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Textbook for Configuration Status Accounting

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Textbook for Configuration Status Accounting

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This Bulletin CMB6-5 is one of a set being prepared for use in the training and education of configuration and data management. The set includes:

- CMB6-1 1/88 Configuration and Data Management References
- CMB6-2 1/88 Configuration and Data Management In-House Training Plan
- CMB6-3 (TBD) Configuration Identification
- CMB6-4 (TBD) Configuration Control
- CMB6-5 3/88 Configuration Status Accounting
- CMB6-6 (TBD) Configuration Audits
- CMB6-7 (TBD) Data Management

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FOREWORD

Configuration management (CM) is the special name that has been coined to describe those specialized engineering management practices used by industry and the Department of Defense (DOD) to define and control items (sometimes referred to as configuration items or CIs) in their inventories. The overall intent of configuration management is to support the establishment of a product service network for all items being developed and to assure the continued serviceability of the items as changes are made throughout their service life.

The configuration of an item is defined in both functional and physical terms. Functional requirements establish the performance the item is expected to achieve; the physical requirements define the specific design and appearance of the item to be built. In practice, an item being developed is described, and its development governed, primarily by its intended functional characteristics. Following development, however, an item being produced for customer use is primarily described and governed by its physical characteristics, although the functional characteristics continue to be controlled.

The practices we follow with configuration management are nothing startling or brand new. Basically, they are common sense management practices that have been formalized into set practices to address the peculiarities of managing large inventories of units in multiple product lines. For convenience sake in describing the practices, CM is divided into four functional areas: identification, audit, control, and status accounting. Each of the four functions has a specific purpose and a specific area of emphasis.

- Common sense tells me to define what I want the product to do, or what it should look like, before I sign a contract to buy it. Through configuration identification, we obtain quality documentation that is used to define both the performance we desire from the design under development and the design of the interchangeable production items we want to buy. The documentation will also define the exact design for which a servicing capability must be established and maintained.

- If I have specified some requirements that the product must meet, common sense tells me that I must check at some point in time to be sure that those requirements have been met. Through configuration audits, we verify that the design activity has proven that the items, as designed, meet or exceed the specified performance and that the design specified in the configuration documentation exactly matches the configuration of the (production) unit being audited and about to be delivered.

- If I am one of the contracting parties, common sense (and business law, too) tells me that the other party to the contract should not be allowed to change the contract without informing me of all of the considerations and obtaining my agreement to the change. Through configuration control, we require that the full impact of a proposed change be determined before we make a decision on each change to the contractual (baseline) configuration identification. We are also constraining the design activity from making changes without the concurrence of the management activity.

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- If I want to manufacture a consistent product and have the capability to service it, common sense tells me that I must have a means of recording and tracking the production paper used to manufacture the unit as well as the configuration of each unit my company produces. Through configuration status accounting, we follow up on the results of other configuration management activities to keep track of the current configuration identification documents, the current configuration of the delivered units, the status of changes being reviewed, and the status of the implementation of approved changes.

This text will cover the details of the status accounting function. Identification, audits, and control are covered in other textbooks. It is the intent of the authors that this status accounting text will serve a broad general population of managers engaged in development, manufacturing, and distribution of both commercial and military items. The figures in this text provide illustrations of sample data which might be required and sample formats that might be used by your organization in accomplishing status accounting. You will have to make the decisions about the exact content and format appropriate for your project and/or facility based on the information contained in this text.

The general concepts herein apply during the design and delivery of products to various types of customers and include elements of information which must be monitored for the continued support and service of your products. The Department of Defense (DOD) represents a major customer of such goods and services; consequently, a highly structured program utilizing status accounting along with the related configuration management disciplines exists in the environment of military item acquisition. The authors, however, have tried to avoid emphasis on DOD-related systems and requirements; where specific DOD requirements are discussed, we have attempted to indicate that such is the case.

CHAPTER 1

INTRODUCTION

What is Status Accounting?

