted-schedules	output	plosch
356	plotter	process	
357	popular-name	element	popnam
358	preparation-agency	element	preage
359	prerequisite-tasks	group	
360	previous-cfsr-report-date	element	prcfreda
361	price-at-completion	group	pratco
362	price-budget-beginning-of-perd	group	prbubeofpe
363	prime-contractor	group	pricon
364	prime-item-quantity	element	pritgu
365	problem-name	element	pronam
366	problem-tracking	process	protra
367	problem-tracking-examples	memo	prtrex
368	problems	group	
369	procurement-opr	element	proopr
370	procurement-source-code	element	prsoco
371	procuremnt-officer-letter-date	element	prfleda
372	product-test-trace	process	prtetr
373	production-contracts	group	procon
374	production-milestone-schedule	group	prmisc
375	production-planning-schedule	element	prplsc
376	production-vs-rdte	element	prvsrd
377	program-acquisition-cost-var	group	praccova
378	program-acquisition-costs	group	pracco
379	program-baseline-beg-of-period	group	prbabeofpe

name list

	name	type	synonym
380	program-budget-report	output	prbure
381	program-description	element	prodes
382	program-element-number	element	prelnu
383	program-highlights	group	pronig
384	program-manager	element	proman
385	program-name-number	group	prnanu
386	program-office	interface	prof
			spo
			system-program-offi
387	program-office-name	element	prfina
388	program-period-end-baseline	group	prpeenba
389	program-schedule	output	prosch
390	program-title	element	protit
391	projected-by-period	group	prbype
392	projected-cost	element	procos
393	projected-system-maint-data	input	prsymada
394	quantities-delivered	group	quadel
395	quantity-per-assembly	element	gupeas
396	record-establishment-date	element	reesda
397	record-identifier-code	element	reidco
398	recurring-cost-elem-desc	element	recoelde
399	recurring-cost-elem-numbers	group	recoelnu
400	recurring-cost-elements	group	recoel
401	recurring-cost-items	group	recoit
402	recurring-cost-wbs-items	group	recoabit
403	recurring-training-cost	group	retrco
404	repair-description	group	repdes
			varnam
405	repair-rates	group	reprat
406	repair-variable-name	element	revana
407	report-control-symbol	element	recosy
408	report-date	group	repdat

name list

	name	type	synonym
409	report-page-number	group	repanu
410	report-period	element	repe
411	reporting-capabilities	process	reca
412	required-completion-date	element	repcap
413	required-time	element	recoda
414	requirements-analysis	process	regtim
415	requirements-design-trace	process	rean
416	requirements-evaluation	process	reqana
417	requirements-product-trace	process	redetr
418	requirements-relation-analysis	process	regeva
419	requirements-test-trace	process	reprtr
420	results-of-analysis	element	rerean
421	references-to-other-sections	group	retetr
422	revised-schedule-element	element	reofan
423	revised-task-status	element	retootse
424	revision-date	element	rescel
425	sar-section-a-cover-sheet	output	retast
426	sar-section-b-summary	output	revdat
427	sar-section-c-technical	output	saseacosh
428	sar-section-d-schedule	output	saseacovsh
429	sar-section-e-costs	output	sasebsu
430	sar-section-f-contract-info	output	sasecte
431	sar-section-g-variances	output	sasedsc
432	sched-listing-of-orla-elements	element	saseeco
433	schedule	group	sasefcoin
434	schedule-data	set	sasegva
435	schedule-planning-and-tracking	process	scloforel
436	schedule-variance	group	schedu
437	scheduled-completion-of-orla	element	schdat
			scplantr
			scva
			sccoofor

name list

	name	type	synonym
438	scheduled-ident-of-orla-proc	element	scidoforpr
439	scheduled-implementation	element	schimp
440	scheduled-lsa-interfaces	group	sclsin
441	scheduled-prelim-orla-review	element	scprorre
442	selected-acquisition-report	output	seacre
443	share-of-cost-dollar-value	element	shofcodova
444	share-ratio	element	
445	shipping-cost	group	
446	signature	element	shicos
447	signature-date	element	
448	skill	group	
449	skill-hours	element	
450	skill-level	element	skihou
451	skill-type	element	skilev
452	source-maintenance-code	element	skityp
453	special-facilities	element	somaco
454	special-identification-code	group	spefac
455	special-items	element	spidco
456	special-people	group	speite
457	special-report-data	group	
458	split-maintenance	entity	spreda
459	standard-report-generation	group	splmai
460	statement-of-problem	process	strege
461	subsystem-name	element	stapro
462	subtotal	element	subnam
463	support-equipment-desc	group	
464	system-acquisition-plan-init	element	sueqde
465	system-acquisition-plan-update	input	syacplin
466	system-completeness-assessment	input	syacplup
467	system-completeness-example	process	sycoas
468	system-consistency-analysis	memo	sycoex
469	system-contractors	process	sycoan
		interface	syscon

name list

	name	type	synonym
470	system-major-contractors	interface	symaco
471	system-minor-contractors	interface	symico
472	system-name	element	sysnam
473	system-performance-analysis	process	sypean
474	system-performance-memo	memo	sypeme
475	system-prime-contractor	interface	syprco
476	system-specifications	input	sysppe
477	system-symbol	element	sysSYM
478	target-price	element	tarpri
479	target-profit	element	tapr
480	task-description	input	tasdes
481	task-description-text	element	tadete
482	task-duration	element	tasdur
483	task-number	element	tasnum
484	task-schedule-element	element	tascel
485	tech-agreement-letter-date	element	teagleda
486	technical-characteristics	element	teccha
487	technical-requirements-impact	group	tereim
488	test-specification	output	tesspe
489	text-processing	input	tepr
490	title	process	
491	total	element	
492	total-allocated-budget	group	toalbu
493	total-budget	element	totbud
494	total-budget-at-completion	group	tobuatco
495	total-costs	element	totcos
496	total-funds-requirements	group	tofure
497	total-life-cycle-cost-summary	output	tolicycosu
498	total-manpower	group	totman
499	total-number-of-pages	element	tonuofpa
500	total-variance	group	totvar
501	traceability-analysis	process	traana

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name list

name	type	synonym
502 training-cost	group	tran
503 transaction-identifier	element	tracos
504 type-of-action-code	element	traide
505 type-of-schedule	element	tyofacco
506 undistributed-budget	group	tyofsc
507 unit-costs	group	unbu
508 unit-issue	element	unbbud
509 unit-price	element	unicos
510 units-accepted-to-date	group	uniiss
511 unliquidated-commitments	group	unipri
512 user-functions	process	unactoda
513 user-modes	process	unlcom
514 user-requested-nonstd-analyses	process	usefun
515 utilization	element	usefu
516 variable-value	element	usemod
517 variance-adjustment	group	usmo
518 wbs-description	group	dabaqu
519 wbs-descriptor	group	usrenoan
520 wbs-item	group	utiliz
521 wbs-item-costs	group	varval
522 weapon-system-budget-estimate	output	varadj
523 weapon-system-name	element	wbsdes
524 weekly-cost-updates	group	wbsite
525 weekly-schedule-updates	group	wbitco
526 weekly-technical-updates	group	wesybues
527 work-breakdown-structure-items	group	wesyna
528 work-to-be-performed	element	wecoup
		wescup
		weteup
		wobrstit
		wotobepe

name list			
	name	type	synonym
529	work-unit-code	group	wounco
530	x-mini-board-date	element	wuc
531	y-mini-board-date	element	xmida ymida

APPENDIX 90
SELECTED BIBLIOGRAPHY
(CADSAT GENERATED)

1 entity GFE;
2 synonyms are: gfe-docs;
3 keywords: documents,
4 gfe;
5

6 group GFE-documents;
7 synonyms are: gfe-documents;
8 description;
9 This is a CADSAT listing of all Government Furnished
10 Equipment (GFE) for the CADSAT/MIS contract, in this
11 circumstance a list of GFE documents;
12 keywords: documents,
13 gfe;
14 consists of:
15 AD701303,
16 AD784926,
17 ADA011730,
18 AD765203,
19 ADA016452,
20 AD767306,
21 AD736210,
22 AD736987,
23 AD877476L,
24 AD766092,
25 AD785143,
26 AD783544,
27 AD787704,
28 ADA006334,
29 AD781749,
30 ADB005306L,
31 ADB008075,
32 ADB010246L;
33
34

35 element AD701303;
36 synonyms are: ad701303;
37 description;
38 Application and Demonstration of NAS Sausley Manpower
39 Allocation and Productivity Measurement Model;
40 keywords: documents,
41 gfe;
42 contained in: GFE-documents;