Basically, status accounting refers to the record-keeping functions inherent in the other elements of Configuration Management (CM) and to the specialized management information systems that must exist to provide all of the information. In order to accomplish the status accounting function, we must maintain a record of the documentation which defines each major item (of hardware or software), must record the configuration of each unit of the major item as it is delivered, and must track the implementation of approved changes into the documentation and the units of the major items. Status accounting aids informed decisions about the spares requirements for, the service for, and the overhaul of the major items; it allows accurate programming and timely availability of service elements for the changed items. Through status accounting, a manager should be able to trace the baselined documentation (i.e. listings, drawings, specifications, etc.) from their current status back to the original baseline status and to trace a specific unit from its current configuration back to its delivered configuration.

For example, over a period of years that a product is being produced, there will be hundreds of minor design changes and tens of major design changes to improve the producibility or the performance/utility of the product. The configuration control function will make sure that the change identifies all the impacts and has the necessary approval, but status accounting must provide the information system to assure that the effects of the change are recorded for future reference. As a result of these changes, there will be many different configurations being used by your customers. In order to provide them with adequate service, you must have documentation/information available which can tell a service per-

son which configuration they have by looking at some unique identifying number(s) on that unit. The proliferation of variations or versions is greater with software than with hardware. This, together with normally greater change activity and the difficulty of visually determining software's configuration, make status accounting information a must for software developers.

Given the complexity of current systems, and given the requirement to keep them operating for many years, it is imperative that both vendors and users have an up-to-date, accurate source of information about the configuration of the units and their related documentation. It should be understood that the information is usually available even without status accounting, but it is usually located at many different locations. Under these circumstances, the complete data may be hard to obtain, and some of it may not be rigorously controlled and updated.

Why Do We Need Status Accounting?

The end-purpose for all CM activities is to assure the supportability of the products delivered to our customers. The bottom line of both CM and Status Accounting is very simple: If your customer service system is very responsive to the customer's needs, it is more likely that your product will be the customer's first choice for his next purchase. On the other hand, if your organization provides poor service, the customer may reject your more capable product and buy one from another organization with an excellent customer service record. The money spent on an effective status accounting (and CM) system is a good investment in the serviceability and marketability of your products.

The status accounting information will provide your organization with the information needed to easily determine the configuration(s) of the units to be

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supported and to maintain the spares and service capabilities to keep them operating. It will also provide you with the information needed to determine the exact configuration of a particular unit (or units) which has failed in operation. If enough units of the same configuration fail, it can be used as a part of the failure analysis activities as your engineers try to isolate the failure prone component. After the failure has been analyzed and a correction designed, the information system will help you to identify the quantities of units (perhaps by specific serial number) which contain the failing component and which need to be returned for modification. As such, the status accounting information system can pay for itself just by minimizing the legal (and monetary) liability your organization may incur as a result of such failures.

As a part of their normal activities, the identification, audit, and control elements of CM review, validate, and revise documentation and related information describing the configuration of your products. Status accounting requires us to record the results of these activities, and the information relative to the documents and units, so that all units of the products can be serviced. For example

- we attempt to develop products with both optimum utility for the customer and ease of repair for our service personnel. The documentation prepared to describe the product performance and design must reflect the most current configuration. However, historical records must be maintained to identify all prior, but still used, configurations. Earlier valid versions of the software and its documentation will be retained in archival libraries for legal purposes and for other reasons, even after it is no longer used, so the status accounting system must also store information about these earlier software configurations.

- a rigorous change control system is established to assure that all documentation, production line elements, and service factors impacted by the change are identified and considered before the change decision is made. Status accounting must include some way of verifying that all of the necessary actions resulting from these impacts and approved with the change decision are actually accomplished.

- quality assurance keeps a careful record of the configuration of each unit as it is manufactured to verify that the correct product is being built. Status accounting must keep track of the unit configuration after it is delivered to a customer.

All of these follow-up activities require information for their accomplishment; status accounting establishes the needed data base to provide the information and establishes the necessary requirements for the periodic or continuous update of the information. For now, let's briefly look at each of these areas, with the understanding that we will cover them in more complete detail later in the course.

Descriptive Documentation and Identification Numbers.

An information/management system should be provided to record the most current versions of the documents which describe the products and the most current identification numbers used to identify (label) the products and their related documentation. The information elements should be incorporated into the system progressively as they are generated or become available as a result of the establishment of the functional, allocated, and product baselines. This information should be updated as changes from the baseline configuration are approved, so that the most current descriptive information is the primary information stored. However, where continuing operational use of more than one configuration of a product is approved, the system should

identify all differences between the most current configuration and each earlier (but still approved) configuration.

- **Configuration Identification.**

The identification number, revision level, and issue date of each of the specifications and drawings that comprise the baselines for the various products must be recorded. With software, the documentation and tools which are utilized with the baselined item must also be identified and controlled. The exact name or number and change or date and version must be recorded. For the remaining life of the product, they must be updated as necessary to reflect the approved configuration being purchased by the government. The date of original establishment of each baseline must also be recorded.

- **Product Data.**

When each baseline for a product or one of its major components is established, the design organization must compile a listing of the identification numbers (e.g. part numbers, model numbers, national stock numbers, nomenclature, version number, module/unit number) for the parts and documentation that constitute the baseline. As changes are approved after the baseline is established, the records of these identification numbers must be updated to reflect the new configuration.

Active Change Preparation and Processing.

An information/management system should be available which is capable of tracking all proposed changes from first activity concerning an idea through official notice of the final decision to proceed. All changes to the documented design or performance must be carefully tracked from the time the idea is first recorded officially until the time it is approved/disapproved and the official notification of the decision is provided to the design organization. Since proposed changes to software often begin with a software

problem report (SPR) [a "bug report" in the vernacular] or with a software change request (SCR), the information identifying and tracking these documents must be recorded and tracked along with the information about the corresponding engineering change proposal. The intent is to expedite the processing of changes and to assure that changes are not lost or delayed during processing. If very detailed tracking and management of the change processing is required, the system should track specific scheduled and actual dates associated with the generation of the change documents by the design organization and associated with the review of the change by the management organization. It should include the capability to suspense scheduled events that are due to occur soon and to flag events which are late.

Approved Change Implementation Status.

An information/management system should be provided to document the initial approved configuration of each product and to identify the impact of each approved (contractually authorized) change from the baselined configuration. The information should include the total approved serial number effectivity of the change, including both those production-line units manufactured in the new configuration and those already-delivered units modified/retrofitted to the new configuration. Status accounting requires the tracking of the implementation of approved changes, once they have been placed on contract, until all implementation activities have been completed. The system should track the completion of all tasks required as result of each approved change. Software updates may impact numerous other software programs used by the customer as tools, and they may impact the related documentation provided to assist in using those tools. In the proposed change documentation, the design organization has identified all impacts to the program documentation and has provided a schedule for incorporating all changes into

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the production line, the operational units, and the customer service system. Status accounting requires tracking of all these actions to make sure they are accomplished as scheduled in the proposed change.

Where the criticality/size of the product warrants, an optional information system should be established to track the status of interim events required to completely implement that particular aspect of the change. It should be used to identify key events (especially those related to the logistics elements) required for completion of work on the change and should track the scheduled and actual dates for the accomplishment of those events. For example, development of new/revised manuals, purchase or manufacture of new spares, and updates to service equipment/Automatic Test Equipment programs must be tracked to assure the capability to service the new configuration. For retrofit/rework changes, tracking of the development and delivery of the kits of modification parts and the associated installation/checkout instructions is usually required. In many cases, the actual installation of these kits in operational units is closely tracked. This optional system should include the capability to suspense

scheduled events that are due to occur soon and to flag events which are late.

Operational Unit Configuration.

In addition to following-up on actions due to approved engineering changes, status accounting also involves the continuous tracking of the configuration of all operational units, especially due to normal maintenance (remove/replace) actions. In some cases, this involves only part number control of the components installed in a product or system; in others, there must be part number and serial number control of certain critical components. In the case of software, the developer must track the exact configuration of the software modules/units which are linked to form each version of the program delivered to the customer. An information/management system should be provided to document the exact delivered configuration of each unit and to track changes to the configuration of each unit while it is being used by your customers. Differences in the configuration of like items must be documented and tracked. The system should be capable of identifying the exact configuration of each unit of the product and of identifying the total units with a specific configuration.