43
44 element AD784926;
45 synonyms are: ad784926;
46 description;
47 Representation of Information in the Design-Construct:
48 Process;
49 keywords: documents,
50 gfe;
51 contained in: GFE-documents;
52
53 element ADA011730;
54 synonyms are: ada011730;
55 description;
56 Experimental Interim RADC MIS System (FEMIS);
57 keywords: documents,
58 gfe;
59 contained in: GFE-documents;
60
61 element AD765203;
62 synonyms are: ad765203;
63 description;
64 Generalized Data Base Management System and Selected
65 Air Force Applications;
66 keywords: documents,
67 gfe;
68 contained in: GFE-documents;
69
70 element AD875036;
71 synonyms are: ad875036;
72 description;
73 Description of the SACCS Data Management System;
74 keywords: documents,
75 gfe;
76 contained in: GFE-documents;
77 security is: TOIT,
78 C.Hartman;
79
80 element ADA016452;
81 synonyms are: ada016452;
82 description;
83 Concept of a Management Information System for TESPO;
84 keywords: documents,
85 gfe;
86 contained in: GFE-documents;

87

88 element AD767306;
89 synonyms are: ad767306;
90 description;

91 Program and Financial Management Plan, Resources Informatic
92 Systems. Volume IV. NUSC PERT/TIME/COST Program User's Manual;
93 keywords: documents,
94 gfe;
95 contained in: GFE-documents;
96

97 element AD736210;
98 synonyms are: ad736210;
99 description;
100 Use of Edit Information to Measure and Reduce File Error
101 Content in a MIS;
102 keywords: documents,
103 gfe;
104 contained in: GFE-documents;
105

106 element AD736987;
107 synonyms are: ad736987;
108 description;
109 MIS Technology: A view of the Future;
110 keywords: documents,
111 gfe;
112 contained in: GFE-documents;
113

114 element AD877476L;
115 synonyms are: AD8774761,
116 ad877476L,
117 ad8774761;
118 description;
119 The Army Communications-Electronics Management Information
120 System (ACEMIS) -Coordination Draft- Master Development Plan
121 Volume I. Executive Summary
122 -- Two copies of this manual were acquired
123 rather than a copy of manual AD877476
124 Application and Demonstration of NAS Saufley Manpower
125 Allocation and Productivity Measurement Model;
126 keywords: documents,
127 gfe;
128 contained in: GFE-documents;
129 security is: TOIT,
130 C.Hartman;
131

132 element AD766092;
133 synonyms are: ad766092;
134 description;
135 Implementation of Complex Management Information Systems;

136 keywords: documents,
137 gfe;
138 contained in: GFE-documents;
139

140 element AD785143;
141 synonyms are: ad785143;
142 description;
143 Feasibility and Utility of an on-line Information
144 Communications System in a Research and Development Management
145 and Planning Environment;
146 keywords: documents,
147 gfe;
148 contained in: GFE-documents;
149

150 element AD783544;
151 synonyms are: ad783544;
152 description;
153 Application of a Process Model to a Management Support System
154 keywords: documents,
155 gfe;
156 contained in: GFE-documents;
157

158 element AD787704;
159 synonyms are: ad787704;
160 description;
161 An Analysis of Program Evaluation and Review Technique (PERT)
162 in Weapon System Acquisition;
163 keywords: documents,
164 gfe;
165 contained in: GFE-documents;
166

167 element ADA006334;
168 synonyms are: ada006334;
169 description;
170 An Evaluation of the Integrated Managerial Programing Analysis
171 and Control Technique System (IMPACT) of the Aeronautical Systems
172 Division (AFSC) -- A Management Information System;
173 keywords: documents,
174 gfe;
175 contained in: GFE-documents;
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177 element AD781749;
 178 synonyms are: ad781749;
 179 description;
 180 Technical Literature Review Concerning Management Informati

 181 Systems;
 182 keywords: documents,
 183 gfe;
 184 contained in: GFE-documents;
 185
 186 element ADB005306L;
 187 synonyms are: ADB0053061,
 188 adb005306L,
 189 adb0053061;
 190 description;
 191 Implementation of United States Air Force Automatic
 192 Data Processing Requirements Studies - A Management
 193 Dilemma;
 194 keywords: documents,
 195 gfe;
 196 contained in: GFE-documents;
 197 security is: TOIT,
 198 C.Hartman;
 199
 200 element ADB008075;
 201 synonyms are: adb008075;
 202 description;
 203 DREV Management Information System;
 204 keywords: documents,
 205 gfe;
 206 contained in: GFE-documents;
 207
 208 element ADB010246L;
 209 synonyms are: ADB0102461,
 210 adb010246L,
 211 adb0102461;
 212 description;
 213 Army Management Information Systems Master Plan -
 214 (AMIS Master Plan);
 215 keywords: documents,
 216 gfe;
 217 contained in: GFE-documents;
 218 security is: TOIT,
 219 C.Hartman;