CHAPTER 2

DESIGNING A STATUS ACCOUNTING SYSTEM

Internal Design Organization Requirements

Determining Information Needs. Each organization responsible for the design and manufacture of items will have to establish a status accounting system to fit its needs. As with the other Configuration Management (CM) functions, the scope of status accounting will be dictated by the type and complexity of the products (hardware and/or software) that you are marketing and by the responsibilities your organization assumes for maintenance, distribution of manuals, providing a supply point for repair parts, etc. Another major determining factor is the type of customer you will be supplying. The type of information necessary for dealing with sales to private individuals can be significantly different from that required by a DOD or industry customer. The individual will expect you to maintain and provide the information necessary to exactly identify the configuration of his unit and to expedite its repair when it breaks. DOD, on the other hand, will usually require exact documentation of the delivered configuration of a unit, but it will internally track the configuration of that unit once it has been delivered into the operational inventory.

While some documentation and information must be maintained for each part and computer program, there are also some specialized management techniques which are applied only to the higher-level assemblies. The selection of the assemblies requiring this specialized management visibility is covered in the text on configuration identification, so we will not try to cover that material again. However, for each assembly selected, these management techniques require the generation of information which must be tracked in the status accounting system. Thus,

the numbers and types of items selected for special management visibility will certainly influence the size and complexity of the status accounting system. In establishing the organization guidelines for management of assemblies, the capabilities of the status accounting system must be considered. When doing business with the DOD, these key assemblies are called "configuration items" (CIs); selection of CIs is required as a part of the contract. DOD has a set of criteria to be used in identifying CI candidates; these criteria may be more stringent than your standard organization practices, and the resultant number of CIs may exceed the capabilities of your status accounting system. Therefore, if you expect to be doing a lot of business with the DOD, you will be well advised to consider the government requirements in sizing your organization's procedures and capabilities.

If your organization is just establishing an information system, it is strongly recommended that a single data base be maintained by a single central organization, with the data base accessible by all parties with a need to know. Report generation programs can be developed to provide information for a recurring special need. A single data base will prevent the occurrence of conflicting information, where the user is left to determine which is apparently right or wrong. Since neither data base can automatically be assumed to be RIGHT, all other data in each data base becomes suspect, defeating the purpose of the status accounting system.

Unless your organization is just starting up, there are usually many sources of status accounting information already available in fragmented form throughout the organization. It may be very difficult to combine all of the data bases into a single data base.

although this is still recommended, and to agree on the single central organization to control and update the information. The engineering, manufacturing, quality, and service functions will have some information which will be used in the status accounting system. In setting up the system, you should first survey all of the functions of the organization to determine what information is already available. Since it is usually resident on the same mainframe computer, much of the initial setup of the status accounting system is a matter of getting all of the data elements to match up and all of the separate systems to successfully interchange the necessary data. However, you should try to use the available data in its existing format, rather than demanding compliance with your peculiar requirements, especially when you are trying to get the cooperation of all of the functions in supplying and updating the information in the system. If you have some specialized requirements, then make them a part of your system and reprocess the existing data or add the needed new data to fulfill your needs. It is highly desirable to link these separate subsystems to provide a "closed loop" to detect errors and omissions. For example, it would be well to know when the "as-built" record indicates that a part was included in the unit when the corresponding "as-designed" record doesn't specify the requirement for that part.

The software library (or very commonly, libraries) together with the software tools utilized in the development process determine to a large extent the software status accounting capabilities. It is therefore evident that, with software, the status accounting planning must be accomplished in concert with planning for the configuration identification and control tools. Data bases and tools used for these other activities are linked and utilized for status accounting purposes. In trying to meet customer requirements, it would be advisable to discuss the status accounting informa-

tion which is readily available, or planned to be available, with the customer to see if it fits his or her needs. In the case of software, the developer usually has a need for status information at a more detailed level than the customer, so the probability is that the customer can be satisfied by existing information. Most systems require software status accounting data at the module/unit level.

Engineering Release Systems (ERS).

As a normal part of the documentation control and release function, most companies establish engineering release systems. While the main function of the ERS is to assure that new documents have been fully reviewed and approved before they are released and that old, outdated documents are retrieved and placed in archives for a prescribed period of time, they also generate and store a great deal of information about the documentation and the items. For software, the ERS function is normally within the software library function and primarily involves internal releases; it may be required to include additions to the DOD-required developmental configurations) and external release to the customer. DOD customers invoke standards for the ERS which require management information capabilities far beyond those needed for the simple release of the new documentation. Therefore, the ERS should be the primary source for much of your status accounting data. Common engineering release functions include:

- Drawing revision information. The system should include information about each drawing controlled by the organization's engineering section. It should reflect the current drawing revision being used, the number of sheets that comprise the complete drawing, the date that revision was released for use, and the number of the internal (and customer) change document that was approved to authorize the change. It should also maintain a historical record of the same information

for all previous revisions of the drawing that have been released. Many companies use "computer program drawings" to control the release of versions of a computer program; such "drawings" require the same kind of traceability information. If your organization does not follow this practice, then the ERS should contain similar information for each computer program under its control.

Documentation revision information. The system should include information about each specification (or similar document) issued by the organization's engineering (and/or marketing) section. It should reflect the current revision/specification change notice level of the document, the date that change notice was released, and the number of the change document that was approved to authorize the revision/notice. It should also maintain a historical record of the same information for all previous revisions/notices of the document that have been released.

Next higher assembly. The system should contain information reflecting the next higher assembly in which this item is used. If there is more than one application, then all higher assemblies should be indicated. This provides the capability, at any level of assembly, to identify all of the parts that assemble together to comprise the assembly and thus to generate the parts list for the assembly.

Information Needs of Functional Elements. As a part of a cooperative management information system, it is likely that the ERS will include information that can be used by other functional elements within your organization. To fulfill the most common information needs for the various functions, the system should solicit the inputs of the CM, Contracting, Engineering, Manufacturing, Quality, and Service functions. As will be discussed later in this book, the different functions have requirements varying from a few to nearly all of the information elements we will be covering. Figure 2-1 provides a matrix of these primary functional elements with the

INFORMATION	ENGR	CONF	MFG	QUAL	SERV	CONTR
SPEC NUMBER/REVISION	X	X				
DRAWING NUMBER/REVISION	X	X	X	X	X	X
SOFTWARE NUMBER/VERSION	X	X	X	X	X	X
ITEM PART NUMBER	X	X				
CUSTOMER ID NUMBERS	X	X	X	X	X	X
AS-BUILT RECORDS	X	X	X	X		
MAINTENANCE RECORDS	X	X	X	X	X	
RETROFIT/MODIF RECORDS	X	X			X	X
INTERNAL CHG PROCESS SCHED	X	X	X	X		
CUSTOMER CHG PROCESS SCHED	X	X	X	X	X	X
APPROVED EGRG CHG RECORD	X	X	X	X	X	X
BASELINE DOC REV ACTIVITY	X	X		X		
TECH MANUAL REV ACTIVITY	X	X		X	X	
SPARES PURCHASE DISTRIB	X	X			X	
SUPPORT EQUIP REV ACTIVITY	X	X		X		
SOFTWARE REV ACTIVITY	X	X	X	X		
CALENDAR REPORTS	X	X				
NO ACTIVITY REPORTS	X	X				
PAST DUE ACTIVITY REPORTS	X	X	X	X	X	X
MANAGEMENT REPORTS	X	X	X	X	X	X

Figure 2-1 Information Needs of Functional Organization

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various general types of status accounting information elements completed to show a typical sample using the information needs for the functions in one organization. The specific needs for the functions in your organization may vary according to the type, complexity, and quantity of units that it manufactures. A blank copy of this matrix is provided in the back of the book, as Appendix 1, for your use in coordinating with the functions in your organization and in determining their information needs.

Customer Requirements.

Consumers. As mentioned earlier, individuals who purchase your product for their own use rely on you to provide the necessary service capabilities to keep it operating. This may be as simple as providing a mailing address to which they send the malfunctioning units. It can mean providing detailed maintenance manuals for their private use. Or, it can require the establishment of wholly-owned or franchised/approved service facilities to which they can take their malfunctioning units. For each product, your organization must decide what kind of a service network will be provided; then, it must establish a status accounting system with information sufficient to provide timely and effective service to the customer. Information required to provide adequate service to consumers includes the following:

- Traceability of a model number/top part number to a serial numbered group of units with a specific parts list.
- Traceability of a part number to a specific drawing revision.
- Traceability to a specific manual/section for check out and repair.
- Traceability of a version of a software program to a group of linked modules/units and to a specific customer.

- Traceability of a version of a software program to specific versions of tools and documentation.

- Traceability of a version of software to a model number/top part number of a hardware item.

Other companies. Companies respond to effective service support from their suppliers in much the same way that individuals do. They do not want their product out of service because of lack of support for your item. However, they are also concerned about the repeatability of their product, since multiple configurations increase the size and complexity of their tracking system. Thus, they will consider companies with proven control over the configuration of their products and with a proven service network more favorably than those with just the lowest price. Companies also have to respond to their customers needs for status accounting information, especially when the customer is the DOD. Thus, the organization will usually go to a vendor with a proven information system. In evaluating the magnitude and the comprehensiveness needed for the data base of its status accounting system, your organization should consider the following in addition to the capabilities mentioned above for consumer support:

- Number of different products being offered by your organization.
- Number of subassemblies (most serial numbered) which will need to be separately tracked and/or provided as spare parts.
- Number of software components and/or modules/units which will be tracked.
- Number of versions of software which will be tracked.
- Anticipated volume and rate of change activity.

- Number (order of magnitude) of different customers you expect to deliver products to.

- Percentage of your products which may be used in DOD systems. (See the next paragraph, also.)

Government (DOD) Customers. In most cases, the DOD will plan to buy hardware or software from an organization with the intent of establishing a DOD-supplied (and manned) support system. Therefore, the DOD customer will be more concerned about your organization's ability to provide adequate documentation of the design of the item, adequate instructions and hardware/software to aid his operation and maintenance of the item, and adequate control over the design to assure uniformity of the delivered configuration. In the contract your organization signs, the DOD customer will define exactly what status accounting data and

management capabilities must be provided. However, these requirements will be modified in part by the information system which your organization has in being. Frequently, your DOD customer will request that your proposal (for example, in the CM Plan, in the Software Development Plan, or in the Software CM Plan) include your approach to satisfying the status accounting requirements. This is an opportunity to describe your existing (and perhaps matured) systems and their capabilities, especially in the software area. It is to both parties' advantage if the existing, proven system(s) can be utilized. If your organization plans to deal with the DOD for sales of many of its products (or if it intends to act as a supplier to a prime contractor for DOD systems), it should consider all of the information elements identified in the following chapters in establishing a status accounting system.

CHAPTER 3

DESCRIPTIVE DOCUMENTATION AND IDENTIFICATION NUMBERS

General.

An information/management system should be provided to record the most current versions of the documents which describe the products and the most current identification numbers used to identify (label) the products and their related documentation. The information elements should be incorporated into the system progressively as they are generated or as they are subjected to internal control as a result of a design freeze or a customer baseline. Since there are both top-level requirements documentation schemes (e.g. specifications) and lower-level detail design documentation schemes (e.g. drawings, parts lists, and listings of files containing software) for both hardware and software items, the two must be interrelated to provide adequate traceability. This information should be updated as changes from the baseline configuration are approved, so that the most current descriptive information is the primary information stored. However, where continuing operational use of more than one configuration of a product is approved, the system should identify all differences between the most current configuration and each earlier (but still approved) configuration.

- **Configuration Identification.** The identification number, revision level, and issue date of each of the specifications, data sheets, catalog descriptions, and/or drawings that comprise the baselines for the various products must be recorded. For the remaining life of the product, the numbers must be updated as necessary to reflect the approved configuration(s) being purchased by (or available for order by) the customer. The system should also retain the information about all previous configurations which are still being used by customers in the field. The date of original

establishment of each baseline must also be recorded. DOD also requires the reporting the status of the various design documents which constitute the developmental configuration. These documents later become the product baseline for the software item.

- **Product Data.** When each baseline for a product or one of its major components is established, the design organization must compile a listing of the identification numbers (e.g. part numbers, model numbers, national stock numbers, nomenclature) for the parts and for the documentation that constitute the baseline. These numbers are the unique labels for the items and for the documentation; they constitute a shorthand which will be used for years to describe the items. As changes are approved after the baseline is established, the records of these identification numbers must be updated to reflect the new configuration.

Product Component Indentured Listing.

For each product being marketed by your organization, a listing should be generated and maintained identifying the product by name and model number. The listing should also identify the major assemblies and subassemblies (for software, the major components and modules/units) that comprise the product so that the hierarchical relationship of the various pieces of the product can be understood from the listing. (For products being designed and produced for the DOD, many of the major assemblies and subassemblies are referred to as configuration items or CIs; this designation may also be used for your products to separate out these special assemblies and subassemblies.) This does not mean, however, that the listing must comprehensively list every part that comprises the product. While it is a common industry practice to

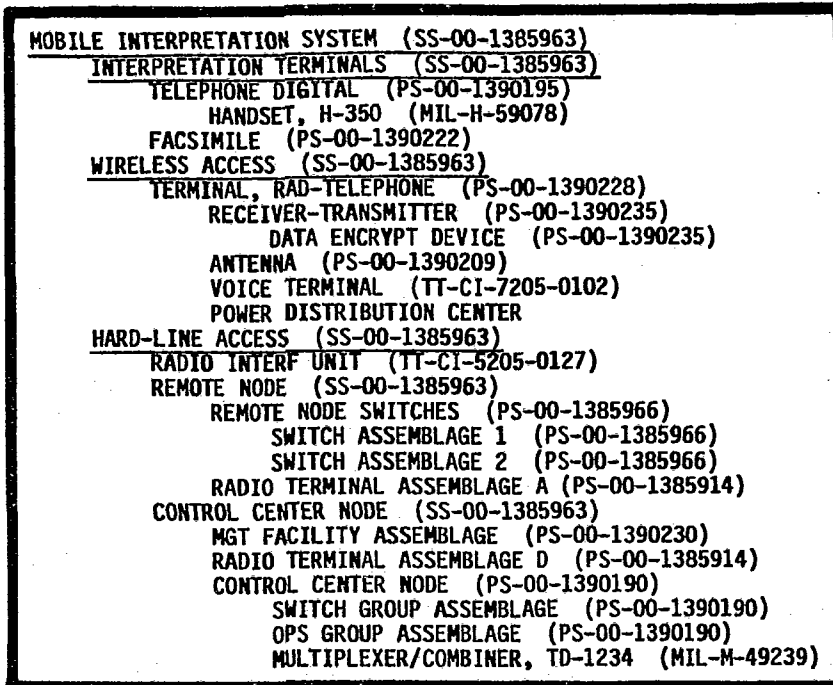


Figure 3-1. Indentured Listing of Product Components

have this kind of a comprehensive capability inherent in the engineering release system data base, it is not necessary to repeat that much very detailed information in this kind of hierarchical listing. On the other hand, the listing should not be limited just to the configuration item assemblies and subassemblies.

Figure 3-1 provides an example of an indentured listing. It shows a partial listing of the major assemblies and subassemblies (including configuration items) for this system. The indentation from left margin indicates level of assembly of that component and thus reflects the hierarchical relationships of the various components. It makes it easy to determine which components are of equal importance to the system as well as to determine the major subassemblies that comprise it. As corollary data, this listing includes a parenthetical reference to the specification (or similar requirements document) for each component; while this is not mandatory data, it provides a ready cross-reference to the documentation that further describes the component. The specification number also gives an indication of which assemblies

are CIs; the highest-level assembly having the same specification number is the configuration item or system.

Hierarchical Diagram of Product Components.

For each product being marketed by your organization, a similar listing could be generated and maintained identifying the major elements of the product in a hierarchical manner. The diagram should identify the major assemblies and subassemblies (for software, the major components and modules/units) that comprise the product so that the hierarchical relationship of the various pieces of the product can be understood from the listing. Such hierarchical diagrams are common for software products; the decomposition and top-down design process common to many software developments lead to this type of presentation. The diagram will normally start with the system or the top-level software (configuration) item, with the breakdown showing lower-level software (configuration) items, top-level software components, and significant lower-level software components; most lower-level components and modules/units are usually not included in the diagram.